

WBS SFT 2012-03-23 analysis

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Summary

An abbreviated version of the SFT, using laser 1 only, was performed to verify the WBS functionality. Therefore the data analysis was not fully automated. Manual inspection of all parameters showed no deviations from previous behaviour. The WBS-V comb is lower than specified, but still at the same level as before the ICU SEU. The long-term trend of a lowering of the WBS-V efficiency in subband 4 continues and may potentially lead to enhanced noise in the future.

Essential housekeeping parameters

HWH Laser 1= 93.1911127388 mA
HWH Laser 2= 0.0457791613258 mA
HWH Power Laser 1= 32.7504120125 mW
HWH Power Laser 2= 0.173960813038 mW
HWH Temperature= 16.9144845266 °C
HWV Laser 1= 90.4443630593 mA
HWV Laser 2= 0.137337483977 mA
HWV Power Laser 1= 33.2448269548 mW
HWV Power Laser 2= 0.265519135689 mW
HWV Temperature= 17.7507172069 °C

All parameters are in the optimum range. The WbsCheckFt2 script was not able to correctly analyse the latchup test, but manual inspection of the HK values showed the expected behaviour.

Attenuator test

Efficiency

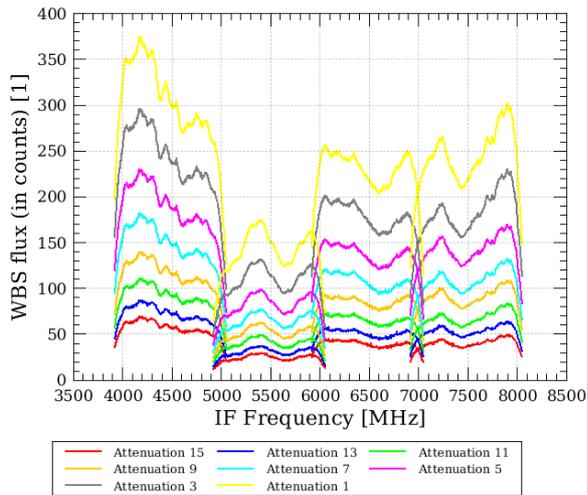


Fig 1: WBS-H

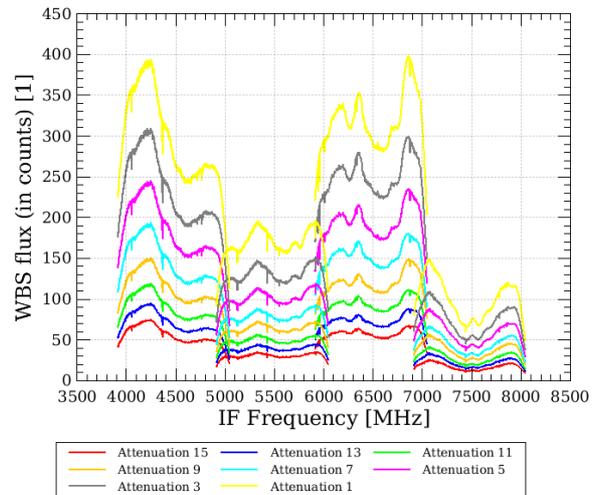


Fig 2: WBS-V

The WBS-H efficiency is slightly lower than in the SFT in January 2010. The small difference can be due to the different temperature. For the WBS-V efficiency, the reduction is more pronounced, with a noticeable effect in subband 4. This may be measurable as a slight increase of the noise. It needs to be discussed whether a change of the operating temperatures could improve the performance again.

Attenuator steps

The measured attenuator steps are almost identical to those measured in WBS SFT 2010-01-13 .

WBS-H main attenuators:

Index	steps	attenuation 1 [dB]	attenuation 2 [dB]	attenuation 3 [dB]	attenuation 4 [dB]
0	0	1.0142943267864...	1.1368489160285...	1.1441169731465...	1.2873759888658...
1	1	2.1124549789749...	2.3542435495943...	2.2733085859421...	2.3609530181735...
2	2	3.1339405890976...	3.4077561301960...	3.3485735621050...	3.5319871534127...
3	3	4.2234369884650...	4.3946953029417...	4.3260201900190...	4.3210988136972...
4	4	5.2198472648365...	5.4648113653625...	5.4827504014988...	5.6020959632342...
5	5	6.3076657801033...	6.6111469191602...	6.5733136114382...	6.6128187886997...
6	6	7.3141798116060...	7.6471722513254...	7.6683517206623...	7.8020899728346...
7	7	8.1970623887168...	8.2865261086284...	8.30749081750339	8.3078063347792...
8	8	9.2189698481300...	9.4162022135622...	9.4868076075605...	9.5385272852691...
9	9	10.310807215061...	10.584550023035...	10.658651185868...	10.644964139387...
10	10	11.340257715851...	11.657344797082...	11.733224941929...	11.793581445611...
11	11	12.408180130158...	12.621831565182...	12.613857745799...	12.662531151995...
12	12	13.405338726415...	13.718118232927...	13.752815678269...	13.921822382152...
13	13	14.4990347566857	14.880985145640...	14.887403288103...	14.929796105953...
14	14	15.504638583523...	15.963230161663...	15.973232850498...	16.124439382837...

WBS-H subband attenuators:

Index	steps	attenuation 1 [dB]	attenuation 2 [dB]	attenuation 3 [dB]	attenuation 4 [dB]
0	0	1.2086133310951...	1.3068371409704...	1.2622106980493...	1.1705589126195...
1	1	2.2747879791949...	1.9981607664620...	2.2059379611169...	2.3726271503258...
2	2	3.3853149837040...	3.2612954879662...	3.3708822912358...	3.4464082076831...
3	3	4.1574228706176...	4.2033841337011...	4.2918621053940...	4.2343030352705...
4	4	5.3054930863507...	5.5231664355455...	5.5214901397784...	5.3910810537942...
5	5	6.3666707417869...	6.2016268359524...	6.4443739503125...	6.5172694668147...
6	6	7.4523535443680...	7.4813737786293...	7.6094981703311...	7.6097025380685...

WBS-V main attenuators:

Index	steps	attenuation 1 [dB]	attenuation 2 [dB]	attenuation 3 [dB]	attenuation 4 [dB]
0	0	1.0692125150806...	1.1645356595310...	1.0797671343530...	1.2726220203184...
1	1	2.0794673230884...	2.2415669031563...	2.1582068092004...	2.2558153352134...
2	2	3.1390081086005...	3.3304548680148...	3.1994839801080...	3.4049162540083...
3	3	4.1720099280303...	4.2709098125226...	4.2468585346498...	4.2166659439109...
4	4	5.2058519716507...	5.3724895926321...	5.3481274705844...	5.5180157572849...
5	5	6.1869263884551...	6.3764331150228...	6.3680803193242...	6.4528819800931...
6	6	7.2220344513678...	7.4488372297878...	7.4399683615803...	7.6289249163457...
7	7	7.8727480092643...	7.8488604876942...	7.8789357219021...	7.9883815426197...
8	8	8.9346030740764...	9.0094785794631...	9.0371875876825...	9.2130162980376...
9	9	9.93652103619793	10.043046233256...	10.140769996308...	10.253177851582...
10	10	10.996806635855...	11.142225683223...	11.203750399743...	11.358227933034...
11	11	11.991156314469...	12.048331405698...	12.078666239732...	12.162600668309...
12	12	13.022387396106...	13.151772251600...	13.195344066552...	13.456153350237...
13	13	13.999712171750...	14.155410550541...	14.233963142459...	14.379579902315...
14	14	15.042822495453...	15.239938133727...	15.2886589289343	15.583781058334...

WBS-V subband attenuators:

Index	steps	attenuation 1 [dB]	attenuation 2 [dB]	attenuation 3 [dB]	attenuation 4 [dB]
0	0	1.2879154324934...	1.1760705354201...	1.0201094502269...	1.2608673183304...
1	1	2.2390502505621...	2.0171547019687...	2.2396432222575...	2.3634515927222...
2	2	3.4182698965343...	3.1684219500882...	3.2219585880241...	3.4930518802296...
3	3	4.1666819659122...	4.0895206527283...	4.2306036393358...	4.2760909610284...
4	4	5.3934198060277...	5.2805262775907...	5.21293461894521	5.50764391758996
5	5	6.3422749133773...	6.1115090061230...	6.4175965640922...	6.5841381938722...
6	6	7.4908619999872...	7.2771947654244...	7.38138395981448	7.72561933468214

Combs

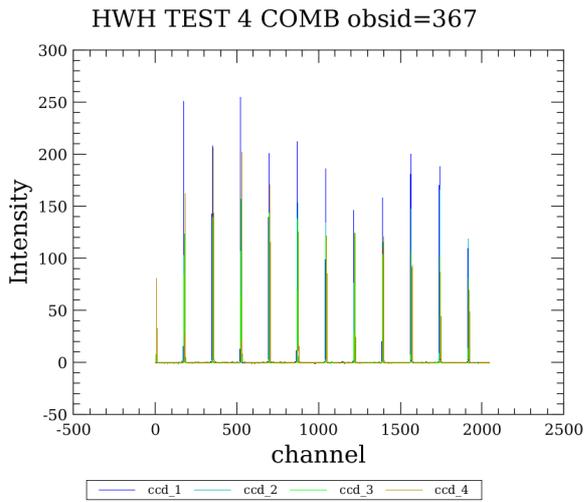


Fig 3: WBS-H

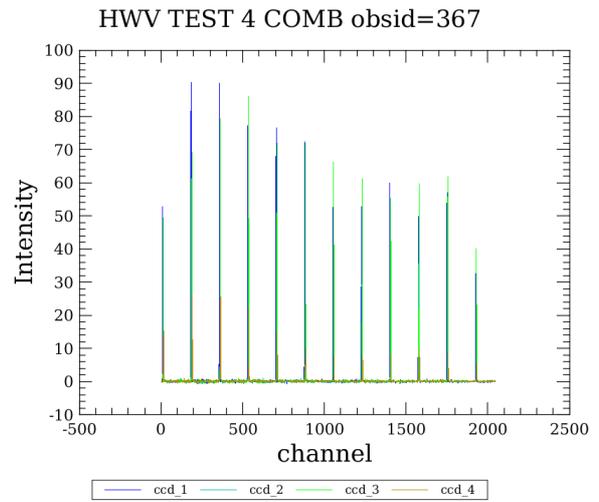


Fig 4: WBS-V

Data Selector		HK Data	Laser OFF	Laser ON
obsid:	367	Comb	Attenuator	
Laser ON: Obsid 367				
HWH:				
lines #:	central_position	pixel_spacing	FWHM	power
CCD 1	1041.7	0.574 +/-0.008 pix/MHz	0.987 +/-0.080 MHz	395.0
CCD 2	1043.8	0.574 +/-0.008 pix/MHz	0.979 +/-0.096 MHz	255.3
CCD 3	1044.3	0.574 +/-0.007 pix/MHz	1.004 +/-0.086 MHz	255.3
CCD 4	1049.2	0.574 +/-0.007 pix/MHz	1.035 +/-0.079 MHz	289.1
HWV:				
lines #:	central_position	pixel_spacing	FWHM	power
CCD 1	1051.8	0.573 +/-0.008 pix/MHz	1.015 +/-0.143 MHz	134.0
CCD 2	1055.5	0.574 +/-0.008 pix/MHz	1.086 +/-0.095 MHz	92.8
CCD 3	1056.1	0.574 +/-0.008 pix/MHz	1.012 +/-0.076 MHz	134.9
CCD 4	1058.4	0.573 +/-0.008 pix/MHz	1.093 +/-0.131 MHz	29.3 min= 13.000

Fig 5: Comb parameters

All comb parameters except for the WBS-V CCD-4 intensity are nominal.

The comb in the WBS-V subband 4 is at a level much lower than specified in agreement with the overall trend of decaying comb intensity over the Herschel mission lifetime. To check whether another step in the decay of the comb line intensities has happened, we compared the last comb before the SEU and the comb from the SFT.

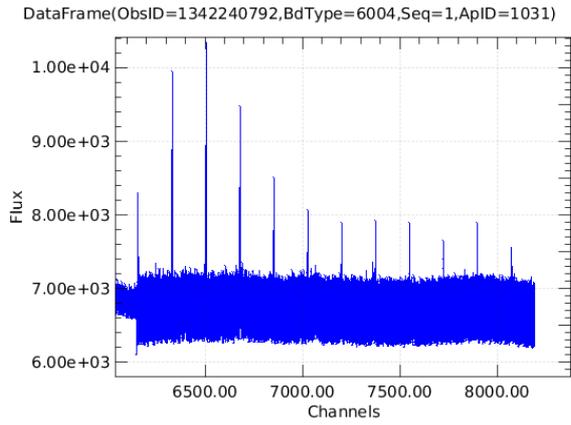


Fig 6: Raw comb data frame from WBS-V sub-band 4 from OD 1029

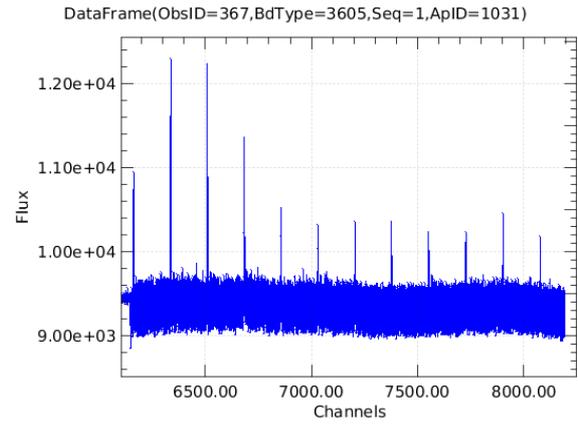


Fig 7: Raw comb data frame from WBS-V sub-band 4 from OD 1045 (SFT)

The two spectra only differ by the dark offset. There is no significant drop in the comb line intensity over the period when HIFI was switched off. The minimum comb line intensity was 6 counts before and after the period.

Frequency scale

Non-linearity of the scale:

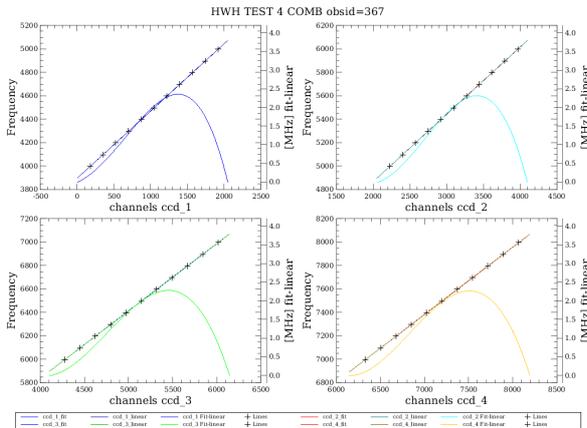


Fig 8: WBS-H

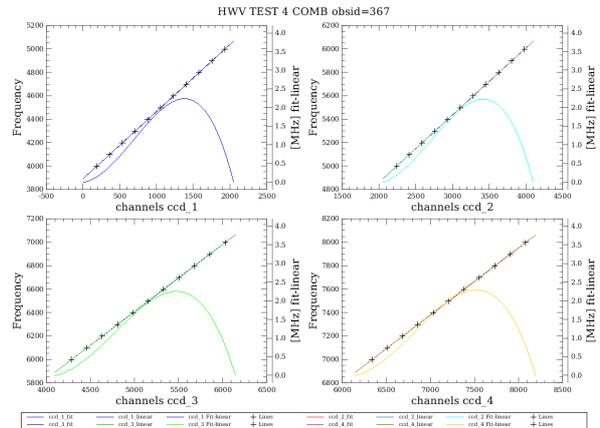


Fig 9: WBS-V

The frequency scales are almost identical to those measured in the January 2010 SFT.