Calibrazione ottica e metrologica dello spettrografo per la missione Solar-C EUVST

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Admission to PhD course - 27/10/2021

Solar-C_EUVST

Extreme UltraViolet High-Throughput Spectroscopic Telescope

JAXA M-class mission

International partecipation

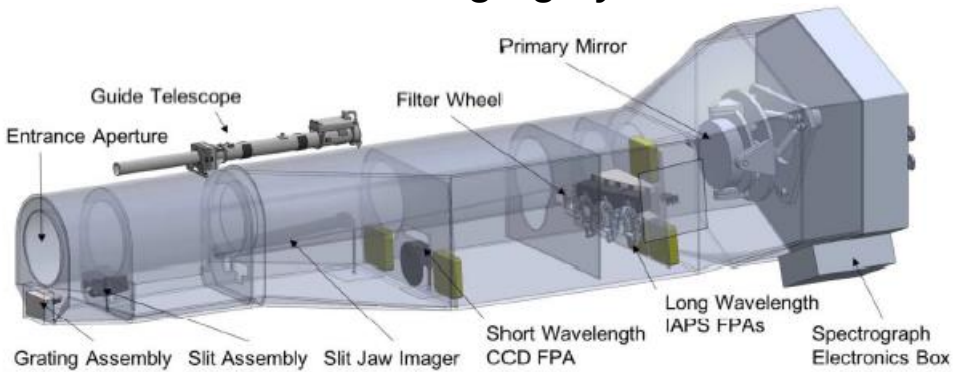
Purpose: to understand

- Formation of solar atmosphere and solar wind
- Instabilities of the solar atmosphere

Il telescopio

Primary instrumentations:

- EUV spectrometer
- Slit-Jaw imaging system



Observe all temperature regimes

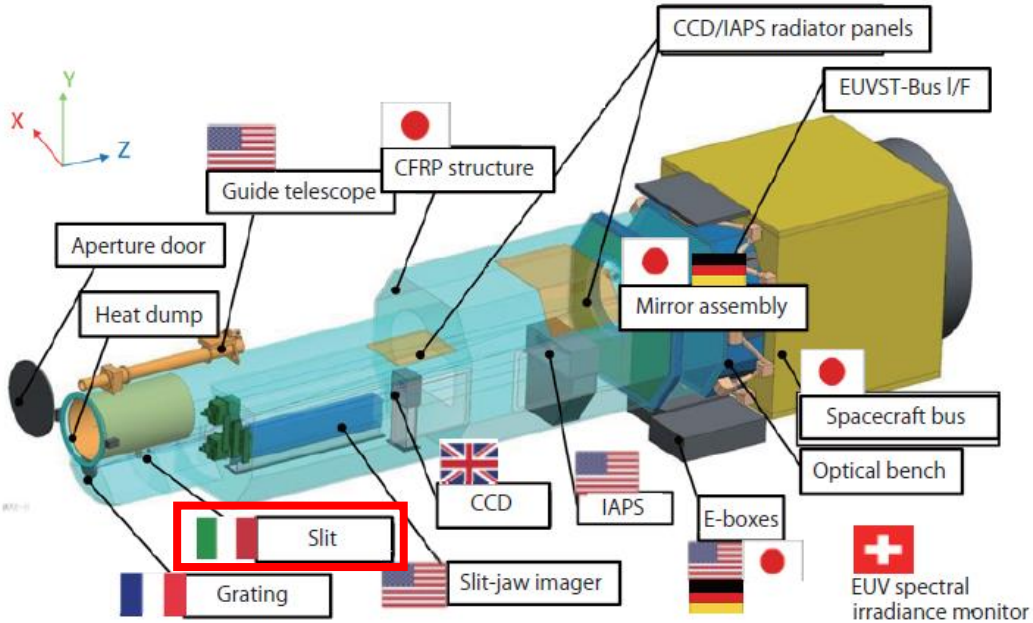
Track the evolution of the elemental structures of the atmosphere

Spectroscopic analysis of the dynamics of elementary process

The Italian contribution

INAF (Istituto Nazionale di Astrofisica) is responsible of the realization of the Slit Assembly

CNR-IFN will perform the calibration of the Slit Assembly



The Slit Assembly

Slit Assembly

Limit the light entering the imaging spectrograph

Reflect light onto the Slit-Jaw Imager

- 4 scientific slits
- 1 calibration slit
- 1 circular aperture
- Stop position
- 1 pinhole

Positioner: two linear translators (piezo-actuator)

Redundancy and efficiency

Research activities

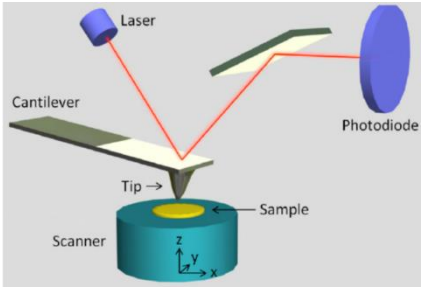
CNR-IFN has to optically and metrologically calibrate the Slit Assembly

- Preparation of the instrumentations needed to perform the measurements
- Metrological characterization of the slits and the substrate
- Morphological characterization of the slits and the substrate
- Reflectivity test of the substrate
- Calibration of the mechanism: repeatability, linearity, life test, hysteresis, characterization of the uncertainties

Research activities

Metrological characterization of the slits and the substrate

AFM (Atomic Force Microscope)



Analysis of microroughness

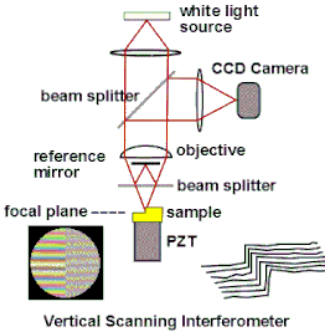
Optical microscope

Analysis of surface roughness
Shape of the slits

Research activities

Morphological characterization of the substrate

Interferometer



Analysis of substrate planarity and thermal deformation

Reflectivity test of the substrate

- Reflectometer UV-vis → Reflectivity test in UV-vis band
- FTIR spectrometer → Reflectivity test in IR band

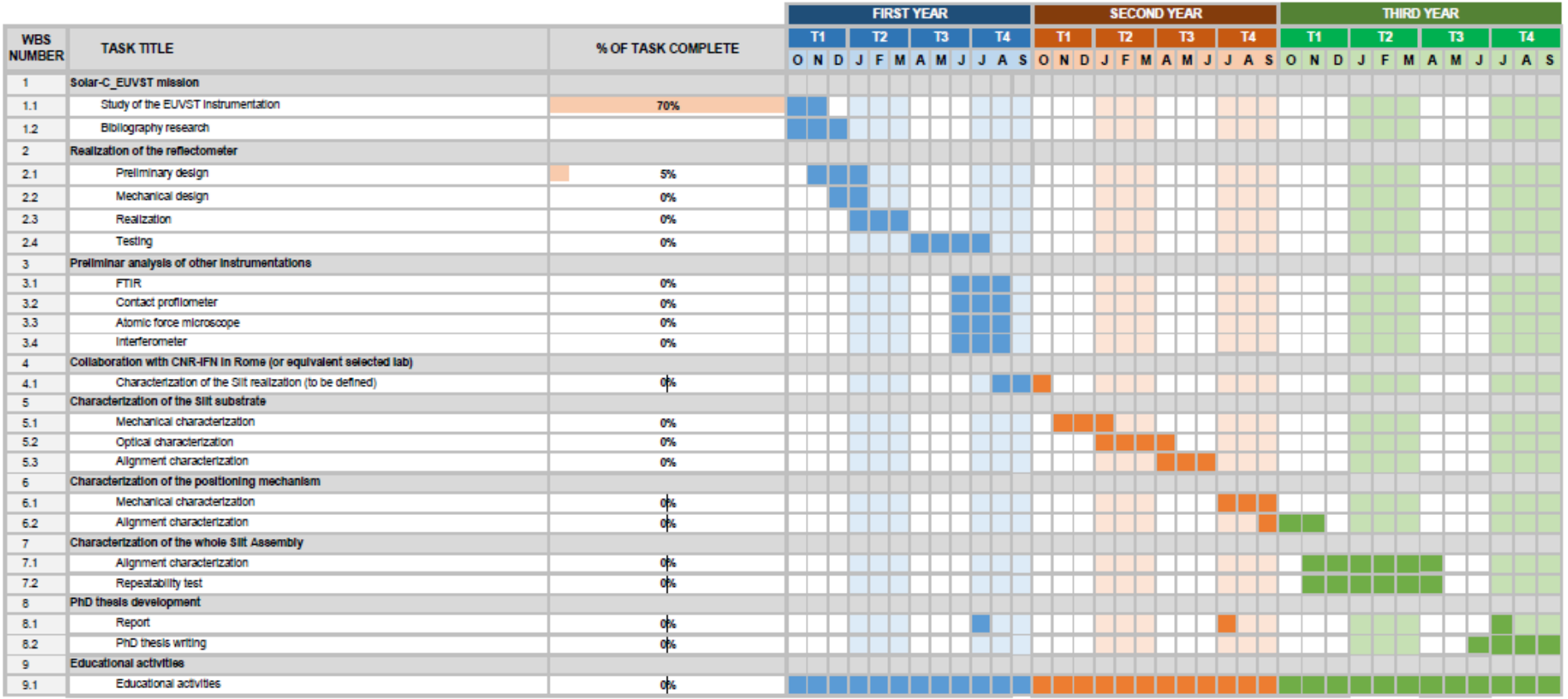
Research activities II

- Test of the instrumentation: sample test and broadband characterization of coatings (UV, vis, IR)

- Collaboration with the selected lab during the electron beam litography process: slits alignment, slits shape

- Collaboration with the selected industry during the realization/testing of the Slit Assembly: calibration of the mechanism (repeatability, linearity, life test, hysteresis, characterization of the uncertainties)

Gannt-bar chart



WBS NUMBER	TASK TITLE	% OF TASK COMPLETE
1	**Solar-C_EUVST mission**	
1.1	Study of the EUVST instrumentation	70%
1.2	Bibliography research	
2	**Realization of the reflectometer**	
2.1	Preliminary design	5%
2.2	Mechanical design	0%
2.3	Realization	0%
2.4	Testing	0%
3	**Preliminar analysis of other instrumentations**	
3.1	FTIR	0%
3.2	Contact profilometer	0%
3.3	Atomic force microscope	0%
3.4	Interferometer	0%
4	**Collaboration with CNR-IFN in Rome (or equivalent selected lab)**	
4.1	Characterization of the Slit realization (to be defined)	0%
5	**Characterization of the Slit substrate**	
5.1	Mechanical characterization	0%
5.2	Optical characterization	0%
5.3	Alignment characterization	0%
6	**Characterization of the positioning mechanism**	
6.1	Mechanical characterization	0%
6.2	Alignment characterization	0%
7	**Characterization of the whole Slit Assembly**	
7.1	Alignment characterization	0%
7.2	Repeatability test	0%
8	**PhD thesis development**	
8.1	Report	0%
8.2	PhD thesis writing	0%
9	**Educational activities**	
9.1	Educational activities	0%

Activities for unexpected delays

- Collaboration in research activities at CNR-IFN lab, especially characterization of optical space elements operating in the UV and visible band
- Collaboration in the research activities about deformable grating and satellite instrumentation for the EUV observation
- Study of the reflectivity of mirror coatings in the UV band

Thanks for the attention