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Pressure induced insulator to metal transition and orbital dynamics in Sr2VO4 SUKANTA KARMAKAR[1], Bhabha Atomic Research Centre, Mumbai — The unusual ground states of transition metal oxides with layered perovskite structure (K_2NiF_4 type) are driven by a complex interplay between charge, orbital, spin and lattice degrees of freedom. The S=1/2 and $3d^1$ system Sr_2VO_4, a Mott insulator, is of particular interest because of its vicinity to the insulator-metal boundary. The strong two-dimensionality along with a weak Jahn-Teller distortion (slightly elongated VO_6 octahedra along c-axis) causes splitting of t_{2g} orbitals (xy orbital and doubly degenerate yz and zx orbitals), pressure-tuning of which is expected to reveal interesting physical properties. Our recent high pressure Raman spectroscopic investigations at low temperature describe the orbital dynamical changes in this system. The anomalous pressure dependence of the strong magnetic excitations in Raman spectra confirms the unconventional spin-orbital composite nature (magnetic octupolar type order) of the dxy/zy levels [PRL **103**, 067205, (2009)]. The system transforms from high temperature orbital liquid like state to the low temperature orbital ordered state via a short range orbital order precursor at 150K. With increasing pressure the orbital ordering transition temperature decreases, predicting a QCP at $\sim$8 GPa. At this pressure the system undergoes an insulator to metal transition (as observed from mid IR reflectance measurements as well as sharp rise in Raman intensity of phonon modes due to occurrence of intraband transitions).

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