4. **Thermal-optical design and preliminary simulation for the ETRUSCO-2 GNSS Retroreflector Array (15:00-15:15)**

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Measurements performed at the SCF_LAB for the ETRUSCO projects, along with others, were a major background and input to the following ETRUSCO-2 ASI-INFN R&D project, whose goals include the development and measurement of a full size array of retroreflectors to be used on GNSS constellations and the construction of a new characterization facility, the SCF-G, optimized for the test of a GRA (GNSS Retroreflector Array). GRA design is intended to enhance performance in orbit of retroreflector arrays in three critical aspects:

- Low thermal exchange between the retroreflectors and the array baseplate
- Minimize array signature for all the laser inclinations
- Minimize optical performance degradation

Here we report preliminary concurrent thermal and optical simulations of the array performed with two different softwares: Thermal Desktop and CODEV. Optical simulations with CODEV were essential to determine the basic characteristics of the GRA to be realized for the project. In Thermal Desktop a finite element model of a single retroreflector was defined. We simulated in TD a critical orbit of Galileo, GNSS Critical half-Orbit (GCO), which is the one whose angular momentum is orthogonal the Sun-Earth direction. The output was the temperature distribution inside all of the CCRs at each time step of the orbit, which was eventually converted into an axial-radial gradient of temperature inside the CCRs. Those thermal gradients were input to the CODEV optical model of the array to plot the resulting FFDP at each time step. Intensity variation at the VA of 24 μrad was then plotted for the entire orbit. Results showed some distinct differences from the real Galileo CCR, thanks to the thermally optimized mounting scheme implemented in Thermal Desktop, inherited from the LAGEOS satellite CCRs. These simulations, along with SCF measurements, will help the optimization of the GRA (one of the main products of ETRUSCO-2) to reduce the thermal degradation of the optical response (FFDP) in orbit. A good optimization process for these payloads is fundamental in order to deeply exploit the contribution of SLR tracking of GNSS satellites: increased satellite positioning accuracy, absolute positioning of GNSS satellites with respect to the ITRF (International Terrestrial Reference Frame), better orbital modeling and more accurate time transfer.