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Title : **GOCE L1b Data Quality Control Report April 2011**

Author : **GOCE Quality Control Team**

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DOCUMENT CHANGE RECORD

Issue	Date	Reason for Change	Changed Pages/Paragraphs
1.0	07/07/2011	First issue	

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1. INTRODUCTION

1.1 Purpose and Scope

This document contains the Quality report for GOCE L1b data for April 2011.

The latest version of this document is available on the GOCE Data Quality portal at:

http://earth.esa.int/GOCE/ → "Level 1b QC" → "Monthly"

The GOCE Data Quality portal is the principal source for any quality-related information on GOCE products.

http://earth.esa.int/GOCE/ → "Level 1b QC".

1.2 Glossary

The following acronyms and abbreviations have been used in this report.

ABBREVIATION	MEANING
EGG	Electrostatic Gravity Gradiometer
DFACS	Drag Free and Attitude control system
SST-I	Satellite-to-satellite tracking instrument
CTR	Control Voltages
STR	Star Tracker
Trace SD	Trace Spectral Density
ICM	Inverse Calibration Matrix
GAR	Gradiometer Angular Rates
FPM	Fine Pointing Mode

2. APRIL 2011 OVERVIEW

- Anomalous oscillation found in Uyy component of the gravity gradients tensor at UTC 01/04/2011 03:44:46 with impacts on trace.
- Beam Out event at UTC 03/04/2011 00:49:11.
- Beam Out event at UTC 07/04/2011 02:24:49.
- Beam Out event at UTC 25/04/2011 08:22:03.
- Anomaly in gradients and CTR data with impacts on trace at UTC 10/04/2011 02:28:30.
- Performance worsening in the lower part of the measurement bandwidth during the 2nd to 14th April time period and during the 29th to 31st April time period.
- Instrument Calibration operations were performed on April 04th. EGG data are not produced during Calibration Operations. Apr 04th and 05th data are affected by these operations.

2.1 Instruments Quality summary tables

Apr	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

Table 1 April 2011 EGG QC Status

Apr	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

Table 2 April 2011 SST QC Status

- GAP (details within Monthly Report)
- NOT USABLE
- Special Event
- Nominal
- Calibration
- EGG in Acquisition Mode
- Not yet released

3. APRIL 2011 DATA QUALITY ANALYSIS

3.1 Anomalous oscillation in Uyy component on 1st of April

The Gravity gradients trace spectral density is not nominal, during the 1st of April reference period. Trace SD is reported in Figure 1, below.

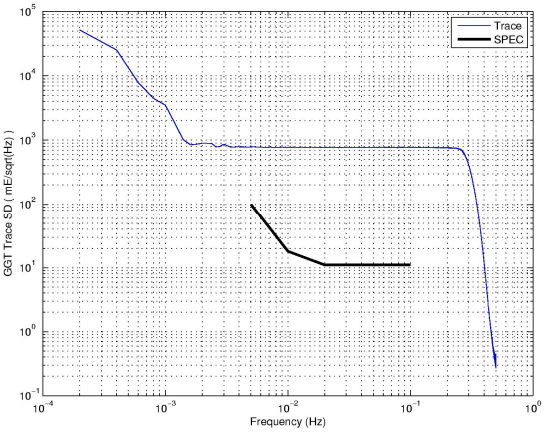

Figure 1 Current trace PSD.

The non nominal behavior of the trace SD during the reference period is due to an anomalous oscillation (of magnitude 1.26e-1 1/s2) found in Uyy component at UTC 01/04 03:44:46, as reported below:

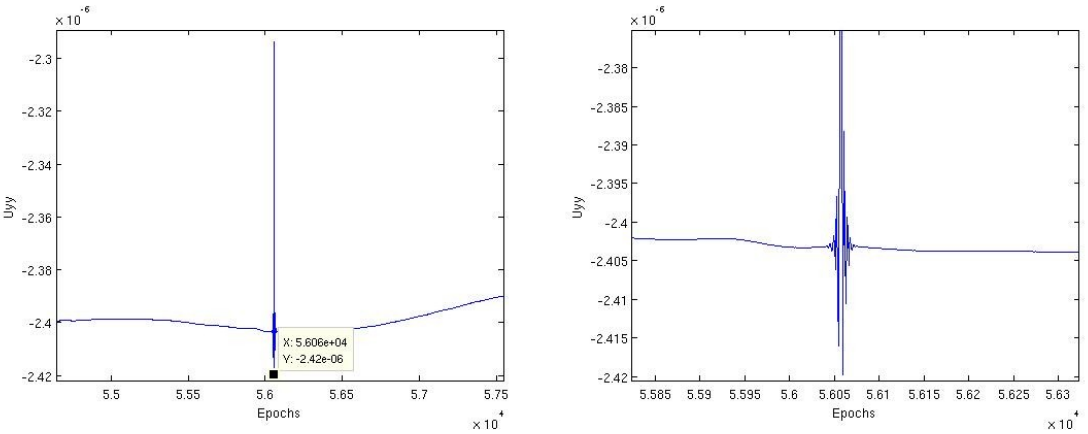

Figure 2 Uyy oscillation (left) and its first derivative (right)

The same oscillation is present in the following CTR components:

- A1: X1-4, Z1-2
- A2: Y1-2, Z1,2
- A3: X1-4, Y1-2
- A4: X1-4, Z1-2
- A5: Y1-2, Z1-2
- A6: X1-4, Y1-2

Below an example of oscillation found in A2 Y2 component and in DM 25_Y:

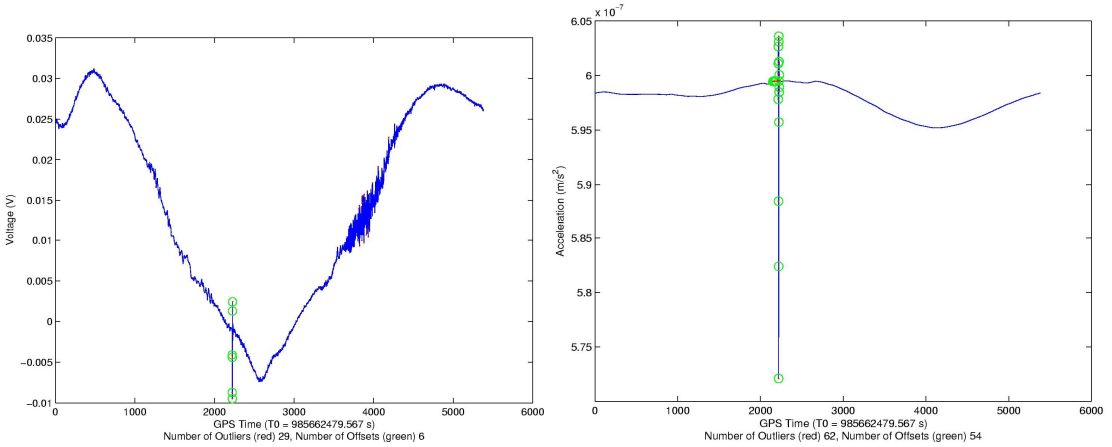

Figure 3 A2 Y2 CTR component (left) and DM acceleration 25_Y (right)

The same oscillation is present in the L0 CTR datasets as well, as reported below:

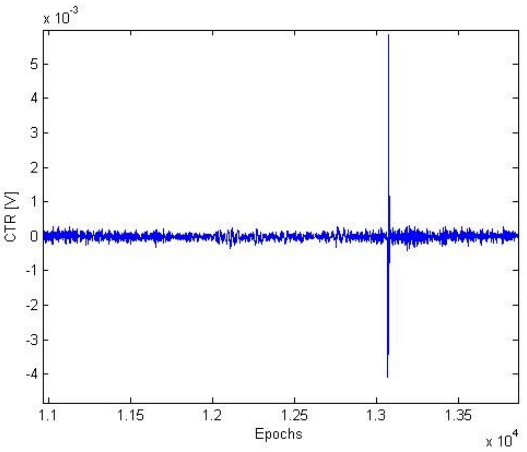

Figure 4 L0 CTR A2 Y2 component

The oscillation could be related to the performed Thermal mode changing to CALIBRATION in order to support the upcoming shaking calibration.

3.2 CTR anomaly on 10th of April

The Gravity gradients trace spectral density is not nominal, during the 10th of April reference period. Trace SD is reported in Figure 5, below.

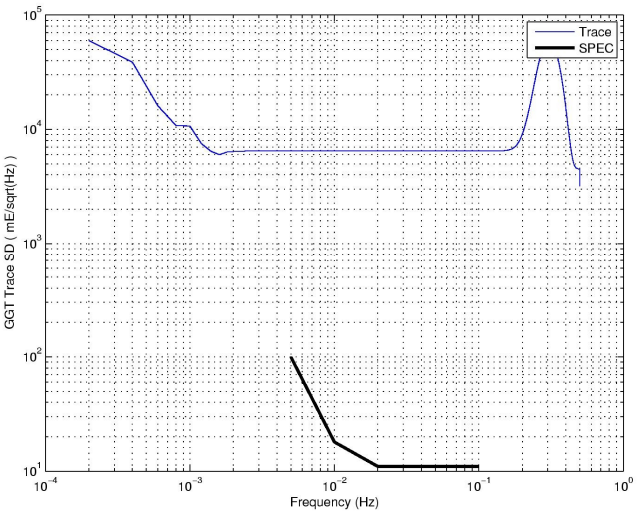

Figure 5 Current trace PSD

An anomaly in gradients data has been found at UTC 10/04 02:28:30 which is the cause of the non nominal trace:

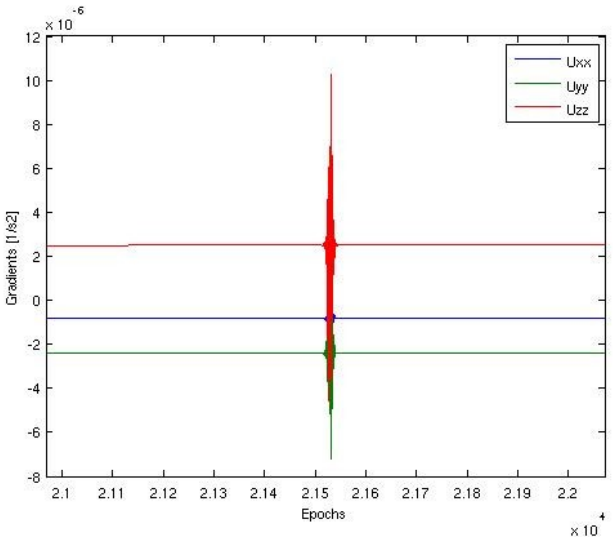

Figure 6 Anomaly in the diagonal component of the gravity gradients tensor

The same anomaly affects also all the CTR components of all the six accelerometers. The trace PSD not considering the anomalous oscillation is reported below and shows a nominal behaviour.

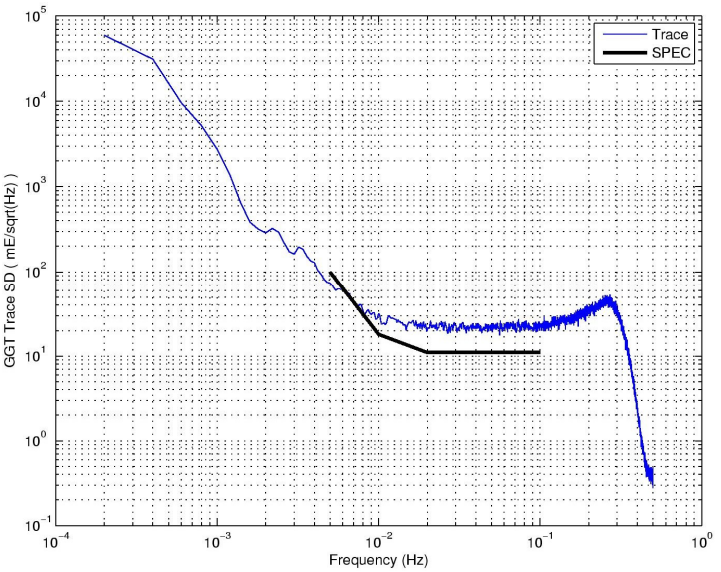

Figure 7 Trace PSD not considering the anomalous event on 10/04

3.3 Performance worsening

A worsening of the performance in the lower part of the measurement bandwidth occurred on April 2011 during the 2nd to 14th and during the 29th to 31st time periods which is evident in the computed trace PSD as reported below (the 2nd of April is taken here as an example):

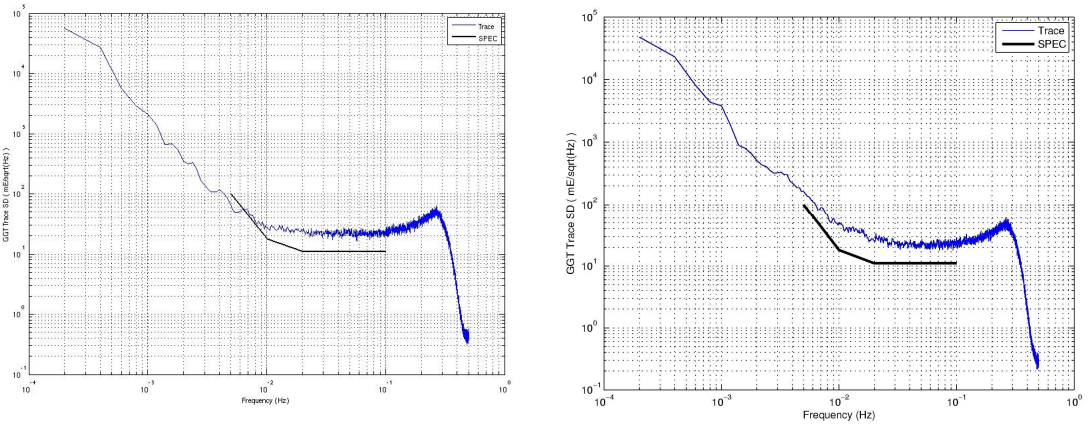

Figure 8 Trace PSD computed on 29th of March (left) and on 2nd of April (right)

These periods are characterized also by an increase of the CM signals which is evident by looking at the PSD:

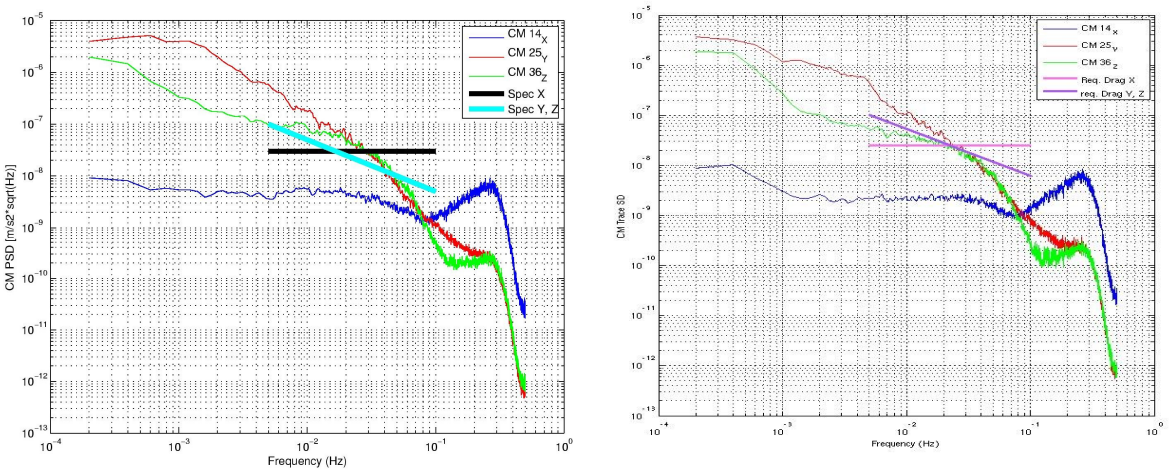

Figure 9 CM PSD for 2nd April reference period (left) and 29th March reference period (right)

The CM PSDs show that during the reference period the 14_X component increases from 1e-9 m/s2*sqrt(Hz) which is the value in a nominal scenario, to 4e-9 m/s2*sqrt(Hz) but anyway below requirements. The components 25_Y and 36_Z are both above the requirements.

The worsening could be related to periods with more severe environmental conditions. Such periods are characterized by a higher drag (mean & peak-to-peak variations).

3.4 Instrument Calibration

Special Spacecraft Operations for Instrument Calibration were performed on 04th April 2011, from

- 20110404T 072349

to

- 20110405T 071928

EGG_NOM_1b data are unavailable during this period, i.e. between products:

- GO_CONS_EGG_NOM_1b_20110404T072349_20110404T085333_0001

and

- GO_CONS_EGG_NOM_1b_20110405T071928_20110405T084912_0001

An expected Kalman filter reinitialization affects the data starting from product GO_CONS_EGG_NOM_1b_20110405T071928_20110405T084912_0001 due to the gap in the EGG production. Nominal data behavior starts from the successive product.

3.5 Beam Out events

Three Beam Out events occurred at the following UTC time during April 2011 reference frame:

EVENT NUMBER	UTC TIME
1	2011-04-03T00:49:11
2	2011-04-07T02:24:49
3	2011-04-25T08:22:03

Table 3 Beam out event

Below, the effects of the Beam Out in the common mode acceleration, component 14_x, are displayed, for the five events.

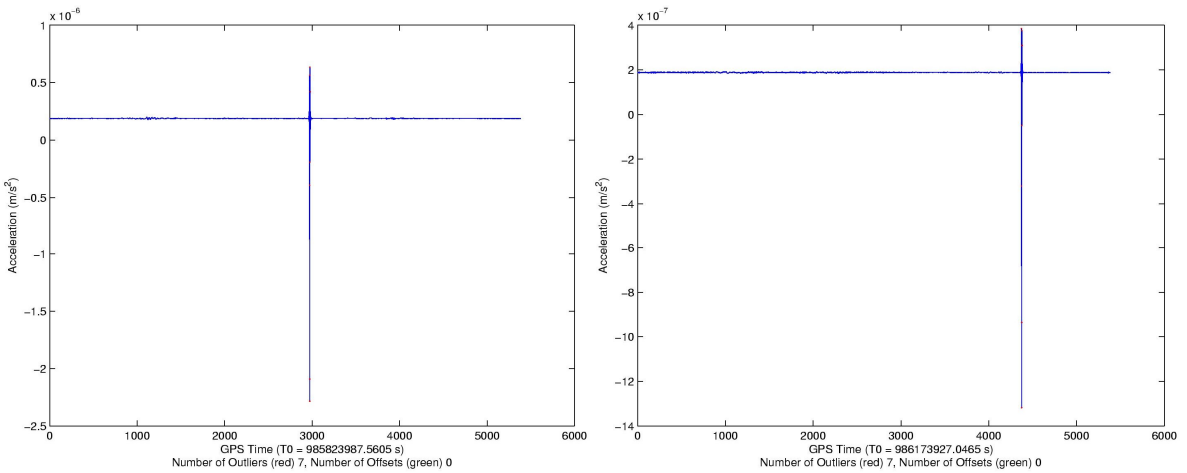

Figure 10 Beam Out event on 3rd of April (left) and on 7th of April (right)

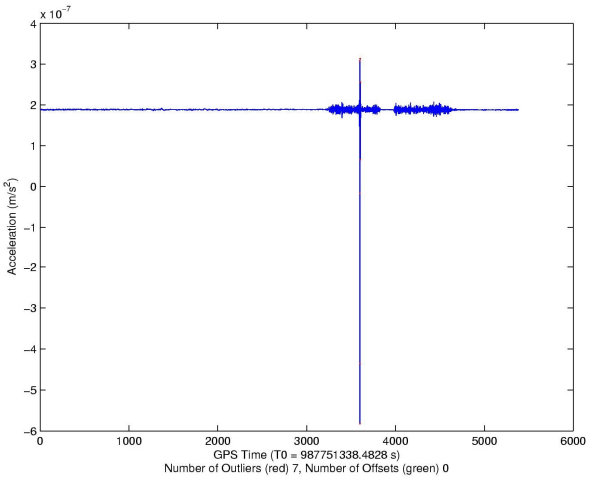

Figure 11 Beam Out event on 25th of April

This oscillation enters the gradients time series notably in the Uxx component.

This effect may be seen in the Gradients PSD graphs below:

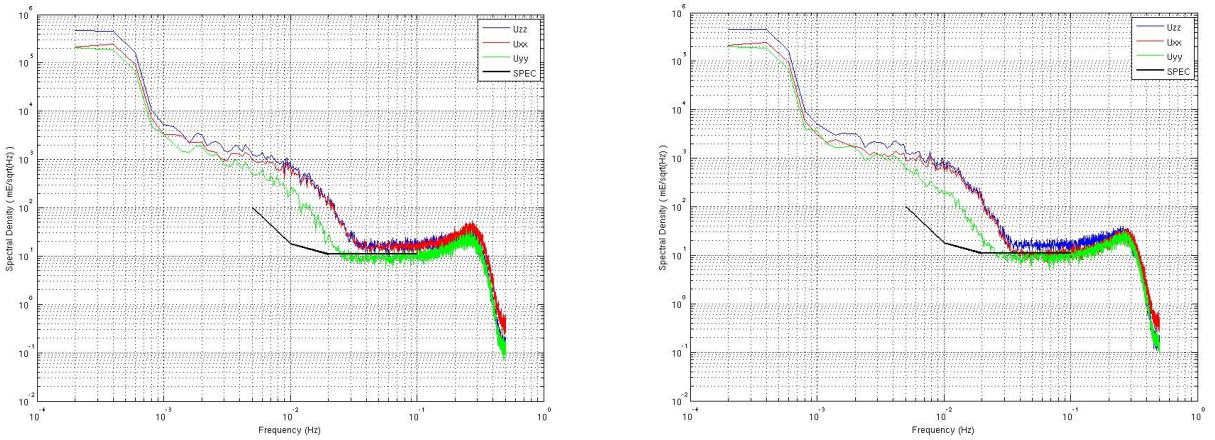

Figure 12 Gradients PSD considering the Beam Out event of 03rd of April (left), gradients PSD not considering the Beam Out event of 03rd of April (right)

Uxx (red in the plots) has a higher value in the PSD above, when the beam-out is included (only the trace and gradients PSD for 03rd of April are reported, plots for the other Beam Out events of February show similar behavior).

No relevant differences in terms of trace PSD are recognized, as reported in figure below:

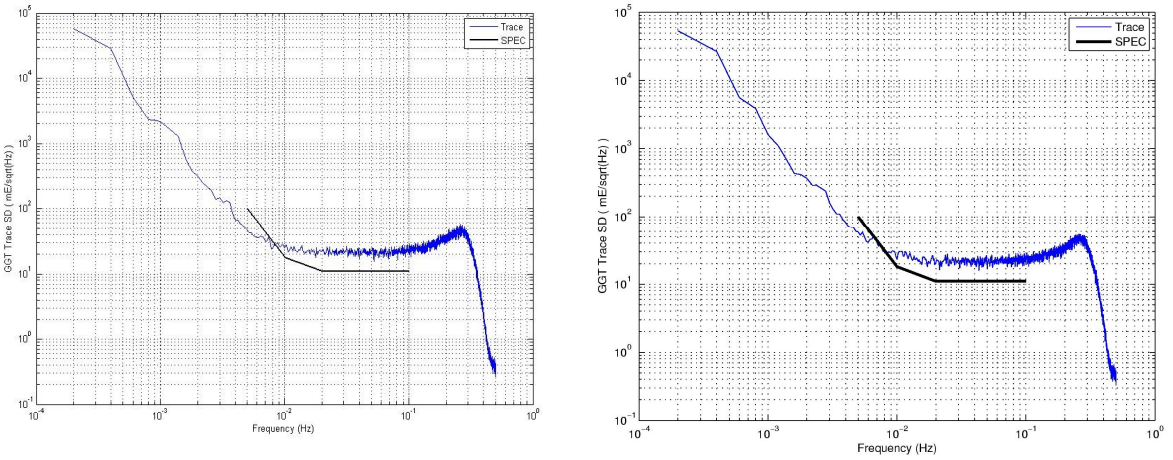

Figure 13 Trace PSD considering the Beam out event (left), trace PSD not considering the Beam out event (right)