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The IFMIF RFQ as a resonant combiner: equivalent circuit and operational scenarios

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The IFMIF RFQ has to accelerate a D+ beam of 125 mA from the source energy of 100 keV to its final energy of 5 MeV. For such a purpose, the needed RF power (approximately 600 kW dissipated power and 600 kW beam power) is injected in the RFQ from 8 amplifier chains with 8 coupling loops. In order to quantitatively understand the different circumstances which can occur, an equivalent circuit of the RFQ (that can be generalized to a generic multple-feed cavity) with all the feed lines and couplers will be described, and the expressions for cavity and reflected voltages and powers will be derived. Moreover, some operational scenarios that can occur will be analyzed. In particular errors in amplitude phase and coupling of each of the 8 feed lines of the RFQ itself will be introduced. This analysis is also useful as a guideline in determining the basic architecture of the amplitude/phase controls of the cavity feeds, for a given set of amplifier amplitude/phase characteristics.

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Footnotes

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Yes

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