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Interactive comment on "Radar observability of near-Earth objects using EISCAT 3D" *by* Daniel Kastinen et al.

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Dear Reviewer #1, Thank you very much for the helpful feedback on the manuscript. We have below addressed each of the points mentioned in the review individually.

Line 173: Equations 2 and 3 are currently not numbered. Fixed.

Line 171: Note that equation 1 is missing the cos(theta) factor for the pole location, such that if you observe the object parallel to the pole, the bandwidth is near 0, but if you observe the object perpendicular to the pole the bandwidth is maximized. The formula in equation 1 is actually an approximate formulation of the of the measured Doppler bandwidth where the rotation of the observing frame

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Discussion paper

(i.e. the rotation of the Earth) is removed as this factor is much smaller then the effect of the intrinsic rotation of the object around its own axis. The text before equation 1 states "depends on the rotation rate and diameter of the object", i.e. not the rotation of the observer. This is slightly unclear and we have added a clarification and changed the preceding text to the following:
The measured Doppler bandwidth is a combination of relative translation and rotation of the observing frame and the intrinsic rotation of the observed object around its own axis. However, in all cases considered by this study, the effect of a moving observation frame is negligible. As such, the Doppler width B of a rotating rigid object depends on the rotation rate around its own axis and diameter of the object:

Line 205: For equation 6, is epsilon an alpha level / test statistic? I would caution using epsilon here as the variable since on line 192 it is also used for permittivity, as is typical in radar. ϵ is the relative standard error of the signal power estimator. As such it is not a statistical test but rather an acceptance criteria on the relative standard error. As the ϵ variable is only used in this section we have changed it to δ for clarity. We have not used α as this is not hypothesis testing or confidence interval calculations. To clarify this we have added the following to the text before this equation:
To determine if the measurement is statistically significant or not, a criterion can be set on the relative standard error δ. Using the signal power estimator variance from Eq. 6, δ is defined as

Line 245: "transmitter bandwidth of $\leq$ 5 Hz; transmitter bandwidth of $\leq$ 30 Hz", whats the difference here? This was a typo. There was also a missing MHz and It should read: "transmitter bandwidth of ≤ 5 MHz; receiver bandwidth of ≤ 30 MHz;". It has been changed to this.

Line 246: This is the first mention of the operating frequency of the radar.

I would suggest to mention this much earlier, potentially in the abstract. It would also be valuable in the introduction to compare this with the operating frequencies of Arecibo and Goldstone.
We have added the operating frequency and peak power of EISCAT 3D in the abstract. We have also added the the operating frequencies and peak power of the EISCAT 3D, Arecibo and Goldstone systems where they are first mentioned in the introduction for the convenience of the reader. While we do in several places state that Arecibo and Goldstone are significantly more sensitive radars than EISCAT 3D, we have chosen not to go into too much detail. The primary purpose of this paper is to study the capabilities of EISCAT 3D. The performance of Goldstone and Arecibo are relatively well characterized e.g., in the paper by Naidu et.al., (2016), which we refer to. We do agree that it would be advantageous to make a more thorough comparison of the performance of various ground based radars for NEO detection in the future, but we are of the opinion that this is outside the scope of this current paper.

Line 312: "for a radar for a radar" - repeat Fixed.

Line 332: "discovery was investigated" - should be "were" investigated Fixed.

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