



ISRO-IRNSS-PER-20-2

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

APRIL-JUNE 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 (SIS), 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 April, May and June 2020 has been provided in this document.

## 1.2 PERFORMANCE INDICATORS

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

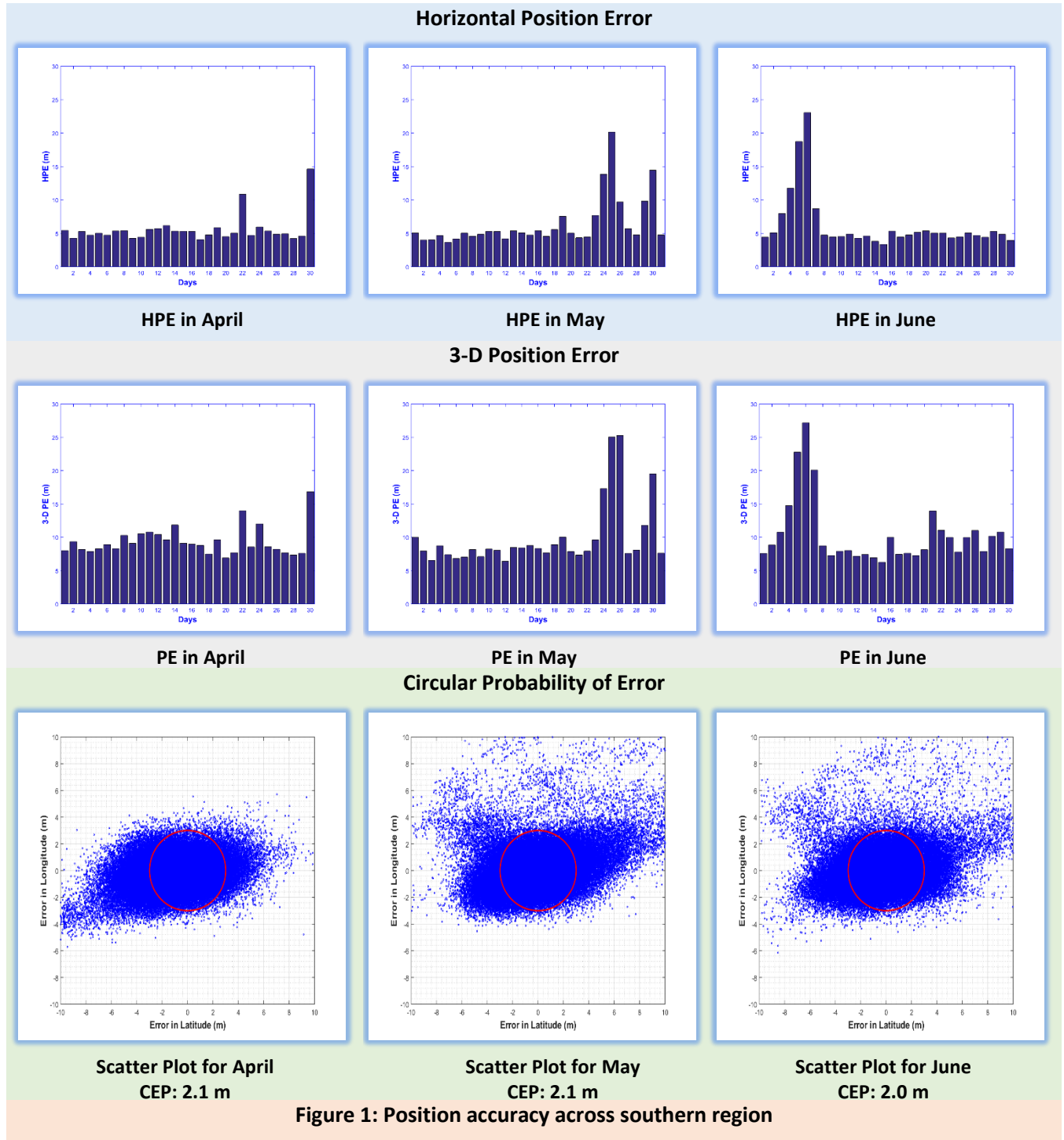
Table 1: Performance Indicators for NavIC (IRNSS)		
<b>Position Accuracy</b>	Horizontal Position Error (HPE) 3-D Position Error Circular Error Probability (CEP)	HPE is two dimensional and can be quantified in terms of error in latitude and longitude. It is calculated as twice the distance-root-mean-square (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.
<b>Availability</b>	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.
<b>Carrier-to-Noise ratio</b>	Received $C/N_0$ in L5 band Received $C/N_0$ in S band	
<b>Satellite Geometry</b>	Dilution of Precision	

**NOTE:**

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

SOUTHERN REGION

2.1. SIGNAL IN SPACE ACCURACY



**NOTE:**

Occasional rise in position error is observed due to SV.

### 2.2. SATELLITE AVAILABILITY

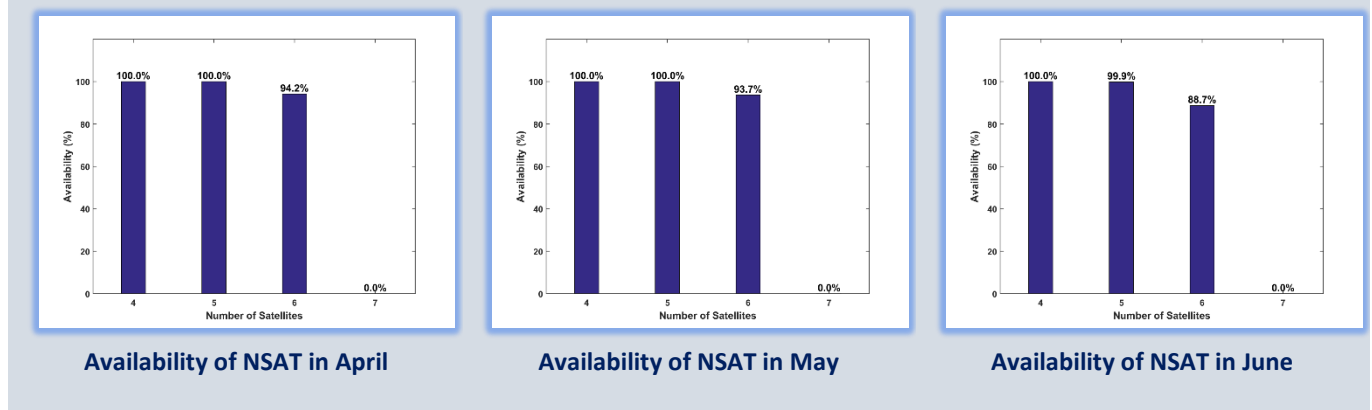


Figure 2: Percentage availability of number of SVs for SPS service in southern region

### 2.3. DILUTION OF PRECISION STATISTICS

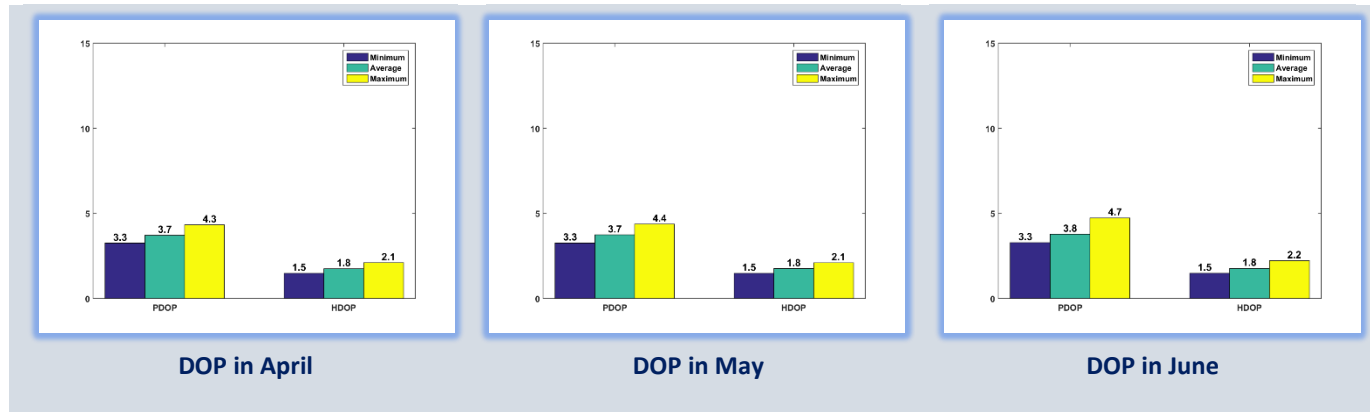
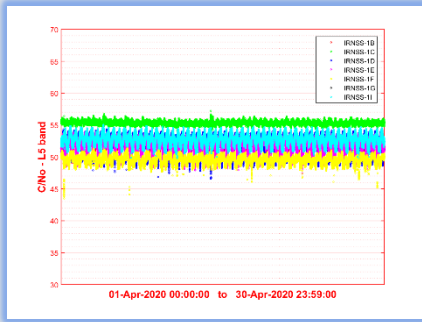


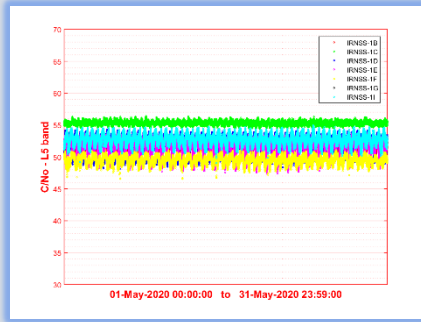
Figure 3: DOP statistics across southern region

2.4. CARRIER TO NOISE RATIO

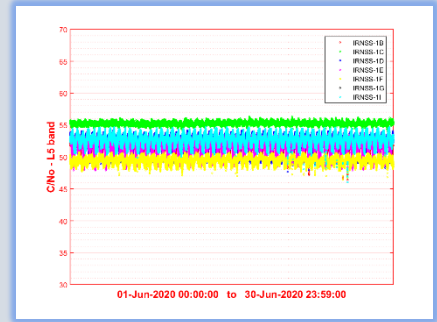
C/N<sub>0</sub> in L5 band



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



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

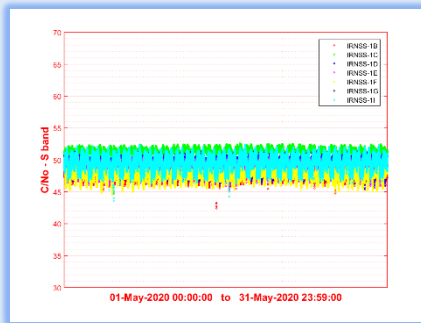


C/N<sub>0</sub> in June

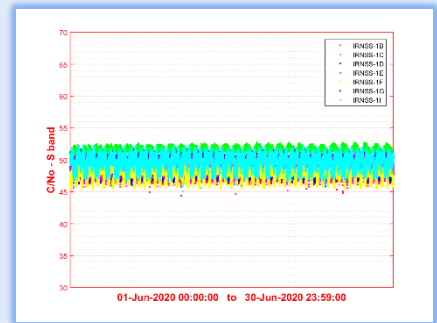
C/N<sub>0</sub> in S band



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



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



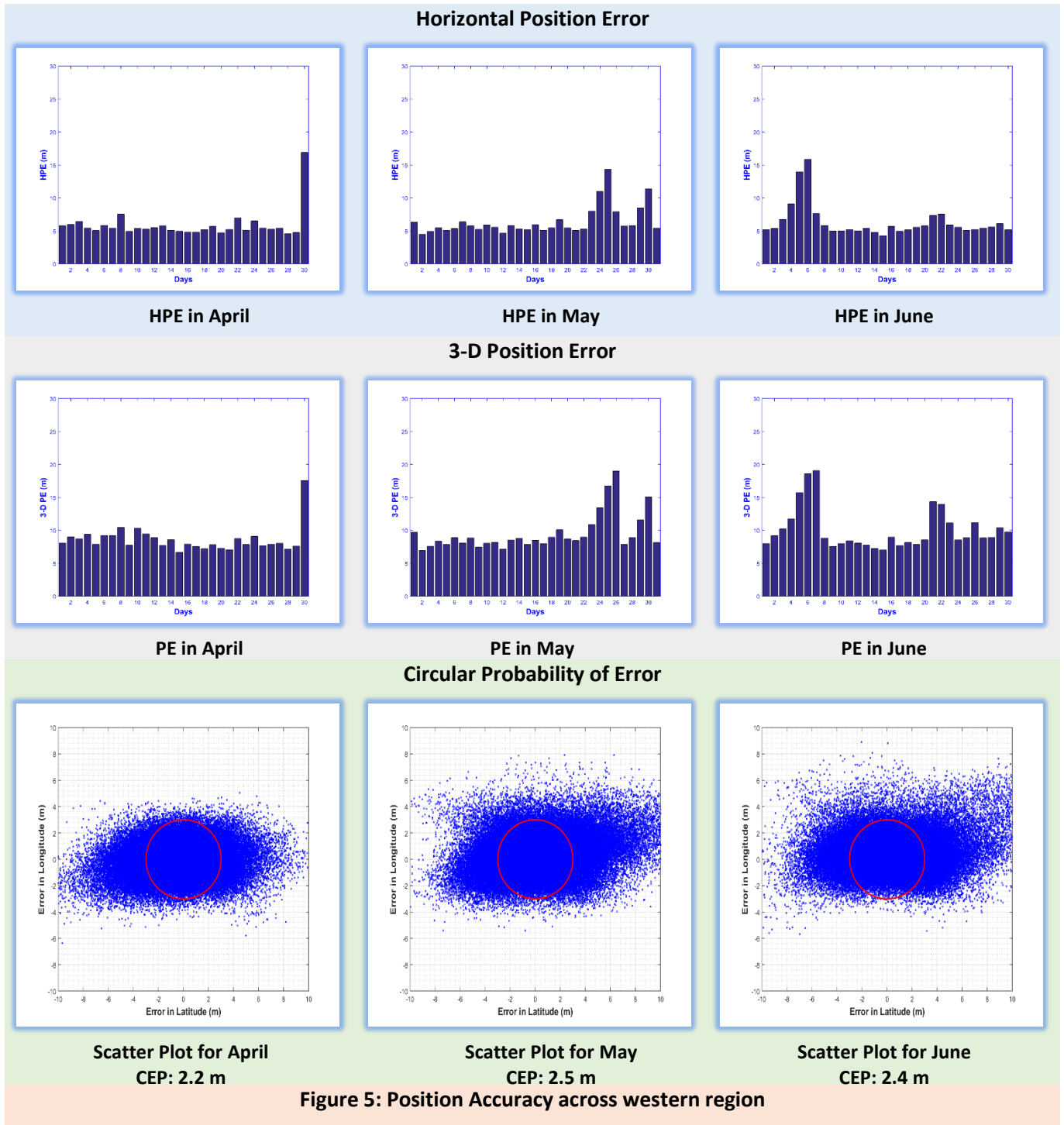
C/N<sub>0</sub> in June

Figure 4: Received C/N<sub>0</sub> across southern region



WESTERN REGION

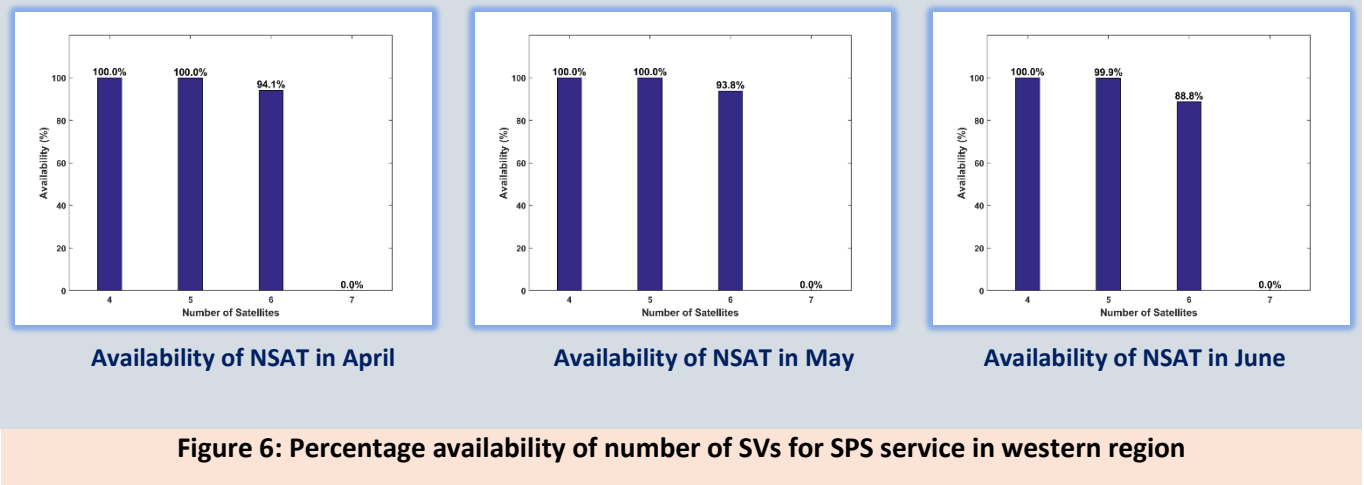
3.1 SIGNAL IN SPACE ACCURACY



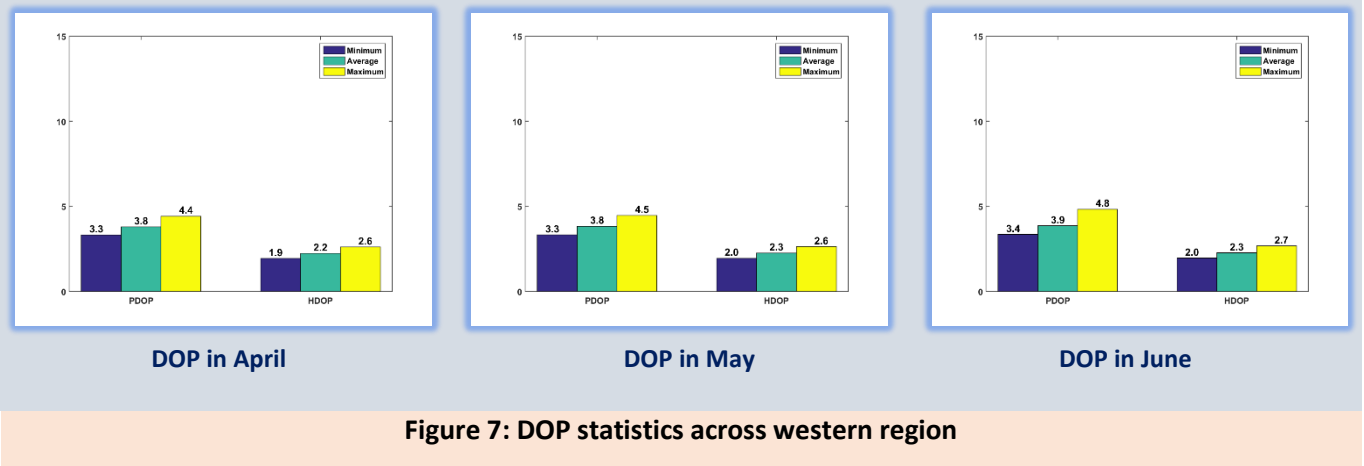
**NOTE:**

Occasional rise in position error is observed due to SV.

### 3.2 SATELLITE AVAILABILITY



### 3.3 DILUTION OF PRECISION STATISTICS



### 3.4 CARRIER TO NOISE RATIO

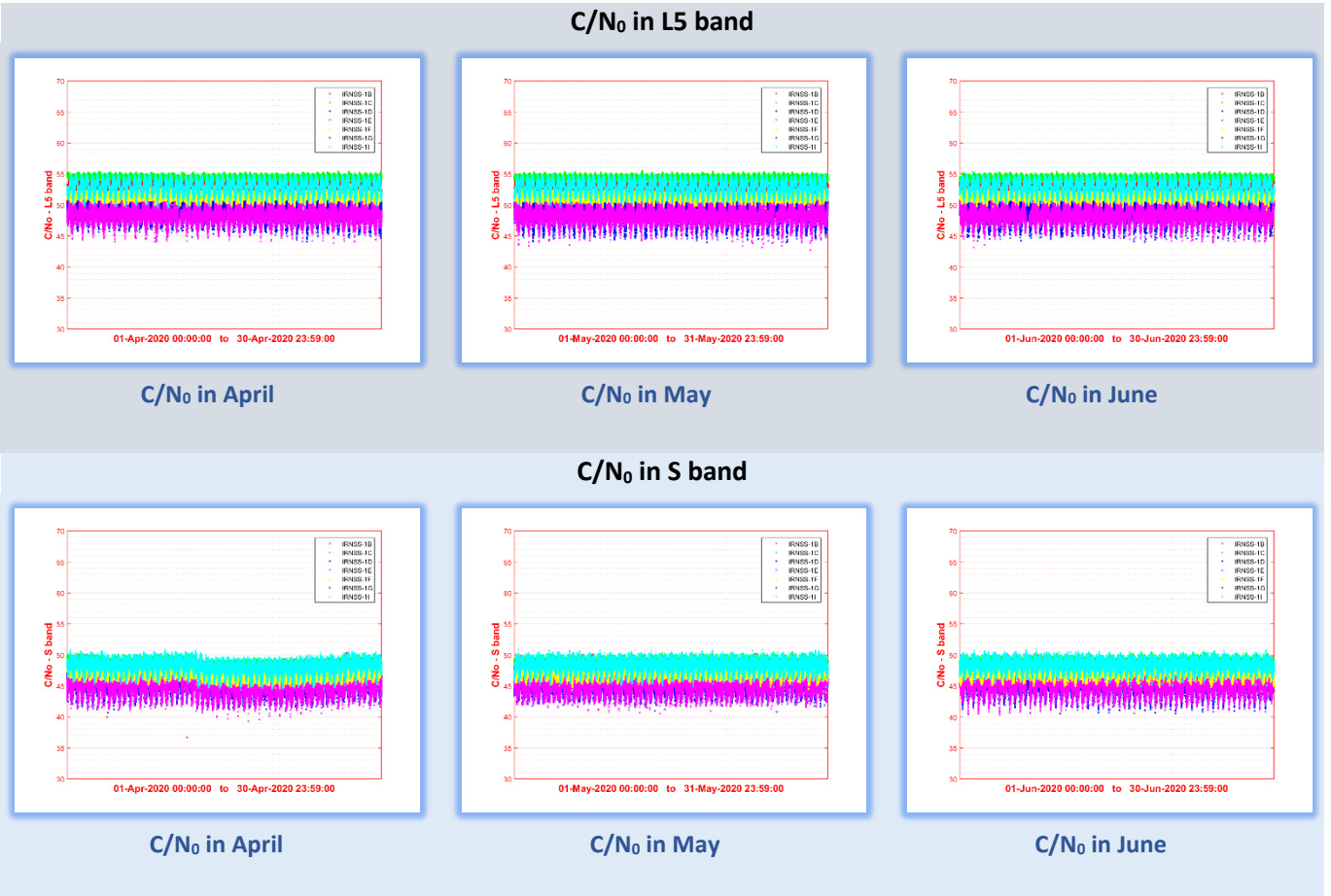
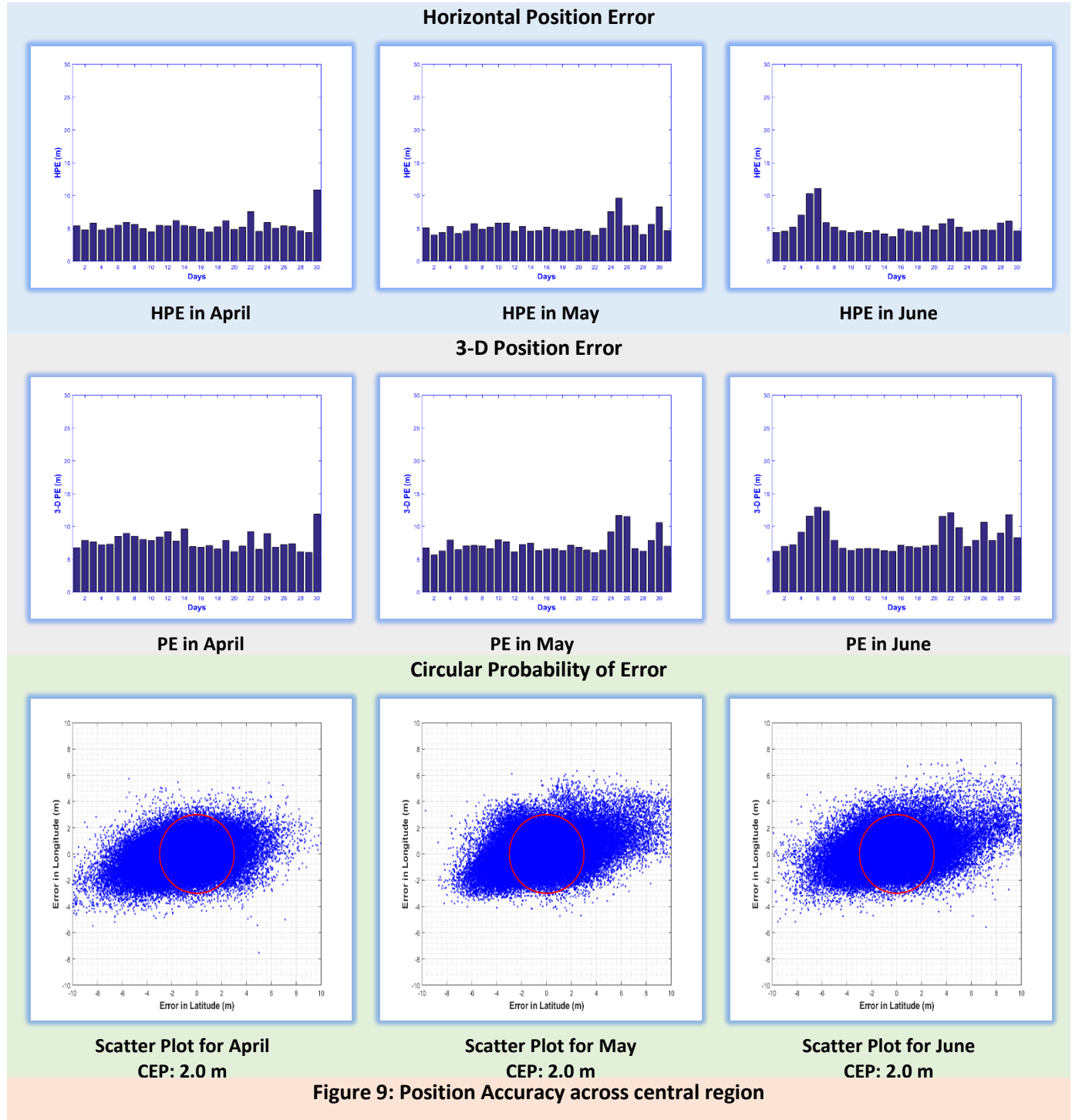


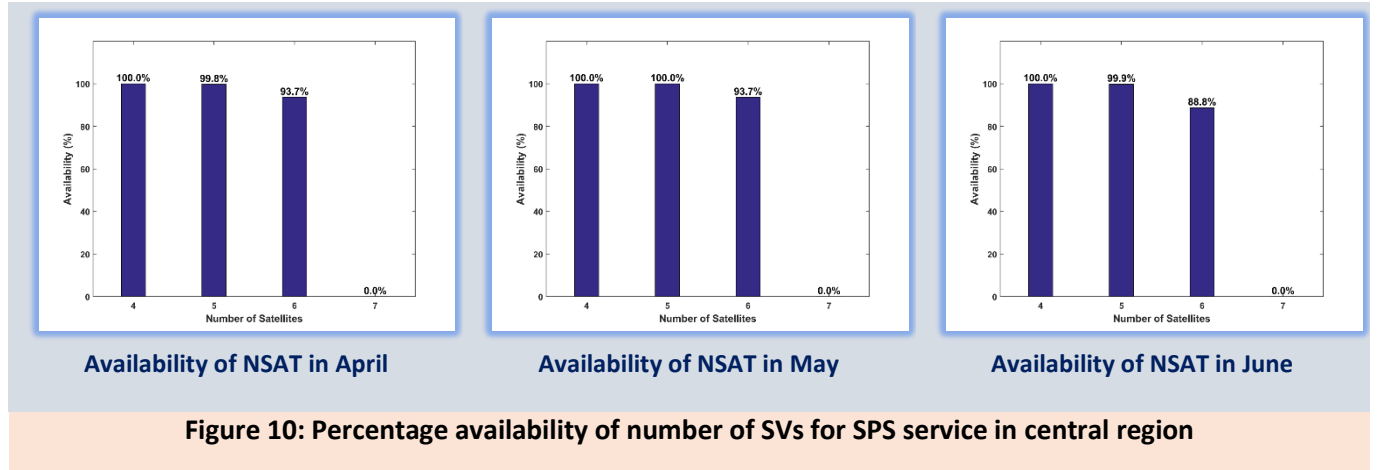
Figure 8: Received C/N<sub>0</sub> across western region

CENTRAL REGION

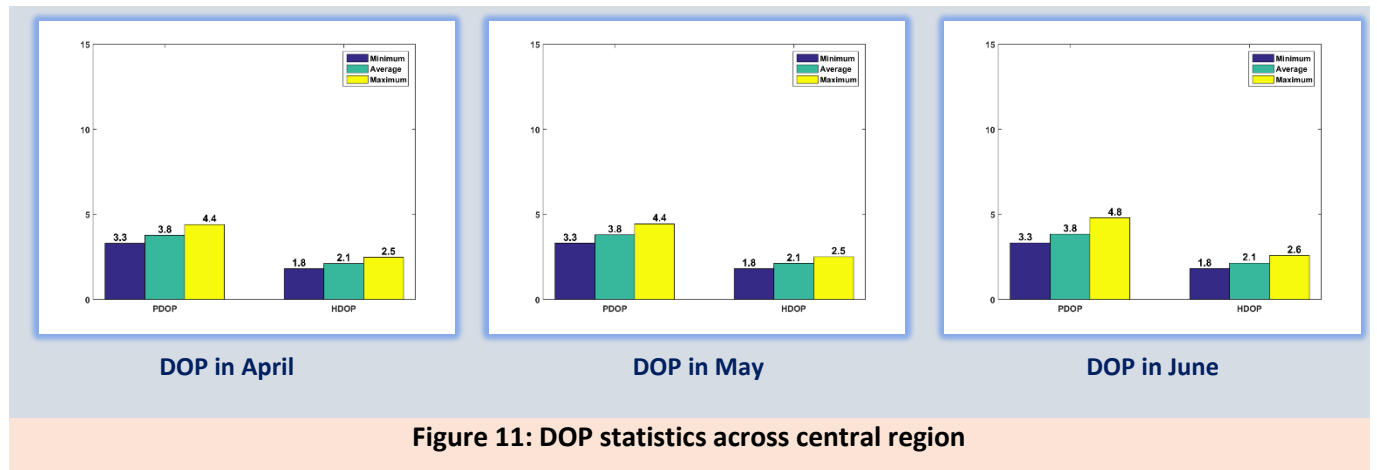
4.1 SIGNAL IN SPACE ACCURACY



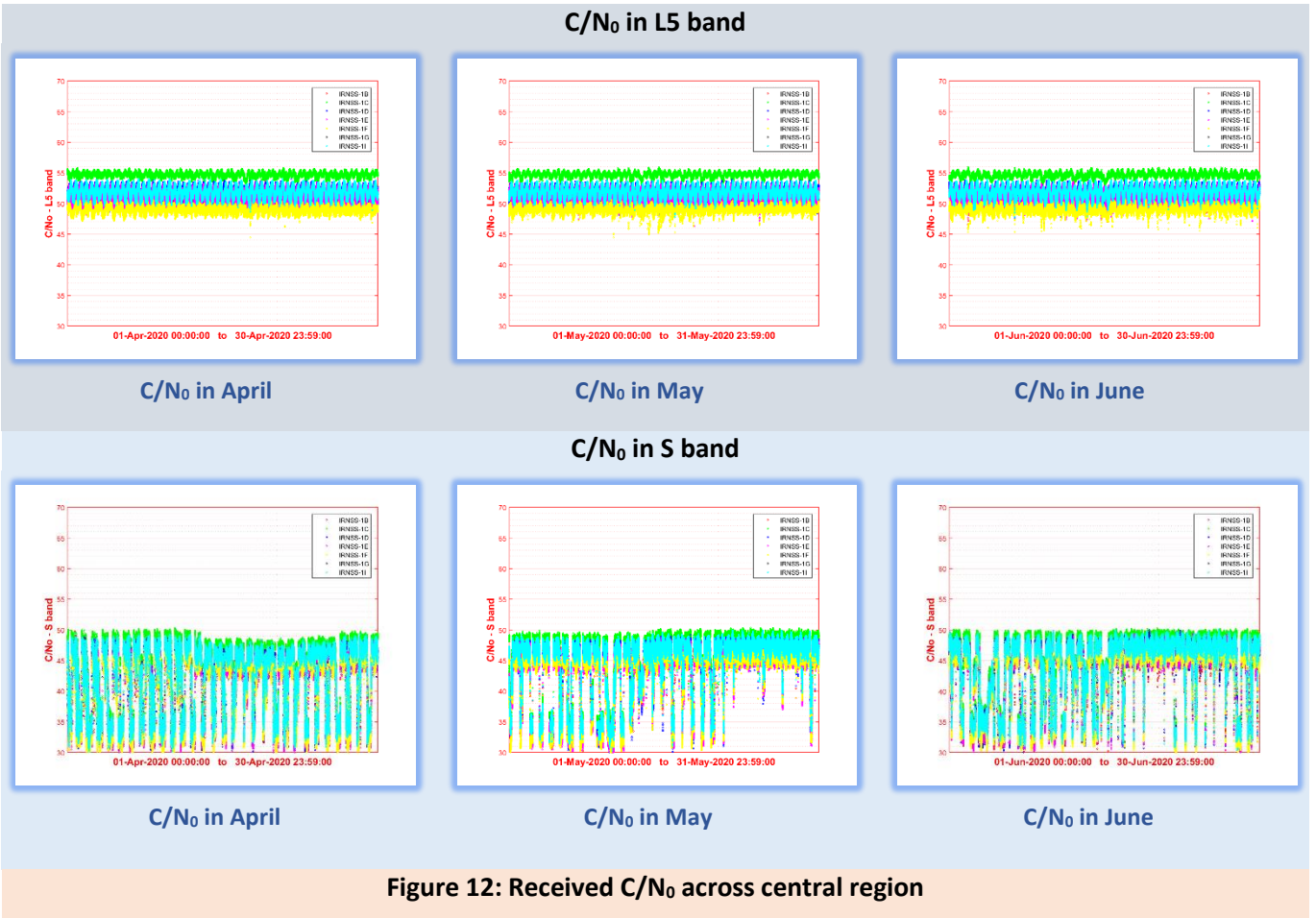
### 4.2 SATELLITE AVAILABILITY



### 4.3 DILUTION OF PRECISION STATISTICS



4.4 CARRIER TO NOISE RATIO



**NOTE:**

Occasional drop in C/N<sub>0</sub> is observed due to local interference.

5.1 SIGNAL IN SPACE ACCURACY

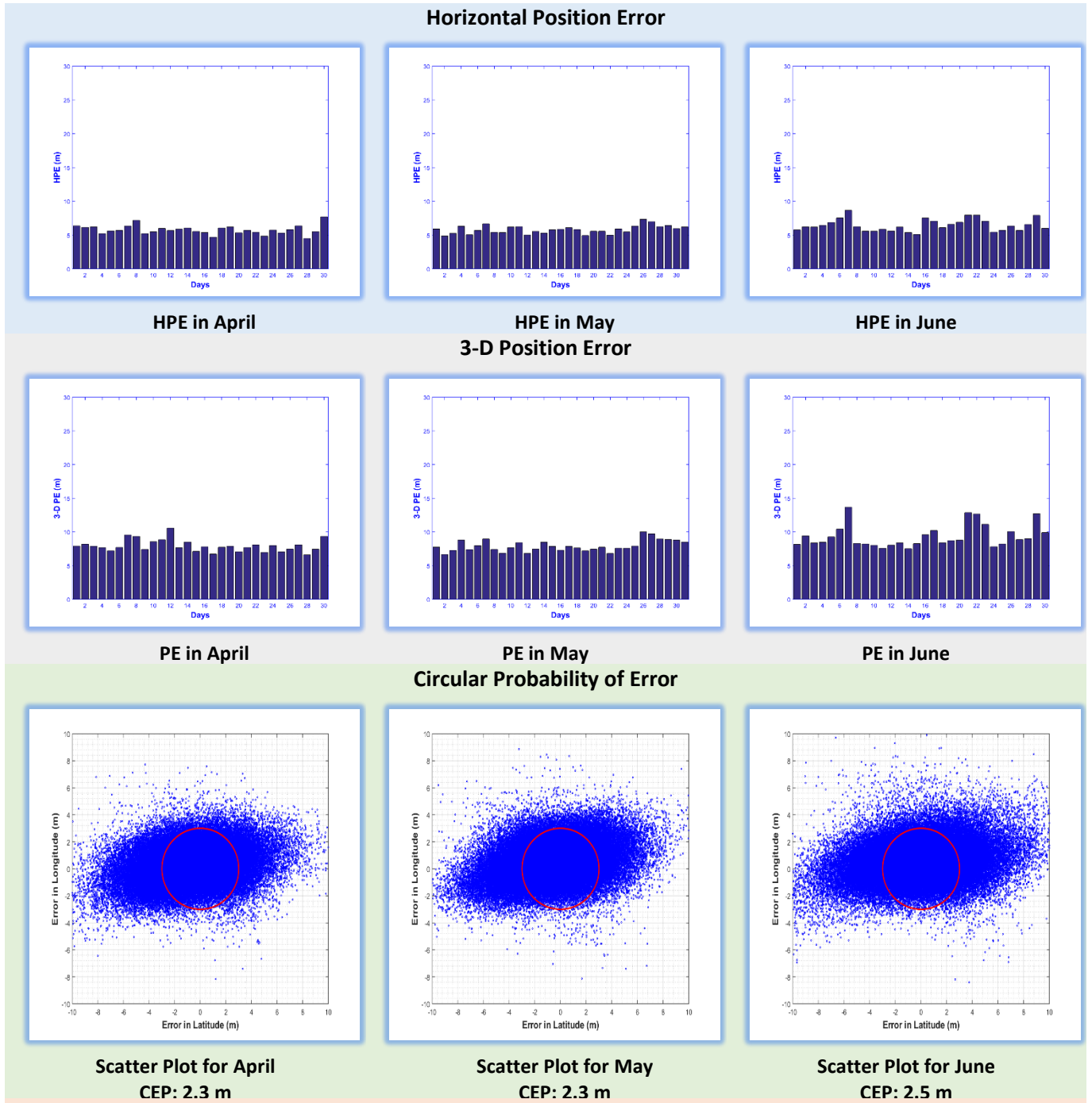


Figure 13: Position Accuracy across northern region

### 5.2 SATELLITE AVAILABILITY

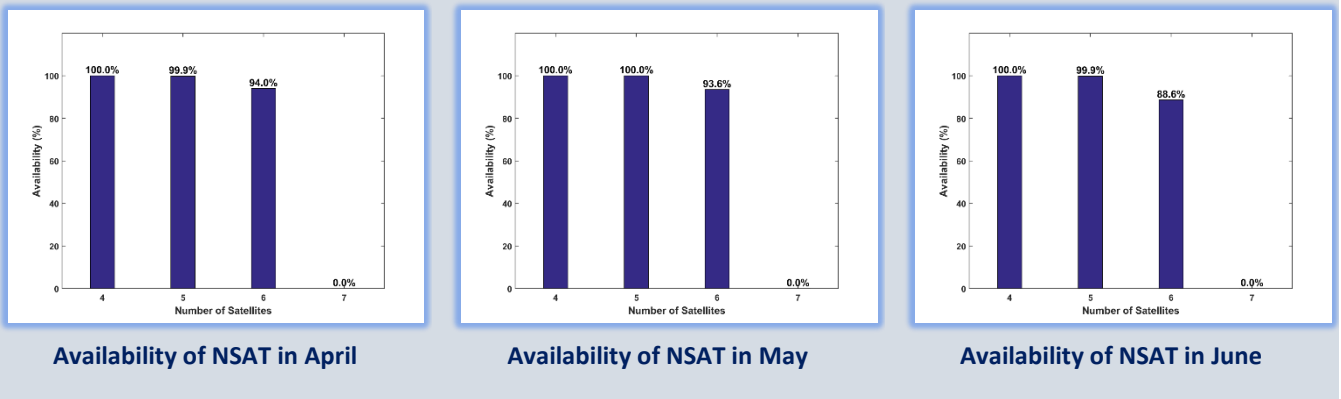


Figure 14: Percentage availability of number of SVs for SPS service in northern region

### 5.3 DILUTION OF PRECISION STATISTICS

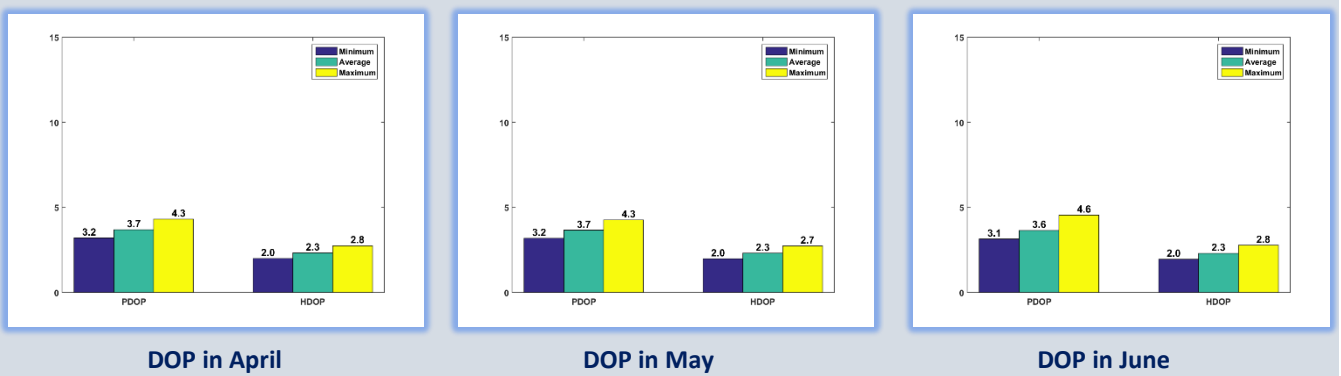
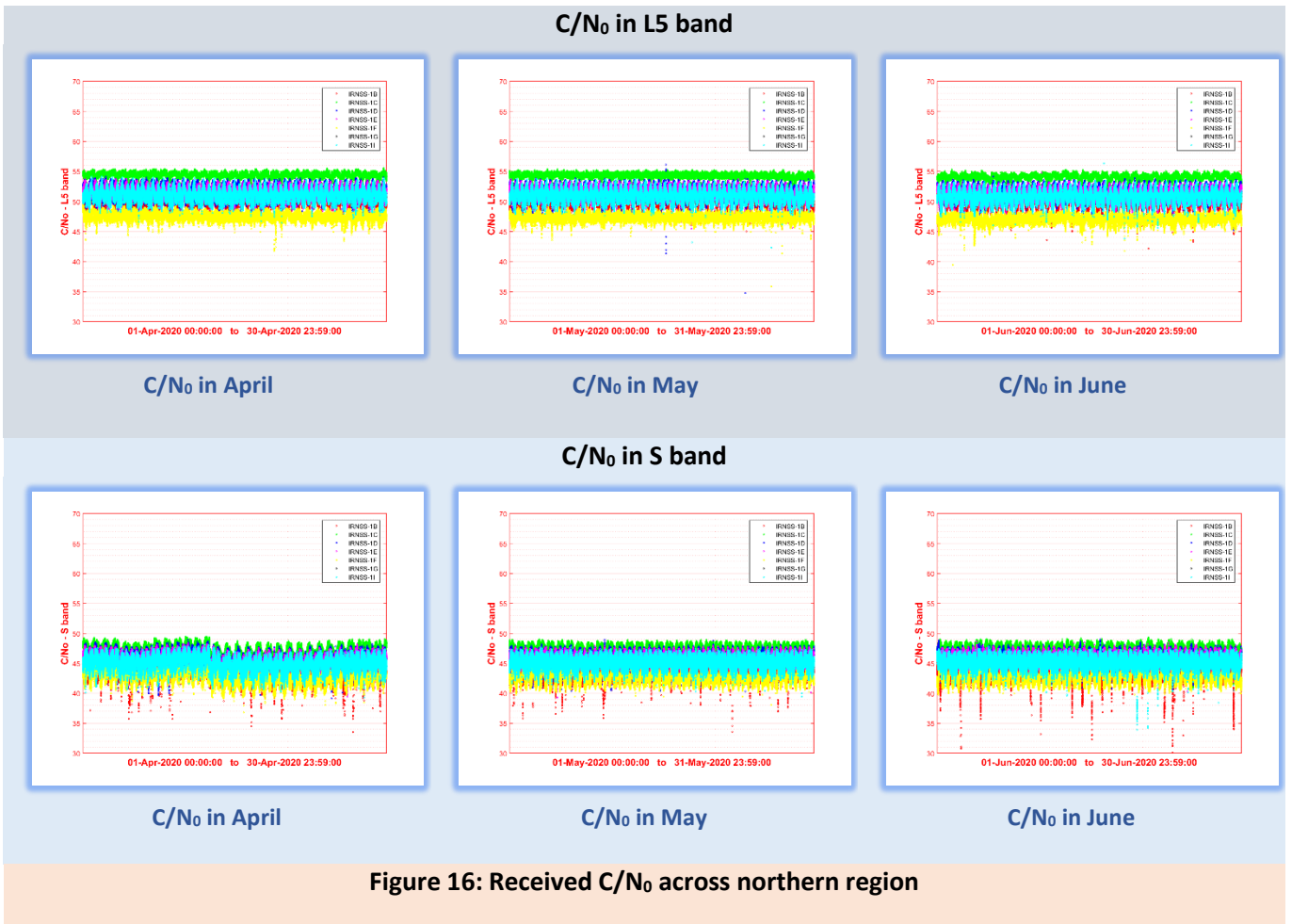


Figure 15: DOP statistics across northern region

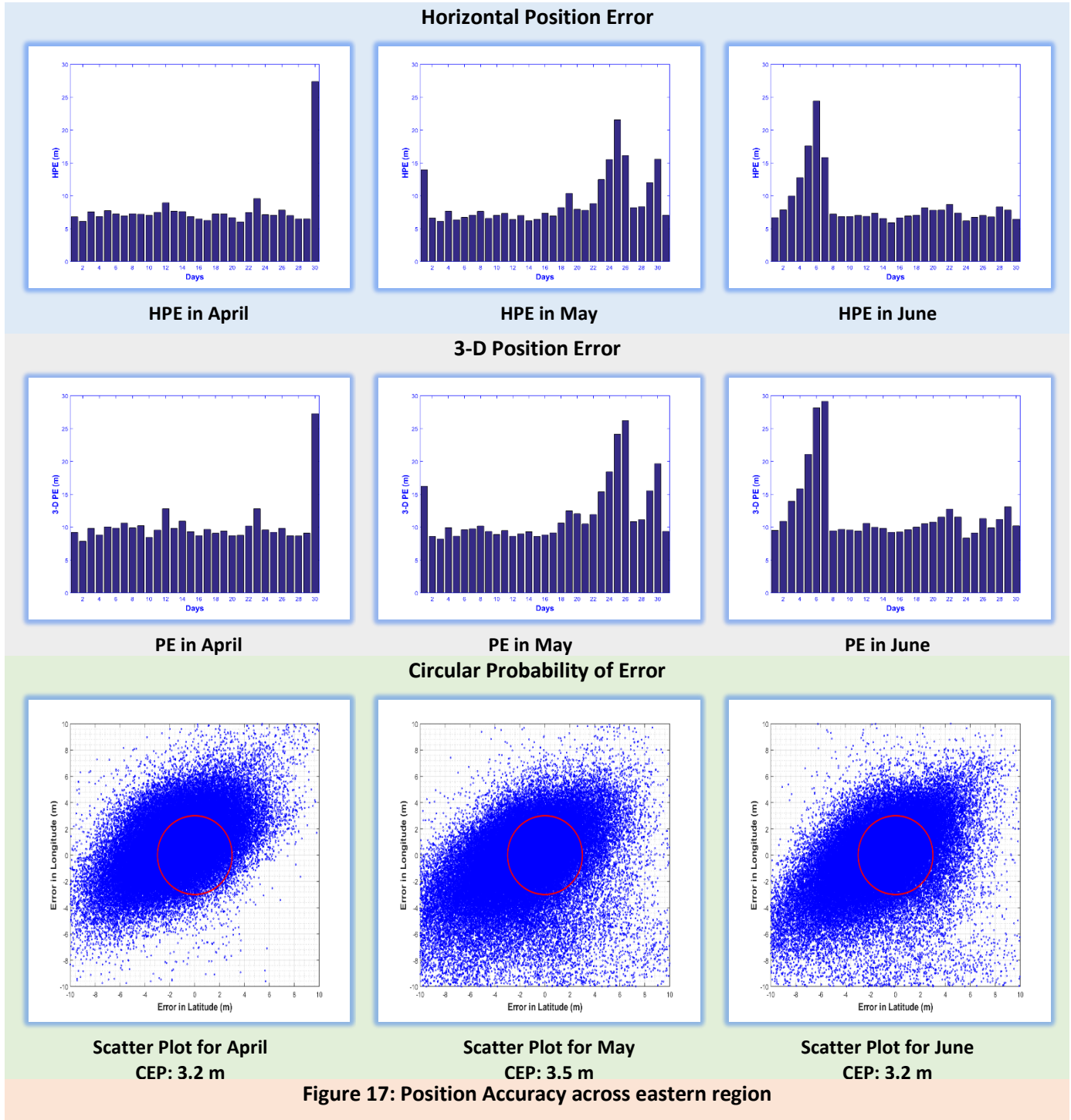


### 5.4 CARRIER TO NOISE RATIO



EASTERN REGION

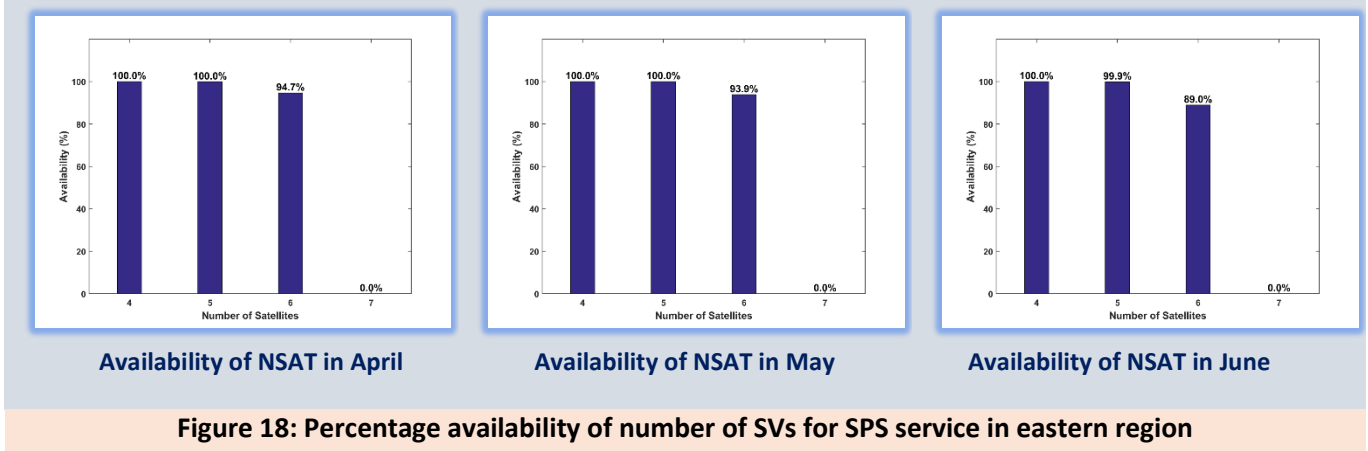
6.1 SIGNAL IN SPACE ACCURACY



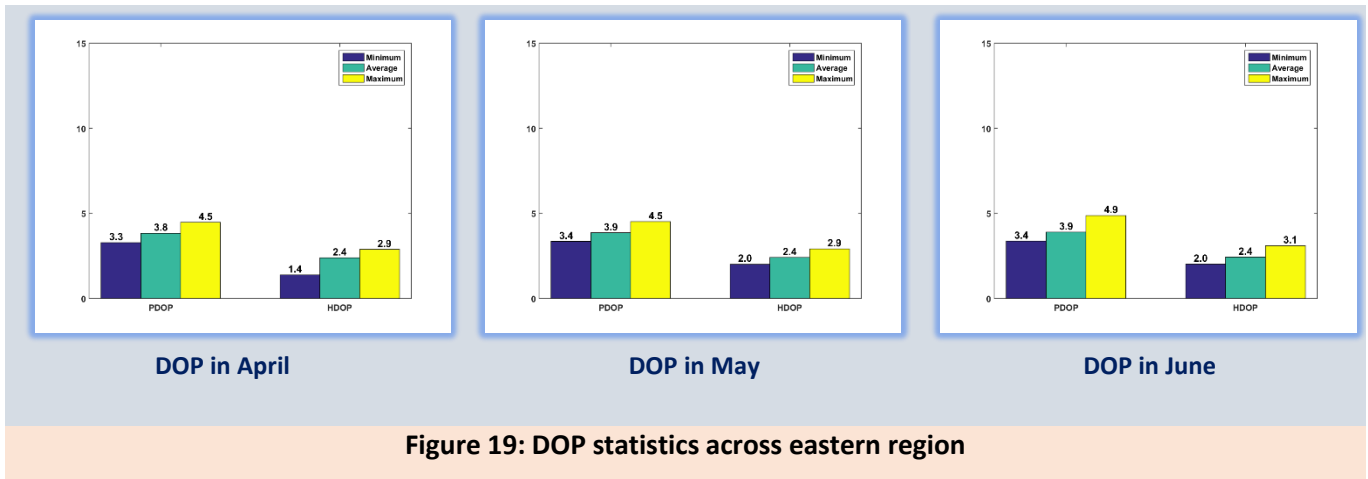
**NOTE:**

Occasional rise in position error is observed due to SV.

### 6.2 SATELLITE AVAILABILITY

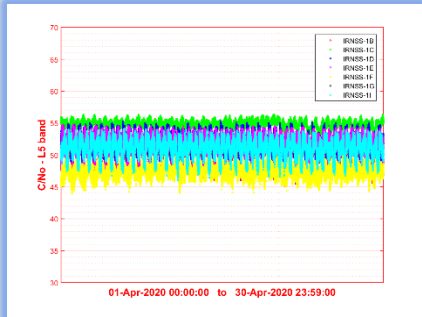


### 6.3 DILUTION OF PRECISION STATISTICS

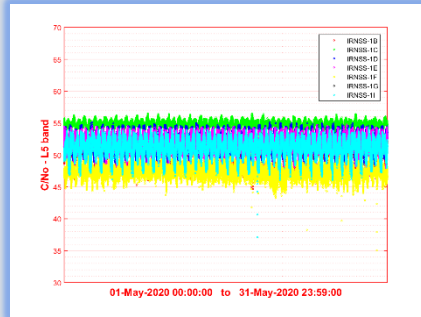


### 6.4 CARRIER TO NOISE RATIO

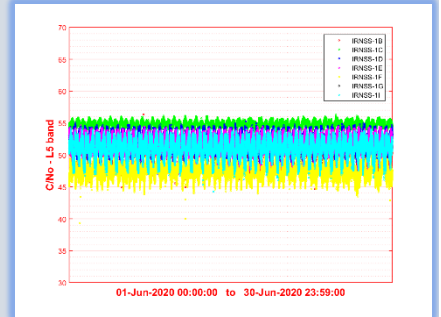
#### C/N<sub>0</sub> in L5 band



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

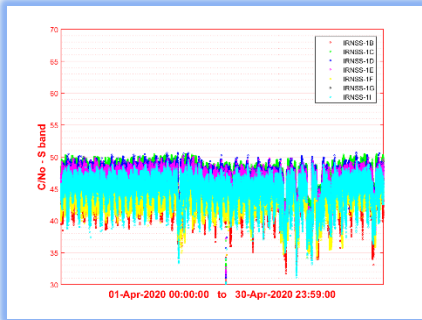


C/N<sub>0</sub> in May

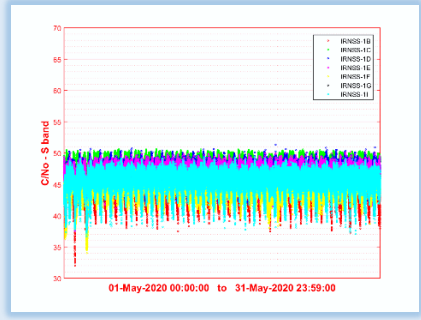


C/N<sub>0</sub> in June

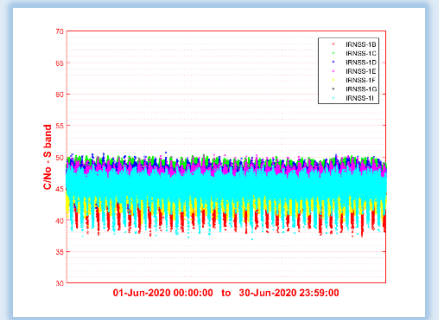
#### C/N<sub>0</sub> in S band



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



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



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

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