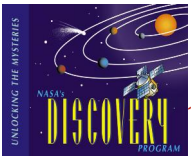# HRI Spectral Imager Module (SIM)
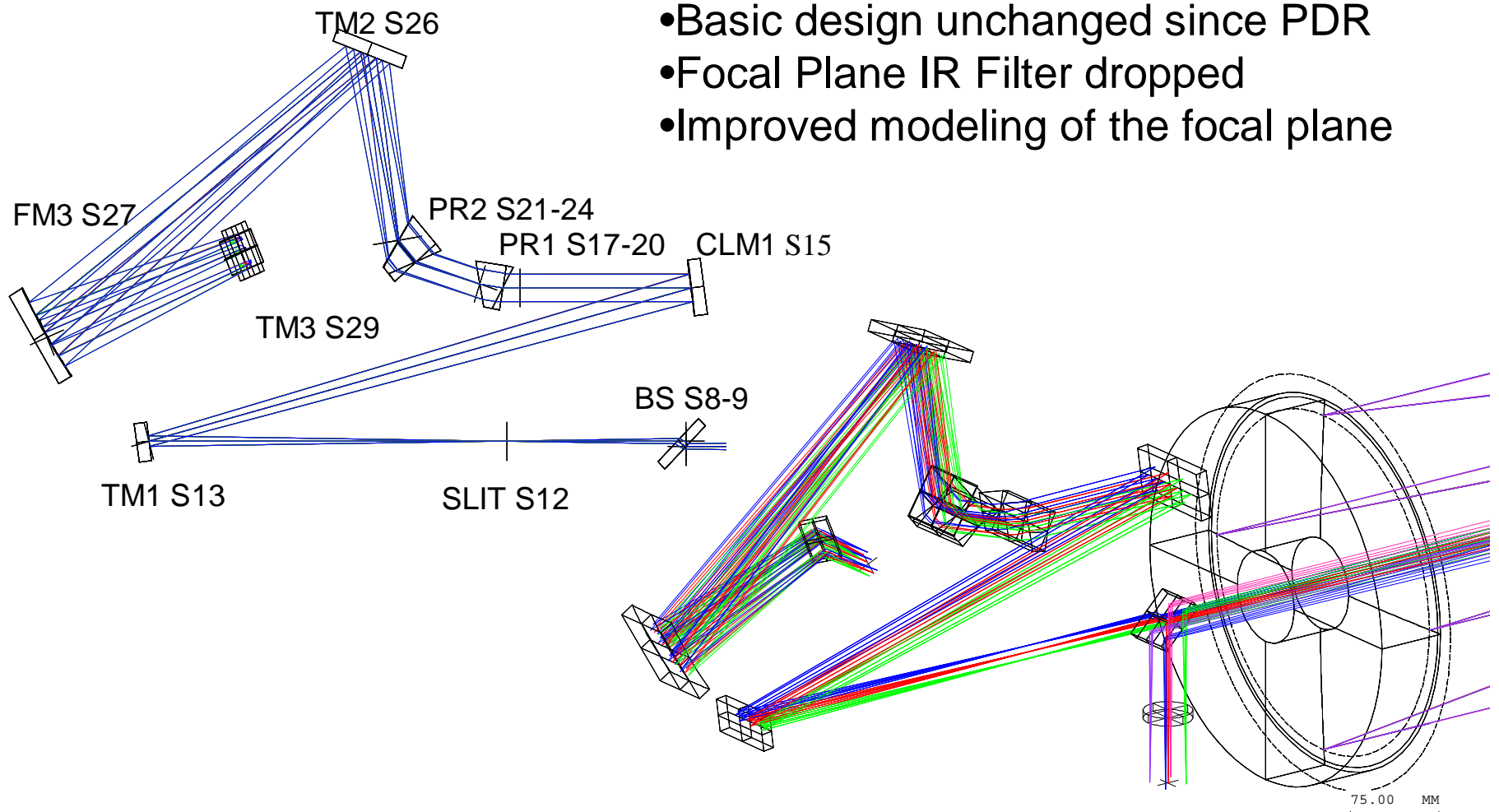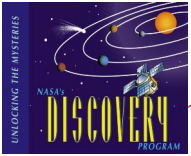# Optical Design and Performance

Topics

- **SIM Optical design.**

- **Optical resolution**

- **Optical error budget.**

- **Optical tolerances and sensitivities.**

- **Progress on Optical component fabrication**

- **SIM optical assembly**

- **SIM optical test and verification**

- Basic design unchanged since PDR
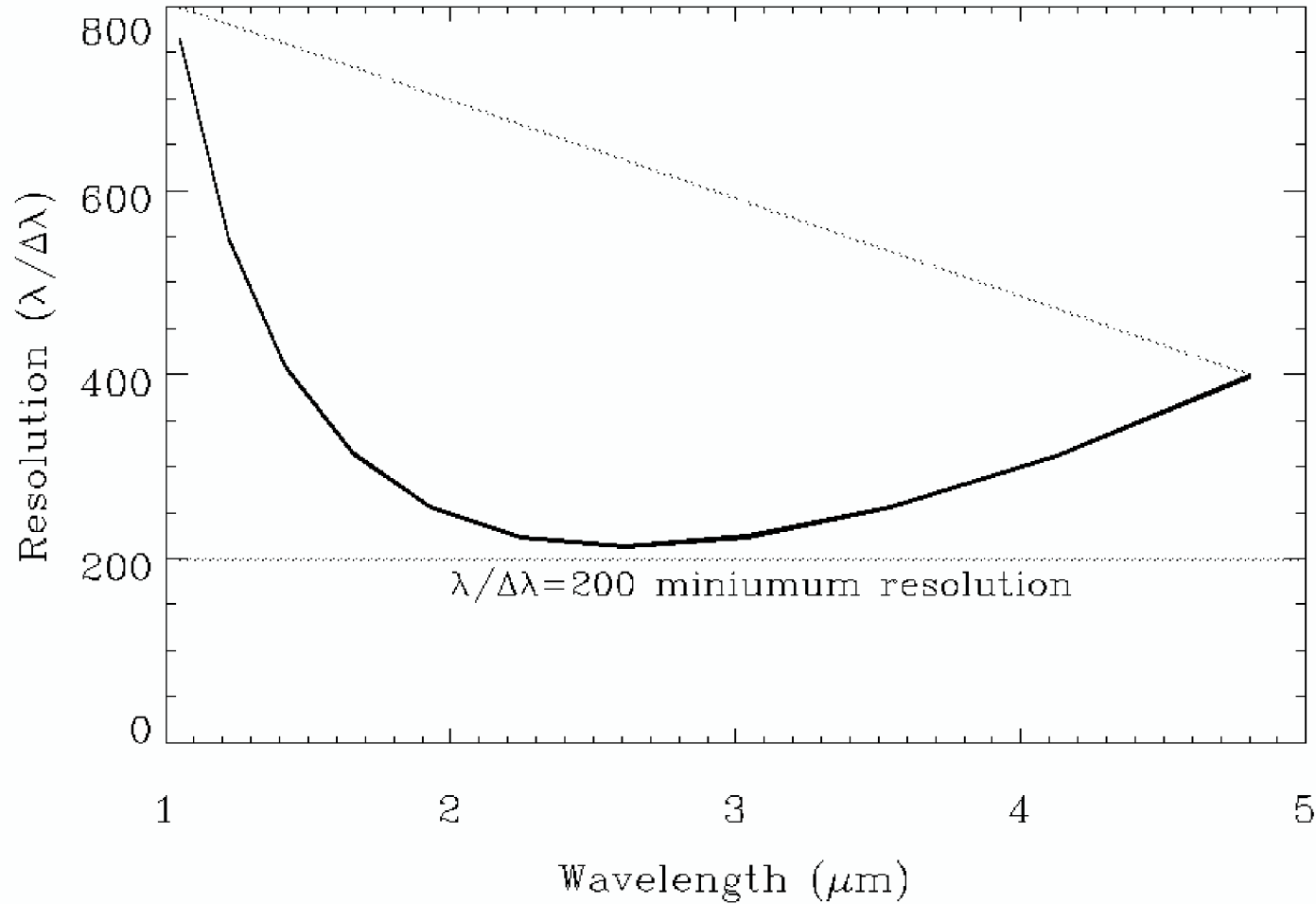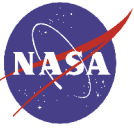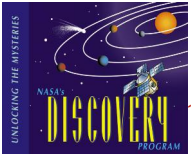- Focal Plane IR Filter dropped
- Improved modeling of the focal plane

TM2 S26

FM3 S27

PR2 S21-24

PR1 S17-20   CLM1 S15

TM3 S29

BS S8-9

TM1 S13

SLIT S12

75.00   MM

MSSR 5.2.13.1.12 requirement: $\lambda/\lambda\Delta > 200$

SIM Error Budget Spread Sheet Shows 28% Margin

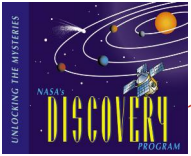## Deep Impact SIM Errors Summary Table (2500 nm)

	Mechanical Manufacturing Errors (inches and degrees)						2500 nm	
	Translations			Tilts				
	X (in)	Y (in)	Z (in)	α (°)	β (°)	γ (°)	field pt 0°	pt .0725°
Beam splitter	na	na	na	0.083	0.083	na	0.000	0.008
Slit							0.000	0.000
Fold mirror 1	na	na	0.016	0.05	0.05	na	0.003	0.002
Collimator mirror	0.016	0.016	0.016	0.05	0.05	na	0.008	0.008
CaF prism	0.023	0.023	0.023	0.05	0.05	0.083	0.001	0.001
ZnSe prism	0.0079	0.0079	0.016	0.05	0.05	0.08	0.009	0.008
Fold mirror 2	na	na	0.016	0.05	0.05	na	0.009	0.009
Camera mirror (adjusted)	0.016	0.016	0.00025	0.006	0.009	na	0.000	0.008
Fold mirror 3	na	na	0.016	0.05	0.05	na	0.010	0.009
Detector (adjusted)	0.016	0.016	0.016	0.5	0.5	na	0.009	0.009
Optical Element Manufacturing errors							0.087	0.092
HRI telescope errors							0.028	0.028
In-Flight Environmentally-Induced errors							0.000	0.008
Boresight Errors spatial (pixels)							12	12
Boresight Errors spectral (pixels)							7	7
total RSS wavefront error of SIM							0.093	0.093
Budgeted wavefront error							0.130	0.130

α is rotation about x-axis

β is rotation about y-axis

γ is rotation about z-axis

x, y, and z are local coordinates defined per CODEV prescription: Z is perpendicular to the entrance face of each optic, x and y are perpendicular to z

Znse Prism Aspheric Surface Fabricated as Designed

- Prisms being fabricated at II-VI
    II-VI grown ZnSe
- Tight Dimensional Tolerances held
- Diamond Turned flats @ <30Å RMS
- Interferogram of generated surface
    precisely matches theoretical
    Shows high precision, great
    regularity, and indicates smoothness

Actual fringe data

ZnSe prism on spindle

Simulated fringe data