Scope of involvement in VLF science for ionospheric studies at ICSP for students

Tamal Basak, Sourav Palit, Sayak Chakraborty, Taraknath Bera, Sandip K. Chakrabarti

Indian Centre for Space Physics, Kolkata

Very Low Frequency (VLF) radio waves serve as a powerful tool for probing the Earth's ionosphere, particularly the D- and E-regions, which are difficult to study using conventional techniques such as satellites or rockets. Sub-ionospheric VLF science offers students a wide range of opportunities, from developing low-cost ground-based receivers to analyzing signals from high-power global transmitters. For over two decades, ICSP has monitored VLF transmissions, including those from the Indian VTX transmitter at the southern tip of the country. Research at ICSP encompasses solar flares, eclipses, solar cycle variability, geomagnetic storms, and seismo-ionospheric coupling. Students can also gain expertise in computational modeling, signal processing, and emerging machine learning applications. Participation in VLF research fosters interdisciplinary skills across physics, atmospheric science, mathematics, computation, and engineering, while contributing to space weather studies and practical applications in communication and navigation.