



ID de Contribution: 74

Type: **Oral Presentation**

HIGH-GRADIENT S-BAND ELECTRON LINAC FOR THOMX

mercredi 11 mai 2016 10:00 (15 minutes)

The THOMX project aims to design and build a compact X-rays Compton backscattering light source demonstrator resulting from collisions between laser pulses and relativistic electron bunches. The project was recently funded and is under construction in the Orsay University campus. The machine consists of a 50–70 MeV LINAC injector and a storage ring. The PhD program covers the linear accelerator research on many different aspects. The purpose is to increase the compactness of the accelerator complex whereas the beam properties for ring injection are kept. First, a LAL Orsay-PMB ALCEN collaboration on high-gradient S-band structure research for the LINAC upgrade has been established. The program foresees the RF design, thermal analysis, prototyping and power tests of a high-gradient compact S-band accelerating structure. The RF design has been carried out using 3D simulation codes like HFSS and CST MWS. The goals of these prototypes is to verify and validate all technical choices obtained by the simulations and to develop an effective fabrication procedure. Second, to fulfill the technical specifications at the interaction point, the LINAC must be carefully designed, especially the photo-injector. Beam dynamics simulations have been performed for optimizing the emittance and the longitudinal phase space for the ring entrance. Total beam emittance in the photo-injector has been minimized by means of emittance compensation. The best set of parameters across the laser spot size, pulse length and magnetic field strength has been determined. The effect of the accelerating section to the beam dynamics at the end of the LINAC are studied as well.

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Classification de Session: Accelerator physics

Classification de thématique: Accelerator Physics