

Dear Gerd:

Thanks for catching these inconsistencies. Please see our replies below.

Bob Sica

(for the co-authors)

Associate Editor Decision: Publish subject to technical corrections (04 Oct 2019) by Gerd Baumgarten Comments to t
Dear Rob Sica,

- thanks for the revised paper. I noticed that the change of "digital ..." to "photon counting" may not be complete. In Figures and captions the wording is still "digital ..."

Fixed: digital ... has been changed photon counting everywhere, including figures and captions.

- Regarding the reviewers question to "saturated": Page 10, line 8: "become saturated". What do you mean with "What we are implying here is that the photon counting measurements that are above 10MHz are no longer linear"

I do believe that equation 5 means that even below 10 MHz the measurements are not linear. The question is to what degree.

Maybe the term "saturated" and "saturation equation" (Equation 5) are confusing in the text.

Giving the correction factor ($N_{\text{true}}/N_{\text{obs}}$) for 10 MHz may help.

Good point. We have changed the text in 2 places.

1. Pg 5, lines 5-9 (here we have removed "saturation equation"):

The response of the photomultiplier tubes operated in the photon counting mode can become nonlinear at high count rates. In the case of RALMO, the true and observed counts are related by the equation for non-paralyzed systems:

$$\begin{equation} \begin{aligned} N_{\text{observed}} &= \frac{N_{\text{true}}}{1 + N_{\text{true}}\gamma}. \end{aligned} \end{equation}$$

where γ is the counting system dead time.

2. Pg 11, beginning of Section 5.1 (here we have discussed quantitatively the correction factor)

Figure~\ref{fig:1} shows the RALMO 30,min coadded count measurements in the four PRR channels for case 1 given in Table~\ref{tab:casestudy}. The analog signals is linear over its entire range. The photon counting measurements are affected by nonlinearity below about 9,km for the JL channel (6,km for JH) by about 0.5% (count rates of about 1,MHz) and as much as 1% for the JL photoncounts around 4,km altitude (Eq.~\ref{eq:5}).