5.1.8 ORIENTATION OF POLARIZING FILTERS

5.1.8.1 NAC FM POLARIZATION RESULTS

As reported in Reference 5.1.8.1-1

Reference 5.1.8.1-1- IOM 388-PAG-CCA96-14,"NAC Fm Calibration Results: Polarization - Rev. 1", C. Avis, October 29, 1996, Change: Correction of wording on page 2

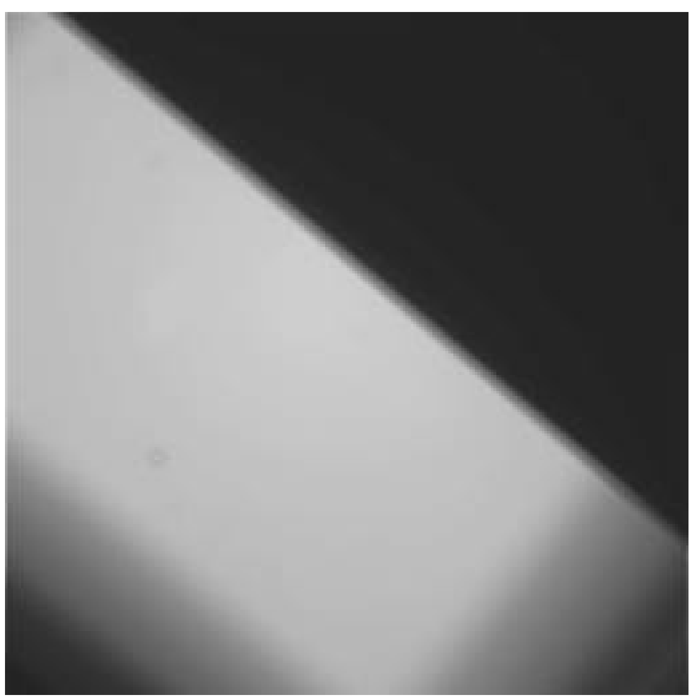
5.1.8.1.1 INTRODUCTION

The Narrow-angle Flight Model thermal/vacuum testing included the acquisition of a set of images for determination of the polarization axis of the polarizing filters.

The image data was taken at a chamber temperature of 5° C. The reported optics temperature was 8° C and the detector was at -89° C. The test utilized a polarizing target whose polarization axis was perpendicular to an associated knife edge to ±0.25°. The target-knife edge combination was manually rotated between exposures. At each measurement angle, images were taken in full-resolution mode at Gain state 2 (‘100K’) in the six filter combinations listed below:

CL1/CL2	P60/CL2	P0/CL2
P120/CL2	IRP0/CL2	CL1/MT2

Typical Narrow-angle image:



METHOD

As the polarized target rotated, the signal recorded by the camera varied because the polarized filter in the camera filter wheels remained fixed. The maximum response of the camera occurred when the two polarization axes aligned. Assuming the edge was precisely aligned perpendicular to the target polarization axis, the angle of the edge at maximum response determined the polarization axis of the camera's filter.

Therefore, the analysis job had three steps:

1. measure the angle of the edge within the image data,
2. measure the signal relative to that of an unpolarized camera filter,
3. fit these two measurements to a function in order to derive the exact maximum response angle.

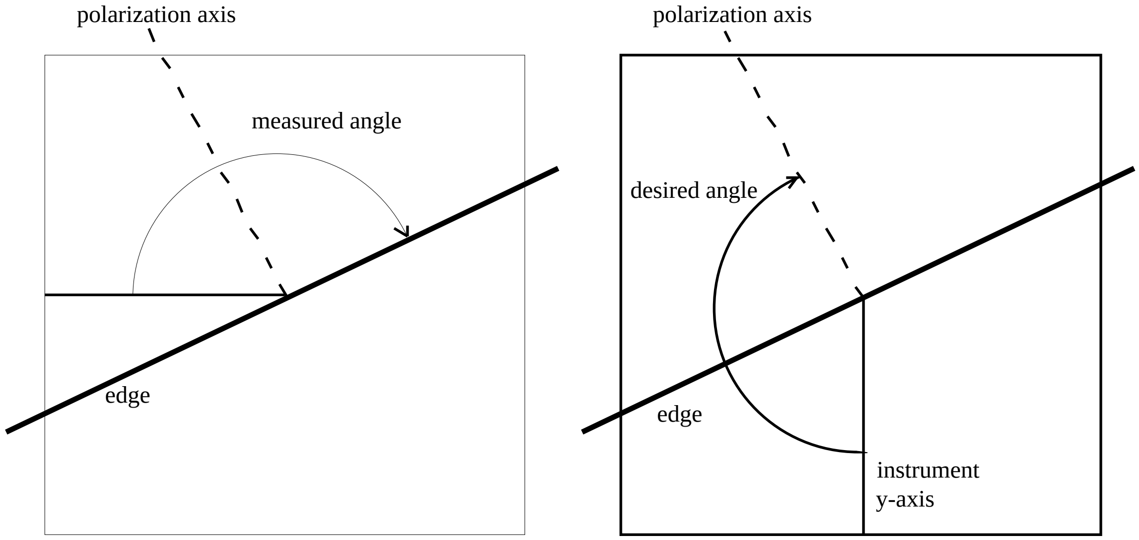
Measuring the angle

Because the various filter combinations were all taken at the same angle, the angle of the edge was measured in the unpolarized filter images. New software was written which first scanned the image for an edge. An edge-crossing point was defined as the point where the pixel values transitioned from below the image mean value to above. In addition, the values had to stay above the mean for a certain number of pixels. Because of the shading at the image edges, the edge search avoided them.

After finding the edge-defining pixels, the software then iteratively solved a least-squares equation for the best fit edge angle θ. At each iteration, the points with the worst residuals were removed. The resulting edge angles are in the following coordinate system:

- origin is at the image center
- zero is in the decreasing sample direction
- value increases clockwise

The left drawing below shows the angle being measured by finding the edge. The right one shows the desired angle (polarization axis relative to the instrument y-axis). This shows that finding the edge in the above coordinate system gives the appropriate value.



Measuring the signal

For each test image, the mean signal was measured. Each polarized filter's signal was compared to that of the unpolarized filter's signal at the same angle:

$$S_p = M_p / M_u$$

where S_p = the corrected mean signal for polarized filter p,
M_p = the mean signal for polarized filter p,
M_u = the mean signal for unpolarized filter.

The unpolarized filter combination used for the ratio was the CL1/CL2 for the non-IR polarizer filters and was the CL1/MT2 for the IR polarizer filters.

Deriving the angle of maximum response

For the set of polarized images, a collection of S_p and θ values were fit to the following function:

$$S_p = a + b \cdot cos^2(\theta - \theta_0)$$

where a = an offset factor,
b = a scale factor,
θ = the measured edge angle,
θ_0 = the angle of maximum response.

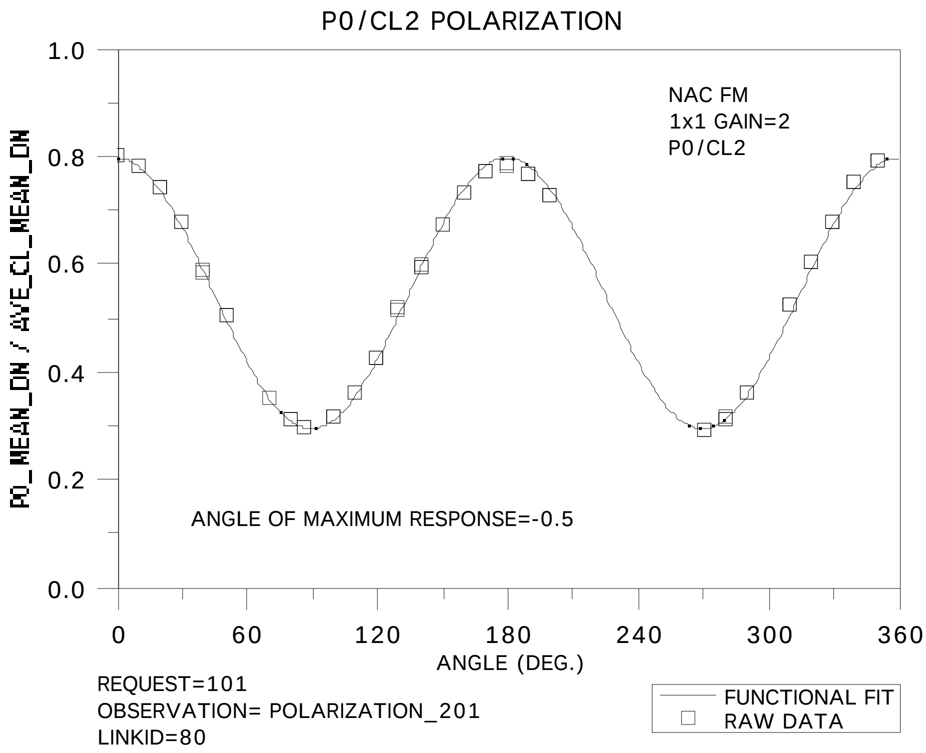
The best values of a, b, and θ_0 were derived from an iterative Metropolis algorithm.

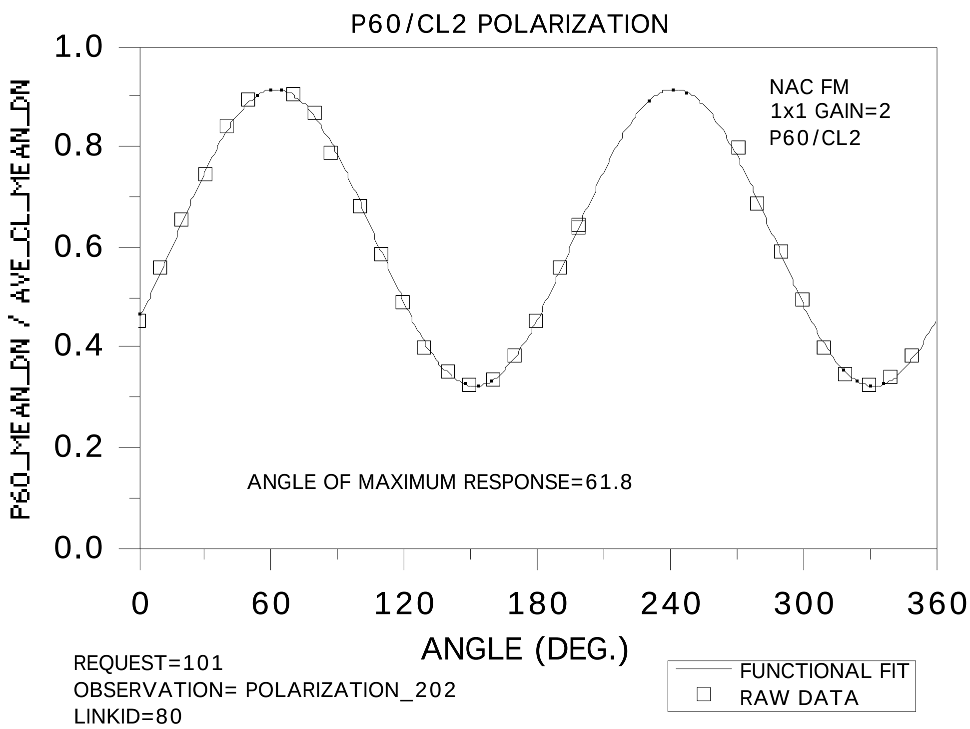
5.1.8.1.2 RESULTS

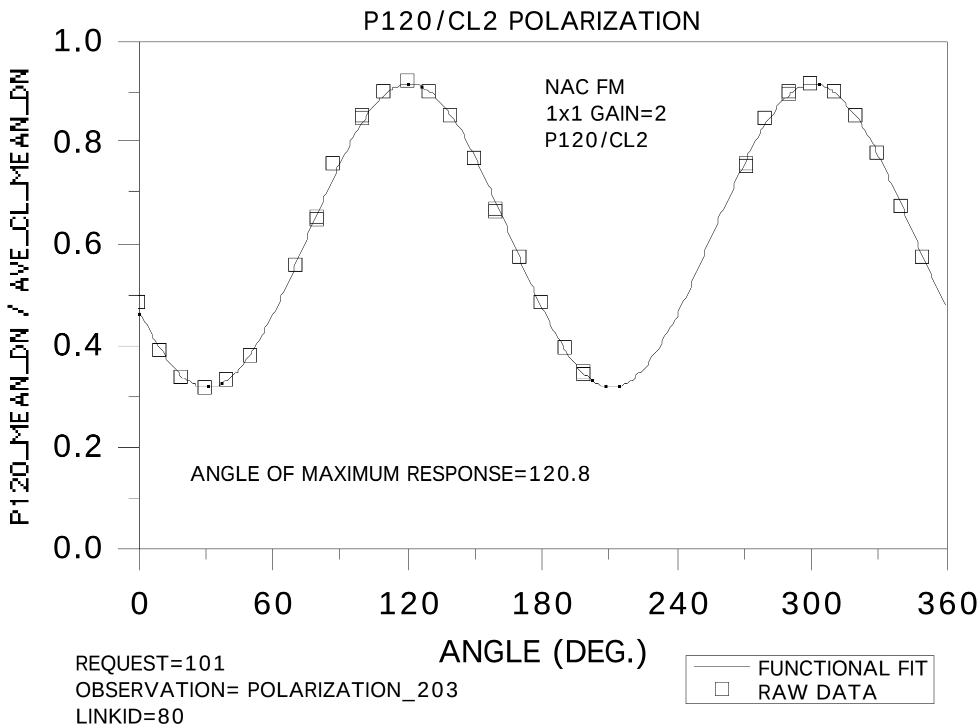
The following table lists the best fit angle of maximum response for each of the polarizing filter combinations. The requirement for filter alignment is to "ISS best effort".

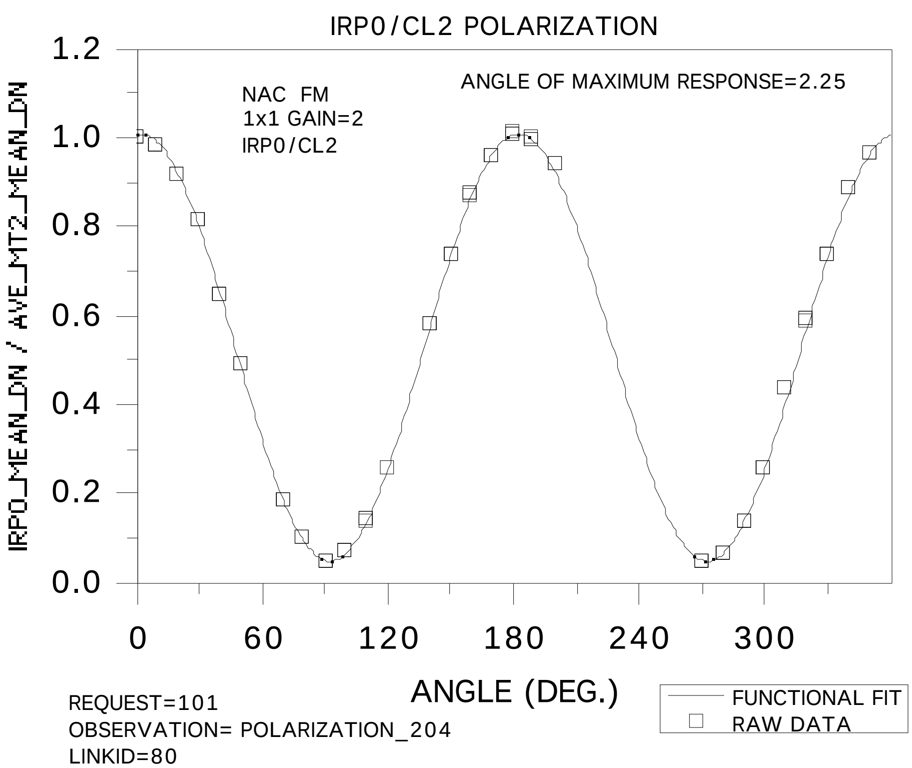
FILTER COMBINATION	ANGLE OF MAXIMUM RESPONSE	PERCENT ERROR
P0 / CL2	-0.5	0.566
P60 / CL2	61.8	0.580
P120 / CL2	120.8	0.434
IRP0 / CL2	2.25	1.34

The following plots show the measured data points and the best fit function for each of the polarizing filter combinations. Around 80 data points are in each plot, but at the scale used here, many points overlap.


P0/CL2 POLARIZATION
P0_MEAN_DN / AVE_CL_MEAN_DN
1.0
0.8
0.6
0.4
0.2
0.0
NAC FM
1x1 GAIN=2
P0/CL2
ANGLE OF MAXIMUM RESPONSE=-0.5
0
60
120
180
240
300
360
ANGLE (DEG.)
REQUEST=101
OBSERVATION= POLARIZATION_201
LINKID=80
FUNCTIONAL FIT
RAW DATA


P60/CL2 POLARIZATION
P60_MEAN_DN / AVE_CL_MEAN_DN
1.0
0.8
0.6
0.4
0.2
0.0
NAC FM
1x1 GAIN=2
P60/CL2
ANGLE OF MAXIMUM RESPONSE=61.8
0
60
120
180
240
300
360
ANGLE (DEG.)
REQUEST=101
OBSERVATION= POLARIZATION_202
LINKID=80
FUNCTIONAL FIT
RAW DATA


P120/CL2 POLARIZATION
1.0
0.8
0.6
0.4
0.2
0.0
P120_MEAN_DN / AVE_CL_MEAN_DN
NAC FM
1x1 GAIN=2
P120/CL2
ANGLE OF MAXIMUM RESPONSE=120.8
0
60
120
180
240
300
360
ANGLE (DEG.)
REQUEST=101
OBSERVATION= POLARIZATION_203
LINKID=80
FUNCTIONAL FIT
RAW DATA


IRP0/CL2 POLARIZATION
1.2
1.0
0.8
0.6
0.4
0.2
0.0
IRP0_MEAN_DN / AVE_MT2_MEAN_DN
NAC FM
1x1 GAIN=2
IRP0/CL2
ANGLE OF MAXIMUM RESPONSE=2.25
0
60
120
180
240
300
ANGLE (DEG.)
REQUEST=101
OBSERVATION= POLARIZATION_204
LINKID=80
FUNCTIONAL FIT
RAW DATA

5.1.8.1.3 IMAGES USED IN POLARIZATION ANALYSIS

sclk	day	eventtime	filter1	filter2	expos
122272	146	15:26:5.0	CL1	CL2	150
122273	146	15:27:35.0	CL1	CL2	150
122275	146	15:30:23.0	P0	CL2	150
122277	146	15:33:22.0	P0	CL2	150
122278	146	15:34:29.0	P60	CL2	180
122279	146	15:35:58.0	P60	CL2	180
122280	146	15:37:28.0	P60	CL2	180
122281	146	15:38:35.0	P120	CL2	180
122282	146	15:40:4.0	P120	CL2	180
122283	146	15:41:34.0	P120	CL2	180
122284	146	15:42:41.0	IRP0	CL2	150
122285	146	15:44:10.0	IRP0	CL2	150
122286	146	15:45:40.0	IRP0	CL2	150
122287	146	15:46:58.0	CL1	MT2	10000
122289	146	15:50:19.0	CL1	MT2	10000
122290	146	16:8:50.0	CL1	CL2	150
122291	146	16:10:19.0	CL1	CL2	150
122292	146	16:11:49.0	CL1	CL2	150
122293	146	16:12:56.0	P0	CL2	150
122294	146	16:14:25.0	P0	CL2	150
122295	146	16:15:55.0	P0	CL2	150
122296	146	16:17:2.0	P60	CL2	180
122297	146	16:18:31.0	P60	CL2	180
122298	146	16:20:1.0	P60	CL2	180
122299	146	16:21:8.0	P120	CL2	180
122300	146	16:22:37.0	P120	CL2	180
122301	146	16:24:7.0	P120	CL2	180
122302	146	16:25:14.0	IRP0	CL2	150
122303	146	16:26:43.0	IRP0	CL2	150
122304	146	16:28:13.0	IRP0	CL2	150
122305	146	16:29:31.0	CL1	MT2	10000
122306	146	16:31:11.0	CL1	MT2	10000
122307	146	16:32:52.0	CL1	MT2	10000
122308	146	16:49:58.0	CL1	CL2	150
122309	146	16:51:27.0	CL1	CL2	150
122310	146	16:52:57.0	CL1	CL2	150
122311	146	16:54:7.0	P0	CL2	150
122312	146	16:55:36.0	P0	CL2	150
122313	146	16:57:6.0	P0	CL2	150
122314	146	16:58:13.0	P60	CL2	180
122315	146	16:59:42.0	P60	CL2	180
122316	146	17:1:12.0	P60	CL2	180
122317	146	17:2:19.0	P120	CL2	180
122318	146	17:3:48.0	P120	CL2	180
122319	146	17:5:18.0	P120	CL2	180
122320	146	17:6:25.0	IRP0	CL2	150
122321	146	17:7:54.0	IRP0	CL2	150
122322	146	17:9:24.0	IRP0	CL2	150
122323	146	17:10:42.0	CL1	MT2	10000
122324	146	17:12:23.0	CL1	MT2	10000
122326	146	17:27:12.0	CL1	CL2	150
122327	146	17:28:41.0	CL1	CL2	150
122328	146	17:30:11.0	CL1	CL2	150
122332	146	17:35:24.0	P60	CL2	180
122333	146	17:36:54.0	P60	CL2	180
122334	146	17:38:23.0	P60	CL2	180
122335	146	17:39:30.0	P120	CL2	180
122336	146	17:41:0.0	P120	CL2	180
122337	146	17:42:29.0	P120	CL2	180
122338	146	17:43:36.0	IRP0	CL2	150
122339	146	17:45:5.0	IRP0	CL2	150
122340	146	17:46:35.0	IRP0	CL2	150
122341	146	17:47:53.0	CL1	MT2	10000
122342	146	17:49:34.0	CL1	MT2	10000
122343	146	17:51:14.0	CL1	MT2	10000
122344	146	17:56:26.0	CL1	CL2	150
122345	146	17:57:56.0	CL1	CL2	150
122347	146	18:0:43.0	P0	CL2	150
122348	146	18:2:13.0	P0	CL2	150
122349	146	18:3:42.0	P0	CL2	150
122350	146	18:4:49.0	P60	CL2	180
122351	146	18:6:19.0	P60	CL2	180
122352	146	18:7:48.0	P60	CL2	180
122353	146	18:8:55.0	P120	CL2	180
122354	146	18:10:25.0	P120	CL2	180
122355	146	18:11:54.0	P120	CL2	180
122356	146	18:13:1.0	IRP0	CL2	150
122357	146	18:14:31.0	IRP0	CL2	150
122359	146	18:17:30.0	CL1	MT2	10000
122360	146	18:19:11.0	CL1	MT2	10000
122361	146	18:20:51.0	CL1	MT2	10000
122362	146	18:35:29.0	CL1	CL2	150
122363	146	18:36:59.0	CL1	CL2	150
122364	146	18:38:28.0	CL1	CL2	150
122365	146	18:39:35.0	P0	CL2	150
122366	146	18:41:5.0	P0	CL2	150
122367	146	18:42:34.0	P0	CL2	150
122368	146	18:43:41.0	P60	CL2	180
122369	146	18:45:11.0	P60	CL2	180
122371	146	18:47:59.0	P120	CL2	180
122372	146	18:49:29.0	P120	CL2	180
122373	146	18:50:58.0	P120	CL2	180
122374	146	18:52:5.0	IRP0	CL2	150
122375	146	18:53:35.0	IRP0	CL2	150
122376	146	18:55:4.0	IRP0	CL2	150
122377	146	18:56:22.0	CL1	MT2	10000
122378	146	18:58:3.0	CL1	MT2	10000
122380	146	19:4:48.0	CL1	CL2	150
122381	146	19:6:18.0	CL1	CL2	150
122382	146	19:7:47.0	CL1	CL2	150
122383	146	19:9:3.0	P0	CL2	150
122384	146	19:10:33.0	P0	CL2	150
122385	146	19:12:2.0	P0	CL2	150
122386	146	19:13:9.0	P60	CL2	180
122387	146	19:14:39.0	P60	CL2	180
122388	146	19:16:8.0	P60	CL2	180
122389	146	19:17:15.0	P120	CL2	180
122390	146	19:18:45.0	P120	CL2	180
122391	146	19:20:14.0	P120	CL2	180
122392	146	19:21:21.0	IRP0	CL2	150
122393	146	19:22:51.0	IRP0	CL2	150
122394	146	19:24:20.0	IRP0	CL2	150
122395	146	19:25:38.0	CL1	MT2	10000
122396	146	19:27:19.0	CL1	MT2	10000
122397	146	19:28:59.0	CL1	MT2	10000
122398	146	19:40:32.0	CL1	CL2	150
122399	146	19:42:1.0	CL1	CL2	150
122400	146	19:43:30.0	CL1	CL2	150
122401	146	19:44:38.0	P0	CL2	150
122402	146	19:46:7.0	P0	CL2	150
122403	146	19:47:36.0	P0	CL2	150
122404	146	19:48:43.0	P60	CL2	180
122406	146	19:51:42.0	P60	CL2	180
122407	146	19:52:49.0	P120	CL2	180
122408	146	19:54:19.0	P120	CL2	180
122409	146	19:55:48.0	P120	CL2	180
122410	146	19:56:55.0	IRP0	CL2	150
122411	146	19:58:25.0	IRP0	CL2	150
122412	146	19:59:54.0	IRP0	CL2	150
122413	146	20:1:12.0	CL1	MT2	10000
122414	146	20:2:53.0	CL1	MT2	10000
122415	146	20:4:33.0	CL1	MT2	10000
122416	146	20:18:56.0	CL1	CL2	150
122417	146	20:20:25.0	CL1	CL2	150
122418	146	20:21:54.0	CL1	CL2	150
122419	146	20:23:1.0	P0	CL2	150
122420	146	20:24:31.0	P0	CL2	150
122421	146	20:26:0.0	P0	CL2	150
122422	146	20:27:8.0	P60	CL2	180
122423	146	20:28:37.0	P60	CL2	180
122424	146	20:30:6.0	P60	CL2	180
122425	146	20:31:14.0	P120	CL2	180
122426	146	20:32:43.0	P120	CL2	180
122427	146	20:34:12.0	P120	CL2	180
122428	146	20:35:20.0	IRP0	CL2	150
122430	146	20:38:18.0	IRP0	CL2	150
122431	146	20:39:37.0	CL1	MT2	10000
122432	146	20:41:17.0	CL1	MT2	10000
122433	146	20:42:57.0	CL1	MT2	10000
122434	146	20:47:44.0	CL1	CL2	150
122435	146	20:49:13.0	CL1	CL2	150
122436	146	20:50:42.0	CL1	CL2	150
122437	146	20:51:50.0	P0	CL2	150
122438	146	20:53:19.0	P0	CL2	150
122440	146	20:56:8.0	P60	CL2	180
122441	146	20:57:37.0	P60	CL2	180
122442	146	20:59:6.0	P60	CL2	180
122443	146	21:0:14.0	P120	CL2	180
122444	146	21:1:43.0	P120	CL2	180
122445	146	21:3:12.0	P120	CL2	180
122446	146	21:4:20.0	IRP0	CL2	150
122447	146	21:5:49.0	IRP0	CL2	150
122448	146	21:7:18.0	IRP0	CL2	150
122449	146	21:8:37.0	CL1	MT2	10000
122450	146	21:10:17.0	CL1	MT2	10000
122451	146	21:11:57.0	CL1	MT2	10000
122452	146	21:16:2.0	CL1	CL2	150
122453	146	21:17:31.0	CL1	CL2	150
122454	146	21:19:0.0	CL1	CL2	150
122456	146	21:21:37.0	P0	CL2	150
122457	146	21:23:6.0	P0	CL2	150
122458	146	21:24:14.0	P60	CL2	180
122459	146	21:25:43.0	P60	CL2	180
122460	146	21:27:12.0	P60	CL2	180
122461	146	21:28:20.0	P120	CL2	180
122462	146	21:29:49.0	P120	CL2	180
122463	146	21:31:18.0	P120	CL2	180
122464	146	21:32:26.0	IRP0	CL2	150
122465	146	21:33:55.0	IRP0	CL2	150
122466	146	21:35:24.0	IRP0	CL2	150
122467	146	21:36:43.0	CL1	MT2	10000
122468	146	21:38:23.0	CL1	MT2	10000
122469	146	21:40:3.0	CL1	MT2	10000
122470	146	21:52:36.0	CL1	CL2	150
122471	146	21:54:5.0	CL1	CL2	150
122472	146	21:55:34.0	CL1	CL2	150
122473	146	21:56:42.0	P0	CL2	150
122474	146	21:58:11.0	P0	CL2	150
122475	146	21:59:40.0	P0	CL2	150
122476	146	22:0:48.0	P60	CL2	180
122477	146	22:2:17.0	P60	CL2	180
122478	146	22:3:46.0	P60	CL2	180
122479	146	22:4:54.0	P120	CL2	180
122480	146	22:6:23.0	P120	CL2	180
122481	146	22:7:52.0	P120	CL2	180
122482	146	22:9:0.0	IRP0	CL2	150
122483	146	22:10:29.0	IRP0	CL2	150
122485	146	22:13:27.0	CL1	MT2	10000
122486	146	22:15:7.0	CL1	MT2	10000
122487	146	22:16:47.0	CL1	MT2	10000
122488	146	22:21:20.0	CL1	CL2	150
122489	146	22:22:49.0	CL1	CL2	150
122490	146	22:24:18.0	CL1	CL2	150
122491	146	22:25:26.0	P0	CL2	150
122492	146	22:26:55.0	P0	CL2	150
122494	146	22:29:42.0	P60	CL2	180
122495	146	22:31:11.0	P60	CL2	180
122497	146	22:33:59.0	P120	CL2	180
122498	146	22:35:28.0	P120	CL2	180
122499	146	22:36:57.0	P120	CL2	180
122500	146	22:38:5.0	IRP0	CL2	150
122501	146	22:39:34.0	IRP0	CL2	150
122502	146	22:41:3.0	IRP0	CL2	150
122503	146	22:42:22.0	CL1	MT2	10000
122504	146	22:44:2.0	CL1	MT2	10000
122505	146	22:45:42.0	CL1	MT2	10000
122506	146	22:50:57.0	CL1	CL2	150
122507	146	22:52:26.0	CL1	CL2	150
122508	146	22:53:55.0	CL1	CL2	150
122509	146	22:55:3.0	P0	CL2	150
122511	146	22:58:1.0	P0	CL2	150
122514	146	23:2:7.0	P60	CL2	180
122515	146	23:3:15.0	P120	CL2	180
122516	146	23:4:44.0	P120	CL2	180
122517	146	23:6:13.0	P120	CL2	180
122518	146	23:7:21.0	IRP0	CL2	150
122519	146	23:8:50.0	IRP0	CL2	150
122520	146	23:10:19.0	IRP0	CL2	150
122521	146	23:11:38.0	CL1	MT2	10000
122522	146	23:13:18.0	CL1	MT2	10000
122523	146	23:14:58.0	CL1	MT2	10000
122524	146	23:27:11.0	CL1	CL2	150
122525	146	23:28:40.0	CL1	CL2	150
122526	146	23:30:9.0	CL1	CL2	150
122527	146	23:31:17.0	P0	CL2	150
122528	146	23:32:46.0	P0	CL2	150
122529	146	23:34:15.0	P0	CL2	150
122530	146	23:35:23.0	P60	CL2	180
122531	146	23:36:52.0	P60	CL2	180
122532	146	23:38:21.0	P60	CL2	180
122533	146	23:39:29.0	P120	CL2	180
122534	146	23:40:58.0	P120	CL2	180
122535	146	23:42:27.0	P120	CL2	180
122536	146	23:43:35.0	IRP0	CL2	150
122537	146	23:45:4.0	IRP0	CL2	150
122538	146	23:46:33.0	IRP0	CL2	150
122540	146	23:49:32.0	CL1	MT2	10000
122541	146	23:51:12.0	CL1	MT2	10000
122567	147	1:43:30.0	CL1	CL2	150
122568	147	1:44:59.0	CL1	CL2	150
122569	147	1:46:28.0	CL1	CL2	150
122570	147	1:47:36.0	P0	CL2	150
122573	147	1:51:42.0	P60	CL2	180
122574	147	1:53:11.0	P60	CL2	180
122575	147	1:54:40.0	P60	CL2	180
122576	147	1:55:48.0	P120	CL2	180
122577	147	1:57:17.0	P120	CL2	180
122578	147	1:58:46.0	P120	CL2	180
122579	147	1:59:54.0	IRP0	CL2	150
122580	147	2:1:23.0	IRP0	CL2	150
122581	147	2:2:52.0	IRP0	CL2	150
122582	147	2:4:11.0	CL1	MT2	10000
122584	147	2:7:31.0	CL1	MT2	10000
122585	147	2:25:37.0	CL1	CL2	150
122586	147	2:27:6.0	CL1	CL2	150
122587	147	2:28:35.0	CL1	CL2	150
122588	147	2:29:43.0	P0	CL2	150
122589	147	2:31:12.0	P0	CL2	150
122591	147	2:34:1.0	P60	CL2	180
122593	147	2:36:59.0	P60	CL2	180
122594	147	2:38:7.0	P120	CL2	180
122595	147	2:39:36.0	P120	CL2	180
122596	147	2:41:5.0	P120	CL2	180
122597	147	2:42:13.0	IRP0	CL2	150
122598	147	2:43:42.0	IRP0	CL2	150
122599	147	2:45:11.0	IRP0	CL2	150
122600	147	2:46:29.0	CL1	MT2	10000
122601	147	2:48:9.0	CL1	MT2	10000
122602	147	2:49:49.0	CL1	MT2	10000
122603	147	3:0:58.0	CL1	CL2	150
122604	147	3:2:27.0	CL1	CL2	150
122606	147	3:5:15.0	P0	CL2	150
122607	147	3:6:44.0	P0	CL2	150
122608	147	3:8:13.0	P0	CL2	150
122609	147	3:9:21.0	P60	CL2	180
122610	147	3:10:50.0	P60	CL2	180
122612	147	3:13:38.0	P120	CL2	180
122613	147	3:15:7.0	P120	CL2	180
122614	147	3:16:36.0	P120	CL2	180
122616	147	3:19:13.0	IRP0	CL2	150
122617	147	3:20:42.0	IRP0	CL2	150
122618	147	3:22:1.0	CL1	MT2	10000
122619	147	3:23:41.0	CL1	MT2	10000
122620	147	3:25:21.0	CL1	MT2	10000
122621	147	3:37:25.0	CL1	CL2	150
122622	147	3:38:54.0	CL1	CL2	150
122623	147	3:40:23.0	CL1	CL2	150
122624	147	3:41:31.0	P0	CL2	150
122625	147	3:43:0.0	P0	CL2	150
122626	147	3:44:29.0	P0	CL2	150
122627	147	3:45:37.0	P60	CL2	180
122628	147	3:47:6.0	P60	CL2	180
122629	147	3:48:35.0	P60	CL2	180
122630	147	3:49:43.0	P120	CL2	180
122631	147	3:51:12.0	P120	CL2	180
122632	147	3:52:41.0	P120	CL2	180
122633	147	3:53:49.0	IRP0	CL2	150
122634	147	3:55:18.0	IRP0	CL2	150
122635	147	3:56:47.0	IRP0	CL2	150
122636	147	3:58:6.0	CL1	MT2	10000
122637	147	3:59:46.0	CL1	MT2	10000
122638	147	4:1:26.0	CL1	MT2	10000
122639	147	4:23:16.0	CL1	CL2	150
122640	147	4:24:45.0	CL1	CL2	150
122641	147	4:26:14.0	CL1	CL2	150
122642	147	4:27:22.0	P0	CL2	150
122644	147	4:30:20.0	P0	CL2	150
122645	147	4:31:28.0	P60	CL2	180
122646	147	4:32:57.0	P60	CL2	180
122647	147	4:34:26.0	P60	CL2	180
122648	147	4:35:34.0	P120	CL2	180
122649	147	4:37:3.0	P120	CL2	180
122650	147	4:38:32.0	P120	CL2	180
122651	147	4:39:40.0	IRP0	CL2	150
122652	147	4:41:9.0	IRP0	CL2	150
122653	147	4:42:38.0	IRP0	CL2	150
122654	147	4:43:57.0	CL1	MT2	10000
122655	147	4:45:37.0	CL1	MT2	10000
122658	147	5:1:48.0	CL1	CL2	150
122659	147	5:3:17.0	CL1	CL2	150
122660	147	5:4:25.0	P0	CL2	150
122661	147	5:5:54.0	P0	CL2	150
122662	147	5:7:23.0	P0	CL2	150
122663	147	5:8:31.0	P60	CL2	180
122664	147	5:10:0.0	P60	CL2	180
122665	147	5:11:29.0	P60	CL2	180
122666	147	5:12:37.0	P120	CL2	180
122671	147	5:19:51.0	IRP0	CL2	150
122672	147	5:21:10.0	CL1	MT2	10000
122673	147	5:22:50.0	CL1	MT2	10000
122674	147	5:24:30.0	CL1	MT2	10000
122675	147	5:58:34.0	CL1	CL2	150
122676	147	6:0:3.0	CL1	CL2	150
122677	147	6:1:32.0	CL1	CL2	150
122678	147	6:2:40.0	P0	CL2	150
122680	147	6:5:38.0	P0	CL2	150
122682	147	6:8:15.0	P60	CL2	180
122683	147	6:9:44.0	P60	CL2	180
122685	147	6:12:21.0	P120	CL2	180
122686	147	6:13:50.0	P120	CL2	180
122687	147	6:14:58.0	IRP0	CL2	150
122689	147	6:17:56.0	IRP0	CL2	150
122690	147	6:19:15.0	CL1	MT2	10000
122692	147	6:22:35.0	CL1	MT2	10000
122693	147	6:36:6.0	CL1	CL2	150
122694	147	6:37:35.0	CL1	CL2	150
122695	147	6:39:4.0	CL1	CL2	150
122696	147	6:40:12.0	P0	CL2	150
122697	147	6:41:41.0	P0	CL2	150
122698	147	6:43:10.0	P0	CL2	150
122699	147	6:44:18.0	P60	CL2	180
122700	147	6:45:47.0	P60	CL2	180
122701	147	6:47:16.0	P60	CL2	180
122703	147	6:49:53.0	P120	CL2	180
122704	147	6:51:22.0	P120	CL2	180

122705	147	6:52:30.0	IRP0	CL2	150
122706	147	6:53:59.0	IRP0	CL2	150
122707	147	6:55:28.0	IRP0	CL2	150
122708	147	6:56:47.0	CL1	MT2	10000
122709	147	6:58:27.0	CL1	MT2	10000
122712	147	8:9:32.0	CL1	CL2	150
122713	147	8:11:1.0	CL1	CL2	150
122714	147	8:12:9.0	P0	CL2	150
122715	147	8:13:38.0	P0	CL2	150
122717	147	8:16:25.0	P60	CL2	180
122718	147	8:17:54.0	P60	CL2	180
122719	147	8:19:23.0	P60	CL2	180
122720	147	8:20:31.0	P120	CL2	180
122721	147	8:22:0.0	P120	CL2	180
122722	147	8:23:29.0	P120	CL2	180
122723	147	8:24:37.0	IRP0	CL2	150
122724	147	8:26:6.0	IRP0	CL2	150
122725	147	8:27:35.0	IRP0	CL2	150
122726	147	8:28:54.0	CL1	MT2	10000
122727	147	8:30:34.0	CL1	MT2	10000
122728	147	8:32:14.0	CL1	MT2	10000
122729	147	8:42:14.0	CL1	CL2	150
122730	147	8:43:43.0	CL1	CL2	150
122731	147	8:45:12.0	CL1	CL2	150
122732	147	8:46:20.0	P0	CL2	150
122733	147	8:47:49.0	P0	CL2	150
122735	147	9:10:3.0	P60	CL2	180
122736	147	9:11:33.0	P60	CL2	180
122737	147	9:13:2.0	P60	CL2	180
122738	147	9:14:9.0	P120	CL2	180
122739	147	9:15:38.0	P120	CL2	180
122740	147	9:17:8.0	P120	CL2	180
122741	147	9:18:15.0	IRP0	CL2	150
122742	147	9:19:44.0	IRP0	CL2	150
122743	147	9:21:14.0	IRP0	CL2	150
122745	147	9:24:12.0	CL1	MT2	10000
122746	147	9:25:53.0	CL1	MT2	10000
122838	147	12:31:29.0	CL1	CL2	150
122839	147	12:32:59.0	CL1	CL2	150
122840	147	12:34:28.0	CL1	CL2	150
122841	147	12:35:35.0	P0	CL2	150
122842	147	12:37:5.0	P0	CL2	150
122843	147	12:38:34.0	P0	CL2	150
122845	147	12:41:11.0	P60	CL2	180
122846	147	12:42:40.0	P60	CL2	180
122847	147	12:43:47.0	P120	CL2	180
122848	147	12:45:17.0	P120	CL2	180
122849	147	12:46:46.0	P120	CL2	180
122850	147	12:47:53.0	IRP0	CL2	150
122851	147	12:49:23.0	IRP0	CL2	150
122852	147	12:50:52.0	IRP0	CL2	150
122853	147	12:52:10.0	CL1	MT2	10000
122857	147	12:59:4.0	CL1	CL2	150
122858	147	13:0:33.0	CL1	CL2	150
122859	147	13:1:40.0	P0	CL2	150
122861	147	13:4:39.0	P0	CL2	150
122862	147	13:5:51.0	P60	CL2	180
122863	147	13:7:21.0	P60	CL2	180
122866	147	13:11:37.0	P120	CL2	180
122867	147	13:13:6.0	P120	CL2	180
122868	147	13:14:13.0	IRP0	CL2	150
122869	147	13:15:43.0	IRP0	CL2	150
122870	147	13:17:12.0	IRP0	CL2	150
122871	147	13:18:30.0	CL1	MT2	10000
122872	147	13:20:11.0	CL1	MT2	10000
122873	147	13:21:51.0	CL1	MT2	10000
122874	147	13:23:39.0	CL1	CL2	150
122875	147	13:25:9.0	CL1	CL2	150
122877	147	13:27:57.0	P0	CL2	150
122878	147	13:29:27.0	P0	CL2	150
122879	147	13:30:56.0	P0	CL2	150
122880	147	13:32:3.0	P60	CL2	180
122881	147	13:33:33.0	P60	CL2	180
122883	147	13:36:21.0	P120	CL2	180
122884	147	13:37:51.0	P120	CL2	180
122885	147	13:39:20.0	P120	CL2	180
122886	147	13:40:27.0	IRP0	CL2	150
122887	147	13:41:57.0	IRP0	CL2	150
122888	147	13:43:26.0	IRP0	CL2	150
122889	147	13:44:44.0	CL1	MT2	10000
122890	147	13:46:25.0	CL1	MT2	10000
122891	147	13:48:5.0	CL1	MT2	10000
122892	147	13:55:40.0	CL1	CL2	150
122893	147	13:57:10.0	CL1	CL2	150
122894	147	13:58:39.0	CL1	CL2	150
122895	147	14:1:25.0	P0	CL2	150
122896	147	14:2:54.0	P0	CL2	150
122897	147	14:4:23.0	P0	CL2	150
122898	147	14:5:31.0	P60	CL2	180
122899	147	14:7:0.0	P60	CL2	180
122900	147	14:8:29.0	P60	CL2	180
122901	147	14:9:36.0	P120	CL2	180
122902	147	14:11:6.0	P120	CL2	180
122903	147	14:12:35.0	P120	CL2	180
122905	147	14:15:12.0	IRP0	CL2	150
122906	147	14:16:41.0	IRP0	CL2	150
122907	147	14:18:0.0	CL1	MT2	10000
122908	147	14:19:40.0	CL1	MT2	10000
122909	147	14:21:20.0	CL1	MT2	10000