

Review of Brändström et al., "Results from the intercalibration of optical low-light calibration sources 2011"

The paper reports on the intercalibration results obtained at the calibration meeting in 2011. It also discusses and compares the results of previous intercalibration sessions made during the last four decades. Table 1 nicely points to the importance of this study, with no reports of known calibration workshops during the last 5 years, and I welcome a paper that compares the sources qualitatively, and helps making the community aware of the significant and intricate business of getting real units on your data. A well conducted calibration of any optical instrument is extremely important, especially as the technology is constantly developing and the sensitivity increasing, and still very little attention is given to this complex matter, unjustifiably. I would therefore very much like to see this paper in print. However, the paper is somewhat difficult to get through in places, and I have a few more comprehensive suggestions, and some minor suggestions of improvement, as listed below:

Somewhat more extensive comments

1) The authors offer a brief discussion on the definition of the Rayleigh, which is a unit often shrouded in mystery. A clear interpretation is thus utterly important, and I believe that a good description here will significantly contribute to the community, and to the impact of this paper. When reading the description provided here, I get stuck at the expression for the apparent spectral radiant sterance L (equation 2), which looks like it is taken directly from Baker and Romick (1976), but unfortunately it is not that straightforward. I would like to see an extended discussion on the derivation of L with clearer steps, and maybe the text can be written in a way to better relate to the results you present later on in the paper, by for example add a discussion on the use of R/A vs R ?

2) You mention that the calibrations have been for the European sector, and that all the sources used in this study are European. It would be interesting if you know of any intercontinental intercalibrations, or has this not been done? If you know of any, that could be something to just mention briefly in the introduction. Though the paper is about calibration of optical instruments with known sources, you could also consider just mentioning any other methods used for calibration, such as calibration using the known luminosity of the stars. However, if so, this should be kept brief and not take too much focus from the paper.

3) Is there a general reference for the Fritz Peak and the other national standards? If there is, please state it up front, when they are first mentioned. If no publication is suitable, please consider adding something referring to NIST or in another way describe where these sources come from. Are these standards regularly controlled somehow? This should also be mentioned.

4) The description of the intercalibration procedure could be explained further. Instead of focusing on who is in which room, it would be interesting to learn more about the experiment setup in terms of distance between the source and the PMT for

example, the integration time, details about the PMT and so forth, so that the experiment could be reproduced by a reader. Also, the description as it is now raises more questions than it answers. How come the SNR issue with some of the samples could not be overcome by just integrating for a longer time for example? It is only mentioned that the procedure is unchanged since the 80's, but it would be much better if you gave a recap of what this procedure is, especially since many of the older calibration reports are hard to get hold of, being technical reports and so forth. I also suggest a better description of the figures showing the setup and the sources for clarification. You could for example add labels to the different parts (numbers, or letters) and then describe/list them in the figure captions.

5) In the abstract you mention that the errors are of the order 5 – 20%, but this is not repeated or much discussed in the text. Only in the conclusions is it said that the error for the IRF Lauche source is 15 %. This is based on the preliminary results from the measurements at UNIS, and you say nothing about the results of the actual measurements you're reporting on in the paper in the conclusion section. It is true that you present the results in the tables and Figure 3, but I would like to see some mentioning also in the conclusions, and perhaps also get an extended discussion about the 5-20 % error interval in the error analysis section.

Minor comments

6) Page 93, line 22: after 'The apparent spectral radiant sterance' you could add (spectral radiance), since this is the more conventional term.

7) Page 94, second paragraph: After referencing some work in the early 80's, and then jumping to talk about activity in the 00's, I get as a reader the feeling that nothing was reported on intercalibration between that. From the table I learn that the workshops were continuous over the decades, but I suggest that you rewrite the text a bit or at least mention that intercalibration workshops have taken place regularly in the text too, perhaps by adding more references in the text (line 10).

8) Should there be a hyphen in Fritz-Peak or not? Please be consistent, both versions are used in the paper as it is now.

9) Page 95, line 7: '... are well-known tungsten lamps'. If they are well-known, please provide a reference where they have been discussed. Or what do you mean by well-known? Commonly used?

10) Page 96, procedure point 2: 'Position 0 corresponds to the dark-current.' This was just mentioned and can be omitted. As pointed out in the major comments, this part of the paper could be expanded, containing more detail.

11) Table 2: Why is the Fritz Peak source referred to as FP transfer? (I'm assuming this is what it is). This is confusing.

12) Table 2: Is it correct that the Fritz Peak source has its largest spectral column emission rate in the NIR? There seem to be a general positive trend starting at 557.3

nm. How does this relate to the discussion on low SNR at these wavelengths due to the weak source, that was mentioned on page 97? Or is it that the 'FP transfer' in the table in fact is something else than the emission rate of the standard source?

13) Table 3: The word 'ratio' is misplaced just above the column of years. It would be better if it said year there instead, and ratio can either be added under the name of the sources in the column to the left, or as a general title above the table, or not mentioned at all, since it is mentioned in the caption.

14) Table 4: In the table caption you mention that the calibration workshop took place in November 2011. This would be nice if it was also stated in the running text where you talk about this calibration.

15) Table 4: Also here the word ratio is misplaced, and I suggest replacing it with Location and add Ratio as a title on top of the table instead.

16) Figure 1: As mentioned above, please label and list all the components visible in the figure. Where is the filter wheel? What is the pink box?

17) Figure 2: Also here it would help the reader if you add labels to the figure.

18) Figure 3: Do you think you could fit the name of the source also in the legend of the plot, instead of only a, b, c, d. That is, in addition, it is still good to keep a, b, c, d, and the description of what is what in the caption, but seeing the name of the source in the plot will give a better idea of which is a lamp and which is a radioactive source.