In this document, I will present the comments from reviewer 2 in bold preceded by a right chevron

>**As such.**

My reply will be in plain text.

I would like to begin by thanking the anonymous reviewer for their effort in reviewing the manuscript.

>**The present manuscript describes the capabilities of the new EISCAT 3D radar to perform planetary radar science. In particular, the manuscript explains that lunar mapping is a plausible application for the EISCAT 3D radar and that there would be multiple opportunities to conduct this type of observations in the following years. The document conducts a comparison between expected results for the EISCAT 3D radar and lunar measurements conducted with the Jicamarca radar in recent years, the comparison shows that EISCAT 3D images would be of higher quality providing useful information to study the characteristic of Moon surface. Since the proposed technique would generate lunar observations with a radar wavelength not used before for this type of studies, the results obtained with EISCAT 3D would complement previous studies and observations. Since the document is also well written and organized I would recommend its publication after the following minor comments are addressed.**

>**In section 3, I would recommend to include the expression used to estimate the SNR of planetary targets and the parameters used in its calculation in order to be able to reproduce Table 1. This would facilitate the interpretation of the results presented here.**

The SNR of planetary targets was found using the same method as in the companion paper, Radar observability of near-Earth objects using EISCAT 3D (Kastinen et al.),

The expression and a short description is added to the manuscript. These equations are discussed in further detail in Planetary Radar Astronomy (Ostro, 1993) and the companion paper.

>**In section 4, I would suggest to compute and discuss the expected resolution of the lunar radar images to be obtained with EISCAT 3D. These values should be compared with the Jicamarca radar observations in order to discuss the improvement that would be achieved using the EISCAT 3D radar.**

I have added a paragraph describing the theoretically achievable resolution of a range-Doppler map using EISCAT 3D. The range resolution R_r achievable is found as $R_r = \frac{c}{2B}$, where B is the transmit bandwidth and c is the speed of light. As EISCAT 3D has a transmit bandwidth of 5 MHz, this results in a range resolution along-sight of approximately 30 m. The frequency resolution R_f along the equator is found as $R_f = \frac{\lambda D_m}{2 v_{rot} c \tau_m}$, where D_m is the diameter of the Moon, v_{rot}, and τ_m is the observation time in seconds. The apparent rotation velocity of the Moon will change day-to-day, but will be be somewhere between 0.5 m/s and 2.0 m/s For a one-hour observation with an apparent rotation velocity of 1.2 m/s, the average resolution in the Doppler dimension will be 520 m

The practically achievable resolution will be significantly lower than what is theoretically possible. Much of this reduction comes from efforts to compensate for low SNR and to reduce speckling. Another challenge is that Rogers and Ingalls method of north-south disambiguation assumes a stationary Doppler axis. This assumption does not hold for long observations of the lunar face, effectively limiting possible observation times. These effects will be dependent upon the specifics of each observation, and can be expected to vary significantly.

$>$**Given that lunar echo signals would be obtained at low elevation angles (30 degrees) using the EISCAT 3D radar, it is likely that the shape of the antenna beam pattern would have an impact on the observations distorting the reconstructed images. I would suggest the authors to consider including a discussion about this in the manuscript**

The relatively low elevation angle of the lunar face presents three challenges for radar imaging. 1) The antenna gain pattern will be elongated in the elevation direction. This will cause a loss of signal strength. 2) The elevation pointing direction will also cause a polarization dependent phase and amplitude response for the antenna. This will require careful calibration. 3) The point spread function of the interferometer will also be affected.

Of these effects, the polarization dependent antenna response is probably most important. This will most likely require the community to develop an azimuth and elevation dependent polarization response model for the EISCAT 3D antenna.