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RFD crab cavity HOM evolution: cold tests, cryostating & cryomodule testing at 2 K

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As part of the High Luminosity LHC (HL-LHC) project, crab cavities will be installed around CMS and ATLAS experiments of the LHC. To accommodate the different crossing angle planes, two cavity designs have been selected: the RF Dipole (RFD) and the Double Quarter Wave resonator (DQW).

Two prototype RFD cavities were fabricated and successfully tested at CERN. Subsequently, the cavities were integrated into a dedicated cryomodule at STFC Daresbury in the UK. At CERN's SM18 test facility the cryomodule was tested at 2 K, validating RF, mechanical, and cryogenic performance. Very strong damping along with potentially high HOM power (˜1 kW) is specified as a requirement for both crab cavity designs. This study presents the evolution of Higher Order Mode (HOM) measurements for the two RFD cavities, including measurement results from vertical tests and cryomodule tests at 2 K. The measured results are compared simulation data and used to qualify the prototype HOM couplers and their performance across test environments. Preliminary insights are also drawn from RFD cryomodule tests with beam at SPS.

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Footnotes

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