



## **Decorrelation of GNSS signals during periods of scintillations near the EIA crest**

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GNSS modernization program includes addition of new civilian frequencies, L2C and L5, to augment the already existing L1 and semi-codeless L2 frequencies with the objective of providing improved multi-frequency ionospheric corrections. A significant factor in decorrelating the signals arises from the different phase decorrelation effects due to diffraction of signals from local random inhomogeneities of the medium of propagation frequently found to develop in the equatorial region during post-sunset hours. Relative robustness of these new signals and interoperability of constellations needs to be examined during periods of deep signal fading frequently encountered at equatorial regions. Two multi-frequency and multi-constellation GNSS receivers are operational at University of Calcutta, Calcutta and North Bengal University, Siliguri along 88°E around the northern crest of the EIA in the geophysically sensitive Indian longitude sector.

During March 2014, frequent and intense amplitude scintillations associated with cycle slips were observed from Calcutta and Siliguri, with duration exceeding 10s, being higher than that specified by ICAO APV. It is interesting to note that cycle slips were found to be more frequent at L5 compared to L1, and L2C compared to L5, the latter result indicating less robustness of L2C signal. Periodic fluctuations were noted at the three L-band frequencies prior to occurrence of a scintillation patch which may be treated as precursors.

Signal decorrelations and scattering coefficients were calculated across a pair of frequencies during periods of scintillations. The results were binned into different time intervals during post-sunset to early morning hours. It is found that inter-frequency low correlation coefficients between  $C/N_0$  deviations were associated with high  $S_4$ , high scattering coefficient and resulting large receiver position deviations for about 40% of a scintillation patch. Similar studies have been conducted from Siliguri during 2015-2016.