4.8.5.4 Radiometer Local and Remote M&C Interface

The radiometer status and commanding is through LAN TCP/IP. The remote interface protocol is defined in SED Radiometer DS3 Radiometer ICD 129220. Remote and local control parameters include:

- Local/Remote toggle switch (local control only)
- Initiate immediate NTMs according to selected signal band/pol/feed
- View results for NTMs on the front panel display or read results remotely
- TPR calibration measurements
- Multiple scheduled NTMs (remote only) and results
- View and set all ENR and noise diode path calibration values for the noise diodes and TPR calibration constants (local only)
- Review and clear the alarm log

The DS3 radiometer's remote interface is backwards compatible with DSA2 radiometer. A DS3 version radiometer can be used in Cebreros if configured for X-band Rx and Ka-band Rx only. The differences in the interface are as follows :

- Control commands to the DS3 radiometer now accommodate the selection of more IF inputs
- Monitor messages report the status of additional noise diodes if configured to do so
- Monitoring and control by multiple clients is also supported (as many as 3 clients simultaneously)

4.8.6 Pointing Calibration Sources for DS3

SED has identified potential calibrators suitable for use in the DS3 PCS. At this time 172 candidates have been identified. The calibration sources are listed in Table 4-33 Preliminary List of DS3 Position Calibrators.

Figure 4-79 shows the distribution of these radio sources as a function of RA and declination.

Sources from DSA2 with declination less than +45 deg are included since they will rise above the horizon at Malargue with a minimum of 10 degrees elevation. Additional new sources have been identified with declinations as low as –81 deg (the lowest one identified) to allow calibration up to 90 deg elevation at DS3 and good pole region coverage.

The PCS will use radio sources that are small in angular extent, have a well defined position, have negligible motion in RA and Dec, and have a catalogue flux density greater than about 0.75 Jy. (note that the catalogue flux and the actual flux can be quite different). During on-site integration tests, specific sources will be tested with the PCS. Those that are not suitable for pointing error measurements will be removed from the PCS database.

The additional sources were chosen from the ***Parkes Radio Sources Catalogue*** (PKSCAT90) (Wright+ 1990) (http://vizier.u-strasbg.fr/viz-bin/VizieR?-source=VIII/15). Pointing calibrators will be selected to have very small angular sizes, so typically quasars, BL Lacertae galaxies and N-type galaxies are used. It should be noted that all radio sources of this nature are variable in their intensity by a factor of likely 10 times in signal strength since their energy source is the ingestion of discrete lumps of matter into black holes for "short" periods (months or years) and not typically steady-streaming matter.

A second set of enlarged angular sources were chosen for their stability. These sources are typically supernova remnants (SNR). Since the source energy is produced by synchronous processes (electrons spiralling in magnetic fields), the sources are stable over millennia. However, these sources are extended in angular dimension. These sources are included in the list of G/T calibrators (refer to Section 4.8.7).

Typically, survey objects extend only into X-band as is the case for the Parkes catalogue. Sources chosen to cover the entire sky are as best as possible. Parkes calibrators are selected according to their flux at X-band and it is likely that the flux is less for each calibrator at Ka-band. As found for DSA2, there will be fewer suitable calibrators for Ka-band. The PCS database includes flux values for both X-band, Ka-band and now K-band for each calibrator. Therefore, when scheduling calibration measurements at a minimum flux density, the X-band, Ka-band or K-band calibrators that are selected by the PCS will be optimum for the band under test. Sources in crowded radio areas and double sources were excluded.

The list presented in the following table represents a preliminary extension of the VLA Calibrator Catalogue to extend useful calibrators south of where VLA catalogue ends.

Table 4-33 Preliminary List of DS3 Position Calibrators

Jname	Alias	RAJ2000 (h:m:s)	Dec J2000 (d m s)	Xflux (Jy)	Ka Flux (Jy)
0108+015	JVAS J0108+0135	01h08m38.771074s	01d35'00.317140"	2.05	2.4
0204+152	JVAS J0204+1514	02h04m50.413904s	15d14'11.043460"	2.32	1.7
0237+288	4C 28.07	02h37m52.405678s	28d48'08.990080"	4.65	2.1
0319+415	3C84 Perseus A NGC 1275	03h19m48.160102s	41d30'42.103050"	21.7	16.4
Fornax A	NGC 1316	03h22m41.5s	-37d12'33"	-1	
0339-017	NVSS J033930-014634	03h39m30.937787s	-01d46'35.803990"	2.08	2.4
0348-278		03h48m38.144561s	27d49'13.565300"	1.78	1.8
0403-360	1RXS J040353.1-360448	04h03m53.749908s	-36d05'01.913200"	3.9	3.5
0433+053	3C120 JVAS J0433+0521	04h33m11.095535s	05d21'15.619420"	3.3	2.8
0437+296	3C123	04h37m04.3750s	29d40'13.820"	10.1	
0501-019	4C-02.19	05h01m12.809888s	-01d59'14.256200"	3.7	3.1
0532+075	AS J0532+0732	05h32m38.998531s	07d32'43.345860"	2.08	3.2
0555+398	JVAS J0555+398	05h55m30.805608s	39d48'49.165000"	6.2	2.7
0607-085	QSO J0607-085	06h07m59.699243s	-08d34'49.978150"	3.22	2.9
0609-157		06h09m40.949538s	15d42'40.672640"	9.2	7.6
0646+448	NVSS J064632+445116	06h46m32.025985s	44d51'16.590130"	2.2	2.4
0730-116	QSO B0727-115	07h30m19.112472s	-11d41'12.600480"	3.97	2.4

Table 4-33 Preliminary List of DS3 Position Calibrators

Jname	Alias	RAJ2000 (h:m:s)	Dec J2000 (d m s)	Xflux (Jy)	Ka Flux (Jy)
0739+016	JVAS J0739+0137	07h39m18.033894s	01d37'04.618030"	2	2.1
0854+201		08h54m48.874925s	20d06'30.640880"	2.4	3.05
0927+390	NVSS J092703+390220	09h27m03.013916s	39d02'20.851950"	7.2	5
1058+015	JVAS J1058+0133	10h58m29.605209s	01d33'58.823720"	3.75	3.7
1159+292	JVAS J1159+2914	11h59m31.833911s	29d14'43.826940"	1.54	1.5
1215-175	1Jy 1213-172	12h15m46.751770s	-17d31'45.402890"	2.4	1.5
1229+020	3C273	12h29m06.699729s	02d03'08.598190"	27.5	24
1230+123	3C274 Virgo A M87	12h30m49.423381s	12d23'28.043930"	3.7	8
1256-057	3C279	12h56m11.166560s	-05d47'21.524580"	15.6	23
1331+305	3C286 JVAS J1331+3030	13h31m08.287984s	30d30'32.958850"	5.23	2.59
1357+193	JVAS J1357+1919	13h57m04.436656s	19d19'07.372340"	1.55	1.7
1415+133	JVAS J1415+1320	14h15m58.817499s	13d20'23.712600"	1.62	3.1
1507-168	2E 3382	15h07m04.786960s	-16d52'30.267340"	2.4	1.7
1512-090	1Jy 1510-089	15h12m50.532939s	-09d05'59.829500"	2.15	1.9
1517-243	1Jy 1514-241 AP Librae.	15h17m41.813132s	-24d22'19.475940"	1.56	2.2
1613+342	NVSS J161341+341247	16h13m41.064249s	34d12'47.909090"	2.67	2.3
1626-298	1Jy 1622-297	16h26m06.020843s	-29d51'26.971080"	2.25	2.57
1642+398	3C345	16h42m58.809951s	39d48'36.993950"	7	12.1
1733-130	QSO B1730-130	17h33m02.705790s	-13d04'49.548230"	10.5	10
1743-038	1Jy 1741-038	17h43m58.856137s	-03d50'04.616680"	3.8	3.81
1751+096	JVAS J1751+0939	17h51m32.818573s	09d39'00.728510"	2	4.4
1833-210	QSO B1830-211A	18h33m39.9150s	-21d03'40.050"	6.75	3.3
1911-201	QSO B1908-202	19h11m09.652893s	-20d06'55.109070"	2.4	1.6
1924-292	1RXS J192450.8-291437 1921-293 (1950)	19h24m51.055957s	-29d14'30.121150"	5.8	13
2025+337	JVAS J2025+3343	20h25m10.842097s	33d43'00.214540"	3.8	2.3
2131-121	QSO J2131-1207	21h31m35.261758s	-12d07'04.795880"	3.1	2.6
2136+006	P2134+0	21h36m38.586299s	00d41'54.213350"	7.03	3.5
2148+069	JVAS J2148+0657	21h48m05.458679s	06d57'38.604220"	6.6	5.2
2202+422	BL Lac	22h02m43.291377s	42d16'39.979940"	3.95	2.8
2232+117	JVAS J2232+1143	22h32m36.408914s	11d43'50.904100"	2.75	3
2246-121	1Jy 2243-123	22h46m18.231976s	-12d06'51.277340"	2.4	2.1
2253+161	JVAS J2253+1608 2251+158 (1950) 3C454.3	22h53m57.747932s	16d08'53.560890"	10.9	16
2258-279	1Jy 2255-282	22h58m05.962888s	-27d58'21.256750"	3.75	2.3
2348-165	1Jy 2345-167	23h48m02.608516s	-16d31'12.022020"	1.95	1.8
0025-2602		00 25 49.17	-26 02 12.7	2.2	
0049-5738		00 49 59.473	-57 38 27.33	1	
0106-4034		01 06 45.1081	-40 34 19.958	2.2	
0137-2430		01 37 38.35	-24 30 53.8	1	
0210-5101		02 10 46.201	-51 01 01.89	2.5	
0240-2309		02 40 08.175	-23 09 15.74	2.2	
0303-6211		03 03 50.634	-62 11 25.24	1.6	

Table 4-33 Preliminary List of DS3 Position Calibrators

Jname	Alias	RAJ2000 (h:m:s)	Dec J2000 (d m s)	Xflux (Jy)	Ka Flux (Jy)
0334-4008		03 34 13.6549	-40 08 25.395	2	
0403-3605		04 03 53.7498	-36 05 01.908	2	
0408-6545		04 08 20.375	-65 45 09.62	1.3	
0440-4333		04 40 17.1800	-43 33 08.597	2.3	
0453-2807		04 53 14.646	-28 07 37.32	1.8	
0450-8101		04 50 05.438	-81 01 02.23	1.3	
0457-2324		04 57 03.18	-23 24 52.0	2.1	
0522-3627		05 22 58.01	-36 27 31.9	6.4	
0538-4405		05 38 50.3613	-44 05 08.931	3.6	
0635-7516		06 35 46.54	-75 16 16.8	6.5	
0648-3044		06 48 14.1108	-30 44 19.540	0.9	
0825-5010		08 25 26.77	-50 10 37.8	1.3	
0836-2016		08 36 39.22	-20 16 59.4	1.3	
0841-7540		08 41 22.43	-75 40 10.0	0.8	
1058-8003		10 58 43.311	-80 03 54.16	1.3	
1107-4449		11 07 08.6938	-44 49 07.614	2.6	
1107-6820		11 07 12.695	-68 20 50.73	0.9	
1154-3505		11 54 21.7949	-35 05 28.992	1.5	
1218-4600		12 18 06.23	-46 00 28.6	1.2	
1246-2547		12 46 46.802	-25 47 49.29	1.6	
1254-7138		12 54 59.992	-71 38 18.44	1.3	
1257-3155		12 57 59.0728	-31 55 16.890	1.3	
1427-4206		14 27 56.298	-42 06 19.44	2.2	
1522-2730		15 22 37.676	-27 30 10.79	1.8	
1556-7914		15 56 58.871	-79 14 04.28	3.2	
1617-7717		16 17 49.276	-77 17 18.47	2.5	
1624-6809		16 24 18.438	-68 09 12.50	1.3	
1626-2951		16 26 06.02	-29 51 26.7	2	
1723-6500		17 23 41.030	-65 00 36.60	3	
1744-5144		17 44 25.411	-51 44 43.87	2.2	
1819-6345		18 19 34.990	-63 45 48.10	2.2	
1837-7108		18 37 28.715	-71 08 43.56	2	
1912-8010		19 12 40.021	-80 10 05.94	1	
1911-2006		19 11 09.653	-20 06 55.11	2.3	
1924-2914		19 24 51.056	-29 14 30.12	9.5	
1939-6342		19 39 25.006	-63 42 45.68	2.6	
1957-3845		19 57 59.8256	-38 45 06.080	1.6	
2009-4849		20 09 25.404	-48 49 53.74	1	
2109-4110		21 09 33.1847	-41 10 20.469	2	
2152-7807		21 52 03.224	-78 07 06.40	0.7	
2151-3027		21 51 55.5219	-30 27 53.714	1.3	
2258-2758		22 58 05.97	-27 58 21.4	3.2	
2329-4730		23 29 17.704	-47 30 19.11	1.6	

Table 4-33 Preliminary List of DS3 Position Calibrators

Jname	Alias	RAJ2000 (h:m:s)	Dec J2000 (d m s)	Xflux (Jy)	Ka Flux (Jy)
2356-6820		23 56 00.682	-68 20 03.47	0.9	
2357-5311		23 57 53.266	-53 11 13.69	1.8	
1229+0203	3C273	12 29 06.6	+02 03 08	30.4	
2253+1608	3C454.3	22 53 57.7	+16 08 53	42.6	
1256-0547	3C279	12 56 11.1	-05 47 22	14.4	
1924-2914	OV236	19 24 51.1	-29 14 30	10.6	
2136+0041		21 36 38.6	+00 41 54	12.2	
0522-3627	13271	05 22 58.0	-36 27 32	4.39	
1833-2103		18 33 41.3	-21 03 28	8.25	
0440-4333	17989	04 40 17.2	-43 33 08	7.73	
1617-7717		16 17 49.5	-77 17 18	8.7	
0635-7516	26085	06 35 46.4	-75 16 16	4.8	
1130-1449	OM-146	11 30 07.1	-14 49 27	4.7	
0108+0135	4C01.02	01 08 38.7	+01 35 00	5.52	
2148+0657	4C06.69	21 48 05.5	+06 57 39	6.2	
2225-0457	3C446	22 25 47.3	-04 57 01	3.73	
2206-1835	22-Nov	22 06 10.4	-18 35 39	2.74	
0423-0120		04 23 15.8	-01 20 33	7.12	
1733-1304	NRAO530	17 33 02.8	-13 04 50	3.80	
0530+1331		05 30 56.4	+13 31 55	5.17	
0538-4405		05 38 50.4	-44 05 09	3.74	
2218-0335	4C-3.79	22 18 52.1	-03 35 37	5.72	
0836-2016		08 36 39.2	-20 16 59	2.34	
0607-0834		06 07 59.7	-08 34 50	4.11	
0408-6544	22737	04 08 20.3	-65 45 10	-1.48	
1512-0905		15 12 50.5	-09 06 00	3.91	
0405-1308	OF-105	04 05 34.0	-13 08 15	3.37	
0210-5101		02 10 46.3	-51 01 00	2.69	
2123+0535	OX036	21 23 44.5	+05 35 22	5.43	
1058+0133	4C01.28	10 58 29.6	+01 33 59	3.17	
0339-0146	CTA26	03 39 30.9	-01 46 36	3.00	
2134-0153	4C-2.81	21 34 10.4	-01 53 17	3.20	
0854+2006	OJ287	08 54 48.8	+20 06 31	1.41	
0334-4008		03 34 13.6	-40 08 25	3.5	
0453-2807	OF-285	04 53 14.6	-28 07 37	2.67	
0049-5738		00 49 59.3	-57 38 27	3.24	
2246-1206		22 46 18.2	-12 06 51	1.84	
2109-4110		21 09 33.2	-41 10 20	2.60	
1743-0350		17 43 58.8	-03 50 05	2.7	
0750+1231		07 50 52.0	+12 31 05	3.00	
0501-0159	4C-2.19	05 01 12.8	-01 59 14	2.63	
1337-1257	OP-1583	13 37 39.8	-12 57 25	2.43	
0725-0054		07 25 50.6	-00 54 56	1.94	

Table 4-33 Preliminary List of DS3 Position Calibrators

Jname	Alias	RAJ2000 (h:m:s)	Dec J2000 (d m s)	Xflux (Jy)	Ka Flux (Jy)
0738+1742		07 38 07.4	+17 42 19	2.12	
1107-4449		11 07 08.7	-44 49 08	2.31	
1957-3845		19 57 59.9	-38 45 06	2.00	
2131-1207		21 31 35.3	-12 07 05	2.14	
1507-1652	15-13	15 07 04.8	-16 52 30	1.45	
0050-0929	OB-080	00 50 41.3	-09 29 05	2.62	
1150-0023	4C-0.47	11 50 43.8	-00 23 54	1.16	
0116-1136		01 16 12.5	-11 36 16	2.02	
1626-2951		16 26 06.1	-29 51 27	2.24	
0739+0137		07 39 18.0	+01 37 04	1.27	
1454-3747		14 54 27.4	-37 47 33	2.32	
1624-6809		16 24 18.6	-68 09 13	1.83	
1912-8010	1904-80	19 12 39.4	-80 10 08	2.15	
0609-1542		06 09 41.0	-15 42 40	1.13	
2258-2758		22 58 06.0	-27 58 22	2.24	
1257-3155		12 57 59.1	-31 55 17	1.96	
0137-2430	OC-259	01 37 38.3	-24 30 54	2.06	
0238+1636		02 38 38.9	+16 36 59	1.19	
2158-1501		21 58 06.3	-15 01 09	1.44	
1058-8003		10 58 43.6	-80 03 54	2.22	
1246-2547		12 46 46.8	-25 47 50	1.86	
1037-2934	OL-259	10 37 16.0	-29 34 03	1.77	
0303-6211		03 03 50.5	-62 11 24	2.00	
1937-3958		19 37 16.3	-39 58 01	1.60	
2229-0832		22 29 40.0	-08 32 55	1.29	
1041+0610	4C06.41	10 41 17.2	+06 10 17	0.89	
0204-1701		02 04 57.7	-17 01 19	1.38	
0608-2220	OH-212	06 08 59.7	-22 20 21	1.89	

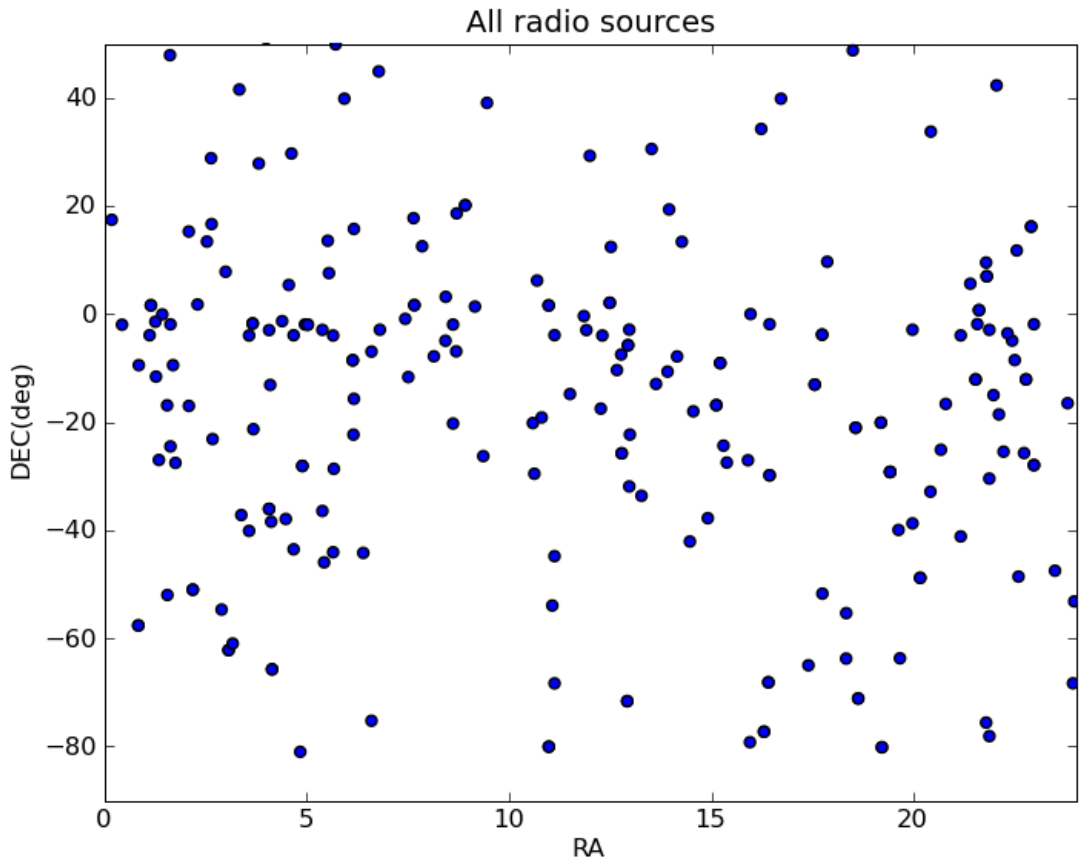

Figure 4-98 Preliminary PCS Calibrators for DS3

The following (Figure 4-99) is a plot of the azimuth/elevation coverage by the radio sources over 24 hours. Note that the direction to the celestial pole is now to the south at 180 degrees azimuth from north whereas for DSA2, it was at zero azimuth (directly north).