Behavioral study of Doppler Radio signal response on ionospheric layers owing to Super Blue Blood Moon

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***Abstract*— The total lunar eclipse appeared when the Moon is near its perigee position on January 30, 2018. This condition is termed as the Super-Moon. It is the combination of various lunar events like lunar eclipse along with blue Moon, and Super-Moon. Appear all in one on January 31, 2018 creating the 'Super Blue Blood Moon'. The previous lunar eclipse was in September 2015. In this paper we will discuss the modeling of lunar orbit geometry at ecliptic condition and the reception of Doppler Radio Data in response to Earth ionosphere during this kind of lunar eclipse.**

Keywords*— *Doppler Radio Data; lunar eclipse; penumbra; Super-Moon; umbra;

I. INTRODUCTION

In this paper is we are investigating radio data associated with the lunar eclipse again we also depict a model geometry for lunar eclipse. The radio frequency data distributed from the several transmitting stations and received at other zone are considered to determine the signal responsive zones at the eclipse. The Doppler shifting of the radio data from the Ecliptic lunar surface at the Super-Moon give us important facts about the ecliptic Moon. The thermal property of Moon is very important fact for radio-telescopic observation of Moon over processes of photometry. This leads us to some noteworthy facts, which are well supported by the lunar data from several space agencies.

II. WHAT IS LUNAR ECLIPSE

When the Moon passes within the Earth shadow named as umbra the lunar eclipse occurs [1]. Then, the shadow begins to swallow the part of the Moon. The dark red-brown colour shadow is generated on the Moon surface due to Earth's atmospheric conditions [2]. In the planetary umbra the Rayleigh scattering and the Earth's atmospheric refraction of light make the Moon reddish [3]. A lunar eclipse appears at night when the Earth moves between the Sun and the Moon. The lunar eclipse appears in two continuous areas first in the sunlight dimming outer penumbral shadow, and second in an inner umbral shadow. Here heavily dimmed solar rays only exist due to Earth's atmosphere refraction. Therefore the red colour is created. Different exposures of a partial lunar eclipse like 1/80, 2/5, and 2 seconds are observed. In fact the complete absence of Moon in the umbra is not happened due to the refraction of sunlight by the Earth's atmosphere into the shadow cone. The aerosols and the minute particles in Earth atmosphere scatter the shorter wavelength for which the lunar eclipse never becomes a pitch dark. Due to titling of moon orbit with respect to Earth in five degree as show in figure1 responsible of this super moon eclipse event. The modeling of the same is show in figure1.

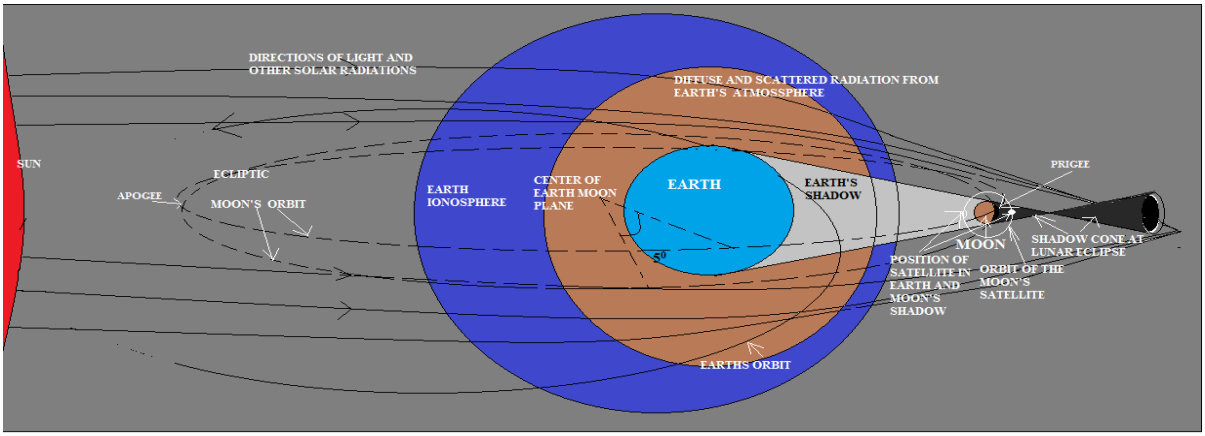

Fig.1. Modeling of Lunar Orbit during Eclipse

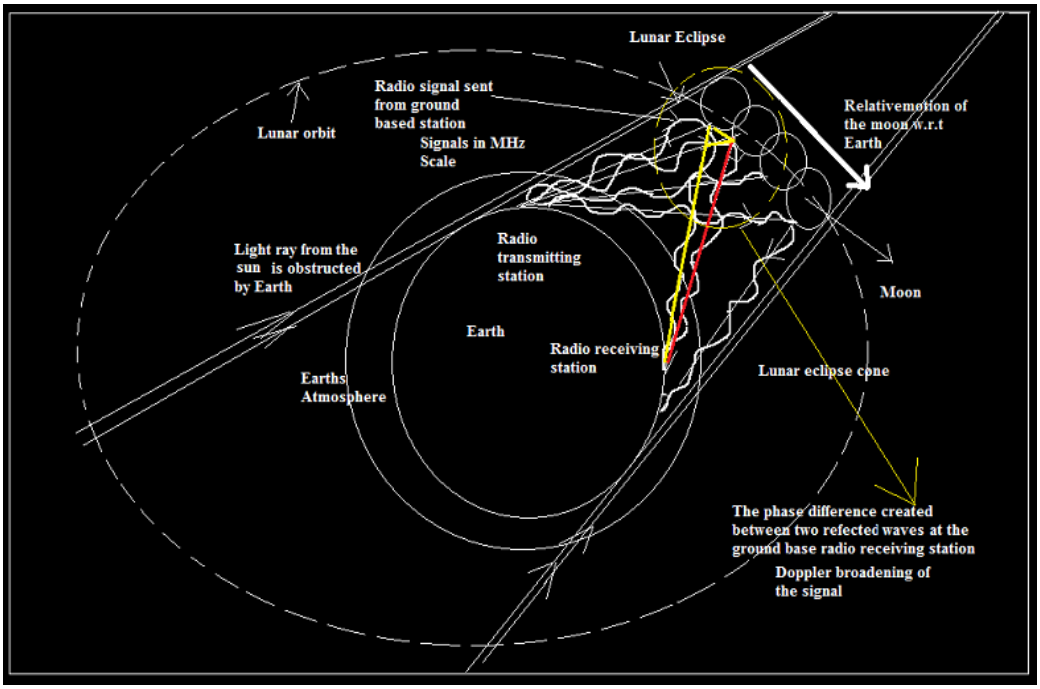

Fig.2. Geomtry of Dopplar Broadening of the Radio signal sent from Earth surface to moon

The above figure 2 shows the Geomtry of Dopplar Broadening of the Radio signal sent from Earth Surface to Moon.

III. RADIO-DOPPLER STUDY OF LUNAR ECLIPSE

The Moon has passed through the zenith position **(c)** Frequency- domain image in meridian transit of Moon. [4]. At Lunar eclipse the passage of the Moon through the earth's penumbra to umbra and the reverse way is recorded by the Doppler shift in radio telescopy. The Frequency-domain pictures surrounding lunar zenith transit is shown in figure. The direct signal in the spectrum is enough strong in nature, while a weak reflection appears perhaps 100 Hz higher in frequency [4]. The echo so generated is blue-shifted. This is the situation just prior to zenith. In fact the Moon is moving toward the observer then few second later a red-shift of the echo about 100 Hz is recognized. The Moon has moved through the zenith position and is now actually moving away from the observer. Here the minimum amount of Doppler shift is recorded. Again in right at meridian transit case this rate is maximum [5]. Instantaneously after the zenith position is crossed the frequency of the echo become lower. The strong direct signal remains static in the spectrum analyzer display. Again interestingly from the observation it shows that the there will be no significant drop in the reflected frequency from surface of the Moon in Doppler shift data for Moon bounce at atmospheric window frequency i.e. 1296 Hz. So it can easily be depicted that the lunar transition happens at eclipse condition makes the Doppler shift same as that of without lunar eclipse [6]. The Radio signal propagated from the Earth's remains unaltered in this phenomenon.

IV.CONCLUSION

From the above study it can be conclude that the ionospheric changes is no longer related with it as it is more prominent in case of solar eclipse. Which is accountable for the forming the boosting point of the radio signal [7]. This strange behavior provides us gloomy facts of lunar eclipse. It seems that some difficulty is hidden there for telescopic detection [5]. By investigations it is suggested that the lunar surface is not solid rock which heats quickly under the solar radiation but it is made up with broken-up composition of dust, sand, and small pebbles termed as known as 'regolith' [8]. Those structures are responsible for slow thermal response to Solar illumination. The long time appearance of lunar eclipse does not considerably change the lunar soil temperature, as considered in case of the radio emission of the entire Moon.

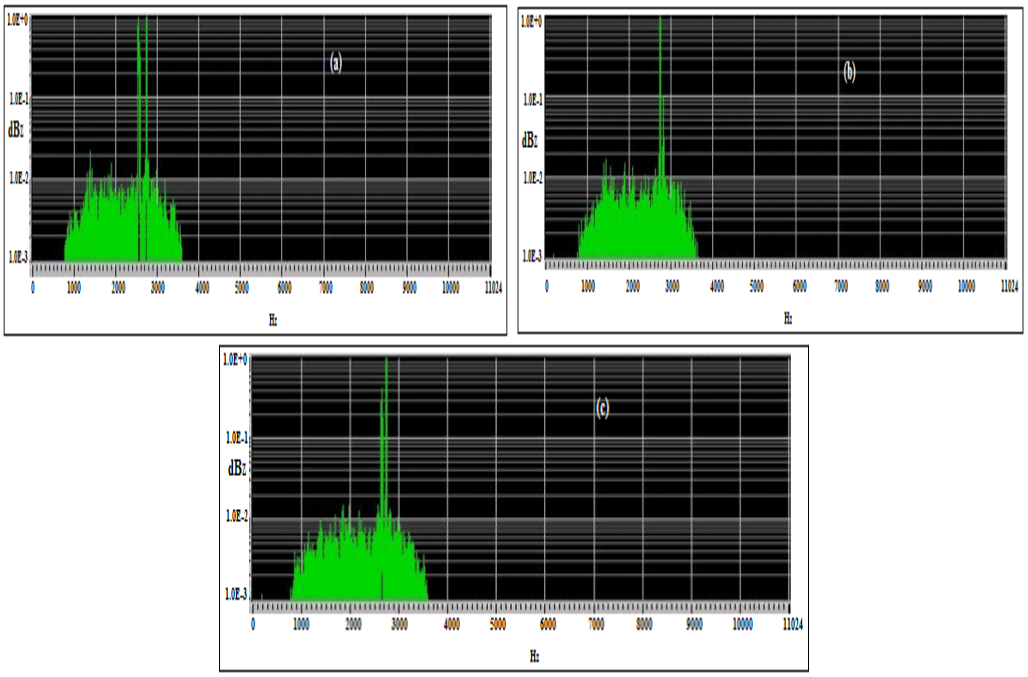

Fig.2 (a) Frequency-domain images encompassing lunar zenith transit of Moon. **(b)** Frequency- domain image

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