

Deep Impact In-Flight Calibration Summary (from the Calibration Paper, 06/27/2006)

Data Acquisition Date (2005)	DOY(s) of downlink	Activity	Data types				Target(s)	Purpose	Comments
			HRIVIS	MRIVIS	IR	ITS			
1/12		Launch							
1/14	15, 16	Quick instrument alignment and engineering checkout	Stars, darks, STIMs	Stars, darks, STIMs	Darks	Darks, STIMs	NGC3532	Engineering validation of operability, alignment, psf	All instruments operational with good relative alignment. Noted HRIVIS to be out of focus.
1/16	17, 18	Earth/Moon calibration	Darks, Moon, Earth	Darks, Moon, Earth	Darks, Moon, Earth		Earth, Moon	Radiometry, focus	Incorrect lunar exposures caused some saturation, most IR data saturated due to insufficient cooling of instrument bench, larger than expected pointing errors due to insufficient settling time allocation with the slow ADCS convergence algorithm employed for launch.
1/25	26, 27	MRI straylight and Moon radiometry calibration		Darks, Moon			Moon	Radiometry, scattered light	MRI turned off by onboard fault protection shortly after sequence initiation due to requested exposure time in excess of 5 minutes.
1/26	27, 28	Flyby autonav Moon test	Moon	Moon			Moon	Autonav test	Clear filter only
1/28	29	MRI straylight and Moon radiometry calibration (re-run)	Darks, Moon, Earth	Darks, Moon, Earth	Darks, Moon, Earth		Earth, Moon	Radiometry, focus	Good data
1/29	30	IR radiometry and scattered light calibration and HRI focus test	Moon, star	Moon, star	Moon		Moon, iCar	Radiometry, scattered light, focus	IR scattered light test revealed error in data compression lookup tables (data degraded), IR bench still warmer than desired resulting in elevated background levels and noise, IR flat field only partially successful due to timing mismatch in the sequence, star imagery successful.
2/4	36	IR radiometry and scattered light calibration and HRI focus test (re-run)	Moon, star	Moon, star	Moon		Moon, iCar	Radiometry, scattered light, focus	Obtained good IR flats, IR compression LUTs still incorrect, Moon only 58° from the Sun resulted in heating of HRI telescope baffle and excess 5-mm signal
2/5	37	Flyby autonav Jupiter test	Jupiter	Jupiter			Jupiter	Autonav encounter test	Clear filter only
2/15	46	HRIVIS focus diagnostics (aka "ghost test")	Star	Star			Canopus	Determine focal plane position	Long exposures through all filters to bring up ghost image from reflection off filter surface, also "knife-edge" images with filter aperture partially obscuring image beam, HRI bakeout heaters on.
2/18	50	Impactor checkout				Star	Background stars at cruise attitude	Test ITS image quality	Good performance verified
2/21	52, 53	HRIVIS ghost test #2	Star	Star			Canopus	Observe focus as a function of bakeout	
2/22	55	ITS quick alignment check				Stars	NGC3532	Engineering validation of alignment and psf	Successful

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3/2	62	MRI straylight and geometric calibration and precise alignment determination		Stars			NGC3114, various rich fields, encounter attitude star background	Engineering validation of focal length, geometric distortion, psf, and alignment	Successful, clear filter only
3/8	67	HRIVIS ghost test #3	Star	Star			Canopus	Observe focus as a function of bakeout	
3/11	70	HRIVIS ghost test #4	Star	Star			Canopus	Observe focus as a function of bakeout	
3/13	72	HRIVIS ghost test #5	Star	Star			Canopus	Observe focus as a function of bakeout	
3/15	74	HRIVIS ghost test #6	Star	Star			Canopus	Observe focus as a function of bakeout	
3/17	76	HRIVIS ghost test #7	Star	Star			Canopus	Observe focus as a function of bakeout	
3/17	76	HRIVIS ghost test #8	Star	Star			Canopus	Observe focus as a function of bakeout	
3/18	78	HRIVIS ghost test #9	Star	Star			Canopus	Observe focus as a function of bakeout	
3/21	81	HGA "jitter" test	Star				Pointed to RA 159.0658 DEC - 58.2708	See effects of the HGA tracking the Earth during encounter attitude maneuver on image smear	Smear observed was minimal
3/24	83	Encounter validation	Darks	Darks	Darks		None	Validate downlink to be used on encounter day	
3/31	91	MRI opnav photocal		Darks, stars			21 standard stars	Determine MRI response to stars of various types	Clear filter only
4/5 - 4/8	95 - 99, 119, 123	April science calibration	Stars, clusters, darks, STIMs	Stars, clusters, darks, STIMs	Stars, clusters, darks	Stars, clusters, darks, STIMs	Achernar, iCar, 16CygA, Vega, Canopus, bet Hyi, HD60753, Sirius, NGC6543, M11, NGC3114, IC2391	Radiometry, focal length, geometric distortion, psf	The clusters and planetary nebula were not detectable with the IR, the ITS images were mostly mispointed due to a sequencing error (got a few of M11 and some over-exposed Vega images useful for crosstalk characterization), good stellar radiometry data in all filters (except for ITS), good IR and VIS linearity data, good geometric data for HRIVIS and MRIVIS

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4/18	109	HRIVIS straylight, HRI/MRI alignment	Darks, stars	Stars			NGC3114 and encounter attitude star background	Engineering validation; ADCS attitude knowledge characterization	Clear filter only; ADCS test failed due to setup errors
4/23	113, 114	HRIVIS straylight, HRI/MRI alignment (re-run)	Darks, stars	Stars			NGC3114 and encounter attitude star background	Engineering validation; ADCS attitude knowledge characterization	Clear filter only
4/27 - 4/28	118	HRIVIS/IR straylight	Star, darks, STIMs	Star, STIMs	Star, darks		Canopus	Straylight calibration and ADC performance	Successful
4/30	120,121	ITS autonav Saturn test				Saturn	Saturn	Autonav ITS encounter test	Successful
5/6	126,127	ITS straylight & alignment				Stars	Encounter attitude star backgrounds	Navigation test	Successful; no apparent straylight in ITS at encounter attitude
5/10 - 5/13	130 - 136	May science calibration	Stars, clusters, darks, STIMs	Stars, clusters, darks, STIMs	Stars, clusters, darks	Stars, clusters, darks, STIMs	Achernar, iCar, 16CygA, Vega, Canopus, bet Hyi, HD60753, Sirius, 47Tuc, NGC3114, NGC7027	Radiometry, focal length, geometric distortion, psf, VIS crosstalk, IR alignment	Obtained first good ITS calibration, good crosstalk data, measured IR alignment, obtained IR geometric distortion data over half the slit with 47Tuc, missed IR coverage of NGC7027 and 16CygA due to pointing errors (did cover 16CygB), incomplete IR coverage of Sirius due to use of wrong scan rate, good radiometry and linearity data, good VIS geometric data.
5/21 - 5/24	145	ITS/ADCS attitude estimation				Stars	NGC3114	Navigation test	Successful
5/28	148	LUT checkouts	Darks, STIMs	Darks, STIMs	Darks	Darks, STIMs	None	Verify updated LUTs	New IR LUTs were still incorrect; VIS LUTs good.
6/3	153	ITS/ADCS attitude estimation				Stars	NGC3114	Re-run of DOY 145 test to verify repeatability	Successful
6/3	154	MRI/HRI engineering images	Stars	Stars			Cruise attitude star background	Autonav test to characterize cosmic rays and hot pixels	No hot pixels found
6/7 - 6/9	158 - 161, 163, 169	June science calibration	Stars, clusters, darks, STIMs	Stars, clusters, darks, STIMs	Stars, clusters, darks	Stars, clusters, darks, STIMs	Achernar, iCar, 16CygA, Vega, Canopus, bet Hyi, HD60753, 47Tuc, NGC3114, NGC7027	Radiometry, focal length, geometric distortion, psf, VIS crosstalk, IR alignment	Good radiometry, geometry, linearity, crosstalk data, covered other half of IR slit with 47Tuc, lost MRI data of 47Tuc, Canopus, and Achernar plus most of betHyi and 2 dark frames when camera fault protection turned it off, missed IR unbinned scans of NGC7027 due to erroneous zero scan rate in sequence (got binned-mode scan).

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6/10	164	Autonav ITS engineering test				Stars	Cruise attitude star background	Autonav test to characterize image quality, cosmic rays and hot pixels	No hot pixels found, representative sample of cosmic rays
6/14	165	Minical	Star, darks	Stars	Star, darks		16CygA, NGC7027	HRI psf, IR response at encounter temperature	Good dithered HRI psf images, IR unbinned scan of NGC7027.
6/16	167	IR LUT update checkout			Darks		None	Verify corrected IR compression LUTs	Verified to be correct.
6/19	170	Autonav HRI/MRI engineering test	Stars	Stars			Cruise attitude star background	Autonav test of image quality and hot pixels	No hot pixels found
6/25	178	Impactor checkout				Stars	Cruise attitude star background	Engineering validation	
6/27 - 7/3	179 - 183	ITS engineering checkout				Stars	Cruise attitude star background	Navigation test of image quality and hot pixels	No hot pixels found
7/2	183	Minical	Star, darks	Stars	Star, darks		16CygA, NGC7027	HRI psf, IR response at encounter temperature	Good dithered HRI psf images, IR unbinned scan of NGC7027.
7/3	184	Encounter dark frames	Darks, STIMs	Darks, STIMs	Darks	Darks	None	Final dark/STIM data before encounter	Data acquired successfully
7/6 - 7/8	188 - 190	Post-encounter calibration	Stars, clusters, darks, STIMs	Stars, clusters, darks, STIMs	Stars, clusters, darks		Achernar, iCar, 16CygA, Vega, Canopus, bet Hyi, 47Tuc, NGC3114, NGC7027	Radiometry, focal length, geometric distortion, psf, VIS crosstalk, IR alignment	Good radiometry, geometry, linearity data, covered both halves of IR slit with 47Tuc.
7/9	190	Minical	Star, darks	Stars	Star, darks		16CygA, NGC7027	HRI psf, IR response at encounter temperature	Good dithered HRI psf images, IR scans.
7/13 - 7/14	195	Additional HRIVIS STIMs	STIMs, darks					Improve HRIVIS flat field	Successful