Abstract: We present the X-ray properties of a complete and well-defined sample of 24 high-z (z=4-5.5) blazar candidates selected from the CLASS radio survey. After completing the existing archival data (Swift-XRT, Chandra and XMM-Newton) with dedicated Swift-XRT observations, we identified the bona-fide blazars based on the X-ray luminosity (compared to the optical one) and flatness of the X-ray spectrum. We then compared their X-ray to Microwave Background ratios with those of a sample of confirmed blazars at lower redshifts (z=1.1), finding a significant difference in the two populations. We interpret this redshift-dependent evolution of the X-ray-to-radio luminosity ratios due to the interaction of the electrons within an extended part of the jet with the Cosmic Microwave Background photons (see Ighina et al., 2019 for more details).

Blazars can be identified thanks to their flat X-ray spectral indices and intense X-ray emission (when compared to the optical ones, e.g. Giommi et al., 2019). As examples, we report here the Spectral Energy Distribution (SED) of two sources in the CLASS sample. The red region represents the expected X-ray emission from the X-ray coronal for radio-quiet (RQ) AGNs with the same optical luminosity of the blazar candidate (Steffen et al., 2006), the slope is assumed to be $f=1.97$ ($\alpha_s$=0.97, Shemmer et al. 2005). The slope of the continuous green line is given by $1-\alpha_x$, where the $\alpha_x$ index measure the relative intensity of the X-ray/optical emission:

$$\alpha_x = -0.3026 \frac{\log_{10} L_{\text{X-ray}}}{\log_{10} L_{\text{radio}}}$$

- On the left, a good example of bona-fide blazar, with an X-ray emission flattener [i.e. smaller value of photon index] and stronger than the one expected from a RQ AGN.
- On the right, the X-ray emission consistent with the one expected from the corona, indicating a non-blazar nature.

Comparison of the X-Ray Radio luminosity ratio of the confirmed blazars in the CLASS sample with a well-defined radio selected sample of blazars at lower redshift (z=1.1) with an almost complete X-ray data (see Ighina et al., 2019 for more details on the selection). CLASS sources have an average X-ray-to-radio ratio 2.4 (0.5) higher than blazars at lower redshift. The difference can be tentatively interpreted as due to the interaction of the electrons in an extended region of the jet through inverse Compton with the photon of the Cosmic Microwave Background (CMB), see e.g. Wu et al 2013 and Zhu et al. 2019. We expect the X-ray emission produced by this process to increase with redshift as the energy density of the CMB: $L_x/L_B \propto (1+z)$.

Conclusions:

• From our X-ray analysis we confirmed the blazar nature of 21 CLASS sources, whereas the remaining 3 are too faint to be blazars (VLBI observations are under way in order to strengthen this classification).
• A redshift-dependent evolution of the X-ray emission could be interpreted as the interaction of the relativistic jet with the photons of the CMB. We are now evaluating whether this model can explain the discrepancy recently observed between the Cosmological properties of X-ray and radio selected samples of blazars (see Caccianiga et al. 2019).