

The VUV Free Electron Laser based on the TESLA Test Facility at DESY, J. ROSSBACH, DESY, FOR THE TESLA FEL COLLABORATION - A Free Electron Laser (FEL) is under construction at DESY in Hamburg, aiming at short wavelengths in the VUV region. It makes use of the TESLA Test Facility (TTF), a superconducting linear accelerator now under construction at DESY in the framework of the TESLA collaboration. Its purpose is to provide the technical basis for TESLA, a superconducting, high-efficiency, high-gradient linear e⁺/e⁻ collider with integrated X-ray laser facility. The concept of a superconducting linac makes it possible to choose a relatively small accelerating rf frequency (1.3 GHz) and a large duty cycle (0.01). As a consequence, the TESLA linac is indeed exceptionally well suited for a short-wavelength Free Electron Laser: Excellent beam quality, mandatory for a high-gain, short wavelength FEL, can be maintained during acceleration due to small wake fields. A large variety of pulse train patterns can be provided to serve various needs of potential users. The VUV FEL at the TTF comes in two phases, which are both approved. Phase 1 is the proof-of-principle experiment to demonstrate the Self-Amplified Spontaneous Emission (SASE) principle at wavelengths down to 42 Nanometers and to cultivate the technology necessary, such as small emittance photoinjectors, bunch compressors, precise undulators and appropriate beam diagnostics. It will come into operation during 1999. Phase 2 aims at 6 Nanometers and provides photon beams for users. The paper describes the over-all layout and challenges of phases 1 and 2 and the status of key components.