OCI Flight TVAC LSF
Requirement Verification Report

OCI-60,122,127,128

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V&V Summary

	Cross-track BBR	IFOV	MTF	GSD
OCI requirement ID	OCI-122	OCI-128	OCI-127	OCI-60
Requirement Title	Band-to-Band Registration	Instantaneous Field of View	Modulation Transfer Function	Ground Sample Distance
Pass/Fail (OCI-122 passes with waiver OCI-DW-0154, see slide 12)	Fail for CPT 7,9,10 (69.65%). Pass for CPT 17 (72.28%) after realignment of CCD bands	Pass	Cross-track: Pass (based on GLAMR 340nm measurement for below 400nm bands), Along-track: Pass	Pass
Compliance shown on slides	15	Cross track: 16, 18 Along track: 21-24	Cross track: 25-27 Along track: 28-31	Cross track: 32-34 Along track: 35
WOA number(s)	WOA-OCI-THRM-2626, 2627, 2628	WOA-OCI-THRM-2626, 2627, 2628	WOA-OCI-THRM-2626, 2627, 2628	WOA-OCI-THRM-2626
Test Plan(s)	OCI-SYS-PLAN-0104	OCI-SYS-PLAN-0104	OCI-SYS-PLAN-0104	OCI-SYS-PLAN-0457
Test ID(s)	LSF-2 PHYS-L DELAY STEPPED	LSF-2 PHYS-L DELAY STEPPED	LSF-2 PHYS-L DELAY STEPPED	GSD CHARACTERIZATION ALT PPR

Requirements

ID		Requirement
OCI-122	Band-to-Band Registration (BBR)	Spatial band-to-band registration between any two bands shall be greater than 70% of one IFOV.
OCI-128	Instantaneous Field of View (iFOV)	OCI along track and cross track iFOV, defined as full width half max of one science pixel, shall be between 0.07639 degrees and 0.09296 degrees and verified at 865nm. All other spectral bands shall have an IFOV within +/-10% of the value measured at 865nm.
OCI-127	Modulation Transfer Function (MTF)	Design Requirement: The MTF in both track and scan direction shall equal or exceed: Fraction of Nyquist GSD Sample Frequency (MTF Req) 0.00 (1.0), 0.25 (0.9), 0.50 (0.7), 0.75 (0.5), 1.00 (0.3) Test Requirement: This requirement will be verified in the lab during the LSF measurement. See OCI-SCI-ANYS-0072 for description
OCI-60	Ground Sample Distance (GSD)	The OCI cross track ground sample distance (GSD), defined as the angle between the centroid of adjacent science pixels, shall be equal to the measured OCI cross IFOV within +1%, -2% The OCI along-track ground sample distance (GSD), defined as the angle subtended at the instrument by successive science pixel centers at scan center, at mission altitude and 20 degrees tilt, shall be between 94 and 98.5 % of the angular size of the measured along-track IFOV. The distance between successive pixel centers shall be the product of the maximum ground speed at mission altitude and the rotational period of the rotating telescope assembly. GSD will be verified at 865nm and shall measured or estimated for all bands.

Waivers

ID		Waiver
OCI-DW-0154	OCI Band-to-Band Registration in the SWIR	OCI Band-to-Band Registration in the SWIR

Description of Requested Deviation/Waiver:

The band-to-band (BBR) specification requires that for any pixel, the area on the ground viewed by any two OCI bands overlaps by more than 80%. The SWIR band response is delayed by the SWIR electronics, and this delay varies by band, this means some SWIR bands view a certain pixels too late (or too early) relative to other bands. This results in the center of the viewed pixel area of the SWIR bands being shifted in cross track direction relative to the other bands. Based on ETU results, the smallest overlap is expected to be 73%. Therefore, the BBR specification (OCI-122) shall be modified such that for the SWIR bands, an overlap of 70% meets the requirement.

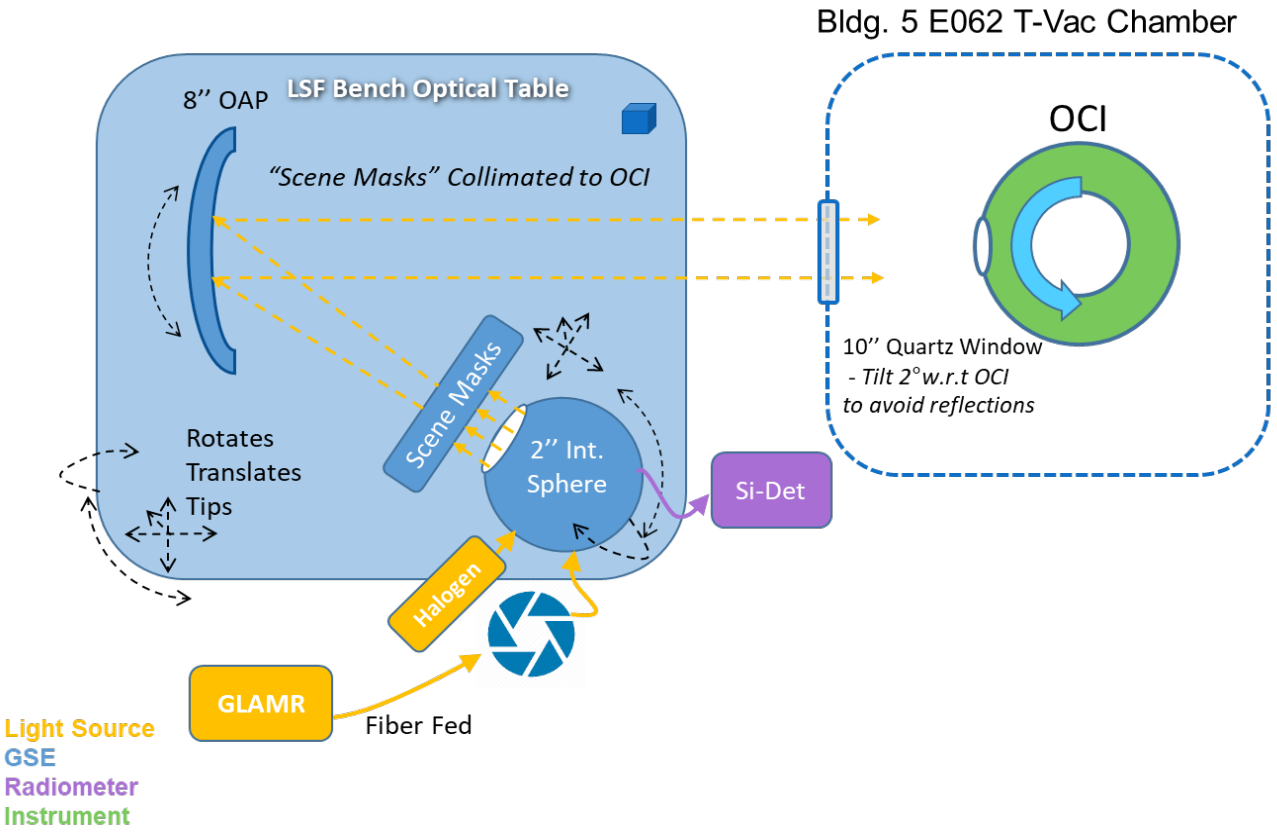
Reason/Justification for Deviation/Waiver:

Two sentence summary: Project Deputy Scientist Brian Cairns provided impact assessment on threshold products (water cloud droplet effective radius and optical depth), using high spatial resolution images from Landsat 8 as truth data set. More than 95% of all errors due to band-to-band registration are manageable within the current uncertainty allocation, which is acceptable.
Detailed summary: The optical depth and effective radius errors induced by band to band registration (BBR) errors are summarized in the attached document (BBR_Summary.pdf). More than 95% of all errors are less than 7.5% and the BBR errors are therefore manageable within the current allocation to the OCI sensor of 15% of which 7-8% is consumed by calibration uncertainty for the effective radius retrieval product.
Note that while the BBR error is systematic its impact on the retrievals is random (histograms of errors are symmetric) because of the variability in the clouds themselves. Since BBR is a systematic error that has a random impact on products it should be added to the calibration uncertainty impact on retrieval products in quadrature. The total OCI systematic errors for the effective radius (driving requirement) are therefore 12.5% if we allow 10% for calibration and 7.5% for BBR. This is within the allocation of 15% to the OCI sensor.

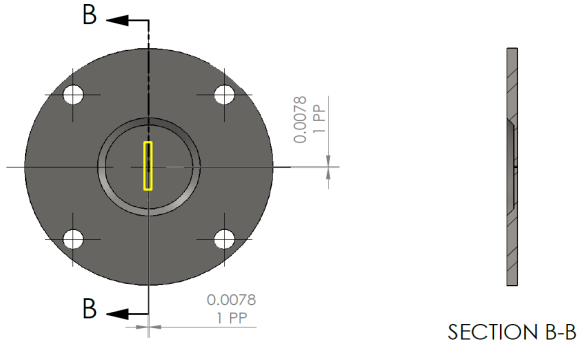
Test Overview

- LSF bench, PHYS-L mask, 1x1 aggregation, white light (EQ400 through light pipe:100%, Lamp A:100%) and GLAMR 340nm, 620nm
- Time delay unit = OCI MCC (Master Clock Cycles) of the DDC 136 MHz clock.
- The line length for flight = 736 MCC (1 physical pixel)
- The physical pixel fraction change = (time delay step)/736 = ¼ physical pixel for 1SP range
- CPT TVAC Time-delay PHYS-L tests for verifying BBR, cross-track IFOV, cross-track MTF: XINA wrapper marker ID 185125
- PPR (Pulse Per Revolution) GSD: Two time-delay PHYS-L tests
  - Characterization TVAC with standard PPR : XINA wrapper marker ID 185125, Standard PPR : -109.289245605468
  - Characterization TVAC with changed PPR : XINA wrapper marker ID 141520, ALT PPR: -111.288757324218

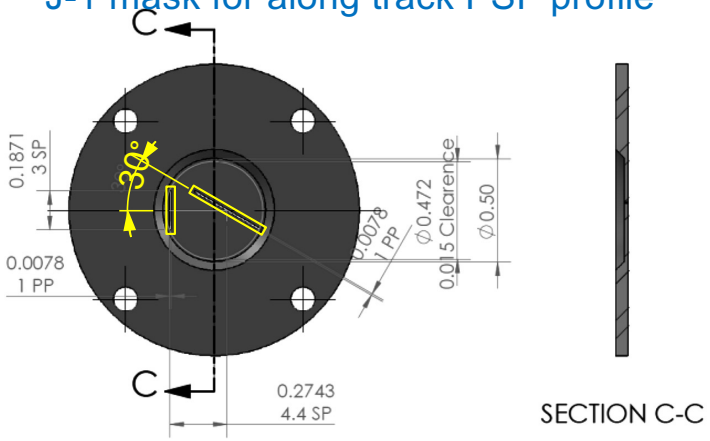
TVAC LSF test setup



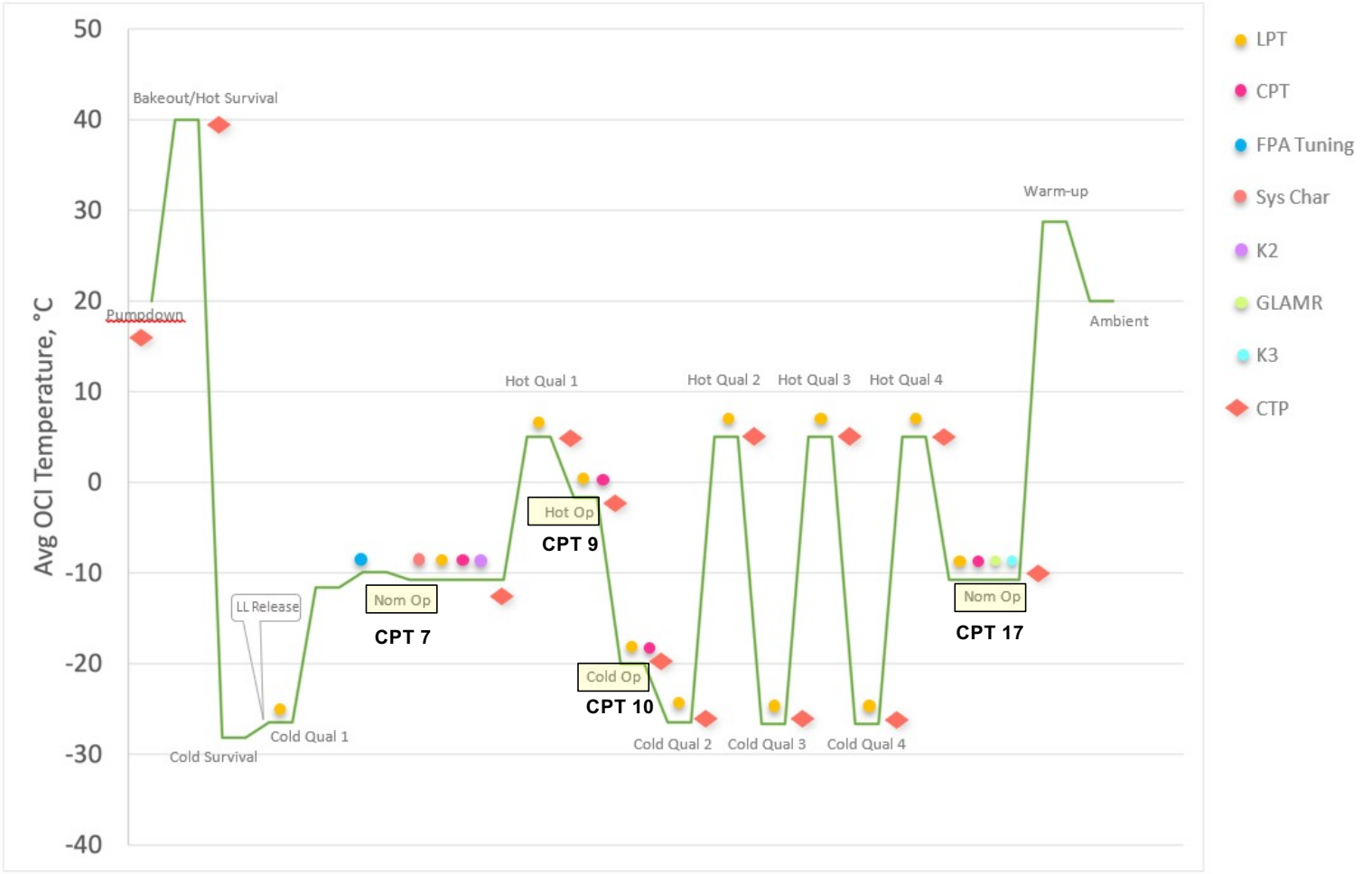
PHYS-L mask has physical pixel slit width with 8 physical pixel length in along track



J-1 mask for along track PSF profile



Flight TVAC (Thermal-Vacuum) Profile



Data Sets

TVAC CPT time-delay PHYS-L mask tests with White Light

CPT#	Temperature	LABEL	PRI_ID	U_INT_ID	T_START_UTC	T_END_UTC	DURATION_S	L1A_COVERAGE	AGGMODE	DAUMODE	DEBUG	ENVIRONMENT	HAM_FACE	LIGHTLEVEL	LIGHTSOURCE	LSF_MASK	MCESIDE	MODE_CONTROL_SELECT	RTAMODE	RTA_RATE	SCVOLT	SDAMODE	SPHERE
7	Nominal Op	CPT LSF-2 PHYS-L DELAY STEPPED	185125	1663203508000	2022-09-15T00:58:28.602	2022-09-15T01:22:18.596	1429.994	100	1x1	TDI	NO	TVAC	X	100% 100%	LSF-LAMP EQ400	PHYS-L	PRIMARY	DIAGNOSTIC	ROTATING	5.6988	NOMINAL	TDI	2-H
9	Hot Op	CPT LSF-2 PHYS-L DELAY STEPPED	185125	1663722495000	2022-09-21T01:08:15.913	2022-09-21T01:32:05.636	1429.723	100	1x1	TDI	NO	TVAC	X	100% 100%	LSF-LAMP EQ400	PHYS-L	REDUNDANT	DIAGNOSTIC	ROTATING	5.699098	NOMINAL	TDI	2-H
10	Cold Op	CPT LSF-2 PHYS-L DELAY STEPPED	185125	1663886676000	2022-09-22T22:44:36.238	2022-09-22T23:08:20.459	1424.222	100	1x1	TDI	NO	TVAC	X	100% 100%	LSF-LAMP EQ400	PHYS-L	PRIMARY	DIAGNOSTIC	ROTATING	5.698502	NOMINAL	TDI	2-H
17	Nominal Op 2	CPT LSF-2 PHYS-L DELAY STEPPED	185125	1664982672000	2022-10-05T15:11:12.410	2022-10-05T15:35:00.595	1428.186	100	1x1	TDI	NO	TVAC	X	100% 100%	LSF-LAMP EQ400	PHYS-L	PRIMARY	DIAGNOSTIC	ROTATING	5.6988	NOMINAL	TDI	2-H

TVAC CPT time-delay PHYS-L mask tests with GLAMR

CPT#	Temperature	LABEL	PRI_ID	U_INT_ID	T_START_UTC	T_END_UTC	DURATION_S	L1A_COVERAGE	AGGMODE	DAUMODE	DEBUG	ENVIRONMENT	HAM_FACE	LIGHTSOURCE	LSF_MASK	MCESIDE	MODE_CONTROL_SELECT	RTAMODE	SCVOLT	SDAMODE	WAVELENGTH
7	Nominal Op	CPT LSF-2 PHYS-L DELAY STEPPED GLAMR	185127	1663254854000	2022-09-15T15:14:14.591	2022-09-15T15:38:11.700	1437.11	100	1x1	TDI	NO	TVAC	X	GLAMR	PHYS-L	REDUNDANT	DIAGNOSTIC	ROTATING	NOMINAL	TDI	340
7	Nominal Op	CPT LSF-2 PHYS-L DELAY STEPPED GLAMR	185127	1663257752000	2022-09-15T16:02:32.707	2022-09-15T16:26:30.692	1437.985	100	1x1	TDI	NO	TVAC	X	GLAMR	PHYS-L	REDUNDANT	DIAGNOSTIC	ROTATING	NOMINAL	TDI	620
9	Hot Op	CPT LSF-2 PHYS-L DELAY STEPPED GLAMR	185127	1663694946000	2022-09-20T17:29:06.702	2022-09-20T17:52:53.665	1426.962	100	1x1	TDI	NO	TVAC	X	GLAMR	PHYS-L	REDUNDANT	DIAGNOSTIC	ROTATING	NOMINAL	TDI	340
9	Hot Op	CPT LSF-2 PHYS-L DELAY STEPPED GLAMR	185127	1663698313000	2022-09-20T18:25:13.004	2022-09-20T18:49:02.600	1429.597	100	1x1	TDI	NO	TVAC	X	GLAMR	PHYS-L	REDUNDANT	DIAGNOSTIC	ROTATING	NOMINAL	TDI	620
10	Cold Op	CPT LSF-2 PHYS-L DELAY STEPPED GLAMR	185127	1663872955000	2022-09-22T18:55:55.466	2022-09-22T19:19:37.576	1422.11	100	1x1	TDI	NO	TVAC	X	GLAMR	PHYS-L	PRIMARY	DIAGNOSTIC	ROTATING	NOMINAL	TDI	340
10	Cold Op	CPT LSF-2 PHYS-L DELAY STEPPED GLAMR	185127	1663876275000	2022-09-22T19:51:15.473	2022-09-22T20:15:01.670	1426.196	100	1x1	TDI	NO	TVAC	X	GLAMR	PHYS-L	PRIMARY	DIAGNOSTIC	ROTATING	NOMINAL	TDI	620
17	Nominal Op 2	CPT LSF-2 PHYS-L DELAY STEPPED GLAMR	185127	1664969315000	2022-10-05T11:28:35.781	2022-10-05T11:52:19.704	1423.922	100	1x1	TDI	NO	TVAC	X	GLAMR	PHYS-L	REDUNDANT	DIAGNOSTIC	ROTATING	NOMINAL	TDI	340
17	Nominal Op 2	CPT LSF-2 PHYS-L DELAY STEPPED GLAMR	185127	1664973069000	2022-10-05T12:31:09.858	2022-10-05T12:54:57.798	1427.941	100	1x1	TDI	NO	TVAC	X	GLAMR	PHYS-L	REDUNDANT	DIAGNOSTIC	ROTATING	NOMINAL	TDI	620

Data Sets

LSF-1 ATRACK test (6/6/22) with GAToR tilt

LABEL	PRI_ID	U_INT_ID	T_START_UTC	T_END_UTC	DURATION_S	L1A_COVERAGE	AGGMODE	DAUMODE	DEBUG	ENVIRONMENT	HAM_FACE	LIGHTLEVEL	LIGHTSOURCE	LSF_DETECTOR_MODEL1	LSF_GAIN_SETTING1	LSF_MASK	MCESIDE	MODE_CONTROL_SELECT	ROTPOS	ROTTAKE	RTAMODE	SCVOLT	SDAMODE	SPHERE	TILTPOS
LSF-1 ATRACK	185050	1.65453E+13	2022-06-06T14:42:33.785	2022-06-06T14:43:17.045	43.25981	100	1x1	TDI	NO	AMBIENT	X	HALOGEN: 44%. EQ-400: 100%%	NT HALO & EQ-400	D1B 350-	20uA/V	SP	EDUNDAN	IAGNOSTI	0.017	0	ROTATING	NOMINAL	TDI	2-H	-0.005
LSF-1 ATRACK	185050	1.65453E+13	2022-06-06T14:45:54.437	2022-06-06T14:46:37.702	43.26492	100	1x1	TDI	NO	AMBIENT	X	HALOGEN: 44%. EQ-400: 100%%	NT HALO & EQ-400	D1B 350-	20uA/V	SP	EDUNDAN	IAGNOSTI	0.017	0	ROTATING	NOMINAL	TDI	2-H	0.006
LSF-1 ATRACK	185050	1.65453E+13	2022-06-06T14:47:58.610	2022-06-06T14:48:41.927	43.3167	100	1x1	TDI	NO	AMBIENT	X	HALOGEN: 44%. EQ-400: 100%%	NT HALO & EQ-400	D1B 350-	20uA/V	SP	EDUNDAN	IAGNOSTI	0.017	0	ROTATING	NOMINAL	TDI	2-H	0.018
LSF-1 ATRACK	185050	1.65453E+13	2022-06-06T14:50:06.161	2022-06-06T14:50:49.418	43.25668	100	1x1	TDI	NO	AMBIENT	X	HALOGEN: 44%. EQ-400: 100%%	NT HALO & EQ-400	D1B 350-	20uA/V	SP	EDUNDAN	IAGNOSTI	0.017	0	ROTATING	NOMINAL	TDI	2-H	0.029
LSF-1 ATRACK	185050	1.65453E+13	2022-06-06T14:52:35.632	2022-06-06T14:53:18.870	43.23819	100	1x1	TDI	NO	AMBIENT	X	HALOGEN: 44%. EQ-400: 100%%	NT HALO & EQ-400	D1B 350-	20uA/V	SP	EDUNDAN	IAGNOSTI	0.017	0	ROTATING	NOMINAL	TDI	2-H	0.04
LSF-1 ATRACK	185050	1.65453E+13	2022-06-06T14:54:33.593	2022-06-06T14:55:16.891	43.29292	100	1x1	TDI	NO	AMBIENT	X	HALOGEN: 44%. EQ-400: 100%%	NT HALO & EQ-400	D1B 350-	20uA/V	SP	EDUNDAN	IAGNOSTI	0.017	0	ROTATING	NOMINAL	TDI	2-H	0.051
LSF-1 ATRACK	185050	1.65453E+13	2022-06-06T14:56:39.073	2022-06-06T14:57:22.323	43.24515	100	1x1	TDI	NO	AMBIENT	X	HALOGEN: 44%. EQ-400: 100%%	NT HALO & EQ-400	D1B 350-	20uA/V	SP	EDUNDAN	IAGNOSTI	0.017	0	ROTATING	NOMINAL	TDI	2-H	0.063
LSF-1 ATRACK	185050	1.65453E+13	2022-06-06T14:58:41.640	2022-06-06T14:59:24.984	43.34441	100	1x1	TDI	NO	AMBIENT	X	HALOGEN: 44%. EQ-400: 100%%	NT HALO & EQ-400	D1B 350-	20uA/V	SP	EDUNDAN	IAGNOSTI	0.017	0	ROTATING	NOMINAL	TDI	2-H	0.074
LSF-1 ATRACK	185050	1.65453E+13	2022-06-06T15:10:51.329	2022-06-06T15:11:34.575	43.246	100	1x1	TDI	NO	AMBIENT	X	HALOGEN: 44%. EQ-400: 100%%	NT HALO & EQ-400	D1B 350-	20uA/V	SP	EDUNDAN	IAGNOSTI	0.017	0	ROTATING	NOMINAL	TDI	2-H	0.085
LSF-1 ATRACK	185050	1.65453E+13	2022-06-06T15:21:09.148	2022-06-06T15:21:52.492	43.3445	100	1x1	TDI	NO	AMBIENT	X	HALOGEN: 100%. EQ-400: 100%%	NT HALO & EQ-400	D1B 350-	20uA/V	SP	EDUNDAN	IAGNOSTI	0.017	0	ROTATING	NOMINAL	TDI	2-H	0.063
LSF-1 ATRACK	185050	1.65453E+13	2022-06-06T15:24:26.999	2022-06-06T15:25:10.242	43.24262	100	1x1	TDI	NO	AMBIENT	X	HALOGEN: 100%. EQ-400: 100%%	NT HALO & EQ-400	D1B 350-	20uA/V	SP	EDUNDAN	IAGNOSTI	0.017	0	ROTATING	NOMINAL	TDI	2-H	0.074
LSF-1 ATRACK	185050	1.65453E+13	2022-06-06T15:27:29.007	2022-06-06T15:28:12.304	43.29717	100	1x1	TDI	NO	AMBIENT	X	HALOGEN: 100%. EQ-400: 100%%	NT HALO & EQ-400	D1B 350-	20uA/V	SP	EDUNDAN	IAGNOSTI	0.017	0	ROTATING	NOMINAL	TDI	2-H	0.085
LSF-1 ATRACK	185050	1.65453E+13	2022-06-06T15:40:19.253	2022-06-06T15:50:27.579	608.3216	100	1x1	TDI	NO	AMBIENT	X	HALOGEN: 100%. EQ-400: 100%%	NT HALO & EQ-400	D1B 350-	20uA/V	SP	EDUNDAN	IAGNOSTI	0	0	ROTATING	NOMINAL	TDI	2-H	0.13
LSF-1 ATRACK	185050	1.65453E+13	2022-06-06T15:52:26.999	2022-06-06T16:02:35.445	608.4457	100	1x1	TDI	NO	AMBIENT	X	HALOGEN: 100%. EQ-400: 100%%	NT HALO & EQ-400	D1B 350-	20uA/V	SP	EDUNDAN	IAGNOSTI	0	0	ROTATING	NOMINAL	TDI	2-H	0.175
LSF-1 ATRACK	185050	1.65453E+13	2022-06-06T16:05:36.923	2022-06-06T16:11:45.887	368.9631	100	1x1	TDI	NO	AMBIENT	X	HALOGEN: 100%. EQ-400: 100%%	NT HALO & EQ-400	D1B 350-	20uA/V	SP	EDUNDAN	IAGNOSTI	0	0	ROTATING	NOMINAL	TDI	2-H	1.995
LSF-1 ATRACK	185050	1.65453E+13	2022-06-06T16:15:32.527	2022-06-06T16:25:40.823	608.2959	100	8x8	TDI	NO	AMBIENT	X	HALOGEN: 100%. EQ-400: 100%%	NT HALO & EQ-400	D1B 350-	20uA/V	SP	EDUNDAN	SHOLD_SC	0	0	ROTATING	NOMINAL	TDI	2-H	1.995
LSF-1 ATRACK	185050	1.65453E+13	2022-06-06T16:30:25.886	2022-06-06T16:40:34.266	608.3799	100	8x8	TDI	NO	AMBIENT	X	HALOGEN: 100%. EQ-400: 100%%	NT HALO & EQ-400	D1B 350-	20uA/V	SP	EDUNDAN	SHOLD_SC	0	0	ROTATING	NOMINAL	TDI	2-H	4.995
LSF-1 ATRACK	185050	1.65453E+13	2022-06-06T16:42:45.892	2022-06-06T16:52:54.296	608.4039	100	8x8	TDI	NO	AMBIENT	X	HALOGEN: 100%. EQ-400: 100%%	NT HALO & EQ-400	D1B 350-	20uA/V	SP	EDUNDAN	SHOLD_SC	0	0	ROTATING	NOMINAL	TDI	2-H	9.995
LSF-1 ATRACK	185050	1.65453E+13	2022-06-06T16:55:31.384	2022-06-06T17:05:39.945	608.5611	100	8x8	TDI	NO	AMBIENT	X	HALOGEN: 100%. EQ-400: 100%%	NT HALO & EQ-400	D1B 350-	20uA/V	SP	EDUNDAN	SHOLD_SC	0	0	ROTATING	NOMINAL	TDI	2-H	14.995
LSF-1 ATRACK	185050	1.65454E+13	2022-06-06T17:12:06.726	2022-06-06T17:12:50.150	43.42415	100	1x1	TDI	NO	AMBIENT	X	HALOGEN: 44%. EQ-400: 100%%	NT HALO & EQ-400	D1B 350-	20uA/V	SP	EDUNDAN	IAGNOSTI	0	0	ROTATING	NOMINAL	TDI	2-H	-0.005
LSF-1 ATRACK	185050	1.65454E+13	2022-06-06T17:14:29.293	2022-06-06T17:15:12.649	43.35054	100	1x1	TDI	NO	AMBIENT	X	HALOGEN: 44%. EQ-400: 100%%	NT HALO & EQ-400	D1B 350-	20uA/V	SP	EDUNDAN	IAGNOSTI	0	0	ROTATING	NOMINAL	TDI	2-H	-0.016
LSF-1 ATRACK	185050	1.65454E+13	2022-06-06T17:16:52.063	2022-06-06T17:17:35.431	43.36295	100	1x1	TDI	NO	AMBIENT	X	HALOGEN: 44%. EQ-400: 100%%	NT HALO & EQ-400	D1B 350-	20uA/V	SP	EDUNDAN	IAGNOSTI	0	0	ROTATING	NOMINAL	TDI	2-H	-0.027
LSF-1 ATRACK	185050	1.65454E+13	2022-06-06T17:19:04.857	2022-06-06T17:19:48.240	43.38254	100	1x1	TDI	NO	AMBIENT	X	HALOGEN: 44%. EQ-400: 100%%	NT HALO & EQ-400	D1B 350-	20uA/V	SP	EDUNDAN	IAGNOSTI	0	0	ROTATING	NOMINAL	TDI	2-H	-0.038
LSF-1 ATRACK	185050	1.65454E+13	2022-06-06T17:21:20.091	2022-06-06T17:22:03.346	43.25519	100	1x1	TDI	NO	AMBIENT	X	HALOGEN: 44%. EQ-400: 100%%	NT HALO & EQ-400	D1B 350-	20uA/V	SP	EDUNDAN	IAGNOSTI	0	0	ROTATING	NOMINAL	TDI	2-H	-0.05
LSF-1 ATRACK	185050	1.65454E+13	2022-06-06T17:32:15.977	2022-06-06T17:32:59.342	43.36545	100	1x1	TDI	NO	AMBIENT	X	HALOGEN: 44%. EQ-400: 100%%	NT HALO & EQ-400	D1B 350-	20uA/V	SP	EDUNDAN	IAGNOSTI	0	0	ROTATING	NOMINAL	TDI	2-H	-0.061
LSF-1 ATRACK	185050	1.65454E+13	2022-06-06T17:34:36.927	2022-06-06T17:35:20.307	43.37958	100	1x1	TDI	NO	AMBIENT	X	HALOGEN: 44%. EQ-400: 100%%	NT HALO & EQ-400	D1B 350-	20uA/V	SP	EDUNDAN	IAGNOSTI	0	0	ROTATING	NOMINAL	TDI	2-H	-0.072
LSF-1 ATRACK	185050	1.65454E+13	2022-06-06T17:49:41.925	2022-06-06T17:50:25.246	43.32097	100	1x1	TDI	NO	AMBIENT	X	HALOGEN: 100%. EQ-400: 100%%	NT HALO & EQ-400	D1B 350-	20uA/V	SP	EDUNDAN	IAGNOSTI	0	0	ROTATING	NOMINAL	TDI	2-H	-0.072
LSF-1 ATRACK	185050	1.65454E+13	2022-06-06T17:53:49.680	2022-06-06T17:54:33.023	43.34251	100	1x1	TDI	NO	AMBIENT	X	HALOGEN: 100%. EQ-400: 100%%	NT HALO & EQ-400	D1B 350-	20uA/V	SP	EDUNDAN	IAGNOSTI	0	0	ROTATING	NOMINAL	TDI	2-H	-0.084
LSF-1 ATRACK	185050	1.65454E+13	2022-06-06T17:57:02.752	2022-06-06T17:57:46.075	43.32281	100	1x1	TDI	NO	AMBIENT	X	HALOGEN: 100%. EQ-400: 100%%	NT HALO & EQ-400	D1B 350-	20uA/V	SP	EDUNDAN	IAGNOSTI	0.017	0	ROTATING	NOMINAL	TDI	2-H	-0.095
LSF-1 ATRACK	185050	1.65454E+13	2022-06-06T17:59:15.536	2022-06-06T18:09:24.245	608.7091	100	1x1	TDI	NO	AMBIENT	X	HALOGEN: 100%. EQ-400: 100%%	NT HALO & EQ-400	D1B 350-	20uA/V	SP	EDUNDAN	IAGNOSTI	0.017	0	ROTATING	NOMINAL	TDI	2-H	-0.14
LSF-1 ATRACK	185050	1.65454E+13	2022-06-06T18:10:53.853	2022-06-06T18:21:02.204	608.3465	100	1x1	TDI	NO	AMBIENT	X	HALOGEN: 100%. EQ-400: 100%%	NT HALO & EQ-400	D1B 350-	20uA/V	SP	EDUNDAN	IAGNOSTI	0.017	0	ROTATING	NOMINAL	TDI	2-H	-0.185
LSF-1 ATRACK	185050	1.65454E+13	2022-06-06T18:24:03.547	2022-06-06T18:34:11.857	608.3095	100	8x8	TDI	NO	AMBIENT	X	HALOGEN: 100%. EQ-400: 100%%	NT HALO & EQ-400	D1B 350-	20uA/V	SP	EDUNDAN	SHOLD_SC	0.017	0	ROTATING	NOMINAL	TDI	2-H	-2.005
LSF-1 ATRACK	185050	1.65454E+13	2022-06-06T18:38:04.126	2022-06-06T18:48:12.453	608.3269	100	8x8	TDI	NO	AMBIENT	X	HALOGEN: 100%. EQ-400: 100%%	NT HALO & EQ-400	D1B 350-	20uA/V	SP	EDUNDAN	SHOLD_SC	0.017	0	ROTATING	NOMINAL	TDI	2-H	-5.005
LSF-1 ATRACK	185050	1.65454E+13	2022-06-06T18:53:33.388	2022-06-06T19:03:41.792	608.4041	100	8x8	TDI	NO	AMBIENT	X	HALOGEN: 100%. EQ-400: 100%%	NT HALO & EQ-400	D1B 350-	20uA/V	SP	EDUNDAN	SHOLD_SC	0.017	0	ROTATING	NOMINAL	TDI	2-H	-10.005
LSF-1 ATRACK	185050	1.65454E+13	2022-06-06T19:09:08.581	2022-06-06T19:19:16.919	608.3384	100	8x8	TDI	NO	AMBIENT	X	HALOGEN: 100%. EQ-400: 100%%	NT HALO & EQ-400	D1B 350-	20uA/V	SP	EDUNDAN	SHOLD_SC	0.017	0	ROTATING	NOMINAL	TDI	2-H	-15.005

Data Sets

PPR GSD test during TVAC characterization test

LABEL	PRI_ID	U_INT_ID	T_START_UTC	T_END_UTC	DURATION_S	L1A_COVERAGE	AGGMODE	DAUMODE	DEBUG	ENVIRONMENT	HAM_FACE	LIGHTLEVEL	LIGHTSOURCE	LSF_MASK	MCESIDE	MODE_CONTROL_SELECT	RTAMODE	RTA_RATE	SCVOLT	SDAMODE	SPHERE	
LSF-2 PHYS-L DELAY STEPPED	185125	1662555040000	2022-09-07T12:50:40.499	2022-09-07T13:14:30.651	1430.151	100	1x1	TDI	NO	TVAC	X	100% 100%	LSF-LAMP EQ400	PHYS-L	PRIMARY	DIAGNOSTIC	ROTATING	5.6988	NOMINAL	TDI	2-H	
LABEL	**PRI_ID**	**U_INT_ID**	**T_START_UTC**	**T_END_UTC**	**DURATION_S**	**L1A_COVERAGE**	**AGGMODE**	**ALT_PPR**	**DAUMODE**	**DEBUG**	**ENVIRONMENT**	**HAM_FACE**	**LIGHTLEVEL**	**LIGHTSOURCE**	**LSF_MASK**	**MCESIDE**	**MODE_CONTROL_SELECT**	**RTAMODE**	**SCVOLT**	**SDAMODE**	**SPHERE**	**STD_PPR**
GSD CHARACTERIZATION ALT PPR	141520	1662556685000	2022-09-07T13:18:05.497	2022-09-07T13:41:53.591	1428.094	100	1x1	-111.289	STANDBY	NO	TVAC	X	100% 100%	LSF-LAMP EQ400	PHYS-L	PRIMARY	DIAGNOSTIC	ROTATING	NOMINAL	TDI	2-H	-109.289

LSF SL test with different rotation angles for GSD calculation

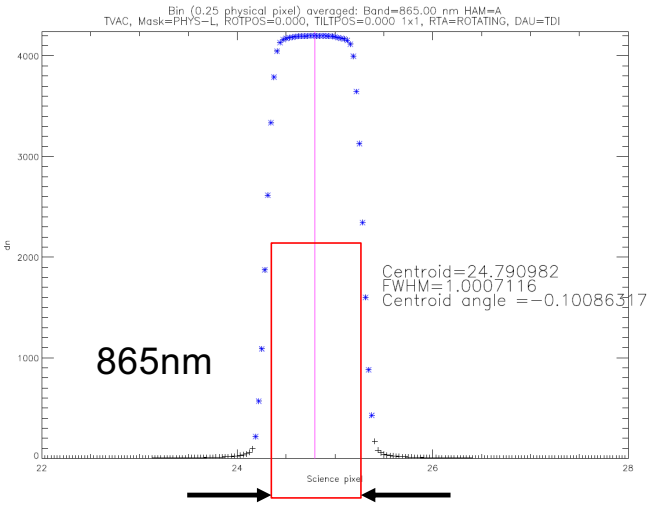
LABEL	PRI_ID	U_INT_ID	T_START_UTC	T_END_UTC	DURATION_S	AGGMODE	DAUMODE	DEBUG	VIRONME	HAM_FACE	LIGHTLEVEL	LIGHTSOURCE	_DETECTOR_MOD	GAIN_SETT	LSF_MASK	MCESIDE	CONTROL_	ROTPOS	ROTTAKE	RTAMODE	SCVOLT	SDAMODE	SPHERE	TILTPOS
LSF-1 XTRACK LONG DWELL	185030	16542904010001	2022-06-03T21:06:41.854	2022-06-03T21:08:44.014	122.1599	8x8	TDI	NO	AMBIENT	X	HALOGEN: 44%. EQ-400: 100%%	DIRECT MNT HALO & EQ-400 LIGHT PIPE	SM05PD1B 350-1100nm	20uA/V	SP	PRIMARY	SHOLD_SCI	0.033	0	ROTATING	NOMINAL	TDI	2-H	-0.005
LSF-1 XTRACK LONG DWELL	185030	16542910020001	2022-06-03T21:16:42.470	2022-06-03T21:18:44.518	122.04837	8x8	TDI	NO	AMBIENT	X	HALOGEN: 44%. EQ-400: 100%%	DIRECT MNT HALO & EQ-400 LIGHT PIPE	SM05PD1B 350-1100nm	20uA/V	SP	PRIMARY	SHOLD_SCI	25.033	0	ROTATING	NOMINAL	TDI	2-H	-0.005
LSF-1 XTRACK LONG DWELL	185030	16542914470001	2022-06-03T21:24:07.520	2022-06-03T21:26:09.557	122.03729	8x8	TDI	NO	AMBIENT	X	HALOGEN: 44%. EQ-400: 100%%	DIRECT MNT HALO & EQ-400 LIGHT PIPE	SM05PD1B 350-1100nm	20uA/V	SP	PRIMARY	SHOLD_SCI	50.033	0	ROTATING	NOMINAL	TDI	2-H	-0.005
LSF-1 XTRACK LONG DWELL	185030	16542920750001	2022-06-03T21:34:35.787	2022-06-03T21:36:37.947	122.15985	8x8	TDI	NO	AMBIENT	X	HALOGEN: 44%. EQ-400: 100%%	DIRECT MNT HALO & EQ-400 LIGHT PIPE	SM05PD1B 350-1100nm	20uA/V	SP	PRIMARY	SHOLD_SCI	-24.967	0	ROTATING	NOMINAL	TDI	2-H	-0.005
LSF-1 XTRACK LONG DWELL	185030	16542926170001	2022-06-03T21:43:37.244	2022-06-03T21:45:39.302	122.05756	8x8	TDI	NO	AMBIENT	X	HALOGEN: 44%. EQ-400: 100%%	DIRECT MNT HALO & EQ-400 LIGHT PIPE	SM05PD1B 350-1100nm	20uA/V	SP	PRIMARY	SHOLD_SCI	-49.967	0	ROTATING	NOMINAL	TDI	2-H	-0.075

J-1 mask tests in ambient with white light and TVAC CPT time-delay J-1 tests

CPT#	Temperature	LABEL	PRI_ID	U_INT_ID	T_START_UTC	T_END_UTC	DURATION_S	L1A_COVERAGE	AGGMODE	DAUMODE	DEBUG	ENVIRONMENT	HAM_FACE	LIGHTLEVEL	LIGHTSOURCE	LSF_MASK	MCESIDE	MODE_CONTROL_SELECT	ROTPOS	ROTTAKE	RTAMODE	SCVOLT	SDAMODE	SPHERE	TILTPOS
1	Ambient	CPT-LSF-2 J-1	185125	1.65101E+13	2022-04-26T21:36:25.359	2022-04-26T21:46:27.286	601.9263	100	1x1	TDI	NO	AMBIENT	X	HALOGEN: 100%. EQ-400: 100%%	HALOGEN: 100%. EQ-400: 100%	J-1	PRIMARY	DIAGNOSTIC	0	0	ROTATING	NOMINAL	TDI	2-H	0
CPT#	**Temperature**	**LABEL**	**PRI_ID**	**U_INT_ID**	**T_START_UTC**	**T_END_UTC**	**DURATION_S**	**L1A_COVERAGE**	**AGGMODE**	**DAUMODE**	**DEBUG**	**ENVIRONMENT**	**HAM_FACE**	**LIGHTLEVEL**	**LIGHTSOURCE**	**LSF_MASK**	**MCESIDE**	**MODE_CONTROL_SELECT**	**RTAMODE**	**SCVOLT**	**SDAMODE**	**SPHERE**			
7	Nominal Op	CPT LSF-2 J-1 DELAY STEPPED	185120	1.66324E+13	2022-09-15T11:42:40.605	2022-09-15T11:49:07.816	387.2107	100	1x1	TDI	NO	TVAC	X	100% 100%	LSF-LAMP EQ400	J-1	PRIMARY	DIAGNOSTIC	ROTATING	NOMINAL	TDI	2-H			
9	Hot Op	CPT LSF-2 J-1 DELAY STEPPED	185120	1.66372E+13	2022-09-21T00:03:10.895	2022-09-21T00:09:38.682	387.7877	100	1x1	TDI	NO	TVAC	X	100% 100%	LSF-LAMP EQ400	J-1	REDUNDANT	DIAGNOSTIC	ROTATING	NOMINAL	TDI	2-H			
10	Cold Op	CPT LSF-2 J-1 DELAY STEPPED	185120	1.66389E+13	2022-09-22T22:16:51.309	2022-09-22T22:23:13.597	382.2879	100	1x1	TDI	NO	TVAC	X	100% 100%	LSF-LAMP EQ400	J-1	PRIMARY	DIAGNOSTIC	ROTATING	NOMINAL	TDI	2-H			

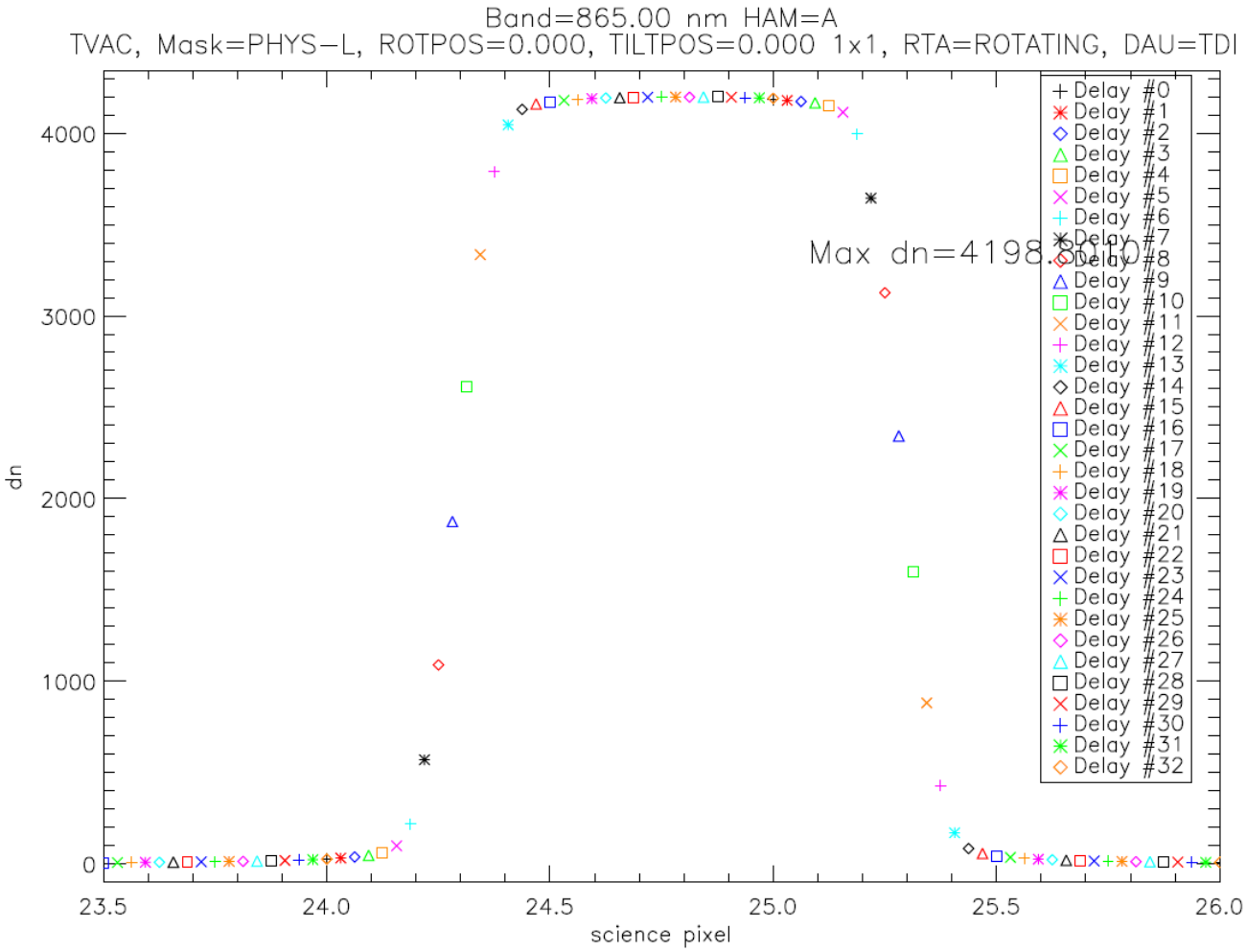
Methods

1. **Aggregation**
   - **For 1SP response: convert 1x1 aggregation data into 8x8 L1B data to make 1SP signal response from 1 physical pixel signal.**
2. **Construct PSF profile by collecting all delayed steps by shifting 1/4 physical pixels using delay step number (shifting pixel position values).**
3. **Creating bin(1/4 physical pixel) averaged PSF profile.**
4. **Find centroids from the pixels greater than 5% of maximum peak to avoid the signal recovery problem.**
5. **Apply SWIR band alignment numbers for CCD to SWIR alignment to SWIR band centroids.**
6. **Calculate BBR(Band-to-Band Registration) using the centroids from constructed Science Pixel PSF profile (i=8).**
7. **Calculate iFOV (FWHM) from bin-averaged PSF profile.**
8. **Calculate MTF from bin-averaged PSF profile.**
9. **Calculate PPR GSD from two time-delay PHYSL tests (one with standard PPR and one with changed PPR). PPR GSD=ΔPPR angle/ Δcentroids**



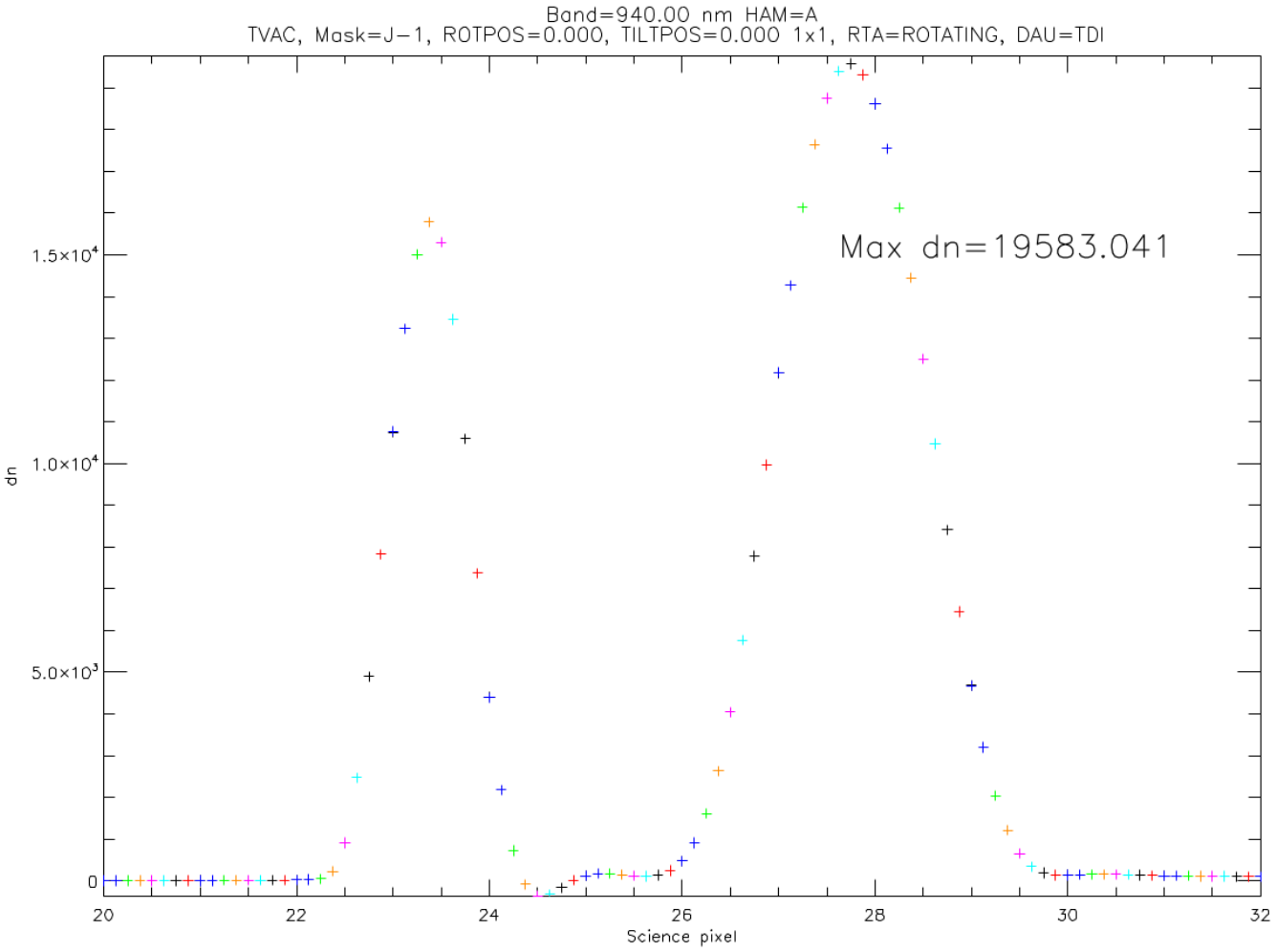
FWHM
(Full Width Half Maximum)

Time delay measurement: science pixel PSF profile



- Each symbol with different color from ¼ physical pixel (1/32 science pixel) delay step.
- Left plot shows the 33 delay step data were collected to construct a science pixel PSF profile from time-delay PHYS-L mask test.
- 1x1 physical pixel signal was converted into L1B 8x8 to make the science pixel signal response.

Time delay measurement: J-1 mask SWIR band



- The symbol with the same color is from 1 physical pixel (1/8 science pixel) delay step.
- Left plot shows the 9 delay step data were collected to construct a J-1 mask profile.
- The along track PSF can be calculated from the second profile from slanted slit of J-1 mask by multiplying the tangent of slant slope.

BBR Overview

OCI-122	Band-to-Band Registration (BBR)	Spatial band-to-band registration between any two bands shall be greater than 70% of one IFOV.

OCI BBR

BBR is the spatial overlap between the science pixels in different spectral channels.

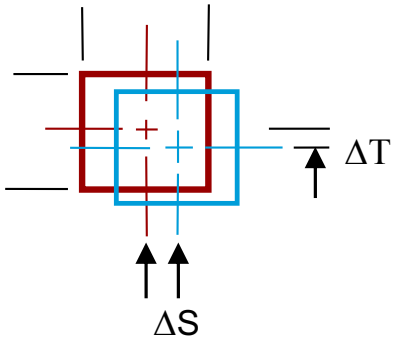
The centroid differences (ΔT and ΔS) in the along-track and cross-track directions are converted to fractional misregistration by dividing by the science pixel size (8 pixels for 1x1) in that direction.

$BBR_{(m,n)} = (1 - \Delta T_{(m,n)}/T) \times (1 - \Delta S_{(m,n)}/S) > 0.7$ where (*m, n*) is band *m* and band *n* pair

OCI's 1 km slit is the along-track field mask for all spectral channels, so $\Delta T \approx 0$

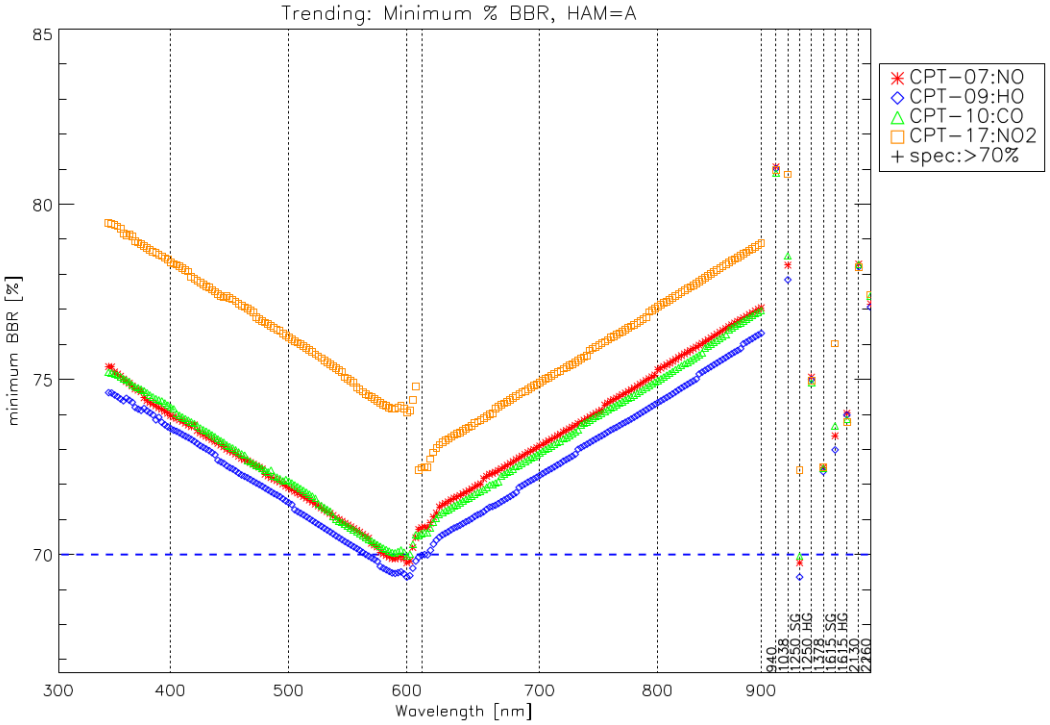
$\Delta S_{(m,n)}$ is calculated from estimated centroid band-to-band pairs.

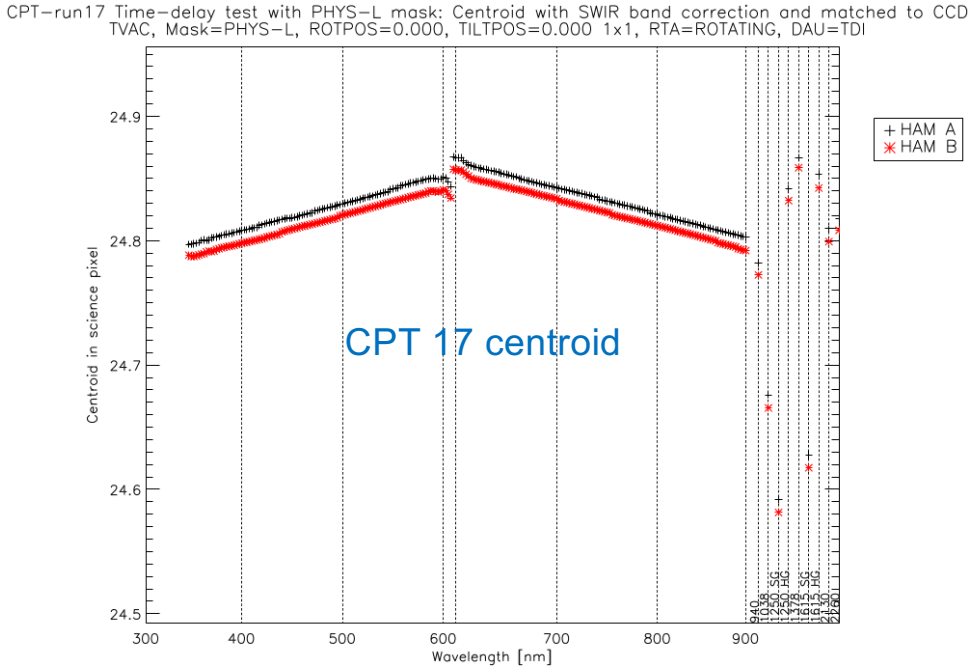
Minimum % BBR for a band is the minimum BBR value in percent from the BBR values between the target band and all other bands.



Cross-track Min % BBR and Centroid: Time-delay PHYS-L

- CPT 7, 9, 10 have lower than 70% BBR requirement at blue to red transition bands and 1250 SG band.
- During CPT 17 (Nominal Op 2), the OCI engineering team changed CCD band alignment to SWIR bands and the lowest % BBR for CPT 17 was improved to 72.28% which pass the BBR requirement.





IFOV requirement

OCI-128	**Instantaneous Field of View (iFOV)**	**OCI along track and cross track iFOV, defined as full width half max of one science pixel, shall be between 0.07639 degrees and 0.09296 degrees and verified at 865nm. All other spectral bands shall have an IFOV within +/-10% of the value measured at 865nm.**

Measured cross track IFOV at 865 nm band in degree

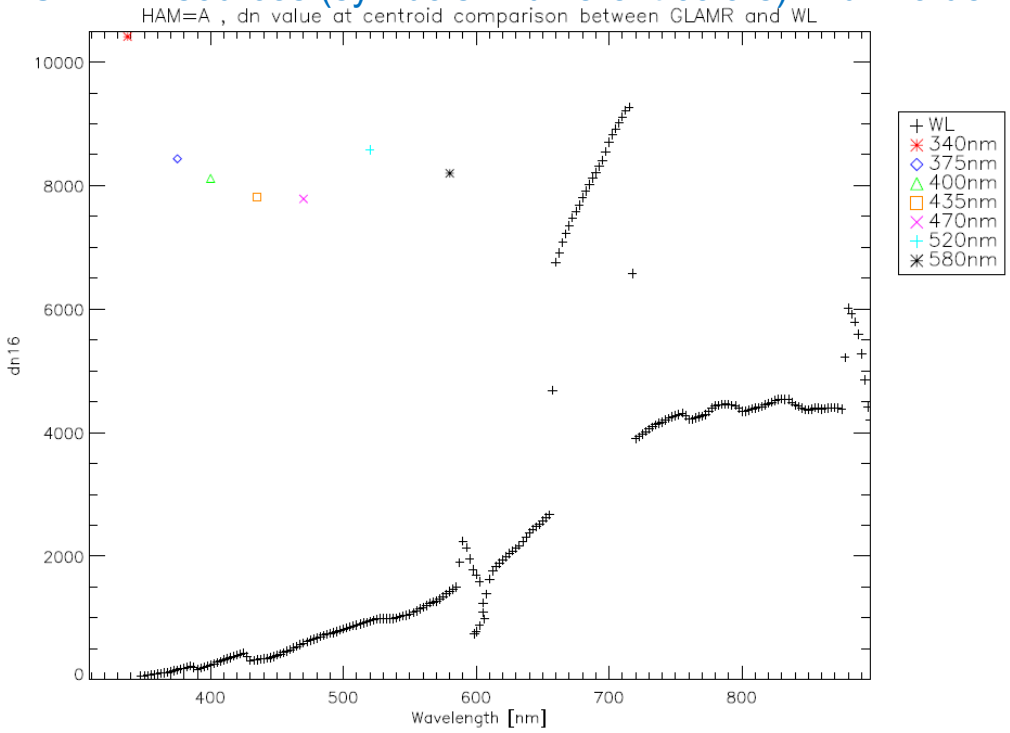
	CPT 7 (Nom Op)	CPT 9 (Hot Op)	CPT 10 (Cold Op)	CPT 17 (Nom Op 2)
HAM A	0.088876	0.088893	0.088884	0.088875
HAM B	0.088875	0.088892	0.088878	0.088875

- Due to low signal level at blue bands, GLAMR 340nm source was used for high radiance input.

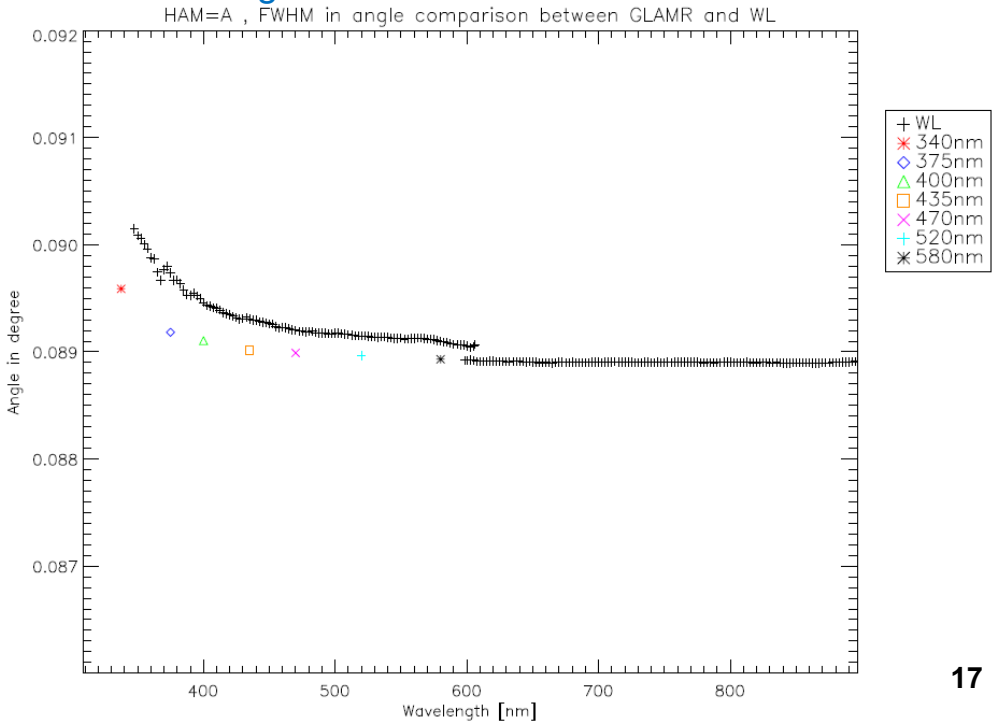
Ambient cross-track iFOV with GLAMR sources

- Ambient flight 4/26/2022 (CPT1) and 6/9/2022 (LSF SL) tests have time-delay PHYS-L mask with various GLAMR sources (340, 375, 400, 435, 470, 520, 580 nm). Symbols are GLAMR sources in below plots.
- For flight TVAC tests, we only used 340, 620 nm GLAMR based on the iFOV trend as right plot.

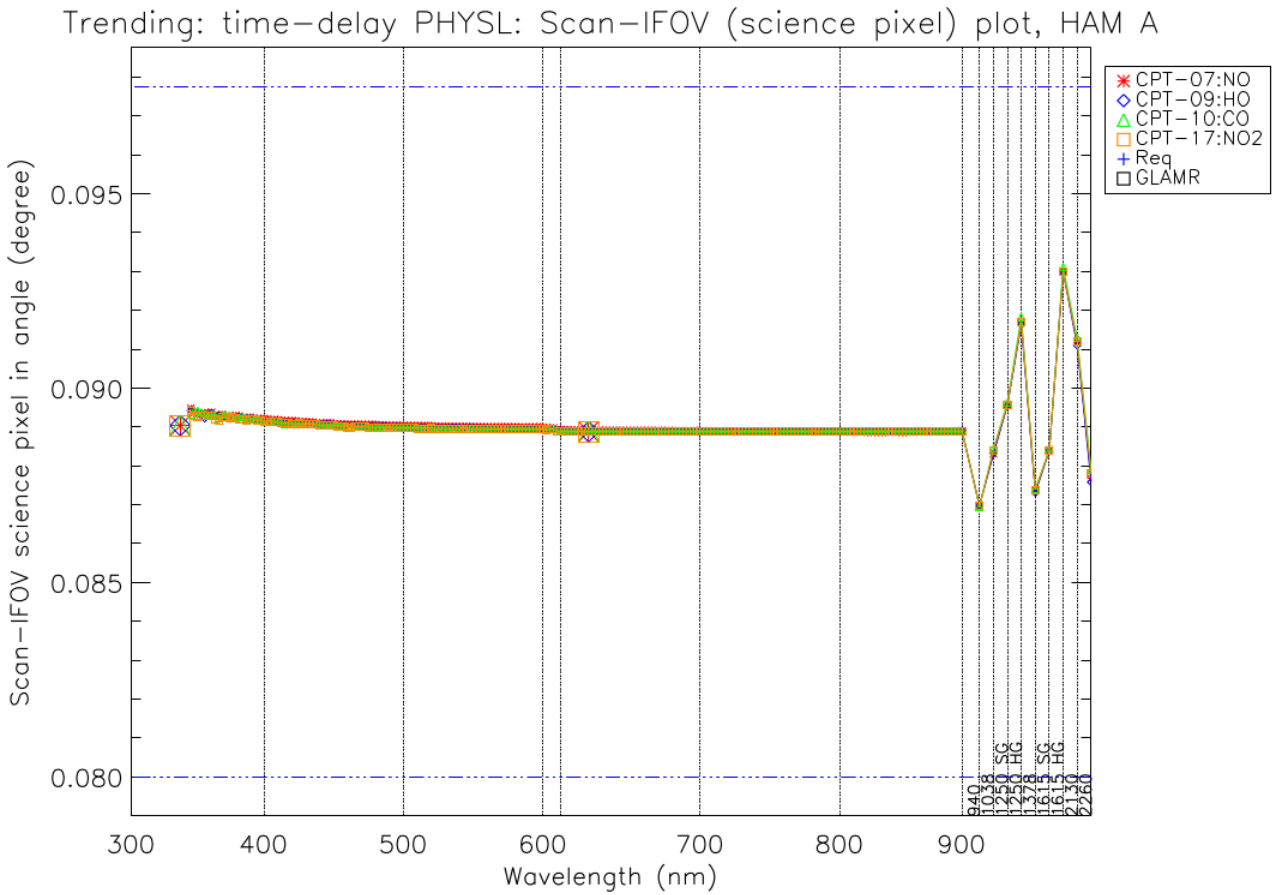
Light level comparison between WL (white light) and GLAMR sources (symbols in different colors) in dn value



iFOV comparison between WL (white light) and GLAMR sources in angle



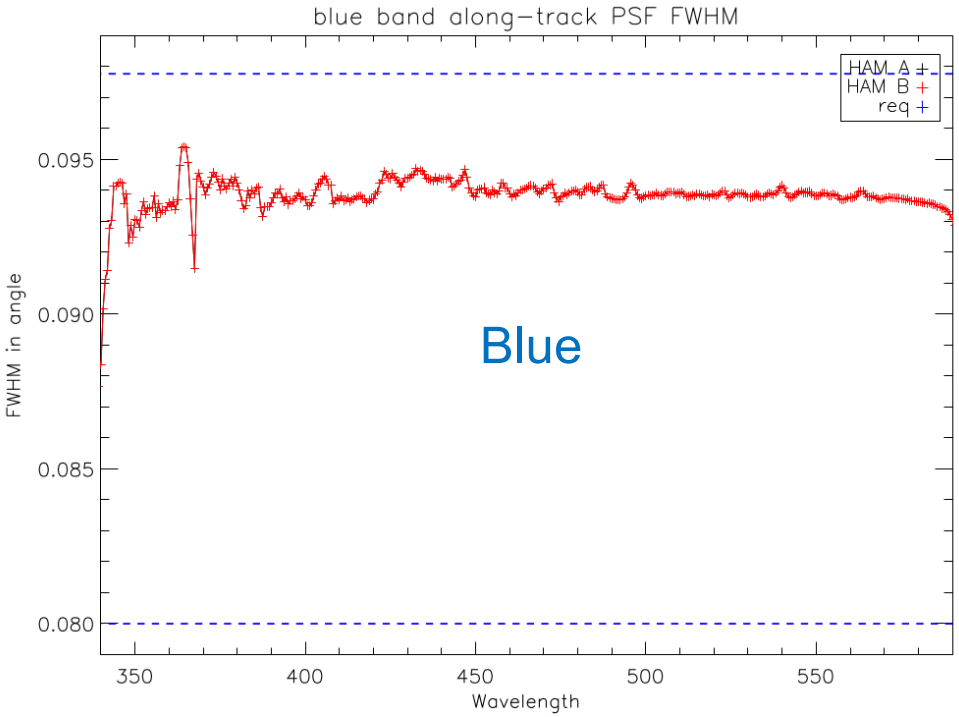
TVAC cross-track iFOV: Time-delay PHYS-L

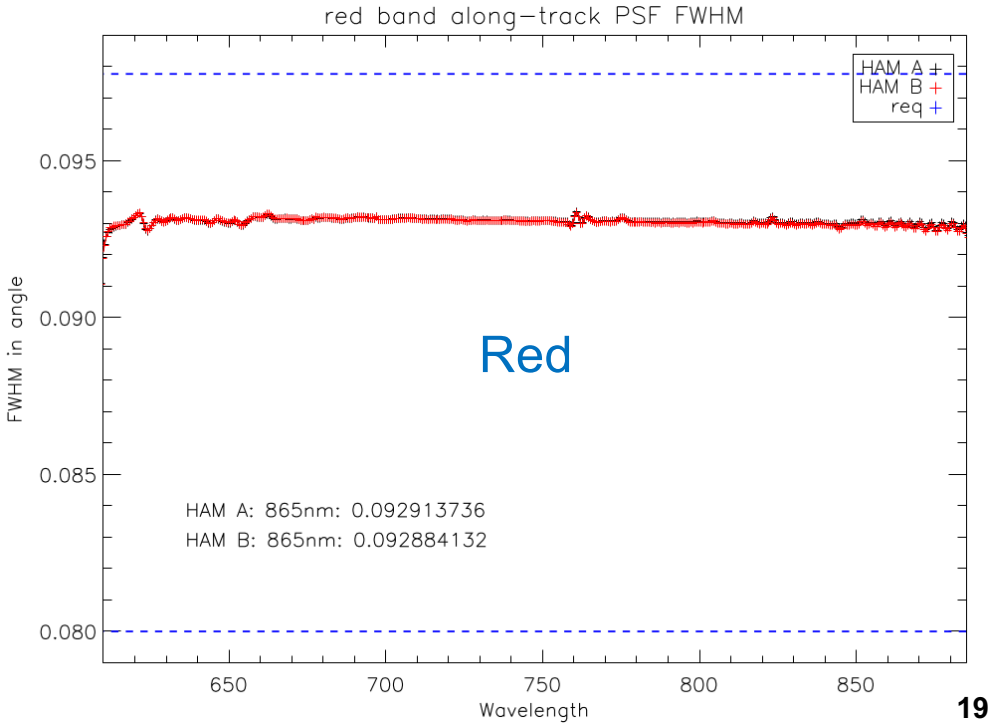


iFOV values for all bands pass the iFOV requirements which are blue dashed lines in the plot

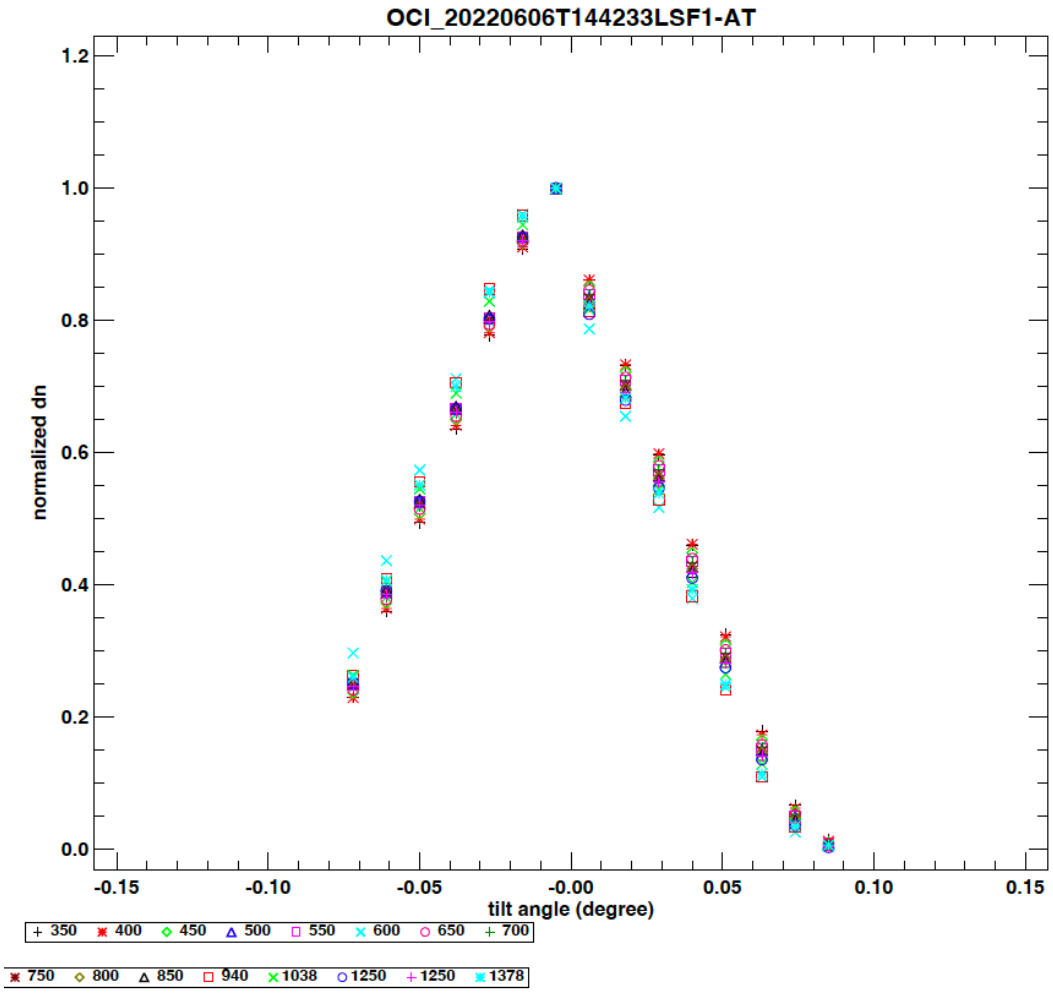
Ambient along-track iFOV from J-1: CCD bands

- Along-track iFOV values of CCD bands were calculated from J-1 mask test with white light source by Christopher Field.
- iFOV values for all CCD bands pass the iFOV requirements which are blue dashed lines in the plot.
- TVAC along-track iFOV will be calculated.





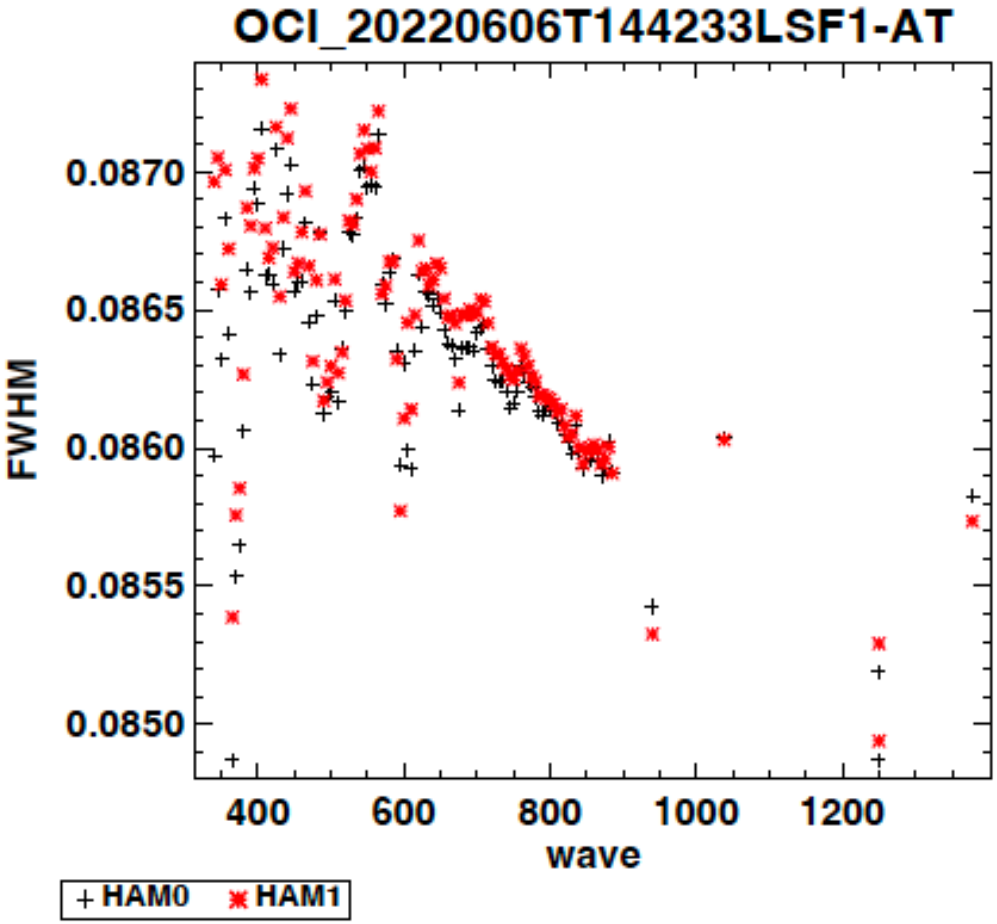
Ambient: Along-track iFOV using along-track GAToR tilt



- LSF bench with 1 science pixel mask (6/6/2022 LSF SL test)
- OCI was tilted by GAToR with 0.01° increment for in-field and ±0.14°, ±0.18°, ±2°, ±5°, ±10°, ±15° for out-of-field measurements.
- Light source: Halogen 44%, EQ-400 100%

- Shihyan Lee provided the analysis results.
- Left plot shows some variation of along-track centroids depending on bands.

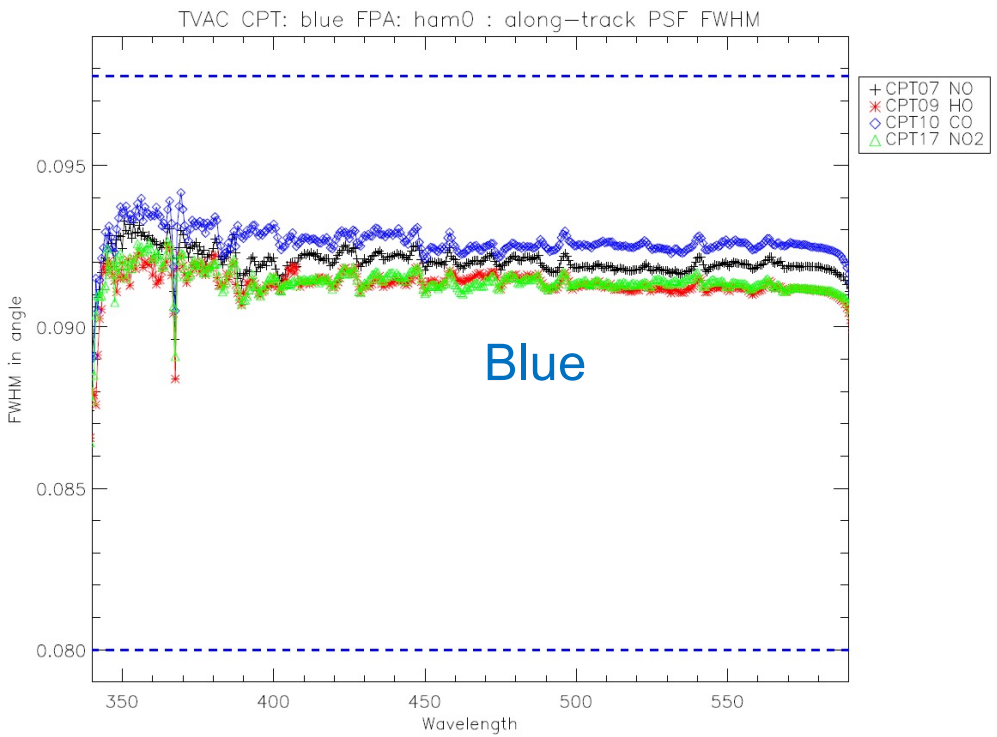
Ambient: Along-track iFOV using along-track GAToR tilt

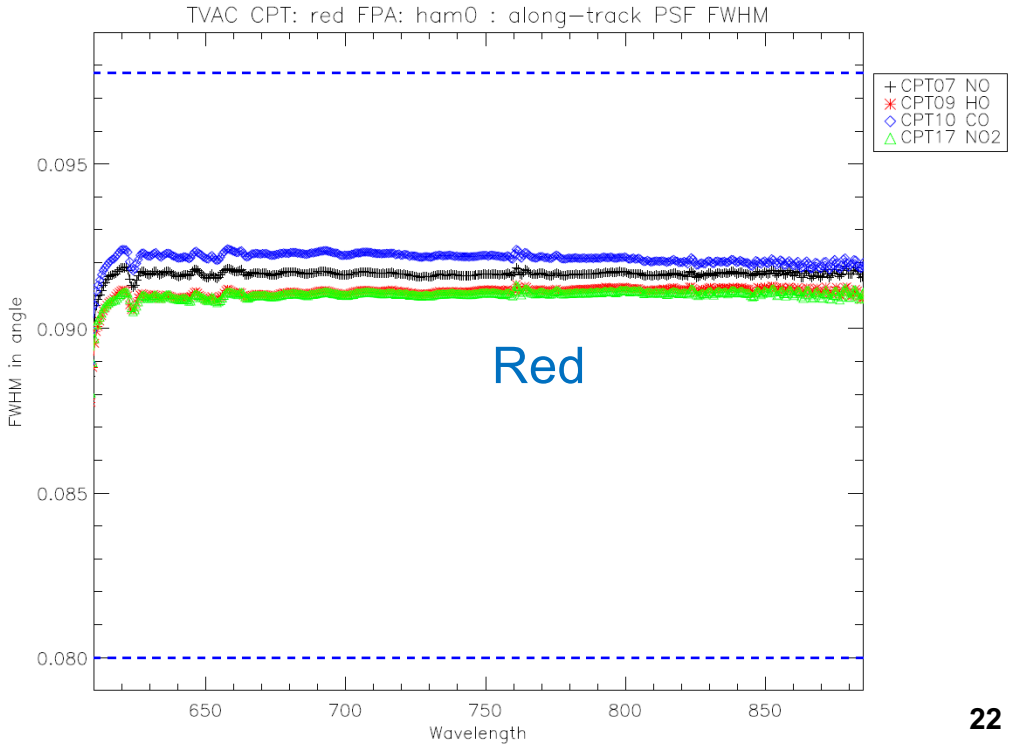


- Along-track iFOV (FWHM) measured values are within the requirement values as below.
- Along-track iFOV requirement:
  - CPT7 iFOV@865 nm = 0.088876°
  - -10% iFOV@865 nm = 0.079988°
  - +10% iFOV@865 nm = 0.0977636°

TVAC along-track iFOV from J-1: CCD bands

- Along-track iFOV values of CCD bands were calculated from TVAC CPT J-1 mask tests with white light source by Christopher Field.
- iFOV values for all CCD bands pass the iFOV requirements which are blue dashed lines in the plot.





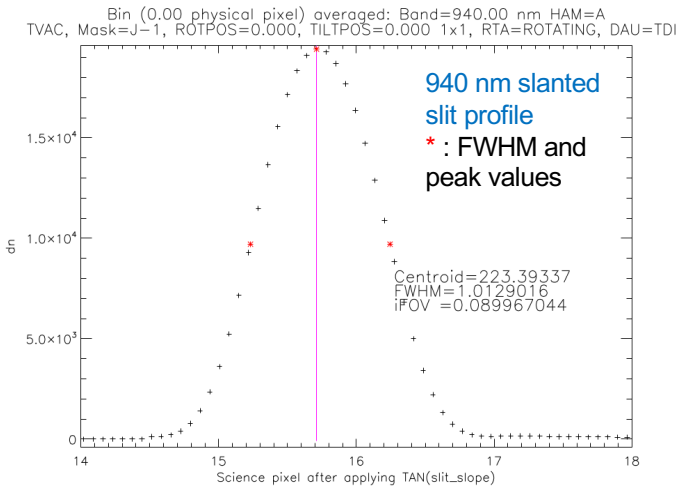
TVAC along-track iFOV: SWIR bands

- Christopher Field provided TVAC along-track iFOV for SWIR bands from time-delay J-1 mask.
- CPT 7 iFOV measurement at 865nm band is 0.088876 degree and the iFOV requirement range is between 79.988 and 97.7636 milli-degree.
- All SWIR bands pass the along-track iFOV requirement.

SWIR Band	Along Track FOV (FWHM milli-deg)
940 nm	89.63, σ=0.37
1038 nm	91.08, σ=0.37
1250 nm SG	91.78, σ=0.29
1250 nm HG	91.26, σ=0.28
1378 nm	89.65, σ=0.33
1615 nm SG	91.43, σ=0.27
1615 nm HG	91.85, σ=0.27
2130 nm	91.67, σ=0.35
2260 nm	90.49, σ=0.39

TVAC along-track iFOV: SWIR bands

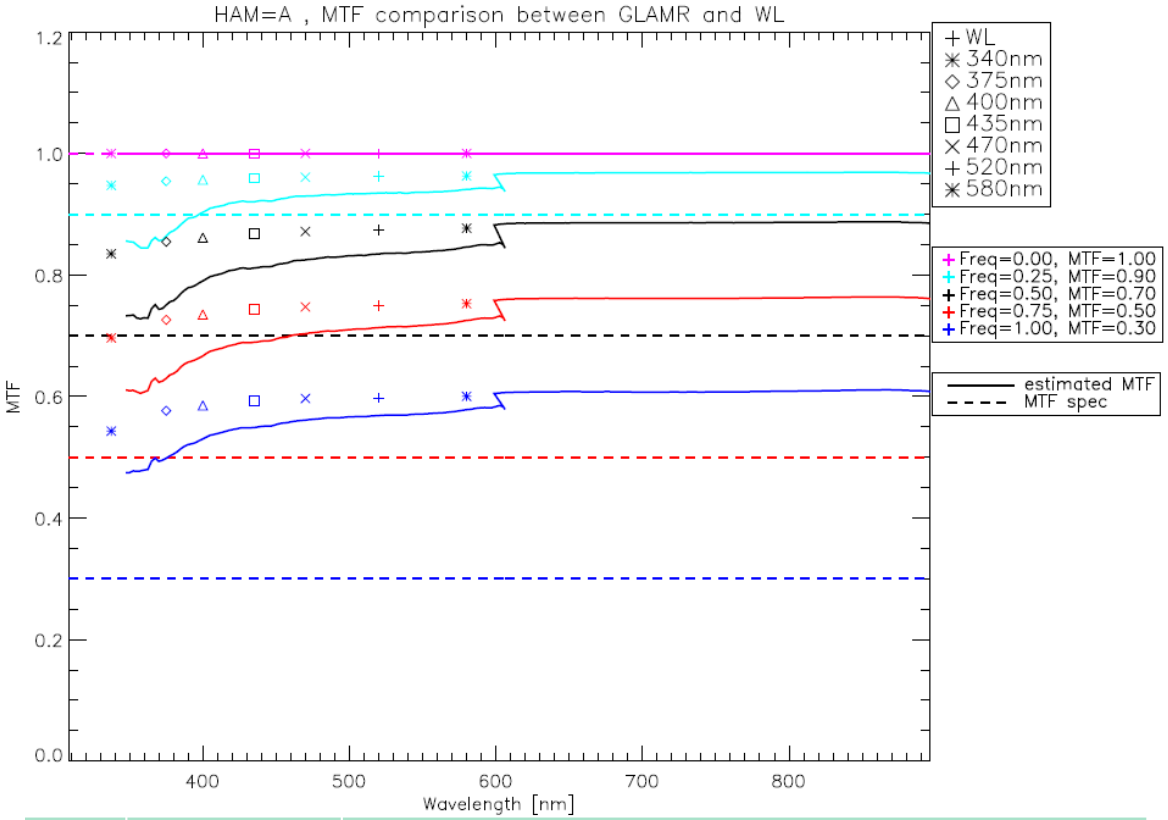
- TVAC along-track iFOV (FWHM) values were measured from time-delay J1 mask slanted slit profile after applying tangent of measured slanted slit angles from C. Field to the science pixel grid.
- CPT 7 iFOV measurement at 865nm band is 0.088876 degree and the iFOV requirement range is between 0.0799 and 0.0977°.
- All SWIR bands pass the along-track iFOV requirement.



	Along-track IFOV in degree									
	CPT7		CPT9		CPT10		Mean		Sigma	
Band	HAM A	HAM B	HAM A	HAM B	HAM A	HAM B	HAM A	HAM B	HAM A	HAM B
940	0.09	0.0901	0.0893	0.0892	0.0904	0.0904	0.0899	0.0899	0.000557	0.000624
1038	0.0912	0.0914	0.0907	0.0907	0.0919	0.092	0.091267	0.091367	0.000603	0.000651
1250 SG	0.092	0.0922	0.0915	0.0915	0.0925	0.0925	0.092	0.092067	0.0005	0.000513
1250 HG	0.0917	0.0918	0.091	0.091	0.092	0.092	0.091567	0.0916	0.000513	0.000529
1378	0.0898	0.0899	0.0891	0.0891	0.0902	0.0902	0.0897	0.089733	0.000557	0.000569
1615 SG	0.0913	0.0915	0.0907	0.0907	0.0916	0.0917	0.0912	0.0913	0.000458	0.000529
1615 HG	0.0922	0.0924	0.0916	0.0916	0.0925	0.0925	0.0921	0.092167	0.000458	0.000493
2130	0.0916	0.0918	0.0909	0.091	0.0922	0.0922	0.091567	0.091667	0.000651	0.000611
2260	0.0902	0.0904	0.0896	0.0897	0.0909	0.091	0.090233	0.090367	0.000651	0.000651

Measured slanted slit angles		
CPT#	HAM A	HAM B
CPT7	29.406	29.447
CPT9	29.382	29.395
CPT10	29.471	29.485

Ambient cross-track MTF: GLAMR vs WL



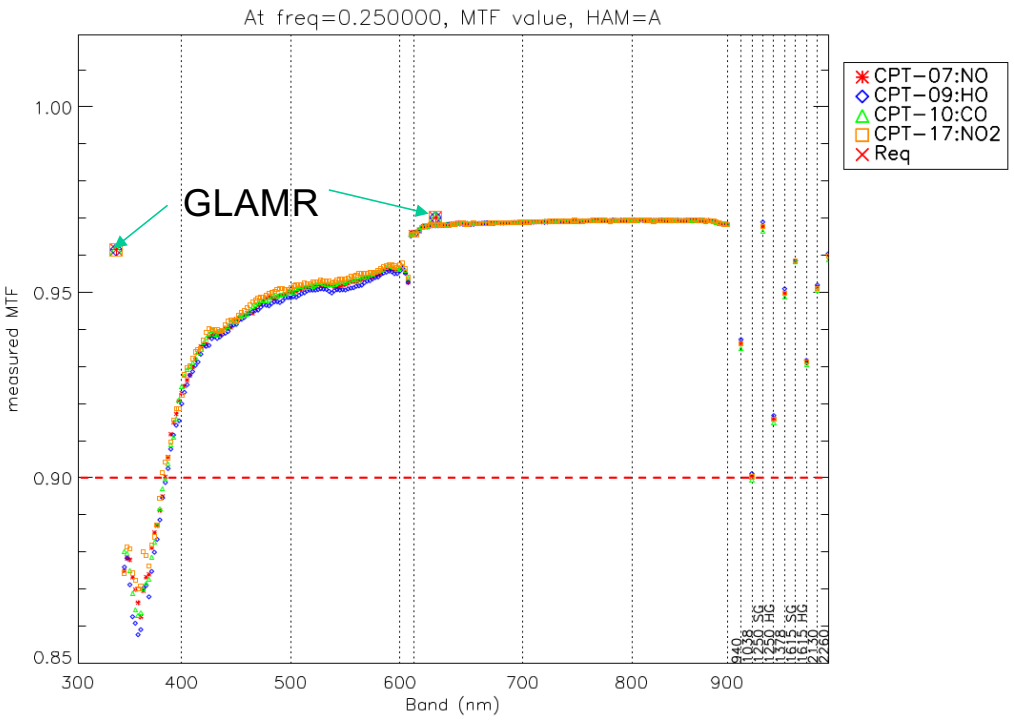
OCI-127	**Modulation Transfer Function (MTF)**	**Design Requirement:** **The MTF in both track and scan direction shall equal or exceed:** **Fraction of Nyquist GSD Sample Frequency (MTF Req)** **0.00 (1.0), 0.25 (0.9), 0.50 (0.7), 0.75 (0.5), 1.00 (0.3)**

- Ambient flight 4/26/2022 (CPT1) and 6/9/2022 (LSF SL) tests have time-delay PHYS-L mask with various GLAMR sources (340, 375, 400, 435, 470, 520, 580 nm). Symbols are GLAMR sources in the left plot.
- Dashed lines with different color are the minimum MTF requirements for frequency ratio (freq/Nyquist freq) at 0, 0.25, 0.5, 0.75, 1.
- MTF values with GLAMR sources (symbols in the plot) are much higher than white light source for blue bands. MTF values at 0.25 frequency (cyan color) for below 400 nm bands couldn't pass the requirement with white light source due to low radiance level.
- For TVAC, 340nm GLAMR were used for MTF verification at low blue bands (<400nm). If 340nm GLAMR pass the MTF requirement, we assume that MTF values below 400 nm bands pass the MTF requirement based on the trend shown on the left plot.

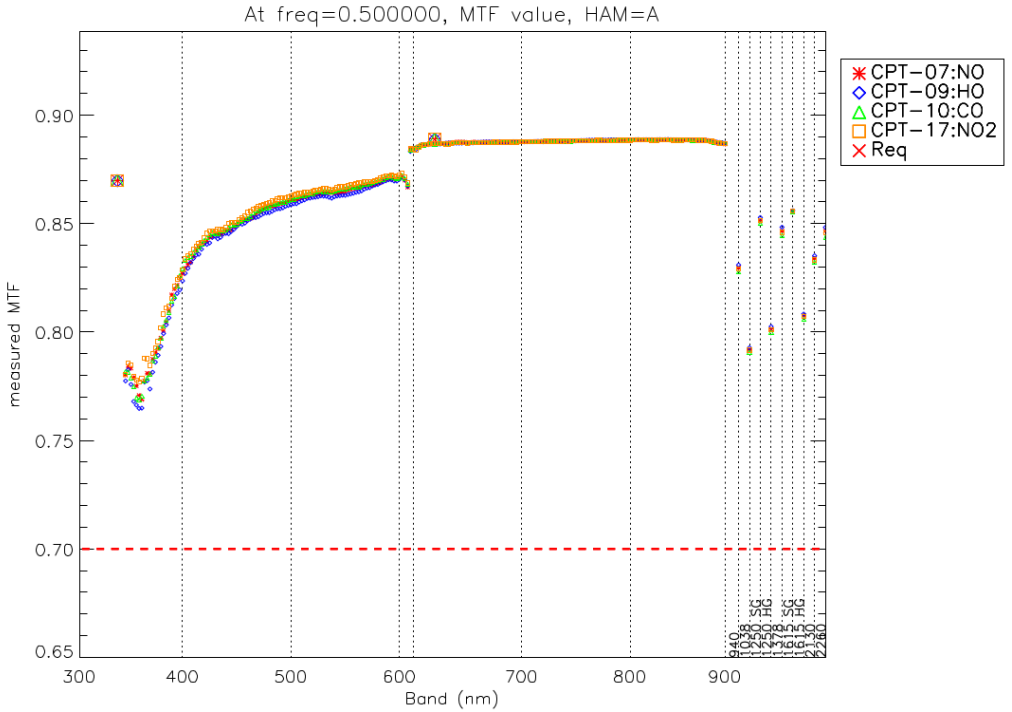
TVAC Cross-track MTF

- All bands pass the requirement.

Freq=0.25

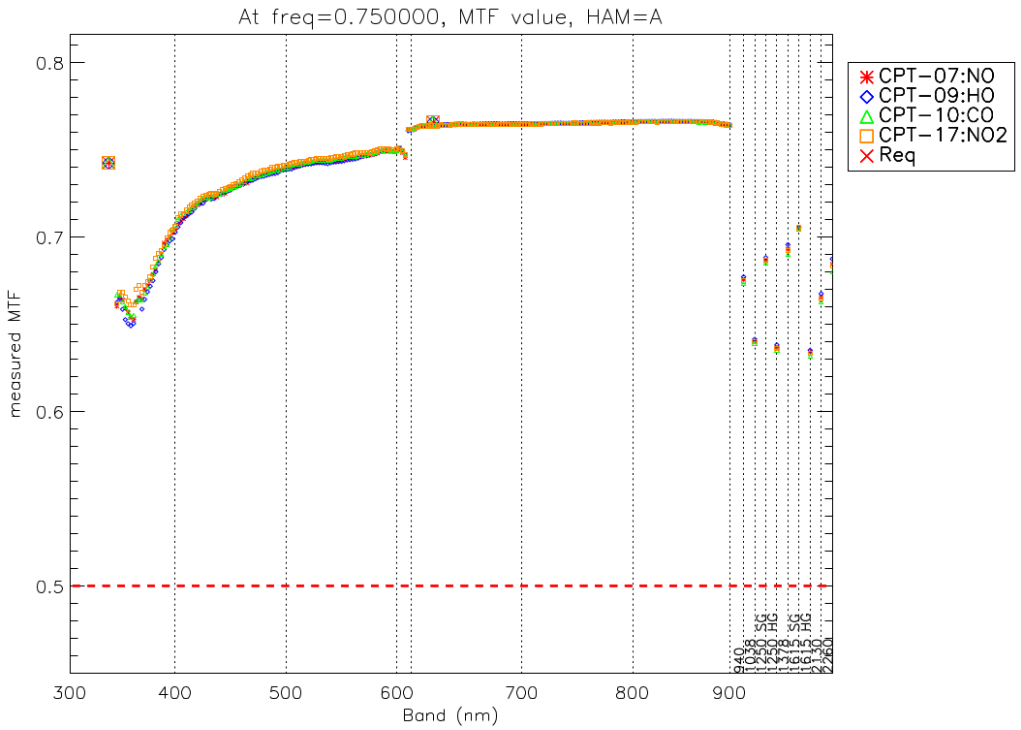


Freq=0.5

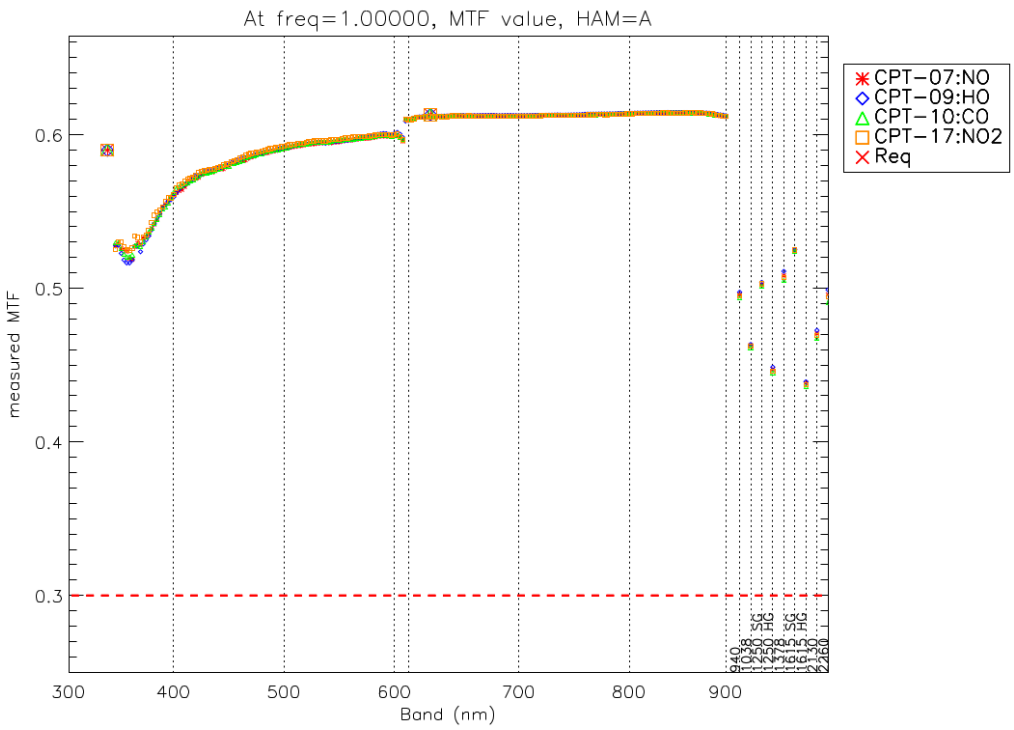


TVAC Cross-track MTF

Freq=0.75

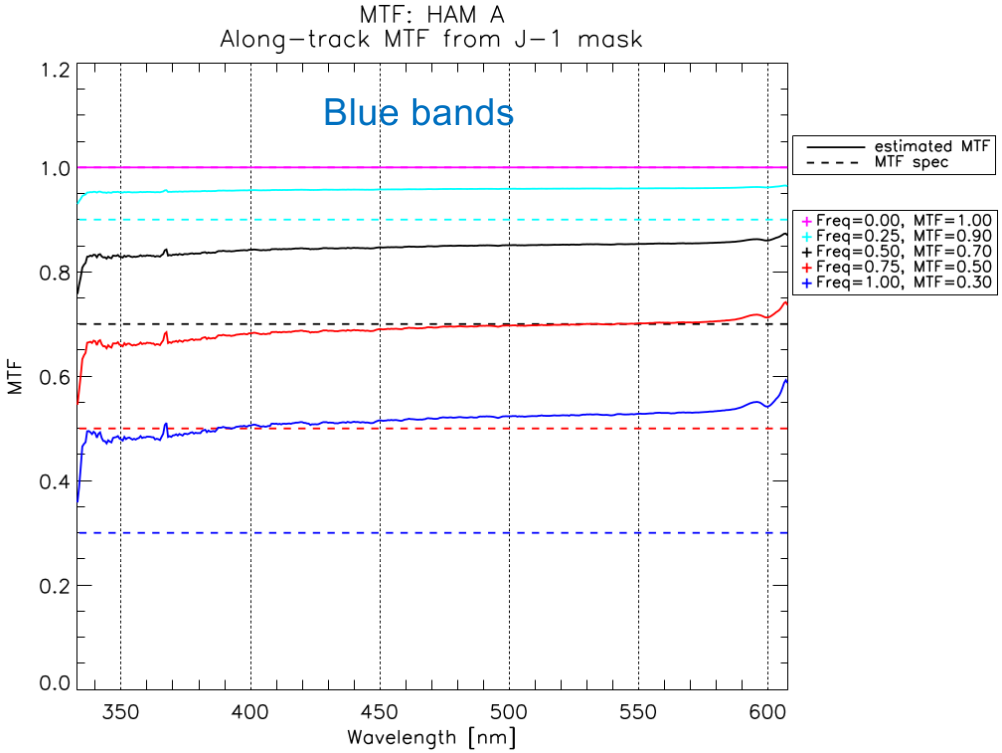


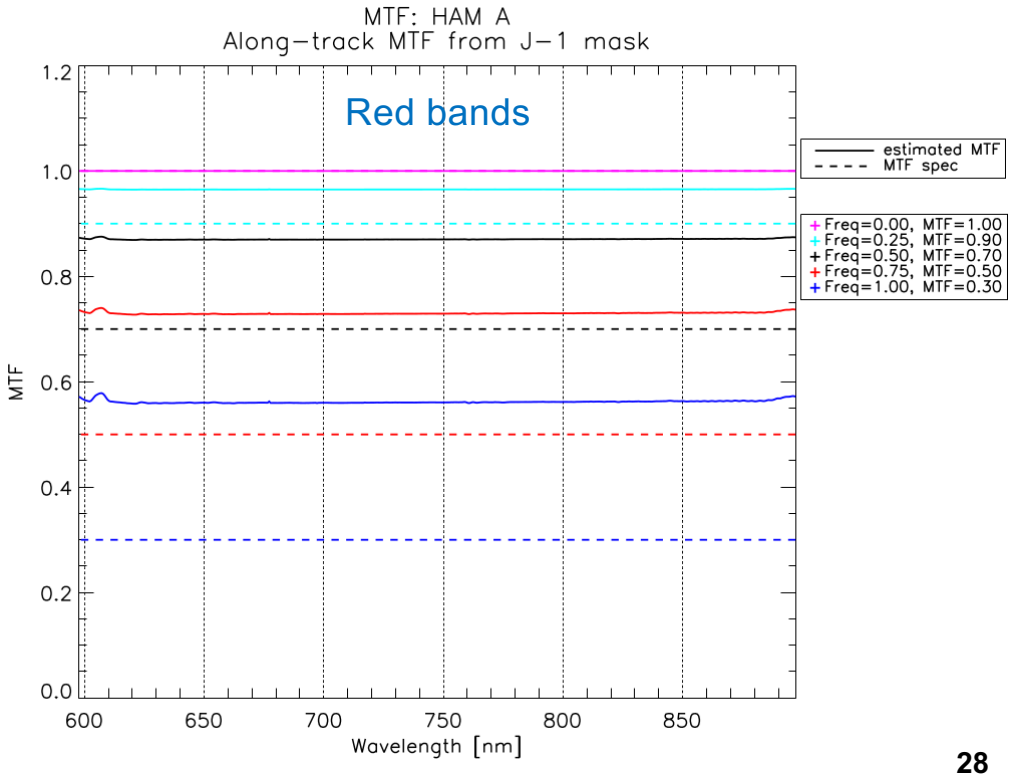
Freq=1.0



Ambient Along-track MTF

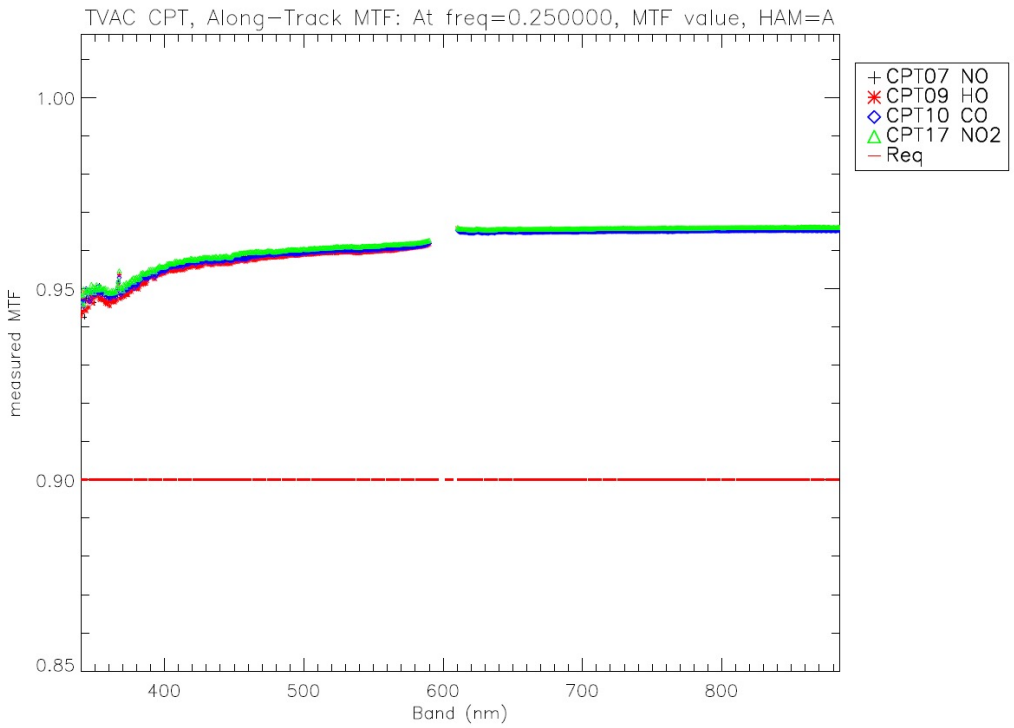
All CCD bands pass the requirements. TVAC MTF values will be calculated from J-1 mask data.

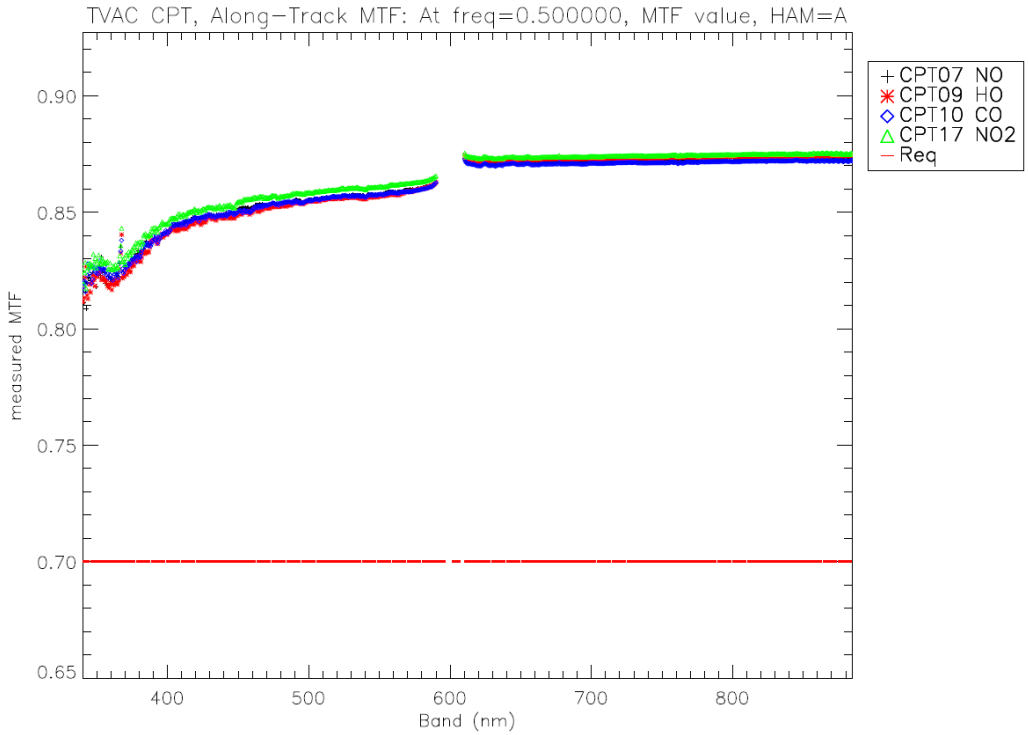




TVAC Along-track MTF: Freq=0.25, 0.5

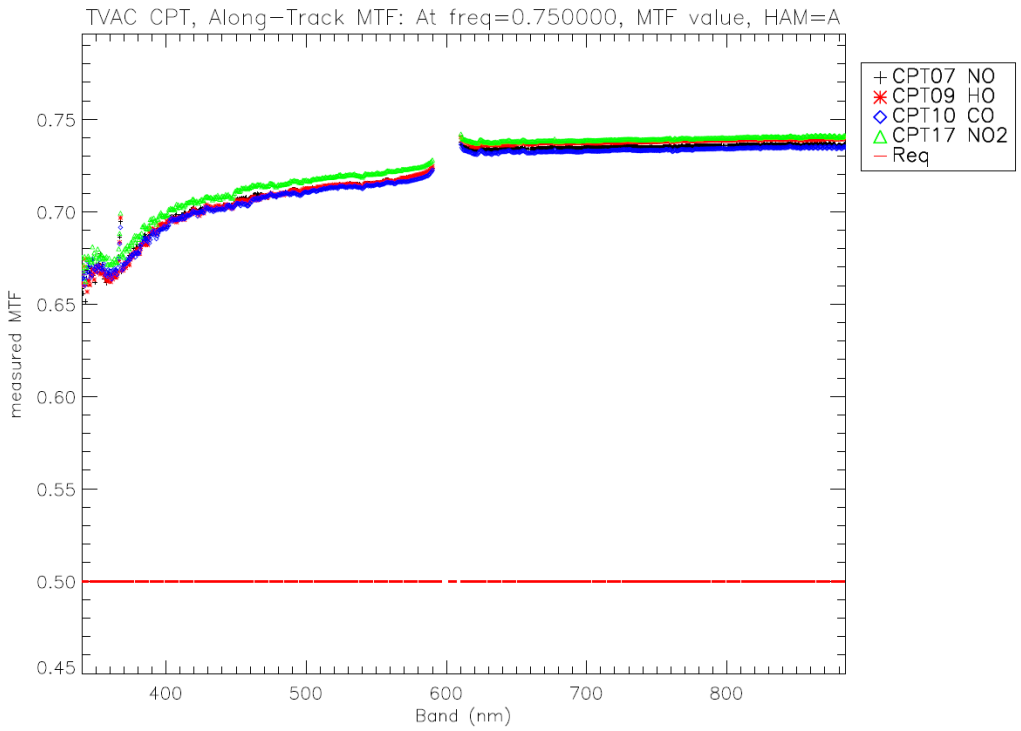
All CCD bands pass the requirements. TVAC MTF values were calculated from along track PSF from J-1 mask data.

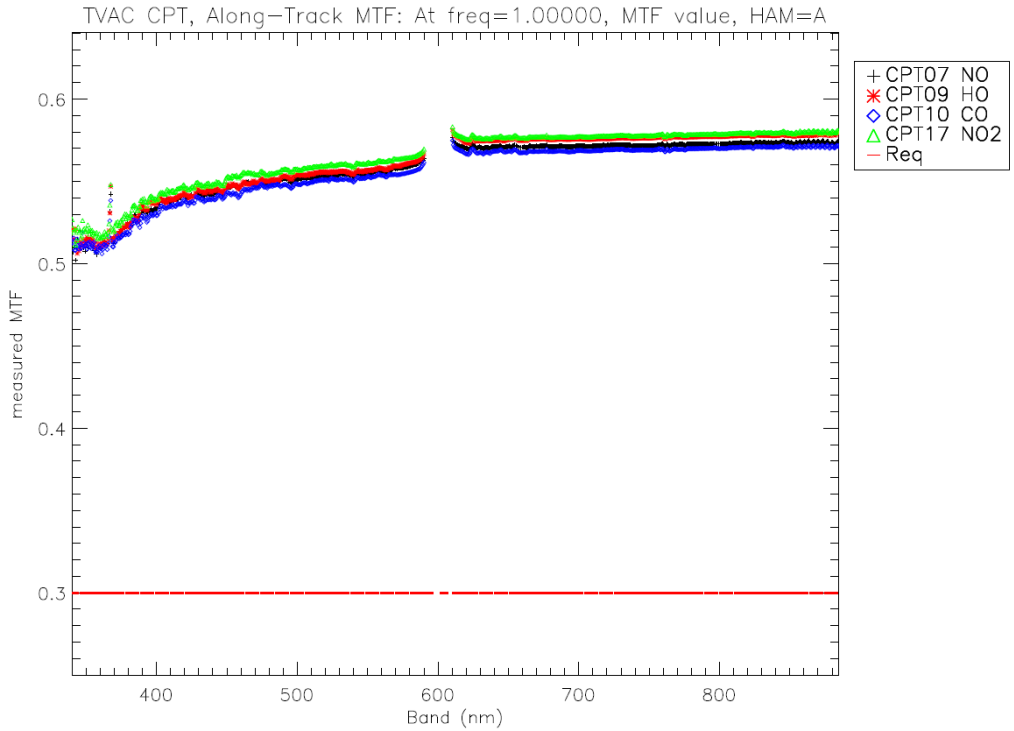




TVAC Along-track MTF: Freq=0.75, 1.0

All CCD bands pass the requirements. TVAC MTF values were calculated from along track PSF from J-1 mask data.





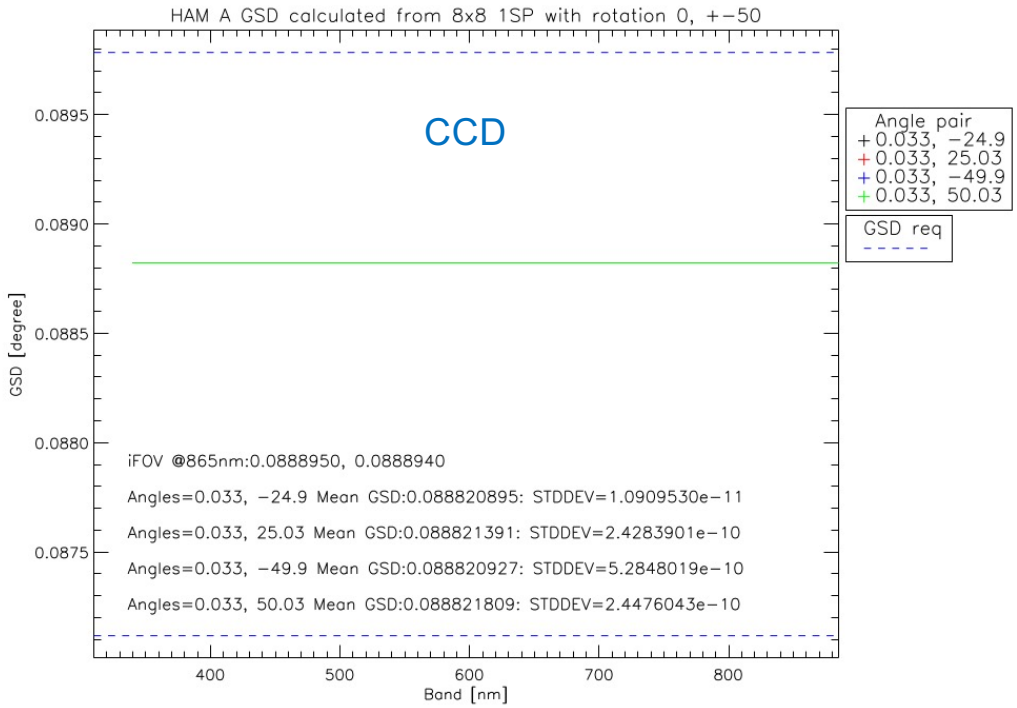
TVAC along-track MTF (SWIR)

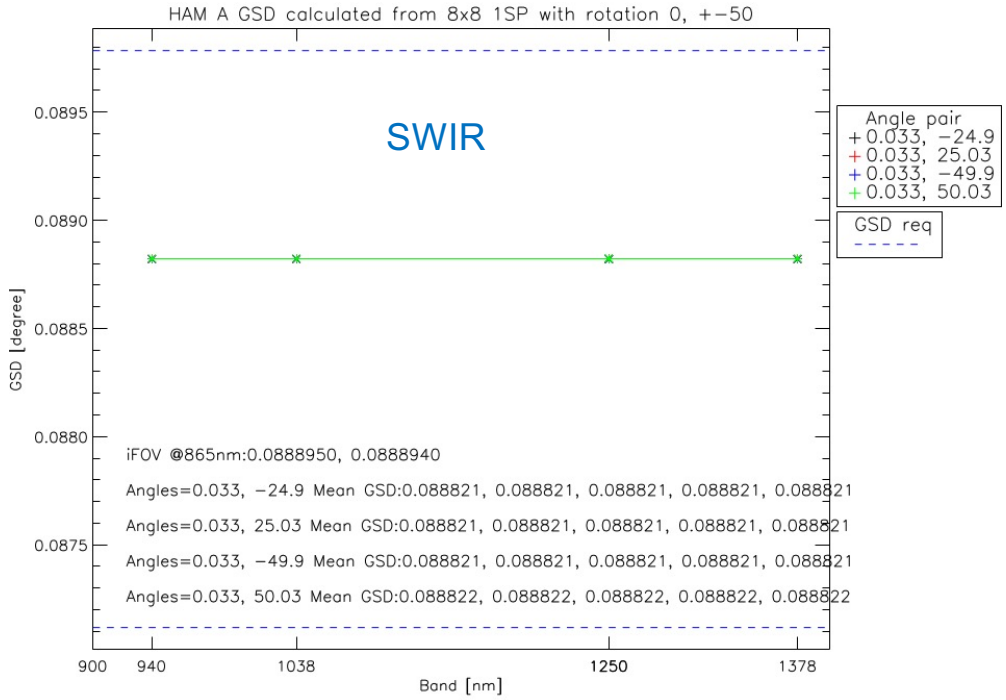
- Along-track MTF values were calculated from the Fourier-transform of along-track PSF.
- All SWIR bands pass the requirements for along-track MTF.

	Along-track MTF (HAM A)											
CPT#	CPT 7 (Nominal Op)				CPT 9 (Hot Op)				CPT 10 (Cold Op)			
Freq (Req.)	0.25 (0.9)	0.5 (0.7)	0.75 (0.5)	1 (0.3)	0.25 (0.9)	0.5 (0.7)	0.75 (0.5)	1 (0.3)	0.25 (0.9)	0.5 (0.7)	0.75 (0.5)	1 (0.3)
940	0.93	0.81	0.64	0.45	0.93	0.81	0.64	0.46	0.93	0.80	0.64	0.45
1038	0.90	0.78	0.62	0.44	0.90	0.78	0.62	0.45	0.90	0.77	0.61	0.44
1250 SG	0.97	0.85	0.68	0.49	0.97	0.85	0.68	0.49	0.97	0.85	0.67	0.48
1250 HG	0.90	0.79	0.63	0.45	0.90	0.79	0.63	0.45	0.90	0.79	0.62	0.44
1378	0.94	0.82	0.65	0.47	0.94	0.82	0.66	0.47	0.94	0.82	0.65	0.46
1615 SG	0.95	0.84	0.68	0.49	0.95	0.84	0.68	0.49	0.95	0.84	0.67	0.49
1615 HG	0.93	0.81	0.64	0.45	0.93	0.81	0.64	0.46	0.93	0.81	0.64	0.45
2130	0.95	0.83	0.66	0.47	0.95	0.83	0.66	0.48	0.95	0.83	0.66	0.47
2260	0.96	0.84	0.67	0.48	0.96	0.84	0.68	0.49	0.96	0.84	0.67	0.48

Ambient GSD using different rotations

- LSF bench, 8x8 aggregation, SP mask, 6/3/2022(LSF SL, LSF-1 XTRACK LONG DWELL)
- Light source: White light (HALOGEN: 44%. EQ-400: 100%)
- Rotation angles: 0, ±25, ±50 degree, XINA markers: 185030
- Calculated GSD values with different rotations are very close to 0.088821



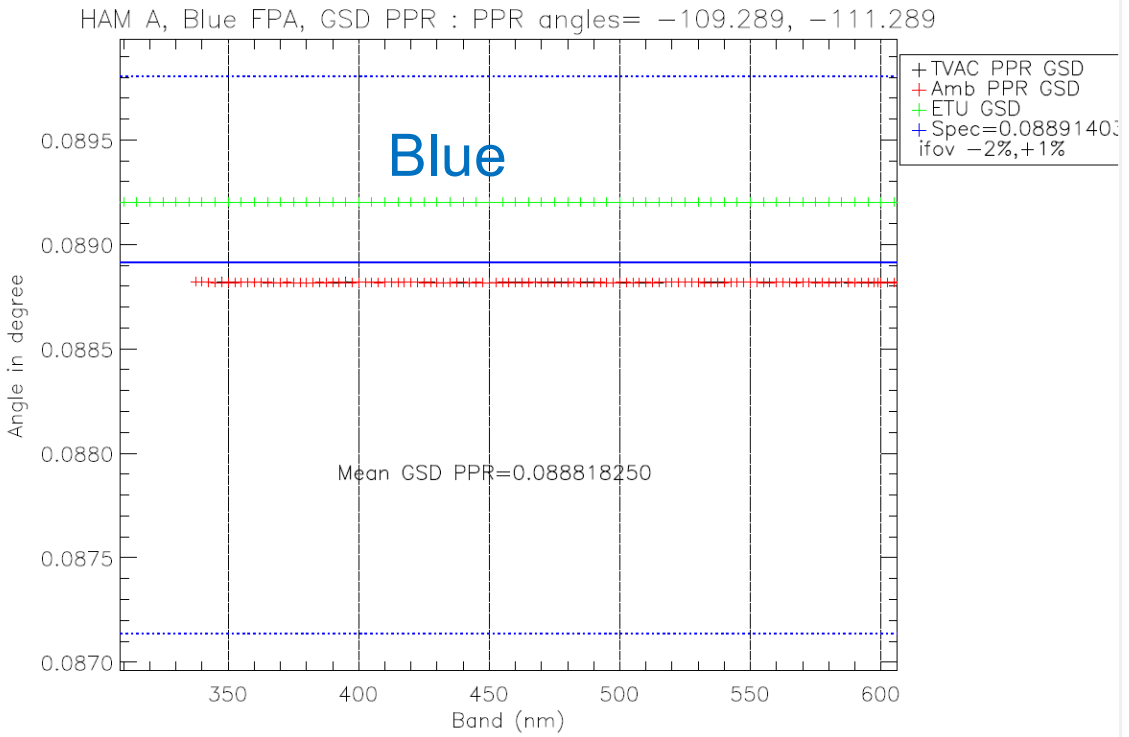


OCI-60	**Ground Sample Distance (GSD)**	**The OCI cross track ground sample distance (GSD), defined as the angle between the centroid of adjacent science pixels, shall be equal to the measured OCI cross track IFOV within +1% /-2%.**

PPR GSD : TVAC characterization test (9/7/22)

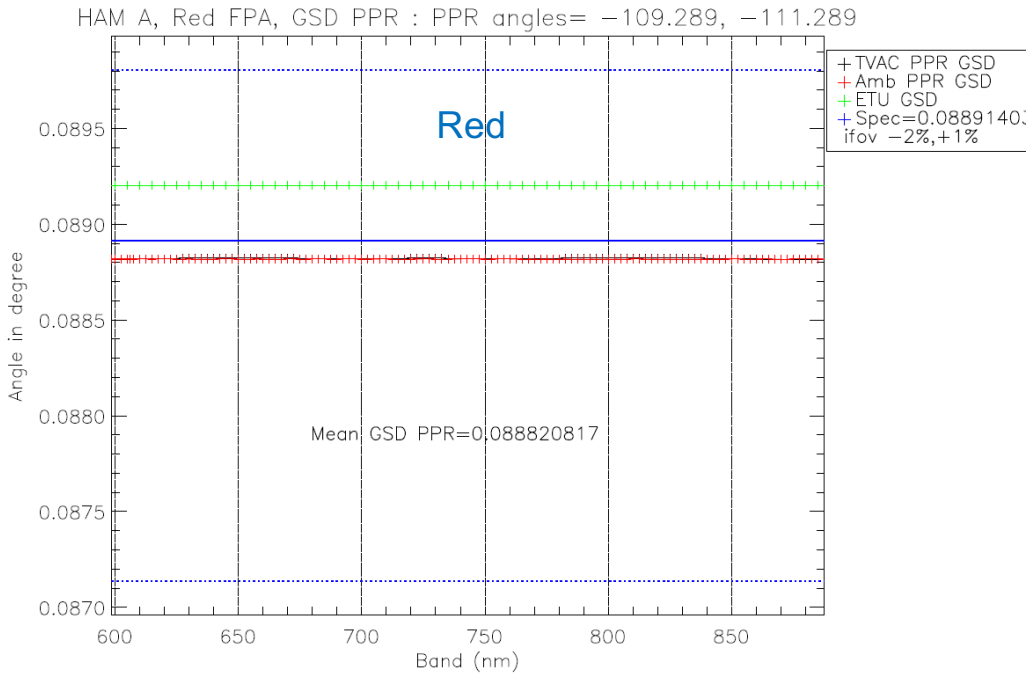
- PPR (Pulse Per Revolution) is the start position of EV (Earth View) scan. This position could be reprogrammed for different position by ~2 degree.
- ~2 degree change gives ~22.5 science pixel centroid change.
- PPR GSD=ΔPPR angle/ Δcentroids, ΔPPR angle=(-109.289245605468)-(-111.288757324218)=1.9995117°
- Flight TVAC iFOV from time-delay PHYS-L at 865nm = 0.08891403°
- Flight GSD from two rotation =0.088821°, ETU iFOV from TVAC2 Nom time-delay MS1 = 0.08923
- TVAC PPR GSD = 0.088821°
- iFOV and PPR GSD are very close
- Ambient PPR GSD and TVAC PPR GSD values are almost identical. PPR GSD values of MCT bands didn't show noticeable differences than other bands.

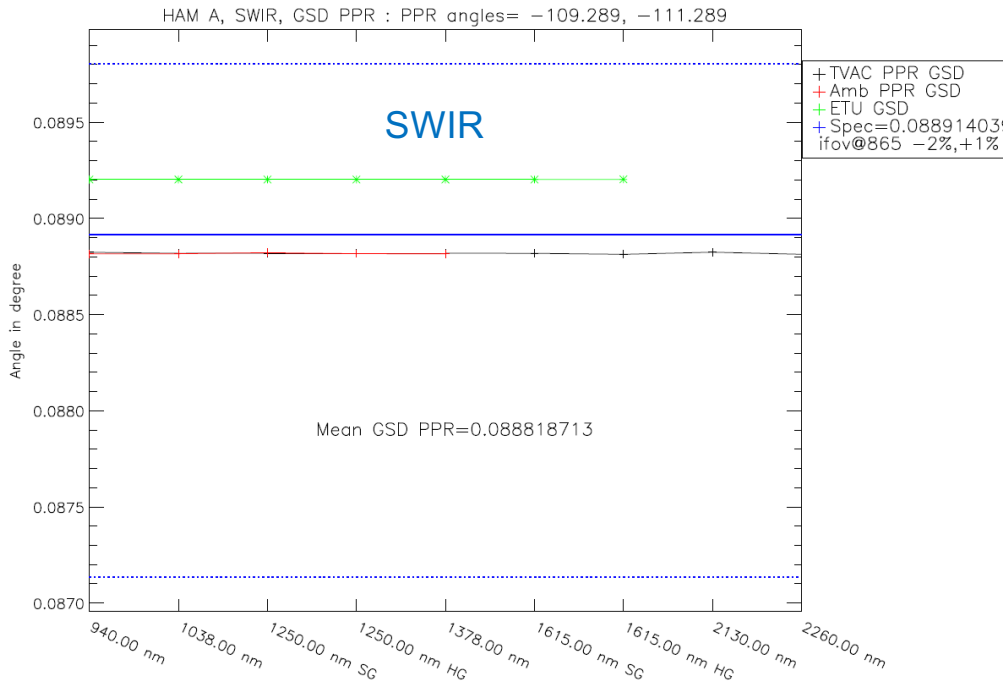
Black: TVAC PPR GSD, Red: Ambient PPR GSD, Green: ETU GSD from two rotations, Blue: TVAC iFOV at 865nm



TVAC PPR GSD

Black: TVAC PPR GSD, Red: Ambient PPR GSD, Green: ETU GSD from two rotations, Blue: TVAC iFOV at 865nm



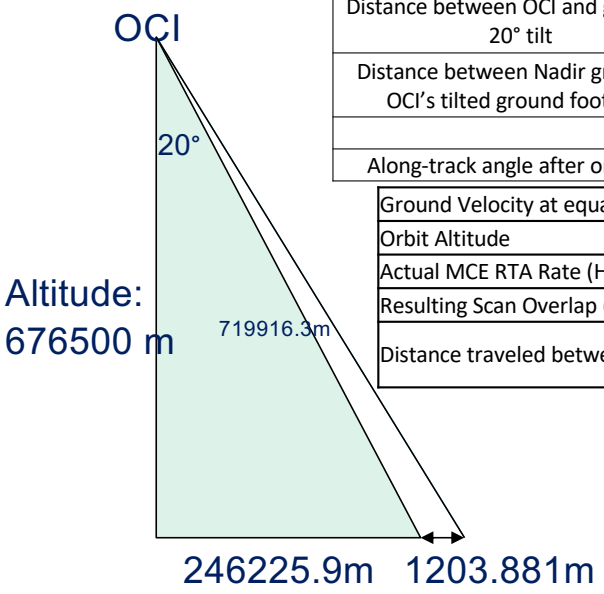


Along-track GSD

- OCI's ground distance between nadir and 20° tilted position = 719916.3 m
- Calculated along-track GSD in meter = 6861.075 m/s X 0.175465 = 1203.881 m
- When we don't think about OCI's movement during the second scan, total distance between the ground location at nadir and the tilted OCI's ground second scan footprint is 247429.78 m = 246225.9 + 1203.881
- Total OCI's along-track angle to the second scan = ATAN(247429.78/676500) = 20.08998°
- Calculated along-track GSD = 0.08998°
- Curved-Earth calculated along-track GSD = 0.088094°
- Along-track iFOV at 865nm = 0.09291°, 0.09288°
- Along-track GSD requirement at 865nm: HAM A: 0.08734° ~ 0.09152°, HAM B:0.08731° ~0.09149°
- Both along-track GSD values pass the requirement OCI-60.

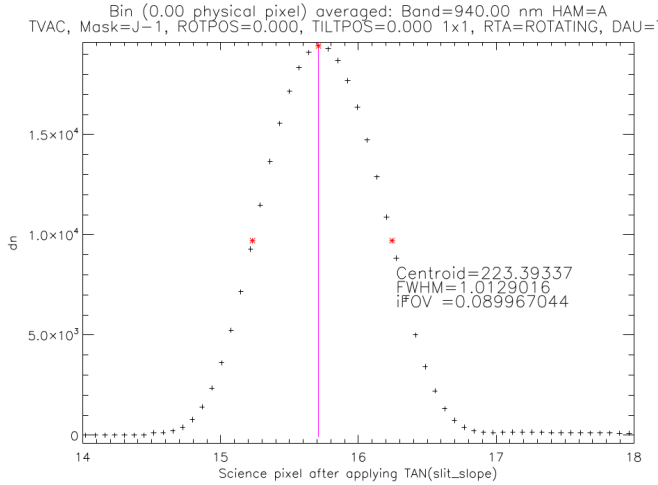
OCI Tilted angle	20	degree
one scan time	0.175465	Second/Rev
Distance travel on ground	1203.881	meter
Distance between OCI and ground at 20° tilt	719916.3	meter
Distance between Nadir ground to OCI's tilted ground footprint	246225.9	meter
Along-track angle after one scan	20.08998	degree

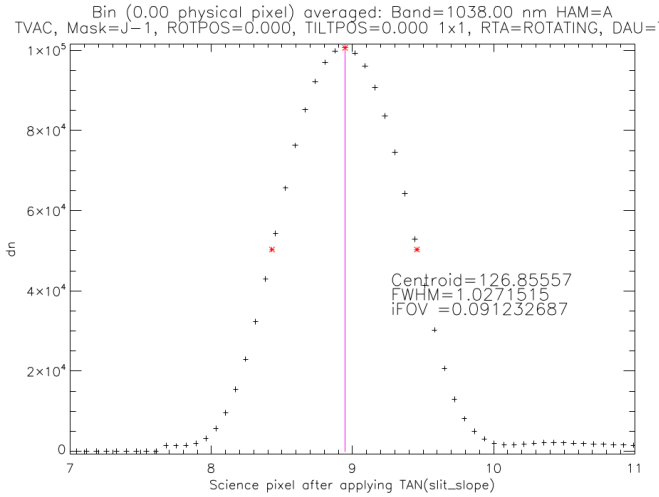
Ground Velocity at equator modifier	6861.075	m/s
Orbit Altitude	676500	m
Actual MCE RTA Rate (Hz)	5.699129	Hz
Resulting Scan Overlap (m)	29.053	m
Distance traveled between scans	1203.881	m

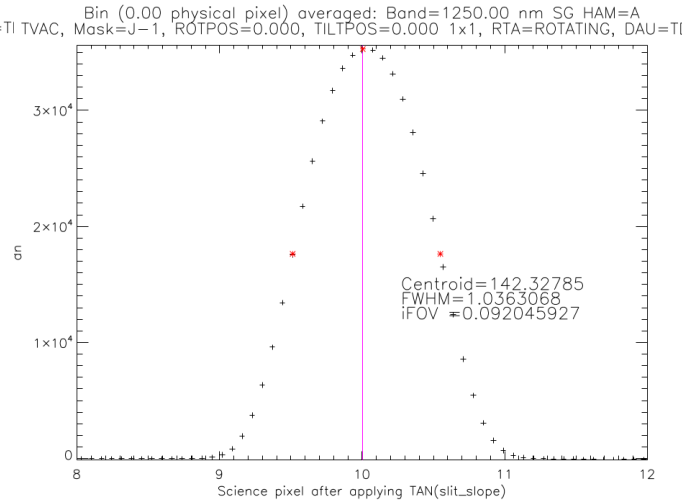


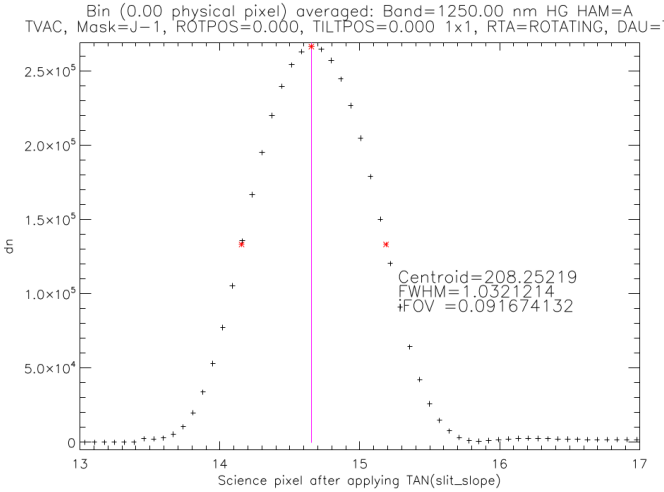
OCI-60	Ground Sample Distance (GSD)	**The OCI along-track ground sample distance (GSD), defined as the angle subtended at the instrument by successive science pixel centers at scan center, at mission altitude and 20 degrees tilt, shall be between 94 and 98.5 % of the angular size of the measured along-track IFOV. The distance between successive pixel centers shall be the product of the maximum ground speed at mission altitude and the rotational period of the rotating telescope assembly. GSD will be verified at 865nm and shall measured or estimated for all bands.**

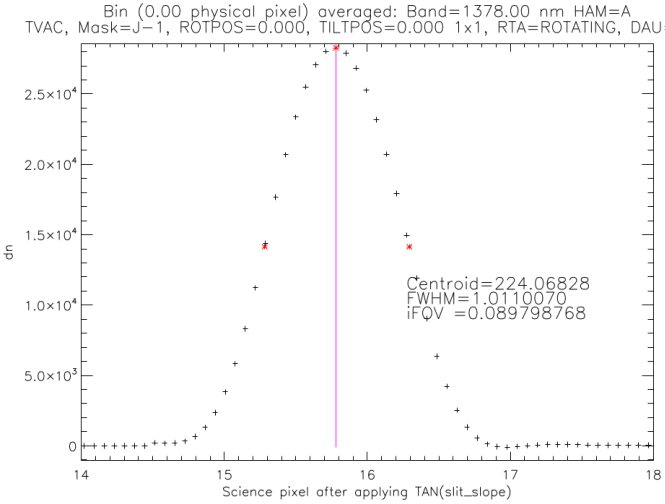
BACK UP (SWIR along-track PSF with FWHM points)

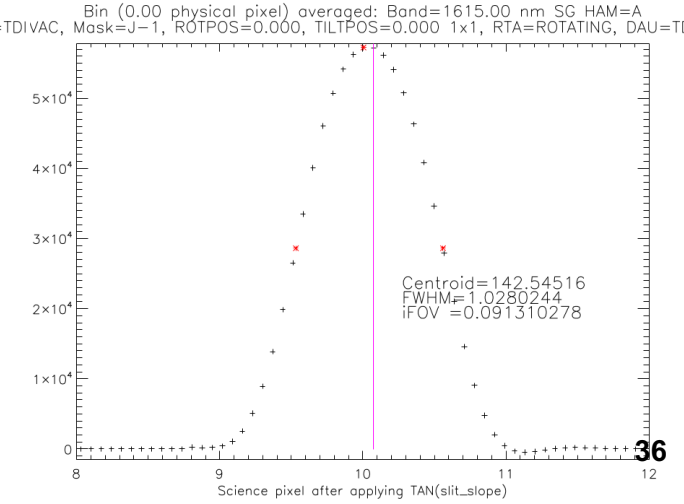




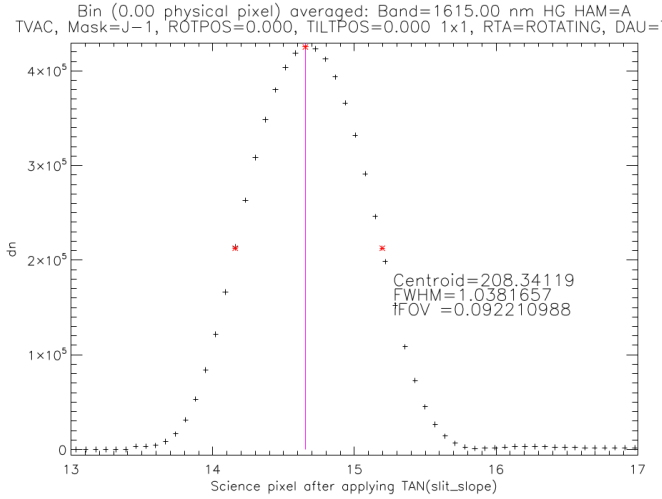


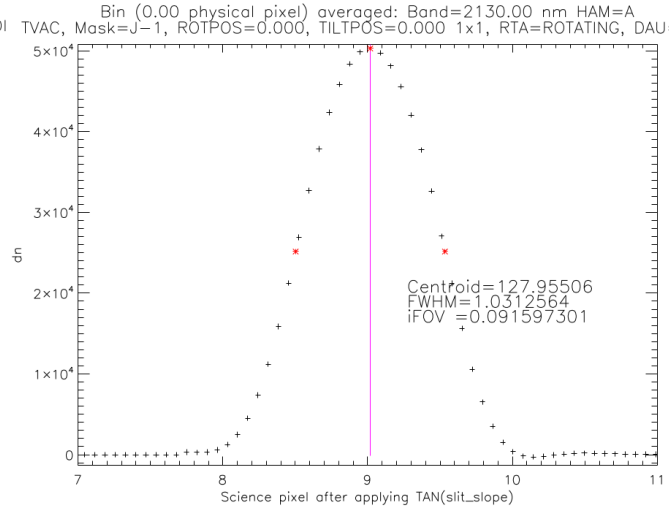


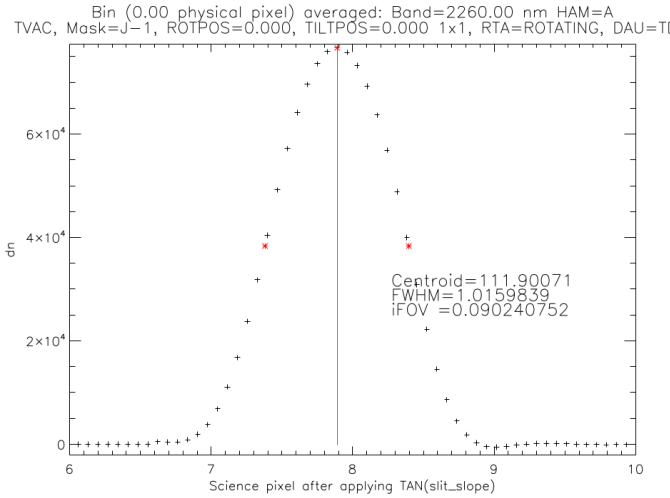




BACK UP (SWIR along-track PSF with FWHM points)



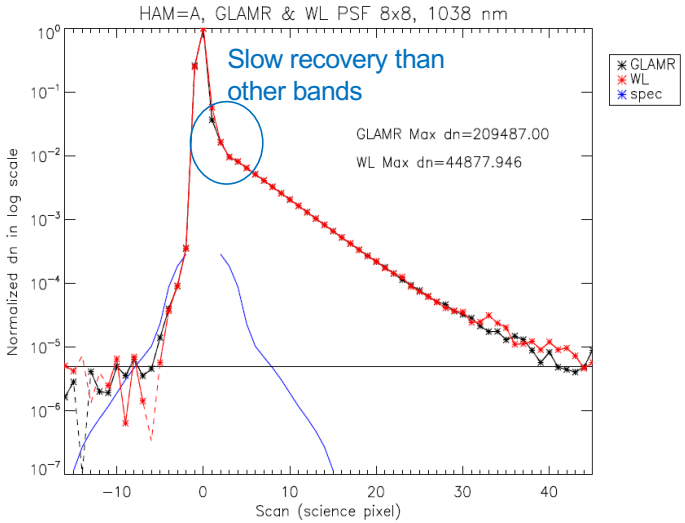


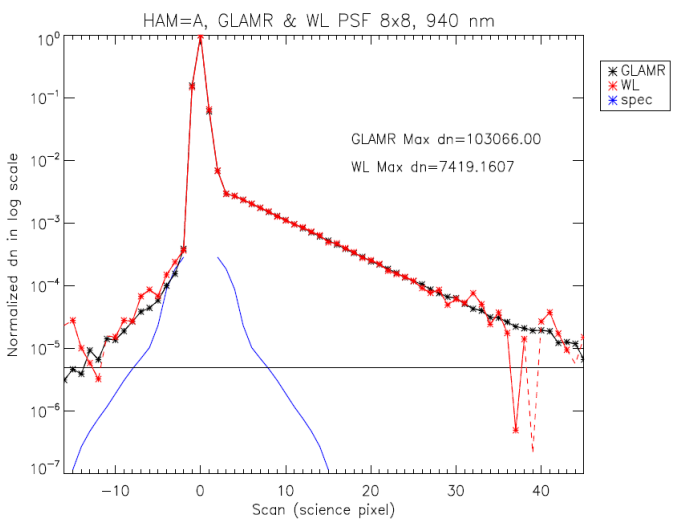


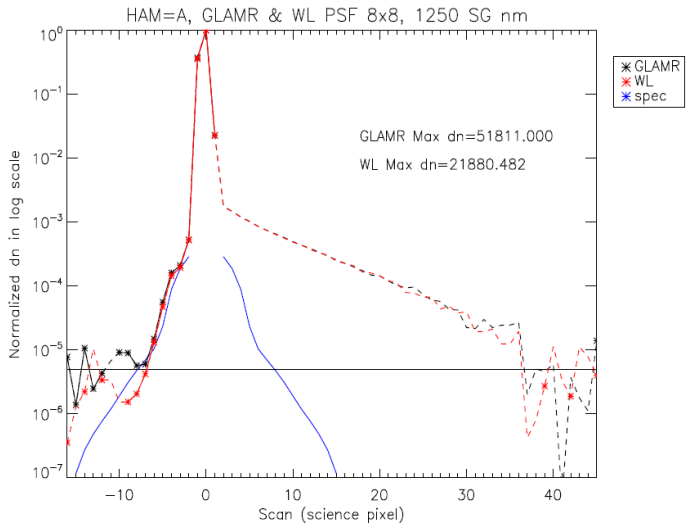
BACK UP (SWIR along-track MTF raw values)

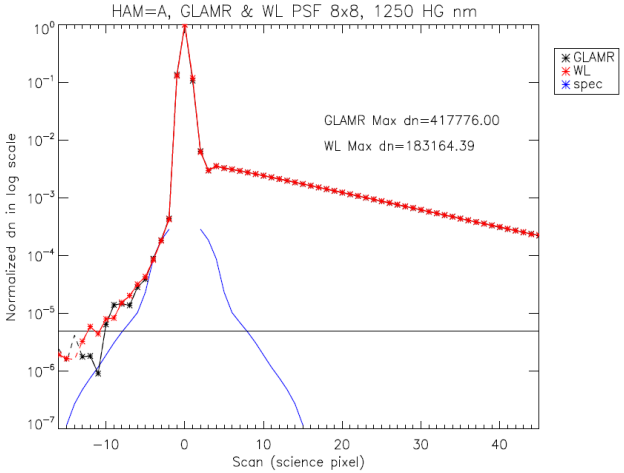
	Along-track MTF (HAM A)											
CPT#	CPT7				CPT9				CPT10			
Freq (Req)	0.25 (0.9)	0.5 (0.7)	0.75 (0.5)	1 (0.3)	0.25 (0.9)	0.5 (0.7)	0.75 (0.5)	1 (0.3)	0.25 (0.9)	0.5 (0.7)	0.75 (0.5)	1 (0.3)
940	0.9278	0.807	0.6384	0.4541	0.9292	0.8097	0.6426	0.4597	0.9263	0.8049	0.6356	0.4506
1038	0.8979	0.7757	0.6161	0.4418	0.8989	0.7779	0.6195	0.4456	0.8966	0.773	0.6119	0.4363
1250 SG	0.9685	0.8505	0.6789	0.4868	0.9704	0.8533	0.6827	0.4913	0.9666	0.8474	0.6746	0.4818
1250 HG	0.9025	0.7886	0.6262	0.4462	0.9036	0.7904	0.6291	0.4501	0.9008	0.7856	0.6222	0.4418
1378	0.938	0.8208	0.6515	0.4653	0.9396	0.824	0.6567	0.4718	0.9367	0.8189	0.6489	0.4617
1615 SG	0.9515	0.8398	0.677	0.4918	0.9512	0.8403	0.6786	0.4947	0.9512	0.8381	0.6738	0.4876
1615 HG	0.9278	0.8081	0.6389	0.4527	0.928	0.8091	0.6411	0.456	0.927	0.806	0.6357	0.4489
2130	0.9474	0.8295	0.6603	0.4718	0.9486	0.8313	0.663	0.4752	0.9458	0.8268	0.6559	0.466
2260	0.956	0.8403	0.6723	0.4845	0.9563	0.8417	0.675	0.4882	0.9552	0.8377	0.6675	0.4778

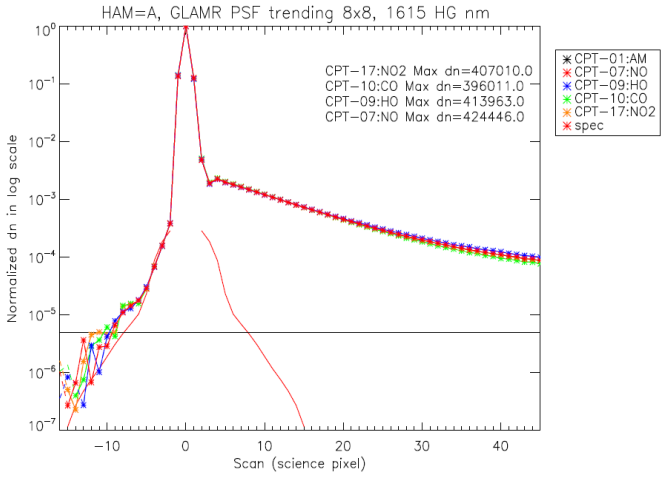
BACK UP (1038 nm hysteresis impact on MTF)

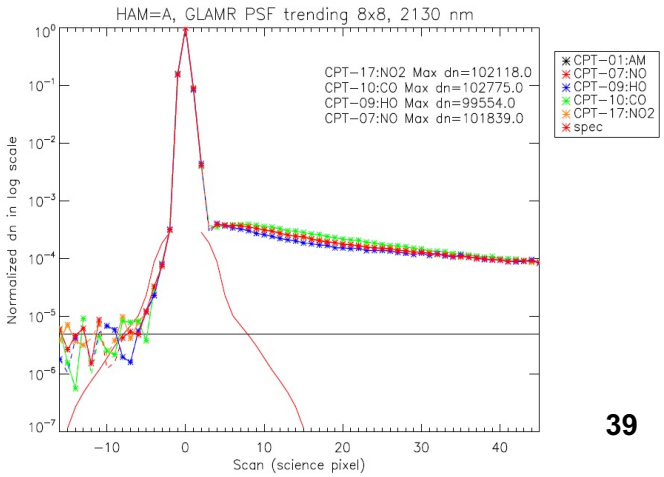




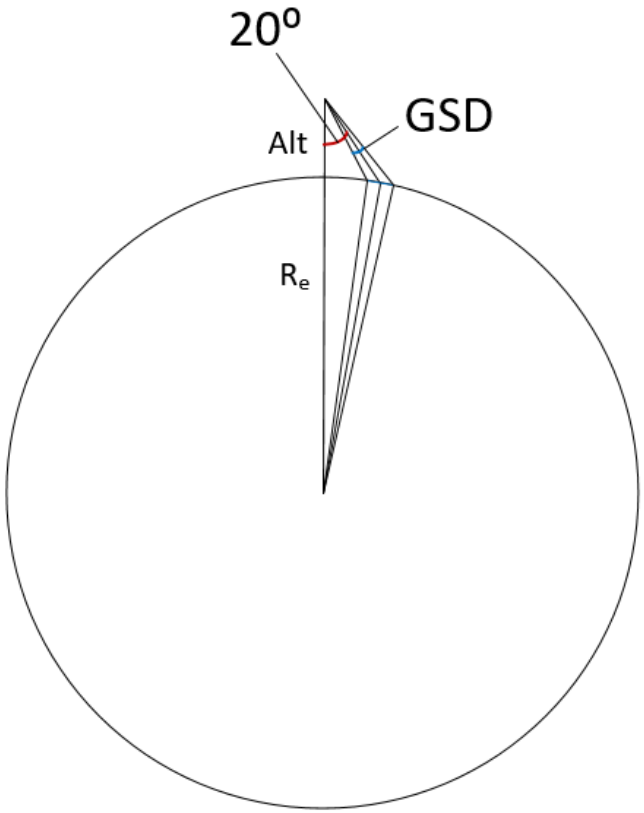








BACK UP (Curved-Earth calculated along-track GSD)



Curved Earth
GSD calculations