Plans and Propects of X-ray Observations

as a Contribution to the VESUVIO Survey

The most important part of the X-ray observations will be provided by the diffuse X-ray emission tracing the highest density regions in the Supercluster: the galaxy clusters and their immediate environments. AGN featuring as X-ray point sources will also be interesting in connection with the multi-wavelength coverage of the survey since they are part of the characterization of the galaxy population in the survey. The X-ray point source observations are not a prime interest of the X-ray WG, however, and will be sesn more as a by-product.

The diffuse X-ray emission from hot plasma in galaxy clusters and possibly from their filamentary environment will allow us to address the following most important science topics:

• to determine the properties and the mass of the galaxy clusters in the super cluster. This is important for the main goal of the programme: the characterization of the galaxy population as function of environment, where the clusters act as a the laboratories of high matter and gas density. Thus to be able to characterize the gravitational and gas mass distribution in the clusters is vital for the overall project.

The cluster masses are further important for the modeling of the mass distribution on large scales. The cluster masses and positions form the input of the constraint mass reconstruction modeling by the theory group. This would actually provide some insight into the large-scale distribution of the dark matter.

• To study as good as possible the nature of the warm-hot intergalactic gas in the supercluster. Current observational capabilities in X-rays allow us to detect the warm-hot gas outside the virialzed galaxy clusters only with greatest difficulty and only first traces of this medium have been observed. With the information from the supercluster survey at hand we will be in a position to greatly optimize the search for the signature of the warm-hot medium. And if it is discovered, the survey will allow us to put the detections immediately in perpespective with the grand picture of the large-scale structure of this supercluster region.

• The galaxy clusters and their surroundings are to some degree very important closed box laboratories carying several fossil traces of the processes of galaxy formation. Most important, the X-ray observation will provide information about the heavy element production and thus on the supernova explosion history of the galaxies contained in the clusters. This provides the complementary information which is needed to piece together a scenario of galaxy formation as a function of environment. The second important part of information on energy released in the early history of galaxy formation is encoded in the entropy structure of the intracluster medium of the galaxy clusters.

• The X-ray observations will further provide detailed information on the cluster morphology and dynamical state. One of the important goals within the survey project is to study the connection of the cluster structure with the surrounding large-scale matter distribution. This will provide very important insight in how galaxy clusters grow out of the density fluctuations of the cosmic web.

Therefore the two most important observational approaches are:

• to well characterized the structure and properties of a large and representative sample of galaxy clusters within the supercluster with pointed X-ray observations (primarily with XMM-Newton).

• to search for the faint diffuse emission of the warm-hot intergalactic medium in the most promissing places crystallizing out of the overall survey project.