An SZ Cluster Sample for OCRA

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This document outlines a possible sample for observation with OCRA over the winter season 2006. It has been chosen to contain enough clusters for cosmological studies over a wide range of redshift whilst remaining highly complete. Such statistically complete samples are rare, or non–existent in current SZ science. OCRA has the capabilities to detect the entire sample on a relatively short timescale, thus forming an 'SZ catalogue' unique to this collaboration, and useful to the community as a whole. Publications resulting from such an observing program would help establish OCRA as a competitive SZ instrument.

The sample consists of 34 clusters at redshifts $z > 0.2$, and with X-ray luminosities greater than or equal to that of Abell 773 (12×10^{44} erg s^{-1} in the BCS catalogue). It is the most complete of its kind compiled to date within the selection criteria, and was selected from four X-ray catalogues:

- the Brightest Cluster Sample (BCS, Ebeling et al. 1998), 90% flux complete to a limit of $f_{\rm X} = 4.4 \times 10^{-12}$ erg cm^{-2} s^{-1});
- the Extended BCS (eBCS, Ebeling et al. 2000), 75% complete to a limit of $f_{\rm X} = 2.8 \times 10^{-12}$ erg cm^{-2} s^{-1};
- the Northern ROSAT All-Sky Survey galaxy cluster sample (NORAS, Böhringer et al. 2000), 45% complete above $f_{\rm X} = 3 \times 10^{-12}$ erg cm^{-2} s^{-1}; and
- the serendipitous Einstein Medium Sensitivity Survey (EMSS, Gioia et al. 1990).

The sample is summarised in Table 1. The BCS clusters alone form a highly complete sample, and in fact the addition of the other objects compromises this completeness. However, the larger sample has a far more extended redshift range, and yet remains 85% complete. Of the 34 clusters, 30 have XMM and/or Chandra observations. We have been awarded XMM time (at C-priority) to observe the remaining four.

Radio point sources are an unfortunate contaminant in SZ observations. All available radio information has been assembled for each cluster in the OCRA sample. In some cases, data are available at the OCRA observing frequency of 30 GHz. However for the majority, only lower frequency information is available, and some extrapolation is necessary in order to assess the magnitude of the problem at 30 GHz. In many cases, the pointing centre has been shifted away from the X-ray centre in order to avoid sources which may potentially contaminate the observations. The advised pointing centres are based on a 'worst case scenario' approach regarding the predicted high–frequency fluxes of known radio sources, and may be modified appropriately after the initial observations in order to achieve the highest possible signal-to-noise.

The suggested observational strategy for this sample is as follows. Observe each object for 30 minutes at each of three positions: 2^h before transit, at transit, and 2^h after transit. Each observation of the cluster should be followed by a control observation of a trailing field. This sequence should be repeated on each of three days such that a total of about 9^h is spent per target. This will comprise about two weeks, over which time pointing checks, sky opacity checks and flux density calibrations should also be made.

Catalogue	Cluster Name	RA(J2000)	Dec(J2000)
BCS	A1835	14 01 02	+02 53 43
	ZWCL1953	08 50 03	+36 04 16
	A689	08 37 25	+14 59 41
	ZWCL3146	10 23 36	+04 11 56
	RXJ1532.9+3021	15 32 59	+30 21 11
	A2390	21 53 37	+17 40 15
	A2219	16 40 24	+46 40 52
	RXJ2129.6+0005	21 29 44	+00 06 06
	A2261	17 22 27	+32 07 04
	A781	09 20 28	+30 29 58
	A697	08 42 58	+36 21 45
	A1763	13 35 26	+41 00 04
	A68	00 37 05	+09 09 26
	A520	04 54 10	+02 55 21
	A267	01 52 42	+01 00 26
	RXJ0439.0+0715	04 39 01	+07 16 55
	ZWCL7160	14 57 20	+22 20 36
	A773	09 17 51	+51 43 20
eBCS	RXJ2228.6+2037	22 28 33	+20 37 12
	ZWCL2661	09 49 53	+17 06 52
	RXJ0027.6+2616	00 27 50	+26 16 26
	A1722	13 20 08	+70 04 31
	A2552	23 11 33	+03 38 07
	ZWCL3959	11 15 57	+01 29 56
	A611	08 00 57	+36 03 26
	ZWCL5699	13 05 58	+26 30 53
	A2631	23 37 37	+00 16 35
NORAS	A959	10 17 35	+59 33 28
	A1758	13 32 45	+50 32 33
	RXJ0856.1+3756	08 56 09	+37 56 59
	RXJ1354.6+7715	13 54 41	+77 16 23
	A1995	14 52 55	+58 02 59
EMSS	CL0016+16	00 18 34	+16 26 06
	ZWCL6429	13 59 51	+62 30 06

Table 1: Suggested pointing centres for SZ observations of the cluster sample