

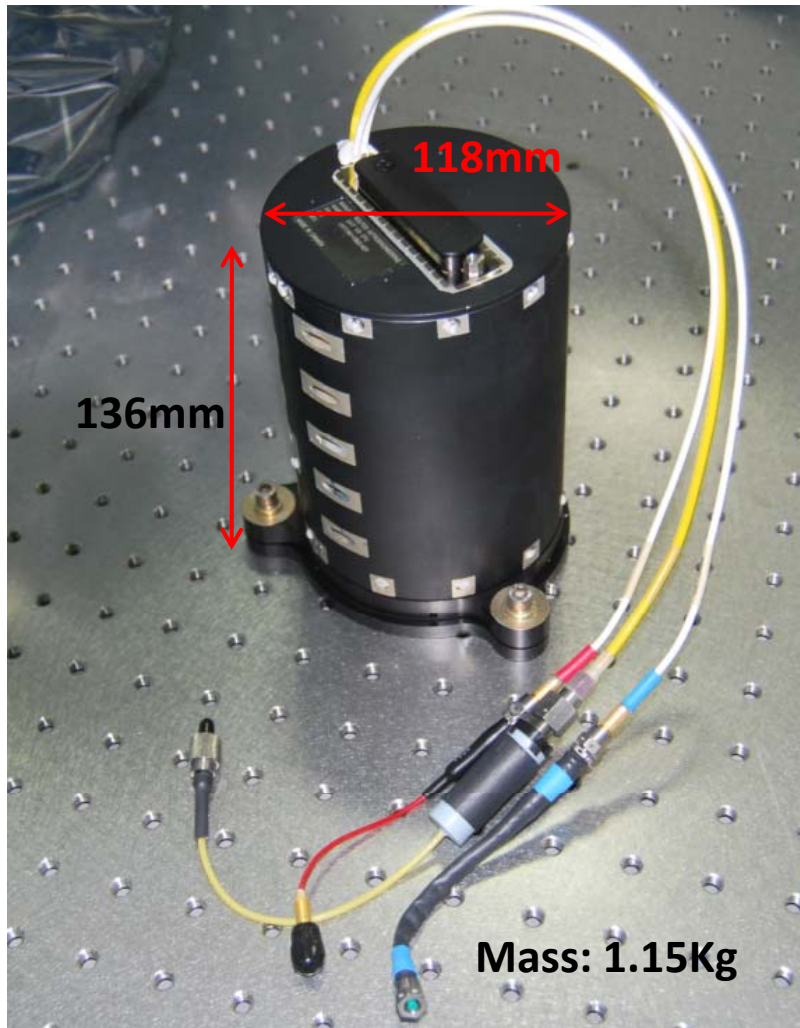
UVIT
Detectors
and
Filter Wheel Motors

UVIT-PMB
June 8 2012

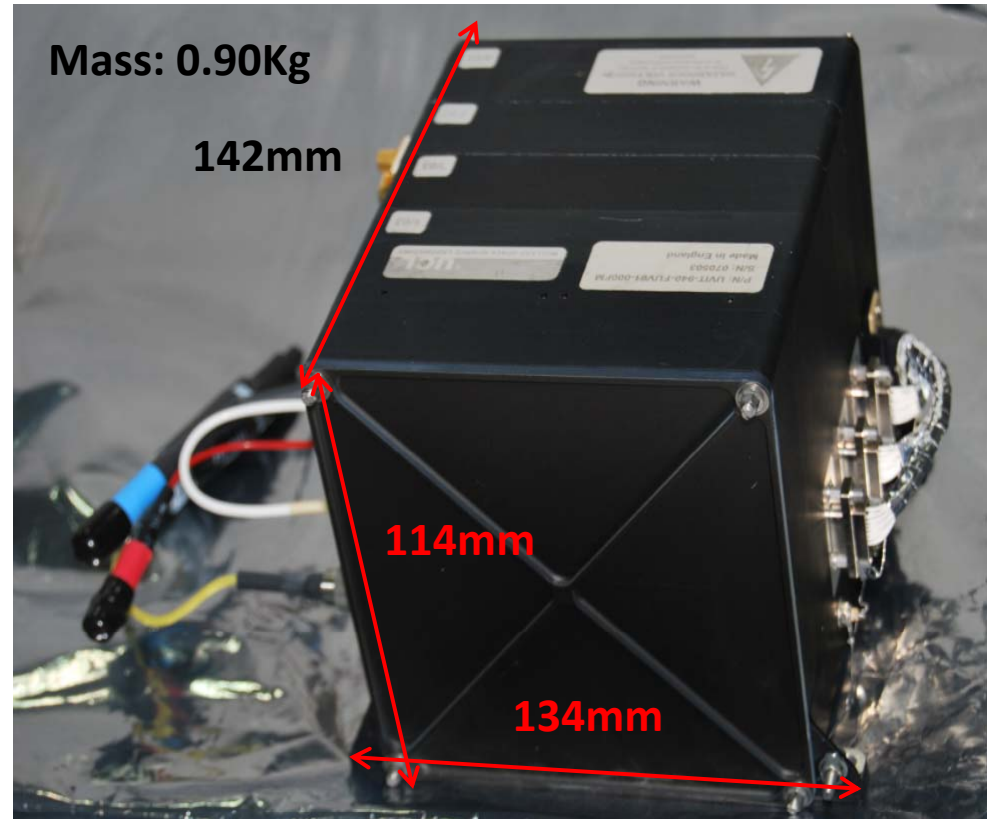
By:
Amit Kumar

Detector Specifications

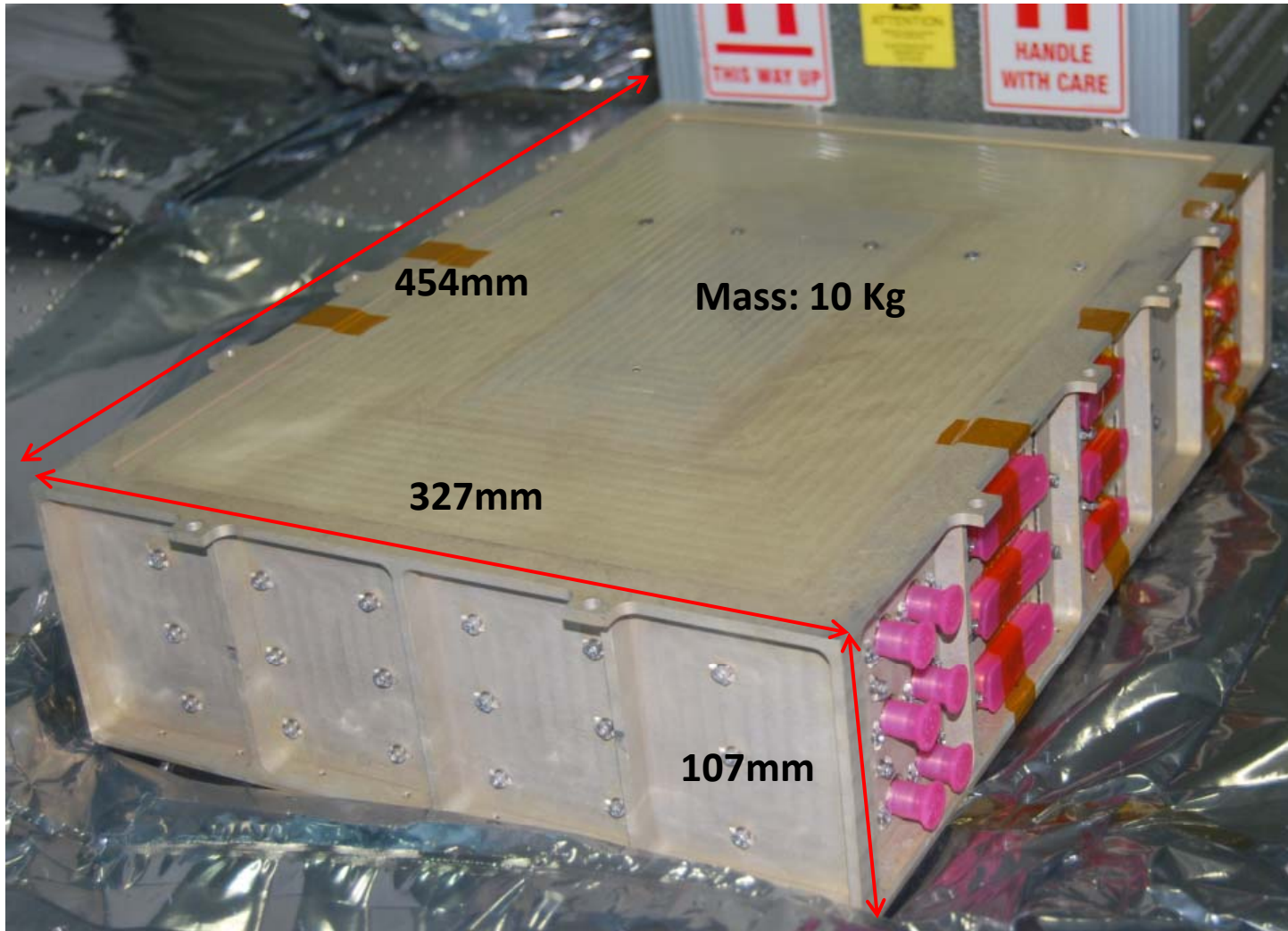
- FUV : wavelength 130nm - 180nm
- NUV: wavelength 200nm – 300nm
- VIS : wavelength 320nm – 550 nm
- General Specifications for all 3 detectors
 - Window Size: 39mm, Field of View: 28 arc minute
 - Sensor: CMOS STAR250, pixel size 25um, 512x512pixels
 - Detector Type: Photon Counting
 - Spatial Resolution: better than 1.5 arc second
 - Detectors are supplied by Canadian Space Agency
 - Power Dissipation: 20 watts per channel (CPU, HVU & EU)



Camera Proximity Unit (CPU)



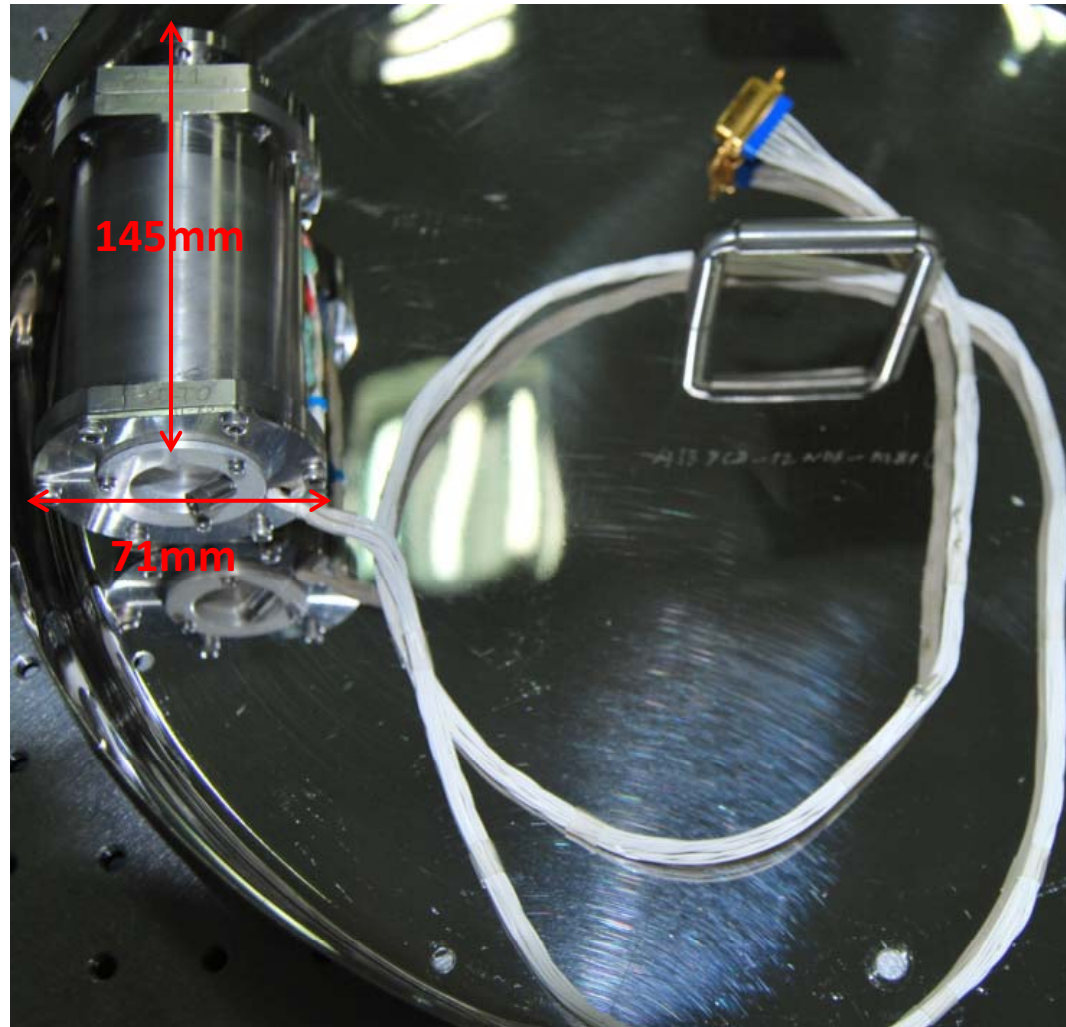
High Voltage Unit (HVU)



Electronics Unit (EU)

Filter Wheel Motor

- Step Size: 1.8° per step.
- Position accuracy: ± 5 arc min (with motor enable)
- ± 15 arc min (with motor disable)
- Position Repeatability: ± 5 arc min
- Time to reach Safe Position: 20sec max.
- Measurement accuracy: ± 30 arc min. (Telemetry angle)
- Motor Power Dissipation: 3.5W max.
- Motor Weight: 1.8 kg (per motor)
- Drive Electronics weight: 3.2 kg (for all 3 channels)
- FWM and FWDE supplied by IISU, Trivandrum.



Filter Wheel Motor (FWM)

Components Received at IIA

Name of Component	Engineering Model	Flight Model	Supplier
Detector System	Jan 2009	March 2010	CSA
Filter Wheel Motor	August 2009	April-2011 & Nov-2011	IISU, ISRO

Qualification of Individual Components (EM)

- EM (NUV) detector was qualified for all the environmental tests [qualification level] (EMI-EMC, Vibration, Thermo-vacuum) at David Florida Laboratory (DFL), CSA.
- Initial calibration of EM detector was done at Calgary.
- QE, distortion tests were done in IIA.
- EM FWM and FWDE qualified for environmental tests (qualification level) at IISU, Trivandrum.

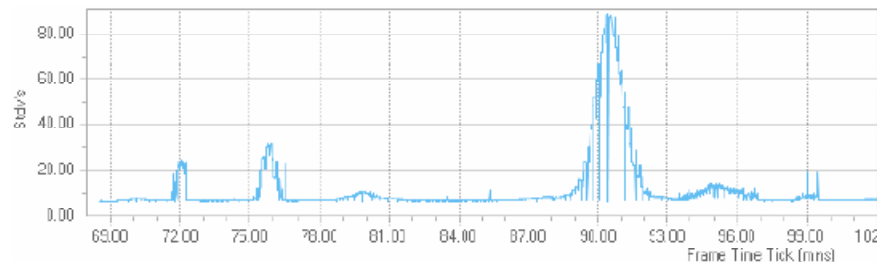
EMI/EMC Test on EM-UVIT DS (Test date: Feb-2010)

- To qualify UVIT DS EMI-EMC performance in split plane configuration, equivalent to spacecraft configuration as per ISAC.
 - Background
 - EM-UVITDS had been qualified for EMI-EMC test on single plane configuration at David Florida Laboratory (DFL), Canadian Space Agency (CSA) as per MIL-STD-461E.
- Test Results:** Passed; except at 2 frequency bands, as mentioned below

This Sheet Explains the Observations on Standard Deviation of Image Frame for RS and CS tests

PS: From Canadian Science Team, Oct 2008: "Below 30 count Standard Deviation is OKAY" [Ref: CSA (Routes)-CDR Slides of Environment testing]

Name of Test	Frequency Range	Data File Name	Frame Stdv with EMI	Stdv (Stdv)	Frame Stdv without EMI	Notes	Conclusion
RS	20M-200MHz	s_0094_i_0035	6.62-88.61	10.39	6.19-6.81	First Peak of Stdv 31.23 at 75.83 min; 12535th Frame. Peak of Stdv 88.48 at 90.38 min; 37650th Frame. See RS20M-200MHz and RS 20MHz-200MHz (Time Vs Freq) worksheets for more details	Failed at freq band 33-34.8MHz and 59.5-63MHz. Stdv peak (88.48) at 61.6238 MHz, Stdv Start corrupting from Freq 59.5MHz and Recovered at 63MHz.



Frame Time Tick (mins): It shows the time (in minutes) how long the system is ON (it get RESET if system resets)

Effect on Detector Performance: By this noise overall resolution would increase from 1.5'' (1.8'') to 1.6'' (1.9'') in Photon counting mode. In Integration mode the effect on the original resolution of ~ 3'' is very small. **This is acceptable.**

EMI-EMC Test Setup

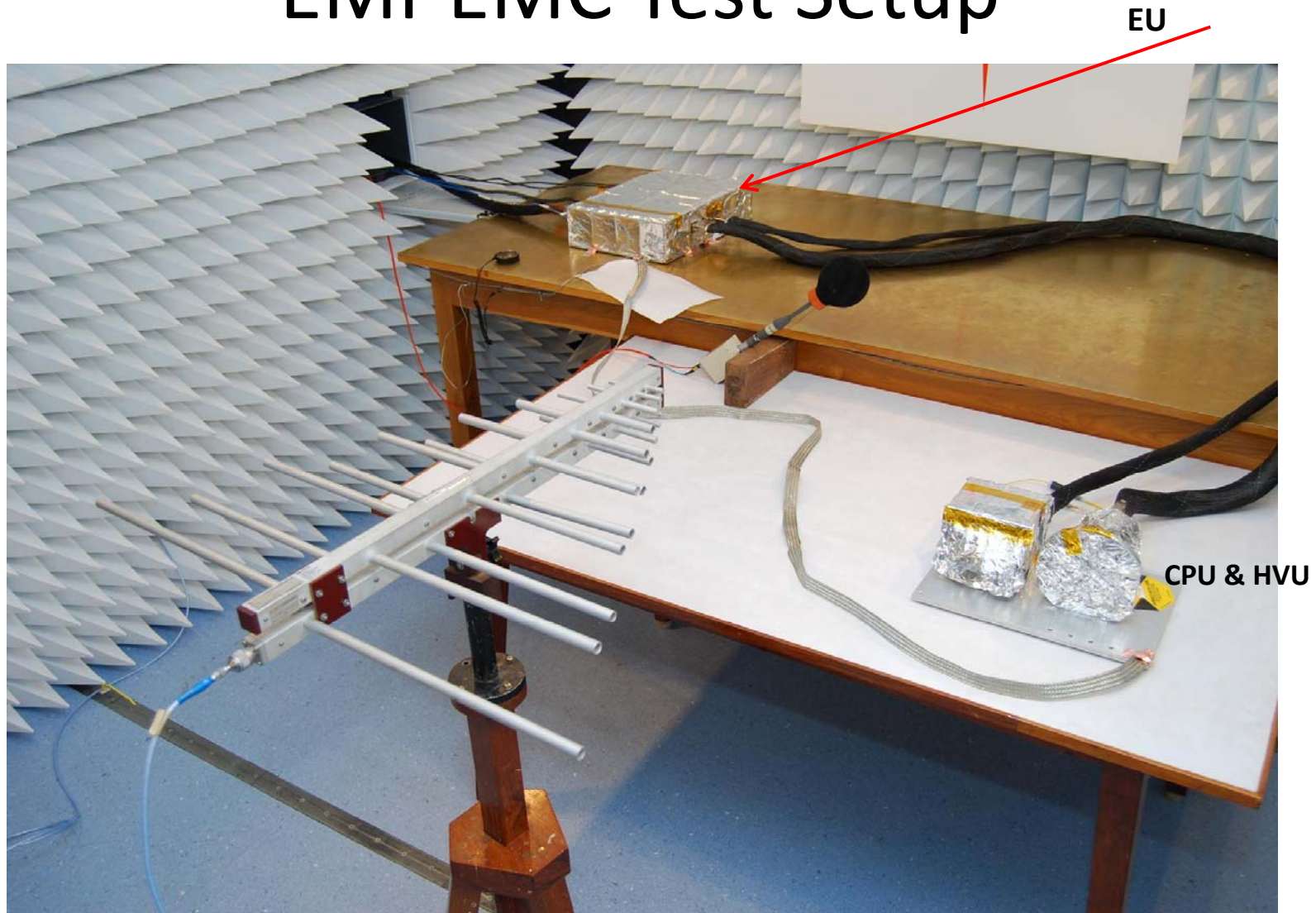
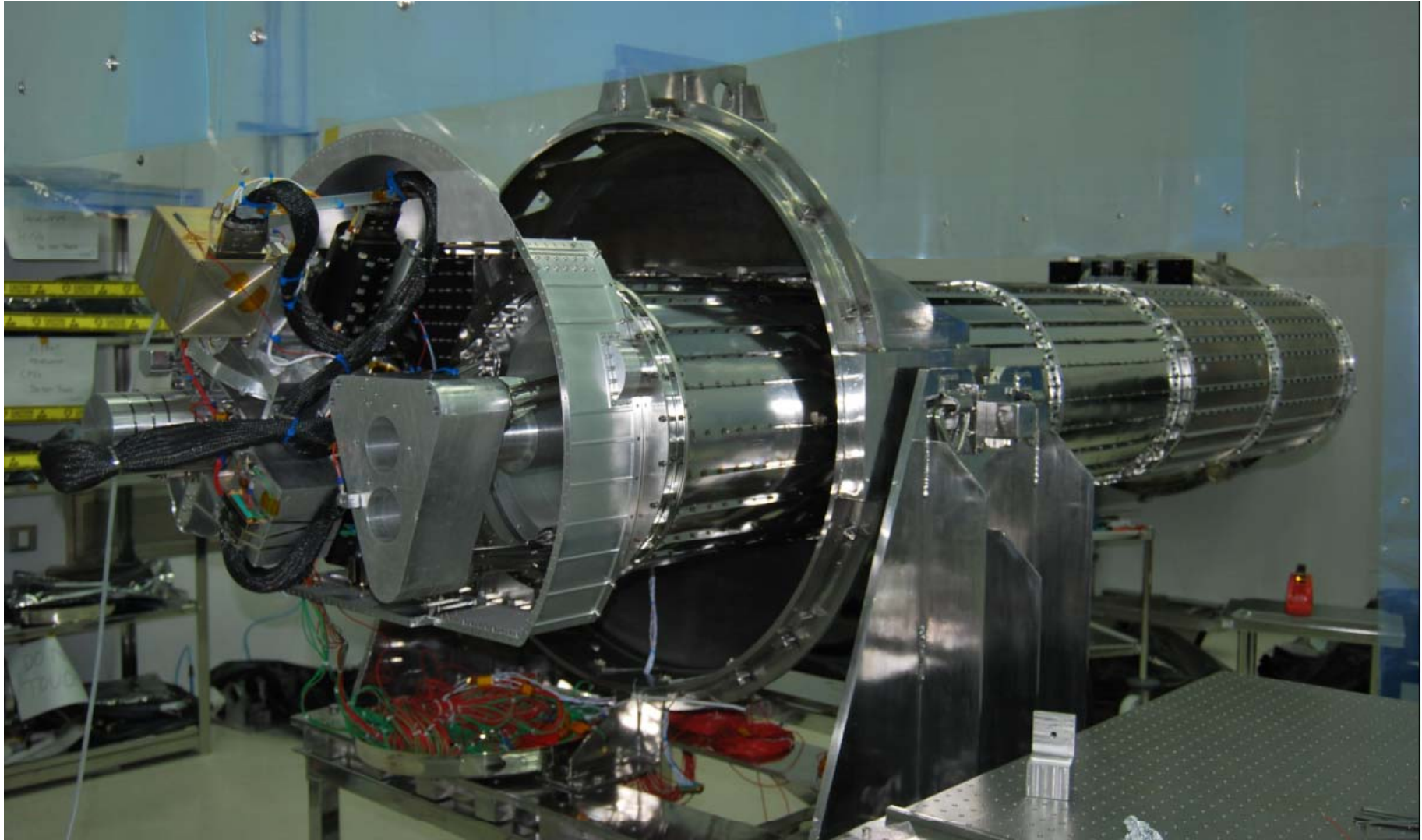


Photo Courtesy: ASTROSAT, Project Office, ISAC

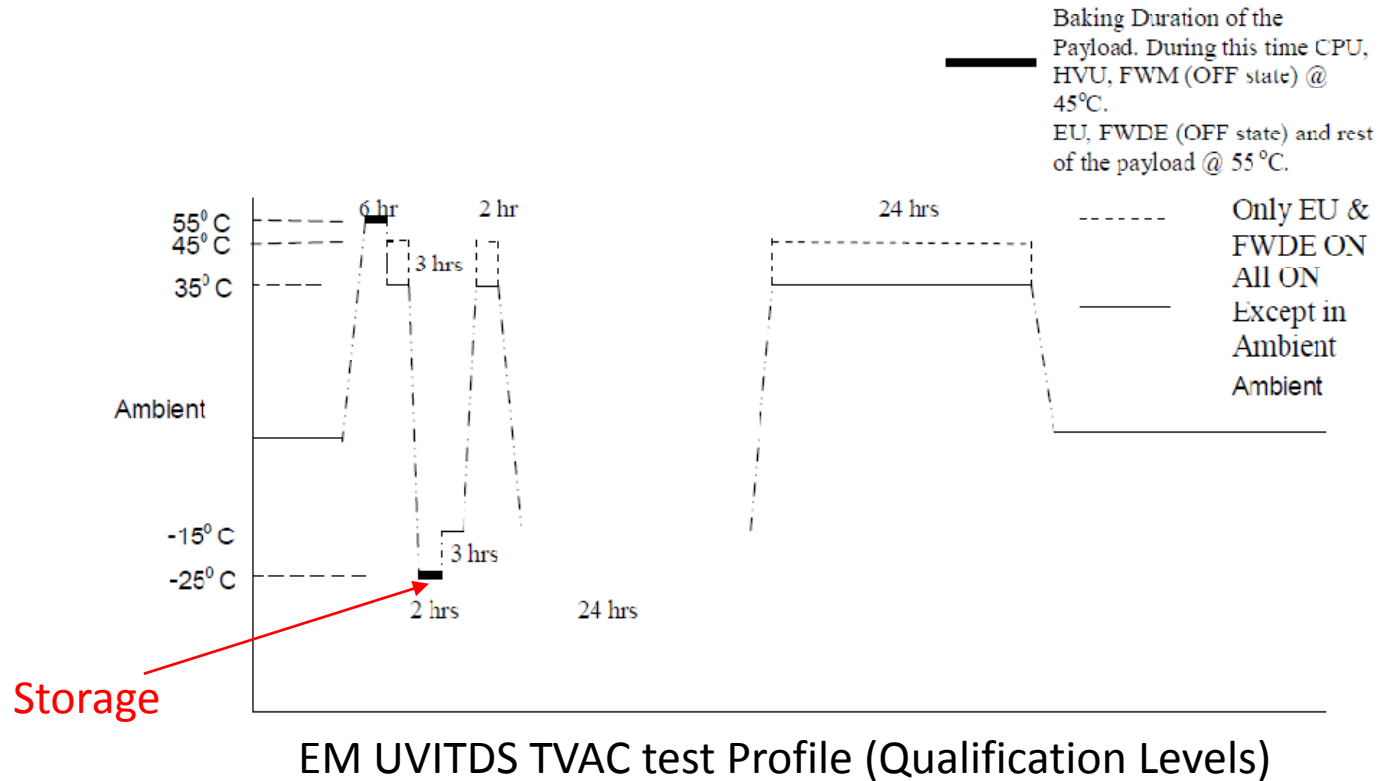
EM-UVIT-Payload



Thermo-vacuum Test on UVIT Payload (Test Date: May-2011)

- To qualify integrated EM-UVIT payload in TVAC as per the environmental test specifications (Qual level).
 - Background
 - Individual subsystems of UVIT were qualified at the supplier end as per the specs.
 - UVIT detector system (CPU, HVU & EU) were qualified at CSA.
 - Filter Wheel Motor (FWM) & Filter wheel drive electronics (FWDE) were qualified at IISU.
 - Mirrors were qualified at LEOS.
- To get experience & Modalities that need to be addressed for achieving the cleanliness and to minimize the contamination levels for flight model payload/ spacecraft tests.
- To get all the accessories and procedures for the FM qualification.

TVAC Test Temperature Profile



Test duration: 29/04/11 to 04/05/11 (continuous)

➤ On each temp plateau all the electronics (CPU, HVU, EU, FWM & FWDE) was powered on and performance was verified.

➤ Temp monitoring & recording on critical components was done continuously by UVIT team.

TVAC Test Result: UVIT passed TVAC test successfully

Test Setup

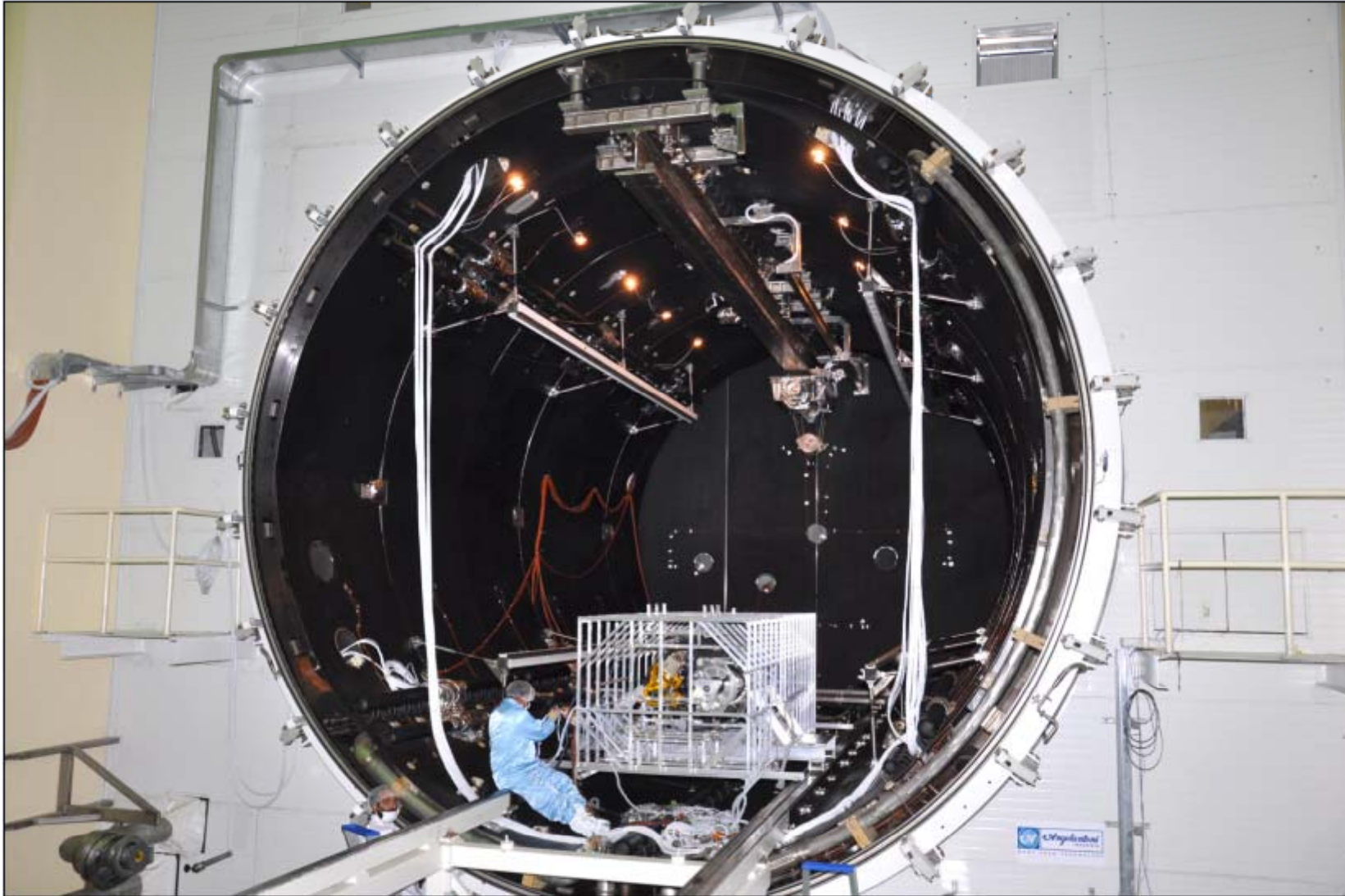


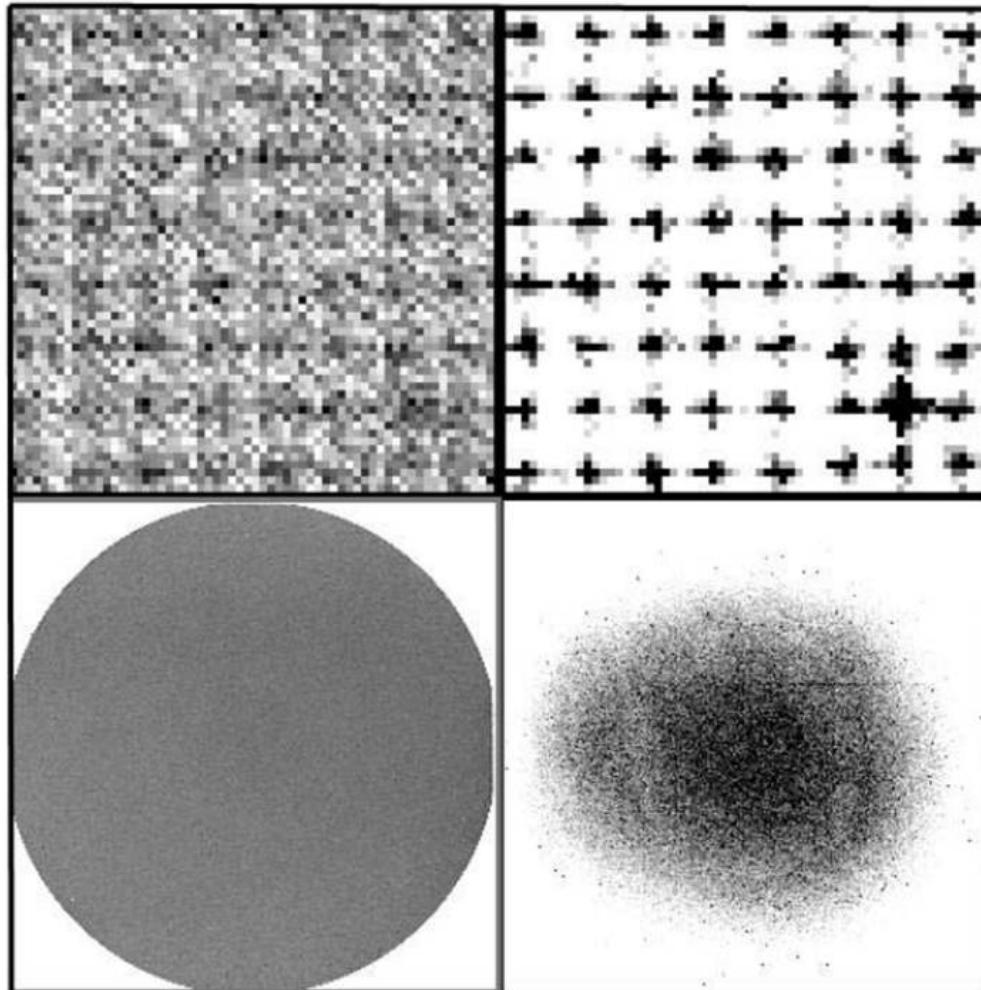
Photo Courtesy: ASTROSAT, Project Office, ISAC

Qualification of Individual Components (FM)

- FM (FUV, NUV & VIS) detectors was qualified for all the environmental tests [acceptance level] (Vibration, Thermo-vacuum) at David Florida Laboratory (DFL), CSA.
- Initial calibration of FM detectors was done at Calgary.
- QE, Distortion tests were done at IIA.
- FM (FUV, NUV & VIS) FMWs was qualified for all the environmental tests [acceptance level] (Vibration, Thermo-vacuum) at ISAC and IISU.

Flat Fielding

8x8 pixel
subarray
(nominal
gain)



8x8 pixel
subarray
(low gain)

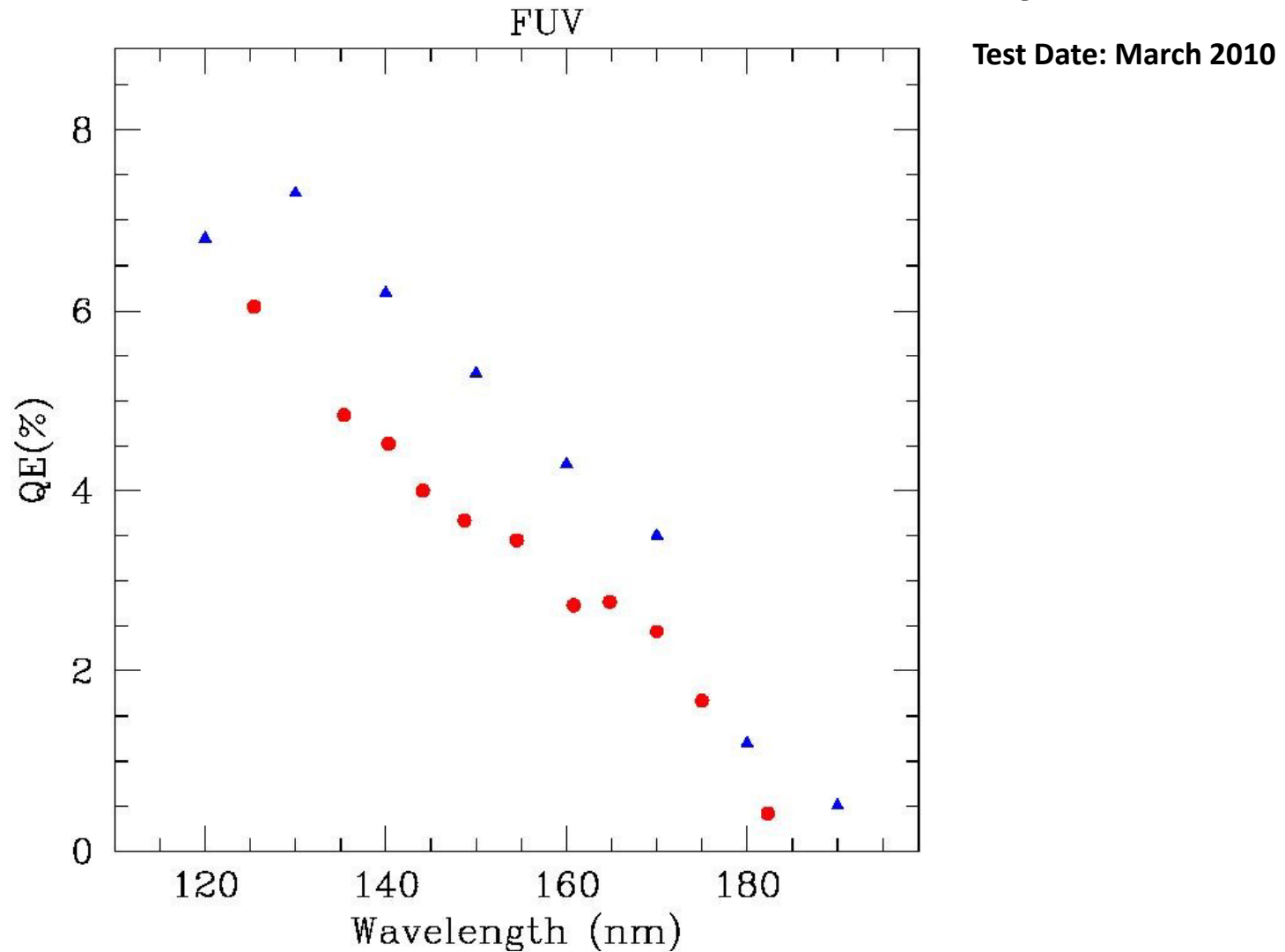
Full Image
(nominal
gain)

Full Image
(low gain)

FUV Detector Flat Field Images with 3x3 centroiding at
1/8 pixel resolution

Joe Postma et al, 2011, PASP

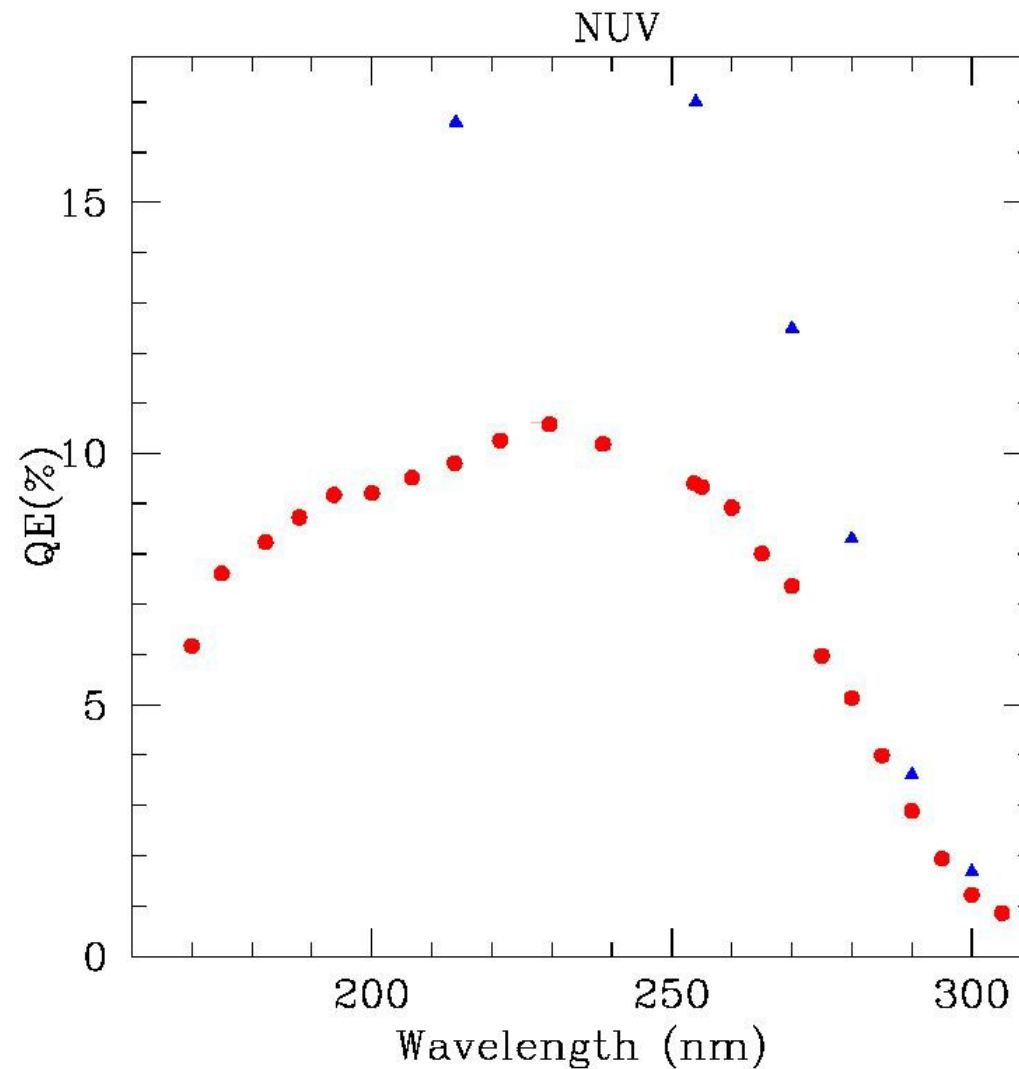
FUV Quantum Efficiency



QE of the FM FUV detector. Here red filled circles refer to our measured values, and the blue filled triangles refer to the values provided by Photek.

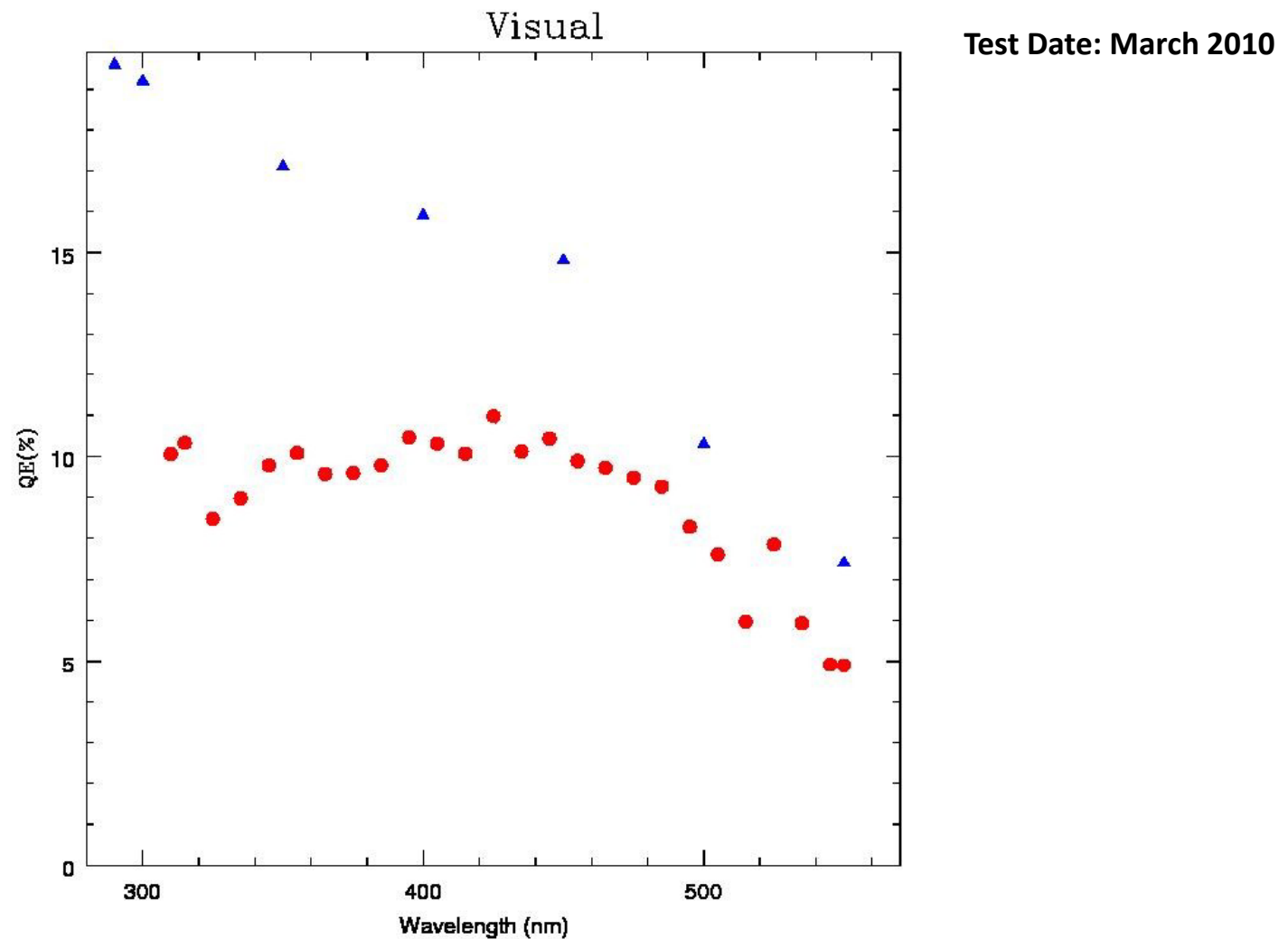
NUV Quantum Efficiency

Test Date: March 2010



QE of the FM NUV detector. Here red filled circles refer to our measured values, and the blue filled triangles refer to the values provided by Photech.

VIS Quantum Efficiency



QE of the FM VIS detector. Here red filled circles refer to our measured values, and the blue filled triangles refer to the values provided by Photek.

Integration with FM Telescopes

- NUV & VIS FWs were integrated with NUV-VIS telescope in Jan-12
- NUV & VIS detectors were integrated with NUV-VIS telescope in February 2012.
- NUV-VIS Telescope was tested for Focus test March 2012.
- FUV detector and FW and integrated with FUV telescope in May-12 and focus test is undergoing.

Thanks