

Issue Date : 17 February 2011
Issue : 1.0

Title : GOCE L1b Data Quality Control Report
January 2011

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Distribution : GOCE Users Community



DOCUMENT CHANGE RECORD

Issue	Date	Reason for Change	Changed Pages/Paragraphs
1.0	17/02/2011	First issue	



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1. INTRODUCTION

1.1 Purpose and Scope

This document contains the Quality report for GOCE L1b data for January 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. JANUARY 2011 OVERVIEW

- Beam Out event at UTC 01/01/2011 22:58:49.
- Science operations were interrupted on 2nd January by a severe anomaly on the SSTIs (GPS receivers). Following a reconfiguration from SSTI-A to SSTI-B, S/C dynamics were increasingly non-nominal with very high attitude errors. A survival mode was narrowly avoided by commanding a fallback to CPM, allowing to recover proper S/C attitude control in CPM.
Initial investigation shows there was a sudden change in the state vector delivered by SSTI-A, corresponding to a rotation of the state vector by 90 deg around the Z-axis. This led to an FDIR-triggered switchover to SSTI-B, which however provided the same erroneous state vector, thereby leading to the severe controller problems in DFM_FINE. Investigations on the sudden change in the SSTI state vector on 2nd January have identified a problem in the SSTI application software as the root cause. New SSTI application software 4.1 was installed on 17th of January on both units, resolving the software problems. DFM_FINE mode and nominal operation were resumed on 19th of January.
- Anomalous oscillation in Uyy component on 20/01 21:30:31.
- Beam Out at Utc time 21/01 04:29:59 and anomalous oscillation in Uyy component on 21/01 09:47:54.
- Instrument Calibration operations were performed on January 27th. EGG data are not produced during Calibration Operations. Jan 27 and 28 data are affected by these operations.
- Beam Out event at UTC 31/01 07:17:51.








2.1 Instruments Quality summary tables

Jan 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 31

Table 1 January 2011 EGG QC Status

Jan 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 31

Table 2 January 2011 SST QC Status

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

3. JANUARY 2011 DATA QUALITY ANALYSIS

3.1 Anomalous oscillation in Uyy component on 20 and 21 of January

Over the days 20th and 21st of January, the trace PSD shows an anomalous behaviour due to two oscillations which affect the Uyy components. Below are reported the two anomalies:

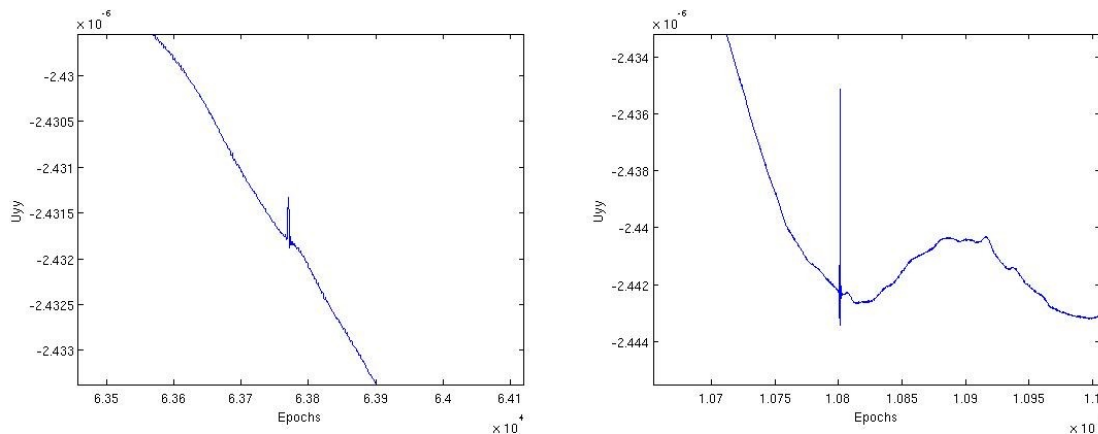


Figure 1 Uyy anomalous oscillations (first oscillation on 20th of January 21:30:31 (left), second oscillation on 21st of January 09:47:54 (right))

The two anomalies lead to a non nominal behaviour of the Uyy PSD and consequently of the trace, as reported below:

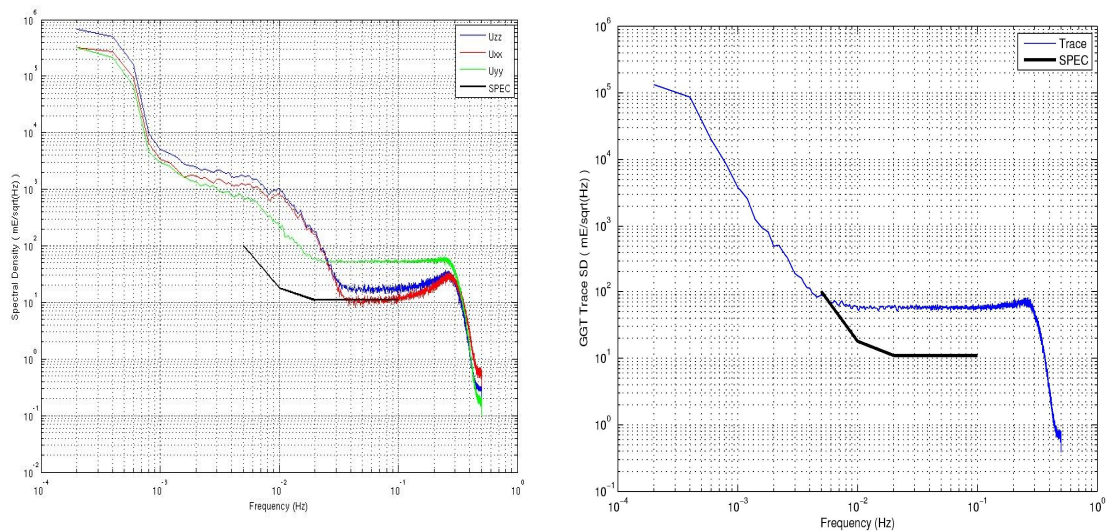


Figure 2 Uyy anomalous PSD (green curve) on the left panel and the trace PSD on the right panel

The same two anomalies affect the following L0 CTR datasets as well:

- A1: X1, X2, X3, X4, Y1, Y2
- A2: X1, X2, X3, X4, Z1, Z2
- A3: X1, X2, X3, X4, Z1, Z2
- A4: X1, X2, X3, X4, Y1, Y2
- A5: X1, X2, X3, X4, Z1, Z2
- A6: X1, X2, X3, X4, Z1, Z2

Below the two oscillations in CTR A1 Y1 (the plots report the derivative of the data in order to highlight the oscillations):

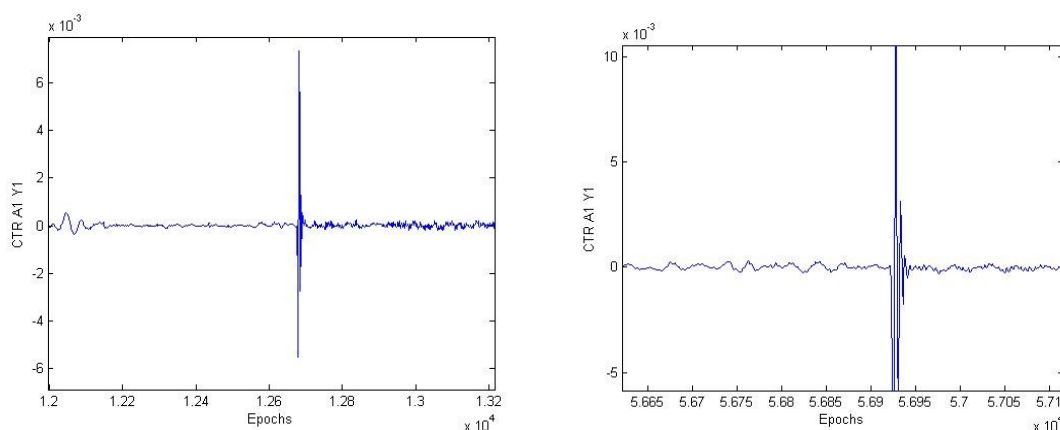


Figure 3 CTR A1 Y1 anomalous oscillations (first oscillation on 20th of January 21:30:31 (left), second oscillation on 21st of January 09:47:54 (right))

3.2 Instrument calibration on 27/01/2011

Special Spacecraft Operations for Instrument Calibration were performed on 27th January 2011, from

- 20110127T061647

to

- 20110128T061225

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

- GO_CONS_EGG_NOM_1b_20110127T044703_20110127T061647_0002

and

- GO_CONS_EGG_NOM_1b_20110128T061225_20110128T074208_0001

An expected Kalman filter reinitialization affects the data starting from product GO_CONS_EGG_NOM_1b_20110128T061225_20110128T074208_0001 due to the gap in the EGG production. Nominal data behavior starts from the successive product.

3.3 Spacecraft contingency on 2nd of January

Due to the anomaly in the state vector delivered by SSTI-A, corresponding to a rotation of the state vector by 90 deg around the Z-axis, science operations were interrupted on the 2nd of January. The patch for solving the SSTI issues was installed on 17th of January. Below the comparison between the PVT and NAV solutions before and after the SSTI patch:

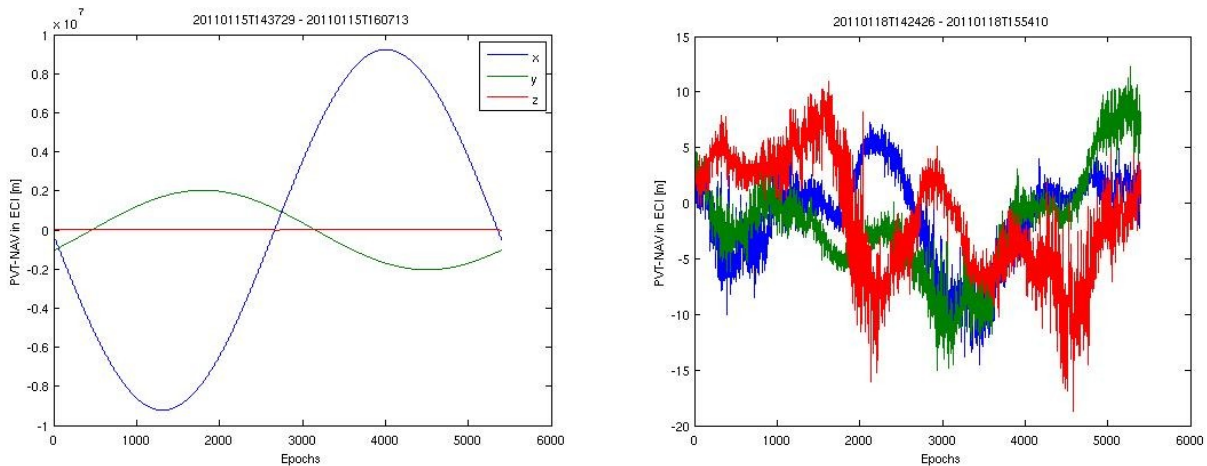


Figure 4 NAV vs PVT solutions before the patch (left) and after (right)

During the period of SSTI anomaly the EGG instrument was switched off, so the last good product is the following:

GO_CONS_EGG_NOM_1b_20110101T184148_20110101T201131_0001

while the nominal operation on DFM_FINE was reached on 19th of January and the EGG production was resumed starting from the product:

GO_CONS_EGG_NOM_1b_20110119T005232_20110119T022216_0001

The nominal behaviour of the trace was resumed around 19/01 18:49 as reported below after the expected Kalman filter reinitialization occurred in the product GO_CONS_EGG_NOM_1b_20110119T005232_20110119T022216_0001, due to the gap in the nominal production:

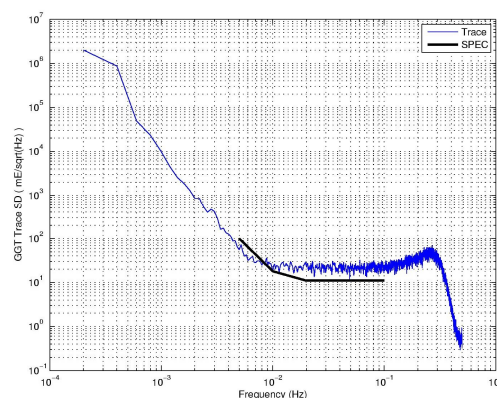


Figure 5 Trace PSD over the reference period (19/01 18:49 to 20/01 03:47) with STR2 in the loop

3.4 Beam Outs events

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

EVENT NUMBER	UTC TIME
1	2011-01-01T22:58:49
2	2011-01-21T04:29:59
3	2011-01-31T07:17:51

Table 3 Beam out event

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

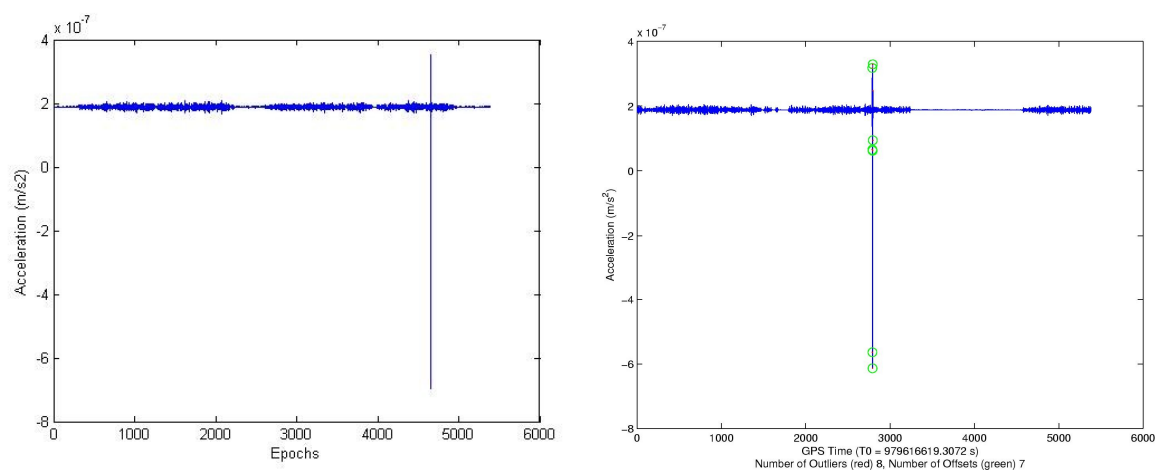


Figure 6 Beam Out event on 1st of January (left) and on 21th of January (right)

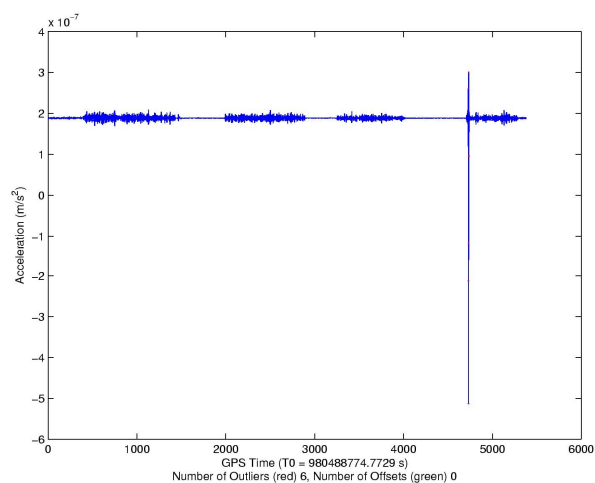


Figure 7 Beam Out event on 31st of January

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

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

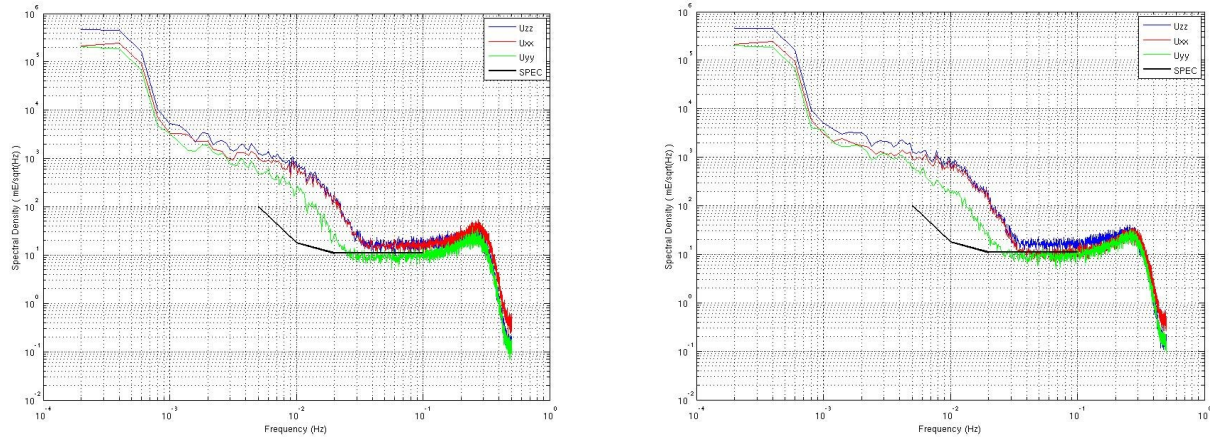


Figure 8 Gradients PSD considering the Beam Out event of 01st of January (left), gradients PSD not considering the Beam Out event of 01st of January (right)

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 01st of January are reported, plots for 21st and 31st of January show similar behavior).

No relevant differences in terms of trace PSD are recognized, as reported in figure 9:

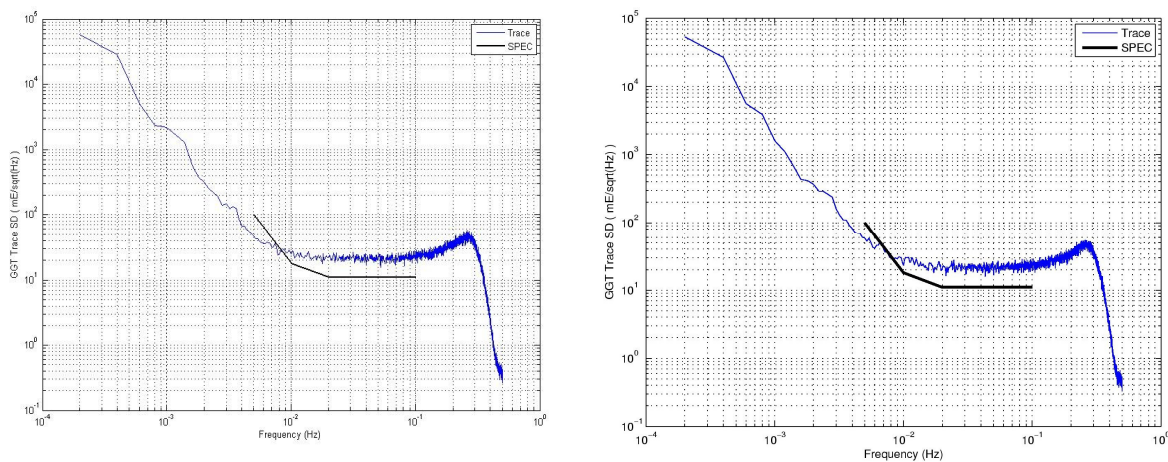


Figure 9 Trace PSD considering the Beam out event (left), trace PSD not considering the Beam out event (right)

3.5 Product overlap on 24th of January

Due to PDGS processing artifacts, there is an overlap in the filename between the following couple of products:

GO_CONS_EGG_NOM_1b_20110124T033025_20110124T050009_0002

GO_CONS_EGG_NOM_1b_20110124T050008_20110124T062952_0002

No overlaps in the related GPS time datasets have been found in-between.