



ISRO-IRNSS-PER-20-1

**NavIC (IRNSS)**  
**STANDARD POSITIONING SERVICE**  
**PERFORMANCE REPORT**

JANUARY-MARCH 2020

SATELLITE NAVIGATION PROGRAM  
U.R. RAO SATELLITE CENTRE  
INDIAN SPACE RESEARCH ORGANIZATION

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## ABBREVIATIONS

SPS	Standard Positioning Service
HPE	Horizontal Position Error
PE	Position Error
CEP	Circular Error Probability
drms	Distance root mean square
SV	Space Vehicle
NSAT	Number of Satellites
DOP	Dilution Of Precision

## INTRODUCTION

## 1.1 INTRODUCTION

The performance of the Signals in Space, broadcasted by NavIC (IRNSS) system, is continuously being evaluated for both single and dual frequency users across various locations within the service area. The NavIC (IRNSS) SPS service performance in dual frequency mode for the months of January, February and March 2020 has been provided in this document.

## 1.2 PERFORMANCE INDICATORS

Table 1 describes the various parameters considered as the indicators of performance.

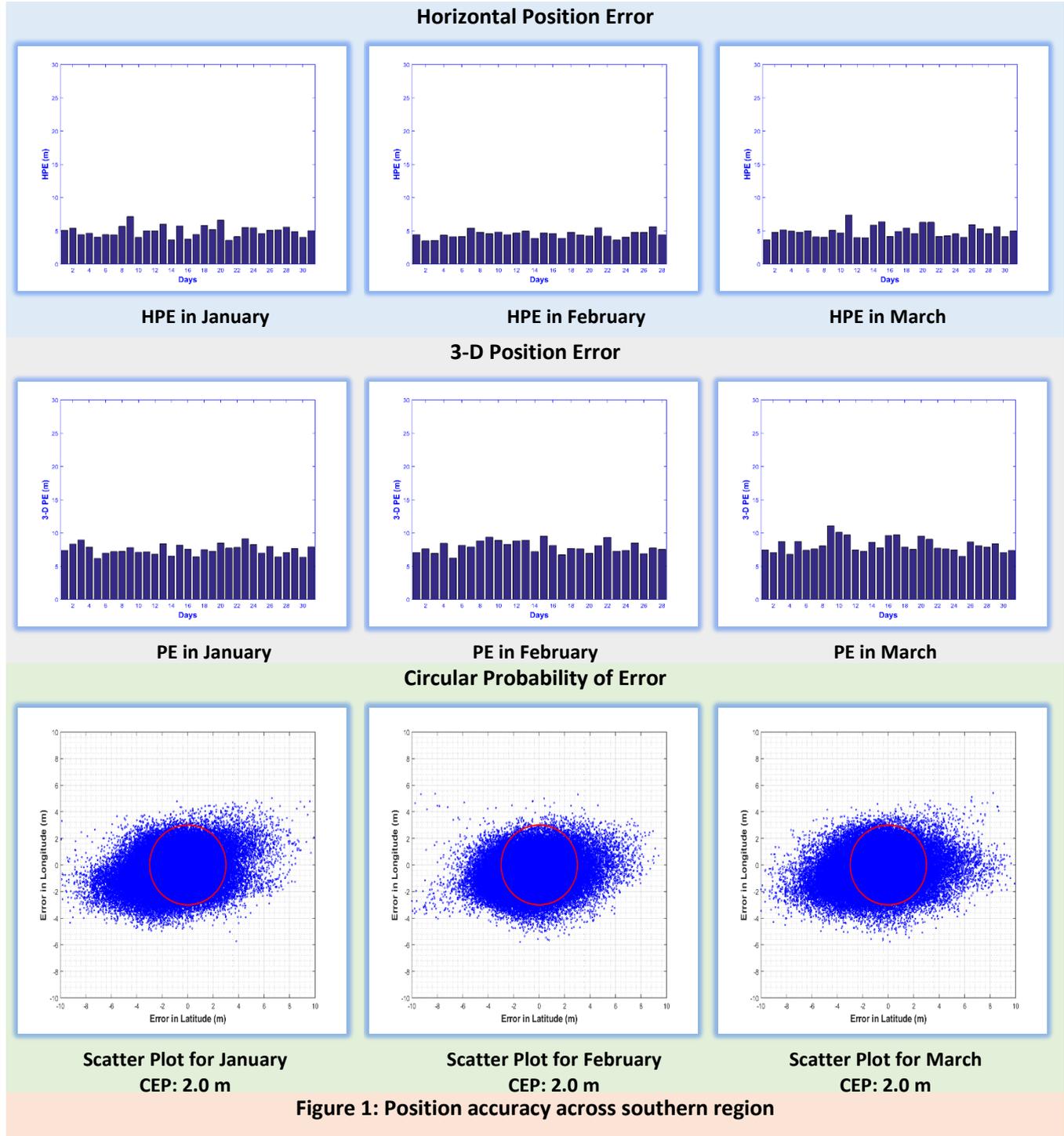
Table 1: Performance Indicators for NavIC (IRNSS)		
Position Accuracy	Horizontal Position Error (HPE) 3-D Position Error Circular Error Probability (CEP)	HPE is two dimensional and can be quantified in terms of error in latitude and longitude. It is calculated as twice the distance-root-mean-square (2drms) with the probability of 95% in this report. 3-D Position Error describes the overall accuracy by combining the effects of horizontal as well as vertical accuracy. The values taken are 2-sigma with 95% probability. CEP is the radius of a circular region, defined in such a way that, the probability of computed estimates falling inside this region is 50%. CEP can be computed from the scatter plot of latitudinal and longitudinal errors.
Availability	Percentage availability of SVs	The availability of service is computed at any user location as the percentage of time an SV can be used for position computation. This metric has been calculated by examining the status of Alert flag and URE index of each SV at every 30 s interval.
Carrier-to-Noise ratio	Received $C/N_0$ in L5 band Received $C/N_0$ in S band	
Satellite Geometry	Dilution of Precision	

Note:

IRNSS 1G was not available for performance evaluation since October 05, 2019.

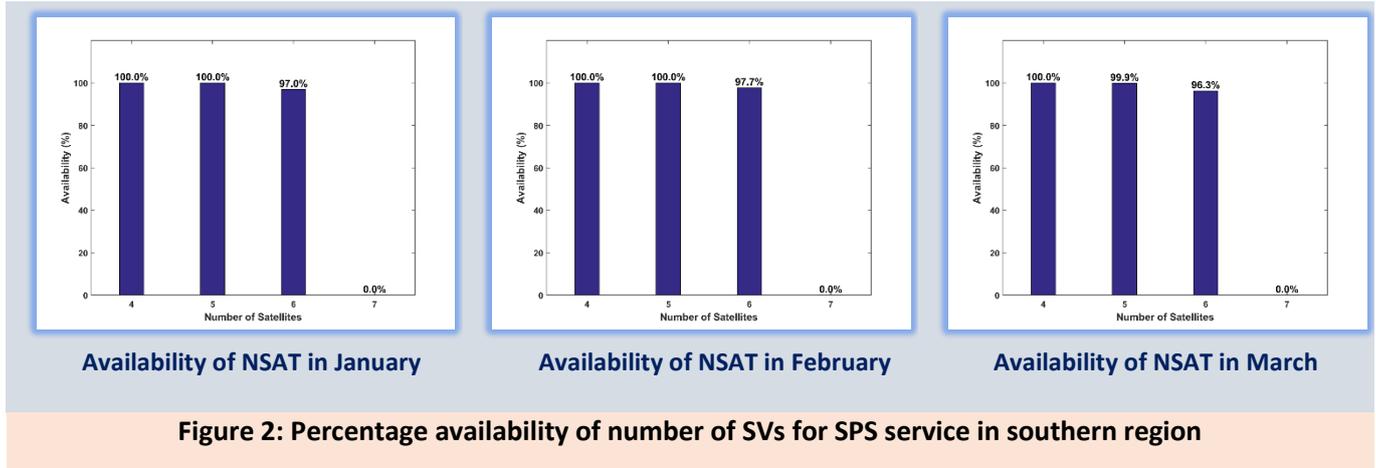
SOUTHERN REGION

2.1. SIGNAL IN SPACE ACCURACY

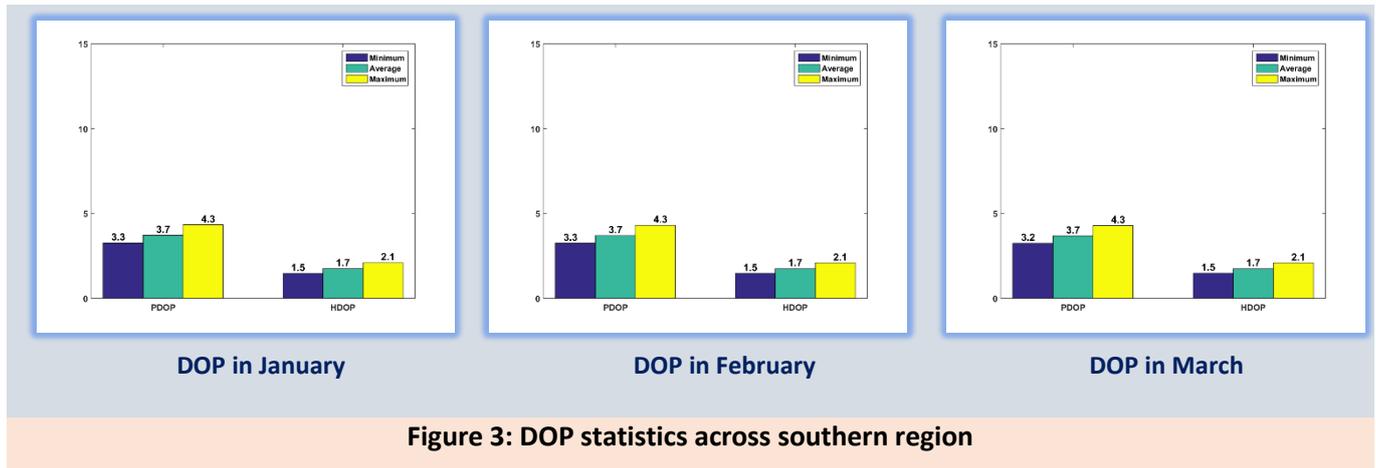


NOTE:

2.2. SATELLITE AVAILABILITY

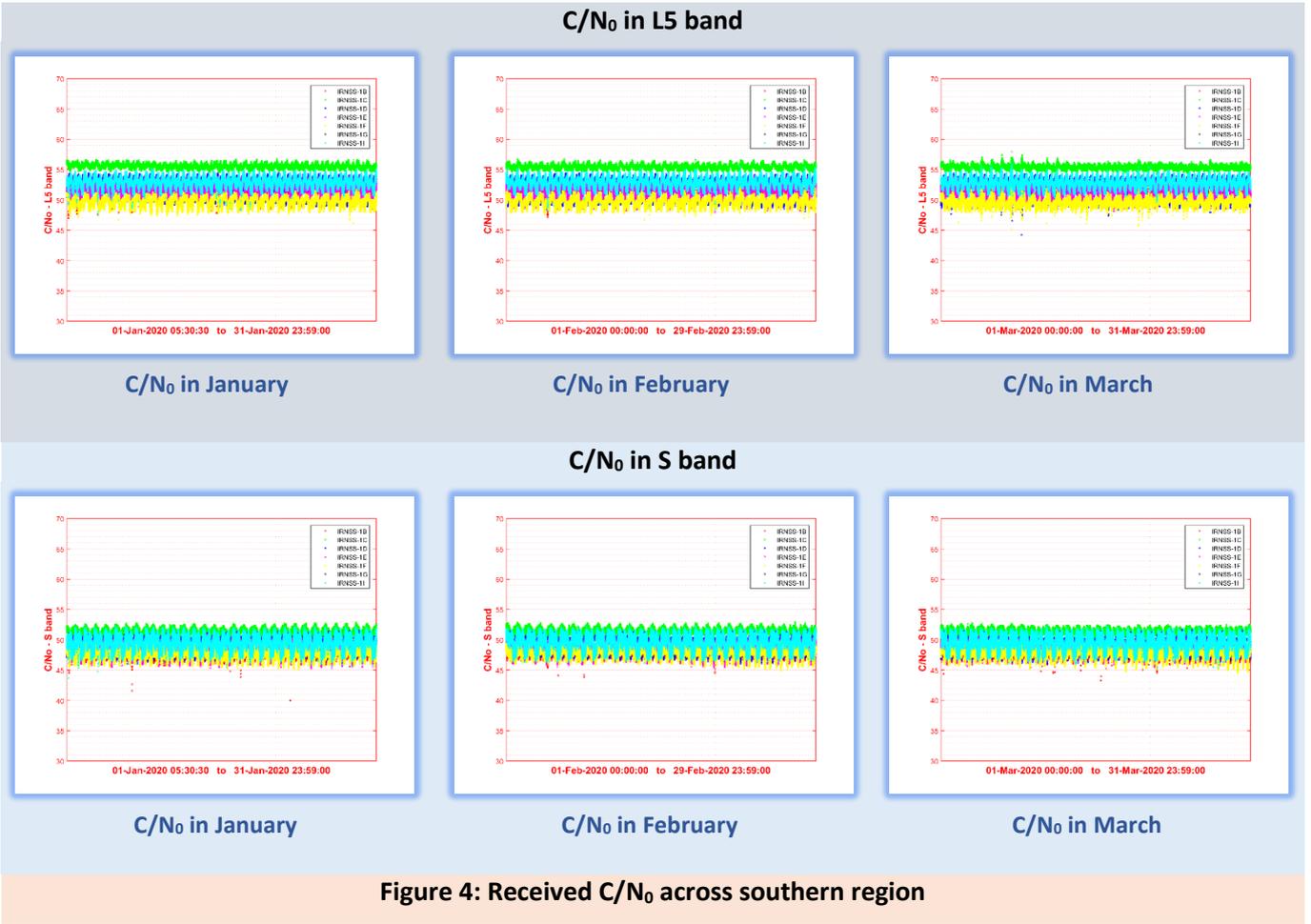


2.3. DILUTION OF PRECISION STATISTICS



NOTE:

2.4. CARRIER TO NOISE RATIO

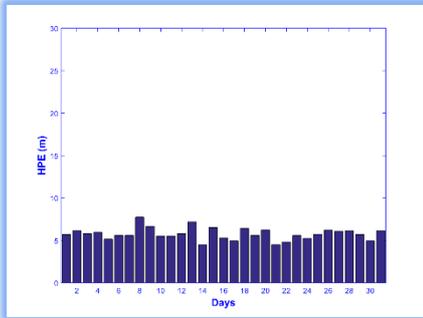


**NOTE:**

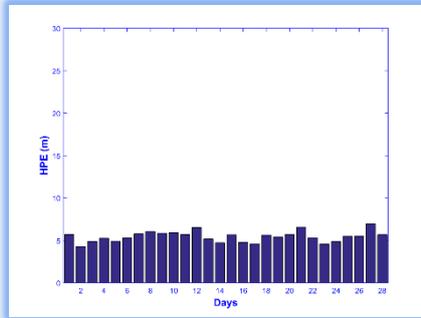
WESTERN REGION

3.1 SIGNAL IN SPACE ACCURACY

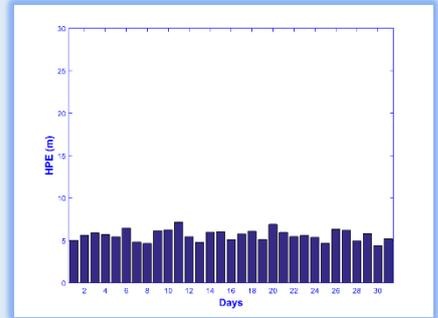
Horizontal Position Error



HPE in January

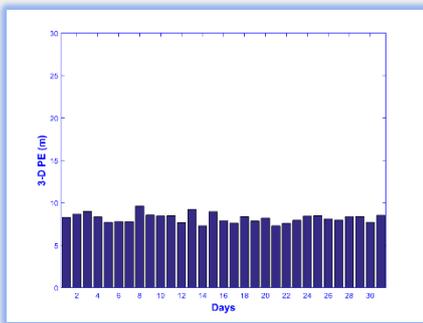


HPE in February

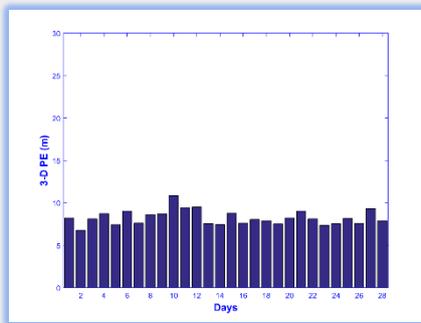


HPE in March

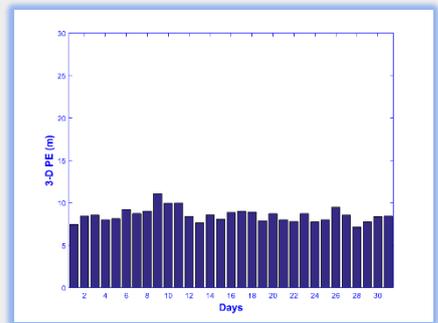
3-D Position Error



PE in January

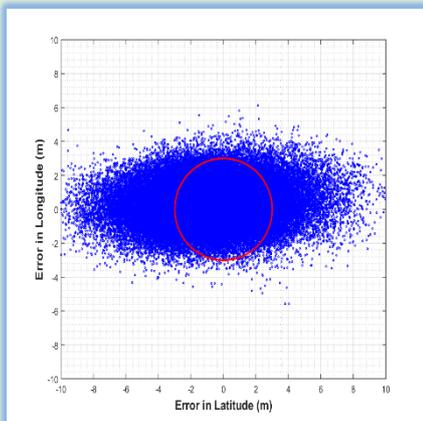


PE in February

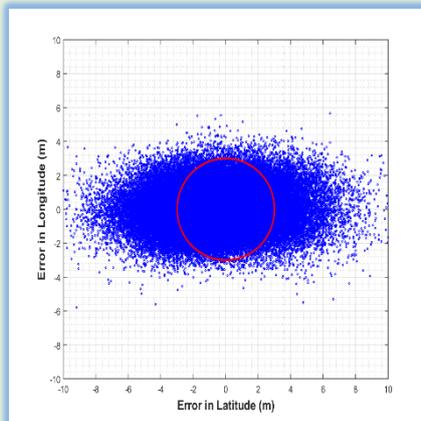


PE in March

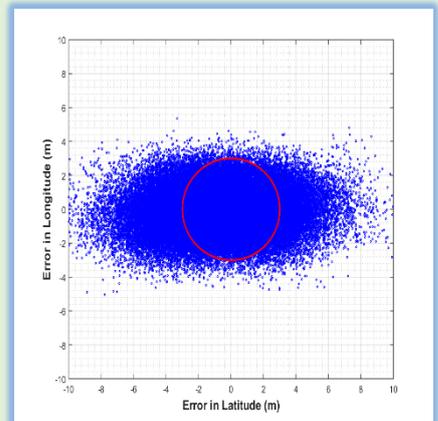
Circular Probability of Error



Scatter Plot for January  
CEP: 2.2 m



Scatter Plot for February  
CEP: 2.2 m

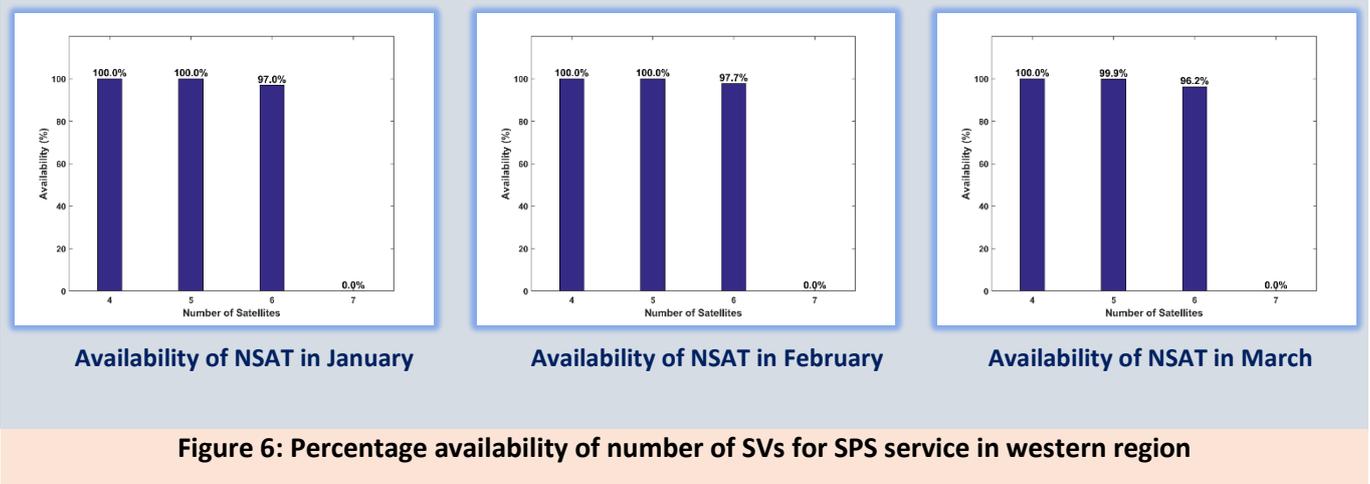


Scatter Plot for March  
CEP: 2.2 m

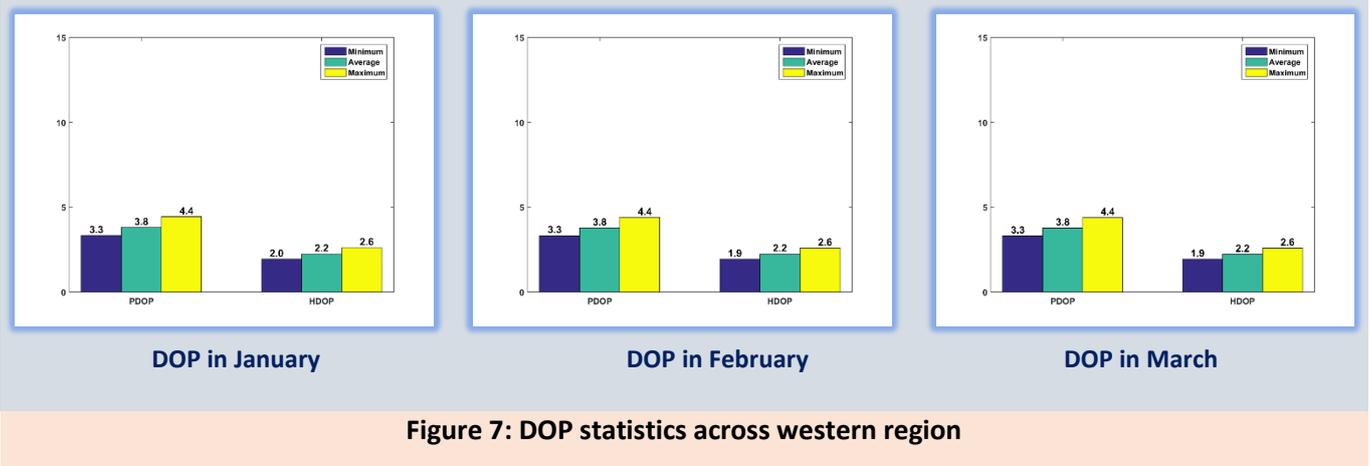
Figure 5: Position Accuracy across western region

**NOTE:**

### 3.2 SATELLITE AVAILABILITY



### 3.3 DILUTION OF PRECISION STATISTICS



**NOTE:**

### 3.4 CARRIER TO NOISE RATIO

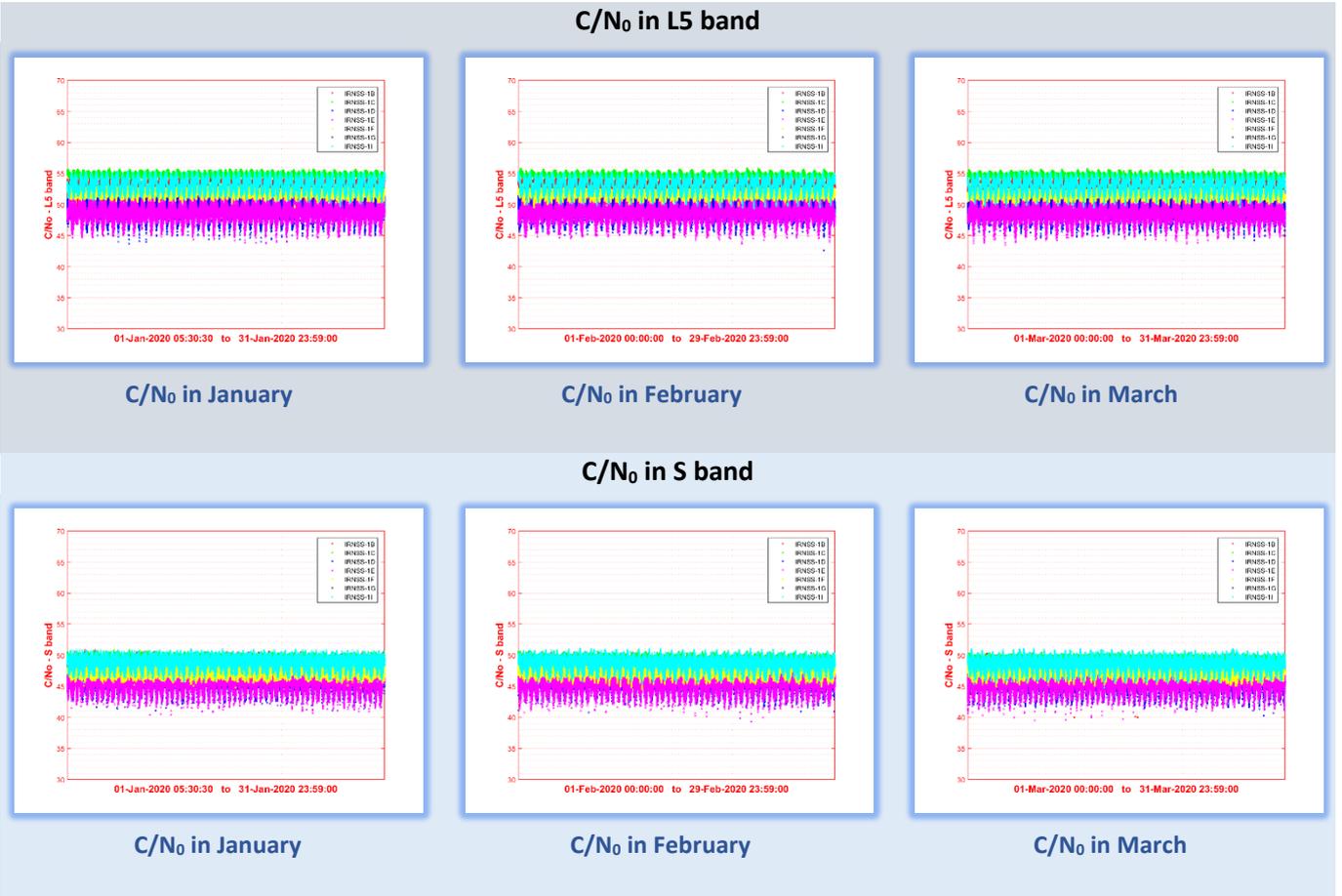
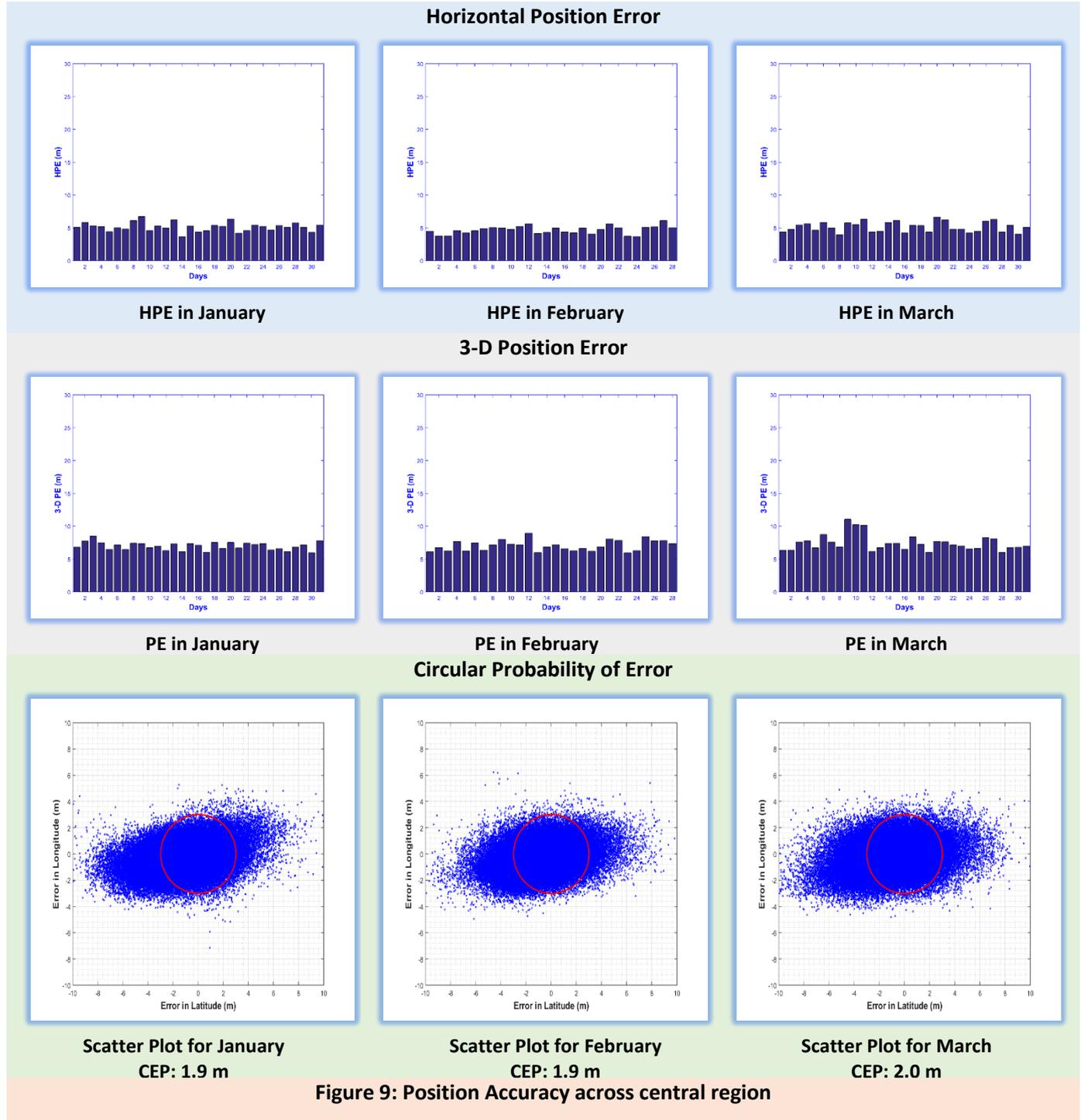


Figure 8: Received C/N<sub>0</sub> across western region

**NOTE:**

CENTRAL REGION

4.1 SIGNAL IN SPACE ACCURACY



NOTE:

### 4.2 SATELLITE AVAILABILITY

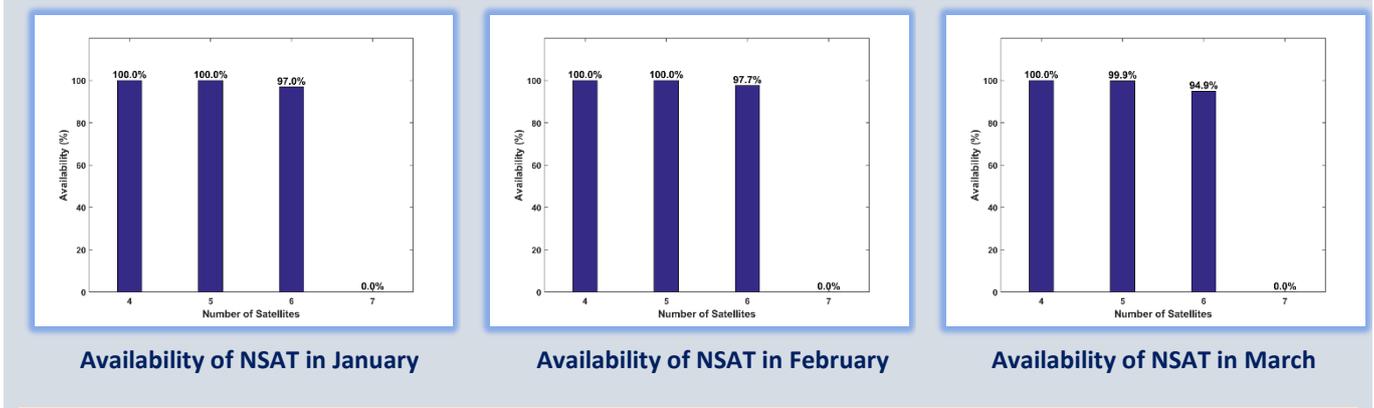


Figure 10: Percentage availability of number of SVs for SPS service in central region

### 4.3 DILUTION OF PRECISION STATISTICS

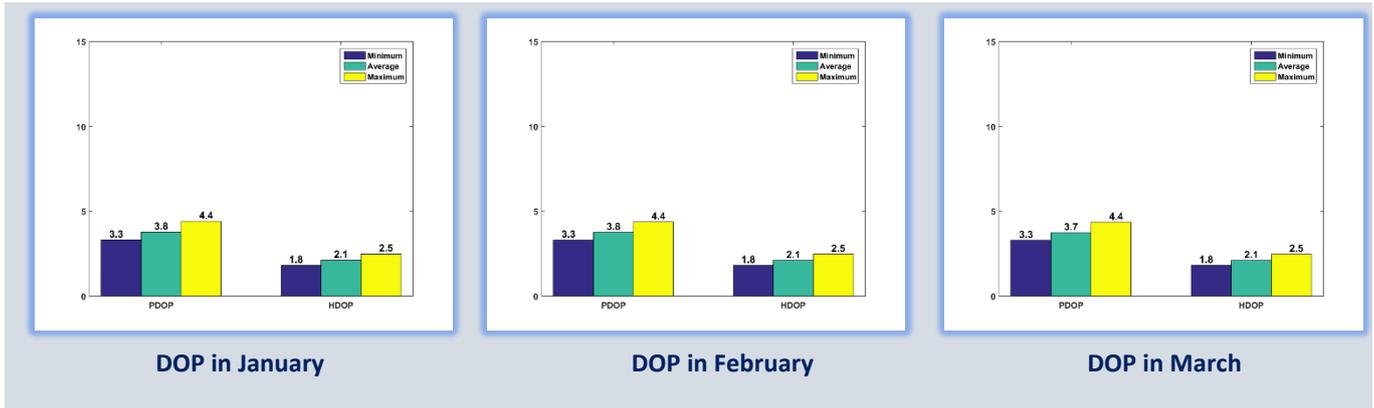
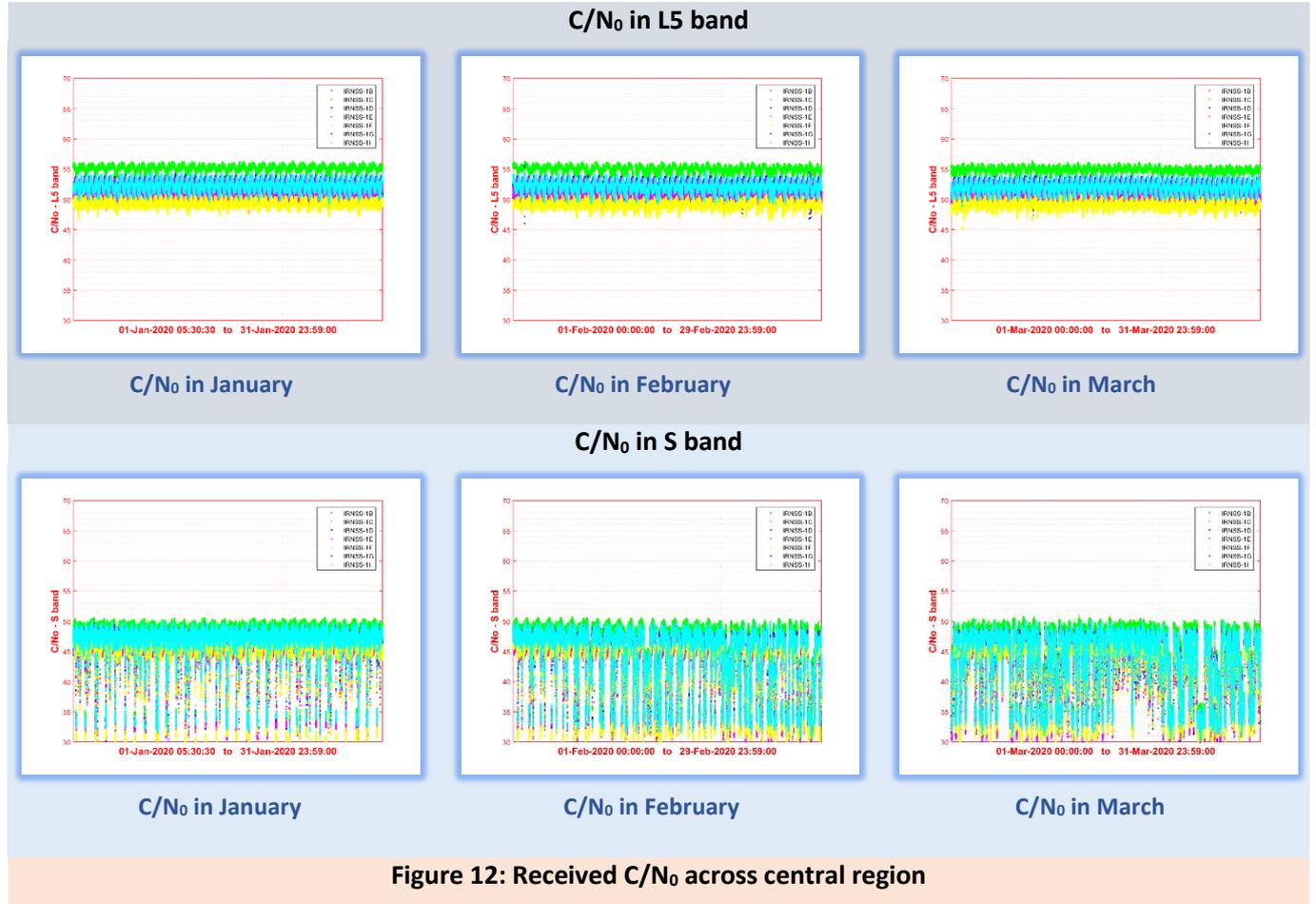


Figure 11: DOP statistics across central region

NOTE:

4.4 CARRIER TO NOISE RATIO



**NOTE:**

5.1 SIGNAL IN SPACE ACCURACY

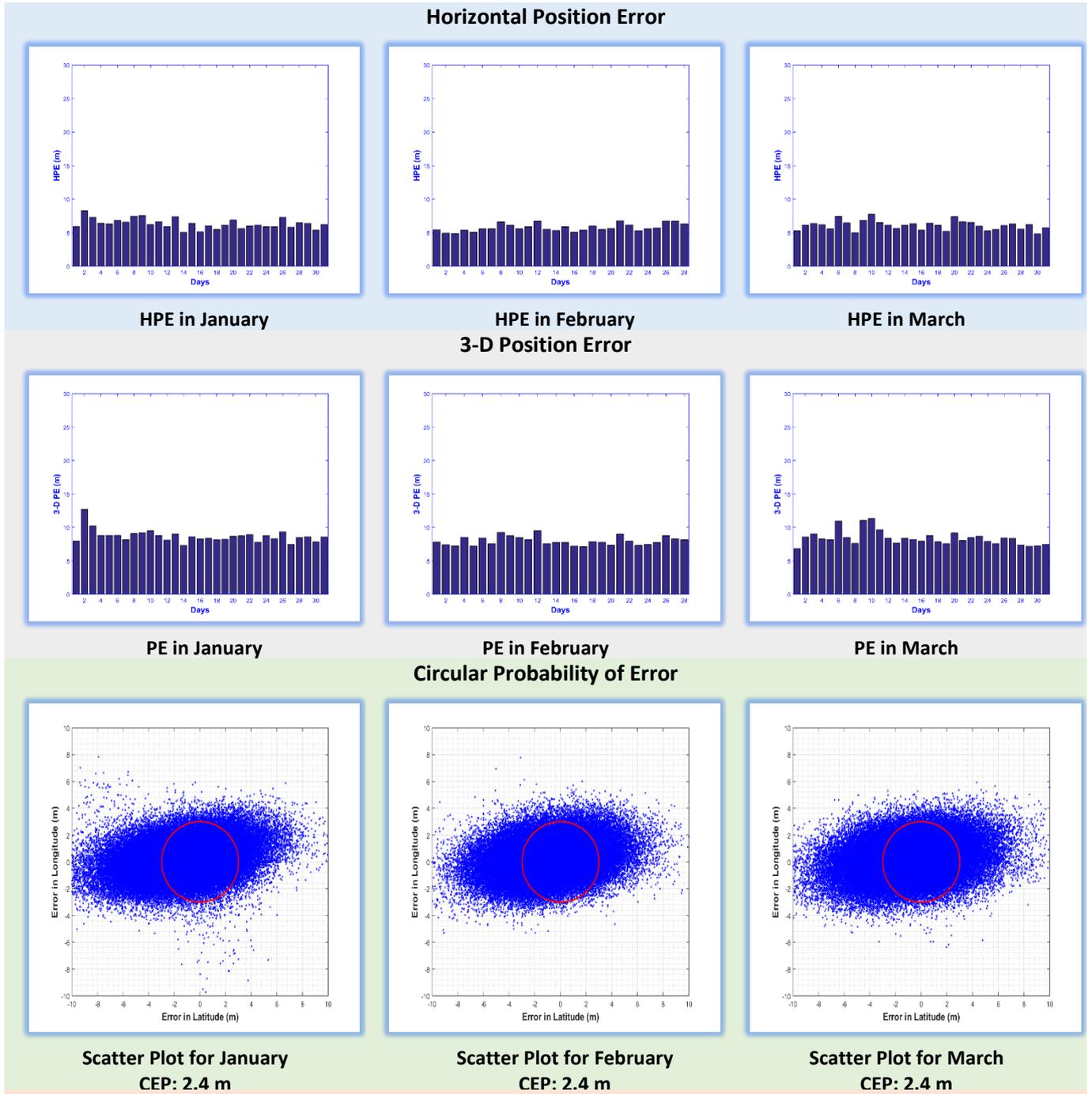
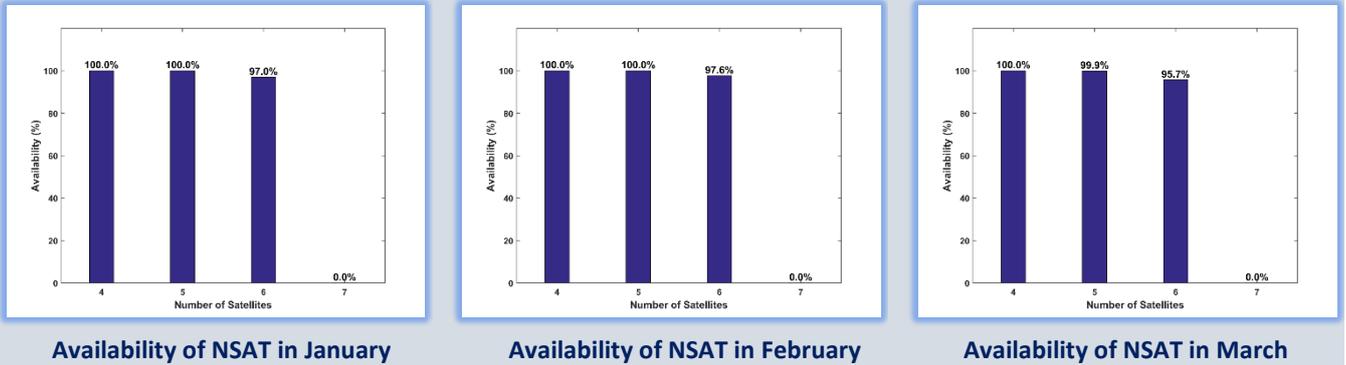


Figure 13: Position Accuracy across northern region

NOTE:

### 5.2 SATELLITE AVAILABILITY



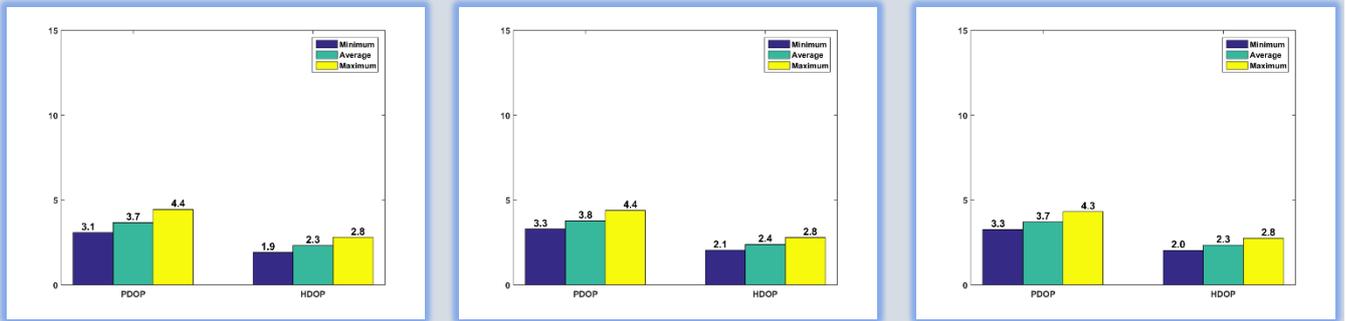
Availability of NSAT in January

Availability of NSAT in February

Availability of NSAT in March

Figure 14: Percentage availability of number of SVs for SPS service in northern region

### 5.3 DILUTION OF PRECISION STATISTICS



DOP in January

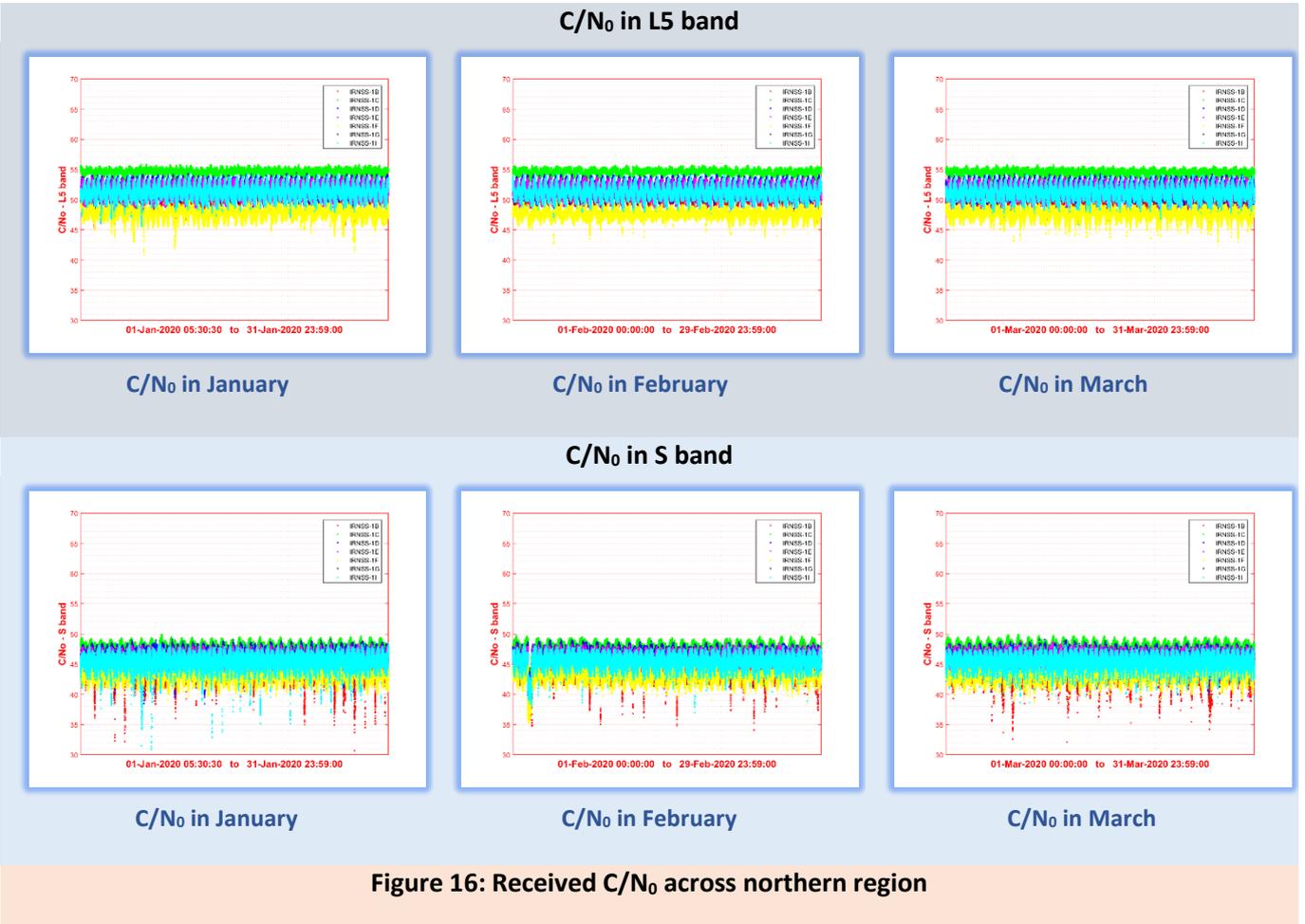
DOP in February

DOP in March

Figure 15: DOP statistics across northern region

**NOTE:**

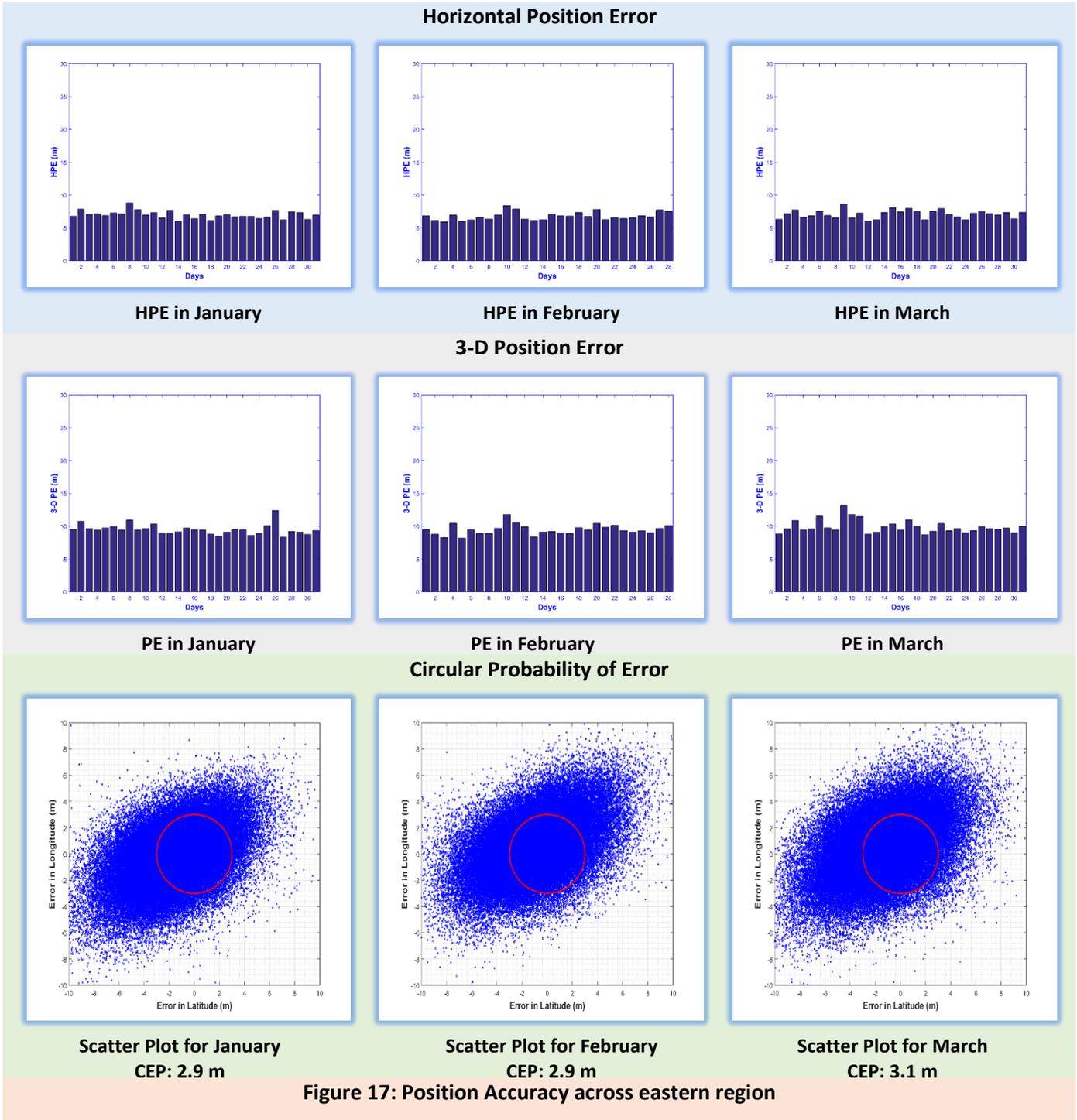
5.4 CARRIER TO NOISE RATIO



**NOTE:**

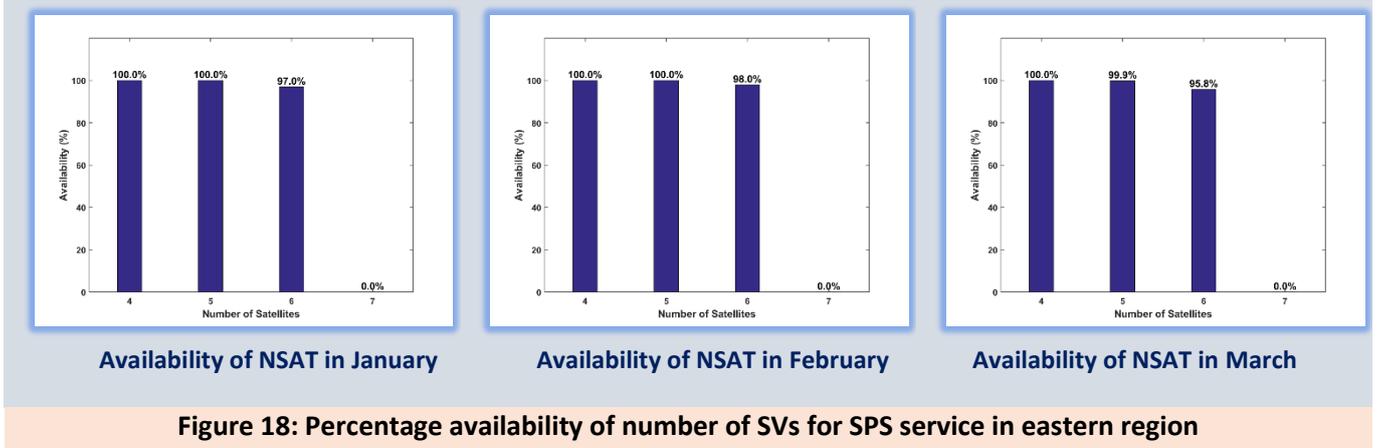
EASTERN REGION

6.1 SIGNAL IN SPACE ACCURACY

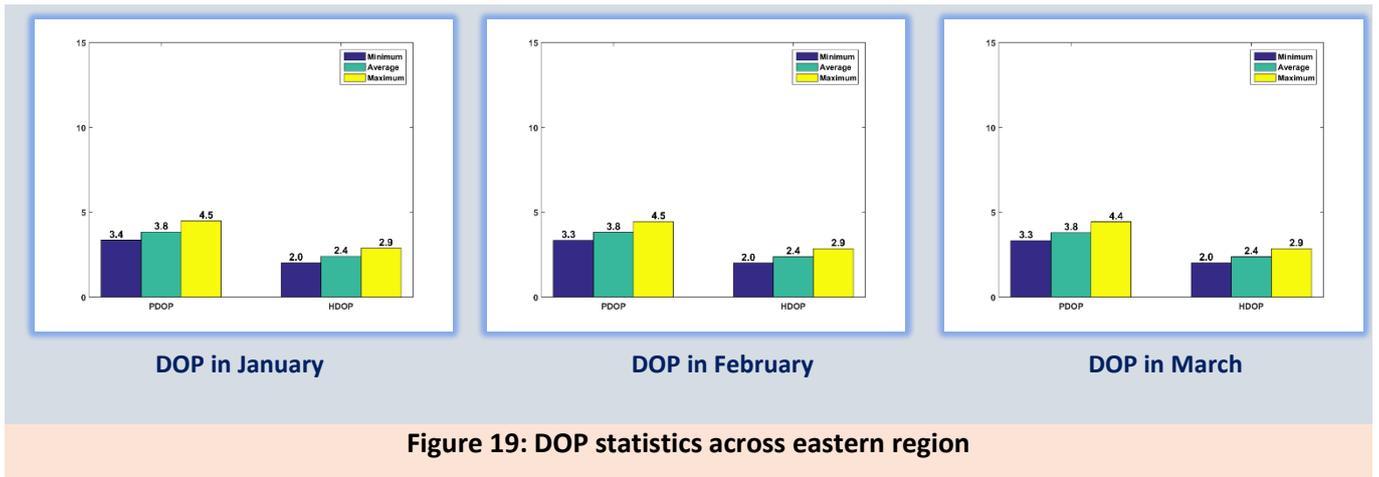


NOTE:

### 6.2 SATELLITE AVAILABILITY



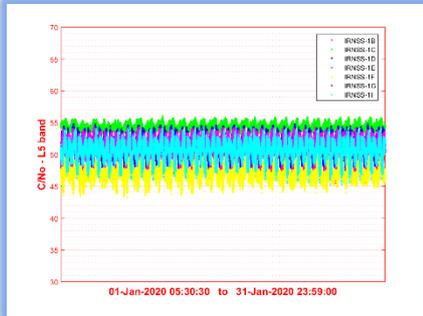
### 6.3 DILUTION OF PRECISION STATISTICS



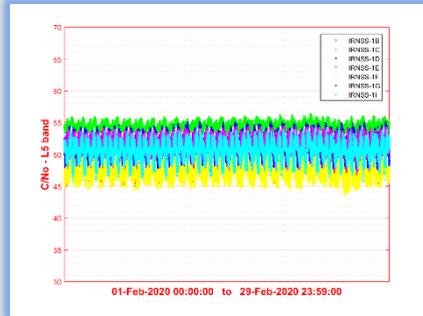
**NOTE:**

### 6.4 CARRIER TO NOISE RATIO

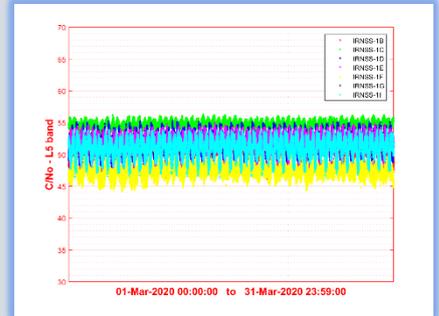
#### C/N<sub>0</sub> in L5 band



C/N<sub>0</sub> in January

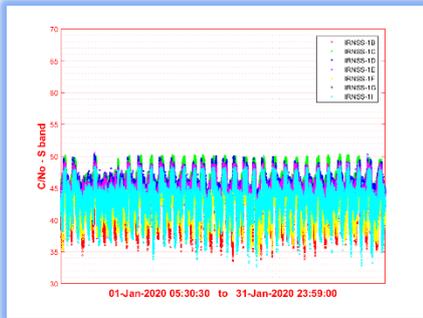


C/N<sub>0</sub> in February

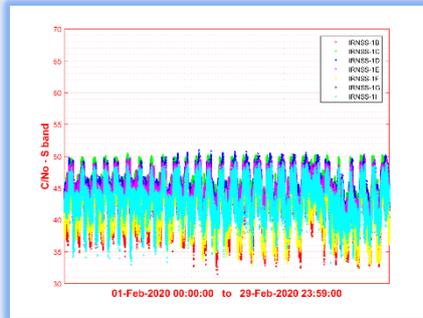


C/N<sub>0</sub> in March

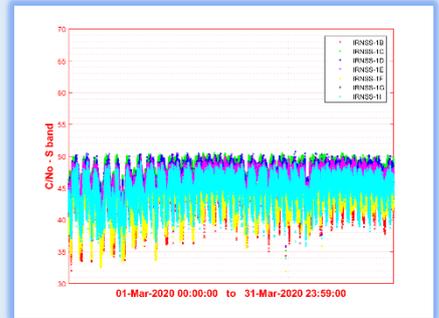
#### C/N<sub>0</sub> in S band



C/N<sub>0</sub> in January



C/N<sub>0</sub> in February



C/N<sub>0</sub> in March

**Figure 20: Received C/N<sub>0</sub> across eastern region**

**NOTE:**