

Design of a Power Coupler for the AAA Spoke Resonators

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Beam apertures of spoke resonators require a direct coupling of the input power to the cavity volume. For low input power loop couplers for magnetic coupling are considered. Higher input power makes the thermal management of loop couplers in a cryogenic environment impractical. In our power coupler design work coupling by a coaxial antenna has been proposed and demonstrated. The baseline design for the coupler for spoke resonators at 350 MHz consists of a half-height WR2300 wave-guide section merged with a shorted coaxial conductor. At the transition is a 4.8-mm thick cylindrical ceramic window creating the air/vacuum barrier. The coax has a 103-mm outer diameter and an inner conductor matched to a 75-Ohm coaxial line impedance. The coax extends from the short through the wave-guide and terminates with an antenna tip close to the sidewall of the cavity. A full outer conductor diameter pumping port is located in the quarter-wave stub to facilitate good vacuum at the ceramic window. The coaxial geometry chosen is based on multipacting and thermal design considerations. The coupling coefficient is adjusted by statically re-setting the outer conductor length. The RF-physics design will be presented with emphasis on the interaction of the coupler with the cavity.