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# Indoor-Outdoor GNSS Performance Across Various Android Smartphones

Publisher: IEEE

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Debipriya Dutta ; Somnath Mahato ; Moutusi Mondal ; Pritul Kumar Roy ; Abheek Konar ; Divyesh Deshpande All Authors

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## Abstract

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### Abstract:

This study investigates the performance of multi-GNSS systems on Android smartphones in both outdoor and indoor environments. With these systems fully operational since early 2017, research has largely overlooked smartphone-specific performance. This paper fills that gap by examining satellite visibility, usability, and positioning accuracy in eastern India using two smartphones. Data was collected in "Aeroplane Mode" to eliminate cellular interference, focusing on GNSS satellite detection and accuracy. Outdoor results revealed an average of 30–33 usable satellites and low DOP values (1), indicating high positioning accuracy with 2D precision within 4 m and 3D precision within 2.5m. Conversely, indoor environments showed fewer usable satellites (7–13) and higher DOP values (2.6), leading to reduced accuracy with 2D precision around 9m and 3D precision about 7m. This study highlights the significant impact of environmental factors on GNSS performance and underscores the need for optimisation in both outdoor and indoor settings to enhance navigation accuracy for smartphone users.

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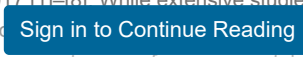
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### I. Introduction

Recent advancements in smartphone navigation have leveraged GPS, GLONASS, GALILEO, BeiDou, and NavIC, which became fully operational by early 2017 [1]–[8]. While extensive studies have explored the availability and reliability of these GNSS systems with various smartphones [9]–[18]. Investigating how these systems perform on smartphones across different environments can offer valuable insights into optimizing navigation for Indian users.



### Authors

Debipriya Dutta

Electronics and Communication Engineering Department, Dr. B.C. Roy Engineering College, Durgapur, India

Somnath Mahato

Climate Research & Services India Meteorological Department, Meteorological Training Institute, Pune, India

Moutusi Mondal

Electronics and Communication Engineering Department, Dr. B.C. Roy Engineering College, Durgapur, India

Pritul Kumar Roy

Electronics and Communication Engineering Department, Dr. B.C. Roy Engineering College, Durgapur, India

Abheek Konar

Electronics and Communication Engineering Department, Dr. B.C. Roy Engineering College, Durgapur, India



[Divyesh Deshpande](#)

Climate Research & Services India Meteorological Department, INSAT AWS Lab, Surface Instrument Division, Pune, India

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