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A CBXFEL demonstrator setup at the European XFEL

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A cavity based free-electron laser (CBXFEL) is a next generation X-ray source promising radiation with full three-dimensional coherence, nearly constant pulse to pulse stability and more than an order of magnitude higher spectral flux compared to SASE FELs. In this contribution, an R&D project for installation of a CBXFEL demonstrator experiment at the European XFEL facility is conceptually presented. It is composed of an X-ray cavity design in backscattering geometry of 133 m round trip length with four undulator sections of 20 m total length producing the FEL radiation. It uses cryocooled diamond crystals and employs the concept of retroreflection to reduce the sensitivity to vibrations. Start to end simulations were carried out which account for realistic electron bunch distributions, inter RF-pulse bunch fluctuations, various possible errors of the X-ray optics as well as the impact of heat load on the diamond crystals. The current state of the project shall be presented in this contribution.

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