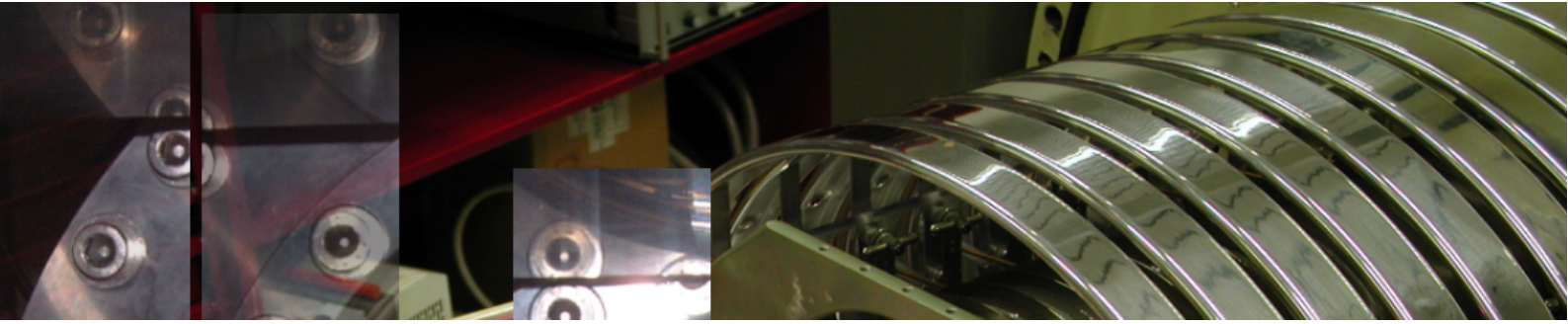

GIORNATA ACCELERATORI 7-8.04.2022

Speaker: Luigi Palumbo

FLASH- RADIOTHERAPY A NEW PARADIGM FOR TUMOR TREATMENT ?

Cancer is a critical global health issue of the world society. Radiation therapy (RT) is one of the principal tools used for the treatment of cancer. The conventional radiotherapy, typically with X-rays, is delivered over several weeks in order to give the necessary dose for the cancer cure and limit at the best the damage to the healthy tissues caused by the ionization radiations. Radiotherapy with heavier charged particles, hadron therapy (HT), with protons and other ions species, like carbon, has also been developed and offers several advantages over the classical RT with X-rays as they deposit most of their energy at the end of their range and the particle beam can be shaped with great precision. Radio-Therapy with electrons have historically been used at low energy (low-energy electron LEE) to treat cancer but mostly for the treatment of superficial tumors given their very limited penetration depth.

The Flash therapy is a new promising technique where the necessary therapeutic dose is released in fraction of a second and the mean dose rate is much higher than the conventional irradiation. With this treatment the healthy tissues result to be partially preserved from the damage of the ionization radiation while the efficiency in the tumor cure remains unchanged, offering new opportunity to cancer treatment plans.

More recently, the idea of investigating the use of very high-energy (50-200 MeV) electron (VHEE) beams for RT has gained interest worldwide. The main advantages of VHEE beams over photons are related to the fact that small diameter VHEE beams can be scanned and focused easily, producing finer resolution for intensity modulated treatments than photon beams, and accelerators may be constructed at significantly lower cost compared to the current installations required for protons beams. In addition, VHEE beam can operate at very high dose rate compatible with the FLASH regime that can change dramatically the future scenario of the radiotherapy. To investigate how well VHEE can meet the current assumptions and become a clinical reality, a research effort based on accelerator technology as well as radiobiological and pre-clinical studies is needed.