

M.a.r.i.X
**Conceptual Design Report of a Multi-disciplinary Advanced Research
Infrastructure for the generation and application of X-rays**

Luca Serafini

*Istituto Nazionale di Fisica Nucleare, Sezione di Milano, Milano, Italy
luca.serafini@mi.infn.it*

The need of a fs-scale pulsed, MHz-class repetition rate, X-ray source for time-resolved fine analysis of matter (spectroscopy and photon scattering) in the linear response regime is addressed by the conceptual design of a facility called MariX, outperforming current X-ray sources based on FELs or Synchrotrons for the declared scope. MariX is based on the original design of a two-pass two-way superconducting linear electron accelerator, equipped with an arc compressor, to be operated in CW mode (1MHz). MariX provides FEL emission in the range 0.2-8 keV with 10^8 photons per pulse using a 1.5 GeV Linac, instead of a typical 3 GeV Linac requested by such FEL photon energy. The accelerator complex includes an early stage that supports an advanced inverse Compton source of very high-flux hard X-rays (up to 10^{13} monochromatic X-ray photon beams), of energies up to 180 keV, that are well adapted for large area advanced radiological imaging. Such a complex enables a broad science program and will serve a multidisciplinary user community, covering fundamental science of matter and application to life sciences, including health at preclinical and clinical level. Although its C.D.R. is based on a site-independent study, MariX is designed to represent a new research infrastructure for Northern Italy, and in particular for the Milan metropolitan area and the new Scientific Campus of University of Milan in the post-Expo area (and its Milan Innovation District, MIND). See www.marix.eu