# Testing the nanoflare model in coronal loops


## *Susanna Parenti[1], Jean-Claude Vial[2]*

[1]Royal Observatory of Belgium, Be
[2]Institut d'Astrophysique Spatial, CNRS-Université Paris Sud, Fr

**Contact**: [sparenti@oma.be]


The heating of the solar corona by nanoflares (Parker, 1998), is becoming one of the more promising models. One possible way to test such model is by investigating at high resolution the statistical distributions of lines intensity and thermal energies in loops, as a response to the heating injection. The most recent investigations in loops have shown that lines formed at very high temperatures (> 4 MK) are probably the most appropriate tools to correctly study such impulsive events (e.g Parenti et al. 2006, Patsourakos & Klimchuk 2006).
Solar Orbiter, through EUS, will provide lines profiles over the highest spatial resolution ever obtained. This will allow to investigate the dynamics and intensity fluctuations over spatial scales before inaccessible.

## *EUS instrument requirements*

### 1. Emission line requirements

Compatibly with other science case the bands 7a and 7b are of primary importance. Here we find first and second order coronal lines: Ar XII 1018 (2.5 MK), Fe X 1028 (1MK), Mg X (1.2 MK) 609.8, 624.95, Fe XII 1241.5 (1.2 MK), Si XII 499.4 Å, 520.7 Å (if the window can be extended a bit), Ne IX 1248.1 (2 MK), .
Flares lines: Ca XIV 943.5 (3 MK), Fe XVIII 974.8 (6.3 MK), Fe XIX 592.3 (6.9 MK), Cr XX 1205.8 (10 MK).
With this temperature coverage it will be possible to study the distribution of the plasma in temperature.
These bands will be complementary to the wavebands of Solar-B.
Band 1 will also suit the requirements.

### 2. Spectral resolution requirements

It is necessary to resolve the line profiles in order to study their widths and deblend the superposition between first and second order lines.

### 3. Spatial coverage

Il would be necessary to cover a full loop length and eventually a full active region. But the higher spatial resolution is essential to detect the unresolved loop fine scale.

### 4. Time resolution (incl. count rates)

High cadence is not a priority here. The hottest lines in these bands are not very intense. We are more interested in detecting them.

**5. Requirements for other instruments**

Essential are the contributions from EUI images Fe X/XI 174 (1.5 MK), Fe XVI 334 (7 MK) or Fe XXII 132.9 (12 MK).

**6. Other requirements**

## *Relation to Solar Orbiter science goals*

**1. Determine the properties, dynamics and interactions of plasma, fields and particles in the near-Sun heliosphere**

N/A

**2. Investigate the links between the solar surface, corona and inner heliosphere**

N/A

**3. Explore, at all latitudes, the energetics, dynamics and fine-scale structure of the Sun's magnetized atmosphere**

The high resolution images of TRACE has evidenced that the elemental structure of loops may be not resolved yet. SOHO/SUMER high spectral and spatial resolutions instrument has shown that the corona is highly dynamic at small spatial scales and at all temperatures. A detailed map in temperature of the plasma, together with measurements of plasma motion of the spatial fine scales are extremely important for the constraints of heating models.

**4. Probe the solar dynamo by observing the Sun's high-latitude field, flows and seismic waves**

N/A