

SMALL SATELLITE MISSIONS SYMPOSIUM (B4)
Small Space Science Missions (2)

Author: Mr. Saptarshi Bandyopadhyay
Indian Institute of Technology, United States, bandyop2@illinois.edu

Mr. Ashish Goel
United States, ashishgoel87@gmail.com
Mr. Srujan Meesala
Indian Institute of Technology, India, srujanm@iitb.ac.in
Mr. Subhasis Das
Indian Institute of Technology, India, subhasis256@gmail.com
Mr. Jhonny Jha
Indian Institute of Technology, India, jhajhonny@gmail.com
Ms. Deepika Thakur
Indian Institute of Technology, India, deepikat.iitb@gmail.com
Mr. Manas Rachh
Indian Institute of Technology, India, manasrachh@gmail.com
Mr. Kartavya Neema
Purdue University, United States, kartavyaneema@gmail.com

MEASUREMENT OF TOTAL ELECTRON COUNT OF THE IONOSPHERE AND THE SOCIAL
GOAL OF PRATHAM, INDIAN INSTITUTE OF TECHNOLOGY BOMBAY'S FIRST STUDENT
SATELLITE**Abstract**

Students from the Indian Institute of Technology Bombay (IITB) are currently in the process of building a fully functional microsatellite named 'Pratham', which is slated for launch by Indian Space Research Organization (ISRO) in the fourth quarter of 2010. The satellite being built is a 260 mm cube and weighs nearly 10kg. This landmark project has completed the phases of Requirements Capture, Conceptual Design, and Preliminary Design and is currently in the Detailed Design Phase. Detailed documentation and thorough reviews were conducted by ISRO scientists and IITB faculty before the conclusion of each of the above Design phases.

The goal of the satellite project is to educate students in the field of Satellite and Space Technology in the process of building a satellite for measuring the Total Electron Count (TEC) of the Ionosphere. This paper will discuss the technique being used by Pratham for measurement of TEC with 99.9% accuracy using the principle of Faraday rotation. This method has helped in reducing the cost of the ground station as well as the onboard complexity. The satellite will enable the generation of TEC maps of India and France with the help of ground stations set up at eleven Indian universities and the Institut de Physique du Globe de Paris (IPGP), France. A novel technique for ionospheric tomography using the generated TEC data has also been discussed in this paper. The algorithm reconstructs the distribution of electron density across various layers of the ionosphere with more than 85% accuracy.

This paper will also discuss the Social Goals of the Project. Pratham will be transmitting onboard data when it passes over India. With a low-cost ground station, students from other universities will also be able to detect the beacon signal and measure TEC. Workshops on making low-cost ground stations (<\$500) have been held at IITB for students from other universities. Moreover, the simulations developed

for Pratham are being made available online in a Virtual Laboratory for the benefit of students all over the world. The entire documentation of Pratham, TEC data and the Virtual Laboratory will be freely available at www.aero.iitb.ac.in/pratham. We hope these will serve as stepping stones for future missions.