NRT M-factor delivery document 02 Mar 2009

Klaus Bramstedt, ife Bremen

 $02 \ \mathrm{Mar} \ 2009$

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: 24 Feb 2009– 02 Mar 2009
- Prediction: 03 Mar 2009–09 Mar 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.

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

validity identifier	M_CAL	M_DL	M_DN
20090224_181642_20090226_181642	meas.	meas.	interp.
20090225_192541_20090227_192541	meas.	meas.	interp.
20090226_185404_20090228_185404	meas.	meas.	interp.
20090227_182227_20090301_182227	meas.	meas.	meas.
20090228_193126_20090302_193126	meas.	meas.	pred.
20090301_185949_20090303_185949	meas.	meas.	pred.
20090302_182812_20090304_182812	pred.	pred.	pred.
20090303_193711_20090305_193711	pred.	pred.	pred.
20090304_190534_20090306_190534	pred.	pred.	pred.
20090305_183357_20090307_183357	pred.	pred.	pred.
20090306_194256_20090308_194256	pred.	pred.	pred.
20090307_191118_20090309_191118	pred.	pred.	pred.
20090308_183941_20090310_183941	pred.	pred.	pred.
20090309_194840_20090406_194840	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 range	197 784	$\begin{array}{c} 1140 \\ 1859 \end{array}$	$2131 \\ 2943$	$3117 \\ 3925$	$\begin{array}{c} 4151 \\ 4863 \end{array}$	$5226 \\ 5914$	$6154 \\ 7157$	7178 8181

Table 4: Content check results.								
	max. rat	io (ch. 6/	7: median)	mean ratio				
	$M_{-}CAL$	$M_{-}DL$	M_DN	$M_{-}CAL$	$M_{-}DL$	M_DN	limit	status
1	1.0252	1.0362	1.0313	1.0014	1.0064	1.0101	1.0400	OK
2	1.0049	1.0110	1.0124	1.0015	1.0036	1.0048	1.0200	OK
3	1.0042	1.0045	1.0032	1.0001	1.0006	1.0007	1.0100	OK
4	1.0006	1.0009	1.0006	1.0001	1.0003	0.9998	1.0100	OK
5	1.0014	1.0020	1.0014	1.0000	1.0001	0.9997	1.0120	OK
6	1.0009	1.0017	1.0014	0.9998	1.0002	0.9998	1.0100	OK
$\overline{7}$	1.0014	1.0006	1.0008	_	_	_	1.0070	OK
8	1.0187	1.0204	1.0190	_	_	_	1.0120	Not OK

certain limit l:

$$M_{ratio,t} = \frac{M_t}{M_{t_0}}$$
 with $M_{ratio,i} < l$ and $\frac{1}{M_{ratio,i}} < l$ (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 23 Feb 2009, therefore M_{t_0} is taken from the m-factor file SCI_MF1_AXNIFE20090223_225529_20090223_184819_20090225_184819_.

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 exceeds the limits. Additional checks are necessary.

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

- 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 (24 Feb 2009– 09 Mar 2009) to the corresponding m-factor of the previous delivery day (23 Feb 2009). The grey boxes visualize the maximum ratio allowed.