



Contribution ID: 7

Type: **not specified**

Fabrication, Conditioning and Installation of the 1st S-band High Gradient Module for the Energy Upgrade of the FERMI Free Electron Laser Linac

Thursday, November 9, 2023 9:20 AM (20 minutes)

FERMI is the seeded free electron laser (FEL) user facility at Elettra laboratory in Trieste, operating in the VUV to soft X-rays spectral range. In order to extend the FEL spectral range to shorter wavelengths, an increase in the linear accelerator (linac) energy from 1.5 GeV to 2.0 GeV is required. This result will be achieved by replacing the present old sections with the newly designed accelerating sections which can work at high gradient with lower transverse wakefields. After the successful testing of a short prototype, 354 mm in length, of a new high-gradient (HG) section that sustained an accelerating gradient of 40 MV/m with a breakdown rate (BDR) of 8×10^{-8} bpp, two 3.0 m HG structures with the same design were built and installed at the FERMI linac. We report here the recent experience on the conditioning and installation of the first high gradient sections and the operation of the spherical pulse compressor prototype, conditioned up to 100 MW output power with a power amplification factor of 3.5.

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Track Classification: 26th ESLS RF Workshop