# NRT M-factor delivery document 05 Jan 2009

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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: 30 Dec 2008– 05 Jan 2009
- Prediction: 06 Jan 2009–12 Jan 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			
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551e2cfb5fd7b57d88ba1ff2a9696d54	SCI_MF1_AXNIFE20090123_095301_20081230_191704_20090101_191704			
9031b98cd7885a621ac47a8991e9166d	SCI_MF1_AXNIFE20090123_095301_20081231_184527_20090102_184527			
71acb9a4e1dfb19771b25d4daa99bc84	SCI_MF1_AXNIFE20090123_095301_20090101_181350_20090103_181350			
57ca4b520e127ae157d2345368c706aa	SCI_MF1_AXNIFE20090123_095301_20090103_185111_20090105_185111			
3f1103f1b93f642e3adc8e50e77e134b	SCI_MF1_AXNIFE20090123_095301_20090104_181934_20090106_181934			
3f815d1270119148bf97856831f57d9f	SCI_MF1_AXNIFE20090123_095301_20090105_192833_20090107_192833			
b2d903a7b162acb761eaa1ec32754eaf	SCI_MF1_AXNIFE20090123_095301_20090106_185656_20090108_185656			
8391123b6583763ea3a21b2c6236f1f8	SCI_MF1_AXNIFE20090123_095301_20090107_182519_20090109_182519			
f7b28146ee2c4bc58e85648590d16f90	SCI_MF1_AXNIFE20090123_095301_20090107_182519_20090109_182519			
e74a46168aaf10245cafb64fbb0f6fd8	SCI_MF1_AXNIFE20090123_095301_20090108_193418_20090110_193418			
a3947a7e778e8f8556b2975411443a08	SCI_MF1_AXNIFE20090123_095301_20090109_190241_20090111_190241			
6e19b9c2d06b5682938087cc4ed92ac3	SCI_MF1_AXNIFE20090123_095301_20090110_183104_20090112_183104			
e15087300780145ae865196db1aa2c20	SCI_MF1_AXNIFE20090123_095301_20090111_194003_20090113_194003			
7d9a4893449d6ce252fb657d903dc76d	SCI_MF1_AXNIFE20090123_095301_20090112_190826_20090209_190826			

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

validity identifier	M_CAL	$M_{-}DL$	M_DN
20081230_191704_20090101_191704	pred.	pred.	pred.
20081231_184527_20090102_184527	pred.	pred.	pred.
20090101_181350_20090103_181350	pred.	pred.	pred.
20090102_192248_20090104_192248	pred.	pred.	pred.
20090103_185111_20090105_185111	pred.	pred.	pred.
20090104_181934_20090106_181934	pred.	pred.	pred.
20090105_192833_20090107_192833	pred.	pred.	pred.
20090106_185656_20090108_185656	pred.	pred.	pred.
20090107_182519_20090109_182519	pred.	pred.	pred.
20090108_193418_20090110_193418	pred.	pred.	pred.
20090109_190241_20090111_190241	pred.	pred.	pred.
20090110_183104_20090112_183104	pred.	pred.	pred.
20090111_194003_20090113_194003	pred.	pred.	pred.
20090112_190826_20090209_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 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. ratio (ch. $6/7$ : median)			mean ratio					
	$M_{-}CAL$	M_DL	M_DN	$M_{-}CAL$	$M_{-}DL$	$M_{-}DN$	limit	status	
1	1.1836	1.2949	1.1475	1.0188	1.0226	1.0105	1.0400	Not OK	
2	1.1237	1.1673	1.1419	1.0261	1.0285	1.0213	1.0200	Not OK	
3	1.1293	1.1567	1.1371	0.9911	0.9923	0.9941	1.0100	Not OK	
4	1.1159	1.1168	1.1100	1.0208	1.0219	1.0145	1.0100	Not OK	
5	1.6512	1.6485	1.6146	1.1821	1.1803	1.1209	1.0120	Not OK	
6	1.1135	1.0926	1.0721	1.0122	1.0154	1.0163	1.0100	Not OK	
$\overline{7}$	1.0000	1.0000	1.0000	_	_	_	1.0070	Not OK	
8	1.0000	1.0000	1.0000	_	_	_	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 29 Dec 2008, therefore  $M_{t_0}$  is taken from the m-factor file SCI\_MF1\_AXNIFE20090123\_095143\_20081229\_194841\_20081231\_194841\_.

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 (30 Dec 2008– 12 Jan 2009) to the corresponding m-factor of the previous delivery day (29 Dec 2008). The grey boxes visualize the maximum ratio allowed.