Appearance of auroral roar and MF burst

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Auroral roar originates from strong excitation of upper hybrid wave in a particular altitude range where $f_{UH} \sim n f_{ce}$ is satisfied, and propagates to the ground after the mode conversion into a L-O mode electromagnetic wave [e.g. Weatherwax et al., 2002]. Medium Frequency (MF) burst is a broadband impulsive radio emission detected at ground-level. In order to understand generation mechanisms of these MF auroral radio emissions, we started observation at Husafell in Iceland (CGM Lat.: 65.3 deg) in September 2005. A receiver and loop antennas were designed to perform polarization and spectrum measurements. In addition, a new instrumentation was installed at Longyearbyen in Svalbard (CGM Lat.: 75.2 deg) in August 2008. The instrument consists of two types of observation systems; one was designed for the continuous observation of spectrum in a frequency range below 6 MHz. The other was designed to obtain waveform data in a frequency range below 4 MHz by an A/D converter with a sampling speed of 10MSPS. Use of the wave form data makes it possible to estimate the arrival direction angle of a received radio wave.

Several event studies show characteristics of their appearance depending on auroral activity, ionospheric conditions, local time, and so on. For example, several MF burst and auroral roar emissions were detected at Longyearbyen on September 4 and 8, 2008. Comparison with other ground-based observation data showed that the MF burst was coincident with low latitude absorption event while the auroral roar was not associated with any absorption events. The results suggests that MF burst is generated by high energy (more than several keV) electrons in the low latitude region in association with auroral breakup, and auroral roar is generated by low energy (~several hundred eV) electrons above the station. In this presentation, we will show comprehensive event study based on both the Iceland and Svalbard observations.