

ImCheck3 Installation and User's Guide

Peter Burns

pdburns@ieee.org

ImCheck3 is intended to demonstrate the use of widely distributed printed test targets (test charts) to evaluate the imaging characteristics of digital cameras and scanners. The Q13 target is used to measure the Opto-Electronic Transform Function (OECF). Two ISO Spatial frequency Response (SFR) targets can be used to evaluate both the OECF and SFR. In addition, the original ISO 12233 target can also be used using this programme.

This version of the software was generated using the Matlab (version 7.7, R2008b) Compiler, and requires MCR (Matlab Component Runtime) software libraries from The Mathworks inc. The MCR should be installed before attempting to install and run *ImCheck3*. If you have previously installed the MCR for Matlab version 2008b, or Matlab version 7.7.0.471 (R2008b) software, then you do not need to do install the MCR.

Note that you will need administrative rights to install this software.

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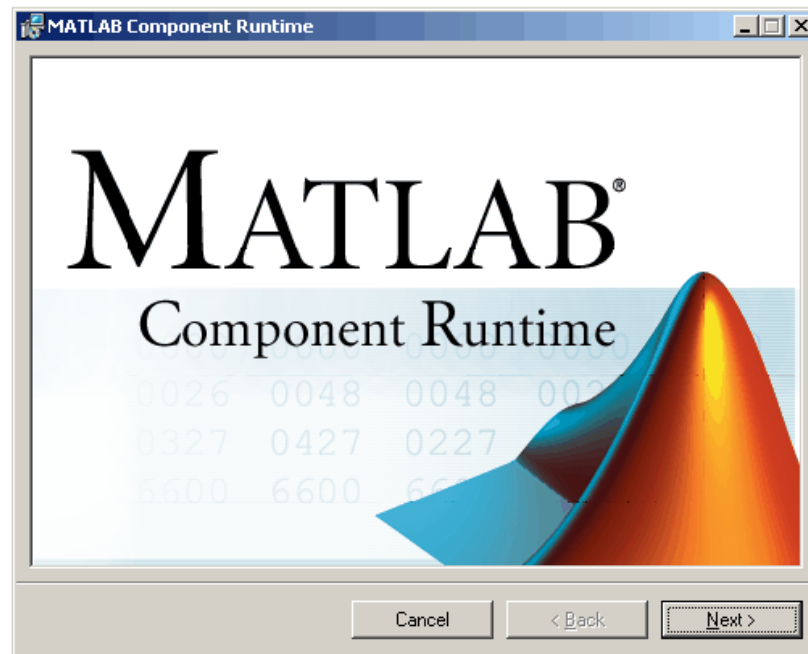
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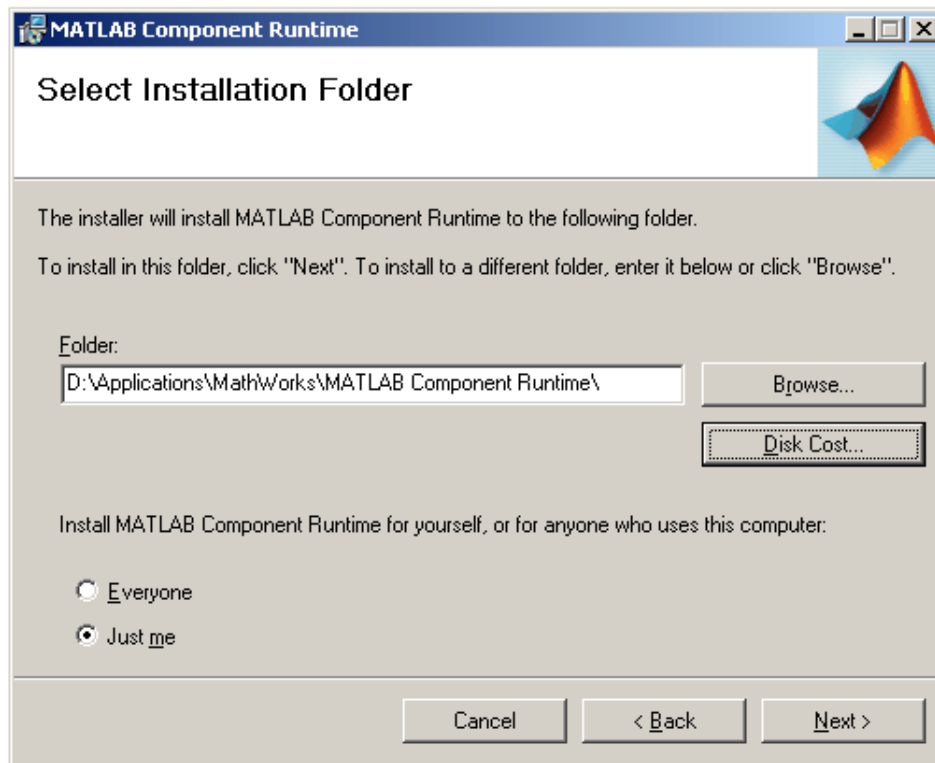
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1. Installation of the MCR

1. Locate. **MCRInstaller.exe**, which is supplied with the ImCheck3 distribution.
2. Double-click on this file.
3. The MCRInstaller opens a command window and begins preparation for the installation.
4. When the **MATLAB Component Runtime** startup screen appears, click **Next** to begin the installation. Note: Graphics shown will differ somewhat from those shown in next two figs.



5. The setup wizard starts. Click **Next** to continue.
6. The **Select Installation Folder** dialog lets you choose where you want to install the MCR. This dialog also lets you view available and required disk space on your system. You can also choose whether you want to install the MCR for just yourself or others. Select your options, and then click **Next** to continue.



7. Confirm your selections by clicking **Next**.
8. The installation begins. The process takes some time (5-10 min.) due to the quantity of files that are installed.
9. When the installation completes, click **Close** on the **Installation Completed** dialog to exit.

2. Installing *ImCheck3vX* (where *X* is a number, e.g. 5)

- a. Save the file **ImCheck3vX.zip** to a location in your computer C: drive where you have permission to write files. For example in the, *My Documents* folder whose path is, *C:\Documents and Settings\your_name\My Documents*, or *C:*.
- b. Unzip this file to the same folder. A folder, *ImCheck3vX xx* should be created.
- c. Inside this folder find **imcheck3vX.exe** (or make a shortcut to **imcheck3vX.exe**, and double-click on this.

After a few seconds the program *ImCheck3vX* should start to run and the following window should appear.



Figure 1: Initial ImCheck3v5 console window

If this console window appears, with a title of *ImCheck3*, things are going well. This window should have five drop-down menus; **File**, **Q13 test**, **SFR test**, **Inspector** and **Help**. In addition, simple instructions should appear in the window.

3. Running ImCheck3

You will have started ImCheck3 when you unzipped the distribution file and ‘double-clicked’ the (icon for) the file *ImCheck3vX.exe*. The windows shown in Fig. 1 should have appeared.

Open and read in image data from a file using the **File -> Open**. A file selection dialog window will open for you to select a file. Following file selection and reading a small (preview) image is displayed in the *ImCheck3* console. Reading the data into computer memory can take about 30 sec or more, depending on the file size. When the preview image is shown, you have not started any analysis of the image data. The next step is to choose from the **Q13 test**, **SFR test** or **Inspector** menus.

Choose to run one of the tests by selecting from the **Q13 test**, **SFR test**, or **Inspector** menus. The tests, as you can see in Fig. 2, are for the Q13 step tablet target, or for SFR analysis using several test targets. If a file has not been already chosen (as in step 1.) from the **File -> Open** menu, a file selection dialog window will display. Figure 3 shows the basics steps

involved for each of the tests.

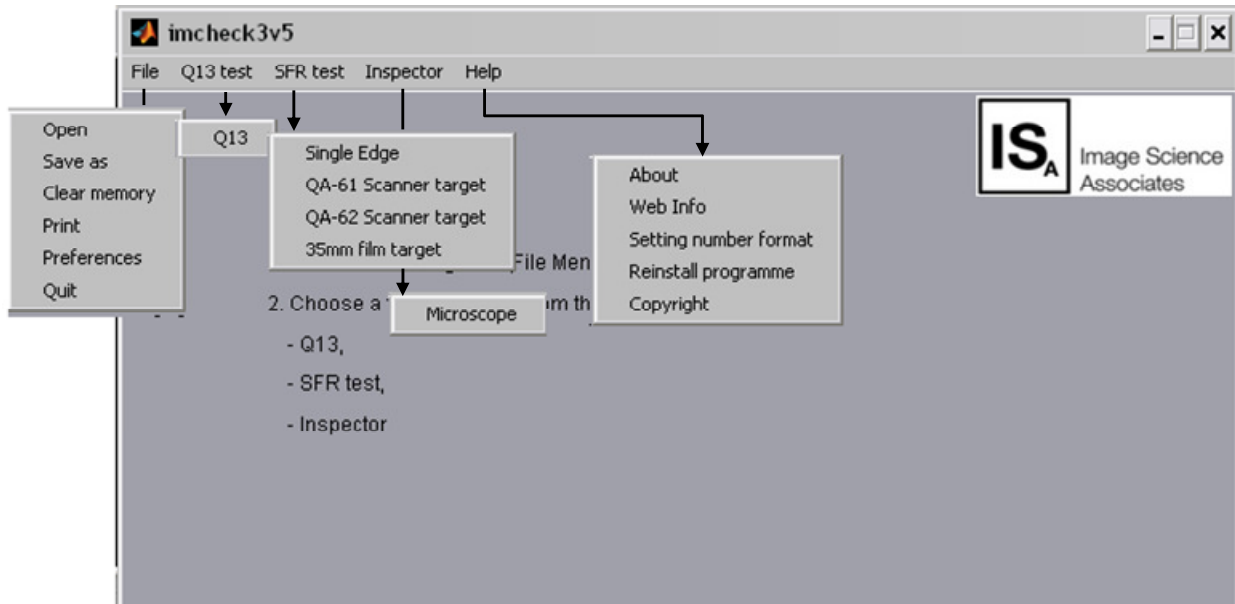


Figure 2: Selections for the various drop-down menus

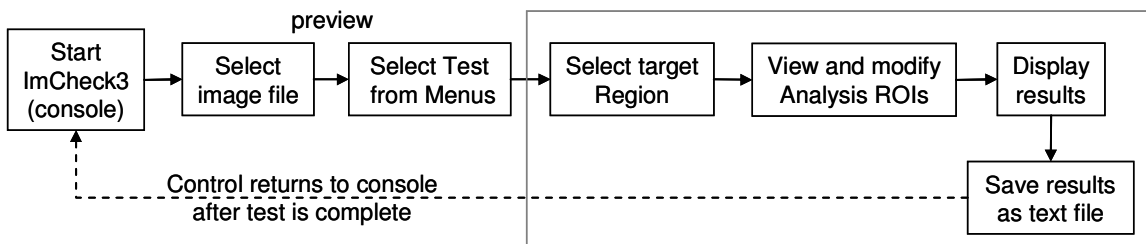


Figure 3: Common steps when performing evaluation tests, Q13 and SFR

Q13 test

If you choose Q13 test the digital image will be displayed in a larger window for you to select the Q13 target area. This is done using the computer mouse by clicking on first the upper left, and then the lower right, corner of the step tablet in the displayed image. This is shown in Fig. 4.

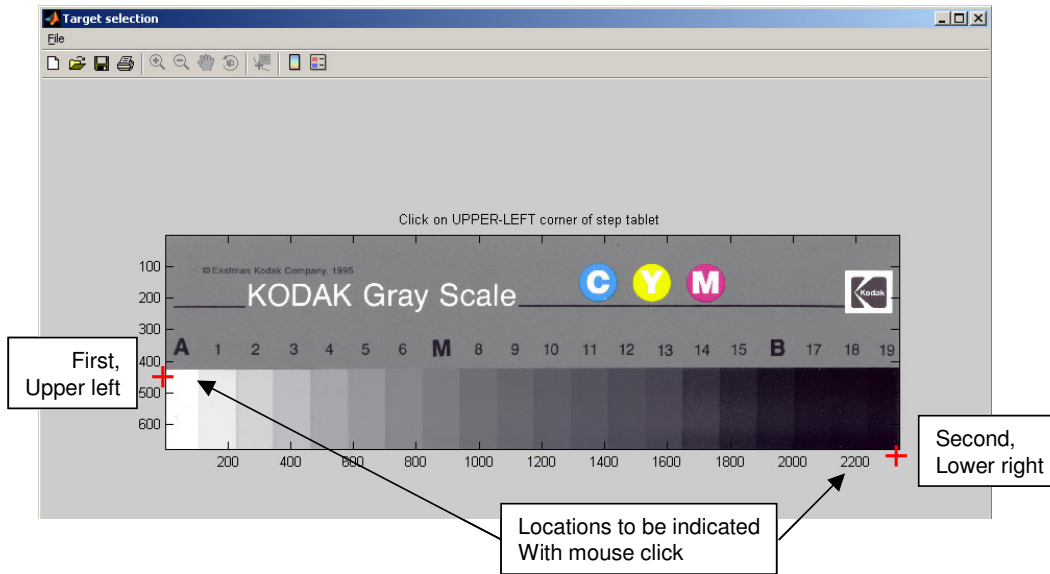


Figure 4: Selection of step tablet location in Q13 test

Following this operation, this window will close and a second one will display showing only the previously selected area with a superimposed box indicating the Region of Interest (ROI) for each step of the tablet. This is shown in Fig. 5. The digital image data from each ROI will be extracted for analysis. You can move the ROIs using the computer mouse in a select, drag and release operation. When satisfied, select the **GO** button in the upper right.

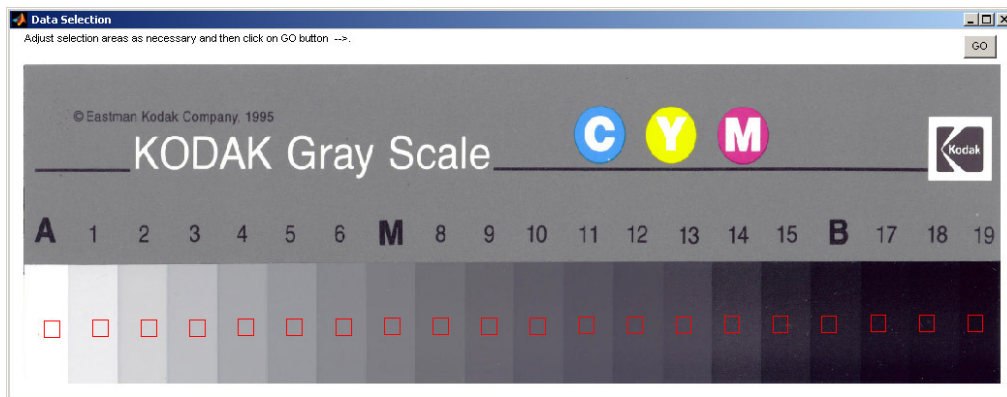


Figure 5: The data selection window of the Q13 test

This window will be replaced with the Q13 test results window, shown in Fig. 6. The lower left-hand plot shows the large-area tone reproduction data in the form of the OECF curve. For evaluation of a printed reflection target, a curve is fit to the data in the form of a normal video gamma function and the fitted (inverse) gamma value is also listed. In the lower right-hand side is a plot of the standard-deviation of the image data in each ROI plotted against the corresponding mean (average) signal value.

If you select the **Save** button you will have the chance to save these results to a text file, via a file save dialog (Fig. 7). This allows you to save the data elements from the above graphs in a text file. If you name this file with the extension, *xls* (e.g. *results1.xls*), it will easily be opened by Microsoft Excel.

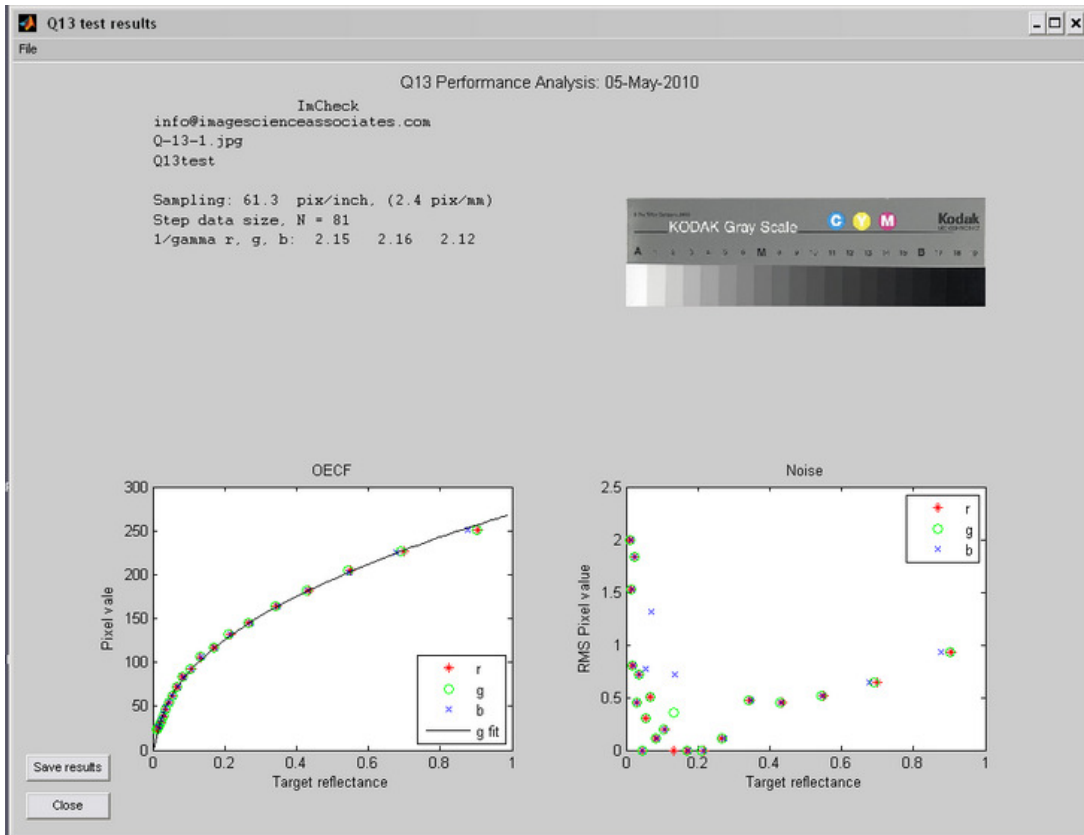


Figure 6: Results window for the Q13 test

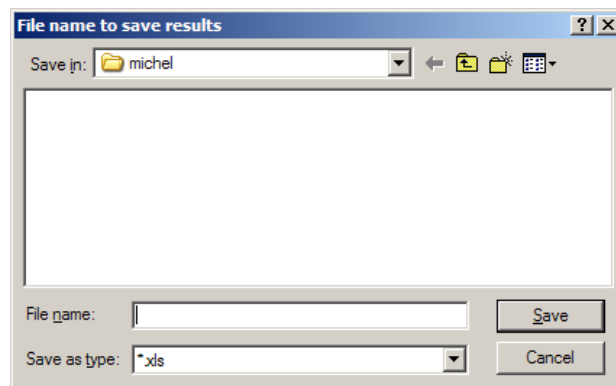


Figure 7: Save results window

SFR Test

There are four analysis procedures under this menu item;

- Single Edge
- QA-61 Scanner Target
- QA-62 Scanner Target
- 36 mm film Target

The most flexible is the **Single Edge** method which performs SRF evaluation on any single edge feature. Candidate test targets to use with this analysis are shown in the Appendix. If you chose the **Single Edge** the selected digital image will be displayed in the center of the ImCheck3 Console window of Fig. 1.

Since this analysis can be done using any edge, the image sampling cannot be inferred from the image data alone. This is specified using a data sampling dialogue (Fig. 8). This is done by either indicating pixels/inch (ppi), or sampling interval in mm. If a digital camera is being evaluated, then the image sampling on the target may be unknown. In this case simply selecting OK to the sampling of 1.0 (pixels) is recommended. This will cause the results to be reported as a function of cy/pixel, rather than cy/mm.

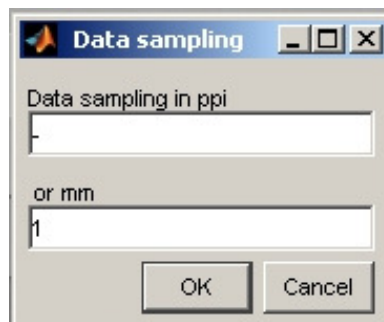


Figure 8: Data sampling selection window

Next a larger window for you to select a region of interest (ROI) will appear. This is done by using the computer mouse in a 'rubber-band' manner. An example is shown in Fig. 9. You can select a horizontal or vertical edge. After a single edge has been selected, this window will close.

After a few seconds, the results window will be displayed. Figure 10 shows the summary results that are displayed after the test is complete. The plot shows the results of the slanted-edge analysis in the form of Spatial Frequency Response (SFR). From these data, the sampling efficiency is computed as the ratio of 10%-SFR_frequency and the half-sampling frequency. You can choose to save the results or close this window using the available buttons.

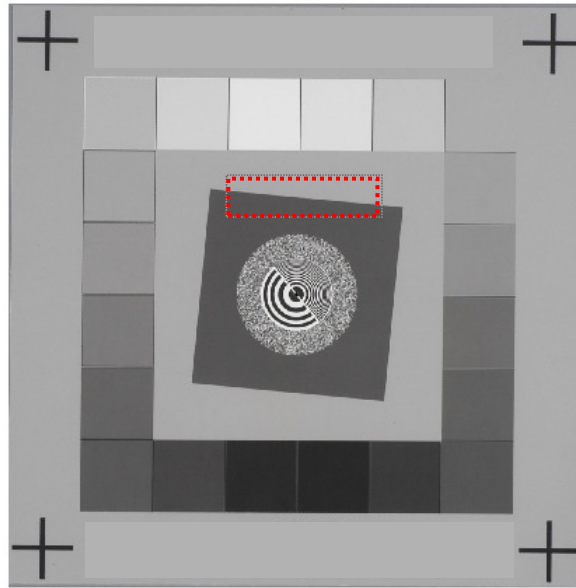


Figure 9: ROI selection for horizontal edge.

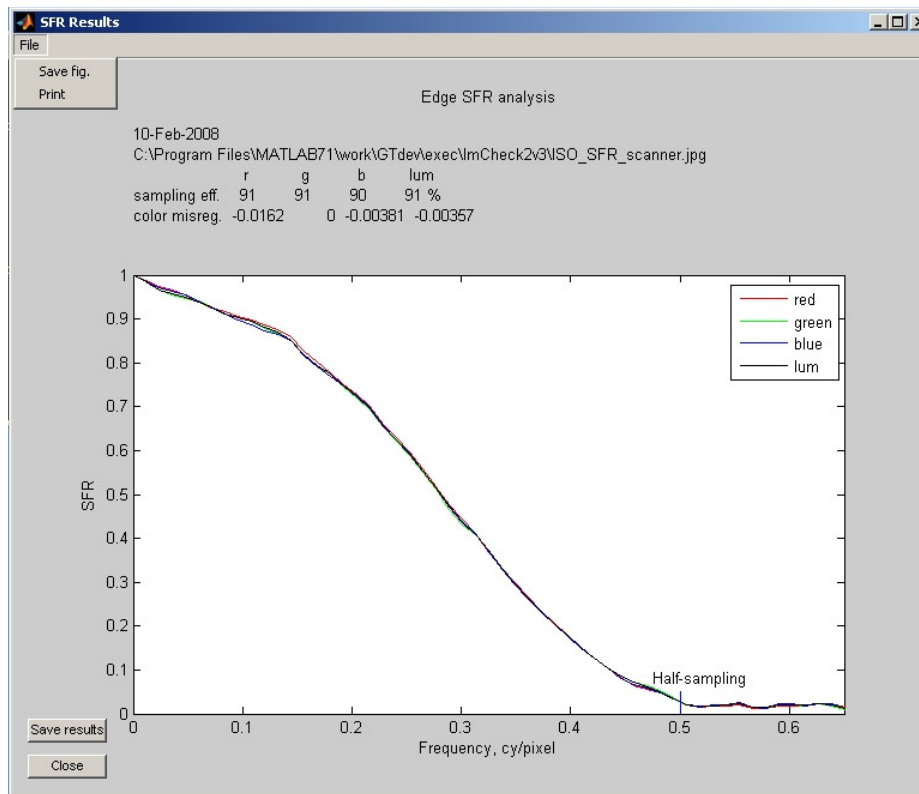


Figure 10: Results window for the **Single-edge SFR** test

SRF - QA-62 Scanner Target

The analysis for the QA-61, QA-62 and 35 mm film target are similar, so we will only describe the QA-62. This analysis combines the OECF analysis of the Q13 procedure, with the edge-

SFR evaluation of the single-edge method. The edge analysis is performed on four edges. Candidate test targets to use with this analysis are shown in the Appendix. If you chose the SCANNER SFR the selected digital image will be displayed in a larger window for you to select a region of interest (ROI). This is done using the computer mouse by clicking on the center of first the upper left, and then the lower right, '+' feature of the test chart in the displayed image. An example is shown in Fig. 11.

Following this operation, the window will close and a second one will display showing the locations for two sets of ROIs. One set is for the four edge features, and the other is for the set for each step of the tablet surrounds the center. This is shown in Fig. 12. You can drag the ROIs using the computer mouse in a select, drag and release operation. When satisfied, select the **GO** button.

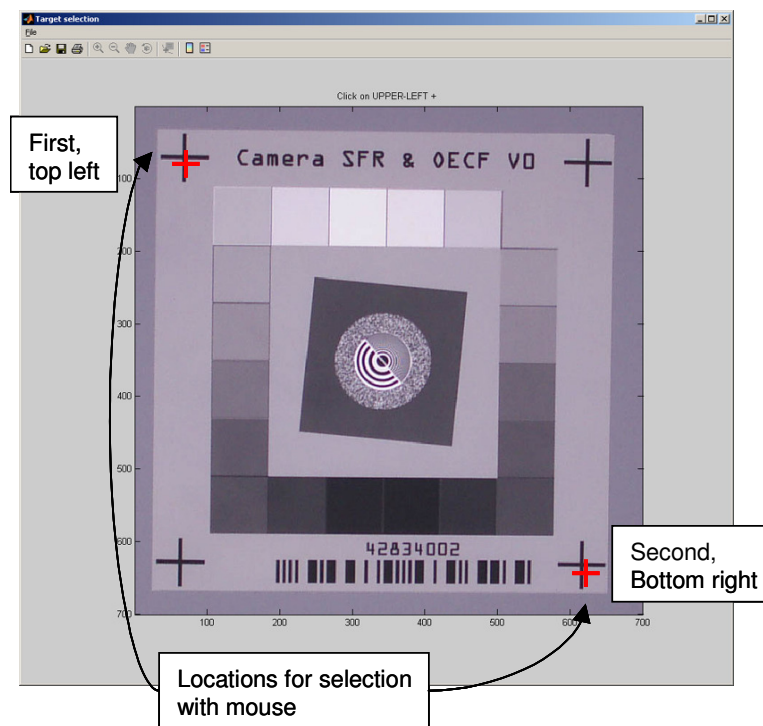


Figure 11: Selection of step tablet location in **ISO SFR** test

Figure 13 shows the summary results that are displayed after the test is complete. The upper plot shows the large-area tone reproduction data in the form of the OECF curve. This can be plotted versus target density (default) or reflectance values.

The lower plots show the results of the slanted-edge analysis in the form of Spatial Frequency Response (SFR). From these data, the spatial frequencies corresponding to the 50% and 10% response are tabulated.

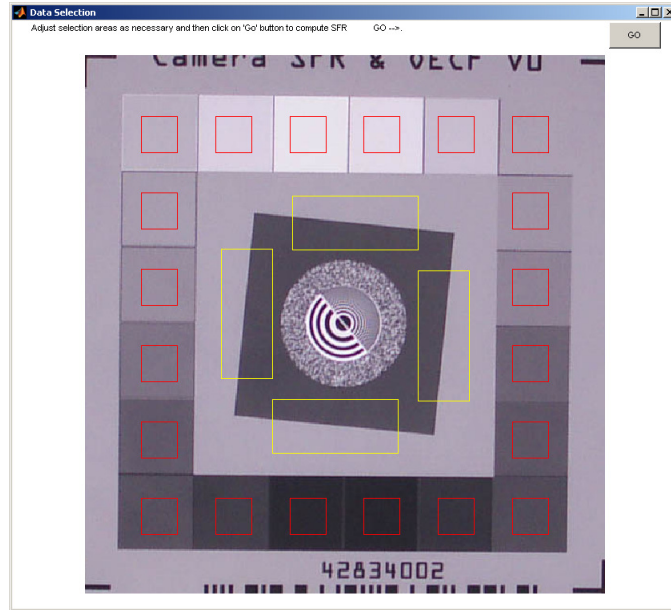


Figure 12: The data selection window of the **ISO SFR** test

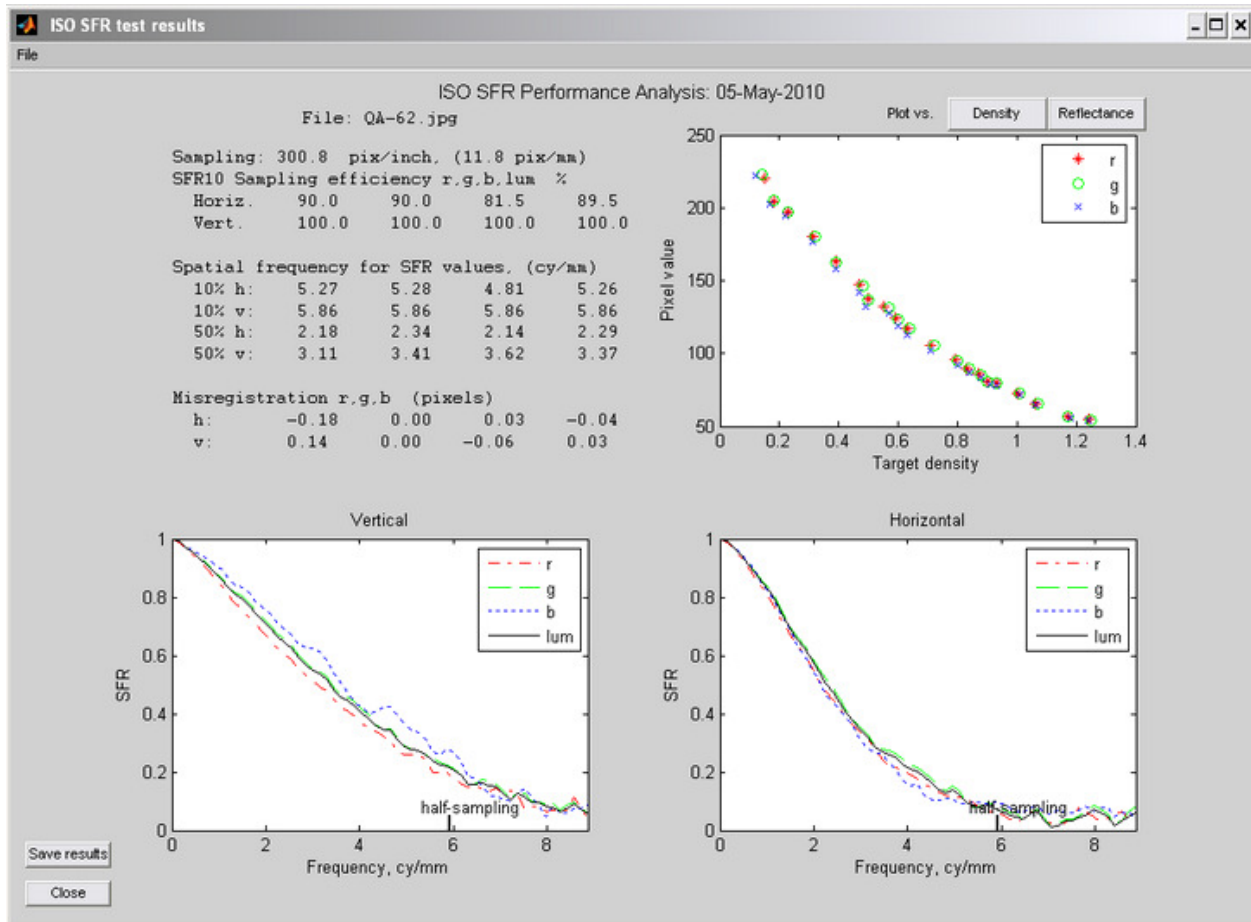


Figure 13: Results window for the **SFR QA-62** test

A **Save Results** button is displayed, as shown in Fig. 13. After you have saved your results or decided not to (Cancel), you may close the Results window to continue analyzing other test image files, or otherwise running ImCheck3 from the console window of Fig. 1

Inspector

This menu has a single option, **microscope**, which allows close visual inspection of large image files. When you select this operation, a new window will appear on the left-hand side of your computer screen displaying your test image file. This is the navigation window. As soon as you select a location within the image are of this window, a second, zoom widow, will appear to the right side of the navigation window. When you move your mouse while holding down the button, the zoom window will appear with all or part of your test image without sub-sampling. Moving the mouse (with button still pressed) changes the image array location of the center of the zoom window.

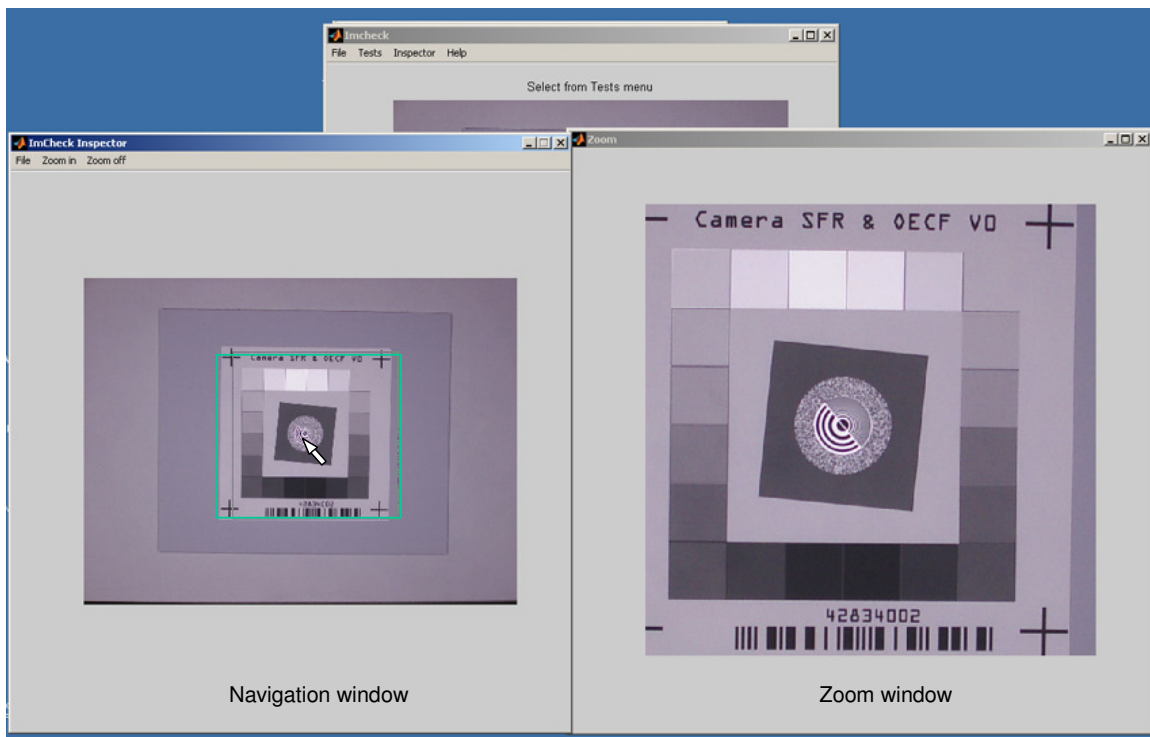


Figure 14: Operation of **Inspector**->**microscope** operation

References:

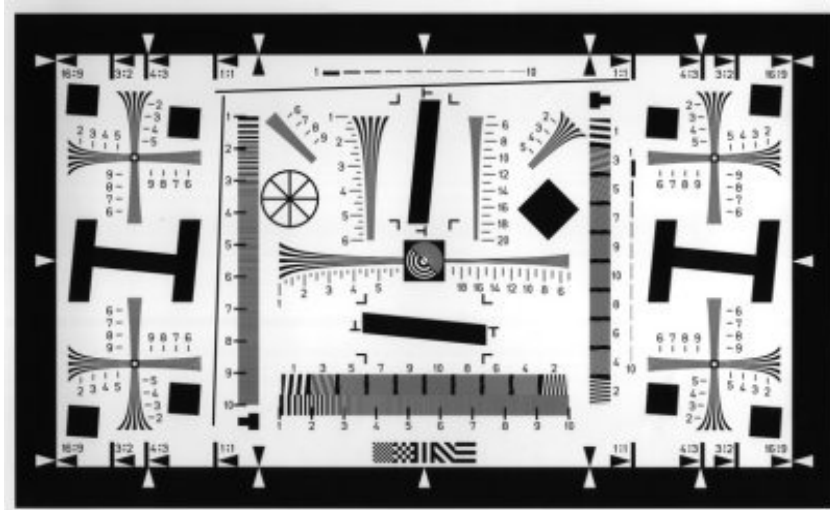
For background on the evaluation of images using *ImCheck3*, please refer to course notes from the tutorials, or articles posted at <http://www.imagescienceassociates.com>

For questions or to report errors you may contact the author at pdburns@ieee.org

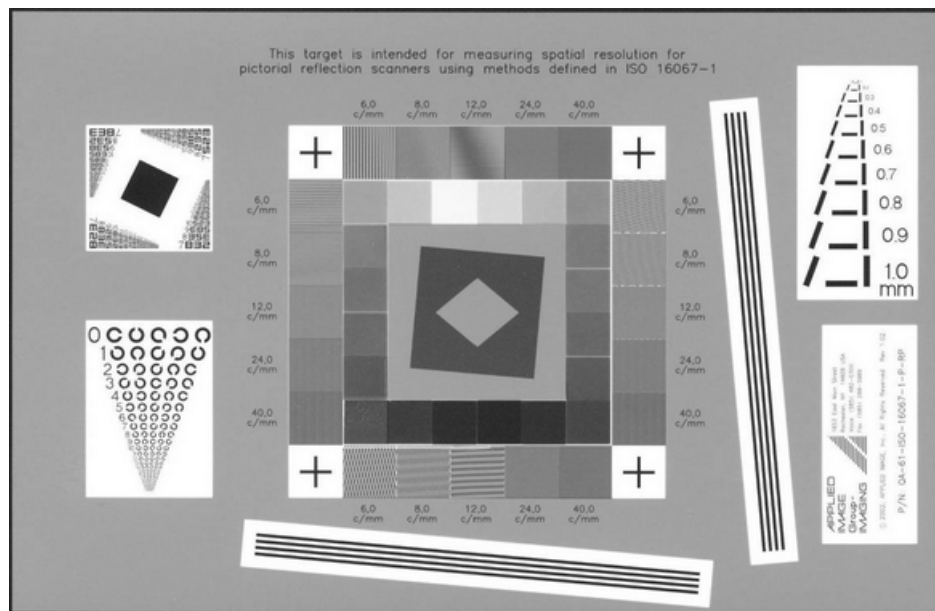
Appendix

Examples of test targets analyzed by *ImCheck3*

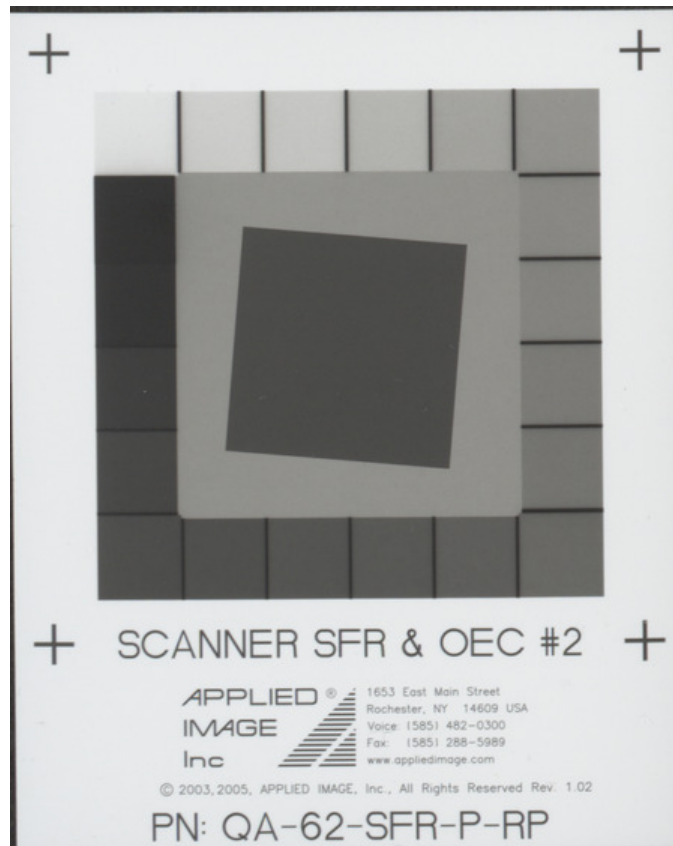
Q13. See Fig. 6.



Single-Edge SFR. Several edges can be evaluated using this test, including those from scans of the QA-61 and QA-62 Targets.



ImCheck3 Menu: QA-61 Target.



ImCheck3 Menu: QA-62 Target