

Spectrum Safety: Compatibility of NTS-3 Signals with GNSS Signals

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With the upcoming launch of the Navigation Technology Satellite-3 (NTS-3) in 2023, it is necessary to ensure that the NTS-3 signals do not interfere with existing Global Navigation Satellite Service (GNSS) signals. We have created an analysis framework in Python to evaluate the possibility of interference between various signals.

Traditionally, interference from radio navigation satellites services (RNSS) to the reception of constant RNSS signals has been analyzed using a methodology set out by the International Telecommunications Union-Radiocommunications (ITU-R) [1]. In an earlier study [2], a similar methodology was used to evaluate the interference of RMP (Regional Military Protection) capabilities with existing GPS signals. We are using a similar methodology to evaluate the interference of NTS-3 signals with existing GNSS signals. This methodology consists of computing the Spectral Separation Coefficients (SSC) between a desired signal and potential interfering signals to calculate the effective C/N_0 noise floor increase.

Preliminary analysis indicates that interference of NTS-3 experimental signals with existing GNSS signals is negligible. We are currently completing a comprehensive computational study, and plan to follow the analysis with experimental validation in a laboratory setting.

Additionally, we are investigating other methods to reduce the risk of harmful interference if concerns remain following analysis and experiments. Examples include using a non-standard pseudo-random number (PRN) code, setting the NTS-3 signals to “unhealthy”, reducing broadcast power, continuous monitoring with legacy user equipment during any high risk-operations, and performing experiments at night when fewer users would be potentially impacted.

References

[1] International Telecommunications Union-Radiocommunications, “A Coordination Methodology for Radionavigation-Satellite Service Inter-System Interference Estimation,” ITU-R M.1831-1, Sep. 2015.

[2]. J. W. Betz, “On the Interference from GPS Regional Military Protection to Reception of Other GPS Signals,” MITRE Document No. MP200152. Jun. 2021.

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