XMM-LSS Spectroscopic Redshift - Selection Functions and Completness - Version 1.0

The XMM-LSS field is covered by a multitude of different mostly small surveys so selection and completeness are highly variable. In addition quite a few of the sources are not published so limited information is available on their selection and how complete they are. Due to the number of sources available we have talked about the Selection and Completeness Sections in each section.

1 VIMOS VLT Deep Survey (VVDS) - Source 1

The VIMOS VLT Deep Survey (VVDS) spectroscopic campaign described by Le Fèvre et al (2005) measures in total 8981 redshifts within the XMM-LSS field. This source contains data from the first year of the VVDS-deep survey which will cover the region $\sim 2^h23^m$ to 2^h29^m in RA (J2000) and -5° to -4° in DEC (J2000). In this region all galaxies and AGN are targeted with the criteria that $17.5 \leq I_{AB} \leq 24$ and is purely a magnitude limited sample. At the time of publishing only $\sim$30% of pointings have been completed. Of the 10157 galaxies targeted 8591 have a secure redshift, so a success rate of 84%. Of the original photometric catalogue a total of 22.8% has been observed (or 40% in the central region of the field). The distribution of galaxies observed is shown in Figure 1 and the completness as a function of magnitude is shown in Figure 2. An extra 278 reliable redshifts are also in the catalogue which are serendipitous secondary targets.

2 XMM follow-up, Garcet et al. (2005) - Source 2

The sample in this analysis is an X-ray selected sample where galaxies which are detected ($\geq 3\sigma$) in the [2–10] keV band with fluxes between 8×10^{-15} and 8×10^{-14} erg s^{-1} cm^{-2} and with more than 80 counts are included. This gives a sample of 612 X-ray sources. They collect optical spectra from multiple surveys, 79 from 2dF, 11 from VVDS (Source 1), and 9 were observed were observed with VIMOS at the VLT. As far as we know all observed sources resulted in a reliable redshift.
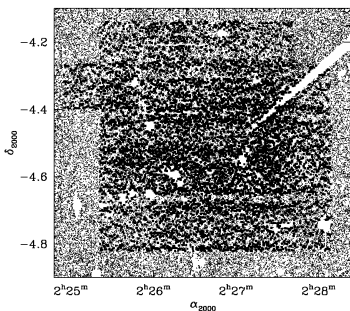

Figure 1 This figure has been taken from Figure 12 in the VVDS paper (Le Fèvre et al 2005). The caption taken directly from the paper is: Distribution of galaxies observed in VVDS-02h.
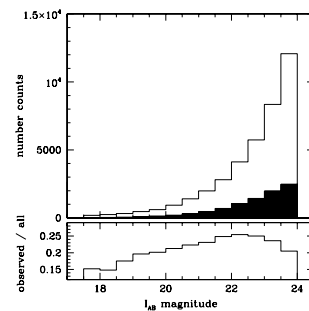

Figure 2 This figure has been taken from Figure 13 in the VVDS paper (Le Fèvre et al 2005). The caption taken directly from the paper is: Number and fraction of objects observed in the VVDS-02h, compared to the total number of objects in the photometric catalog with $17.5 \leq I_{AB} \leq 24$.

3 Quasars and AGN Selected in the Mid-Infrared, Lacy et al. 2007 - Source 4

The sample used in this paper is based on data from the X-ray and Spitzer IRAC data (SWIRE) observations of the XMM-LSS field. Galaxies were selected by talking all objects with detections in all IRAC and MIPS 24μm band. AGN and quasars were selected assuming the following conditions $\log(S_{5.8}/S_{3.6}) > -0.1$, $\log(S_{8.0}/S_{4.5}) \leq -0.2$, and $\log(S_{8.0}/S_{4.5}) \leq 0.8\log(S_{5.8}/S_{3.6}) + 0.5$. Candidates were selected down to detection limit of $6.6\,\mathrm{mJy}$ in the SWIRE fields and $4.4\,\mathrm{mJy}$ at 24μm in the XFLS fields.

Data was taken with ISIS instrument on William Herschel Telescope, the ESI instrument on the Keck II telescope and with the Kast spectrograph on the Shane Telescope. All 77 objects in the sample have reliable optical redshifts.

4 X-Ray Sources, Stalin et al. (2010) - Source 4

In this study a flux-limited sample of 829 point sources were created from an optical limit of $g' \leq 22\,\mathrm{mag}$ and an X-ray limit of $f_{0.5-2.0keV} > 1 \times 10^{-25}\,\mathrm{erg\,cm^{-2}\,s^{-1}}$ with sources in regions covered by the XMM-LSS and CFHTLS observations. Figure 3 shows the distribution of the sample and which were detected or non-detected. Out of the 829 sources that meet the selection 693 objects were observed (83%) with 487 providing a reliable redshift. The completeness of the overall sample is therefore 59%.
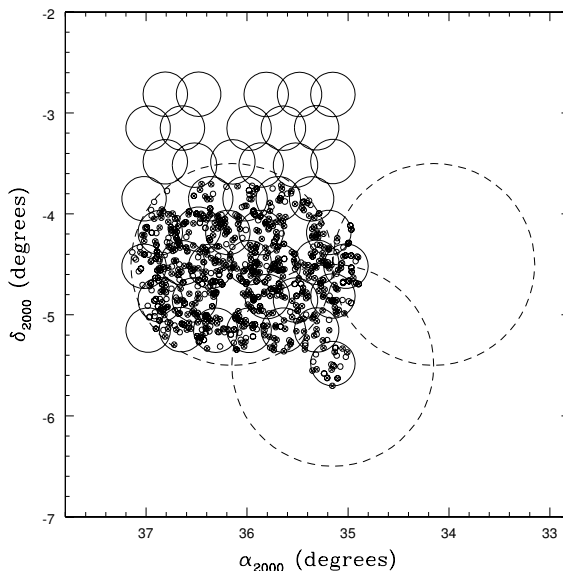

Figure 3 This figure has been taken from Figure 1 of Stalin et al. (2010). The caption taken directly from the paper is: Layout of the 45 XMMLSS pointings (large closed circles). The positions of our initial sample of 829 sources with $g' < 22\,\mathrm{mag}$ and flux in the 0.5–2 keV band larger than $1 \times 10^{15}\,\mathrm{erg\,cm^2\,s^1}$ are marked with open small circles. Crosses show the XMM sources for which reliable spectroscopic identifications are obtained in this work. The upper half of the XMMLSS pointings do not have corresponding optical coverage in the CFHTLS. The larger dashed circles are the three AAT pointings.

5 Supernova Host Sources, Lidman et al. (2012) - Source 16

This paper presented a spectroscopic campaign to obtain redshifts for galaxies that had supernovas during the first three years of the Supernova Legacy Survey (SNLS). The SNLS field uses the MegaCam wide-field camera on the CFHT which has a $0.96 \times 0.94\,\mathrm{deg^2}$ field-of-view, with the field centred at a RA

of 02:26:00.00 and DEC of -04:30:00.00 (J2000). The spectroscopic campaign is for all four fields of the SNLS, in the XMM-LSS field we have 178 redshifts observed, of which 139 are considered reliable (Q $\geq$ 3).

6 Old Passive Galaxies, Yamada et al. (2005) - Source 32

This work investigates old passively evolving galaxies (OLEGs) at z~1 which have been selected from the region of XMM-LSS covered by deep Subaru observations. OLEGs have been selected on the colour magnitude diagram with the following criteria: $0.8 < i' - z' < 1.2$ and $-0.05z' + 3.01 < R - z' < -0.03z' + 2.49$ which is intended to pick up OLEGs between z= $0.91 - 1.1$. However, due to photometric errors a further 0.05 mag margin at both the red and blue sides of the model loci have been added. The spectroscopic follow-up was to confirm whether the intended redshift range was selected. The spectroscopic survey used spare slits of a survey to looking at interesting X-ray sources, where spare slits were available OLEGs with $z' < 23$ mag and if possible then to $z' < 24$ mag. The field is centred at 02:18:00 and -5:00:00 (RA, DEC; J2000), with a distribution shown in Figure 4. Of the 93 objects observed (the total photometric sample is ~4000 objects), 77 provided reliable redshifts all with $z' < 22$ mag.
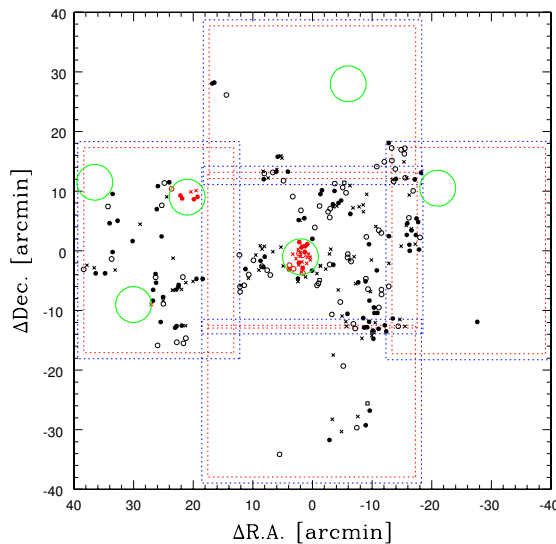

Figure 4 This figure has been taken from Figure 7 of Yamada et al. (2005). The caption taken directly from the paper is: Sky distribution of targets in spectroscopic observations. The circles show the OPEG candidates, and the squares show other objects. Filled symbols indicated those for which redshifts were obtained. Large circles show the high-density regions of red galaxies studied in Kodama et al. (2004).

7 Lyα Emitters at z = 3.1, 3.7, 5.7, Ouchi et al. (2008) - Source 64

Lyα (LAE) emitting galaxies are selected based on the photometry of the Suburu narrowband filters and so the sample is based on Suburu observations and so have the same area as those from Source 32 and Figure 4. Spectroscopic follow-up was performed on galaxies showing a narrowband excess and a continuum break in the blue band. Observations were taken of 128 objects at z = 3.1/3.7 and 29 at z = 5.7. As observations were shared with other projects some unreliable LAE candidates were included and so only 60% were confirmed to be LAEs. In total we collected 84 spectra from Ouchi et al. (2008) with 82 being classed as reliable.

8 Lyα Emitters at z = 3–4, Ono et al. (2010) - Source 128

Only two new redshifts presented from Lyα (LAE) emitting galaxies in the Subaru/XMM-Newton deep/UKIDSS UDS. The observations were performed on Magellan I Baade telescope.

9 SFRs of Starburst Galaxies, Sargsyan & Weedman (2009) - Source 256

This paper gathers together galaxies with *Spitzer* IRS spectra and select starbursts based on an equivalent width of the 6.2μmPAH feature greater than 0.4μm. This study adds 34 reliable spectra to the XMM-LSS field.

10 UDSz Survey - Source 512

The UDSz survey is ESO large program (180.A-0776) targeting ∼3000 galaxies with VIMOS and FORS2. Candidates are selected in the K-band with a magnitude limit of $K_{AB} < 23$ mag. The redshifts used are a provisional catalogue available on the UDS website (version is dated March 2014), and is expected to be published in Almaini et al. in prep. The UDS covers an area of 0.8 sq. degrees and is centred on the Subaru-XMM deep field, the RA and DEC ranges are: $33.988 \le$ RA ≤ 34.915 and $-5.563 \le$ DEC ≤ -4.602. Two papers are recommended currently to be cited Bradshaw et al. (2013) and McLure et al. (2013). The catalogue contains 1511 reliable spectra; no further information is available.

11 UDS Catalogue - Source 1024–262144

This catalogue is a compilation of redshifts from a variety of sources of the UDS field (see UDSz section) from the UDS website. Most of the redshifts are unpublished, and the reliability is not guaranteed. This catalogue has a flag to note that the sample is biased to AGN sources. The catalogue compiles data from projects led by Akiyama, Simpson, Croom, Geach, Smail and van Breukelen. As the source of the redshift was listed where possible we mention what criteria went into each source if the data is available. Papers that describe Sources 8192 to 262144 have not been found and so no information is available.

11.1 UDS Catalogue, CJS-VIMOS/CJS-ISIS, Simpson et al. (2012) - Source 1024 & 2048

The analysis of Simpson et al. (2012) is based on galaxies that are radio emitters in the SXDF region and are selected based on $S_{1.4GHz} > 100\mu Jy$. Galaxies listed as Source 1024 were from a VIMOS campaign and one spectra was obtained with the ISIS spectrograph on the WHT (Source 2048). Combining multiple data sources (also in this catalogue) 267 sources were observed of the 505 input sample, of which 256 are robust. However, 488 redshifts in the catalogue are listed as being from "CJS-VIMOS" possibly this work is in prep, or included some other unknown source.

11.2 UDS Catalogue, CVB-DEIMOS, van Breukelen et al. (2007) - Source 4096

This study performed spectroscopy of objects in high-redshift cluster candidates using DEIMOS on the Keck-2 telescope. Overall 194 objects were targeted, with 139 galaxies (72%) yielding reliable redshifts. The distribution of of targets both observed and un-observed is shown in Figure 5.

12 SDSS DR10 - Source 524288

The SDSS data covers the entirety of the XMM-LSS field and provides measurements of 2712 redshifts of which 2496 are considered reliable. As the SDSS contains many different surveys with different selection criteria we refer the reader to the SDSS DR10 webpages.
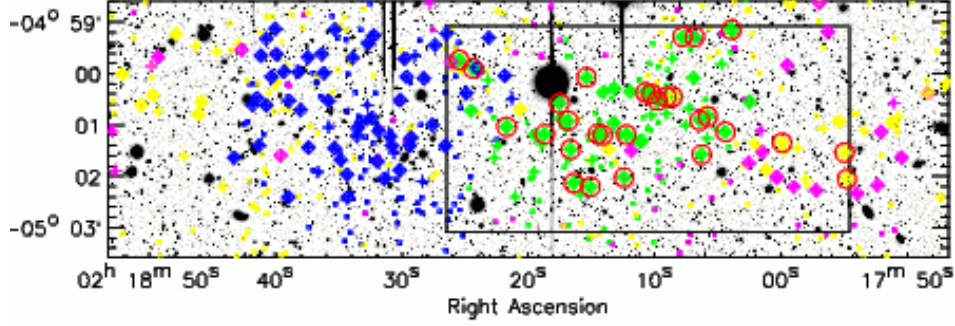
Figure 5 This figure has been taken from Figure 2 of van Breukelen et al. (2007). The caption taken directly from the paper is: Spectroscopy targets overlaid on the i'-band image (Furusawa et al. in preparation) of the DEIMOS field of view. Sample 1 is depicted in green symbols, sample 2 in the blue, sample 3 in the purple and sample 4 in the yellow symbols. The small squares symbolise all the objects in the target list, the pluses are the objects that were observed and the diamonds are the targets for which a redshift could be determined. The red circles are objects which are included in the final spectroscopic sample for this paper.

13   6df Galaxy Survey - Source 1048576

The 6dF Galaxy redshift survey covers most of the southern sky and as such covers the total XMM-LSS field. The survey is a combination of multiple magnitude limited samples, so an object is measured if either $K \leq 12.65, H \leq 12.95, J \leq 13.75, r_F \leq 15.60$ and $b_J \leq 16.75$. This results in a total of 125071 extra-galactic samples in the total survey, and overall the survey has $\sim 85\%$ completness. In the XMM-LSS field the survey has 160 redshifts of which 156 are considered reliable.