Contribution ID: **50** Type: **Paper**

Experimental Validation of the ESRF Upgrade Program Experimental Hall Prototype Slab

Tuesday, 11 September 2012 15:15 (25 minutes)

In 2008, the Council of the European Synchrotron Radiation Facility (ESRF) launched the ESRF Upgrade Programme 2009-2018, an ambitious ten-year project serving a community of more than 10,000 scientists. Funding for the first phase of the Upgrade (from 2009 to 2015) has been secured to deliver:
• eight new beamlines with capabilities unique in the world;
• refurbishment of many existing beamlines to maintain them at world-class level;
• continued world leadership for X-ray beam availability, stability and brilliance; and,
• major new developments in synchrotron radiation instrumentation.
One of the key elements of the Upgrade Program is to produce nano-sized beams. This will require the construction 120 m and in some cases longer beamlines. A combination of extended experimental hall and satellite buildings will address this need.
One particularly important consideration is the design of the concrete slab that will host these new beamlines. The vibrational stability of the experimental hall slab is a key aspect to in the slab design. However, hydrostatic levelling system (HLS) measurements indicate that slab bending movements driven by temperature gradient variations through the slab are an equally important consideration in beamline stability and performance.
Builders have a difficult time to imagine micrometer movements and nano-radian tilts on a concrete slab. Nonetheless, these were the design specifications they were asked to build to. It took some effort to convert the ESRF design specifications into something that made sense to civil engineers and grounds workers. It was determined that if the slab shrinkage could be maintained below 300 μm/m, then the ESRF design criteria could be met.
To test the construction procedure for theEX2 slab it was a prototype was built. Part of the test procedure was to determine if the prototype slab respected the expected shrinkage tolerance. In addition it was decided to observe the thermally driven slab curling. To do this a survey network and a HLS was installed on the prototype slab.
This paper will present the measurements and that have been made on the prototype slab to help validate its design.

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Session Classification: Long Term Monitoring, Ground Motion and Vibration

Track Classification: Long Term Monitoring, Ground Motion and Vibration