5.2.1.2 WAC FM MTF CALIBRATION RESULTS

As reported in Reference 5.2.1.2-1

Reference 5.2.1.2-1 - IOM 388-PAG-CCA97-13,"WAC FM Calibration Results: MTF", C. Avis, October 1, 1997

5.2.1.2.1 INTRODUCTION

The Wide-angle Flight Model thermal/vacuum testing included the acquisition of images for characterizing the system MTF. Because a collimator was used to project the target into the camera, the analysis really characterizes the camera/collimator/window combination. Further analysis is required to remove the contribution of the collimator and chamber window.

Image data were taken at temperature of -10°, +5° and +25° C in all gain and summation modes. Full-resolution Gain 2 data were acquired with all useful filter combinations. The light projected by the collimator was supplied by a flash lamp to eliminate any effects of vibration during exposures. Antibooming was 'OFF' in all images. At the -10° and 5° C temperatures, various numbers of layers of Kaydry sheets were used to attenuate the light for the CL1/CL2 data sets.

No images were acquired in this configuration with the target removed (i.e., flat-field images).

5.2.1.2.2 METHOD

Image areas containing the appropriate edges were selected. For the Bar targets, all corners and the center provided areas. For the Focus target, only the center region provided useful edges.

These image areas were supplied to the VICAR program OTF1 for characterization of the system MTF. For this analysis, no shading correction was applied before the MTF analysis because no images were acquired without the MTF target.

The algorithm proceeds through the following steps:

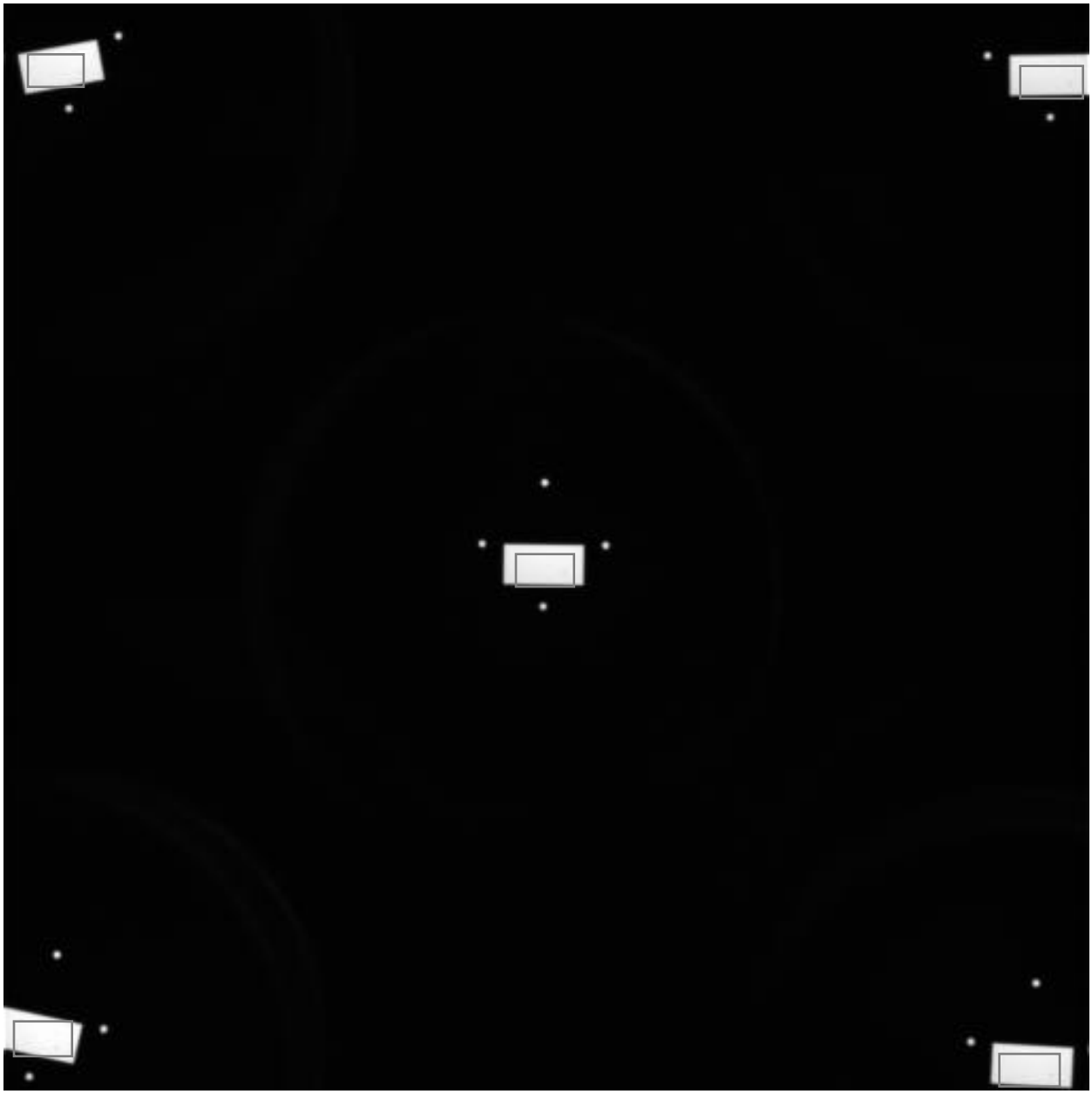
- For each line (or column) passing across the bar, the DN values are differentiated to form Line Spread Function (the peak of the resulting values defines the exact edge of the bar).
- For each line (or column), the LSF is justified using the peak value, resampled by the Sampling Theorem to 256 points and the 1-d Fourier Transform is taken.
- The Real and Imaginary components of the FT for all lines (or columns) are accumulated giving both Real and Imaginary values as a function of spatial frequency.
- The Real and Imaginary components are used to derive the normalized amplitude at each frequency.

The edges which were used are described in the tables below as either:

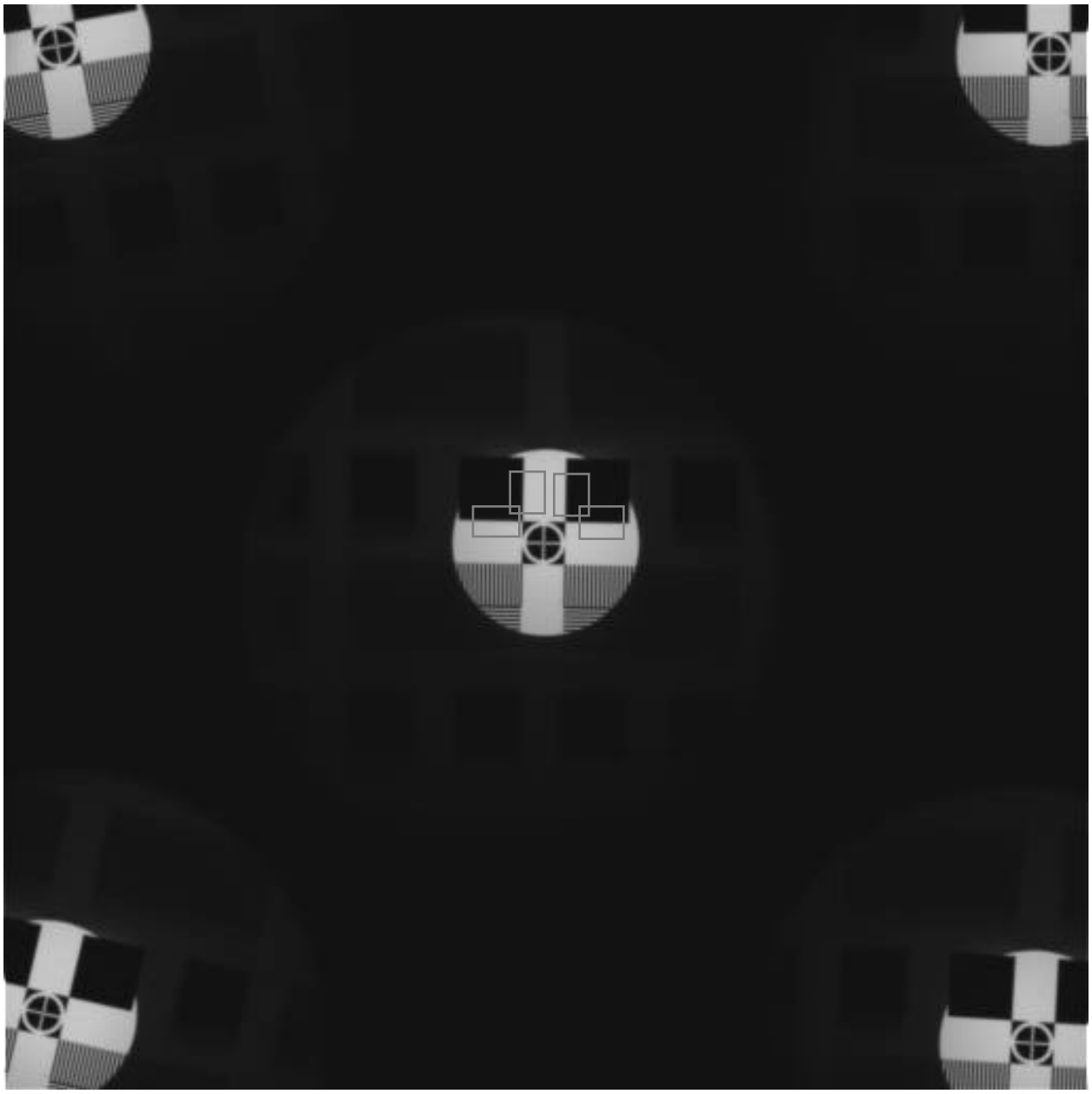
- Ascending Horizontal Edge - An edge used to measure the Vertical MTF. A column of pixels passing across the edge from top to bottom goes from low DNs to high DNs.
- Descending Vertical Edge - An edge used to measure the Horizontal MTF. A line of pixels passing across the edge from left to right goes from high DNs to low DNs.
- Ascending Vertical Edge - An edge used to measure the Horizontal MTF. A column of pixels passing across the edge from top to bottom goes from low DNs to high DNs.

The WAC collimator projected targets into each corner and the image center simultaneously. Examples of the resulting images are shown below. The approximate regions of analysis are indicated as rectangular outlines in the images.

Vertical bright bar (-10° and 5° C)

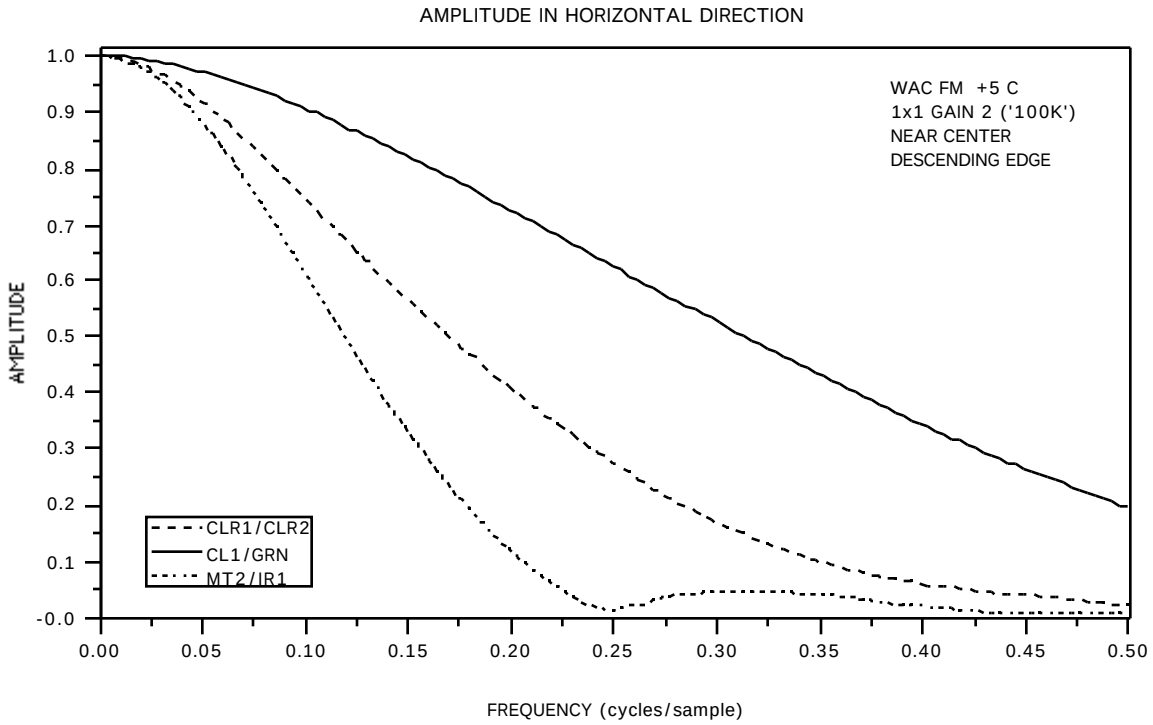


Horizontal bright bar (-10° and 5° C)



Focus Target (25° C only)

Below is a plot of example MTF curves showing CL1/CL2, CL1/GRN, and MT2/IR1 for a vertical edge near the image center.



5.2.1.2.3 RESULTS

Because of the number of filter combinations tested, all curves could not be plotted here. Thus, the following tables summarize the values of the System MTF in the various Gains, Modes, Filters and areas. Recall that the ISS Functional Requirements Document 699-205-4-2036 sets a performance requirement of System MTF ≥ 0.15 at 32 line-pairs/mm (corresonding to .38 cycles/sample). Therefore, all the tabulated values represent the MTF amplitude at this frequency.

CL1/CL2 frames were taken at high (~3000 DN), low (~800 DN) and, for Gain=2, medium exposures. These are indicated in the tables in the Mode column as FULL-H, FULL-L and FULL-M.

WAC MTF Tables

5.2.1.2.4 CONCLUSIONS

1. Low vs. high exposure didn't cause MTF changes for the CL1/CL2 cases where both exposures were available.
2. There was significant variation in MTF amplitude from corner to center for some filters. In particular, images using IR4, CB3, and MT3 show large variations, especially between the center and the bottom left.

3. The horizontal and vertical amplitudes agreed pretty well. However, the agreement was especially good for the +25° data. This is probably due to the fact that for the +25° data, horizontal and vertical measurements used the same image. The others required different targets at different times where conditions may not have been identical. To illustrate this, the list below shows the mean of the absolute value of (horizontal amplitude - vertical amplitude) for the center:

   - -10° 0.020
   - + 5° 0.022
   - +25° 0.007

4. Wide variation in filter MTF quality was expected because of focus tradeoffs in the design. The following table shows the filters sorted by the mean center amplitude (including both horizontal and vertical at +25° C). Even if the collimator/window contribution was removed, three of the filter combinations may not meet the 0.15 requirement.

FILTER 1	FILTER 2	Mean center value
IR2	IR1	0.030
MT2	IR1	0.052
CL1	CL2	0.080
CB3	CL2	0.121
MT3	CL2	0.123
MT3	IRP0	0.129
CB3	IRP0	0.131
MT3	IRP90	0.132
CB3	IRP90	0.133
CL1	VIO	0.135
IR2	IRP90	0.148
IR4	CL2	0.149
IR4	IRP0	0.151
IR2	CL2	0.155
IR2	IRP0	0.161

FILTER 1	FILTER 2	Mean center value
IR4	IRP90	0.161
CL1	IR1	0.162
IR5	CL2	0.167
IR5	IRP90	0.173
IR3	CL2	0.173
IR5	IRP0	0.174
IR3	IRP90	0.175
IR3	IRP0	0.179
CL1	BL1	0.190
CL1	RED	0.247
MT2	CL2	0.250
CB2	CL2	0.270
CL1	HAL	0.336
CL1	GRN	0.393

5.2.1.2.5 List of frames used in MTF analysis

sclk	day	time	observation	filt1	filt2	mode	gain	target
127686	186	3:1:9.0	MTF_FOCUS_505	CL1	CL2	3	40K	FULL	MTF_VERTICAL
127696	186	3:42:43.0	MTF_FOCUS_505	CL1	CL2	3	40K	FULL	MTF_VERTICAL
127702	186	4:3:49.0	MTF_FOCUS_506	CL1	CL2	2	100K	FULL	MTF_VERTICAL
127709	186	4:28:7.0	MTF_FOCUS_506	CL1	CL2	2	100K	FULL	MTF_VERTICAL
127736	186	5:48:33.0	MTF_FOCUS_507	CL1	CL2	1	100K	SUM2	MTF_VERTICAL
127739	186	5:54:52.0	MTF_FOCUS_507	CL1	CL2	1	100K	SUM2	MTF_VERTICAL
127743	186	6:14:38.0	MTF_FOCUS_508	CL1	CL2	0	1400K	SUM4	MTF_VERTICAL
127746	186	6:21:3.0	MTF_FOCUS_508	CL1	CL2	0	1400K	SUM4	MTF_VERTICAL
127751	186	6:42:6.0	MTF_FOCUS_509	CL1	CL2	2	100K	FULL	MTF_VERTICAL
127753	186	6:48:7.0	MTF_FOCUS_509	CL1	RED	2	100K	FULL	MTF_VERTICAL
127755	186	6:53:27.0	MTF_FOCUS_509	CL1	GRN	2	100K	FULL	MTF_VERTICAL
127763	186	7:54:48.0	MTF_FOCUS_509	CL1	VIO	2	100K	FULL	MTF_VERTICAL
127766	186	8:2:57.0	MTF_FOCUS_509	CL1	HAL	2	100K	FULL	MTF_VERTICAL
127770	186	8:15:30.0	MTF_FOCUS_509	CL1	IR1	2	100K	FULL	MTF_VERTICAL
127773	186	8:22:40.0	MTF_FOCUS_509	IR3	CL2	2	100K	FULL	MTF_VERTICAL
127776	186	8:31:58.0	MTF_FOCUS_509	IR4	CL1	2	100K	FULL	MTF_VERTICAL
127782	186	8:46:18.0	MTF_FOCUS_509	IR5	CL2	2	100K	FULL	MTF_VERTICAL
127784	186	8:52:19.0	MTF_FOCUS_509	CB3	CL2	2	100K	FULL	MTF_VERTICAL
127788	186	9:2:41.0	MTF_FOCUS_509	MT3	CL2	2	100K	FULL	MTF_VERTICAL
127791	186	9:9:11.0	MTF_FOCUS_509	CB2	CL2	2	100K	FULL	MTF_VERTICAL
127794	186	9:16:30.0	MTF_FOCUS_509	MT2	CL2	2	100K	FULL	MTF_VERTICAL
127797	186	9:23:47.0	MTF_FOCUS_509	IR2	CL2	2	100K	FULL	MTF_VERTICAL
127800	186	9:31:2.0	MTF_FOCUS_509	IR3	IRP0	2	100K	FULL	MTF_VERTICAL
127804	186	9:40:40.0	MTF_FOCUS_509	IR4	IRP0	2	100K	FULL	MTF_VERTICAL
127810	186	10:1:11.0	MTF_FOCUS_509	IR5	IRP0	2	100K	FULL	MTF_VERTICAL
127812	186	10:7:1.0	MTF_FOCUS_509	CB3	IRP0	2	100K	FULL	MTF_VERTICAL
127817	186	10:19:14.0	MTF_FOCUS_509	MT3	IRP0	2	100K	FULL	MTF_VERTICAL
127821	186	10:29:1.0	MTF_FOCUS_509	IR2	IRP0	2	100K	FULL	MTF_VERTICAL
127823	186	10:33:54.0	MTF_FOCUS_509	IR3	IRP90	2	100K	FULL	MTF_VERTICAL
127825	186	10:38:56.0	MTF_FOCUS_509	IR4	IRP90	2	100K	FULL	MTF_VERTICAL
127834	186	11:17:47.0	MTF_FOCUS_509	IR5	IRP90	2	100K	FULL	MTF_VERTICAL
127836	186	11:23:28.0	MTF_FOCUS_509	CB3	IRP90	2	100K	FULL	MTF_VERTICAL
127840	186	11:33:4.0	MTF_FOCUS_509	CB3	IRP90	2	100K	FULL	MTF_VERTICAL
127842	186	11:38:25.0	MTF_FOCUS_509	IR2	IRP90	2	100K	FULL	MTF_VERTICAL
127844	186	11:43:48.0	MTF_FOCUS_509	IR2	IR1	2	100K	FULL	MTF_VERTICAL
127847	186	12:5:30.0	MTF_FOCUS_509	MT2	IR1	2	100K	FULL	MTF_VERTICAL
127851	186	12:27:52.0	MTF_FOCUS_510	CL1	CL2	3	40K	FULL	MTF_HORIZONTAL
127855	186	12:42:0.0	MTF_FOCUS_510	CL1	CL2	3	40K	FULL	MTF_HORIZONTAL
127858	186	12:52:30.0	MTF_FOCUS_511	CL1	CL2	2	100K	FULL	MTF_HORIZONTAL
127863	186	13:6:57.0	MTF_FOCUS_511	CL1	CL2	2	100K	FULL	MTF_HORIZONTAL
127867	186	13:15:56.0	MTF_FOCUS_512	CL1	CL2	1	100K	SUM2	MTF_HORIZONTAL
127872	186	13:26:18.0	MTF_FOCUS_512	CL1	CL2	1	100K	SUM2	MTF_HORIZONTAL
127881	186	13:53:31.0	MTF_FOCUS_513	CL1	CL2	0	1400K	SUM4	MTF_HORIZONTAL
127884	186	13:58:43.0	MTF_FOCUS_513	CL1	CL2	0	1400K	SUM4	MTF_HORIZONTAL
127886	186	14:2:58.0	MTF_FOCUS_514	CL1	CL2	2	100K	FULL	MTF_HORIZONTAL
127889	186	15:11:50.0	MTF_FOCUS_514	CL1	RED	2	100K	FULL	MTF_HORIZONTAL
127894	186	15:55:55.0	MTF_FOCUS_514	CL1	GRN	2	100K	FULL	MTF_HORIZONTAL
127899	186	16:10:13.0	MTF_FOCUS_514	CL1	BL1	2	100K	FULL	MTF_HORIZONTAL
127903	186	16:25:2.0	MTF_FOCUS_514	CL1	VIO	2	100K	FULL	MTF_HORIZONTAL
127908	186	16:37:7.0	MTF_FOCUS_514	CL1	HAL	2	100K	FULL	MTF_HORIZONTAL
127912	186	16:49:41.0	MTF_FOCUS_514	CL1	IR1	2	100K	FULL	MTF_HORIZONTAL
127917	186	17:3:32.0	MTF_FOCUS_514	IR3	CL2	2	100K	FULL	MTF_HORIZONTAL
127922	186	17:16:53.0	MTF_FOCUS_514	IR4	CL2	2	100K	FULL	MTF_HORIZONTAL
127927	186	17:32:16.0	MTF_FOCUS_514	IR5	CL2	2	100K	FULL	MTF_HORIZONTAL
127929	186	17:41:3.0	MTF_FOCUS_514	CB3	CL2	2	100K	FULL	MTF_HORIZONTAL
127933	186	17:54:27.0	MTF_FOCUS_514	MT3	CL2	2	100K	FULL	MTF_HORIZONTAL
127935	186	18:1:21.0	MTF_FOCUS_514	CB2	CL2	2	100K	FULL	MTF_HORIZONTAL
127937	186	18:6:16.0	MTF_FOCUS_514	MT2	CL2	2	100K	FULL	MTF_HORIZONTAL
127941	186	18:29:38.0	MTF_FOCUS_514	IR2	CL2	2	100K	FULL	MTF_HORIZONTAL
127944	186	18:38:37.0	MTF_FOCUS_514	IR3	IRP0	2	100K	FULL	MTF_HORIZONTAL
127946	186	18:44:36.0	MTF_FOCUS_514	IR4	IRP0	2	100K	FULL	MTF_HORIZONTAL
127952	186	19:4:24.0	MTF_FOCUS_514	IR5	IRP0	2	100K	FULL	MTF_HORIZONTAL
127956	186	19:39:55.0	MTF_FOCUS_514	CB3	IRP0	2	100K	FULL	MTF_HORIZONTAL
127958	186	19:45:31.0	MTF_FOCUS_514	MT3	IRP0	2	100K	FULL	MTF_HORIZONTAL
127961	186	19:55:46.0	MTF_FOCUS_514	IR2	IRP0	2	100K	FULL	MTF_HORIZONTAL
127965	186	20:6:55.0	MTF_FOCUS_514	IR3	IRP90	2	100K	FULL	MTF_HORIZONTAL
127967	186	20:47:21.0	MTF_FOCUS_514	IR4	IRP90	2	100K	FULL	MTF_HORIZONTAL
127969	186	20:54:3.0	MTF_FOCUS_514	IR5	IRP90	2	100K	FULL	MTF_HORIZONTAL
127971	186	21:1:20.0	MTF_FOCUS_514	CB3	IRP90	2	100K	FULL	MTF_HORIZONTAL
127974	186	21:11:8.0	MTF_FOCUS_514	MT3	IRP90	2	100K	FULL	MTF_HORIZONTAL
127979	186	21:36:51.0	MTF_FOCUS_514	IR2	IRP90	2	100K	FULL	MTF_HORIZONTAL
127981	186	21:42:21.0	MTF_FOCUS_514	IR2	IR1	2	100K	FULL	MTF_HORIZONTAL
127985	186	21:52:16.0	MTF_FOCUS_514	MT2	IR1	2	100K	FULL	MTF_HORIZONTAL
128250	188	17:33:6.0	MTF_FOCUS_515	CL1	CL2	3	40K	FULL	MTF_HORIZONTAL
128254	188	17:46:40.0	MTF_FOCUS_515	CL1	CL2	3	40K	FULL	MTF_HORIZONTAL
128256	188	17:52:46.0	MTF_FOCUS_516	CL1	CL2	2	100K	FULL	MTF_HORIZONTAL
128262	188	18:7:54.0	MTF_FOCUS_516	CL1	CL2	2	100K	FULL	MTF_HORIZONTAL
128267	188	18:26:18.0	MTF_FOCUS_517	CL1	CL2	1	100K	SUM2	MTF_HORIZONTAL
128271	188	18:35:51.0	MTF_FOCUS_517	CL1	CL2	1	100K	SUM2	MTF_HORIZONTAL
128273	188	18:40:30.0	MTF_FOCUS_518	CL1	CL2	0	1400K	SUM4	MTF_HORIZONTAL
128276	188	18:46:31.0	MTF_FOCUS_518	CL1	CL2	0	1400K	SUM4	MTF_HORIZONTAL
128278	188	18:54:4.0	MTF_FOCUS_519	CL1	CL2	2	100K	FULL	MTF_HORIZONTAL
128281	188	19:3:51.0	MTF_FOCUS_519	CL1	RED	2	100K	FULL	MTF_HORIZONTAL
128285	188	19:13:39.0	MTF_FOCUS_519	CL1	GRN	2	100K	FULL	MTF_HORIZONTAL
128288	188	19:22:32.0	MTF_FOCUS_519	CL1	BL1	2	100K	FULL	MTF_HORIZONTAL
128290	188	19:27:37.0	MTF_FOCUS_519	CL1	VIO	2	100K	FULL	MTF_HORIZONTAL
128293	188	19:35:40.0	MTF_FOCUS_519	CL1	HAL	2	100K	FULL	MTF_HORIZONTAL
128295	188	19:41:18.0	MTF_FOCUS_519	CL1	IR1	2	100K	FULL	MTF_HORIZONTAL
128297	188	19:47:55.0	MTF_FOCUS_519	IR3	CL2	2	100K	FULL	MTF_HORIZONTAL
128299	188	19:53:26.0	MTF_FOCUS_519	IR4	CL2	2	100K	FULL	MTF_HORIZONTAL
128302	188	20:1:0.0	MTF_FOCUS_519	IR5	CL2	2	100K	FULL	MTF_HORIZONTAL
128305	188	20:8:25.0	MTF_FOCUS_519	CB3	CL2	2	100K	FULL	MTF_HORIZONTAL
128308	188	20:16:35.0	MTF_FOCUS_519	MT3	CL2	2	100K	FULL	MTF_HORIZONTAL
128310	188	20:21:22.0	MTF_FOCUS_519	CB2	CL2	2	100K	FULL	MTF_HORIZONTAL
128312	188	20:27:13.0	MTF_FOCUS_519	MT2	CL2	2	100K	FULL	MTF_HORIZONTAL
128315	188	20:34:12.0	MTF_FOCUS_519	IR2	CL2	2	100K	FULL	MTF_HORIZONTAL
128317	188	20:39:41.0	MTF_FOCUS_519	IR3	IRP0	2	100K	FULL	MTF_HORIZONTAL
128321	188	20:51:16.0	MTF_FOCUS_519	IR4	IRP0	2	100K	FULL	MTF_HORIZONTAL
128323	188	20:57:18.0	MTF_FOCUS_519	IR5	IRP0	2	100K	FULL	MTF_HORIZONTAL
128325	188	21:1:59.0	MTF_FOCUS_519	CB3	IRP0	2	100K	FULL	MTF_HORIZONTAL
128327	188	21:8:6.0	MTF_FOCUS_519	MT3	IRP0	2	100K	FULL	MTF_HORIZONTAL
128329	188	21:12:58.0	MTF_FOCUS_519	IR2	IRP0	2	100K	FULL	MTF_HORIZONTAL
128331	188	21:17:58.0	MTF_FOCUS_519	IR3	IRP90	2	100K	FULL	MTF_HORIZONTAL
128334	188	21:28:11.0	MTF_FOCUS_519	IR4	IRP90	2	100K	FULL	MTF_HORIZONTAL
128335	188	21:30:55.0	MTF_FOCUS_519	IR5	IRP90	2	100K	FULL	MTF_HORIZONTAL
128338	188	21:37:43.0	MTF_FOCUS_519	CB3	IRP90	2	100K	FULL	MTF_HORIZONTAL
128341	188	21:44:33.0	MTF_FOCUS_519	MT3	IRP90	2	100K	FULL	MTF_HORIZONTAL
128344	188	21:51:43.0	MTF_FOCUS_519	IR2	IRP90	2	100K	FULL	MTF_HORIZONTAL
128346	188	21:56:57.0	MTF_FOCUS_519	IR2	IR1	2	100K	FULL	MTF_HORIZONTAL
128347	188	21:59:47.0	MTF_FOCUS_519	MT2	IR1	2	100K	FULL	MTF_HORIZONTAL
128350	188	22:32:14.0	MTF_FOCUS_520	CL1	CL2	3	40K	FULL	MTF_VERTICAL
128351	188	22:35:42.0	MTF_FOCUS_520	CL1	CL2	3	40K	FULL	MTF_VERTICAL
128352	188	22:39:28.0	MTF_FOCUS_521	CL1	CL2	2	100K	FULL	MTF_VERTICAL
128353	188	22:42:15.0	MTF_FOCUS_521	CL1	CL2	2	100K	FULL	MTF_VERTICAL
128355	188	22:47:28.0	MTF_FOCUS_522	CL1	CL2	1	100K	SUM2	MTF_VERTICAL
128356	188	22:49:48.0	MTF_FOCUS_522	CL1	CL2	1	100K	SUM2	MTF_VERTICAL
128357	188	22:52:37.0	MTF_FOCUS_523	CL1	CL2	0	1400K	SUM4	MTF_VERTICAL
128360	188	22:57:20.0	MTF_FOCUS_523	CL1	CL2	0	1400K	SUM4	MTF_VERTICAL
128361	188	23:0:50.0	MTF_FOCUS_524	CL1	CL2	2	100K	FULL	MTF_VERTICAL
128362	188	23:3:51.0	MTF_FOCUS_524	CL1	RED	2	100K	FULL	MTF_VERTICAL
128363	188	23:6:26.0	MTF_FOCUS_524	CL1	GRN	2	100K	FULL	MTF_VERTICAL
128364	188	23:8:58.0	MTF_FOCUS_524	CL1	BL1	2	100K	FULL	MTF_VERTICAL
128365	188	23:12:0.0	MTF_FOCUS_524	CL1	VIO	2	100K	FULL	MTF_VERTICAL
128366	188	23:14:55.0	MTF_FOCUS_524	CL1	HAL	2	100K	FULL	MTF_VERTICAL
128368	188	23:20:45.0	MTF_FOCUS_524	CL1	IR1	2	100K	FULL	MTF_VERTICAL
128369	188	23:23:46.0	MTF_FOCUS_524	IR3	CL2	2	100K	FULL	MTF_VERTICAL
128370	189	1:0:0.0	MTF_FOCUS_534	IR4	CL2	2	100K	FULL	MTF_VERTICAL
128371	189	1:4:38.0	MTF_FOCUS_534	IR5	CL2	2	100K	FULL	MTF_VERTICAL
128372	189	1:11:13.0	MTF_FOCUS_534	CB3	CL2	2	100K	FULL	MTF_VERTICAL
128373	189	1:17:51.0	MTF_FOCUS_534	MT3	CL2	2	100K	FULL	MTF_VERTICAL
128374	189	1:21:17.0	MTF_FOCUS_534	CB2	CL2	2	100K	FULL	MTF_VERTICAL
128376	189	1:29:15.0	MTF_FOCUS_534	MT2	CL2	2	100K	FULL	MTF_VERTICAL
128378	189	1:35:42.0	MTF_FOCUS_534	IR2	CL2	2	100K	FULL	MTF_VERTICAL
128379	189	1:43:5.0	MTF_FOCUS_534	IR3	IRP0	2	100K	FULL	MTF_VERTICAL
128381	189	1:49:35.0	MTF_FOCUS_534	IR4	IRP0	2	100K	FULL	MTF_VERTICAL
128382	189	1:53:26.0	MTF_FOCUS_534	IR5	IRP0	2	100K	FULL	MTF_VERTICAL
128383	189	1:59:11.0	MTF_FOCUS_534	CB3	IRP0	2	100K	FULL	MTF_VERTICAL
128385	189	2:4:54.0	MTF_FOCUS_534	MT3	IRP0	2	100K	FULL	MTF_VERTICAL
128387	189	2:11:47.0	MTF_FOCUS_534	IR2	IRP0	2	100K	FULL	MTF_VERTICAL
128388	189	2:20:36.0	MTF_FOCUS_534	IR3	IRP90	2	100K	FULL	MTF_VERTICAL
128390	189	2:31:42.0	MTF_FOCUS_534	IR4	IRP90	2	100K	FULL	MTF_VERTICAL
128391	189	2:35:51.0	MTF_FOCUS_534	IR5	IRP90	2	100K	FULL	MTF_VERTICAL
128393	189	2:41:41.0	MTF_FOCUS_534	CB3	IRP90	2	100K	FULL	MTF_VERTICAL
128394	189	2:45:17.0	MTF_FOCUS_534	MT3	IRP90	2	100K	FULL	MTF_VERTICAL
128397	189	2:54:1.0	MTF_FOCUS_534	IR2	IRP90	2	100K	FULL	MTF_VERTICAL
128398	189	2:59:59.0	MTF_FOCUS_534	IR2	IR1	2	100K	FULL	MTF_VERTICAL
128399	189	3:3:52.0	MTF_FOCUS_534	MT2	IR1	2	100K	FULL	MTF_VERTICAL
128776	190	21:46:51.0	MTF_FOCUS_525	CL1	CL2	3	40K	FULL	WAC_COLLIMATOR_FOCUS
128780	190	22:1:16.0	MTF_FOCUS_525	CL1	CL2	3	40K	FULL	WAC_COLLIMATOR_FOCUS
128784	190	22:22:39.0	MTF_FOCUS_526	CL1	CL2	2	100K	FULL	WAC_COLLIMATOR_FOCUS
128788	190	22:34:52.0	MTF_FOCUS_526	CL1	CL2	2	100K	FULL	WAC_COLLIMATOR_FOCUS
128791	190	22:48:48.0	MTF_FOCUS_527	CL1	CL2	1	100K	SUM2	WAC_COLLIMATOR_FOCUS
128795	190	22:58:4.0	MTF_FOCUS_527	CL1	CL2	1	100K	SUM2	WAC_COLLIMATOR_FOCUS
128797	190	23:11:44.0	MTF_FOCUS_528	CL1	CL2	0	1400K	SUM4	WAC_COLLIMATOR_FOCUS
128798	190	23:15:9.0	MTF_FOCUS_528	CL1	CL2	0	1400K	SUM4	WAC_COLLIMATOR_FOCUS
128801	190	23:25:0.0	MTF_FOCUS_529	CL1	CL2	2	100K	FULL	WAC_COLLIMATOR_FOCUS
128804	190	23:56:16.0	MTF_FOCUS_529	CL1	RED	2	100K	FULL	WAC_COLLIMATOR_FOCUS
128809	191	0:21:27.0	MTF_FOCUS_529	CL1	GRN	2	100K	FULL	WAC_COLLIMATOR_FOCUS
128811	191	0:30:38.0	MTF_FOCUS_529	CL1	BL1	2	100K	FULL	WAC_COLLIMATOR_FOCUS
128813	191	0:39:9.0	MTF_FOCUS_529	CL1	VIO	2	100K	FULL	WAC_COLLIMATOR_FOCUS
128814	191	0:42:57.0	MTF_FOCUS_529	CL1	HAL	2	100K	FULL	WAC_COLLIMATOR_FOCUS
128819	191	1:7:5.0	MTF_FOCUS_529	CL1	IR1	2	100K	FULL	WAC_COLLIMATOR_FOCUS
128821	191	1:15:8.0	MTF_FOCUS_529	IR3	CL2	2	100K	FULL	WAC_COLLIMATOR_FOCUS
128823	191	1:21:48.0	MTF_FOCUS_529	IR4	CL2	2	100K	FULL	WAC_COLLIMATOR_FOCUS
128827	191	1:35:16.0	MTF_FOCUS_529	IR5	CL2	2	100K	FULL	WAC_COLLIMATOR_FOCUS
128829	191	1:43:19.0	MTF_FOCUS_529	CB3	CL2	2	100K	FULL	WAC_COLLIMATOR_FOCUS
128832	191	2:0:46.0	MTF_FOCUS_529	MT3	CL2	2	100K	FULL	WAC_COLLIMATOR_FOCUS
128835	191	2:9:50.0	MTF_FOCUS_529	CB2	CL2	2	100K	FULL	WAC_COLLIMATOR_FOCUS
128836	191	2:13:19.0	MTF_FOCUS_529	MT2	CL2	2	100K	FULL	WAC_COLLIMATOR_FOCUS
128841	191	2:54:18.0	MTF_FOCUS_529	IR2	CL2	2	100K	FULL	WAC_COLLIMATOR_FOCUS
128846	191	4:22:21.0	MTF_FOCUS_529	IR3	IRP0	2	100K	FULL	WAC_COLLIMATOR_FOCUS
128848	191	4:29:12.0	MTF_FOCUS_529	IR4	IRP0	2	100K	FULL	WAC_COLLIMATOR_FOCUS
128852	191	4:45:39.0	MTF_FOCUS_529	IR5	IRP0	2	100K	FULL	WAC_COLLIMATOR_FOCUS
128855	191	5:2:23.0	MTF_FOCUS_529	CB3	IRP0	2	100K	FULL	WAC_COLLIMATOR_FOCUS
128857	191	5:14:21.0	MTF_FOCUS_529	MT3	IRP0	2	100K	FULL	WAC_COLLIMATOR_FOCUS
128864	191	5:45:1.0	MTF_FOCUS_529	IR2	IRP0	2	100K	FULL	WAC_COLLIMATOR_FOCUS
128865	191	5:47:39.0	MTF_FOCUS_529	IR3	IRP90	2	100K	FULL	WAC_COLLIMATOR_FOCUS
128868	191	5:58:9.0	MTF_FOCUS_529	IR4	IRP90	2	100K	FULL	WAC_COLLIMATOR_FOCUS
128871	191	6:8:30.0	MTF_FOCUS_529	IR5	IRP90	2	100K	FULL	WAC_COLLIMATOR_FOCUS
128875	191	6:24:22.0	MTF_FOCUS_529	CB3	IRP90	2	100K	FULL	WAC_COLLIMATOR_FOCUS
128877	191	6:32:31.0	MTF_FOCUS_529	MT3	IRP90	2	100K	FULL	WAC_COLLIMATOR_FOCUS
128881	191	6:43:12.0	MTF_FOCUS_529	IR2	IRP90	2	100K	FULL	WAC_COLLIMATOR_FOCUS
128882	191	6:46:34.0	MTF_FOCUS_529	IR2	IR1	2	100K	FULL	WAC_COLLIMATOR_FOCUS
128884	191	6:53:6.0	MTF_FOCUS_529	MT2	IR1	2	100K	FULL	WAC_COLLIMATOR_FOCUS