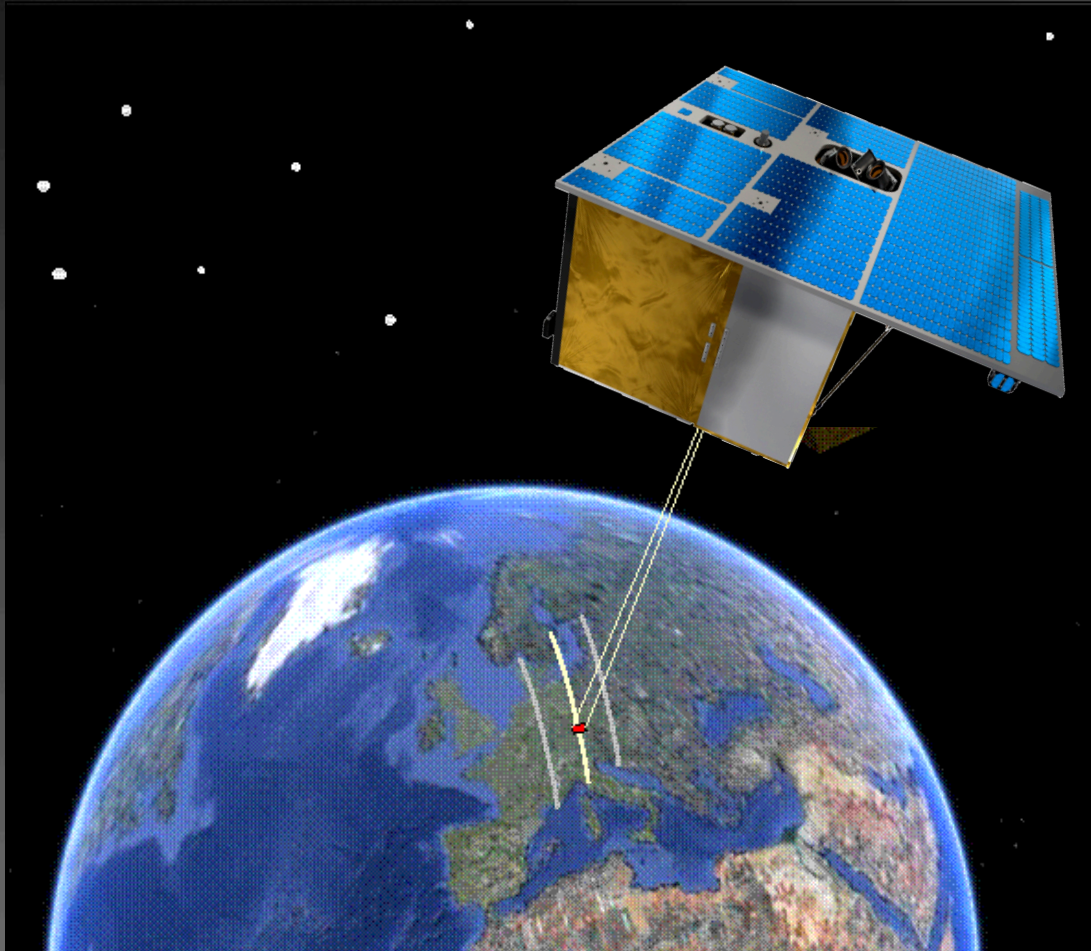
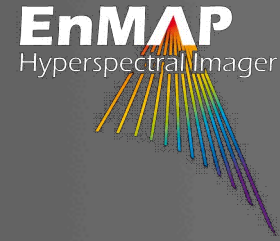


Environmental Mapping & Analysis Program

Development Status and Future Plans

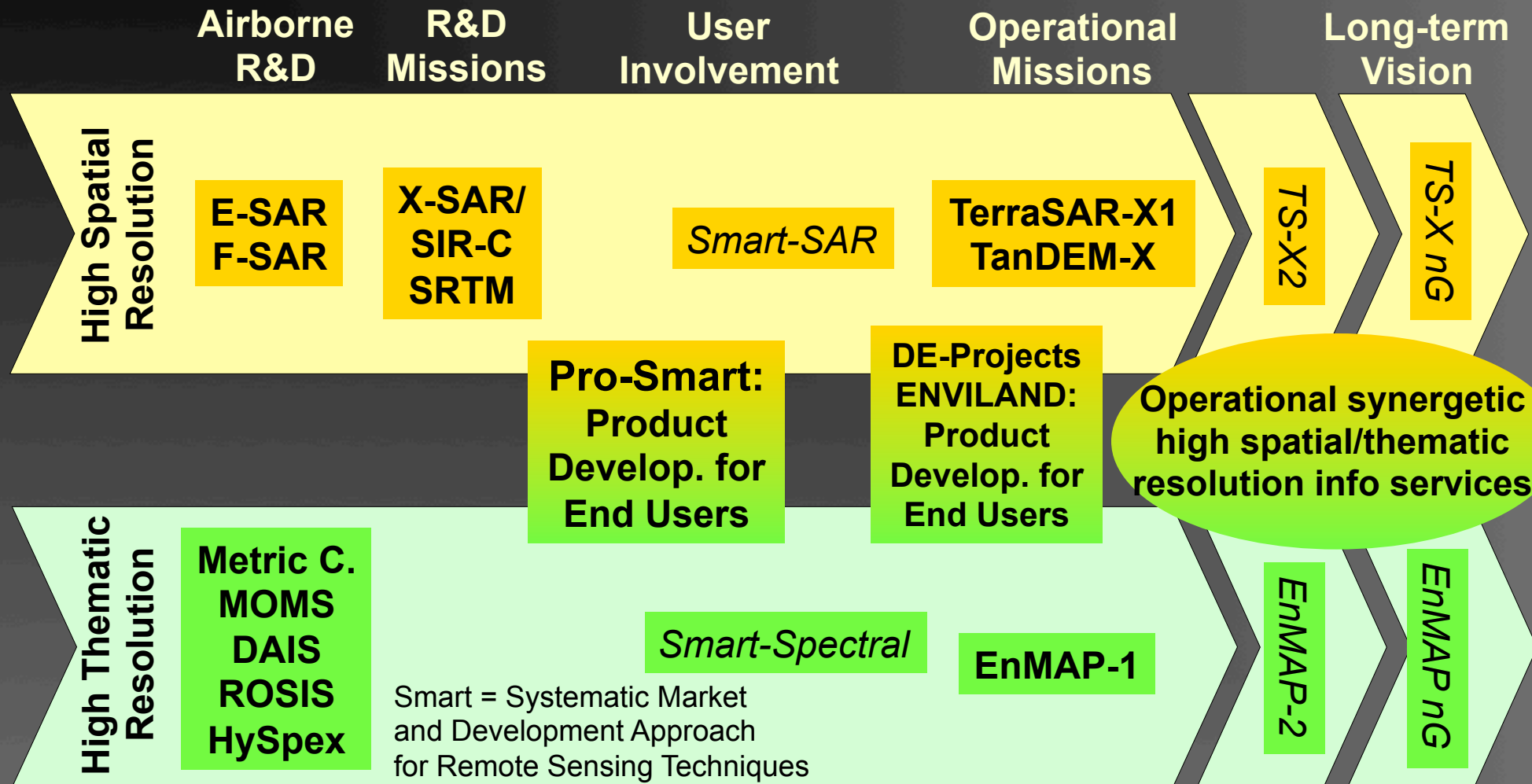
Hermann (Charly) Kaufmann, Karl Segl,
Theres Kuester, Christian Rogass, Sabine
Chabrilat, Luis Guanter, Stefan Hofer,
Bernhard Sang, Andreas Müller, Christian
Chlebek, Godela Rossner and many others

The EnMAP Program



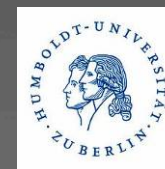
- EnMAP is Germany's first hyperspectral mission
- EnMAP is a scientific 'path finder mission' for later operational services
- It is funded by the Ministry of Economics and Technology

Overall German Programmatic Context



source: DLR-Agency

Project Partners



**Scientific
Principal
Investigator**

GFZ-Potsdam

**Project Management
*DLR Agency***

**Space Segment
*Kayser-Threde - Spectrometer
OHB Bremen - Bus Technology***

**Core Science
Team
Advisory Board**

**Ground Segment
*DLR-Oberpfaffenhofen***

Overall Mission Goals

- To significantly contribute to environmental research studies, notably in the fields of ecosystem functions, natural resource management, natural hazards and Earth system modeling
- To provide high-spectral resolution observations of bio-geochemical and geophysical variables on a global basis
- To develop new concepts and techniques for data extraction and assimilation to achieve synergies with other sensors
- To provide high-quality calibrated data and data products to be used as inputs for improved modeling and understanding of biospheric /geospheric processes

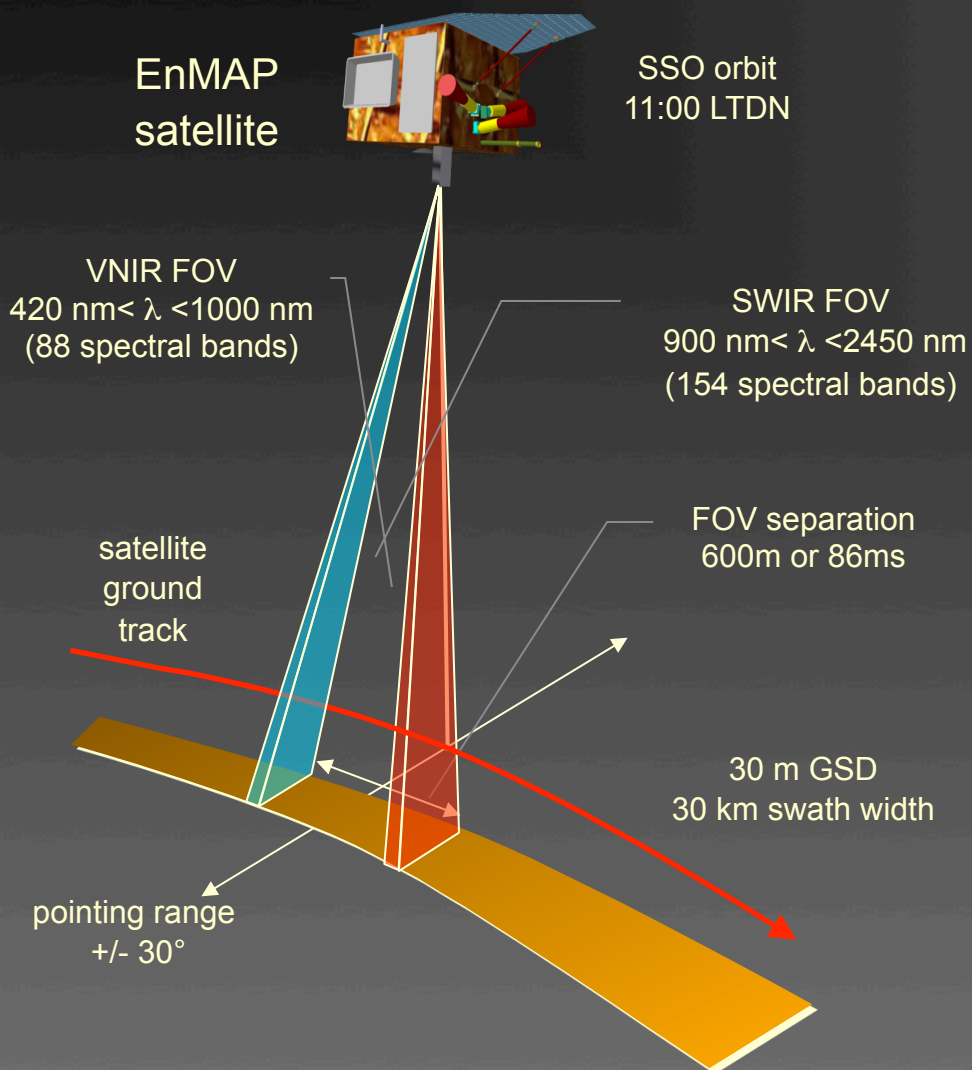
Science Plan downloadable from enmap.org in December

Terrestrial Ecosystems

Keywords: Ecosystem services, Biodiversity, Species migration, Precision farming, REDD, Urban growth

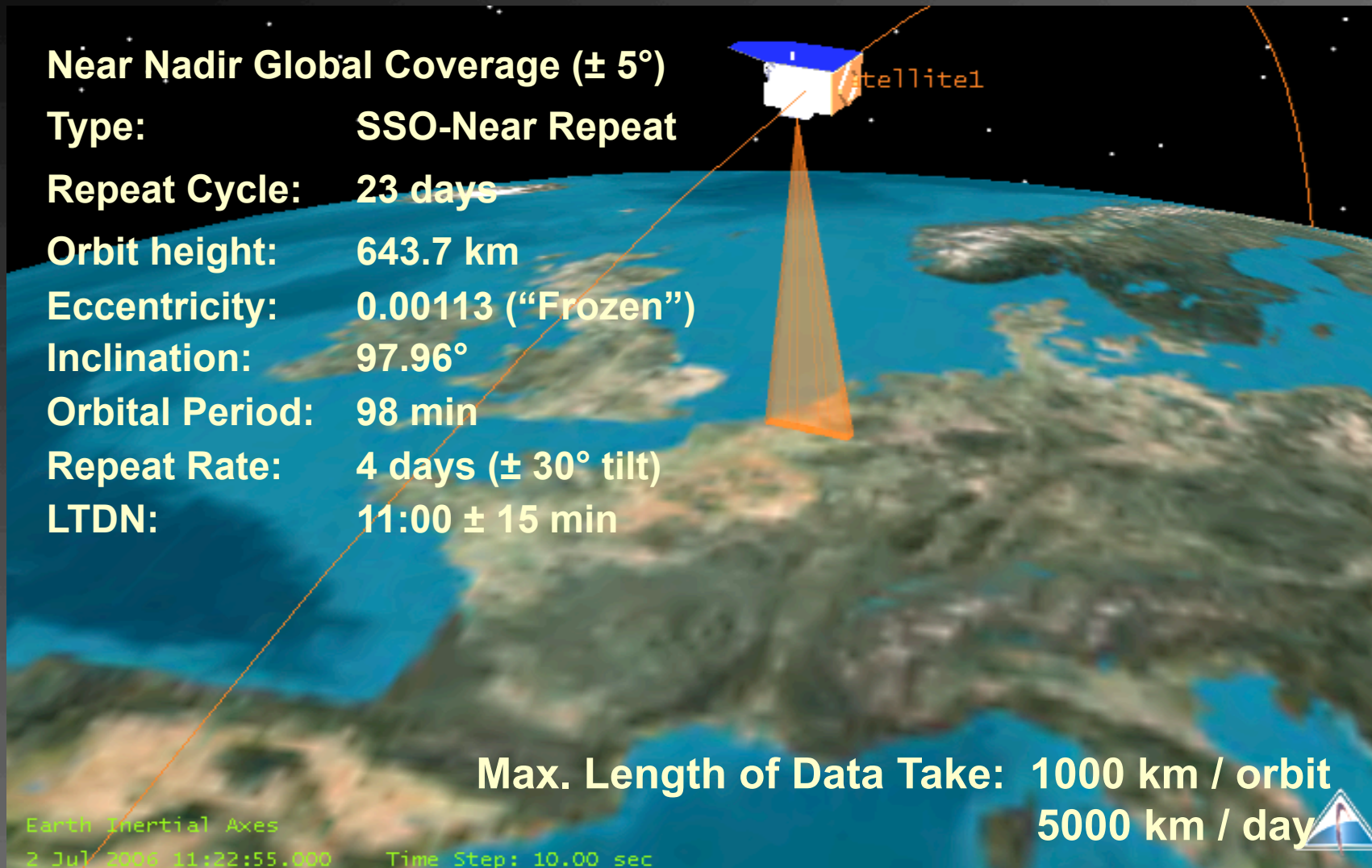
- Quantifying the impact of human activities such as land use/cover change, land management practices, and environmental pollution on ecosystems, their services and biodiversity.
- Quantifying the rate and consequences of ecosystem changes (e.g. species migration).
- Monitoring measures to combat biodiversity loss and improve ecosystem stability (e.g. REDD+).
- Assessing the impact of soot and dust on snow and glacial melt and the consequences for the hydrological cycle.
- Analysing the state and development of urban compositions and growth.

Main Mission Parameters

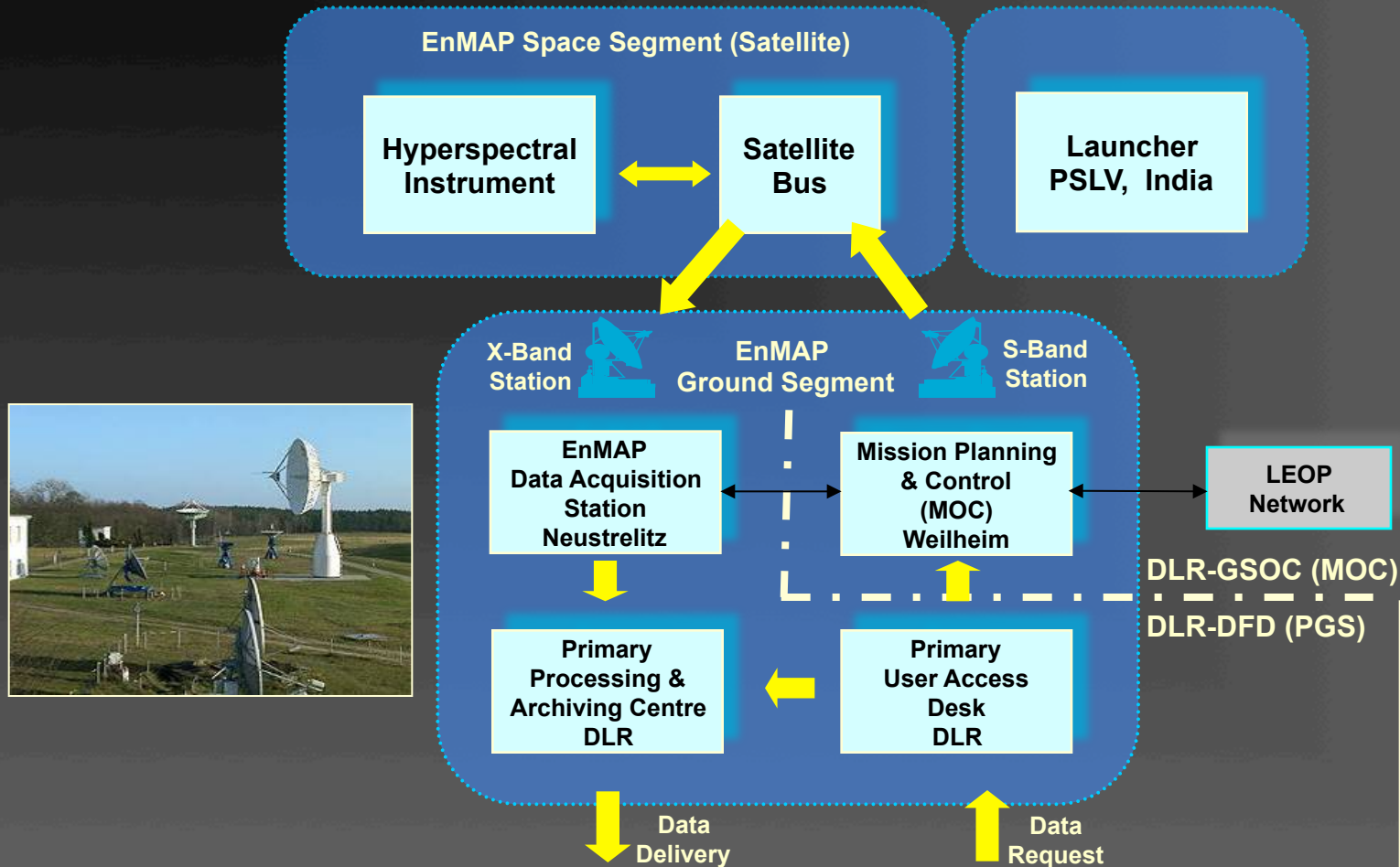


- Push-broom imager
- Spectral range:
 - 420 nm to 1000 nm (VNIR)
 - 900 nm to 2450 nm (SWIR)
- Spectral sampling distance:
 - VNIR 6.5 nm
 - SWIR 10 nm
- Total number of bands: 242
- Signal-to-noise ratio:
 - > 500 @ 495 nm
 - > 180 @ 2200 nm
- GSD at nadir : 30 m
- Swath width: 30 km
- Off-nadir pointing: $\pm 30^\circ$
- Mission lifetime: ≥ 5 years

Main Orbit Parameters

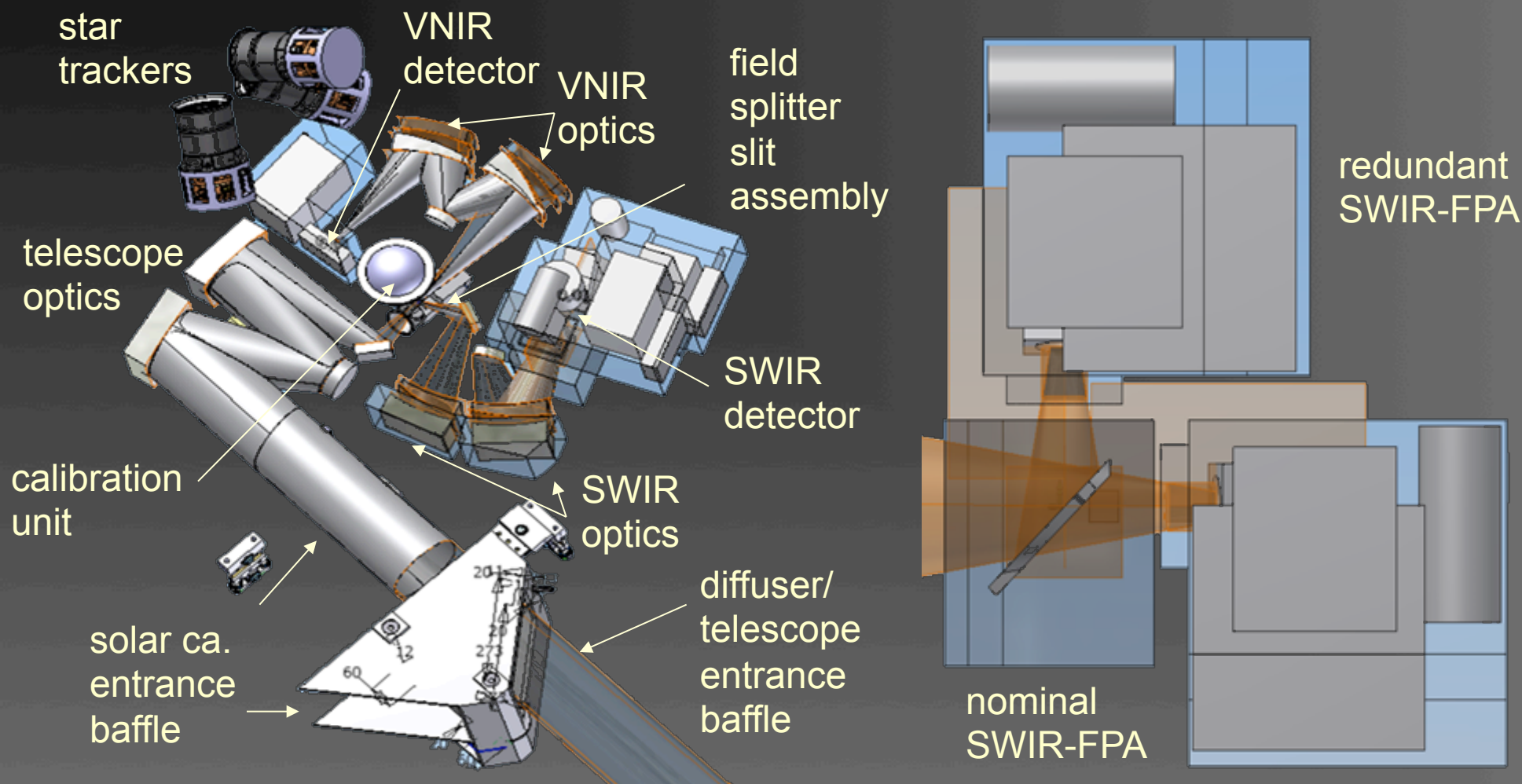


Ground Segment

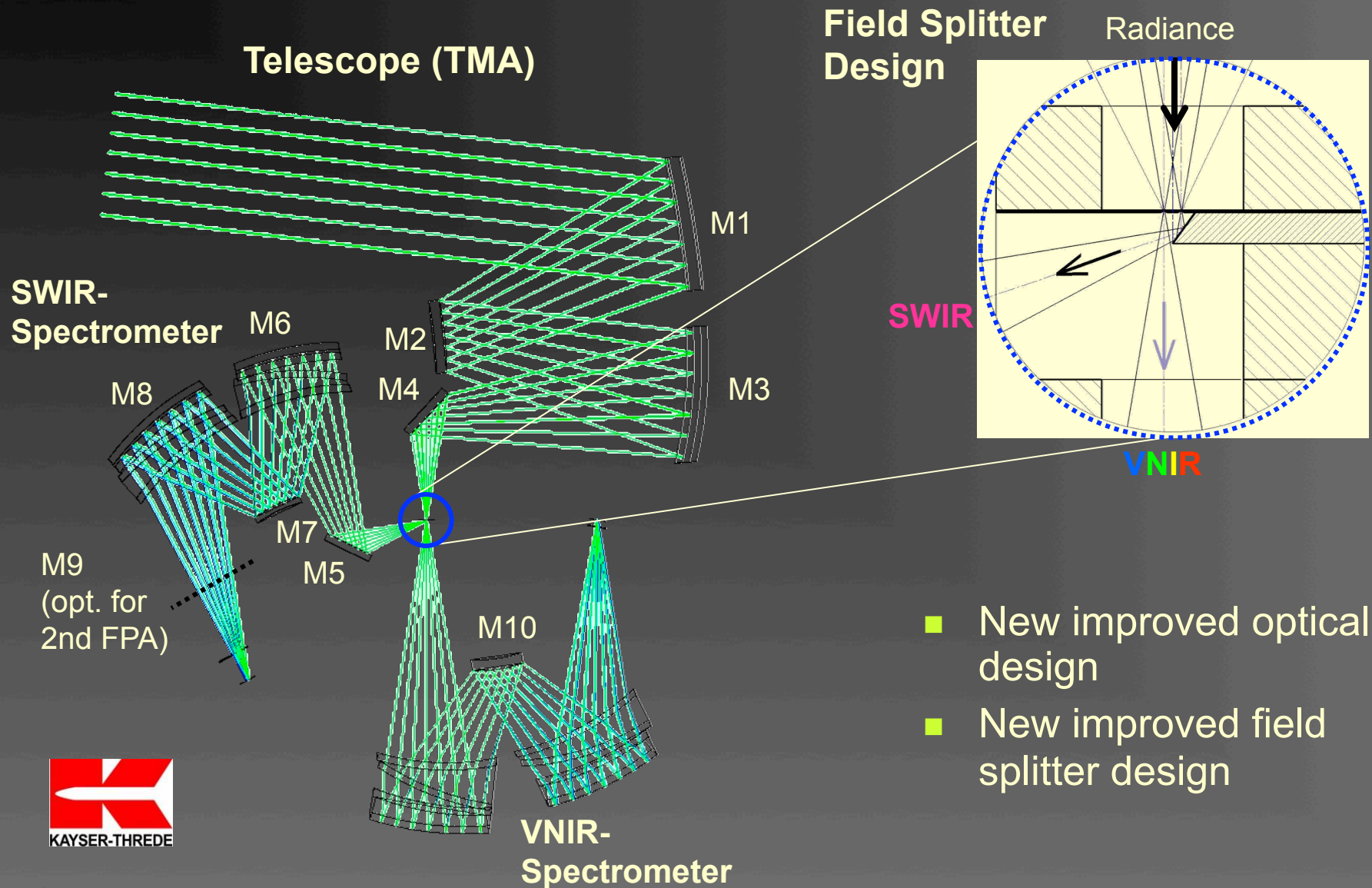


International EnMAP User Community

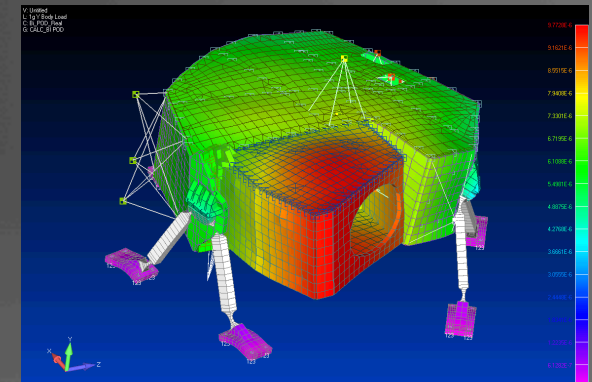
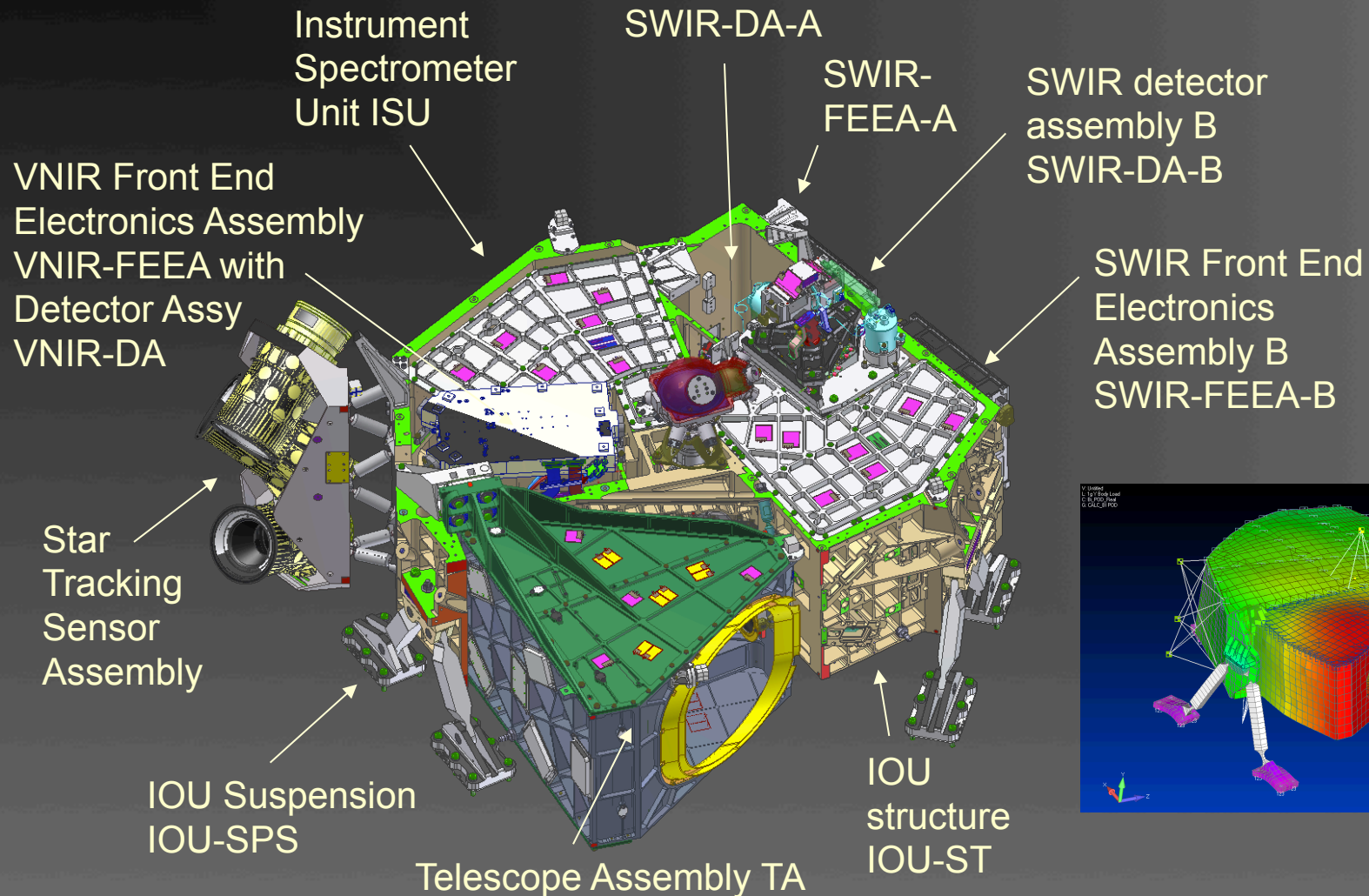
Instrument Optics Unit - Main Elements



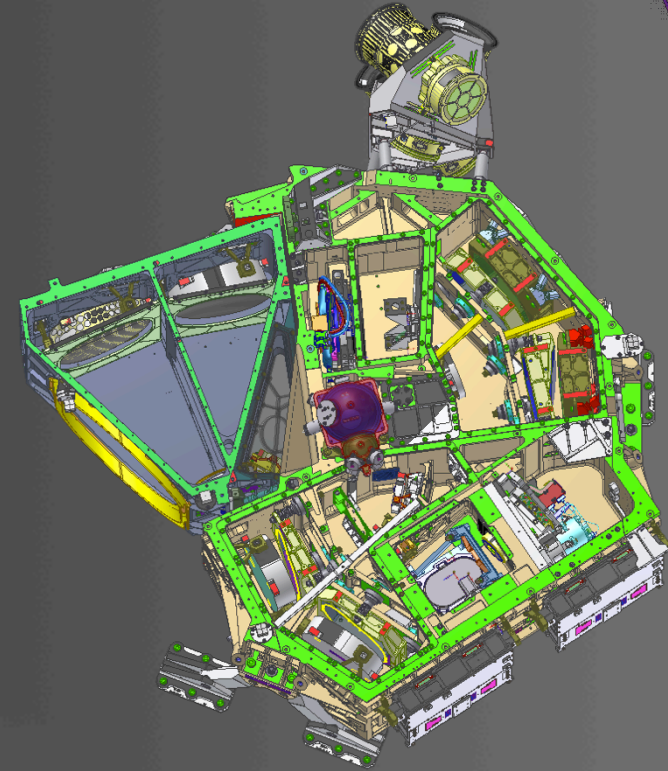
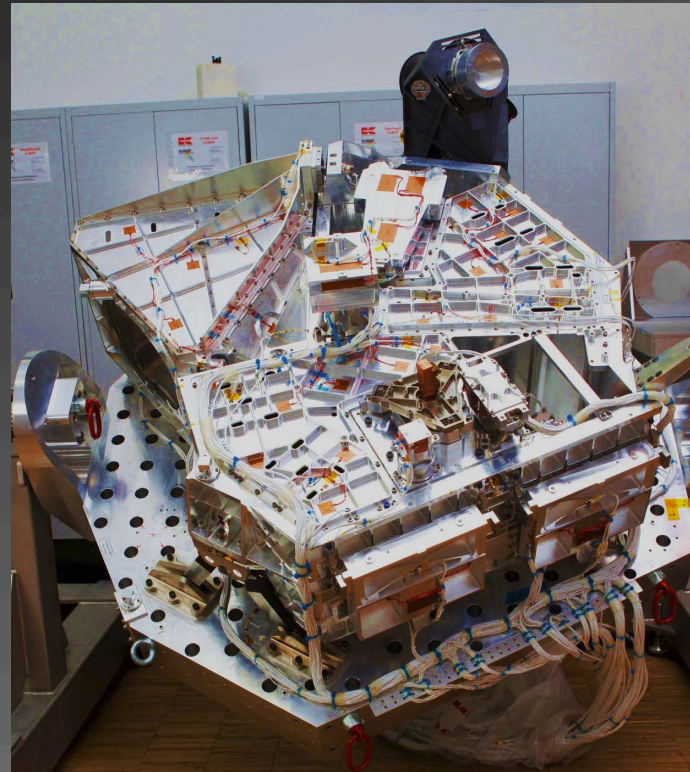
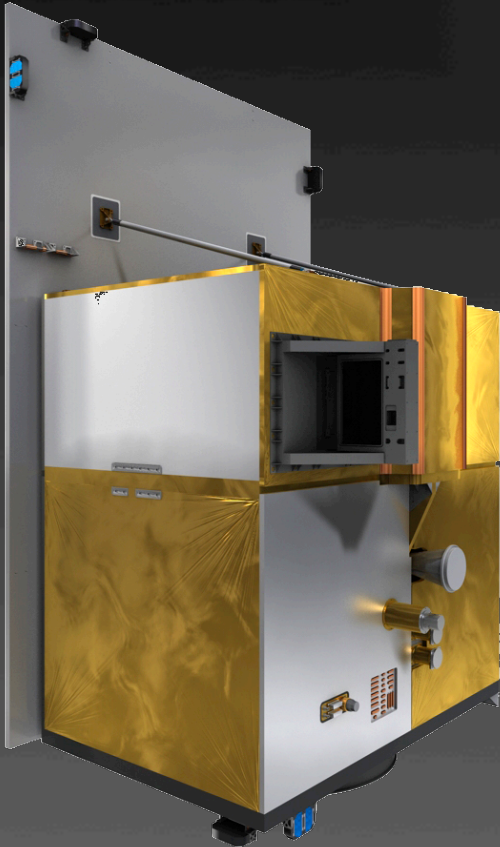
Optical System Layout



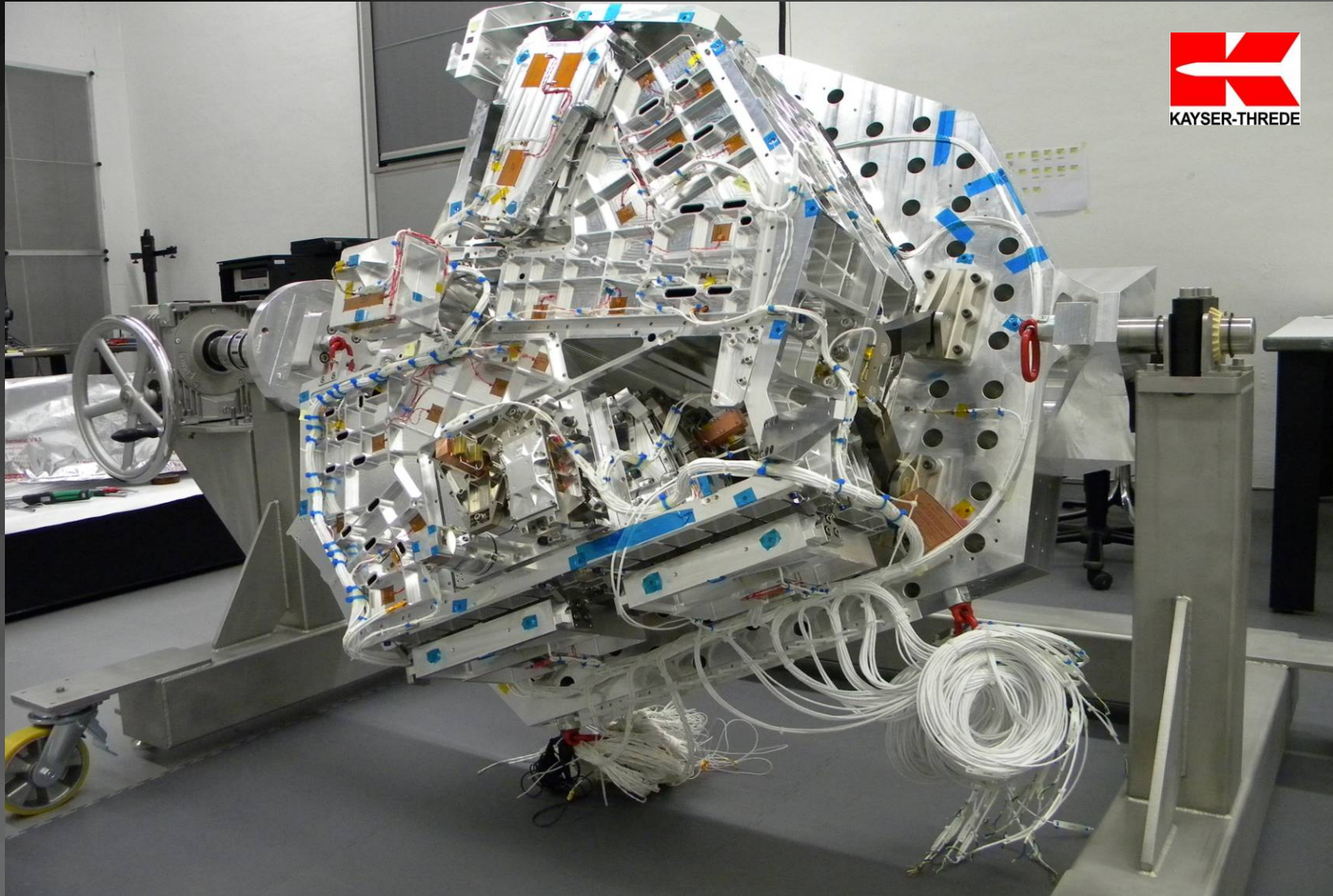
Instrument Design Status



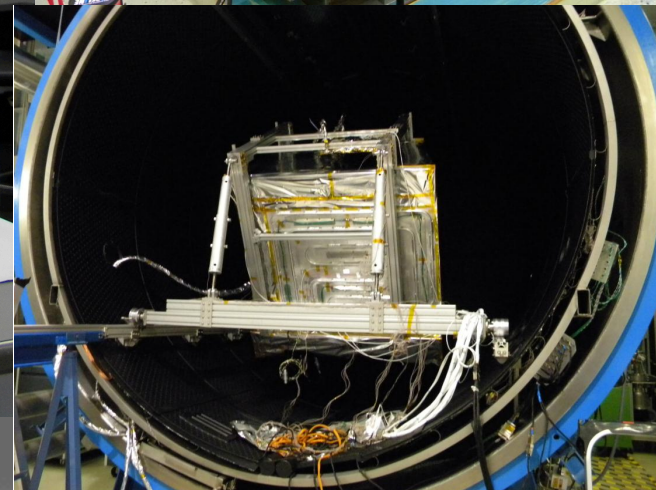
Satellite / Instrument – Bench and CAD



Instrument - Bench Clean Room



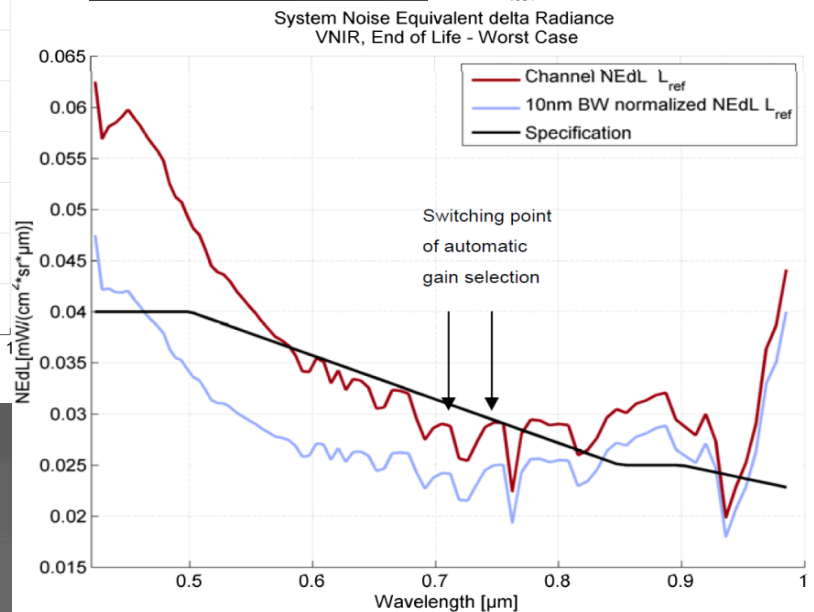
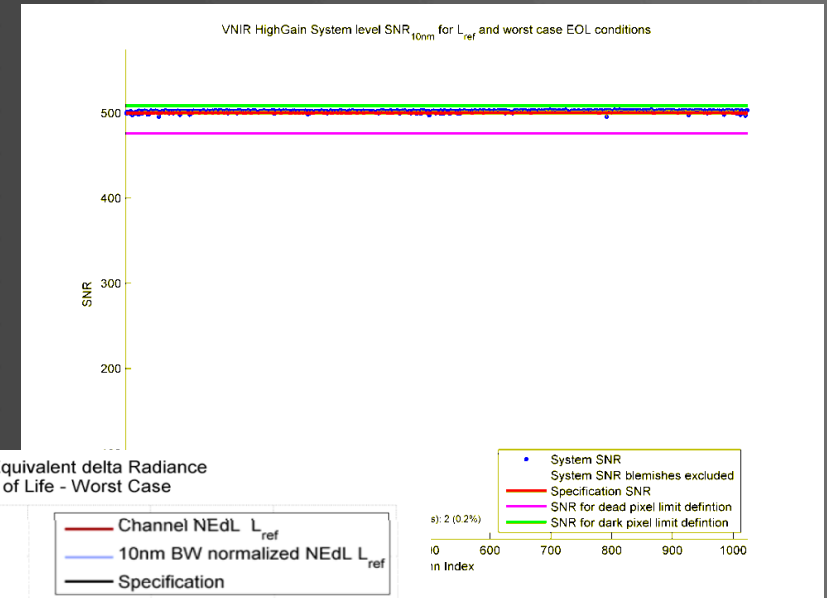
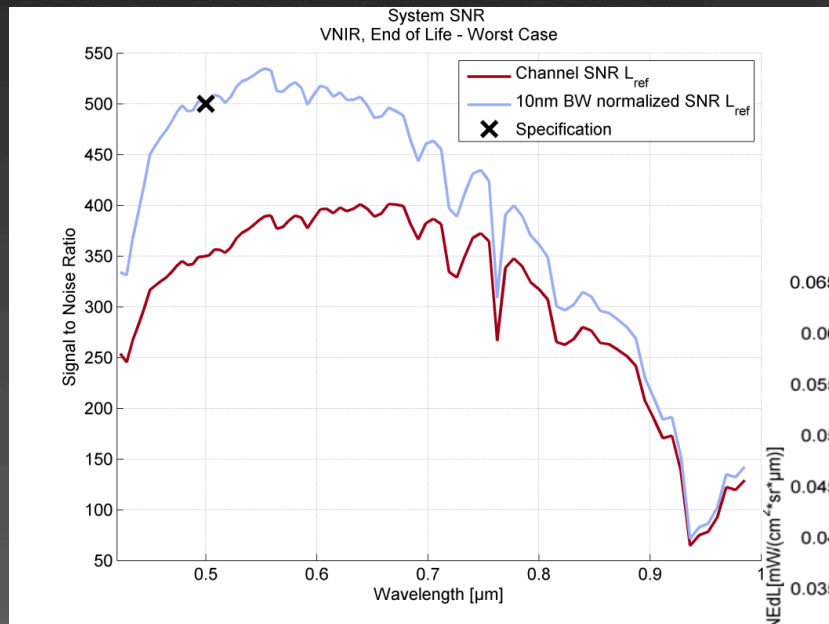
KT-Engineers / Vibration and Thermal Testing



Remote Sensing Section

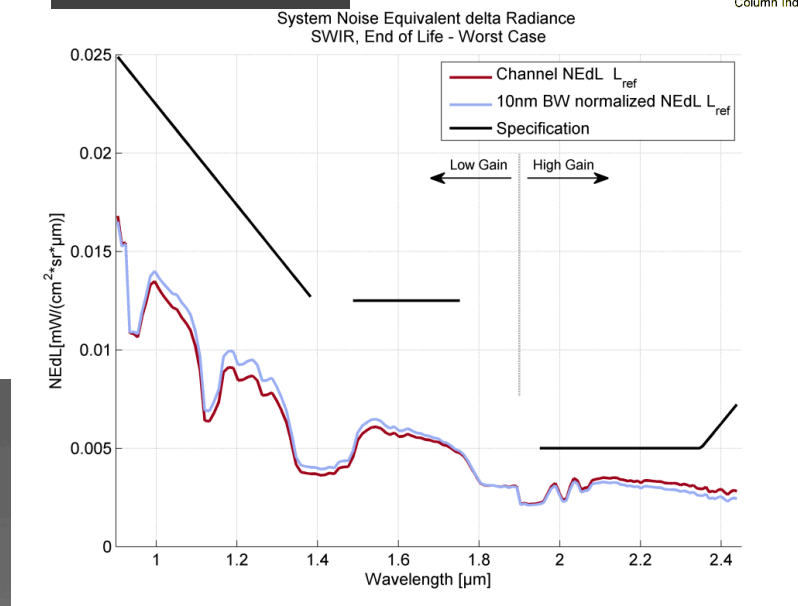
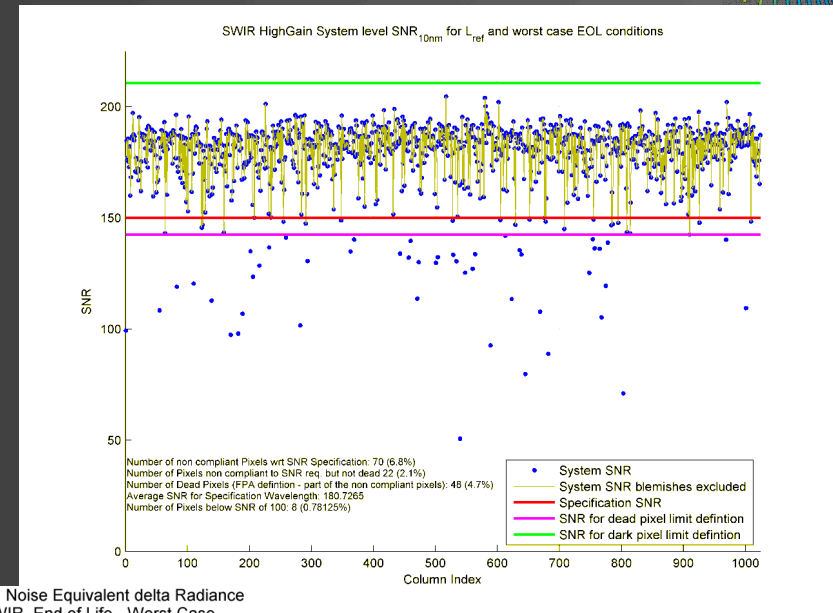
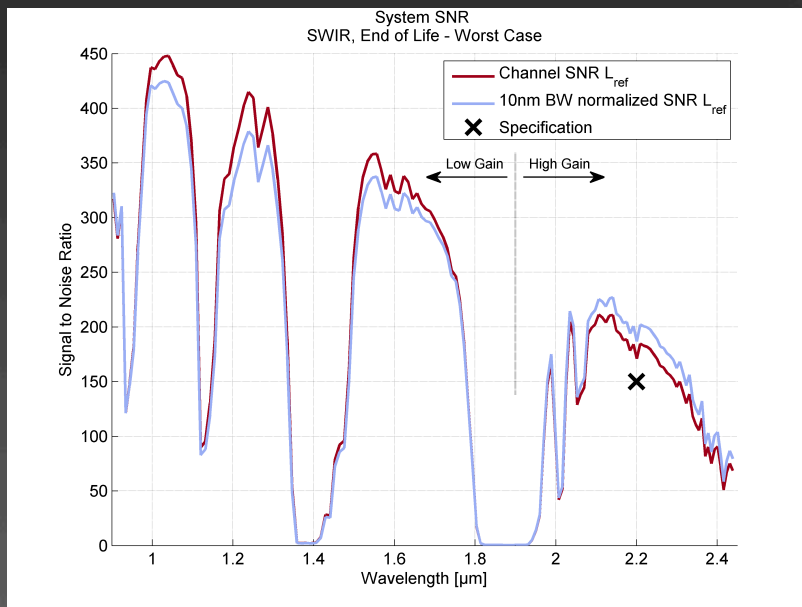
SNR / NE Δ L (VNIR)

Performance simulation end of life worst case scenario



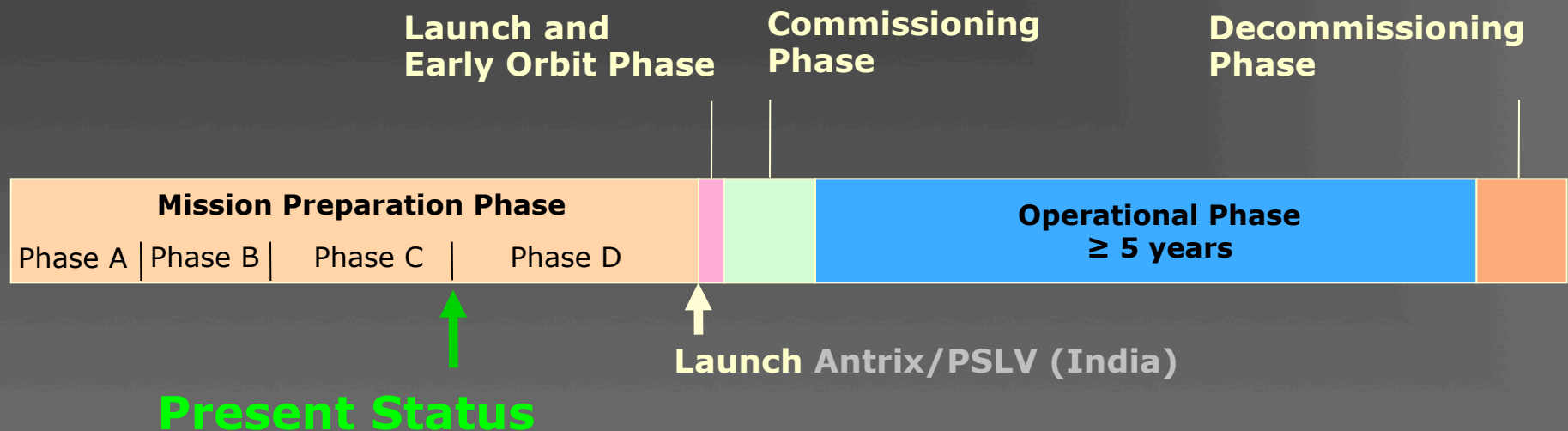
SNR / NE Δ L (SWIR)

Performance simulation end of life (worst case scenario)



History and Current Status

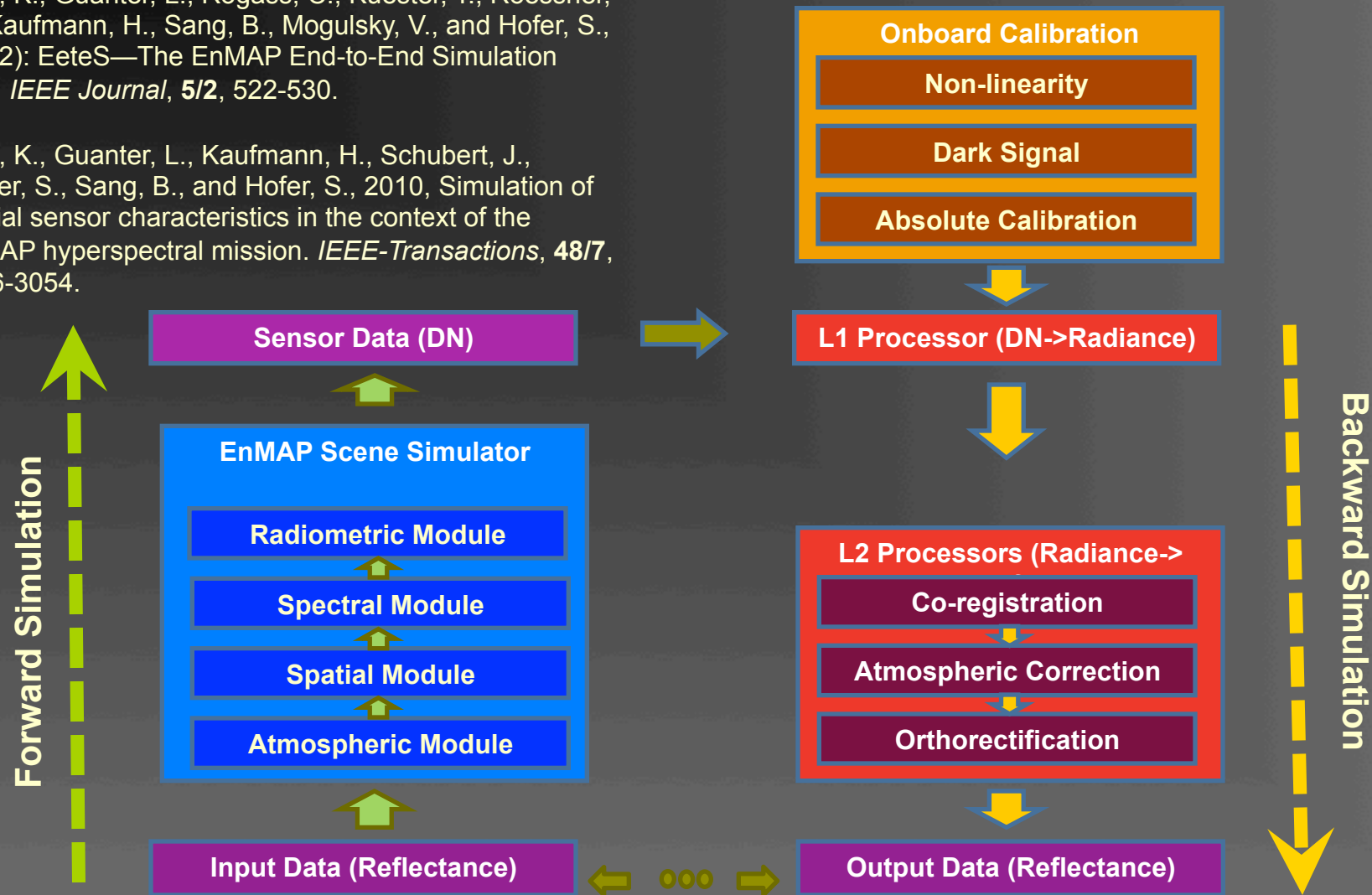
- 2003 Submission of Proposal
- 2005 Phase A study accomplished
- 2007 Phase B accomplished
- 2008 Start of phase C/D
- 2010 CDR Ground Segment
- 2012 CDR Space Segment
- 2017/18 Launch



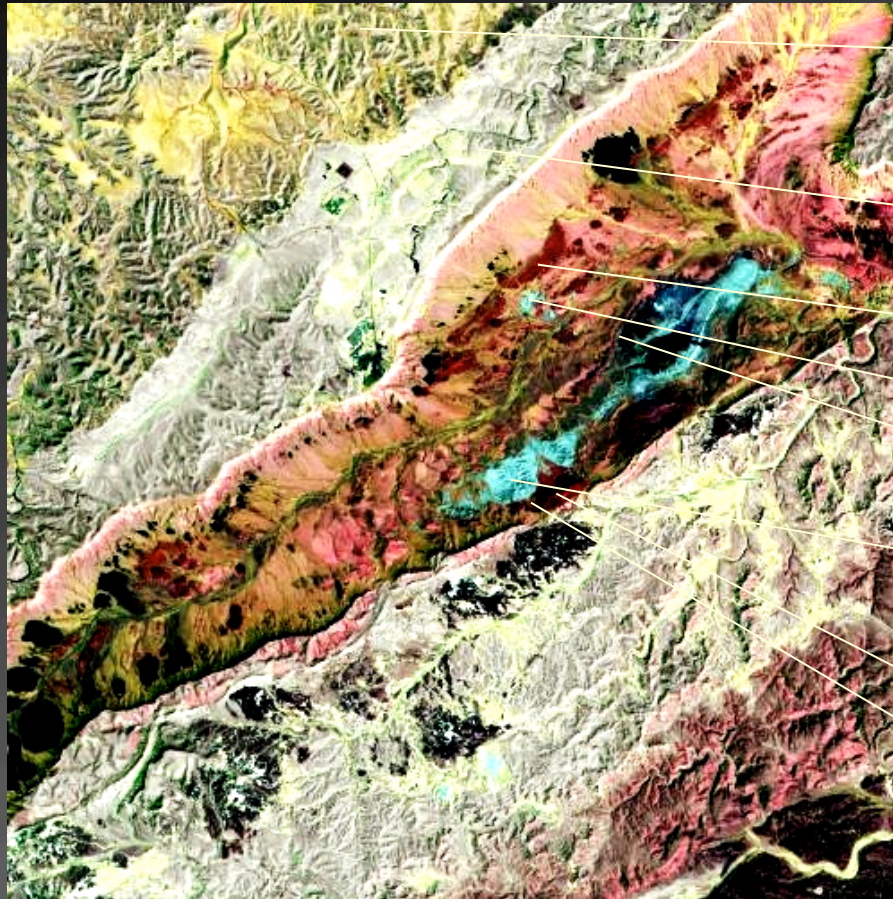
EnMAP End to End Simulator (Eetes)

Segl, K., Guanter, L., Rogass, C., Kuester, T., Roessner, S., Kaufmann, H., Sang, B., Mogulsky, V., and Hofer, S., (2012): EeteS—The EnMAP End-to-End Simulation Tool. *IEEE Journal*, **5/2**, 522-530.

Segl, K., Guanter, L., Kaufmann, H., Schubert, J., Kaiser, S., Sang, B., and Hofer, S., 2010, Simulation of spatial sensor characteristics in the context of the EnMAP hyperspectral mission. *IEEE-Transactions*, **48/7**, 3046-3054.



Landscape Simulation



Dolomite

Calcite

Goetite

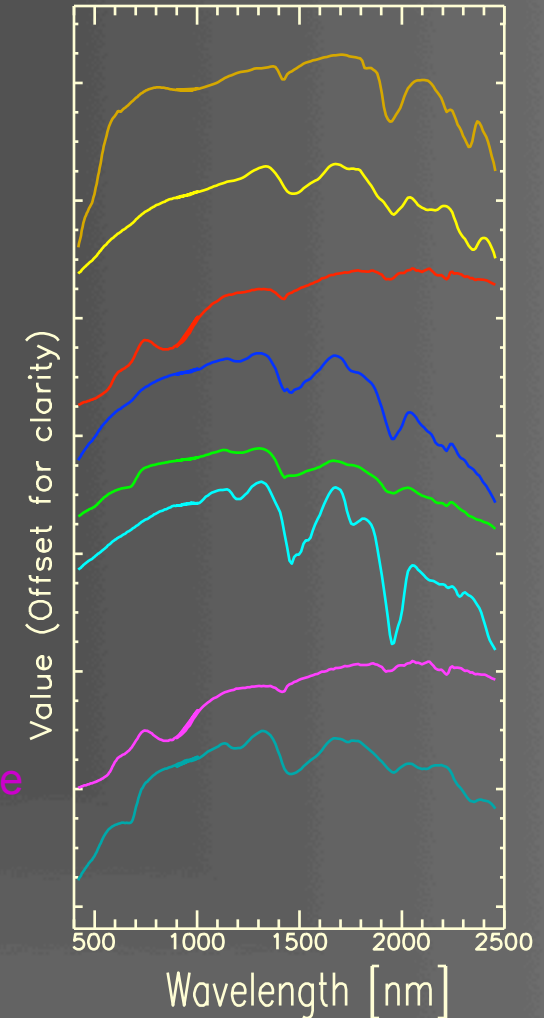
Kaolinite

Bauxite

Gypsum

Iron+Kaolinite

Chlorite



M.Ramon/Israel - RGB (2200/800/450 nm)

Guanter, L., Segl, K., and Kaufmann, H., 2009, Simulation of optical remote sensing scenes with application to the EnMAP hyperspectral mission. *IEEE-Transactions on Geoscience and Remote Sensing*, 47/7, 2340-2351.

Correction Functions conc. BRDF Issues

- Simulation of any canopy structure (e.g. row distance, plant density)
- Simulation of each growth stage
- Simulation of plant stress and disease

MATERIAL ASSIGNMENT

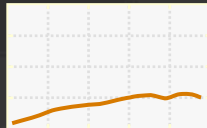
Leaf spectra



Stem spectra



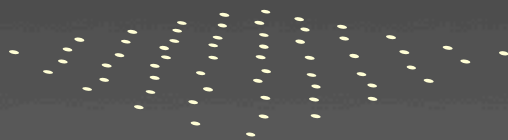
Soil spectra



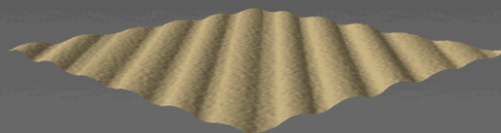
3D GEOMETRY

4D plant model

Plant positions within the canopy



3D soil surface model

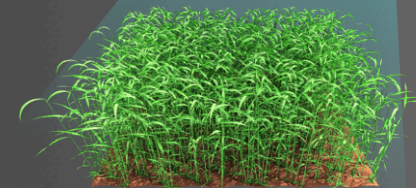


RAY TRACING

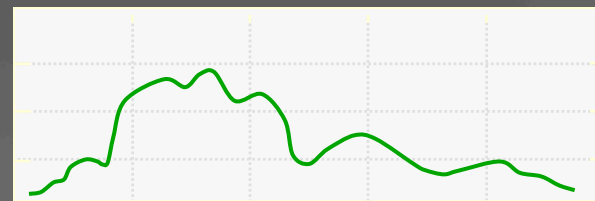
Illumination position
(azimuth, altitude)



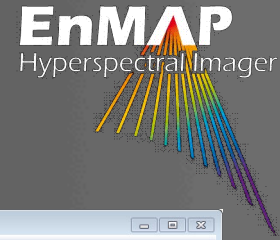
Viewing position
(azimuth, altitude)



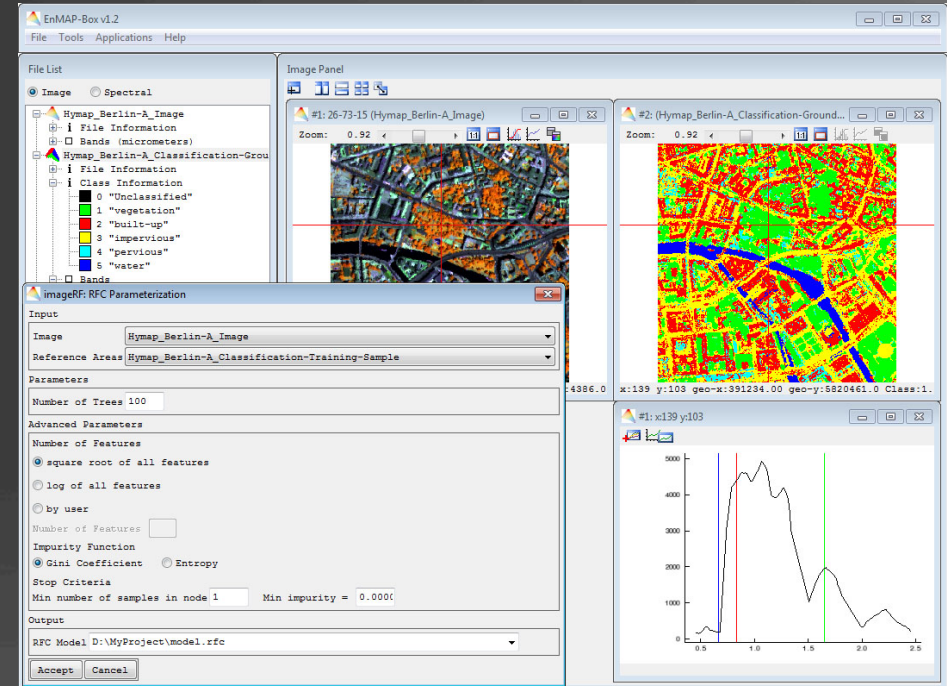
RESULTING CANOPY SPECTRUM



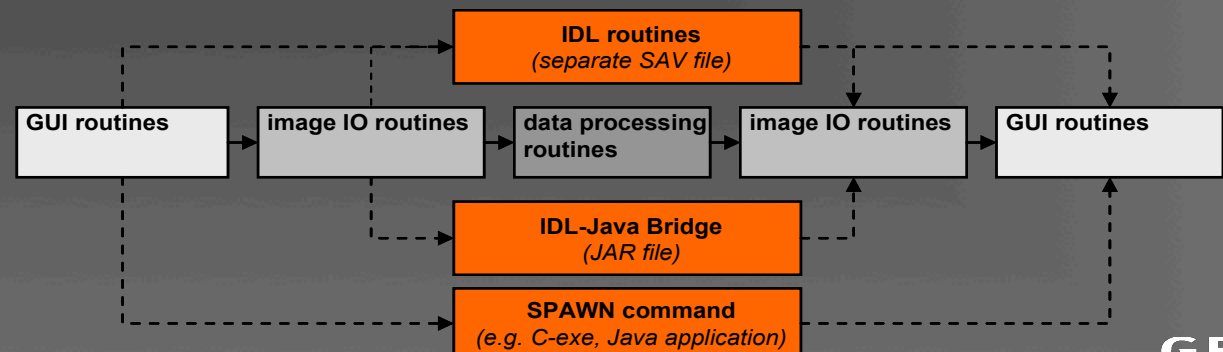
EnMAP Box



- Easy access to processing tools for hyperspectral data
 - widening user community
 - support for training courses
 - utility of state-of-the-art algorithms
- Individual preprocessing tools for EnMAP data
- Platform to test and exchange new and innovative algorithms



Humboldt Uni, 2012



Primary Data Products

Product	Processor	Comment
Level 0	Transcription	Stored in DIMS (no delivery)
Level 1	Radiance	Processing on Demand; Meta Data updated for User Proc.
Level 2geo	Georectification + Radiance	Geometric Correction
Level 2atm	Co-Registration + Reflectance	Atmospheric Correction
Level 2	Georectification + Co-Registration + Reflectance	Geometric and Atmospheric Correction

Tasks – EnMAP Core Science Team (ECST)

TASKS		2010												2011												2012											
		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
T 1	Science Plan & AO	M1SP1M2												SP2M3												M4SP3M5											
T 2	Summer Schools	S1												S2												S3											
T 3	Workshops	W1W2W3												W4												W5											
T 4	Algorithms Development	A1A2A3												A4												A5A6											

Students Program 'Young EnMAP'

Task 1: Science Plan		Task 2: Summer Schools		Task 3: Workshops		Task 4: Algorithms (Toolbox)	
M1	ECST-Project Kick-Off	S1	Summer School 1 (Trier): Hyperspectral Data Exploitation	W1	Int. WorkshopHyperspectral 2010 (Frascati, Italy)	A1	Algorithmenauswahl
M2	2. ECST Meeting			W2	Soil Workshop (GFZ)	A2	Algorithm Priorisation
M3	ECST Mid-Term Meeting	S2	Summer School 2 (Munich): Algorithms & Field Campaigns (Cal/Val)	W3	National Workshop 2010 (GFZ Potsdam)	A3	Start Implementation
M4	4. ECST Meeting			W4		A4	End Implementation
M5	ECST Final Meeting	S3	Summer School 3 (Berlin): International Pre-Launch Campaign	W5	National Workshop 2011 (GFZ Potsdam)	A5	Start Beta Testing
SP1	Science Plan 1.Release					A6	Toolbox Release & Dokumentation
SP2	Science Plan 2.Release						
SPF	Science Plan 3.Release						

Fields of Cooperation

- Science case
- Exchange of students/postdocs
- Cal/Val
 - Vicarious calibration
 - Cross-calibration with HypsIRI, HISUI, Prisma, Hypxim, Shalom, others
- Software development
- Product generation (Toolbox)
- EnMAP-II development

Gateway to EnMAP

LEO Linguee W-Online W-Radar Wassersport Wikipedia Immowelt Immoscout24 Immonet DB Bahn: Alle Infor... GFZ - Sp

Environmental Mapping and Analysis Program



Home Mission Mission elements Applications Glossary Links Contact

3rd National EnMAP User Workshop - Presentations are online

 published on 14-February-2012

The third national EnMAP workshop was held on 09th till 10th of February 2012 at the Helmholtz Centre Potsdam GFZ, Germany. The workshop was devoted to first results of the EnMAP preparatory projects. The workshop program and all presentations are now online available. The workshop language was German.

Workshop program (in German)

[Read more](#)

Young EnMAP

 published on 03-November-2011

YoungEnMAP is a group of young researchers interested in sharing ideas and experiences in the field of imaging spectroscopy. The group was founded during the first EnMAP summer school in Trier, Germany in September 2010.

[Read more](#)

EnMAP Mailing List

 published on 11-August-2011

Join the EnMAP mailing list to receive and exchange information related to the EnMAP scientific mission. Currently, about 200 people interested in EnMAP and hyperspectral remote sensing from research, administration and business are subscribed to the list. Most postings are sent in German. The EnMAP mailing list is managed by the Remote Sensing Section of the GFZ German Research Centre For Geosciences in Potsdam, Germany.

[Read more](#)

1 2 3 4 5 next >

Science

Search

Science

- Core Science Team
- Young EnMAP
- Workshops
- Training
- Projects
- Announcements
- Job announcements
- Publications
- EnMAP Mailing List

EnMAP Data

- Access
- Tools
- Data Products

Gefördert durch:



Bundesministerium
für Wirtschaft
und Technologie

aufgrund eines Beschlusses
des Deutschen Bundestages

Science

- Core Science Team
- Young EnMAP
- Workshops
- Training
- Projects
- Announcements
- Job announcements
- Publications
- EnMAP Mailing List

EnMAP Data

- Access
- Tools
- Data Products

<http://www.enmap.org/>
www.charly@gfz-potsdam.de