Radio frequency Interference effects on GPS Signals

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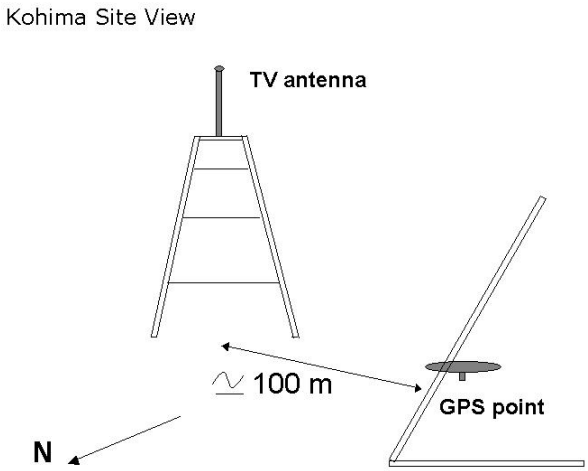
Electromagnetic signal with good signal strength and desired frequency can interfere with GPS signals and cause GPS receiver to loose track of the GPS satellites. Since electromagnetic signal generally affects only one frequency, it is possible to study this phenomenon using dual frequency GPS receivers i.e. interfering signal alters either pseudo range or phase or both on one frequency while observable on second frequency is unaffected. For this study, simultaneous data collected at three sites viz. Kohima, Silchar and Lumding have been used. At Kohima, T.V. broadcasting station is at a distance of around 100m (see figure) . and likely to cause RF interference. Other two sites are completely free from such interference.



GPS data on 332 day of the year (doy), 2004 with observables L1, C1, L2 and P2 are plotted for each satellite for all the sites and compared. To identify cause of discontinuities in GPS observables in some satellites, same day data from other two sites viz. Silcher and Lumding are compared. Since these two sites are within 100 km, any space weather disturbances etc. that can cause loss of lock to satellites are applicable to all three sites. Hence contribution from these disturbances can be easily identified.

Form the GPS data it is seen that for some satellites with particular azimuth angles lost of lock is seen for Kohima data while this is not seen for Silchar and Lumding sites. This signifies that discontinuity is site specific and can be due to radio interference or physical blocking of the signal (due to abstables). The later can be discarded as only L1 frequency is affected while L2 is not indicating that RF signal with frequency around 1575MHz is getting tracked by receiver for particular azimuth of satellite. Television antenna operates in C-Band (2-3GHz) and still causing interference with L-Band (1-2GHz) GPS signals ?. This is because, there are multiple amplifier stages in which other L-Band frequencies right from few MHz till 2.4Ghz are generated. Commercially available directional TV antenna contains an amplifier which can emit spurious radiation in GPS L1 Band with sufficient power to interfere with GPS reception at distances few hundred meters and case loss of lock to particular satellites.