



Contribution ID: 600

Type: **Poster presentation**

First large-scale real-time drift compensation for Low-Level-RF-stations at the European XFEL

Tuesday, June 12, 2018 3:55 PM (15 minutes)

For a reliable and robust operation of free-electron lasers with bunch-arrival time variations on the sub-10fs scale, the short-term and long-term RF stability of the cavity field is a crucial factor. The long-term RF stability depends mainly on temperature and humidity changes acting on various electronic subcomponents of the accelerator. For the European XFEL we used a drift compensation module operating at 1.3GHz to remove long-term amplitude and phase variations of the MicroTCA.4 Low-Level-RF control system on the fs-scale. The module showed excellent suppression of environmental temperature and humidity changes of about two magnitudes down to an amplitude and phase stability of 0.01%, respectively 0.01deg or 20fs (all peak-to-peak values). In this article we present the method, hardware, performance and operation of the module.

Description

uTCA for LLRF

Country

Poland

Minioral

Yes

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Session Classification: Poster 1

Track Classification: Control, Monitoring, Test and Real Time Diagnostics Systems