

The CUBesat Solar Polarimeter (CUSP) mission overview

International X-ray POlarimetry Symposium

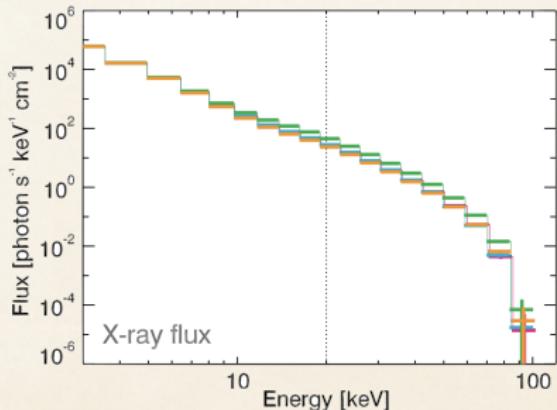
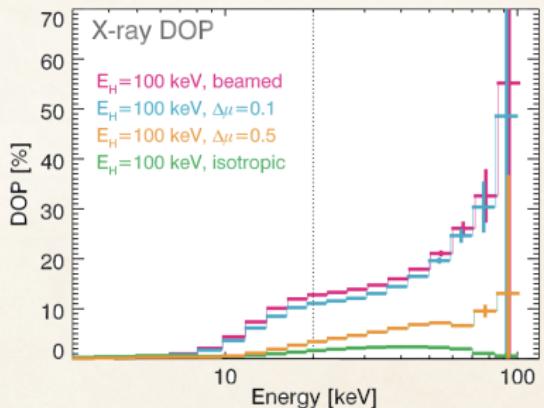
Huntsville, USA – 17th September 2024

Nicolas De Angelis – nicolas.deangelis@inaf.it

INAF-IAPS, Rome, Italy



- Solar Flares energy spectrum in the X-rays is dominated by:
 - **thermal Bremsstrahlung** (due to plasma heating, expected weakly polarized by Emslie & Brown 1980) + emission lines <10 keV
 - **non-thermal Bremsstrahlung** (at the loop top and footprints, due to particle acceleration along magnetic field lines) expected highly polarized (Zharkova+ 2010) >10-20 keV
- X-ray linear **polarimetry** would allow to **disentangle degeneracies** in models of particle beaming and magnetic field structure



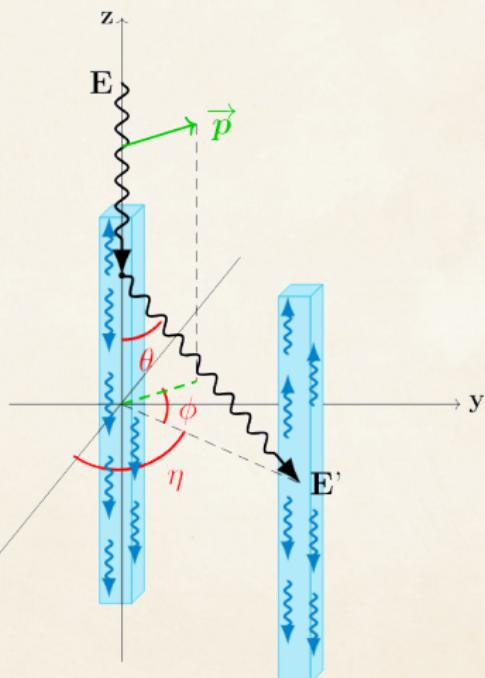
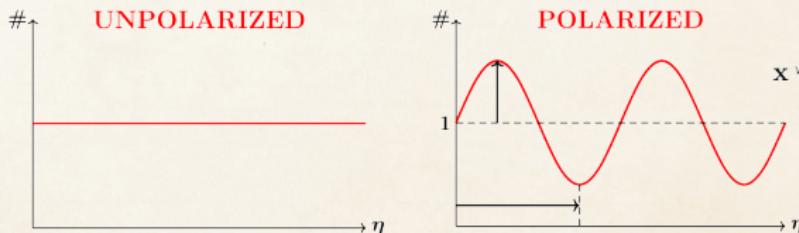
Jeffrey+ 2020 (A&A)

Compton scattering can be used to determine the polarization of a source:

- Azimuthal scattering angle distribution provides information on PD and PA
- Modulation curve parameterized by the Klein-Nishina cross-section:

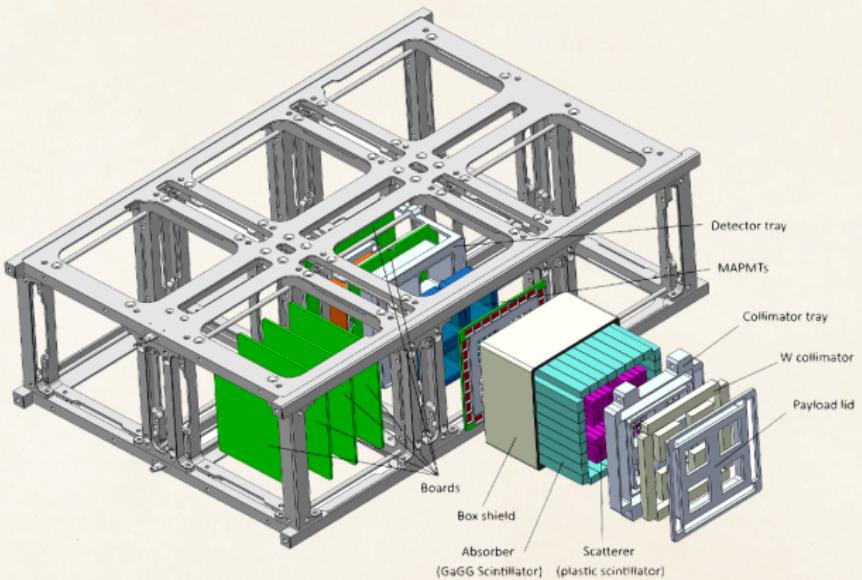
$$\frac{d\sigma}{d\Omega} = \frac{r_e^2}{2} \left(\frac{E'}{E} \right)^2 \left[\frac{E'}{E} + \frac{E}{E'} - 2 \sin^2(\theta) \cos^2(\phi) \right]$$

- Relative amplitude \leftrightarrow PD, phase \leftrightarrow PA
- A segmented array of scintillators can be used to measure the scattering angle distribution (aka modulation curve)

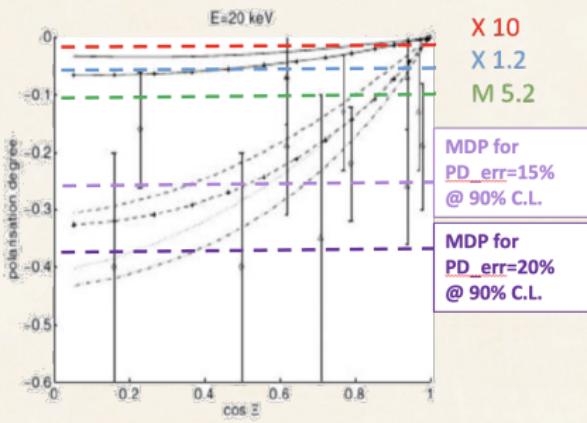
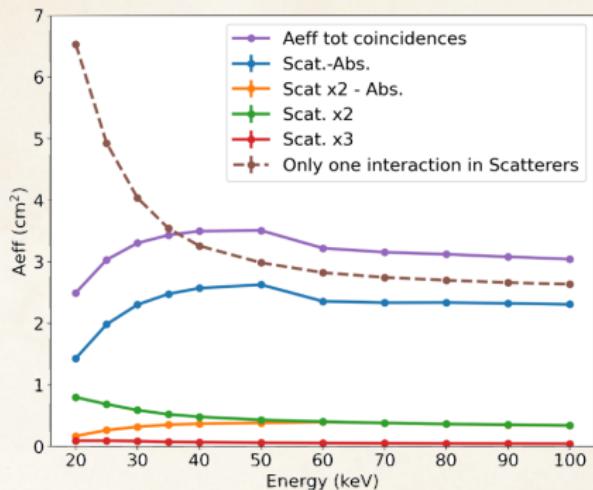


The CUSP mission

Two CubeSats (6U) constellation, phase B starting this week for 12 months.



CUSP scientific performances



adapted from Zharkova+2010 A&A

Flare Class	Integration Time (s)	MDP _{99%} in the 25-100 keV range (%)
M5.2	284	10.2
X1.2	240	5.9
X10	351	1.1