

LHC RF Embedded SC Cavity Conditioning System

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The LHC RF system consists of 16 supra-conductive cavities each individually driven by a 300kW klystron with its associated cavity controller electronics modules. The cavity conditioning system has been embedded in the cavity controller by addition of an independent VME controlled DDS based, versatile dual FM signal generator. The combined generator outputs are gain controlled and interlocked through an onboard failsafe digital vacuum level driven RF attenuator and an FPGA controlled RF VGA. The FPGA can create RF pulses with programmable width and strength at a 50Hz rate through the VGA control. The cavity controller software implements the conditioning mode by connecting the conditioning DDS output to the klystron RF pre-driver, setting up of the conditioning DDS module's parameters and switching the Tuner Loop module to conditioning mode. In this mode the tuner loop module is able to maintain the cavity on tune even with the RF signal being pulsed and swept in frequency. At the same time the tuner loop acquisitions allow the software to measure the amount of RF power delivered to and the E-field created in the cavity during the RF pulses. The software running in the front-end CPU is synchronized with the process through IRQs generated by the conditioning DDS module. A labview application has been created that allows control and supervision of the entire process through a user-friendly graphical interface.

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