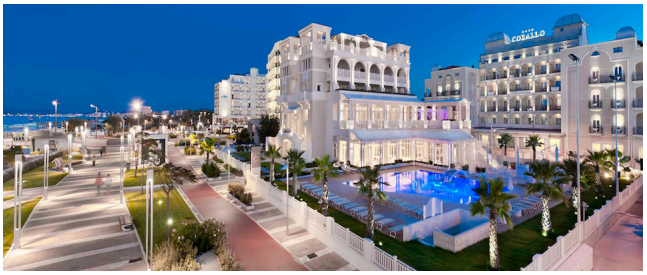

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X-rays from laser produced plasmas

Thursday, 8 June 2023 09:00 (30 minutes)

Since the early 60s, with the advent of LASERs, it was understood how they could be used to create pulsed X-ray sources of extraordinary brightness. The peculiar characteristics of these sources have progressively been implemented hand in hand with the evolution of laser technologies. In fact, as the duration of the laser pulses became shorter and consequently higher intensities were reached, denser and hotter plasmas were produced, with a consequent increase in the source brightness and energy of the emitted photons. With the further advent of the amplification techniques of ultrashort laser pulses (fs) and the overwhelming development of the acceleration of high energy electrons (GeV) in laser produced plasmas, new possibilities of generating X-rays have become possible. Among these certainly the most important are (a) the bremsstrahlung radiation (1), produced by directing the high energy electrons on high atomic number targets (b) the betatron radiation (2) produced by the accelerated electrons in the plasma, during their transverse oscillation motion as they propagate at relativistic speeds in the low-density channel induced by the laser pulse via the ponderomotive forces. We certainly cannot ignore the most important sources of X-ray radiation available at LINACs or synchrotrons, nor the quality of that radiation in terms of tunability, monochromaticity and directionality. However, the sources of X-ray radiation from laser produced plasmas undoubtedly remain favorable by their relatively small dimensions and maintenance costs.

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