Evaluation of data selection algorithm implemented on the LRS/WFC onboard KAGUYA

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The waveform capture (WFC) is one of the subsystems of the Lunar Radar Sounder (LRS) on board the KAGUYA spacecraft. The main purpose of the WFC is to observe plasma waves and radio emissions around the moon. The WFC-L is a waveform receiver and it measures electric waveform from 100Hz to 100kHz. It is essential for achievement of maximum scientific output under restricted telemetry budget to arrange appropriate observation modes of the WFC-L. To utilize the digital filter function more effectively, "automatic filter selection (SELECT)" mode was implemented on the onboard software for WFC-L. In the SELECT mode, the onboard software evaluates maximum amplitudes or averaged powers at frequency bands of 50-100kHz, 25-100 kHz, and 12.5-100kHz extracted by band-pass FIR filters, respectively, in order to determine whether to select an intermittent measurement covering higher frequency range with lower duty ratio or a semi-continuous measurement in the lower frequency range. Because the waveform observation is generally more important in the lower frequency range from a scientific point of view, signal in higher frequency range weaker than the threshold level is automatically eliminated by the above mentioned optional decimation filters in the DSP and the decimated waveform data is packed into mission packets. This technique makes it possible to downlink the significant waveform to the ground in shorter time duration and to capture a new series of waveform data with a higher duty ratio.

The automatic filter selection (SELECT) mode of the WFC-L was performed from June to August, 2008 once or twice a day. In the present study, we evaluated the performance of the SELECT mode.

Keywords: KAGUYA, waveform capture, data selection algorithm, plasma wave, onboard software