

Development of high power long-pulse RF transmitter for ICRF heating in fusion researches and cyclotron accelerator

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A high power long pulse transmitter whose frequency range is in the range of VHF bands have been widely used for fusion researches and accelerator as well as broadcasting. KAERI have been developing the transmitters for ICRF heating for KSTAR and the cyclotron accelerator since 1996. The toroidal magnetic field of KSTAR is nominally 3 T so that 25-60 MHz transmitter is required to cover ICRF heating scenarios of the KSTAR. The first one is 2 MW transmitter operating up to 60 MHz and it succeeded in achieving 2 MW for 300 s in 2008 after several failures of tetrode tube at the final amplifier stage.[1] Up to 300 kW RF power was successfully injected to KSTAR plasmas. The second one is the wideband 70 kW/CW transmitter used for the cyclotron accelerator and their frequency range is from 25 to 50 MHz. Its engineering design was finished. The third one is 1 MW/VHF transmitter which was loaned from JAEA. As the operating ICRF frequency of KSTAR is lower than FM bands, its cavity structure will be modified for KSTAR and the operating frequency would be changed from 110 MHz to 60 MHz. In this presentation, the test results of 60 MHz and lessons from the high power test of 2 MW transmitter will be introduced and the circuit analysis and engineering design work for the second and third amplifiers will be shown.

[1] J. G. Kwak et al., Fusion engineering and design, volume 84, 2009, pp1140