imatest®

IT (Industrial Testing)

Modules for automated testing/quality control

Calculations are same GUI-based modules.

Consists of 14 modules:

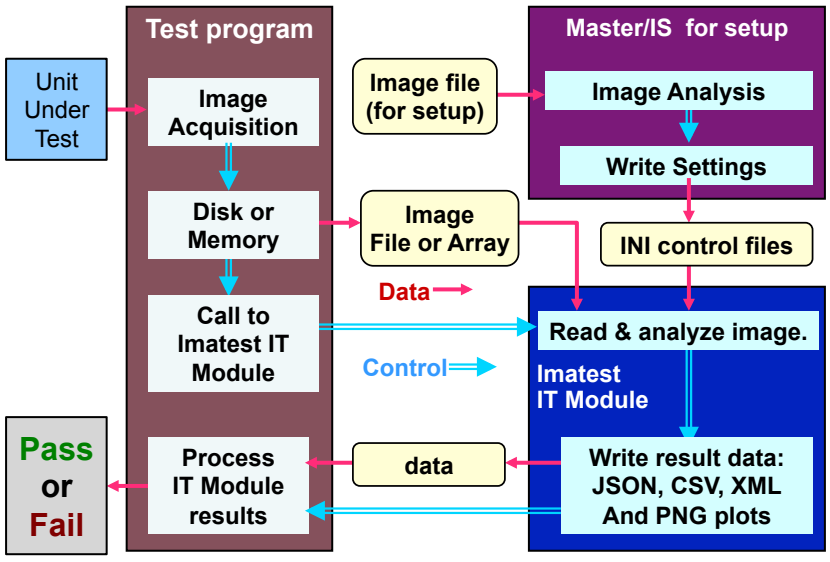
SFRplus	eSFR ISO	SFR	Wedge
Random	Log-f Contrast	Star	Distortion
Blemish	Uniformity	Colorcheck	Stepchart
Multitest	Dot Pattern		

Modules can be run as:

- Executable – EXE
- Shared libraries
  - Windows:DLL, Linux:SO, Mac:Dylib
  - For use with C / C++ / Python / .NET / Labview

imatest®

IT 2: Block diagram

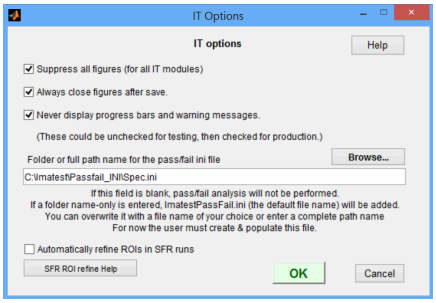


IT 3: Setup 1

In IS or Master, Click **Settings → IT Options** and make sure you have the correct options.

Checking all boxes recommended.

Interface:



Imatest.ini file:

[api]

nomsg = 1

savedel = 1

passFail = C:\camera\ModelX-Spec.ini

sfrrefine = 1

IT 4: Setup 2

3. Analyze the image file with GUI-based ***Imatest Master***.
4. Click Save settings… and save the settings in a named file. Example: api_control_xxx.ini
5. The ini file is a readable text file that can be edited— to change file names when moving between computers, change settings, or remove irrelevant entries.

IT 5: DOS call to EXE

Issue a DOS call from the calling program. Format:

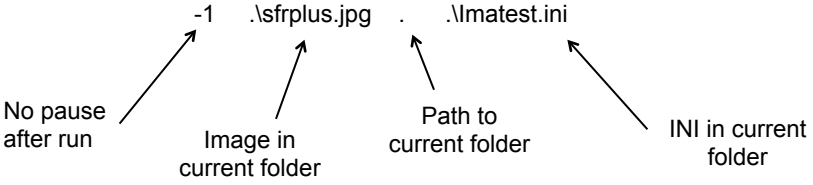
[module].exe param-1 param-2 param-3 param-4 param-5

(The parameters are listed in the next page)

Example:

"C:\Program Files (x86)\Imatest\v4.4\IT\bin\sfrplus.exe"

-1 .\sfrplus.jpg . .\Imatest.ini



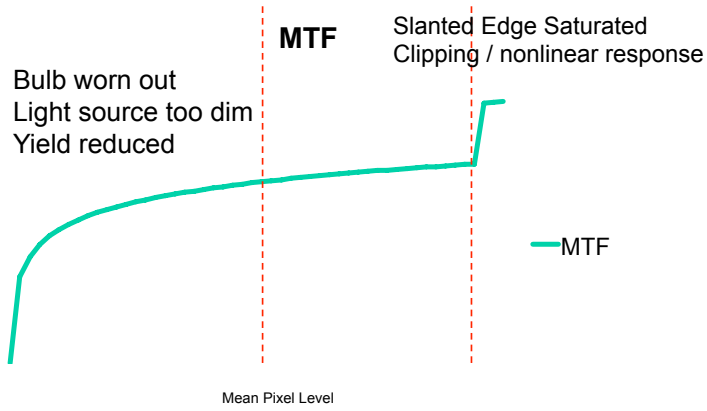
IT 6: EXE Call parameters

EXE call: [Module].exe param-1 param-2 param-3 param-4 param-5

Param	
1	-1 closes all figures after the run ends. (Normal operation) -2 keeps the DOS window open after the program terminates. -3 and -4 are similar to -1 and -2 but open the error log file
2	Image file name
3	Folder where the IT and other programs are located. e.g.: “c:\program files\imatest\IT\bin\”
4*	.ini file name. If omitted, it defaults to imatest.ini.
5*	folder where results are written. defaults to Results/ folder in the directory with image file.

Preventing Darkness & Saturation

- Bulb worn out
- Light source too dim
- Yield reduced



IT 8: Pass Fail INI File – SFRplus 1/2

Secondary Readouts are selected during SFRplus setup

For example:
Secondary_readout_1
means MTF@0.250*Nyquist

Secondary_readout_2
means MTF@0.5*Nyquist

```
[sfrplus]
Secondary_readout_1_center_mean_min = .69
Secondary_readout_1_outer_mean_min = .5
Secondary_readout_2_center_mean_min = .3
Secondary_readout_2_outer_mean_min = .15
Rotation_degrees_max = 1.5
FOV_degrees_diagonal_min = 67
Convergence_angle_max = 1.6

… continued …
```

Center means <0.3 Field

Outer means >=0.3 Field

Tilt test

imatest

IT 9: Pass Fail INI File – SFRplus 2/2

[sfrplus] … continued …

Distortion Bars In Image → Horizontal_bars_OK_min = 1

Found all required ROIs → All_Edge_IDs_detected = 1

Color demosaic proper → Bayer_decode = 1
Mirrored_chart = 1

Don't allow flipped chart

Don't allow too bright/dark → Chart_mean_pixel_level_bounds = .3 .8

Don't allow oversaturated Image (non-linear clipping) → Low_pixel_saturation_fraction_max = .3
High_pixel_saturation_fraction_max = .3

Offset Sqrt(X^2 + Y^2) max → Chart_radial_pixel_shift_max = 18

imatest

IT 10: Pass Fail INI File – Blemish Detect

[blemish]

Defect Pixels → Dead_pixels_max = 50
Hot_pixels_max = 50

Optical Center → Optical_center_offset_max = 30

Corner Difference → Relative_illumination_worst_corner_pct_min = 29
Relative_illumination_corner_diff_pct_max = 21

Uniformity Ratios → Uniformity_RoverG_corners_pct_max = 10.8
Uniformity_BoverG_corners_pct_max = 13.9

Blemishes → Blemish_size_pixels = 20 49
Blemish_maximum_count = 2 1

2 blemishes of 20 pixels allowed
1 blemish of 49 pixels allowed
More blemishes? FAIL!

IT 11: Pass Fail Monitor

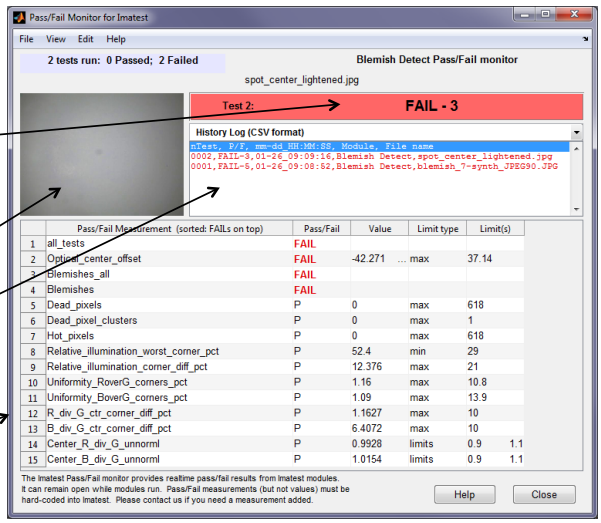
Run from main Imatest window; supported by nearly all fixed & interactive modules. Preview of Pass/Fail results.

Main P/F indicator (**green for P**; **red for F**)

Image thumbnail

History or original results data structure

Parsed results with **FAIL**s on top



IT 12: JSON Output Format

Imatest outputs files in JSON format:

```
{
    "Json Files" :
        { "Are easy to read" : ["by a human",
                                "by a computer program"],
          "Are better than" : ["CSV", "XML",
                               "Reading plots"]
        }
    "Strings"     :   "Asdf",
    "Objects"     :   { "Key" : "Value",    "foo" : "bar" },
    "Arrays"      :   [0, 1, 2, 3, 4, 5],
}
```

JSON files can be easily processed by most programming languages. See http://www.json.org .

IT 13: JSON Test Results

Inside SFRplus Outputs


```
"passfail": {
        "started_at": "2012-09-18 21:48:11",
        "part_number": "720Pcam",
        "serial_number": "123",
        "ended_at": "2012-09-18 21:48:13",
        "all_tests_passed": [1],
        "Rotation_degrees_max": [1],
        "Rotation_degrees": [0.1544402431],
        "Rotation_degrees_passed": [1],
        "FOV_degrees_diagonal_min": [65],
        "FOV_degrees_diagonal": [71.48887417],
        "FOV_passed": [1],
        "Convergence_angle_max": [1],
        "Horizontal_convergence_angle_degrees": [0.1962654529],
        "Horizontal_convergence_angle_passed": [1],
        "Vertical_convergence_angle_degrees": [-0.1782540181],
        "Vertical_convergence_angle_passed": [1],
        "Secondary_readout_1_center_mean_min": [0.69],
        "Secondary_readout_1_center_name": "MTF @ 0.125 C/P",
        "Secondary_readout_1_center_mean": [0.7605115781],
        "Secondary_readout_1_center_mean_passed": [1],
        "Secondary_readout_1_outer_mean_min": [0.5],
        "Secondary_readout_1_outer_name": "MTF @ 0.125 C/P",
        "Secondary_readout_1_outer_mean": [0.6414709955],
        "Secondary_readout_1_outer_mean_passed": [1],
        "Secondary_readout_2_center_mean_min": [0.3],
        "Secondary_readout_2_center_name": "MTF @ 0.250 C/P",
        "Secondary_readout_2_center_mean": [0.4810220612],
        "Secondary_readout_2_center_mean_passed": [1],
        "Secondary_readout_2_outer_mean_min": [0.15],
        "Secondary_readout_2_outer_name": "MTF @ 0.250 C/P",
        "Secondary_readout_2_outer_mean": [0.3197757488],
        "Secondary_readout_2_outer_mean_passed": [1]
}
```


Inside Blemish Outputs


```
"passfail": {
        "started_at": "2014-06-13 21:44:05",
        "part_number": "1080Pcam",
        "serial_number": "123",
        "ended_at": "2014-06-13 21:44:07",
        "all_tests_passed": [1],
        "Dead_pixels_max": [300],
        "Dead_pixels": [2],
        "Dead_pixels_passed": [1],
        "Hot_pixels_max": [300],
        "Hot_pixels": [0],
        "Hot_pixels_passed": [1],
        "Optical_center_offset_max": [90],
        "Optical_center_offset": [-20.73147695,-2.589069404],
        "Optical_center_offset_radial": [20.89252059],
        "Optical_center_offset_passed": [1],
        "Relative_illumination_worst_corner_pct_min": [27],
        "Relative_illumination_worst_corner_pct": [37.4989815],
        "Relative_illumination_worst_corner_passed": [1],
        "Relative_illumination_corner_diff_pct_max": [31],
        "Relative_illumination_corner_diff_pct": [4.813874468],
        "Relative_illumination_corner_diff_pct_passed": [1],
        "Uniformity_RoverG_corners_pct_max": [13.9],
        "Uniformity_RoverG_corners_pct": [1.87],
        "Uniformity_RoverG_corners_pct_passed": [1],
        "Uniformity_BoverG_corners_pct_max": [13.9],
        "Uniformity_BoverG_corners_pct": [1.17],
        "Uniformity_BoverG_corners_pct_passed": [1],
        "Blemishes_detected_pixel_size": null,
        "Blemishes_passed": [1,1],
        "Blemish_size_pixels": [49,49],
        "Blemish_maximum_count": [2,1],
        "Blemishes_all_passed": [1]
}
```


IT 12: Acquire Image Routine

The Imatest IT image acquisition library, called through the Imatest IT shared library, allows you to use use all Imatest IS supported acquisition interfaces

See imatest.com/acquire for all supported hadware

Show supported devices:

list_devices(int nargout, mwArray &devices);

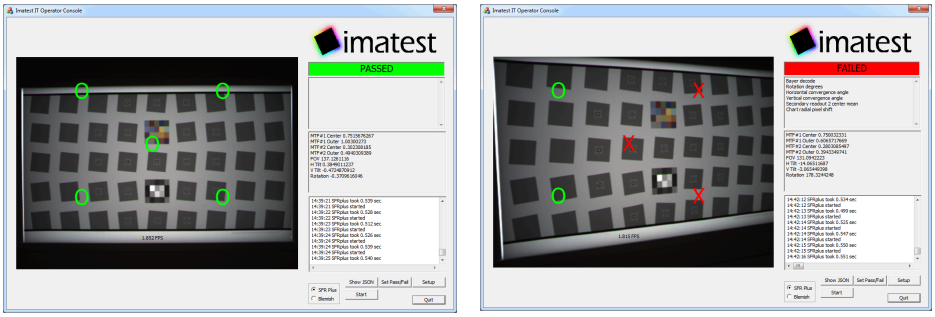
Acquire image from device:

acquire_image(int nargout, mwArray &im_orig, mwArray &vstr, const mwArray &source_id, const mwArray &varargin);

IT 13: Operator Console

Manufacturing Test Interface

- Simple Pass/Fail GUI for Imatest IT
- Integrate with factory control & automated test equipment
- Open source project written in MFC C++
- To be ported to cross-platform GUI framework in future (QT, GTK or Java)



Thank You For Attending Our Class!

We appreciate you attending our class and look forward to working with you.

Get in touch with us:

support@imatest.com	Software feature requests & issues
sales@imatest.com	Purchasing and payment
charts@imatest.com	Chart customization and questions
testing@imatest.com	Equipment, test lab setup and automation
training@imatest.com	On-site training

Best Regards,

-The Imatest Team

End Fin Ende 结束 끝 終わり