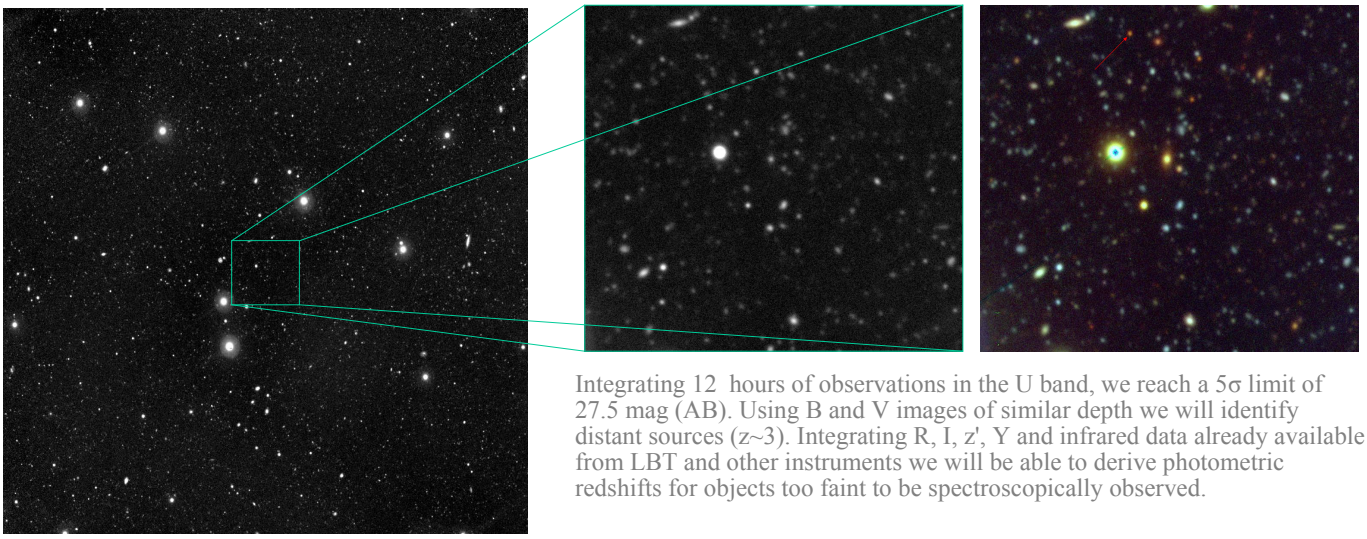
MPI für extraterrestrische Physik

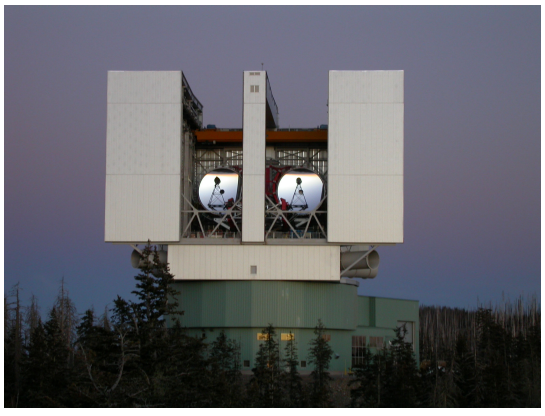
THE XMM-LOCKMAN HOLE SURVEY

Deep multi-band optical imaging with the LBT

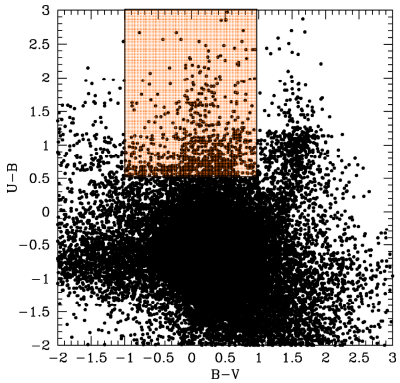
The Lockman Hole (+10^h 53^m, 57° 29′) is a region in the northern sky with the best transparency of galactic material (N_H=5.7×10^{19} cm^{-2}) and thus it is the target of a number of surveys in many wavelengths. An area of ~0.2 deg^2 has been recently observed with XMM-Newton (Brunner et al. 2008, A&A 479, 283) with an effective exposure time of 637 ks, reaching depths of 1.9×10^{-16} erg/cm^2/s in the 0.5-2.0 keV and 9×10^{-16} erg/cm^2/s in the 2.0-10.0 keV bands. In the same area, there is a pool of observations available, including optical (Subaru), infrared (Spitzer) and radio (VLA, MERLIN, GMRT) imaging, as well as optical spectroscopy (HET, see Poster I.3, Burwitz et al. 2008). We are using the Large Binocular Telescope (LBT) in Arizona to obtain deep U and multi-colour images of the Lockman Hole XMM region. When the survey is finished, we will have full optical imaging, helping us to derive spectroscopic redshifts and select distant object using the Lyman-break technique, identify Compton-thick candidates combining the UV with the IR fluxes, and select candidate sources to be observed with LUCIFER.



Integrating 12 hours of observations in the U band, we reach a 5σ limit of 27.5 mag (AB). Using B and V images of similar depth we will identify distant sources (z~3). Integrating R, I, z', Y and infrared data already available from LBT and other instruments we will be able to derive photometric redshifts for objects too faint to be spectroscopically observed.



The Large Binocular Telescope (LBT) in Arizona is fitted with two 8 m telescopes which can observe simultaneously. We have exploited this feature to obtain multi-colour images of the Lockman Hole, as well as the deepest U image to date. The deep optical images and the photometric redshifts will help identify sources to be observed with LUCIFER, a near infrared spectrograph, which will be fitted to the LBT in 2008. Near infrared spectra will reveal the SMBH properties of distant AGN (z>1) using the redshifted Hα and Hβ lines.



Preliminary selection of "U-dropout" sources. Deep coverage in the U-band is essential in selecting U-dropouts (Lyman-break galaxies at redshift z~3). These sources are important to constrain the high redshift Luminosity Function. 1000 U-dropouts are expected, ~10 of them detected in X-rays

Compton Thick AGN

Compton thick AGN (N_H>10^{24} cm^{-2}) at redshift z>1 are so faint in X-rays, that they can not be detected even with the deepest surveys. However, observations in other wavelengths could identify them. One promising method is to compare the (redshifted) UV emission with the infrared emission and look for a MIR excess, which would imply an obscured AGN. Using the LBT U-band image and MIPS imaging (available for the Lockman Hole) one could select Compton-thick source candidates at z>1, in order to test XRB synthesis models predicting a large number of obscured AGN.

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