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Observation of Failure Modes of RF Amplifiers at ATLAS

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Summary

About four years ago, at Argonne Tandem Linac Accelerator System (ATLAS), a 4-meter long 60.625 MHz CW radio-frequency quadrupole (RFQ) had been developed and has been used in operation since then. Two 60 kW vacuum tube type amplifiers are used to provide the power for the RFQ. A new cryomodule consisting of seven 72.75 MHz superconducting (SC) quarter-wave resonators (QWR) has also been developed and put into operation more than two years ago. Seven 4 kW solid state amplifiers are used to provide RF powers to the QWRs. Over the years, we have seen numerous failure modes on both types of amplifiers especially on 60 kW amplifiers. In this paper, we would like to share our observation on failure modes and the measures we have taken to substantially improve the reliability of CW RF amplifiers. Our experience could be beneficial for similar facilities worldwide. This work was supported by the U.S. Department of Energy, Office of Nuclear Physics, under Contract No. DE-AC02-06CH11357. This research used resources of ATLAS facility at ANL, which is a DOE Office of Science User Facility.

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