NavIC Position Errors

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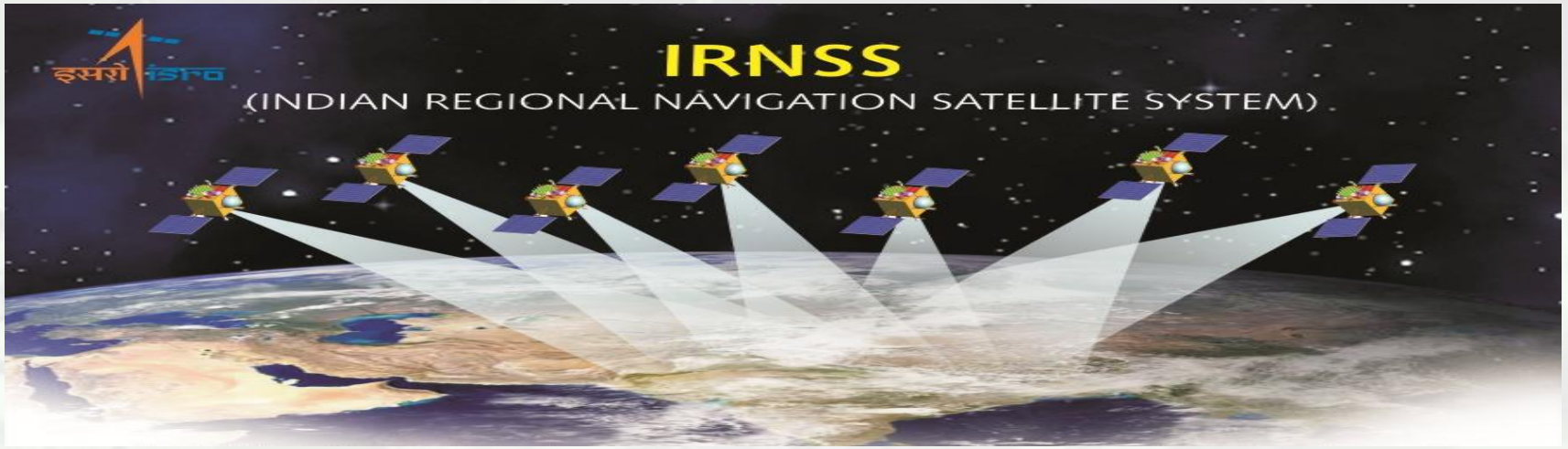
IRNSS



NavIC – A Self Reliant Navigation

Indian Regional Navigation Satellite System (IRNSS (NavIC))

- Provides SPS (civilian) service in L5 and S band
- Service area is India and its island and area bounded by Latitude 5°S to 50°N and Longitude 55°E to 110°E
- Future Satellites will be having additional L1 band SPS service

GNSS Accuracy/ Error definition

- Position error (3D RMS): Defined as position error comprising of standard deviation components for all three direction (east, north & vertical). Normally represented with 2σ(95%).
- Directional error (2D RMS): Defined as position error in particular plane (Vertical or horizontal plane). Normally represented with 2σ(95%).
- CEP : Represented as circle centered with true position with CEP radius. The circle will contain horizontal position error value with 50% probability.

DOP: The DOPs provide a simple characterization of the user-satellite geometry. Larger DOP represent poor satellite geometry.

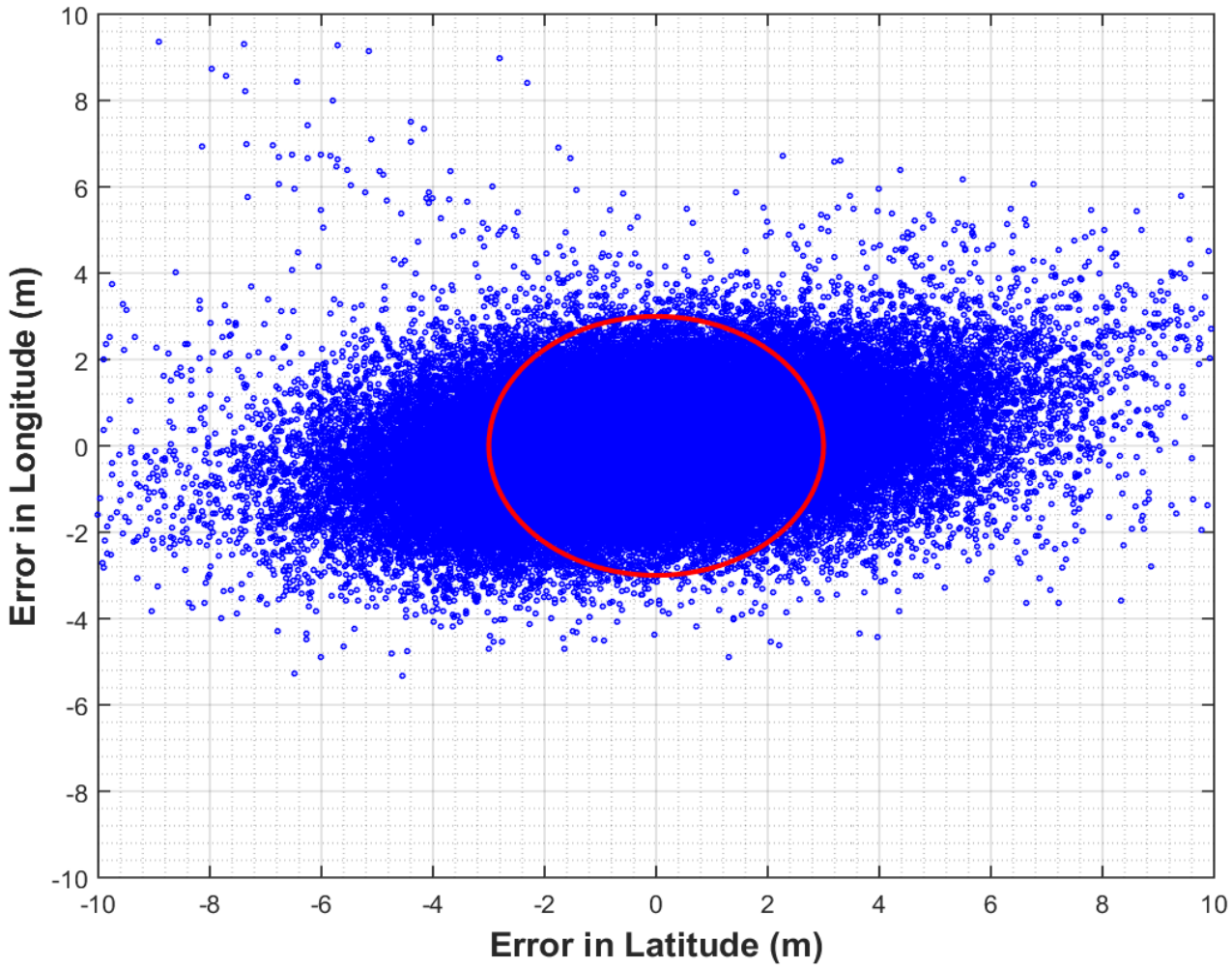
Methodology

- NavIC performance evaluation in dual-frequency mode is being carried out at different regions in India viz:
    i. Northern region
    ii. Southern region
    iii. Western region
    iv. Eastern region

- The navigation data is collected from the various reference stations located across the country and the system performance is evaluated in terms of 3D RMS Position error, Horizontal position error, Vertical position error, CEP and DOP.

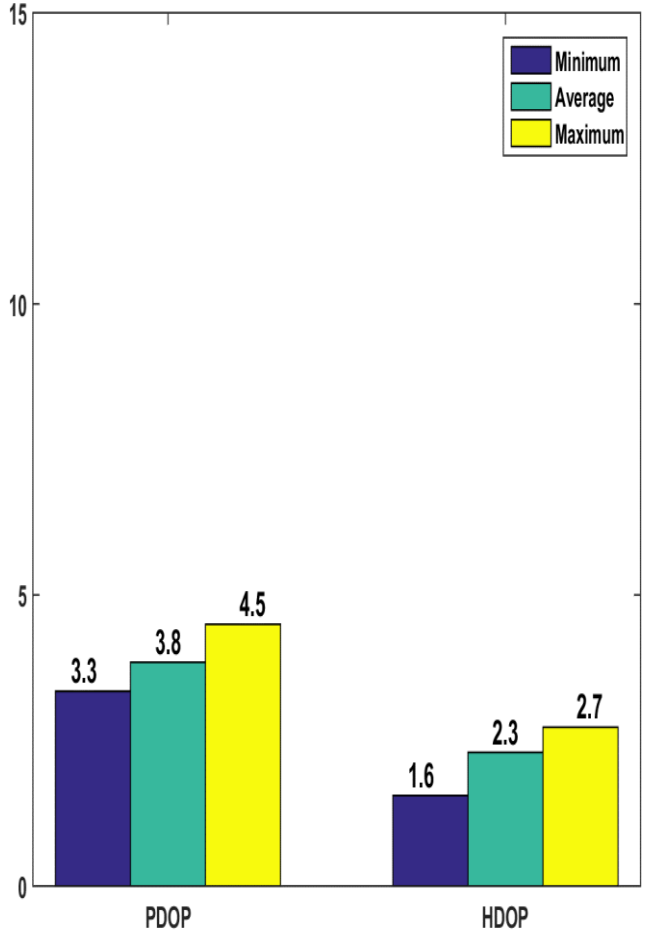
Performance of NavIC – Northern Region

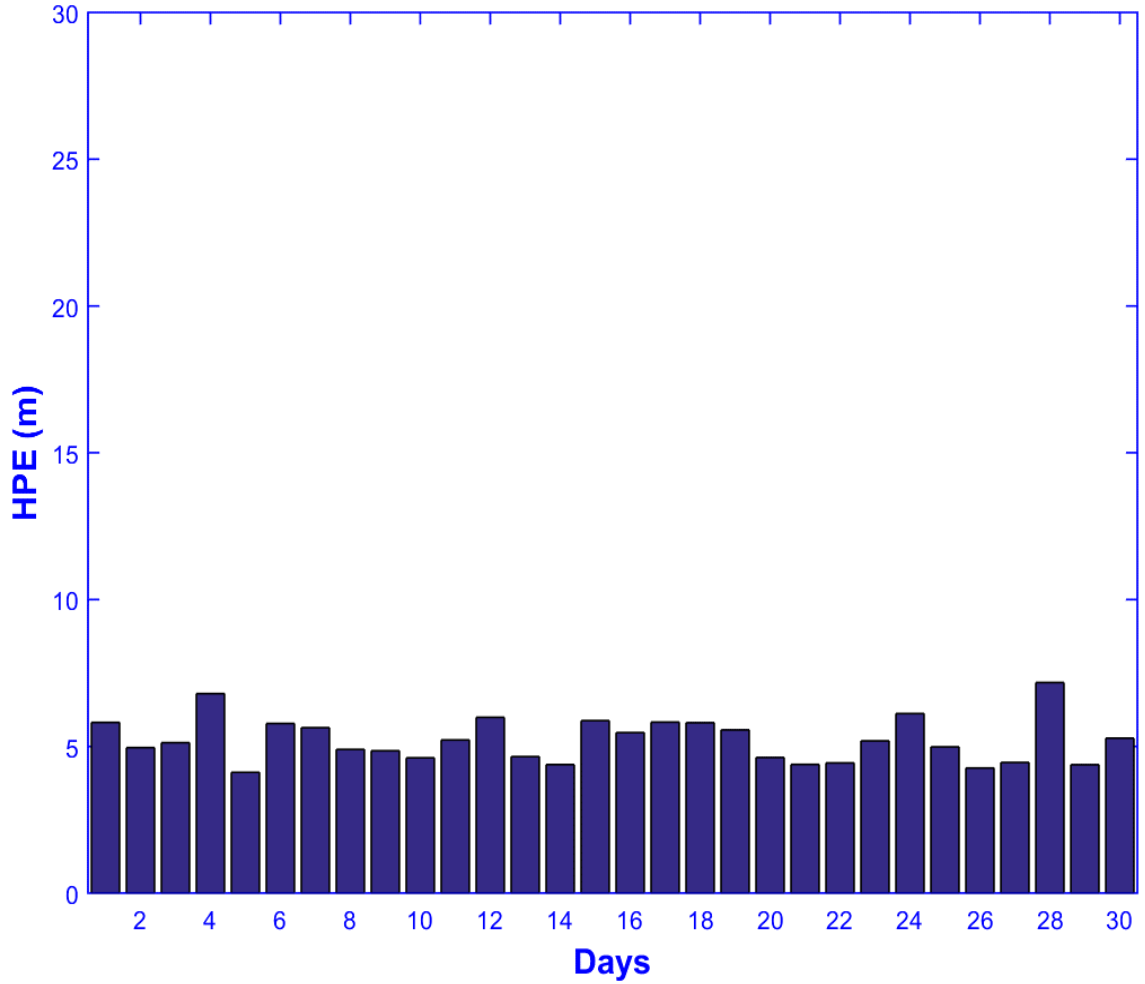
- NavIC performance is being monitored across the service area using various user receivers.
- CEP – 1.93m
- DOP
- PE
- HPE
- HPE vs VPE



Performance of NavIC – Northern Region

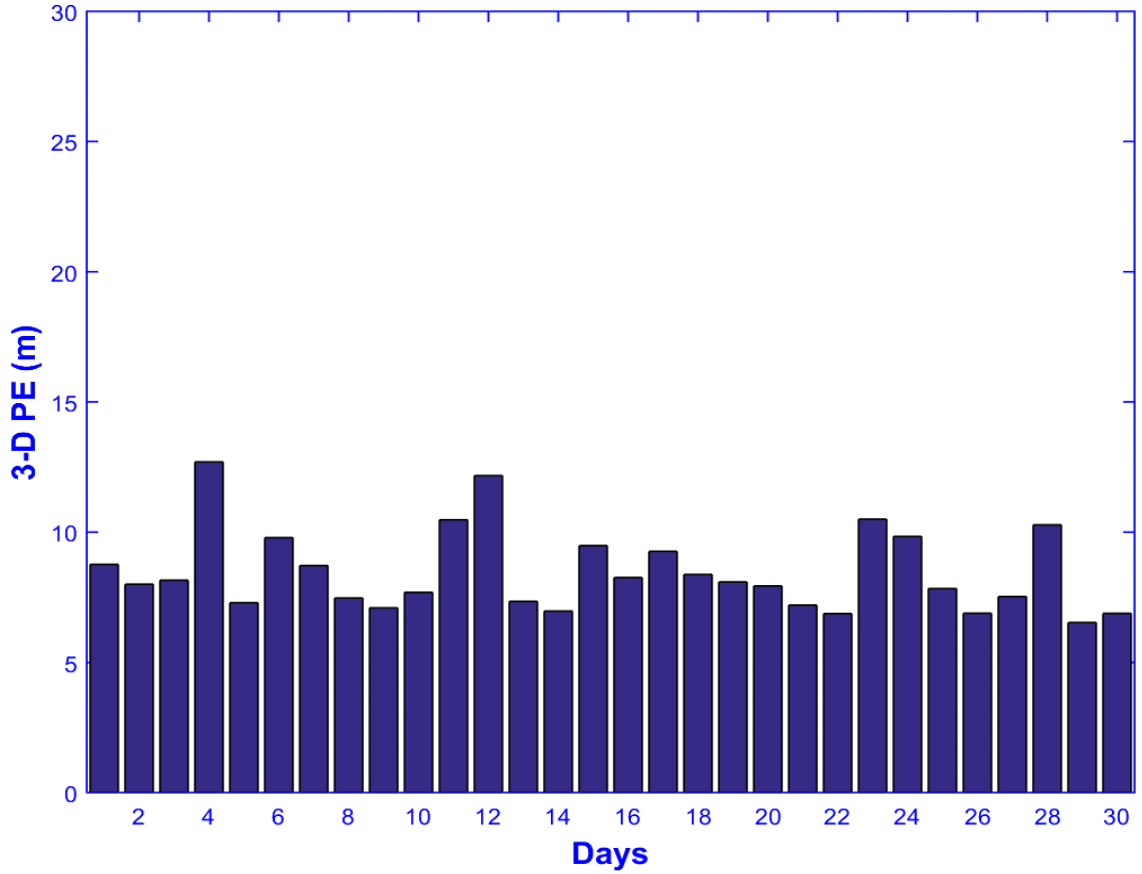
- PDOP ~3.8
- HDOP~ 2.3
- HPE ~4m

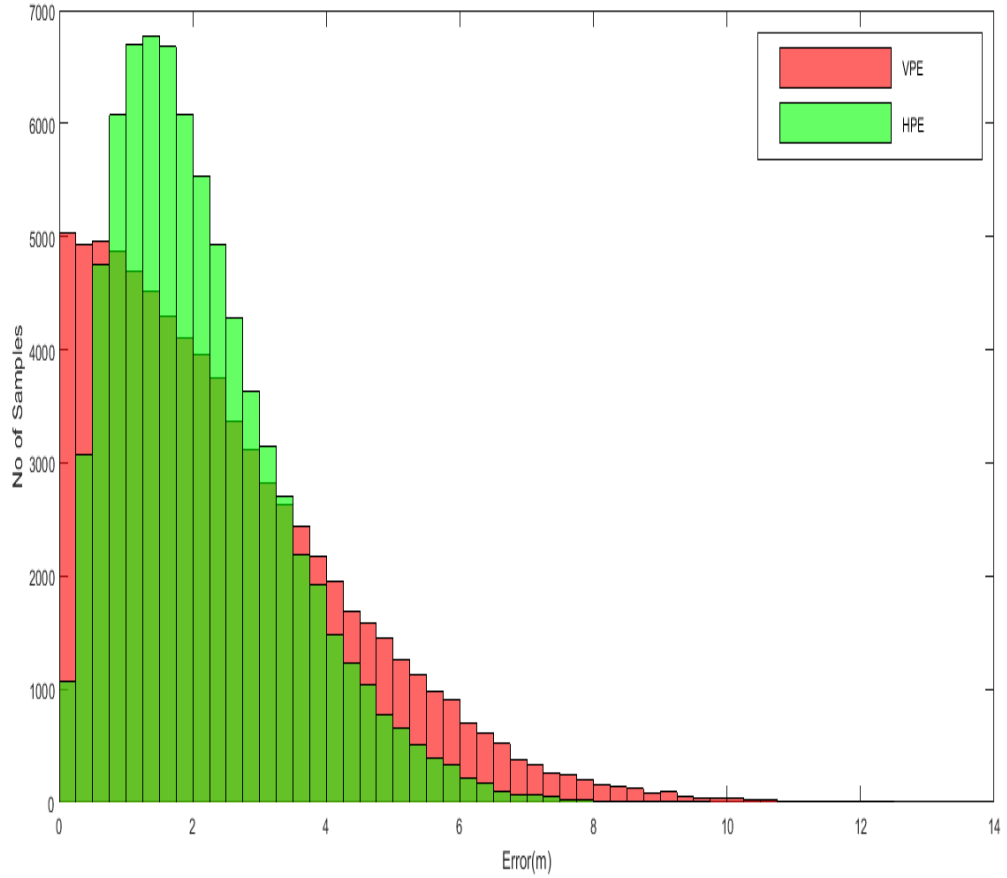




Performance of NavIC – Northern Region

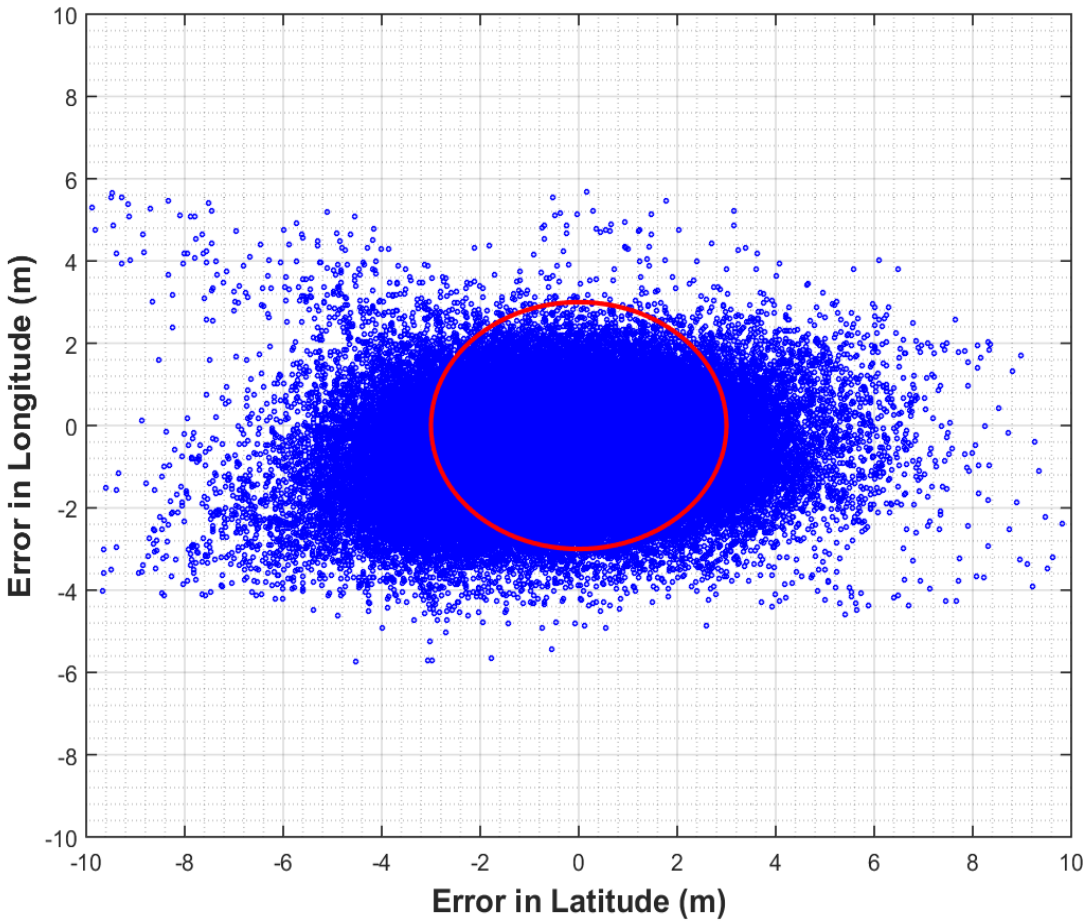
- PE~9m





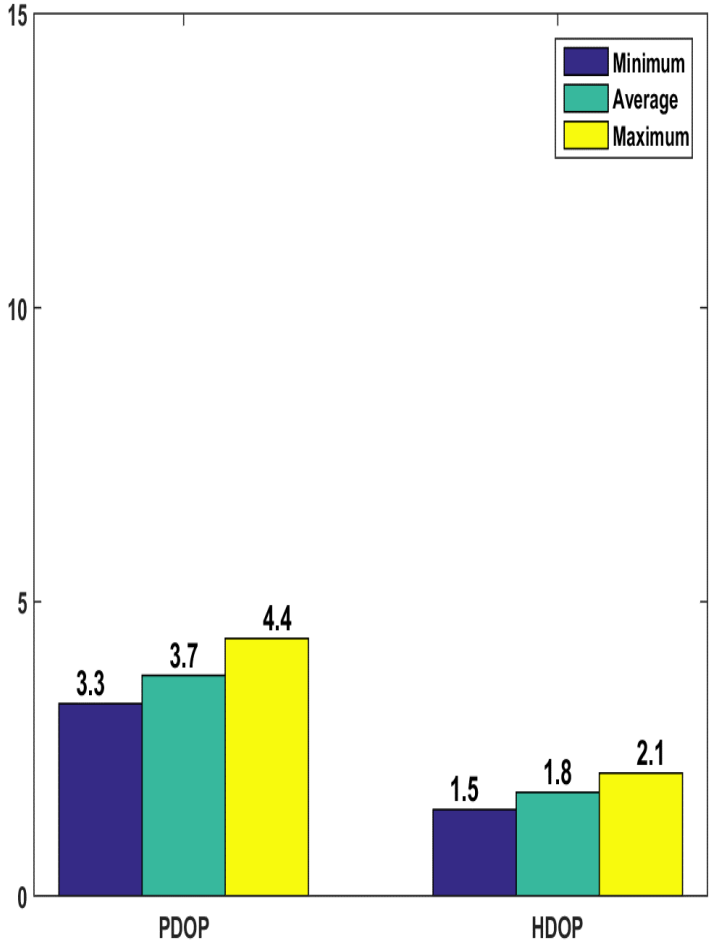
Performance of NavIC – Southern Region

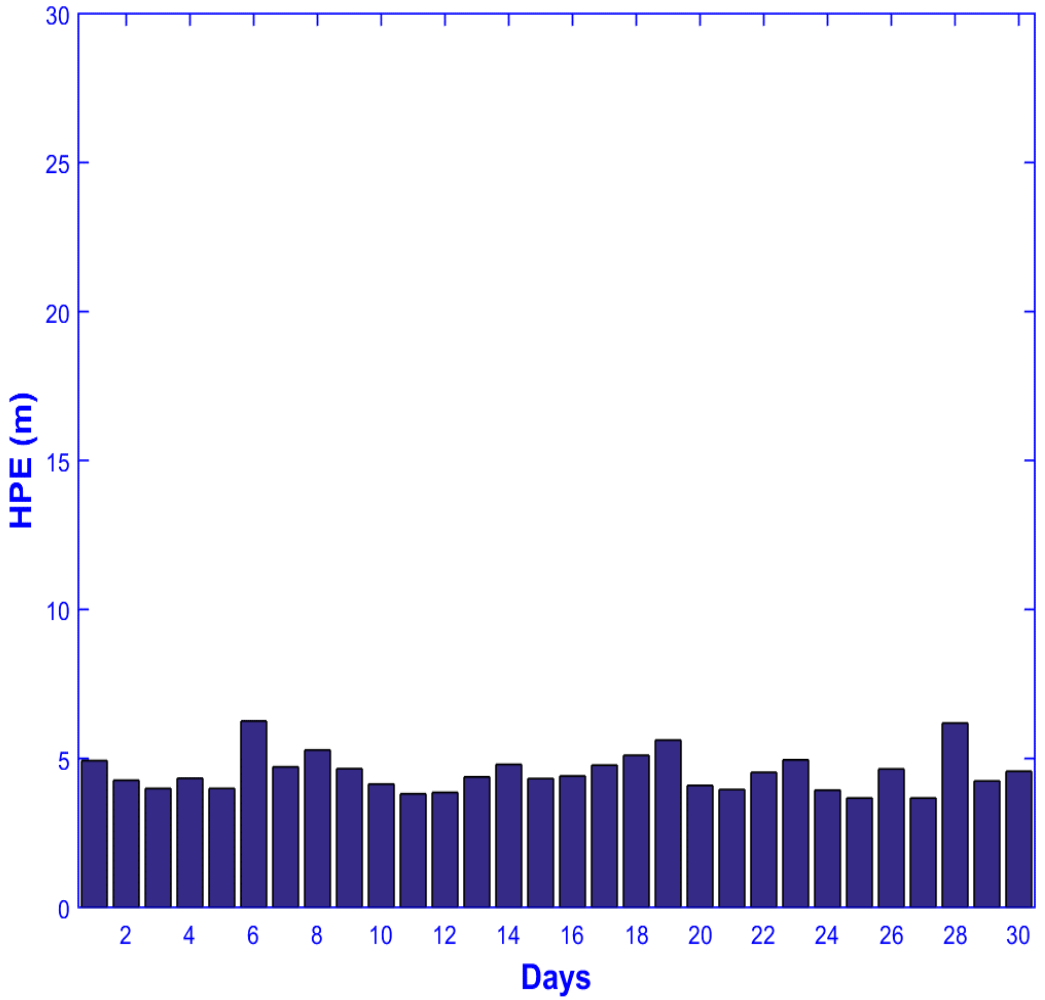
- CEP – 1.95m



Performance of NavIC – Southern Region

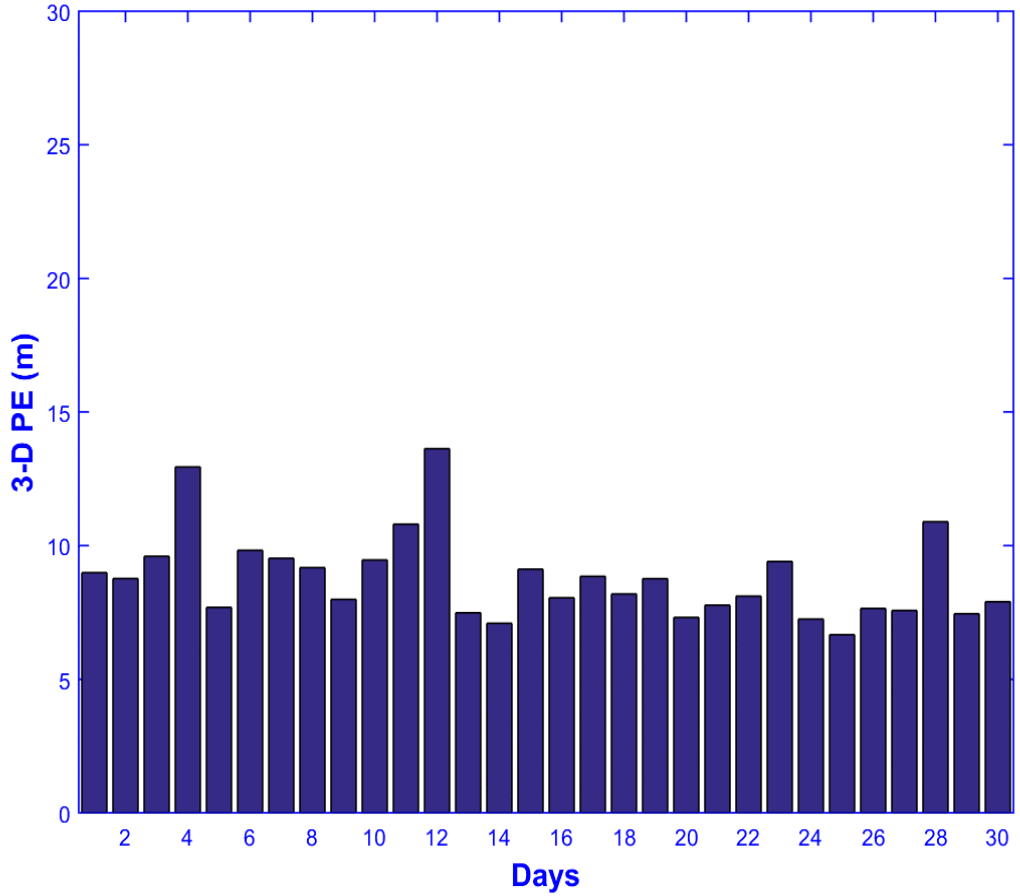
- PDOP ~3.7
- HDOP~ 1.8
- HPE ~4m

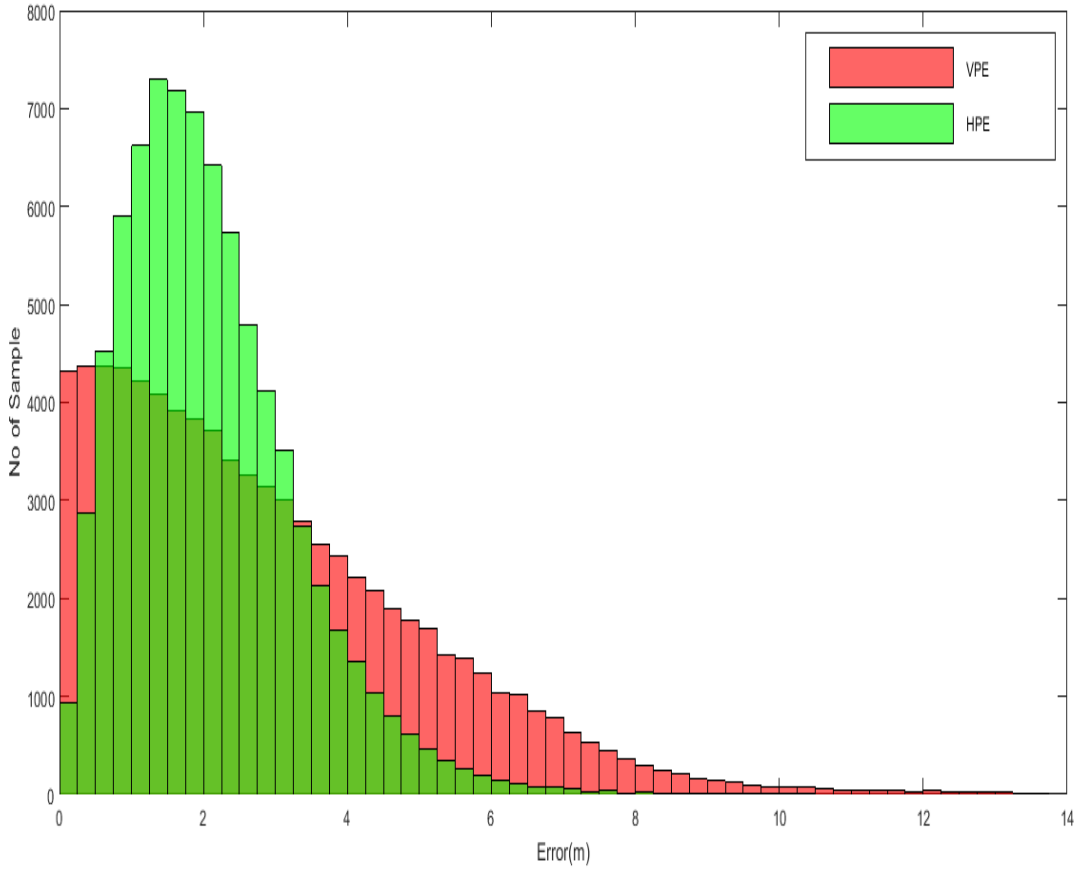




Performance of NavIC – Southern Region

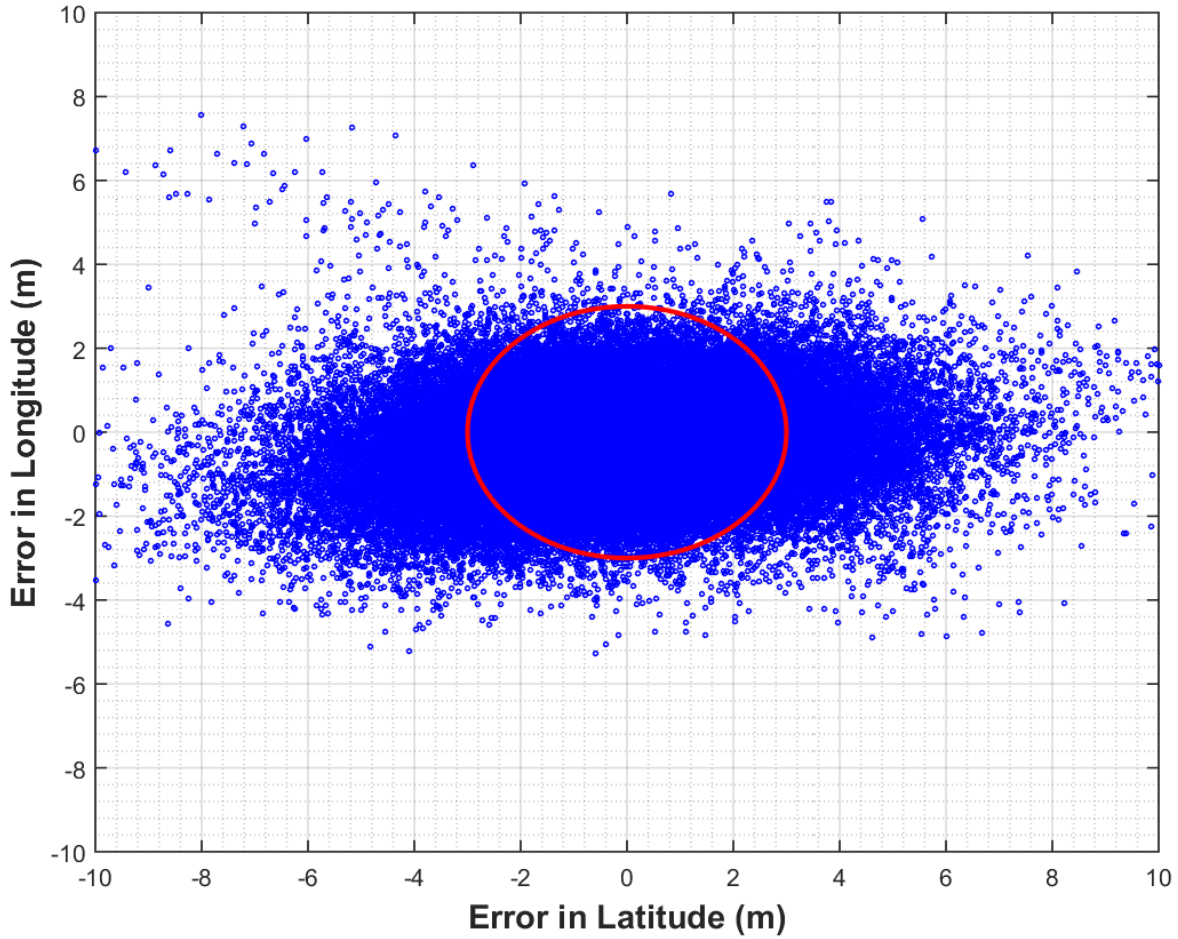
- PE~9m





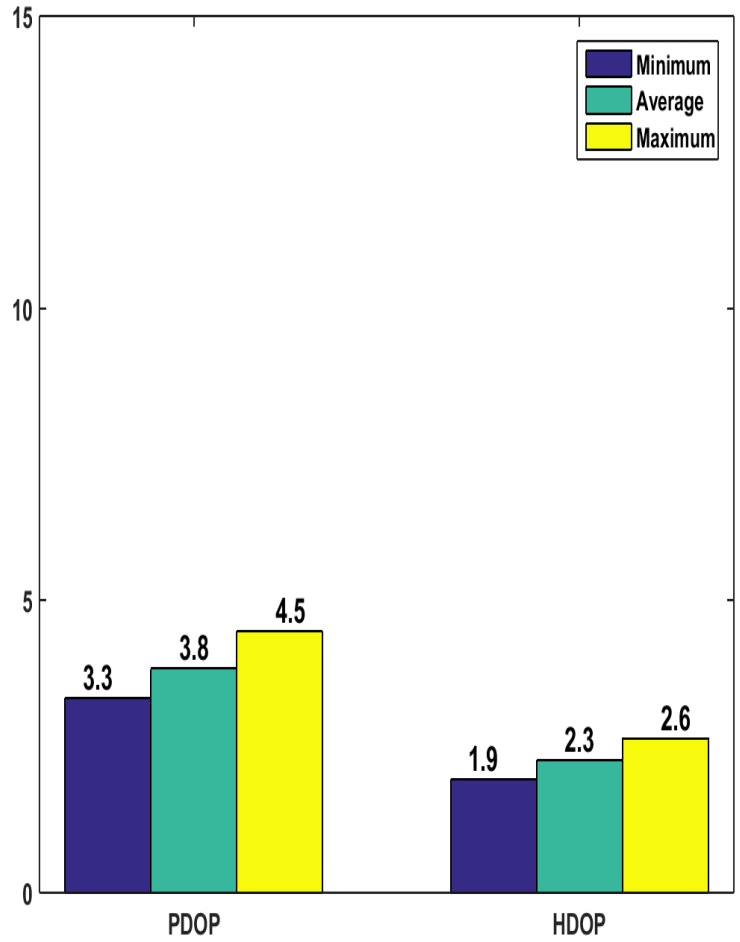
Performance of NavIC – Western Region

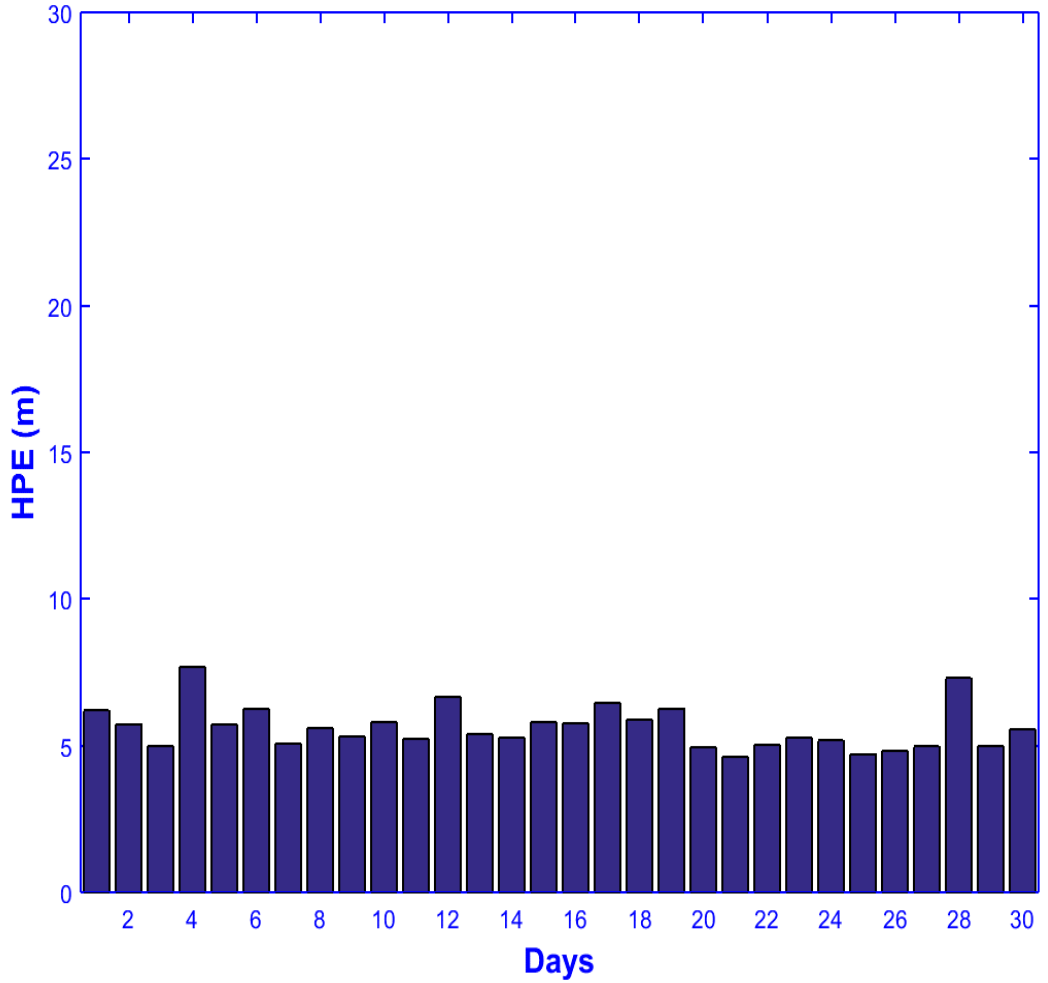
- CEP – 2.27m



Performance of NavIC – Western Region

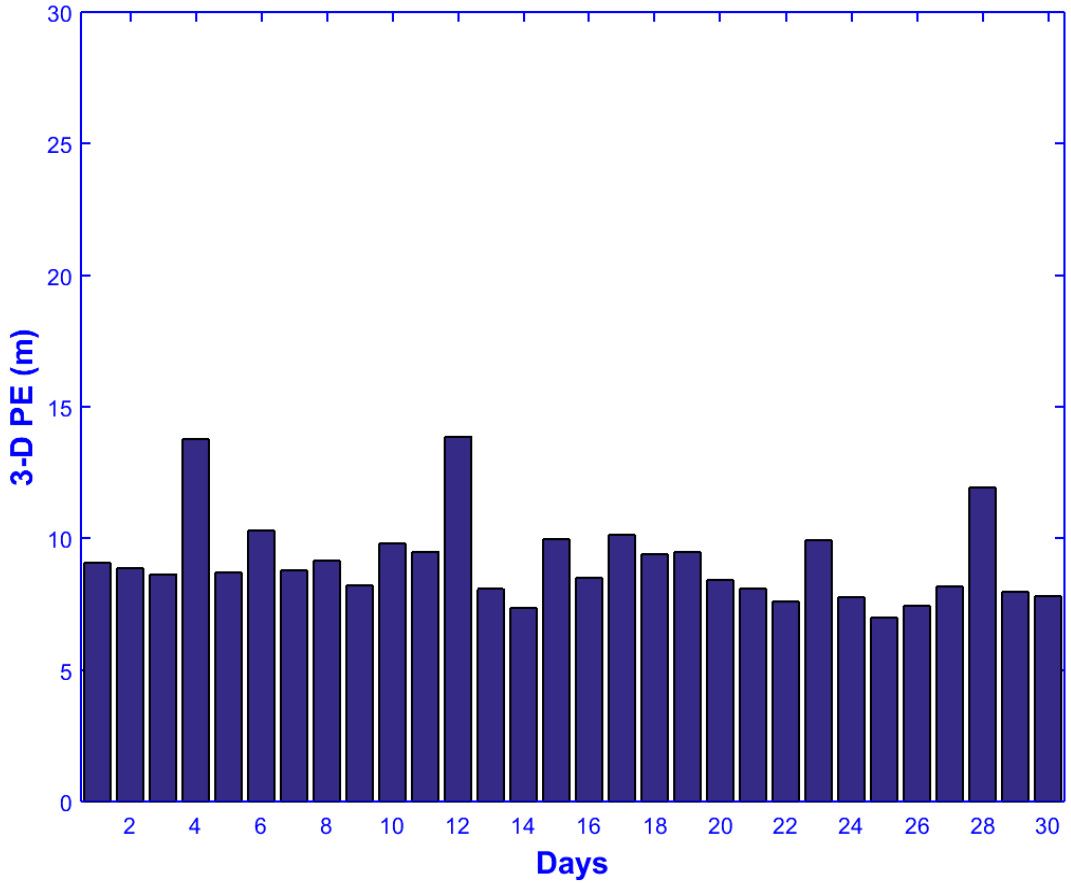
- PDOP ~3.8
- HDOP~ 2.3
- HPE ~5m

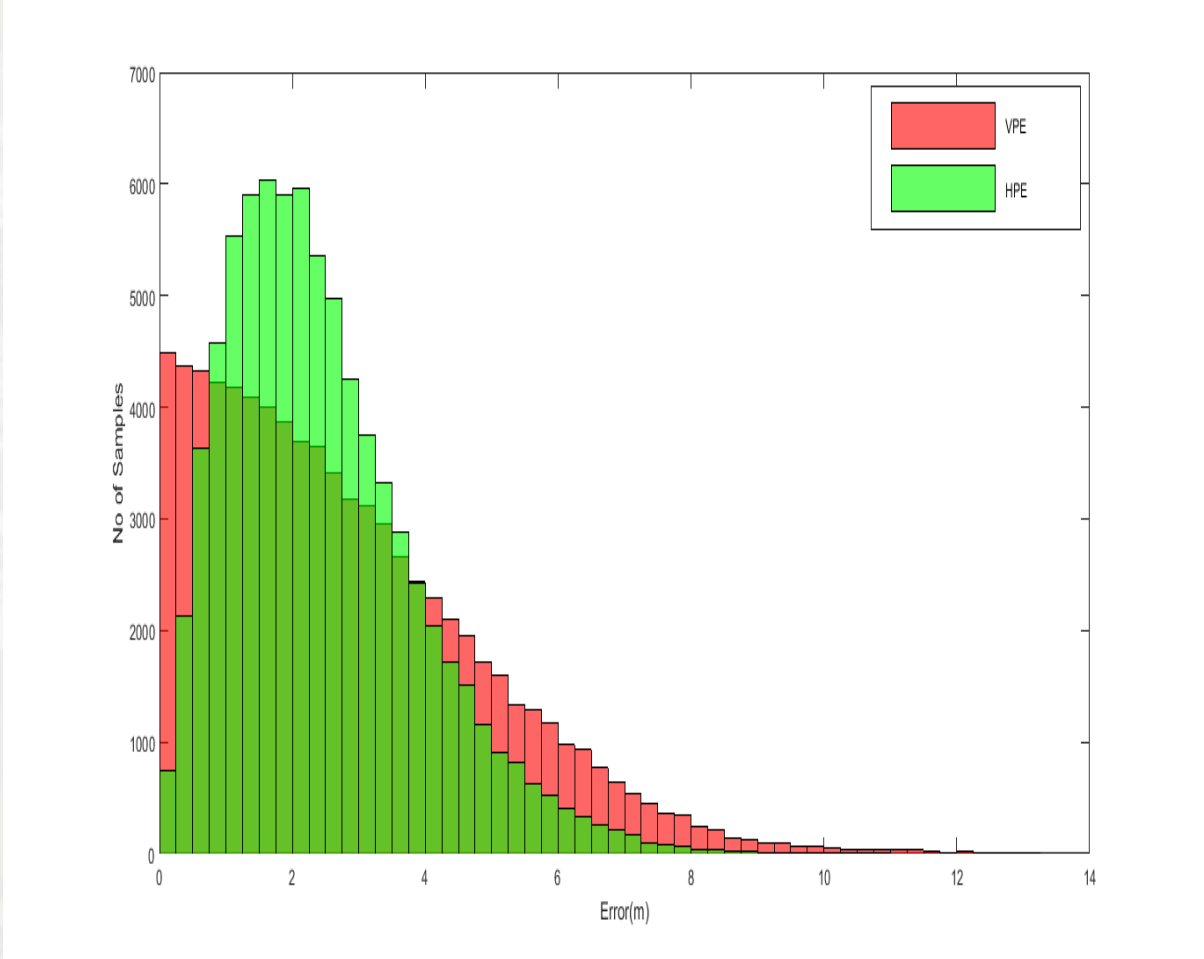




Performance of NavIC – Western Region

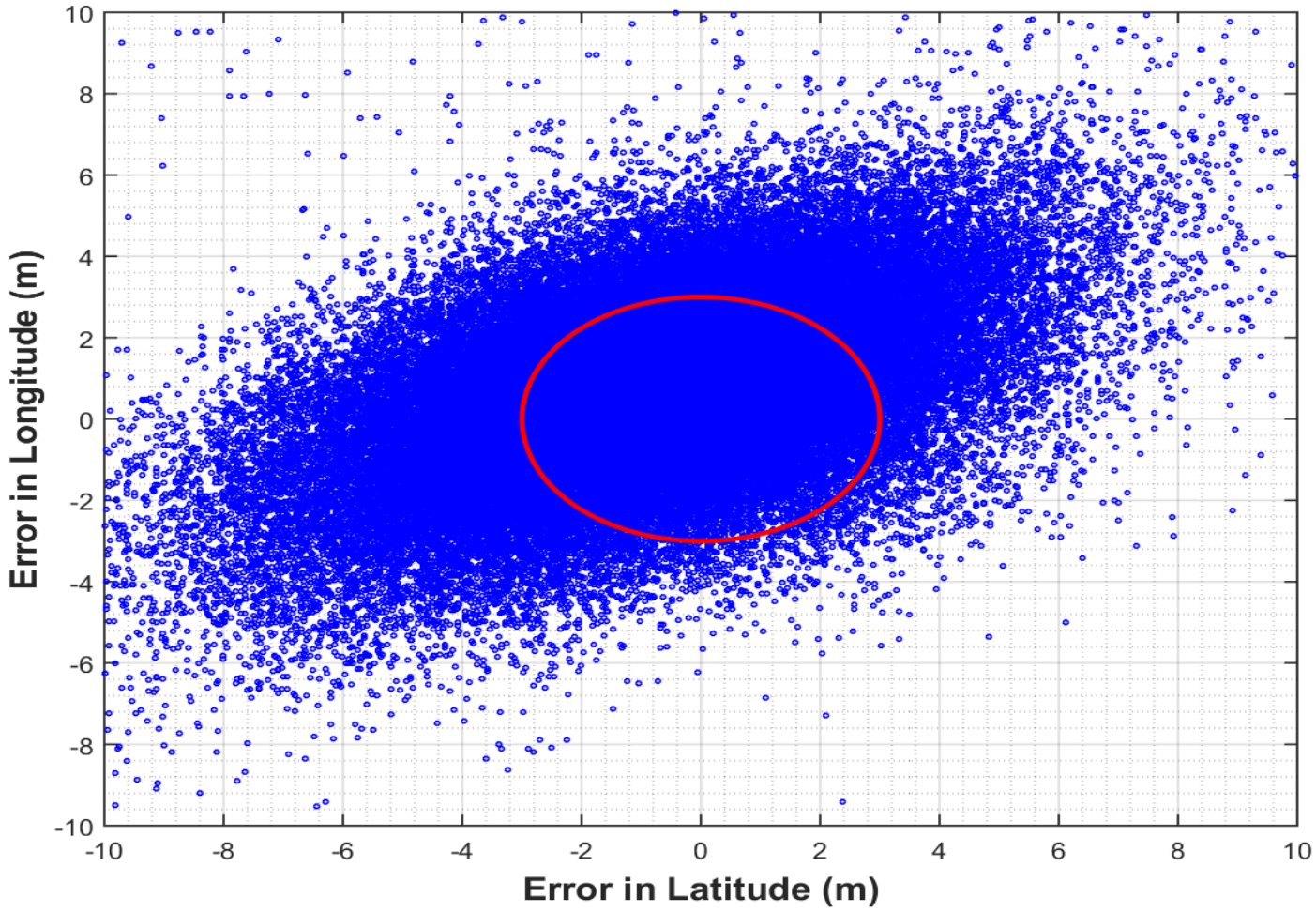
- PE~10m





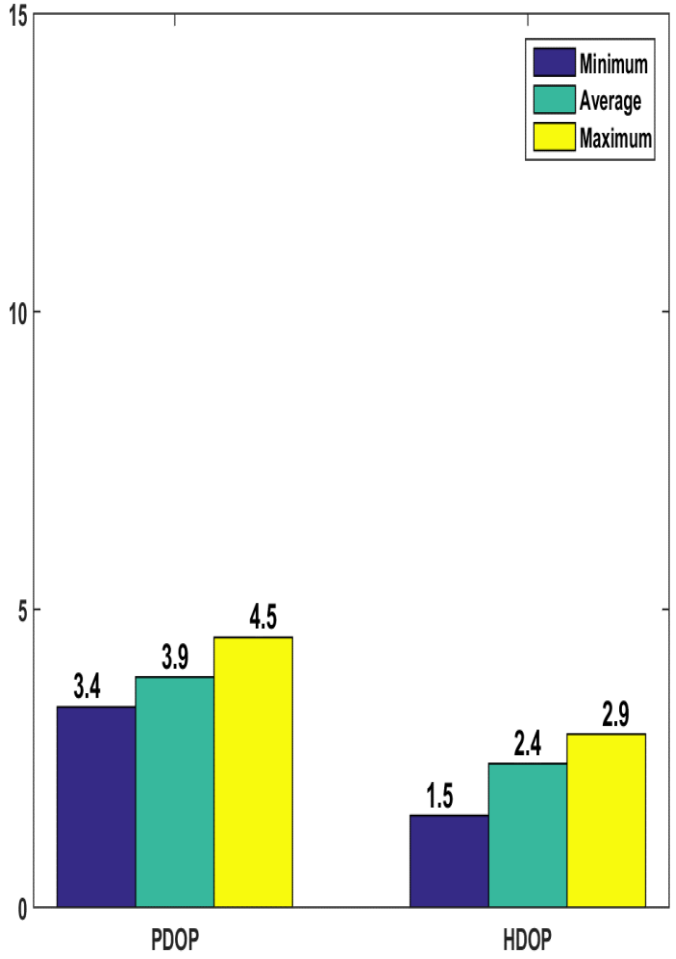
Performance of NavIC – Eastern Region

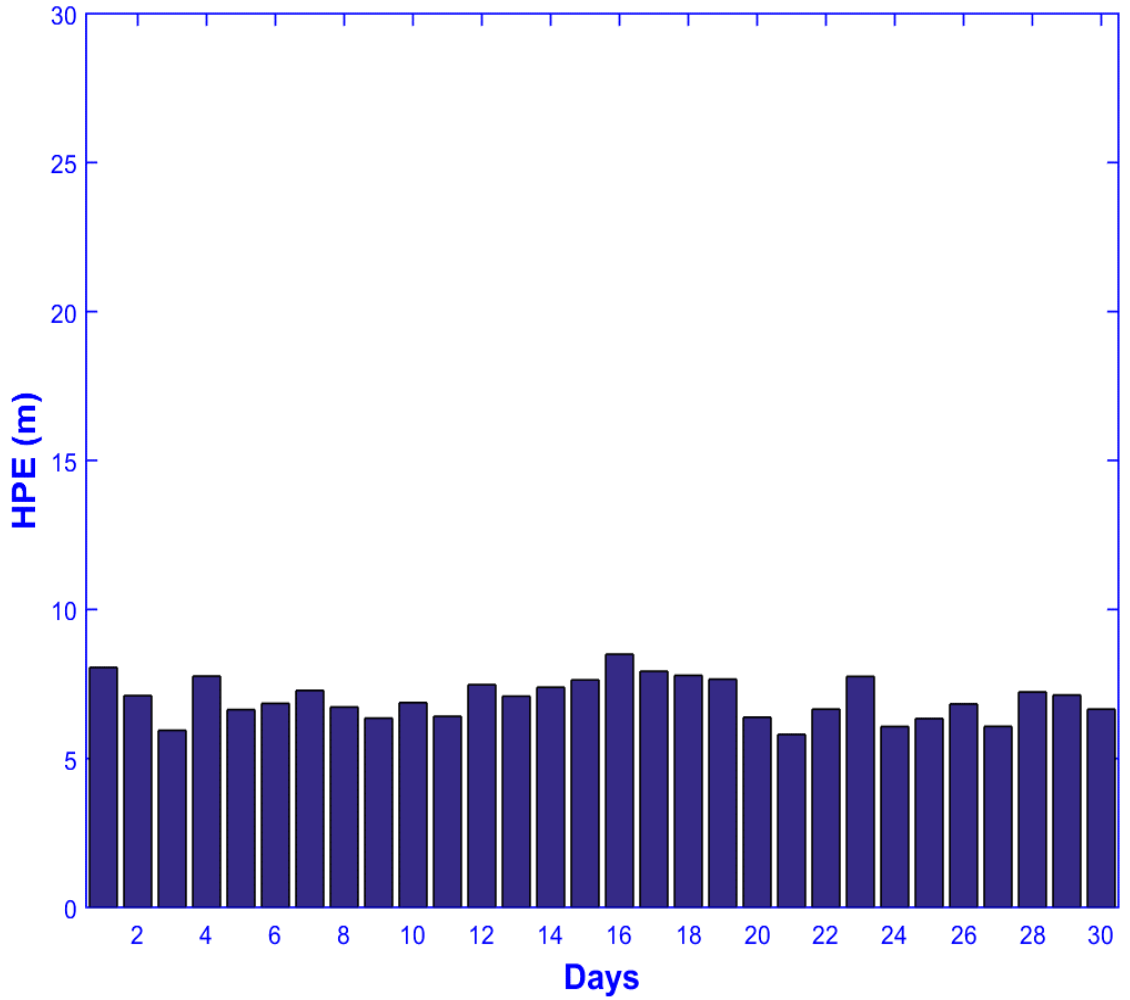
- CEP – 2.89m



Performance of NavIC – Eastern Region

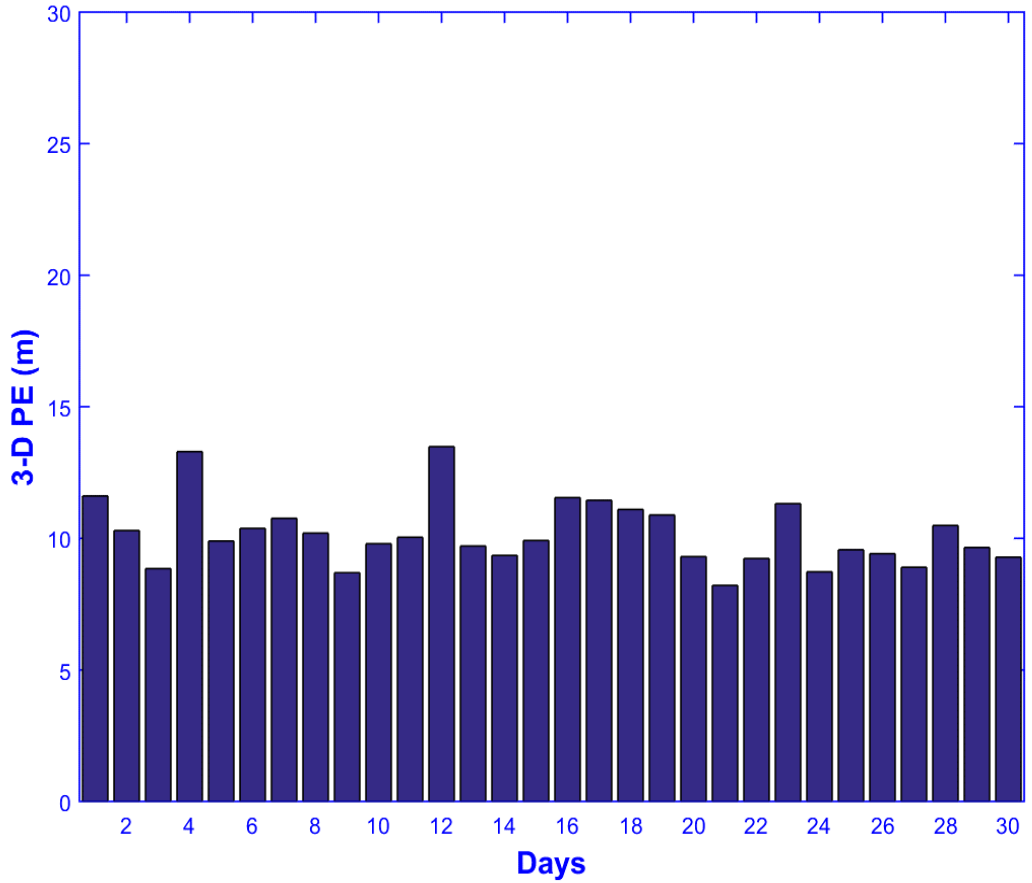
- PDOP ~3.9
- HDOP~ 2.4
- HPE ~7m

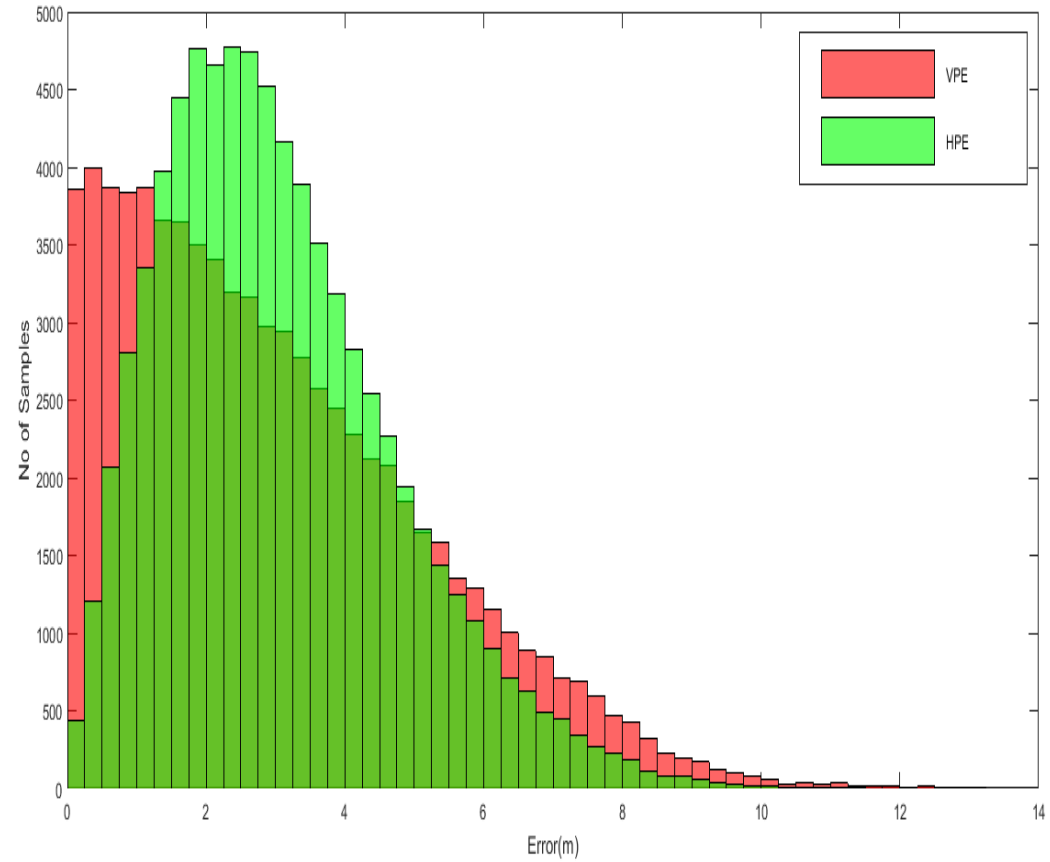




Performance of NavIC – Eastern Region

- PE~12m





Summary

- NavIC position error throughout the Indian region is ~10meters.
- Eastern region is having slightly higher position error compared to other parts.
- Worst case CEP is less than 3 meters throughout the service area.
- VPE is having more no of points towards higher error compared to HPE
- Satellite Navigation Programme regularly monitors the NavIC performance and performance evaluation reports can be found from the following link:

https://www.isro.gov.in/irnss-programme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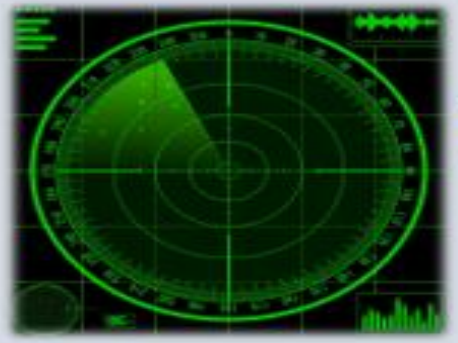

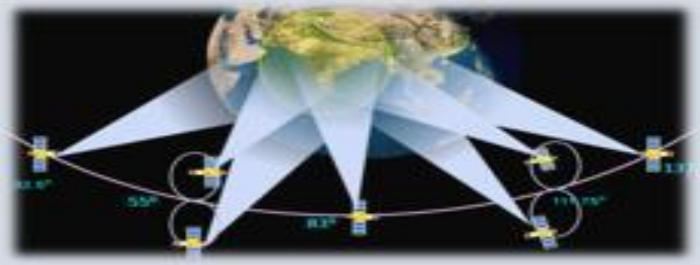


Thank You