



# **FoCal**

**Version 2.0.6**

Auto-Focus Micro-Adjustment Calibration Software

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# 1 Introduction

FoCal is a software utility designed to control a Canon or Nikon DSLR camera and automate the process of choosing the perfect AF Microadjustment/Fine Tune value for the attached lens. FoCal also offers many other features related to quantifying the performance of the autofocus system, lens quality and sensor cleanliness.

## 1.1 Supported Cameras

FoCal supports the following cameras:

### 1.1.1 Canon

- Canon EOS 50D
- Canon EOS 70D
- Canon EOS 7D Mark II\*
- Canon EOS 7D
- Canon EOS 6D
- Canon EOS 5D S and 5D S R
- Canon EOS 5D Mark III\*
- Canon EOS 5D Mark II
- Canon EOS 1D X\*
- Canon EOS-1D Mark IV
- Canon EOS-1Ds Mark III<sup>1</sup>
- Canon EOS-1D Mark III<sup>1</sup>

### 1.1.2 Nikon

- Nikon D810\* (USB2 recommended with this camera)
- Nikon D800 and D800E\* (USB2 recommended with these cameras)
- Nikon D7200\*
- Nikon D7100\*
- Nikon D7000\*
- Nikon D750\*
- Nikon D700\*
- Nikon D610\*
- Nikon D600\*
- Nikon D4s\*
- Nikon D4\*
- Nikon Df\*
- Nikon D300s\*
- Nikon D300\*
- Nikon D3\*
- Nikon D3x\*
- Nikon D3s

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<sup>1</sup> Due to the age of the Canon EOS-1D Mark III and Canon EOS-1Ds Mark III, the Canon SDK does not allow use of Mirror Lockup when controlled from a computer. Therefore Mirror Lockup is not used for any of the tests with these cameras.

Cameras marked with a “\*” operate in a mode where the camera controlled almost completely by the computer, except for one setting: the AF Microadjustment/Fine Tune setting value. When this needs to be changed, the software will inform you. See section 24 for more details of UAM (*User Assisted*) mode.

## 1.2 Supported Computers

Focal can be installed on the following operating systems:

- Windows 7, Windows 8, Windows 8.1 or Windows 10
- Mac OS X 10.9 or OS X 10.10

This manual details the procedures for both Windows and Mac computers and shows screenshots from both operating systems. If there are any areas where the behaviour is different between the operating systems, these will be explained in the manual.

## 1.1 Downloading the Software

You can download the software from the FoCal License Management System which can be reached at `lms.fo-cal.co.uk`.

In order to log in, you will need your registered email address, and your Password as stated in the email received from Reikan on purchase. If you do not have a Password, you can use the password reset option at `lms.fo-cal.co.uk`.

FoCal operates on both Windows and Mac computers. Once logged in to the License Management System you can choose to download and install either.

## 1.2 Installing the Software

### 1.2.1 Windows

The downloaded file is a ZIP file which you must decompress (normally by right-clicking on the file and clicking **Extract All**).

In the file, you will see 3 directories:

- **Documentation** – contains software related documentation
- **Software** – contains the software installation files

**Target Images** – contains the target image file to print

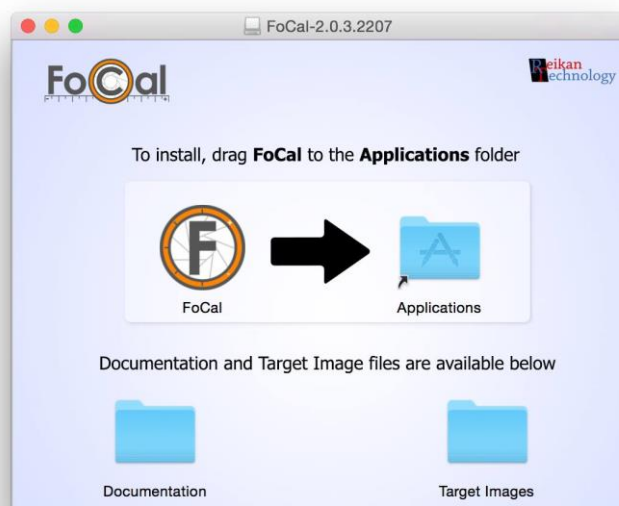
The file in the **Software** directory is supplied as a Windows setup package (MSI). To install, simply execute the `setup.exe` file.

Once installed, the software will appear on the Start menu under **Programs | Reikan | FoCal 2 (Test Release)**.

### 1.2.2 Mac

The downloaded file is a DMG file which you can open from Finder or by clicking on the downloaded file in your internet browser.





To install the application, just drag the FoCal icon to the Applications folder.

The documentation and Target Images are available from within this disk image also.

### 1.3 Camera Connection

You will need to connect the camera to the computer with a USB cable supplied with the camera. You can use a USB extension cable, but keep the maximum total length between the computer and the camera under 5 metres.

If you are using a camera with a USB 3 connector, it is recommended that you either connect to a USB 2 port on the computer, use a USB 2 hub or use a USB 2 extension cable – this will force the computer to use slower USB 2 mode with the camera. This will not affect the overall speed of operation of FoCal but improves reliability under some circumstances.

#### 1.3.1 Verification of Correct Connection

For Canon cameras, If the EOS Utility application (supplied by Canon) can connect to the camera, then FoCal should be able to properly communicate with the camera (but ensure that any Canon software is **not** running when starting FoCal otherwise there will be communication problems).

For Nikon, if the camera appears within Windows Explorer or is indicated as connected by the operating system, then it should work with FoCal.

### 1.4 EOS Utility

If the Canon EOS Utility is running, this will stop FoCal being able to connect to your camera. Since the middle of 2014, EOS Utility can be installed such that it is always running and waits for a camera to be connected. Please ensure that this function is disabled in EOS Utility before using FoCal.

## 2 Calibration Target

In order to determine the correct AF microadjustment values, the software analyses a special calibration target which can be purchased from the FoCal Store (see below), or can be printed using image files included with the software in the downloaded installation package. Note that the software can be made to operate with any image by disabling Target Validation/Optimisation in the settings (so you could for instance use a Spyder LensCal target) but FoCal enables extra features which improve accuracy when used with the special FoCal target.



### 2.1 Hard Targets

You can now purchase plastic Hard Targets from the FoCal store by navigating to:

`store.fo-cal.co.uk`

The Hard Targets are available in 2 sizes, are solid, flat, matt printed and come with sticky pads to attach firmly to a testing surface. Using a Hard Target will give the best results, removing any risk of target movement, creasing or light shining through the target, all of which can affect the analysis results.

FoCal is developed and testing using a Hard Target, so for best results we recommend purchasing and using a FoCal Hard Target.

However, without a Hard Target you can still use FoCal by printing the target file as detailed below:

### 2.2 Printing the Target

The target is designed to cover most general test situations when printed at A4 or US Letter. If you need to calibrate long telephoto lenses, you may wish to print the target at a larger size.

If you print the target at A4 or US Letter size, you will not need to make any adjustments in the software. If you print at a different size, you should measure the length as indicated on the printed target and enter the value into the FoCal settings screen (see section **Error! Reference source not found.**) – this will ensure correct distance measurements between the camera and the target.

#### 2.2.1 Which File?

The target image files are in the *Target Images* directory of the download package. There are 2 targets supplied as both a PDF and a PNG file (so 4 files in total).

**FoCal\_Target** is the target used for all tests *except* the MultiPoint Focus Test.

**FoCal\_MultiFocus\_Target** is the target used *just* for the MultiPoint Focus Test.

Printing using the PDF file will result in the best target print quality as this is a vector graphics file which means it can be scaled and will still keep sharp detail. However, not all PDF viewers allow scaling above the supplied page size, and many external print companies won't accept a PDF for printing.

The PNG file is a bitmap export of the PDF file at 600dpi, and this can be printed up to about 600x900mm without any detrimental effect to the operation of FoCal.

### 2.2.2 Printing the Target

Ideally, the target should be printed on *Matte Heavyweight Paper* with an *Inkjet printer*.

When printing with a laser printer, the toner can be quite reflective and may upset the analysis of the image and result in a less reliable result.

Printing on standard (lightweight) paper will work OK, but there can be some issues with the paper curling over time. Also, when using a smaller macro target at close to 1:1 magnification, fibres on the paper can become a significant part of the image and reduce analysis performance.

### 2.2.3 Target Size

In order for the Target Setup distance calculations to work, you will need to ensure that the target image is printed on a full sheet of A4 or US Letter paper as shown in the “Correct” image above. However, if you are testing a lens where the target size is simply inappropriate (for example a long telephoto lens) you can re-print the target at either a larger or smaller size.

Please bear in mind the following:

- Please use coated printer paper when printing the target at reduced sizes (e.g. heavyweight matte paper) otherwise paper fibres can cause issues with the image analysis.

## 2.3 Positioning the Target

Accurate positioning of the target is checked by the software for this version, and the Target Setup utility can be used to help with and confirm accurate positioning of the target.

The target should be mounted approximately straight and the right way up (the writing will be upright). It should be mounted on an opaque surface, flat, and perpendicular to the camera:

---

Target



Different distances to the target can yield different AF micro adjustment results. Due to the way the autofocus system operates in a camera, a single AF micro adjustment value will almost certainly not provide perfect operation at all distances. Each result obtained at a specific distance is valid for that distance. Ideally, you should calibrate at around the “most used” distance. Canon recommend a

distance of 50x the focal length (e.g. 2.5m for a 50mm lens), but this will only yield a value correct at 50x the focal length, which may not be appropriate for the lens in question (e.g. a macro lens).

It is also worth noting that the AF micro adjust solution may start to move significantly as the test is run close to Minimum Focus Distance (MFD) of the lens, so it is not advisable to run the test with the camera very close to the target.

It is important that the **target does not move during the test** (the software checks for this and alerts you if there is a problem), so the camera should be mounted on a tripod.

To illustrate, correct target positioning is to ensure the CENTRE focus point through the viewfinder is aimed at the central cross of one of the 3 targets on the page (the red rectangle shows where the centre focus point should be):



CORRECT

Ensure the target is not rotated:



**WRONG!**

And that the camera is straight on to the target:



**WRONG!**

## 2.4 Lighting the Target

As the FoCal tests using the target are designed to calibrate or test the performance of the camera and lens AF system as a whole, it is important that the lighting level and quality on the target is appropriate for the test.

The most important factor in lighting the target is consistency of lighting. The following list shows the Do's and Don'ts of target lighting:

- Do use a light level on the target of EV8 (equivalent to 1/30s at f/2.8, ISO100) or above
- It is recommended that you use incandescent lighting (e.g. halogen lights), or even daylight (diffused or direct)
- Use an EVEN light source which does not cast any pattern on the target
- Do NOT use fluorescent lighting or mains powered LED lighting as these can flicker and cause analysis issues
- Do NOT use daylight on a partly cloudy day when clouds are passing over the sun and significantly changing the light level
- Do NOT backlight the target – for example, don't attach it to a window or lightbox to raise the light level.

## 3 Camera Setup

*Please read this section carefully:*

It is important that the camera is correctly configured for the test. The software will check as much as possible, but by setting up correctly you will reduce the incidence of warning messages and stopped tests.

### 3.1 Setup for Canon cameras

- **COVER the eyepiece of the camera!** This is very important as the camera is not being used in a normal mode where your eye and head is usually blocking stray light from entering the viewfinder. Failure to cover the eyepiece may result in bad metering and/or failure to achieve focus during the test.
- For non 1-series Canon cameras, you must ensure the camera is in **Av** mode. Unfortunately, the Canon SDK does not (officially) allow you to change the AE Mode, so the software will not be able to run the test if the not in Av mode.
- For 1-series cameras, you should ensure that the custom functions **do not limit** the choice of AE Mode (ensure A/S/M are allowed), or limit the shutter speed, aperture or ISO range. Failure to observe this requirement may lead to unexpected failure to run tests.
- You must also ensure the AF mode is set to **ONE SHOT**<sup>2</sup> – again, the Canon SDK does not (officially) allow you to change the AF mode. Again, for Nikon this is handled automatically.
- For the Canon 7D, 5D Mark III and 1D X, you should choose the normal single point AF mode (*not* Spot AF) – the software is not able to validate this and the results may be less accurate if you are in the wrong mode.
- If you are using a lens with IS (Image Stabilisation) or equivalent it is recommended that this is switched **off**.
- If you have a lens with a focus limiter (e.g. the Canon 100 f/2.8L IS Macro or the Canon 100-400L IS), please ensure it is set appropriately for the test distance.
- If you are using a battery grip, it is best to remove this as it can cause extra vibration when the camera is mounted on a tripod.
- The minimum light level to run the Fully Automatic test is around an EV of 5 (1/4s at f/2.8, ISO100), but the lighter the environment the more reliable and consistent the AF performance of the camera will be, therefore leading to better results. It is recommended that the light level on the target is around an **EV of 8** (1/30s at f/2.8, ISO100) or above.

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<sup>2</sup> One Shot AF mode is used as it is appropriate for the test. As calibration is of the whole autofocus system, this will improve performance for all autofocus modes.

All other required settings are automatically applied at the appropriate times during the test, and restored when the test completes. When the test is executed, checks are made to ensure the target is correctly positioned and the environment is suitable.

### 3.2 Setup for Nikon Cameras

- **COVER the eyepiece of the camera!** This is very important as the camera is not being used in a normal mode where your eye and head is usually blocking stray light from entering the viewfinder. Failure to cover the eyepiece may result in bad metering and/or failure to achieve focus during the test.
- If available, the camera USB mode in the SETUP menu must be set to PTP/MTP (and NOT Mass Storage) otherwise the camera will not correctly communicate with the computer and FoCal will not be able to open the camera.
- The Live View mode in the SHOOTING menu should be set to **Tripod** if available (rather than hand-held). This is an important setting to ensure correct operation of tests.
- Check that the focus area in Live View is “Normal” (not face detect etc), and the focus mode is AF-S.
- You must also ensure the AF mode is set to “AF-S” (for single AF mode).
- Ensure AF Fine Tune adjustment is ON (on the camera *SETUP* menu in the *AF Fine Tune* option, ensure *AF Fine Tune On/Off* is set to “ON”).
- If you are using a lens with VR (Vibration Reduction) or equivalent this should be switched **off**.
- If you have a lens with a focus distance limiter switch please ensure it is set appropriately for the test distance.
- If you are using a battery grip, it is best to remove this as it can cause extra vibration when the camera is mounted on a tripod.
- The minimum light level to run the Fully Automatic test is around an EV of 5 (1/4s at f/2.8, ISO100), but the lighter the environment the more reliable and consistent the AF performance of the camera will be, therefore leading to better results. It is recommended that the light level on the target is around an **EV of 8** (1/30s at f/2.8, ISO100) or above.

All other required settings are automatically applied at the appropriate times during the test, and restored when the test completes. When the test is executed, checks are made to ensure the target is correctly positioned and the environment is suitable.

### 3.3 Battery Level

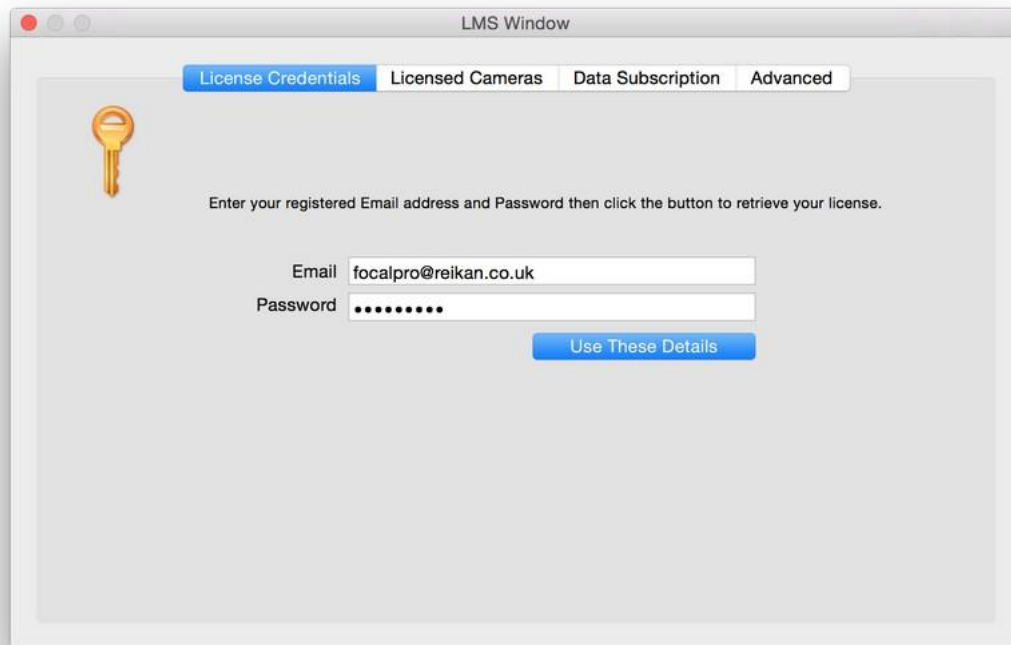
Each test in FoCal either takes shots or uses the Live View capability of the camera, and when the battery level drops below a certain amount the camera can reject requests for certain power-hungry functionality.



Therefore, FoCal will warn if the camera is below 25% battery and give a critical warning if the camera is below 10% battery. You should replace or recharge the battery if either of these warnings are shown to ensure reliable operation.

## 4 Stating Up

When you first start a brand new install of FoCal, you will need to enter your license credentials. This is the same information you used to log in to the LMS in order to download FoCal in the first place.



Enter your email address and password into the boxes then click the *Use These Details* button. Your license will be applied to FoCal and the software will exit.

From now on, FoCal will start without requesting any license details.

### 4.1 Adding a camera to your license

You can add a camera to your license by simply connecting the camera to your computer and hitting the *Connect* button. FoCal will then offer to license the camera if it is not already licensed. Note that you will need an internet connection to add a camera to your license.

### 4.2 File Mode Licensing

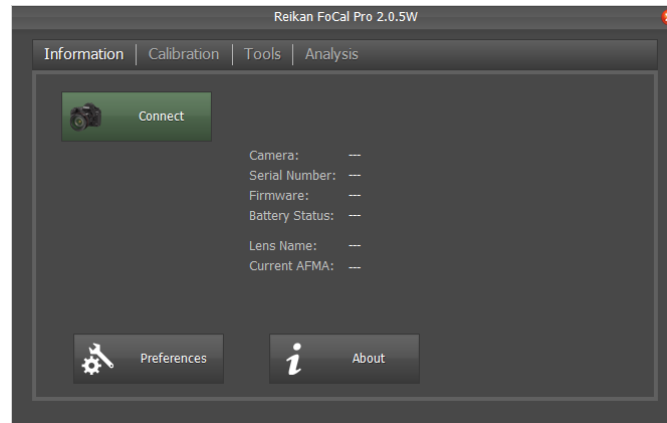
The new File Mode feature in FoCal (see section 18) is not tied to individual camera bodies, but will require that your current computer is added to the license. This is automatically handled within FoCal the first time you use a test in File Mode.

## 5 Main FoCal Window

The main FoCal 2 window is now organised into a number of tab pages.

### 5.1 Information

The information page shows you details about the camera that is currently connected to the software. To start using a camera, you must connect the camera via USB to the computer using the cable supplied with the camera, ensure the camera is switched on and then click *Connect*.



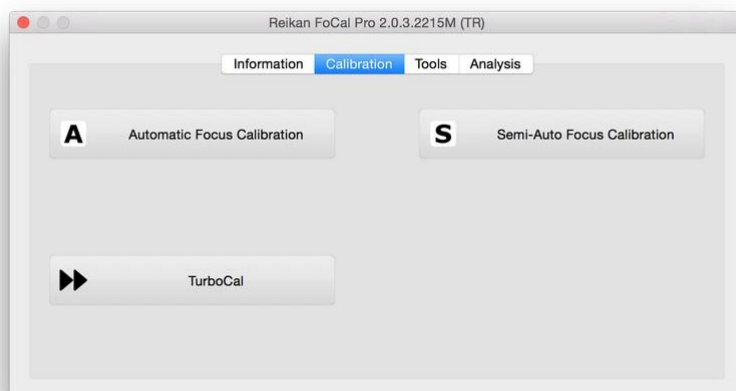
This page also allows you to access the software settings and get information about the software, including your license and subscription information.



**For certain cameras, the Body ID may be shown as *Pending*. This means that the Body ID will be determined during the testing.**

## 5.2 Calibration

The Calibration page shows you options available to calibrate your camera autofocus system.



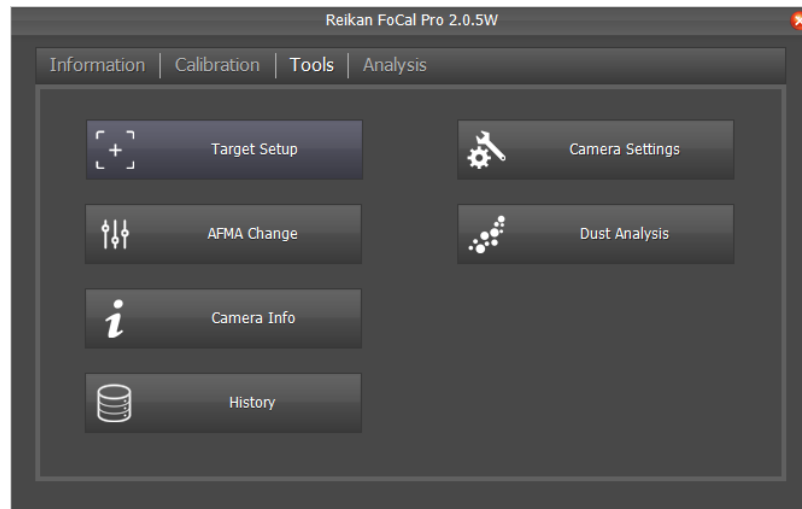
Option	Shortcut	Description
Automatic Focus Calibration	CTRL+F	Fully automated calibration of AF Microadjustment / Fine Tune  See section 11 for further information.
Semi-Auto Focus Calibration	CTRL+S	You control the shots, FoCal reports the quality and you can make your own adjustments to investigate and get the best from your focus system.
TurboCal	CTRL+Q	A rapid test based on focus confirmation



Note that *Manual Mode* has been removed in FoCal 2, as the functionality has been superseded by the much more powerful File Mode capabilities of the Automatic Focus Calibration, Aperture Sharpness and Focus Consistency tests (see section 18 for more details).

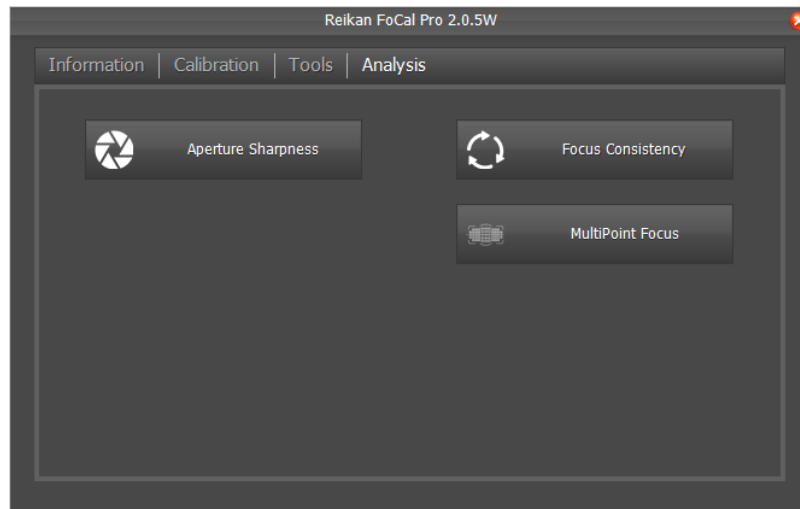
## 5.3 Tools

The Tools page has quick access to useful utilities.



Option	Shortcut	Description
Target Setup	CTRL+T	Video-assisted setup of the target positions See section 8 for further information.
Cal Check	CTRL+K	Disabled in this version
AFMA Change		Change the camera AF Microadjustment / Fine Tune setting
Camera Settings		Save / Restore camera settings
Camera Info		Get information about the camera
Dust Analysis	CTRL+D	Analyse the sensor for dust
History	CTRL+H	View previous test results See section 17 for further information.

## 5.4 Analysis



Option	Shortcut	Description
Aperture Sharpness	CTRL+A	View information about your camera and lens across the full aperture range  See section <b>Error! Reference source not found.</b> for urther information.
AF Consistency	CTRL+C	See information about the repeatability of the focus for your camera and lens  See section 0 for further information.
MultiPoint Focus	CTRL+M	See how individual focus points compare with each other

## 6 Common Test Features

This section describes common features of FoCal that appear in most tests.

### 6.1 Keyboard Shortcuts

You can access the Settings window from within any test window (when the test is not running) by hitting the “,” key on the keyboard.

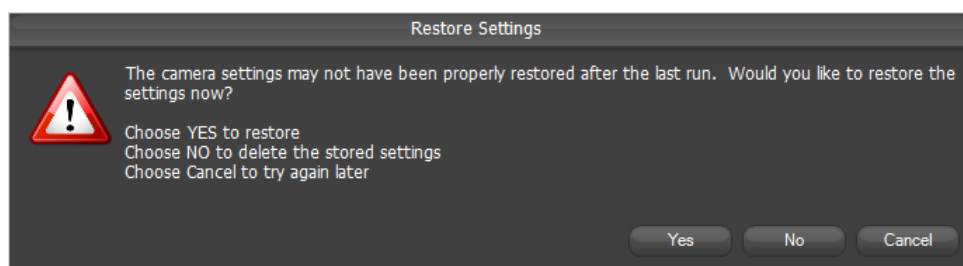
From the main window, you can start many functions with the following keys:

Key	Operation
CTRL+T	Target Setup Utility
CTRL+F	Fully Automatic AF Microadjustment Calibration
CTRL+S	Semi-Automatic AF Microadjustment Calibration
CTRL+C	Autofocus Consistency Test
CTRL+A	Aperture Sharpness Test
CTRL+D	Dust Analysis Test
CTRL+Q	Quick AF Microadjustment Calibration
CTRL+M	MultiPoint Focus Test
CTRL+U	Manual Mode

### 6.2 Storing and Restoring Camera Settings

When a test is run, several of the camera settings are modified (e.g. aperture, shutter speed etc). Before the test is run, these settings are written to a file on the computer, and when the test is complete they are restored.

If for any reason, the software does *not* restore the camera settings (e.g. there is a problem during execution or the software has to be terminated), then when the application starts the *next* time, it will show the following dialog:



If you choose *Yes*, the settings will be restored as long as the camera serial number matches. If the camera has been changed, the software will not write the settings to the new camera but will inform you of the change, along with the serial number of the camera for which the settings are stored.

If you choose *No* the settings will be deleted and you will have to manually restore the camera (see section 25).

If you choose *Cancel* the settings will remain in the system until you run a new test, at which point they will be overwritten with the current camera settings.

## 6.3 Target Setup

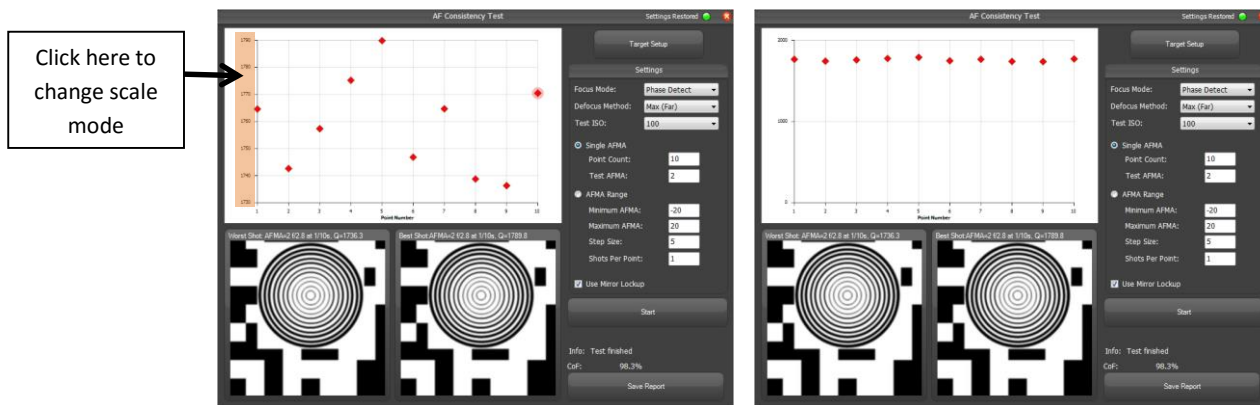
Tests which require the target to be set up correctly will offer the Target Setup utility from a button on the Test window. The Target Setup utility is simple to use, but it's worth reading section 7 to familiarise yourself with how the utility operates.

## 6.4 Changing the Chart Scale

By clicking on the y-axis numbers of any chart, the scale will change between the following modes:

- *Scaled for Data* – the data will take up most of the height of the chart to give a good view of the relative values of the data points. The chart scale will usually not start from 0.
- *Scaled from 0* – the chart will start at 0, giving a better view of the absolute values of the data.

The images below show the same data viewed in the two different modes. On the left is the *Scaled for Data* view, and on the right is the *Scaled from 0* view:



## 6.5 Ignoring Data Points

Several tests (currently the Fully Automatic test, AF Consistency and Manual Mode) offer the ability to ignore selected data points when computing a final result by right-clicking on the points in the chart.



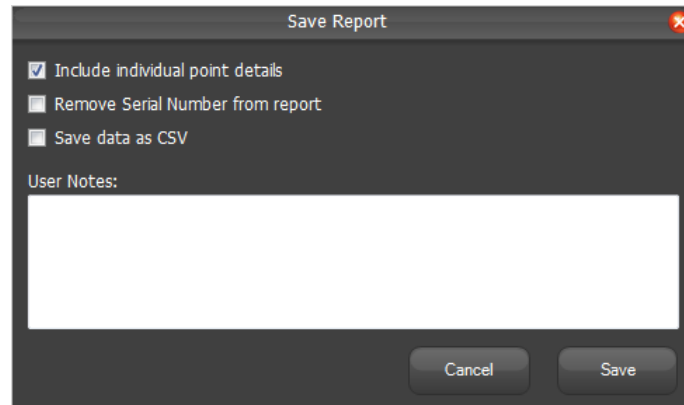
The prediction algorithm does require a both a fair number of points and a good spread of data across the AF microadjustment range to work properly. If too many points are removed, the prediction can become poor and this will be visually obvious.



## 6.6 Saving Reports (FoCal Pro)

When the test is complete, you can click *Save Report*. This will display the Report Options sheet, where you can choose to:

- Include individual point details (uncheck this to create a short summary report)
- Remove the serial number (so you can share the report without any identifiable camera details in included)
- Add you own notes to the report
- Save a CSV file of the test data (not supported for all tests)



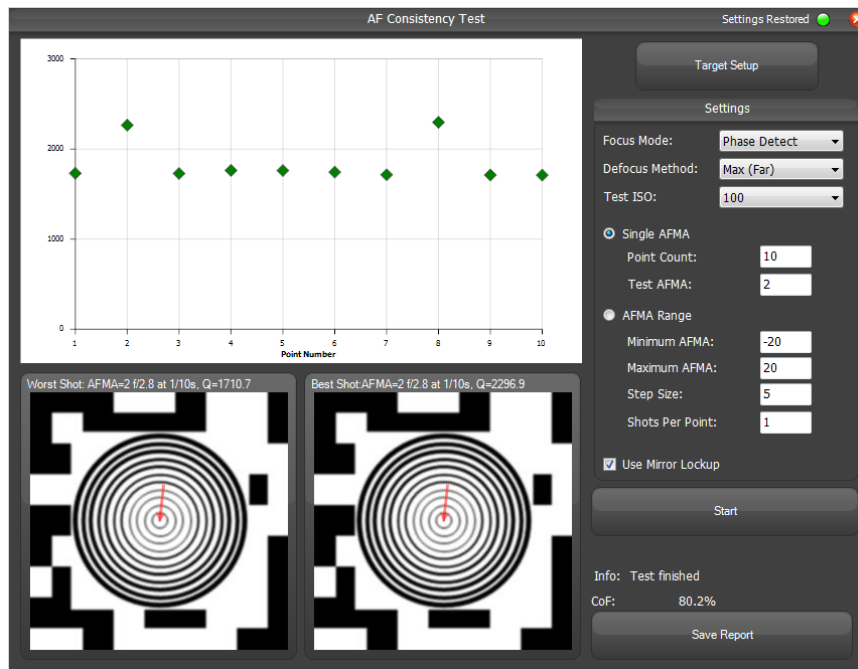
When you have entered any details you wish into the Report Options sheet, you can click *Save* to choose a filename and save the report.

## 6.7 Target Optimisation

With Target Optimisation activated, FoCal will shift the part of the image that is analysed by a small amount to compensate for any movement of the camera - you can think of it as similar to Image Stabilisation, trying to keep the analysed image stable in the presence of movement. This can be especially important during MSC mode tests where you will have to change settings on the camera and there is a movement risk.

In FoCal 1.5, the Target Optimisation algorithm has been significantly reworked and now actually uses 3 different methods in combination to determine the best position for the analysis area under greatly varying test conditions.

When Target Optimisation is enabled, any chart points will be shown in **green**, and the analysed images will have a small arrow on showing how the analysis region has been moved, as shown in the image below:



If the camera is moved slightly during test shots, Target Optimisation will slightly shift the analysis region and you will see the size and direction of the arrow change. Theoretically, the image should stay identically placed across testing, but there may well be movement of a few pixels if you scan across the images. This will not have a big bearing on the results, and will make the final result much more reliable than if Target Optimisation is not used in the presence of movement.

If you are confident that the tripod, camera and target are absolutely solid and there is no chance of movement, it is advisable to keep Target Optimisation switched OFF.

You can enable/disable Target Optimisation from the settings screen (see section 26.2.5)

## 7 FoCal RGB Analysis

### 7.1 Overview

A new analysis method has been introduced in FoCal 1.9.5 called RGB Analysis - this new analysis method brings a much more consistent result under differing environmental conditions, and also takes into account significantly more information to arrive at a single Quality of Focus result.

### 7.2 How does FoCal's RGB Analysis work?

The new *Quality of Focus* (QoF) result in FoCal is a combination of 6 different measurements: horizontal and vertical sharpness in the 3 colour channels – red, green, and blue.

It is best to use the new RGB Analysis feature with raw images – by default, this is the configuration that FoCal will adopt. A new raw processing algorithm performs minimal processing on the raw sensor data, keeping the red, green and blue channels isolated. Analysing a JPEG image will not truly reflect the results at the image sensor as the demosaicing algorithm will merge information from all 3 channels, as well as applying non-linear transforms for gamma correction etc.

#### 7.2.1 RGB Results and Spectral Content

The values are combined based on the amount of each colour that is in the analysed image – so if, for example, you analyse under tungsten lighting then the red component of the image will have more weight on the overall QoF value. In this way you may find a slight difference in the analysis results when you calibrate in different environments.

In FoCal Plus and FoCal Pro, you can see the results from the independent channels, which can give an idea of the amount of axial chromatic aberration exhibited by a lens (this is where light of different colours is focused at different planes – in front and behind the sensor – resulting in blurring of individual colour channels).

#### 7.2.2 Horizontal and Vertical Results

Analysing in both horizontal and vertical directions gives the possibility to identify various issues which can affect image quality. The Astigmatism Factor result shown in FoCal is calculated as follows:

$$\frac{\max(QoF_h, QoF_v)}{\min(QoF_h, QoF_v)} * 100 \quad \text{if } (QoF_v > QoF_h), \text{ result is negative}$$

Where  $QoF_h$  is the horizontal combined QoF (of all 3 colour channels), and  
 $QoF_v$  is the vertical combined QoF (of all 3 colour channels)

In simple terms, the astigmatism factor is positive if the horizontal analysis result is sharper than the vertical analysis result.

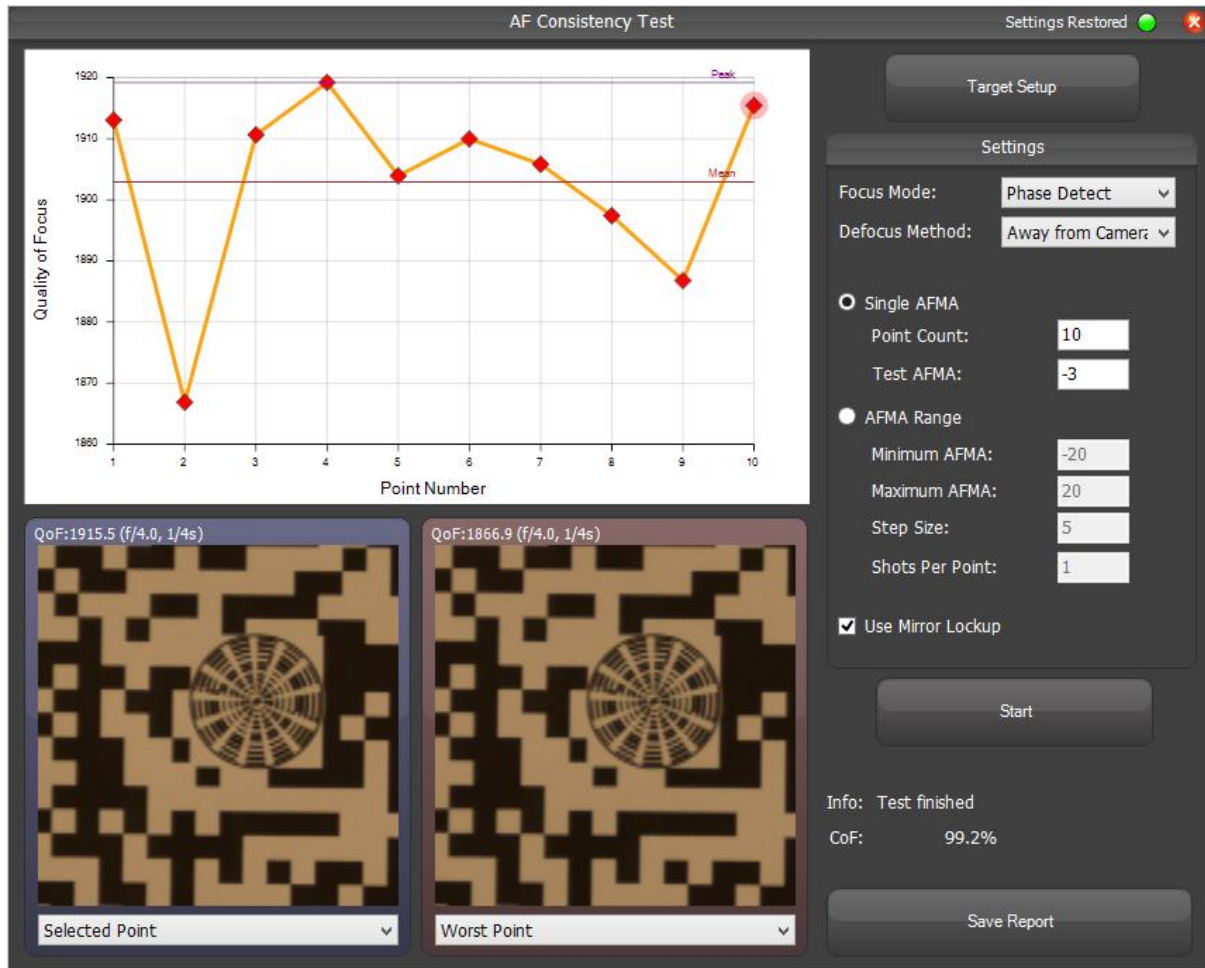
In FoCal Pro, the combined result is shown in the generated PDF report as the mid value of astigmatism factor and the range (e.g.  $5.2\% \pm 0.6\%$ ).

Mirror vibration is typically in a vertical plane and variable during a test, so if you find a result where the variation (“±”) value is high (typically greater than 5%) then your setup may be experiencing some vibration.

Lens defects (e.g. misaligned lens elements) can produce a fixed astigmatism factor difference with very little variation. As an example, if you have a results that is  $14\% \pm 0.8\%$  (so a high mid value and low variation value) then the lens may require a service.

### 7.3 Display the RGB Analysis Results

By default, FoCal will enable RGB Analysis but will not show the results within the application:



In order to enable the RGB Analysis results, you can either:

- Select the *Show RGB Analysis Data* in the Pro tab of the Settings window
- Hit CTRL+S with the test window open to enable/disable the RGB Analysis Data display.

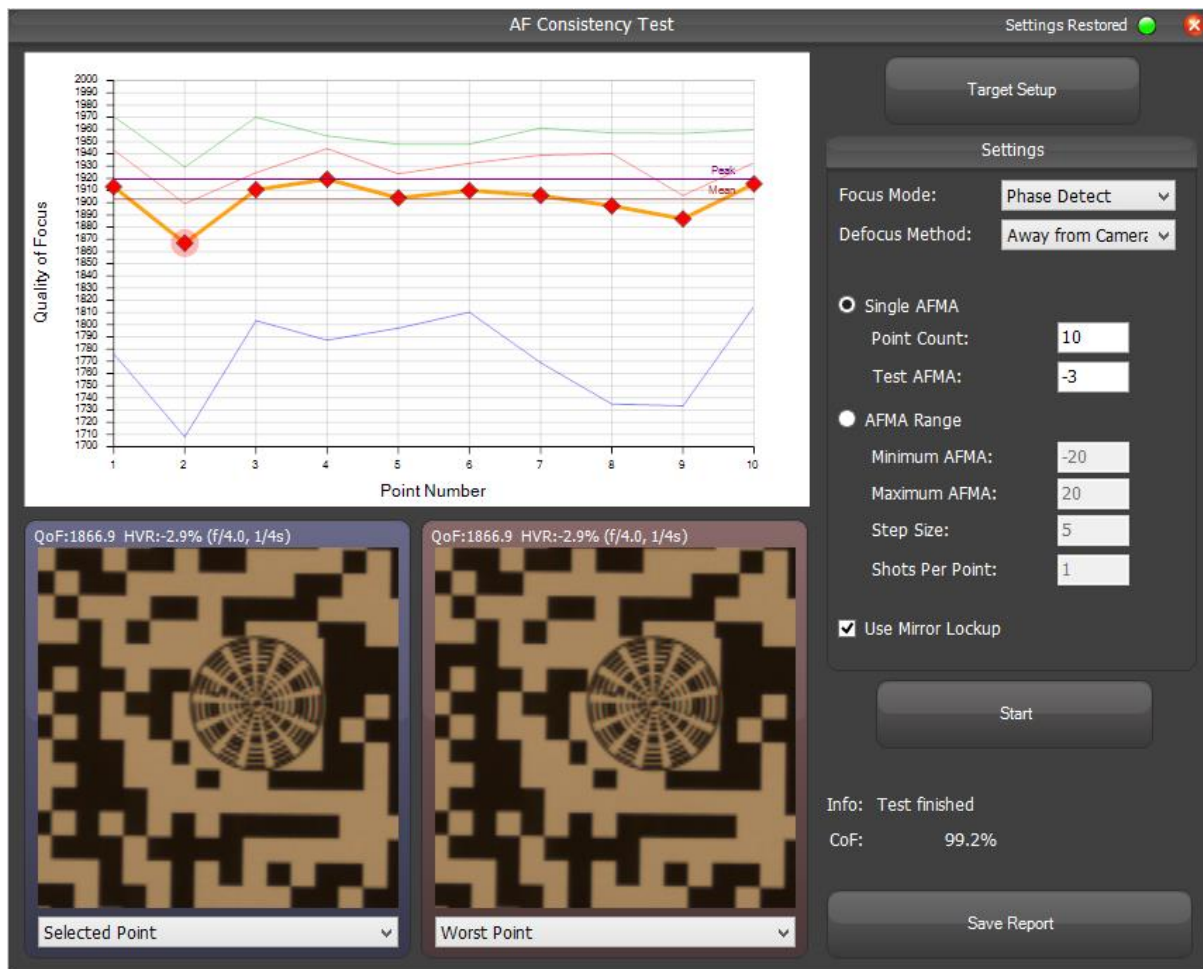
#### 7.3.1 RGB Analysis Data Display

The RGB Analysis Data consists addition *chart* and *panel* information.

On the chart, 3 extra lines are shown – red, green and blue in their appropriate colours. The orange line shows the combined (spectral weighted) result of all 3 channels and both orientations (horizontal and vertical).

The panel text (above the 100% view images) will indicate the Atigmatism Factor (sometimes labelled HVR).

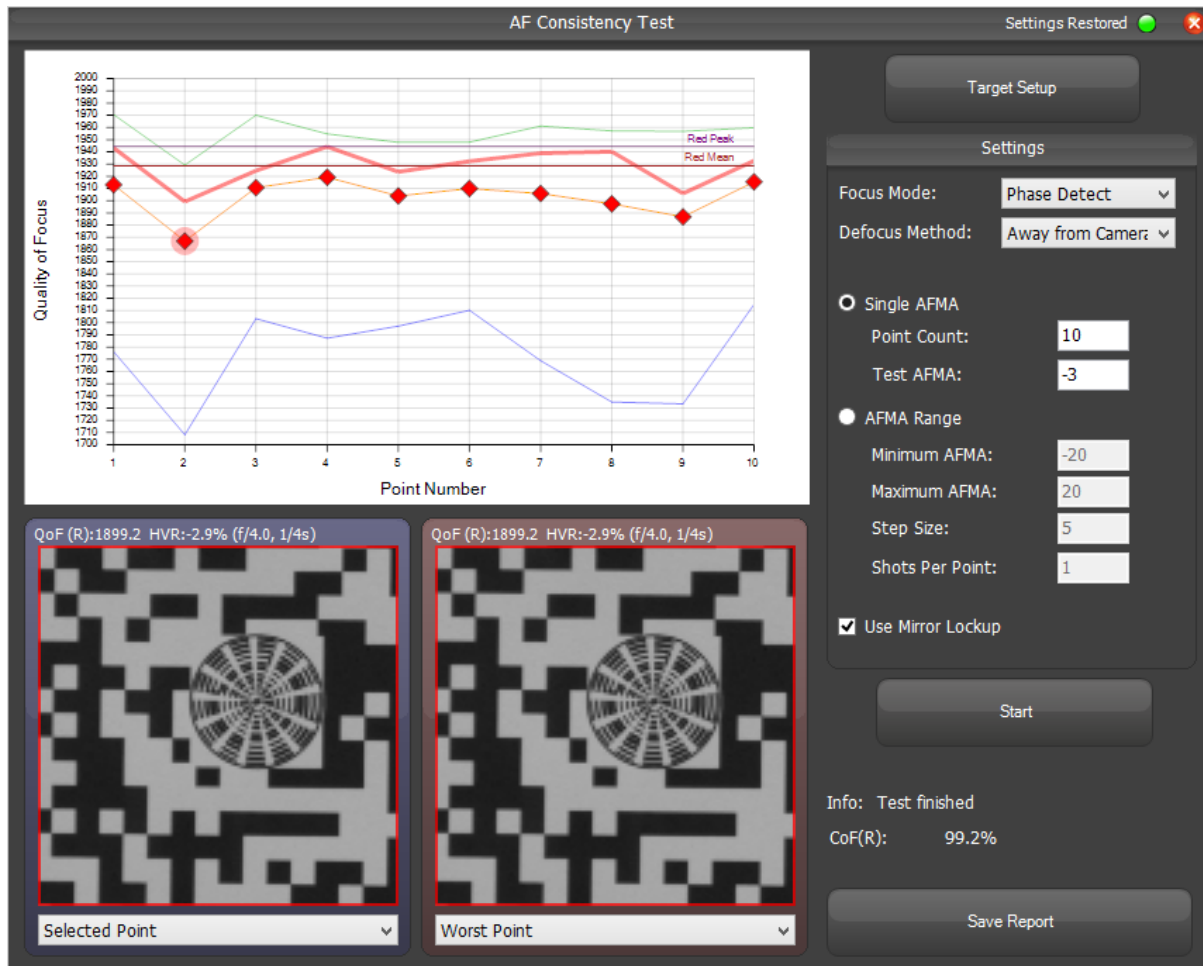
By default, *all* channel information will be selected – so the QoF result will be the combined QoF of all 3 colour channels:



### 7.3.2 Single Colour Channel

Using the following keys, information about a single channel can be shown:

- CTRL + R – show **red** channel information
- CTRL + G – show **green** channel information
- CTRL + B – show **blue** channel information
- CTRL + A – show all channel information (combined RGB – this is the default)



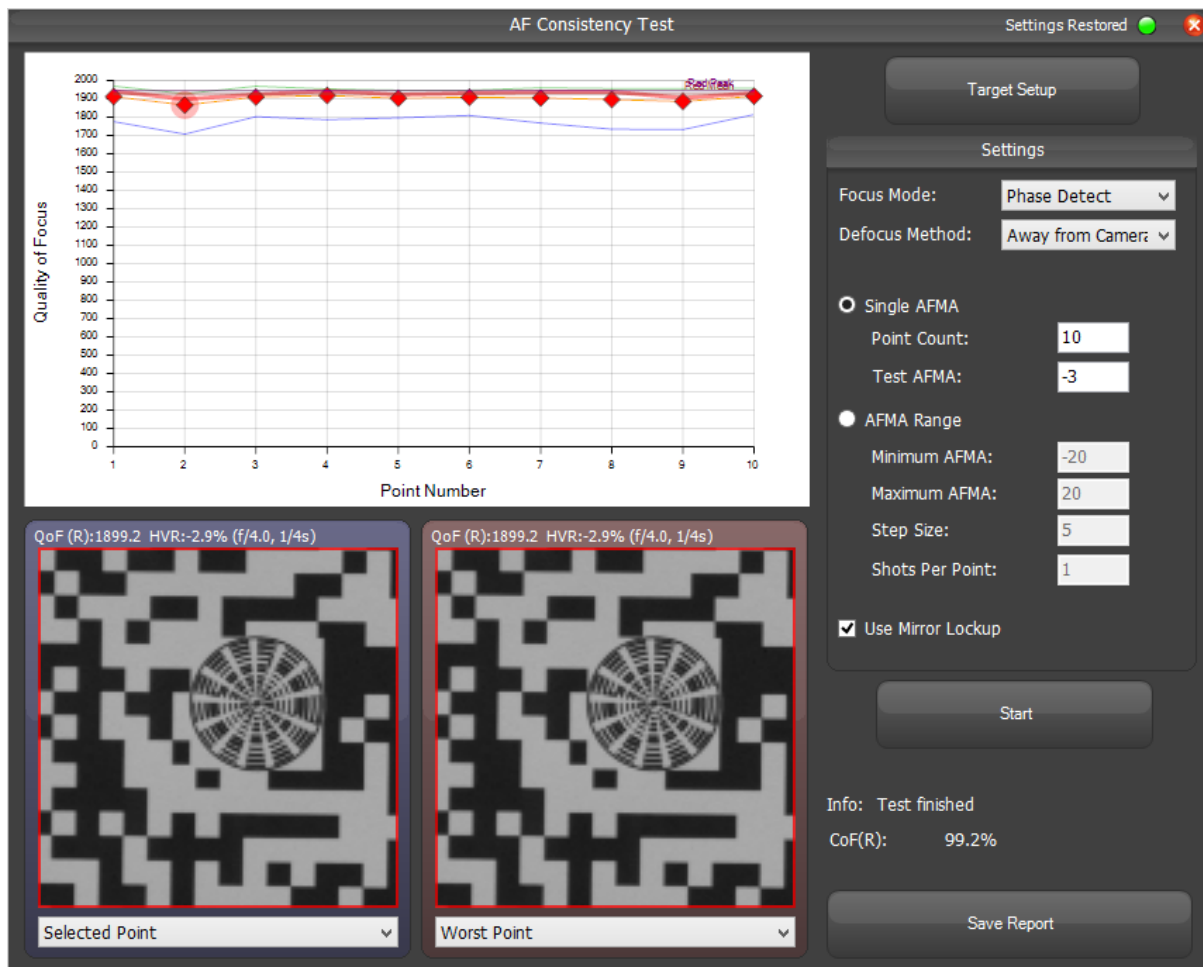
When a single channel is selected, the following changes occurs:

- The appropriate colour channel line on the chart is shown thicker
- The image in the panels shows a border of the appropriate colour
- The image in the panels will appear in greyscale showing the captured brightness of the single channel
- The QoF indication in the panel text shows the single channel QoF value, and indicates the channel (e.g. "(R)" above).

### 7.4 Chart Scaling

The new RGB Analysis method gives a much more consistent result than the previous analysis used in FoCal, so you may be surprised if you see a chart that spans a large amount of the vertical range of the chart (e.g. the image shown in section 7.3). However, remember that the charts are auto-scaling

to show the details of the data, and if you click the y-axis numbers (as explained in section 6.4) you can show the data as an absolute level which will give a more natural view of the results:



## 7.5 Keyboard Shortcuts

As explained above, the following keyboard shortcuts can be used to control the RGB Data Display in the test windows:

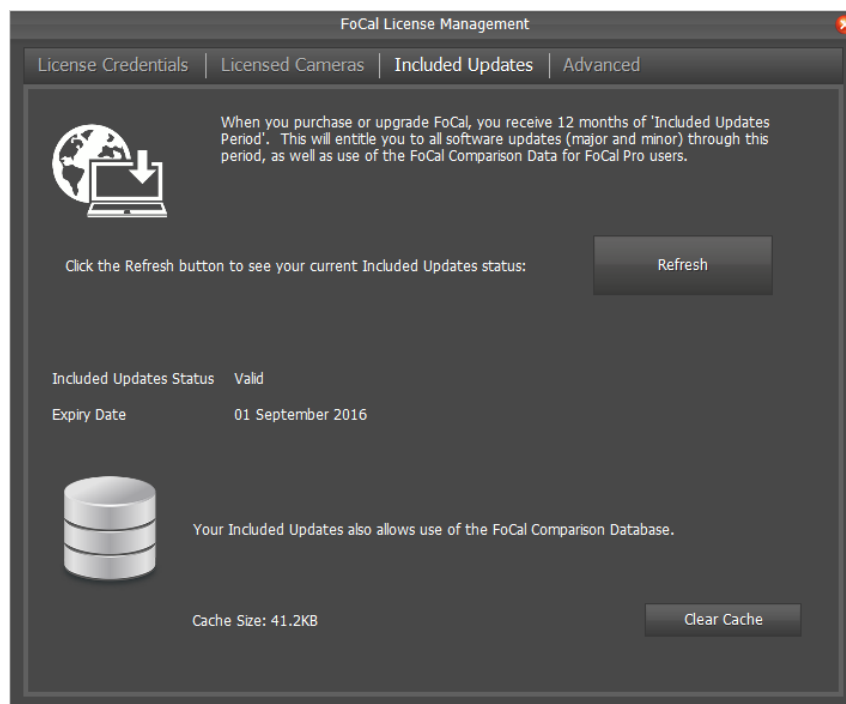
Key	Action
CTRL+S	Show/Hide RGB Analysis Data
CTRL+A	Select all colours (default view)
CTRL+R	Select just red channel
CTRL+G	Select just green channel
CTRL+B	Select just blue channel

## 8 FoCal Comparison Data

Over a number of years we have collected hundreds of thousands of test results to build profiles for thousands of combinations of cameras and lenses and in FoCal 2 we can now give this information back to you as a FoCal user to allow comparison of *your* equipment against the typical behaviour of other users with the same camera/lens combination.

FoCal Comparison Data is available to FoCal Pro users only who are within their Included Updates Period. When you purchase FoCal, you get 12 months of Included Update Periods which gives you all software updates during this time as well as access to the FoCal Comparison Data.

You can check the status of your Included Updates Period by clicking the *About* button on the main window, then the *License* button and choosing the *Included Updates* tab. When this is opened, hit *Refresh* to get the latest status.



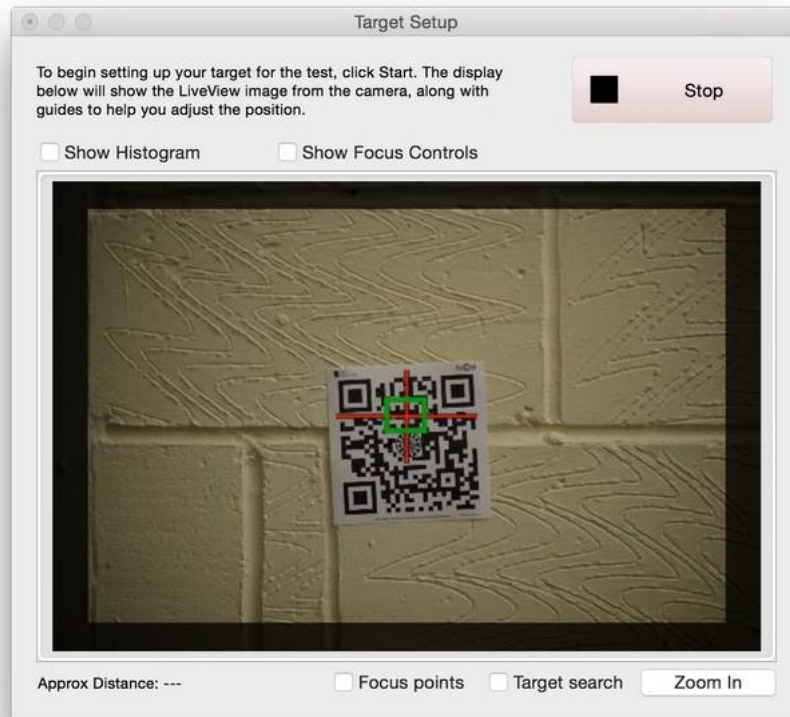
If your Included Updates Period has expired, you can purchase another 12 months through the License Management System at [lms.fo-cal.co.uk](http://lms.fo-cal.co.uk).



## 9 Target Setup

The Target Setup utility in FoCal 2 behaves similarly to FoCal 1 except for offering useful features for optimising manual focus before certain tests.

Open the utility by clicking the Target Setup button on the main FoCal window, then start the Live View display by clicking the *Start* button in the test.

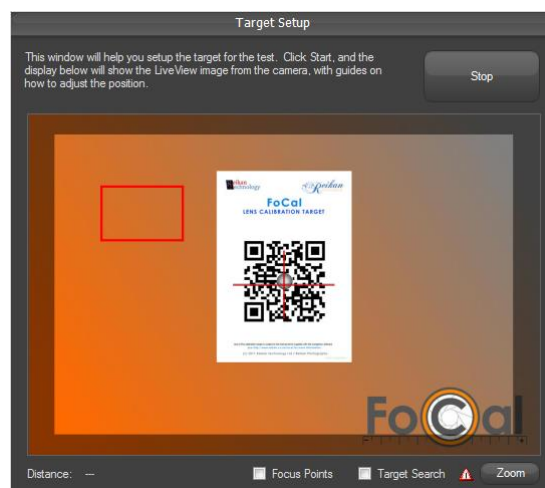


### A note about Live View Zoom (for Target Setup and Semi Auto test):

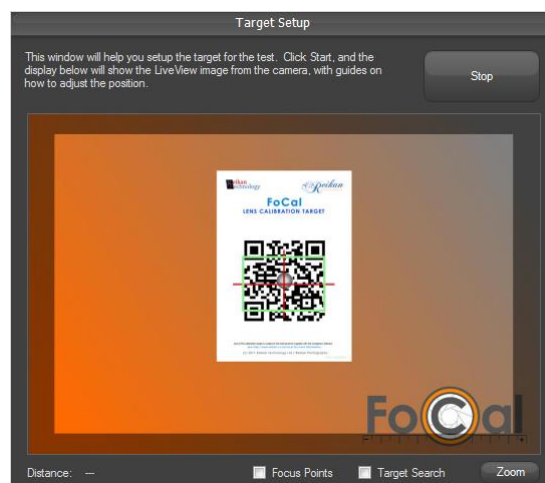
The **Zoom** button allows the LiveView image to be zoomed and returned to normal. **Note that the zoomed view will be of the current position of the Zoom Rectangle on the camera** – this means if you have previously been zooming off-centre, the display in FoCal will be incorrect. The zoom rectangle will be shown in the Live View image in Target Setup if supported by the camera.

**For Canon Cameras:** To ensure the correct zoom position, enable Live View (this can be done during the Target Setup test on the camera by pressing the normal button on the camera to enable LiveView), and press the joystick controller on the camera – this will centre the zoom rectangle on the centre of the screen.

The following image shows the zoom rectangle off centre, indicated by the red rectangle to the left of the target. A warning icon will also be shown by the Zoom button:



This image shows correct zoom rectangle setup, indicated by the green rectangle centred on the cross-hairs in the middle of the image, and no warning icon by the zoom button:



You should start by visually aligning the target with the centre of the crosshairs.

Clicking **Target Search** will start the target detection. This is a computationally intensive operation, and you will notice some delay in the LiveView image updates when this is running. If you are running on a slow computer, you should adjust very slowly to check confirmation.

When the Target Search is running, indicators will be shown on the screen, similar to this:



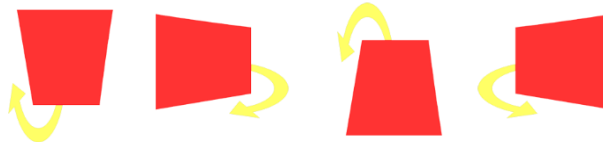
If the target is detected it will be outlined in red. In the centre of the image will be an icon indicating what needs to happen to correctly position the target. The icons have the following meaning:

### 9.1.1 Target Alignment Icons

*The target should be moved in the direction of the arrow:*



*The target is not parallel to the sensor and needs to be moved as shown:*



*The target needs to be rotated to be straight:*



*No target is found:*



*The target is in the correct position:*



You should move the camera and/or target as appropriate to ensure the green tick icon is displayed. You are now ready for running tests.

### 9.1.2 Things to note about Target Search

The target detection routine is very computationally intensive. It is optimised for small changes in the position once a target is found, but is slowest when there is no target on the screen.

You should ensure the target is in approximately the right position before enabling target search.

If you find the responsiveness too slow to successfully move the camera and get updates, you can un-tick the Target Search box, move as indicated and re-enable to check the position.

Note that the target search **only operated with the special FoCal target**, so if you are using a different target you should **not** enable the option.

## 9.2 Target Detection

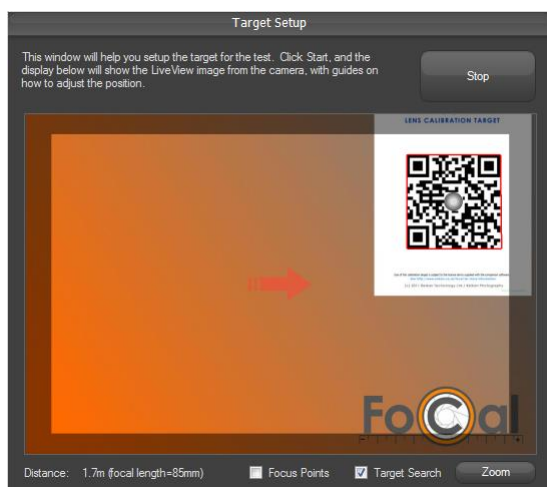
When FoCal detects the target, it is the coded black-and-white square section of the target (shown below) that is used by the software:



This whole black-and-white coded area is detected.

In order for the Target Setup utility to work (and other features that use Target Detection, for example the Target Validation and Target Optimisation options), the image captured from the camera must contain the **complete** coded area shown above within the guides of the utility (approximately 90% of width and height of the image).

The following images show examples of when the target will be detected and when it will not (these are Target Setup examples):



The grey guide around the edge of the LiveView images shows the extent to which the target can be detected. If the *whole* coded area is clear of the outer guides, it will still be detected as shown in this image.

The overlay marker shows which way to move the camera to correct the setup.



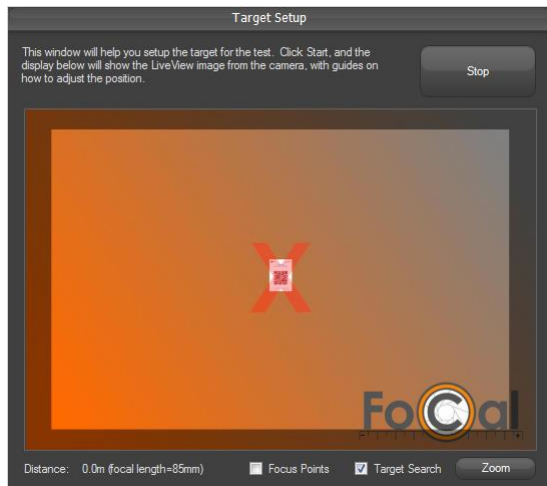
Again, this target is detected as the coded area is completely within the central section.



But when zoomed, not all of the target can be seen so it is no longer detected.



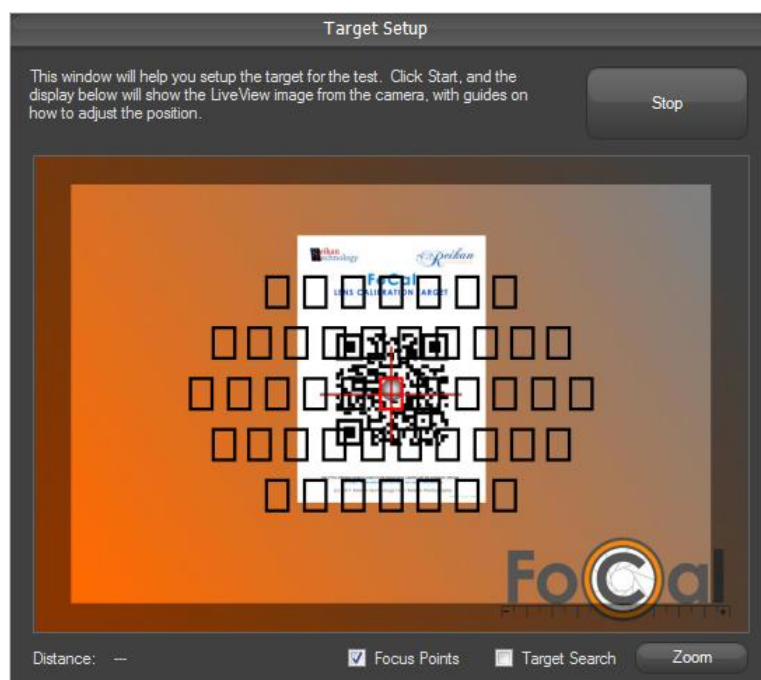
Again, although this target is a good size, the coded area crosses the guides and is not completely within the detection region so it cannot be detected.



Finally, if the target is too small in the image, it will not be detected. If this is the case, either move the camera closer to the target or use a bigger printed target.

### 9.3 Focus Points

From FoCal 1.5, you can use non-centre focus points with both Canon and Nikon cameras. You can display the Focus Points from the camera on the Live View image by clicking the *Focus Points* check box at the bottom of the window. The currently selected focus point is indicated with a red square:



Note that no focus points are displayed when the image is zoomed.

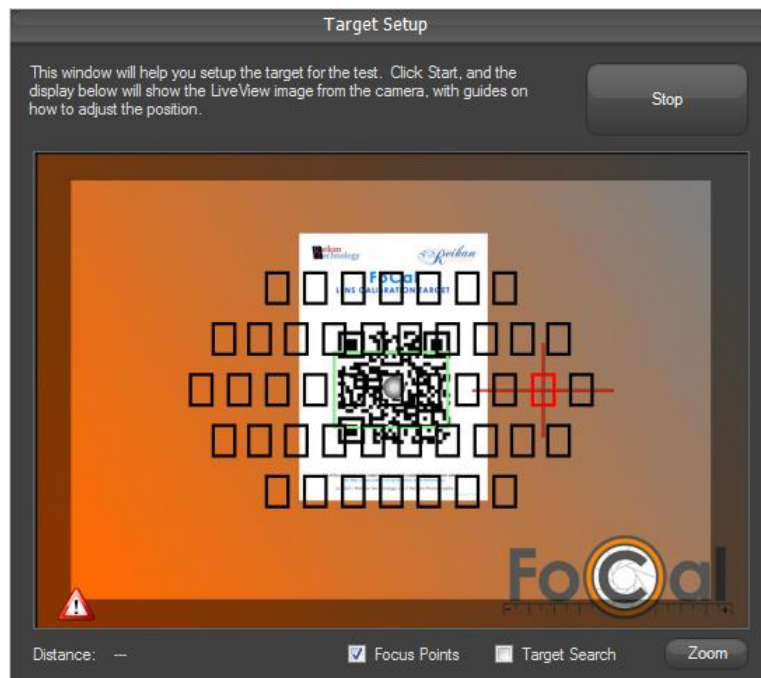
#### 9.3.1 Changing the Focus Point

With FoCal Pro, you can change the focus point used for the analysis (see section 26.3.7). When this feature is enabled, by clicking on a selectable focus point you will be able to select it.

As you move over the focus points, they will be highlighted in yellow. Note that although *all* focus points are highlighted in yellow as you move over them, you cannot necessarily select all the points – it depends on the mode the camera is in. In the example above (which shows the focus point

arrangement for the Canon EOS-1D Mark IV) in certain modes only the inner or outer focus points are selectable. If you click on a point which is not selectable, it will not highlight in red and the focus point will not change.

As using an off-centre focus point is an advanced feature that can have a serious impact on the results, a warning indicator will be shown on the bottom left of the Live View screen if this is selected:



### 9.3.2 Target Search with off-centre focus points

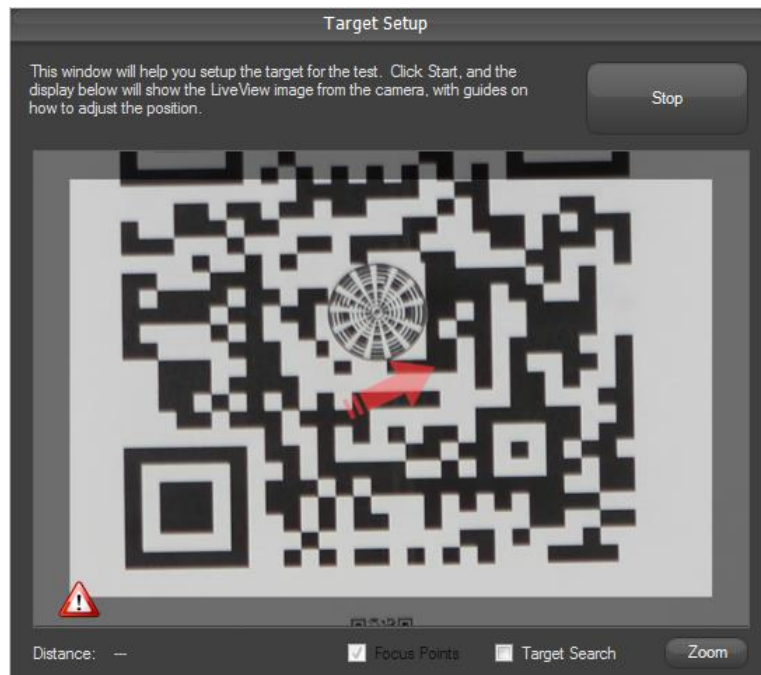
When an off centre focus point is selected, the cross-hair indicating the centre of the analysis region for tests will move as indicated in the image above. Clicking **Target Search** will fade the focus points and indicated how the camera should be moved in order to align the target.



### 9.3.3 Target Search while zoomed (Canon)

In zoom mode on Canon cameras, the image shown in FoCal is the contents of the zoom rectangle on the LiveView screen of the camera, and this may NOT be covering the appropriate point in the image to display the crosshair.

If this is the case, the Target Setup image will show an arrow which indicates how the LiveView zoom rectangle should be moved:

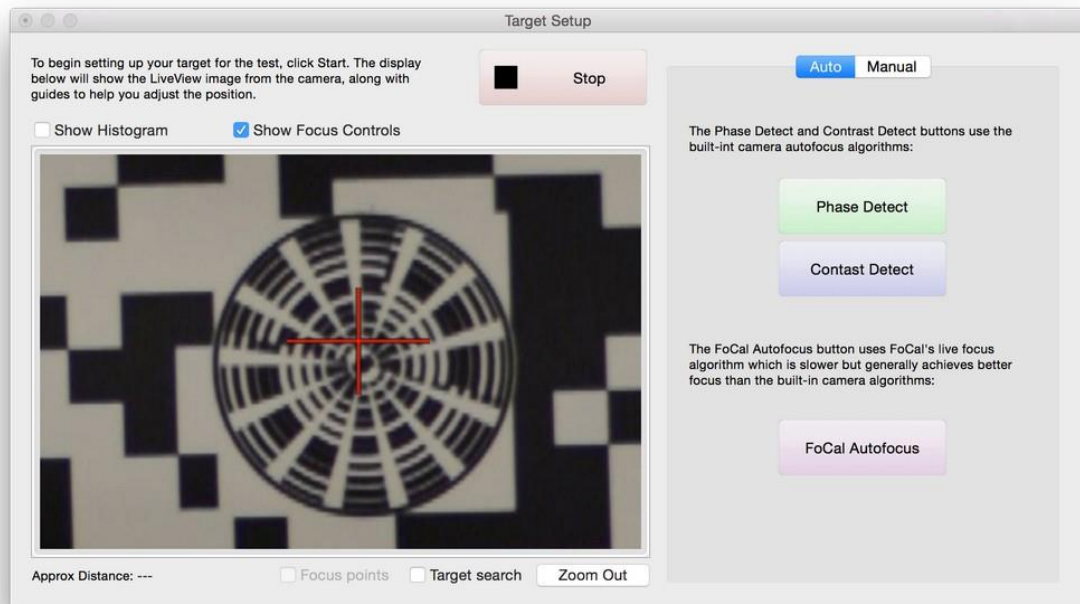


To move the zoom rectangle on Canon cameras, simply enable LiveView on the camera by pressing the appropriate button (this *can* be done while the Target Setup utility is running), and use the joystick on the camera to move the zoom rectangle. The Target Setup utility image will change as you move, and the crosshairs will come into view when you are in the appropriate position.

You should then move the camera on the tripod to align the centre of the target with the crosshairs.

## 9.4 Focus Controls

Clicking the *Show Focus Control* tick box opens the Focus Controls panel which offers features to obtain accurate focus before running certain tests (e.g. Aperture Sharpness test).



### 9.4.1 Auto Tab

The Focus Controls are now divided into 2 tabs – Auto and Manual.

The Auto tab (which can be selected at any time with the “M” key) shows the autofocus controls – Phase Detect, Contrast Detect and FoCal Autofocus.

Clicking any of these buttons will trigger the appropriate focusing operation. You can also use the following keys:

P	Focus using the camera’s Phase Detect system.
C	Focus using the camera’s Contrast Detect system.
L	Use the FoCal Autofocus algorithm to focus the lens.

#### 9.4.1.1 Phase Detect Autofocus

This will trigger a Phase Detect autofocus operation using the camera’s standard algorithm. The mirror will drop and a standard “quick” autofocus operation happens, then you will see the LiveView image again once the operation is complete.

#### 9.4.1.2 Contrast Detect Autofocus

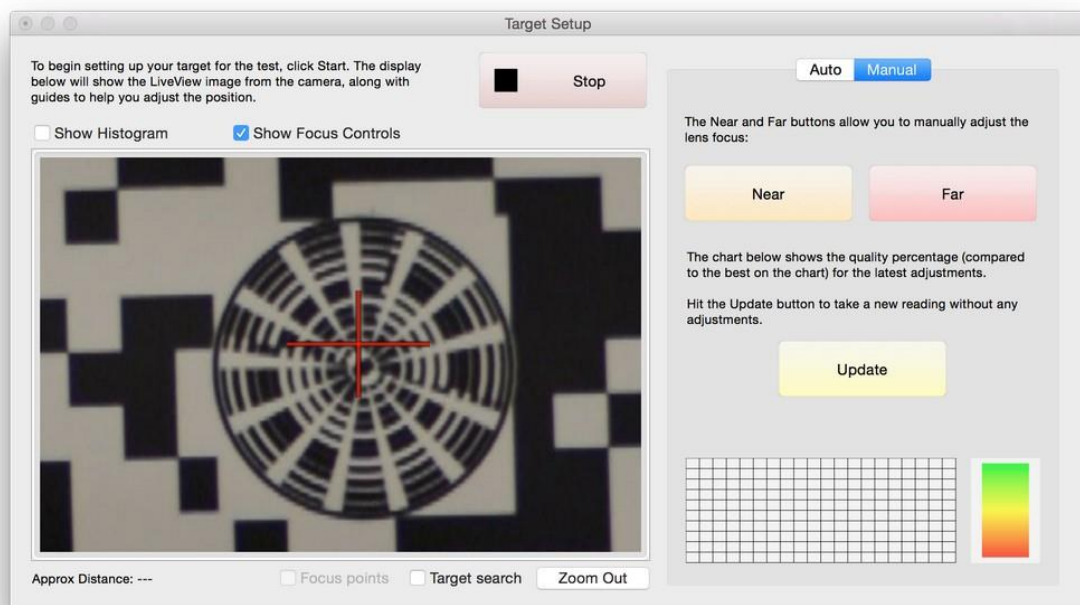
This will trigger a Contrast Detect – also known as “Live” – autofocus operation using the camera’s standard algorithm. The LiveView image will stop updating during the focus operation, and will continue again when the focus operation is complete.

### 9.4.1.3 FoCal Autofocus

The *FoCal Autofocus* button will trigger an algorithm built in to FoCal. This typically takes about 5-10 seconds to achieve focus, but will almost always be better than the camera's standard Phase Detect or Contrast Detect autofocus algorithms.

### 9.4.2 Manual Tab

The Manual tab offers the ability to manually adjust the focus of the lens using the *Near* and *Far* buttons. It also displays the focus quality of the previous 20 focus operations (including any autofocus operations):



You can move the focus point nearer to the camera with the *Near* button, or farther from the camera with the *Far* button. You can also use the following keys:

,	Move the focus point nearer to the camera.
.	Move the focus point farther from the camera.

#### 9.4.2.1 Near / Far Focus

If you want to adjust the focus a little, you can use the Near and Far buttons to move the focus point in either direction, and see the results immediately on the LiveView image.



Note that for older **Nikon** cameras, you must ensure that Tripod is selected in the SHOOTING menu Live View mode if this option is available. You should also ensure that focus mode *in Live View* is AF-S and normal focus Area.

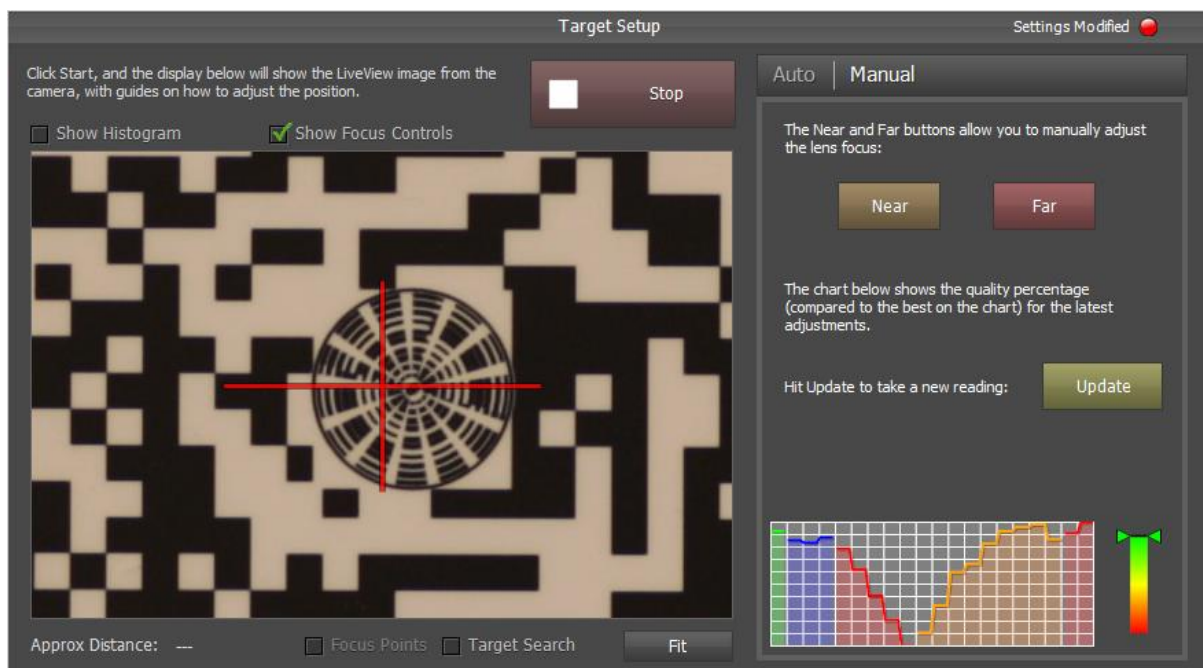
### 9.4.2.2 Focus Quality Indication

The Focus Quality Indicator comprises the chart and quality indicator displayed at the bottom of the *Manual* tab.

Each time a focus operation is complete, a new reading of the quality is taken from the Live View images and displayed on the chart, colour coded depending on the operation that produced the result:

Green	Phase Detect autofocus
Blue	Contrast Detect autofocus
Purple	FoCal autofocus
Orange	Manual <i>Near</i> focus shift
Red	Manual <i>Far</i> focus shift
Yellow	No adjustment – just add a new reading from the current image ( <i>Update</i> button)

The example below shows a typical use case:



The green bar shows an initial Phase Detect autofocus operation (press “P”), then the blue bars show the results from 3 consecutive Contrast Detect operations (press “C”). To get a proper measure of these values, a number of *Far* focus operations were performed (the red area on the chart, from pressing “.”) and the quality can be seen to drop. Then the *Near* focus operation was used (press “,”) to improve the quality in the orange area until the quality just started dropping again. With a final tweak of focus back to *Far* (the final red area) we can be sure we’ve got the best focus quality.

The current value is also expressed with the vertical quality indicator on the bottom right of the window – when the markers are in the green area at the top of the bar, this indicates that the current quality is close to or equal to the maximum value of all the values captured on the graph.

With results as shown above, we can quickly and easily be confident of having achieved very close to the best possible focus achievable by this camera/lens combination.

## 10 Semi-Automatic Autofocus Microadjustment

### 10.1 Overview

The Semi-Automatic Autofocus Micro adjustment Test allows you to quickly and easily compare the performance of the camera and lens at various micro adjustment values. You are in control of the settings, but there's no need to keep changing camera menu items – all this is done for you.

#### 10.1.1 User Assisted Mode (UAM)

With certain cameras, AF Microadjustment/Fine Tune cannot be changed from the computer, so you will be prompted to manually change the setting on the camera. See section 17 for further details.

### 10.2 Running the Test

To start the Semi-Automatic Autofocus Micro adjustment Test, click the appropriate button in the Tests panel. The following window will open:



## 10.3 The Semi Automatic Test Window

The components of the Semi Automatic Test window are detailed below.



### 10.3.1 AF Image

The image on the left of the screen shows the LiveView capture immediately after a phase-detect AF operation has been performed.

Underneath the left image are controls for phase-detect autofocus. Clicking the **Focus** button will trigger an AF operation. **AFMA Near** and **AFMA Far** will adjust the microadjustment value one point in each direction, or bigger changes can be done with the slider underneath.

### 10.3.2 Comparison Image (AF Image | LiveView)

The right image is a composite image with a left and right side, and a slider bar than can be moved to show more or less of one image.

On the left side is a copy of the static *AF Image* (described above), and on the right side is the live *LiveView image*. Immediately after an AF operation (performed by clicking the **Focus** button), both the left and right images will be the same.

Underneath are two buttons (**Focus Near** and **Focus Far**) for adjusting the lens focus while the LiveView image is shown in the smallest possible increment. There are 2 very important things to note about this small increment:

- First, it is in no way related to an AF microadjustment change. It may be larger, it may be smaller, and it depends on the lens that is attached.
- Second, the change is not necessarily the same in both directions – therefore clicking once **Focus Near** and then once **Focus Far** cannot be assumed to put you back in the same position.

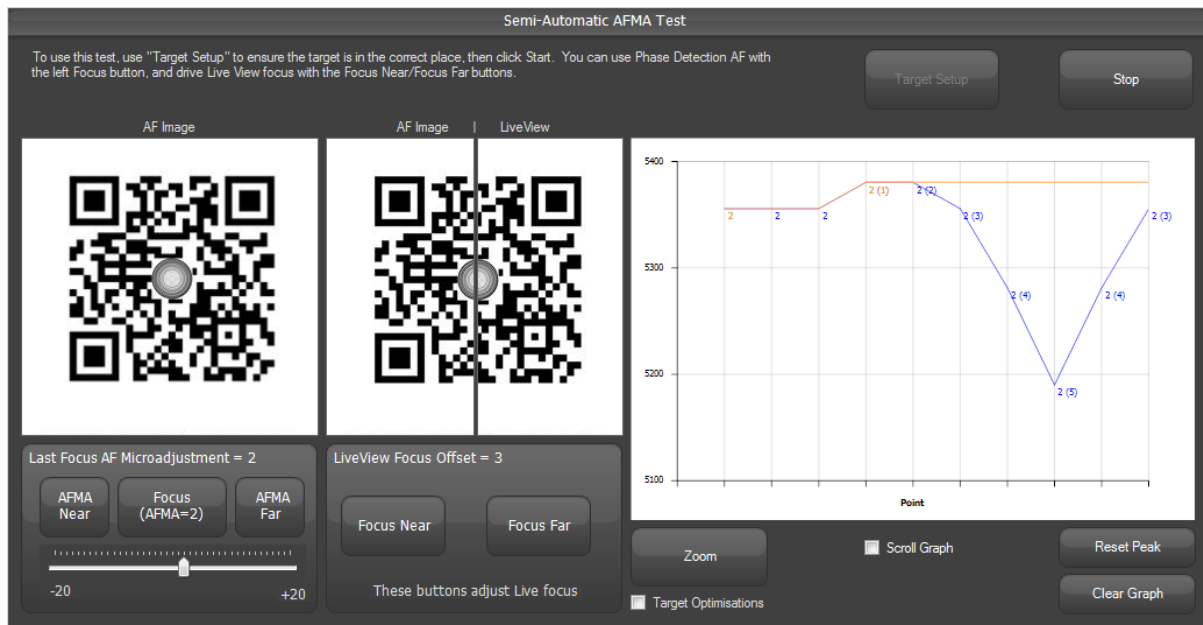
A full explanation of the testing strategy is given below.



### 10.3.3 Indicator Graph

On the right side of the window is the indicator graph. This shows a measure of the sharpness of the image on the right side of the *Comparison Image*.

Each time an operation is performed, a marker is added to the graph to show what happened at that point:





Clicking **Clear Graph** will clear all information from the graph and start again.

#### 10.3.4 Zoom/Fit Button

The Zoom/Fit button will zoom the LiveView image which will usually allow better determination of sharpness. Note that when clicked, it will only affect the live image (the right side of the *Comparison Image*) until a new **Focus** operation is performed, and then all images will be updated.

#### 10.3.5 Target Optimisation

The **Target Optimisation** checkbox (Pro version only) uses knowledge about the target to make minor adjustments to the analysed image and allow better determination of sharpness.

### 10.4 Suggested Testing Strategy

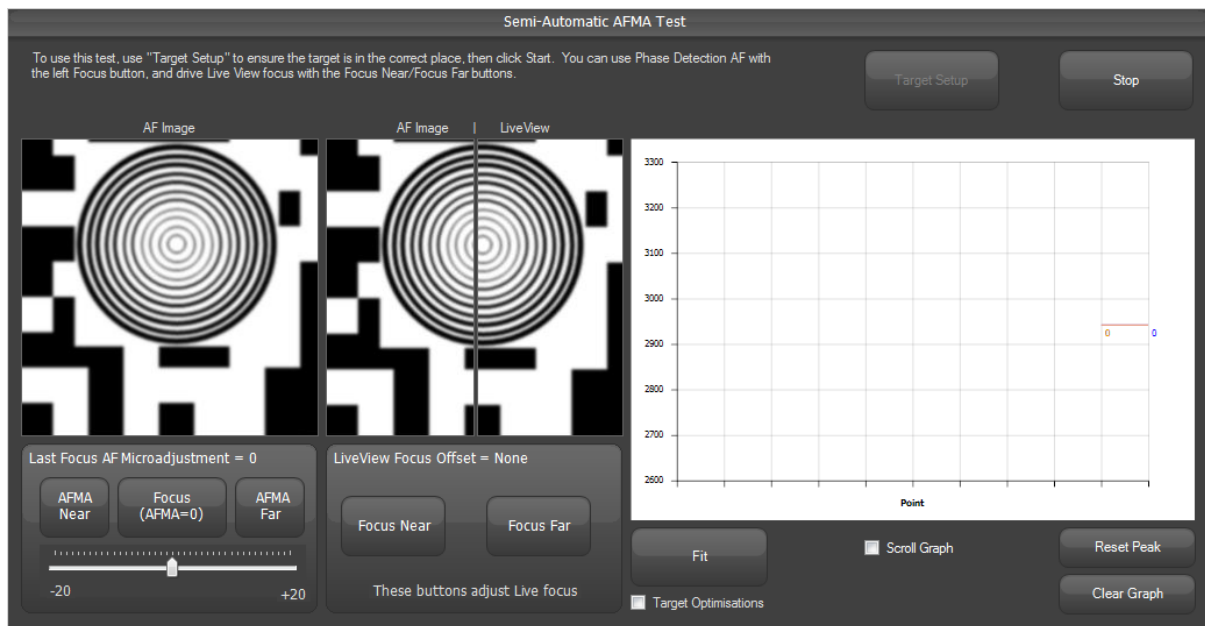
The basic usage of the Semi-Automatic test is as follows:

1. Click **Focus** to focus on the target and get data about the quality at that AFMA value.
2. Using the **Focus Near** button, slightly shift the focus and see if the quality improves (both visually by looking at the left and right side of the *Comparison Image*, and by looking at the data point on the graph).
3. If clicking **Focus Near** button improves the result, shift the AFMA value by clicking the **AFMA Near** button (next to **Focus**).
4. If, however, the **Focus Near** button made the image quality worse, refocus (click **Focus**) and retry from step 2 with the **Focus Far** button.
5. Keep repeating until the chosen AFMA value cannot be made better by using either **Focus Near** or **Focus Far** buttons. You have now found the optimum value, and this can be programmed into the camera using the camera menu after the test.

### 10.4.1 Example

The following series of screenshots show an example of determining the AFMA value for a lens.

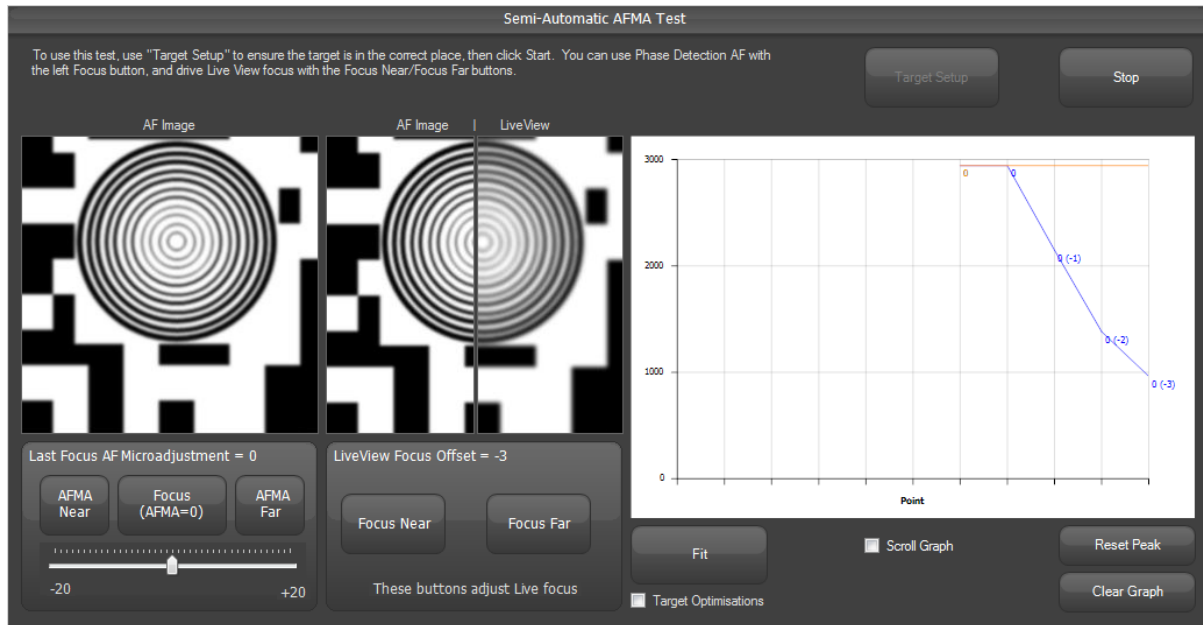
#### 10.4.1.1 Initial Focus



It is generally advisable to click the **Zoom** button in order to get the best detail from the LiveView images. You will need to ensure the tripod you are using is sturdy and there is no vibration of the camera during the test.

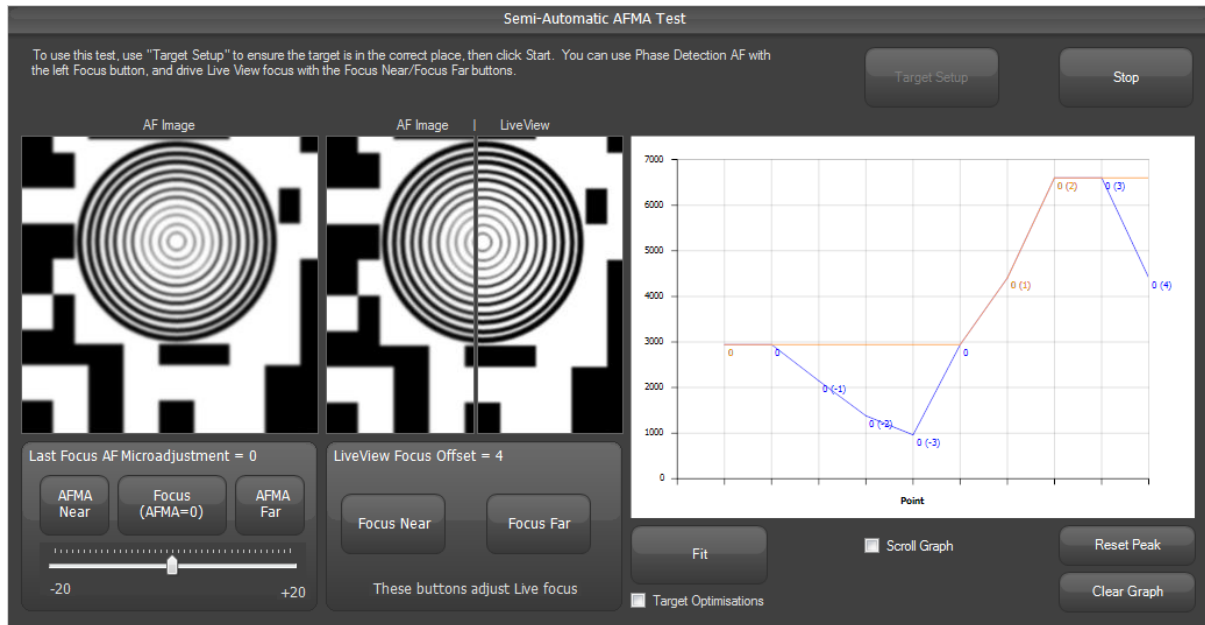
First, with the current AFMA value of 0, the **Focus** button is clicked. The camera focuses, and the indicator on the graph ("0") shows no change in quality (note that this is simulated data, so there is likely to be a bit of movement on the graph for real data).

### 10.4.1.2 See if focussing nearer is better



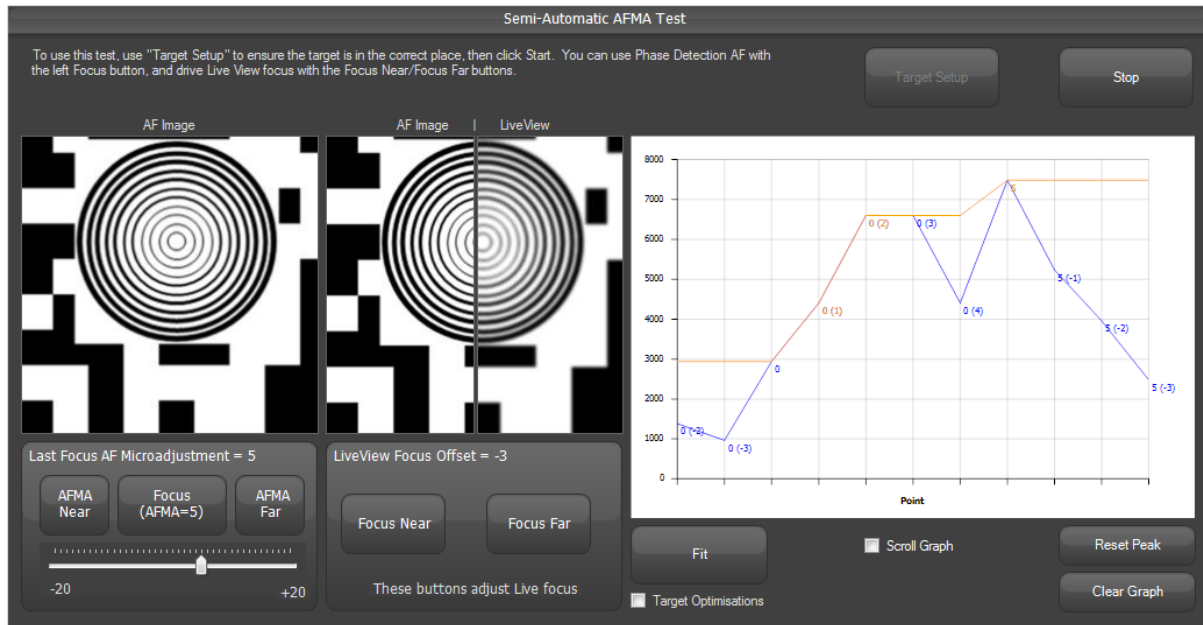
Clicking the **Focus Near** button a few times shows the quality of the image degrading – you can see this visually from the right side of the comparison image (it gets less sharp), and the blue line on the chart drops away from the current peak (orange line).

### 10.4.1.3 See if focussing further away gets better



Re-focusing (click **Focus**), and trying in the other direction by clicking **Focus Far** shows an improvement in quality. The blue line pushes the orange peak line up the graph until the 4<sup>th</sup> click of the **Focus Far** button, where the blue line start dropping. This indicates that the perfect focus point is somewhere in the “far” half of the AFMA scale, and as it took a few clicks of the **Focus Far** button to reach it, a guess would be a few AFMA steps.

#### 10.4.1.4 Try a new AFMA value



Clicking **AFMA Far** a few times (in this case, setting AFMA to +5), the **Focus** button is then clicked to refocus.

The point on the graph labelled “5” shows the point where the AF was finished, and indicates that the quality is around the peak line achieved from the previous tests.

Clicking **Focus Near** a few times shows a degradation in quality, indicating we are now moving away from the best image quality. To confirm the setting, refocus (click **Focus**), and try **Focus Far** – if the AFMA setting is correct, you should see degradation in this graph as well.

### 10.5 Points to Note

It is important to realise that the sharpness value indicated in the graph is heavily dependent on light level. The camera should be used with Exposure Simulation **disabled**, but this can lead to slight steps in the brightness of the image when the external lighting changes.

Ideally, you should run the test under fixed bright lights (not fluorescent or LED lights as these flicker and can affect the results).

This test will also show the performance of the AF system of the camera. Under good lighting conditions, you would expect multiple clicks of the **Focus** button to yield exactly the same results (both visual sharpness in the comparison image, and the same point on the graph). But you will notice in reality that there is some error in the AF system. The results will always be approximately the same under good light, but rarely identical.

## 10.6 Keyboard Shortcuts

Target Setup can be controlled using the keyboard with the following keys:

Key	Action
P	Trigger Phase Detect Autofocus
Z	Toggle Zoom state
S	Toggle Scrolling state
R	Reset graph peak
C	Clear graph
T	Toggle Target Optimisation state
1	Move AFMA setting towards camera
2	Move AFMA setting away from camera
, (Comma)	Move lens small step towards camera
. (Period)	Move lens small step away from camera

## 11 Automatic Focus Calibration

### 11.1 Overview

The Fully Automatic Autofocus Microadjustment Test allows you to quickly and easily calibrate the camera body and lens by automatically taking full resolution shots and analysing to determine the best AFMA value, then programming the camera with this value. In good light, the test will calibrate a camera/lens combination in approximately 60 seconds.

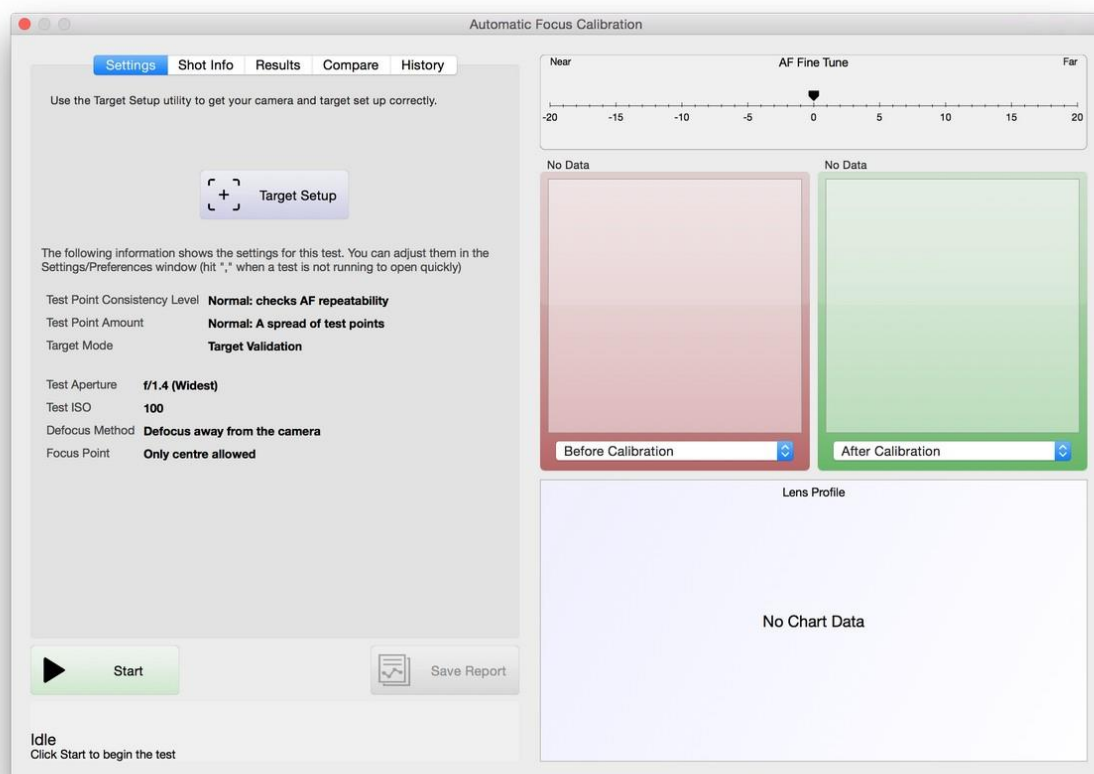
### 11.2 Image Display Panels

The panels can be made to show images from the list below, and the colour of the border reflects the current selection:

- Green = Before Calibration
- Red = After Calibration
- Blue = Selected Point (FoCal Pro only)

### 11.3 Test Window

The Automatic Focus Calibration test window is shown below:



Features include:

- Tabs for Settings, Shot Info, Results, Typical comparison and History
- Calibration results indicator (top right)

- Control buttons (bottom left)
- Analysed Image panels (mid right)
- Chart (bottom right)

The calibration algorithm in FoCal 2 has been optimised to give a result in fewer shots than FoCal 1, so you should find that you achieve a calibration result faster and more easily than before.

## 11.4 Tab Pages

The following pages are available, along with a shortcut key shown in brackets:

- Settings (S) – the settings for the test
- Shot Info (I) – information about the currently selected point
- Results (R) – overall test results
- Typical (T) – comparison with typical data of other FoCal users (requires FoCal Comparison Data, see section 8)
- History (H) – previous results for this camera and lens

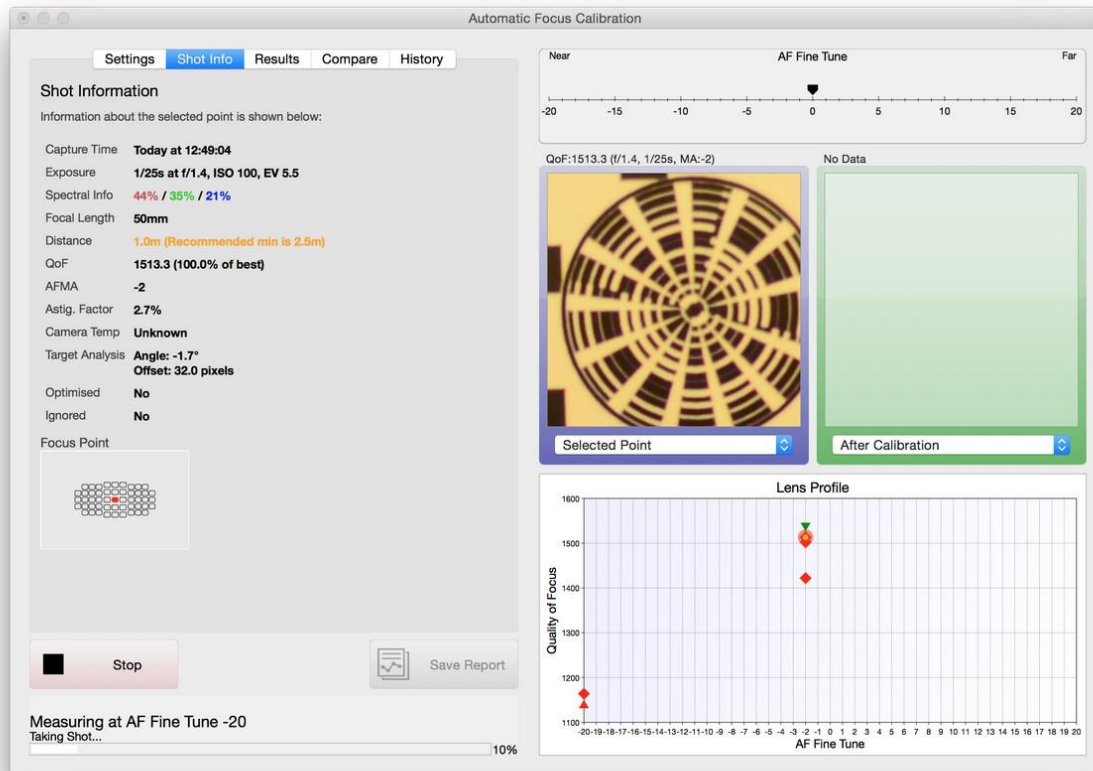
You can select a tab page by clicking the title or pressing the appropriate key at any time.



## 11.5 Running the Test

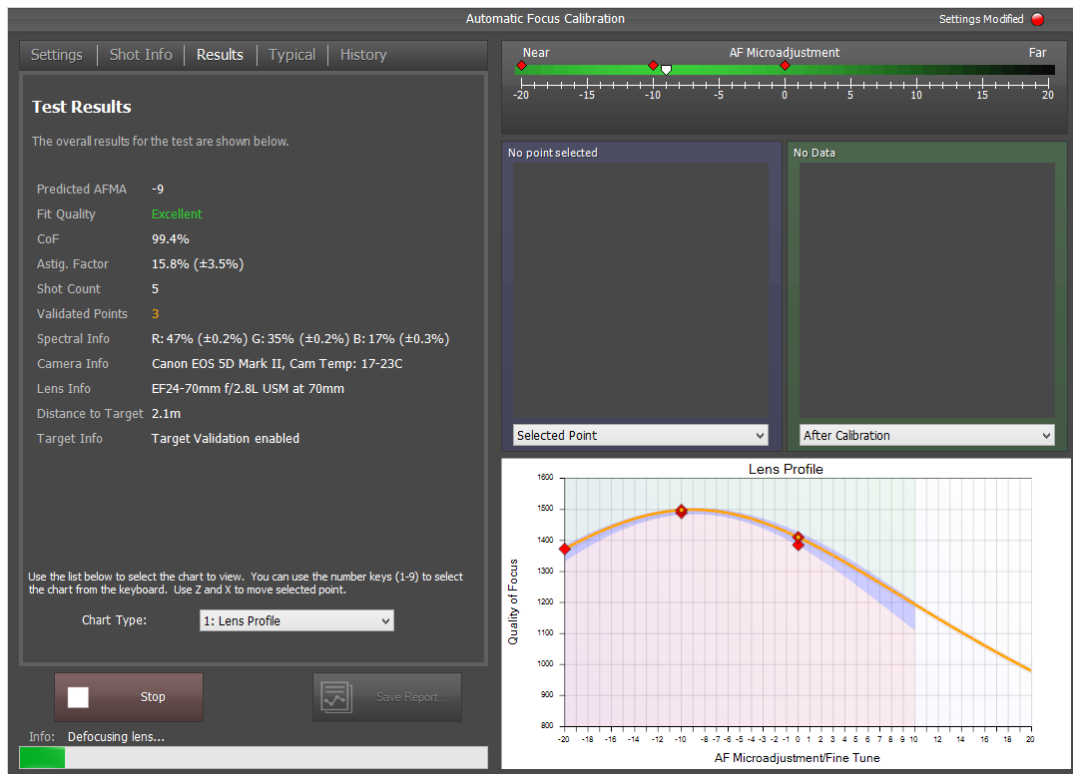
Click *Start* to begin the test.

As the test runs, you can click on any point on the chart to see information about the shot in the *Shot Info* page:

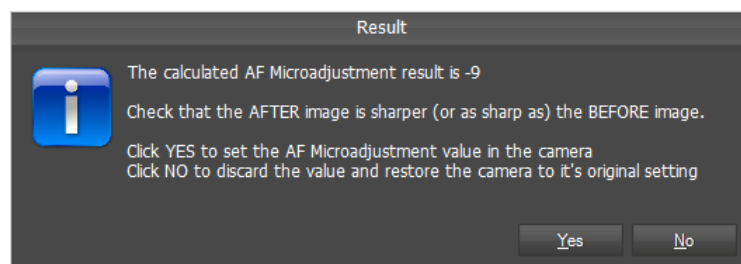
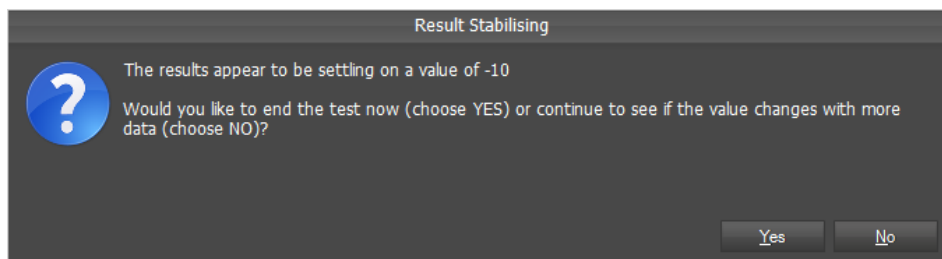


The first shot taken will show the “Before” shot, indicating the current AFMA. The image shown is a 100% crop of the analysed region of the image at the test aperture (widest for FoCal Plus, but can be changed in FoCal Pro).

The *Results* page will be updated with the results as the test runs.



When the test is complete or the results appear to be settling on a result, one of the following messages will be shown:



## 11.6 Charts

There are a number of charts that can be shown giving information about the results from your test.

Note that hitting the CTRL+C key at any time will copy the current chart to the clipboard.

You can select the charts from the list in the *Results* page or using the shortcut key shown in brackets below:

- Lens Profile (1) – the sharpness across the AF Microadjustment / AF Fine Tune range
- Focus Consistency (2) – the consistency of focus for each tested point (requires the Test Point Consistency Level in the Settings to be set to something other than *None*)
- Astigmatism Factor (3) – a value showing how the horizontal and vertical sharpness compare
- ADS Difference (4) – the difference between your test data and the typical data for this camera/lens combination (requires access to the FoCal Comparison Data - see section 8)
- Result Convergence (5) – how the result progressed as each shot was taken
- Image Motion (6) – an indication of any movement of the image at the camera sensor as the test progresses.

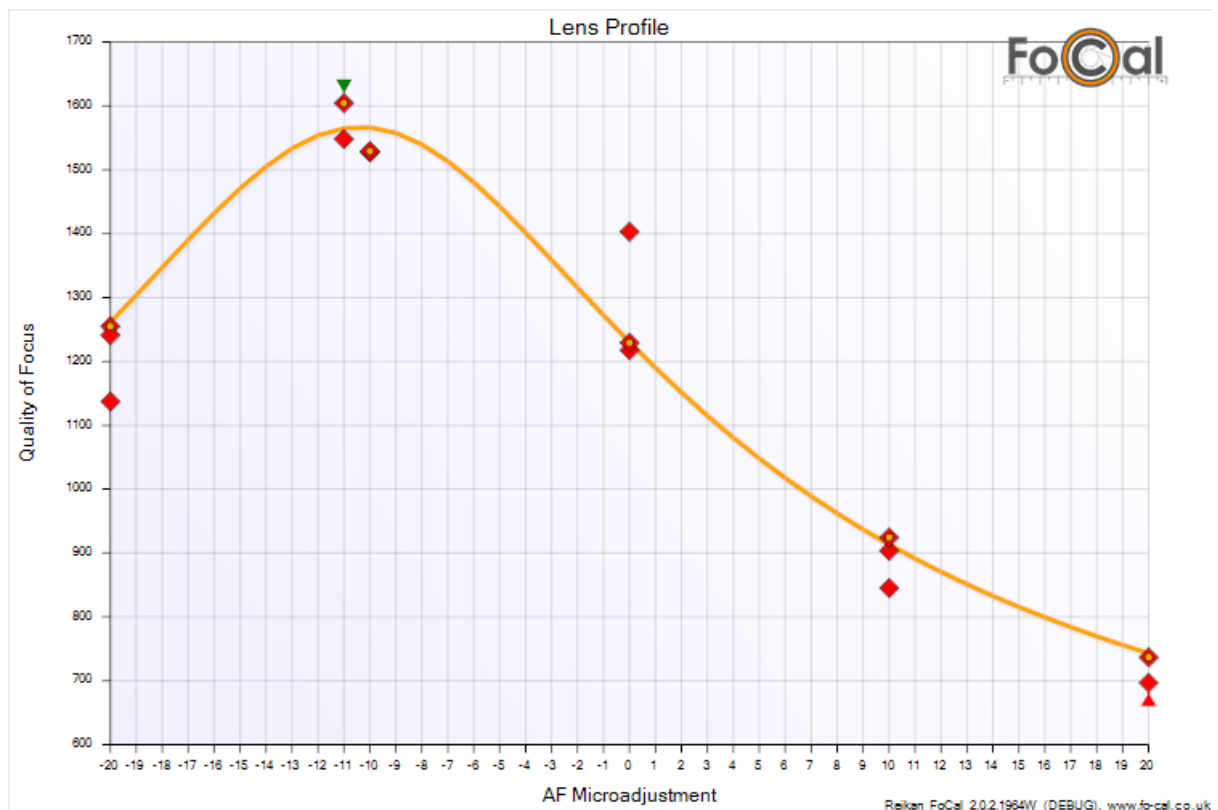


If you have access to the FoCal Comparison Data (see section 8), the charts will show indications about how your data compares to the typical data from other FoCal users with the same camera body and lens. These indications are shown as coloured areas. The **blue** areas shows typical results for this camera/lens combination, the **green** area indicates performance above or better than the typical case and **red** indicates the result falls below or worse than the typical case.

### 11.6.1 Lens Profile

The lens profile shows the sharpness of the analysed region across the AF Microadjustment/Fine Tune range. The highest point on this chart is the best quality image, and usually represents the best AF Microadjustment value to set in the camera.

If you have access to the FoCal Comparison Data (see section 8) and there is information for your camera and lens, the chart will be shown with the *FDS Overlay* displayed – the red, blue and green areas as shown below. These show the typical results from other users of your camera and lens. If your data fits fairly well within the blue area (as shown below) then your lens is behaving similar to typical data from other users.



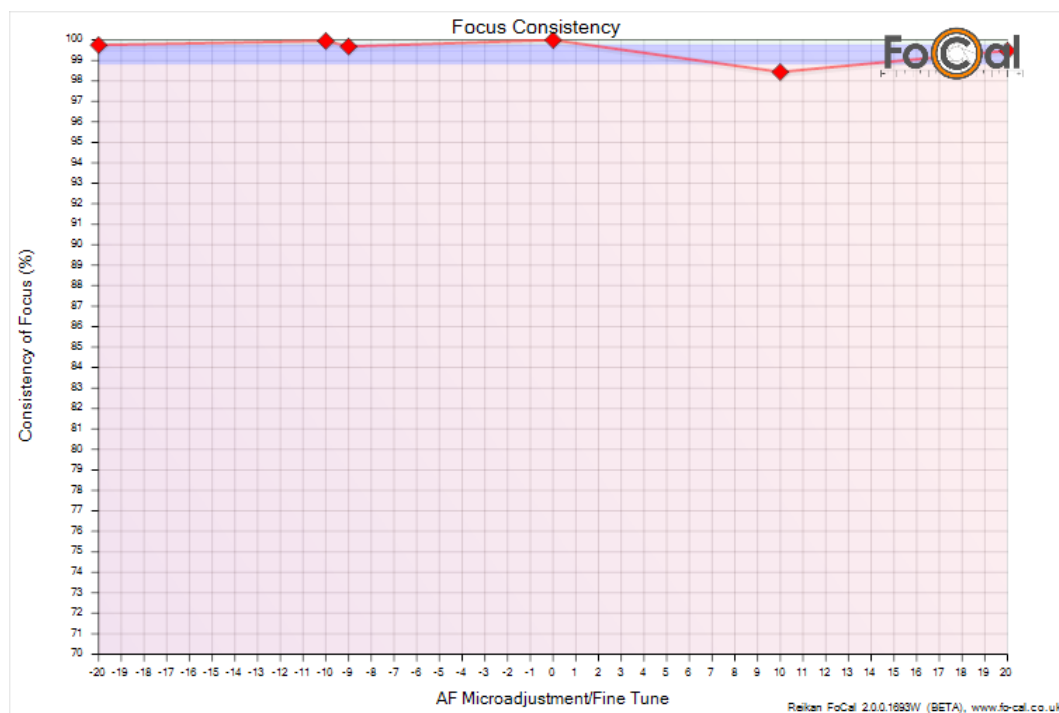
#### **FDS Interpretation**

For FoCal 2 Test Release 2, the comparison data has been removed for the Lens Profile (just the single Lens Profile chart). After a lot of analysis, we found that the lens profile comparison data did not usefully relate to the behaviour of the lens and is more likely to confuse than indicate anything of importance. We are continuing to look at how to present comparison data to give the best view of how your lens compare and may re-implement this feature in a different way in a later version.

### 11.6.2 Focus Consistency

When more than one shot is taken at any particular AF Microadjustment value, the consistency of the focus is measured and displayed on this chart.

The Consistency of Focus is calculated by dividing the average sharpness value by the maximum sharpness value at each point, and has a maximum possible value of 100%. Typically, a value above about 97% is considered acceptable.



#### FDS Interpretation

The FDS overlay shows the typical focus consistency results from other FoCal users with the same camera and lens combination. As with other FDS overlays, the blue area signifies typical performance. The green area indicates better than typical performance (and is very small in the chart above), while the red area indicates poorer than typical performance.

With the example above, the points lie mostly in the typical or better than typical area and indicate that the lens is generally performing slightly better than average. The single point just in the red area is not something to be concerned about as it's only slightly in the red and only a single test point – if the line and points were all (or mostly all) in the red you might want to consider getting the lens focusing checked.

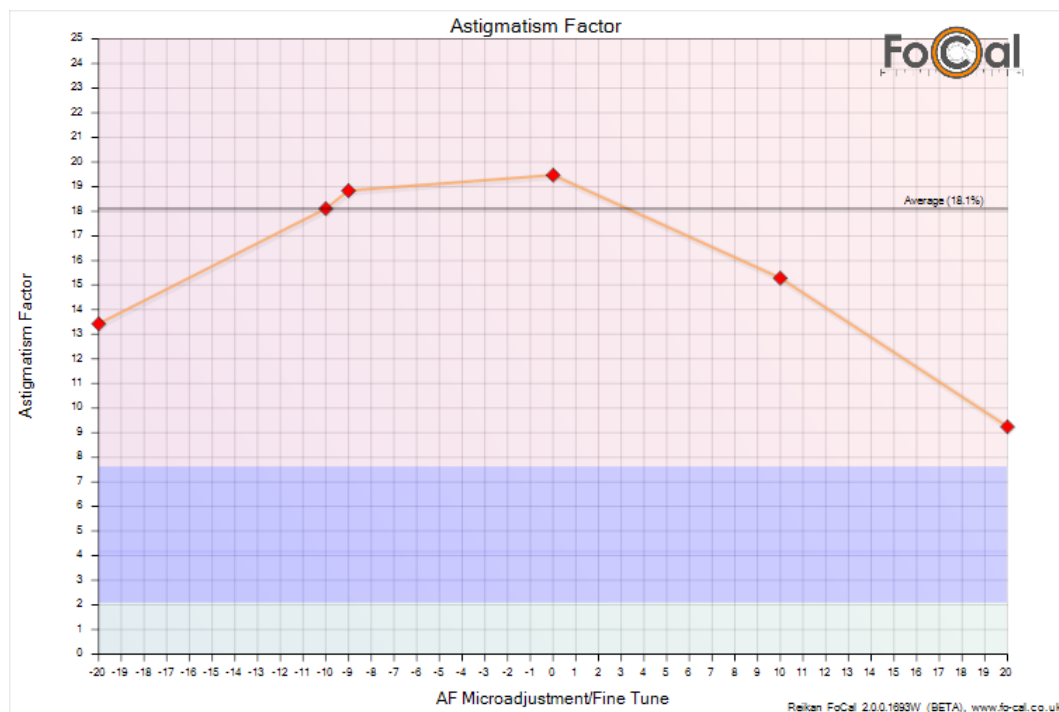
### 11.6.3 Astigmatism Factor (vs AFMA)

The Astigmatism Factor is an indication of how the sharpness differs between horizontal and vertical analysis.

This is still a developmental analysis metric, but it can be used to indicate misalignment of lens elements, lens mount or possible damage to the lens or camera.

Blue markers are used to represent points where the sharpness is highest in the vertical direction, while red markers show points where sharpness is highest in the horizontal direction. For values close to 0 the colour is irrelevant, but for higher values this can give an indication of specific lens-element alignment problems within the lens itself.

Typically, the results should be fairly consistent across the range, and the average value should be below about 10%. The example below shows a known defective Canon lens which sustained some impact damage and shows a high average Astigmatism Factor of around 18%.



#### FDS Interpretation

As with other FDS overlays, the blue area signifies typical performance. The green area indicates better than typical while the red area indicates below typical performance.

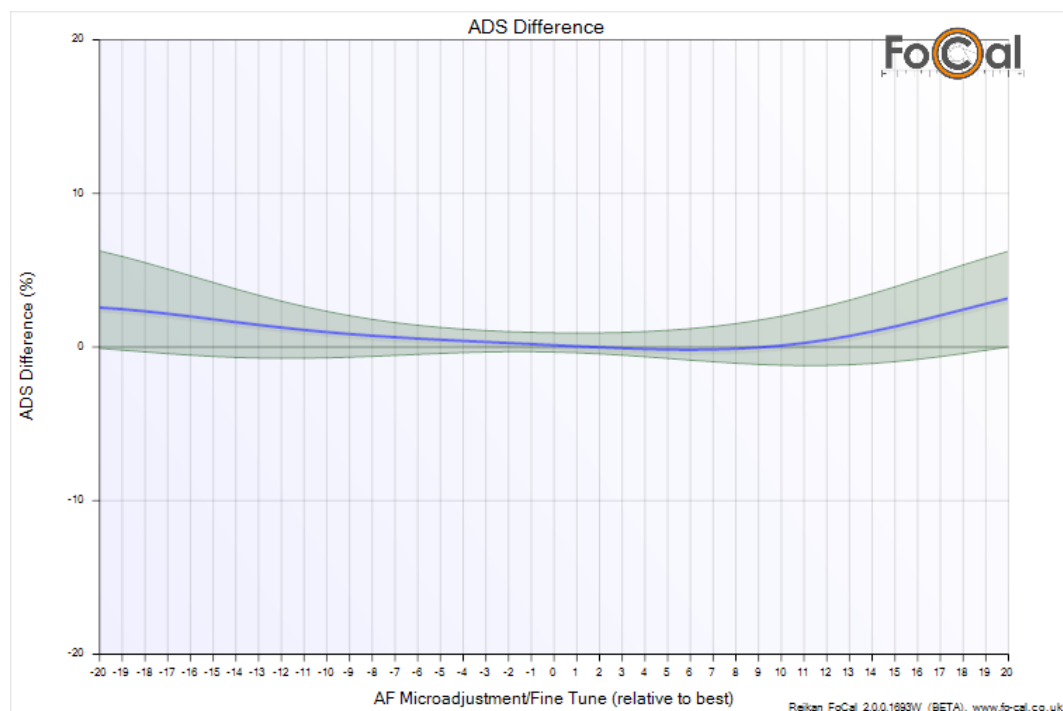
The example above shows that there is quite a range of average values for this lens (between about 2% and 8%), so if the points *mostly* fell within this region we could consider the lens behaving typically. However, the line above is most definitely outside of this area, and indicates a serious anomaly when compared with other FoCal users with the same camera and lens. This is a known defective lens – if during a test you see astigmatism factor results well outside of the blue area it would be well worth rerunning the test under a few different conditions (e.g. different focal lengths

and/or target distances) to check that the results are repeatable. If all results are outside the blue area, you would almost certainly want to get this lens checked.

#### 11.6.4 ADS (Aggregate Data Set) Difference

The ADS Difference indicates how your data compares to the typical data from other users of the same camera and lens. Note that this chart will not be shown if you do not have access to the FoCal Comparison Data (see section 8) or there is no data available for your camera and lens combination.

A value that is generally close to 0 is good (this means your data is very similar to the typical data). Odd peaks away from zero are nothing to worry about, but if the data is – on average - a long way from the 0 line then this may indicate issues with your camera or lens.



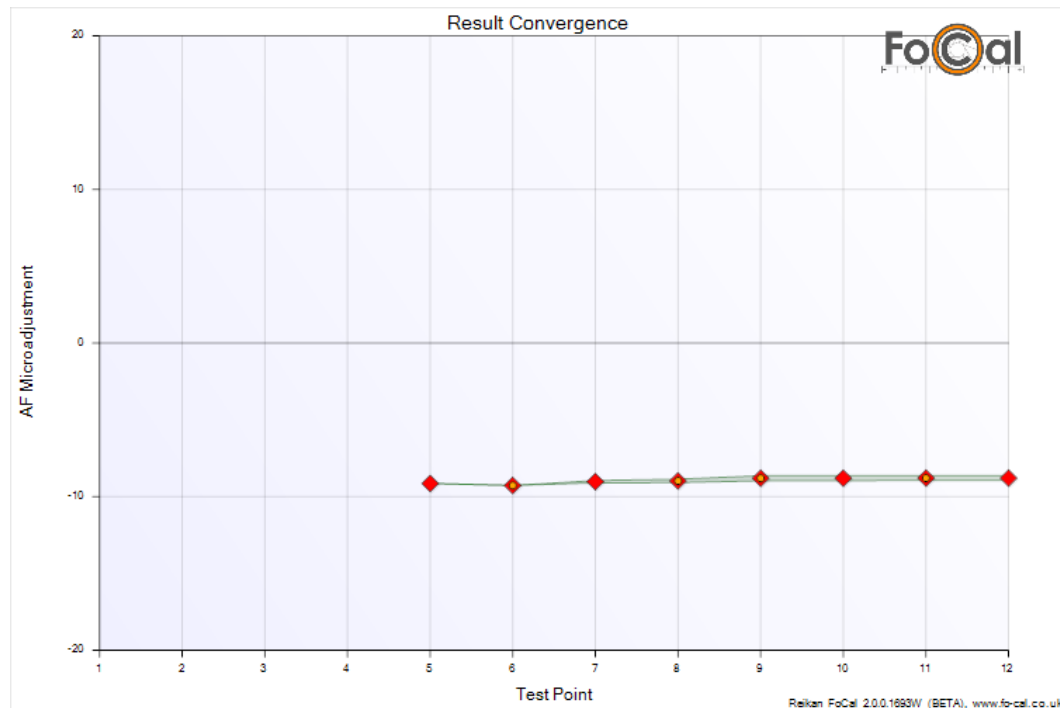
#### **FDS Interpretation**

What you are looking for in this chart is a line that is close to flat and running close to 0 (the above example is well within limits). Remember that this is based on the Lens Profile results and these can be affected by target distance and other environmental factors, so treat these results as supplementary when making any diagnosis about lens behaviour.

### 11.6.5 Result Convergence

The Result Convergence chart shows how the result was calculated after each shot was taken.

The thickness of the green area on the chart shows the confidence of the value (the example below is a very good, quick settle on a value of around -9).



### Interpretation

This chart can give a good idea about reliable the final value can be considered. The above example shows immediate convergence on a value of around -8 or -9 and a very steady and precise (small green band) result while more points are added to the test data. This result can be considered reliable and repeatable.

If you notice that the Result Convergence line jumps around a lot or has a very wide green band even towards the end of the test (right hand side of the chart) then you may want to check for possible issues during testing – e.g. vibration or light level changes.

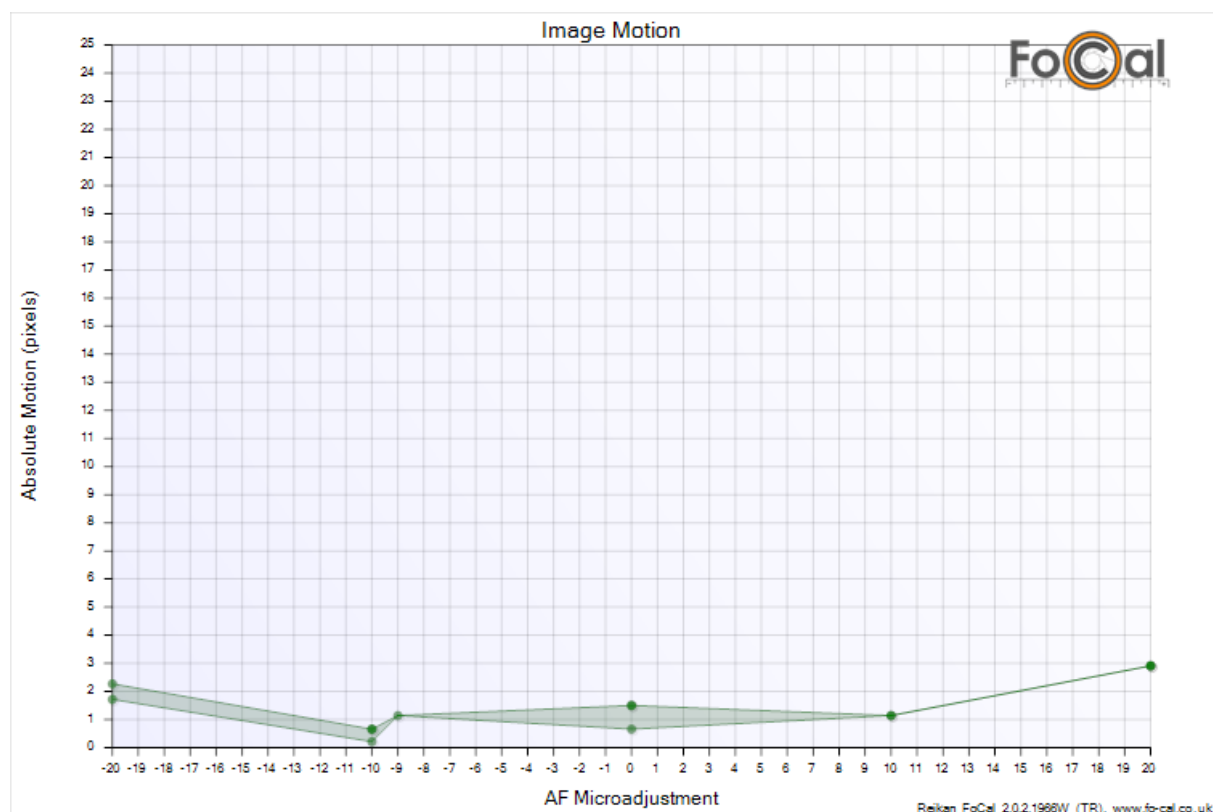


### 11.6.6 Image Motion

The Image Motion chart shows how the image captured by the camera has moved as the test has run.

*Note: Image Motion is only available if Target Validation or Target Optimisation is enabled and the FoCal Target is used and detected during the test.*

For the Fully Auto test run with multiple points per AF Microadjustment / Fine Tune (i.e. Test Point Consistency Level at Normal or Many), the Image Motion chart will show the range of motion for each AF Microadjustment / Fine Tune as shown below:



#### Interpretation

This chart shows how the image captured by the sensor has moved across the test. This motion can be caused by movement of the camera through vibration or environmental changes (e.g. a bouncy floor or the tripod being knocked), and also the motion of the image as the lens optics move within the lens.

A low value of a few pixels is nothing to worry about, but if you see a high value at certain points or across the range this will indicate that the image has moved a lot. You can confirm this by reviewing the analysed test images (use the “,” and “.” keys to move back and forth through the images).

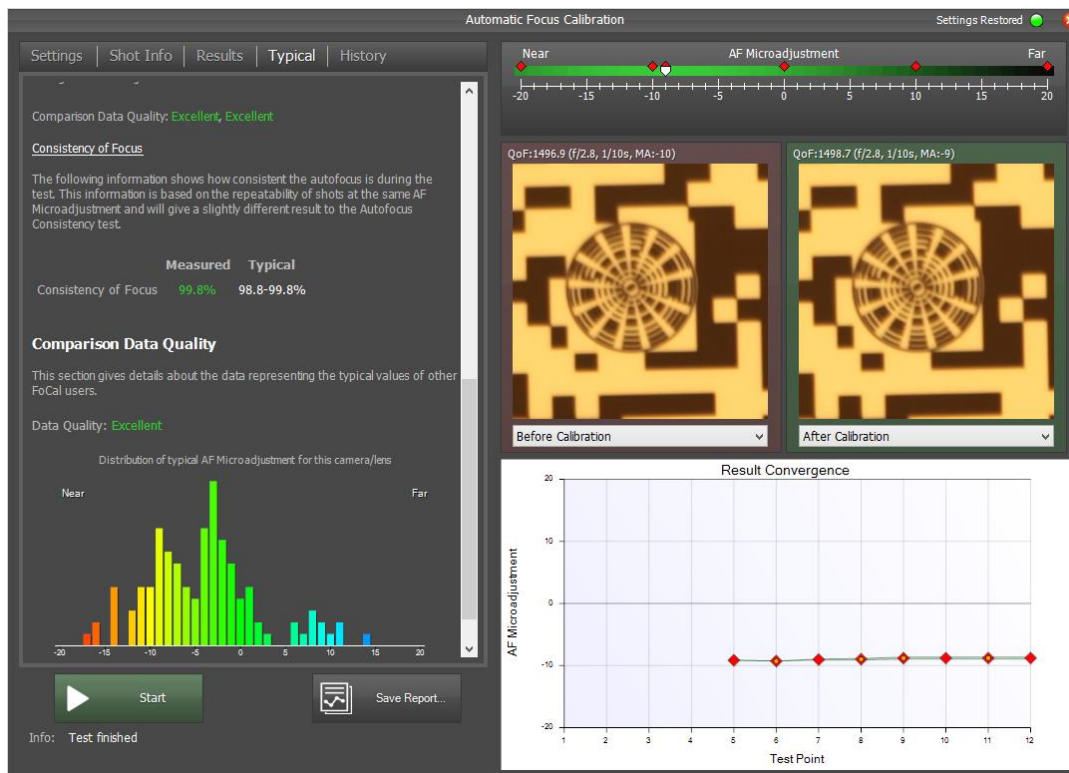
The value on the chart is the absolute offset for each point from the mean offset for the whole test. This means there is no direction shown – just the total number of pixels moved from the average for the test.

## 11.7 Typical Comparison

If you have access to the FoCal Comparison Data (see section 8) you will be able to see information about how your test results compare to typical FoCal users with the same camera and lens.

**NOTE: This is a new feature and will be developed more over the course of the initial FoCal 2 Test Releases.**

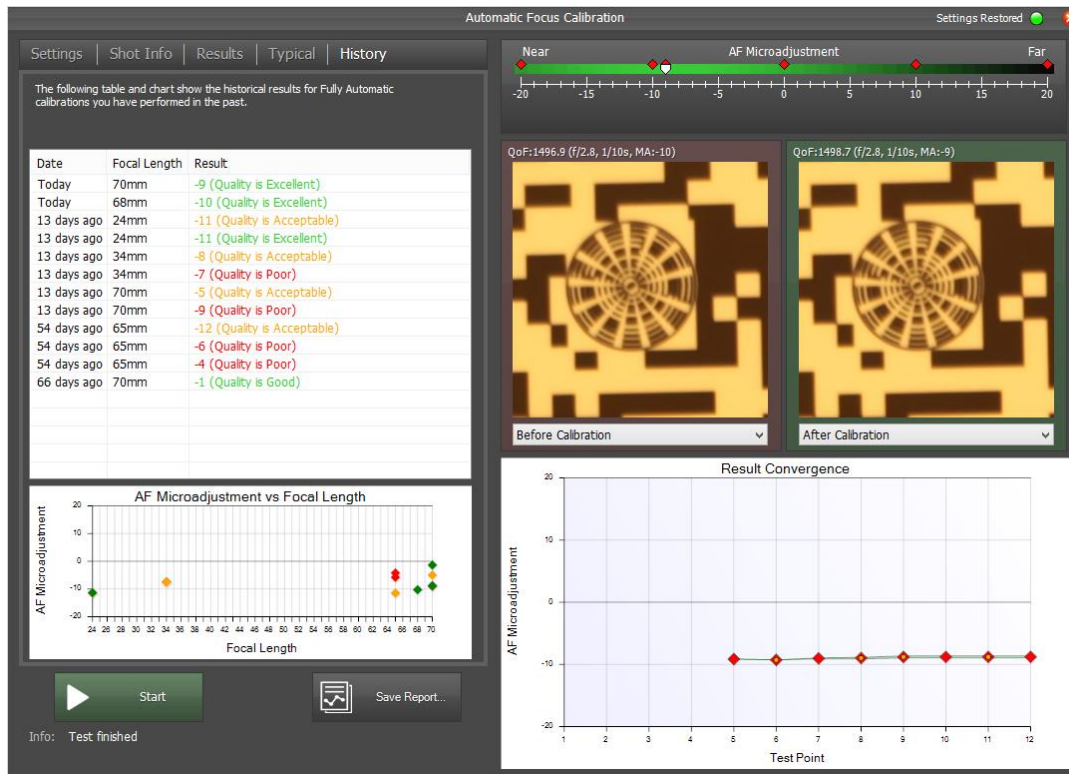
The *Typical* page will show information about different aspects of your test results, and towards the bottom of the page you will see the numeric values for your results and the typical results from other users.



## 11.8 History

In the *History* page you will be able to see the results from previous tests you have performed with this specific camera and lens. For a zoom lens, a graph will be shown at the bottom of the page showing the results across the focal range. This should allow you to gauge where to set your AF Microadjustment value for zoom lenses on cameras that only offer a single setting for the full zoom range.

Additionally, for FoCal 2 Test Release 2 you can now click on an entry in the History list and view the test results for that test so you can compare in more detail.



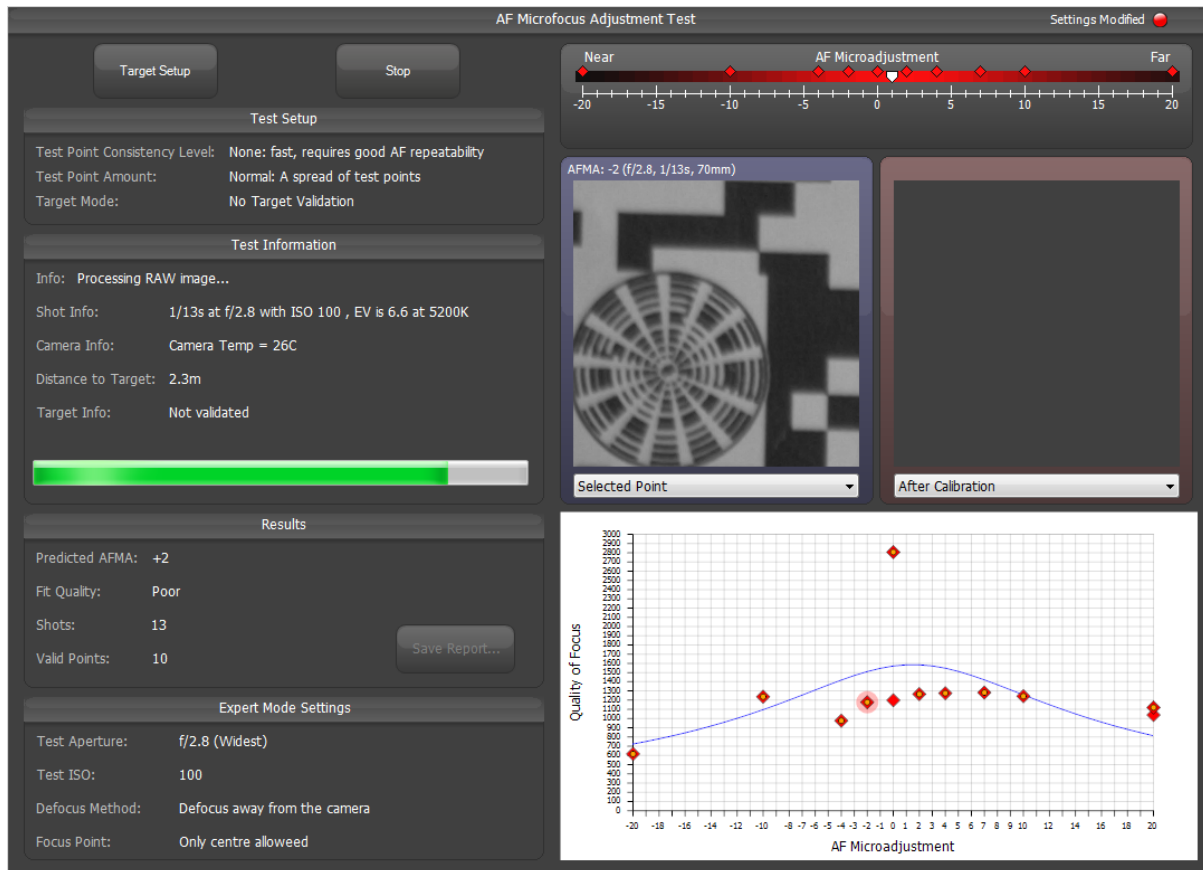
## 11.9 Useful Keys

The following is a list of the keyboard shortcuts available for this test:

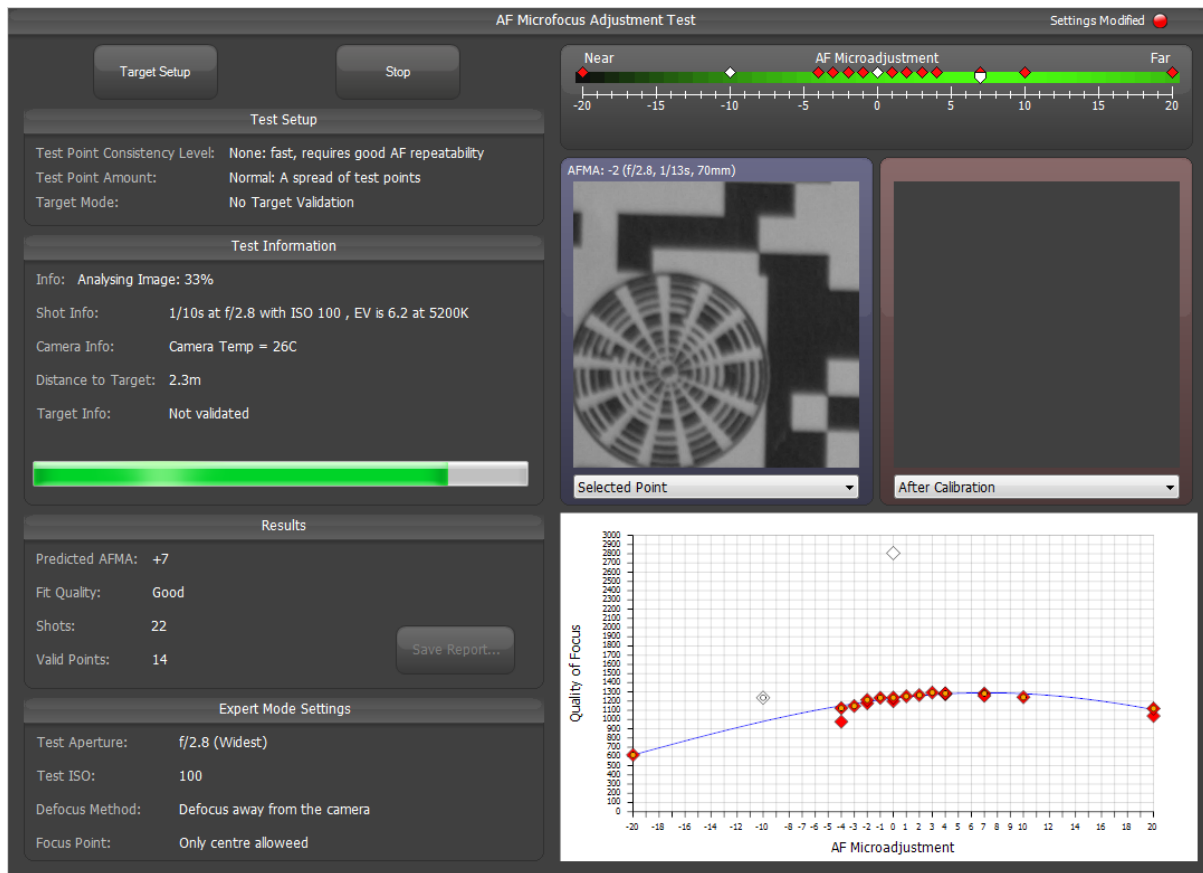
Z,X	Highlight the previous or next point on the chart and display the Shot Information for this point.
1-5	Switches to a specific chart view
CTRL+S	Enable/Disable RGB mode
R, G, B	When RGB mode is enabled, show the analysed Red, Green or Blue images and highlight the information on the chart
S, I, R, T, H	Select the (S)ettings, Shot (I)nfo, (R)esults, (T)ypical or (H)istory tab.
,	When not running a test, display the FoCal Settings window.
CTRL+C	Copy the chart image to the clipboard.

## 11.10 Manually Adjusting the Results

With AF Consistency Validation enabled, the test results are generally representative of the AF performance of the camera. However, sometimes you may end up with some obviously erroneous results when reviewing the chart. The example below shows a run with no Consistency Validation, and with a few points deliberately altered to mess up the data:



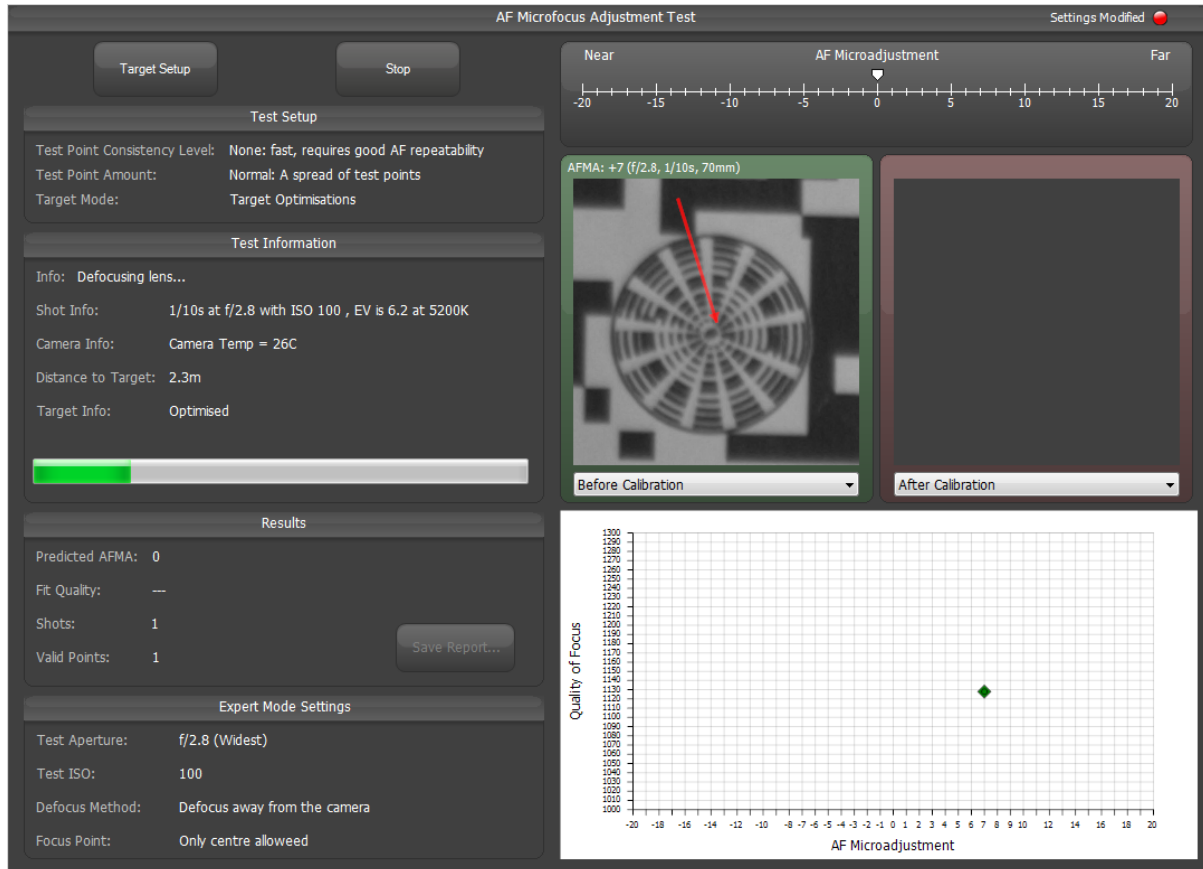
The predicted AF Microadjustment value is +2 but the quality is *Poor*. You can ignore points by right-clicking on the point, and when ignored they will have no colour. By ignoring some points on the example above, the fit can be changed to *Excellent* with high confidence in the AF Microadjustment of +7:



Points can be ignored during the test as well as when reviewing the data afterwards. Each time a point is ignored or re-enabled, the prediction is recalculated so you can see the effect of removing individual points on the result.

### 11.11 Target Optimisation (Pro Version)

If Target Optimisation is enabled (see section 6.7), a red arrow will be shown overlaid on each analysis image you review. This arrow shows the how the analysed region has been moved in order to optimise the analysis:



All data point markers (on both the gauge and the chart in the Analysis Info window) will be shown in **Green** if optimised.

### 11.12 Common Test Features

Please see section 6 for details on changing chart scale, ignoring points, saving reports and other features common to most tests.

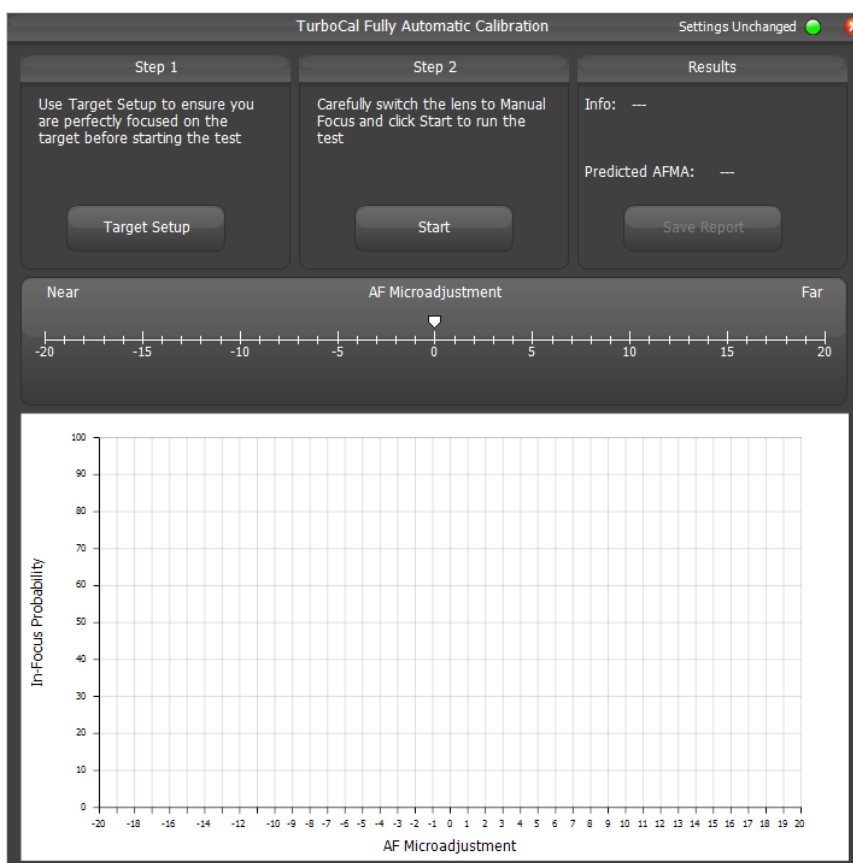
## 12 Turbo Calibration Test (FoCal Plus/Pro)

The Turbo calibration test allows you to calibrate a Canon camera without even taking a shot!



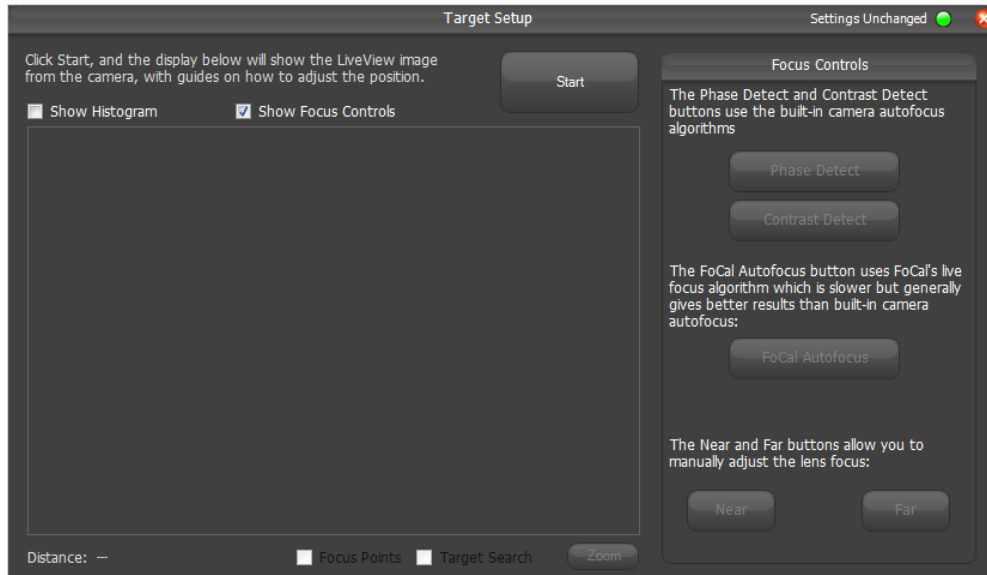
*This test is currently only available for Canon cameras as the necessary information is not reported by Nikon cameras. If you are using a Nikon camera, you can untick the “Show TurboCal instead of QuickCal” option in the Settings window which will make the QuickCal test available (see section 17).*

To start the test, choose the *TurboCal* option from the Tools panel on the main window:

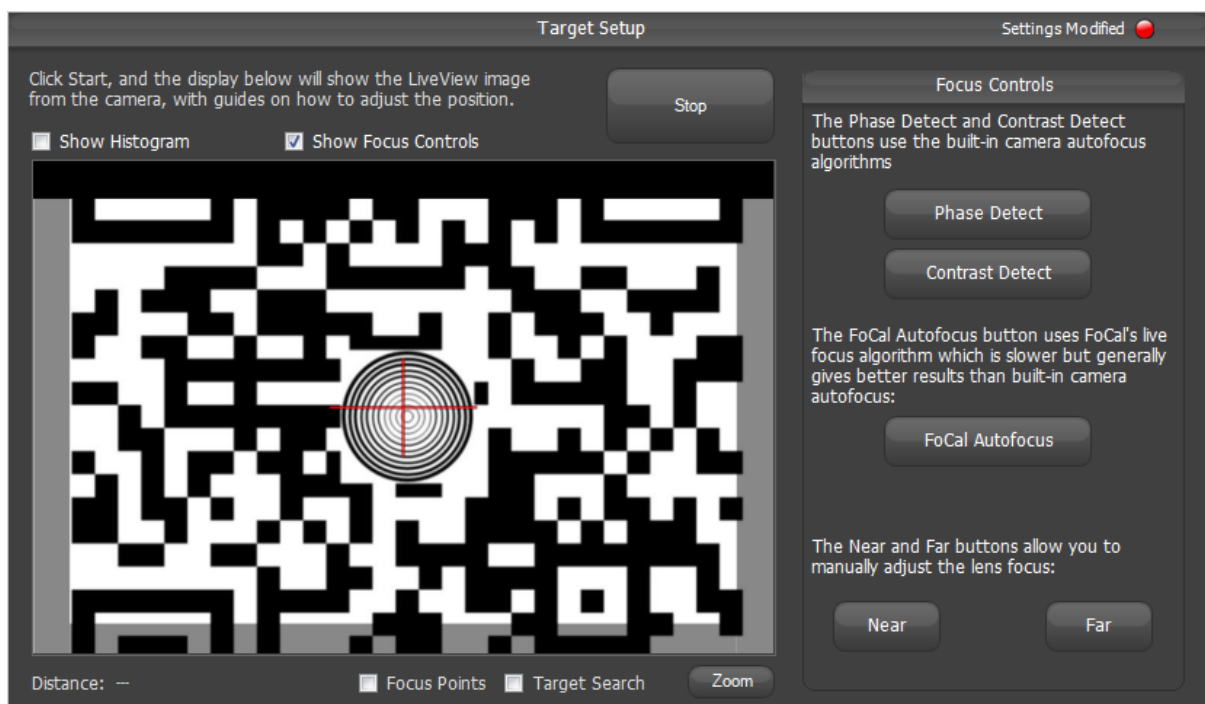


## 12.1 Step 1 – Perfect Focus

For the TurboCal test, it is critical that you start with perfect focus on the target. To do this, click the *Target Setup* button in the *Step 1* panel on the TurboCal test window. This will show the Target Setup tool with the Focus Controls panel already opened and ready:



Click the *Start* button and you will be shown the LiveView image from the camera, zoomed to 100%. Align the image approximately with the centre of the target:



The focus quality should be good as a phase-detect autofocus operation is run before the Target Setup tool starts showing LiveView images, but to get accurate results from the TurboCal test you need to ensure the focus is at the absolute best point possible.



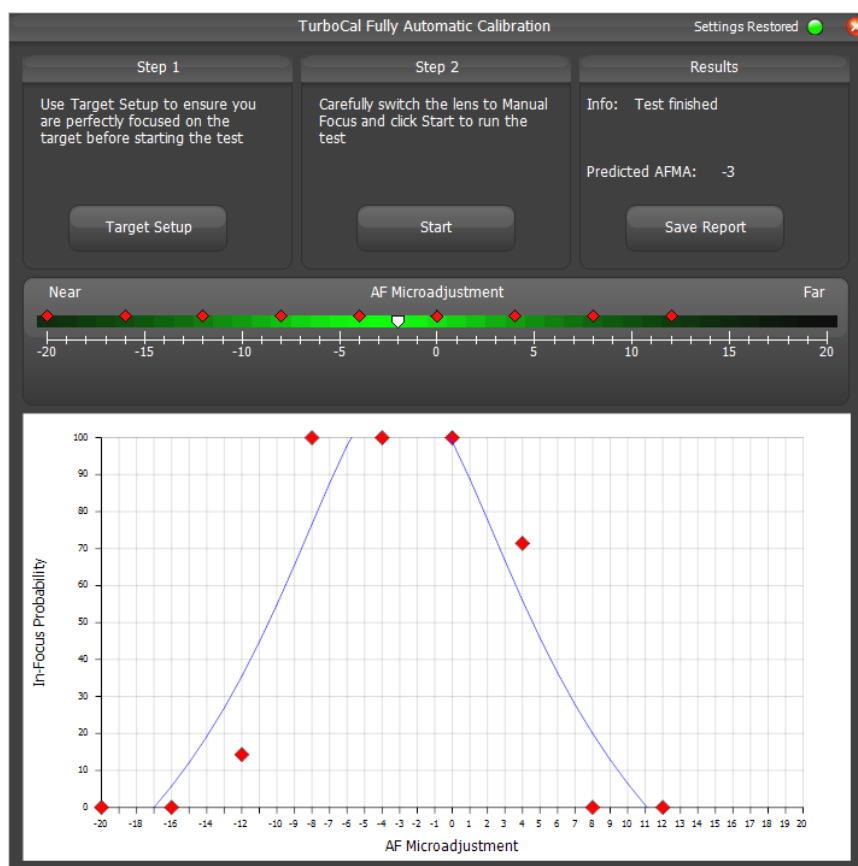
You can do this in a number of ways:

- Click the *FoCal Autofocus* (recommended), or *Contrast Detect / Phase Detect* button and wait a few seconds for the focus operation to complete.
- Use the *Near* and *Far* buttons to confirm that the image you see is the best possible. To do this, click the *Near* button a few times and watch the quality of the image – it should start to blur a little. Then use the *Far* button to improve the quality and keep going until you see it start to blur a little again. Finally, use the *Near* button again to move back to the perfect position.

Once you are happy that the focus is as good as possible, you can click the *Stop* button and close the *Target Setup* utility window.

## 12.2 Step 2 – The TurboCal Test

To run the test, you must put your lens in Manual Focus mode – this will involve **very carefully** switching the small AF/MF switch on the lens to *MF*. Once this is done, you can click the *Start* button in the *Step 2* panel. The test will run and when complete you will see a result similar to the following:



The result is an AF Microadjustment of -3.

Note that the blue prediction line will never fit perfectly with the data points, but it does predict the correct value for AF Microadjustment.

## 12.3 Common Test Features

Please see section 6 for details on saving reports from the TurboCal test.

## 13 Aperture Sharpness

### 13.1 Overview

The Aperture Sharpness test allows you to determine which aperture of the lens you are using gives the sharpest image by taking test shots across the full aperture range and analysing the results.

### 13.2 Image Display Panels

The panels can be made to show images from the list below, and the colour of the border reflects the current selection:

- Green = Best Point (image with the best QoF measurement)
- Red = Worst Point (image with the worst QoF measurement)
- Yellow = Wide Open (the image captured with the lens wide open)
- Blue = Selected Point

### 13.3 Setting Up

The test uses standard FoCal target (although you can use another target if the Target Validation option is set to Off – see section 26.2.5). You should use the Target Setup utility to ensure the camera is in the correct place.

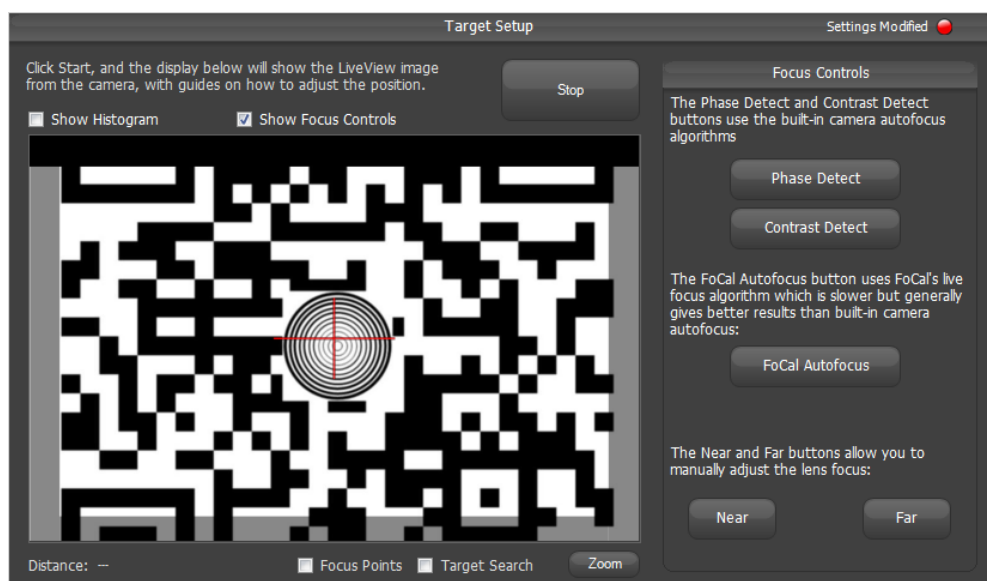
#### 13.3.1 Correct Focus



In order to get valid lens aperture sharpness indications, it is very important that the lens be correctly focused on the target as best as possible.

##### 13.3.1.1 Manually Focusing

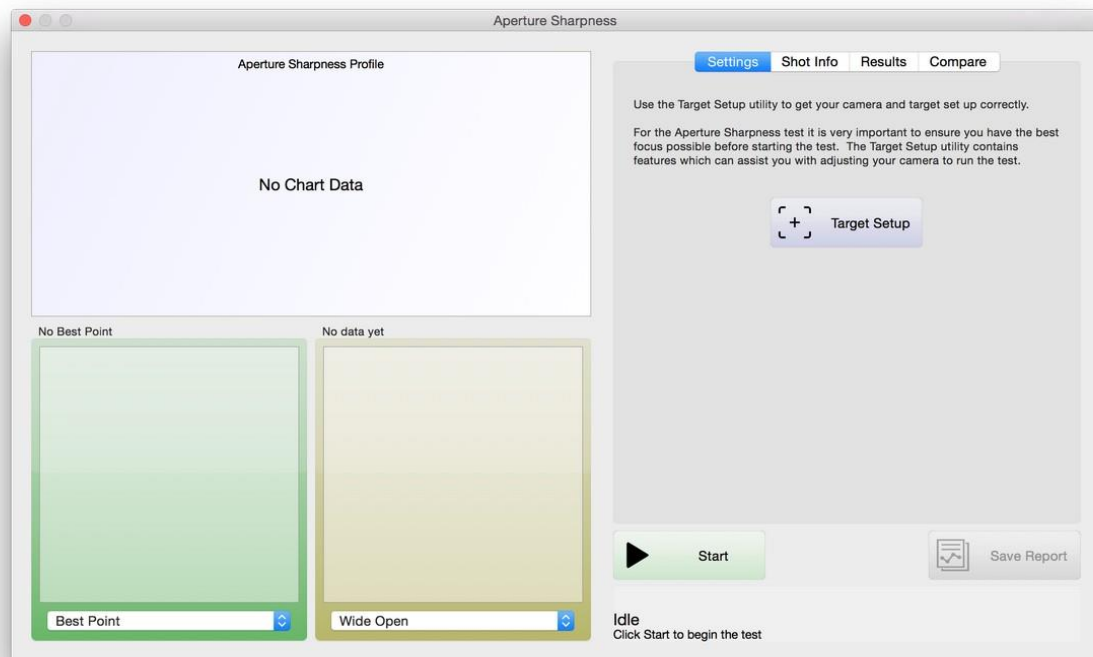
The *Target Setup* tool includes a Focus Control panel which is automatically displayed when you click *Target Setup* from the Aperture Sharpness test window:



See section 12.1 for details on how to achieve perfect focus with the Target Setup tool.

## 13.4 Test Window

The Aperture Sharpness Test window is shown below:



Features include:

- Tabs for Settings, Shot Info, Results and Typical comparison
- Control buttons (bottom right)
- Analysed Image panels (bottom left)
- Chart (top left)

## 13.5 Tab Pages

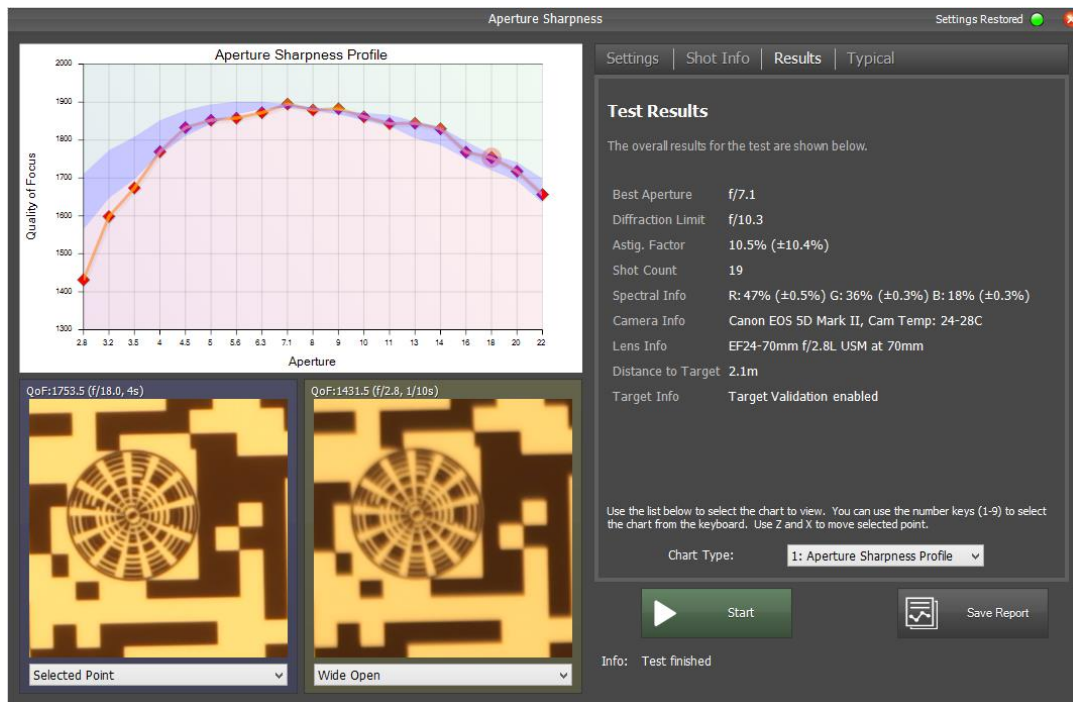
The following pages are available, along with a shortcut key shown in brackets:

- Settings (S) – the settings for the test
- Shot Info (I) – information about the currently selected point
- Results (R) – overall test results
- Typical (T) – comparison with typical data of other FoCal users (requires FoCal Comparison Data, see section 8)

You can select a tab page by clicking the title or pressing the appropriate key at any time.

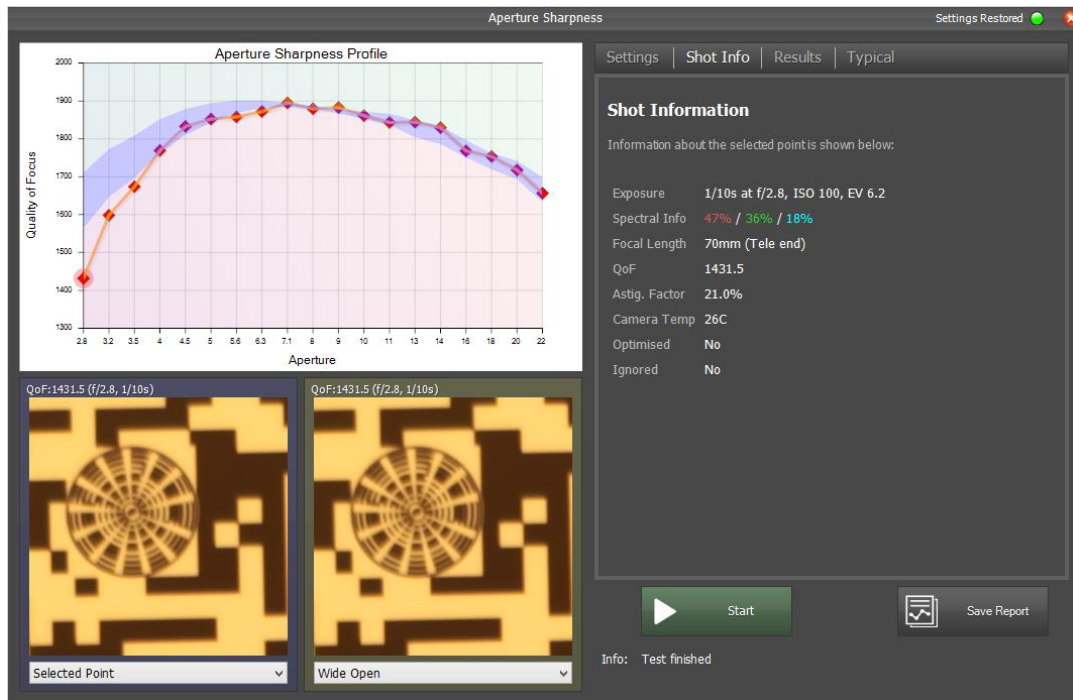
## 13.6 Running the Test

Once Target Setup has been confirmed, you can hit *Start* to begin the test. The test will run, analysing images at different apertures and displaying the overall results in the *Results* panel:



*Note that the red/blue/green overlay is only visible with valid access to the FoCal Comparison Data*

Clicking on any point on the chart will show the *Shot Info* panel for details about the specified selected point:



## 13.7 Charts

There are a number of charts that can be shown giving information about the results from your test.

Note that hitting the CTRL+C key at any time will copy the current chart to the clipboard.

You can select the charts from the list in the *Results* page or using the shortcut key shown in brackets below:

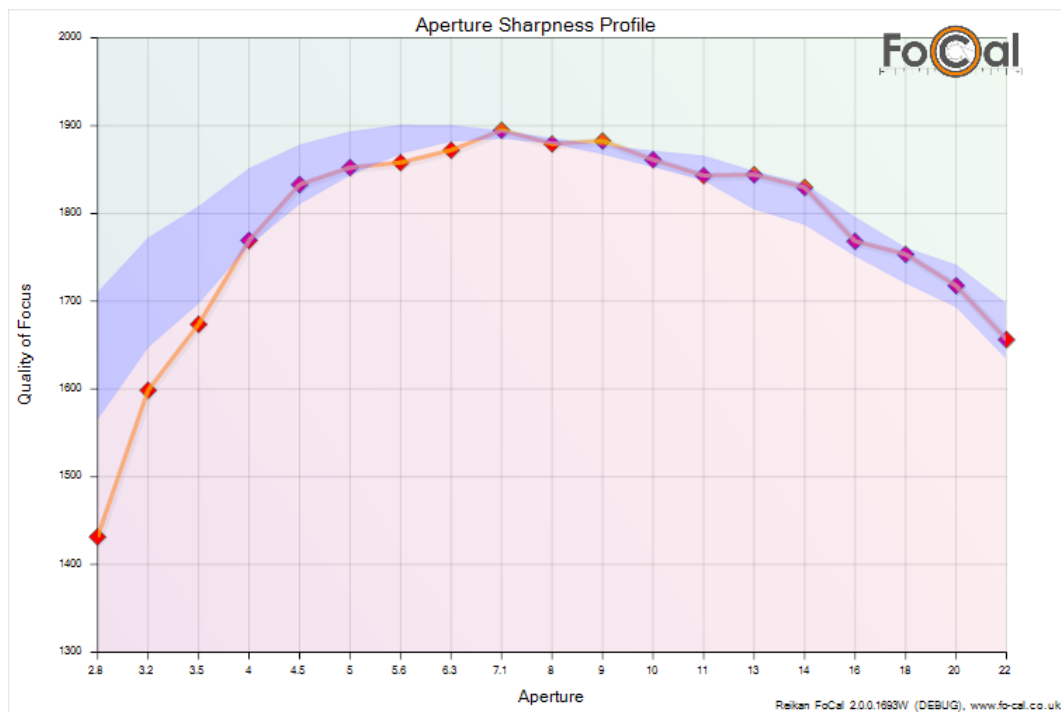
- Aperture Sharpness Profile (1) – the sharpness across the AF Microadjustment / AF Fine Tune range
- Astigmatism Factor (2) – a value showing how the horizontal and vertical sharpness compare
- ADS Difference (3) – the difference between your test data and the typical data for this camera/lens combination (requires access to the FoCal Comparison Data - see section 8)
- Image Motion (4) – an indication of any movement of the image at the camera sensor as the test progresses.
- Corner Brightness Profile (5) – an indication of how the image brightness at the corners changes across the aperture range.

If you have access to the FoCal Comparison Data (see section 8), the charts will show indications about how your data compares to the typical data from other FoCal users with the same camera body and lens. These indications are shown as coloured areas. The green area indicates your data is better than the typical, the blue area indicates the typical region for data, and the red area indicates your data is worse than typical.



### 13.7.1 Aperture Sharpness Profile

The Aperture Sharpness Profile shows the sharpness of the captured images across the aperture range.



#### FDS Interpretation

The FDS overlay shows the typical sharpness obtained by other users of the same camera/lens combination, with the blue area representing the majority of user results, and the green and red values showing better and worse sharpness values respectively.

In the example above, we can see that the tested lens fits within the typical range from f/22 through to f/4 but then starts to degrade below expected performance.

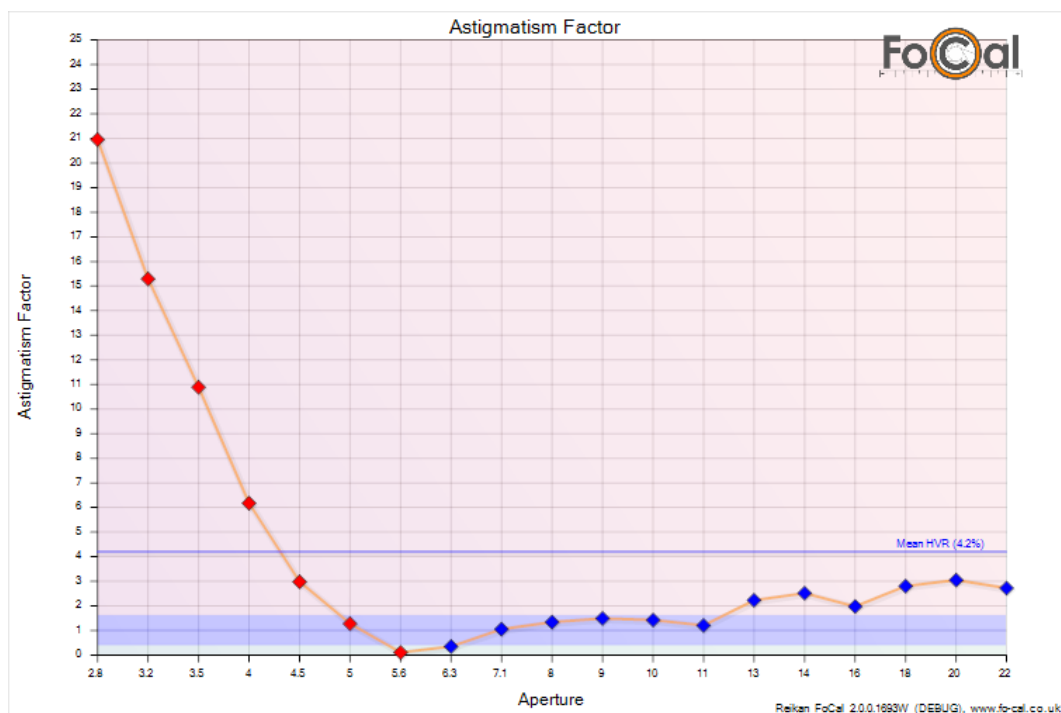
### 13.7.2 Astigmatism Factor (vs Aperture)

The Astigmatism Factor is an indication of how the sharpness differs between horizontal and vertical analysis.

This is still a developmental analysis metric, but it can be used to indicate misalignment of lens elements, lens mount or possible damage to the lens or camera.

Blue markers are used to represent points where the sharpness is highest in the vertical direction, while red markers show points where sharpness is highest in the horizontal direction. For values close to 0 the colour is irrelevant, but for higher values this can give an indication of specific lens-element alignment problems within the lens itself.

Typically, the results should be fairly consistent across the range, and the average value should be below about 10%. The example below shows a known defective Canon lens which sustained some impact damage and shows a large increase in the astigmatism factor as the lens is stopped down below f/5.6.



#### FDS Interpretation

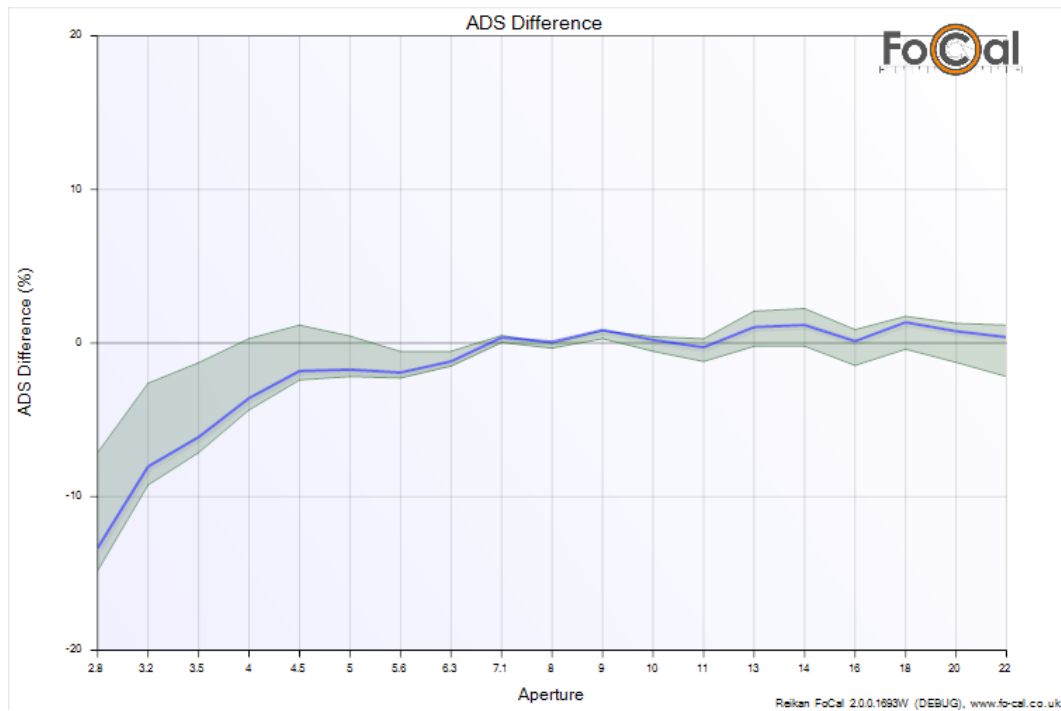
The FDS overlay shows the typical results obtained from other users of the same camera/lens combination. Points in the blue area (or close to it) indicate no real issues, but if the points rise into the red area (as shown below f/5 in the example above) this can indicate lens element alignment issues or other problems with the lens itself.



### 13.7.3 ADS (Aggregate Data Set) Difference

The ADS Difference indicates how your data compares to the typical data from other users of the same camera and lens. Note that this chart will not be shown if you do not have access to the FoCal Comparison Data (see section 8) or there is no data available for your camera and lens combination.

A value that is generally close to 0 is good (this means your data is very similar to the typical data). Odd peaks away from zero are nothing to worry about, but if the data is – on average - a long way from the 0 line then this may indicate issues with your camera or lens.



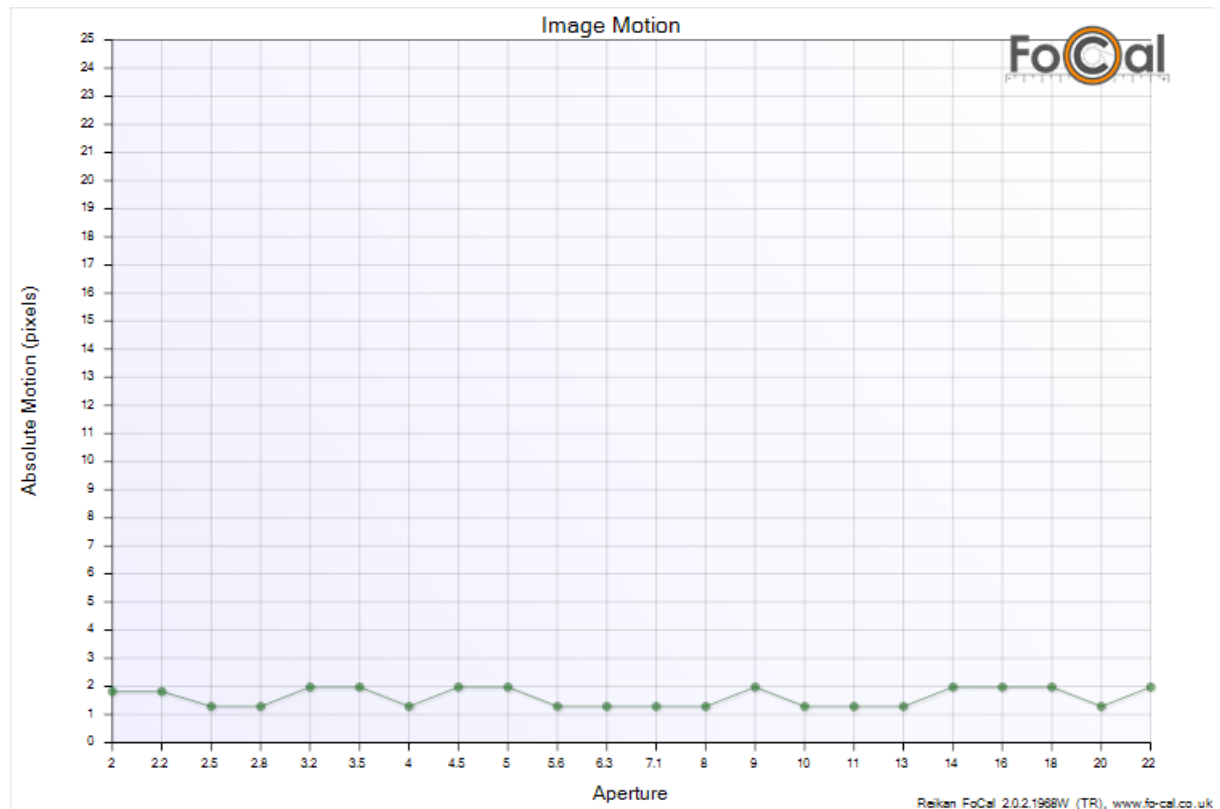
#### **FDS Interpretation**

What you are looking for in this chart is a line that is close to flat and running close to 0 (the above example is within limits with apertures smaller than f/5 but starts to diverge as the lens reaches maximum aperture).

### 13.7.4 Image Motion

The Image Motion chart shows how the image captured by the camera has moved as the test has run.

*Note: Image Motion is only available if Target Validation or Target Optimisation is enabled and the FoCal Target is used and detected during the test.*



#### Interpretation

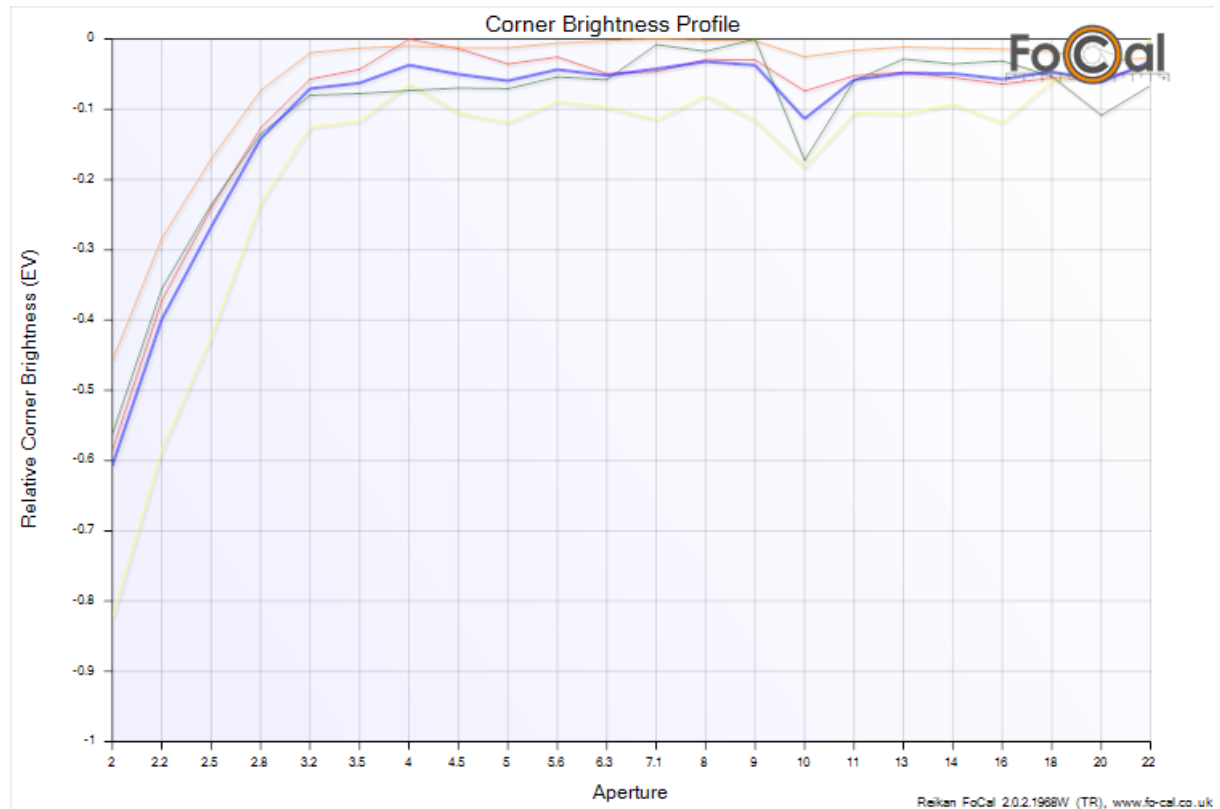
This chart shows how the image captured by the sensor has moved across the test. This motion can be caused by movement of the camera through vibration or environmental changes (e.g. a bouncy floor or the tripod being knocked), and also the motion of the image as the aperture changes within the lens.

A low value of a few pixels is nothing to worry about, but if you see a high value at certain points or across the range this will indicate that the image has moved a lot. You can confirm this by reviewing the analysed test images (use the “,” and “.” keys to move back and forth through the images).

The value on the chart is the absolute offset for each point from the mean offset for the whole test. This means there is no direction shown – just the total number of pixels moved from the average for the test.

### 13.7.5 Corner Brightness Profile

The Corner Brightness Profile gives an indication of how the image brightness at the corner of the captured image changes across the test. This can give an idea of the vignetting that may be experienced with this lens across the aperture range.



#### Interpretation

Each point on the chart shows how a measure of brightness for the particular aperture compares to the brightest aperture for a specific corner.

The red, orange, yellow and green lines on the chart represent data for the top-left, top-right, bottom-left and bottom-right corners respectively. The blue line (thicker) shows the average values for all corners.

The values are adjusted based on a measure of the brightness of the centre of the image. The end results is that this data is pretty much immune to the image content at the corners and moderate changes in brightness across the whole image field.

The values are relative to the brightest aperture, so the example above shows that there is very little change in brightness between f/22 and f/3.2, but stopping down to f/2 causes the corner brightness level to drop by around 0.6 stops.

It's important to understand that this chart does **not** show the relationship between the centre and the corner brightness (which would require a special test chart) – only how the brightness of the corners changes across the aperture range.

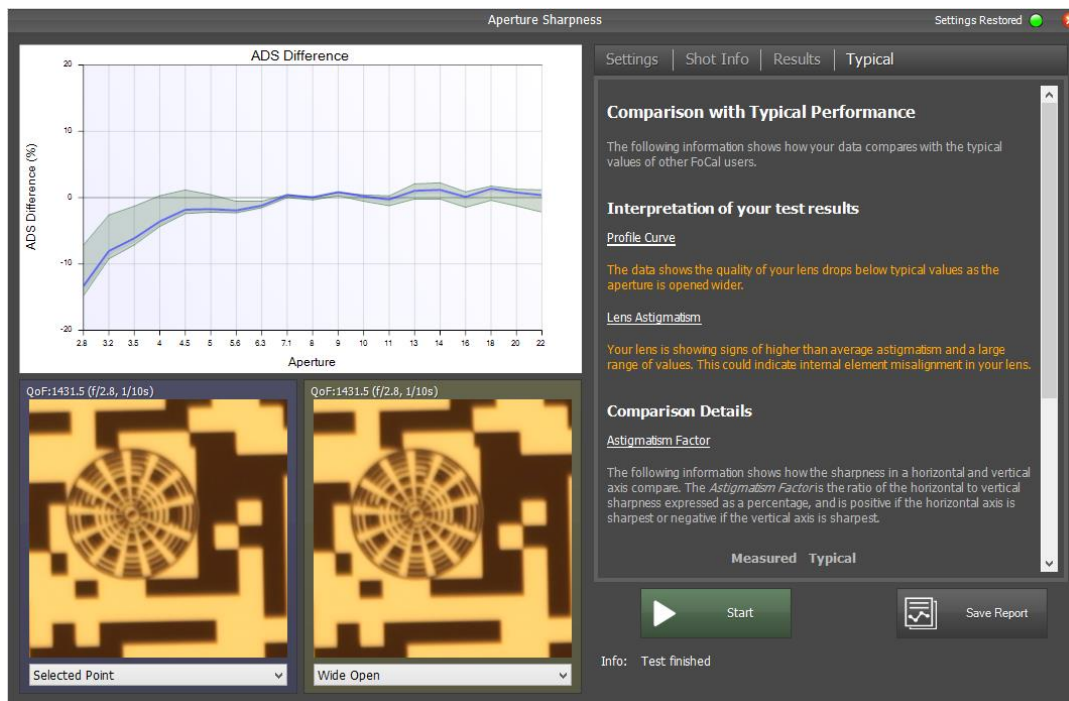


## 13.8 Typical Comparison

If you have access to the FoCal Comparison Data (see section 8) you will be able to see information about how your test results compare to typical FoCal users with the same camera and lens.

**NOTE: This is a new feature and will be developed more over the course of the initial FoCal 2 Test Releases.**

The *Typical* page will show information about different aspects of your test results, and towards the bottom of the page you will see the numeric values for your results and the typical results from other users.



## 13.9 Useful Keys

The following is a list of the keyboard shortcuts available for this test:

Z,X	Highlight the previous or next point on the chart and display the Shot Information for this point.
1-5	Switches to a specific chart view
CTRL+S	Enable/Disable RGB mode
R, G, B	When RGB mode is enabled, show the analysed Red, Green or Blue images and highlight the information on the chart
S, I, R, T	Select the (S)ettings, Shot (I)nfo, (R)esults or (T)ypical tab.
,	When not running a test, display the FoCal Settings window.
CTRL+C	Copy the chart image to the clipboard.

## 13.10 Common Test Features

Please see section 6 for details on changing chart scale, ignoring points, saving reports and other features common to most tests.

### 13.11 Expert Settings

The Expert Setting of test ISO will be applied during this test, so if you are finding that the shutter speed is longer than 30 seconds for the earlier (smaller aperture) shots, you can raise the ISO level. See 26.3.2 for more information.

## 14 AF Consistency

### 14.1 Overview

The AF Consistency test allows you to review the consistency of the AF system of the camera across a number of identical shots. It also gives you an opportunity to take single shots across the AF microadjustment range of the camera.

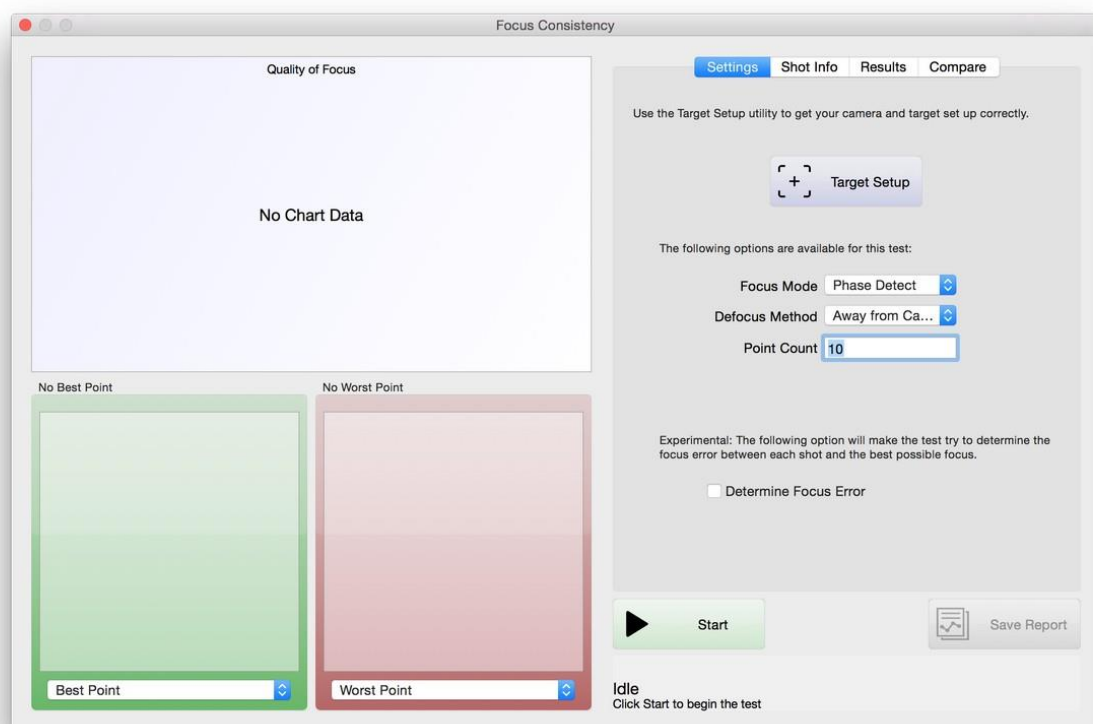
### 14.2 Image Display Panels

The panels can be made to show images from the list below, and the colour of the border reflects the current selection:

- Green = Best Point (image with the best QoF measurement)
- Red = Worst Point (image with the worst QoF measurement)
- Blue = Selected Point

### 14.3 Test Window

The initial AF Consistency window is shown below:



Features include:

- Tabs for Settings, Shot Info, Results and Typical comparison
- Control buttons (bottom right)
- Analysed Image panels (bottom left)

- Chart (top left)

A new feature – *Determine Focus Error* – is enabled by default in the Settings panel. When enabled, this will allow FoCal to attempt to determine the difference between the focussed point quality and the absolute best quality that could be achieved if manually focussed. This is determined after each shot and will extend the test time, but will provide extra information in the results. *Note that this feature is experimental and may not operate perfectly.*

Note that the AFMA Range option of FoCal 1 is no longer available in this test, but will be implemented as a new *AFMA Range* test in a future version of FoCal 2.

## 14.4 Tab Pages

The following pages are available, along with a shortcut key shown in brackets:

- Settings (S) – the settings for the test
- Shot Info (I) – information about the currently selected point
- Results (R) – overall test results
- Typical (T) – comparison with typical data of other FoCal users (requires FoCal Comparison Data, see section 8)

You can select a tab page by clicking the title or pressing the appropriate key at any time.

## 14.5 Running the Test

The Focus Mode determines how the camera will focus each shot. All cameras will offer *Phase Detect* and many cameras will also offer *Contrast Detect* as options.

The Defocus Method is the method used between shots to ensure the AF system runs a full AF procedure. For further information see section 26.3.1.

The quality of the AF system as a whole is indicated by the Consistency of Focus (CoF) value. This is the peak-to-mean Quality of Focus (QoF) ratio expressed as a percentage, calculated as follows:

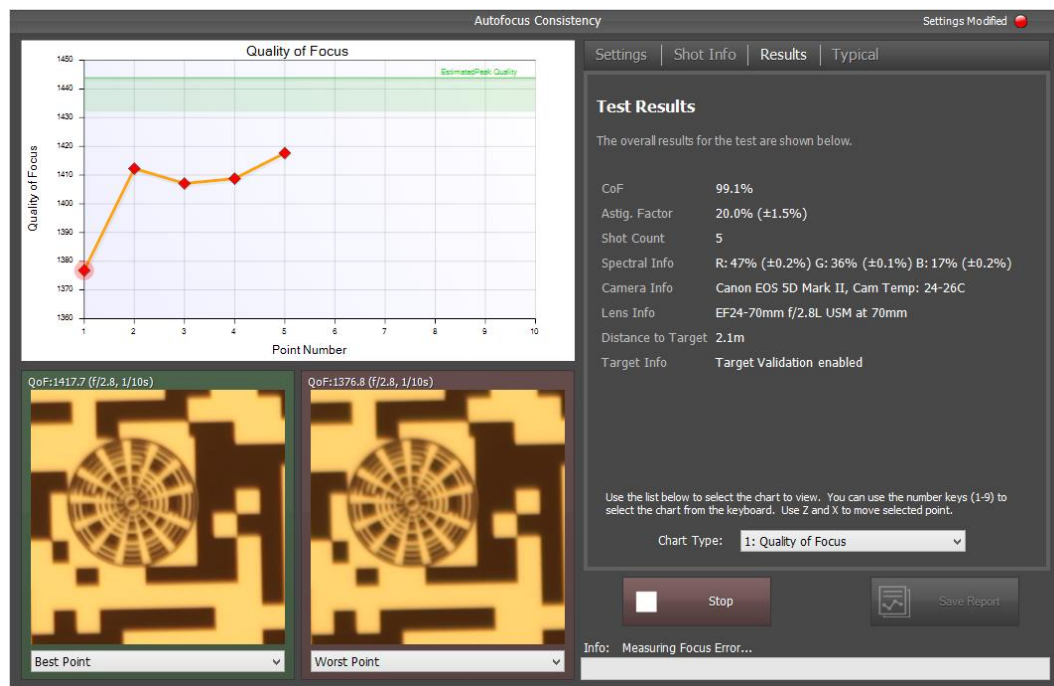
$$\left( \frac{QoF_{mean}}{QoF_{best}} * 100 \right) - 100$$

A theoretically perfect AF system will have all points at exactly the same QoF value, resulting in a CoF of 100%.

Generally, a consistency of above 97% indicates no issue with the AF performance or testing environment. If the value drops below this, you should investigate the test environment – ensure lighting is good, and the camera and target are stable.

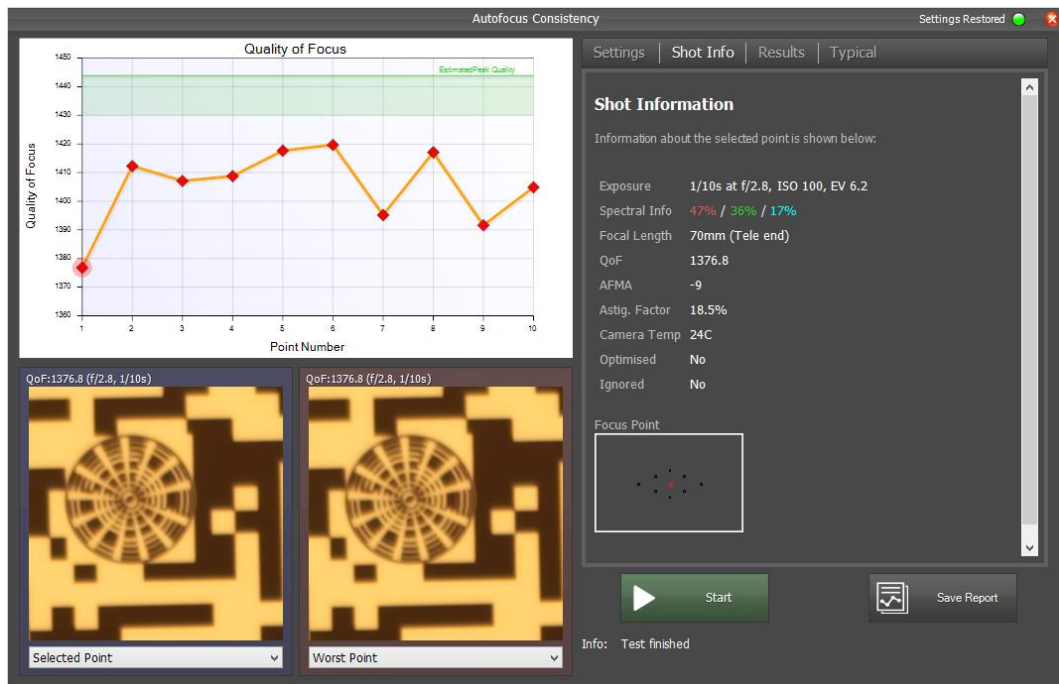
The Peak and Mean values are shown on the charts, and the CoF can be seen visually by how close (vertically) these two lines are.

Once Target Setup has been confirmed, you can hit *Start* to begin the test. The test will run, analysing images at different apertures and displaying the overall results in the *Results* panel:



Clicking on any point on the chart will show the *Shot Info* panel for details about the specified selected point:





## 14.6 Charts

There are a number of charts that can be shown giving information about the results from your test.

Note that hitting the CTRL+C key at any time will copy the current chart to the clipboard.

You can select the charts from the list in the *Results* page or using the shortcut key shown in brackets below:

- Quality of Focus (1) – the sharpness across the AF Microadjustment / AF Fine Tune range
- Result Progression (2) – how the final result calculation has changed as the test has run
- Astigmatism Factor (3) – a value showing how the horizontal and vertical sharpness compare
- Absolute Focus Error (4) – the difference between the autofocus shot quality and the best possible quality
- Percentage Focus Error (5) – the difference between the autofocus shot quality and the best possible quality as a percentage
- Focus Position Error (6) – the autofocus position error in either lens drive motor units or AF Microadjustment units if the data is available.
- Image Motion (7) – an indication of any movement of the image at the camera sensor as the test progresses.

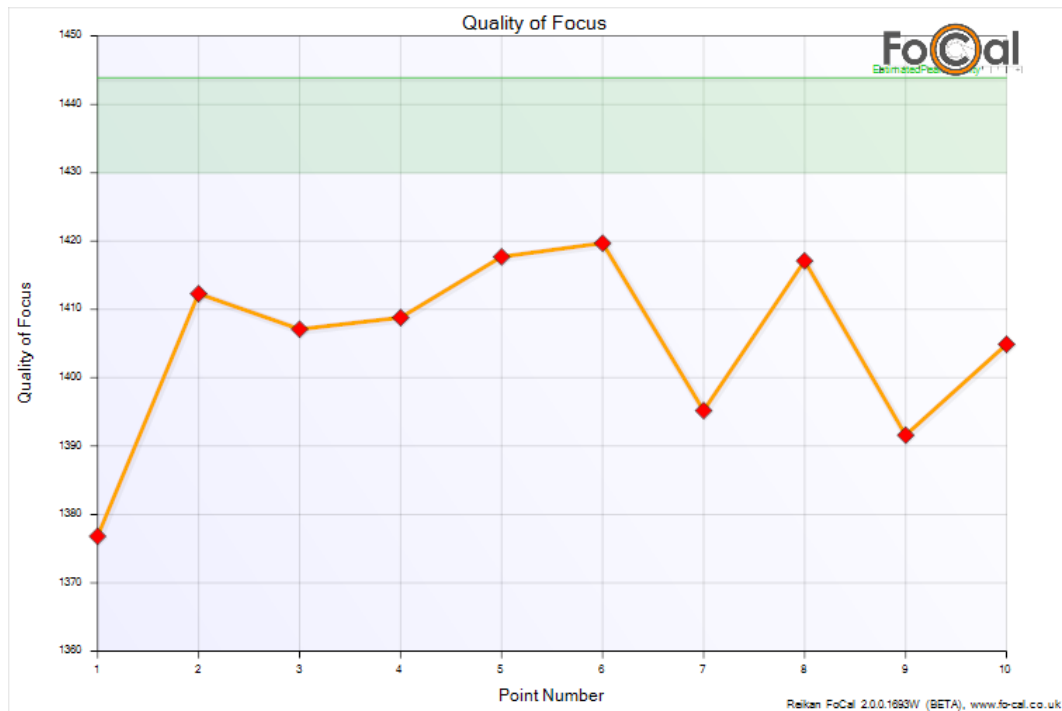


If you have access to the FoCal Comparison Data (see section 8), the charts will show indications about how your data compares to the typical data from other FoCal users with the same camera body and lens. These indications are shown as coloured areas. The **green** area indicates your data is better than the typical, the **blue** are indicates the typical region for data, and the **red** area indicates your data is worse than typical.

### 14.6.1 Quality of Focus

The Quality of Focus chart shows the sharpness for each tested point during the test.

If the *Determine Focus Error* option is enabled, a horizontal green band will be displayed on the chart. This represents the range of the estimate for the best sharpness of the camera/lens with perfect focus.



#### Interpretation

A wide variation of Quality of Focus values across the test could indicate issues with focusing for this camera/lens combination.

If the *Determine Focus Error* option is enabled, the green band displayed will help determine if there is a fixed focus offset that needs calibration. If the green band is significantly higher than the average values of the test points, this could indicate the need for focus calibration.

The example above shows a gap between the test points and the green band, but the absolute Quality of Focus values are not so different. The band ranges from 1430-1440, and the average test point value is around 1400. This represents a focus error of around 2-3% which is not a huge difference.

### 14.6.2 Result Progression

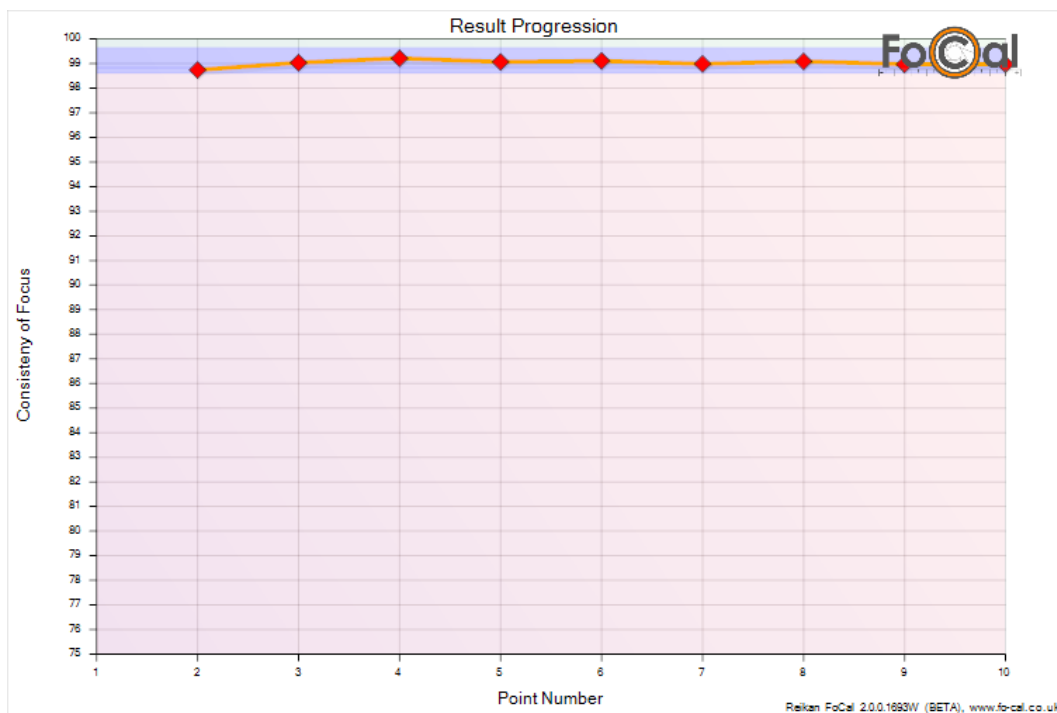
This chart shows the how the Consistency of Focus value progresses across the test.

The quality of the AF system as a whole is indicated by the Consistency of Focus (CoF) value. This is the peak-to-mean Quality of Focus (QoF) ratio expressed as a percentage, calculated as follows:

$$\left( \frac{QoF_{mean}}{QoF_{best}} * 100 \right) - 100$$

A theoretically perfect AF system will have all points at exactly the same QoF value, resulting in a CoF of 100%.

The points shown on this chart indicate how the value settles across the test, so the far-right value is the point representing the most complete result.



#### **FDS Interpretation**

The FDS overlay shows the typical green/blue/red bands representing the typical values from other FoCal users with the same camera/lens combination.

The bands show the final results from other users tests (so the values don't vary across the chart). A camera/lens under test that behaves in a typical way will have the right-most point of the chart above within the blue area, while a poorly performing camera and lens will have a value that drops significantly into the red area. If the test results show a value in the green then the camera/lens combination is performing better than average.

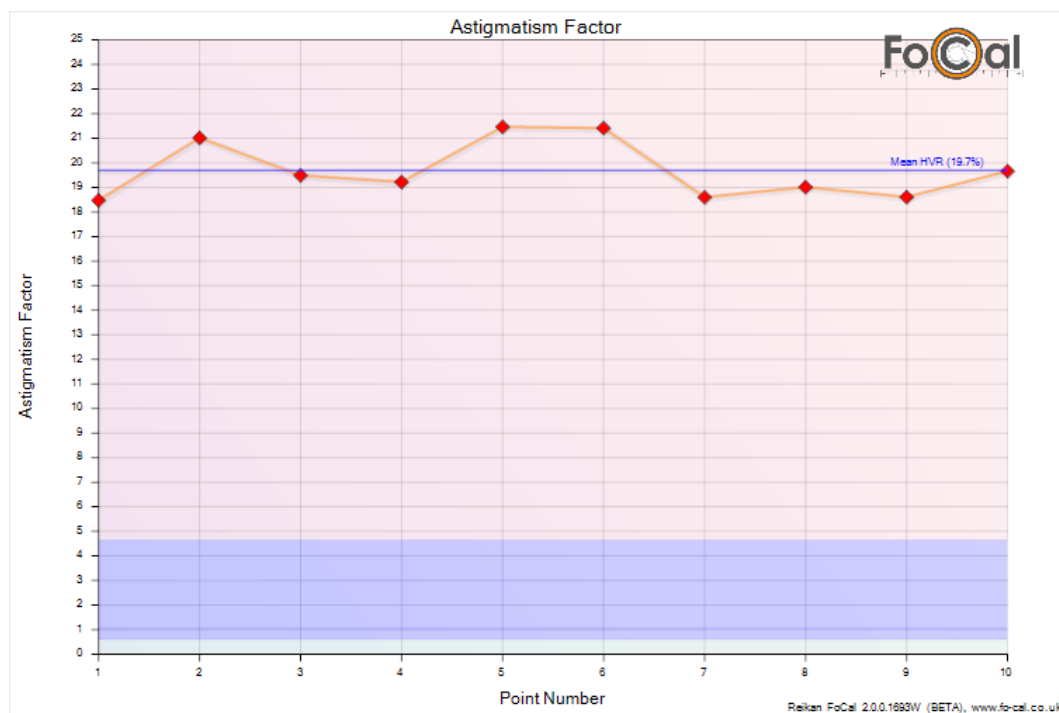
### 14.6.3 Astigmatism Factor (vs Shot)

The Astigmatism Factor is an indication of how the sharpness differs between horizontal and vertical analysis.

This is still a developmental analysis metric, but it can be used to indicate misalignment of lens elements, lens mount or possible damage to the lens or camera.

Blue markers are used to represent points where the sharpness is highest in the vertical direction, while red markers show points where sharpness is highest in the horizontal direction. For values close to 0 the colour is irrelevant, but for higher values this can give an indication of specific lens-element alignment problems within the lens itself.

Typically, the results should be fairly consistent across the range, and the average value should be below about 10%. The example below shows a known defective Canon lens which sustained some impact damage and shows a large astigmatism factor with an average of 19.7% (the points are red so the horizontal sharpness is around 20% higher than the vertical sharpness).



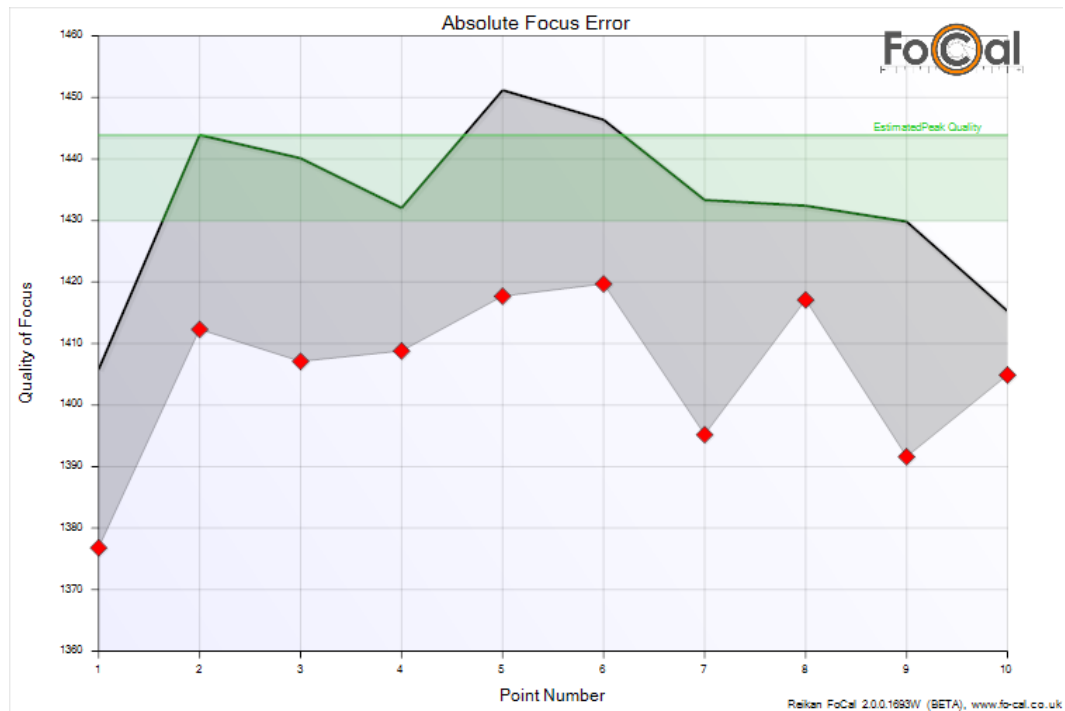
#### FDS Interpretation

The FDS overlay shows the typical results obtained from other users of the same camera/lens combination. Points in the blue area (or close to it) indicate no real issues, but if the points rise into the red area (as shown in the example above) this can indicate lens element alignment issues or other problems with the lens itself.

#### 14.6.4 Absolute Focus Error

***This chart is only available if the Determine Focus Error option is enabled.***

This chart shows the estimate of the best possible quality achievable for each test point. Due to the way that this value is calculated there is some variance in the estimated best quality, but the combination of the values across the test provides a statistically significant result.

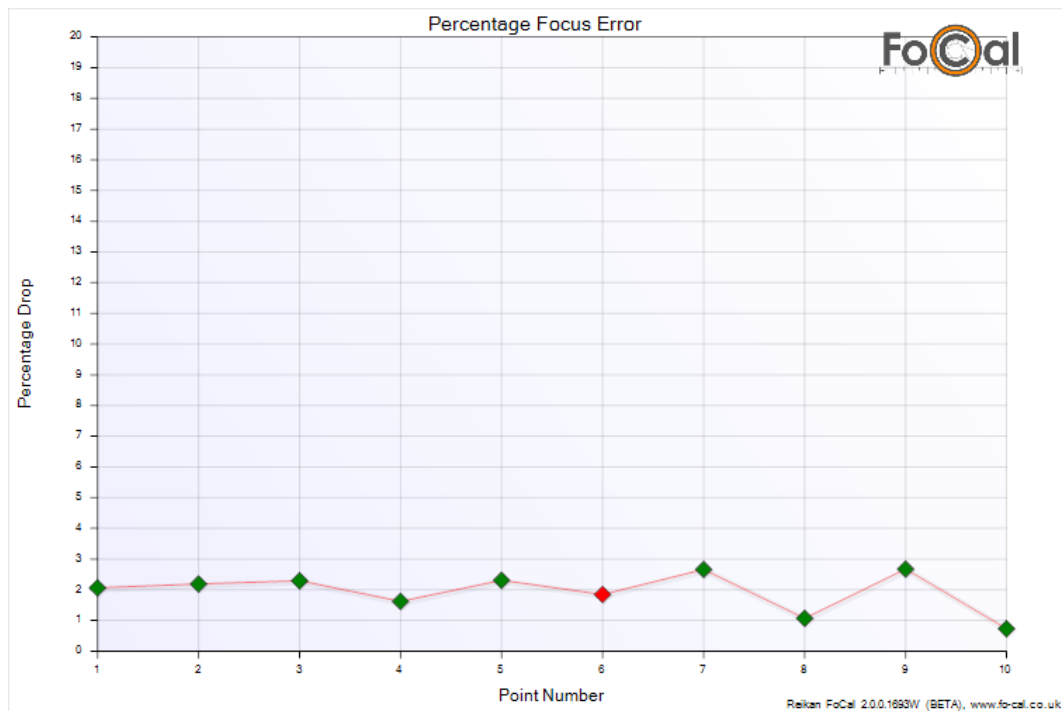


### 14.6.5 Percentage Focus Error

***This chart is only available if the Determine Focus Error option is enabled.***

This chart indicates the percentage quality increase that could be achieved by refocusing the lens to the best possible sharpness for each shot.

Points marked in **green** are deemed to be fair representations of the absolute quality achievable, while points marked in **red** may be less accurate.



#### ***Interpretation***

A line that has pretty stable, even values across the range (as shown above) indicates that the results were similar for all test points and gives confidence to the quality of the result.

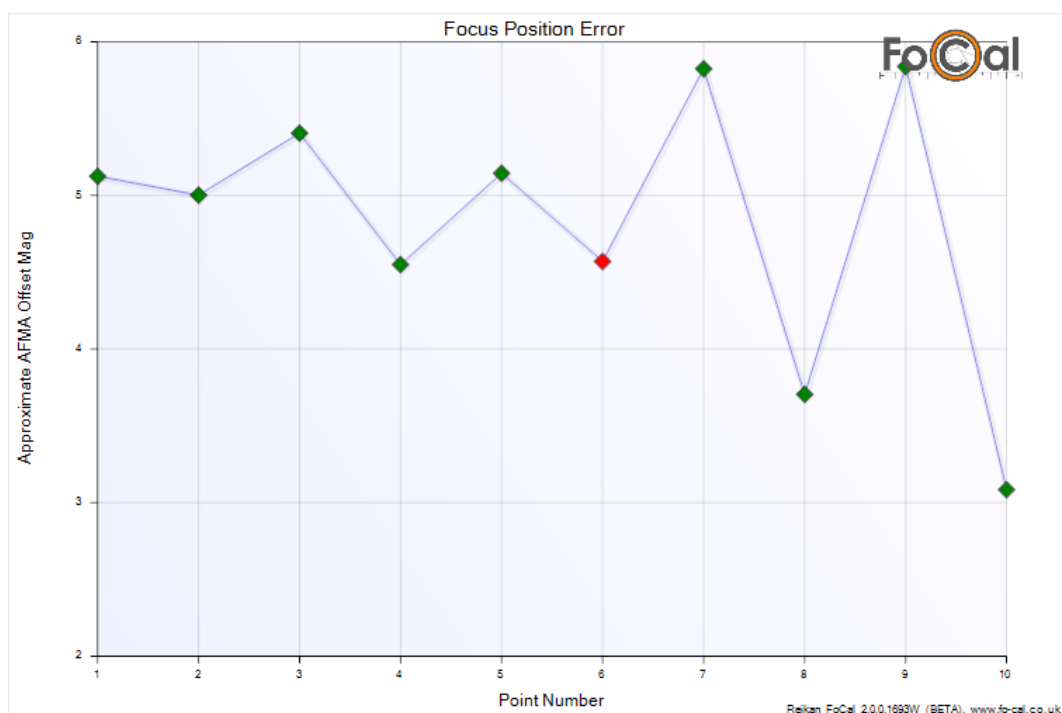
A small error indicates that the focus achieved by the camera during the test is close to the best possible quality. If the line is similar to above, but rising above about 5% on average, the camera focus is very likely to require calibration which you can do by running the *Fully Automatic Calibration*.

### 14.6.6 Focus Position Error

**This chart is only available if the *Determine Focus Error* option is enabled and there is valid FoCal Comparison Data.**

By using the FoCal lens profile model and information obtained from other FoCal users with the same camera/lens combination, it is possible to approximately predict the AF Microadjustment/Fine Tune error indicated by the focus position error data.

In the example below (which is built from the same data used in the other charts above), the average value is around 4-5 AF Microadjustment units so it would be well worth running this camera/lens through the *Fully Automatic Calibration*.

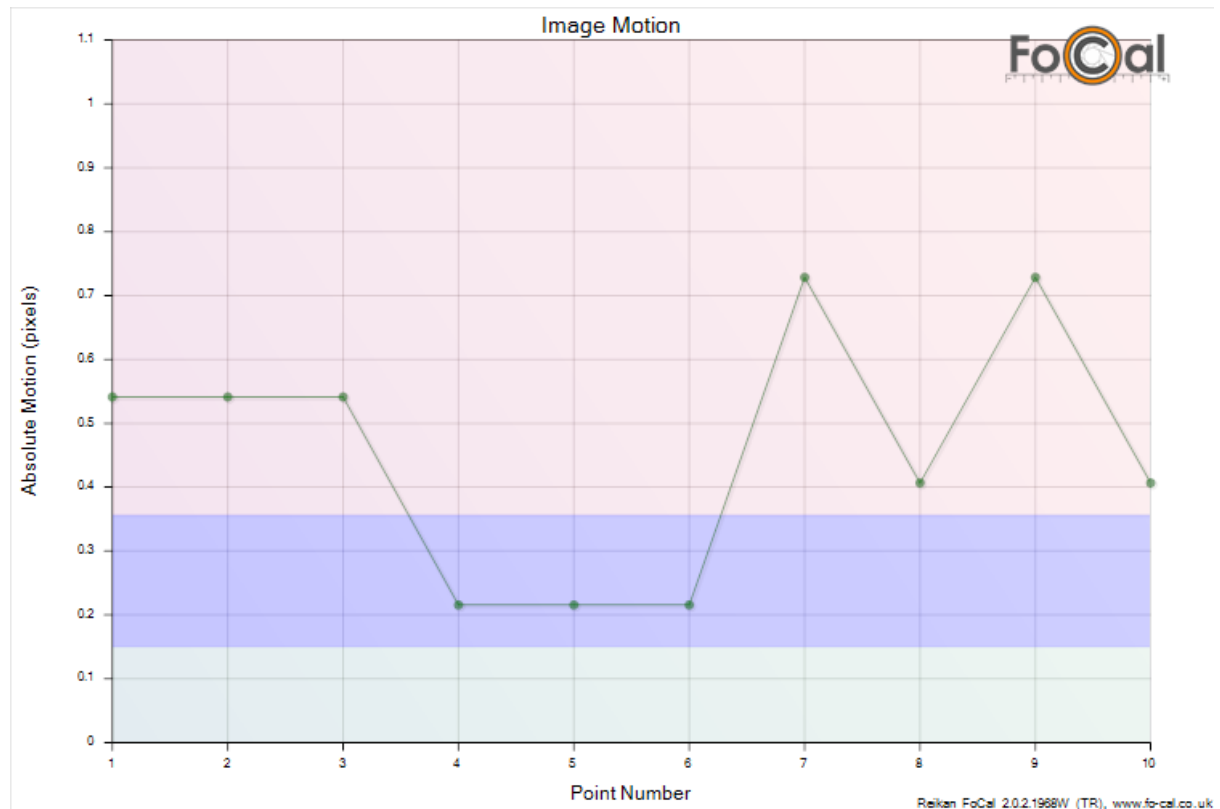




### 14.6.7 Image Motion

The Image Motion chart shows how the image captured by the camera has moved as the test has run.

*Note: Image Motion is only available if Target Validation or Target Optimisation is enabled and the FoCal Target is used and detected during the test.*



### Interpretation

This chart shows how the image captured by the sensor has moved across the test. This motion can be caused by movement of the camera through vibration or environmental changes (e.g. a bouncy floor or the tripod being knocked), and also the motion of the image as the focus changes throughout the test.

If you have access to the FoCal Comparison Data (see section 8), the overlay will be displayed. The green area shows better-than average movement, the blue area is average movement and the red area is worst-than-average movement. Please be aware that the Image Motion data is experimental and it should not be assumed that there is an issue with the lens if points appear in the read area (like the example above). The absolute value of Image Motion should be a better indication of whether there is an issue, and a small value of a few pixels movement should not be any cause for concern.

A low value of a few pixels is nothing to worry about, but if you see a high value at certain points or across the range this will indicate that the image has moved a lot. You can confirm this by reviewing the analysed test images (use the “,” and “.” keys to move back and forth through the images).

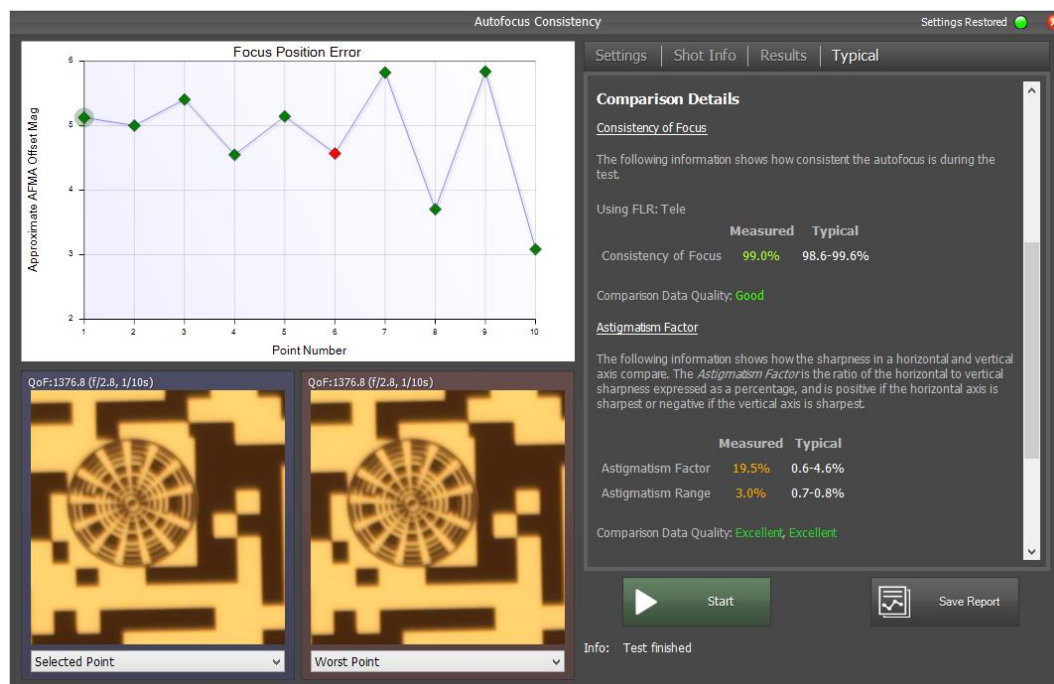
The value on the chart is the absolute offset for each point from the mean offset for the whole test. This means there is no direction shown – just the total number of pixels moved from the average for the test.

## 14.7 Typical Comparison

If you have access to the FoCal Comparison Data (see section 8) you will be able to see information about how your test results compare to typical FoCal users with the same camera and lens.

**NOTE: This is a new feature and will be developed more over the course of the initial FoCal 2 Test Releases.**

The *Typical* page will show information about different aspects of your test results, and towards the bottom of the page you will see the numeric values for your results and the typical results from other users.



## 14.8 Useful Keys

The following is a list of the keyboard shortcuts available for this test:

Z,X	Highlight the previous or next point on the chart and display the Shot Information for this point.
1-5	Switches to a specific chart view
CTRL+S	Enable/Disable RGB mode
R, G, B	When RGB mode is enabled, show the analysed Red, Green or Blue images and highlight the information on the chart
S, I, R, T	Select the (S)ettings, Shot (I)nfo, (R)esults or (T)ypical tab.
,	When not running a test, display the FoCal Settings window.
CTRL+C	Copy the chart image to the clipboard.

## 14.9 Common Test Features

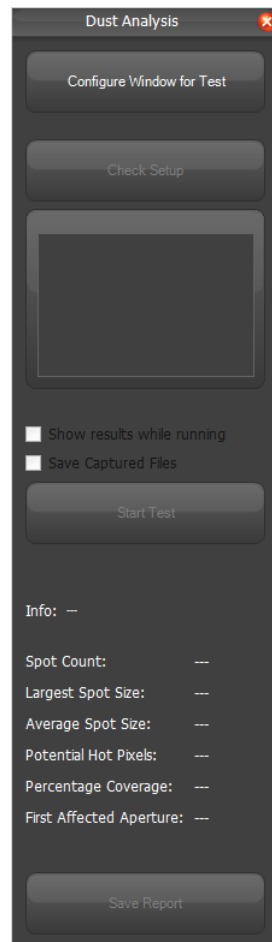
Please see section 6 for details on changing chart scale, ignoring points, saving reports and other features common to most tests.

## 15 Dust Analysis (FoCal Pro only)

The Dust Analysis tool will guide you through a quick procedure to quantify the amount of dust on the camera sensor, as well as showing you where the dust will begin to affect the images.

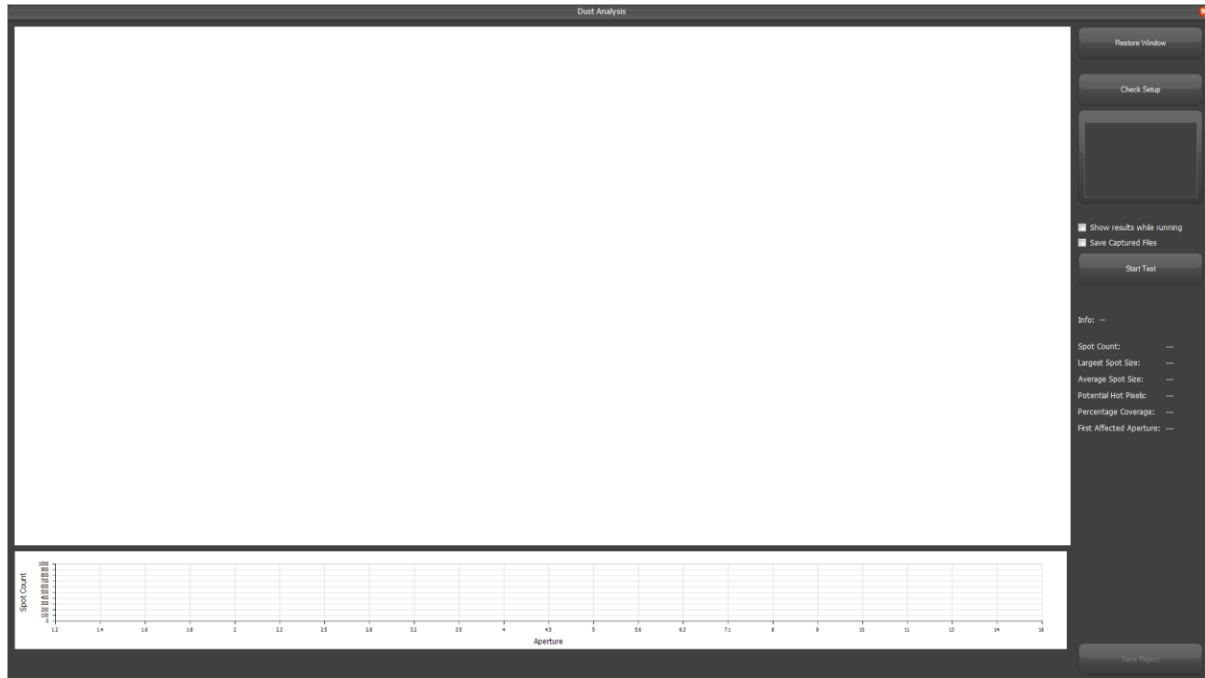
### 15.1 Using the Dust Analysis tool

The test is accessed from the *Show Tools* button. Clicking the *Dust Analysis* button shows the following window:



## 15.2 Setting Up

This tool uses the computer monitor as the target, so the camera will need to be pointed at the monitor screen. To configure the window for the test, click the button *Configure Window for Test*. The window will change to the following:



The test area is the large white area on the screen. The camera should be aimed at this rectangle so that the viewfinder shows nothing but this image. It is not essential to use a tripod for this test.

As well as pointing the camera at the screen, you must manually defocus the image, generally by focusing to infinity. If you are using a zoom lens, it is generally better to zoom to the telephoto end. There should be no discernible things in the viewfinder – just out of focus white.

In order to validate the setup of the camera, click *Check Setup*. This will start a Live View session in the small window underneath the *Check Setup* button. The Live View image is analysed to make sure the camera is defocused and aimed at the white rectangle. When the image of the screen is acceptable, a green Tick will be shown, otherwise a red X will be shown.

### 15.2.1 Show Results While Running

If you are using a different target (e.g. a white wall), you can tick the *Show Results while Running* box. When the test runs, you will be shown the sensor image with the dust spots highlighted, and the chart will update as each shot is analysed.

### 15.2.2 Points to Note

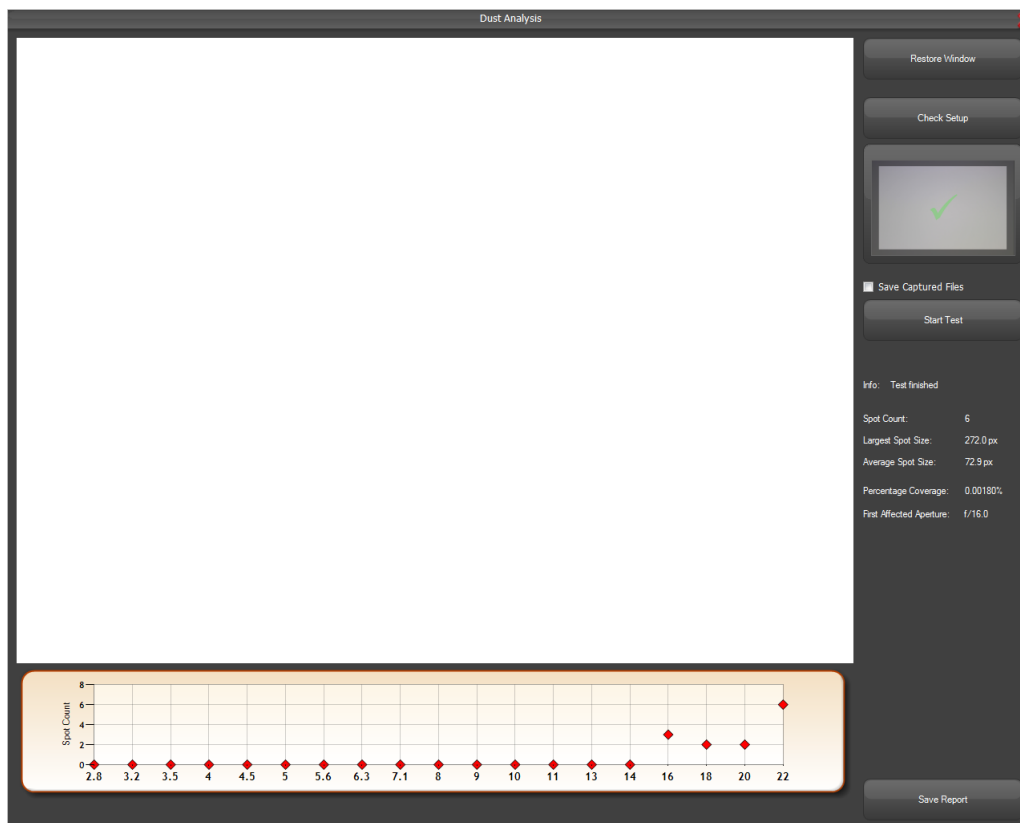
The dust analysis test has some limitations, mainly related to vignetting on certain lenses. It is generally best NOT to use a fast prime for the dust test as the vignetting can be both fairly severe and dynamic across the aperture range. *Remember, this test is for analysing the sensor dust, so actual lens is unimportant to the test results other than for the vignetting.*

If you do use a lens with heavy vignetting wide open, you may never see a green tick on the small *Check Setup* Live View image. This does not necessarily mean you cannot run the test, but it is a warning that you may not get optimal results.

In this case, the dust test can still be useful as you can choose to save the image for manual review.

### 15.3 Running the Test

Once the camera setup is validated, clicking *Start Test* will begin to take shots across the aperture range and analyse the images. If *Save Captured Files* is enabled, a directory chooser will be presented and you can choose a location for the captured full resolution files to be saved, each labelled with the date and time, aperture, camera model and serial number.

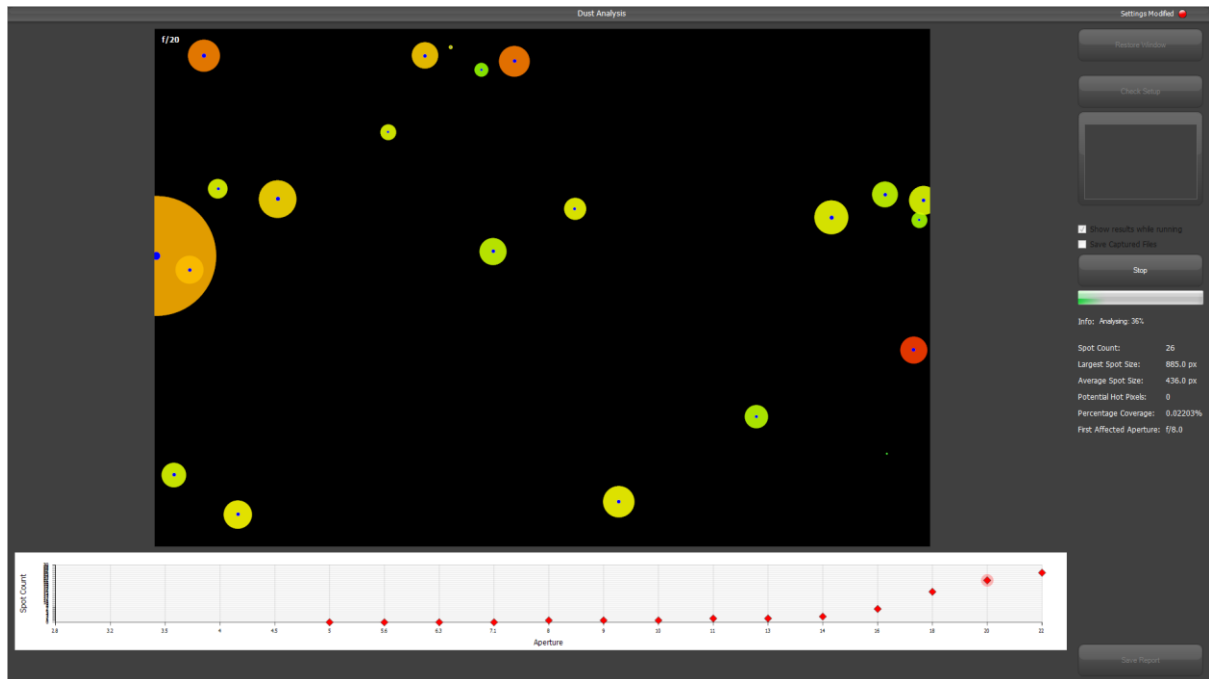


The information panel under the *Start Test* button will show information as the test progresses:

- **Spot Count** is the largest number of spots found so far on any aperture
- **Largest Spot Size** is the total number of pixels covered by the spot. Note that this is *not* the length or width of the spot, but the area.
- **Average Spot Size** is the average size of all the spots
- **Potential Hot Pixels** is a count of the number of possible hot pixels
- **Percentage Coverage** shows how much of the total sensor is wasted to dust
- **First Affected Aperture** shows the first aperture where the spots are noticed by the analysis routine.

## 15.4 Reviewing the data

Once the test is complete, the data can be reviewed by clicking any point on the graph:



Each detected spot is shown with a **blue** marker. As some of the spots will be very small and not visible on the scaled-down view shown in the window, they are highlighted with a proportionally sized larger circle which will be coloured from red through orange to green depending on the opacity of the dust spot.

A very dark, noticeable dust spot will be shown in **red**, and a very faint dust spot will be shown in **green**.

## 15.5 Common Test Features

Please see section 6 for details on changing chart scale, ignoring points, saving reports and other features common to most tests.

## 15.6 Comments on Dust Analysis

The analysis algorithm tries to detect dust spots that are of a size and density to affect images. However, it's important to realise that although the images may show a lot of dust spots, all but the largest will not be particularly noticeable. Even the large ones will only become apparent against a plain area of the image.

As the analysis has a detection threshold, the dust spot count may shift slightly especially at smaller apertures. For instance, in the graph above it appears that f/32 has less visible dust than f/25, but you should consider it that the line is pretty flat above about f/16 so all spots are visible by then.

Remember, this test will show you the worst of your sensor! Don't panic. In the example above, if you mainly shoot at f/14 or below there really is nothing to worry about. But if you shoot a lot of hyperfocal landscapes, you may want to clean the sensor.



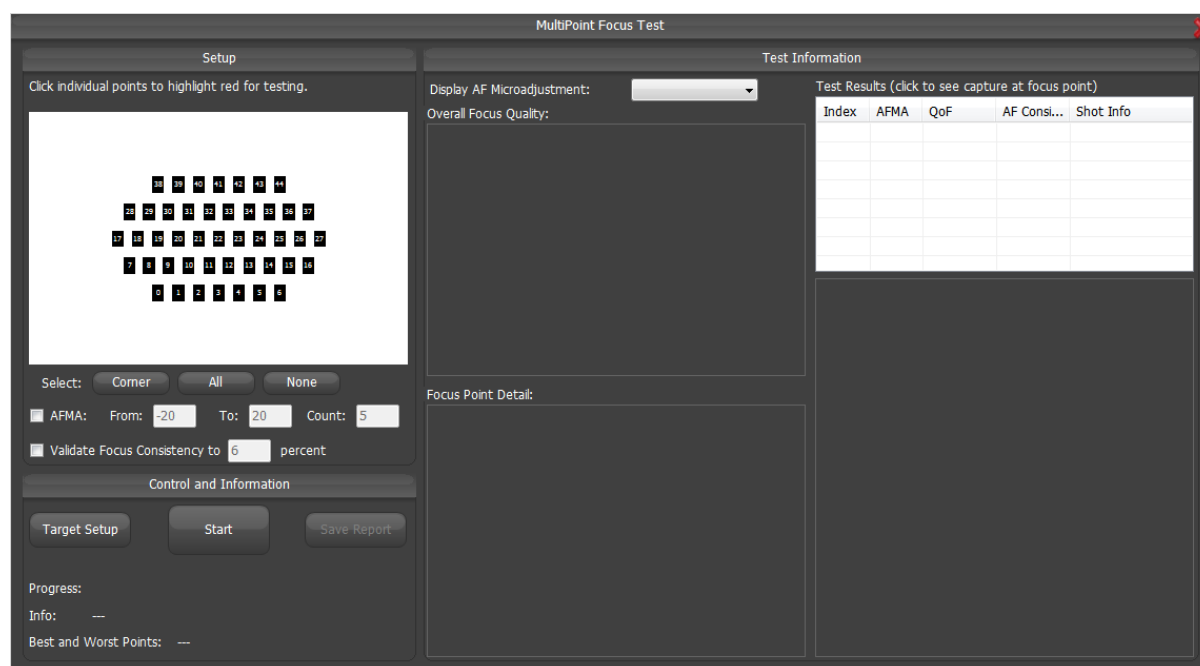
## 16 Multi Point Focus Test (FoCal Pro only)

### 16.1 Overview

The Multi Point Focus Test allows you to see any discrepancies in the focus performance of different focus points, as well as allowing basic determination of the best AF Microadjustment/Fine Tune value for each focal point. The test analyses a small region around each focus point in order to reduce the effect of lens field curvature from affecting the measure of AF point performance.

### 16.2 Running the Test

The test is accessed from the *Show Tools* button. Clicking the *Multi Point Focus* button shows the following window:



The screen is split into a number of sections:

- The *Setup* panel is shown at the top left of the screen and allows you to select the focus points you wish to test and the AF Microadjustment/Fine Tune range for each point. The screenshot above shows the focus points for a Canon EOS 7D.
- The *Control and Information* panel gives you controls to setup the target, start and stop the test and save the report once test information is available. Information about the results is also shown here as the test runs.
- The *Test Information* panel shows you graphical results and allows you to review the data.

## 16.3 Setting Up

### 16.3.1 The MPFT Target

The Multi Point Focus Test uses a new target which is designed to allow analysis all over the surface of the target, and also to be appropriate as an autofocus target. The target is supplied as a vector PDF in the *Target Images* directory, with the filename

FoCal\_MultiFocus\_Target\_1r1ns.pdf (and a bitmap PNG file called FoCal\_MultiFocus\_Target\_1r1ns-600dpi.png)

The file can be opened with readily available software such as Adobe Reader, and the content is a vector graphic so can be printed at any size without a loss in resolution.

### 16.3.2 Lens Choice

The Multi Point Focus Test is designed to test the accuracy of the focus points in the camera, and in order to do this in a valid way the lens should contribute as little as possible to the overall result.

The Multi Point Focus Test target is designed to be analysable at any point, so in order to cover the focus points for a wide angle lens you can use more than 1 printed copy of the target mounted at appropriate places. It is important not to have any white border in the analysed region – see the information in the Target Setup section below for more details.

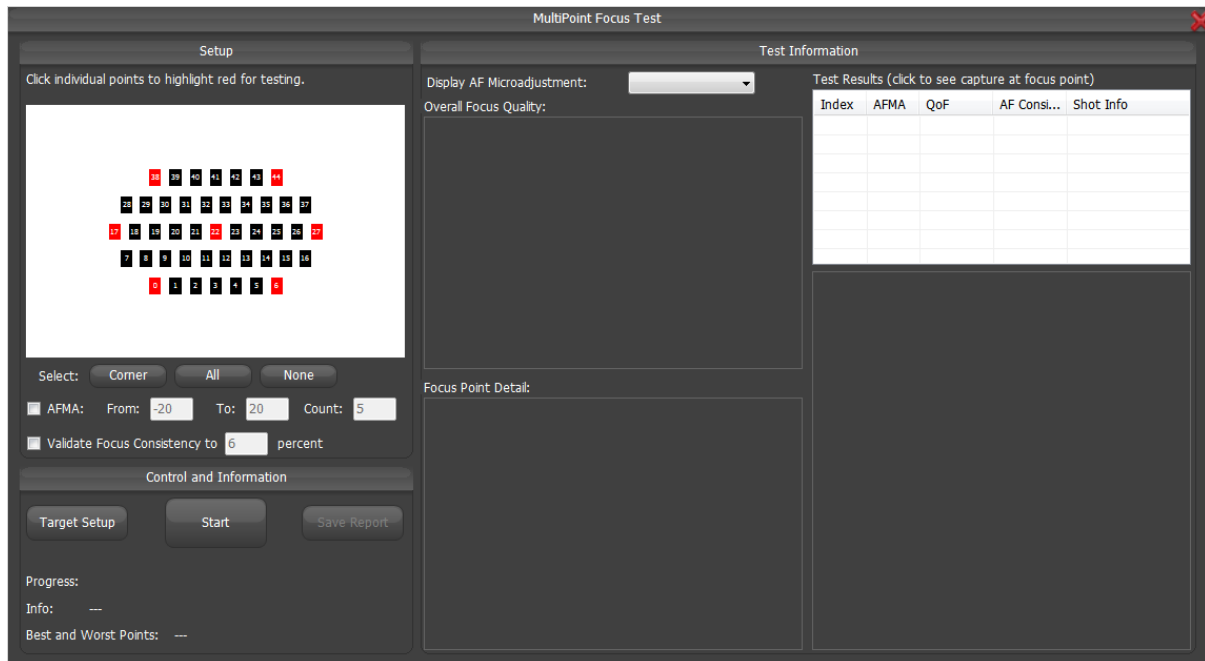
Long telephoto lenses can be susceptible to the effects of vibration so these lenses should be avoided unless you are very confident of the stability of the setup. Poor quality lenses may contribute to poorer performance of the AF system as a whole and result in inconsistent or unreliable results.

## 16.4 Choosing Focus Points

The *Setup* panel contains a focus point selector which allows you to choose the focus points you wish to test. You should select the points to test *before* running the Target Setup utility as this will influence the overlay markers on the Target Setup tool.

To mark a point for testing click on the point and it will turn red – red shows the point will be tested.

You can use the buttons under the selector to select all points (click *All*), deselect all (click *None*) or just choose the corner points and centre (click *Corner*). The following image shows the corner and centre point selected:

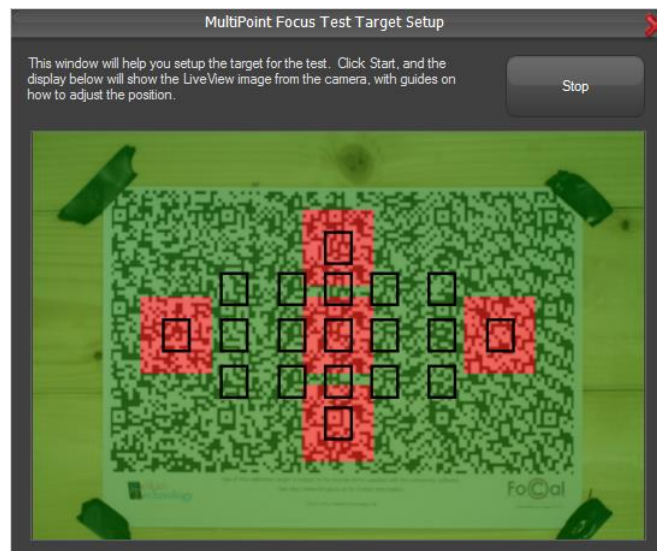


## 16.5 Target Setup Utility

A Target Setup utility is available for assisting in setup of the target for this test. To use this utility, simply click *Target Setup* on the Multi Point Focus Test window. The following window will appear:



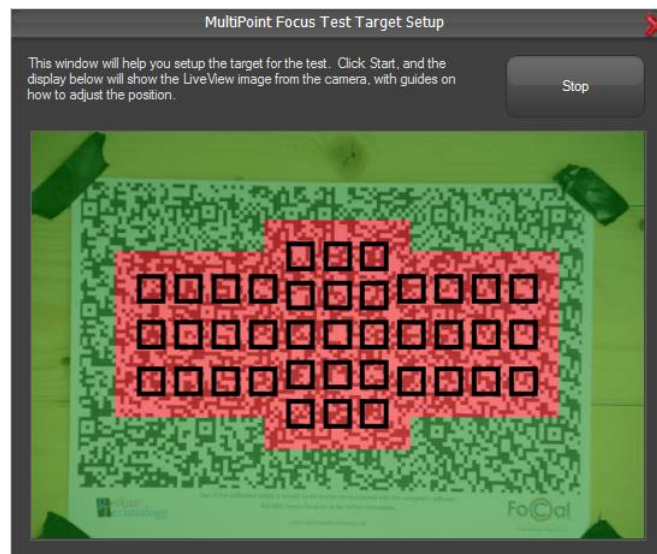
To start the utility, click Start, and you will be presented with a Live View image of the target along with markers to indicate where the target should be. **Note that the markers indicated where the target pattern needs to be under the points selected in the Focus Point Selector in the main window.** For example, if only the corner points are chosen as shown in the screenshot in section 0, the Target Setup overlay will look like this:



The following images give examples of correct and incorrect target positioning.

### Correct Positioning

The correct position is to ensure that every part of the RED area in the overlay covers the target. As shown below, the target extends into the green area on all sides:



### Incorrect Positioning

Some of the red region below falls outside of the target. In this instance, the camera should be moved closer to the target or a longer focal length lens used.



Note that FoCal does not validate the position of the target in this version of the test, so it is important to ensure that target is set up correctly.

When the target is set up correctly, simply hit *Stop* and close the window to return to the Multi Point Focus Test window.

## 16.6 Running the Test

The test can be run in two modes:

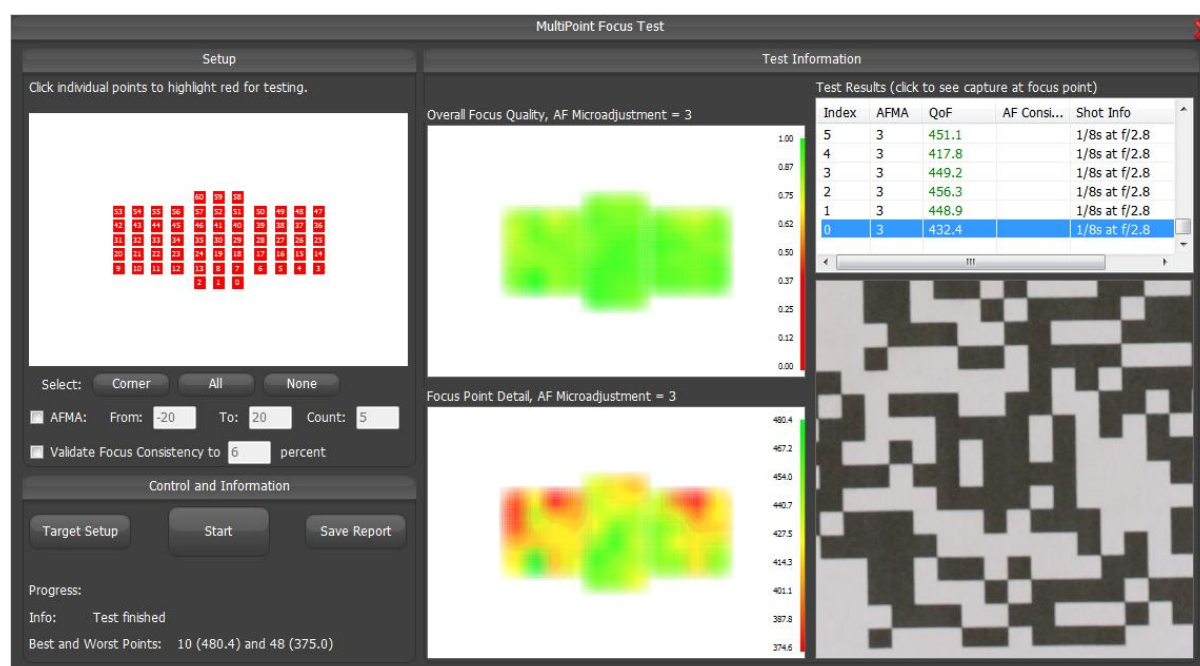
- Single AF Microadjustment/Fine Tune Mode
- AF Microadjustment/Fine Tune Prediction Mode

### 16.6.1 Single AF Microadjustment/Fine Tune Mode

In Single AF Microadjustment/Fine Tune Mode, the test will not adjust the AF Microadjustment/AF Fine Tune of the camera during the test. All points will be shot with the same setting, so the result shows the combination of the AF performance and the lens performance at specified points. In order to run in Single AF Microadjustment/Fine Tune Mode, you must ensure the *AFMA* tick box is *not* ticked.

Once the target is setup and the focus points picked, just click *Start* to begin the test.

As the test runs, the currently analysed AF point will be shown in green on the focus selector. When data is available, the *Overall Focus Quality* and *Focus Point Detail* charts will start to show detail, and the *Test Results* list will show the shot information and data for each point.



Note that as both the charts show information which is based on all the capture information up to the current time, the content may change significantly during the test as more data is available.

### 16.6.2 Analysis Region Quality

When each area is analysed, the suitability of the area under analysis is checked. If the area is deemed to be acceptable to give a useful analysis result, the QoF entry in the list at the top-right of the window will be shown in **green**. If there is a potential issue with the analysed region, the entry will be shown in **red**. You should click on each red entry and check the target image to make sure the region is not outside the random target pattern area.

### 16.6.3 AF Microadjustment/Fine Tune Prediction Mode

In AF Microadjustment/Fine Tune Prediction mode, the test takes a number of shots at each focus point at a range of AF Microadjustment values, and can help determine the best AF Microadjustment at each point. While no camera yet allows you to specify AF Microadjustment values at each focus points, see the spread of values can help determine if there is a problem with your camera or lens.

In order to run in AF Microadjustment/Fine Tune Prediction mode, the *AFMA* tick box should be ticked, and a *From*, *To* and *Step* value supplied:

- The *From* value is the first AF Microadjustment / Fine Tune value to test
- The *To* value is the last AF Microadjustment / Fine Tune value to test
- The *Count* value is the number of AF Microadjustment / Fine Tune points to test spread across the *From* to *To* range defined above.

For example, setting *From* as -20, *To* as +20 and *Count* as 5 will take shots at -20, -10, 0, 10, and 20 for each focus points and build a comprehensive view of the AF Microadjustment / Fine Tune settings for each focus point.

#### 16.6.3.1 Focus Consistency Validation

In order to try to remove the effects of variation in the AF performance of the camera, you can specify a focus consistency percentage. FoCal will keep taking shots until the QoF of 2 shots lie within the percentage defined, at which point the best of the two close values will be taken.

A typical value for this field is 6-8%, but if you want to ensure very tight consistency you can reduce this to around 3%.

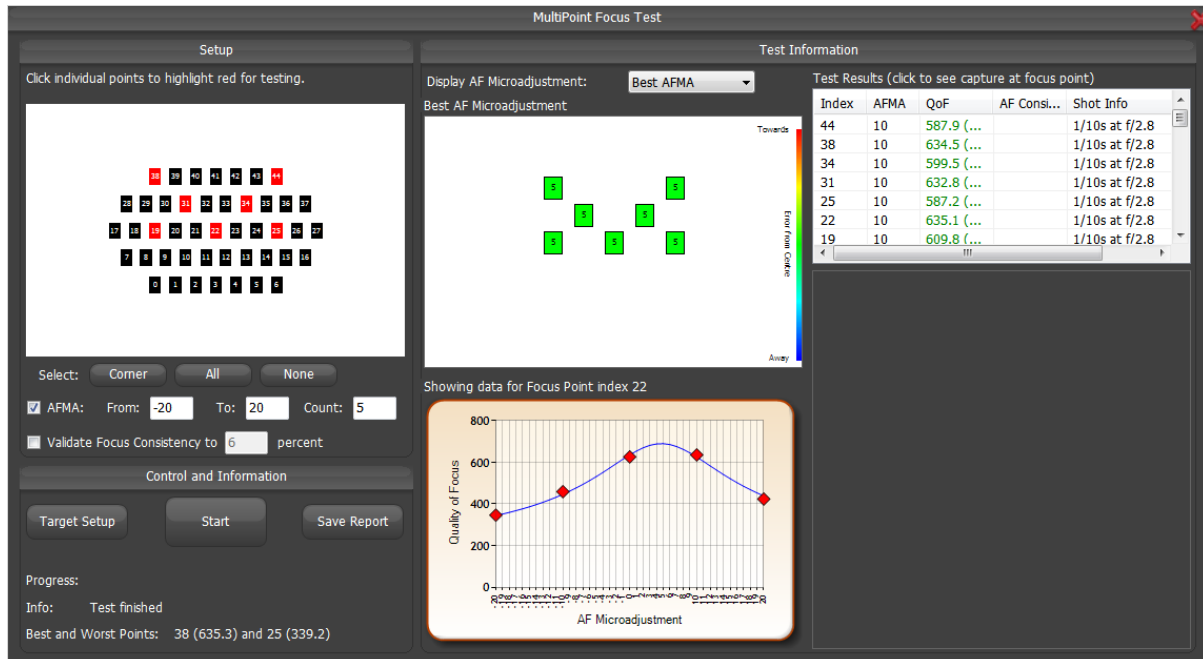
You must activate this setting by ticking the box next to it in order to use validation. *Note that this will increase the number of shots taken to at least 2 shots per selected focus point, and possibly more depending on how consistent the AF system is behaving.*

#### 16.6.3.2 Display AF Microadjustment

When the test is running in AF Microadjustment/Fine Tune Prediction Mode, the results can be displayed in a number of ways depending on the value of the *Display AF Microadjustment* entry:

### 16.6.3.2.1 Best AFMA (AF Microadjustment/Fine Tune)

If *Best AFMA* is chosen, the top chart shows the focus points with the current best AF Microadjustment/Fine Tune value shown within the points.



The AF Microadjustment/Fine Tune value is indicated within the focus rectangles, and the colour of the rectangle indicates how close the predicted value is to the predicted value of the centre focus point (which is taken as a reference point).

The example above shows 7 tested points, all showing a predicted AF Microadjustment value of +5 and all shown in **green** as each point exactly matches the AF Microadjustment value of the centre focus point.

If the predicted AF Microadjustment/Fine Tune value of the point is nearer to the camera than the centre point, the focus point will be shown progressively redder. Equally, if the predicted value is further from the camera, the point will be shown progressively bluer.

Clicking on an individual focus point will show the results for each tested AF Microadjustment point as shown by the graph in the lower chart area.



#### 16.6.3.2.2 Single AF Microadjustment/Fine Tune

If the *Display AF Microadjustment* list is set to one of the tested values (e.g. -20 as shown below), the results are shown in the same way as for the Single AF Microadjustment/Fine Tune mode of the test – the top shows the *Overall Focus Quality* and the bottom shows the *Focus Point Detail*:



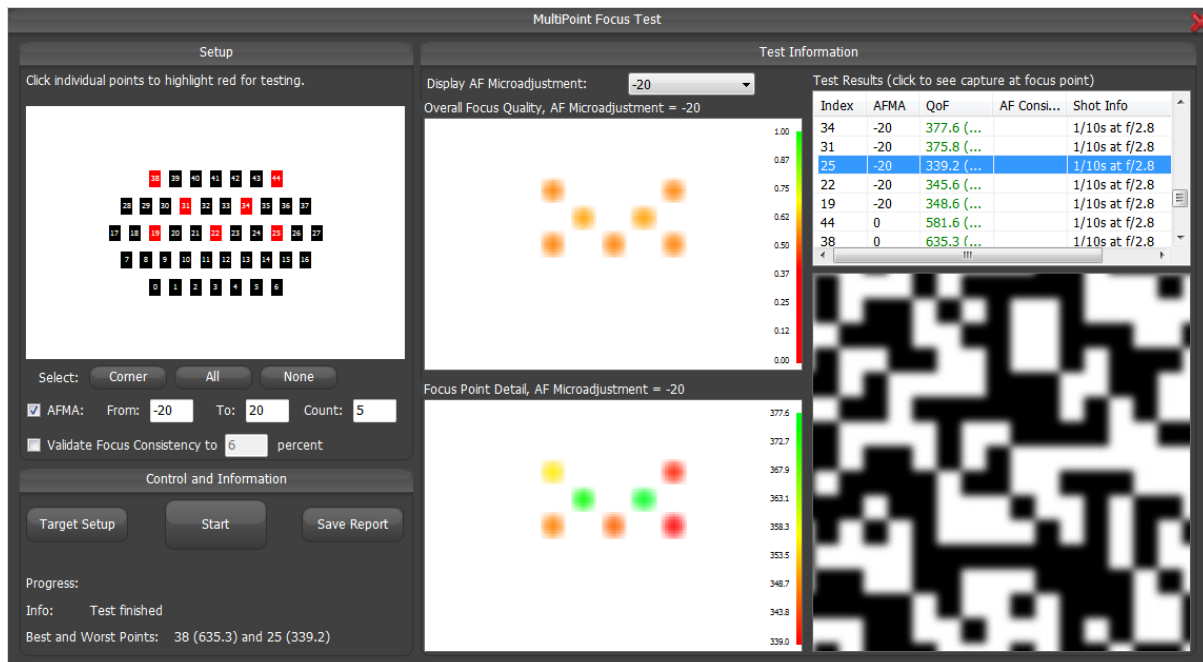
### 16.7 Failure to lock AF

When the test is running, some cameras and lenses are susceptible to failure to lock on to the target occasionally. If this happens, you will see a message box which explains that you can retry and suggests you slightly move the focus beforehand.

If this happens, try turning the focus ring of the lens (in manual if necessary) one way a little and retrying. If this does not help, then try the other way and retry. Usually the camera will focus within one or two attempts, but if you cannot get it to focus after a number of retries you may have to stop the test and rerun at a slightly different distance from the target or different focal length.

## 16.8 Reviewing the results

Each individual result can be reviewed by clicking on the line in the *Test Results* list. This shows the image captured at the AF point that was being tested.



## 16.9 Common Test Features

Please see section 6 for details on changing chart scale, ignoring points, saving reports and other features common to most tests.

### 16.10 Interpreting the results

The information presented as the test runs is presented in the two charts in the centre of the window (these are also included in the saved report).

#### 16.10.1 Overall Focus Quality

This chart shows each point relative to the *best* point currently analysed:

$$x = \frac{QoF_{max}}{QoF}$$

Where  $x$  is the value shown on the chart between 0.0 and 1.0

$QoF_{max}$  is the maximum averaged Quality of Focus (QoF) result from all the points, and

$QoF$  is the QoF value for the point being analysed.

##### 16.10.1.1 Interpreting

For an absolutely ideal camera and lens, this chart should have the same QoF at every point, which would lead to all points having a value of 1.00 and being shown in green. However, where there is a drop in performance compared to the best point, the value shown will start to drop and the point will be coloured towards red.

As all the points are affected by the lens, light level, vibration etc, the effect of these factors is mostly removed by comparing each point to the best point. This means you can draw conclusions

based on the absolute value of the points. Generally, if you have some red points it is indicating a significant drop in quality at these focus points.

### 16.10.2 Focus Point Detail

Unlike the chart above, this spreads the values for the points across the full range of colours. This means the best point will be shown in green, and the worst point will be shown in red, and all other points somewhere in between depending on their quality.

It's important to understand that in the *Focus Point Detail* chart, red does not necessarily mean bad! If the spread of values is very small, the worst (red) point may still be excellent.

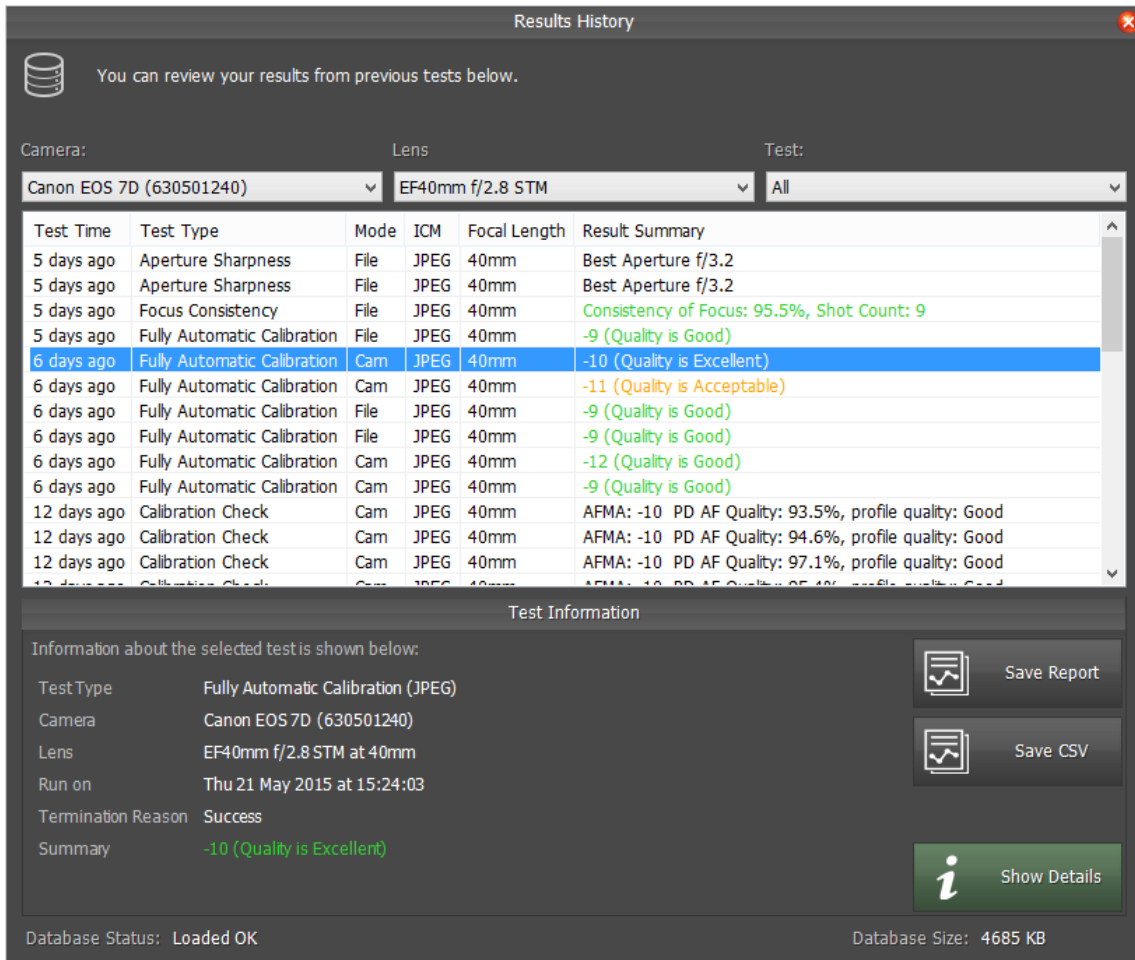
This chart is simply used to show where the best and worst points are. If you notice that there is a definite grouping of good and bad points, and it is consistent across multiple runs of the test, there may be an issue with the AF system.

## 17 History

A new feature in FoCal 2 is the ability to review the results of previous tests run on your computer. This applied to tests run with FoCal 1 as well as FoCal 2, so from the first time you run FoCal 2 you should find you have a populated history already on your computer.

### 17.1 Accessing the History

To see the history on your computer, you can select the *History* button from the *Tools* tab of the main FoCal window. This will show the window below:



Results History

You can review your results from previous tests below.

Camera: Canon EOS 7D (630501240) Lens: EF40mm f/2.8 STM Test: All

Test Time	Test Type	Mode	ICM	Focal Length	Result Summary
5 days ago	Aperture Sharpness	File	JPEG	40mm	Best Aperture f/3.2
5 days ago	Aperture Sharpness	File	JPEG	40mm	Best Aperture f/3.2
5 days ago	Focus Consistency	File	JPEG	40mm	Consistency of Focus: 95.5%, Shot Count: 9
5 days ago	Fully Automatic Calibration	File	JPEG	40mm	-9 (Quality is Good)
6 days ago	Fully Automatic Calibration	Cam	JPEG	40mm	-10 (Quality is Excellent)
6 days ago	Fully Automatic Calibration	Cam	JPEG	40mm	-11 (Quality is Acceptable)
6 days ago	Fully Automatic Calibration	File	JPEG	40mm	-9 (Quality is Good)
6 days ago	Fully Automatic Calibration	File	JPEG	40mm	-9 (Quality is Good)
6 days ago	Fully Automatic Calibration	Cam	JPEG	40mm	-12 (Quality is Good)
6 days ago	Fully Automatic Calibration	Cam	JPEG	40mm	-9 (Quality is Good)
12 days ago	Calibration Check	Cam	JPEG	40mm	AFMA: -10 PD AF Quality: 93.5%, profile quality: Good
12 days ago	Calibration Check	Cam	JPEG	40mm	AFMA: -10 PD AF Quality: 94.6%, profile quality: Good
12 days ago	Calibration Check	Cam	JPEG	40mm	AFMA: -10 PD AF Quality: 97.1%, profile quality: Good

Test Information

Information about the selected test is shown below:

Test Type	Fully Automatic Calibration (JPEG)
Camera	Canon EOS 7D (630501240)
Lens	EF40mm f/2.8 STM at 40mm
Run on	Thu 21 May 2015 at 15:24:03
Termination Reason	Success
Summary	-10 (Quality is Excellent)

Save Report

Save CSV

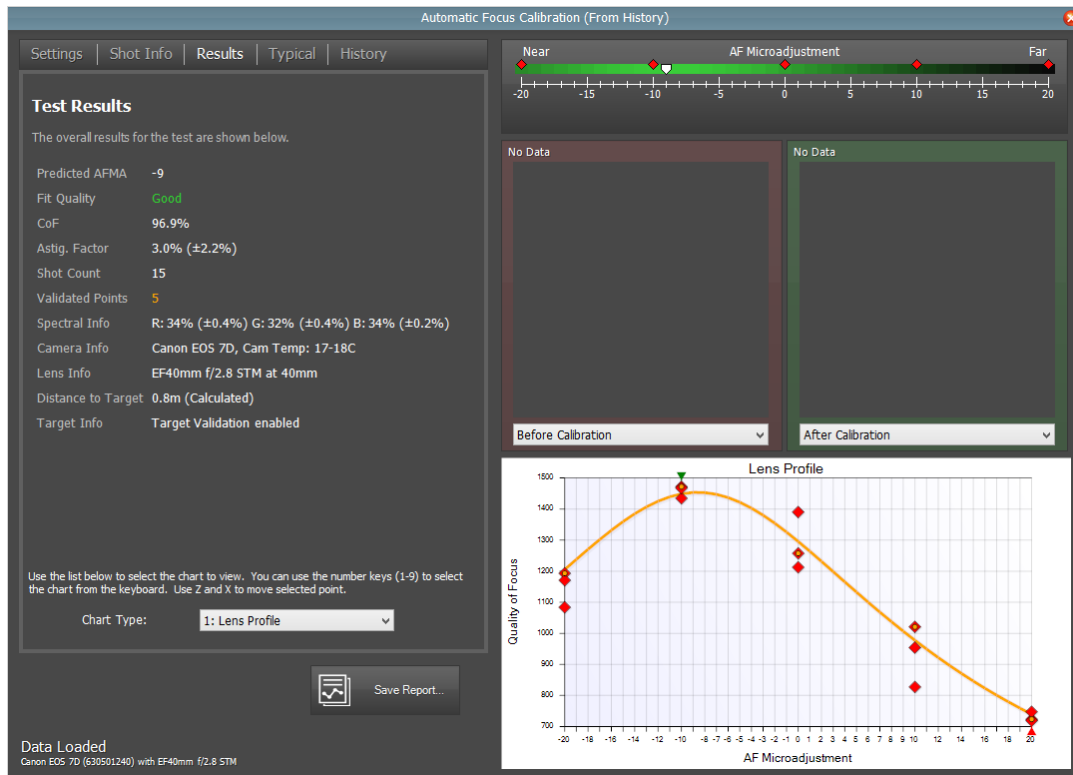
Show Details

Database Status: Loaded OK Database Size: 4685 KB

From here, you can use the drop down lists to choose the camera, lens and test that you want to see results for. Any tests that can be displayed are shown in the big list view in the window – this will include the time the test was run, the version of FoCal used and some extra information about the test (this will depend on the test that was run).

## 17.2 Test Details

By clicking on an entry in the list, you can then see the details for this test.



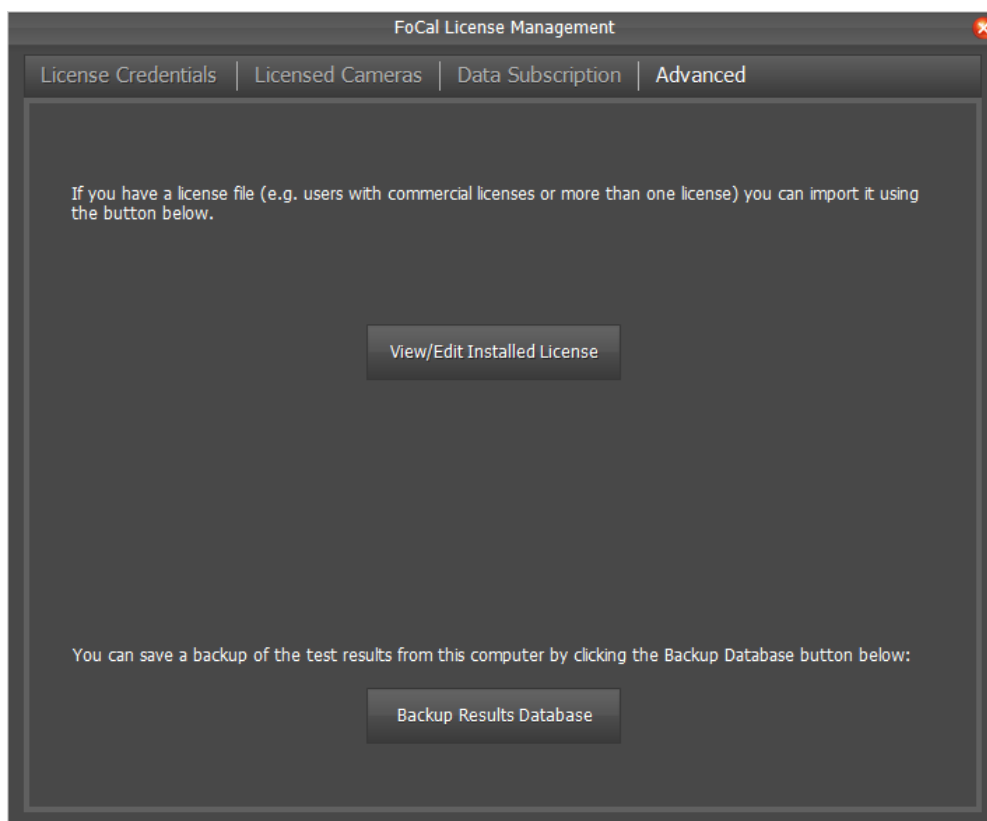
This will include as much information as possible, but may not include all the features available within FoCal 2. For example tests run for FoCal 1.9.5 and later will have populated Astigmatism Factor, but tests run before FoCal 1.9.5 will have no results for this specific metric.

A window which is recreated from history data will have a blue title bar and have “(From History)” added to the title. The information at the bottom left of the window will show the camera and lens that was used for the test.

Note that the history information does **not** include any images, so although you will be able to see the numeric data and charts for the results, you will not be able to review any images.

## 17.3 Backup Local Results

FoCal 2 offers the ability to back up your results data that has been captured for all your previous tests. In order to do this, open the License Management window (click *About* in the main FoCal window, then click *License*) and choose the *Advanced* tab. At the bottom of the window is *Backup Results Database* – click this and choose a location for the file to be saved.



At present, there is no way to import this backup data into FoCal, but this feature will be added in a future version. *It is a good idea to periodically back up your results database and store on another computer so in the event of computer failure the results can be restored.*

## 18 File Mode

File Mode allows you to run the Fully Automatic Calibration, Autofocus Consistency or Aperture Sharpness tests from a set of files you have captured yourself. FoCal has no connection to the camera for File Mode operation, and can be used to analyse images from cameras and lenses which are not supported in tethered mode from FoCal.

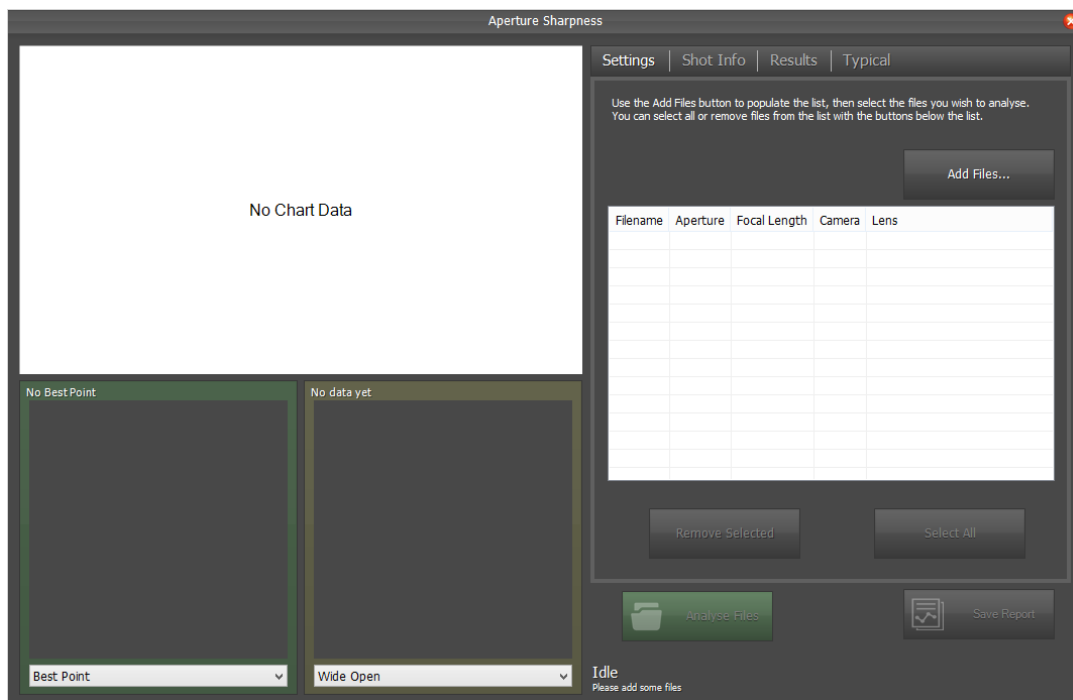
### 18.1 Licensing

File Mode is not tied to specific camera serial numbers like tethered mode, but the valid System ID of the computer you are currently using must be specified in your license. If this is not the case, you will see a message asking if you wish to enable File Mode for this computer – simply accept this message if you wish to enable File Mode on this computer.

### 18.2 Operation

To use File Mode, you go directly to the appropriate test that you want to run **without connecting to a camera**.

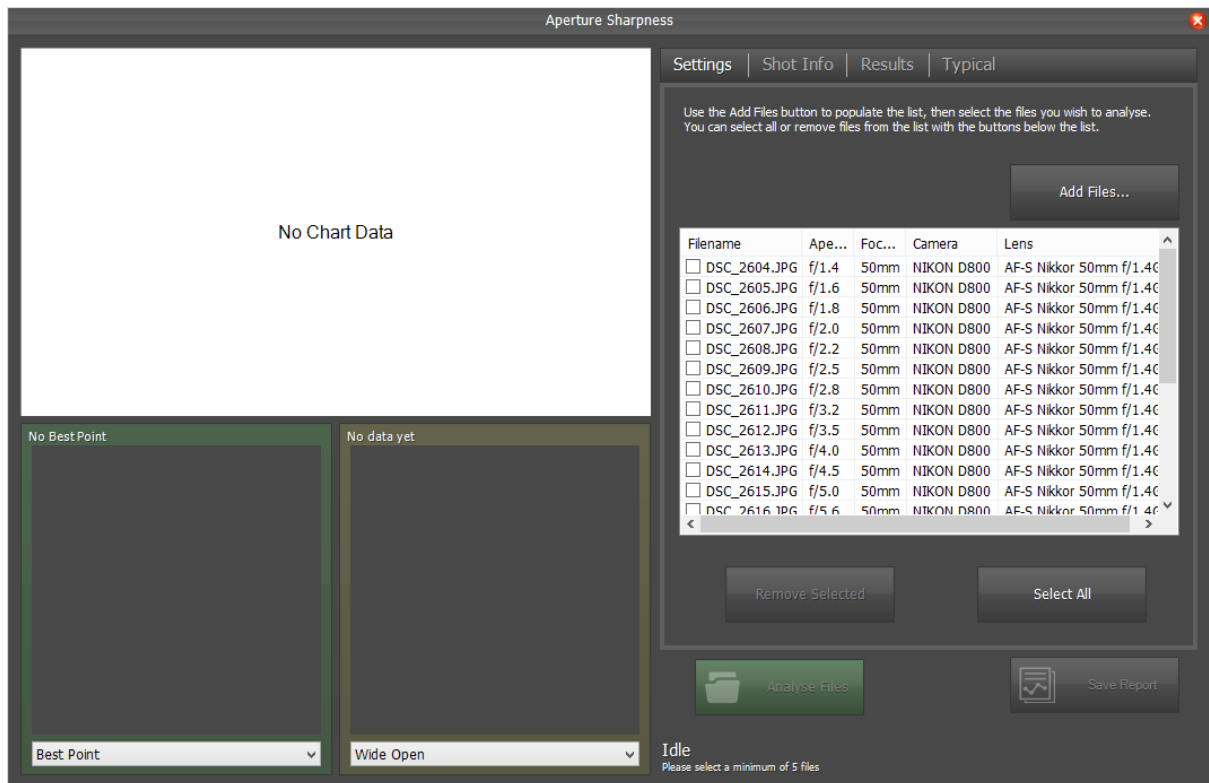
For example, to analyse a set of files for an Aperture Sharpness test, just start up FoCal, go directly to the *Analysis* tab and click the *Aperture Sharpness* button. The test window will open, and the *Settings* tab will show tools for selecting the files to analyse:



#### 18.2.1 Choosing Files

To select files, click the *Add Files* button in the *Settings* tab on the right side of the window.

The file selection dialog will be shown - you can choose multiple files in the usual way, then click *Open* and after a short time the file list in the Test window will be populated with information:



You can add further files with the *Add Files* button if you wish.

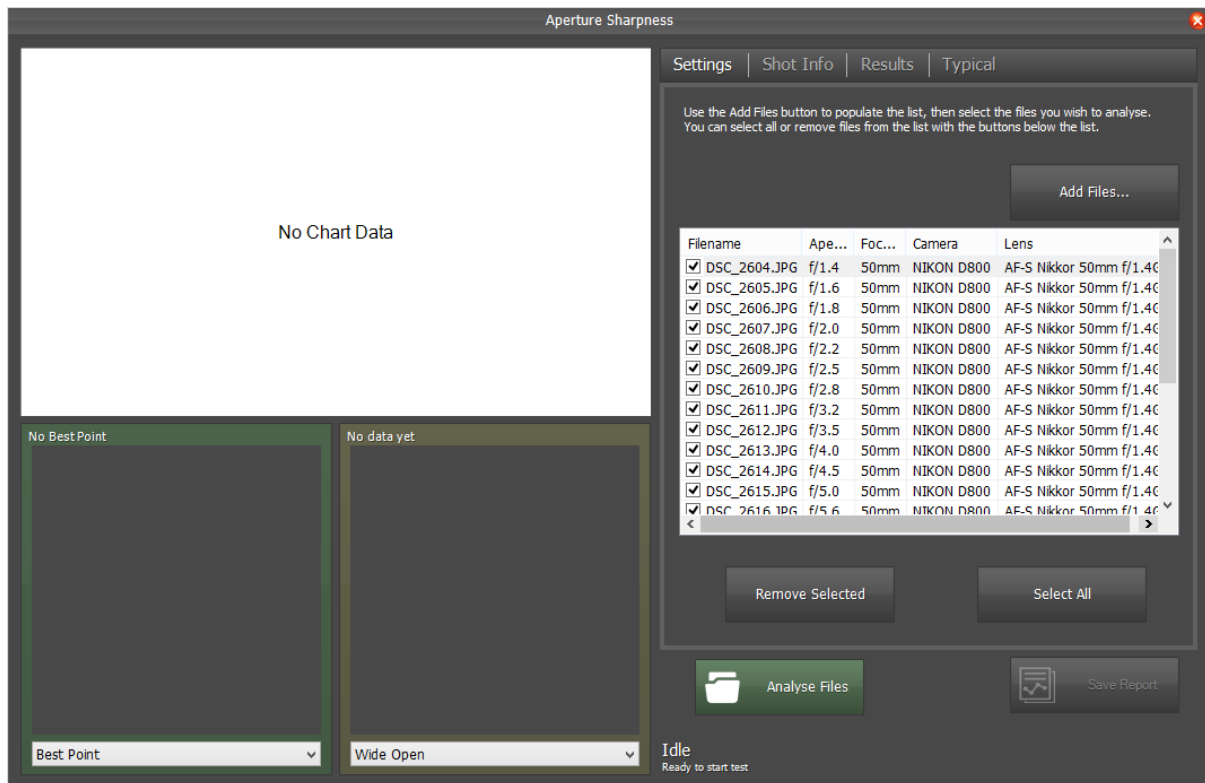
You can remove specific files from the list by ticking the individual files and clicking *Remove Selected*.

Clicking *Select All* will tick all of the files in the list.

The analysis will be performed on the files which are ticked, and the information at the bottom of the window will indicate whether the test is ready to run. In the example above, you must select a minimum of 5 files.

Hitting *Select All* will select all the files and the information will show *“Ready to start test”*:





At this point, just click the *Analyse Files* button to begin the test.

The test will now run, analysing the files and displaying the results. You can interact with the test in the same way as when FoCal is connected to a camera, and the results will be saved to your local History database for you to review later.

### 18.3 Capturing Images

When running in tethered mode, FoCal takes full control of the camera and configures it for the best analysis results during the test. When you manually capture files for File Mode, you will need to replicate these settings in order to get the best from the tests.

The points below form a guide of how to manually capture images for tests:

#### **For All Tests**

- As with tethered mode, ensure the camera is mounted on a sturdy tripod. Remove any battery grip if one is present.
- If you have a remote release cable for the camera it is best to use this as you will then reduce the chance of moving the camera between shots. You could also use a companion smartphone application if this is supported by the camera.
- If the camera supports Mirror Lockup, enable this feature.
- Under normal conditions, you should dial in +1 EV exposure compensation if your camera supports this.

- If analysing JPEG images, be sure to select a neutral picture style (e.g. Faithful, Neutral or Standard).
- It is a good idea to capture both Raw and JPEG images at the same time if your camera has this option, as this will give you the ability to analyse both sets of images in FoCal to get an understanding of how much processing the camera does for the JPEG files.

***For Autofocus Tests (Fully Auto Calibration, AF Consistency)***

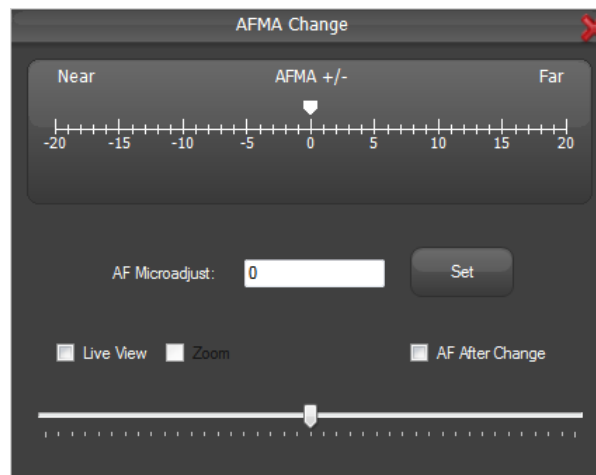
- Select a single, centre focus point in single focus mode (e.g. One Shot or AF-S)
- Between each shot, it's best to carefully defocus the lens towards infinity. This will force the full autofocus algorithm to run within the camera.

## 19 AFMA (AF Microadjustment/Fine Tune) Change Utility

### 19.1 Using the utility

Please note that this utility **WILL** change the AF microadjustment value in the camera and will **NOT** restore it to the original value. You must make a note of the AF microadjustment value before you start and restore it accordingly before exiting the test.

To start the AFMA Change utility, click the Show Tools button in the Test panel, then choose AFMA Change. The following window will open:



This utility offers 2 ways of changing the AF microadjustment value in real time, as well as the ability to immediately see the effects of the change.

#### 19.1.1 Changing AF Microadjustment Value

To change the AF microadjustment value, you can either:

- Enter a valid value (between -20 and +20) in the text box in the middle of the window and click “Set”, or
- Drag the slider at the bottom of the screen to a new value

The value will be set in the camera, and when the camera reports that it has set the value the window information will be updated. Note that there can be a small delay while the camera applied the new value (so rapidly dragging the slider at the bottom of the screen may cause slow, jumpy updates – this is perfectly normal).

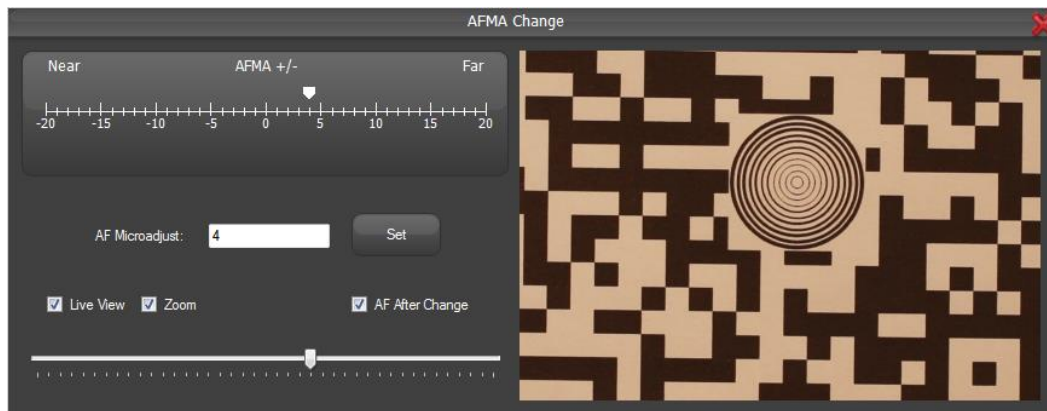
#### 19.1.2 AF After Change

If *AF After Change* is selected, then an AF operation is performed after each change in AF microadjustment value. Looking through the camera viewfinder will allow you to see the effect of the change.

Note that this utility does not apply any camera setting changes, so you must ensure the camera is set up for half-shutter-button-press focussing. If you use purely back-button focusing, the “AF After Change” function will not operate.

## 19.2 Live View

Clicking Live View will enable Live View on the camera and show the results on the extended window:



Clicking Zoom will zoom into the selected LiveView zoom region.

## 19.3 Reviewing on the Camera

When the utility is started, the camera menus will be available to use. Navigating to the AF microadjustment settings (which is C.Fn III, Number 5 on both the 7D and 5Dmk2) will show the camera updating as you change the value with this utility.

## 19.4 Keyboard Shortcuts

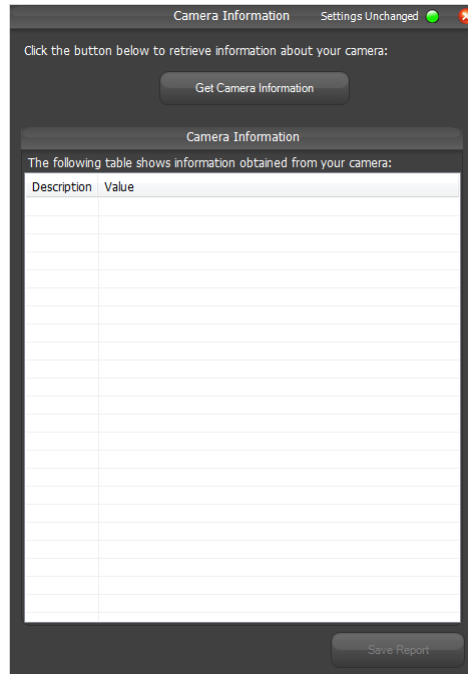
Target Setup can be controlled using the keyboard with the following keys:

Key	Action
P	Toggle "AF After Change" state
Z	Toggle Zoom state
S	Apply the specified value to the camera
R	Reset graph peak
1	Move AFMA setting towards camera
2	Move AFMA setting away from camera

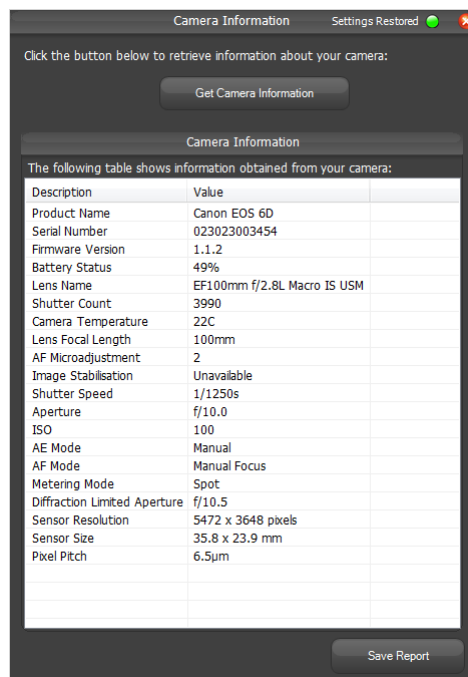
## 20 Camera Information Tool

The Camera Information tool allows you to see a wealth of information about your camera at the click of a button.

To open the tool, click *Camera Info* from the Tool panel:



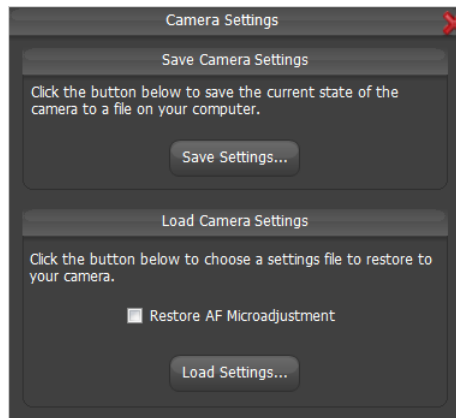
To obtain information from your camera simply click *Get Camera Information*. The camera will take one shot (you may be instructed to change the camera mode to Manual depending on the camera that is connected), and the information will be shown very shortly after:



## 21 Camera Settings Save/Load

### 21.1 Overview

The *Camera Settings* button allows you to take a snapshot of the camera settings and save them to disk to allow restoring at a later time. To open the utility, click *Camera Settings* in the Tools panel. The following window will be shown:



### 21.2 Saving Settings

To save your camera settings, click *Save Settings*. You will be presented with a file-chooser window, and you can specify a file in which to save the settings.

### 21.3 Loading Settings

To load previously saved camera settings, click *Load Settings*. You can choose a settings file and the stored settings will be applied to the camera.

If you click the *Restore AF Microadjustment* (or *Restore AF Fine Tune*) checkbox before clicking *Load Settings...* the AF Microadjustment/Fine Tune value stored in the settings file will be reapplied to the camera, otherwise all other settings will be applied but AF Microadjustment/Fine Tune will be unchanged.

### 21.4 Points to Note

There are some points to note with this first version<sup>3</sup> of the Camera Settings utility:

- The camera serial number will be validated, so you cannot save settings from one camera and restore to another even if they are the same type of camera.
- Only settings relevant to the operation of FoCal are saved and in some cases on Canon cameras, certain settings values will not be recognised and cannot be restored.
- The image quality setting will only restore the setting for the first card slot on cameras with dual card slots.

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<sup>3</sup> In a later version of FoCal, the intention is to make this utility save *all* available camera settings to allow you to take a snapshot of the camera state to restore at a later time.

See section 25 for details of the settings that are stored.

## 22 Quick AF Microadjustment Calibration (FoCal Plus/Pro)

The QuickCal test is made possible due to the accuracy of the mathematics used in FoCal to model the behaviour of the complete AF system. FoCal can use two different ways of calibrating the camera and lens in the same test – one method is fast but cannot be used independently as it does not capture all the information needed to calibrate the system, but when combined with a few known AF Microadjustment/Fine Tune points the result can be quickly determined.

*The QuickCal test is new and somewhat experimental– it generally provides good results but as with all tests it is worth checking with some real-world shooting after calibration.*

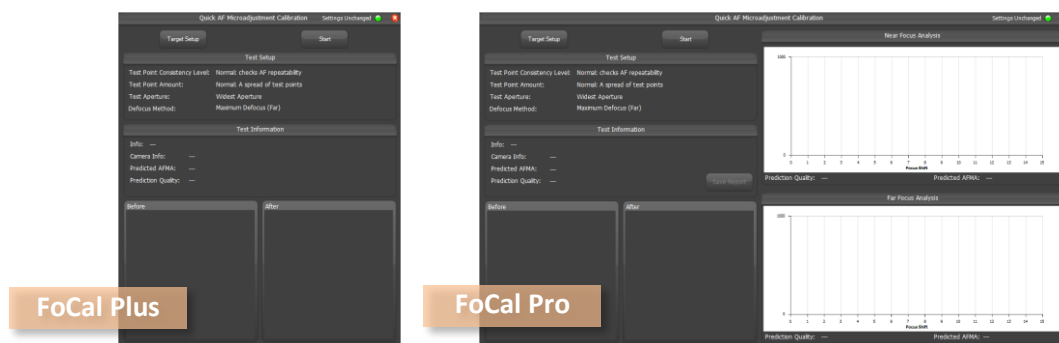
### 22.1 Setup

The following are important points when using the QuickCal test:

- The QuickCal test makes extensive use of LiveView, so it's very important to ensure the camera is stable and not disturbed during the testing.
- The light level should be constant and bright.
- It is advisable to set the *Test Point Consistency Level* in the Preferences window to **strict**.
- If the camera has an **Exposure Simulation** mode (most Canon cameras) then this should be set to **ON**.

### 22.2 Starting the Test

To open the test, simply click the QuickCal button on the main window to open the test:



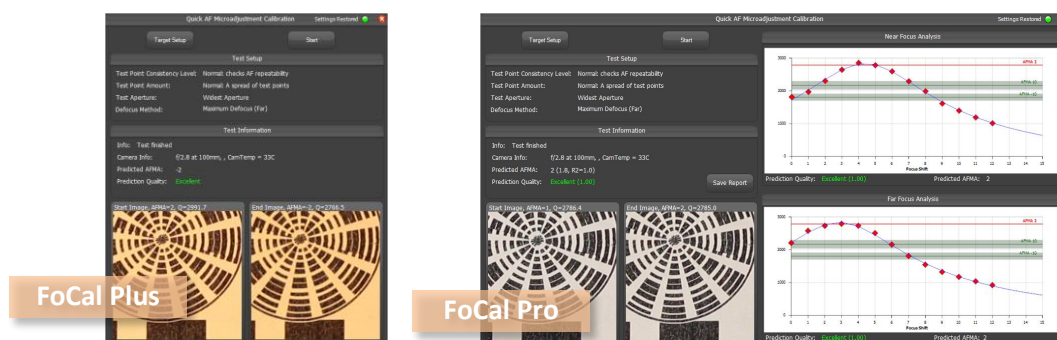
You should use the Target Setup utility to ensure the target is correctly positioned for the test.

To begin the test, click the *Start* button.



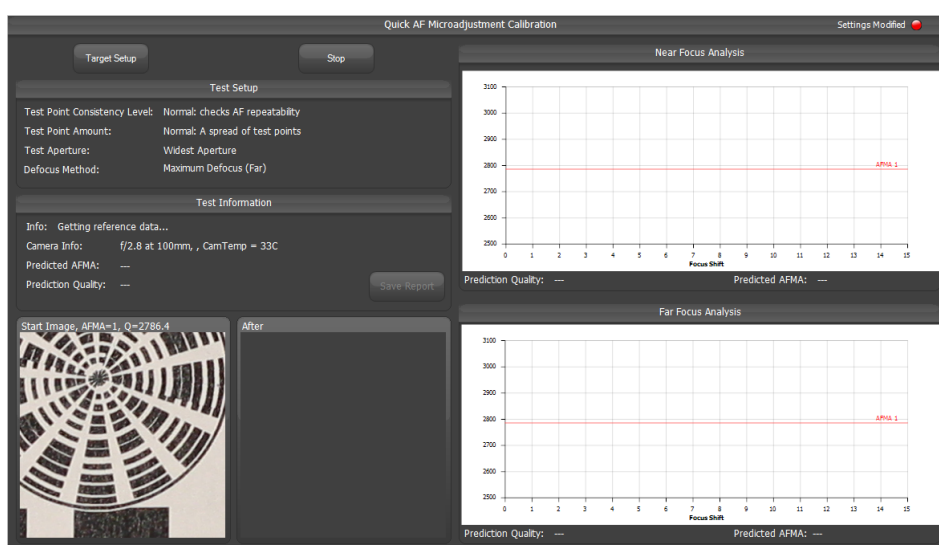
## 22.3 Test Operation

Once you click *Start*, the test will run to completion and give you a result in the *Predicted AFMA* field. You may be asked for up to 3 changes of AF Microadjustment/Fine Tune – only 2 changes are required for the test, and the third one is so an image can be captured using the final setting and shown once the test is complete.

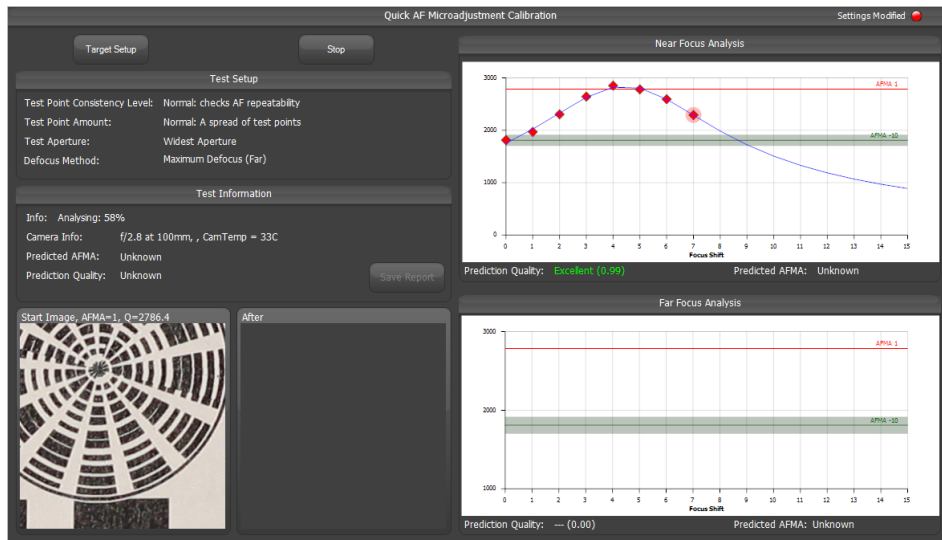


## 22.4 Interpretation of Chart Information (FoCal Pro)

The test runs in a number of phases. First, it will determine the quality level of the currently set AF Microadjustment/Fine Tune value in the camera so as to be able to present you with a starting image:



Next, the test will change the AF Microadjustment/Fine Tune to a specific value and capture some data from this point (if you are using an User Assisted Mode (UAM) camera, you will be asked to change the AF Microadjustment/Fine Tune value at this point).

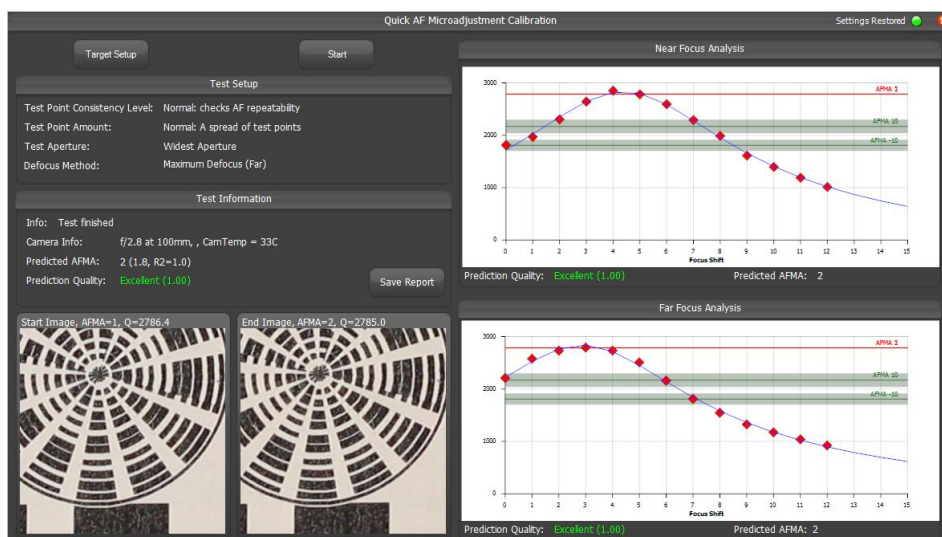


The Quality of Focus value for the specified show will be shown with the green bar in the top and bottom window (the thickness of the bar will depend on the *Test Point Consistency Level* setting).

As this step runs, you will see the quality level displayed on the top graph as the lens is shifted through the best focus position.

Note that you will NOT see any result information at this point.

The above step is then repeated with the second AF Microadjustment/Fine Tune value, and the results will be shown in the same way but on the bottom graph:

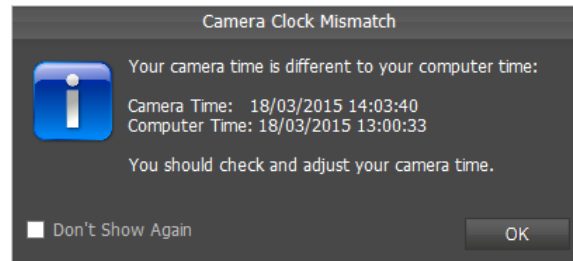


Once there are a few points on the bottom graph, you will start to get a result shown, and when all the data is captured the final result will be available.

## 23 Camera Time Check

FoCal 2 will now inform you if the time of your camera clock is significantly different compared to the time on your PC. This can be very useful in catching daylight saving time changes and keeping your camera time correct.

If you connect a camera with a time significantly different to the computer it is connected to, you will see the following message:



If necessary, you can disable this feature by unticking the *Inform of camera time difference* option in the *Settings* window.

## 24 User Assisted Mode

In order to completely automate some of the tests in FoCal (namely the Fully Automatic AF Microadjustment Test, the Semi-Automatic AF Microadjustment Test and the AF Consistency Test), the software needs to be able to adjust the AF Microadjustment/Fine Tune setting of the camera.

Unfortunately, Nikon have removed the ability to control this setting from the computer since the release of the D300s in July 2009 and Canon have also removed it from the EOS 5D Mark III and EOS-1D X.

In order to get around this issue, FoCal automatically switches to *User Assisted Mode (UAM)* for these cameras. In this mode, you are required to make the AF Microadjustment/Fine Tune change to the camera using the buttons/menu on the camera itself when FoCal informs you to make the change.

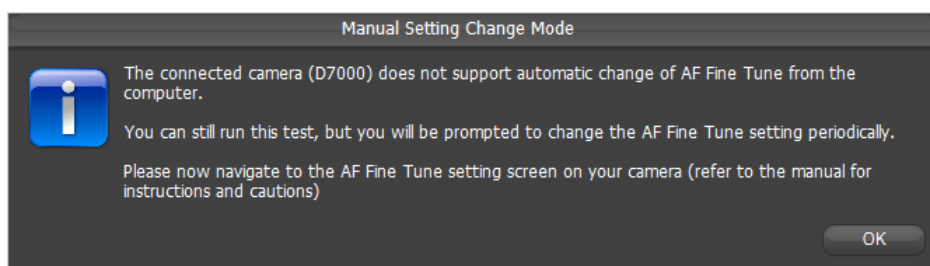
Although this detracts from the completely automatic nature of FoCal, you still get the huge benefits of focus consistency checking and picking a validated representation of the AF result, validation of test environment as the test runs and statistical analysis and prediction as the test runs in order to quickly and definitively find the best AF Microadjustment/Fine Tune result.

### 24.1 Target Optimisation (FoCal Pro only)

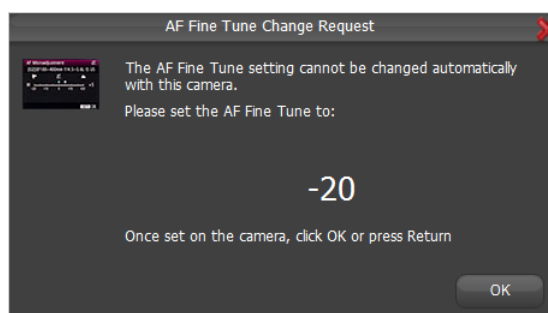
Target Optimisation acts like Image Stabilisation and allows FoCal to compensate for small movements during analysis. If you are using FoCal Pro, it is strongly recommended that Target Optimisation is enabled for cameras running UAM. See section 6.7 for further information.

### 24.2 UAM in use

When you start a test with a camera that must be used in UAM, you will see the following information message when you start the test:



You should continue to use the test as normal, but when the AF Microadjustment/Fine Tune value needs to be changed, you will see the following message:



The value shown in the message box is the value you should apply (see next section for details). **It is very important that you do this as carefully as possible so as not to move the camera during the test.**

The following sections show step-by-step details on how to set up and change the AF Microadjustment/Fine Tune values for both Nikon and Canon cameras.

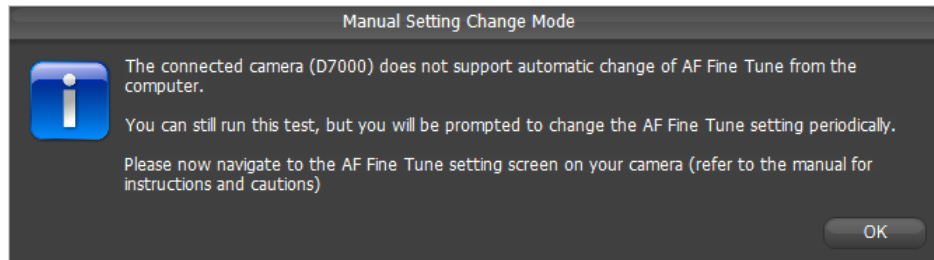
FoCal 1.7 introduces the new Camera HotKey feature which simplifies UAM operation – for further information see section 24.3.3 for Nikon and section 24.4.3 for Canon.

## 24.3 Adjusting Nikon AF Fine Tune

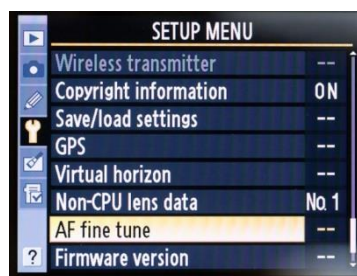
UAM is used for certain Nikon cameras. The following screenshots show you how to set the AF Fine Tune value on the camera (these instructions are for the D7000, but they should be very similar for other Nikon cameras that are used in UAM):

### 24.3.1 Setting up (BEFORE THE TEST):

When you see this message on FoCal, you should follow the steps in this section:



First, press the “Menu” button and navigate to the Setup Menu. Close to the bottom of the list is the AF fine tune entry:



Click this and you will see the following screen (assuming AF fine tune is OFF):



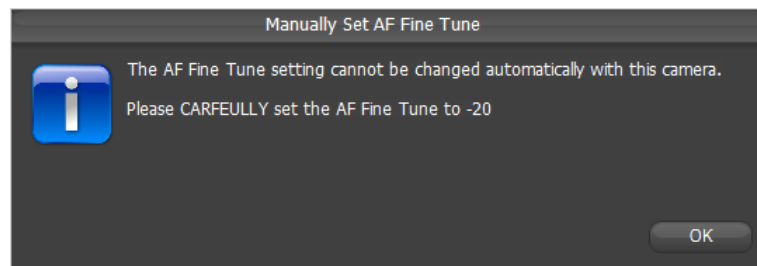
Click on the AF fine tune (On/Off) line and select On:



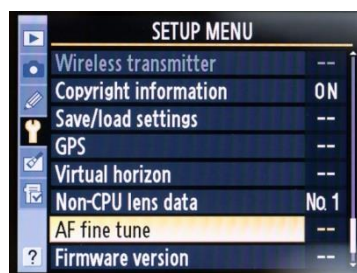
You are now set up ready for the test to run.

### 24.3.2 Adjusting (DURING THE TEST)

When you start the test, you will see messages like this appearing periodically:



When this happens, go to the camera and press the Menu button – you should appear at this point (assuming you followed the setup steps above):



Click the AF fine tune entry, scroll to Saved value:



Click OK, and you will see the adjustment screen:



Using the up and down arrows, change the value in the box to match the value requested by FoCal, then click OK (in this example, the camera is set to -12).



Once this is done, you can click OK in the FoCal message and the test will continue.

**Remember to be very careful with the camera when you do this – try to avoid moving the camera at all.**

### 24.3.3 Nikon Camera HotKey

*Please note – the Camera HotKey feature is new and although it has been tested with a wide variety of cameras there may be problems with certain modes (either not responding to the key or falsely triggering when no key is pressed). If you are seeing odd behaviour, please disable the Camera HotKey function in the Settings window (see section 26.2.9).*

In order to continue the test in UAM, you must tell FoCal that you have entered the new AF Fine Tune value into the camera. You can do this by clicking OK on the dialog box or pressing Enter on the computer, but you can also use the camera HotKey if enabled.

On Nikon cameras, this is the AE-L/AF-L button, shown below:



Once you have entered the correct AF Fine Tune value on the camera, press and hold the AE-L/AF-L button until the dialog disappears from the computer (you will also see the LCD display on the camera flicker a few times). There will be a short delay to let the camera settle once you have taken your finger off the button then the test will continue.

This saves you having to return to the computer after you have entered a new AF Fine Tune value.

*Note: The Camera HotKey feature will only work if the functionality of the key has not been remapped. For Nikon cameras, whichever key actions the **AutoExposure Lock** function will act as the HotKey.*





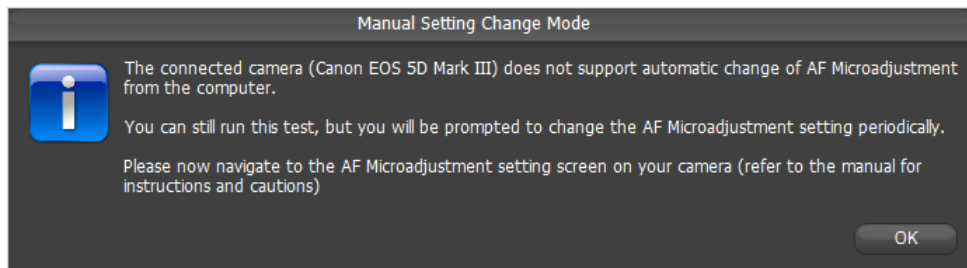
## 24.4 Adjusting Canon AF Fine Tune (5D Mark III)

UAM is used for the 5D Mark III – it is hoped that when the Software Development Kit is released by Canon (mid May 2012) that the camera will be able to be fully controlled.

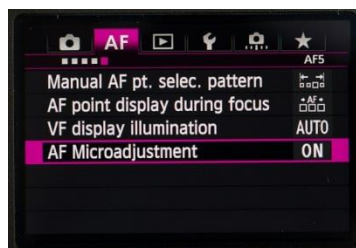
The following screenshots show you how to set the AF Fine Tune value on the camera:

### 24.4.1 Setting up (BEFORE THE TEST):

When you see this message on FoCal, you should follow the steps in this section:



First, press the “Menu” button and navigate to the AF-5 Menu. Select the AF Microadjustment entry with either the wheel or the joystick:



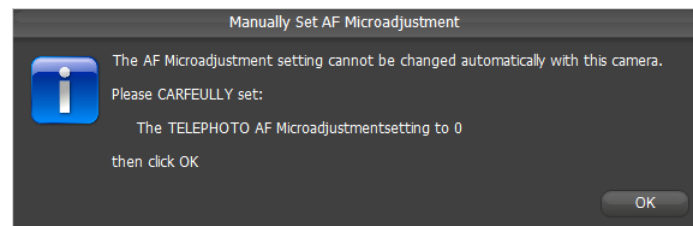
Click SET and you will see a screen similar to the one below (it will depend on which lens you have attached as to what you actually see). Ensure you select *Adjust by lens*:



You are now set up ready for the test to run.

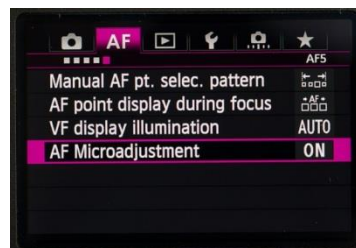
### 24.4.2 Adjusting (DURING THE TEST)

When you start the test, you will see messages like this appearing periodically:



If you are calibrating a zoom lens, you will be told by FoCal to set the wide, telephoto or both settings as appropriate. For a prime lens (fixed focus), there is only one setting available.

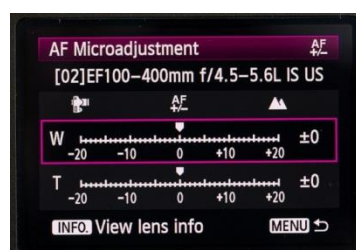
When this happens, go to the camera and press the Menu button – you should appear at this point (assuming you followed the setup steps above):



Click SET on the AF Microadjustment entry:



Then click INFO.:



The above example shows the entries for a zoom lens on the 5D Mark III. Choose either W (if you are at the wide end of the zoom setting), or T (if you are at the telephoto end) – as instructed in the FoCal message box - and click SET:



Dial in the value specified in the software, then click SET again. Finally, click OK on the window on FoCal and the test will continue.

**Remember to be very careful with the camera when you do this – try to avoid moving the camera at all.**

### 24.4.3 Canon Camera HotKey

In order to continue the test in User Assisted Mode, you must tell FoCal that you have entered the new AF Microadjustment value into the camera. You can do this by clicking OK on the dialog box or pressing Enter on the computer, but you can also use the camera HotKey if enabled (see section 26.2.9 for the setting to enable/disable this feature).

On Canon cameras, this is a change in Aperture or Shutter Speed value with one click of the top scroll wheel on the camera:



Once you have entered the correct AF Microadjustment value on the camera, move the top wheel one click round to change the Av/Tv value – note that the value must be *changed* for the computer to notice so if the camera is set to one end of the range you must move the wheel in the direction to change the value. The User Assisted Mode request window will disappear and after a short delay to let the camera settle, the test will continue.

This saves you having to return to the computer after you have entered a new AF Microadjustment value.

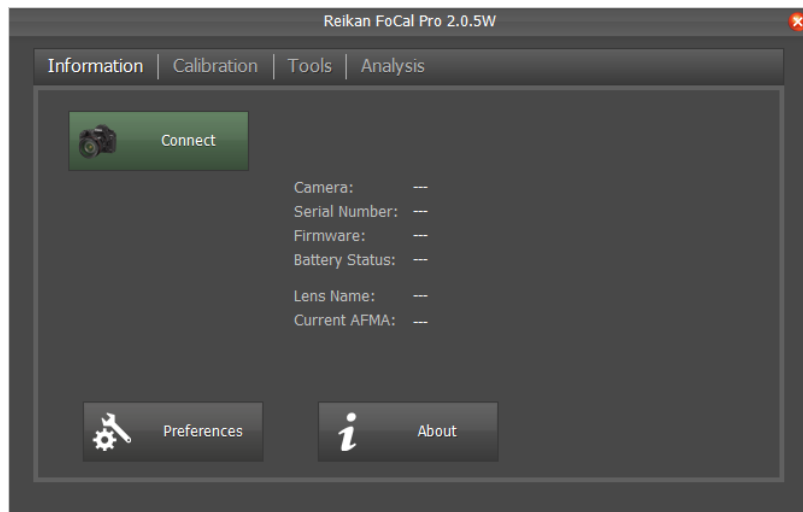
## 25 Settings Adjusted during Testing

To help with restoring the camera in the case where the settings are not automatically restored, the following settings may be modified during the test:

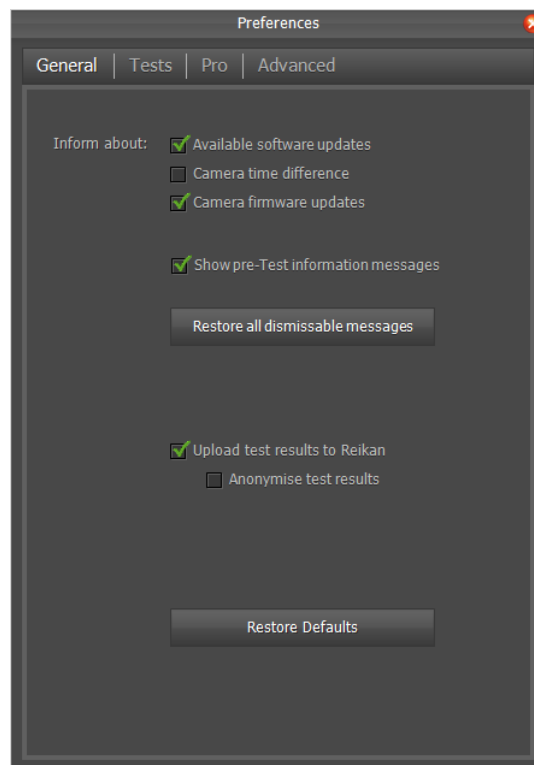
- Image Size (e.g. RAW, Large JPEG/Small JPEG)
- Image Quality (e.g. Fine, Basic)
- Aperture
- Shutter Speed
- ISO
- Metering Mode
- Exposure Compensation
- Drive Mode (e.g. single shot)
- Mirror Lockup (custom function on most Canon cameras)
- Shutter button operation (custom function on Canon)
- White Balance
- Colour Temperature (usually available when White Balance set to K)
- Picture Style

## 26 Program Preferences

Settings for the software are accessible from either the main Test window using the *Preferences* button, or by pressing the “,” (comma) key when most windows are open:



The Preferences window contains the following options:



Note: The *Pro* button is only available in FoCal Pro.

## 26.1 General Settings

### 26.1.1 Inform about Available software updates

If this option is checked, FoCal will check for and notify you of available updates when the program starts. If enabled, a notification will be shown only once in a day.

### 26.1.2 Inform about Camera time difference

If enabled then if your camera time is different the computer time by more than 60 seconds a warning message will be shown.

### 26.1.3 Inform about Camera firmware updates

If firmware updates are available for your camera a message will be shown if this option is enabled.

### 26.1.4 Show Pre-Test Information Messages

Before a test is run, FoCal validates certain settings on the camera to ensure the test *can* be run. There are some settings that cannot be checked (e.g. Image Stabilisation being enabled on a lens) so an information message is shown.

This message is shown every time a test is started, and when you are familiar with FoCal this can be unnecessary information. By unchecking this box, you can disable the display of information messages.

If there is a confirmed reason why the test will not run (e.g. Exposure mode is incorrect and needs to be changed by the user) then a message will still be shown.

### 26.1.5 Restore all dismissable messages

Some information messages in FoCal can be dismissed. If you wish to reset this and show *all* messages (with the option to dismiss selectively as they are shown again), click the **Show All Messages** button. This button is only active if some messages have been dismissed.

### 26.1.6 Upload test results to Reikan / Remove Serial No

If this option is ticked, when you run a successful Fully Automatic AF Microadjustment test, Aperture Sharpness or AF Consistency test, your results will be uploaded to Reikan. **This does NOT include any images** – just numerical results from the tests.

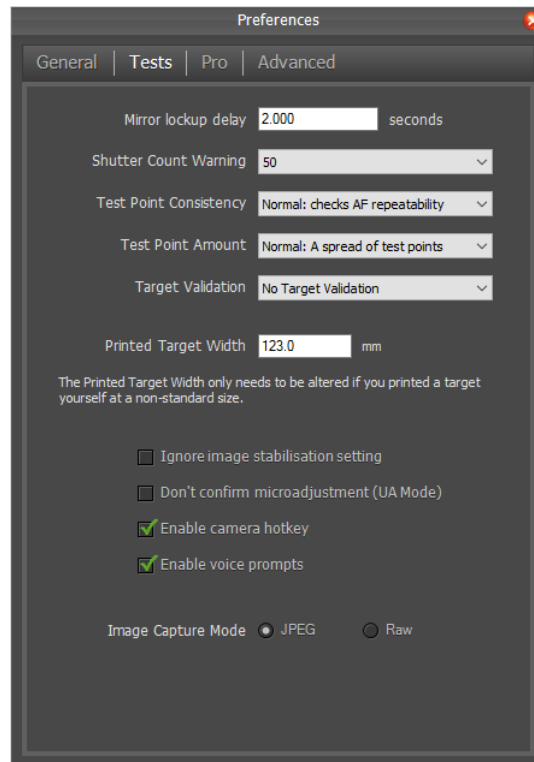
Enabling this feature is entirely optional, but it would be very useful if you could enable it. The only unique identifier we collect is the camera serial number (purely to identify if there is certain behaviour among batches of cameras) – all other data is completely anonymous test results (e.g. aperture, shutter speed, focus quality etc for the test points).

If you are concerned about security, to make the data *completely* anonymous you can tick the *Remove Serial No* button which will stop the serial number being set to Reikan. We would appreciate it if you did *not* tick this box as it leaving it empty allows us to identify behaviour among batches of cameras (those with close serial numbers).



## 26.2 Test Settings

Clicking the **Tests** button at the top of the window will show the Test settings.



### 26.2.1 Mirror Lockup Delay

The test runs with Mirror Lockup enabled - this is where the mirror is lifted some time before the shutter is fired. The mirror movement can induce vibration in the camera, so the idea is that the mirror is lifted and the delay allows all vibration to settle before the shutter is fired (which vibrates the camera much less) – therefore leading to sharper pictures.

The value in the settings window allows setting of the time between the mirror being lifted and the shutter being fired. It is set to 1 second by default.

**Note that this feature is not supported on some cameras (Canon EOS-1D Mark III and EOS-1Ds Mark III), and for those cameras the *Mirror Lockup Delay* field will be ignored.**

### 26.2.2 Shutter Count Warning Level

Due to the iterative nature of the test, it is possible (although very unlikely) that the test may get stuck in a situation where it cannot arrive at a result but continuously tries.

In order to avoid the situation where the test fires unnecessary shutter actuations, when the shutter actuation count reaches the Shutter Count Warning Level, the test will alert the user and allow you to carry on or stop the test.

### 26.2.3 Test Point Consistency Level (Fully Automatic AFMA Test)

The AF systems of modern cameras are pretty good at consistently focussing at the same point when the conditions do not change, but there are instances where the result can be incorrect. Have you

ever taken a shot where the focus confirmation light/beep has fired, but the shot is quite out of focus?

If this situation occurs during an analysis test like the AF Microfocus Adjustment test, it can disturb the results and end up with the wrong value being chosen.

In order to mitigate this situation, the software can be set to repeat focus and verify that the values are consistent before moving to the next test point. This will make the test take longer, but will increase the accuracy of the test result.

The options available are:

**None: fast, requires good AF repeatability**

This setting takes a single shot at each test point and assumes the AF reliability is good for all points. In good light, with a camera that is known to focus well, this option should work without issue.

**Normal: checks AF repeatability (default)**

This setting takes multiple shots until some repeatability is obtained – typically this is just 2 shots, but if an error occurs the shot count will increase. If the values are wildly different across all shots, the test will terminate.

**Tight: strict AF repeatability required**

This setting is the same as above, but the limits for repeatability are tighter. This will give the most accurate results, but any slight variation in AF on each point may make the test fail.

#### 26.2.4 Test Point Amount (Fully Automatic AFMA Test)

When the fully automatic AFMA test is executed, it takes shots at a number of different AFMA points to determine the best value. If few points are chosen, more reliance is placed on the prediction algorithm – this saves shutter actuations but may result in sub-optimal AFMA values.

**Few: Fast but less accurate results**

As few points as is possible are used. If the prediction algorithm cannot reliably predict a value, more points will be automatically added, but the quality of the overall result will be lower. This option generally uses the fewest shutter actuations.

**Normal: A spread of test points (default)**

The normal setting uses slightly more than the minimum amount of points to get better performance from the prediction algorithm. Again, if no reliable result can be predicted during the test, more points will be automatically added.

**Many: A high number of test points**

This setting uses the highest number of points and should give the most accurate result, but is often unnecessary.

### 26.2.5 Validate Target

When used with the special FoCal target, the software can validate the test setup to ensure the test will be as reliable as possible.

#### No Target Validation

If the test is run with a different target than the FoCal target, you will need to select this option. If you have problems with detection of the FoCal target, you could also try this if you are sure the setup is correct.

#### Target Validation

With this option, the software will check the location and setup of the target in relation to the camera ensure it is straight, upright, parallel and in the right place for the test to perform as well as possible. This reduces the change of an incorrect result due to incorrect target setup.

#### Target Optimisations

This setting allows the analysis routine to make minor adjustments to the analysed image in order to get the best, most repeatable results. See section 6.7 for further information.

### 26.2.6 Printed Target Width

With the new Version 5 PDF target supplied with FoCal 1.5, you can print the target at any size you wish without any loss of quality.

In order to accurately calculate the distance between the camera and the target, FoCal needs to know the dimensions of the target. You should carefully measure the length of the top of the large target from left side to right side (as indicated by the arrow on the top of the target image), and enter this into the Large Target Width setting:



Once this is entered, FoCal will be able to calculate the distance between the camera and the target for both the large and small target on the page.

If you print the full PDF on either A4 or US Letter paper, the default value of 123mm is acceptable and does not need to be changed.

### 26.2.7 Ignore image stabilisation setting

With this option ticked, you will not be warned about any lens image stabilisation, and no validation will be performed to check whether it is enabled or disabled.

This will allow comparisons of performance with and without stabilisation to determine if there are any issue with the lens stabilisation hardware.

### 26.2.8 Don't Confirm microadjustment (UAM)

Normally in User Assisted Mode (where the user must change the AF Microadjustment/Fine Tune setting on the camera when prompted by the software), the applied value is verified after the test shot is taken to catch the situation where an error was made entering the value requested by FoCal.

Some cameras have firmware issues which can mean the value is misreported by the camera and FoCal will not let you continue the test. If this happens, you can tick this checkbox and FoCal will ignore the AF Microadjustment/Fine Tune value set in the camera.

*Use this option with caution and ONLY if absolutely necessary. Where firmware issues are known about (e.g. the Nikon D300), FoCal automatically ignored the in camera value, so this option should not normally be set for any camera.*

### 26.2.9 Enable Camera HotKey

When running with a camera in User Assisted Mode, you can use a special button on the camera in order to confirm that you have set up the camera appropriately.

For Nikon cameras, this is the AF-L/AE-L button (see section 24.3.3 for an example).

For Canon cameras, this is a half-press of the shutter button (see section 24.4.3 for an example).

### 26.2.10 Enable Voice Prompts

With this option enabled, during User Assisted Mode operation, the computer will speak out the required setting change that needs to be made. In combination with the camera hotkey, this facilitates a very easy way to calibrate cameras which require their AF Microadjustment/Fine Tune set manually.

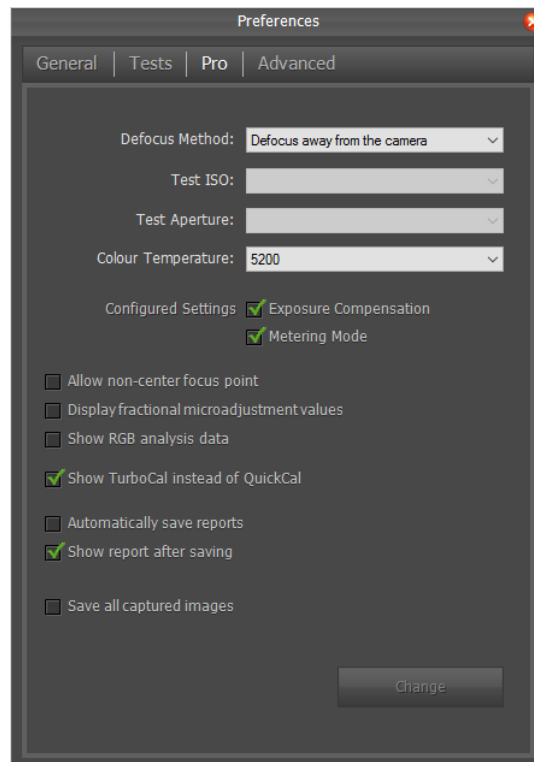
### 26.2.11 Image Capture Mode

Up to and including FoCal 1.7, all analysis was performed on JPEG images from the camera. These images have undergone unknown processing by the camera – including but not limited to demosaicing, vignette and distortion correction, sharpening, contrast adjustment and dynamic range correction. While FoCal has always tried to reduce the effects of this processing by adjusting the camera appropriately, the analysis of JPEG images will always be less than optimal.

Beginning with FoCal 1.8, analysis can now be performed on RAW images from the camera. This means the RAW data about light levels at the sensor is transferred from the camera to FoCal. A special demosaicing routine is then used which is optimised for FoCal's analysis of Autofocus performance, and this image is then analysed.

## 26.3 Pro Features (FoCal Pro Only)

FoCal Pro offers the user the ability to change some test parameters associated with the tests. When the *Pro* button is clicked, the window displays extra options:



### 26.3.1 Defocus Method

This option controls the method by which the camera defocuses the image before running the AF procedure.

#### Maximum Defocus (Near) and Maximum Defocus (Far)

This method defocuses the lens a long way towards infinity or towards the camera between each test point. This will force the AF system of the camera to run a full AF procedure which is more representative of real-world autofocus situations.

Maximum Defocus requires an extra shutter actuation per test point. However, for the Canon EOS-1D Mark III and 1Ds Mark III do not require any extra (with both defocus methods, these cameras require 2 shutter actuations per test point).

### 26.3.2 Test ISO

*If the settings window is opened from the Camera Selector window, the Test ISO and Test Aperture settings will not be available. You must open the camera and choose Settings from the test screen in order that the software can know the ISO and aperture range for the current setup.*

This setting adjusts the ISO at which the Fully Automatic test is performed. The default setting is 100.

Changing this value will alter the shutter speed at which the test operates at and may be required for certain situations (e.g. if there is significant mirror vibration at certain shutter speeds with certain body/lens combinations).

It is important to note that raising the ISO will increase the noise in the image, and can lead to less accurate analysis results. It is best to keep the ISO as close to the lowest value as possible.

### 26.3.3 Test Aperture

*If the settings window is opened from the Camera Selector window, the Test ISO and Test Aperture settings will not be available. You must open the camera and choose Settings from the test screen in order that the software can know the ISO and aperture range for the current setup.*

This setting adjusts the aperture used for the Fully Automatic test. The default setting is *Widest*.

It is generally suggested that the best aperture for an AF microadjustment calibration test is with the lens open widest – this will give the shallowest depth of field and the biggest difference in analysis results for each test point.

However, under some situations, the analysis may not work optimally at widest aperture – particularly with lenses that are very soft or exhibit strong aberrations at widest aperture.

If this setting is changed, it is best to run as close to wide open as possible.

### 26.3.4 Colour Temperature

In order to reduce errors caused by slight changes in the camera's determined white balance, FoCal now runs with a pre-set colour temperature, defaulting to 5200K.

If you are lighting the target with Tungsten lights, you may want to change this value to around 3500K to better match the light source.

### 26.3.5 Configured Settings: Exposure Compensation

By default, FoCal will choose an appropriate exposure compensation to match the content of the target. However, if you find the exposure is incorrect (e.g. the images are too bright and showing signs of degradation), you can untick this box.

When not ticked, FoCal will NOT change the exposure compensation and will run with whatever you have set on the camera at the start of the test.

### 26.3.6 Configured Settings: Metering Mode

Similar to above, FoCal chooses an appropriate metering mode for the test in question.

If you untick this box, the metering mode will not be changed and the test will run with whichever metering mode is set on the camera at the start of the test.

### 26.3.7 Allow Non-Centre Focus Point

If this option is enabled, the tests can be run with a focus point other than the centre point.

There are a number of good reasons for using the centre focus point:

- It is the most accurate focus point within the AF system (it may be the same accuracy as others, but there are no other more accurate points)
- Light hitting the middle AF sensor travels through the centre of the lens which is optically the best line to take, so you are calibrating the AF system and not being affected by any lens imperfections

However, sometimes there is a reason to use off-centre focus points, and by ticking this box you will be able to do so. You can either select the focus points manually, or use the Target Setup utility to select focus points (Canon cameras only) – see section 9.3.

When this option is enabled, various tests will show warning indicators to ensure you are aware that an off-centre focus point is being used.

Note that the analysis in the Fully Automatic and Semi Automatic tests will occur at the specified focus point. If you select an off centre focus point, you should realign the camera so the centre of the target is over that newly selected focus point for best results.

### 26.3.8 Display Fractional AF Microadjustment values

The analysis and prediction algorithm introduced in FoCal 1.6 can determine the AF Microadjustment/Fine Tune value to a high degree of accuracy from the data obtained during the test.

Ticking this option will show the AF Microadjustment/Fine Tune value to 1 decimal place during appropriate tests.

### 26.3.9 Show RGB Analysis Data

If RGB Analysis mode is enabled, checking this box will display extra information on the charts and panels within tests. This can also be toggled within test forms with the CTRL+S key combination.

See section 7 for more information about RGB Analysis.

### 26.3.10 Show TurboCal instead of QuickCal

TurboCal is a shutterless analysis method introduced in FoCal 1.8, but it only works with Canon cameras. If you connect a Nikon camera, the TurboCal option will be disabled.

By unticking this option, you can choose to use the *QuickCal* test. This test, however, is less reliable than both the TurboCal and Fully Automatic test and it is generally recommended that you use the Fully Automatic test.

### 26.3.11 Automatically Save Reports

If this option is ticked then when a test completes you will automatically be presented with the *Save* dialog to choose a filename for saving the report.

### 26.3.12 Show report after save

If this option is ticked, the saved report is automatically opened using the default PDF viewer.

### 26.3.13 Save Captured Images

This option allows you to specify a directory where all images captured during the tests are stored.

Image saving is compatible with the following tests:

- Fully Automatic AF Microadjustment Test
- Aperture Sharpness Test
- AF Consistency Test

The images are named with the date/time, test type, camera model, serial number, lens name, focal length and relevant test information (for example AF microadjustment value or aperture value).

Please note: the saved images are full size JPEGs from the camera, but there may be some re-compression applied in the computer so whilst the image is representative of the captured image, it may not be identical to the camera shot at pixel level.

This option will stay enabled until you disable it, and each image file can be several megabytes. This feature is intended to be used when necessary, rather than left on all the time.



## 27 Troubleshooting

### **Camera Selector window just shows “Searching For Cameras...” when my camera is connected.**

Please ensure the drivers are installed. On Windows 7 this should be automatic assuming you have an internet connection. On Windows XP, this requires the installation of the software from the CD that was supplied with the camera.

### **Tests show a Failed to AF warning**

If you are using a test with a focus limiting switch, ensure it is set appropriately for the distance you are running the test at. For instance, with the Canon 100-400L IS lens, you can limit to 1.8m to infinity, or 6.5m to infinity. If it is set at 6.5m and the distance to the target is less than this, the camera will not be able to focus.

### **The Nikon camera does not open in FoCal**

The camera USB mode in the SETUP menu must be set to PTP/MTP (and NOT Mass Storage) otherwise the camera will not correctly communicate with the computer and FoCal will not be able to open the camera.

### **The lens focus does not move in the Semi-Automatic mode**

The Live View mode in the SHOOTING menu should be set to Tripod if available (rather than hand-held). This is an important setting to ensure correct operation of tests.

### **Canon EOS 5D Mark III fails to focus after using FoCal**

Occasionally, the settings on the 5Dmk3 are not properly restored, and you may notice that half-pressing the shutter button does not cause the camera to focus. This is not a problem with the camera – for some tests, FoCal sets the shutter button to Metering Only in order to stop AF activation. To restore, you choose “Custom Controls” in the Custom Function menu of the camera, choose the shutter button and change the setting to “Metering and AF Start”

### **Target Setup locks up with the Nikon D800**

There appears to be an issue with the D800 and LiveView on some USB 3.0 systems. We are unsure if this is due to the USB 3.0 controller, the cable or the camera itself. If you cannot get LiveView to operate correctly (e.g. the Target Setup utility fails to start) on a D800 and you are using USB 3.0, please change to USB 2 – you can use a standard MicroUSB cable to connect to the camera.

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