5.2.1.1 NAC FM MTF CALIBRATION RESULTS

As reported in Reference 5.2.1.1-1

Reference 5.2.1.1-1 - IOM 388-PAG-CCA97-12,"NAC FM Calibration Results: MTF", C. Avis, October 1, 1997

5.2.1.1.1 INTRODUCTION

The Narrow-angle Flight Model thermal/vacuum testing included the acquisition of a set 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. The data were acquired with NAC FM FOCUS target only.

5.2.1.1.2 METHOD

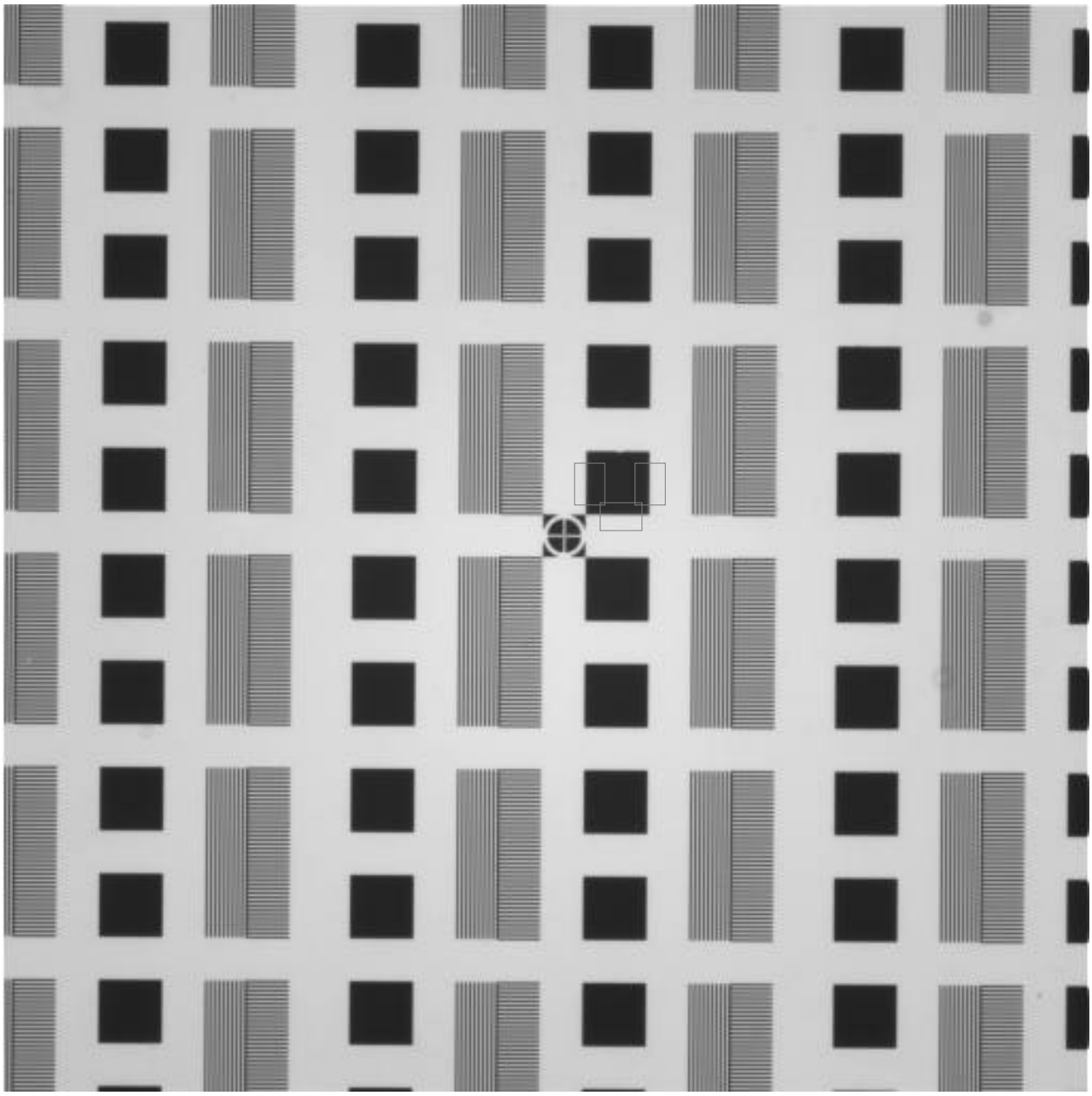
Image areas containing the appropriate edges were selected. These image areas containing edges were supplied to the VICAR program OTF1 for characterization of the system MTF. The OTF1 algorithm proceeds through the following steps:

- For each line 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, 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 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.

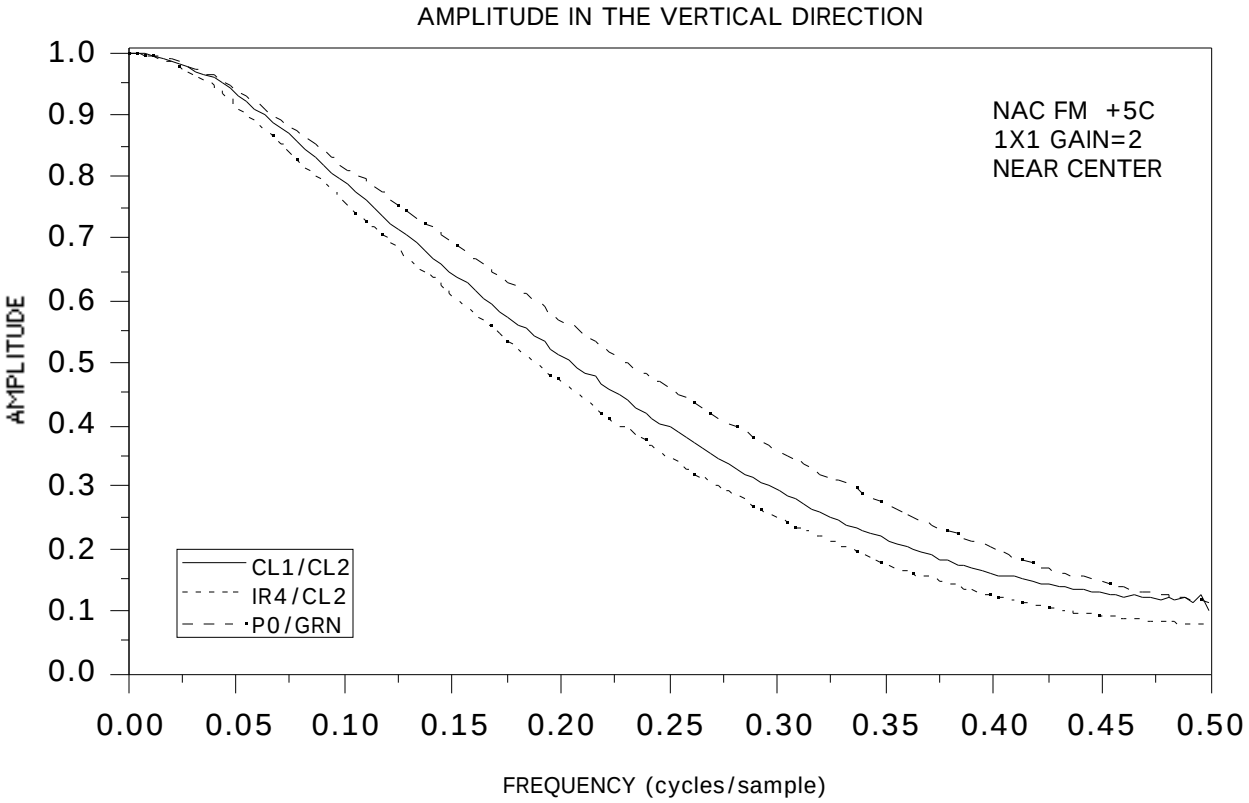
The edges which were used are described in the tables below as either:

- 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.

Below is a typical frame of the NAC FM FOCUS target. The approximate regions of analysis are indicated as rectangular outlines in the images.



Below is a plot of example MTF curves showing CL1/CL2, IR4/CL2, and P0/GRN for a horizontal edge near the image center.



5.2.1.1.3 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 various exposures. The DN levels achieved are indicated in the tables in the Mode column after the 'dash'.

Temperature = +25°C

IMAGE	FILTER 1	FILTER 2	GAIN	MODE	DESCENDING VERTICAL EDGE	ASCENDING VERTICAL EDGE	ASCENDING HORIZONTAL EDGE
117610	CL1	CL2	3	FULL-1300	0.169	0.182	0.186
117614	CL1	CL2	3	FULL-2800	0.163	0.177	0.166
117616	CL1	CL2	2	FULL-1000	0.159	0.214	0.191
117675	CL1	CL2	2	FULL-2800	0.217	0.152	0.195
117619	CL1	CL2	2	FULL-3500	0.184	0.205	0.148
117637	CL1	CL2	2	FULL-3900	0.157	0.213	0.179
117624	CL1	CL2	1	SUM2-900	0.425	0.465	0.314
117622	CL1	CL2	1	SUM2-3000	0.389	0.464	0.263
117630	CL1	CL2	0	SUM4-1200	0.380	0.321	0.351

IMAGE	FILTER 1	FILTER 2	GAIN	MODE	DESCENDING VERTICAL EDGE	ASCENDING VERTICAL EDGE	ASCENDING HORIZONTAL EDGE
117635	CL1	CL2	0	SUM4-3000	0.342	0.339	0.396
117639	CL1	GRN	2	FULL	0.275	0.199	0.243
117651	CL1	UV3	2	FULL	0.248	0.199	0.189
117640	CL1	BL2	2	FULL	0.223	0.187	0.186
117655	CL1	MT2	2	FULL	0.143	0.195	0.163
117659	CL1	CB2	2	FULL	0.197	0.142	0.169
117660	CL1	MT3	2	FULL	0.151	0.106	0.123
117663	CL1	CB3	2	FULL	0.110	0.130	0.110
117668	CL1	MT1	2	FULL	0.188	0.209	0.171
117641	CL1	CB1	2	FULL	0.178	0.247	0.188
117643	CL1	IR3	2	FULL	0.096	0.142	0.092
117647	CL1	IR1	2	FULL	0.169	0.151	0.125
117684	RED	CL2	2	FULL	0.231	0.173	0.220
117688	BL1	CL2	2	FULL	0.261	0.188	0.256
117715	UV2	CL2	3	FULL	0.237	0.186	0.202
117716	UV2	CL2	3	FULL	0.240	0.198	0.220
117692	IRP0	CL2	2	FULL	0.149	0.187	0.140
117695	P120	CL2	2	FULL	0.159	0.197	0.163
117698	P60	CL2	2	FULL	0.149	0.177	0.169
117700	P0	CL2	2	FULL	0.199	0.153	0.159
117705	HAL	CL2	2	FULL	0.205	0.162	0.180
117711	IR4	CL2	2	FULL	0.122	0.093	0.089
117714	IR2	CL2	2	FULL	0.129	0.137	0.130
117724	RED	GRN	2	FULL	0.191	0.244	0.186
117728	RED	MT1	2	FULL	0.214	0.171	0.193
117731	RED	CB1	2	FULL	0.205	0.231	0.177
117733	RED	IR1	2	FULL	0.162	0.181	0.189
117836	IR2	IR1	2	FULL	0.123	0.176	0.132
117741	IR2	CB3	2	FULL	0.143	0.119	0.132
117747	IR2	IR3	2	FULL	0.128	0.127	0.110
117750	IR4	IR3	2	FULL	0.123	0.123	0.090
117765	IRP0	MT2	2	FULL	0.146	0.182	0.149
117771	IRP0	CB2	2	FULL	0.138	0.185	0.162
117773	IRP0	MT3	2	FULL	0.132	0.118	0.106
117777	IRP0	CB3	2	FULL	0.102	0.120	0.107
117755	IRP0	IR3	2	FULL	0.148	0.092	0.101
117762	IRP0	IR1	2	FULL	0.154	0.136	0.144
117781	P120	GRN	2	FULL	0.240	0.202	0.216
117788	P120	UV3	2	FULL	0.246	0.177	0.211
117791	P120	BL2	2	FULL	0.185	0.232	0.188
117799	P120	MT2	2	FULL	0.142	0.195	0.144
117803	P120	CB2	2	FULL	0.175	0.147	0.135
117811	P120	MT1	2	FULL	0.174	0.217	0.204
117818	P120	CB1	2	FULL	0.231	0.183	0.179
117832	P120	IR1	2	FULL	0.183	0.147	0.154
117782	P60	GRN	2	FULL	0.244	0.246	0.255
117787	P60	UV3	2	FULL	0.238	0.188	0.219
117792	P60	BL2	2	FULL	0.225	0.190	0.218
117798	P60	MT2	2	FULL	0.164	0.191	0.137
117804	P60	CB2	2	FULL	0.165	0.186	0.148
117810	P60	MT1	2	FULL	0.214	0.176	0.162
117819	P60	CB1	2	FULL	0.184	0.239	0.222
117829	P60	IR1	2	FULL	0.143	0.176	0.137
117783	P0	GRN	2	FULL	0.262	0.219	0.185
117786	P0	UV3	2	FULL	0.218	0.196	0.216
117793	P0	BL2	2	FULL	0.183	0.227	0.181
117797	P0	MT2	2	FULL	0.142	0.196	0.117
117805	P0	CB2	2	FULL	0.146	0.193	0.168
117809	P0	MT1	2	FULL	0.236	0.170	0.192
117820	P0	CB1	2	FULL	0.184	0.241	0.218

IMAGE	FILTER 1	FILTER 2	GAIN	MODE	DESCENDING VERTICAL EDGE	ASCENDING VERTICAL EDGE	ASCENDING HORIZONTAL EDGE
117828	P0	IR1	2	FULL	0.192	0.136	0.148

Temperature=+5°C

IMAGE	FILTER 1	FILTER 2	GAIN	MODE	DESCENDING VERTICAL EDGE	ASCENDING VERTICAL EDGE	ASCENDING HORIZONTAL EDGE
118148	CL1	CL2	3	FULL-1300	0.164	0.171	0.160
118154	CL1	CL2	3	FULL-3800	0.215	0.181	0.190
118155	CL1	CL2	2	FULL-1100	0.175	0.203	0.205
118158	CL1	CL2	2	FULL-2900	0.215	0.205	0.148
118172	CL1	CL2	2	FULL-3200	0.160	0.172	0.166
118217	CL1	CL2	2	FULL-3500	0.156	0.179	0.176
118159	CL1	CL2	1	SUM2-1000	0.282	0.323	0.440
118160	CL1	CL2	1	SUM2-2900	0.308	0.270	0.454
118161	CL1	CL2	0	SUM4-1000	0.518	0.578	0.319
118168	CL1	CL2	0	SUM4-3000	0.405	0.466	0.315
118185	CL1	GRN	2	FULL	0.261	0.210	0.226
118187	CL1	UV3	2	FULL	0.236	0.190	0.233
118197	CL1	BL2	2	FULL	0.194	0.225	0.217
118199	CL1	MT2	2	FULL	0.146	0.175	0.133
118201	CL1	CB2	2	FULL	0.182	0.139	0.158
118202	CL1	MT3	2	FULL	0.126	0.106	0.099
118205	CL1	CB3	2	FULL	0.097	0.115	0.116
118207	CL1	MT1	2	FULL	0.192	0.182	0.196
118208	CL1	CB1	2	FULL	0.199	0.239	0.181
118209	CL1	IR3	2	FULL	0.101	0.139	0.110
118213	CL1	IR1	2	FULL	0.200	0.161	0.143
118221	RED	CL2	2	FULL	0.186	0.196	0.156
118225	BL1	CL2	2	FULL	0.193	0.231	0.244
118228	UV2	CL2	2	FULL	0.236	0.214	0.189
118235	IRP0	CL2	2	FULL	0.193	0.190	0.169
118236	P120	CL2	2	FULL	0.179	0.141	0.140
118241	P60	CL2	2	FULL	0.180	0.199	0.181
118242	P0	CL2	2	FULL	0.169	0.199	0.168
118249	HAL	CL2	2	FULL	0.210	0.169	0.164
118254	IR4	CL2	2	FULL	0.107	0.096	0.088
118257	IR2	CL2	2	FULL	0.133	0.160	0.139
118271	RED	GRN	2	FULL	0.260	0.214	0.189
118274	RED	MT1	2	FULL	0.248	0.216	0.203
118287	RED	CB1	2	FULL	0.231	0.193	0.194
118291	RED	IR1	2	FULL	0.159	0.179	0.188
118302	IR2	IR1	2	FULL	0.173	0.183	0.144
118421	IR2	CB3	2	FULL	0.114	0.114	0.109
118306	IR2	IR3	2	FULL	0.153	0.135	0.099
118313	IR4	IR3	2	FULL	0.147	0.135	0.128
118319	IRP0	MT2	2	FULL	0.206	0.160	0.149
118325	IRP0	CB2	2	FULL	0.203	0.183	0.173
118326	IRP0	MT3	2	FULL	0.106	0.130	0.145
118328	IRP0	CB3	2	FULL	0.106	0.111	0.127
118337	IRP0	IR3	2	FULL	0.106	0.119	0.131
118341	IRP0	IR1	2	FULL	0.143	0.176	0.159
118346	P120	GRN	2	FULL	0.209	0.219	0.242
118347	P120	UV3	2	FULL	0.236	0.196	0.240
118348	P120	BL2	2	FULL	0.229	0.227	0.184
118350	P120	MT2	2	FULL	0.153	0.158	0.154
118354	P120	CB2	2	FULL	0.171	0.196	0.157
118356	P120	MT1	2	FULL	0.209	0.224	0.199
118362	P120	CB1	2	FULL	0.181	0.209	0.185

IMAGE	FILTER 1	FILTER 2	GAIN	MODE	DESCENDING VERTICAL EDGE	ASCENDING VERTICAL EDGE	ASCENDING HORIZONTAL EDGE
118370	P120	IR1	2	FULL	0.164	0.143	0.140
118375	P60	GRN	2	FULL	0.206	0.221	0.220
118380	P60	UV3	2	FULL	0.239	0.189	0.219
118381	P60	BL2	2	FULL	0.180	0.217	0.207
118382	P60	MT2	2	FULL	0.141	0.164	0.157
118385	P60	CB2	2	FULL	0.144	0.156	0.138
118392	P60	MT1	2	FULL	0.209	0.182	0.169
118387	P60	CB1	2	FULL	0.238	0.208	0.182
118411	P60	IR1	2	FULL	0.199	0.174	0.151
118416	P0	GRN	2	FULL	0.280	0.252	0.223
118406	P0	UV3	2	FULL	0.227	0.182	0.184
118397	P0	BL2	2	FULL	0.192	0.216	0.233
118399	P0	MT2	2	FULL	0.143	0.185	0.168
118401	P0	CB2	2	FULL	0.161	0.196	0.135
118390	P0	MT1	2	FULL	0.197	0.239	0.183
118388	P0	CB1	2	FULL	0.179	0.211	0.227
118412	P0	IR1	2	FULL	0.170	0.199	0.165

Temperature=-10°C

IMAGE	FILTER 1	FILTER 2	GAIN	MODE	DESCENDING VERTICAL EDGE	ASCENDING VERTICAL EDGE	ASCENDING HORIZONTAL EDGE
918896	CL1	CL2	3	FULL-1000	0.165	0.211	0.177
918897	CL1	CL2	3	FULL-1700	0.162	0.209	0.152
918900	CL1	CL2	2	FULL-1200	0.149	0.216	0.141
918902	CL1	CL2	2	FULL-2000	0.160	0.213	0.142
119274	CL1	CL2	2	FULL-2400	0.196	0.172	0.139
918926	CL1	CL2	2	FULL-3200	0.175	0.179	0.193
918906	CL1	CL2	1	SUM2-900	0.326	0.278	0.367
918910	CL1	CL2	1	SUM2-3300	0.325	0.276	0.293
918912	CL1	CL2	0	SUM4-1000	0.348	0.455	0.611
918915	CL1	CL2	0	SUM4-3400	0.362	0.486	0.440
918933	CL1	GRN	2	FULL	0.270	0.222	0.249
918935	CL1	UV3	2	FULL	0.176	0.239	0.212
918939	CL1	BL2	2	FULL	0.200	0.225	0.221
918940	CL1	MT2	2	FULL	0.200	0.155	0.150
918947	CL1	CB2	2	FULL	0.144	0.182	0.156
918949	CL1	MT3	2	FULL	0.163	0.112	0.105
918952	CL1	CB3	2	FULL	0.098	0.155	0.089
918954	CL1	MT1	2	FULL	0.200	0.208	0.212
918955	CL1	CB1	2	FULL	0.226	0.229	0.186
918966	CL1	IR3	2	FULL	0.151	0.129	0.101
918967	CL1	IR1	2	FULL	0.199	0.158	0.177
119277	RED	CL2	2	FULL	0.167	0.212	0.165
119279	BL1	CL2	2	FULL	0.229	0.207	0.185
119290	IRP0	CL2	2	FULL	0.193	0.164	0.182
119291	P120	CL2	2	FULL	0.186	0.154	0.144
119292	P60	CL2	2	FULL	0.169	0.179	0.181
119293	P0	CL2	2	FULL	0.192	0.157	0.195
119269	HAL	CL2	2	FULL	0.182	0.218	0.178
119270	IR4	CL2	2	FULL	0.138	0.099	0.091
119272	IR2	CL2	2	FULL	0.157	0.123	0.113
119294	RED	GRN	2	FULL	0.179	0.255	0.198
119296	RED	MT1	2	FULL	0.193	0.246	0.216
119298	RED	CB1	2	FULL	0.188	0.240	0.170
119299	RED	IR1	2	FULL	0.195	0.161	0.163
119300	IR2	IR1	2	FULL	0.158	0.162	0.123
119306	IR2	CB3	2	FULL	0.103	0.140	0.090

IMAGE	FILTER 1	FILTER 2	GAIN	MODE	DESCENDING VERTICAL EDGE	ASCENDING VERTICAL EDGE	ASCENDING HORIZONTAL EDGE
119308	IR2	IR3	2	FULL	0.160	0.123	0.130
119309	IR4	IR3	2	FULL	0.141	0.096	0.115
119312	IRP0	MT2	2	FULL	0.202	0.164	0.138
119314	IRP0	CB2	2	FULL	0.131	0.186	0.173
119316	IRP0	MT3	2	FULL	0.148	0.116	0.114
119319	IRP0	CB3	2	FULL	0.105	0.129	0.104
119320	IRP0	IR3	2	FULL	0.136	0.114	0.107
119311	IRP0	IR1	2	FULL	0.146	0.193	0.147
119321	P120	GRN	2	FULL	0.245	0.240	0.241
119322	P120	UV3	2	FULL	0.185	0.238	0.214
119324	P120	BL2	2	FULL	0.228	0.196	0.215
119325	P120	MT2	2	FULL	0.198	0.168	0.153
119327	P120	CB2	2	FULL	0.179	0.163	0.172
119328	P120	MT1	2	FULL	0.224	0.217	0.172
119329	P120	CB1	2	FULL	0.188	0.230	0.216
119332	P120	IR1	2	FULL	0.139	0.195	0.142
119333	P60	GRN	2	FULL	0.207	0.267	0.227
119334	P60	UV3	2	FULL	0.180	0.243	0.182
119335	P60	BL2	2	FULL	0.189	0.239	0.206
119337	P60	MT2	2	FULL	0.194	0.173	0.136
119339	P60	CB2	2	FULL	0.138	0.188	0.148
119340	P60	MT1	2	FULL	0.222	0.215	0.208
119343	P60	CB1	2	FULL	0.221	0.236	0.195
119346	P60	IR1	2	FULL	0.142	0.191	0.152
119347	P0	GRN	2	FULL	0.210	0.243	0.263
119348	P0	UV3	2	FULL	0.222	0.223	0.214
119349	P0	BL2	2	FULL	0.209	0.179	0.185
119350	P0	MT2	2	FULL	0.175	0.164	0.133
119352	P0	CB2	2	FULL	0.160	0.171	0.164
119353	P0	MT1	2	FULL	0.231	0.188	0.228
119355	P0	CB1	2	FULL	0.212	0.215	0.208
119359	P0	IR1	2	FULL	0.160	0.181	0.132

5.2.1.1.4 CONCLUSIONS

1. Low vs. high exposure didn't cause MTF changes for the CL1/CL2 cases where multiple exposures were available.
2. The horizontal and vertical amplitudes agreed very well, as did the vertical ascending and descending amplitudes
3. If the MTF contributions due to the collimator and window were removed, the tabulated values would undoubtedly all be above the required 0.15 level.
4. The following table shows the filters sorted by the mean amplitude at 0.38 cps (including both horizontal and vertical at +5° C). Notice that the filters IR4, MT3, CB3 and IR3 consistently show up with low mean values.

Filter 1	Filter2	+5C mean
IR4	CL2	0.10
CL1	MT3	0.11
IR2	CB3	0.11
CL1	CB3	0.11
IRP0	CB3	0.12
IR2	IR3	0.12
CL1	IR3	0.12
IRP0	IR3	0.12
IR4	IR3	0.13
IRP0	MT3	0.13
P120	IR1	0.14
P120	CL2	0.14
P60	CB2	0.15
IR2	CL2	0.15
CL1	CB2	0.15
CL1	MT2	0.15
P120	MT2	0.16
CL1	IR1	0.16
P60	MT2	0.16
IRP0	MT2	0.16
IR2	IR1	0.16
IRP0	IR1	0.16
P0	CB2	0.17
P60	IR1	0.17
HAL	CL2	0.17
P0	MT2	0.17
CL1	CL2	0.18
P120	CB2	0.18
RED	CL2	0.18
P60	MT1	0.18
P0	IR1	0.18
RED	IR1	0.18
IRP0	CB2	0.18
IRP0	CL2	0.18
P0	CL2	0.18

Filter 1	Filter2	+5C mean
P0	UV3	0.19
P60	CL2	0.19
CL1	MT1	0.19
P120	CB1	0.20
RED	CB1	0.20
P60	CB1	0.20
UV2	CL2	0.21
P60	UV3	0.21
RED	GRN	0.21
P120	BL2	0.21
P60	BL2	0.21
CL1	CB1	0.21
P0	MT1	0.21
P120	MT1	0.21
RED	MT1	0.21
CL1	UV3	0.21
P0	CB1	0.21
CL1	BL2	0.22
P60	GRN	0.22
P120	UV3	0.22
P0	BL2	0.22
CL1	GRN	0.22
P120	GRN	0.23
BL1	CL2	0.23
P0	GRN	0.24

5.2.1.1.5 List of frames used in MTF analysis

image	date	time	observation	filt1	filt2	gain	mode
TEMP. = 25°C							
117610	125	9:11:1.0	MTF_FOCUS_301	CL1	CL2	3 (40K)	FULL
117614	125	9:20:48.0	MTF_FOCUS_301	CL1	CL2	3 (40K)	FULL
117616	125	9:24:55.0	MTF_FOCUS_302	CL1	CL2	2 (100K)	FULL
117619	125	9:32:47.0	MTF_FOCUS_302	CL1	CL2	2 (100K)	FULL
117622	125	9:39:57.0	MTF_FOCUS_303	CL1	CL2	1 (400K)	SUM2
117624	125	9:43:15.0	MTF_FOCUS_303	CL1	CL2	1 (400K)	SUM2
117630	125	9:56:23.0	MTF_FOCUS_304	CL1	CL2	0 (1400K)	SUM4
117635	125	10:3:15.0	MTF_FOCUS_304	CL1	CL2	0 (1400K)	SUM4
117637	125	10:7:5.0	MTF_FOCUS_305	CL1	CL2	2 (100K)	FULL
117639	125	10:12:0.0	MTF_FOCUS_305	CL1	GRN	2 (100K)	FULL
117641	125	10:16:54.0	MTF_FOCUS_305	CL1	CB1	2 (100K)	FULL
117643	125	10:21:12.0	MTF_FOCUS_305	CL1	IR3	2 (100K)	FULL
117640	125	10:14:43.0	MTF_FOCUS_305	CL1	BL2	2 (100K)	FULL
117647	126	8:46:54.0	MTF_FOCUS_305	CL1	IR1	2 (100K)	FULL
117651	126	8:56:49.0	MTF_FOCUS_305	CL1	UV3	2 (100K)	FULL
117659	126	9:14:45.0	MTF_FOCUS_305	CL1	CB2	2 (100K)	FULL
117660	126	9:17:12.0	MTF_FOCUS_305	CL1	MT3	2 (100K)	FULL
117663	126	9:23:25.0	MTF_FOCUS_305	CL1	CB3	2 (100K)	FULL
117668	126	9:35:46.0	MTF_FOCUS_305	CL1	MT1	2 (100K)	FULL
117675	126	9:56:19.0	MTF_FOCUS_305	CL1	CL2	2 (100K)	FULL
117684	126	10:15:58.0	MTF_FOCUS_305	RED	CL2	2 (100K)	FULL
117688	126	10:24:24.0	MTF_FOCUS_305	BL1	CL2	2 (100K)	FULL
117692	126	10:33:13.0	MTF_FOCUS_305	IRP0	CL2	2 (100K)	FULL
117695	126	10:38:46.0	MTF_FOCUS_305	P120	CL2	2 (100K)	FULL
117698	126	10:44:37.0	MTF_FOCUS_305	P60	CL2	2 (100K)	FULL
117700	126	10:48:22.0	MTF_FOCUS_305	P0	CL2	2 (100K)	FULL
117705	126	10:59:0.0	MTF_FOCUS_305	HAL	CL2	2 (100K)	FULL
117711	126	11:11:27.0	MTF_FOCUS_305	IR4	CL2	2 (100K)	FULL
117714	126	11:19:16.0	MTF_FOCUS_305	IR2	CL2	2 (100K)	FULL
117715	126	11:21:27.0	MTF_FOCUS_306	UV2	CL2	3 (40K)	FULL
117716	126	11:23:13.0	MTF_FOCUS_306	UV2	CL2	3 (40K)	FULL
117724	126	11:42:29.0	MTF_FOCUS_307	RED	GRN	2 (100K)	FULL
117728	126	11:50:17.0	MTF_FOCUS_307	RED	MT1	2 (100K)	FULL
117731	126	11:57:0.0	MTF_FOCUS_307	RED	CB1	2 (100K)	FULL
117733	126	12:26:8.0	MTF_FOCUS_307	RED	IR1	2 (100K)	FULL
117741	126	12:43:25.0	MTF_FOCUS_307	IR2	CB3	2 (100K)	FULL
117747	126	12:56:58.0	MTF_FOCUS_307	IR2	IR3	2 (100K)	FULL
117755	126	13:13:53.0	MTF_FOCUS_307	IRP0	IR3	2 (100K)	FULL
117750	126	13:3:8.0	MTF_FOCUS_307	IR4	IR3	2 (100K)	FULL
117762	126	13:30:25.0	MTF_FOCUS_307	IRP0	IR1	2 (100K)	FULL
117765	126	13:37:13.0	MTF_FOCUS_307	IRP0	MT2	2 (100K)	FULL
117771	126	14:3:46.0	MTF_FOCUS_307	IRP0	CB2	2 (100K)	FULL
117773	126	14:7:48.0	MTF_FOCUS_307	IRP0	MT3	2 (100K)	FULL
117777	126	14:15:27.0	MTF_FOCUS_307	IRP0	CB3	2 (100K)	FULL
117781	126	14:25:16.0	MTF_FOCUS_307	P120	GRN	2 (100K)	FULL
117782	126	14:27:10.0	MTF_FOCUS_307	P60	GRN	2 (100K)	FULL
117783	126	14:28:56.0	MTF_FOCUS_307	P0	GRN	2 (100K)	FULL
117786	126	14:34:9.0	MTF_FOCUS_307	P0	UV3	2 (100K)	FULL
117787	126	14:35:59.0	MTF_FOCUS_307	P60	UV3	2 (100K)	FULL
117788	126	14:37:51.0	MTF_FOCUS_307	P120	UV3	2 (100K)	FULL
117791	126	14:44:0.0	MTF_FOCUS_307	P120	BL2	2 (100K)	FULL
117792	126	14:45:48.0	MTF_FOCUS_307	P60	BL2	2 (100K)	FULL
117793	126	14:47:33.0	MTF_FOCUS_307	P0	BL2	2 (100K)	FULL
117797	126	14:55:4.0	MTF_FOCUS_307	P0	MT2	2 (100K)	FULL
117798	126	14:57:9.0	MTF_FOCUS_307	P60	MT2	2 (100K)	FULL
117803	126	15:6:53.0	MTF_FOCUS_307	P120	CB2	2 (100K)	FULL
117804	126	15:8:35.0	MTF_FOCUS_307	P60	CB2	2 (100K)	FULL
117805	126	15:10:19.0	MTF_FOCUS_307	P0	CB2	2 (100K)	FULL
117809	126	15:18:21.0	MTF_FOCUS_307	P0	MT1	2 (100K)	FULL
117810	126	15:20:30.0	MTF_FOCUS_307	P60	MT1	2 (100K)	FULL
117811	126	15:22:21.0	MTF_FOCUS_307	P120	MT1	2 (100K)	FULL
117818	126	15:38:51.0	MTF_FOCUS_307	P120	CB1	2 (100K)	FULL
117819	126	15:40:38.0	MTF_FOCUS_307	P60	CB1	2 (100K)	FULL
117820	126	15:42:9.0	MTF_FOCUS_307	P0	CB1	2 (100K)	FULL
117828	126	15:57:32.0	MTF_FOCUS_307	P0	IR1	2 (100K)	FULL
117829	126	15:59:41.0	MTF_FOCUS_307	P60	IR1	2 (100K)	FULL
117832	126	16:16:8.0	MTF_FOCUS_307	P120	IR1	2 (100K)	FULL
117836	127	9:58:6.0	MTF_FOCUS_307	IR2	IR1	2 (100K)	FULL
TEMP. = 5°C							
118148	130	14:48:19.0	MTF_FOCUS_345	CL1	CL2	3 (40K)	FULL
118154	130	15:10:54.0	MTF_FOCUS_345	CL1	CL2	3 (40K)	FULL
118155	130	15:19:54.0	MTF_FOCUS_346	CL1	CL2	2 (100K)	FULL
118158	130	15:29:57.0	MTF_FOCUS_346	CL1	CL2	2 (100K)	FULL
118159	130	16:8:20.0	MTF_FOCUS_347	CL1	CL2	1 (400K)	SUM2
118160	130	16:16:7.0	MTF_FOCUS_347	CL1	CL2	1 (400K)	SUM2
118161	130	16:25:30.0	MTF_FOCUS_348	CL1	CL2	0 (1400K)	SUM4
118168	130	16:45:33.0	MTF_FOCUS_348	CL1	CL2	0 (1400K)	SUM4
118172	130	17:0:30.0	MTF_FOCUS_349	CL1	CL2	2 (100K)	FULL
118185	130	17:50:10.0	MTF_FOCUS_349	CL1	GRN	2 (100K)	FULL
118187	130	17:57:32.0	MTF_FOCUS_349	CL1	UV3	2 (100K)	FULL
118197	130	18:32:27.0	MTF_FOCUS_349	CL1	BL2	2 (100K)	FULL
118199	130	18:39:2.0	MTF_FOCUS_349	CL1	MT2	2 (100K)	FULL
118201	130	18:45:7.0	MTF_FOCUS_349	CL1	CB2	2 (100K)	FULL
118202	130	18:49:8.0	MTF_FOCUS_349	CL1	MT3	2 (100K)	FULL
118205	130	18:58:1.0	MTF_FOCUS_349	CL1	CB3	2 (100K)	FULL
118207	130	19:3:55.0	MTF_FOCUS_349	CL1	MT1	2 (100K)	FULL
118208	130	19:8:39.0	MTF_FOCUS_349	CL1	CB1	2 (100K)	FULL
118209	130	19:13:23.0	MTF_FOCUS_349	CL1	IR3	2 (100K)	FULL
118213	130	19:29:42.0	MTF_FOCUS_349	CL1	IR1	2 (100K)	FULL
118217	130	19:50:51.0	MTF_FOCUS_349	CL1	CL2	2 (100K)	FULL
118221	130	20:29:46.0	MTF_FOCUS_349	RED	CL2	2 (100K)	FULL
118225	130	20:49:9.0	MTF_FOCUS_349	BL1	CL2	2 (100K)	FULL
118228	130	21:38:28.0	MTF_FOCUS_350	UV2	CL2	3 (40K)	FULL

118231	130	21:50:24.0	MTF_FOCUS_350	UV1	CL2	3 (40K)	FULL
118235	130	22:5:0.0	MTF_FOCUS_349	IRP0	CL2	2 (100K)	FULL
118236	130	22:9:38.0	MTF_FOCUS_349	P120	CL2	2 (100K)	FULL
118241	130	22:30:35.0	MTF_FOCUS_349	P60	CL2	2 (100K)	FULL
118242	130	22:34:37.0	MTF_FOCUS_349	P0	CL2	2 (100K)	FULL
118249	130	23:13:38.0	MTF_FOCUS_349	HAL	CL2	2 (100K)	FULL
118254	131	0:9:33.0	MTF_FOCUS_349	IR4	CL2	2 (100K)	FULL
118257	131	0:27:55.0	MTF_FOCUS_349	IR2	CL2	2 (100K)	FULL
118272	131	1:50:3.0	MTF_FOCUS_349	RED	GRN	2 (100K)	FULL
118274	131	1:56:42.0	MTF_FOCUS_349	RED	MT1	2 (100K)	FULL
118287	131	2:45:46.0	MTF_FOCUS_349	RED	CB1	2 (100K)	FULL
118291	131	3:0:14.0	MTF_FOCUS_349	RED	IR1	2 (100K)	FULL
118302	131	3:47:19.0	MTF_FOCUS_349	IR2	IR1	2 (100K)	FULL
118306	131	4:4:16.0	MTF_FOCUS_349	IR2	IR3	2 (100K)	FULL
118313	131	4:27:32.0	MTF_FOCUS_349	IR4	IR3	2 (100K)	FULL
118319	131	4:50:50.0	MTF_FOCUS_349	IRP0	MT2	2 (100K)	FULL
118325	131	5:8:36.0	MTF_FOCUS_349	IRP0	CB2	2 (100K)	FULL
118326	131	5:12:1.0	MTF_FOCUS_349	IRP0	MT3	2 (100K)	FULL
118337	131	5:47:59.0	MTF_FOCUS_349	IRP0	IR3	2 (100K)	FULL
118341	131	6:5:49.0	MTF_FOCUS_349	IRP0	IR1	2 (100K)	FULL
118346	131	6:27:48.0	MTF_FOCUS_349	P120	GRN	2 (100K)	FULL
118347	131	6:56:26.0	MTF_FOCUS_349	P120	UV3	2 (100K)	FULL
118348	131	7:0:21.0	MTF_FOCUS_349	P120	BL2	2 (100K)	FULL
118350	131	7:9:28.0	MTF_FOCUS_349	P120	MT2	2 (100K)	FULL
118354	131	7:19:28.0	MTF_FOCUS_349	P120	CB2	2 (100K)	FULL
118356	131	7:25:18.0	MTF_FOCUS_349	P120	MT1	2 (100K)	FULL
118362	131	7:46:47.0	MTF_FOCUS_349	P120	CB1	2 (100K)	FULL
118370	131	8:10:55.0	MTF_FOCUS_349	P120	IR1	2 (100K)	FULL
118375	131	8:47:13.0	MTF_FOCUS_349	P60	GRN	2 (100K)	FULL
118380	131	9:17:6.0	MTF_FOCUS_349	P60	UV3	2 (100K)	FULL
118381	131	9:41:41.0	MTF_FOCUS_349	P60	BL2	2 (100K)	FULL
118382	131	9:45:43.0	MTF_FOCUS_349	P60	MT2	2 (100K)	FULL
118385	131	9:54:12.0	MTF_FOCUS_349	P60	CB2	2 (100K)	FULL
118387	131	10:2:42.0	MTF_FOCUS_349	P60	CB1	2 (100K)	FULL
118388	131	10:7:40.0	MTF_FOCUS_349	P0	CB1	2 (100K)	FULL
118390	131	10:15:14.0	MTF_FOCUS_349	P0	MT1	2 (100K)	FULL
118392	131	10:34:21.0	MTF_FOCUS_349	P60	MT1	2 (100K)	FULL
118397	131	10:50:9.0	MTF_FOCUS_349	P0	BL2	2 (100K)	FULL
118399	131	10:59:37.0	MTF_FOCUS_349	P0	MT2	2 (100K)	FULL
118401	131	11:13:48.0	MTF_FOCUS_349	P0	CB2	2 (100K)	FULL
118406	131	11:33:31.0	MTF_FOCUS_349	P0	BL2	2 (100K)	FULL
118411	131	11:46:27.0	MTF_FOCUS_349	P60	IR1	2 (100K)	FULL
118412	131	11:50:24.0	MTF_FOCUS_349	P0	IR1	2 (100K)	FULL
118416	131	12:3:43.0	MTF_FOCUS_349	P0	GRN	2 (100K)	FULL
118421	131	12:24:6.0	MTF_FOCUS_349	IR2	CB3	2 (100K)	FULL

TEMP. = -10°C

119270	136	17:54:22.0	MTF_FOCUS_356	IR4	CL2	2 (100K)	FULL
119272	136	18:3:4.0	MTF_FOCUS_356	IR2	CL2	2 (100K)	FULL
119274	136	18:10:20.0	MTF_FOCUS_356	CL1	CL2	2 (100K)	FULL
119277	136	18:21:23.0	MTF_FOCUS_356	RED	CL2	2 (100K)	FULL
119279	136	18:26:37.0	MTF_FOCUS_356	BL1	CL2	2 (100K)	FULL
119290	136	19:16:43.0	MTF_FOCUS_356	IRP0	CL2	2 (100K)	FULL
119291	136	19:20:9.0	MTF_FOCUS_356	P120	CL2	2 (100K)	FULL
119292	136	19:23:46.0	MTF_FOCUS_356	P60	CL2	2 (100K)	FULL
119293	136	19:27:1.0	MTF_FOCUS_356	P0	CL2	2 (100K)	FULL
119294	136	19:31:35.0	MTF_FOCUS_356	RED	GRN	2 (100K)	FULL
119296	136	19:38:28.0	MTF_FOCUS_356	RED	MT1	2 (100K)	FULL
119298	136	19:44:50.0	MTF_FOCUS_356	RED	CB1	2 (100K)	FULL
119299	136	19:49:0.0	MTF_FOCUS_356	RED	IR1	2 (100K)	FULL
119300	136	19:53:3.0	MTF_FOCUS_356	IR2	IR1	2 (100K)	FULL
119306	136	20:36:11.0	MTF_FOCUS_356	IR2	CB3	2 (100K)	FULL
119308	136	20:41:50.0	MTF_FOCUS_356	IR2	IR3	2 (100K)	FULL
119309	136	20:45:30.0	MTF_FOCUS_356	IR4	IR3	2 (100K)	FULL
119311	136	20:51:40.0	MTF_FOCUS_356	IRP0	IR1	2 (100K)	FULL
119314	136	21:5:31.0	MTF_FOCUS_356	IRP0	CB2	2 (100K)	FULL
119316	136	21:13:4.0	MTF_FOCUS_356	IRP0	MT3	2 (100K)	FULL
119319	136	21:20:52.0	MTF_FOCUS_356	IRP0	CB3	2 (100K)	FULL
119320	136	21:25:21.0	MTF_FOCUS_356	IRP0	IR3	2 (100K)	FULL
119321	136	22:1:57.0	MTF_FOCUS_356	P120	GRN	2 (100K)	FULL
119322	136	22:6:21.0	MTF_FOCUS_356	P120	UV3	2 (100K)	FULL
119324	136	22:12:15.0	MTF_FOCUS_356	P120	BL2	2 (100K)	FULL
119325	136	22:16:52.0	MTF_FOCUS_356	P120	MT2	2 (100K)	FULL
119327	136	22:22:43.0	MTF_FOCUS_356	P120	CB2	2 (100K)	FULL
119328	136	22:26:29.0	MTF_FOCUS_356	P120	MT1	2 (100K)	FULL
119329	136	22:30:1.0	MTF_FOCUS_356	P120	CB1	2 (100K)	FULL
119332	136	22:39:30.0	MTF_FOCUS_356	P120	IR1	2 (100K)	FULL
119333	136	22:43:43.0	MTF_FOCUS_356	P60	GRN	2 (100K)	FULL
119334	136	22:55:20.0	MTF_FOCUS_356	P60	UV3	2 (100K)	FULL
119335	136	22:58:58.0	MTF_FOCUS_356	P60	BL2	2 (100K)	FULL
119337	136	23:4:23.0	MTF_FOCUS_356	P60	MT2	2 (100K)	FULL
119339	136	23:9:48.0	MTF_FOCUS_356	P60	CB2	2 (100K)	FULL
119340	136	23:13:19.0	MTF_FOCUS_356	P60	MT1	2 (100K)	FULL
119343	137	0:27:30.0	MTF_FOCUS_356	P60	CB1	2 (100K)	FULL
119346	137	1:19:29.0	MTF_FOCUS_356	P60	IR1	2 (100K)	FULL
119347	137	1:23:30.0	MTF_FOCUS_356	P0	GRN	2 (100K)	FULL
119348	137	1:27:12.0	MTF_FOCUS_356	P0	UV3	2 (100K)	FULL
119349	137	1:30:29.0	MTF_FOCUS_356	P0	BL2	2 (100K)	FULL
119350	137	1:33:26.0	MTF_FOCUS_356	P0	MT2	2 (100K)	FULL
119352	137	1:42:11.0	MTF_FOCUS_356	P0	CB2	2 (100K)	FULL
119353	137	1:45:7.0	MTF_FOCUS_356	P0	MT1	2 (100K)	FULL
119354	137	1:47:36.0	MTF_FOCUS_356	P0	CB1	2 (100K)	FULL
119355	137	1:49:35.0	MTF_FOCUS_356	P0	CB1	2 (100K)	FULL
119359	137	1:59:50.0	MTF_FOCUS_356	P0	IR1	2 (100K)	FULL
918896	135	21:57:6.0	MTF_FOCUS_351	CL1	CL2	3 (40K)	FULL
918897	135	22:3:21.0	MTF_FOCUS_351	CL1	CL2	3 (40K)	FULL
918900	135	22:16:25.0	MTF_FOCUS_352	CL1	CL2	2 (100K)	FULL
918902	135	22:22:51.0	MTF_FOCUS_352	CL1	CL2	2 (100K)	FULL
918906	135	22:47:28.0	MTF_FOCUS_353	CL1	CL2	1 (400K)	SUM2
918910	135	22:56:29.0	MTF_FOCUS_353	CL1	CL2	1 (400K)	SUM2
918912	135	23:2:10.0	MTF_FOCUS_354	CL1	CL2	0 (1400K)	SUM4
918915	135	23:20:19.0	MTF_FOCUS_354	CL1	CL2	0 (1400K)	SUM4
918926	136	0:41:57.0	MTF_FOCUS_356	CL1	CL2	2 (100K)	FULL
918933	136	1:7:44.0	MTF_FOCUS_356	CL1	GRN	2 (100K)	FULL
918935	136	1:15:38.0	MTF_FOCUS_356	CL1	UV3	2 (100K)	FULL
918939	136	1:40:7.0	MTF_FOCUS_356	CL1	BL2	2 (100K)	FULL
918940	136	1:43:47.0	MTF_FOCUS_356	CL1	MT2	2 (100K)	FULL

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918947   136  2:20:56.0     MTF_FOCUS_356   CL1    CB2    2 (100K)   FULL
918949   136  2:29:11.0     MTF_FOCUS_356   CL1    MT3    2 (100K)   FULL
918952   136  2:41:58.0     MTF_FOCUS_356   CL1    CB3    2 (100K)   FULL
918954   136  2:48:49.0     MTF_FOCUS_356   CL1    MT1    2 (100K)   FULL
918955   136  2:53:6.0      MTF_FOCUS_356   CL1    CB1    2 (100K)   FULL
918966   136  4:0:37.0      MTF_FOCUS_356   CL1    IR3    2 (100K)   FULL
918967   136  4:7:12.0      MTF_FOCUS_356   CL1    IR1    2 (100K)   FULL
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