NRT M-factor delivery document
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1 Content

This document describes the m–factor dataset, produced by ife/Bremen according to m–factor tech-note [1]. M–factors for the calibration light path (M_CAL), the limb light path (M_DL) and the nadir light path (M_DN) to the science detectors are included. All other m–factors are set to the default value of 1.0, i. e. have no effect. The m–factors are delivered as auxiliary files as defined in the SCIAMACHY IODD [2]. M–factor version is 06.01.

This document describes a delivery within the near real time (NRT) setup of the Envisat ground segment. A delivery is foreseen every 7 days, it contains the calculated data for the past 7 days (including the current day) and an extrapolation for the next 7 days. In nominal case, the extrapolated m–factors will not be used. They are available in case of an early start of the level 1–2 processing or an delay in the m–factor delivery. The current package contains m–factors for:

- Calculated: 14 Apr 2009– 20 Apr 2009

- Prediction: 21 Apr 2009– 27 Apr 2009

Note: If there is no appropriate monitoring measurement for the delivery day available at the time of calculation, also the nominal calculated m–factors may contain predicted values. Especially for M_DN this will be the case, as the corresponding measurement is performed only every 3 days.

2 Delivered files

Table 1 gives the MD5 sums (md5 text mode) [3] and the names of the delivered m-factor files.

Table 2 gives information, how the file content is calculated: Based on actual measurements (*meas.*), an interpolated m–factor (*interp.*) or a predicted, i. e. extrapolated m–factor value (*pred.*) for three light paths.

Table 1: MD5 sum and filename of the delivered m-factor files.

md5-sum	m-factor auxiliary file
bab91984ce37357bc6106e1da75f6d5b	SCI_MF1_AXNIFE20090420_215442_20090414_191703_20090416_191703
e2cd8d2f05dca982ced41af3016c505d	SCI_MF1_AXNIFE20090420_215442_20090415_184526_20090417_184526
493fd828bd1aa1f32f3fca331a1def8e	SCI_MF1_AXNIFE20090420_215442_20090416_181349_20090418_181349
8a144f86e1de9de86b072e7728102280	SCI_MF1_AXNIFE20090420_215442_20090417_192248_20090419_192248
d9b5db733c17108a80bb6f8b83df8f5b	SCI_MF1_AXNIFE20090420_215442_20090418_185111_20090420_185111
8905a5fa87f10c4510a46fd763399e18	SCI_MF1_AXNIFE20090420_215442_20090419_181934_20090421_181934
78a2eb33f31b1a0c850e47817cf53f86	SCI_MF1_AXNIFE20090420_215442_20090420_192833_20090422_192833
541e6baeb3778727949239523c52fde4	SCI_MF1_AXNIFE20090420_215442_20090421_185656_20090423_185656
9a9e64059e1f550637ace31ba7b34124	SCI_MF1_AXNIFE20090420_215442_20090422_182519_20090424_182519
0378535504173ed81e98a77e7fc1432a	SCI_MF1_AXNIFE20090420_215442_20090423_193418_20090425_193418
b976bf82c6453faf7cee128d5732a125	SCI_MF1_AXNIFE20090420_215442_20090424_190241_20090426_190241
e3a15206a7e21e802d8d1664ff7240cd	SCI_MF1_AXNIFE20090420_215442_20090425_183104_20090427_183104
715f69e92a63a622fef06f595d321af2	SCI_MF1_AXNIFE20090420_215442_20090426_194003_20090428_194003
f45d35a32c327046d39a3d92f30e112e	SCI_MF1_AXNIFE20090420_215442_20090427_190826_20090525_190826

Table 2: Source information for the individual m–factors of the delivery set.

validity identifier	M_CAL	M_DL	M_DN
20090414_191703_20090416_191703	meas.	meas.	interp.
20090415_184526_20090417_184526	meas.	meas.	meas.
20090416_181349_20090418_181349	meas.	meas.	interp.
20090417_192248_20090419_192248	meas.	meas.	interp.
20090418_185111_20090420_185111	meas.	meas.	interp.
20090419_181934_20090421_181934	meas.	meas.	meas.
20090420_192833_20090422_192833	pred.	pred.	pred.
20090421_185656_20090423_185656	pred.	pred.	pred.
20090422_182519_20090424_182519	pred.	pred.	pred.
20090423_193418_20090425_193418	pred.	pred.	pred.
20090424_190241_20090426_190241	pred.	pred.	pred.
20090425_183104_20090427_183104	pred.	pred.	pred.
20090426_194003_20090428_194003	pred.	pred.	pred.
20090427_190826_20090525_190826	pred.	pred.	pred.

3 Content check

M–factors describe the degradation of the instrument and are used to compensate for it in the radiometric calibration. Fast changes with time are not expected, i.e. the ratio $M_{ratio,t}$ of m–factors M_t this delivery to the m–factor M_{t_0} of the previous delivery day should be close to 1. The ratio $M_{ratio,t}$ and its reciprocal value should not exceed a

Table 3: Detector pixels used for the calculations described in this document. SCIA-MACHY has 8 channels with 1024 pixels per channel. The pixel range is given as the first and last pixel in each channel. For channel 2, the pixel number is given in wavelength order, i.e. the pixel numbers are already reversed.

channel	1	2	3	4	5	6	7	8
pixel	197	1140	2131	3117	4151	5226	6154	7178
range	784	1859	2943	3925	4863	5914	7157	8181

Table 4: Content check results.

	max. ratio (ch. 6/7: median)			mean ratio				
	M_CAL	M_DL	M_DN	M_CAL	M_DL	M_DN	limit	status
1	1.0035	1.0189	1.0339	1.0004	1.0071	1.0117	1.0400	OK
2	1.0024	1.0086	1.0137	1.0007	1.0032	1.0050	1.0200	OK
3	1.0008	1.0027	1.0051	1.0002	1.0008	1.0017	1.0100	OK
4	1.0010	1.0011	1.0023	1.0001	1.0002	1.0011	1.0100	OK
5	1.0019	1.0027	1.0011	0.9994	0.9995	1.0003	1.0120	OK
6	1.0023	1.0021	1.0014	1.0001	0.9998	0.9999	1.0100	OK
7	1.0017	1.0014	1.0002	–	–	–	1.0070	OK
8	1.0092	1.0076	1.0083	–	–	–	1.0120	OK

certain limit l:

$$M_{ratio,t} = \frac{M_t}{M_{t_0}} \qquad \text{with} \quad M_{ratio,i} < l \qquad \text{and} \quad \frac{1}{M_{ratio,i}} < l \qquad (1)$$

This limit is defined for each channel. The limits are derived from a time-series of deliveries simulated for 2007 [1]. For channel 1 to 6, each individual pixel for each dataset has to meet the criteria. Channel 7 and 8 are the infrared detectors with a varying number of bad or dead pixels with unpredictable behavior. A criterion for each pixel is not applicable, therefore a median over the channel is used as $M_{ratio,t}$ and has to meet the criteria. Blind pixels, the overlap regions and channel 6+ are excluded from the calculations, see table 3.

The previous delivery day t_0 is 13 Apr 2009, therefore M_{t_0} is taken from the m–factor file SCI_MF1_AXNIFE20090413_215451_20090413_194840_20090415_194840 .

Table 4 summarizes the results for this delivery. Also the settings for the limit are given. For information only, also the mean ratio is given. *OK* in the last column means, that the criteria is fulfilled for the channel.

This delivery is within all limits and can be used.

4 Visualization of content check

Figure 1 shows the ratio $M_{ratio,t}$ for all delivered m–factors for each channel. The grey boxes visualize the maximum ratio allowed.

References

[1] Bramstedt, K, Calculation of SCIAMACHY M-Factors, *Technical note*, IFE-SCIA-TN-2007-01-CalcMFactor, Issue 1, ife Bremen, 2008.

[2] Balzer, W, and Slijkhus, S, *Technical document*, SCIAMACHY Level 0 to 1b Processing Input / Output Data Definition, ENV-TN-DLR-SCIA-0005, Issue 5, DLR Oberpfaffenhofen, 2000.

[3] RFC 1321 - The MD5 Message-Digest Algorithm, *Internet RFC/STD/FYI/BCP Archives*, 1992
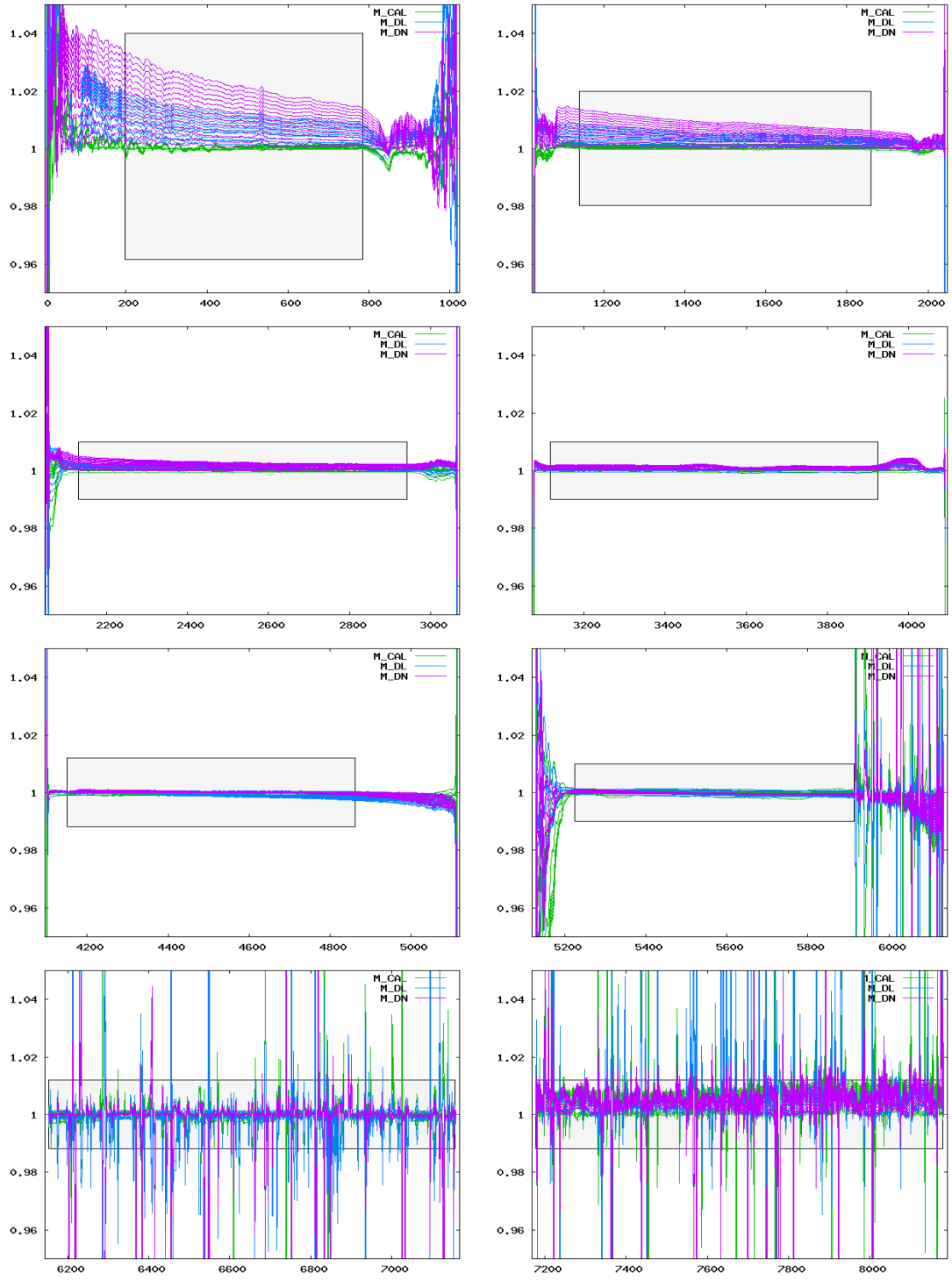
Figure 1: Ratio of delivered m-factors (14 Apr 2009– 27 Apr 2009) to the corresponding m-factor of the previous delivery day (13 Apr 2009). The grey boxes visualize the maximum ratio allowed.