The most distant cluster of galaxies ever detected ?

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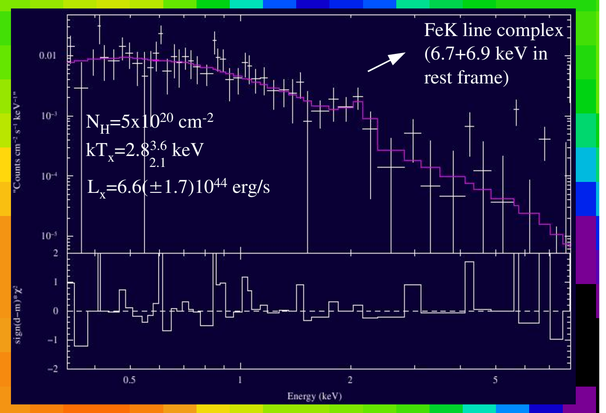
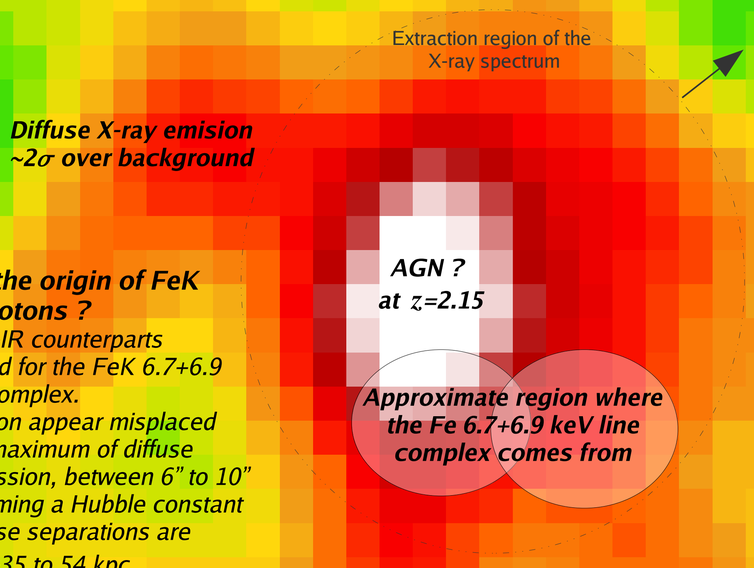
ABSTRACT:

- We investigate the nature of an extended X-ray source serendipitously discovered by the use of a 38 ks off-axis XMM-Newton observation.
- Its central X-ray emission is most likely due to an AGN, while the faint and extended X-ray morphology can be possibly interpreted as ICM.
- No clear optical and near-IR counterpart of the X-ray source is detected in deep images available.
- X-ray spectrum shows a clear signature of the FeK$_\alpha$ line complex [6.7+6.9 keV in rest frame], redshifted at the energy of 2.1keV: z~2.15±0.08 !
- A double-peak of FeK$_\alpha$ emission was found, but displaced from the maximum of the extended 0.3-12 keV emission.
- Total X-ray spectrum (AGN+ICM) was fitted to a temperature kT$_x$~2.8 ±0.7 keV., while diffuse X-ray spectrum (ICM alone) seems to be characterized by a similar, but lower value, kT$_{gas}$~2.2±1.1 keV.

If the nature of the object is confirmed as a cluster of galaxies, it would constitute the highest z-detection from ICM, with an invaluable impact for cosmology.





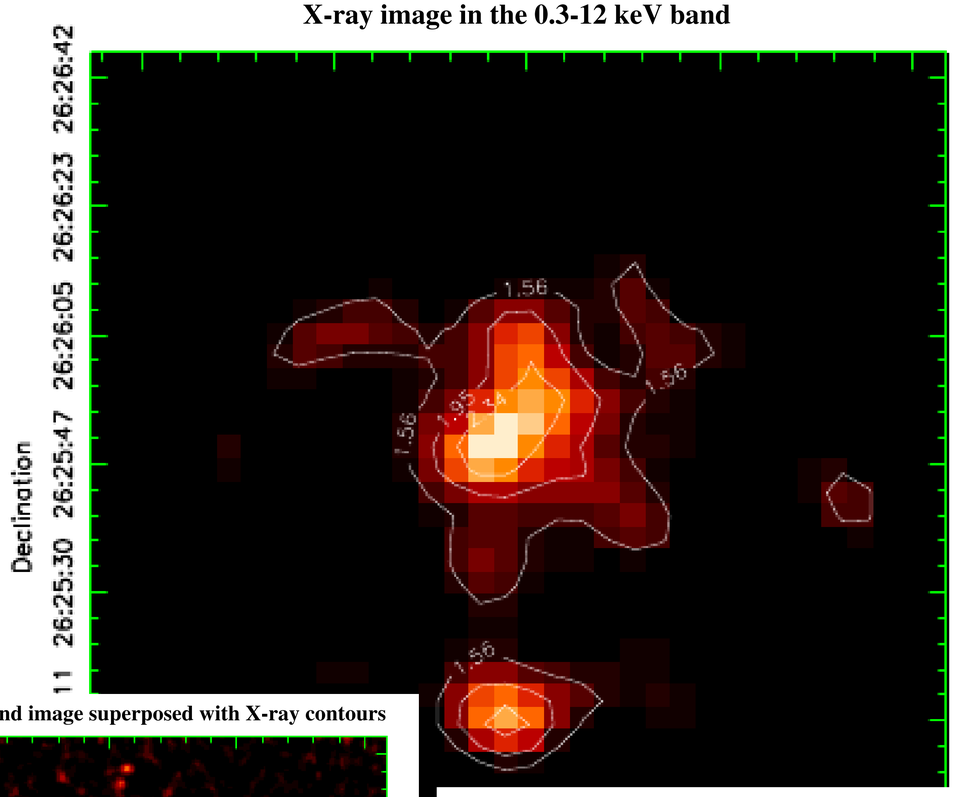
What is the origin of FeK X-ray photons ?

- No near-IR counterparts were found for the FeK 6.7+6.9 keV line complex.
- The region appear misplaced from the maximum of diffuse X-ray emission, between 6" to 10"
- By assuming a Hubble constant of H$_{70}$ these separations are of about ~35 to 54 kpc.

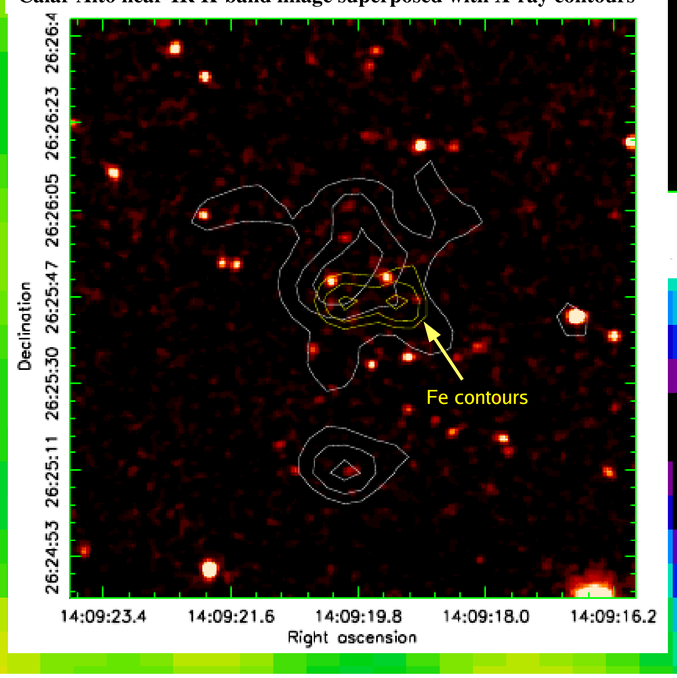
The X-ray spectrum appears softer than expected:

- Low temperature of the object does not match expected kT$_x$-L$_x$ relation for high z-clusters.
- We think X-ray spectral parameters are probably biased by the low photon statistics.

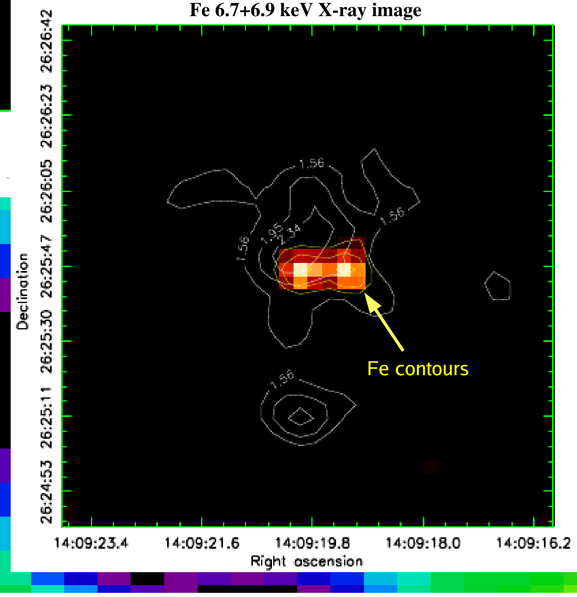
X-ray image in the 0.3-12 keV band



Calar Alto near-IR K-band image superposed with X-ray contours



Fe 6.7+6.9 keV X-ray image



REMARKS:

- We have probably discovered the most distant cluster of galaxies ever detected.
- To confirm this hypothesis we need to reveal the origin of the Fe 6.7+6.9 keV line complex, i.e. whether it is associated to ICM or to an AGN reflection spectrum.

Recently, we have submitted a proposal for Chandra cycle AO10 to observe 57 ksec with the ACIS-S camera.

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