# New scientific opportunities for high energy-resolution XAS/XES measurements at ambient and extreme conditions - the ID24-EBS project

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The new Extremely Brilliant Source (EBS) will feature an important increase in brilliance ($10^{13}$ ph/s) combined with focusing capabilities down to 1 µm FW between 4 and 35 keV at ID24-DCM. It will open up new possibilities for the application of HP-HT spectroscopy and micro-spectroscopy of inhomogeneous materials at ambient and extreme conditions. This will allow studying trace elements embedded in chemically and structurally complex and highly absorbing matrices at higher dilution levels than before (down to few ppm), and with higher spatial resolution [1]. The EBS upgrade will also allow extending the reachable P/T domain at ID24-DCM to the conditions prevailing in the Earth's core (T up to 6000 K and P>150 GPa), and therefore studying heterogeneous samples and trace elements at such extreme conditions.

To fully exploit the capabilities of the new source, the recently developed and commissioned five crystal analyser spectrometer [2] will be installed on the ID24-DCM microspectrometer. The five crystal analyser permits to perform high energy resolution fluorescence detected (HERFD) measurements, which are used in different techniques, such as SXRF, XAS, XES and RIXS. Complementary to the spherically bent crystal analyser spectrometer, we plan to install 1-4 cylindrically bent analyser crystals at 90 degree scattering angle in the von-Hamos geometry. The crystals will be combined with a two-dimensional detector, which makes this setup ideally suited for time-resolved XES in high pressure and temperature sample environments (*i.e.,* laser-heated diamond anvil cell) [3].

I will provide information about the planned crystal-analyser setup at ID24-DCM that will reap the benefits of the EBS and present our plans for the extreme conditions XES programme at ID24-DCM/BM23.

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**References**

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