



Contribution ID: **260** Contribution code: **TUP67**

Type: **Poster Presentation**

Design of high power load front ends for two upcoming beamlines at CHESS

Tuesday 16 September 2025 17:00 (1 hour)

Front end components must endure the harshest operating conditions of all the elements in a synchrotron beamline. At the same time, reliability is a key aspect of their design, with no tolerance for downtime due to the typically very limited access. The unique challenges presented by the front ends of the upcoming Sector 5 and 6 beamlines at CHESS are presented here together with the solutions adopted. The beamlines feature each two undulator sources. In one beamline, the undulators are installed in series for a power load of 12.4 kW over a 6x9 mm² area, with a peak power density of 2270 W/mm². In the other beamline, the undulators are canted to serve two independent branches, with a total radiated power of 14 kW. In addition to these high power loads, further challenges in the design of these front ends included severe space limitations for installation, due to the presence of existing infrastructure in the narrow underground accelerator tunnel; and intense ambient radiation from the 6 GeV storage ring during operation, especially in the beam plane, which affected the cooling and wiring routes as well as local shielding.

Footnotes

Funding Agency

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Session Classification: Poster Session 1

Track Classification: BEAMLINES: Front Ends