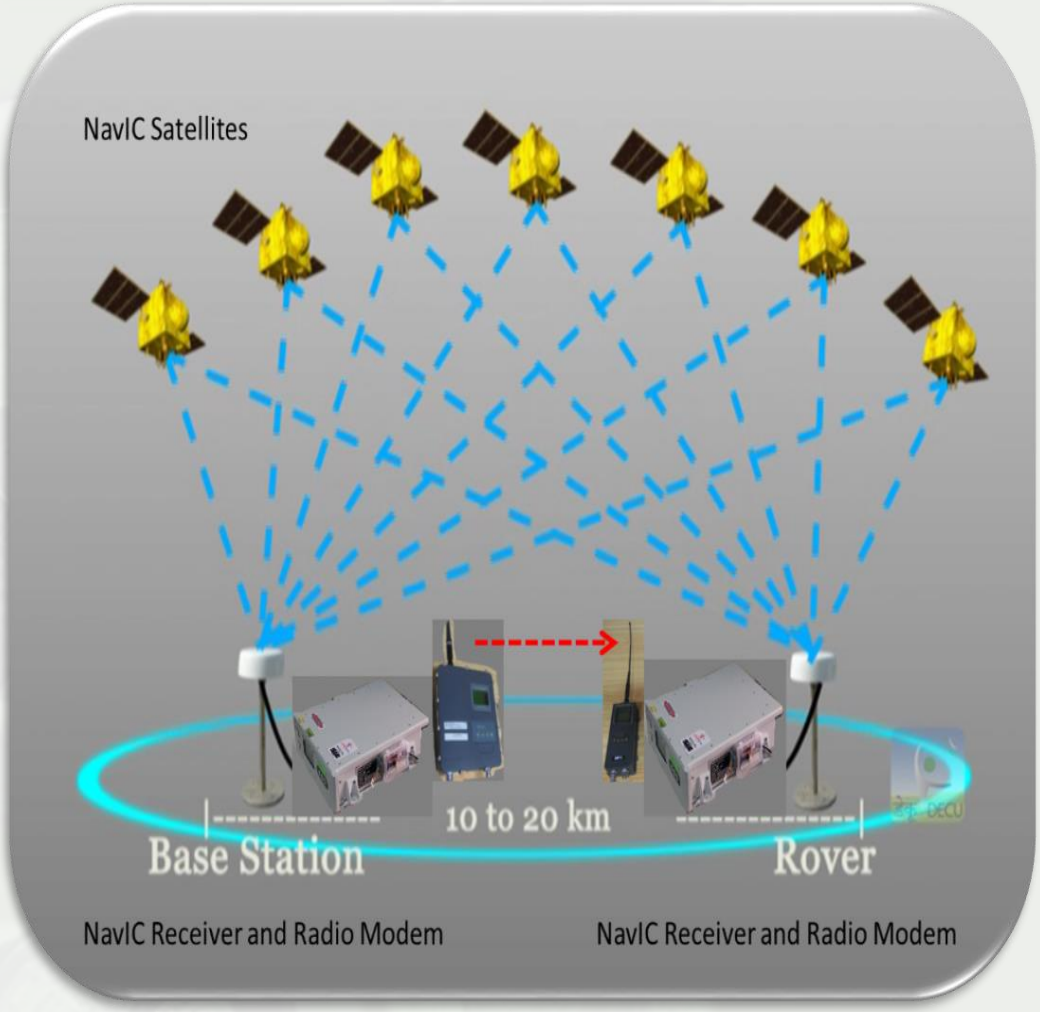
RTK with NavIC

Puneet Kumar Agrawal
SAC- ISRO, INDIA

Brief about RTK

- **Concept:** Differencing of observables from two receivers receiving signals from same set of satellites.
- Using more precise Carrier phase information.
- The satellite clock error is eliminated while differencing between same set of satellites.
- The Receiver clock error is eliminated while differencing between base satellite and other satellites.

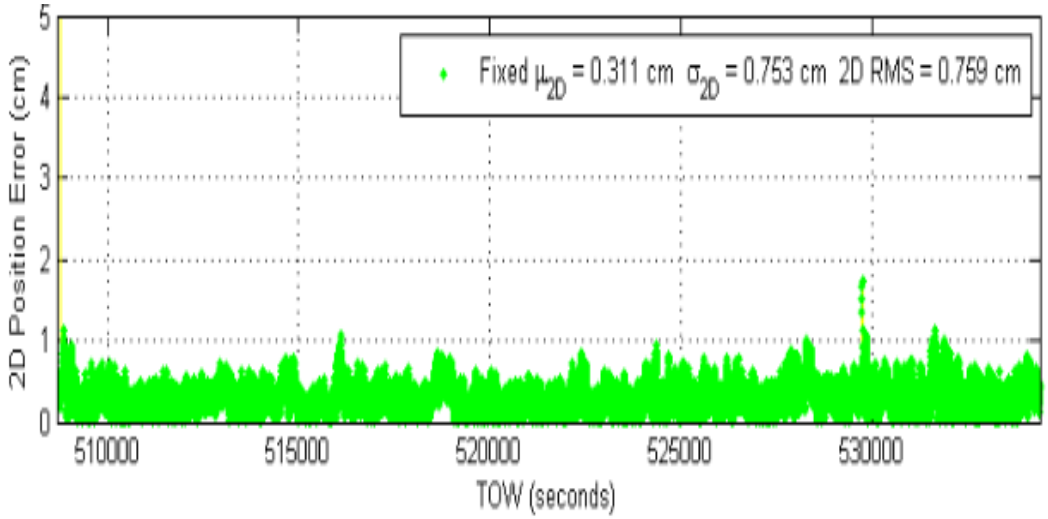


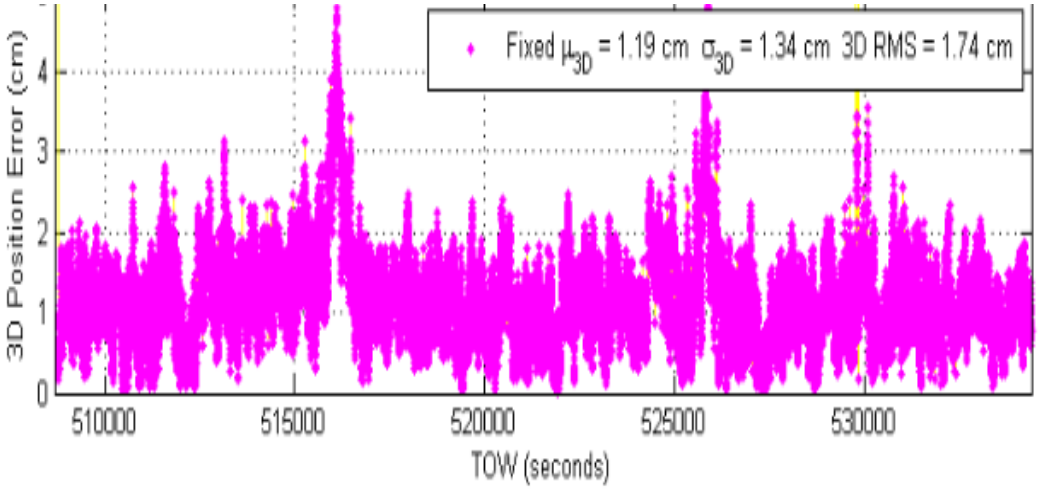
Receiver development

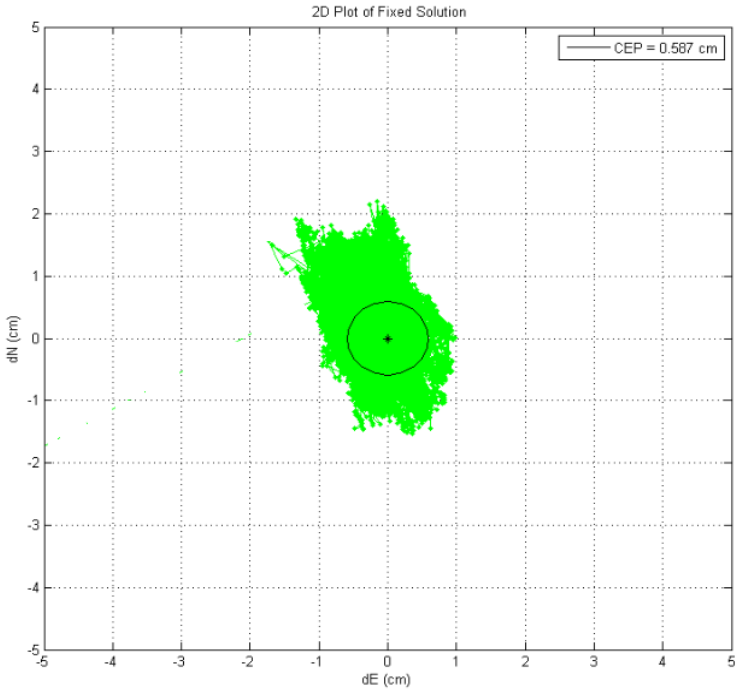
- Carrier Phase Observables accuracy of < 3 mm (1-σ)
- Kalman filter-based algorithm to estimate the float ambiguities.
- LAMBDA(least-squares ambiguity decorrelation adjustment by Teunissen) for integer ambiguity.
- 7 channel NavIC + 12 channel GPS.
- With the combination of NavIC and GPS, the number of satellites available is increased, which improves the positioning precision and availability for RTK.
- Applications: CORS, RTK, PPP.

Base and Rover locations

RTK Solution with 400m baseline (NavIC Live)

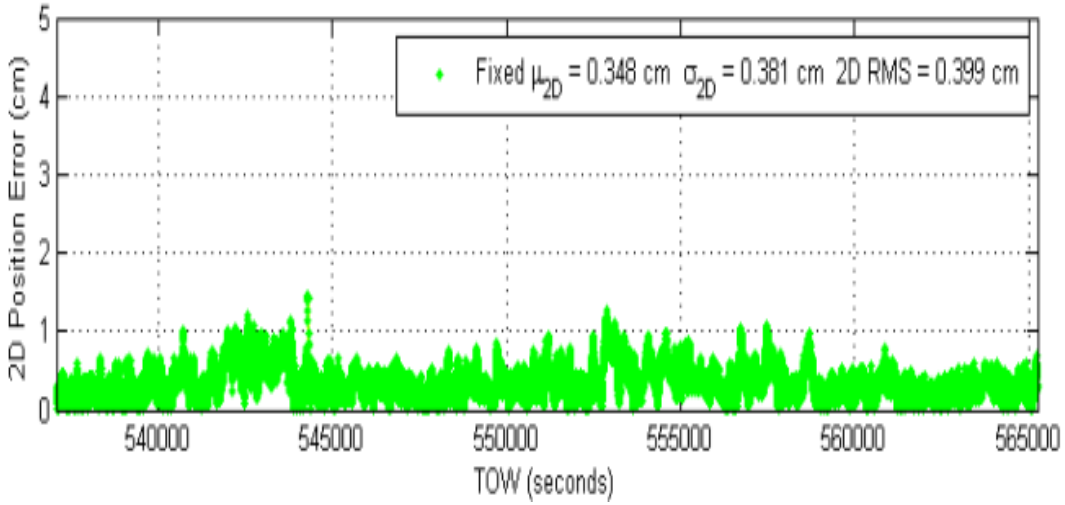


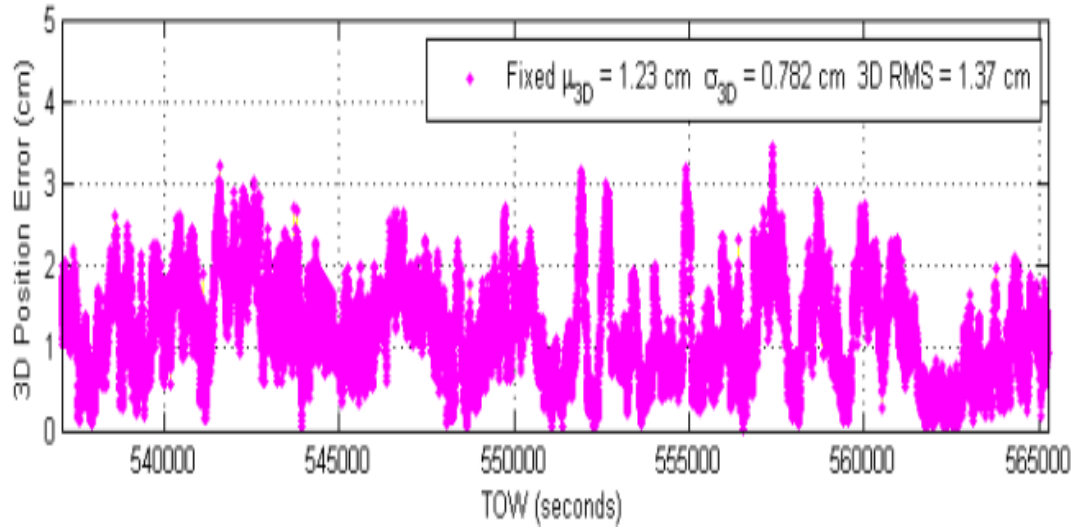


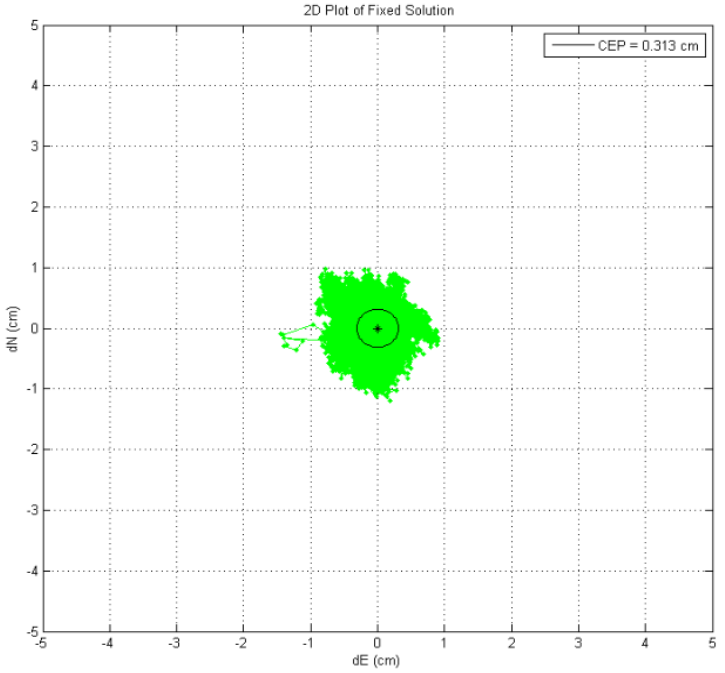


Baseline	400 m
3D-RMS	1.74 cm
CEP	5.9 mm

RTK Solution with 400m baseline (NavIC + GPS Live)







Baseline	400 m
3D-RMS	1.37 cm
CEP	3.1 mm

Conclusion

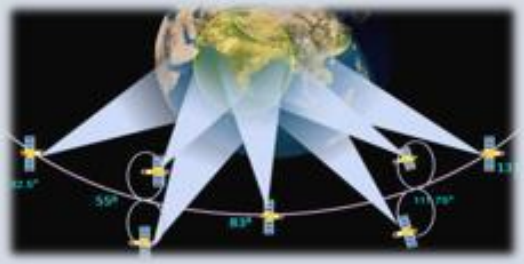
- We have Tested the Receivers both with simulator and with live signals.
- We have achieved < 2cm horizontal error and <3 cm 3d error.

	Simulator	
Baseline	0 m	100 m
3D-RMS	1.4 mm	2.8 mm
CEP	0.4 mm	1.2 mm

	Live Signal			
Baseline	0 m	5 m	50 m	400 m
3D-RMS	1.2 mm	9.8 mm	2.3 cm	1.74 cm
CEP	0.3 mm	2.5 mm	4.6 mm	5.9 mm

Future Roadmap

- Multipath- mitigation.
- Continuous communication between base and rover.
- Tuning of Kalman filter parameters for Dynamic scenario.
- Establishment of optimal threshold for correct ambiguity resolution.
- Extending the RTK for longer baselines using dual frequency NavIC signals.
- Implementation of Network- RTK.
- Extending the concept to PPP.








Thank You