

## Abstract

One of the fundamental issues in astrophysical cosmology is to understand the formation and evolution of structures on various scales from the early Universe up to present time. **EDGE will trace the cosmic history of the baryons** by measuring three tracers of cosmic structures:

## Cosmic filaments

- Detect the largest reservoir of baryons from  $z \sim 1$  to the present time, predicted to reside in the Warm-Hot Intergalactic Medium (WHIM) by measuring densities down to  $10^{-5} \text{ cm}^{-3}$  ( $\sim 30$  times smaller than currently probed within clusters of galaxies)
- Place constraints on the interplay between diffuse baryons and star formation

## Clusters of galaxies

- Trace the evolution and physics of clusters out to their formation epoch ( $z > 1$ )
- Measure the thermodynamical and chemical properties of a fair sample out to the virial radius, a fundamental step to qualify clusters as cosmological probes and for constraining their evolution through the link with the WHIM

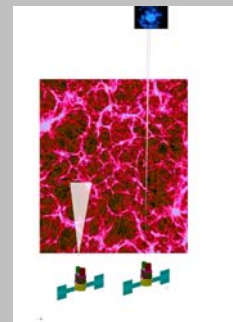
## Gamma-Ray Bursts

- Study the evolution of massive star formation using Gamma-Ray Bursts (GRBs) to trace their explosions back to the early epochs of the Universe ( $z > 6$ )
- Measure the metals in the host galaxies of GRBs and the explosive enrichment in their close environment out to  $z > 6$

## Method

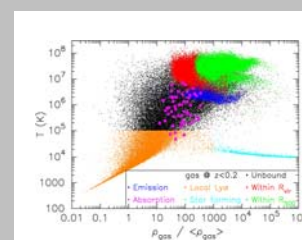
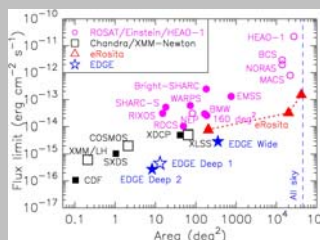
EDGE will trace the low density regime in two complementary ways:

- Using GRBs as backlight to detect faint filaments in absorption (150 GRB/year with flux  $10^{-6}$  erg/cm<sup>2</sup> in 15-150 keV band)
- Using high spectral and angular resolution instruments to image faint emission



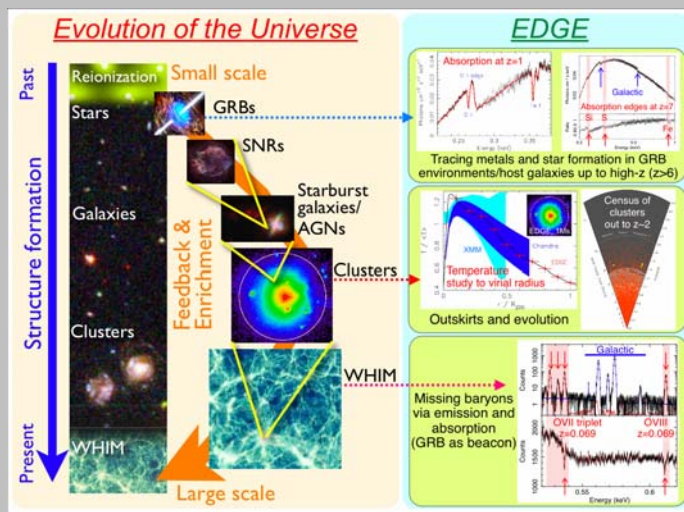
### Sensitivity

- flux limit  $< 10^{-15}$  erg/cm<sup>2</sup>/s for deep observations (1 Ms)
- measurement of overdensities down to 30-60



## Mission profile

- *WFSpectrometer*: high spectral resolution X-ray imaging (wide field spectrometer with a calorimeter and 2/4 fold reflecting mirrors)
- *WFIImager*: high angular resolution with high contrast and low background (wide-field imager using polynomial optics and CCDs)
- *WFMonitor* and *GRB detector*: wide sky ( $\sim 3$  sr) monitoring to find GRBs (using coded mask and scintillator detectors) to detect transient sources
- Fast repointing ( $< 60^\circ$  in 60 sec for 85% of the cases)
- Medium sized satellite (2200 kg, low Earth orbit)



Warm-Hot  
Intergalactic Medium

- Measure lowest density absorbers in absorption (scales with  $\rho$ )
- Produce morphology of the WHIM by detection of OVII and OVIII lines in emission (scales with  $\rho^2$ )
- Study physical conditions

