

Two-color FEL at the SPARC test facility

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The SPARC facility has been conceived as a benchmark for testing new aspects of the FEL physics and new machine operating configurations. The experimental work presented here was developed through a collaboration between ENEA and INFN.

In the recent past, substantial efforts have been devoted to the analysis of FEL operating with two over-compressed electron beam bunches associated with a comb-structure. A comb beam is an electron pulse train with sub-picosecond length and adjustable sub-picosecond inter-distance.

We have obtained coherent and statistically stable two-color FEL radiation by seeding the two electron beam bunches, almost overlapped in time, with a single seed laser pulse. The main experimental results obtained in SASE and seeded regime will be described.

We also present the first test on a short period undulator utilized as afterburner. In this configuration the last undulator (second section) is tuned to a harmonic of the first five undulators (first section). Laser action occurs in the second part, due the bunching acquired in the first. Coherent emission from both the sections was simultaneously observed.