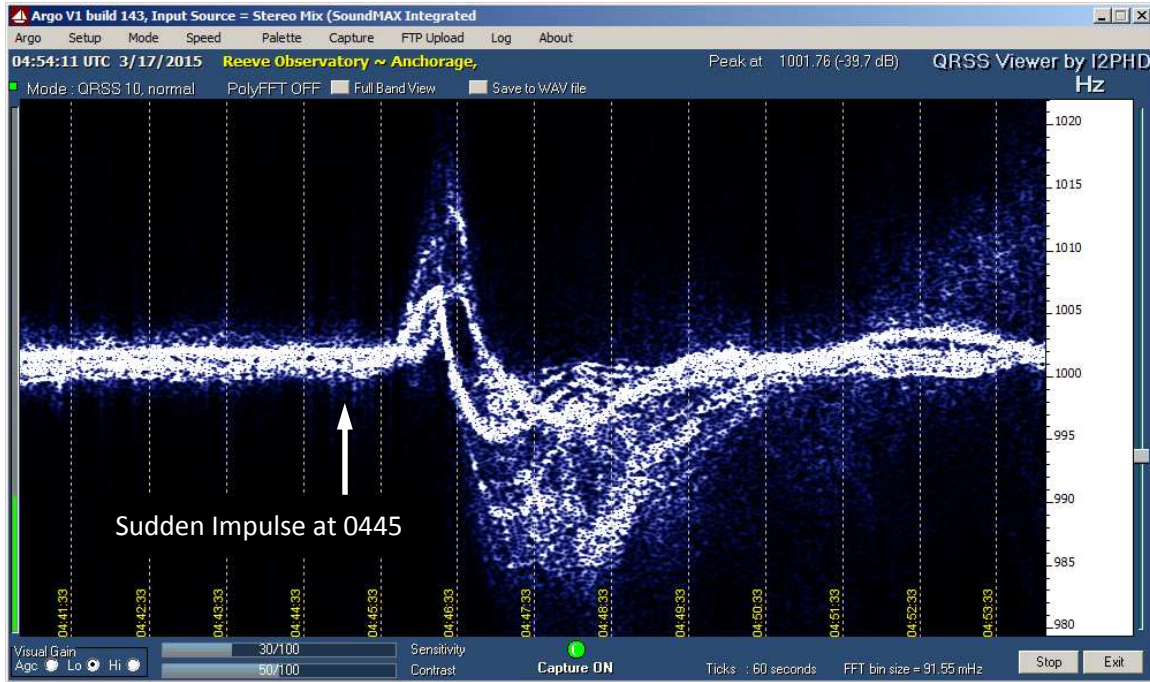


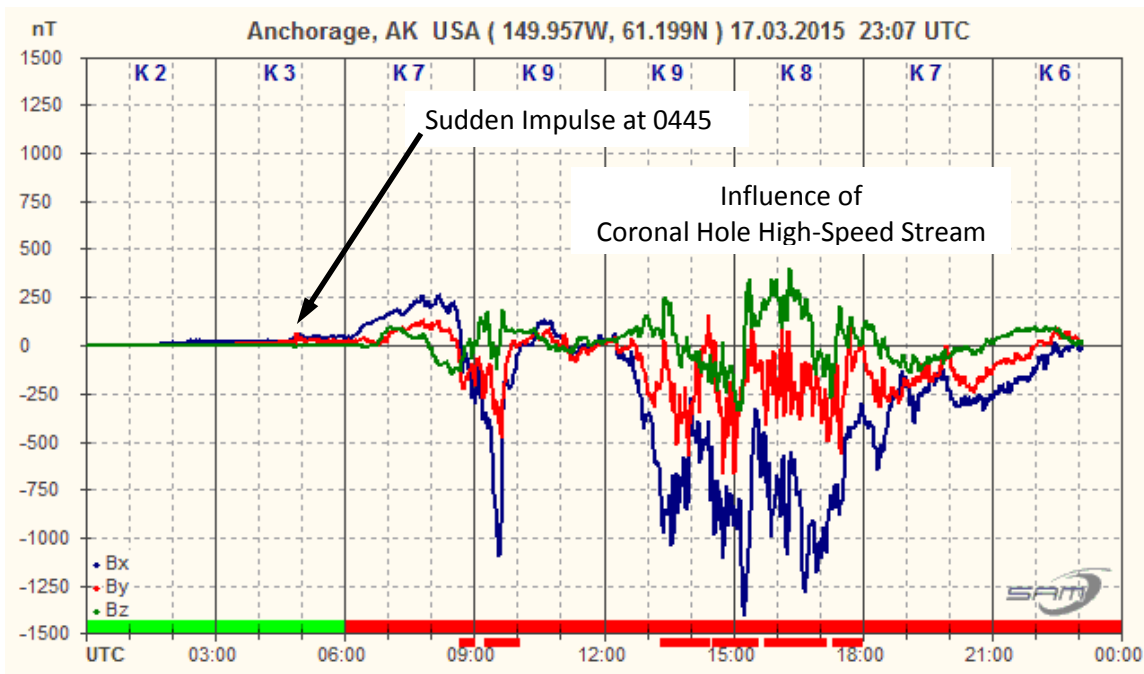
# Coronal Mass Ejection Effects on HF Radio Propagation ~ 17 March 2015

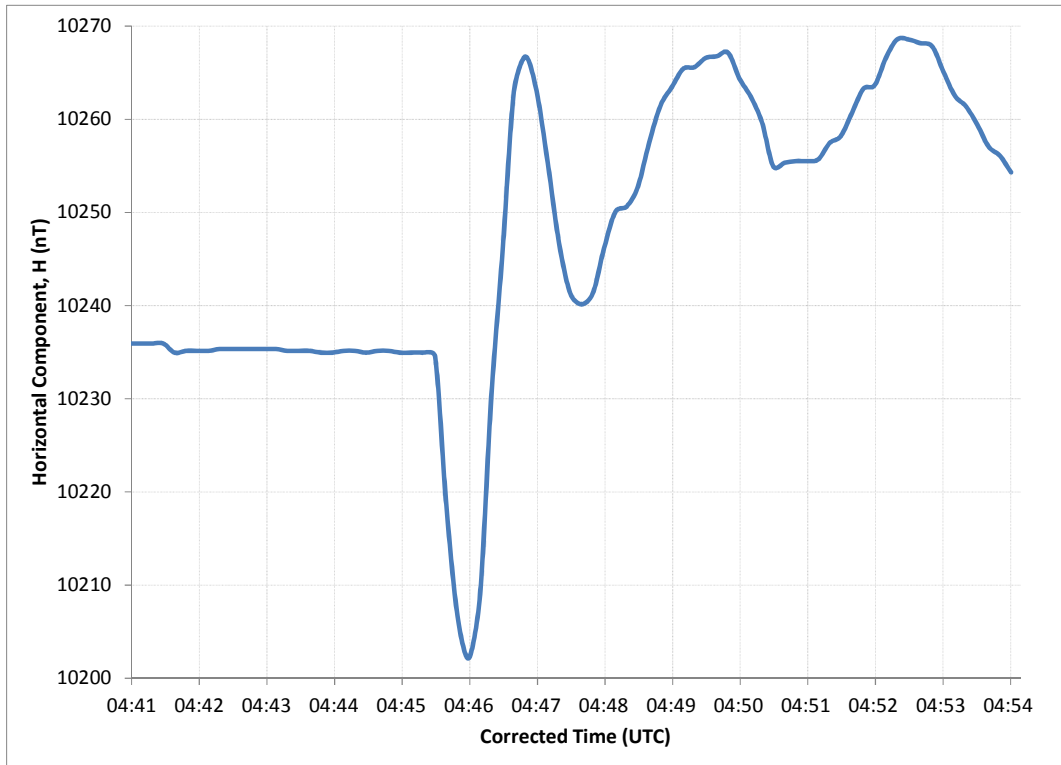
Whitham D. Reeve

**Radio:** Sudden frequency deviations of WWV and WWVH on 10 MHz, peak-to-peak deviation approximately 33 Hz. Chart covers time period 0441 to 0454 UTC. Note: Anchorage sunset: 0404 UTC (2004 AKDT).

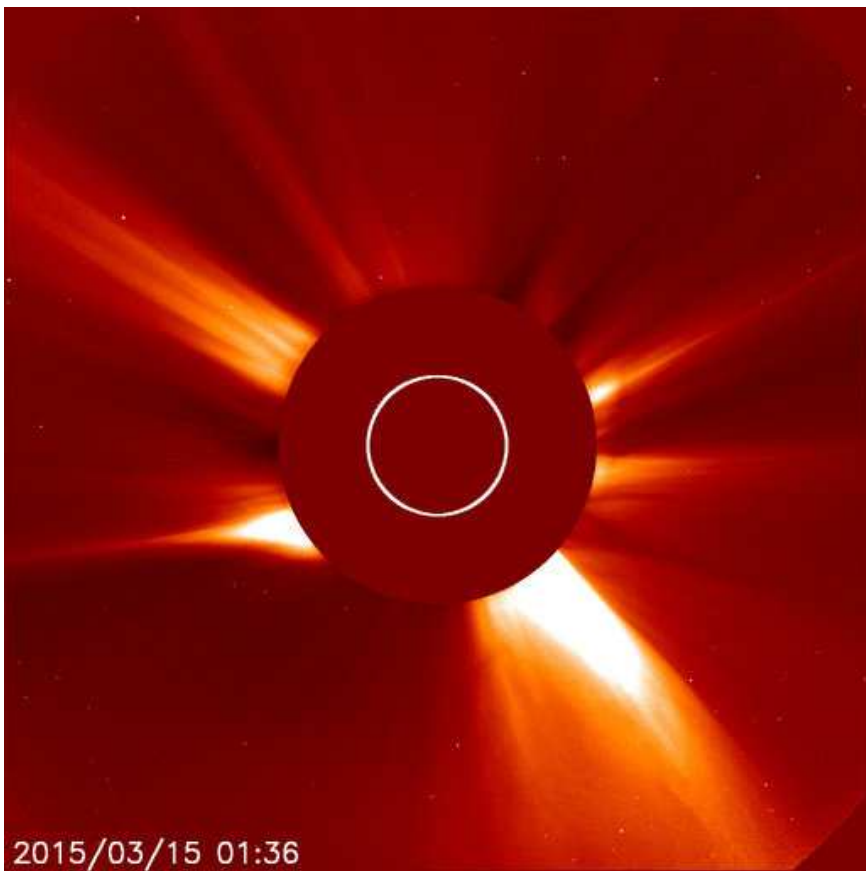


**Geomagnetic:** Geomagnetic sudden Impulse coincident with SFD at 0445 UTC with deviation: 54 nT. Chart covers a 24 h period. The sudden impulse was likely caused by the full-halo coronal mass ejection observed early on 15 March (see image next page). Geomagnetic storm conditions quickly developed after the SI. Additional storm conditions followed later, likely caused by a recurring coronal hole high-speed stream.





Sudden impulse as received at Anchorage, Alaska plotted as horizontal component determined from original X- and Y- component data. Data plotted at same time scale as Argo chart on previous page. Data sampling rate 0.1 Hz. Image © 2015 W. Reeve



Solar: Coronal mass ejection imaged by SOHO LASCO C2 on 15 March 2015. The CME impacted Earth's magnetosphere at 0445 on 17 March. Image courtesy SOHO (ESA/NASA)

How to read charts: In the radio section, the Argo chart is a form of narrowband spectrogram, which shows the received frequency after SSB detection. The Icom R-75 receiver is set to USB and its frequency is tuned about 1 kHz below the carrier frequency of 10 MHz. Therefore, the trace shows an audio trace as proxy for the actual 10 MHz carrier. Time in UTC is shown on the horizontal scale (1 min time stamps) and frequency in Hz is shown on the vertical scale. The frequency span shown is about 40 Hz. Relative intensity of the received signal is shown by the brightness of the trace.

Two charts are shown in the geomagnetic section. The first is a 24 h magnetogram produced by the SAM-III magnetometer and SAM\_VIEW software. Time in UTC is shown on the horizontal scale and magnetic field flux density (magnetic induction) is shown on the vertical scale. The traces show the three field components Bx, By and Bz (key is in the lower-left corner). The software normalizes the field measurements at the beginning of each day, so the trace amplitudes are relative to the field values at 0000 UTC. The second chart is an Excel chart produced from the SAM-III data. It is a zoomed-in trace of only the sudden impulse. Time in UTC is on the horizontal scale and field flux density on the vertical scale. The trace shows absolute flux density and is not normalized.

The image shown in the solar section is a false color image produced by the LASCO spacecraft. The outline of the Sun is the white circle in the center of the occulting disc on the spacecraft imager. A movie of the CME leaving the Sun is here: [http://sohowww.nascom.nasa.gov/pickoftheweek/Earth\\_boundCME\\_C2\\_best.mp4](http://sohowww.nascom.nasa.gov/pickoftheweek/Earth_boundCME_C2_best.mp4)