

Distributed Imaging System for MAGIS-100

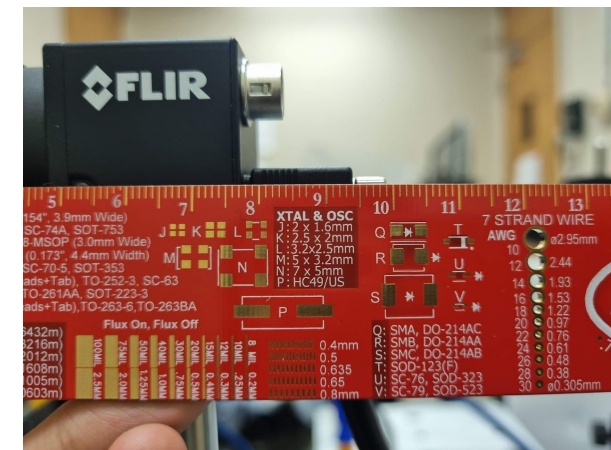
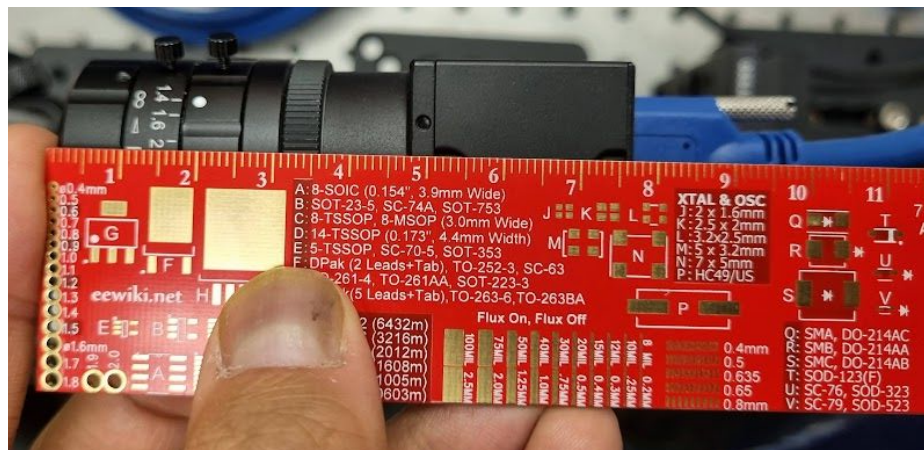
Somewhat Detailed Look at the 25mm High-Magnification Lens

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On behalf of SLAC MAGIS Group

MAGIS-100 Group Meeting
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Overview of DIS High-Magnification System

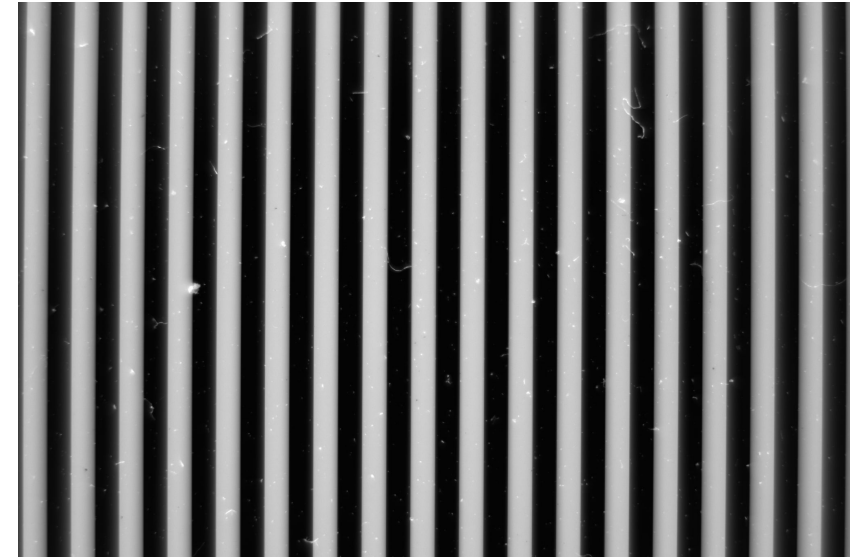
- Camera choice: **final for both systems, [link](#)**
- **25mm Lens ([link](#))** for HM system
- Fixed focal length
- Min. WD = 100mm, but 50-60mm achievable **w/ 5mm extension ring**
 - **Our goal is about 60 - 65mm**
- Variable aperture—f/1.4 to f/16
- Dimensions
 - 31mm max. diameter (+a bit extra for ring-fixing screws)
 - 78mm long including the camera without the USB / GPIO connectors
 - ~110mm including the usual USB Micro B cable
 - **~100mm including the 90deg USB Micro B cable**



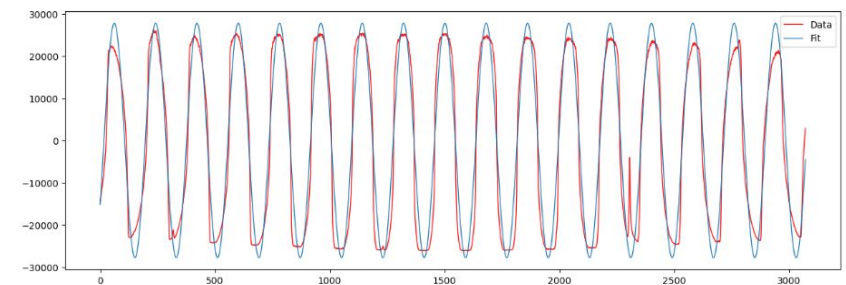
Magnification Measurement

- Images of 1lp/mm target (corresponds to 500 μ m features)
- Magnification calculation based on Will's code
(2 different methods, comparable results)
- Nominal target working point: $WD = 60\text{mm}$, $m = 0.423$

WD (mm)	m (thresholding)	m (curve-fit)
58	0.444	0.447
60	0.423	0.433
62	0.413	0.417
65	0.394	0.397



Example Image @ $WD = 60\text{mm}$

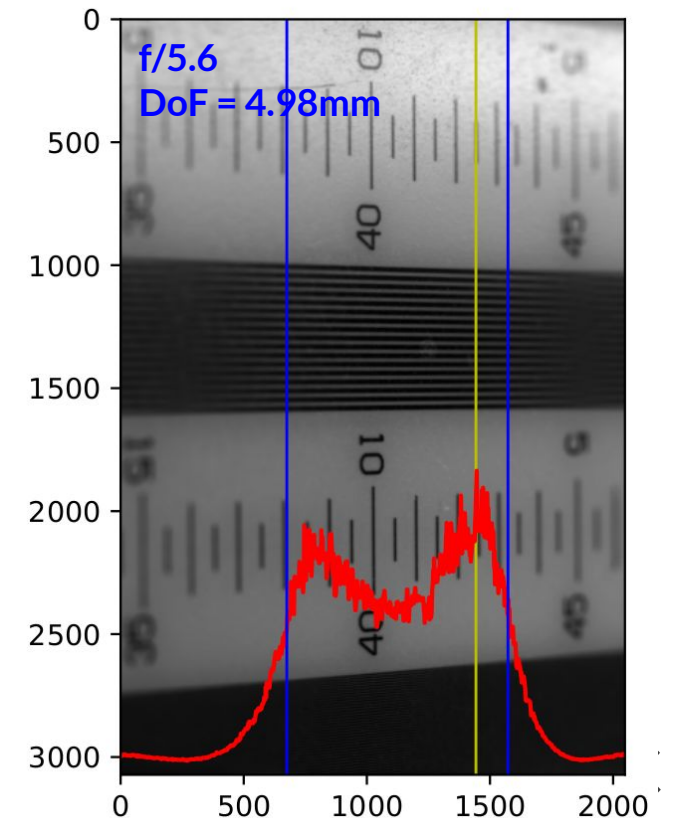
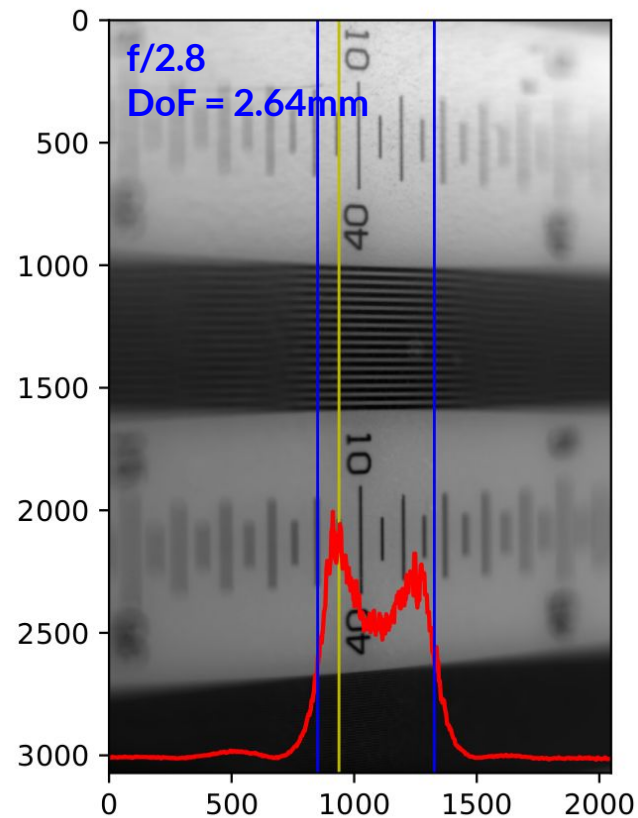
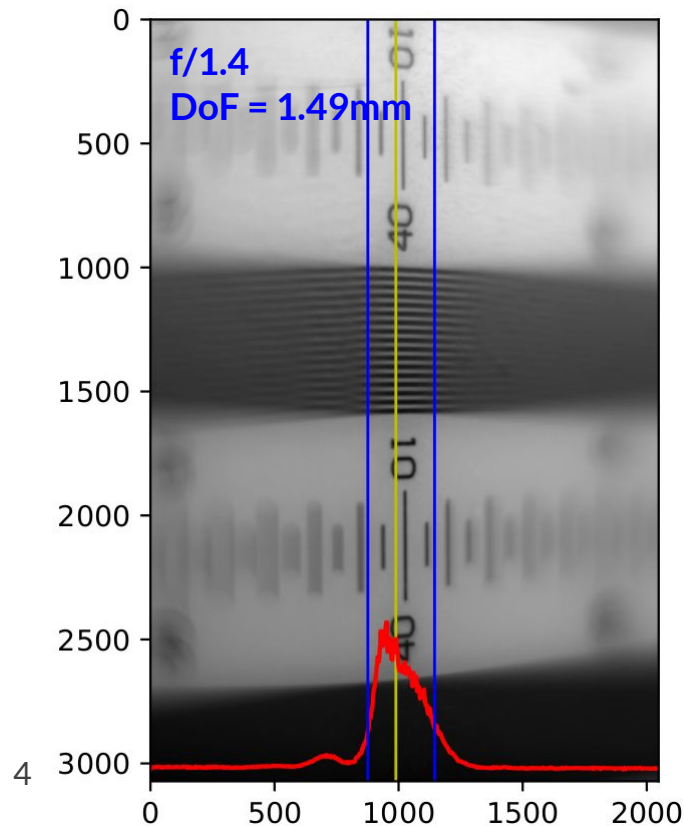


Example Curve-fit @ $WD = 60\text{mm}$

Depth-of-Field Measurement: Examples

- Based on images of 5lp/mm target (corresponds to 100 μ m features)
- DoF calculation based on Will's code
 - Calculate contrast-ratio (CR) across depth, **CR thresholds @ 30% and 15%**
- **f/# scanned from f/1.4 to f/8**

Example images @ WD = 60mm



Depth-of-Field Measurement: Summary

- Images of 5lp/mm target
(corresponds to 100 μ m features)
- **Region of interest: f/2.2 to f/4.5**
 - **Example 1:** $WD = 60\text{mm}$, f/2.2 or so
Aggressive option with DoF $\sim 2.5\text{mm}$
 - **Example 2:** $WD = 65\text{mm}$, f/4.2 or so
Safe/Conservative option with DoF $\sim 4\text{mm}$
- Caveats:
 - DoF measurement not extremely precise
(up to 0.5mm or so?)
 - Aperture ring is continuous

