INDIAN ASSOCIATION FOR THE CULTIVATION OF SCIENCE
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Seminar Notice

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Theoretical Physics Department

Title:	**A closer look at the R_D and R_{D*} anomalies**
Speaker:	**Priti Bhajan Byakti,Department of Theoretical Physics, IACS**
Date:	**November 30,2016 (Wednesday)**
Time:	**03:00 p.m.**
Venue:	**Theoretical Physics Seminar Room (R/No.-C406), 3rd Floor, Centenary Building, IACS**
Abstract:	The measurement of R_D (R_{D^*}), the ratio of the branching fraction of $\overline{B} \to D \tau \bar{\nu}_\tau (\overline{B} \to D^* \tau \bar{\nu}_\tau)$ to that of $\overline{B} \to D l \bar{\nu}_l (\overline{B} \to D^* l \bar{\nu}_l)$, shows 1.9σ (3.3σ) deviation from its Standard Model (SM) prediction. The combined deviation is at the level of 4σ according to the Heavy Flavour Averaging Group (HFAG). In this paper, we perform an effective field theory analysis (at the dimension-6 level) of these potential New Physics (NP) signals assuming $\rm SU(3)_{C} \times SU(2)_{L} \times U(1)_{Y}$ gauge invariance. We first show that, in general, R_D and R_{D^*} are theoretically independent observables and hence, their theoretical predictions are not correlated. We identify the operators that can explain the experimental measurements of R_D and R_{D^*} individually and also together. Motivated by the recent measurement of the τ polarisation in $\overline{B} \to D^* \tau \bar{\nu}_\tau$ decay, $P_\tau (D^*)$ by the Belle collaboration, we study the impact of a more precise measurement of $P_\tau (D^*)$ (and a measurement of $P_\tau (D)$) on the various possible NP explanations. Furthermore, we show that the measurement of R_{D^*} in bins of q^2, the square of the invariant mass of the lepton-neutrino system, along with the information on τ polarisation and the forward-backward asymmetry of the τ lepton, can completely distinguish the various operator structures. We also provide the full expressions of the double differential decay widths for the individual τ helicities in the presence of all the 10 dimension-6 operators that can contribute to these decays.

All are cordially invited to attend the seminar