

ESA Technical Development Activities An Overview

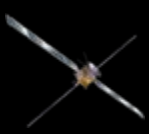
Christian Erd

EJSM Instrument Workshop
18 – 20 January 2010



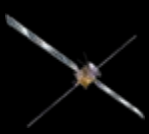
Technology Overview

- A preliminary list was compiled
- ESA activities focusing on spacecraft components
- Development of basic technology common to several instruments possible
- Soliciting input on specifications possibly to be taken into consideration
- ESA is compiling list of activities for payload development – nationally funded
 - Based in input during instrument meetings with DOI teams



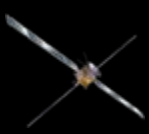
ESA Technology Development Activities

ESA Ref	Title	Budget		
		2009	2010	2011
T215-100MM	Review of Mechanism for steerable HGA in deep space mission	150		
T215-007MM	Demonstration of the deployment of a highly integrated low power ice penetrating radar antenna		600	
T201-003ED	Low mass SpaceWire	150		
C203-101EP	Solar cell LILT design optimisation and characterisation		900	
T223-021QM	Characterisation of radiation resistant materials Phase 1	500		
C223-001QM	Characterisation of radiation resistant materials Phase 2			500
T223-055QM	Materials Charging effects under extreme environments (ultra-low temperatures and high radiation fields)	250		
T222-019QC	Survey of critical components for 1 Mrad (new requirement: 150krad) power system design including delta radiation characterisation of RH power EEE components	350		
T204-041EE	Charging properties of new materials		200	
T203-005EP	1-Mrad (new requirement: 150krad) power converter/system design and prototyping			350



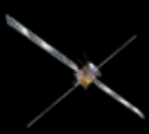
ESA Technology Development Activities

ESA Ref	Title	Budget		
		2009	2010	2011
T222-018QC	Front-end readout ASIC technology study and development test vehicles for front-end readout ASICS	625		
T222-013QC	Radiation characterisation of front-end readout ASIC		350	
T222-017QC	Radiation Tolerant analogue / mixed signal technology survey and test vehicle design	725		
T222-014QC	Radiation characterisation of RT analogue / mixed signal technology		350	
T201-004ED	DAREplus (Design Against Radiation Effects) ASICs for extremely rad hard & harsh environments	1200		
T201-002ED	Latch up protection for COTS (Commercial, off-the-shelf) digital components	150		
T222-020QC	Radiation characterisation of Laplace critical RH optocouplers, sensors and detectors	900		
T222-016QC	Radiation hard memory	800		
T204-009EE	Radiation Effects on Sensors and Technologies for Cosmic Vision SCI Missions (REST-SIM)	500		
T205-100EC	Evaluation of star tracker performance in high radiation environment	250		



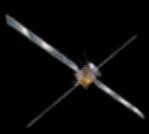
ESA Technology Development Activities

ESA Ref	Title	Budget		
		2009	2010	2011
T204-042EE	Computational tools for spacecraft electrostatic cleanliness and payload analysis	300		
G512-003EC	Precise Gravitational Modelling of Planetary Moons and NEO (Near Earth Objects) Asteroids	350		
C213-001PA	Penetrator development within framework of a Jovian moon mission Phase1	500		
C213-002PA	Penetrator development within framework of a Jovian moon mission Phase 2		800	
C213-003PA	Penetrator development within framework of a Jovian moon mission Phase 3			3700



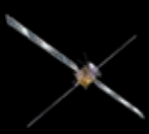
National Technology Proposals 1/5

Instrument	Acronym	Technology Development Activity
Laser Altimeter	LA	Variable laser output energy
Laser Altimeter	LA	Single-photon counting: Detection Schemes
Laser Altimeter	LA	Space qualification of single-photon counting detectors
Laser Altimeter	LA	Development of an appropriate space-qualified laser (short pulses, high peak power, high repetition rate etc.)
Submillimeter Wave sounder	SWI	Broadband tunable synthesizer
Submillimeter Wave sounder	SWI	Development of spectrometer components: ASICs for signal chirp generation and digital preprocessor
High Resolution Camera	HRC	CMOS APS detector
Magnetometer	MAG	Electronics migration to radiation hardened ASIC
Magnetometer	MAG	CDSM TRL uplift
Radio and Plasma Wave Instrument	RPWI	Prototyping different types of RWI antenna designs for later selection.
Visible & InfraRed Hyperspectral Imaging spectrometer	VIRHIS	VIS-IR Linear Variable Filter (LVF)
Visible & InfraRed Hyperspectral Imaging spectrometer	VIRHIS	Radiation hard Focal Plane Array



National Technology Proposals 2/5

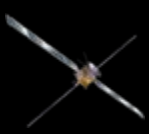
Instrument	Acronym	Technology Development Activity
ORbiter Terahertz Infrared Sounder	ORTIS	THz Quantum Cascade Laser Local Oscillator
ORbiter Terahertz Infrared Sounder	ORTIS	ORTIS THz Schottky Diode Technology
UV Imager	UVI	multi-coating for EUV reflectivity optimization
Dust Telescope	DT	Orbitrap-France
Plasma Package	PP	Fast data acquisition electronics for rad-hard environment
Plasma Package	PP	ToF system based on non-carbon foils
Penetrator Instrumentation	PEN-G	instrumentation impact survivability testing for Ganymede Penetrator
Penetrator Instrumentation	PEN-E	instrumentation impact survivability testing for Europa Penetrator
Penetrator Instrumentation	PEN-G	instrumentation radiation survivability testing for Ganymede Penetrator
Penetrator Instrumentation	PEN-E	instrumentation radiation survivability testing for Europa Penetrator



National Technology Proposals 3/5

Instrument	Acronym	Radiation testing of optical components (gratings, lenses, mirrors, coatings)
Doppler Spectro Imager	DSI	Component qualification at radiation
Laser Altimeter	LA	Radiation-hard receiver telescope
Thermal Mapper	TM	Lenses / mirrors
Thermal Mapper	TM	Mirrors
High Resolution Camera	HRC	Lenses
High Resolution Camera	HRC	Mirrors
High Resolution Camera	HRC	Optical Filters
Wide Angle Camera / Medium Res Camera	WAC/MRC	Radiation testing of glasses
Ultra Stable Oscillator	USO	USO quartz crystal radiation hardness analysis
Spectro-polarimeter for Planetary Exploration	SPEX	SPEX Environment tests for EISM: Birefringent crystals
Optical Laser Receiver**	OLR**	Optical receiver optical components radiation hardness
UV spectral mapping instrument**	USMI**	Bandpass filters testing in relevant environment

** Instrument not recommended for further study by ESA



National Technology Proposals 4/5

Instrument	Acronym	Radiation testing of detectors
Laser Altimeter	LA	Radiation-hard diode for detection of outgoing laser pulses
Thermal Mapper	TM	Detectors testing in radiation environment
High Resolution Camera	HRC	Hybrid SiPIN CMOS detector
High Resolution Camera	HRC	CMOS APS detector
High Resolution Camera	HRC	Environmental Verification of detector Assembly
Spectro-olarimeter for Planetary Exploration	SPEX	SPEX Environment tests for EJSM: Detector
UV spectral mapping instrument**	USMI**	Detectorhead tests in relevant environment
		FPGS, ASIC & electronics radiation testing
Laser Altimeter	LA	Radiation-hard start/rangefinder electronics
High Resolution Camera	HRC	Power Conditioning
Radio and Plasma Wave Instrument	RPWI	Development of radiation hard low noise and low distortion pre-amplifiers for LP-PWI and RWI sensors.
Optical Laser Receiver**	OLR**	Signal Processing FPGA radiation hardness

** Instrument not recommended for further study by ESA



National Technology Proposals 5/5

Instrument	Acronym	Radiation testing of optical glues, cements and coatings
Laser Altimeter	LA	Radiation-hard optical coatings (laser)
Thermal Mapper	TM	Optical Coatings
Thermal Mapper	TM	External Coatings
High Resolution Camera	HRC	Coatings
Wide Angle Camera / Medium Res Camera	WAC/MRC	Stability of baffle coatings under radiation
Wide Angle Camera / Medium Res Camera	WAC/MRC	Radiation testing of epoxies and optical cements
		Radiation testing of mechanical elements
Plasma Package	PP	Radiation effects on entrance gratings
Plasma Package	PP	Shutter for rad-hard environment
High Resolution Camera	HRC	Filter wheel