

Context

Within the EUCLID mission, SILIOS supplies to the Laboratoire of Astrophysics of Marseille (LAM), several large gratings to be integrated in the spectrometer and photometer NISP instrument.

What is the EUCLID mission ?

EUCLID is an ESA astronomy and astrophysics space mission.

The Euclid mission aims at understanding why the expansion of the Universe is accelerating and what is the nature of the source responsible for this acceleration which physicists refer to as dark energy.

The EUCLID launch is planned for 2020. The satellite will be launched by a Soyuz ST-2.1B rocket and then travel to the L2 Sun-Earth Lagrangian point for a 6 years mission.

Euclid will be equipped with a 1.2 m diameter Silicon Carbide (SiC) mirror telescope feeding 2 instruments, VIS and NISP : a high quality panoramic visible imager (VIS), a near infrared spectrometer and photometer (NISP).

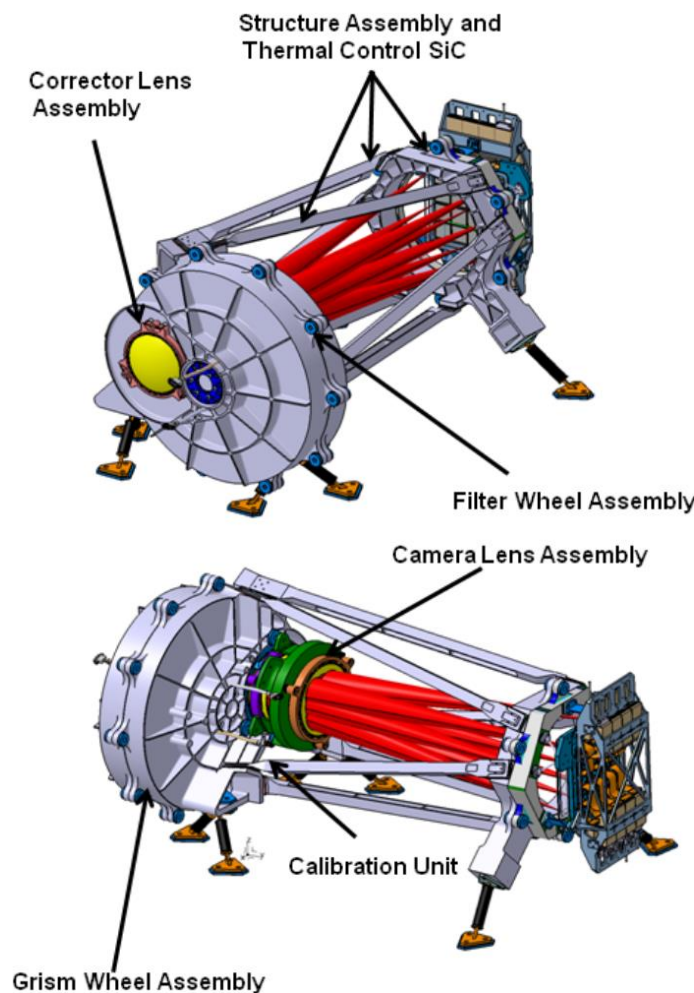
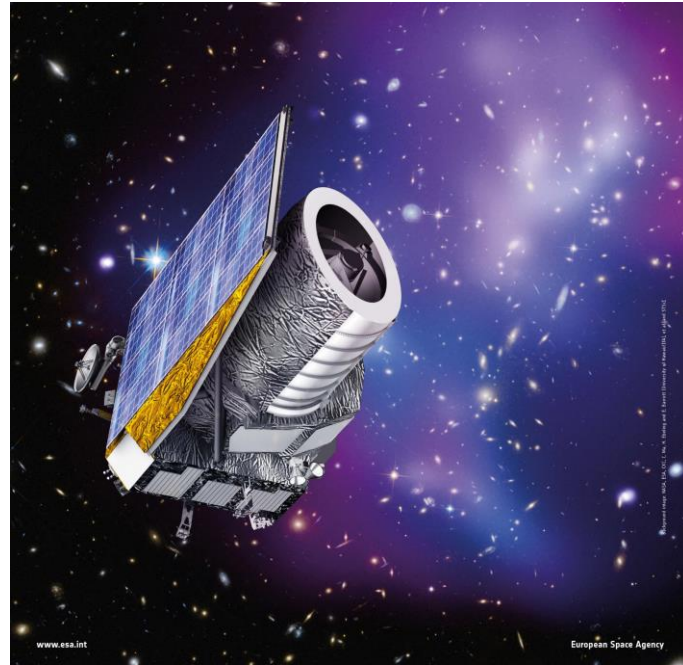
What is the NISP instrument ?

The NISP instrument aims at providing near infrared (between 1000 and 2300 nm) photometry of all galaxies observed also with VIS and near infrared low resolution spectra and redshifts of millions galaxies.

The NISP focal plane is composed of a matrix of 4x4 2000x2000 detectors covering a field of view of 0.53 deg² share with VIS. The photometric channel will be equipped with 3 broad band filters (Y, J and H) with a mean image quality of about 0.3 arc-second.

The spectroscopic channel will be equipped with 4 different low resolution near infrared gratings, 3 "red" (1250 nm – 1850 nm) and 1 "blue" (920 nm – 1250 nm), but no slit ("slitless spectroscopy").

The three red gratings will cover the same wavelength range but will provide spectra with three different orientations in order to decontaminate each slitless spectrum from possible overlapping spectra of other sources in the field.



What is a GRISM ?

A **grism** (also called a **grating prism**) is a combination of a prism and grating arranged so that light at a chosen central wavelength passes straight through.

The advantage of this arrangement is that one and the same camera can be used for both imaging (without the grism) and spectroscopy (with the grism) without having to be moved. Grisms are inserted into a camera beam that is already collimated.

They create a dispersed spectrum centered on the object's location in the camera's field of view.

What does SILIOS do ?

SILIOS pushed its manufacturing limits.

During an R&D period of 2 years, SILIOS adapted its equipment and processes to be able to manufacture uniform gratings onto 150mm diameter substrates.

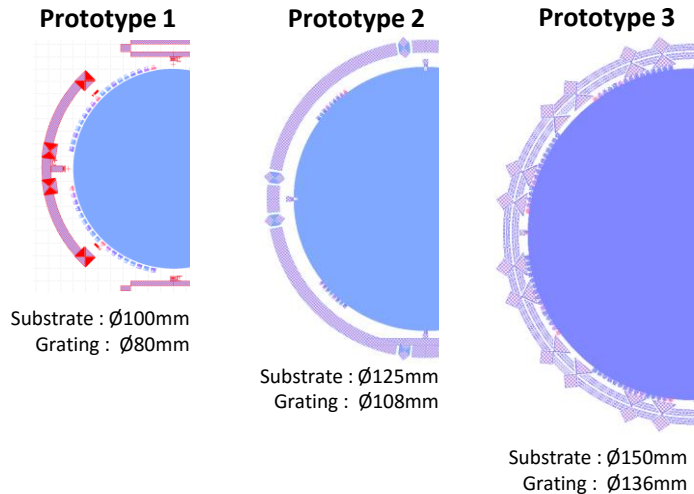
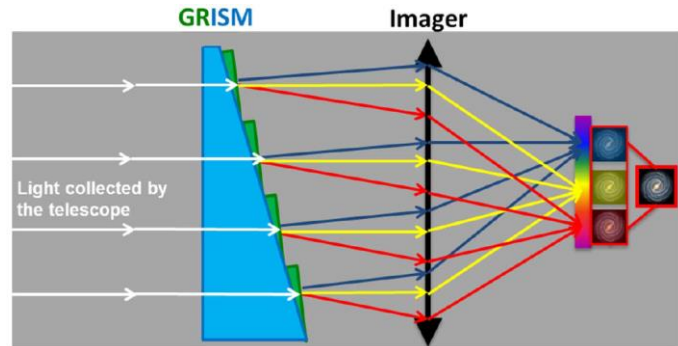
SILIOS manufactures resin-free blazed and curved gratings.

The gratings are manufactured using cumulative etching method onto fused silica substrates. The component are resin-free, only composed of fused silica.

SILIOS supply uniform and high efficiency gratings.

SILIOS' technology allows manufacturing and supplying very high optical performances onto large gratings (>80% transmitted efficiency, <30nm RMS wavefront error, groove shape and roughness very close to theory and uniform over the useful aperture) [1].

[1] Amandine Caillat; Sandrine Pascal; Stéphane Tisserand; Kjetil Dohlen; Robert Grange; Vincent Sauget; Sophie Gautier, *Bulk silica transmission grating made by reactive ion etching for NIR space instruments*, Proc. SPIE 9151, Advances in Optical and Mechanical Technologies for Telescopes and Instrumentation, 91511F (August 7, 2014).



D136mm Grating on a D150mm Suprasil Substrate