

# **Project for Generation of Femtosecond X-ray Beams from the Duke Storage Ring**

V.N.Litvinenko, O.A.Shevchenko, S.F.Mikhailov, Y. Wu

*FEL Laboratory, Duke University, P.O. Box 90319, Durham, NC 27708, U.S.A*

In this paper we describe the project for developing an intense X-ray source at Duke storage ring. The project is based on a mm-wave FEL, which will be used for creating and maintaining electron bunches with sub-picosecond (femtosecond) time structure and for generating hard X-ray beams with circular polarization via Compton intracavity backscattering. A strong coherent synchrotron radiation (CSR) is the main limiting factor for proposed mode of operation. We present the results of theoretical and numerical studies of instabilities caused by CSR and the attainable parameters for femtosecond electron bunches in the Duke storage ring. Based on these studies, we present the design and predicted performance of the 1.5-75 keV X-ray pulsed source with of 10-fsec RMS duration and 10<sup>5</sup> photons per pulse. The rep-rate of the source can be tuned from few Hz to tens of MHz.

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