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Alignment of the ESRF Extremely Brilliant Source (EBS)

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After 20 years of success and scientific excellence, the ESRF, embarked upon an ambitious and innovative modernisation project – the Upgrade Programme. The first phase of this programme was completed over the period 2009-2015. In May 2015, the ESRF launched the second part of this programme, the Extremely Brilliant Source (ESRF – EBS) project.

The highlight and major technological challenge of the ESRF EBS project is the creation of an ultra-bright synchrotron source with performances 100 times superior to present day synchrotrons. This new light source will produce more intense, coherent and stable X-ray beams. It is a strategic project for the future of the ESRF that will open new perspectives for X-ray science.

The EBS is sum of the myriad related sub-parts and pieces. The quality of assembly, alignment and control of the key accelerator components are critical for the ultimate success of the EBS. The importance of alignment is expressed in the requirement that close to 900 magnetic elements comprising the EBS accelerator must be placed to within of 50 μm to 80 μm of their nominal positions for the new machine to function correctly. These tolerances include all of the possible positional errors from fabrication to final placement in the tunnel.

In this paper, we will examine the full alignment of the EBS accelerator. We will pay particular attention to the expression of the measurement and alignment uncertainty as expressed by the GUM: Guide to the Expression of Uncertainty in Measurement published by the International Bureau of Weights and Measures (BIPM).

Summary

In this paper, we will examine the alignment of the EBS accelerator presently being assembled and installed at the ESRF in Grenoble France.

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