

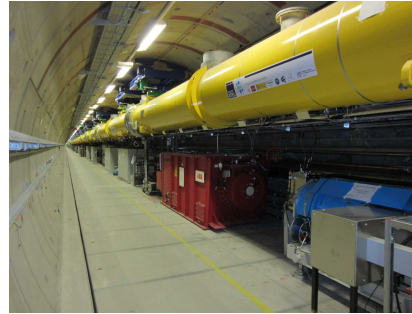
SUMMARY OF THE TEST AND INSTALLATION OF 10MW MBKS FOR THE XFEL PROJECT

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For the European XFEL project, horizontal multi-beam klystrons (MBK) which produce RF power up to 10 MW, at an RF frequency of 1.3 GHz, 1.5 ms pulse length and 10 Hz repetition rate, were chosen as RF power sources. All MBKs have been manufactured by two companies, 22 tubes from Thales Electron Devices and 7 tubes from Toshiba Electron Tubes & Devices. In this article we will give a summary of the tube testing, conditioning and installation in the underground linear accelerator tunnel.



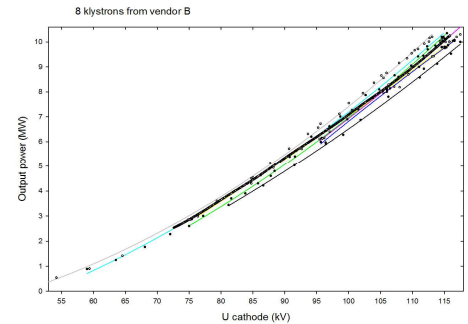
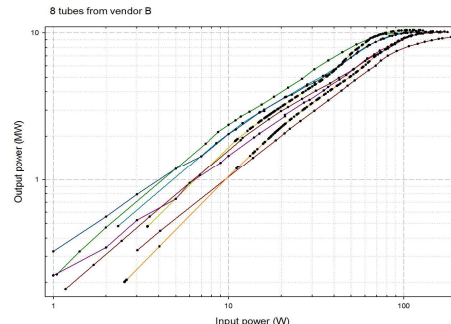
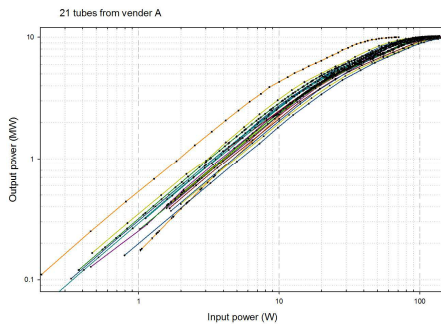
Klystrons test stands in Hamburg



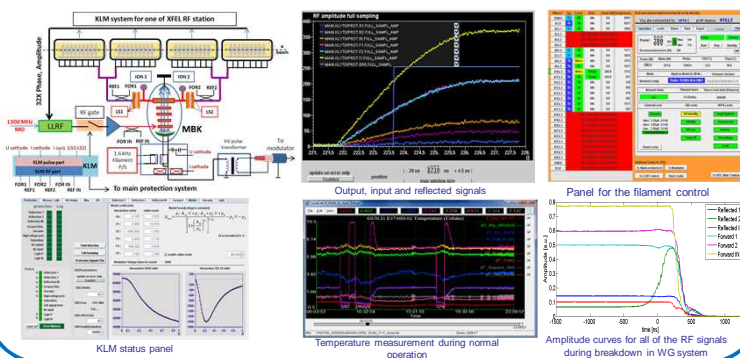
One of RF stations in the XFEL tunnel



HV connection between pulse transformer and MBK



Klystron Life Time Management System (KLM)



Racks for control and measurements at MBK test stands, Hamburg

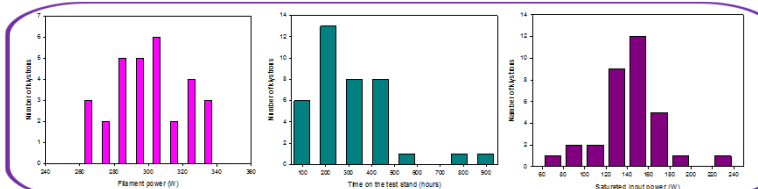


Vacuum create and HFPS for the filament inside one of tunnel racks



Portable klystron simulator create

For the reliable operation of 26 RF stations which are inside the underground tunnel it is very important to be sure that all of the remote measurements and interlock signals are correct. A special removable electronic create named as "klystron simulator" (KS) was developed, for the moment it includes: calibration of ion pumps current measurement and test of vacuum interlock signals in case if current level in the one of ion pumps will be higher than RF stop level, HV stop level or filament stop level. One of others functions of KS are calibration of klystron voltage and current measurements and the simulation of HV gun arc in the klystron. KS has possibility of fast measurement of oil quality that is inside of the klystron gun tank and connection module, different kind of interlocks of high frequency filament transformer can be simulated also. Development of the RF part of KS is under way, after finishing it will be possible to make the calibration for the RF input and output power measurement and the simulation of RF breakdown inside the klystron and in the waveguide system, the simulation of the light spark near klystron output windows will be possible too.



Control racks in the XFEL injector area



Two RF stations in the XFEL injector area



Preparation for MBK transportation inside the XFEL tunnel

All of the MBKs for the European XFEL were delivered from two vendors. After six years of testing and conditioning of MBKs for the European XFEL, on the DESY test stands, twenty four MBKs are already installed in the main underground XFEL tunnel and two are installed inside the XFEL injector area. During the commissioning of the XFEL injector, one of the RF station operated already more than 9000 hours. Several of the RF stations inside of main underground tunnel are already tested in place and were operated for conditioning of the couplers in the cryogenic modules. We expect the delivery of last two additional MBKs before the end of this year.