

GRITSS API Notes

The GRITSS is a small payload that will generate a novel geodetic time-of-flight (TOF) observable reference by determining the Global Position System (GPS) time solution of its host satellite and upconverting and retransmitting that information using two distinct frequencies (3200 MHz and 10200 MHz) which are compatible with all Very Long Baseline Interferometry (VLBI) earth stations. The VLBI earth stations will observe this TOF reference signal from GRITSS and then use it to calculate the co-location delay closure between the GRITSS reference signal and the signals received by other Global Navigation Satellite System (GNSS) receivers at the VLBI earth station locations. Determining this co-location delay closure allows direct suppression of common reference clock terms (e.g., clock bias) which in turn enables the location of objects on the surface of the Earth using the International Terrestrial Reference Frame (ITRF) to be determined with greater accuracy. The goal of the GRITSS payload is to successfully demonstrate the ability to use the ITRF to determine an object's position accuracy within 1 millimeter.

The GRITSS payload will transmit this space-to-Earth reference signal at frequencies of 3200 MHz and 10200 MHz when in view of the VLBI stations located at Glenn Dale, Maryland; Fort Davis, Texas; Kauai, Hawaii; and Westford, Massachusetts. The GRITSS payload may also be supported by international VLBI earth station locations at Fortaleza, Brazil; Yebes, Spain; Santa Maria, Portugal; Ny- Ålesund North, Norway; Wettzell South, Austria; Onsala NE, Sweden; Onsala, SW Sweden; Cambridge Tasmania, Australia; Cossack North Territory, Australia; and Tsukuba Ibaraki, Japan.

The frequencies selected by the GRITSS payload are within Earth Exploration-Satellite Service (EESS) (active) allocations, but since the GRITSS payload does not qualify as an active sensor the USA intends to operate this system on a non-interference basis under the Space Research Service (SRS). The USA does not expect GRITSS payload operations to create harmful interference to VLBI earth station operations, because the VLBI earth stations will actively plan and schedule support for the GRITSS payload to avoid their normal radio astronomy observations within these frequency bands. Additionally, given the low power flux density (PFD) levels at the surface of the Earth from GRITSS payload operations, $-170.9 \text{ dBW/Hz/m}^2/4 \text{ kHz}$ for 3200 MHz and $-172.3 \text{ dBW/Hz/m}^2/4 \text{ kHz}$ for 10200 MHz, GRITSS payload operations are not expected to impact terrestrial operations in these frequency bands.