**AMT 2013-215**
**Title: Introduction to the in orbit test and its performance of the first meteorological imager of the Communication, Ocean, and Meteorological Satellite**

Reply to Referee #3

We really appreciate the editor's efforts and acknowledge referee for their constructive comments and suggestions which led to substantial improvements. In the followings, the issues raised by the referee are addressed point-by-point in the order they are asked. The referee' comments are shown in italic; the authors' reply is shown in red.

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**Anonymous Referee #3**
Received and published: 14 May 2014

**General comments:**
*Overall this paper contains some interesting information about a new satellite instrument and is worthy of publication, following some major revisions. In general, the paper reads much more like a technical report, rather than a scientific article as it seems to focus much more on the history of the instrument and basic performance metrics, rather than a specific scientific focus.*

*The abstract is too long and generalised and includes details about the history of the instrument which are not relevant. The abstract direction in the introduction section which needs to focus much more on the scientific analyses that are the results of this paper (the SNR etc.) rather than giving a biography of the instrument.*

*This historical information could be omitted and the reader referred to a report/website/other reference to provide this sort of detail. No references are used in the introduction section which is unusual and should be rectified – use references to direct the reader to the details which are not relevant to the study undertaken and instead provide more of an introduction to the scientific work that is the main focus of this article.*

**General Responses:**
The main objective of this paper is, as a matter of fact, to introduce a new capability of geostationary meteorological observation available in East Asia region and we thought it would be a very nice introduction if we provide the test results obtained during the in orbit test. Along with the introduction of the new capability, documenting the IOT processes (which are not generally available in the public domain) in the open literature would benefit many interested audiences, including people actually involved in the space development, data users, and so on. On the other hand, as recommended by the referee, a lengthy introduction and explanation of the instrument and IOT process could lose the scientific interests that the manuscript should carry. Thus, firstly, we reorganized the manuscript using the Appendix which collects the technical aspects of the instrument and IOT processes, shortening the abstract and refining the test results (refer below), reshaping introduction, shortening the functional tests, and adding a few more relevant references. And secondly, the all relevant data acquired during IOT is reprocessed to extend the analysis of the radiometric performance to check any significant short-term variability, long-term stability, and any

significant diurnal variability. In conclusion, thanks to the referee's comments, we could have a chance to revisit the important data acquired during the IOT and drew several new important conclusions. The updated abstract reads like;

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The first geostationary earth observation satellite of Korea, named Communication, Ocean, and Meteorological Satellite (COMS), is successfully launched on 27 June 2010 in Korea Standard Time. After arrival of its operational orbit, the satellite underwent in orbit test (IOT) lasting for about 8 months. During the IOT period, the meteorological imager (MI) went through tests for its functional and performance demonstration and the test results are introduced here.

The radiometric performance of MI is tested by signal to noise ratio (SNR) for visible channel, noise equivalent differential temperature (NEdT) for infrared channels, and pixel to pixel non-uniformity. In case of the visible channel, SNR of all eight detectors are obtained using the ground measured parameters with the background signals obtained in orbit. The overall performance shows a value larger than 26 at 5% albedo, exceeding the user requirement of 10 with a significant margin. Also, the relative variability of detector responsivity among the eight visible channels meets the user requirement, showing values of about 10% of the user requirement. For the infrared channels, the NEdT of each detector is well within the user requirement and is comparable with or better than the legacy instruments, except the water vapor channel which is slightly noisier than the legacy instruments. The variability of detector responsivity of infrared channels is also below the user requirement, within 40% of the requirement except shortwave infrared channel. The improved performance result is partly due to the stable and low detector temperature obtained with the spacecraft design, by installing a single solar panel to the opposite side of the meteorological imager.

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*Section 2 serves as an extension of the introduction and much of this could be summarised in a table. I suggest that sections 1 and 2 are both shortened and merged, with most of the remaining introduction content coming from the later part of section 2. Section 3 again serves as a technical introduction to the instrument and should be reduced and summarised.*

Thanks to the referee's comment and reflecting the suggestions, we reorganized the manuscript as described in the general response. Session 1 and 2 are shortened and merged, thus previously Session 4 is now replace by Session 3. Appendix is composed of three Sessions: A1 COMS/MI. A2 Outgassing operation and A3 Functional performance of COMS/MI during IOT period. And previous Figure 2-6 are now Figure A1-A5.

*The results section needs to be extended for an article of this type. More detail should be given into the tests which were conducted. The section on the functional tests are not very informative, and simply demonstrate that the instrument works (as do figures 2-5). The information in section 4.2 is the "new" material and should be the focus of the paper. The results quoted should be expanded upon, for example some results are quoted but not demonstrated. The sensitivity test for the dependence of calibration slopes that are quoted as having been conducted should be described and the results shown as should the obtained values for PRNU at 220 and 300K.*

Reflecting the comments, we first reprocessed all of the relevant data obtained during the IOT and reassessed the radiometric performance during the whole time period. With the reprocessing a few new interpretations and discussions on the radiometric performance are added (Figure 3-5 in revised manuscript). For an example, for the SNR value of the visible channels, following discussions are added.

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The space look count values obtained from the selected IFOVs are processed using Eq. (1) and the monthly mean SNR for all eight detectors from August 2010 to March 2011 are summarized in Figure 8 (Figure 3 in revised version of manuscript), along with the diurnal variation of the time averaged SNR values. At the beginning of the IOT, all eight SNR values are higher than the user requirement of 10. Among the eight detectors, the detector number 1 has slightly higher SNR value than that of detector number 5, by about 2. The difference is mainly due to the difference in the *m* value used for the estimation of $A_{in\_orbit}$. Although it looks rather a significant difference, the difference is compensated by taking out the space look count during the calibration process and does not a significant consequnces such as in the PRNU value. In terms of long-term trend, at least during the IOT period, all eight detectors show a quite stable SNR performance, showing not a significant drift or degradation, although there is small monthly variation which is almost the same magnitude as the uncertainty in the monthly mean SNR value, about 0.8.

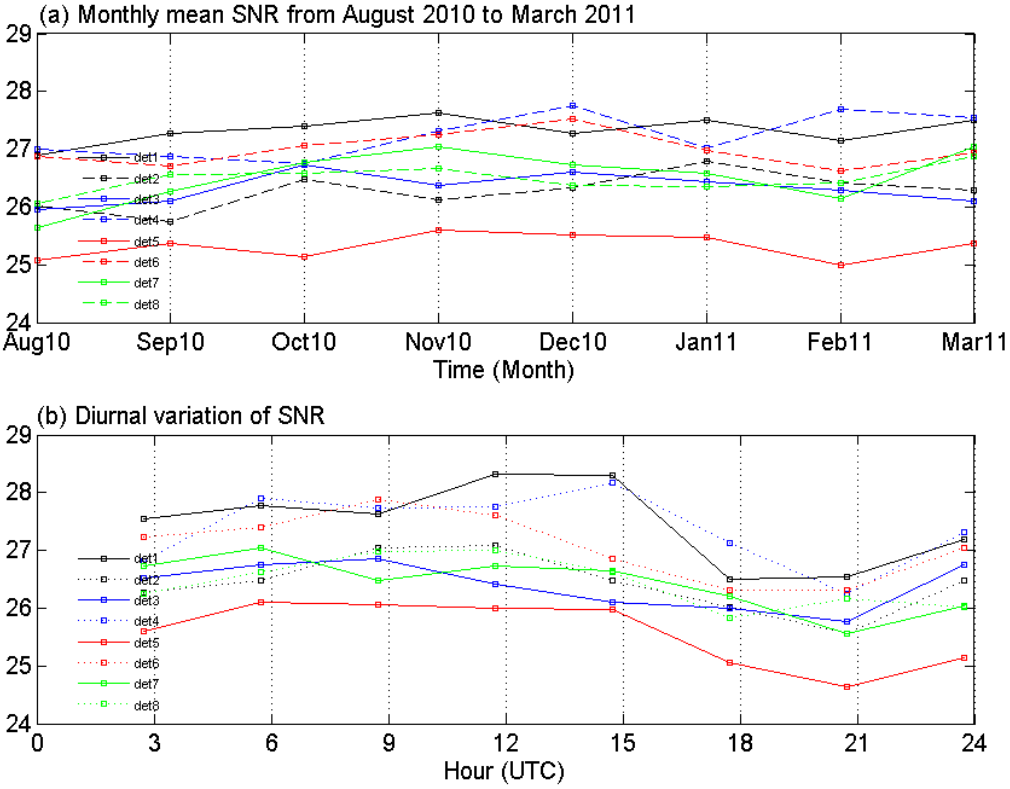


Figure 3. Time series of SNR of visible channels. (a) Monthly mean SNR of 8 detectors from August 2010 to March 2011. (b) Diurnal variation of SNR for Full Disk images (every 3 hour interval of measuremnet schedule for COMS/MI).

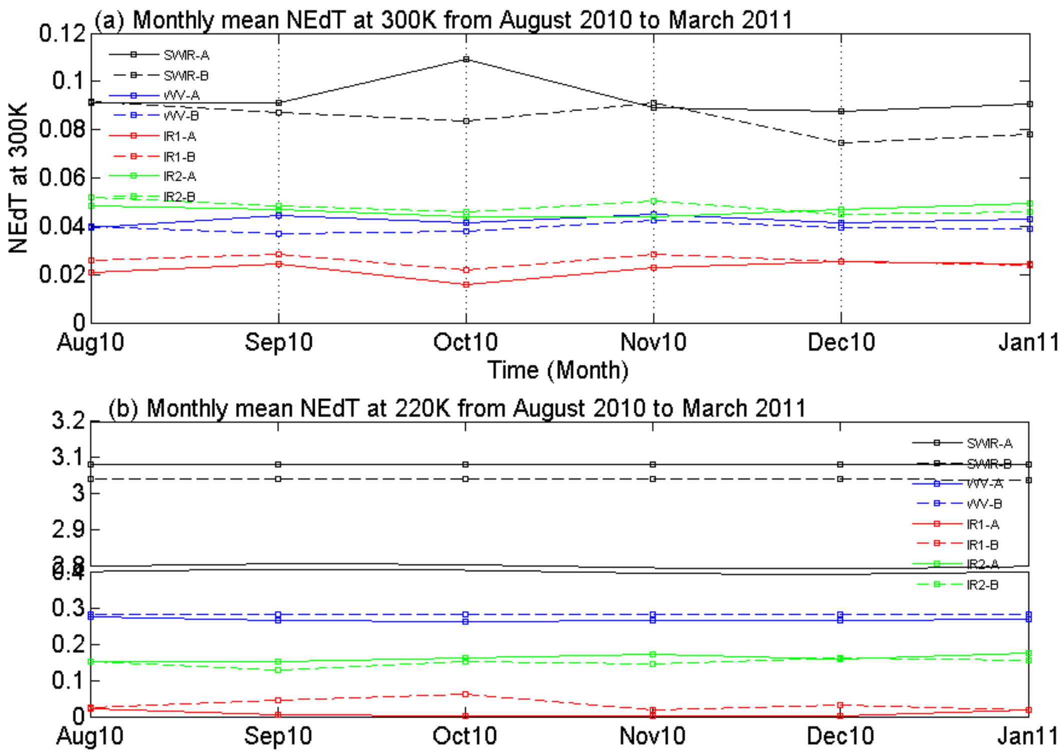


Figure 4. Monthly mean NEdT at 300K(a) and 220K(b) for 4 IR channels from August 2010 to January 2011.

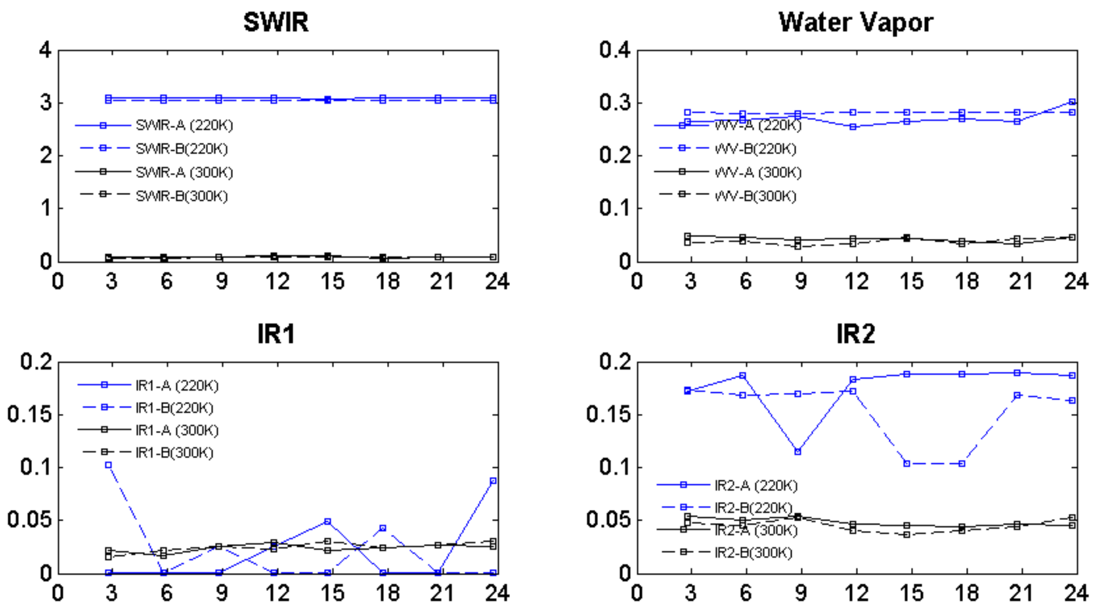


Figure 5. Diurnal variation of NEdT at 300K and 220K of 4 IR channels for each detector in the channel. Every 3 hour interval data of Full Disk images in January 2011 are used.

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*Some general comments Needs to be thoroughly proof read before resubmission. The manuscript is littered with typographic errors and grammatical inconsistencies. For example,* *tenses are frequently interchanged and the terms "is" and "are" are often used incorrectly. Also, numbers less than ten should be consistently spelt out, rather than written as words. Equations should always be written on a new line and assigned an equation number.*

Thanks for the comments. We did our best to correct those annoyances.

*Table 2: States that the 100% albedo values will be given, but these are missing from the table. Table 4: in the caption "the requirement is the same for the same channel" does this mean the requirement is the same for each detector in the same channel?*

Modified as suggested. Instead of giving the results for 100% albedo, the results are given at 5% albedo. In case of Table 4, the caption is modified to "while the requirement is the same for each detector in the same channel". Thanks.

*Figure 7: the graph needs to include a key / labels to explain what each of the lines represent.*

Each line corresponds to the eight different detectors and the detector number is specified in the graph (Figure 2).

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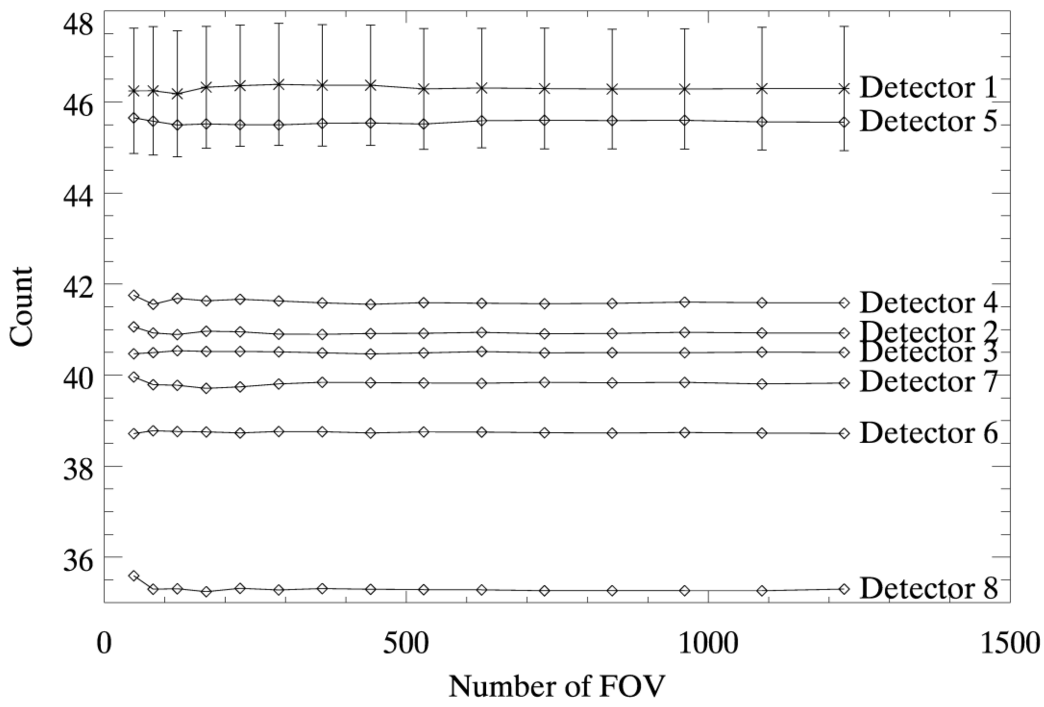


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Figure 2. Variation of average and standard deviation of space-look signal in terms of the digital count value as a function of number of pixels used to estimate the average and standard deviation.