

DETECTION AND CHARACTERISATION OF WHISTLERS AND SFERICS

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Naturally occurring radio signals from lightning discharges produce whistlers and sferics that can be prospectively used in the analysis of the middle atmosphere, especially the D-region of the ionosphere because of its ability to travel into the particular region. The initial portion of this study focused on developing a magnetic loop antenna and a high gain very low frequency (VLF) amplifier. Magnetic loop antennas are more favourable in this research area due to ease of construction and simplicity. In this study, a magnetic loop antenna of 1 m² was constructed on a wooden frame. Insulated copper wire with a diameter of 1 mm was wrapped 40 times around the frame to form the antenna. A high gain VLF amplifier was designed using the OP27 and the CA3140 integrated circuits and constructed using the ultra-violet (UV) exposure method. In the latter part of the study, sferics were observed throughout September 2019 till January 2020 in the University of Peradeniya premises using the constructed VLF receiver and the magnetic loop antenna. Obtained sferics were used to estimate the ionosphere D-region height, and the results were consistent with the theoretical values. D-region height estimated from the time difference between 1st and 2nd hop waves with the ground wave ranged from 35 to 57 km. Additionally, the frequency variation of the observed sferics was determined to be in the range of 3000 Hz – 8000 Hz. Also, the duration of the sferics was determined using the obtained amplitude vs time plots.

Keywords: Ionosphere, Magnetic loop antenna, Sferics, VLF amplifier, Whistlers