Cas A Calibration

QMAP Flight 2, 10Nov96

th, 13Apr98

- beam pairs are combined for width fit; separate but constrained for amplitude
- final beam fits (mode 1)
- center frequencies from guesses of square bandpass limits
- new fit of Cas A, including Baars 1977 (>300MHz), Mezger 1986, and Chini 1984
- Cas A fit now includes eml data
- fractional instead of linear decrease model
- errors include frequency uncertainty
- error version including systematic error estimate in the integral

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Cas A	a	5.7128 ± 0.023
	b	-0.759 ± 0.006
	d	0.97 ± 0.040
	e	-0.3 ± 0.040
	epoch	1980

Observing Epoch	1996.86	
time difference	16.86	years

Constants	c	2.998E+10	cm/s
	k	1.380E-16	erg/K
	flux	1.000E-23	cgs/Jy
	ln10	2.3025851	
	deg -> rad	0.0174533	rad/°
	FWHM -> s	0.4246609	

Channel	ν	σν	Flux Density of Cas A (fit 1998) Se	D	S in flight (Jy)		
Ka1	31.2E+09	8.30E+08	200.2	0.9948	183.3 ± 16.1	8.8%	note:
Ka2	30.5E+09	3.20E+08	203.9	0.9948	186.6 ± 16.0	8.6%	flux error includes
Q1	41.7E+09	4.50E+08	160.8	0.9952	148.2 ± 13.0	8.7%	frequency error
Q2	41.1E+09	4.10E+08	162.4	0.9951	149.6 ± 13.1	8.7%	
Q3	42.3E+09	4.10E+08	159.1	0.9952	146.7 ± 12.8	8.7%	
Q4	41.3E+09	4.90E+08	162.0	0.9951	149.2 ± 13.1	8.7%	

	Beam FWHM major axis (°)	FWHM minor axis (°)	Omega (ster)	
Ka1	0.932 ± 0.006	0.831 ± 0.005	2.67E-04 ± 2.25E-06	0.8%
Ka2	0.932 ± 0.006	0.831 ± 0.005	2.67E-04 ± 2.25E-06	0.8%
Q1	0.674 ± 0.010	0.616 ± 0.009	1.43E-04 ± 2.86E-06	2.0%
Q2	0.674 ± 0.010	0.616 ± 0.009	1.43E-04 ± 2.86E-06	2.0%
Q3	0.730 ± 0.012	0.694 ± 0.012	1.75E-04 ± 4.20E-06	2.4%
Q4	0.730 ± 0.012	0.694 ± 0.012	1.75E-04 ± 4.20E-06	2.4%

	predicted Tsky of Cas A T (K)		errors without Cas A	ν
Ka1	0.0229 ± 0.0026	11.3%	± 0.0017	± 0.0002
Ka2	0.0245 ± 0.0022	9.1%	± 0.0007	± 0.0002
Q1	0.0194 ± 0.0018	9.4%	± 0.0007	± 0.0004
Q2	0.0201 ± 0.0019	9.3%	± 0.0007	± 0.0004
Q3	0.0153 ± 0.0014	9.4%	± 0.0005	± 0.0004
Q4	0.0163 ± 0.0016	9.6%	± 0.0007	± 0.0004

	calibration spikes						
	a0	a1	a2	a3	a4	frame	CAL
Ka1	9771.8	-0.25804	8.62E-06	-1.23E-10	6.74E-16	37500	7064.4
Ka2	18399.5	-0.58542	1.94E-05	-2.76E-10	1.51E-15	37500	12224.6
Q1	2104.3	-0.07253	2.33E-06	-3.24E-11	1.80E-16	37500	1315.1
Q2	4638.4	-0.10166	2.72E-06	-2.52E-11	6.66E-17	37500	3450.6
Q3	3511.9	-0.11814	4.28E-06	-6.85E-11	4.35E-16	38800	2354.8
Q4	3548	-0.07049	2.08E-06	-2.42E-11	1.13E-16	38800	2780.1

	measured flux density of Cas A			**syst. integral error**	
	P (counts)	P (CAL)		fractional	sigma_I'
Ka1	141.2 ± 0.9	0.0200 ± 0.0001	0.7%	0.07	3.74E-07
Ka2	176.2 ± 1.0	0.0144 ± 0.0001	0.6%	0.07	2.70E-07
Q1	46.9 ± 0.8	0.0357 ± 0.0006	1.6%	0.04	2.05E-07
Q2	98.3 ± 1.2	0.0285 ± 0.0004	1.3%	0.04	1.63E-07
Q3	107.3 ± 2.1	0.0456 ± 0.0009	2.0%	0.08	6.37E-07
Q4	89.7 ± 1.4	0.0323 ± 0.0005	1.6%	0.08	4.51E-07

	Calibration		errors without		
	K/CAL		Cas A	ν	
Ka1	**1.147** ± **0.129**	11.3%	± 0.084	± 0.012	errors include only
Ka2	**1.699** ± **0.154**	9.1%	± 0.052	± 0.017	formal errors on beam
Q1	**0.543** ± **0.052**	9.5%	± 0.021	± 0.014	
Q2	**0.705** ± **0.066**	9.4%	± 0.025	± 0.017	
Q3	**0.336** ± **0.032**	9.6%	± 0.014	± 0.010	
Q4	**0.506** ± **0.049**	9.7%	± 0.022	± 0.015	

Ka1	**1.147** ± **0.152**	13.2%	± 0.116	± 0.080	errors include estimate
Ka2	**1.699** ± **0.194**	11.4%	± 0.129	± 0.119	of the systematic error
Q1	**0.543** ± **0.054**	10.0%	± 0.027	± 0.022	in the beam integral
Q2	**0.705** ± **0.070**	10.0%	± 0.034	± 0.028	instead of formal errors
Q3	**0.336** ± **0.041**	12.1%	± 0.028	± 0.027	
Q4	**0.506** ± **0.062**	12.3%	± 0.044	± 0.040	