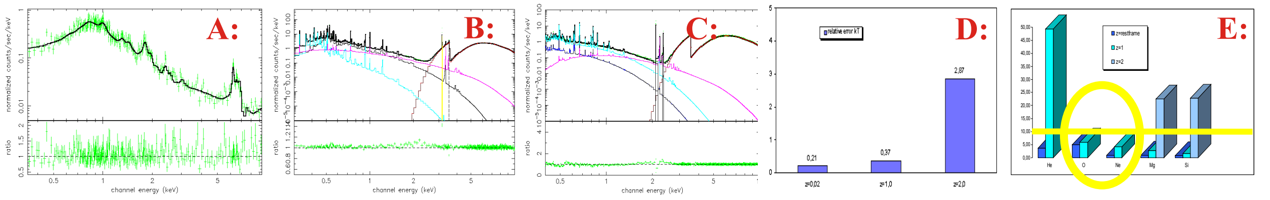
XEUS: X-ray photoionized plasma diagnostics modelling

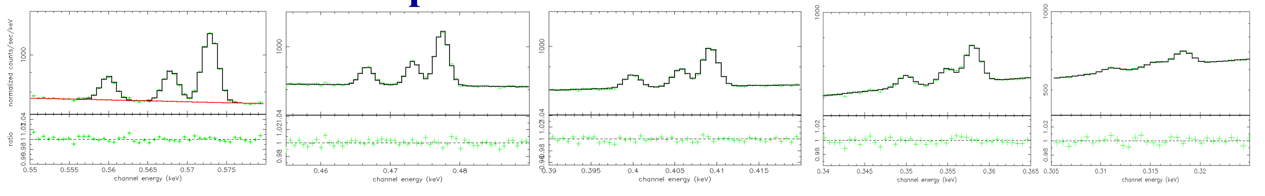
To demonstrate the XEUS capabilities for determining the properties of X-ray photoionized plasma parameters in AGN, detailed WFI and NFI simulation have been performed. One of the most important and challenging goals of XEUS is to precisely measure the plasma temperatures, element abundances as well as Broad-Line Region temperatures and densities from He-like triplets. It is demonstrated that even for the brightest objects some parameters remain unconstrained in the simulations.

The NGC 6240 case

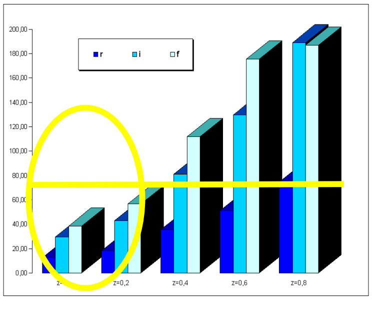


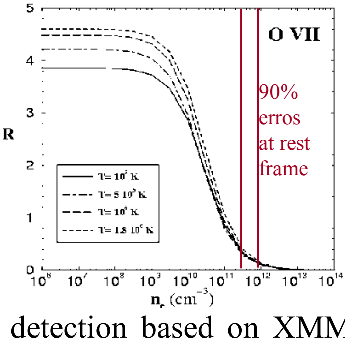
A: XMM-Newton spectrum of NGC 6240. Three plasma temperatures (0.6, 1.2, 5.6 keV) are constrained with a relative error of about 5%, while the element abundances remain unconstrained. **B:** and **C:** show XEUS WFI 100 ks simulations at z=1 and z=2. The temperatures **D**: are constrained by about 3% at z=2. The element abundances are only constrained for He, O, Ne, Mg, and Si in the rest frame **E:**. At z=1 only O, Ne, Mg, and Si are constrained by about 10%. At z=2 only O, and Ne can be measured below the 10% error.

He-like triplet simulations: The Mrk 110 case



XEUS 100 ks NFI simulations for a partially photoionized plasma for the He-like O VII line ratios for the resonance (r), intercombination (i), and forbidden lines (f). The simulations are based on the brightest NLS1 galaxy Mrk 110 as observed with XMM-Newton. From left to right, the NFI simulations increase from redshifts of z=0.0, 0.2, 0.4, 0.6, to 0.8.





Relative errors (left) for the r, f, and i lines as a function of z. Only the R value is constrained in the rest frame, resulting to an electron density of (3-8)$\cdot 10^{11}$ cm^{-3} (Right: Porquet, Dubau 2000), consistent with the results of Schulz et al 08. The G value (Temperature) remains unconstrained even for the brightest O VII detection based on XMM-Newton. A factor of about 10 longer XMM-Newton observations are required to constrain the T and element abundances as well as other He-like triptles, e.g. C V, Ne IX, N VI, Mg XI, and SIX III. XEUS is required to disentangle and to finally understand the underlying physics.

Thomas Boller