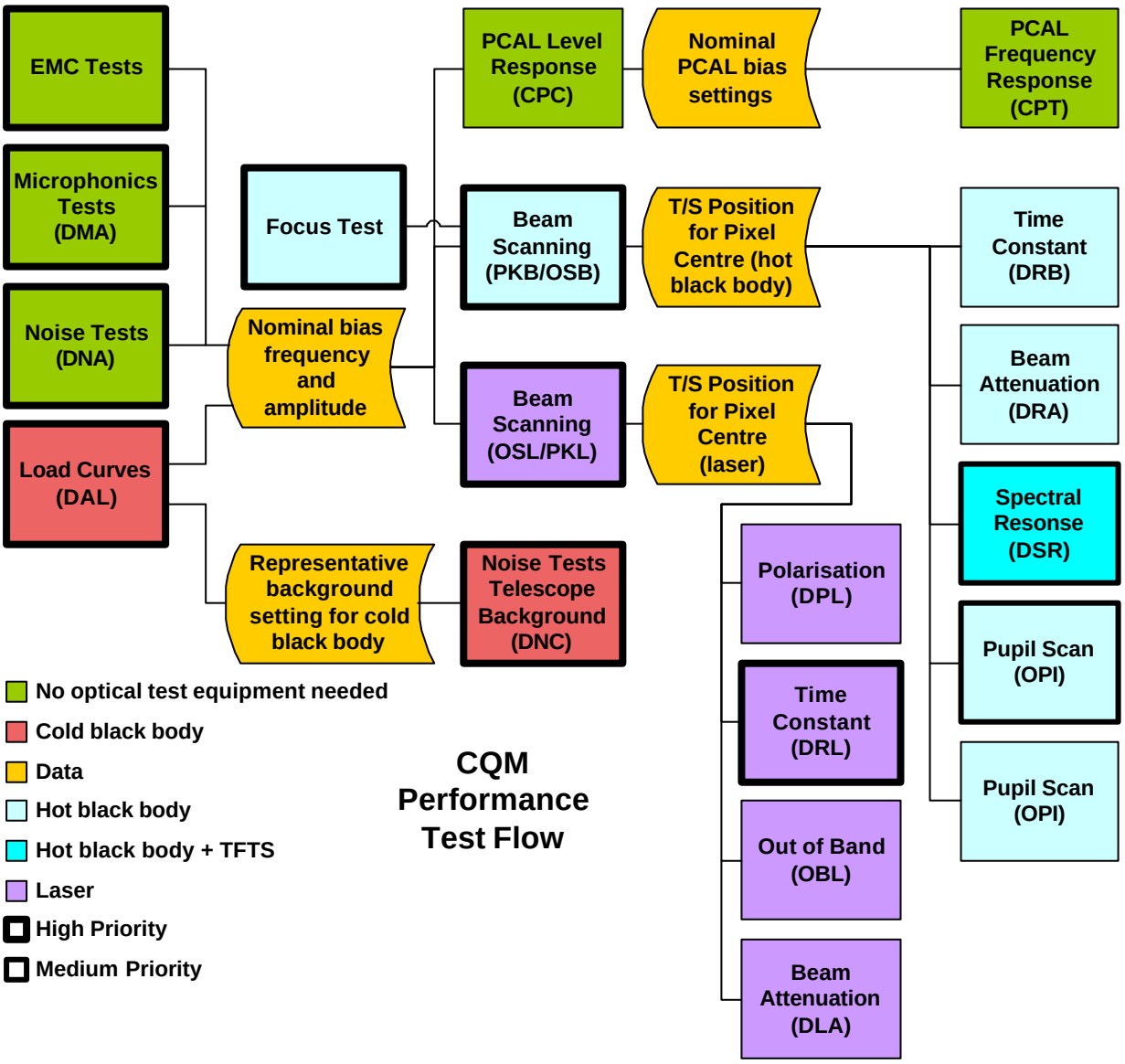
Performance Tests

1. SUMMARY



Scheme 1 – Cold black body and PCAL can be used

Period 1 = Initial 48 hours during thermal tests

1st Priority Tests – in order of execution		
Test	**Time**	**Comments**
DNA-P	8 hours	3 minutes, whole parameter space
DAL-P	7.5 hours	3 minutes, 7 bb settings, one bias freq

CPC-P	1 hour	3 minutes, whole parameter space
DAM-P+EMC Test)	4 hours	For Doug to decide
DNC-P	8.5 hours	3 minutes, whole parameter space
CPT-P	4 hours	10 minutes, 5 freqs, 5 settings
DAM-P+EMC Test)	2 hours	For Doug to decide
Total	**35.0 hours**	
2nd Priority Tests		
DAL-P	7.5 hours	3 minutes, 7 bb settings, different bias freq
CPT-P	4 hours	Another 5 settings
Contingency	1.5 hours	TBD
Total	**48 hours**	

Periods 2-7 = Daily 8 hour shifts

Period 2 – The works on the central pixel		
Test	**Time**	**Comments**
Daily Check	0.5 hours	
PKB	0.5 hours	Central pixel allowing 15 minutes extra as we are doing this for the first time
OSB-P	2.0 hours	Central pixel only (see figure 3)
OPI-P	2.0 hours	Based on central pixel, allowing 15 minutes to change lab configuration
PKL	0.5 hours	Central pixel, again allowing an extra 15 minutes
DRL-P	0.5 hours	Central pixel only
DSR (first day)	2.0 hours	Central pixel only first day version
Period 3		
Daily Check	0.5 hours	
PKB or PKL	0.25 hours	Pixel C2
OSB or OSL	2.0 hours	Pixel C2
PKB or PKL	0.25 hours	Pixel C8
OSB or OSL	2.0 hours	Pixel C8
PKB or PKL	0.25 hours	Pixel A5
OSB or OSL	2.0 hours	Pixel A5
PKB or PKL	0.5 hours	Pixels A1 and E9
Period 4		
Daily Check	0.5 hours	
PKB or PKL	0.25 hours	Pixel E5
OSB or OSL	2.0 hours	Pixel E5
DRB-P	2.0 hours	7 chop frequencies, 3 minutes each, 4 pixels, C2, C8, A5, E5
DPL-P	0.5 hours	5 minutes at each of two laser polarisations
DRL-P	2.0 hours	Same as DRB
PKB or PKL	0.5 hours	Pixels E1 and A9
Period 5		
Daily Check	0.5 hours	
DSR	7.5 hours	As many scans as needed per pixel

Period 6		
Daily Check	0.5 hours	
DPL-P	0.5 hours	5 minutes at each of two laser polarisations
DLA-P	1.0 hours	Allowing plenty of faff time
OBL-P	3.5 hours	5 OOB laser lines, 10 minutes each
OSB or OSL-P	2.0 hours	Corner pixels E9
DRL-P	0.5 hours	Corner pixel E9
Period 7		
Daily Check	0.5 hours	
DRA-P	2.0 hours	Centre pixel C5, likely to need much less than this
OSB or OSL-P	2.0 hours	Corner pixels E1
DRL-P	0.5 hours	Corner pixel E1
OSB or OSL-P	2.0 hours	Corner pixels A9
DRL-P	0.5 hours	Corner pixel A9

Scheme 2 – Cold black body and PCAL can not be used

Period 1
Tests to be performed, DAM-P+EMC Test), DNA-P
DAM-P plus EMC Test (To be written by Doug) 6 Hours (could have more)
DNA-P 8 hours
Period 2: DAL-P, DNC-P, CPC-P
Period 3: Daily Check, PKU, OSB-P – as many pixels as time allows
Period 4: Daily Check, DPL-P, DRB-P
Period 5: Daily Check, DSR
Period 6: Daily Check, DRL-P, OSL-P
Period 7: Daily Check, OBL-P, OPI-P**,** Repeat subset of detector tests

2. COMMAND SUMMARIES

DNA-P Noise Test

Total Time = 7.8 hours

1. Request photometer data
2. Set bias frequency to 50 Hz
3. 12 bias amplitudes 20-240mV, 3 minutes each (36 minutes)
4. Repeat for bias frequencies 70, 90, 110, 130, 150, 170, 190, 210, 230, 250, 270, 290 (432 minutes)

DNC-P Noise Test with Telescope Load

Total Time = 8.3 hours

1. Set the cold black body to 20 K (TBR)
2. Request photometer data
3. Set nominal bias amplitude and frequency
4. Wait 30 minutes
5. Set bias frequency to 50 Hz

6. 12 bias amplitudes 20-240mV, 3 minutes each (36 minutes)
7. Repeat for bias frequencies 70, 90, 110, 130, 150, 170, 190, 210, 230, 250, 270, 290

DAL-P Load Curves

Total Time = 66 minutes x 6 + 36 minutes = 7.2 hours

Note steps 1-5 not included in time estimate as it is assumed this is done before the 8 hour test period starts.

1. Request photometer data
2. Set bias frequency, amplitude and sample rate to nominal (*assuming 200Hz, 100 mA and 15.3 Hz for now)*
3. Cold black body is set to 10 K
4. Set flip mirror to put cold black body in the beam
5. Wait 30 minutes
6. 12 bias amplitudes 20-240mV, 3 minutes each (36 minutes)
7. Cold black body is set to 15 K
8. Wait 30 minutes
9. 12 bias amplitudes 20-240mV, 3 minutes each (36 minutes)
10. Repeat 6-8 for cold black body settings 20K, 25K, 30K, 35K, 40K

CPC-P PCAL Level Test

Total Time = 54 minutes

1. Cold black body is off
2. Set flip mirror to put cold black body in the beam
3. Request photometer data
4. Set bias frequency, sample rate and amplitude to nominal (assuming 200Hz, 15.3 and 100 mV for now)
5. Set PCAL bias to 4.5mA
6. Wait for 3 minutes
7. Repeat for PCAL bias settings of 4.2, 4.0, 3.8, 3.6, 3.4, 3.2, 3.0, 2.8, 2.6, 2.4, 2.2, 2.0, 1.8, 1,6, 1.4, 1.2, 1.0.

CPT-P PCAL Frequency Test

Total Time = 4 hours

1. Cold black body is off
2. Set flip mirror to put cold black body in the beam
3. Request photometer data
4. Set bias frequency, sample rate and amplitude to nominal (assuming 200Hz, 15.3 and 100 mV for now)
5. Set PCAL bias to 4.5mA (TBR – depending on CPC results)
6. Wait for 0.125 seconds
7. Set PCAL to 2.5 mA (TBR – depending on CPC results)
8. Wait for 0.125 seconds
9. Repeat 12-15 2400 times (i.e giving 10 minutes of data)
10. Repeat for PCAL bias settings of 2 Hz, 1 Hz, 0.5 Hz, 0.25 Hz (10 minutes each)
11. Repeat for 4 other pairs of bias values (50x5 minutes = 4 hours)

DCK-P Daily Check

Total Time = 30 minutes

1. Cold black body is off
2. Set flip mirror to put the cold black body in the beam
3. Request photometer data
4. Set bias frequency, sample rate and amplitude to nominal (assuming 200Hz, 15.3 and 100 mV for now)
5. Wait 2 minutes
6. Repeat for bias amplitudes 40, 100, 160, 220 mV (10 minutes)
7. Switch PCAL to nominal high bias e.g. 4mA
8. Wait 0.25 seconds
9. Switch PCAL to nominal low bias e.g. 2mA
10. Wait 0.25 seconds
11. Repeat 360 times (3 minutes)
12. Set flip mirror so that the room is in the beam
13. If the hot black body or laser is switched on, set the telescope simulator so that the telescope beam does not fall on the instrument (preferably) or at the edge of the FOV if this is not possible.
14. Wait 2 minutes
15. Repeat for bias amplitudes 40, 100, 160, 220 mV (10 minutes)
16. Repeat steps 7-11 (3 minutes)

PKB-P Peak-Up With The Hot Black Body

Total Time = (30 minutes) + 15 minutes per pixel

1. Cold black body is off, hot black body is on at 1000 ^{o}C
2. Chopper is running at 2Hz (TBR may depend on nominal sample rate)
3. Set flip mirror to put the window in the beam
4. Request photometer data
5. Set bias frequency, sample rate and amplitude to nominal (assuming 200Hz, 15.3 and 100 mV for now)
6. Set telescope simulator to position beam at nominal centre of central pixel (C5)
7. Wait for QLA to determine if source is detected
8. Move source to centre of central pixel
9. Check QLA to determine if source on central pixel and adjust again if necessary
10. Move telescope simulator -18 arcseconds in the Z direction (figure 2 position 1)
11. Wait for 2 minutes
12. Move the telescope simulator +9 arcseconds in the Z direction (figure 2 position 2)
13. Wait for 2 minutes
14. Move the telescope simulator +4.5 arcseconds in the Z direction (figure 2 position 3) then wait 2 minutes
15. Repeat 14, 3 more times (figure 2 positions 4,5,6)
16. Move +9 arcseconds in the Z direction (figure 2 position 7) and wait 2 minutes
17. Move the telescope simulator to Z = nominal centre, Y = -18 arcseconds
18. Repeat steps 11-16, moving in +Y direction instead of +Z

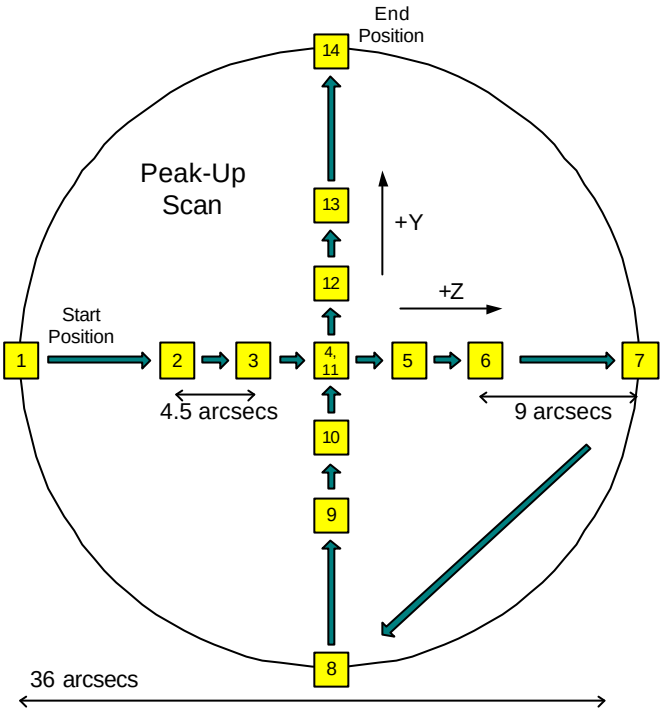


Figure 2: Raster Pattern For Peak-Up

OSB-P Beam Scanning

Total Time = (30 minutes) + 15 minutes for peakup 2 hours per pixel

1. Run PKU
2. Move source to centre of central pixel
3. Move telescope simulator + 36 arcseconds in the +Y direction
4. Wait for 3 minutes
5. Move the telescope simulator 4.5 arcseconds in the -Y direction and 9.0 arcseconds in the –Z direction (position 2 in figure 3), wait for 3 minutes
6. Move to the remaining pixels in turn as indicated in figure 3 (see table 1), waiting 3 minutes at each.

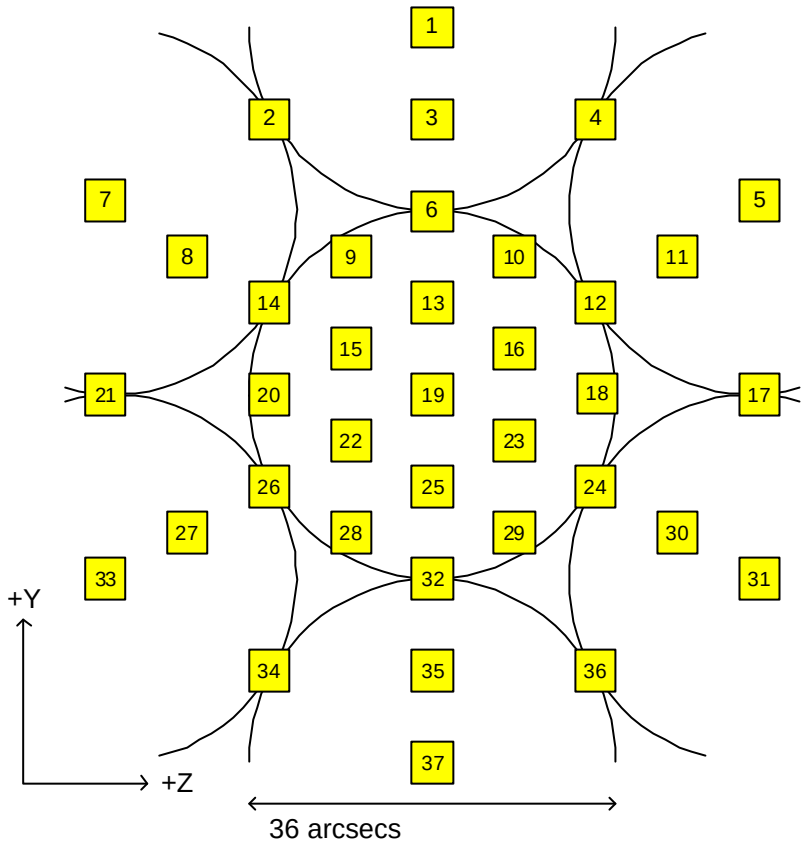


Figure 3: Beam Scan Raster Pattern

Raster Position	Offset in Y from Central Pixel (arcsecs)	Offset in Z from Central Pixel (arcsecs)	Offset in Y from previous raster position (arcsecs)	Offset in Z from previous raster position (arcsecs)
0	0.0	0.0	0.0	0.0
1	+36.0	0.0	+36.0	0.0
2	+27.0	-15.6	-9.0	-15.6
3	+27.0	0.0	0.0	+15.6
4	+27.0	+15.6	0.0	+15.6
5	+18.0	+31.2	-9.0	+15.6
6	+18.0	0.0	0.0	-31.2
7	+18.0	-31.2	0.0	-31.2
8	+13.5	-23.4	-4.5	+7.8
9	+13.5	-7.8	0.0	+15.6
10	+13.5	+7.8	0.0	+15.6
11	+13.5	+23.4	0.0	+15.6
12	+9.0	+15.6	-4.5	-7.8
13	+9.0	0.0	0.0	-15.6
14	+9.0	-15.6	0.0	-15.6
15	+4.5	-7.8	-4.5	+7.8
16	+4.5	+7.8	0.0	+15.6
17	0.0	+31.2	-4.5	+23.4

18	0.0	+15.6	0.0	-15.6
19	0.0	0.0	0.0	-15.6
20	0.0	-15.6	0.0	-15.6
21	0.0	-31.2	0.0	-15.6
22	-4.5	-7.8	-4.5	+23.4
23	-4.5	+7.8	0.0	+15.6
24	-9.0	+15.6	-4.5	+7.8
25	-9.0	0.0	0.0	-15.6
26	-9.0	-15.6	0.0	-15.6
27	-13.5	-23.4	-4.5	-7.8
28	-13.5	-7.8	0.0	+15.6
29	-13.5	+7.8	0.0	+15.6
30	-13.5	+23.4	0.0	+15.6
31	-18.0	+31.2	-4.5	+7.8
32	-18.0	0.0	0.0	-31.2
33	-18.0	-31.2	0.0	-31.2
34	-27.0	-15.6	-9.0	+15.6
35	-27.0	0.0	0.0	+15.6
36	-27.0	+15.6	0.0	+15.6
37	-36.0	0.0	-9.0	-15.6

OPI-P Pupil Scanning

Total Time = 1.75 hours

1. Reconfigure lab to put hot black body in beam at pupil
2. Set the telescope simulator to the position of the central pixel
3. Chopper is running at 2Hz (TBR may depend on nominal sample rate)
4. Move the source to the edge of the pupil
5. Wait 5 minutes
6. Move the source 5% of the distance across the pupil
7. Wait for 5 minutes
8. Repeat until source scanned across pupil

PKL-P Peak-Up With The Laser

Total Time = 30 minutes + 50 minutes per pixel – 9 pixels = 8 hours

1. Cold black body is off, laser is on with brightest in band line
2. Chopper is running at 2Hz (TBR may depend on nominal sample rate)
3. Repeat steps 3-19 from PKB-P/OSB-P

DRL-P Time Response With The Laser

Total Time = 0.5 hours per pixel

1. Repeat test DRB-P

DSR Photometer Spectral Response (first day)

Total Time = 2 hours

1. Cold black body is off, hot black body is on at 1000°C and test FTS is being used.
2. Set flip mirror to put hot black body in the beam.
3. Request photometer data
4. Set bias frequency, sample rate and amplitude to nominal (assuming 200Hz, 15.3 and 100 mV for now)
5. Set telescope simulator at centre of central pixel (assuming no need for peakup as we 've already established centre)
6. Set the test FTS to range (2 cm)
7. Set nominal scan speed (1 mm/s)
8. Set sampling frequency to 25 µm
9. Scan the test FTS enough times to fill one hour (or one half time remaining)
10. Check data with QLA
11. Switch off black body and wait to cool
12. Repeat FTS scans for another hour (or other half time remaining)

DSR Photometer Spectral Response

Total Time = 7.5 hours

13. Cold black body is off, hot black body is on at 1000°C and test FTS is being used.
14. Set flip mirror to put hot black body in the beam.
15. Request photometer data
16. Set bias frequency, sample rate and amplitude to nominal (assuming 200Hz, 15.3 and 100 mV for now)
17. Set telescope simulator at centre of central pixel (assuming no need for peakup as we 've already established centre)
18. Set the test FTS to scan the maximum range (20 cm)
19. Set nominal scan speed (1 mm/s)
20. Set sampling frequency to 25 µm
21. Scan the test FTS 10 times (35 minutes)
22. Check data with QLA
23. If necessary continue scanning TFTS until a reasonable S/N can be obtained.
24. Repeat for as many pixels as possible, in order, C2,C8,A5,A7,E3,E7,A5,E5
25. Switch off black body and wait to cool
26. Repeat FTS scans for each pixel

OSL-P Beam Scanning With The Laser

Total Time = 30 minutes + 50 minutes per pixel – 9 pixels = 8 hours

1. Cold black body is off, laser is on with brightest in band line
2. Chopper is running at 2Hz (TBR may depend on nominal sample rate)
3. Repeat steps 3-19 from PKB-P/OSB-P

DPB-P Polarisation With The Black Body

Total Time = 0.5 hour

1. Cold black body is off, hot black body is on at maximum setting, chopper is running at 2 Hz
2. Set flip mirror to put hot black body in the beam
3. Request photometer data
4. Set bias frequency, sample rate and amplitude to nominal (assuming 200Hz, 15.3 and 100 mV for now)

5. Set telescope simulator at centre of central pixel (assuming no need for peakup as we established centre yesterday)
6. Wait for 3 minutes
7. Place polariser in beam and note setting
8. Wait for 5 minutes
9. Move polariser 45 degrees
10. Wait for 5 minutes
11. Move polariser another 45 degrees
12. Wait for 5 minutes
13. Remove polariser from beam
14. Wait for 3 minutes

DRB-P Time Constant With The Hot Black Body

Total Time = 4.5 hours

1. From previous test, telescope simulator is at centre of central pixel, photometer data is being taken at nominal detector settings
2. Set detectors to maximum sample rate for nominal bias frequency
3. Wait for 3 minutes
4. Change chop frequency to 10 Hz
5. Wait 3 minutes
6. Repeat 4-5 for chop frequencies of 7, 4, 3, 1, 0.5 Hz (28 minutes)
7. Repeat for other co-located pixels including 2Hz setting (C2,C8,A5,A7,E3,E7,A5,E5) (*Peakup should not be needed as positions already established)*

DLA-P Beam Attenuation With The Laser

Total Time = 1.0 hours per pixel

1. Return to central pixel
2. Set chop frequency to 2Hz
3. Wait 3 minutes
4. Place known attenuation in beam (eg one sheet of paper)
5. Wait 5 minutes
6. Place another attenuator in beam (now two sheets of paper)
7. Wait 5 minutes
8. Repeat until unable to get signal from hot black body

DBA-P Beam Attenuation With The Hot Black Body

Total Time = 2 hours

1. TBW, this will be done by adjusting the temperature of the hot black body

DPL-P Polarisation With The Laser

Total Time = 30 minutes

1. Set telescope simulator back to position beam at centre of central pixel (C5)
2. Wait 5 minutes
3. Switch laser polarisation
4. Wait 5 minutes
5. If difference is noted return to initial polarisation setting

OBL-P Out of Band Sensitivity

Total Time = 3.5 hours

1. Cold black body is off, laser is on with brightest in band line
2. Chopper is running at 2Hz (TBR may depend on nominal sample rate)
3. Wait 3 minutes
4. Change laser line to out of band line (assuming 30 minutes to do this)
5. Wait 10 minutes
6. Repeat for four more lines

Random Comments

Could re-do DNA with detectors at a higher temperature.
Do we need to sample 'sample rate' space?
Need to sort out what black body setting is needed for DNC.
Could do CPC on top of various backgrounds set by the cold black body, will wait till the flight model.
Peakup test assumes pixel can be hit by the telescope simulator well enough to start rastering without need for any other FOV scanning first.
PKU+OSB misses two co-aligned pixels, does not scan outside pixel
OSB will need bigger raster eventually for beam mapping

3. DETAILED COMMANDING

Conversion Assumptions

Sample Freq = 10^7/ 512 * divider, divider commanded
Sample Rate = Sample Freq/(divider + 1), divider commanded
PCAL bias conversion from subsystem reactions doc 4.5 mA -> 4095 steps -> 1.1µA/step

DNA-P and DNC-P – Full Test

Step	Action	Command/TM
1	**Select SCOS display (DCU Parameters)**	
2	**Run QLA-PERF-DNA-P**	
3	**With SCOS request bolometer array science packets**	SetDataMode(0x0000) 843C0000 SetStartFrame(0x0001) 843E0001
4	**Set bias frequency to 50.08 Hz** **Set sample rate to 16.69 Hz**	SetPhotoBiasFreq(0x0186) 84190186 SetPhotoSampFreq(0x0002)
5	**Set bias amplitude to 20mV** **Wait 180 sec** **Set bias amplitude to 40mV** **Wait 180 sec** **Set bias amplitude to 60mV** **Wait 180 sec** **Set bias amplitude to 80mV** **Wait 180 sec** **Set bias amplitude to 100mV**	SetPhotoBiasAmplLW(0x0014) 841C0014 SetPhotoBiasAmplLW(0x0028) 841C0028 SetPhotoBiasAmplLW(0x003C) 841C003C SetPhotoBiasAmplLW(0x0050) 841C0050 SetPhotoBiasAmplLW(0x0064) 841C0064

	Wait 180 sec **Set bias amplitude to 120mV** **Wait 180 sec** **Set bias amplitude to 140mV** **Wait 180 sec** **Set bias amplitude to 160mV** **Wait 180 sec** **Set bias amplitude to 180mV** **Wait 180 sec** **Set bias amplitude to 200mV** **Wait 180 sec** **Set bias amplitude to 220mV** **Wait 180 sec** **Set bias amplitude to 240mV** **Wait 180 sec**	SetPhotoBiasAmplLW(0x0078) 841C0078 SetPhotoBiasAmplLW(0x008C) 841C008C SetPhotoBiasAmplLW(0x00A0) 841C00A0 SetPhotoBiasAmplLW(0x00B4) 841C00B4 SetPhotoBiasAmplLW(0x00C8) 841C00C8 SetPhotoBiasAmplLW(0x00DC) 841C00DC SetPhotoBiasAmplLW(0x00F0) 841C00F0
6	**Set bias frequency to 70.00 Hz** **Set sample rate to 17.50 Hz**	SetPhotoBiasFreq(0x0117) 84190117 SetPhotoSampFreq(0x0003)
7	**Repeat step 5**	
8	**Set bias frequency to 90.00 Hz** **Set sample rate to 15.00 Hz**	SetPhotoBiasFreq(0x00D9) 841900D9 SetPhotoSampFreq(0x0005)
9	**Repeat step 5**	
10	**Set bias frequency to 110.35 Hz** **Set sample rate to 15.76 Hz**	SetPhotoBiasFreq(0x00B1) 841900B1 SetPhotoSampFreq(0x0006)
11	**Repeat step 5**	
12	**Set bias frequency to 130.21 Hz** **Set sample rate to 16.27 Hz**	SetPhotoBiasFreq(0x0096) 84190096 SetPhotoSampFreq(0x0007)
13	**Repeat step 5**	
14	**Set bias frequency to 150.24 Hz** **Set sample rate to 16.69 Hz**	SetPhotoBiasFreq(0x0082) 84190082 SetPhotoSampFreq(0x0008)
15	**Repeat step 5**	
16	**Set bias frequency to 169.84 Hz** **Set sample rate to 16.98 Hz**	SetPhotoBiasFreq(0x0073) 84190073 SetPhotoSampFreq(0x0009)
17	**Repeat step 5**	
18	**Set bias frequency to 189.62 Hz** **Set sample rate to 15.80 Hz**	SetPhotoBiasFreq(0x0067) 84190067 SetPhotoSampFreq(0x000B)
19	**Repeat step 5**	
20	**Set bias frequency to 210.01 Hz** **Set sample rate to 16.15 Hz**	SetPhotoBiasFreq(0x005D) 8419005D SetPhotoSampFreq(0x000C)
21	**Repeat step 5**	
22	**Set bias frequency to 229.78 Hz** **Set sample rate to 16.41 Hz**	SetPhotoBiasFreq(0x0055) 84190055 SetPhotoSampFreq(0x000D)
23	**Repeat step 5**	
24	**Set bias frequency to 250.40 Hz** **Set sample rate to 15.65 Hz**	SetPhotoBiasFreq(0x004E) 8419004E SetPhotoSampFreq(0x000F)
25	**Repeat step 5**	
26	**Set bias frequency to 271.27 Hz**	SetPhotoBiasFreq(0x0048) 84190048

	Set sample rate to 15.96 Hz	SetPhotoSampFreq(0x0010)
27	**Repeat step 5**	
28	**Set bias frequency to 291.5 Hz** **Set sample rate to 16.19 Hz**	SetPhotoBiasFreq(0x0043) 84190043 SetPhotoSampFreq(0x0011)
29	**Repeat step 5**	

DNA-P Daily Check

Note it is assumed here that the nominal bias frequency is 200 Hz and the nominal bias amplitude is 100 mV, this may change following analysis of DNA and DAL.

Step	Action	Command/TM
1	**Select SCOS display (DCU Parameters)**	
2	**Run QLA-PERF-DNA-PS**	
3	**With SCOS request bolometer array science packets**	SetDataMode(0x0000) 843C0000 SetStartFrame(0x0001) 843E0001
4	**Set bias frequency to 150.24 Hz** **Set sample rate to 16.69 Hz**	SetPhotoBiasFreq(0x0082) 84190082 SetPhotoSampFreq(0x0008)
5	**Set bias amplitude to 100mV** **Wait 120 sec** **Set bias amplitude to 40mV** **Wait 120 sec** **Set bias amplitude to 160mV** **Wait 120 sec**	SetPhotoBiasAmplLW(0x0064) 841C0064 SetPhotoBiasAmplLW(0x0028) 841C0028 SetPhotoBiasAmplLW(0x00A0) 841C00A0
6	**Set bias frequency to 199.29 Hz** **Set sample rate to 15.33 Hz**	SetPhotoBiasFreq(0x0062) 84190062 SetPhotoSampFreq(0x000C)
7	**Repeat step 5**	
8	**Set bias frequency to 250.40 Hz** **Set sample rate to 15.65 Hz**	SetPhotoBiasFreq(0x004E) 8419004E SetPhotoSampFreq(0x000F)
9	**Repeat step 5**	

DAL-P

Total Time = 66 minutes x 6 + 36 minutes = 7.2 hours

Note it is assumed here that the nominal bias frequency is 200 Hz, this may change following analysis of DNA and DAL.

Step	Action	Command/TM
1	**Select SCOS display (DCU Parameters)**	
2	**Run QLA-PERF-DAL-P**	
3	**With SCOS request bolometer array science packets**	SetDataMode(0x0000) 843C0000 SetStartFrame(0x0001) 843E0001
4	**Set bias frequency to 199.29 Hz** **Set sample rate to 15.33 Hz** **Set bias amplitude to 100mV**	SetPhotoBiasFreq(0x0062) 84190062 SetPhotoSampFreq(0x000C) SetPhotoBiasAmplLW(0x0064) 841C0064
5	**Set cold black body to 10K**	**??**
6	**Put cold black body in the beam with the flip mirror**	**??**
7	**Wait 30 minutes**	
8	**Set bias amplitude to 20mV** **Wait 180 sec** **Set bias amplitude to 40mV** **Wait 180 sec** **Set bias amplitude to 60mV** **Wait 180 sec** **Set bias amplitude to 80mV** **Wait 180 sec** **Set bias amplitude to 100mV** **Wait 180 sec** **Set bias amplitude to 120mV** **Wait 180 sec** **Set bias amplitude to 140mV** **Wait 180 sec** **Set bias amplitude to 160mV** **Wait 180 sec** **Set bias amplitude to 180mV** **Wait 180 sec** **Set bias amplitude to 200mV** **Wait 180 sec** **Set bias amplitude to 220mV** **Wait 180 sec** **Set bias amplitude to 240mV** **Wait 180 sec**	SetPhotoBiasAmplLW(0x0014) 841C0014 SetPhotoBiasAmplLW(0x0028) 841C0028 SetPhotoBiasAmplLW(0x003C) 841C003C SetPhotoBiasAmplLW(0x0050) 841C0050 SetPhotoBiasAmplLW(0x0064) 841C0064 SetPhotoBiasAmplLW(0x0078) 841C0078 SetPhotoBiasAmplLW(0x008C) 841C008C SetPhotoBia sAmplLW(0x00A0) 841C00A0 SetPhotoBiasAmplLW(0x00B4) 841C00B4 SetPhotoBiasAmplLW(0x00C8) 841C00C8 SetPhotoBiasAmplLW(0x00DC) 841C00DC SetPhotoBiasAmplLW(0x00F0) 841C00F0
9	**Set cold black body to 15K**	**??**
10	**Wait 30 minutes**	
11	**Repeat step 8**	See step 8
12	**Repeat steps 9-11 for black body temperatures of 20, 25, 30, 35,**	See steps 9-11

	40K	

CPC-P

Note it is assumed here that the nominal bias frequency is 200 Hz and the nominal bias amplitude is 100 mV, this may change following analysis of DNA and DAL.

Step	Action	Command/TM
1	**Select SCOS display (DCU Parameters)**	
2	**Run QLA-PERF-CPC-P**	
3	**With SCOS request bolometer array science packets**	SetDataMode(0x0000) 843C0000 SetStartFrame(0x0001) 843E0001
4	**Set bias frequency to 199.29 Hz** **Set sample rate to 15.33 Hz** **Set bias amplitude to 100mV**	SetPhotoBiasFreq(0x0062) 84190062 SetPhotoSampFreq(0x000C) SetPhotoBiasAmplLW(0x0064) 841C0064
5	**Check that cold black body is switched off**	
6	**Put cold black body in the beam with the flip mirror**	**??**
7	**Set PCAL bias to 4.5 mA** **Wait 180 sec** **Set PCAL bias to 4.2 mA** **Wait 180 sec** **Set PCAL bias to 4.0 mA** **Wait 180 sec** **Set PCAL bias to 3.8 mA** **Wait 180 sec** **Set PCAL bias to 3.6 mA** **Wait 180 sec** **Set PCAL bias to 3.4 mA** **Wait 180 sec** **Set PCAL bias to 3.2 mA** **Wait 180 sec** **Set PCAL bias to 3.0 mA** **Wait 180 sec** **Set PCAL bias to 2.8 mA** **Wait 180 sec** **Set PCAL bias to 2.6 mA** **Wait 180 sec** **Set PCAL bias to 2.4 mA** **Wait 180 sec** **Set PCAL bias to 2.2 mA** **Wait 180 sec** **Set PCAL bias to 2.0 mA** **Wait 180 sec** **Set PCAL bias to 1.8 mA** **Wait 180 sec**	SetPhCalBias(0x0FFF) A0C80FFF SetPhCalBias(0x0EEE) A0C80EEE SetPhCalBias(0x0E38) A0C80E38 SetPhCalBias(0x0D82) A0C80D82 SetPhCalBias(0x0CCC) A0C80CCC SetPhCalBias(0x0C16) A0C80C16 SetPhCalBias(0x0B60) A0C80B60 SetPhCalBias(0x0AAA) A0C80AAA SetPhCalBias(0x09F4) A0C809F4 SetPhCalBias(0x093E) A0C8093E SetPhCalBias(0x0888) A0C80888 SetPhCalBias(0x07D2) A0C807D2 SetPhCalBias(0x071C) A0C8071C SetPhCalBias(0x0666) A0C80666

	Set PCAL bias to 1.6 mA **Wait 180 sec** **Set PCAL bias to 1.4 mA** **Wait 180 sec** **Set PCAL bias to 1.2 mA** **Wait 180 sec** **Set PCAL bias to 1.0 mA** **Wait 180 sec**	SetPhCalBias(0x05B0) A0C805B0 SetPhCalBias(0x04FA) A0C804FA SetPhCalBias(0x0444) A0C80444 SetPhCalBias(0x038E) A0C8038E

CPT-P

Note it is assumed here that the nominal bias frequency is 200 Hz, this may change following analysis of DNA and DAL.
Also note that the bias pairs may change depending on analysis of CPC.

Step	Action	Command/TM
1	**Select SCOS display (DCU Parameters)**	
2	**Run QLA-PERF-DNA-PS**	
3	**With SCOS request bolometer array science packets**	SetDataMode(0x0000) 843C0000 SetStartFrame(0x0001) 843E0001
4	**Set bias frequency to 199.29 Hz** **Set sample rate to 15.33 Hz** **Set bias amplitude to 100mV**	SetPhotoBiasFreq(0x0062) 84190062 SetPhotoSampFreq(0x000C) SetPhotoBiasAmplLW(0x0064) 841C0064
5	**Check that cold black body is switched off**	
6	**Put cold black body in the beam with the flip mirror**	**??**
7	**Start PCAL chopping between 4.5 and 2.5 mA at 4 Hz** **Set PCAL bias to 4.5 mA** **Wait 0.125 seconds** **Set PCAL bias to 2.5 mA** **Wait 0.125 seconds** **repeat 2400 times (10 minutes)**	SetPhCalBias(0x0FFF) A0C80FFF SetPhCalBias(0x083E) A0C8083E
8	**Repeat 10 minutes each for frequencies of** **2 Hz, wait 0.25 seconds, 1200 times** **1 Hz, wait 0.5 seconds, 600 times** **0.5 Hz, wait 1 second, 300 times** **0.25 Hz, wait 2 seconds, 150 times**	
9	**Repeat steps 7-8 for 4 other TBD pairs of PCAL bias values,** **1-3 mA** **1-4 mA** **1.5-4 mA** **1-2 mA**	 SetPhCalBias(0x038E) A0C8038E SetPhCalBias(0x0AAA) A0C80AAA SetPhCalBias(0x038E) A0C8038E SetPhCalBias(0x0E38) A0C80E38 SetPhCalBias(0x0555) A0C80555 SetPhCalBias(0x0E38) A0C80E38 SetPhCalBias(0x038E) A0C8038E SetPhCalBias(0x071C) A0C8071C

CPT-P Daily Check

Note it is assumed here that the nominal bias frequency is 200 Hz, this may change following analysis of DNA and DAL.

Also note that the bias pairs may change depending on analysis of CPC.

Step	Action	Command/TM
1	**Select SCOS display (DCU Parameters)**	
2	**Run QLA-PERF-DNA-PS**	
3	**With SCOS request bolometer array science packets**	SetDataMode(0x0000) 843C0000 SetStartFrame(0x0001) 843E0001
4	**Set bias frequency to 199.29 Hz** **Set sample rate to 15.33 Hz** **Set bias amplitude to 100mV**	SetPhotoBiasFreq(0x0062) 84190062 SetPhotoSampFreq(0x000C) SetPhotoBiasAmplLW(0x0064) 841C0064
5	**Check that cold black body is switched off**	
6	**Put cold black body in the beam with the flip mirror**	**??**
7	**Start PCAL chopping between 4.5 and 2.5 mA at 4 Hz** **Set PCAL bias to 4.5 mA** **Wait 0.125 seconds** **Set PCAL bias to 2.5 mA** **Wait 0.125 seconds** **repeat 720 times (3 minutes)**	SetPhCalBias(0x0FFF) A0C80FFF SetPhCalBias(0x083E) A0C8083E
8	**Repeat for frequency of 2 Hz, wait 0.25 seconds, 360 times**	
9	**Repeat steps 7-8 for bias values 1-3 mA**	SetPhCalBias(0x038E) A0C8038E SetPhCalBias(0x0AAA) A0C80AAA

PKB-P/OSB-P

Note it is assumed here that the nominal bias frequency is 200 Hz, this may change following analysis of DNA and DAL.

Step	Action	Command/TM
1	Select SCOS display (DCU Parameters)	
2	Run QLA-PERF-OSB-P	
3	With SCOS request bolometer array science packets	SetDataMode(0x0000) 843C0000 SetStartFrame(0x0001) 843E0001
4	Set bias frequency to 199.29 Hz Set sample rate to 15.33 Hz Set bias amplitude to 100mV	SetPhotoBiasFreq(0x0062) 84190062 SetPhotoSampFreq(0x000C) SetPhotoBiasAmplLW(0x0064) 841C0064
5	Check that cold black body is switched off	??
6	Put telescope simulator in the beam with the flip mirror	??
7	Set external chopper to 2Hz	
8	Set the hot black body to 1000^{o}C	
9	Wait for 30 minutes	
10	Set telescope simulator to position beam at nominal centre of central pixel (pixel C5)	
11	Wait for QLA to determine where source is detected	
12	Move source to centre of central pixel	
13	Check QLA to determine if source on central pixel and adjust again if necessary	
14	Move telescope simulator +10 arcseconds in the y direction	
15	Move telescope simulator +10 arcseconds in the z direction	
16	Wait for 2 minutes	
17	Move the telescope simulator -5 arcseconds in the z direction	
18	Wait for 2 minutes	
19	Repeat 16-17 3 times giving 5 points in y offset of +10 arcseconds	
20	Move the telescope simulator -5 arcseconds in y	
21	Raster back to y=+5, z=+10 (see figure 1.)	
22	Repeat for y=0, -5, -10	
23	Repeat for the other co-located	

	pixels (C2,C8,A5,A7,E3,E7,A5,E5)	

DPB-P

Note it is assumed here that the nominal bias frequency is 200 Hz, this may change following analysis of DNA and DAL.

Step	Action	Command/TM
1	**Select SCOS display (DCU Parameters)**	
2	**Run QLA-PERF-OSB-P**	
3	**With SCOS request bolometer array science packets**	SetDataMode(0x0000) 843C0000 SetStartFrame(0x0001) 843E0001
4	**Set bias frequency to 199.29 Hz** **Set sample rate to 15.33 Hz** **Set bias amplitude to 100mV**	SetPhotoBiasFreq(0x0062) 84190062 SetPhotoSampFreq(0x000C) SetPhotoBiasAmplLW(0x0064) 841C0064
5	**Check that cold black body is switched off**	**??**
6	**Put telescope simulator in the beam with the flip mirror**	**??**
7	**Set external chopper to 2Hz**	
8	**Set the hot black body to 1000^{o}C**	
9	**Wait for 30 minutes**	
10	**Set telescope simulator to centre of central pixel (pixel C5)**	
11	**If necessary follow peakup procedure**	
12	**Wait 3 minutes**	
13	**Place polariser in beam and note setting**	
14	**Wait for 5 minutes**	
15	**Move polariser 45 degrees and wait for 5 minutes**	
16	**Move polariser another 45 degrees and wait for 5 minutes**	

DRB-P

Note it is assumed here that the nominal bias frequency is 200 Hz, this may change following analysis of DNA and DAL.

Step	Action	Command/TM
1	**Select SCOS display (DCU Parameters)**	
2	**Run QLA-PERF-OSB-P**	
3	**With SCOS request bolometer array science packets**	SetDataMode(0x0000) 843C0000 SetStartFrame(0x0001) 843E0001
4	**Set bias frequency to 199.29 Hz** **Set sample rate to 15.33 Hz** **Set bias amplitude to 100mV**	SetPhotoBiasFreq(0x0062) 84190062 SetPhotoSampFreq(0x000C) SetPhotoBiasAmplLW(0x0064) 841C0064
5	**Check that cold black body is switched off**	**??**
6	**Put telescope simulator in the beam with the flip mirror**	**??**
7	**Set external chopper to 2Hz**	
8	**Set the hot black body to 1000^{o}C**	
9	**Wait for 30 minutes**	
10	**Set telescope simulator to centre of central pixel (pixel C5)**	
11	**If necessary follow peakup procedure**	
12	**Wait 3 minutes**	
13	**Change external chop frequency to 10 Hz**	
14	**Wait 3 minutes**	
15	**Repeat for chop frequencies of 7, 4, 3, 1, 0.5 Hz**	
16	**Repeat for other co-located pixels including 2Hz setting (C2,C8,A5,A7,E3,E7,A5,E5)**	

DRA-P

Note it is assumed here that the nominal bias frequency is 200 Hz, this may change following analysis of DNA and DAL.

Step	Action	Command/TM
1	**Select SCOS display (DCU Parameters)**	
2	**Run QLA-PERF-OSB-P**	
3	**With SCOS request bolometer array science packets**	SetDataMode(0x0000) 843C0000 SetStartFrame(0x0001) 843E0001
4	**Set bias frequency to 199.29 Hz** **Set sample rate to 15.33 Hz** **Set bias amplitude to 100mV**	SetPhotoBiasFreq(0x0062) 84190062 SetPhotoSampFreq(0x000C) SetPhotoBiasAmplLW(0x0064) 841C0064
5	**Check that cold black body is switched off**	**??**
6	**Put telescope simulator in the beam with the flip mirror**	**??**
7	**Set external chopper to 2Hz**	
8	**Set the hot black body to 1000^{o}C**	
9	**Wait for 30 minutes**	
10	**Set telescope simulator to centre of central pixel**	
11	**If necessary follow peakup procedure**	
12	**Wait 3 minutes**	
13	**Place known attenuation in beam (eg one sheet of paper)**	
14	**Wait 5 minutes**	
15	**Place another attenuator in beam (now two sheets of paper)**	
16	**Wait 5 minutes**	
17	**Repeat until unable to get signal from hot black body**	

DSR

Note it is assumed here that the nominal bias frequency is 200 Hz, this may change following analysis of DNA and DAL.

Step	Action	Command/TM
1	**Select SCOS display (DCU Parameters)**	
2	**Run QLA-PERF-OSB-P**	
3	**With SCOS request bolometer array science packets**	SetDataMode(0x0000) 843C0000 SetStartFrame(0x0001) 843E0001
4	**Set bias frequency to 199.29 Hz** **Set sample rate to 15.33 Hz** **Set bias amplitude to 100mV**	SetPhotoBiasFreq(0x0062) 84190062 SetPhotoSampFreq(0x000C) SetPhotoBiasAmplLW(0x0064) 841C0064
5	**Check that cold black body is switched off**	**??**
6	**Put telescope simulator in the beam with the flip mirror**	**??**
7	**Place the test FTS in the beam**	
8	**Set the hot black body to 1000°C**	
9	**Wait for 30 minutes**	
10	**Set telescope simulator to centre of central pixel**	
11	**If necessary follow peakup procedure**	
12	**Set the test FTS to scan the maximum range (20 cm)** **Set nominal scan speed (1 mm/s)** **Set sampling frequency to 25 µm**	
13	**Scan the test FTS 10 times (35 minutes)**	
14	**Check data with QLA**	
15	**If necessary continue scanning TFTS until a reasonable S/N can be obtained.**	
16	**Repeat for as many pixels as possible, in order, C2,C8,A5,A7,E3,E7,A5,E5**	
17	**Switch off hot black body and wait to cool**	
18	**Repeat FTS scans for each pixel**	