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Upgrade of the T2K magnetic horns for a high power beam beyond 1MW

T2K (Tokai to Kamioka) magnetic horn system in the J-PARC neutrino facility is designed for a 30GeV 750kW proton beam. The design current for the horns is 320kA (peak) with a half-sine wave (2-3msec). The horns are contained inside a large helium vessel and are operated in a helium atmosphere in order to reduce tritium and NOx productions.

The current horns have been used from 2009 and have been operated more than ten million pulses. The current achieved beam power is 230kW for T2K (the number of protons accelerated in a spill is 1.2x10¹4). Major problems for 750kW beam are a hydrogen production and an insufficient stripline cooling, which limit the acceptable beam power to 400kW. We have been modifying the horns to solve the problems. The upgraded horns will be installed in this summer and summer in 2014. We describe the problems and the modifications in the upgraded horns.

We also describe the further upgrades for the beam power beyond 750kW in the near future.

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