GOME SCAN MIRROR POSITIONS ANALYSIS

Angelika Dehn, Claus Zehner

ESA/ESRIN, Product Control Service; Via Galileo Galilei; 00044 Frascati, Italy
e-mail: adehn@esrin.esa.it, czehner@esrin.esa.it

ABSTRACT

To analyse the impact of different GOME swath operations on the scan mirror bearings, the behaviour of selected scan mirror position sets was analysed for the narrow swath mode (240 km) and the nominal swath mode (960 km).

1. DATA ANALYSED

- three data sets with narrow swath mode, measured on 24-25/11/97, 14-15/12/98 and 04-05/01/99
- two data sets with nominal swath mode, measured on 23-24/11/97 and 16-17/12/98

2. METHOD

To analyse a possible impact on the GOME scan mirror bearings, following strategy was realized:

- Calculate a reference scan mirror signal by connecting the maximum narrow swath positions with a straight line (y = (8.724/24 * x) - 8.724);
- for the nominal swath use the equation (y = (30.976/24 * x) - 30.976)
- Compare the measurements (raw data EGOI) - in particular scan mirror sets 12 and 16 with subset counter 2 - with the reference signal by subtracting the reference values of the raw data. (Difference = raw_data - reference)

3. RESULTS

The Results for the instrument in narrow swath mode are shown in figures 1 - 3.

Fig 1 (24-25/11/97): Within one day the scan mirror position set 12 remains approximately stable. The difference for set 16 increases with time, maximum deviation after 14 Orbits is ~ -0.16 deg

Fig 2 (14-15/12/98): The scan mirror position set 12 remains approximately stable only for the first 9 orbits. The last three orbits show a significant difference. Scan mirror set 16 shows the same behaviour as for the data in November 1997; maximum deviation after 13 Orbits is ~ -0.18 deg

Fig 3 (04-05/01/99): position set 12 remains stable during the narrow swath operation; set 16 shows the same behaviour as in the examples before, maximum deviation after 13 Orbits is ~ -0.16 deg

The results for the nominal swath are shown in figures 4 and 5.

Fig 4 (23-24/11/97): The scan mirror position sets 12 and 16 are stable within one day.

Fig 5 (16-17/12/98): Scan mirror position set 12 and 16 are stable within one day. The difference for set 12 to the reference value becomes higher compared to the data of 1997.

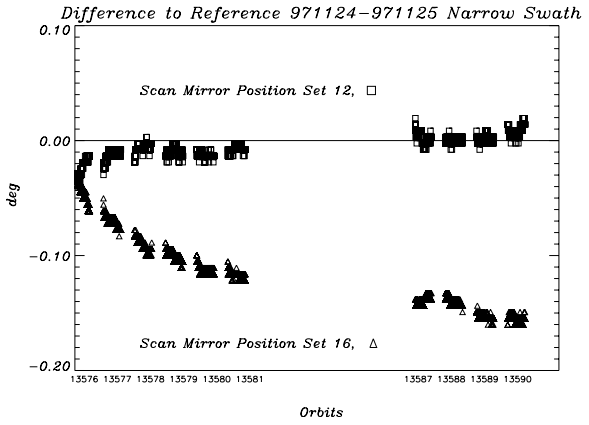

Figure 1. Difference of scan mirror in narrow swath to reference signal, for positions 12 and 16, subset counter = 2

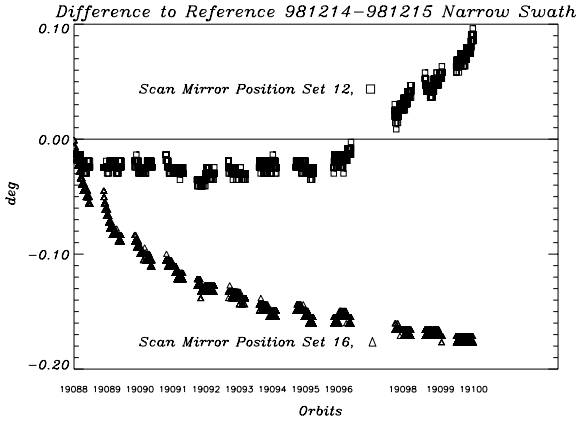

Figure 2. Difference of scan mirror in narrow swath to reference signal, for positions 12 and 16, subset counter = 2

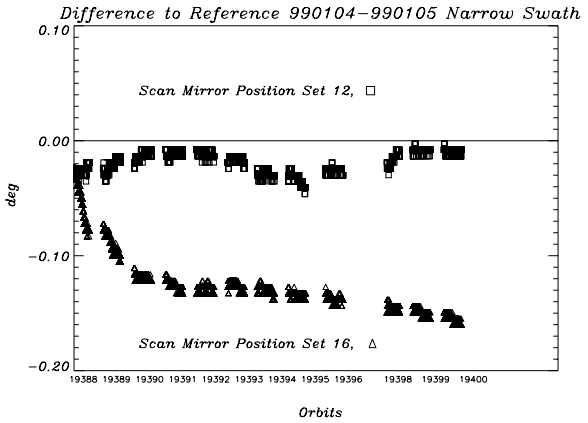

Figure 3. Difference of scan mirror in narrow swath to reference signal, for positions 12 and 16, subset counter = 2

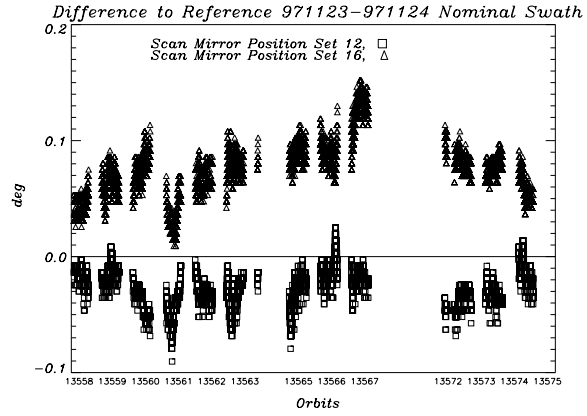

Figure 4. Difference of scan mirror in nominal swath to reference signal, for positions 12 and 16, subset counter = 2

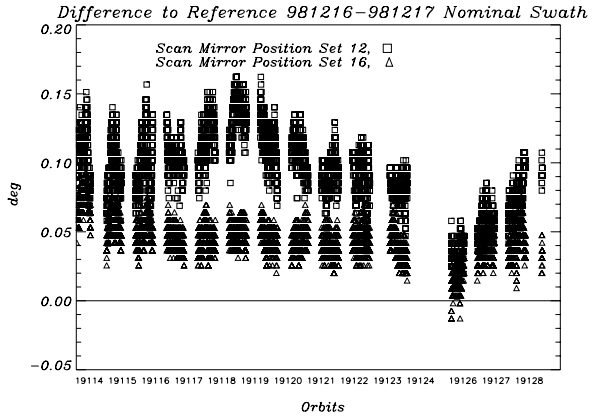

Figure 5. Difference of scan mirror in nominal swath to reference signal, for positions 12 and 16, subset counter=2

4. CONCLUSIONS

Narrow Swath:
Scan mirror positions set 12: The results for scan mirror position set 12 show a stable behaviour during a measurement period of one day. But sometimes (e.g. 14-15/12/98) significant deviations occur, starting without any change in the instrument operations, after 10 orbits. The deviation increases up to 0.1 deg which is significant larger than the allowed deviation of 0.0645 deg according to instrument specifications.

Scan mirror positions set 16: During the operation period of one day the deviation for set 16 increases always significantly in time. With a value of ~0.18 deg, the deviation increases up to approximately three times as much as the allowed deviation of 0.0645 deg according to instrument specifications.

Nominal Swath:
Scan mirror positions set 12: For the nominal swath mode, the scan mirror position set 12 stays approximately stable during a one day measurements period. But significant long term changes can be seen. From November 97 to December 98, the deviation to the normal position has an offset of ~0.14 deg. The deviation to the normal position in December 98 values ~0.12 deg and is approximately twice as large as the value according to instrument specifications.

Scan mirror positions set 16: The scan mirror position set 16 shows a stable behaviour within a measurement period of one day.

5. FUTURE ACTIONS

Analyse more data sets since the beginning of the narrow swath operations.
Possible reduction of the duration of GOME narrow swath operations.