Extreme conditions programme at BM23/ID24 after the EBS upgrade

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X-ray absorption spectroscopy is a powerful tool to explore matter under extreme conditions of pressure and temperature and has important applications in various scientific domains such as materials science, Earth and planetary sciences and fundamental physics. It enables monitoring local structural changes and electronic transitions of trace and major elements in different matrixes (solids, fluids and melts) at high density. A large part of BM23/ID24 activity has been devoted to high pressure science including the study of phase transitions from semiconductor to metal, electronic transitions such as changes of the oxidation or spin state as well as the incorporation of trace elements in melts or solids up to conditions of 3000 K and 150 GPa.

The new Extremely Brilliant Source (EBS) will allow us to extend the reachable P/T domain to the conditions prevailing in the Earth's core (T up to 6000 K and P>150 GPa) and to study trace elements at very high dilution levels (few ppm) and at such extreme conditions. Here, I will present the extreme conditions programme at ID24/BM23 after the EBS and provide information about the new capabilities of these instruments (X-ray beam size, energy range, brilliance, scan speed, experimental stations, technical advances of the high pressure and temperature devices) and give an outlook of the new and unique scientific possibilities.