Review of

I. Fountoulakis, A. M. Redondas, A. F. Bais, J. J. Rodriguez-Franco, K. Fragkos and A. Cede: Dead time effect on the Brewer measurements: correction and estimated uncertainties; submitted to Atmos. Meas. Tech. Discuss., 8, 12589–12632, 2015. October 2015

General comments:

This paper provides a very sound study on the impact of dead time from the Brewer instrument photomultiplier detector system on the uncertainties of different products derived from the Brewer instruments such as UV irradiance, total ozone column and aerosol optical depths. The authors well describe the detector system, the theoretical framework of dead time determination and the practical determination of the dead time with different approaches. The results of the study are also useful to correct the dead time effect in order to reduce the overall uncertainties of the products.
Both the correction and the calculation of the uncertainties are important to be published in the scientific community to improve the Brewer measurements.

There is one issue which would complete the thorough study: The uncertainty of the raw signal in terms of counts as a function of dead time effect and depending on the different conditions should be summarized. With such a summary the reader can apply the results of the study for other quantities derived from the raw signal.

The submitted paper is well written and organized and the methods and data are fully described.

The paper can be published with minor revision.

Specific comments:

For me it is unclear how the number of counts is related to the specific uncertainty of this number of counts, the dark counts and the uncertainty of the dead time.
This issue is addresses several times in the paper, however, an overview of this relationship would be very helpful, maybe in form of an additional table.

E.g.: On page 12595 line 26 the authors state that a weak signal may lead to large uncertainties. This is obvious, however the author also state in section 3.1 that at very large counts the uncertainty is also large (by the effect of dead time). Therefore there should be an optimal number of counts with a minimum uncertainty. If this is correct, a range of best number of counts can be determined. This very useful finding to optimize the instruments setting could be stated in the text.

In order to reproduce the uncertainties derived for the different products, such as UV irradiance, TOC and aerosols, it will be very helpful for other scientists to see numbers of the counts and their corresponding uncertainties for each wavelength depending on dead time and different atmospheric conditions e.g. different solar zenith angles. Such a table of numbers would serve to obtain an overview of the uncertainty source at the raw signal level.

Section 2.3.3: it is an interesting finding that the dark counts are not much affected by the dead time effect below 10’000 counts. However, since the authors also stated that generally the dark counts are much lower (e.g. pp 12594, line 9), this section is not that important and could be reduced. If there are other implications regarding dark counts on the overall uncertainty of products, this should be elaborated more specific and stated clearly.

In the following some small suggestions are listed to improve the clarity of the manuscript, which needs minor revision before publication.

Smaller issues:

Abstract:
The abstract basically describes the intention and results of the study – no changes.

Section 2.3.4: page 12602 line 21: Is there any evidence that the stray light effect, cause the increased uncertainty? Maybe a reference from literature?

Section: 2.4: the advantages of determinations DT from sun measurement are stated several times – the disadvantages of this method should also be highlighted.

Page 12604, line 12. …at local noon: what was the solar zenith angle? Line 16 what was the range of the solar zenith angles?

Page 12604, line 16: a quantification of the estimated DT would be very helpful.

Page 12604,line 23: why is the calculated DT lower than the nominal?

Section 3.1: page 12607, line 7: please state the range of UV irradiance. Is the effect mentioned below in this section valid for the entire range?

Section: 3.3, page 12613, line 14: 0.01 and 0.05 are these absolute values? Please state, line 180:…05 to 0.07 again please state the absolute values.

Section 5, page 12618, line 8 ff: For better overview a list of bullet points to provide a short summary is helpful.

Figure 5: The range of investigated UV range should be stated.