Abstract Submitted for the SHOCK11 Meeting of The American Physical Society

New developments in multiple simultaneous diagnostics at HP-**CAT** GUOYIN SHEN, Carnegie Institution of Washington, CIW TEAM¹. CARNEGIE DOE ALLIANCE CENTER TEAM, HIPSAC- UNIVERSITY NEVADA TEAM, LAWRENCE LIVERMORE NATIONAL LAB TEAM — The HPCAT facility, located at Sector 16 of the Advanced Photon Source (APS) which is currently under a major upgrade, has been established for high-pressure research in multidisciplinary scientific areas by integrating multiple x-ray diffraction, x-ray spectroscopy, and x-ray tomography probes. Current state-of-the-art high-pressure synchrotron facilities including HPCAT are limited to spatial resolution of 3-10 μ m. Since pressure is force per unit area and ultrahigh pressures are reached at diminishingly minute samples, high spatial resolution would be the key for the nextgeneration advancement to TPa pressures beyond the current maximum at ~ 400 GPa, and will impact an exceedingly broad scientific frontier. These include the long-standing quest of low-temperature metallic hydrogen, and the newly recognized complexities of the apparently "simple" alkali metals. The order-of-magnitude higher resolutions will enable quantifications of grain-to-grain interactions under pressure, precise determinations of equations of state and pressure calibration, combinatorial studies of a large array of samples, and isolation of a μ m-size single crystal from a polycrystalline aggregate. The potential impacts on high pressure research in several scientific areas will be discussed.

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