Inverse Compton Scattering X-ray Source

RadiaBeam Technologies is developing a compact tunable source of monochromatic X-rays based on Inverse Compton Stattering, the ICSX.

The ICSX source has potential applications in CD metrology, nano-imaging, SAXS, and phase contrast imaging of biological tissues. With some modifications, the ICSX can also be extended to applications in clinical imaging, as well as nuclear spectroscopy, nuclear waste inspection and nonproliferation, and radioisotope synthesis.

RadiaBeam is looking for partners in the industrial, medical, and defense communities to explore these and other ICSX applications.

Figure 2: A RadiaBeam-developed photinjector for the gamma ray ICS system at the STAR facility in Italy.

Coverage	3 – 100 keV
Source Size	30 – 15 μm
System Footprint	~6 m
Average e-beam current	~3 – 5 μA
Interaction rate	~10^4 /s
Brightness (ph/s·mm^2·mrad·0.1%BW)	10^{11} – 10^{13}

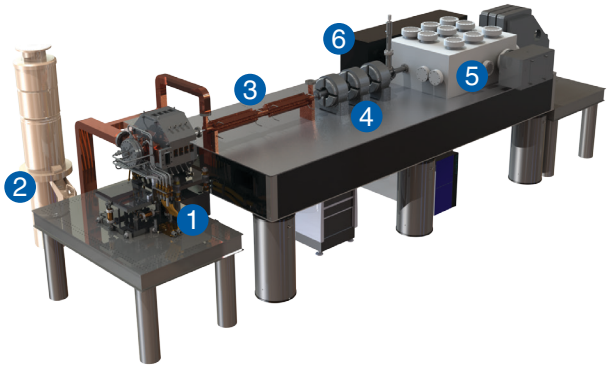

Figure 1: The reconfigurable ICSX is less than 6 meters in length yet covers a wide range of wavelengths.

The entire ICSX system is very compact while its simple and modular architecture makes it easily adoptable to a variety of applications. ICSX components and subsystems are predominately designed using already demonstrated technical solutions.

As shown in Figure 1, a photoinjector (1 and also Figure 2), powered by a klystron (2), generates a 4–5 MeV electron beam which is further accelerated in a 1-meter long high gradient linac (3); whereupon it is directed through a matching line (4), into an interaction chamber (5), and disposed by a 90° bending magnet into a beam dump. A klystron feeds RF power to the photoinjector and the high gradient linac. A laser beam after the amplifier (6) is injected into an evacuated optical cavity inside the interaction chamber and recirculated at ~ 100 MHz repetition rates to match the burst mode operation regime of the electron beam.

Tuning the ICS wavelength is accomplished by changing the electron beam energy.

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