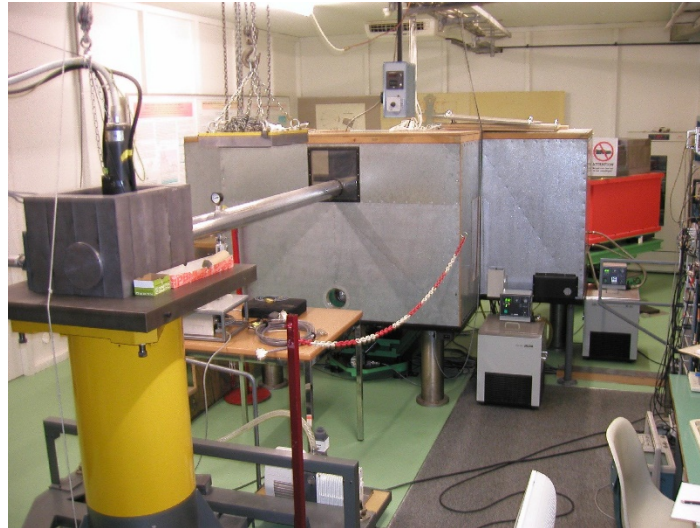


DuMond spectrometer

The DuMond crystal spectrometer of Fribourg consists mainly of a target chamber, a bent crystal plate that can be rotated around a vertical axis by ± 20 deg. and a self-propelled detector-collimator system.



DuMond bent crystal spectrometer of Fribourg

The latter can move on a 4.5 m long circular track by means of two conical stainless steel rollers, permitting the detector and collimator to be rotated by ± 40 deg. During acquisition, the detector-collimator system is automatically aligned on the double Bragg angle by means of an optical tracking system. The axes of rotation of the crystal and detector are separate but aligned vertically. The distances between the target and the bent crystal and the crystal and the detector are 3.1 m and 2.9 m, respectively. The instrument is therefore rather big, occupying a volume of approximately $7 \times 4 \times 2 \text{ m}^3$. To minimize the absorption of the measured x rays in air, two evacuated pipes were installed between the target chamber and the crystal and between the crystal and the front of the collimator.

For the measurements of x rays, the DuMond spectrometer is operated in the so-called modified slit-geometry. In this geometry the sample is viewed by the crystal through a narrow rectangular slit located on the Rowland circle, a few cm in front of the target. For x-ray measurements, this geometry presents several advantages with respect to the standard DuMond geometry. In particular, the slit-geometry makes possible the use of extended radiation sources. This is an important asset when measuring gaseous or liquid samples. Furthermore, it permits one to get rid of the systematic errors originating from the thermal deformation of the irradiated sample and to enhance the luminosity of the spectrometer by diminishing the self-absorption of the fluorescence x-rays in the target. The 30-mm high rectangular slit is made of two vertical 5-mm thick juxtaposed Pb plates. Depending on the desired instrumental resolution and luminosity, slit widths of 0.05, 0.10 and 0.15 mm can be chosen.