## Update for the degradation function of LYRA Head 2

IED 19 May 2011

This update is based on seven additional calibration campaigns between 13 Dec 2010 and 20 Apr 2011, combining head 2 (nominal unit) and head 3 (back-up unit). It adjusts the former reports
http://solwww.oma.be/users/dammasch/IED_20101203_DegradationFit_Update.pdf
and
http://solwww.oma.be/users/dammasch/IED_20101209_LyraDegradationCorrection.pdf
which were based on campaigns up to 24 Nov 2010. - Please note that the occultation studies stored in Lev1_bca FITS files were not considered for this update.

This update will change the degradation estimation after day #169 (i.e. 23 Jun 2010) and will thus have its influences on chapter 4 of the report
http://solwww.oma.be/users/dammasch/IED_20110226_FirstLightDayCalibration.pdf
It has to be implemented into a new version of the BSDG software within the LYRA pipeline.

The following pages show three figures that result form this update:

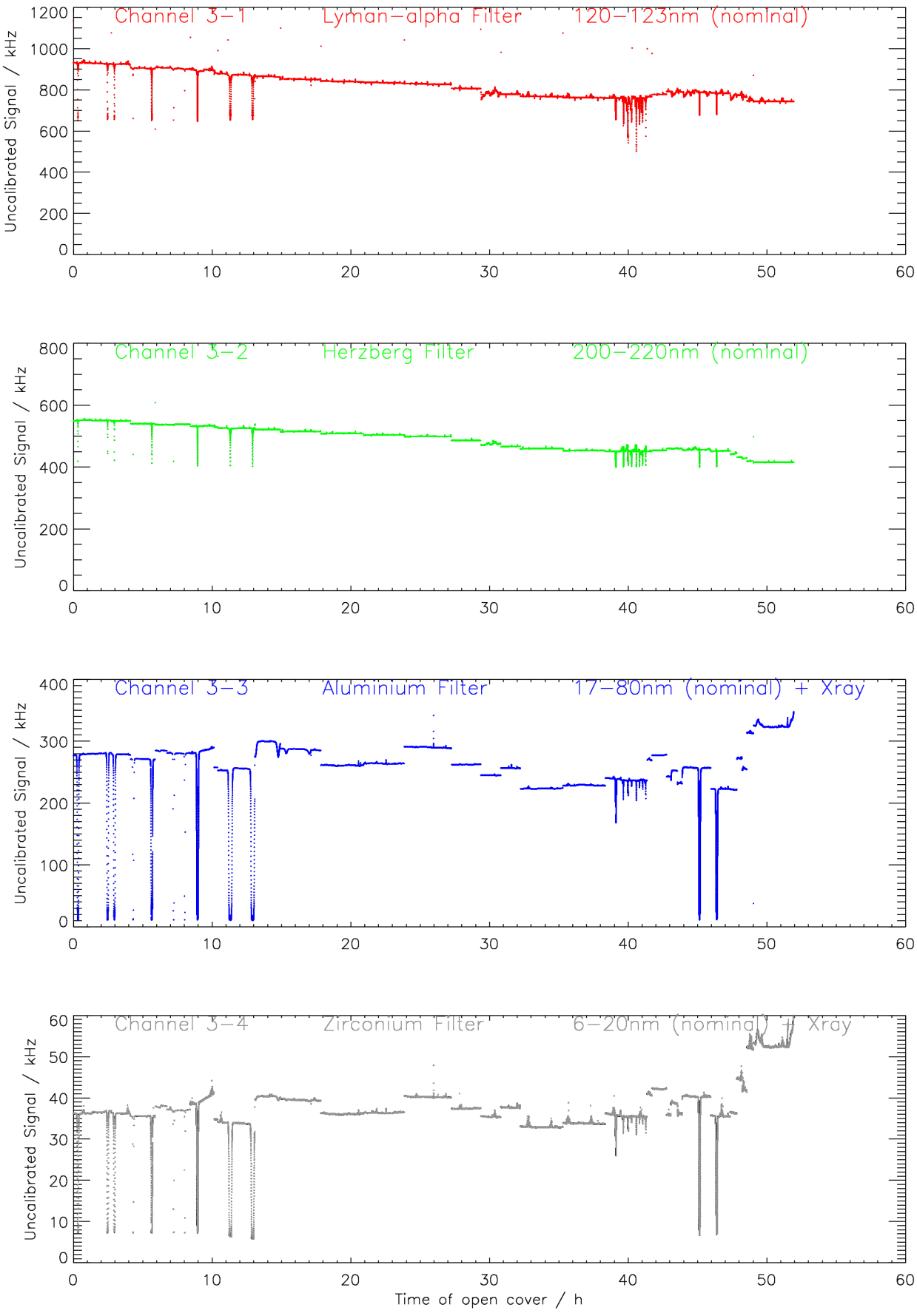
Figure 1 shows the development including the last ten hours (42-52 h) of head 3 exposure with open cover. A slight degradation can be observed in channels 1 and 2. When the solar influence is removed, a slight degradation can also be observed in channel 3, but no apparent degradation in channel 4. Therefore, a normalized channel 3-4 was again used to remove solar influences in order to calibrate head 2.

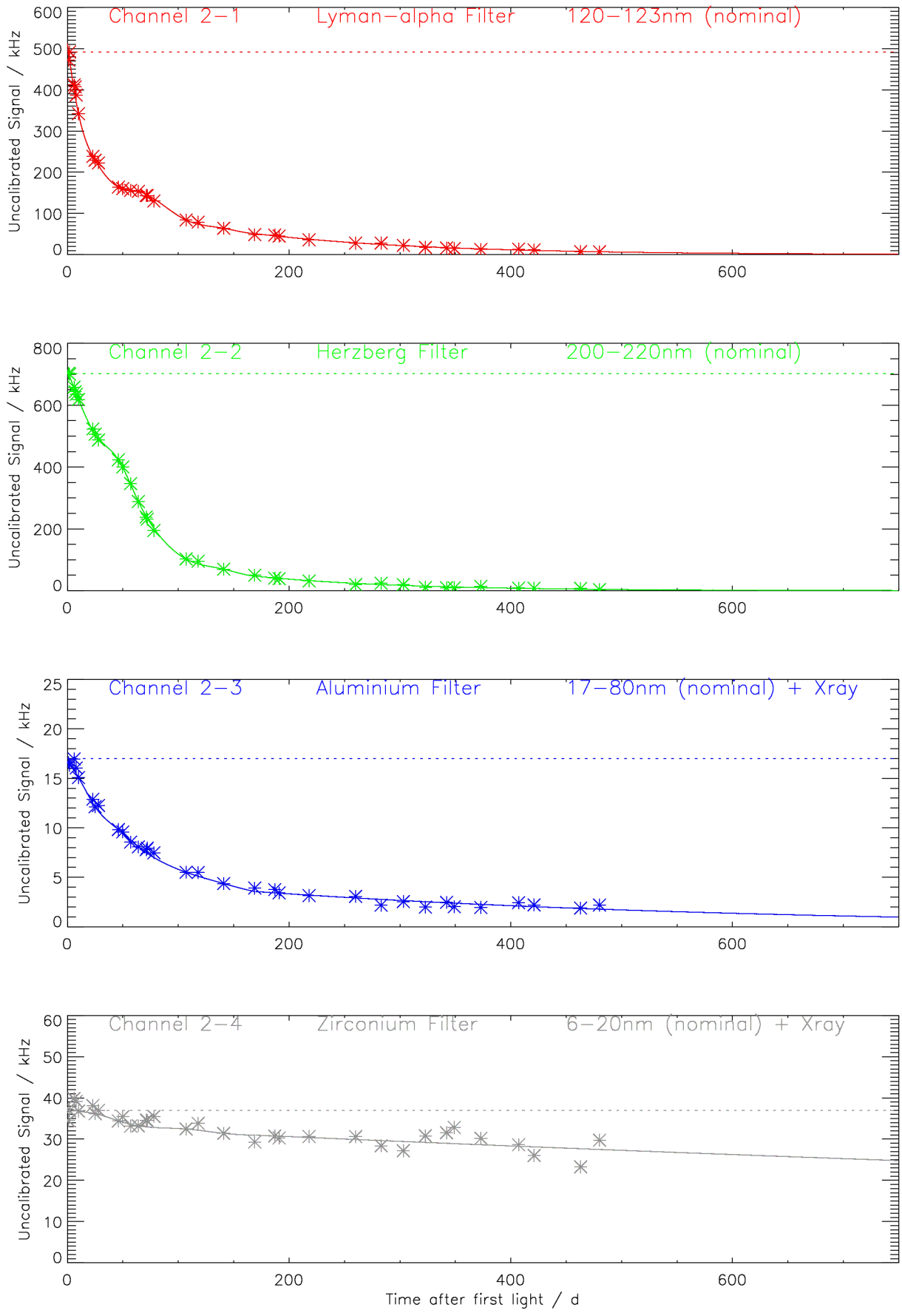
Figure 2 shows the estimated degradation curves of head 2 on the basis of the new results. The techniques are the same as described in the reports above, with the exception that now an exponential fitting exp(a+b*time) is used instead of the earlier approach using 1/(a+b*time). The new approach appears to be more stable. - Since the difference to the earlier estimate is not very obvious, a third graph is included:

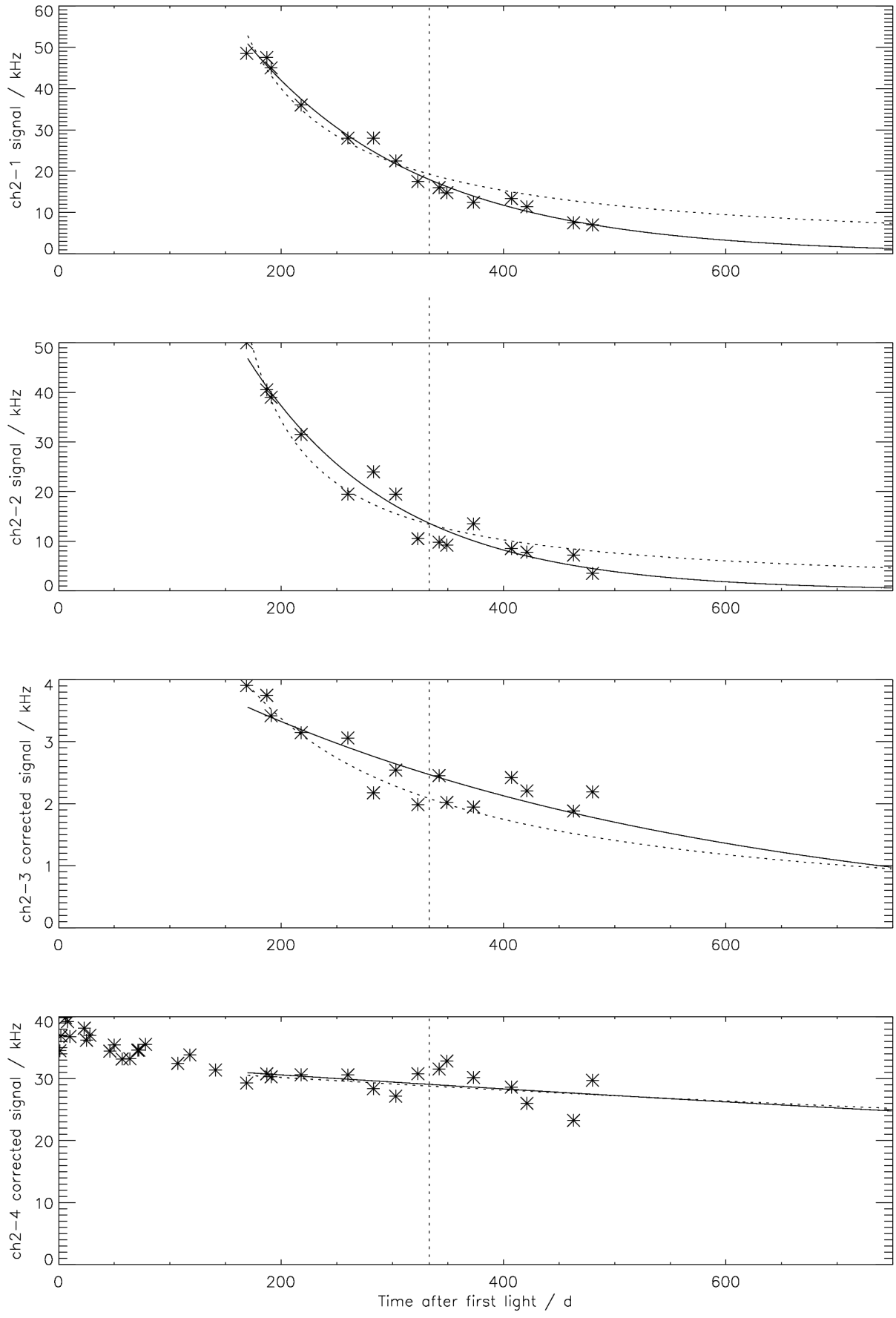
Figure 3 shows the new projection (straight line) versus the old projection (dotted line), which was solely based on data before 24 Nov 2010 (vertical dotted line). The values observed on the campaign days are marked as asterisks. The projections start at day #169 - i.e., earlier estimates remain unchanged - and ends at day #750, or end-2011. One can clearly see that the old projection over-estimated channels 1 and 2. Channel 3 may have been slightly under-estimated, channel 4 remains as estimated before.

To give an example how much difference the new degradation estimate will make on 18 May 2011 (or day #498), 00:00 UTC:
channel 2-1 will be 6.309 instead of 6.242
channel 2-2 will be 697.8 instead of 694.0
channel 2-3 will be 2.333 instead of 2.374
channel 2-4 will be 0.9383 instead of 0.9522
All values in mW/m², compare also:
http://proba2.sidc.be/lyra/data/Level4calibrated/LyraL4C20110518.png
In other words, the resulting differences are between 0.5% and 1.8%.

*This update procedure must be regularly repeated in the future with data from new calibration campaigns in order to estimate plausible degradation curves.*


Channel 3-1 Lyman-alpha Filter 120-123nm (nominal)
Channel 3-2 Herzberg Filter 200-220nm (nominal)
Channel 3-3 Aluminium Filter 17-80nm (nominal) + Xray
Channel 3-4 Zirconium Filter 6-20nm (nominal) + Xray
Uncalibrated Signal / kHz
Time of open cover / h


Channel 2-1
Lyman-alpha Filter
120-123nm (nominal)
Channel 2-2
Herzberg Filter
200-220nm (nominal)
Channel 2-3
Aluminium Filter
17-80nm (nominal) + Xray
Channel 2-4
Zirconium Filter
6-20nm (nominal) + Xray
Uncalibrated Signal / kHz
Time after first light / d


ch2−1 signal / kHz
ch2−2 signal / kHz
ch2−3 corrected signal / kHz
ch2−4 corrected signal / kHz
Time after first light / d
0
200
400
600