

# **Study of spatial and temporal characteristics of L-band scintillations over the Indian low latitude region and their possible effects on GPS navigation**

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The scintillation data (S4-index) at the L-band frequency of 1.575 GHz recorded from a total of 18 GPS receivers installed at different locations in India under the GAGAN project has given an unique opportunity, for the first time in the Indian region, to make a simultaneous study of spatio-temporal and intensity characteristics of the trans-ionospheric scintillations during the 18 month period from January 2004 to July 2005. During this period the occurrence of scintillations is maximum around the pre-midnight hours of equinox months with very little activity during post midnight hours. No significant scintillation activity is observed during the summer and winter months in this low sunspot activity (LSSA) period. The intensity (S4 index) of scintillation activity is stronger around the equatorial ionization anomaly (EIA) region in the geographic latitude range of 15° to 25° N in the Indian region. These scintillations are often accompanied by the TEC depletions with durations ranging from 10 to 30 minutes and magnitudes from 5 to 20 TEC units that affect the positional accuracy of GPS by 1 to 3.5 metres. Further, during the intense scintillation events ( $S4 > 0.45$  and  $\geq 10$  dB) the GPS receiver is found to lose its lock for a short duration (1 to 4 min) increasing the error bounds that affects the integrity of the SBAS operation. During this LSSA period (2004-2005) a total of 395 loss of lock events are observed in the Indian EIA region; this number is likely to increase during the high sunspot activity period creating much more adverse conditions for the trans-ionospheric communications and navigation systems.