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Geoscientific Instrumentation Methods and Data Systems Discussions
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Interactive comment on "In-flight Calibration of the Cluster/CODIF sensor" *by* L. M. Kistler et al.

Anonymous Referee #2

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This paper presents the methods of the in-flight efficiency calibration of the CODIF sensors on three of the Cluster spacecraft (S/C 1, S/C 3, and S/C 4; CODIF on S/C 2 failed to operate) as those efficiencies declined during the mission due to decreasing microchannel plate (MCP) gain. These results will be useful to those using CODIF data and will also be useful for those designing instruments using MCPs in a space plasma environment. The approach uses internal information from the sensors themselves, comparisons with other sensors, and checks based on geophysically reasonable assumptions. The calibration is most complete for H+, which is usually the dominant species, somewhat less so for O+, with changing efficiencies for the rarer species He+ and He++ largely taken from the two more abundant species. In general the paper is clearly written and should be published after the authors respond to the specific comments listed below.

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Interactive Discussion
Discussion Paper

1. The term Absolute Efficiency is used for two different concepts. In line 6 on pg 226, it is defined as the product of three separate sensor efficiencies: the start and stop time-of-flight efficiencies and the single_position efficiency. This is a traditional definition. However, in many figures (3, 4, 5, 7, and 14) and their captions and accompanying text, the same term is used for what appear to be Relative Efficiencies, normalized to the beginning of mission. Some different terms should be used with some care taken since the term "Relative efficiencies" has already been used in section 2.4 to refer to efficiency variations among anodes. One possibility is "total efficiency" for the three-term product and "relative total efficiency" and "relative anode efficiency".

2. The term "single position" efficiency is used in line 1, pg 226 but that is changed to Single_Event_Efficiency in formula (3). It appears that SEV is the rate of single position events so that SEV/SFR should be Single_Position_Efficiency. The two terms are used almost interchangeable after this (e.g. line 19, pg 227) and should all be the same.

3. On the same page, there is a discussion of what allows the deduced values of the Start_Efficiency (= SFR/SR; coincidence rate over stop rate) to be larger than 1, which should be impossible. It is argued that the threshold of the SR rate is actually lower than that of the stop signal being fed to the coincidence circuit, which results in an SR rate that is too high. That would appear to produce a start efficiency that is too low, not too high.

4. Fig. 1 caption should be "Stop, Start, and Single Position efficiencies . . ." to correspond to the figure panels starting from the top.

5. line 1, pg 227; "start" should be "stop"

6. line 20, pg 227; delete "due to"

7. Figure 6. The fact that the LS/HS density ratio drops with time must mean that corrected HS densities and uncorrected LS densities are being used. Otherwise the more rapid decrease in HS efficiency due to the higher flux of particles incident on that

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side would be expected to cause the LS/HS ratio to increase with time. If that is true, please make it clear.

8. Why to the Revised Efficiency curves in Fig. 11 cover a larger energy range than the original curves?

9. Fig. 12 caption; change “on CODIF” and “on HIA” to “from CODIF” and “from HIA”.

10. line 20, pg 231; “effect” => “affect” and “plan” => plane

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Interactive comment on Geosci. Instrum. Method. Data Syst. Discuss., 3, 221, 2013.