

# Co-located Space Geodetic Techniques Observatory in India: Progress Towards Installation of the IDS Scientific Station



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## Introduction

Space geodetic techniques, i.e., GNSS, VLBI, SLR, and DORIS enable research across various Earth science domains. These techniques, preferably co-located, are crucial for accurately realising the ITRF. For this purpose, the proposed first co-located space geodetic technique observatory in India (Project Saptarshi) will be established at the Indian Institute of Technology Kanpur (IITK), which will be managed by the National Centre for Geodesy (NCG) established by the Department of Science & Technology, Govt. of India. It is envisaged that the IDS station at NCG-IITK will be installed and commissioned by the end of 2024.

## Geodetic Instrumentation at NCG

NCG has initiated Project Saptarshi to set up a core site in the form of a 'Geodesy Village in India' at IITK (shown in Fig 1), which would act as a National Space Geodetic Techniques Observatory.

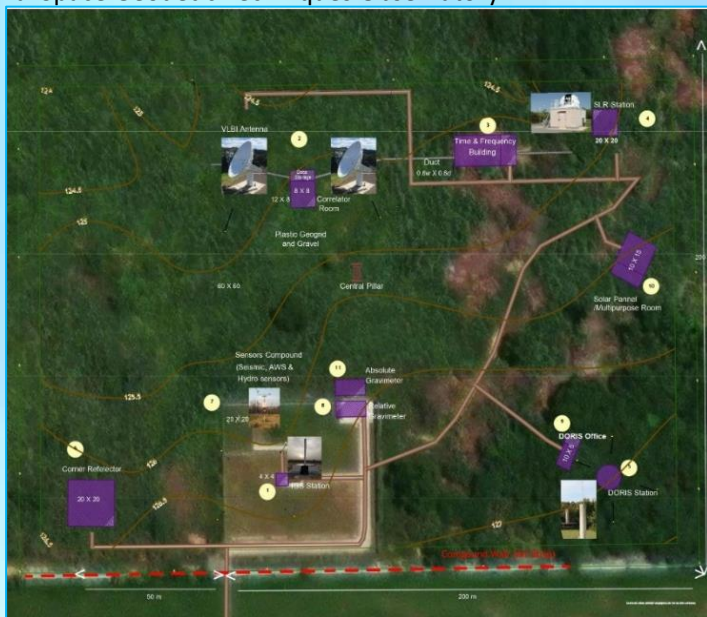


Fig 1: Geodesy village map. DORIS station will be placed at the S-E corner of the site (<https://www.iitk.ac.in/ngc/geodesy-village>).

## Timeline Flowchart



Completed

On-going

Future plans

- The village will include DORIS, GNSS, VLBI, SLR, gravimeter, corner reflectors for SAR interferometry, and water vapour radiometers.
- The geodetic instruments already in operation are the IGS station (id: IITK00IND), gPhoneX gravimeter, an automatic weather station (AWS) and two permanent continuously operating GNSS stations at a distance of about 250 m from the IGS station.
- The proposal to set up VLBI and SLR is under consideration of Govt of India.

Table 1: Planned approx. distances (in metres) between techniques

	DORIS	SLR	VLBI	GNSS
DORIS	---	175	300	150
SLR	175	---	150	300
VLBI	300	150	---	175
GNSS	150	300	175	---

## Installed



IGS Station  
AWS  
gPhoneX gravimeter



## Future Scope

The establishment of an IDS station, in conjunction with techniques like VLBI and SLR, will represent a groundbreaking initiative in the country. This effort is poised to make significant contributions to the fields of geodesy and geophysics by enabling:

- Estimation of geodetic (station coordinates, pole estimation, and LOD) and physical parameters (orbit determination).
- Precise determination of DORIS station positions and velocities, which will enhance the ITRF in terms of Geocentre and Scale.
- Co-location of IGS and IDS stations, allowing for close comparisons facilitating correlations in geodetic data, such as tropospheric corrections and meteorological information.
- Improvement of the vertical accuracy of GNSS, a key challenge for IGS stations.

## References

1. Saunier, J. (2016). Assessment of the DORIS network monumentation. *Advances in Space Research*, 58(12), 2725-2741. <https://doi.org/10.1016/j.asr.2016.02.026>
2. Saunier, J. (2023). The DORIS network: advances achieved in the last fifteen years. *Advances in Space Research*, 72(1), 3-22. <https://doi.org/10.1016/j.asr.2022.07.016>