VLA calibrators at Q-band.

VLA Test Memo #192

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The following is a list of measurements of sources in the VLA calibrator manual at 43 GHz, obtained to determine whether these objects are bright enough to be used as calibrators at Q-band. Most of the sources have not been checked for source structure at 43 GHz, but it is expected that at higher frequencies the emission will be dominated by a compact core, and so can be assumed to be unresolved. The emission is also likely to be variable.

Sources brighter than 1 Jy are fine as calibrators. Sources fainter than 1 Jy but brighter than about 0.5 Jy are probably OK under good observing conditions (short baselines, dry and stable atmosphere), but I suggest that at present they only be used if nothing brighter is within about 15 degrees of the program source. I do not recommend using sources fainter than 0.5 Jy as phase calibrators.

Source (1950)	Flux (Jy)	error (Jy)	origin of measurement (*=repeat if possible)
0003-066	1.47	0.03	VD
0007+171	0.470	0.007	MH
0016+731	0.91	0.04	VD
0022+390	0.408	0.004	MH
0035+413	0.299	0.003	MH
0039+230	0.435	0.007	MH
0048-097	1.43	0.05	VD
0055+300	0.606	0.003	MH
0102+480	0.250	0.005	MH
0106+013	1.20	0.12	VD
0108+388	0.062	0.004	MH
0112-017	1.06		VD*
0113-118	0.87	0.04	VD
0119+041	0.55	0.02	VD
0133+476	1.62	0.08	VD
	1.342	0.004	MH
0138-097	0.55		VD*
0146+056	0.566	0.002	MH
0147+187	0.247	0.003	MH
0149+218	0.88	0.04	CC
	1.024	0.001	MH
0201+113	0.565	0.003	MH
0202+149	1.32	0.05	CC
	1.270	0.005	MH
0202+319	0.73	0.02	CC
0212+735	2.00	0.31	VD
	1.60	0.16	G94
0218+357	0.83	0.01	CC
0221+067	0.71	0.06	VD
0224+671	1.37	0.21	VD
	0.92	0.05	LR

0229+131	0.44	0.02	CC
	0.478	0.003	MH
0234+285	1.80	0.09	VD
	1.852	0.002	MH
0235+164	3.54	0.19	VD
	1.890	0.003	MH
0237-027	0.38	0.04	CC*
0239+108	1.383	0.003	MH
0248+430	0.385	0.003	MH
0259+121	0.136	0.002	MH
0300+470	1.23	0.19	VD
	0.90	0.04	G94
	0.830	0.002	MH
0306+102	0.42	0.02	CC
	0.466	0.005	MH
0309+411	0.576	0.002	MH
0316+162	0.146	0.005	MH
0316+413	14.3	1.74	VD
	21.1	0.37	G94
	10.2	0.90	LR
0317+188	0.041	0.005	MH
0319+121	0.250	0.003	MH
0326+277	0.191	0.004	MH
0327-241	0.39	0.06	CC*
0333+321	1.94	0.57	VD
	1.01	0.07	LR
0336-019	2.52	0.60	VD
0338-214	0.43	0.08	CC*
0342+147	0.247	0.004	MH
0346-279	1.42	0.29	VD
0355+508	5.74	1.84	VD
	2.90	0.20	G94
0400+258	0.39	0.03	LR
	0.336	0.002	MH
0406+121	0.488	0.004	MH
0414-189	0.86	0.05	CC
0420-014	3.13	0.52	VD
	7.96	0.06	G94
0420+417	0.959	0.004	MH
0428+205	0.30	0.01	CC
	0.36	0.02	LR
0429+415	0.37	0.03	CC
	0.578	0.004	MH
0430+052	2.48	0.39	VD
	1.438	0.003	MH
0454-234	1.75	0.38	VD
0454+066	0.321	0.002	MH
0458-020	2.99	0.52	VD
0458+138	0.174	0.002	MH
0459+135	0.543	0.002	MH
0500+019	0.33	0.02	CC
0506+101	0.688	0.002	MH
0507+179	1.02	0.07	LR
	1.003	0.003	MH
0511-220	0.52	0.06	CC
0518+165	0.42	0.02	CC
0528+134	8.54	1.52	VD
	5.85	0.04	G94

0529+075	4.21	0.68	VD
	1.75	0.03	CC
	1.694	0.002	MH
0536+145	0.685	0.002	MH
0537+531	0.293	0.004	MH
0538+474	0.234	0.002	MH
0538+498	0.58	0.05	CC
	0.90	0.02	LR
0539-057	0.74	0.04	CC
	0.62	0.02	LR
0552+398	4.27	0.89	VD
	4.57	0.18	G94
	2.482	0.002	MH
0605-085	3.62	0.66	VD
	2.20	0.20	CC
0607-157	6.25	1.27	VD
0611+131	0.301	0.001	MH
0642+449	2.18	0.12	VD
	1.429	0.001	MH
0646+600	0.285	0.003	MH
0648-165	1.89	0.31	VD
0650+371	0.462	0.002	MH
0657+172	0.736	0.004	MH
0710+439	0.279	0.002	MH
0716+714	0.23		VD*
	0.67	0.01	G94
0723-008	2.01	0.17	VD
0727-115	3.35	0.01	VD
	2.24	0.11	LR
0733-174	0.35	0.05	CC
0735+178	2.89	0.50	VD
	1.359	0.005	MH
	1.73	0.22	CC
0736+017	2.07	0.38	VD
0738+272	0.125	0.001	MH
0741-063	0.24	0.03	CC
0742+103	0.550	0.003	MH
	0.64	0.07	CC
0742+318	0.149	0.003	MH
0743-006	0.73	0.23	VD
0745+241	1.26	0.17	VD
	0.838	0.002	MH
0746+483	0.33	0.06	CC
0748+126	4.42	0.69	VD
	2.446	0.004	MH
	3.47	0.45	CC
0754+100	2.47	0.41	VD
	1.063	0.003	MH
0804+499	1.52	0.11	VD
0805+410	0.921	0.003	MH
0808+019	1.02	0.41	VD
0814+425	0.69	0.03	VD
0818-128	0.61	0.30	VD
0820+560	1.48	0.09	VD
	0.506	0.005	MH
0823-223	0.46	0.06	CC
0823+033	2.06	0.29	VD

0828+493	0.305	0.002	MH
	0.28	0.06	CC
0829+046	1.28	0.13	VD
0831+557	0.322	0.002	MH
	0.34	0.08	CC
0833+585	0.23	0.05	CC
0834-201	1.54	0.27	VD
0836+710	0.84	0.21	CC
0850+581	0.237	0.006	MH
0851+202	2.62	0.23	VD
	2.65	0.03	G94
0859-140	1.80	0.62	VD
0859+470	0.485	0.004	MH
	0.39	0.06	CC
0906+015	0.55	0.09	VD
0913+391	0.345	0.005	MH
0917+449	2.24	0.25	VD
	1.274	0.004	MH
0917+624	1.54	0.16	VD
	0.987	0.004	MH
0919-260	0.14	0.05	CC*
0923+392	9.61	0.95	VD
	7.49	0.05	G94
	6.526	0.004	MH
0925-203	0.37	0.04	CC
0941+522	0.318	0.003	MH
0945+408	1.56	0.30	VD
	0.767	0.001	MH
0953+254	1.06	0.10	VD
0954+556	0.623	0.002	MH
0954+658	1.07	0.13	VD
0955+327	0.89	0.12	CC
0955+476	1.00	0.07	LR
	0.732	0.005	MH
1011+250	0.46	0.06	CC
1012+232	0.64	0.06	VD
	1.03	0.15	CC
1034-293	1.49	0.28	VD
1044+719	0.54	0.11	CC
1045-188	0.96	0.11	VD
1055+018	3.01	0.40	VD
1101+384	0.57	0.05	VD
1124-186	1.08	0.15	VD
1144+402	0.99	0.03	VD
1150+497	1.78	0.08	VD
1226+023	41.1	0.18	G94
	27.2	4.36	VD
1228+126	12.0	0.28	G94
1244-255	1.22	0.24	VD
1253-055	19.7	0.10	G94
	31.9	7.37	VD
1308+326	3.75	0.16	G94
	3.24	0.12	VD
1328+307	1.79	0.04	G94
	1.86	0.26	O94
1334-127	6.63	0.15	VD
1354+195	2.13	0.68	VD
1409+524	0.67	0.18	G94

1413+135	1.81	0.18	G94
	4.25	0.52	VD
1418+546	0.89	0.04	VD
1502+106	1.76	0.20	VD
1510-089	3.77	0.23	VD
1511-100	1.31	0.06	VD
1514-241	2.39	0.21	VD
1546+027	1.21	0.17	G94
	2.76	0.24	VD
1548+056	2.30	0.29	VD
1606+106	0.88	0.13	VD
1611+343	5.46	1.30	VD
1622-297	1.33	0.04	LR
1633+382	4.49	1.31	VD
1637+574	2.64	0.75	VD
1638+398	1.04	0.02	G94
1641+399	11.3	0.10	G94
	11.2	2.97	VD
1655+077	2.56	0.52	VD
1657-261	2.37	0.36	VD
1725+044	1.09	0.23	VD
1730-130	8.98	1.87	VD
1739+522	0.91	0.27	VD
1741-038	5.06	1.05	VD
1749+096	7.86	2.13	VD
1800+440	0.96	0.07	CC
1803+784	1.92	0.03	G94
	2.37	0.39	VD
1807+698	1.69	0.34	VD
1810+010	0.37	0.01	LR
1823+568	1.93	0.36	VD
1828+487	2.36	0.39	VD
1849+670	1.41	0.07	CC
1908-201	1.30	0.07	LR
	1.39	0.04	VD
	1.64	0.06	CC
1921-293	9.80	0.40	LR
	9.10	0.86	VD
1923+210	1.09	0.07	LR
	0.99	0.10	VD
1928+738	2.65	0.04	G94
	2.22	0.44	VD
1936-155	1.29	0.05	CC
1954+513	1.43	0.13	VD
1957+406	4.04	0.02	G94
1958-179	0.45	0.04	VD
2005+403	1.27	0.05	LR
	1.51	0.13	VD
2007+777	2.02	0.05	G94
	1.30	0.24	VD
2008-159	0.78	0.02	VD
2021+317	1.65	0.10	VD
2021+614	1.24	0.19	VD
2022+542	0.73	0.04	LR
2023+336	2.79	0.10	VD
2037+511	3.03	0.26	VD
2059+034	1.15	0.07	CC
2121+053	0.52	0.04	VD

2128-123	1.75	0.08	VD
2131-021	1.05	0.04	VD
2134+004	2.92	0.12	VD
2145+067	7.65	0.21	VD
2155-152	1.22	0.08	VD
2200+420	4.18	0.30	G94
	2.53	0.13	VD
2201+315	1.65	0.08	VD
2203-188	1.00	0.05	CC
2210-257	0.51	0.03	CC
2216-038	1.17	0.03	VD
2223-052	2.13	0.15	VD
2227-088	2.29	0.14	CC
2229+695	0.28	0.01	LR
	0.34	0.02	CC
2230+114	1.76	0.09	CC
2234+282	0.84	0.08	VD
2243-123	1.64	0.05	VD
2251+158	10.9	0.08	G94
	17.1	0.75	VD
2255-282	1.74	0.11	VD
2318+049	1.08	0.10	VD
2345-167	1.70	0.03	VD
2355-106	0.94	0.05	CC

VD=Vivek Dhawan, VLA measurements
CC=Claire Chandler, VLA measurements
LR=Luis Rodriguez, VLA measurements
MH=Mark Holdaway, VLA measurements
G94=Greve et al. (1994) A&A 286, 654, IRAM 30-m measurements
O94=Ott et al. (1994) A&A 284, 331, Bonn 100-m measurements

Bright sources not in VLA calibrator list with Q-band flux density measurements, from Mark Holdaway.

Source (1950)	Flux (Jy)	error (Jy)	RA(2000)	Dec(2000)
0003+380	0.775	0.011	00 05 57.1750	+38 20 15.156
0007+205	0.140	0.006	00 10 28.7420	+20 47 49.719
0011+188	0.303	0.005	00 13 56.3780	+19 10 41.953
0017+257	0.237	0.003	00 19 39.7810	+26 02 52.344
0021+464	0.239	0.002	00 24 21.5390	+46 44 06.219
0037+487	0.107	0.004	00 39 46.9990	+49 00 33.188
0039+568	0.323	0.006	00 42 19.4520	+57 08 36.562
0046+316	0.207	0.007	00 48 47.1440	+31 57 25.094
0059+581	2.403	0.004	01 02 45.7630	+58 24 11.125
0110+495	0.805	0.013	01 13 27.0070	+49 48 24.062
0120+259	0.155	0.004	01 23 43.0430	+26 15 22.422
0121+560	0.109	0.007	01 24 25.8250	+56 18 51.875
0123+257	0.245	0.003	01 26 42.7910	+25 59 01.266
0129+431	0.380	0.002	01 32 44.1260	+43 25 32.656
0140+120	0.75	0.25	01 43 31.0930	+12 15 42.945
0151+474	0.363	0.005	01 54 56.2900	+47 43 26.531
0202+145	0.159	0.002	02 05 13.1170	+14 44 32.375
0206+136	0.402	0.002	02 09 36.0000	+13 52 00.750
0222+185	0.424	0.003	02 25 04.6700	+18 46 48.766
0223+341	0.359	0.001	02 26 10.3340	+34 21 30.250
0227+403	0.180	0.003	02 30 45.7070	+40 32 53.094
0239+175	0.229	0.003	02 42 24.2700	+17 42 58.844
0241+131	0.133	0.006	02 44 45.6930	+13 20 07.219
0251+393	0.323	0.004	02 54 42.6310	+39 31 34.688
0307+380	0.236	0.010	03 10 49.8830	+38 14 53.844
0318+438	0.122	0.004	03 21 36.8730	+43 59 22.500
0322+222	0.793	0.023	03 25 36.8140	+22 24 00.422
0323+151	0.115	0.003	03 26 31.6330	+15 21 26.750
0327+467	0.177	0.002	03 30 32.6290	+46 56 23.344
0345+460	0.572	0.004	03 49 18.7420	+46 09 59.656
0350+465	0.578	0.005	03 54 30.0160	+46 43 18.750
0354+599	0.403	0.004	03 59 02.6410	+60 05 22.062
0411+341	0.498	0.004	04 14 37.2580	+34 18 51.125
0412+447	0.506	0.008	04 15 56.5230	+44 52 49.656
0414+548	0.115	0.004	04 18 19.3400	+54 57 15.312
0415+398	0.293	0.003	04 19 22.5510	+39 55 28.969
0424+328	0.107	0.003	04 28 05.8160	+32 59 51.969
0424+414	0.211	0.011	04 27 46.0430	+41 33 01.094
0436+426	0.172	0.006	04 40 07.8750	+42 44 40.250
0442+389	0.139	0.006	04 46 11.4920	+39 00 17.094
0503+466	0.177	0.003	05 07 23.6600	+46 45 42.344
0506+056	0.397	0.004	05 09 25.9610	+05 41 35.340
0510+559	0.181	0.002	05 14 18.6990	+56 02 11.062
0515+067	0.219	0.003	05 17 51.3440	+06 48 03.191
0532+506	0.227	0.003	05 36 20.2340	+50 38 26.250
0533+446	0.110	0.002	05 37 30.0620	+44 41 03.531
0548+378	0.620	0.004	05 52 17.9380	+37 54 25.281
0602+405	0.281	0.002	06 05 50.8590	+40 30 08.094
0609+413	0.244	0.003	06 12 51.1880	+41 22 37.406
0609+607	0.177	0.003	06 14 23.8670	+60 46 21.750
0610+510	0.113	0.002	06 14 49.1600	+51 02 13.125
0612+570	0.465	0.008	06 17 16.9220	+57 01 16.375

0618+588	0.127	0.002	06 23 21.7770	+58 49 01.875
0633+596	0.343	0.004	06 38 02.8750	+59 33 22.188
0651+410	0.162	0.003	06 55 10.0230	+41 00 10.125
0656+082	0.177	0.001	06 59 18.0000	+08 13 30.930
0714+457	0.869	0.018	07 17 51.8440	+45 38 03.250
0722+145	0.517	0.007	07 25 16.8050	+14 25 13.734
0723+488	0.102	0.002	07 27 03.1020	+48 44 10.094
0724+571	0.379	0.005	07 28 49.6330	+57 01 24.375
0729+259	0.329	0.006	07 32 56.2810	+25 48 38.734
0730+504	0.480	0.003	07 33 52.5230	+50 22 09.062
0737+289	0.132	0.004	07 40 33.5470	+28 52 47.250
0738+313	0.943	0.003	07 41 10.7110	+31 12 00.219
0738+491	0.385	0.005	07 42 02.7500	+49 00 15.594
0740+173	0.134	0.001	07 43 05.1090	+17 14 24.406
0747+185	0.308	0.004	07 50 00.3280	+18 23 11.422
0751+095	0.101	0.002	07 53 51.9450	+09 24 19.758
0821+394	1.270	0.002	08 24 55.4840	+39 16 41.906
0821+621	0.190	0.004	08 25 38.6090	+61 57 28.562
0830+425	0.301	0.004	08 33 53.8830	+42 24 01.844
0833+585	0.217	0.005	08 37 22.4060	+58 25 01.812
0836+426	0.176	0.003	08 39 56.5620	+42 27 55.844

VLA calibrators bright at 90 GHz which might also be OK at Q band. Do not use these sources unless absolutely necessary, until 43 GHz measurement have been obtained.

Source (1950)	90 GHz Flux (Jy)	origin of measurement
0007+106	0.8	HL
	1.8	TB
0118-272	0.6	HL
0119+115	0.6	HL
0122-003	0.5	HL
0135-247	1.0	HL
0238-084	1.7	TB
0403-132	1.9	HL
0405-123	0.6	TB
0426-380	1.0	HL
0440-003	0.6	HL
	0.7	TB
0451-282	0.6	HL
0514-161	1.4	HL
0521-365	2.2	HL
0528-250	0.1	TB
0646-306	1.0	HL
0805-077	1.2	HL
0827+243	0.8	HL
0838+133	0.6	HL
1032-199	0.7	HL
1039+811	1.0	HL
1116+128	0.7	HL
1127-145	0.6	HL
	1.1	TB
1150+812	0.8	HL
1156+295	1.6	HL
	1.0	TB
1213-172	1.5	HL
1219+285	0.6	HL
	0.3	TB
1243-072	0.8	HL
1302-102	0.6	HL
1313-333	2.1	HL
1328+254	0.5	HL
1345+125	1.0	HL
	0.4	TB
1351-018	1.0	HL
1354-152	0.3	TB
1357+769	0.5	HL
1406-076	0.6	HL
1435-218	0.6	HL
1508-055	0.5	HL
1519-273	0.5	HL
1532+016	0.5	HL
1538+149	0.8	HL
1555+001	0.6	HL
	1.0	TB
1622-253	1.3	TB
1624+416	0.6	HL

1642+690	0.8	HL
	0.7	TB
1652+398	0.8	HL
	0.6	TB
1656+053	0.3	TB
1716+686	0.4	HL
1732+389	1.1	HL
1749+701	0.5	HL
	0.4	TB
1758+388	0.8	HL
1800+440	0.7	HL
1830-210	2.5	HL
1842+681	0.7	HL
1845+797	0.2	TB
1849+670	0.7	HL
2029+121	0.9	HL
2059+034	0.9	HL
2113+293	0.5	HL
2136+141	0.8	HL
2144+092	0.6	HL
2149-306	0.8	HL
2210-257	0.7	HL
2227-088	0.7	HL
2230+114	1.7	HL
	2.1	TB
2240-260	0.8	HL
2329-162	0.8	HL

HL=Harvey Listz, NRAO 12-m measurements
TB=Tom Balonek, NRAO 12-m measurements