

Response to Anonymous Referee #1

The authors deeply thank the referee for his comments and remarks.

Responses are following:

Section 3.1

Frequency response is given for each of the four sensors on the Bx axis. The authors could consider to include also By and Bz axes for reference (recommended, but not essential)

- ⇒ **Differences between 3 components are small, and will be not visible on a general plot, so to show the difference between components we preferred plotting only the difference, as given on fig6.**

Mechanical to magnetic mis-alignments are small, however has the impact on wave-form data been quantified? To what extent may this explain the discrepancy with FGM? (probably the effect is minimal, however it would be good to see an upper-limit on the effect)

- ⇒ Interesting question, because $\sin(0.5^\circ)=0.0087$ close to 0.9 %
But if results give an agreement within 1% in magnitude, the difference in direction is within 2-4 degrees. Significant conclusion is not obvious. Furthermore, FGM data are not corrected of the misalignment, and FGM accuracy is given of about 1%. We propose to add the following sentence:

“Note that $\sin(0.5^\circ)=0.0087$, which is close to 1%. As we will see in section 9, 1% is also the best agreement found between STAFF and FGM, with all sources of errors. Another work could take into account these small errors, but it should be done at once for STAFF and FGM. It could be done in the future”

Are figures 3 and 4 the initial data or the corrected data? This should be made clear

=> sentence “Figure 3 gives the amplitude and Fig. 4 the phase of the transfer functions.” will be corrected into **“Figure 3 gives the amplitude and Fig. 4 the phase of the corrected transfer functions.”**

Section 3.4 3.2

The 10% correction factor is explained, and assumed to be applied to all ground-test data, however elsewhere (later) in the manuscript it is stated that the SC1 function is derived by averaging the other three. What exactly is the method for deriving each function? This should be clarified.

=> we propose to add line 1 page 687:

**Transfer function of S/C #2,3 and 4 are corrected by this formula.
Corrected transfer function of S/C #1 is computed by a complex averaging of the 3 other transfer function.**

Section 5.6

Explain how f_s is derived

=> line 8 page 693, replace “ f_s is the spin frequency” by “ **f_s is the spin frequency given in auxiliary data**”

Phase angle from ‘Sun pulse or any other quantity’ - please explain which method is used

=> line 6 page 693, replace “derived from the Sun pulse or any other quantity to...” by “**derived from the Sun pulse which give the time where the Sun-sensor is in the plane defined by the spin axis and the direction of the Sun. Knowing the position of the Sun_sensor onboard the spacecraft (see figure 1) and the time of each telemetry point, we can deduce the spin phase angle ...**”

Various software packages are described. If these are publicly available it would be useful to say so.

=> **Unfortunately, there is no publicity, but documents are available on the web, as indicated in the references.**

Section 6.1

‘Non-linearity of the transfer function’ could be mis-interpreted: The TF is that of a linear-system so maybe an alternative wording to represent that fact that function is variable and hence requires correction in the frequency-domain

=> replace “Due to the non linearity of the transfer function” by “**The transfer function being frequency dependent but not proportional,**”

Section 6.3

Refers to the ‘previous’ trapeze function but I don’t believe this has already been introduced. I suggest to provide a brief description of the weighting function here. Can figure 11 be augmented with some more quantitative information?

=> page 698, line 6, replace “the previous trapeze is taken” by “**we chose a trapeze function as described in figure 11. For other applications, an alternative could be a “rounded trapeze”, by replacing the edges by a $\sin^2$ function rather than a line.**”

Section 7

I find this part to be incomplete, in contrast to the other sections. What is Δ_{ij}^{mn} ? More detail could be provided here.

=> change are following:

page 703, line 16: add subsection “**7.1 On board calculations**”

page 704 line 8: add subsection “**7.2 Routine on ground calibration**”

page 704, line 12: after “...performed in the laboratory.”, add “**...in the laboratory, including the inverse transfer function of the sensors, STAFF search coils and EFW antennas.**”

Page 704, **remove line 26 to 29, and page 705 line 1 to 3.**

and page 705, instead of removed lines, add:

To calculate $\sim S$ and $\sim D$, we have chosen a reference noise level corresponding to $AGC = 80$ ($AGC = 0$ to 255). To this ideal calibration we had foreseen to apply a small correction, in two different cases: first if the spin is not nominal, i.e. is different from 4 seconds, this parameter being routinely provided by the spacecraft auxiliary data; second if the spin-plane receivers are not identical; in this later case, the corrections parameters have been identified during ground tests of the instrument before launch (Harvey et al, 2004).

Reference Harvey will be added.

Page 705 line 4, add after "to calculate" **"to calculate the spectral matrix"**

Page 705, after line 11, add paragraph:

This overall treatment of STAFF SA data gives the complete complex spectral matrix (SM). The diagonal coefficients of the matrix being the power spectral density (PSD) for the 5 components, in physical units. These PSD diagonal coefficients are kept at a better time resolution than the overall SM. To obtain from the Spectral Matrix the polarization and propagation parameters one can use the PRASSADCO program that has been specifically developed for the use of Cluster STAFF SA (Santolik, 2003), as can be seen in the following section.

Section 8.1

Fig 15: SA or waveform: which is which?

=> complete caption by replacing "...of the waveform data" by **"...of the waveform data (black line)"** and "...SA spectrum" by **"...SA spectrum (cross)"**

Section 9.3.2

Using the same table might change the comparison with FGM. Has this been attempted? Maybe this could be mentioned as 'future work'

=> page 710, line 21, add: **"This could be done in a future work"**

Clarify how the transfer functions were generated for SC1 vs. SC2/3/4 (see also comment on section 3.4)

=> **done in section 3.4 3.2**

Section 9.4.4

Deviation at higher frequency may be due to fall-off in the FGM frequency-response?

=> We don't know. We propose to add after line 22 p. 712 : "...to explain this." → **"...to explain this. Effect of fall-off in the FGM frequency-response at this frequency could be studied in a future work."**

Technical Corrections

p680 I25 'built' I26 suggest 'deeply' -> 'substantially'

⇒ **Yes, will be corrected**

p681 I11 'on calibration parameters'

⇒ **Yes, will be corrected**

P682 I24 suggest 'first order high pass...'

⇒ **Yes, will be corrected**

p690 (x y y) -> (x y z) [twice]

⇒ **Yes, will be corrected**

p692 I9 Z_SCS use under script for SCS

⇒ **Yes, will be corrected**

p693 I16 suggest to change 'operations' to 'manoeuvres'

⇒ **Yes, will be corrected**

p694 (x y y) -> (x y z)

⇒ **Yes, will be corrected**

p696 I24 'non-spinning'

⇒ **Yes, will be corrected**

p697 Define the window function W_k

⇒ **After sentence** "the second step is to apply a weighting function on the signal centering on zero." **We propose to add: "the weighting function must preserve the shape of the signal, but also to ensure that the weighted signal is periodic, so that its edges fall to zero. By experience, the choice of a very long trapezoid works well, as shown in Figure 11."**

p700 I1 'transfer function'

⇒ **Yes, will be corrected**

p704 use subscripts in the equations

⇒ **Yes, will be corrected**

p707 I14 suggest to reword this last lien as I don't fully understand the meaning

⇒ **Yes, we suggest to replace** "It is not only useful to validate the data, but only to precise the respective use of the two instruments." **By "This is not only useful for data validation, but this also permit to clarify the respective roles of the two instruments."**

p708 define NBR

⇒ **sorry, NBR means Normal Bit Rate, changed to "normal bit rate mode (NBR) sampled at 25 Hz"**

p712 I6 STAFF I23 Nykiri

⇒ **Yes, will be corrected**

Figure 17/18 Explain which trace is which in the caption

⇒ **Added on caption : “Black: STAFF, red: FGM”**