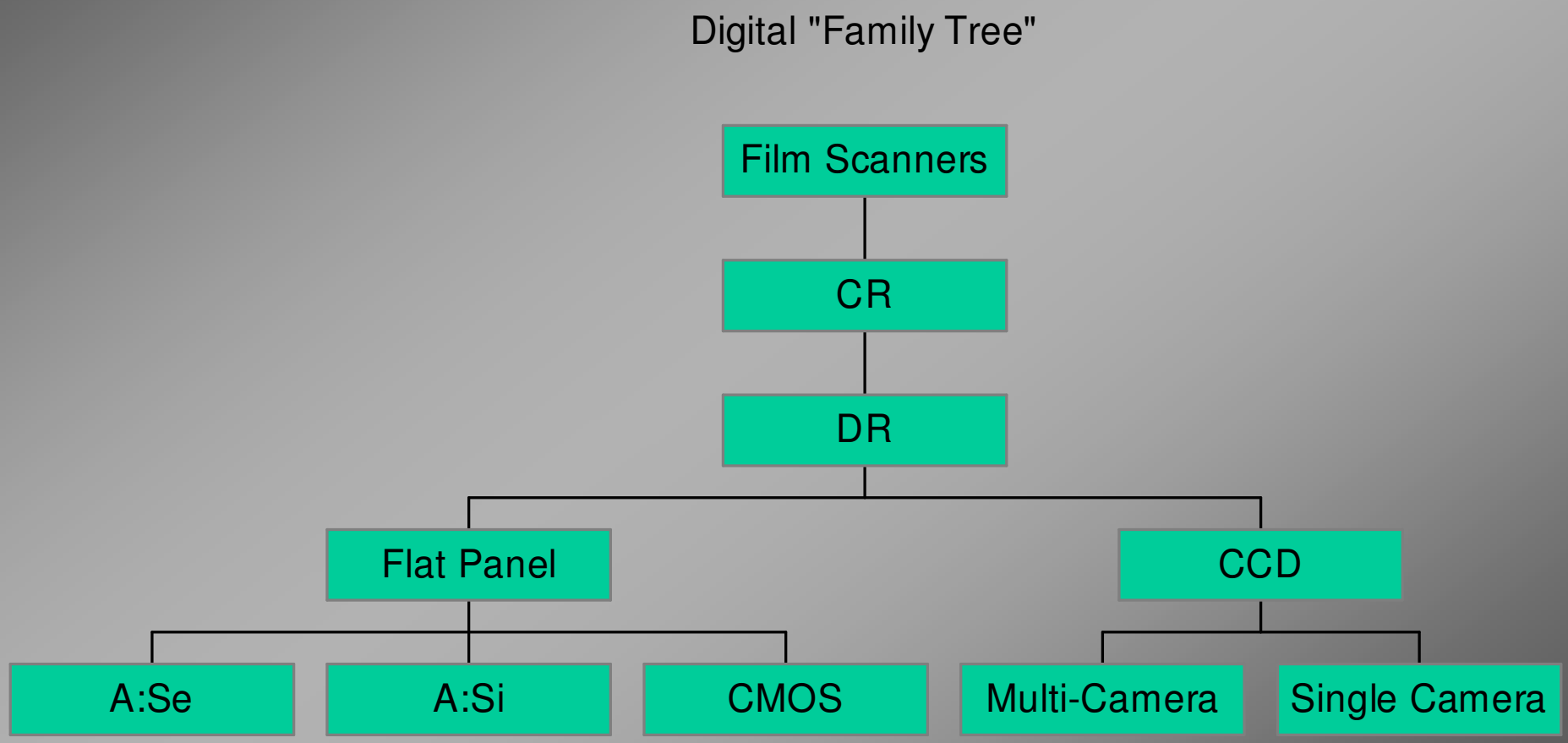
DR QA

AAPM 46th Annual Meeting
Pittsburgh

Robin Winsor
Imaging Dynamics

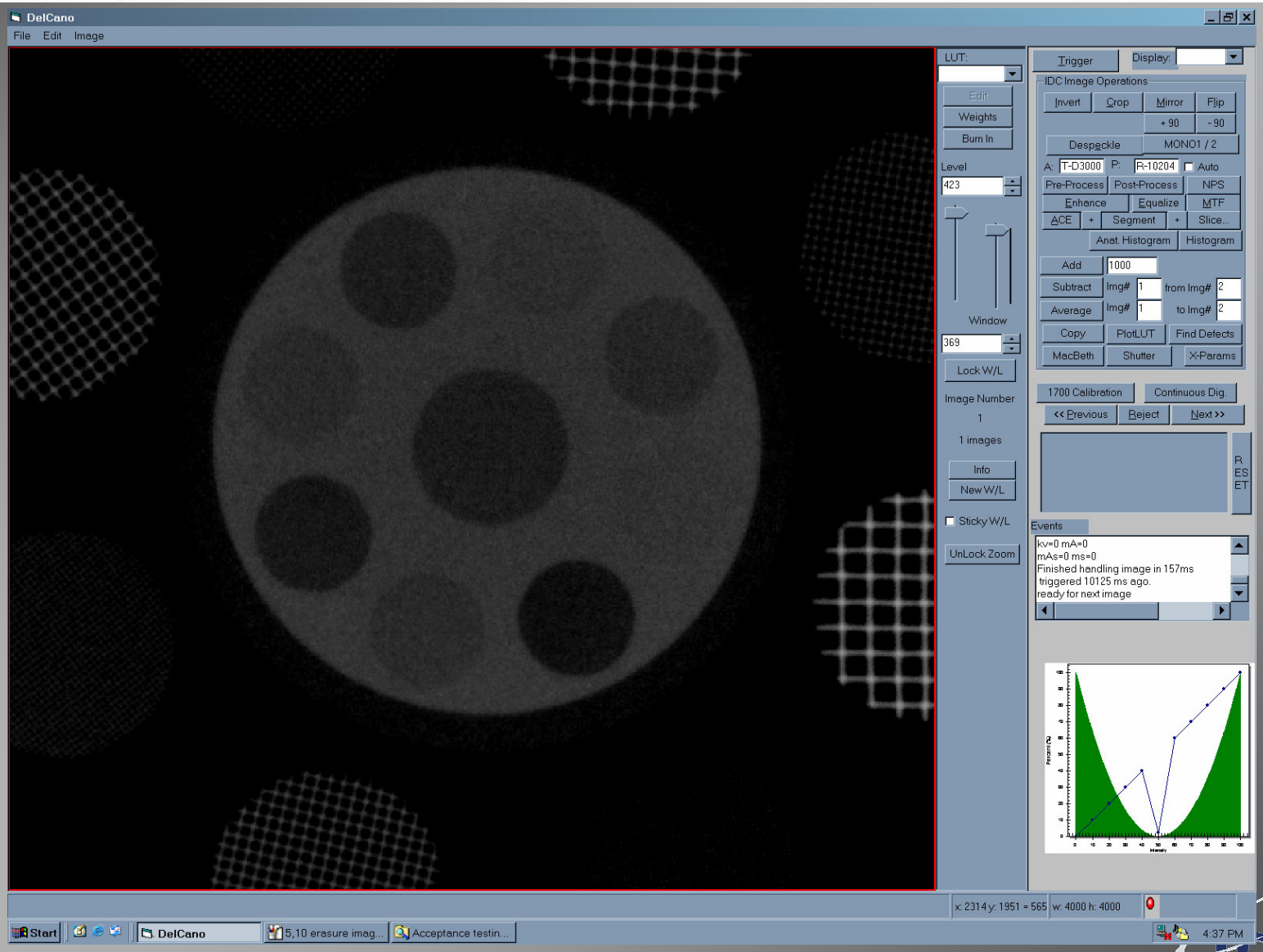
Overview – Family Tree



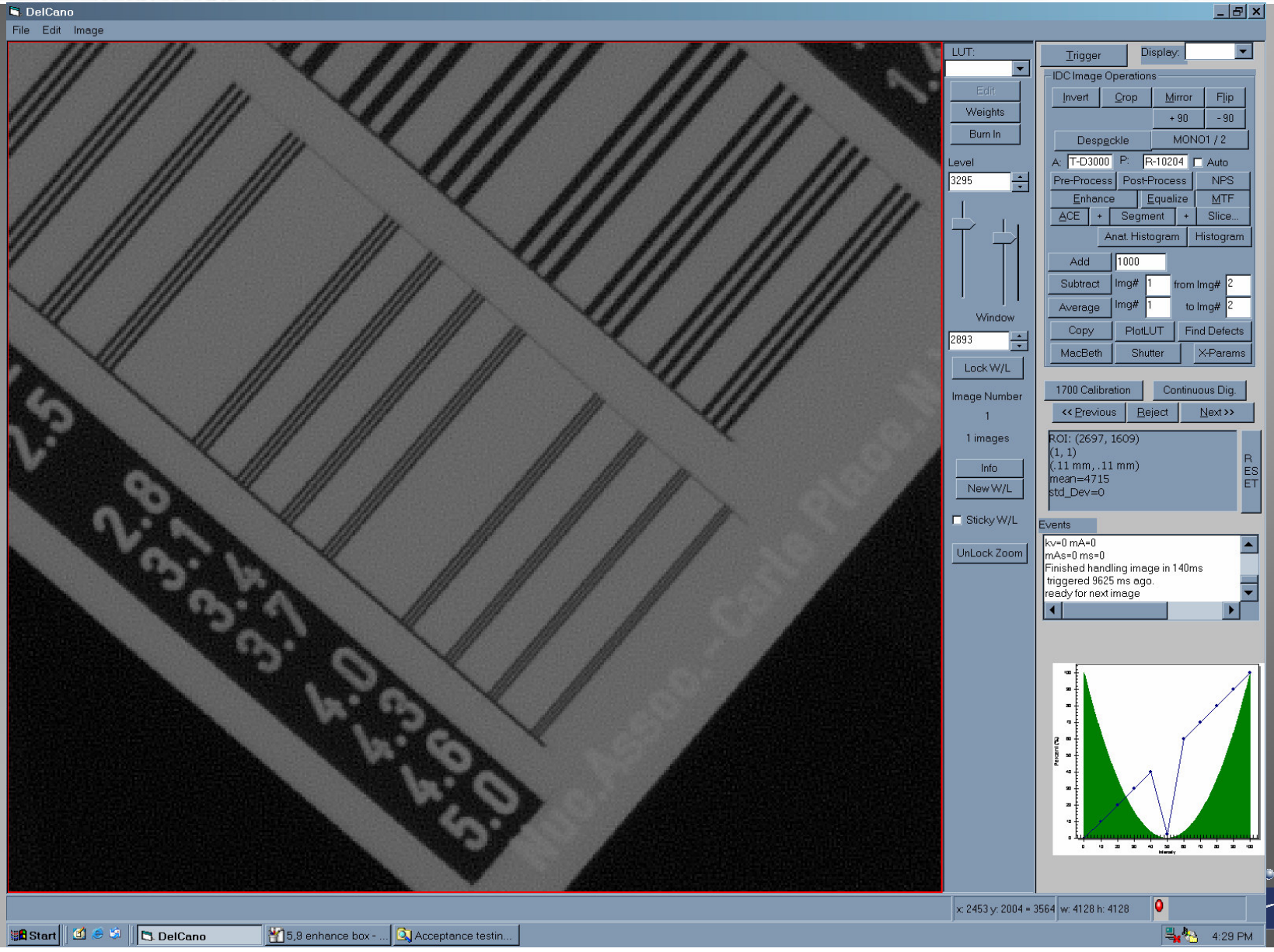
QA Topics

- **Initial Acceptance Testing**
- **Regular Performance Monitoring**
  - Variable system parameters
  - Automated QA
- **Dose Monitoring**
  - Individual image parameters
  - Exposure trends
- **Technologist success / failure**

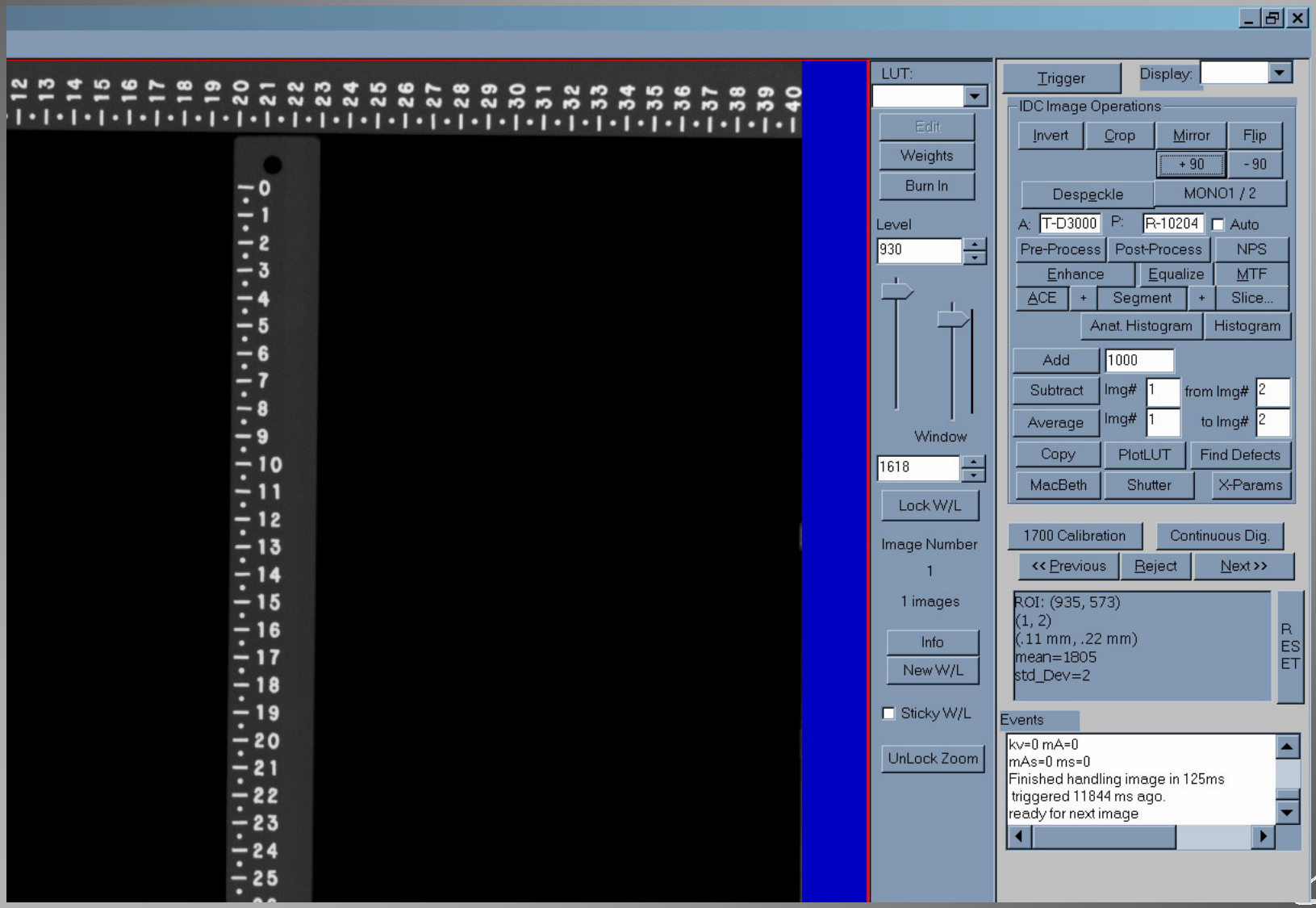
Acceptance: Low Contrast



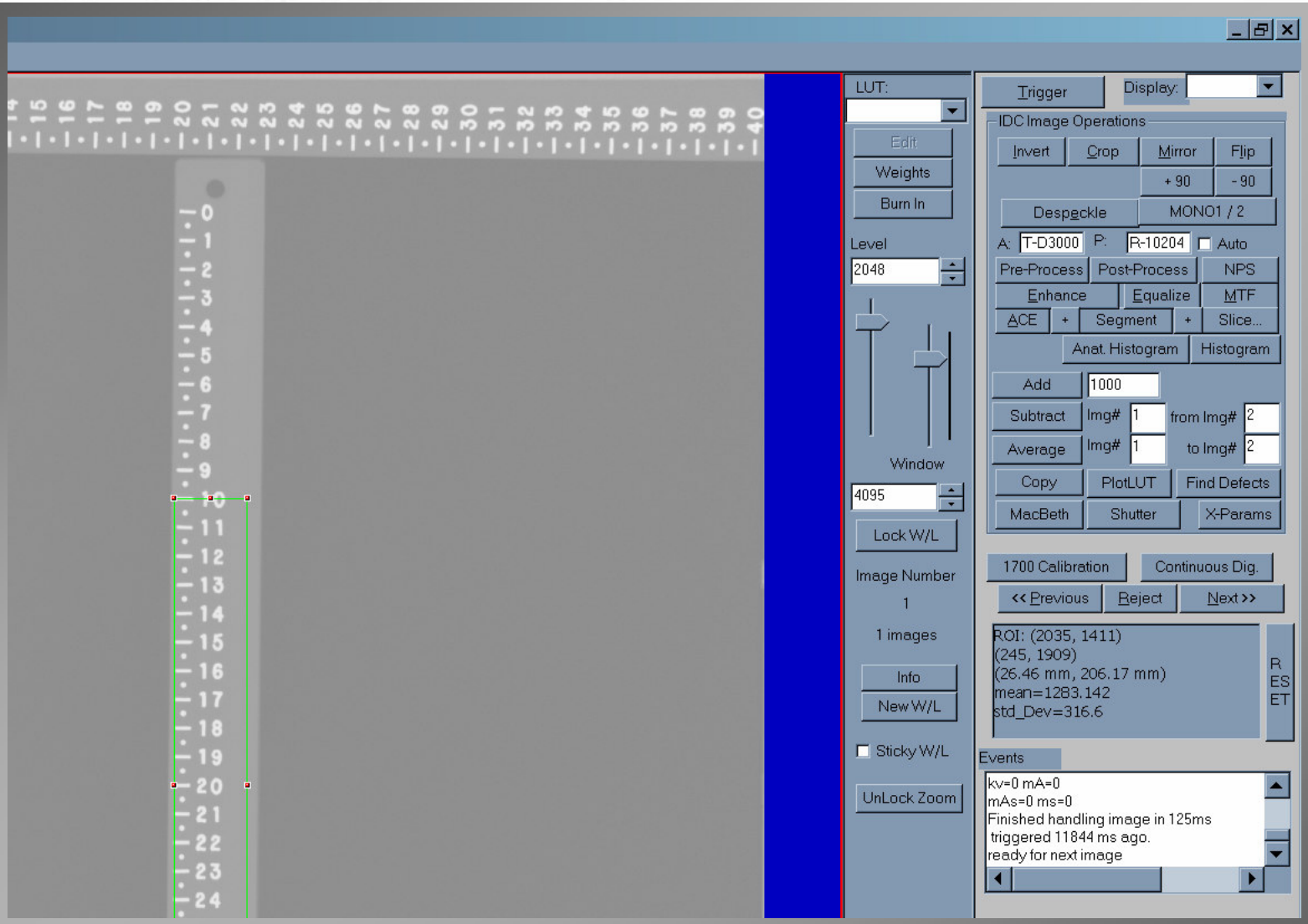
Acceptance: High Contrast



Acceptance: Distortion



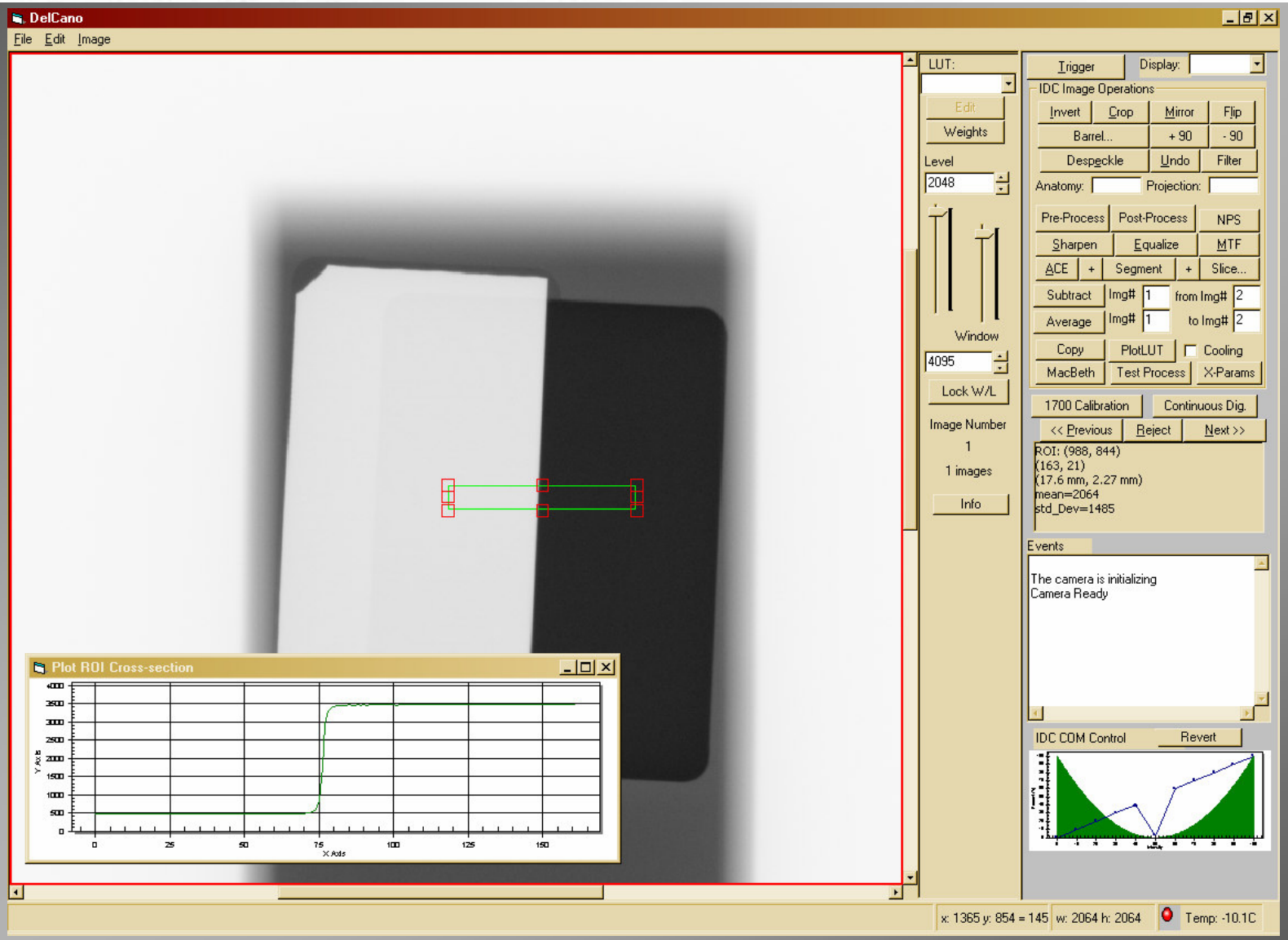
Acceptance: Distortion



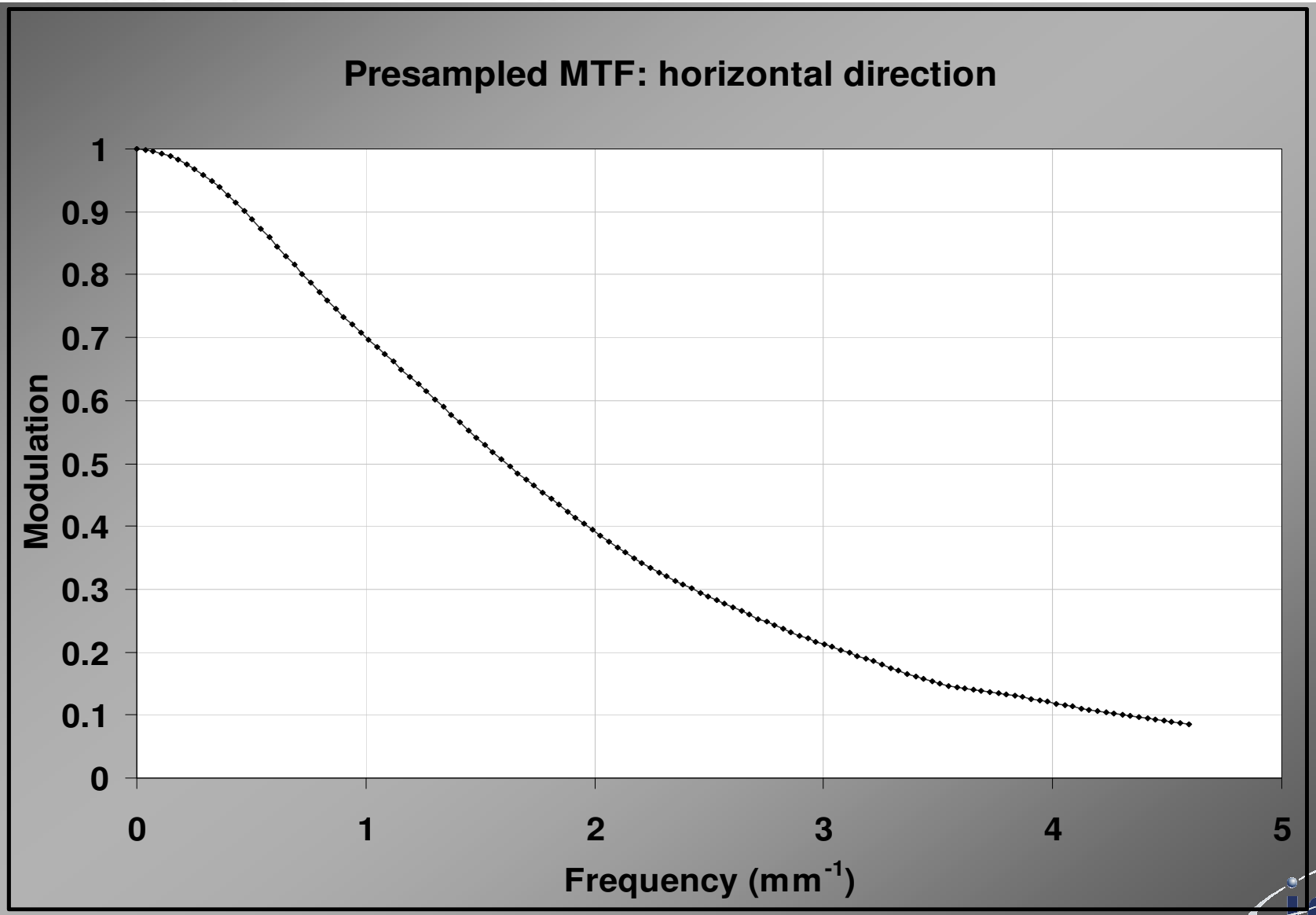
Monitoring

- **Noise characteristics**
- **Physical properties**
  - Temperature
  - Output level
- **Computer system**

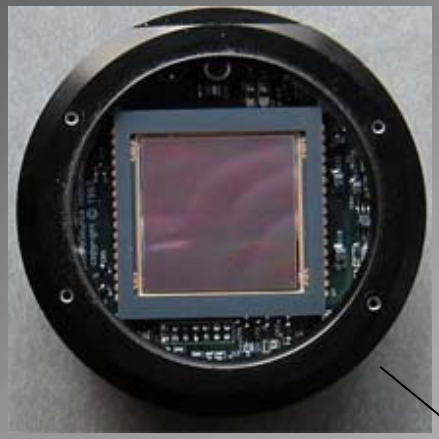
Monitoring: Analysis Tools

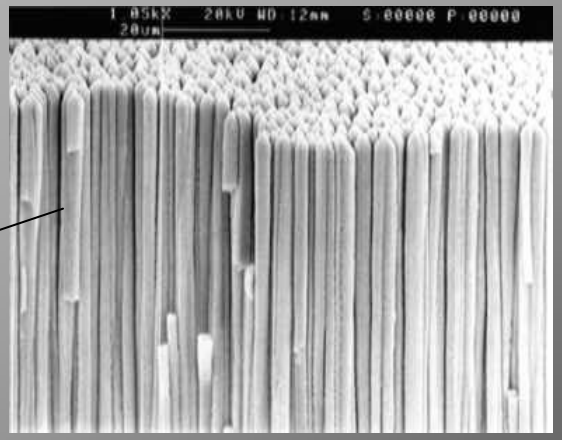


Monitoring: MTF

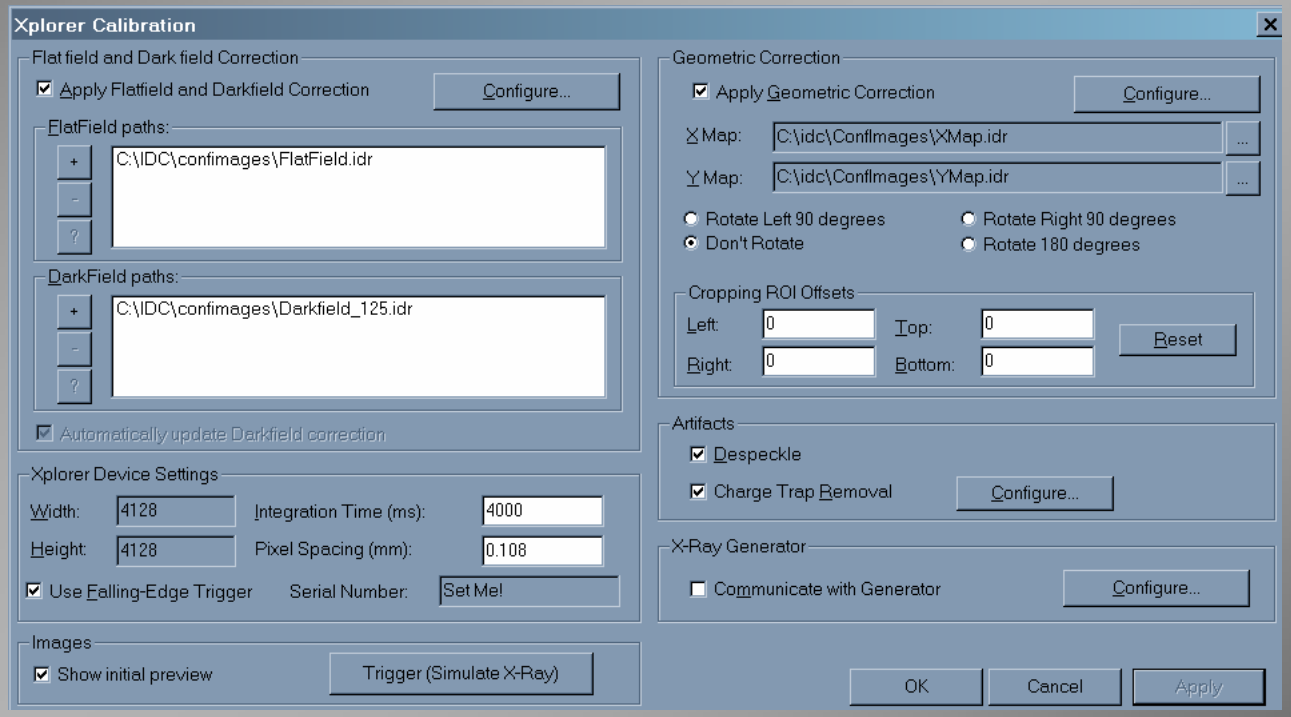


Monitoring: Components

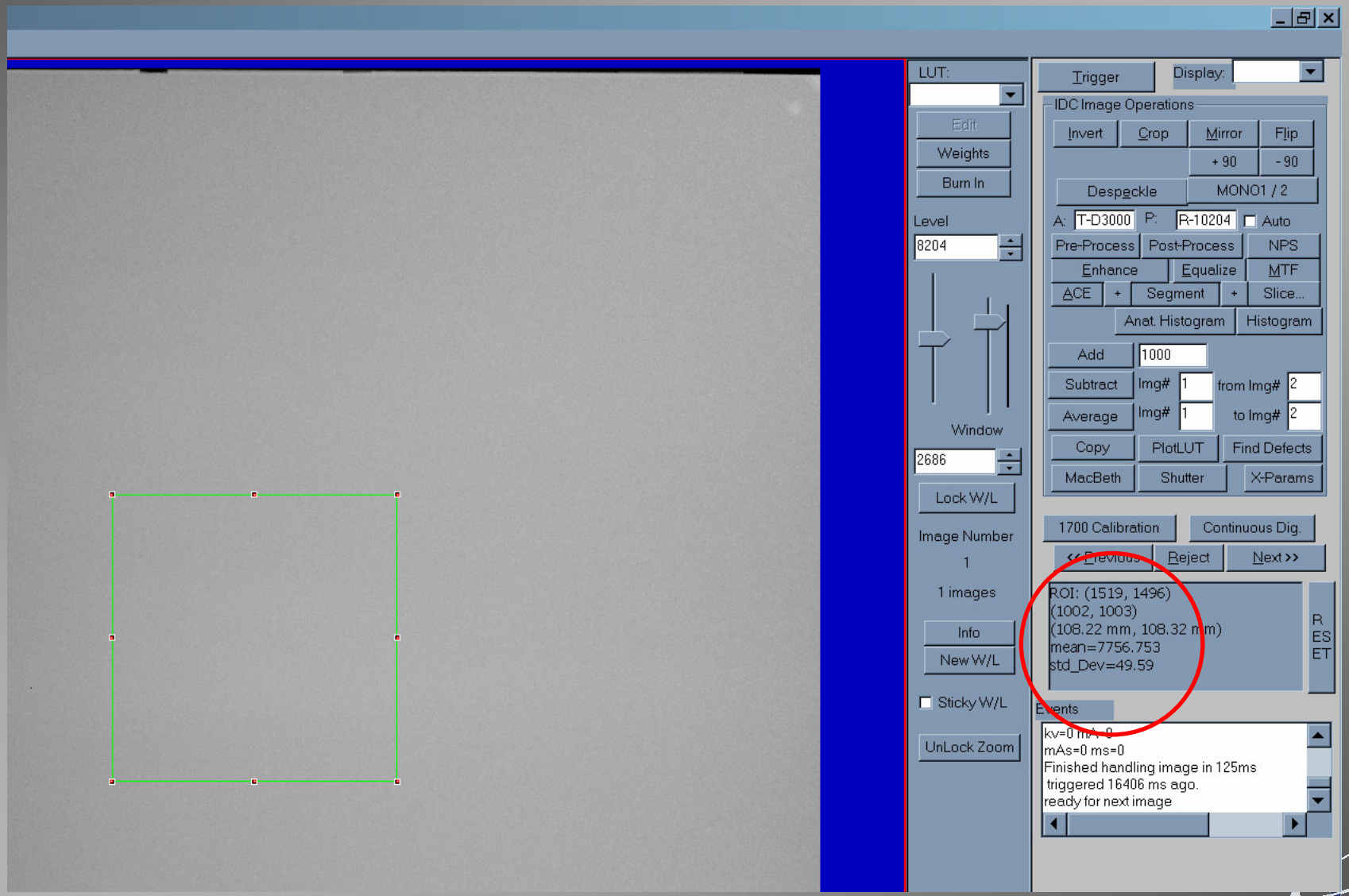




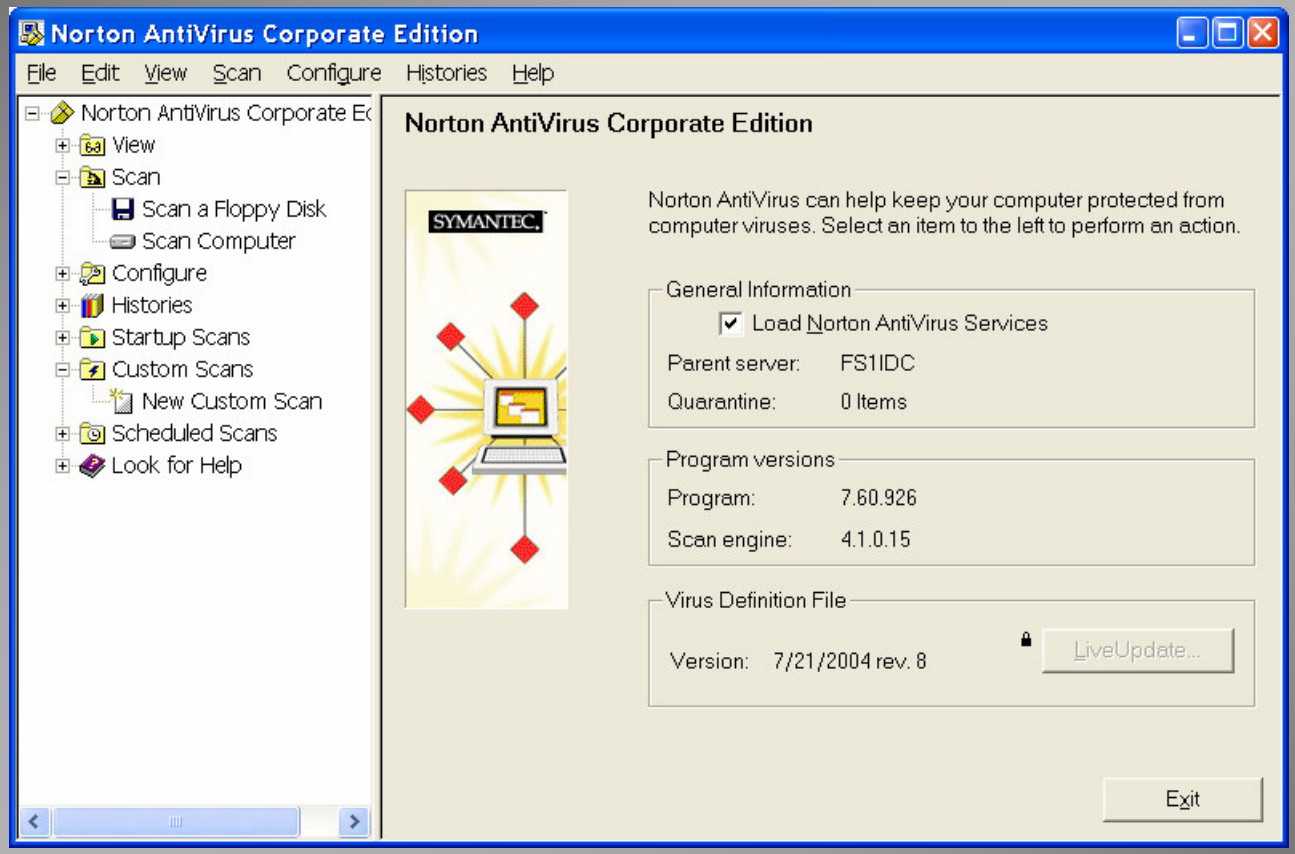
Monitoring: Dark & Flatfields



Monitoring: Noise

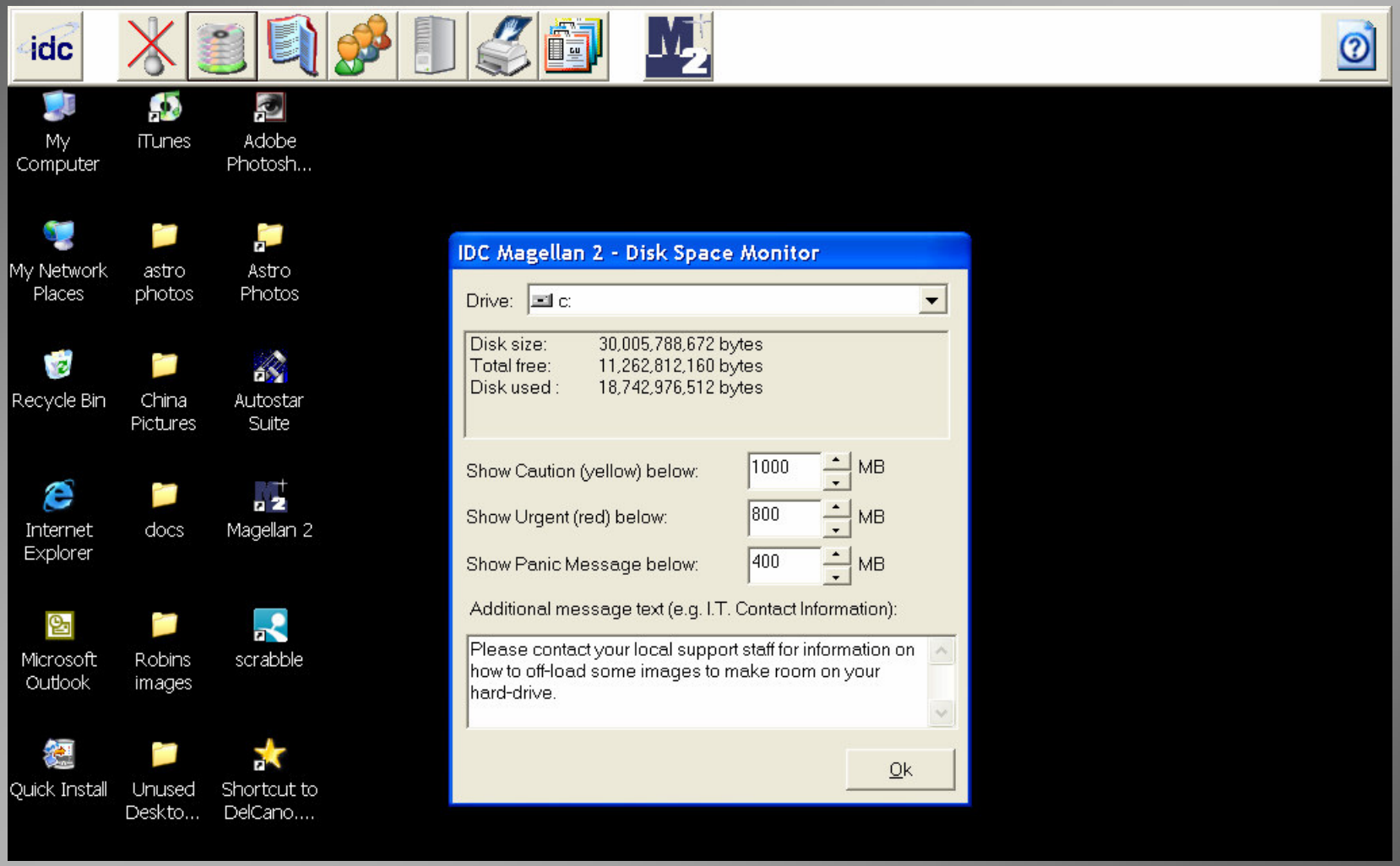


Monitoring: Computer

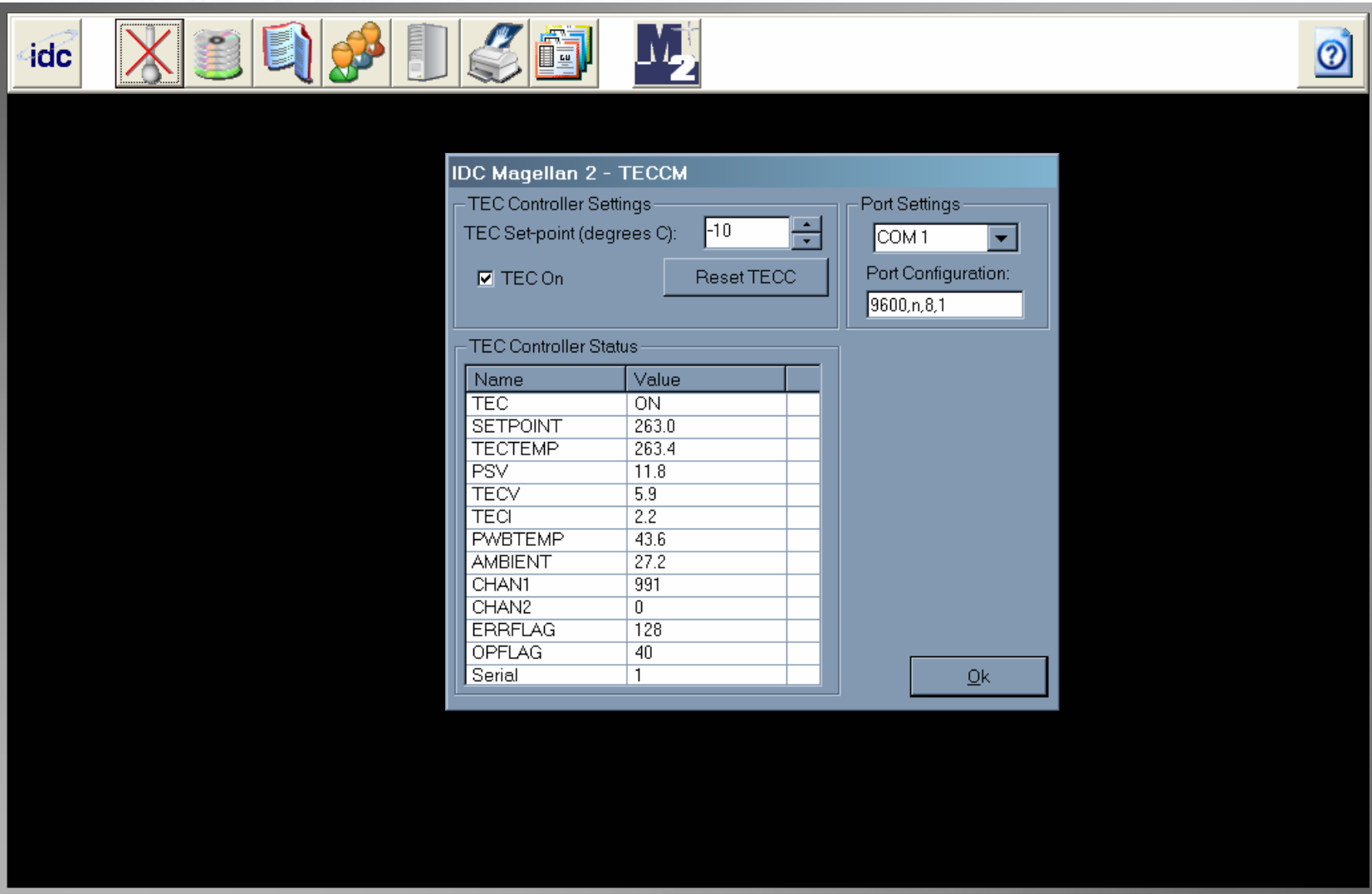


"System" includes the computer…

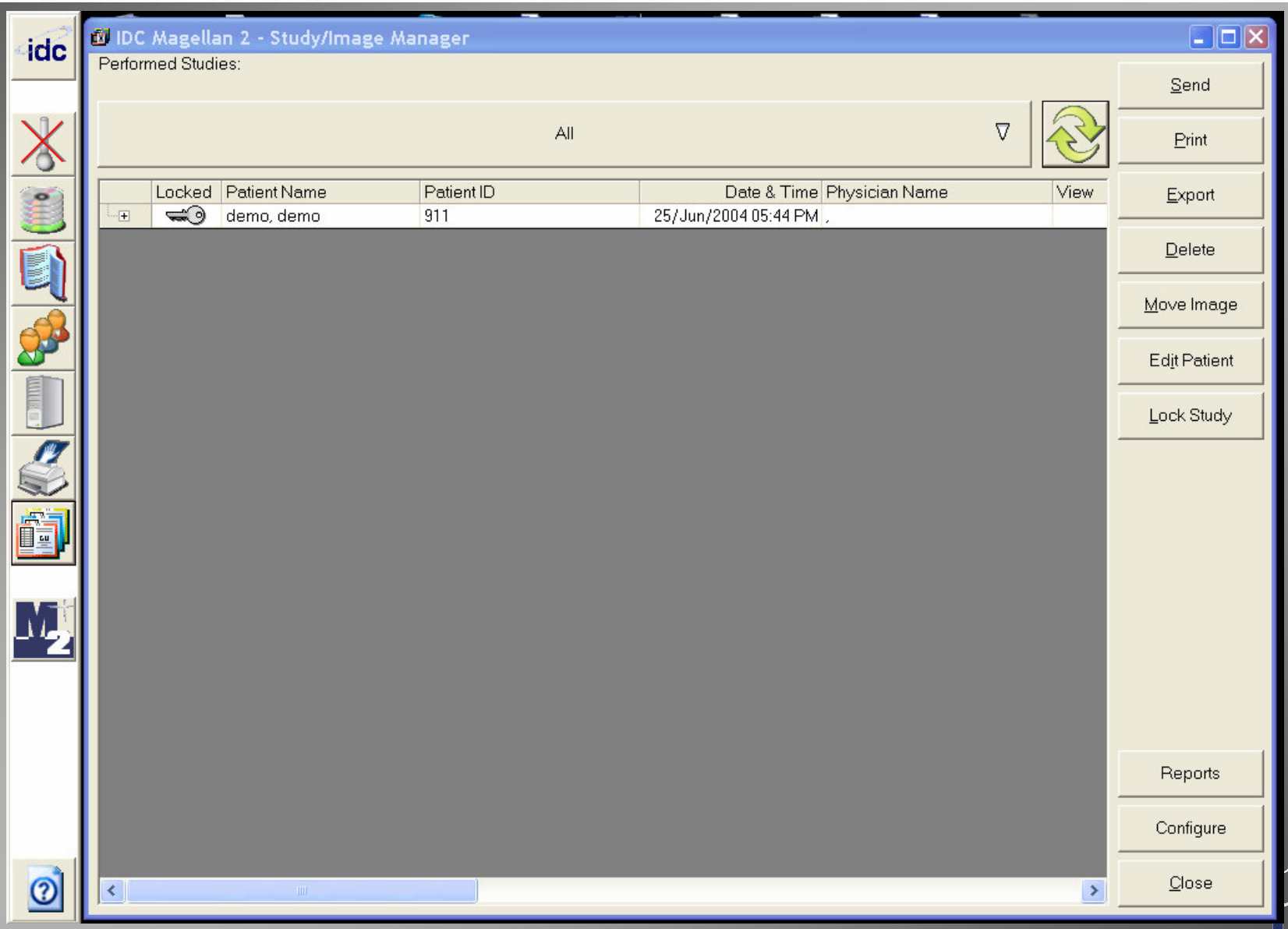
Monitoring: Computer



Monitoring: System



Monitoring: Automation



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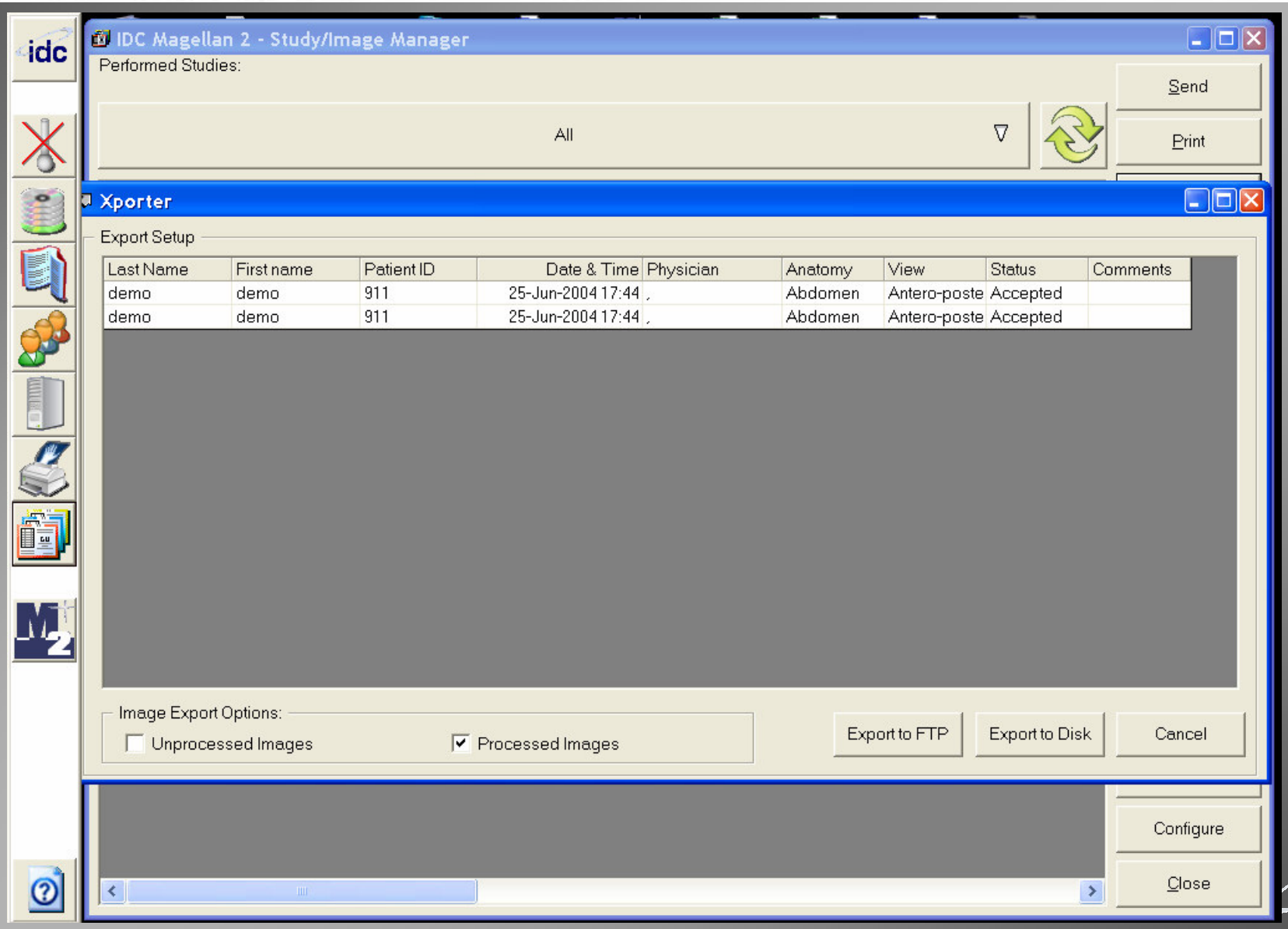
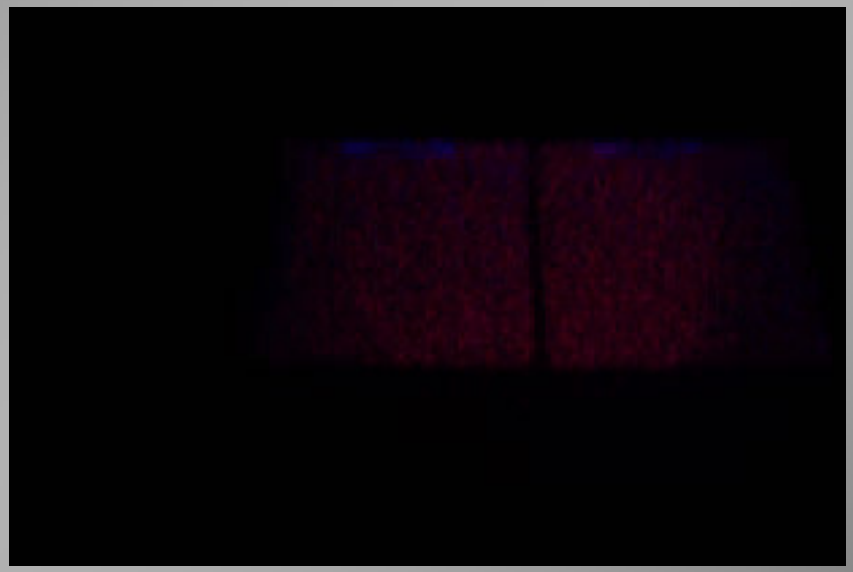


Monitoring: Automation

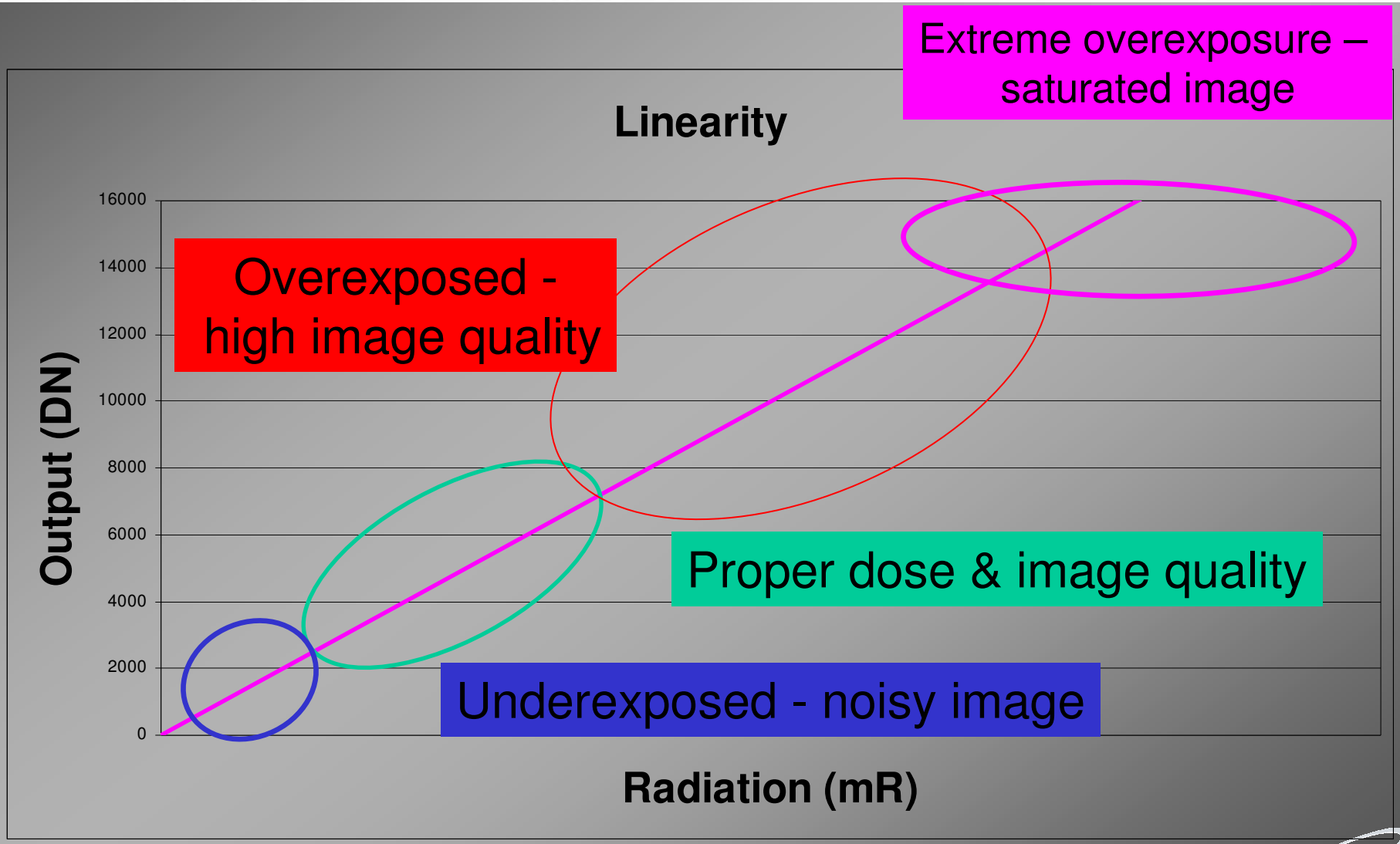
Grid / Phantom Drawer

Monitoring: Automation

- Longwave ultraviolet – 345nm
- Shortwave ultraviolet – 254nm



Exposure Monitoring



Exposure Monitoring: Calibration

- Determine mR/DN using 80kVp, 1mm Cu filtered beam
- Set a desired "speed equivalent" S_0 for each anatomy in database

Exposure Monitoring: Segmentation

- Find region of direct exposure
- Find region outside collimation
- Get median anatomy histogram value
- Calculate system entrance exposure, from DN / mR relationship

$$X_{Med} = I_{Med} . R_{IO}$$

Exposure Monitoring: Calculation

- Calculate estimated film speed equivalent

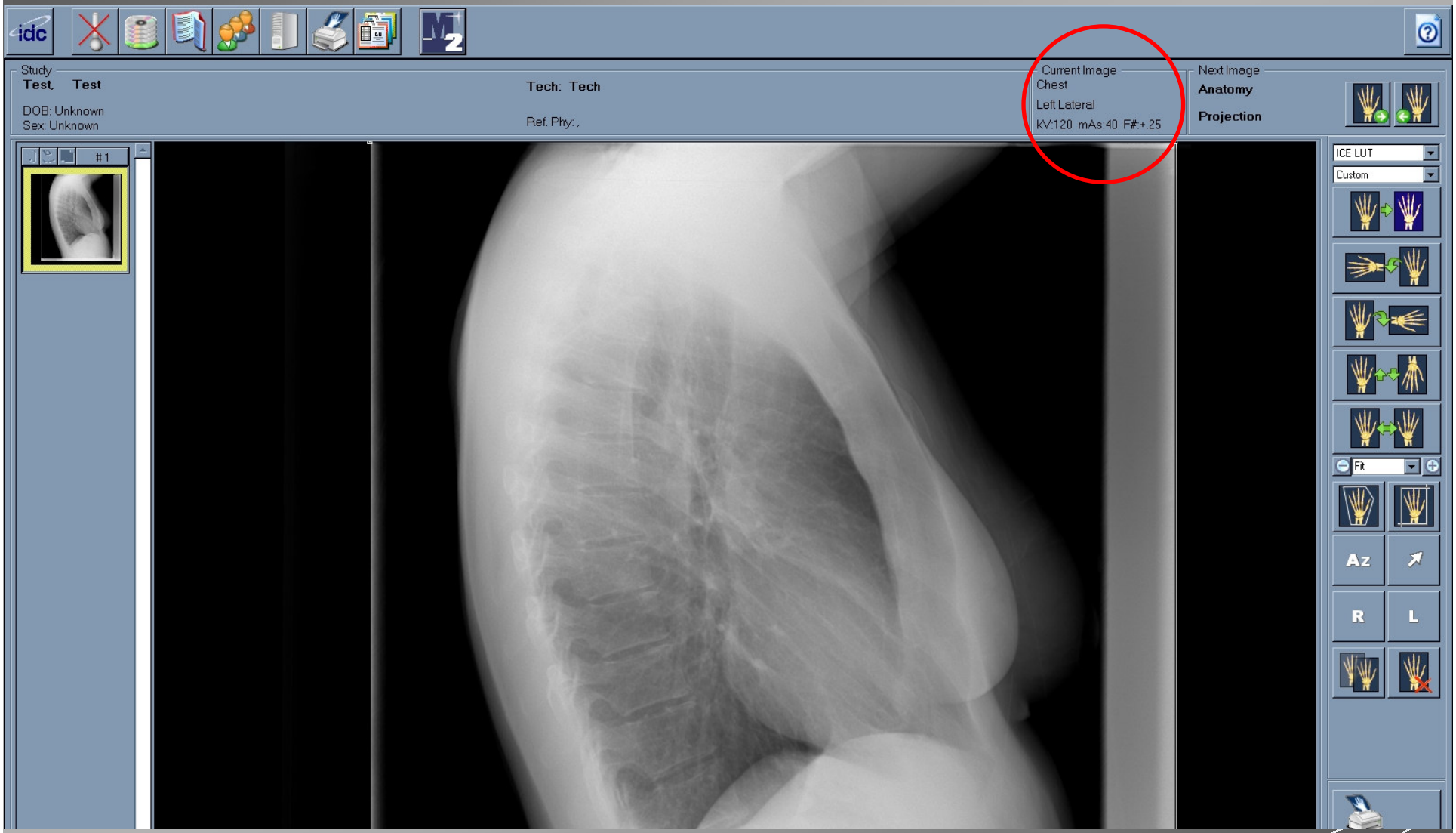
$$S_a = \frac{200}{X_{Med}}$$

- Compare to target speed equivalent

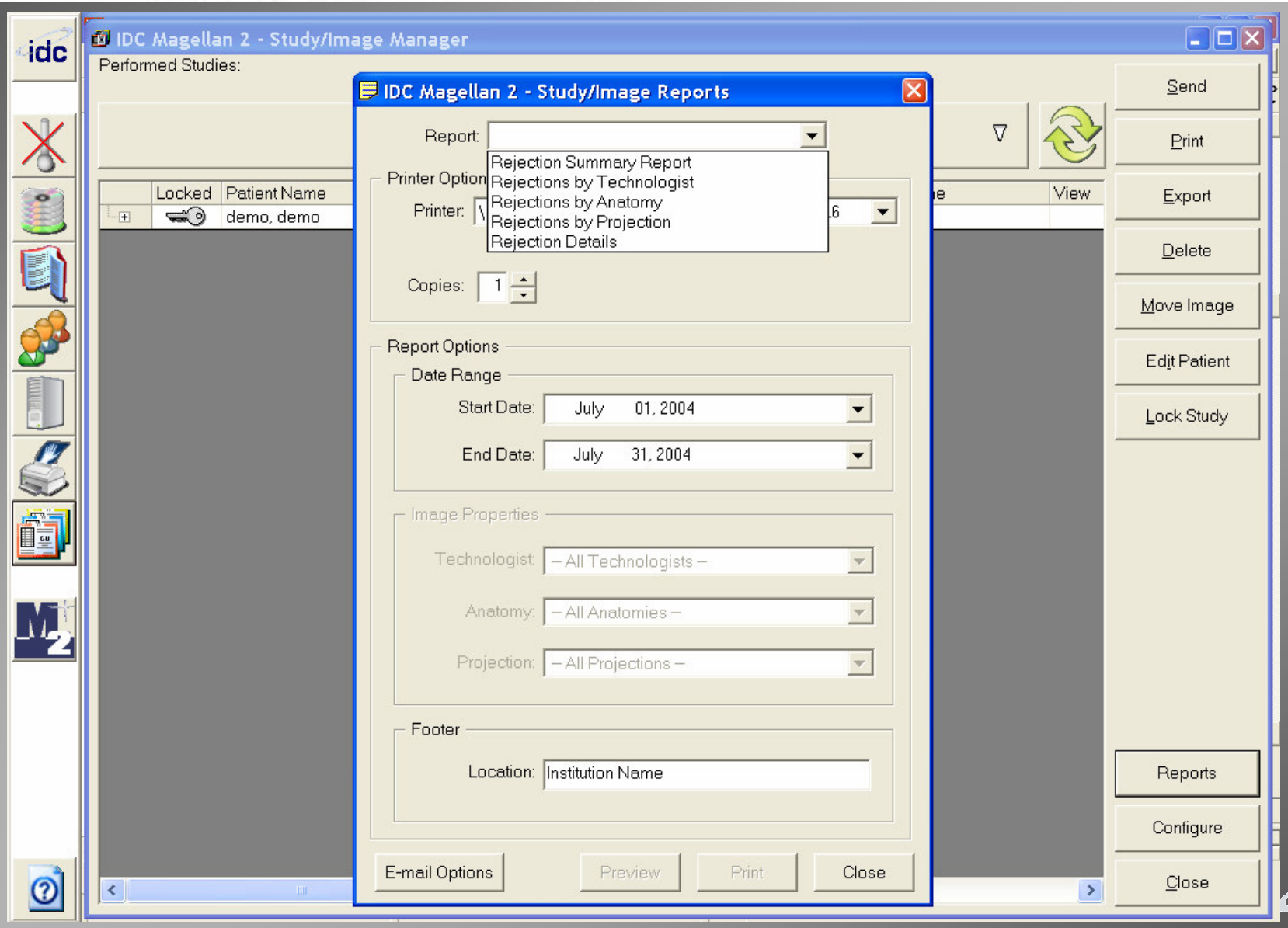
$$f = \log_2\left(\frac{S_0}{S_a}\right)$$

- Range should be from –1 to +1

Exposure Monitoring: Display



Exposure Monitoring: Reporting



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