

# Imatest Change Log

## Imatest™ change log (release notes)

To obtain the latest version of Iatest (for updates, new installations, and trial as well as and full versions) go to [Imatest Download](#). Iatest license holders are entitled to free updates for one year from the date of purchase. After that you need to [renew](#). If you license is not current, you can download and install the version that was current one year after the purchase date from <http://www.imatest.com/packages/Imatest-Release.exe> where *Release* can be found in the table below. Example: <http://www.imatest.com/packages/Imatest-2.5.4.exe> . (This also works for [beta](#) releases.)

You rarely need to uninstall an existing version. If you suspect that your installation has been corrupted, click on the button (in recent versions of Iatest), or try clicking Settings, Reset Defaults (in the Iatest main window). See the [Troubleshooting page](#) for more details.

A [beta](#) release is usually available on request or by clicking [here](#). Beta releases are updated frequently and contain the newest features, which may not be documented. Operation is usually *more* robust than the official release, though problems related to the new features occasionally appear.

Date	Release	Description
September 2012 (continuing)	3.9-Beta	<p><b>Imatest main window: Explore image file folder</b> and <b>Explore recent save folder</b> have been added to the File dropdown. <b>INI File Settings</b> have been given their own dropdown to minimize clutter. <b>Explore INI file folder</b> has been added. The INI file Editor (useful for fixing errors and for setting up INI files for the <a href="#">Functional Interface</a> and <a href="#">IT</a>) has been greatly enhanced.</p> <p><b>Most modules:</b> Dialog boxes for selecting new regions and repeating regions for same-size images have been greatly improved, with clearer instructions and options for lightening and (where appropriate) zooming the image. The last image file name is saved and displayed in the File select dialog box (a time-saver for repeated runs). Region settings for several image sizes are now saved for most modules (except for SFR and SFRplus). <a href="#">JSON</a> output has been added (in addition to XML and CSV).</p> <p><a href="#">Raw file</a> support has been greatly strengthened (dialog boxes are somewhat changed).</p>

[Multicharts](#) supports the following charts: [general  \$m \times n\$  grid](#), [SMPTE/Hale color bars](#), [Image Engineering TE226](#), [DSClabs DreamCatcher 48](#), and [Image Science Associates ColorGauge](#). [Multicharts noise analysis](#) has been extended to include several types of chroma noise as well as image sensor noise (from [raw](#) files). The [Color correction matrix](#) has improved linearization options (based on measured tonal response), and a file for weighting patches (for the matrix optimization) can be entered.

[Multicharts](#) and [Stepchart](#) support the Imatest [36-patch Dynamic Range chart](#), which is available in the [Imatest Store](#).

[Blemish Detect](#) detects light (and both dark and light) blemishes in addition to the standard dark blemishes. It can perform nearly all functions of [Uniformity](#). Third order exponential filtering ( $\exp(-x^3)$ ) can be selected. Contiguous blemishes are counted (not just total blemish pixels) and can be displayed in the Blemish count plot. Additional display options show blemish regions more clearly.

[SFRplus](#) can run without the top and bottom distortion bars (select Auto- no bars in the Rows box). The [Field of View](#) calculation has been improved (particularly for distorted images). Rejection of interfering patterns outside the chart has been greatly improved. Additional region selection options include the [Skype specification](#) (3 regions) and custom regions specified by an [Edge ID file](#).

[SFR](#) and [SFRplus](#): Several rise distances in addition to 10-90% (e.g., 20-80%) can be calculated. The Image or Image & Geometry display has a **crop to ROI** feature the displays an enlarged region with edge and MTF plots below, providing an excellent visual correlation between appearance and measurements.

[Log F-Contrast](#): The MTF/contrast 2D contour plot is more strongly smoothed for improved readability and accuracy.

[Uniformity](#) (formerly Light Falloff): Extra smoothing option greatly improves contour plots. Hot and dead pixel thresholds can be specified by percentage above or below neighboring pixels (in addition to absolute levels).

[Test Charts](#): The 12-patch ISO-14524 OECF chart, revised low-contrast (4:1) ISO-12233 edge chart, SVG checkerboard, and [36-patch Dynamic Range](#) chart (for reference; not printing) have been added.

New web pages: [Skype video specification support](#) | [Validating the Imatest slanted-edge calculation](#)

A new [Functional Interface](#) is available for test lab

		<p>environments that need simple operation and consistent settings.</p> <p><a href="#">IT/DLL</a> (Industrial Testing – non-GUI version) can now receive images (raw or processed) directly from the calling program and pass detailed results back to the calling program via easy-to-parse <a href="#">JSON</a> objects. <a href="#">Pass/Fail</a> criteria can be entered (most useful for production testing, but available in GUI versions). Detailed <a href="#">IT Online documentation</a>, including INI file references, is available.</p>
May 12, 2011	3.8	<p><b>This version uses the new registration system. Contact <a href="mailto:sales@imatest.com">sales@imatest.com</a> for a license key.</b></p> <p><b><a href="#">I3A CPIQ (Camera Phone Image Quality)</a> enhancements:</b>  The <a href="#">Dot Pattern</a> module has been added for analyzing distortion and lateral chromatic aberration (LCA). The Dot pattern and ISO-15739 charts have been added to Test Charts. The CPIQ Acutance measurement (similar to SQF) has been added to SFR and SFRplus. The CPIQ color uniformity metric (<math>\Delta C_{\max}</math>) has been added to Light Falloff and Uniformity Interactive.</p> <p><a href="#">Noise analysis</a> has been added to Multicharts. Support for extremely distorted SFRplus charts has been improved.</p>
Dec. 12, 2010	3.7	<p>An analysis of <a href="#">Random (Spatial-invariant)</a> patterns has been added to <a href="#">Rescharts</a>. Since these patterns are unaffected by software sharpening but strongly affected by noise reduction, they reveal how well fine texture is rendered. A temporal noise analysis (which requires reading two input files) has been added to <a href="#">Colorcheck</a> and <a href="#">Stepchart</a>. A <a href="#">powerful noise reduction technique</a> for slanted-edge MTF calculations has been added to SFR and SFRplus. After a <a href="#">Color correction matrix</a> has been calculated in <a href="#">Multicharts</a> the corrected image used for the calculation can be saved. Images can be read in, color-corrected with the matrix, and saved. SFRplus region selection is much more tolerant of large amounts of barrel distortion. An Edge Roughness plot that distinguishes noise from aliasing has been added to SFR and SFRplus. <a href="#">Universal Test Target (UTT)</a> color and grayscale (stepchart) patterns are now supported by <a href="#">Multicharts</a> and <a href="#">Stepchart</a>. Special icons for starting Imatest can be created with ini file arguments to ensure consistent settings for test operations. MTF patch levels are displayed on the <a href="#">SFRplus Tonal response plot</a>. The Edge &amp; MTF plot in <a href="#">SFR</a> and <a href="#">SFRplus</a> can now display unnormalized edges, which are useful for diagnosing situations where a channel can saturate.. <a href="#">Secondary readout</a> has been added to several <a href="#">Rescharts</a> modules: <a href="#">Star Chart</a>, <a href="#">Wedge</a>, <a href="#">Log Frequency</a>, and <a href="#">Random</a>. Imatest can be run with <a href="#">saved settings</a> using <a href="#">Custom Icons or shortcuts</a>.</p>

April 17, 2010	3.6	<p><b>This is the first release built with Matlab R2009B (previous releases used R13). The first time you install 3.6+ you should <a href="#">download and install the Full version</a> (about 175MB), which includes the libraries. Afterwards you can <a href="#">Upgrade only</a>.</b></p> <p><b>Several modules have been added:</b>  <a href="#">Find Sharp Files</a> allows batches of files to be ranked for sharpness.<a href="#">Blemish Detect</a> detects visible sensor defects, using a filter based on the Human Visual System. It is highly tunable to match viewing conditions for individual applications.  <a href="#">Uniformity-Interactive</a> performs all <a href="#">Light Falloff</a> (vignetting and sensor nonuniformity) measurements in an interactive window, compatible with the Imatest Image Sensor edition.  <a href="#">Wedge</a> (part of <a href="#">Rescharts</a>) analyzes hyperbolic and trapezoidal wedges (part of the <a href="#">ISO 12233</a> and other charts) for the onset of aliasing ("vanishing resolution" in <a href="#">CIPA DC-003</a>) and MTF.<a href="#">Generalized raw read</a> capability enables noncommercial raw files (not supported by dcraw) to be read. A new <a href="#">Lens-style MTF plot</a> is similar to MTF displays in the <a href="#">Canon</a>, <a href="#">Nikon</a>, and <a href="#">Zeiss</a> websites. <a href="#">Batchview</a> can display lines as well as bars. <a href="#">Data Cursor</a> (now available in all Figures and most interactive modules— Rescharts, Multicharts, etc.) displays numeric values of plots and image pixels. Multiple <a href="#">3D plots</a> can be produced by <a href="#">SFRplus</a> (running in auto mode). <a href="#">Test Charts</a> can create a USAF 1951 resolution chart. <a href="#">Diffraction-limited MTF</a> is displayed in SFR and SFRplus MTF plots when the pixel spacing is entered. <a href="#">Angular frequency</a> (cycles/milliradian and cycles/degree) is available for MTF measurements.A <a href="#">new web page</a> shows the relationship between <a href="#">MTF Curves and Image Appearance</a>.</p>
Sept. 17, 2009	3.5.1	<p>Additional geometric information has been added to the <a href="#">Image &amp; Geometry</a> display in SFRplus. Numerous small improvements have been made to the interface: User interface locations are much more tightly controlled. <a href="#">XML data for SFR and SFRplus</a> has been restructured in preparation for an upcoming Database product.</p>
August 5, 2009	3.5	<p><a href="#">Sensitivity</a> (ISO speed) measurements have been added to Stepchart, Colorcheck, SFRplus, and Multicharts. The <a href="#">dcraw</a> interface has been updated to include gamma selection and an option to turn off auto white level (import for sensitivity). A new region selection in <a href="#">SFRplus</a> allows detailed 3D plots to be generated from charts with two contrast levels (selecting all important high contrast edges). SFRplus CSV output has been</p>

		enhanced. Corrected a bug in <a href="#">SFRplus</a> batch (multi-file) runs in 3.4 and 3.4.1.
July 1, 2009	3.4.1	<a href="#">SFR</a> and <a href="#">SFRplus</a> calculations have been sped up significantly. A Speedup checkbox in both modules provides additional speed by removing some calculations (SQF, noise statistics, clipping check, etc.) A view toggle button has been added for <a href="#">SFRplus 3D plots</a> . <a href="#">Color correction matrix</a> calculations have been enhanced. A Speedup button <a href="#">Light Falloff</a> skips calculations when the corresponding plot is not called.
May 8, 2009	3.4	<b>3D plots</b> with automatic or manual scaling are available in <a href="#">SFRplus</a> and <a href="#">Light Falloff</a> . These plots can be rotated for improved visualization and offer numerous display options. A second secondary readout is available in <a href="#">SFR</a> and <a href="#">SFRplus</a> . <a href="#">Color analysis</a> has been added to SFRplus for charts that contain the optional color pattern. Several options have been added to <a href="#">SFRplus</a> : edge cropping, additional edge selections, the ability to select the number of rows manually (useful when the square aspect ratio is not 1:1). <a href="#">Distortion</a> now works with a single edge near the image boundary. Figures can be saved as Matlab Fig files, which can be opened and manipulated in Imatest. 3D images can be rotated. But Fig files should be used sparingly: they're much larger than PNG image files. The button in the Imatest main window displays the complete EXIF data for an image file (most formats).
Jan. 8, 2009	3.3	The <a href="#">Batchview</a> module has been released for viewing summary results of batch lens tests (for example sequences of images at different f-stops). <a href="#">Dynamic Range</a> and <a href="#">SFRplus</a> calculations have been made more robust. Imatest Studio can now run batches of up to six files (for use with <a href="#">Batchview</a> ).
Dec. 26, 2008	3.2.5	A <a href="#">Vectorscope</a> (pattern used for adjusting video/cinema cameras) has been added to <a href="#">Multicharts</a> , along with support for the <a href="#">DSC Labs ChromaDuMonde 28</a> test chart . Optional constraints have been added to the color matrix calculation. buttons have been added to <a href="#">Multicharts</a> and <a href="#">Rescharts</a> .
Dec. 2, 2008	3.2.4	A new <a href="#">View/Rename Files</a> utility has been added so that files can be renamed using EXIF data– a big help when large amounts of data has been taken and file names direct from cameras make little sense. The buttons have been repaired.
Nov. 26,	3.2.3	Color/brightness <a href="#">profile plots</a> , similar to plots in <a href="#">Light Falloff</a> ,

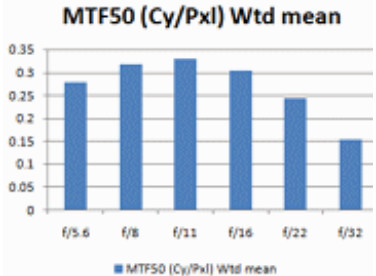
2008		has been added to <a href="#">SFRplus</a> . An <a href="#">Image display</a> for examining details (individual color channels and exaggerated saturation) has also been added, and region detection is more robust.
Nov. 12, 2008	3.2.2	Many small improvements make <a href="#">SFRplus</a> calculations more robust. The noise spectrum has been added to histogram figure. Weighting options have been added to the Multicharts <a href="#">Color matrix</a> calculation: highlights can receive stronger weight.
Nov. 7, 2008	3.2.1	<a href="#">EXIF</a> metadata can be read in greater detail from all image file formats with the addition of <a href="#">Phil Harvey's ExifTool</a> , which must be downloaded and installed following instructions <a href="#">here</a> . Noise readouts and histograms in SFR and <a href="#">SFRplus</a> have been greatly improved. Wider regions (ROIs) are available in <a href="#">SFRplus</a> for improved noise analysis. Many SFRplus bug fixes.
Oct. 30, 2008	3.2	The <a href="#">SFRplus</a> module, which implements automated ROI selection using a <a href="#">special test chart</a> available for <a href="#">purchase</a> , has been added. It measures distortion and tonal response in addition to MTF and Lateral Chromatic Aberration. Color correction matrix calculations in Multicharts have been significantly improved (with better starting values). Dcraw now includes dcrawMS, which works with Vista. <a href="#">Rescharts</a> can read and average multiple files.
August 3, 2008	3.1	Multiple files can be read and averaged (and saved) to facilitate measurements of fixed-pattern noise (in <a href="#">Stepchart</a> , <a href="#">Colorcheck</a> , and <a href="#">Light Falloff</a> ) and image stabilization effectiveness ( <a href="#">SFR</a> ). Highly distorted regions of interest (ROIs) can be analyzed with <a href="#">Colorcheck</a> and <a href="#">Stepchart</a> . New ?E measurement options have been added to the <a href="#">Light Falloff</a> Color shading display. Evaluation versions can be set for Master (default) or Studio mode. The Light Falloff hot/dead pixel display can be set to all/selected/any channel for color images. Several of the <a href="#">SVG test charts</a> have been redesigned to work better with upcoming automated test modules. A new <a href="#">editor for INI files</a> has been added to facilitate troubleshooting when modules stop working: sections can be easily located and their contents can be quickly edited or removed.
June 28, 2008	3.0.1	You can enter a DOS command from the Settings dropdown menu in the latest main window. This can be useful for troubleshooting (finding path issues, etc.). In <a href="#">Rawview</a> you can select which of the two green channels (G(R) or G(B) to display) and you can save the undemosaiced image as a half-sized RGB file (using the selected green channel).
June 17,	3.0	<b>Light</b> and <b>Pro</b> have been renamed <b>Studio</b> and <b>Master</b> . There



2008		is a new <a href="#">price schedule</a> . Colorcheck has an option for selecting patches using 24 squares (similar to Multicharts) instead of the (old) standard auto patch detection. This can be valuable for distorted chart images. Single color analysis in SFR is faster than the standard 4 color analysis and useful for filtered images where some channels may have invalid data. The x and y-spacing and aspect ratio of the grid pattern is displayed in the Distortion intersection plot (useful for analyzing scanner aspect ratio distortion). The secondary readout in the SFR MTF plot can be emphasized (enlarged, bold face).
March 21, 2008	2.7.2	<a href="#">Dynamic Range</a> can calculate dynamic ranges of individual color channels ( <b>R</b> , <b>G</b> , and <b>B</b> , as well as <b>Y</b> ) in Imatest Master. <a href="#">Star Chart</a> allows the number of calculation radii to be selected (32 (fastest), 64, or 128). It was formerly 32; the default is now 64. There is an additional option for low frequency MTF normalization. Some issues with reading custom density charts into <a href="#">Stepchart</a> and <a href="#">Multicharts</a> have been resolved.
March 18, 2008	2.7.1	<a href="#">Distortion</a> can now analyze square (checkerboard) patterns. A gamma plot has been added to <a href="#">Dynamic Range</a> . <a href="#">Star Chart</a> can now accommodate a chart with a smaller inner circle (ID 5% of OD).
March 16, 2008	2.7	The new <a href="#">Dynamic Range</a> module calculates camera dynamic range from the CSV output of several differently-exposed <a href="#">Stepchart</a> runs. The Imatest main window has been rearranged. A checkerboard pattern has been added to <a href="#">Test Charts</a> and <a href="#">Screen Patterns</a> . Several new video pattern sizes (6x0x480, etc.) have been added to <a href="#">Test Charts</a> .
March 8, 2008	2.6.12	<a href="#">Screen Patterns</a> now includes <a href="#">SMPTE color bars</a> , <a href="#">slanted-edge grid patterns</a> , and a <a href="#">simulated Colorchecker and stepcharts</a> . R-G and B-G shift in pixels has been added to the <a href="#">Chromatic Aberration</a> display.
March 2, 2008	2.6.11	<a href="#">Screen Patterns</a> now includes patterns for <a href="#">Distortion</a> and <a href="#">Monitor calibration</a> and a <a href="#">Zone plate</a> for camera testing. The CSV and XML output of SFR now includes results at standard frequencies of (0.05, 0.1, 0.15, ... ) Cycles/pixel.
Feb. 24,	2.6.10	The <a href="#">Screen Patterns</a> module generates monitor test patterns

2008		for <a href="#">Light Falloff</a> and <a href="#">SFR</a> . A 4th order <a href="#">polynomial fit</a> to Light Falloff is available in Imatest Master. Options & Settings has been divided into two windows (I and II) to accommodate more options. A new option for naming SFR output files is available.
Feb. 20, 2008	2.6.9	<a href="#">Chromatic Aberration</a> display has been enhanced to include a thumbnail showing the ROI as well as R-G and B-G spacings that can be used for correcting CA (especially valuable with <a href="#">RAW</a> images prior to <a href="#">demosaicing</a> ).
Feb. 15, 2008	2.6.8	<a href="#">CIEDE2000 color difference formulas</a> have been added to <a href="#">Colorcheck</a> and <a href="#">Multicharts</a> . CIEDE2000 has replaced CMC measurements in some displays, but CMC measurements are available in the CSV output files.
Feb. 13, 2008	2.6.7	You can now choose between display of the cropped edge or entire edge in the <a href="#">SFR Edge &amp; MTF</a> plot. The entire edge is of interest for flare studies. A spot detection display has been added to <a href="#">Light Falloff for Imatest Master</a> .
Feb. 7, 2008	2.6.6	<a href="#">SFR</a> can now display spatial frequency in LP/PH (Line Pairs per Picture Height) in addition to LW/PH. This makes it easier to compare results with <a href="#">Dpreview.com's new lens reviews</a> . The mapping between color and <a href="#">Bayer RAW</a> channel can now be selected. This will affect some displays.
Feb. 4, 2008	2.6.5	The Rawview utility (next to dcraw) in the Imatest main window allows Bayer Raw files to be previewed and colors to be associated with pixel position. Bugs in calculating RAW Chromatic aberration were fixed.
Feb. 3, 2008	2.6.4	A GUI (graphic user interface) for <a href="#">dcraw</a> , which can can <a href="#">demosaic</a> RAW images or convert them into <a href="#">Bayer RAW</a> format, can be called from the Imatest main window. In Imatest Master, <a href="#">SFR</a> , <a href="#">Rescharts</a> , and <a href="#">Stepchart</a> can now analyze <a href="#">Bayer RAW</a> files. Support for other modules will be gradually added; feedback appreciated.
Jan. 28, 2008	2.6.3	A new <a href="#">summary CSV output file</a> (with a name of the form, <a href="#">filename_Y_sfrbatch.csv</a> ) is produced for multiple-ROI SFR batch runs. This file is particularly convenient for generating Excel plots of the type shown below, next to 2.6.1.
Jan. 18, 2008	2.6.2	<a href="#">Options &amp; Settings</a> (in Imatest main window) now offers options to shrink input files for <a href="#">Distortion</a> and <a href="#">Light Falloff</a> 1/2x to prevent memory overflow if they are over 40 or 80 MB (m x



		n x colors) and also to fix the order that batch files run (which may be different for different operating systems). <a href="#">Raw files</a> can now be converted to Bayer raw (undemosaiced) TIFF files, and also work better in batch runs.														
Jan. 8, 2008	2.6.1	<p>The SFR and SFR multi-ROI CSV output files have been enhanced to work better with high volume testing. A new summary block in the <a href="#">multi-ROI CSV file</a> can be conveniently copied and pasted into Excel files for plotting. Two new options are available for refining multiple ROI selections in <a href="#">repeated SFR runs</a> (Imatest Master only). (1) <a href="#">Multi-ROI fine adjustment</a> (shift, magnify, reduce), and (2) <a href="#">Automatic ROI refinement</a>. These speed up test sequences of different cameras and lenses, where it may be difficult to maintain exact chart alignment.</p>  <table><caption>MTF50 (Cy/Pxl) Wtd mean</caption><tr><th>Spatial Frequency</th><th>MTF50 (Cy/Pxl) Wtd mean</th></tr><tr><td>f/5.6</td><td>~0.28</td></tr><tr><td>f/8</td><td>~0.32</td></tr><tr><td>f/11</td><td>~0.33</td></tr><tr><td>f/16</td><td>~0.30</td></tr><tr><td>f/22</td><td>~0.25</td></tr><tr><td>f/32</td><td>~0.18</td></tr></table>	Spatial Frequency	MTF50 (Cy/Pxl) Wtd mean	f/5.6	~0.28	f/8	~0.32	f/11	~0.33	f/16	~0.30	f/22	~0.25	f/32	~0.18
Spatial Frequency	MTF50 (Cy/Pxl) Wtd mean															
f/5.6	~0.28															
f/8	~0.32															
f/11	~0.33															
f/16	~0.30															
f/22	~0.25															
f/32	~0.18															
Jan. 6, 2008	2.6															
Dec. 30, 2007	2.5.8	A 2-Dimensional summary plot of <a href="#">SFR multiple ROI results</a> that shows how performance varies over the image surface has been added. The SFR multiple ROI CSV output file has been altered to be more readable and contain more detailed results.														
Dec. 16, 2007	2.5.7	<a href="#">Stepchart</a> manual zone detection (the number of patches specified in the input dialog box) now works with vertically-oriented charts. (This orientation often has less glare.) Most Multicharts charts will also work in vertical orientation (rotated by multiples of $\pm 90^\circ$ ). An additional 2x3 pattern has been added to <a href="#">SVG Test charts</a> . Data columns for peak MTF, MTF50P and direction have been added to the table in the <a href="#">SFR multiple ROI CSV output file</a> .														
Nov. 28, 2007	2.5.6	An edge plot (spatial domain) has been added to <a href="#">MTF Compare</a> . New version of ddraw supports the Canon EOS-40D.														
Oct. 30, 2007	2.5.5	Input dialog boxes for <a href="#">SFR</a> and <a href="#">Rescharts Slanted-edge SFR</a> have been improved. More detail has been added to EXIF/summary results in <a href="#">Rescharts Slanted-edge SFR</a> . A summary/EXIF display has been added to <a href="#">MTF Compare</a> . Estimated chart contrast has been added to several SFR displays.														
Oct 25,	2.5.4	The maximum display frequency for MTF plots can now be														

2007		specified in <a href="#">SFR</a> , <a href="#">Rescharts Slanted-edge SFR</a> , and <a href="#">MTF Compare</a> . Several enhancements have been made to <a href="#">MTF Compare</a> output.
Oct. 22, 2007	2.5.3	Allows choice of <a href="#">Star chart</a> normalization method.
Oct. 21, 2007	2.5.2	Several improvements and bug fixes in <a href="#">Star chart</a> calculations and display. The number of chart cycles is automatically detected. Radii are selected on a logarithmic scale for a more even frequency increment. MTF is normalized to 1 individually for each segment.
Oct. 16, 2007	2.5.1	The Stepchart calculation in <a href="#">Multicharts</a> now includes a choice of density steps (0.1, 0.15, 0.20, and 0.30) as well as a density reference file.
Oct. 15, 2007	2.5	<a href="#">Star chart</a> has been added to <a href="#">Rescharts</a> . Improves MTF display in <a href="#">Log F-Contrast</a> , allowing MTF to be normalized at low spatial frequencies.
Oct. 11, 2007	2.4.2	Fixed a problem with B&W images in <a href="#">Log Frequency</a> . Added a Normalize ALL option and a ?L*, a*, b*, and C* plot option to the uniformity profiles in <a href="#">Light Falloff (Uniformity)</a> . Added ?E and ?C to the color shading in <a href="#">Light Falloff</a> . Includes the first beta release of <a href="#">Star chart</a> (a part of <a href="#">Rescharts</a> ).
Oct. 4, 2007	—	The prices of Imatest Studio and Pro have been increased to \$199 and \$599, respectively.
Sept. 10, 2007	2.4.1	A <a href="#">Color correction matrix</a> calculation has been added to <a href="#">Multicharts</a> . The Multicharts window has been enlarged to accommodate new controls.
Sept. 4, 2007	2.4	Sept. 4, 2007. Imatest 2.4 Introduces <a href="#">Rescharts</a> : a set of modules with a highly-interactive user interface for resolution-related measurements. <a href="#">Slanted-edge SFR</a> performs the same calculations as SFR. <a href="#">Log Frequency</a> measures MTF and color moiré from a chart that varies in spatial frequency. <a href="#">Log F-Contrast</a> measures MTF over a range of contrast levels, showing how much fine detail is lost as a result of software noise reduction.

August 23, 2007	2.3.18	Fixed the View settings function so imatest, multicharts, and rescharts ini files display properly (useful for debugging).
August 5, 2007	2.3.17	Several noise and SNR (signal-to-noise ratio) display options and CSV/XML outputs, similar to those added to <a href="#">Stepchart</a> , have been added to <a href="#">Colorcheck</a> .
August 3, 2007	2.3.16	A <a href="#">color uniformity profile plot</a> has been added to <a href="#">Light Falloff for Imatest Master</a> . Profile information has been added to the CSV and XML outputs. Several noise and SNR (signal-to-noise ratio) display options and CSV/XML outputs have been added to <a href="#">Stepchart</a> .
July 20, 2007	2.3.15	Fixes several bugs, some introduced in 2.3.12 – 2.3.14, that caused problems with image file input.
July 16, 2007	2.3.14	The dialog boxes that ask if you want to repeat an ROI (for images of the same size as the previous run) now allow you to adjust the previous ROI. <a href="#">Rescharts</a> has been upgraded to beta-2. x,y, and Y (measured and ideal) values have been added to the L*, a*, and b* values in the CSV and XML output files from <a href="#">Colorcheck</a> and <a href="#">Multicharts</a> .
July 10, 2007	2.3.13	<a href="#">Rescharts</a> beta has been quietly released. It measures several resolution-related charts using a highly interactive interface. New measurements include color moire and fine detail lost to software noise reduction. 2.3.13 can be downloaded from the <a href="#">Rescharts page</a> .
July 9, 2007	2.3.12	Improved cropping options are available for <a href="#">Colorcheck</a> , <a href="#">Distortion</a> , and <a href="#">Light Falloff</a> by clicking on Settings, Options and Settings... in the Imatest main window. <a href="#">Light Falloff</a> enhancements: Pseudocolor displays are available for the <a href="#">luminance</a> and <a href="#">f-stop contour plots</a> . Superposed contours, pseudocolor display, and an added histogram are available for the <a href="#">noise detail plot</a> .
July 2, 2007	2.3.11	Added a new histogram for RGB channels to <a href="#">Light Falloff for Imatest Master</a> that facilitates analysis of stuck (hot, dead) pixels. Added an option to select size of side and corner regions in Light Falloff. Additional side and corner results have been added to the CSV and XML output files. Added an option to <a href="#">SVG test charts</a> that replaces squares with hexagons with near-45 degree edges: useful for analyzing motion-caused blur.

		The <a href="#">Multicharts</a> interface has been clarified by the addition of the button.
June 15, 2007	2.3.10	Fixed a numerical error in <a href="#">SFR</a> that affected the results for very long regions of interest (ROIs)— over about 550 pixels. Added a View settings (ini file) command to the file menu in <a href="#">Imatest</a> and <a href="#">Multicharts</a> , which opens the ini (settings) file in Notepad. Fixed a bug in <a href="#">Distortion</a> that affected Imatest Studio only.
June 12, 2007	2.3.9	The function in <a href="#">Multicharts</a> and <a href="#">MTF Compare</a> allows you to view a snapshot of the screen using either the default image viewer or the viewer of your choice. Automatic rotation in <a href="#">Multicharts</a> is now bidirectional— the direction toggles each time you turn it on. Several new Log frequency-contrast chart options have been added to <a href="#">Test Charts</a> in preparation for a new module. A memory problem with <a href="#">Distortion</a> has been corrected.
May 31, 2007	2.3.8	<a href="#">Multicharts</a> supports two additional test charts: the <a href="#">CMP Digital Target 003</a> and the <a href="#">QPcard 201</a> .
May 28, 2007	2.3.7	A setting has been added to the <a href="#">Options and settings</a> window that allows the EXIF read for JPEG files to be turned off.
May 27, 2007	2.3.6	<a href="#">Distortion</a> calculations are now more robust, consistent, and less sensitive to region of interest (ROI) selection. An input option allows the selection of weak ROI filtering, which produces good results in most cases. A new <a href="#">Radius correction figure</a> has been added (Imatest Master only).
May 16, 2007	2.3.5	<a href="#">SVG test charts</a> have been redesigned to work better with an upcoming module for automated testing. A Welcome page is now displayed when the evaluation version is launched.
May 13, 2007	2.3.4	The 3D plots in <a href="#">Multicharts</a> can now rotate automatically using the button..
May 9, 2007	2.3.3	<b>First version recommended for Windows Vista.</b> Fixed a small bug in Colorcheck that affected the Color analysis display of ideal colors (inner squares) with new GMB reference values and wide gamut color spaces (and little else).
May 7, 2007	2.3.2	Fixed several bugs introduced with 2.3 and 2.3.1.

May 3, 2007	2.3.1	<a href="#">Light Falloff</a> images can now be cropped. The method is different from other modules: the number of pixels to crop from the L, R, T, and B borders is entered in the input dialog box.
April 30, 2007	2.3	Windows Vista operation has been improved. Several new <a href="#">SVG patterns</a> have been added to <a href="#">Test Charts</a> , including a <a href="#">Star Chart</a> described in the proposed ISO 12233 update and several scalable MTF charts, better suited to automated testing than previous charts. The labeling of the <a href="#">Color shading</a> plot in <a href="#">Light Falloff</a> has been clarified.
April 4, 2007	2.2.3	Bugs that prevented <a href="#">Test Charts</a> from creating distortion grids and <a href="#">MTF Compare</a> from running have been fixed.
Feb. 28, 2007	2.2.2	Adds the ITE Grayscale to to <a href="#">Stepchart</a> and <a href="#">Multicharts</a> in Imatest Master. Fixes a few little bugs, mostly involving saved parameters, with Stepcharts and Multicharts.
Feb. 25, 2007	2.2.1	Fixes some <a href="#">Stepchart</a> output errors for 20-patch OECF charts. Allows <a href="#">Stepchart</a> noise to be normalized to the maximum pixel level (255) as well as the pixel level corresponding to a 1.5 density difference. Allows density values for linear step charts to be read from a file (Pro-only). Corrects an error in the LW/BH scaling of the <a href="#">SVG chart</a> in <a href="#">Test Charts</a> (it was actually reading LP/BH).
Feb. 19, 2007	2.2	A new Imatest Master module, <a href="#">MTF Compare</a> , allows MTF results calculated in <a href="#">SFR</a> and saved in CSV files to be compared for a wide variety of cameras, lenses, and imaging systems.
Feb. 11, 2007	2.1.4	Adds support for 20-patch OECF charts, included in several proposed standards, to <a href="#">Stepchart</a> and <a href="#">Multicharts</a> in Imatest Master.
Feb. 6, 2007	2.1.3	The contrast ratio in <a href="#">Test Charts</a> has been corrected. The first of several <a href="#">Structured Vector Graphics</a> charts has been added to <a href="#">Test Charts</a> . Unlike bitmap charts, SVG charts can be printed any size with the highest print quality (though chart design is optimized for specific sizes). Variance is displayed by

		<a href="#">SFR</a> when Line Spread Function is selected for the Edge plot (the upper plot of the Edge/MTF figure).
Jan. 16, 2007	2.1.2	<a href="#">Veiling glare</a> (lens flare) measurement has been added to <a href="#">Stepchart</a> . <a href="#">Stepchart</a> now asks if you want to use the same ROIs (regions of interest) as the previous run when the image size is the same and manual ROI selection has been selected.
Jan. 6, 2007	2.1.1	The a*b* color difference figure in <a href="#">Colorcheck</a> now allows a choice between RMS (s) and maximum color error (in addition to mean). <a href="#">Multicharts</a> interface has been sped up: dialog boxes that duplicate settings in the main window (for example, with the 24-patch ColorChecker) have been removed. <a href="#">Multicharts</a> allows custom reference files to be read in for the ColorChecker SG. It remembers the reference file folders.
Dec. 25, 2006	2.1	<a href="#">Special charts</a> have been added to <a href="#">Multicharts</a> . Special charts include the <a href="#">Applied Image and ISO charts</a> , also analyzed by <a href="#">Stepchart</a> as well as monochrome or color squares arranged on a circle, which can be used to analyze “pie” charts. <a href="#">Multicharts</a> now asks if you want to use the same ROI (region of interest) as the previous run when the image size and type are the same.
Dec. 18, 2006	—	The prices of Imatest Studio and Pro have been increased to \$129 and \$499, respectively.
Dec. 10, 2006	2.0.11	<a href="#">Distortion</a> has been made more robust against small interfering patterns: partial lines, dust specks, etc.
Dec. 9, 2006	2.0.10	The second <a href="#">Stepchart</a> plot can be selected to display either f-stop noise or SNR (1/f-stop noise). The dynamic range calculation has been made more robust for irregular density response. A recently-introduced error in <a href="#">SFR</a> that can cause the red (R) channel to be analyzed instead of the selected channel (typically Luminance Y) been fixed.
Nov. 29, 2006	2.0.9	The SFR charts in <a href="#">Test Charts</a> can now be printed at several average tonal levels, light to dark. This is useful for creating low contrast edges for studying nonlinear signal processing. A recently-introduced bug that interfered with has been fixed.
Nov. 23, 2006	2.0.8	The input dialog box for several modules ( <a href="#">SFR</a> , <a href="#">Stepchart</a> , <a href="#">Colorcheck</a> , <a href="#">Light Falloff</a> , <a href="#">Distortion</a> ) has been changed so that plot on/off selections are grouped together. All plots can be turned off (needed for the upcoming API release). Fixed a bug



		that prevented Distortion from running to completion when Single line is selected.
Oct. 30, 2006	2.0.7	Fixed a recently-introduced bug that prevented SFR from displaying cycles/mm or cycles/in (Cycles/pixel displayed fine). SQF can now be plotted as a function of viewing distance for a fixed print size.
Oct. 27, 2006	2.0.6	The default name for saving figures, CSV, and XML files, which has been the image file name with a suffix added, can now be overridden in all the Save dialog boxes. A larger portion of the SFR edge is displayed for very wide transitions. SFR is more tolerant of noisy, low contrast edges.
Oct. 24, 2006	2.0.5	SQF results have been added to the CSV and XML output files. The multiple ROI plot choices have changed: you can now plot MTF in either C/P or LW/PH, and you can also plot SQF.
Oct. 21, 2006	2.0.4	Improves some details of <a href="#">SQF</a> numerical calculations.
Oct. 20, 2006	2.0.3	<a href="#">SQF</a> (Subjective Quality Factor) has been quietly added to SFR. It's still a "beta" calculation in need of additional testing. SQF is extremely important: it's easier to understand and closer to viewer experience than MTF, but less familiar. It will be released with more fanfare when it has been more thoroughly tested and documented.
Sept. 21, 2006	2.0.1,2.0.2	<a href="#">Light Falloff</a> has sliders that allow the hot pixel detection threshold to be set between 6 and 255, and the dead pixel threshold to be set between 0 and 250 ( <a href="#">Imatest Master</a> only). Color shading results may be displayed normalized (the default; maximum of 1) or unnormalized. The Light falloff contour plots may be turned off (useful where other results like hot/dead pixels or color shading are the primary measurement).
Sept. 17, 2006	2.0	Includes the new <a href="#">Multicharts</a> module, which interactively analyzes a number of test charts, including the GretagMacbeth™ Colorchecker® SG and the industry-standard IT8.7. Upgrade is available to all Imatest customers who have purchased or renewed their license in the last year.

## 1.n versions

--	--	--

Date	Release	Description
Aug. 31, 2006	1.7.4	<a href="#">Stepchart</a> now supports a pattern with a fixed number of patches ( <a href="#">Imatest Master</a> only). This option adds a <a href="#">fine ROI selection</a> . It is useful when high shadow noise confuses the automatic ROI detection.
Aug. 30, 2006	1.7.3	16-bit file support in <a href="#">SFR</a> is more robust. The button (formerly ; <a href="#">Imatest Master</a> only) includes an <a href="#">option</a> to lighten the ROI filtering in SFR. This can be helpful for endoscope images or other images with interference, but it can lead to inaccurate results if used carelessly.
Aug. 27, 2006	1.7.2	Support for <a href="#">dcraw</a> raw conversion has been updated. The new version supports the latest cameras (such as the Sony Alpha), writes TIFF files, and allows selection of the color space (default = sRGB).
Aug. 8, 2006	1.7.1	<a href="#">Colorcheck</a> region selection works better in uneven lighting; produces better diagnostic messages.
July 26, 2006	1.7	Several test charts have been added to <a href="#">Stepchart</a> ( <a href="#">Imatest Master</a> ): The <a href="#">Applied Image QA-61 (ISO-16067-1)</a> , <a href="#">QA-62</a> , <a href="#">ST-51 (EIA grayscale)</a> , and <a href="#">ST-52 (ISO-14524)</a> charts and the ISO-15739 (Noise) chart. New ColorChecker reference values from GretagMacbeth and <a href="#">Danny Pascale</a> are available in <a href="#">Colorcheck</a> . A minor bug that affects <a href="#">Stepchart</a> dynamic range calculations when patch values go to pixel level 0 has been fixed.
July 26, 2006	Renewal	<a href="#">Imatest Renewal</a> has been launched: you are entitled to one year of free updates after you purchase Imatest. After that time you must <a href="#">renew</a> your Imatest license to be able to install current updates.
May 27, 2006	1.6.16	In Imatest Master , the default folder for opening files and saving results may now be selected globally using the button in the main Imatest window. <a href="#">Details here</a> . This can be a convenience when data for several test modules is stored in the same folder. A bug with multi-ROI plots for B&W images in <a href="#">SFR</a> has been fixed. A rare bug with dynamic range calculation has been fixed.
May 10, 2006	1.6.15	The Colorchecker patch used to calculate the noise spectrum can be selected (Imatest Master only). Spectra for the R, G, B,

		and Y channels are displayed. An item in the Imatest Settings menu can be checked to keep the sharpening radius fixed so it doesn't increase for edges with poor MTF.
May 6, 2006	1.6.14	The folder used for Save and Retrieve settings is stored and used as the default in the Save/Retrieve settings dialog box. A checkbox in the SFR input dialog box allows the original ISO 12233 SFR calculation to be performed.
April 14, 2006	1.6.13	CMC color difference formulas have been added to <a href="#">Colorcheck</a> .
April 10, 2006	1.6.12	<a href="#">Colorcheck</a> Figure 3 now offers a choice between standard ( $\Delta E^*_{ab}$ , $\Delta C^*_{ab}$ ) and (more accurate) CIE-94 ( $\Delta E_{94}$ , $\Delta C_{94}$ ) color difference formulas.
April 9, 2006	1.6.11	<a href="#">Colorcheck</a> now supports ProPhoto RGB, Apple RGB, and ColorMatch color spaces. There have been some notation changes: $\Delta E(a^*b^*)$ is now called $\Delta C^*_{ab}$ . Several additional color metrics, including $\Delta E_{94}$ and $\Delta C_{94}$ have been added to the CSV and XML output files. A new <a href="#">Colorcheck Appendix</a> page describes the formulas and algorithms in detail.
March 24, 2006	1.6.10	The Print Test CIE 1931 xy plot display has been improved. A program crash cause by defective or missing EXIF data has been fixed.
Feb. 27, 2006	1.6.9	Very minor bug fixes involving SFR file save and secondary printout glitches.
Feb. 20, 2006	—	<a href="#">Imatest Lab announced</a> . Imatest Lab is a set of executable (EXE) programs that duplicate the functionality of Imatest modules. They are designed to operate with no manual intervention (no GUI) in automated testing systems.
Feb. 13, 2006	1.6.8	Color shading (sensor nonuniformity) is now optionally displayed in <a href="#">Light Falloff</a> . First release of this display; it will be refined somewhat. Pro only.
Feb. 9, 2006	1.6.7	<a href="#">Colorcheck</a> , <a href="#">Stepchart</a> , <a href="#">Light Falloff</a> , and <a href="#">Distortion</a> can now operate in batch mode (multiple image files) in Imatest Master.
Jan. 29, 2006	1.6.6	<a href="#">Test Charts</a> has been greatly improved in preparation for an upcoming Star chart module. The limitation on the number

		of <a href="#">SFR</a> runs has been removed. The maximum grid lines in <a href="#">distortion</a> has been increased to 60.
Jan. 3, 2006	1.6.5	“mpxls ideal” in <a href="#">SFR</a> has been limited to the total sensor megapixels to avoid misunderstandings: It can go higher with weak anti-aliasing or excessive sharpening, but image quality is not improved. A minor XML output bug was fixed. Dcrow has been updated.
Jan. 2, 2006	1.6.4	XML output has been added to all modules that currently have .CSV output. It is mostly self-explanatory. XML output will be used for extensions to Imatest (databases, etc.) by Imatest and third parties. It will be refined in succeeding Imatest releases.
Dec. 18, 2005	1.6.3	The <a href="#">SFR</a> input dialog box has been redesigned for clarity. The Standardized sharpening plot setting (on/off) is now saved. MTF50P (the frequency where MTF drops to 50% of its peak value; useful for video images that will not be post-processed) is displayed when Standardized sharpening is off. MTF50P has also been added to the Secondary readout. The edge can be displayed as a linear value (the default), line spread function (LSF), and pixel levels.
Dec. 10, 2005	1.6.2	Minor improvements to <a href="#">Colorcheck</a> display. <a href="#">Oversharpening / undersharpening</a> in <a href="#">SFR</a> has been redefined to be independent of the <a href="#">standardized sharpening</a> radius. Interpolation improves the accuracy of <a href="#">standardized sharpening</a> calculations for small ROIs.
Dec. 9, 2005	1.6.1	<a href="#">Stepchart</a> and <a href="#">Colorcheck</a> now display the correct exposure error for overexposure severe enough to clip highlight patches.
Dec. 6, 2005	1.6	Imatest has been split into <a href="#">Light and Pro versions</a> , priced at \$99 and \$299, respectively. The version now displays correctly immediately after registration is complete.
Dec. 2, 2005	1.5.7	<a href="#">Stepchart</a> figure 3 now displays the exposure error for reflective charts.
Nov. 28, 2005	1.5.6	The number of detected zones in <a href="#">Stepchart</a> now includes “indistinct” zones, and there is a small improvement in the detection of the darkest zone. The Imatest version is displayed in most modules and all .CSV files. A minor problem with <a href="#">Colorcheck</a> .CSV output for Adobe RGB and WGRGB has been fixed.

Nov. 25, 2005	1.5.5	<a href="#">Test Charts</a> adds 320, 400 dpi densities to accommodate printers listed by <a href="#">Dry Creek Photo</a> . The <a href="#">Total dynamic range</a> display in Stepchart has been changed to include <a href="#">indistinct zones</a> in charts where they appear (the Stouffer T4110). Additional control over output axes is provided so one set of axis scales can be maintained for several runs.
Nov. 20, 2005	1.5.4	The third <a href="#">Stepchart</a> figure now includes a plot showing the slope of the density response. This information can be helpful for measuring lens flare. It is included in the .CSV output.
Nov. 19, 2005	1.5.3	<a href="#">Light Falloff</a> displays hot and dead pixels (Imatest Master only). <b>Imatest 1.n Pro</b> is displayed at the top of the main window in preparation for the split into two versions. Warning messages that don't require user input are displayed briefly, then closed. The red rectangles showing the ROIs in <a href="#">SFR</a> are more transparent. The crop size is displayed in <a href="#">Stepchart</a> . The <a href="#">Stepchart</a> noise normalization factor is displayed.
Nov. 11, 2005	1.5.2	<a href="#">Light Falloff</a> now analyzes R, G, and B channels in addition to the default Y (luminance) channel. Warning messages for clipping in <a href="#">SFR</a> no longer require user intervention. They are displayed for one second, then processing continues. Edge roughness is displayed in <a href="#">SFR</a> when Standardized sharpening is turned off.
Nov. 6, 2005	1.5.1	Fixes a bug in the evaluation version.
Nov. 5, 2005	1.5	The first Imatest add-on, SFR Any Angle, has been released (later incorporated into Imatest Master).
Nov. 4, 2005	1.4.16	<a href="#">Colorcheck</a> now displays the exposure error: for best results it should be kept under 0.25 f-stops. A bug that can result in erroneous <a href="#">Standardized sharpening</a> results for non-integer sharpening radii has been fixed. Two bugs in <a href="#">Light Falloff</a> have been fixed.
Oct. 23, 2005	1.4.15	The <a href="#">SFR</a> ROI (region of interest) selection dialog box now includes the boundary locations (pixels from the top-left of the image), which can be entered numerically. These locations also appear under the ROI thumbnail image on the MTF plot. The plot of <a href="#">standardized sharpening</a> results can be turned off to reduce display clutter. If it is turned off, the edge and MTF plots for the

		<p>separate RGB channels are emphasized and the 10-90% rise distances and MTFs for the separate channels are displayed. These values have been added to the .CSV MTF summary file, which is unaffected by the plot setting.</p>
Oct. 8, 2005	1.4.14	<p>Small bug fixes: .CSV output for B&amp;W images in <a href="#">SFR</a> has been cleaned up slightly. The criteria for detecting uneven illumination in <a href="#">Colorcheck</a> has been tightened so the warning will be issued less often (and correlate better with true illumination problems). A problem that occasionally causes output to be written in the wrong folder (not in the Results subfolder) has been corrected.</p>
Sept. 25, 2004	1.4.13	<p><a href="#">Stepchart</a> now includes a figure showing the density response for all channels (Y, R, G, and B) in color images. This information is also included in the .CSV output. Some additional <a href="#">SFR</a> bugs have been fixed.</p>
Sept. 23, 2004	1.4.12	<p>Fixed the pulldown menus and another bug that could cause <a href="#">SFR</a> to crash.</p>
Sept. 21, 2004	1.4.11	<p>Fixed a problem with B&amp;W files in <a href="#">SFR</a> that arose in 1.4.8.</p>
Sept. 11, 2005	1.4.10	<p>Corrects some numerical errors, visible only on tiny ROIs (&lt;15×15 pixels).</p>
Sept. 10, 2005	1.4.9	<p>Corrects a 1-pixel error in the <a href="#">SFR</a> ROI selection (invisible before 1.4.8).</p>
Sept. 9, 2005	1.4.8	<p><a href="#">SFR</a> can now analyze ROIs (selected Regions of Interest) as small as 10×10 pixels, though larger regions are still recommended for best accuracy.</p>
Sept. 7, 2005	1.4.7	<p><a href="#">Distortion</a> can now display a figure that illustrates the <a href="#">corrected image</a>. This is useful for cases of extreme distortion (such as fisheye lenses), where the image has to be severely cropped for Distortion to work. It allows comparison of the different correction formulas (3rd order, 5th order, and PW Pro (tan/arctan)).</p>
Aug. 23, 2005	1.4.6	<p>.CSV output has been added to <a href="#">Light Falloff</a>. The.CSV summary file in <a href="#">SFR</a> now includes Chromatic Aberration (CA) results, even if CA isn't plotted. Two changes have been made to the Colorchecker La*b* plot. (1) Color error ?C has been renamed ?E(a*b*). (2) ?E(a*b*) <i>without</i> saturation correction has been</p>



		added to the plot.
Aug. 8, 2005	1.4.5	The <a href="#">Close figures after save</a> checkbox in the SFR Save dialog box prevents a buildup of open figures during large batch runs.
July 8, 2005	1.4.3,1.4.4	<a href="#">Distortion</a> line detection routines have been enhanced to work better under poor conditions: underexposure, high noise, and uneven lighting, and to reject small dust spots.
July 5, 2005	1.4.2	Adds a decentering calculation to <a href="#">Distortion</a> , as well as the scale factor for the Picture window Pro correction. This release completes the feature set for <a href="#">Distortion</a> , apart from some refinements and inevitable bug fixes. The new version of dcraw fixes gamma at 0.45.
June 30, 2005	1.4.1	Adds a 5th-order distortion coefficient calculation, an intersection point figure to the <a href="#">Distortion</a> module, and intersection point data to the .CSV output file. Fixes several minor bugs in <a href="#">Distortion</a> and a bug in writing SFR .CSV files.
June 21, 2005	1.4	Incorporates the new <a href="#">Distortion</a> module for calculating lens distortion and the coefficients for correcting it. <a href="#">Test Charts</a> has been enhanced to create a grid pattern for use with <a href="#">Distortion</a> .
June 5, 2005	1.3.9	The average noise calculation in <a href="#">Stepchart</a> has been refined slightly. Average noise is now displayed in the bottom plot (Noise based on pixel levels) of the second figure. A zone plate pattern has been added to <a href="#">Test Charts</a> . A new page on <a href="#">noise</a> has been added.
May 17, 2005	1.3.8	xyY 5000K or xyY 6500K reference files can now be read into <a href="#">Colorcheck</a> . <a href="#">Stepchart</a> figures have been refined somewhat.
May 15, 2005	1.3.7	<a href="#">Colorcheck</a> allows you to select among several sets of reference data for the GretagMacbeth Colorchecker. Reference data (Lab or xyY) can also be read from files. The <a href="#">Danes-Picta</a> BST4D chart (similar to the Colorchecker) has been added. Detection of <a href="#">Stepchart</a> zones has been improved.
May 13, 2005	1.3.6	Corrects a bug in writing monochrome SFR .CSV files.

May 11, 2005	1.3.4,1.3.5	.CSV (Excel-readable) output has been added to <a href="#">Stepchart</a> and greatly enhanced for <a href="#">SFR</a> and <a href="#">Colorcheck</a> . Virtually all numeric or graphic results displayed in the figures are now included. 1.3.5 corrects a bug in writing SFR .CSV files.
May 6, 2005	1.3.3	Has a new <a href="#">Test Charts</a> module that creates files for printing a variety of test charts on high quality inkjet printers. In addition to standard SFR charts, <a href="#">Test Charts</a> includes star charts and log frequency charts that allow you to view color Moire and detail (high spatial frequency, low contrast) lost to software noise reduction. You can now make fine adjustments to <a href="#">SFR</a> regions of interest (ROIs) after they have been selected.
April 8, 2005	1.3.2	Fixes a rare error that occurred when very small regions were selected for SFR. The Additional parameters in the SFR data window, some of which overwrite EXIF data, now display properly in the MTF plots. They are also saved and reused in new runs with the same image dimensions (in pixels) as the previous run.
April 6, 2005	1.3.1	Fixes errors that occurred when highly asymmetrical regions (ROIs) were selected for SFR.
March 31, 2005	1.3	The new Light falloff module measures the light falloff (vignetting) of lenses and the uniformity of sensors.
March 22, 2005	1.2.14	Fixes an error in the chromatic aberration plot in the evaluation version.
March 21, 2005	1.2.13	Fixes a bug which can reduce accuracy of color channel noise calculations in rare instances.
March 8-9, 2005	1.2.11, 12	Fixes several bugs related to the new SFR readout and batch mode features, which can hang up SFR.
March 7, 2005	1.2.10	SFR can now perform batch runs. You can select several files to run in sequence. This can be particularly convenient when you test a lens at several apertures.
March 5, 2005	1.2.9	Q-13 Stepchart has been renamed Stepchart. It has a number of enhancements, particularly when used with the Stouffer T4110 target ( $D_{max} = 4.0$ ), where the steps become indistinct in dense regions. "Beta" has been removed from the Print test button.

March 1, 2005	1.2.8	Print test displays a*b* color gamut areas. The original working color space and the scanner output color space can be specified separately. You can select whether to display the HSL contour plots and the xy gamut plot. (La*b* gamut plots are always displayed.) The Print test target has been improved slightly: adds one extra pixel at the margins of the color and grayscale patterns so the extremes of lightness, hue, and saturation are not "marginalized." The message for cropping errors (all modules) has been improved; it contains an example of a correct crop. You can select a secondary readout in SFR. (The primary readout is MTF50). The default secondary readout is MTF30. You can change it to (spatial frequency for) MTF at any percentage level, or MTF at a spatial frequency specified by cy/pxl, lp/mm, or lp/in.
Feb. 10, 2005	1.2.7	Adds the ability to save and retrieve settings (contents of imatest.ini). Particularly useful for saving regions of interest (ROIs). The MTF .CSV file (output of SFR) now contains the MTFs for all four channels (R, G, B, and Y (luminance) ).
Feb. 4, 2005	1.2.6	Adds Wide Gamut RGB color space to the spaces available for Colorcheck and Printtest. Allows smaller ROIs (as low as 30 pixels) in SFR.
Dec. 3, 2004	1.2.5	Issues a warning for uneven illumination in Colorcheck. Displays average R, G, B, and Y noise levels in Q-13 Stepchart. Fixes a bug that caused Imatest to crash when an attempt is made to save a figure that hasn't been created.
Nov. 16, 2004	1.2.3	Print test Gamut maps have been enhanced to display lines of constant hue.
Nov. 14, 2004	1.2.2	Print test now displays La*b* saturation maps, which illustrate gamut with great clarity. Print test is now complete, but it will retain beta status for two weeks. It is available to all users. The Colorcheck La*b* color error plot now displays the color space gamut limits as a gray line in the background.
Nov. 4, 2004	1.2.1	Fixes a rare glitch in dynamic range calculations. Allows the Chromatic Aberration figure to be turned off. Increases the size of the image used for cropping. Includes a beta version of the new Print test module, available only to registered users. Documentation will be available in a few days.
Oct. 24, 2004	—	A new page has been added to the website: <a href="#">How to test lenses with Imatest</a> . The description of SFR figures has been divided into three pages: <a href="#">MTF (Sharpness) plot</a> , <a href="#">Chromatic Aberration</a> ,

		<a href="#">Noise, and Shannon Capacity plot</a> , and <a href="#">Multiple ROI (Region of Interest) plot</a>
Oct. 17, 2004	1.2	RAW files are supported for a large number of digital cameras using <a href="#">Dave Coffin's drcraw</a> program. Files are converted with minimal signal processing— no sharpening or noise reduction. This allows the true performance of cameras and the behavior of raw converters to be analyzed. Chromatic Aberration is now measured as percentage of the distance from the image center. This is an improvement over area in pixels because CA tends to be proportional to that distance. The new measurement is relatively independent of camera pixel count and measurement location. A checkbox on the main window allows you to turn off automatic expansion of the figures for high resolution screens (>1280 pixels wide). The smaller figures are better for posting on the web.
Oct. 12, 2004	1.1.3	SFR regions of interest (ROIs) are now saved between runs. B&W images are handled better by SFR: A message is displayed indicating that Chromatic Aberration can't plot, and Noise/Shannon capacity plots properly.
Oct. 7, 2004	1.1.2	Fixes a memory problem that slowed repeated SFR runs.
Oct. 6, 2004	1.1.1	Lighter grid lines make plots far more legible. SFR output has been simplified for clarity. Dynamic range information is displayed more clearly on Q-13 Stepchart.
Sept. 28, 2004	1.1	Greatly expands noise and dynamic range calculations in <a href="#">Q-13 Stepchart</a> and noise calculations in <a href="#">Colorcheck</a> . Noise measurements in f-stops have been added to both programs. These are relative measurements, which correspond closely to the workings of the eye. Q-13 Stepchart now calculates total dynamic range (using a more sensitive detection algorithm) as well as noise-limited dynamic ranges for several quality levels. Colorcheck now includes noise measurements for the third Colorchecker row, which includes Blue, Green, Red, Yellow, Magenta, and Cyan. In evaluation mode, multiple region SFR runs now count as two runs (even if more than two regions are selected).

Sept. 11, 2004	1.0.3	Improves compatibility with 48-bit color files.
Sept. 7, 2004	1.0.2	Fixes some registration/activation issues. Not needed if you were able to register 1.0.
Sept. 6, 2004	1.0.1	
Sept. 4, 2004	1.0	<b><i>The first release!</i></b> A number of improvements have been made since the final Beta version. Q-13 now displays camera dynamic range when run with transmission step targets (the reflective Q-13 has insufficient contrast to measure the dynamic range of digital cameras.) Colorcheck now displays the color temperature error (in degrees K and mireds) of the Colorchecker gray patches. A bug was fixed that caused SFR to always calculate the MTF for the same color channel.

## Beta versions

Date	Release	Description
August 14, 2004	Beta 1.5.13	Some small enhancements, including a drop-down help menu with the beginnings of the purchase/registration dialog.
August 12, 2004	Beta 1.5.12	A few small fixes. Change directory in the Save windows now works correctly.
August 11, 2004	Beta 1.5.10	Contains a <a href="#">speedup</a> for runs where the ROI is repeated— it allows you to omit the requests for input data and save information, which is assumed to be repeated. The shortcut for installations where other Matlab versions are present is changed (see <a href="#">Troubleshooting</a> , below). <a href="#">Excel .CSV output</a> has been added to the Colorcheck module.
August 9, 2004	Beta 1.5.7	Incorporates several suggestions from <a href="#">Q. Tuan Luong</a> . Multi-region runs now display two vertical axes for MTF and a box with a summary of the results— a weighted MTF that can be used as an overall sharpness figure. SFR Cycles per (pixel, mm, inch) plot settings are saved between runs. Multi-region output has been documented <a href="#">here</a> .
August 7, 2004	Beta 1.5.6	Fixes a bug in the SFR binning algorithm that caused occasional crashes. It displays numeric results on the multiple ROI plots.

		<a href="http://Digitalcamerainfo.com">Digitalcamerainfo.com</a> , a new digital camera review site from the creators of <a href="http://Camcorderinfo.com">Camcorderinfo.com</a> , has become the first site to use Imatest for its tests.
August 3, 2004	Beta 1.5.5	Corrects some problems with multiple ROI selection and improves some details of the Excel .CSV output files.
August 1, 2004	Beta 1.5.4	Has the exact equations for converting between sRGB, XYZ, and Lab color spaces. Beta 1.5.3 adds Adobe RGB (1998) files to Colorcheck. A problem with creating imatest.ini has been solved. No additional features are planned for the product release— just refinements and bug fixes. More documentation is coming.
July 29, 2004	Beta 1.5.2	Has some minor fixes and small improvements in the multiple region plots.
July 27, 2004	Beta 1.5	produces plots of MTF50 (without and with standardized sharpening) and rise distance as a function of distance from the center of the frame for images where multiple regions have been selected. This is a big advance— the results for several locations are summarized in two figures. Full documentation is forthcoming.
July 26, 2004	Beta 1.4.6	Stores and recalls settings, including directories for reading and saving images, SFR plot settings, and save selection. This is a major convenience. Settings are stored in imatest.ini, which is a simple, readable ASCII file.
July 18, 2004	Beta 1.4.4	Has some improvements in ROI selection, displays MTF30 instead of MTF20 (minor change) and adds standard deviation (sigma) to the L*a*b* color error. I'll be traveling until July 24. I've left some old versions (below) as a backup.
July 17, 2004	Beta 1.4.2	Fixes some font size problems with 1600×1200+ displays. The OK/Cancel buttons have been switched in some dialog boxes: OK (yes) is always on the left.
July 16, 2004	Beta 1.4.1	Allows you to select several regions of interest (ROIs) in SFR instead of just one. This makes it convenient to test sharpness from the center to the edge, etc. ROIs are now saved. If you run SFR on an image with the same pixel dimensions as the previous image, SFR will ask you if you want to use the same ROIs. This can speed up repeat runs, for example, when the same image is used to test a lens at several f-stops.



July 12, 2004	Beta 1.3.4	SFR output has been simplified by omitting the LW/PH MTF Figure (as default) and removing the Shannon capacity and noise spectrum plots from the Chromatic Aberration Figure (also as defaults). These plots can be restored by means of a checkbox. The installer is somewhat better checking for installed libraries.
July 11, 2004	Beta 1.3.3	Fixes the font size problem in the GUI windows— All fonts should now be set properly by the font size box. Also fixes some Install/Uninstall issues. Windows XP should be OK, but there may still be problems with 98.
July 8, 2004	Beta 1.3.1	Changes the definition of camera gamma so pixel level = $\text{exposure}^{(\text{camera gamma})}$ . It corrects some Q-13 display issues: the first zone is now number 1.
July 5, 2004	Beta 1.3.0	<b>The installer has arrived.</b> Installation is now simple— just double-click on lmatest-[version].exe and answer the questions— mostly click Next >.
July 2, 2004	Beta 1.2.6	Has an option for an Excel .CSV plot of (cycles/pixel, LW/PH, MTF, MTF(corr)). The aerial MTF50 is now called “ideal megapixels.”
July 1, 2004	Beta 1.2.5	Includes estimates of aerial MTF50 (half-contrast frequency in megapixels) in addition to linear MTF50 (in cycles/pixel and LW/PH).
June 26, 2004	Beta 1.2.3	Incorporates several small improvements, including the ability to select the standardized sharpening radius. The directory structure has been changed to conform to the final (I hope) release.
June 24, 2004	Beta 1.2.2	Has better zone detection in Q-13, which now analyzes several step charts in addition to the Q-13, including transmission charts from Kodak and <a href="#">Stouffer</a> . These charts are valuable for testing dynamic range and performance in scanners and digital cameras. Colorcheck displays the average R, G, B, and Y noise for the gray patches.
June 22, 2004	Beta 1.2.0	Allows Colorcheck and Q-13 images to be cropped. This makes it easy to analyze Colorchecker images in the “Davebox” images in <a href="#">imaging-resource.com</a> . 48-bit color files are now supported. Colorcheck and Q-13 request the title of the run (which defaults to the input file name).

June 17, 2004	Beta 1.1.3	Corrects some cropping issues with Colorcheck and reports gamma in a consistent manner for all modules (generally in the vicinity of 2). Where “Oversharpening” was a negative number, it is now reported as “Undersharpening.” The <a href="#">Imatest forum</a> for posting questions and responses is now working.
June 10, 2004	Beta 1.1.1	Allows choice of small, normal, and large fonts to cover a wider range of screen resolutions. Plot size is increased for 1600×1200 or larger screens. Mean saturation and color error have been added to the Colorcheck L*a*b* color error plot. If new EXIF data is present, data derived from previous EXIF entries is cleared. Clipping warning message boxes and tooltips have been added.
May 28, 2004	Beta 1.1.0	Has a new input window for SFR that allows output to be set to cycles per mm, along with numerous other settings. It also allows the output font size to be reduced.
May 23, 2004	Beta 1.0.6	Numerous small improvements in displays. The last number of the release version will be incremented for every build, no matter how minor.
May 18, 2004	Beta 1.0.5	Corrects a number of Colorcheck issues and has a new L*a*b* color error diagram.
May 13, 2004	Beta 1.0.4	Minor bug fixes and refinements. The Change directory box in the Imatest main window was removed. Imatest modules now remember the last directory used. There are new versions of install2.bat and install98.bat.
May 9, 2004	Beta 1.0.3	A number of small improvements, including calculation of Shannon capacity for several signal levels, representing several image contrast levels. Documentation has been updated, but there are still plenty of loose ends.
April 29, 2004	Beta 1.0	<b>First GUI (graphics user interface) version.</b> Incorporates most of the improvements and bug fixes suggested by the Beta testers (thanks to all of you). Includes two new modules— ColorCheck for analyzing the GretagMacbeth ColorChecker, and Q-13 for the Kodak Q-13 gray scale step chart.

April 21, 2004	Beta 0.07	Now based on Matlab Release 13 (version 6.5.1). Must be reinstalled from scratch, not as an upgrade. The Chromatic Aberration calculation has been corrected. Gamma has been inverted: It now defaults to 2 (less confusing). Noise calculations, noise spectrum, and an approximate Shannon capacity have been added.
March 31, 2004	Beta 0.06	Now includes a Chromatic Aberration plot. Asks whether you want to save the results of the run (so your folders don't get cluttered with bad results).
March 27, 2004	Beta 0.05	Sharpening radius is adjusted to give good results for blurred edges.
March 23, 2004	Beta 0.04	Box that requests another SFR run gives option of using same image. Many small refinements.
March 22, 2004	Beta 0.03	Region of Interest (ROI) selection of digital camera images now functions properly. Some data is "sticky." it remains unchanged between successive runs. Many small improvements have been made on the user interface.
March 20, 2004	Beta 0.02	Files are now written for use with Microsoft Excel.
March 17, 2004	Beta 0.01	First Beta release.