CHAMP+ Efficiency Measurements [PDF]

Date	Source	Θ_d["]	$\eta_f(\eta)$	Subarray	ν[GHz]	Θ_{mb}["]	$\eta_s(\lambda)$	Notes
Observing Campaign: July-September 2014								
10.09.2014	Mars	6.58.	0.95	LFA	660.4	9.1	0.43	Observations with new closed-cycle calibratio
				HFA	807.1	7.7	0.32	Results are consistent with previous LN2 cali
10.07.2014	Mars	8.94.	0.95	LFA	691.9	8.7	0.41	Cal Unit out of operation.
				HFA	807.1	7.7	0.34	Calibration performed manually with LN2 pac
Observing Campaign: November 2012								
07.11.2012	Jupiter	47.4	0.95	LFA	691.9	8.9	0.49	Mars to weak. Because Jupiter is consistent v
				HFA	807.1	7.7	0.48	use 2009 efficiencies for compact targets.
Observing Campaign: July 2010								
23.07.2010	Jupiter	43.1	0.95	LFA	691	8.9	0.48	LFA efficiencies are 10% on the low side, for
			0.95	HFA	809	7.7	0.48	to be investigated in September 2010
19.-25.07.	Mars	4.85	0.95	LFA	691		0.36	
			0.95	HFA	809		0.36	
23.07.2010	Uranus	3.56	0.95	LFA	691		0.34	
			0.95	HFA	809		0.32	
Observing Campaign: August 2009								optics corrected, surface adjusted
04.08.2009	Moon	1765	0.95	LFA	691	8.9	0.82	close to full moon
			0.95	HFA	806	7.6	0.84	
04.08.2009	Jupiter	47.3	0.95	LFA	691	8.9	0.52	
			0.95	HFA	806	7.6	0.49	
04.08.2009	Mars	5.4	0.95	LFA	661	8.7	0.43	LFA beam is smaller than "nominal"
			0.95	HFA	809	7.6	0.35	
Observing Campaign: June 2009								CHAMP+ optics anomaly (5)

16.06.2009	Jupiter	42.36	0.95	LFA	661	9.3	0.46	dewar position: 97 deg
			0.95	HFA	809	7.7	0.40	
22.06.2009	Mars	4.86	0.95	LFA	689	8.8	0.40	dewar position: 90 deg
				HFA				no data, recommend to use 0.35
Observing Campaign: September 2008								after telescope surface adjustment
14.09.2008	Moon	1855	0.95	LFA	691	8.9	0.82	full moon
			0.95	HFA	806	7.7	0.78	
09.09.2008	Jupiter	41.1	0.95	LFA	658	9.4	0.48	
			0.95	HFA	815	7.7	0.45	
			0.95	HFA	881	7.0	0.44	
14.09.2008	Uranus	3.64	0.95	LFA	691	8.9	0.38	
			0.95	HFA				too weak for cal, use Oct 07 numbers
Observing Campaign: July 2008								prior to tel. adjustment; after subreflector cha
18.07.2008	Jupiter	45.8	0.95	LFA	661	9.3	0.45	
			0.95	HFA	809	7.7	0.43	
05.07.2008	Mars	4.36	0.95	LFA	691	8.9	0.28	
			0.95	HFA	806	7.7	0.30	
Observing Campaign: October 2007								calibration with internal cold/losses
22.10.2007	Jupiter	32.5	0.95	LFA	661	9.3	0.45	
			0.95	HFA	809	7.7	0.42	
23.10.2007	Mars	11.4	0.95	LFA	691	8.9	0.38	
			0.95	HFA	806	7.7	0.35	

Addendum:

1. The CHAMP$^+$ beams are diffraction limited, use $\Theta_{FWHP} \approx 1.2\ \lambda/D$.

2. The forward efficiency $\eta_f(\lambda)$ is best estimated (0.95 ± 0.02); so far we have been unable to establish stable skydip analysis for submm wavelength (incl. self-consistent solution for the sky temperature in atm).
3. Efficiencies are generally uniform across the arrays (within a few per cent); except for HFA pixels #1 and #2, for which in 09-2008 we derive slightly lower source couplings (η_s(#1) = 0.85 and η_s(#2) = 0.89 times the table figures). This can be supplied by the apexOfflineCalibrator.
4. Image gains: for the 2007 measurements, a gain ratio of 0.05 is a good figure. Due to the transport damage to the refurbished cryo-optics, in 2008 sideband suppressions vary with frequency and with pixel position. But generally are better than 10 dB in the IF band center. Currently the calibrator cannot handle IF-variable image gains.
5. The June 2009 observations were affected by an anomaly in the warm optics (relaxed mirror fixation). This made the LFA beam toggle on the subreflector depending on the cryostat position. In consequence we have a coupling efficiency that depends on the orientation of the dewar (Fig). Fortunately, because we make use of the 60 deg symmetry of the array, most of the observations are carried out in an angular range that compares with the angle used for typical efficiency measurements. For proper calibration (1) inspect the range of the dewar angles used for your observation and (2) correct with the tools made available, if necessary (contact F. Wyrowski about the procedures). The HFA efficiency was somewhat reduced, but independent of the dewar orientation.