## Astronomy & Astrophysics Division Seminar

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Title : **FRB121102 : First detection across 4 - 8 GHz, spectral and polarization properties**

Speaker : Dr. Vishal Gajjar (University of California, Berkeley, USA)

Date : 16.11.2017 (Thursday)

Time : 16:00 Hrs

Venue : Seminar Room # 113/114 (Thaltej Campus)

**Abstract:**

Fast Radio Bursts (FRBs) are some of the most energetic and enigmatic events in the Universe. The origin of these sources is among the most challenging questions of modern-day astrophysics. Thus, it is imperative to understand the properties of these bursts across a range of radio frequencies. Among the known FRBs, FRB121102 is the only source known to show repeated bursts [Spitler et al., Nature, 531, 7593 202-205, 2016], which can allow a detailed investigation of various origin models. In August 2017, we initiated a campaign observing FRB 121102 using the Breakthrough Listen Digital Backend with the C-band receiver at the Robert C. Byrd Green Bank Telescope (GBT). We recorded baseband voltage data across 5.4 GHz of bandwidth, completely covering the C-band receiver's nominal 4-8 GHz band [MacMahon et al. arXiv:1707.06024v2]. The recorded data were searched for dispersed pulses consistent with the known dispersion measure of FRB 121102 (557 pc/cm^3) using high-speed GPU software tools. We detected 21 bursts above our detection threshold of 6 sigmas in the first 60-minutes, out of which 18 occurred in the first 30-minutes only. To our knowledge, this is the highest event rate seen for FRB121102 at any observing frequency. These observations are the highest frequency and widest bandwidth detection of bursts from FRB 121102 (or any other FRB) obtained to-date. We note that individual bursts show marked changes in spectral extent ranging from hundreds of MHz to

several GHz. We have used high frequency dynamic spectra of these bursts to estimate the characteristic scintillation bandwidth and correlation time-scale. We also found distinctive temporal structures, separated by a few milliseconds, in three of the strongest bursts, with each sub-structure exhibiting varied spectral features. We will discuss our findings and how these detections of FRB 121102 around 8 GHz opens up a new regime in scrutinizing various origin models. We will also highlight the unique capabilities of the Breakthrough Listen instrument at the GBT which allowed such sensitive and detailed observations.