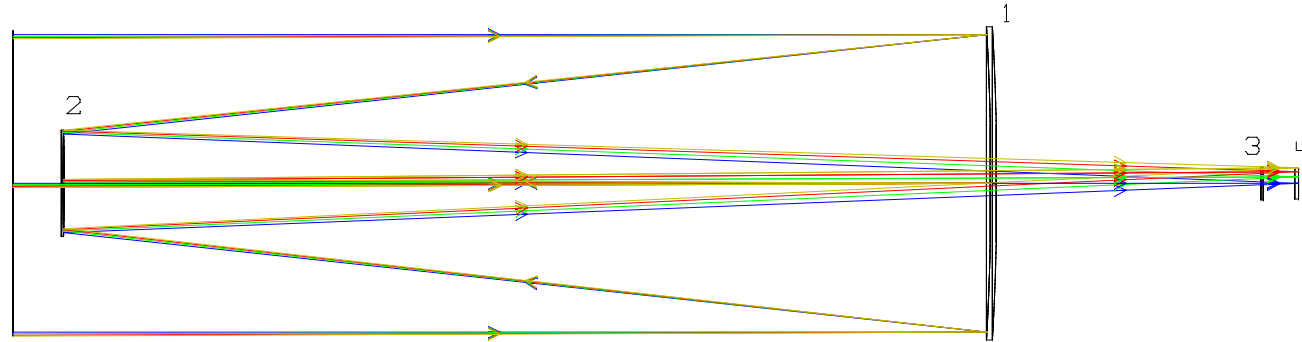


Test and Calibration of ASTROSAT - UVIT

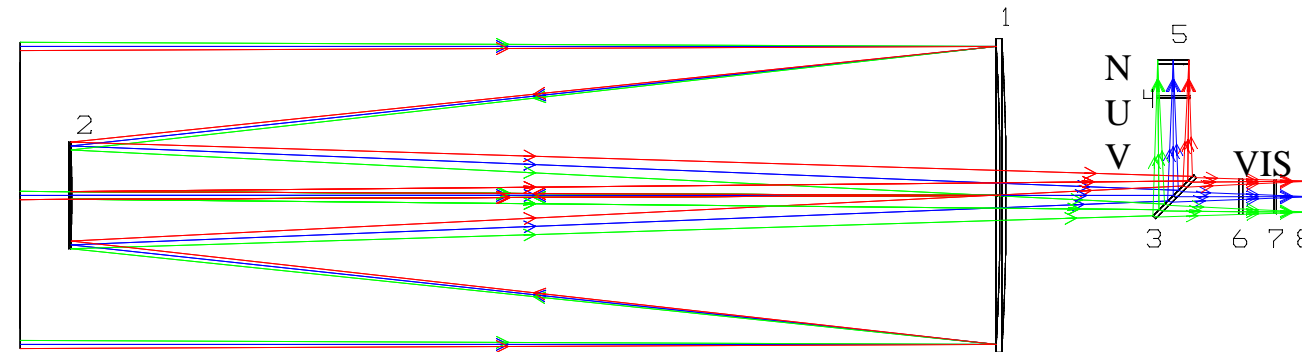
B. Raghavendra Prasad
Indian Institute of Astrophysics

UVIT-Optical Layout



FUV Telescope
(130-180nm-15cm²)

- 1- PRIMARY MIRROR
- 2- SECONDARY MIRROR
- 3- FILTER
- 4- DETECTOR WINDOW



NUV-VIS Telescope
(180-300nm & 350-550nm)
(20cm²&25cm²)

- 3- BEAM SPLITTER
- 4- NUV FILTER
- 5- NUV DETECTOR WINDOW
- 6- VIS CORRECTOR
- 7- VIS FILTER
- 8- VIS DETECTOR WINDOW

Tests on Optical components

➤ **Filters**

➤ **Detectors**

➤ **Beam Splitters**

Test Matrix

Objects	Test	Spectral	Spatial	AZ Rotation(90⁰) Single wavelength
Filter	Transmission	X	X	
	Wedge		X	
	Focus Shift	X		
Beam Splitter	Transmission	X	X	
	Reflection	X	X	
Detectors	Spectral			
	Response(QE)	X	X	
	Focus Shift	X		
	Distortion			X

Accuracies

Tests Accuracy (Res) Measurable Quantity

*Filter transmission
and spatial variation*

Better than 1% (2mm)

Photon Flux

*Wedge-angle
measurement*

1'

Image Centroid shift

*Focus shift measurement
for the filters*

5 Micron

Image Centroid

*Beam Splitter Spatial
and Spectral Calibration*

Better than 1% (2mm)

Photon Flux

*Detector
Calibration*

Spectral

Better than 1%

Photon Flux

Spatial

1mm

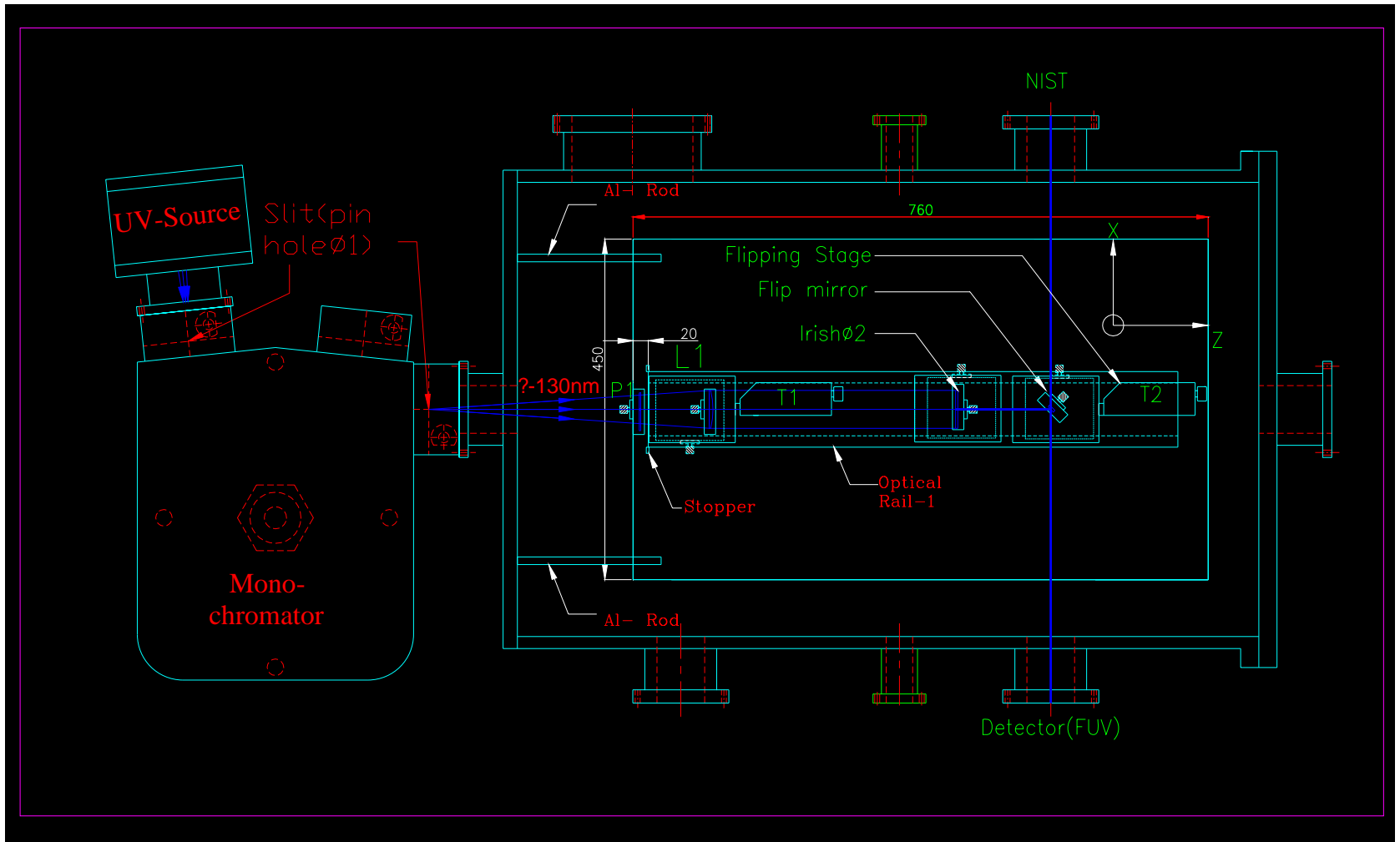
Photon Flux

Focus Shift

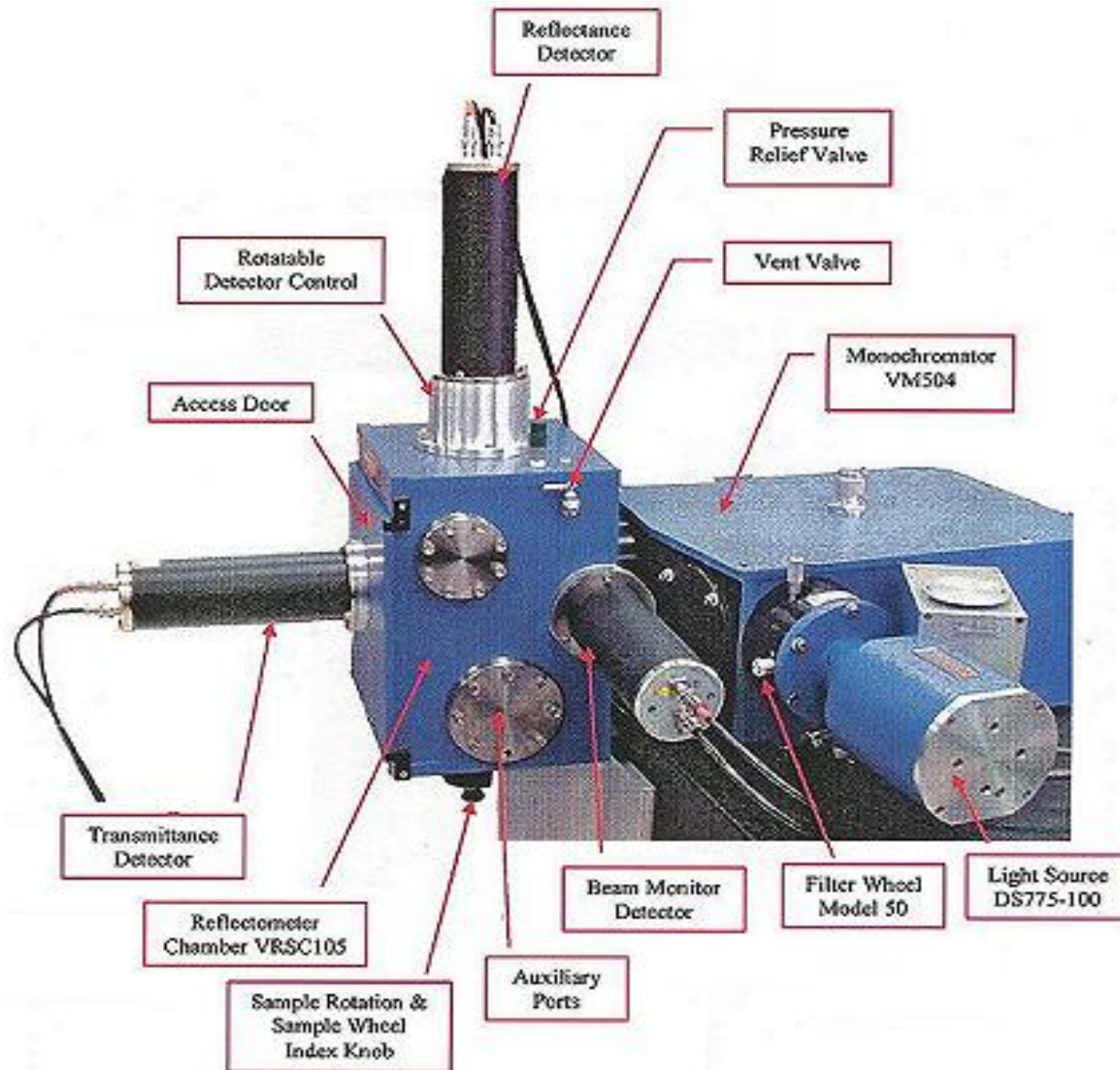
5 micron

Image centroid Shift

Typical setup



Vacuum Reflectometer



Tests on Integrated **Telescope**

Error Analysis

(FUV channel, MgF2 filter and detector window)

Source of Error		RMS μ	Variance (μ^2)	Contribution to Variance (μ^2)
Nominal image		5.926	35	----
Defocus (μ)	100	7.380	55	20
	200	9.753	95	60
	300	12.534	157	122
Relative Decentre between primary and secondary mirror(μ)	200	7.120	51	16
	300	8.057	65	30
	500	10.093	102	67
Tilt of secondary (arc min)	1	6.665	44	9
	2	7.750	60	25
	3	9.053	82	47
Detector		16	256	256
Jitter		7.2	52	52
Attitude determination		4.8	23	23

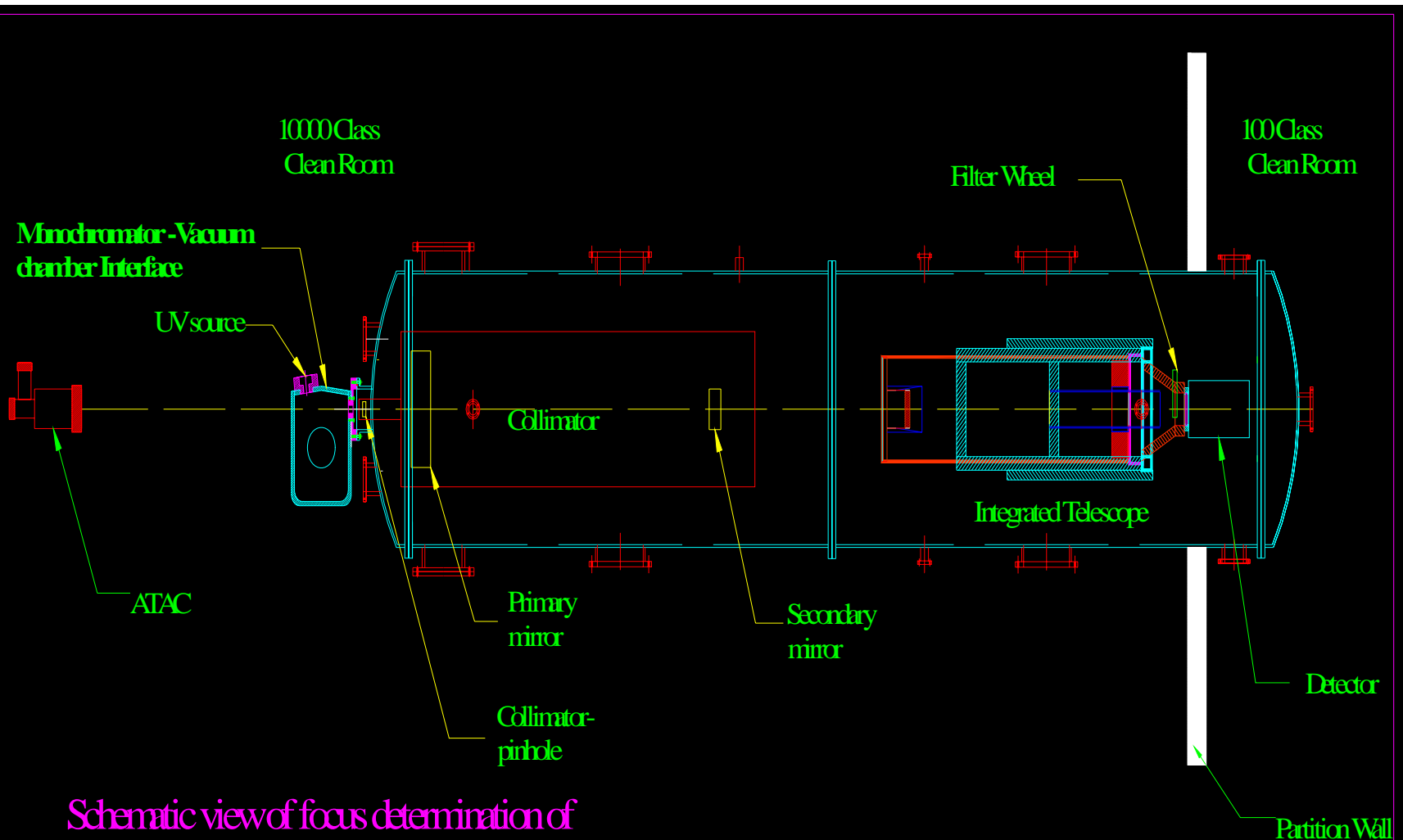
Error Analysis & Alignment Requirement

- Decentre < 0.1 mm
- The two mirrors should have a relative tilt $< 30''$
- Separation of the two mirrors should be correct to 0.1 mm
- Axial position of the detectors should be correct to 0.05 mm
- Radial position of the detectors should be correct to 0.5 mm
- Perpendicularity of detector to optical axis better than 2.5 Arc min

Optics Integration and Alignment

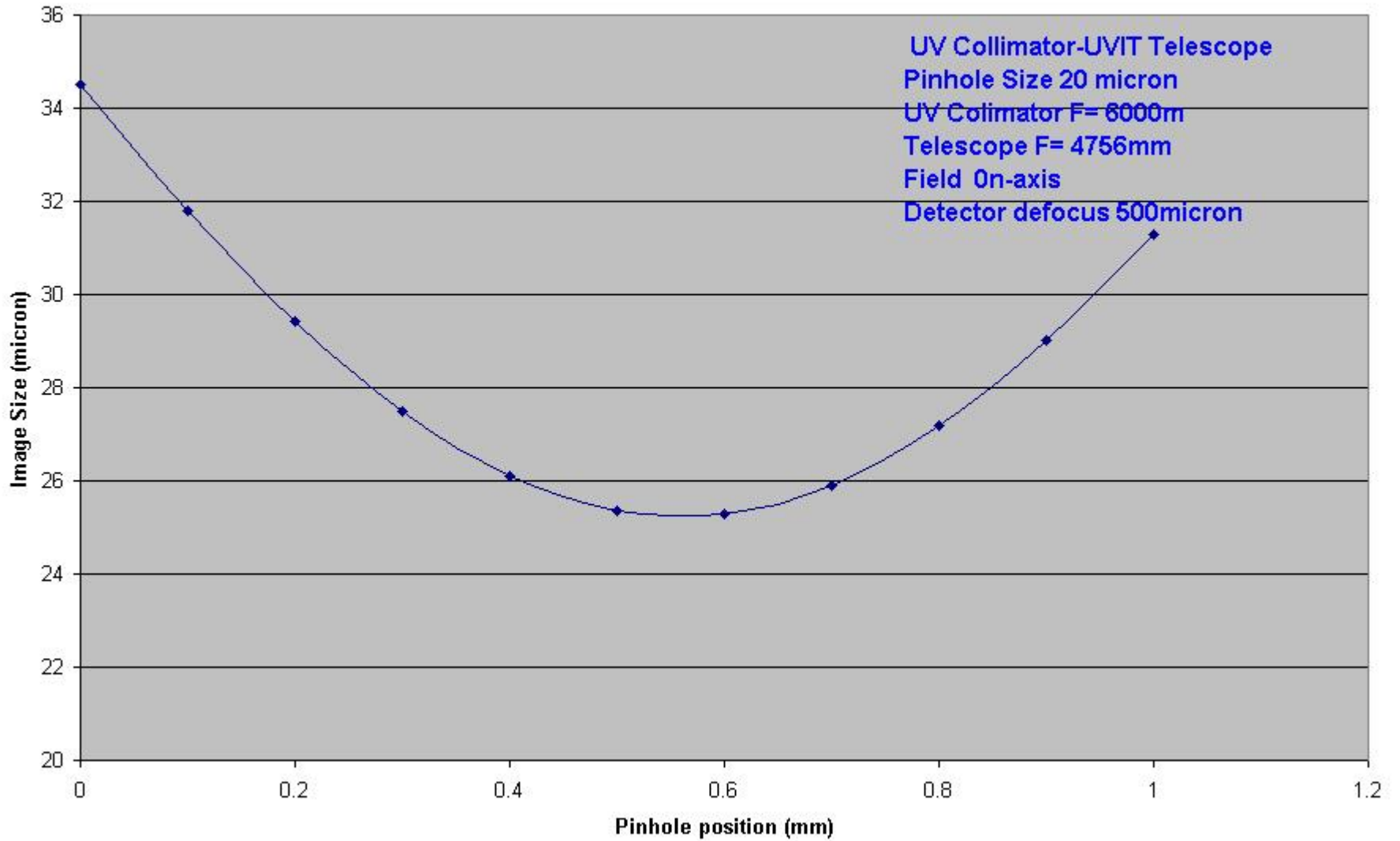
- Initial Alignment- *Telescope Mirrors-Detector plane*
 - Alignment telescope /Auto collimator
- Final Alignment- *Finer adjustments*
 - Interferometer
- Detector Focus
 - UV collimator/ Vacuum Chamber

Focus test setup



Schematic view of focus determination of integrated telescope

Telescope Focus Determination



Prof. MGK Menon Laboratory for Space Sciences

- Primary purpose of this facility is to test, integrate and calibrate components and instruments for space-based observational platforms
- Clean laboratories in compliance with FED209E, ISO 14644-1 and ISO 14644-2 standards to meet VUV cleanliness requirements
- Totally automated center with 24/365 monitoring facility to meet above mentioned ISO standards

Facilities

- **Fizeau Interferometer (Zygo Corporation)**
- **Thermovac chamber**
- **Vacuum reflectometer**
- **Small vacuum chamber for component tests**
- **VUV test chamber (1m×5m ultra-clean vacuum chamber with VUV source, monochromator, precision motion stages etc.)**
- **Ultra-clean vibration isolation tables (Newport)**
- **VUV photon counting detectors (Photek)**
- **Metrology equipment (Zeiss)**
- **Ultra-clean gas lines (Class-c or better)**
- **Clean-room monitoring systems etc..**

Prof. MGK Menon Laboratory for Space Sciences



Air-handling units



Brine chillers



Internal wall paneling work

