Thesis defence:

Study of Machine Learning methods for optimization and reliability improvements of high power linacs

By Mathieu Debongnie

Date: Thursday March 25, 2021 at 1:30 pm

Location: Grand Amphithéâtre (LPSC)

Recent particle accelerator projects need to meet higher and higher reliability and stability levels. This is especially true for ADS (Accelerator Driven System) projects that aim to drive a nuclear reactor with a particle accelerator. These require building high power (a few MW) proton accelerators with extremely high reliability in order to incinerate nuclear waste without compromising the reactor structure. This is the case for the accelerator of the MYRRHA (Multi-purpose hYbrid Research Reactor for High-tech Applications) that would provide a 4 mA CW (Continuous Wave) proton beam at 600 MeV (this corresponds to a 2.4 MW beam power). This project, led by the SCK CEN in Belgium, is based on the construction of a superconducting linear accelerator (linac) and aims to go under the limit of 10 unscheduled beam trips longer than 3 seconds for each operation cycle of 3 months. This represent a level of reliability never achieved before in the world.

A key point to achieve this goal is to ensure a good configuration of the injector in order to minimize the beam losses that can force the shutdown of the machine if they exceed the tolerance level. This thesis explores novel methods to facilitate tuning an injector. In this presentation, the training of neural networks with the aim to model the experimental behavior of the MYRRHA injector will be discussed. The test on the injector and on the trained model of an algorithm called Particle Swarm Simulation will also be presented.

Link to the visioconference (zoom):
https://univ-grenoble-alpes-fr.zoom.us/j/97665244379?pwd=RVVVZG9IT0c2cVZxT1BlMGhrdGNGQT09

- Meeting ID: 976 6524 4379
- Code : 55395

Speech: French
Slides: English