Enhancements in upcoming NavIC Satellites

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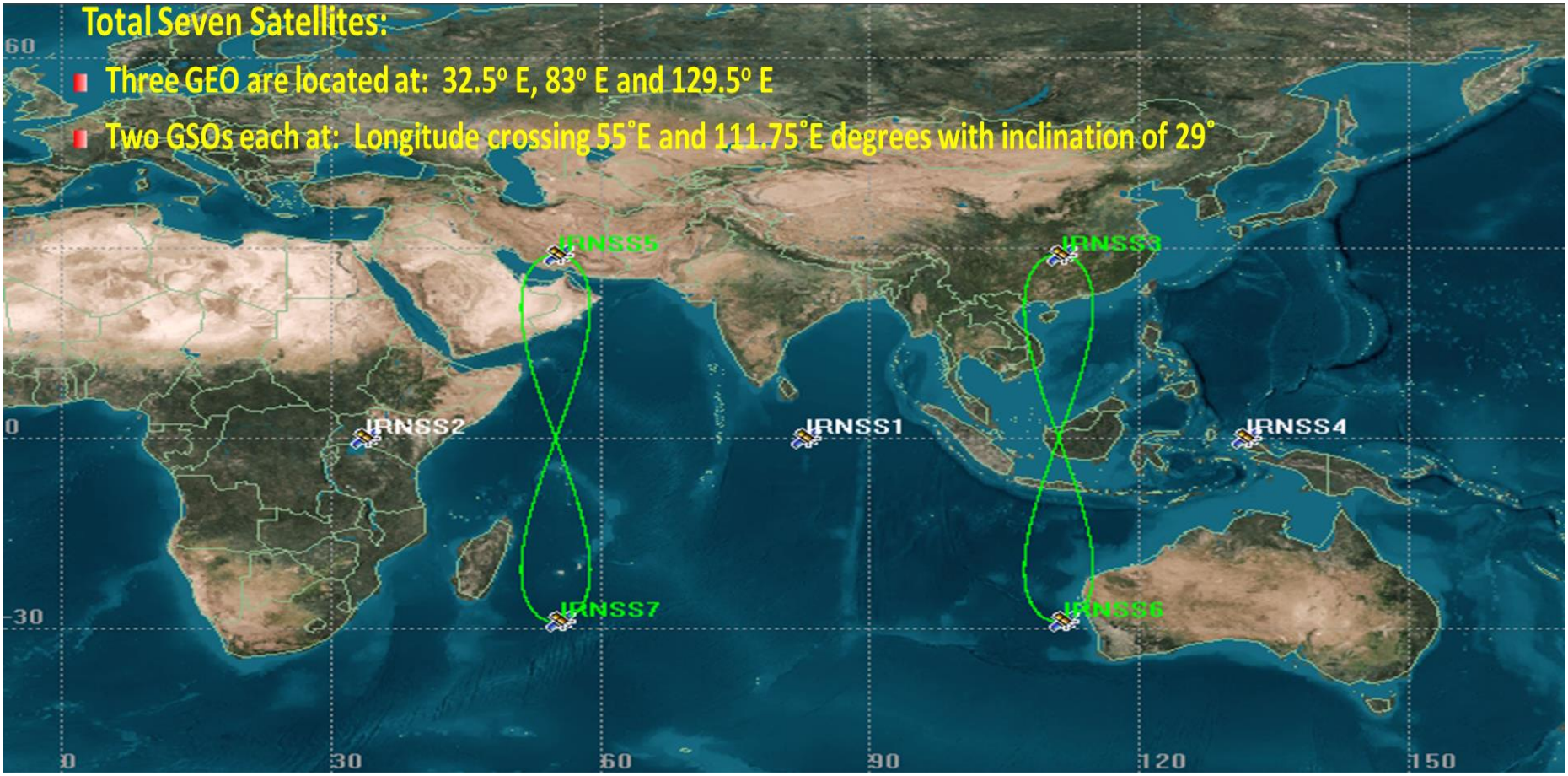
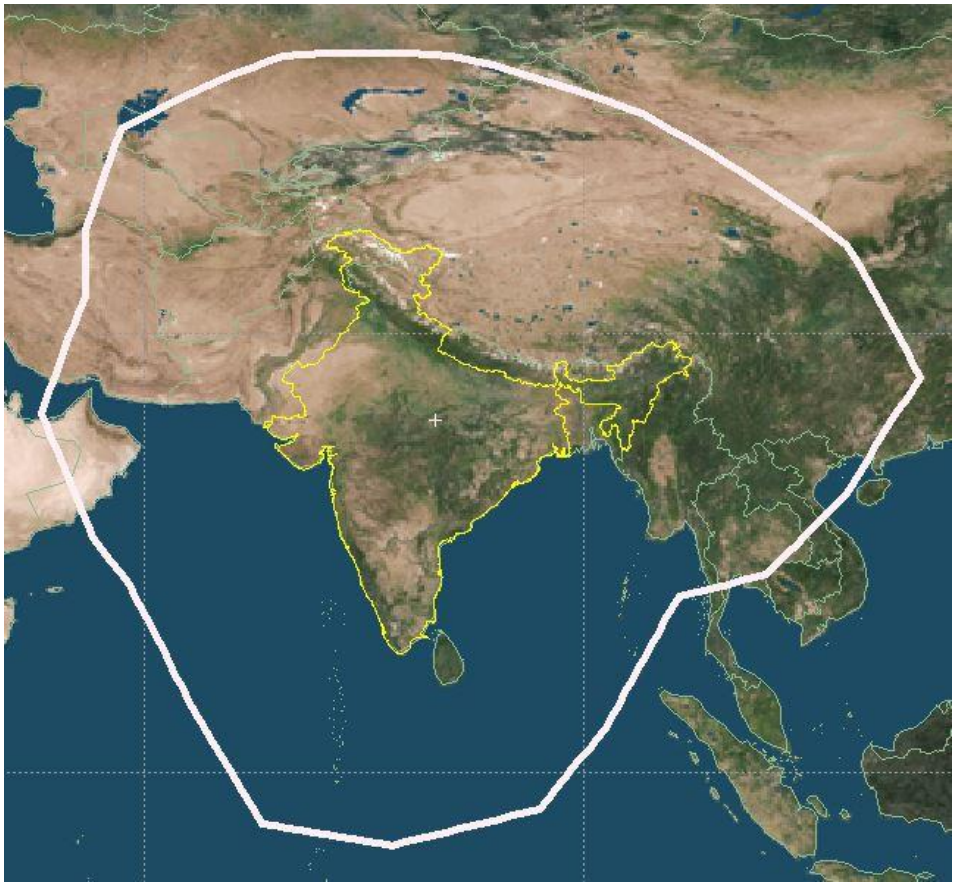
Present NavIC Constellation



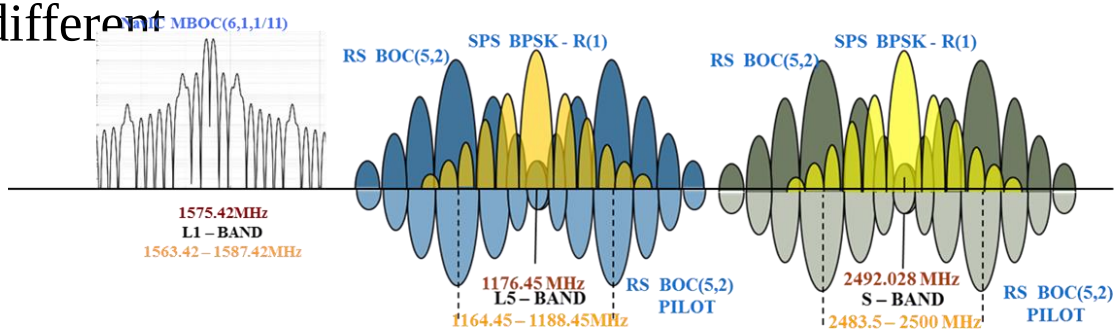
Present NavIC Service Area



Service Area is defined as the area covered by 1500 km contour from Indian geopolitical boundary.

Enhancements in upcoming NavIC Satellites

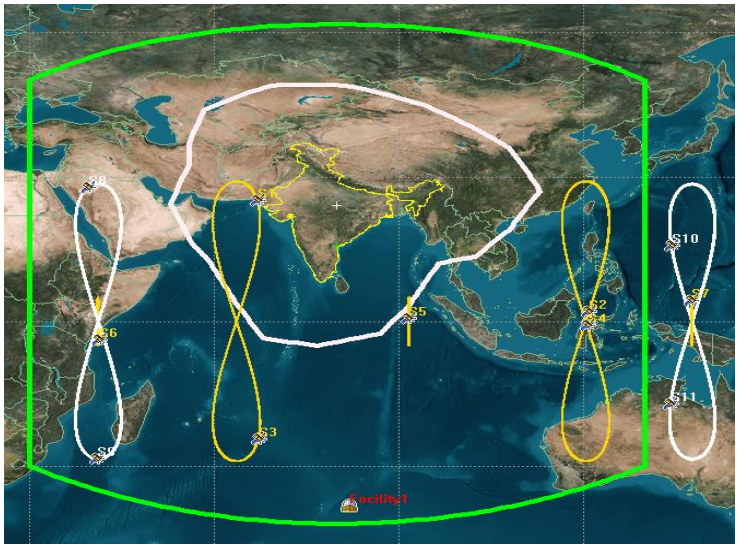
- Extension of NavIC constellation
- Open service signals on three different frequency bands:
  - L5 Band – BPSK(1)
  - S Band – BPSK(1)
  - *L1 Band – MBOC(6, 1, 1/11)*



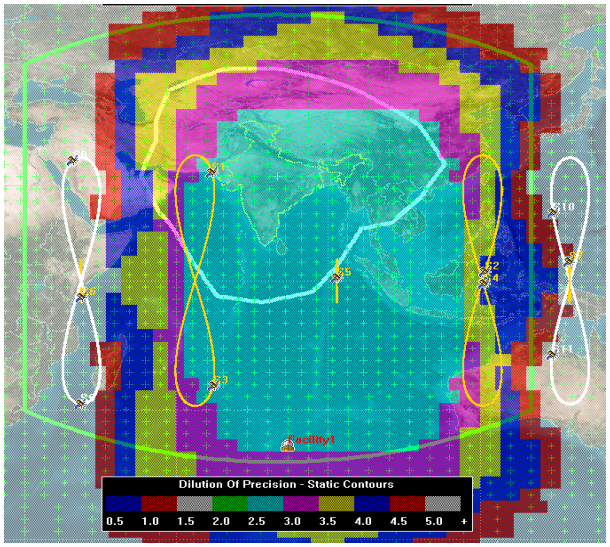
- NavIC Space Service Volume
- Satellite Aided Search and Rescue Payload on Future NavIC Satellites
- Onboard Integrity and Auto-navigation (AUTONAV) System

Extension of NavIC Constellation

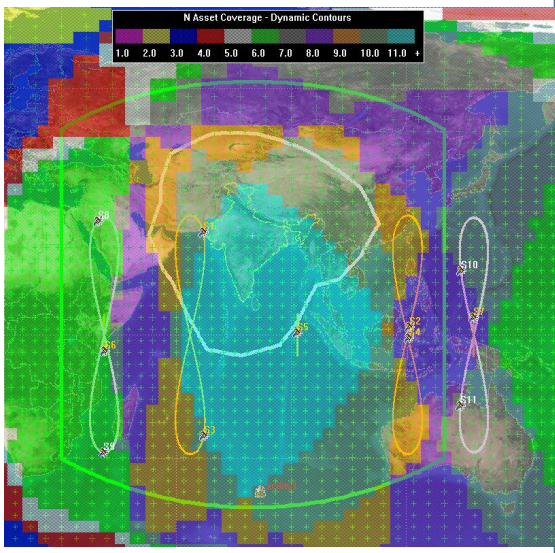
- Four more satellites to extend the service area
  - To Improve Service coverage Area : Lat. 30^0S to 50^0N, Long. 30^0 to 130^0E.
  - To improve the availability of satellite – minimum 6 Satellites
  - To improve the accuracy and continuity of service - better then 3m @ 2σ



Extended Constellation Satellites : Four
32.5 & 129.5 E IGSO @ 29° – Two in Each Slot

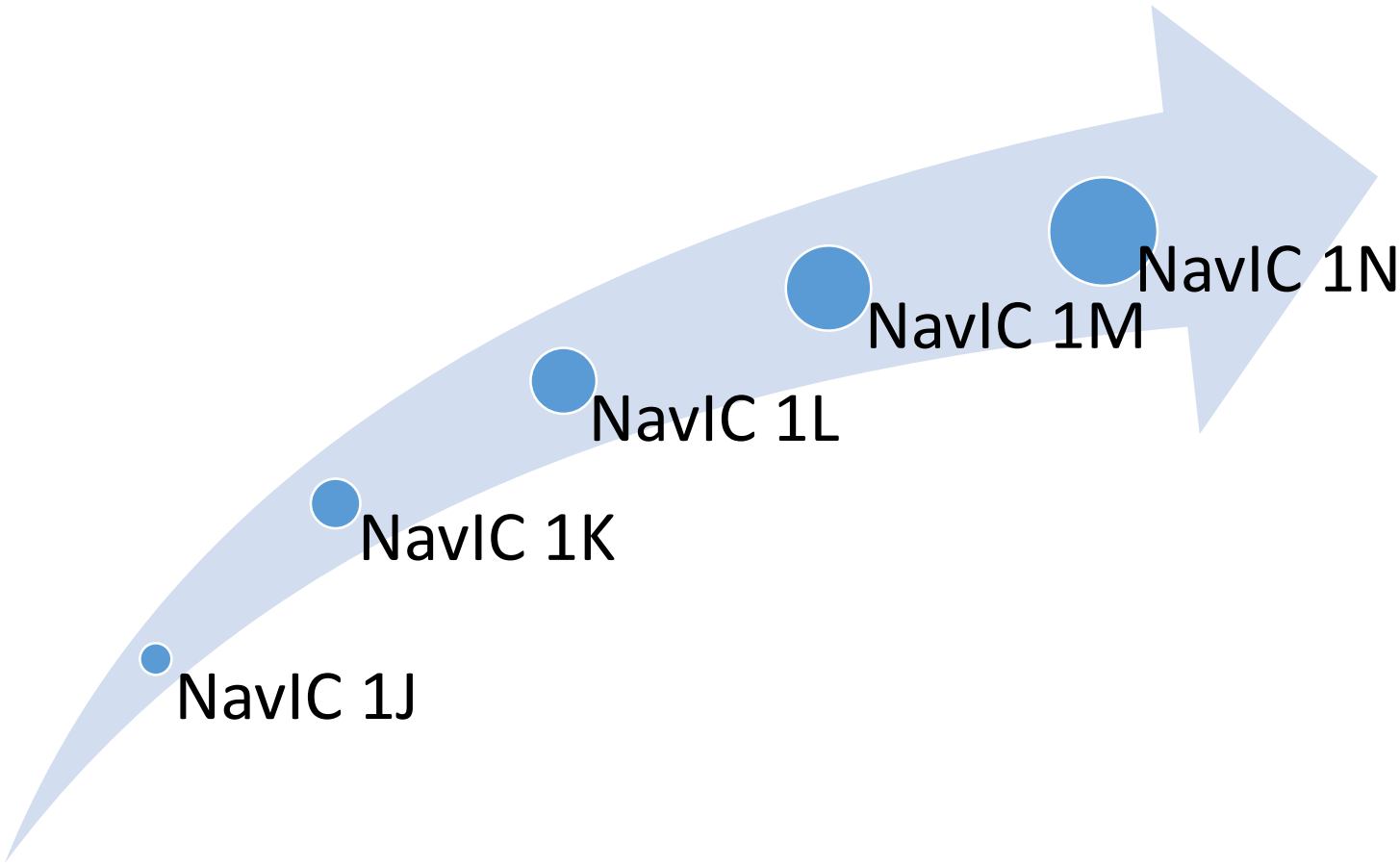


GDOP of NavIC



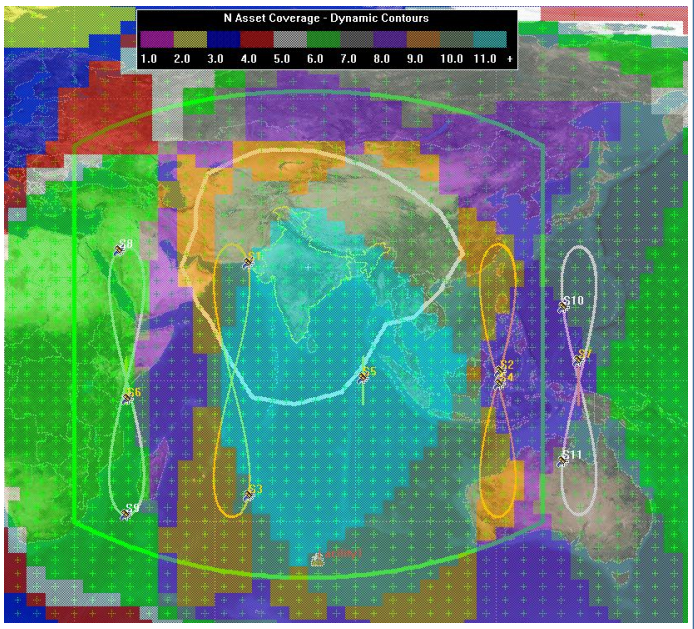
Satellite Availability of NavIC

NavIC Extended Constellation Roadmap



New L1 Open Service in NavIC

- L1 Signal for Standard Positioning Civilian Service over India and surrounding region.
- L1 SPS Signal will be RF compatible with other L1C systems –
  - MBOC (6,1,1/11) PSD & Receive Power Level
- Inter-operatable with other L1C systems – Frequency Band, Polarization & System time offset details
- Better Iono parameters (Grid Based Model) for defined coverage – Better accuracy
- Better vertical dilution of precision and satellite availability for common GNSS users

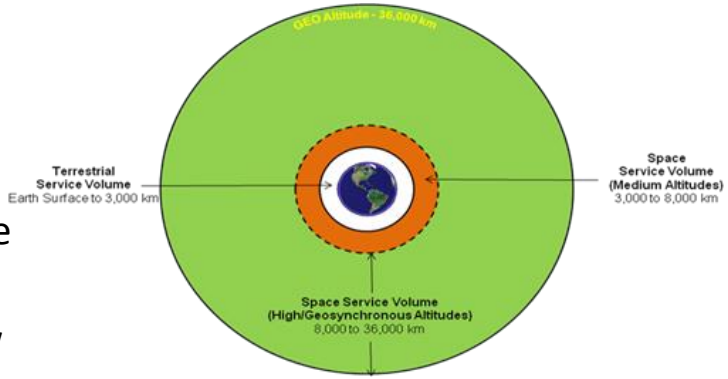


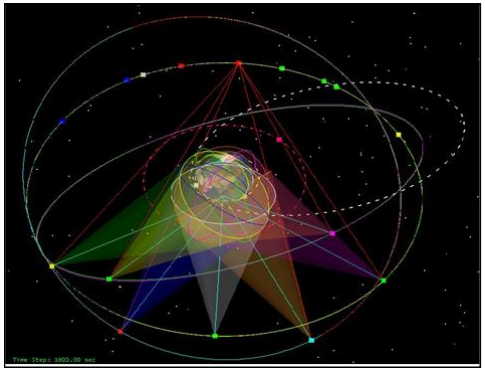
NavIC L1 Signals Availability

SSV of NavIC for LEO, MEO, GSO & HEO

The NavIC SSV coverage :

- L5 Band : ± 28.7° off boresight angle
- S Band : ± 24.5° off boresight angle
- Minimum received power -188dBW





IRNSS Signal Availability (% in Time) for Space Service Users								
Space Service User Orbit	L5 Signal Availability over ± 28.7° off Boresight angle				S Signal Availability over ± 24.5° off Boresight angle			
	No Signal	At Least 1 Signal	Min. 4 Signals	All 7 Signals	No Signal	At Least 1 Signal	Min. 4 Signals	All 7 Signals
LEO	11.06	88.94	66.99	30.92	11.32	88.68	66.99	30.92
MEO	2.53	97.47	58.71	4.53	0.00	100.00	94.08	23.26
GSO	24.74	75.26	34.58	0.35	13.85	86.15	49.48	6.27
GEO	26.82	73.74	21.23	0.00	18.44	82.12	36.87	1.68
HEO	42.16	57.84	20.73	0.00	38.50	61.50	23.26	0.26

0dBi RHCP Antenna Received Power (dBW)		
L5 Band Signals		S Band Signals
HEO Orbit User		
Minimum	-187.9	-187.9
Maximum	-147.7	-166.6
LEO Orbit User		
Minimum	-186.9	-187.6
Maximum	-135.6	-154.7
MEO Orbit User		
Minimum	-187.9	-187.9
Maximum	-128.0	-145.5
GSO/GEO Orbit User		
Minimum	-187.9	-187.9
Maximum	-144.3	-163.4

On-Board Integrity & Autonomy

On Board Integrity Monitoring:

- By monitoring on board clock, power, data & payload hardware performance
- To improve service quality and performance

On Board Autonomy :

- To make system more robust and independent
- To Improves availability and continuity

Thank You