NavIC Performance using S-Band Signals

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Introduction to NavIC

- NavIC, the operational name for the Indian Regional Navigation Satellite System (IRNSS), provides precise Position, Velocity and Timing (PVT) services to its users over the Indian Region.

- NavIC, broadcasts its Signal-in-space in 2 frequency bands.

  L5 band - Centre frequency 1176.45 MHz

  S band- Centre frequency 2492.028 MHz

S Band Frequency Allocation

- ITU WRC has allocated, S band frequency range between 2483.5 to 2500 MHz for Radio Determination Satellite Service (RDSS) in Region-1,2 and Region-3.
- India comes under Region-3.

Region 1	Region 2	Region 3
2 483.5-2 500 FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) 5.351A RADIODETERMINATION- SATELLITE (space-to-Earth) 5.398 Radiolocation 5.398A 5.150 5.399 5.401 5.402	**2 483.5-2 500** FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) 5.351A RADIOLOCATION RADIODETERMINATION- SATELLITE (space-to-Earth) 5.398 5.150 5.402	**2 483.5-2 500** FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) 5.351A RADIOLOCATION RADIODETERMINATION- SATELLITE (space-to-Earth) 5.398 5.150 5.401 5.402

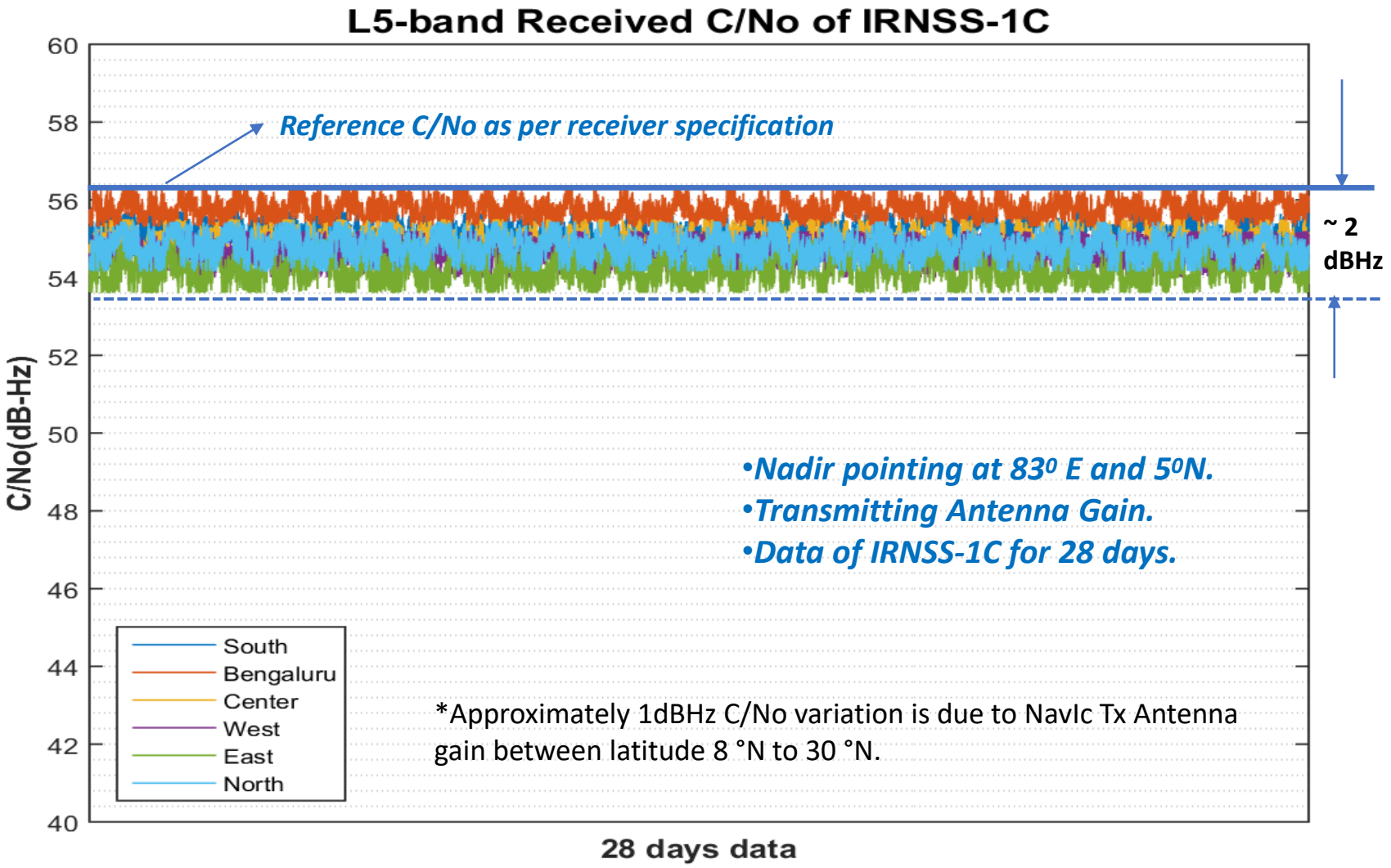
NavIC Performance Evaluation

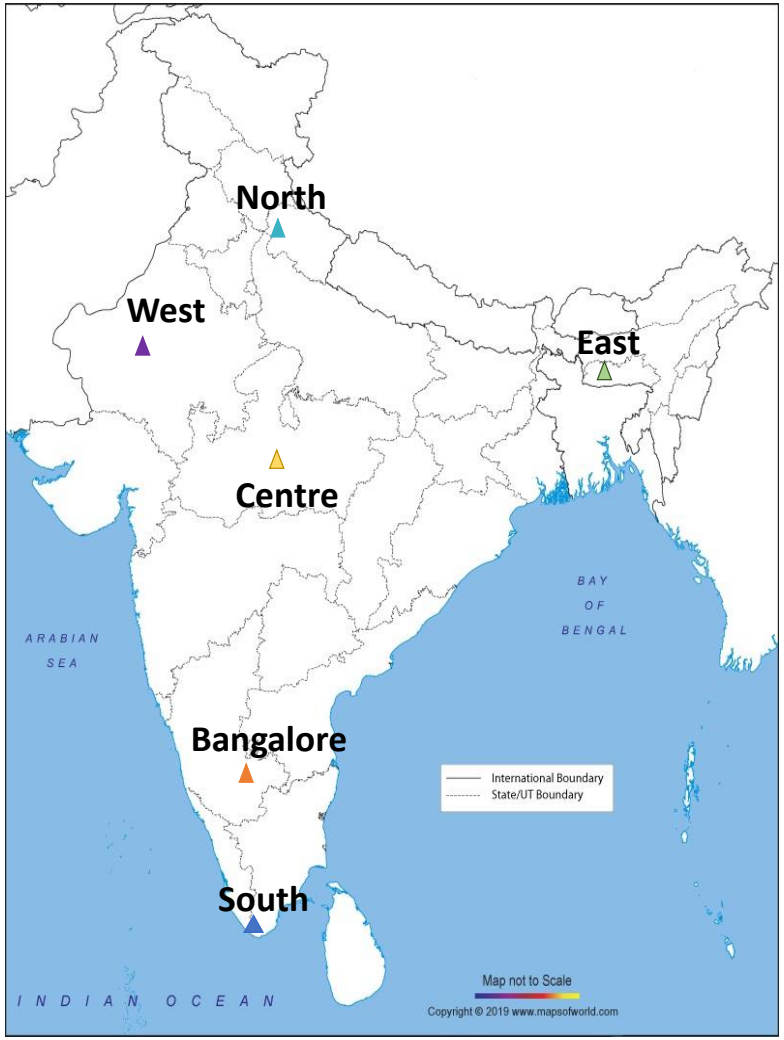
- NavIC performance analysis using S-band frequency is being carried out at various locations in India viz:

i.	**South**	**: Mahendragiri**	(08.20° N, 77.67° E)
ii.	**Bangalore**		(12.81° N, 77.37° E)
iii.	**Centre**	**: Bhopal**	(23.25° N, 77.41° E)
iv.	**West**	**: Jodhpur**	(26.23° N, 73.02° E)
v.	**East**	**: Shillong**	(25.57° N, 91.89° E)
vi.	**North**	**: Dehradun**	(30.31° N, 78.03° E)

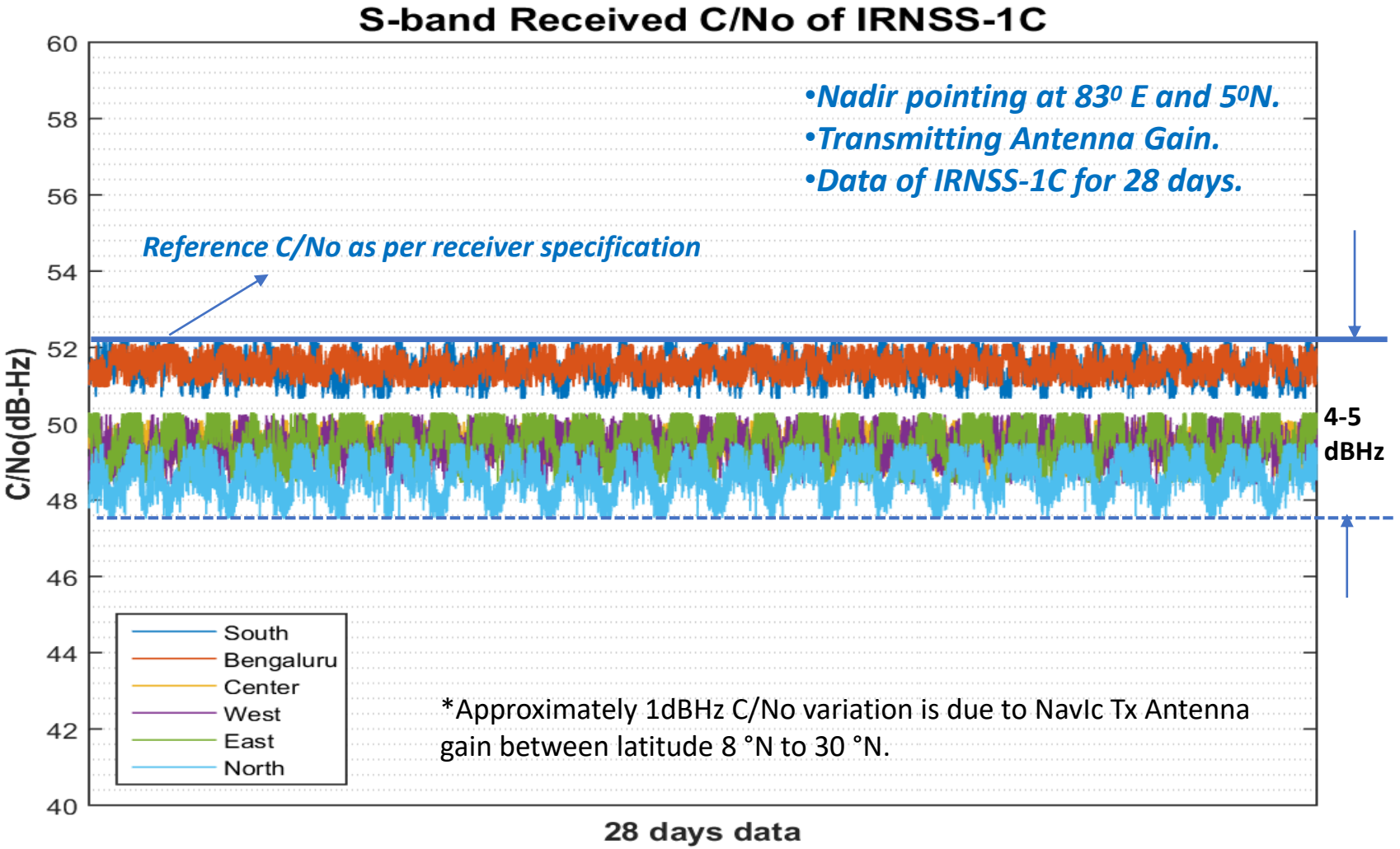
- The navigation data is collected from the various reference stations located across the country and the system performance is evaluated in terms of position accuracy and received C/No.

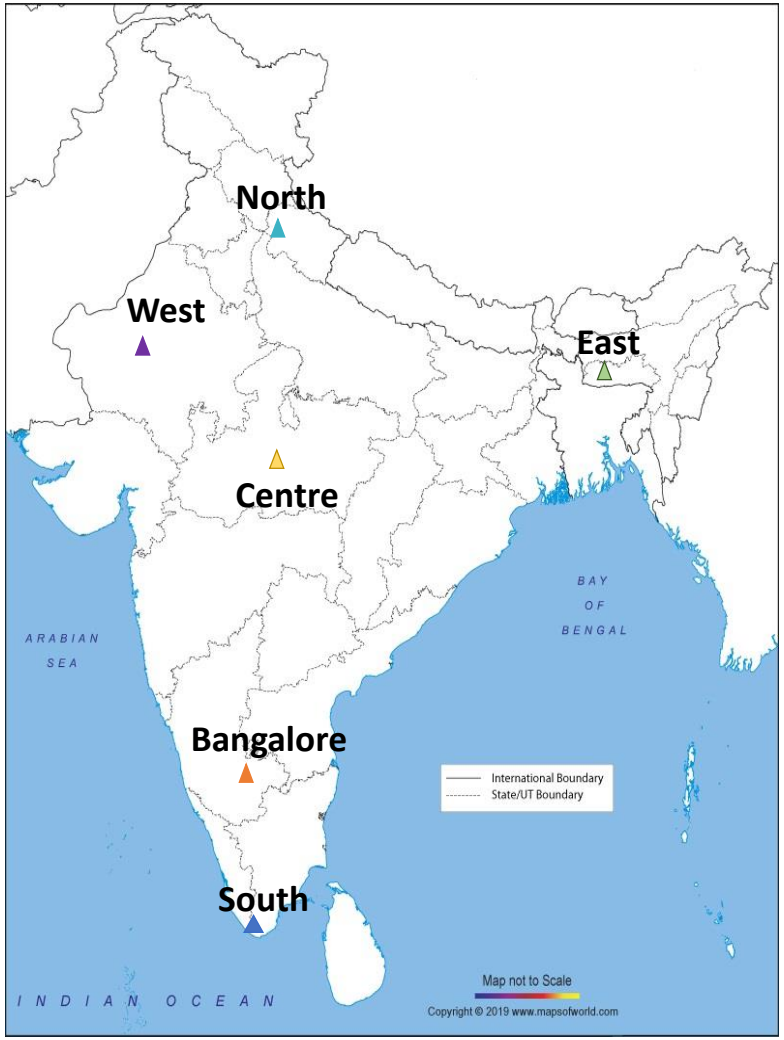
L5-Band Received C/No Variation





S-Band Received C/No Variation

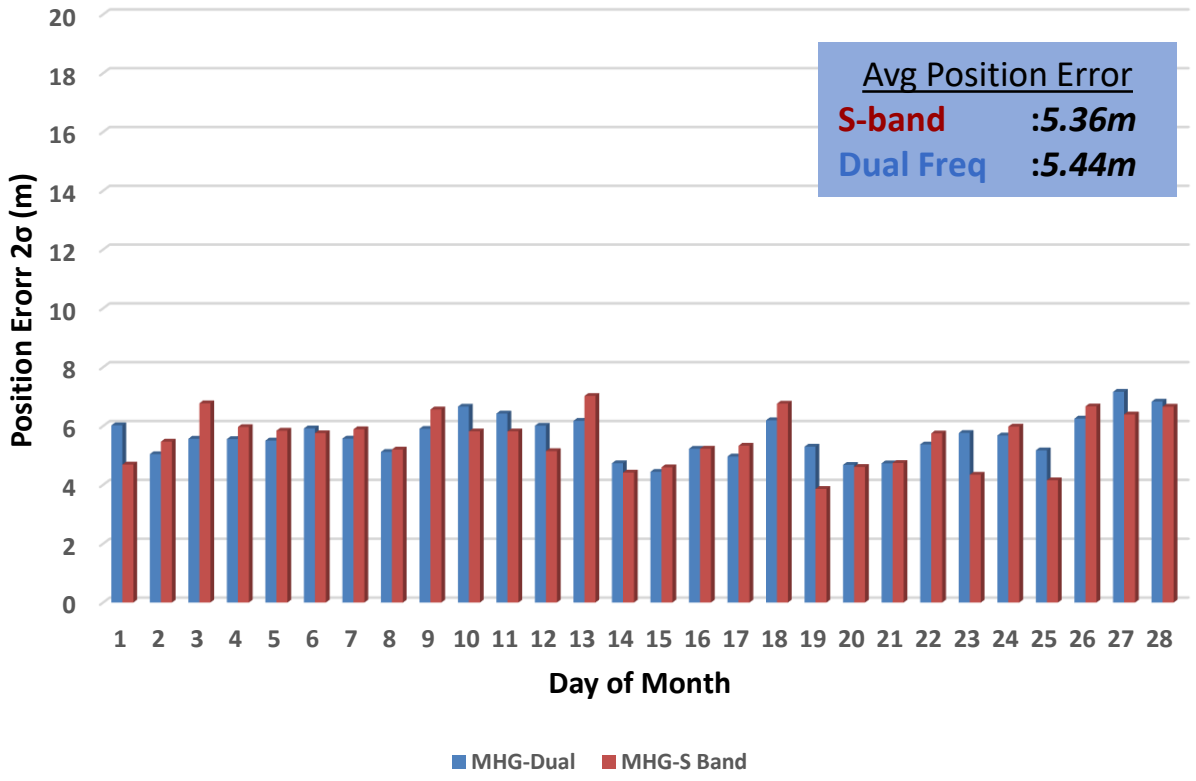




Comparison of Position Errors(PE)

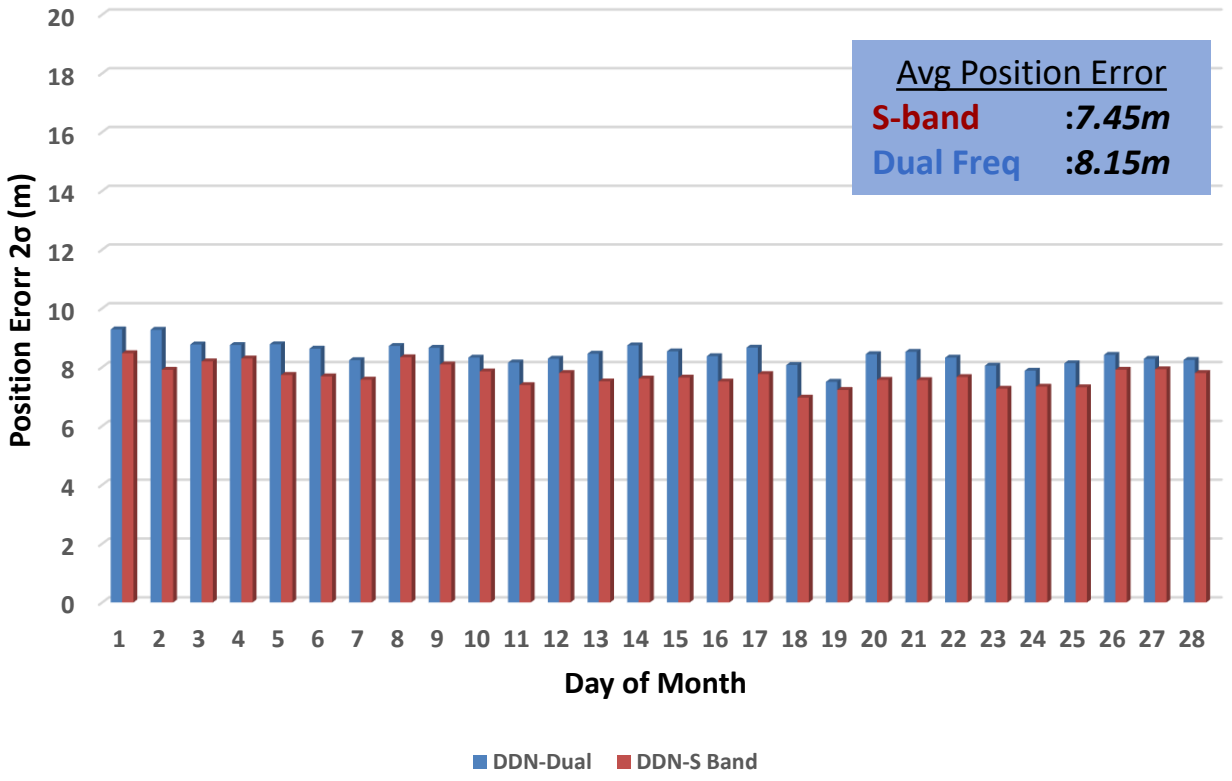
Position Error - Dual Frequency Vs S-band

Region: **South** (18.97° N, 84.37° E)



Position Error - Dual Frequency Vs S-band

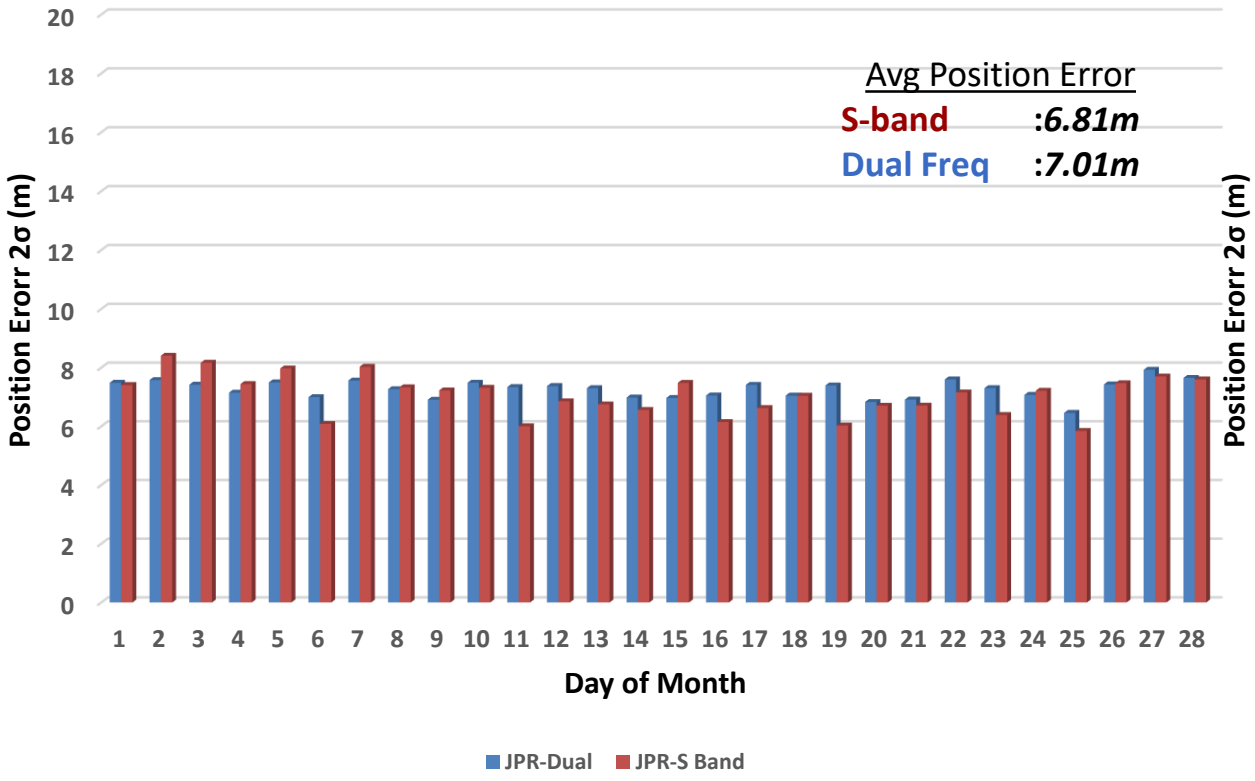
Region: **North** (30.31° N, 78.03° E)



Comparison of Position Errors(PE)

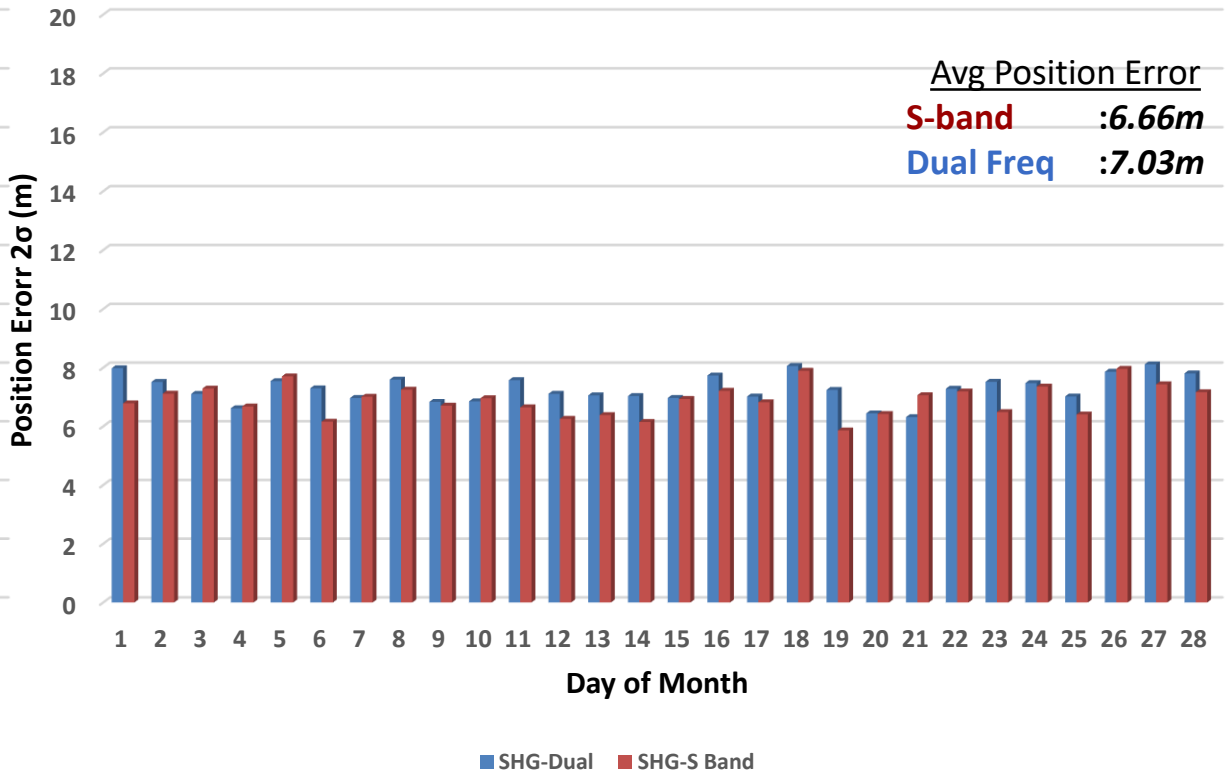
Position Error - Dual Frequency Vs S-band

Region: **West** (26.23° N, 73.02° E)



Position Error - Dual Frequency Vs S-band

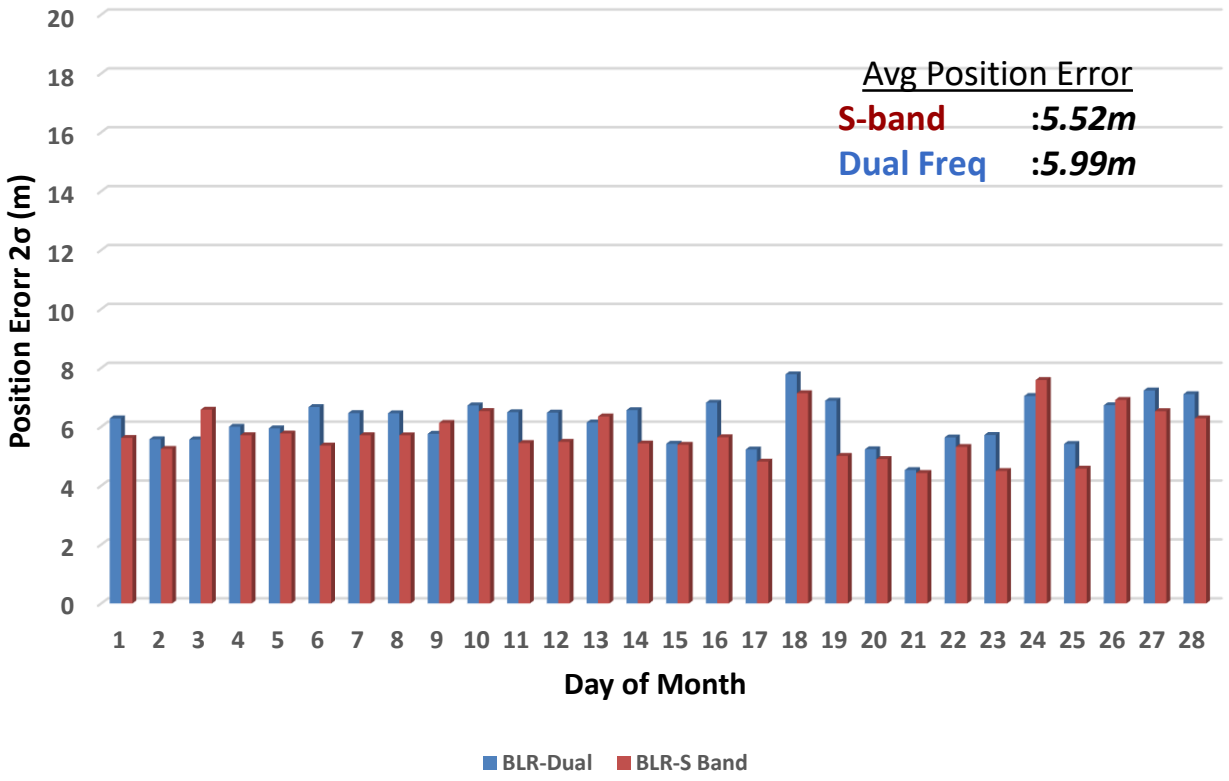
Region: **East** (25.57° N, 91.89° E)



Comparison of Position Errors(PE)

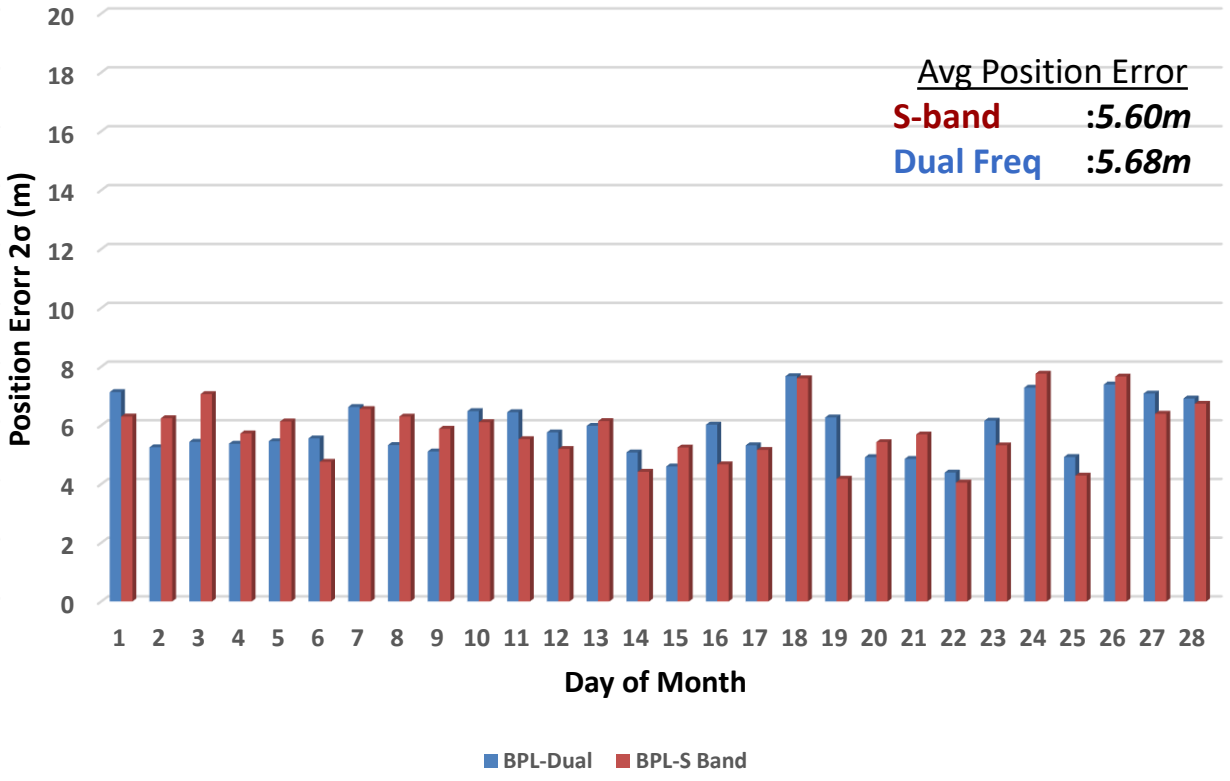
Position Error - Dual Frequency Vs S-band

Region: Bangalore (18.97° N, 84.37° E)



Position Error - Dual Frequency Vs S-band

Region: Centre (23.26° N, 77.41° E)



Conclusion

- The Position Error(PE) performance of NavIC using single frequency S band receiver is comparable with dual frequency(L5 and S) performance.

- South India or at low latitudes, the received C/No levels are in line with designed levels. The peak to peak received C/No variation in S band is 5 dB-Hz, with respect to latitude separation(North- C/No drop is more).

- The received C/No levels in L5 frequency band are in line with the designed levels. The peak to peak C/No variations are within 2 dBHz, with respect to latitude separation.

Thank You !!!