

DESIGN OF MAIN COUPLER FOR 650 MHz SC CAVITIES OF PIP-II PROJECT



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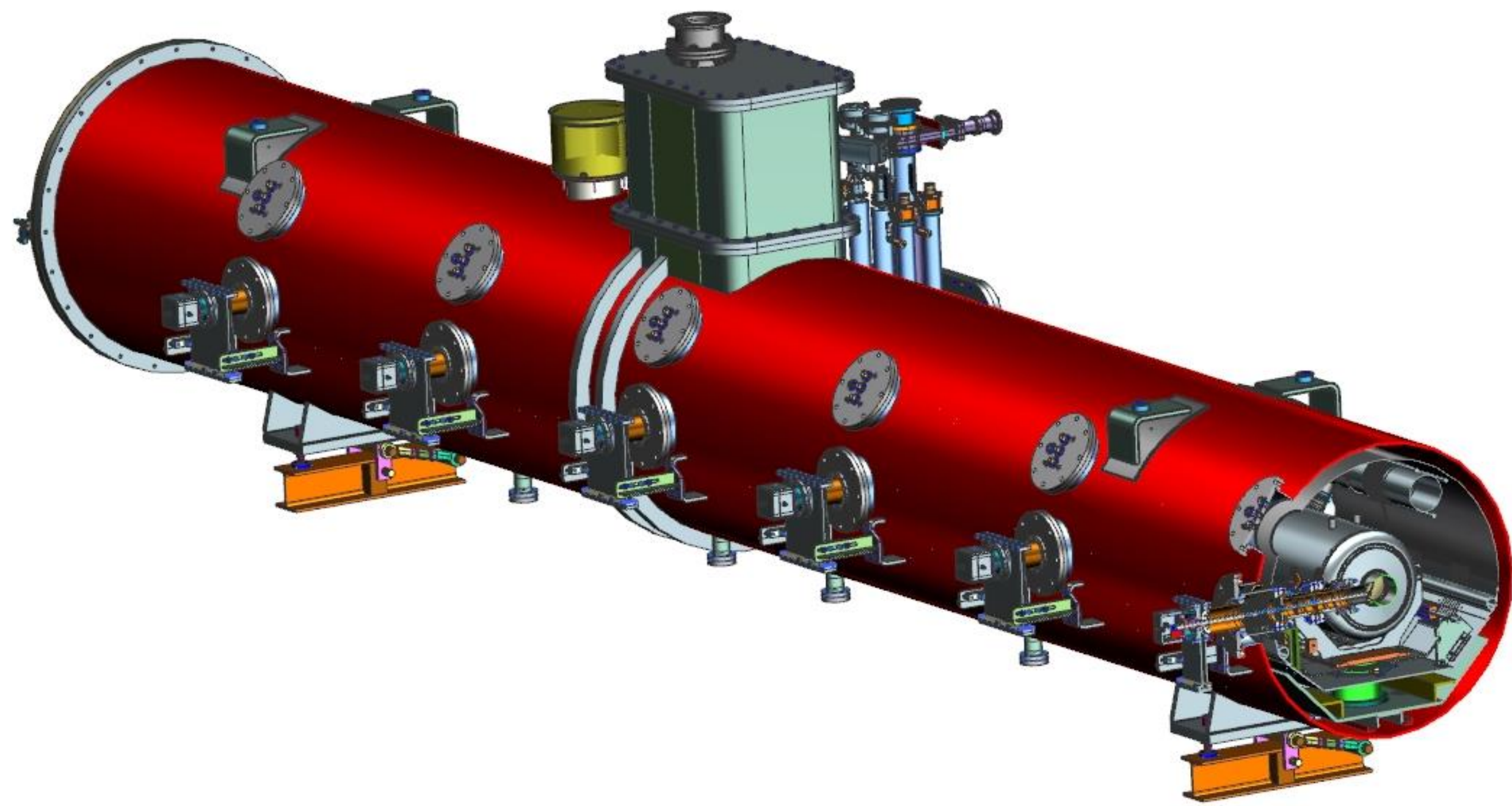
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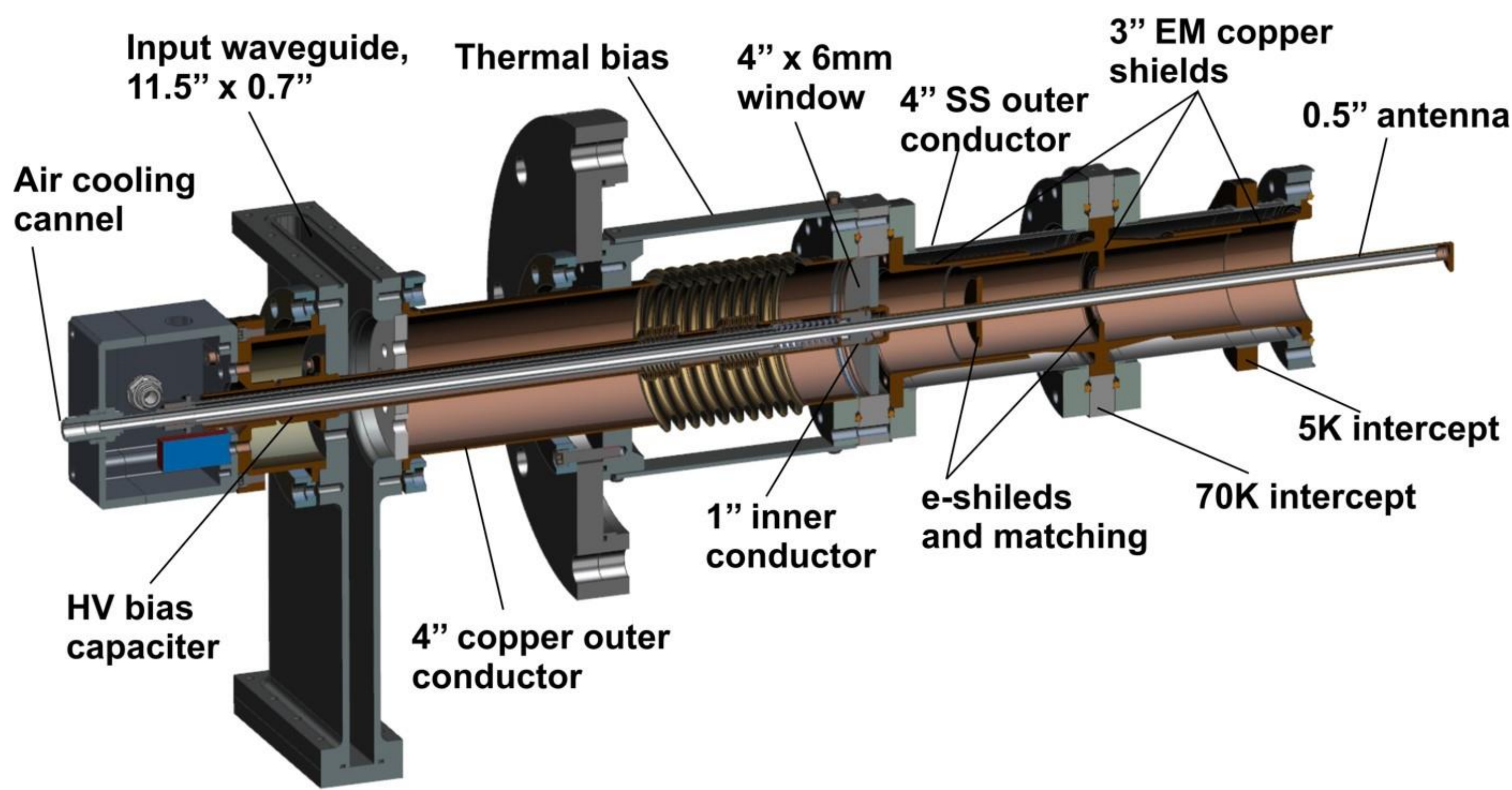
Abstract

Proton Improvement Plan-II at Fermilab has designed an 800MeV superconducting pulsed linac which is also capable of running in CW mode. The high energy section from 185MeV to 800MeV will be using two types of 650MHz elliptical cavities. Both types of cryomodules will include six 5-cell elliptical cavities. Each cavity will have one coupler. Status of the 650 MHz main coupler development is reported.

HIGH POWER COUPLER WITH HB 650MHz cavity

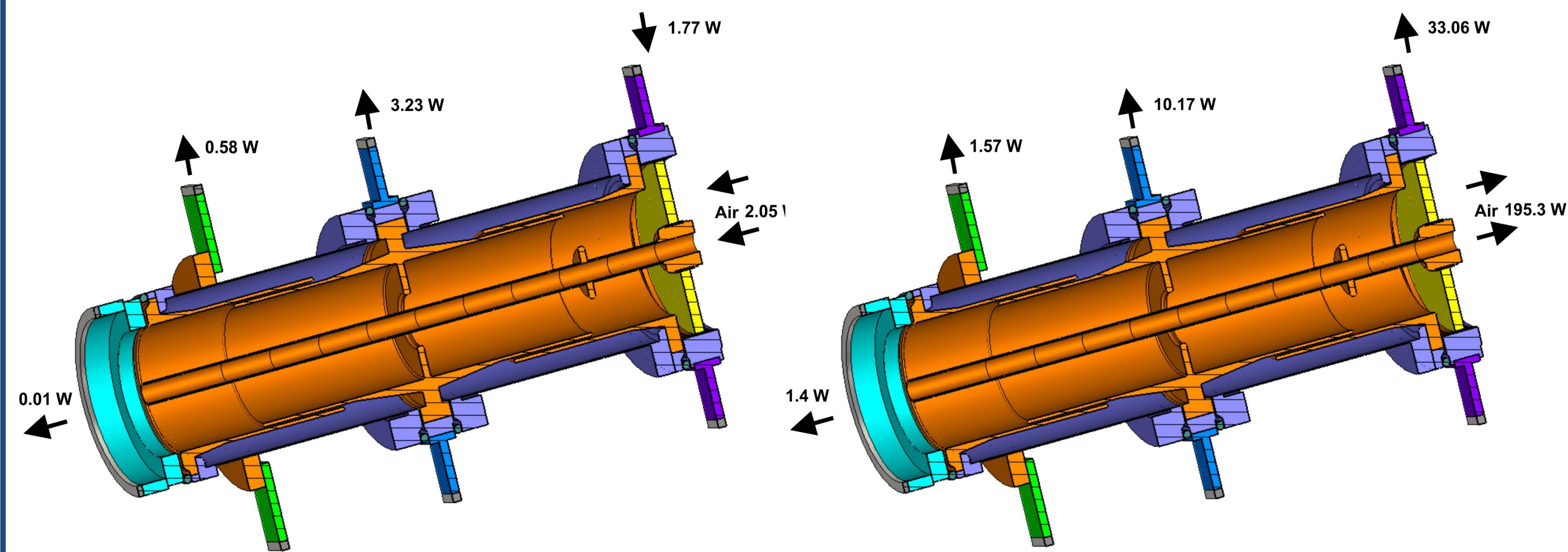


HB 650 MHz Cryomodule assembly

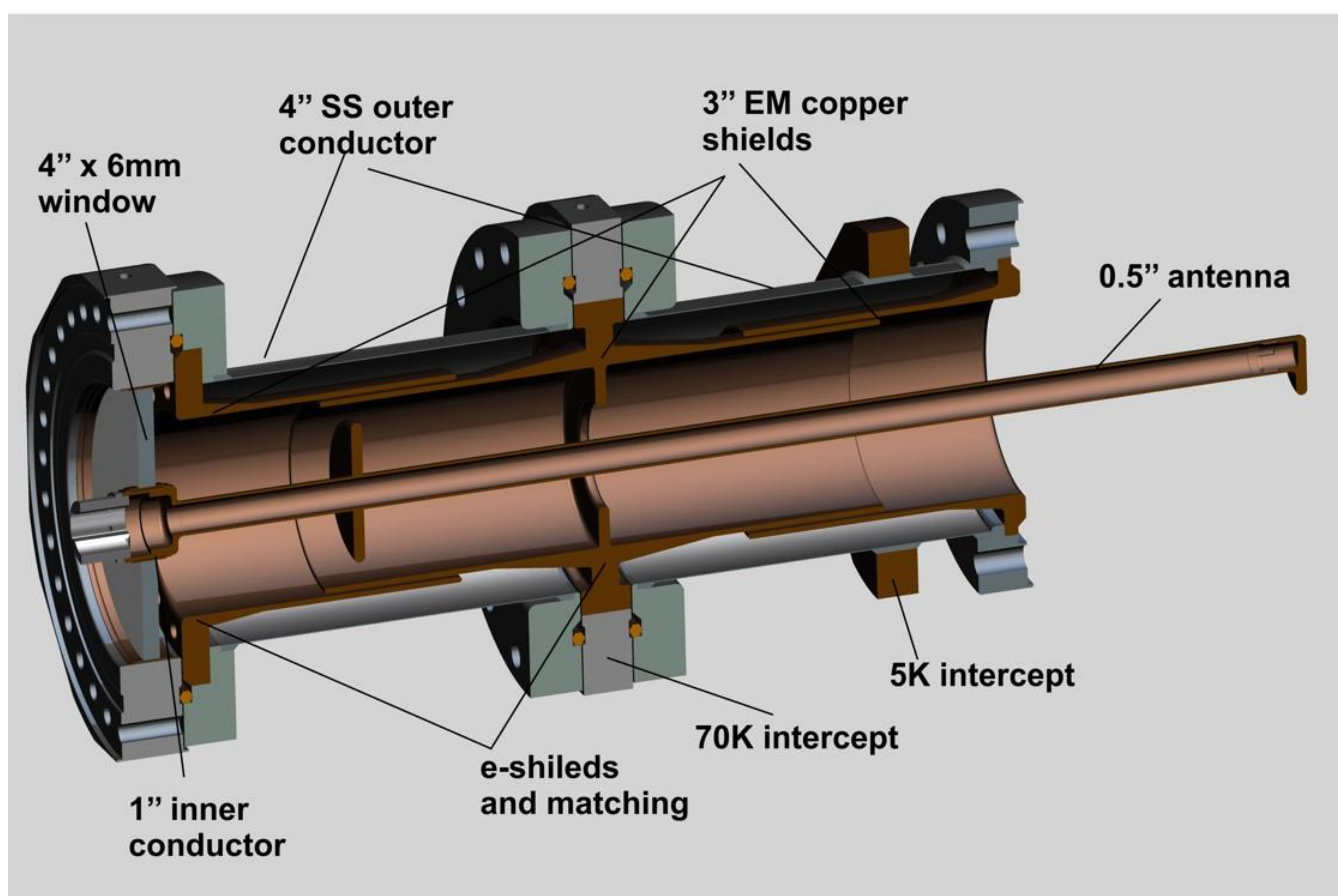


Thermal property of 650 MHz coupler with EM shields Simulations were done for 300 kW, CW, TW (matching load)

	2K	5K	70K	293K	Air
Static (0 kW), W	0.01	0.6	3.2	- 1.8	-2.1
Total (300 kW), W	1.4	1.6	10.2	33	195



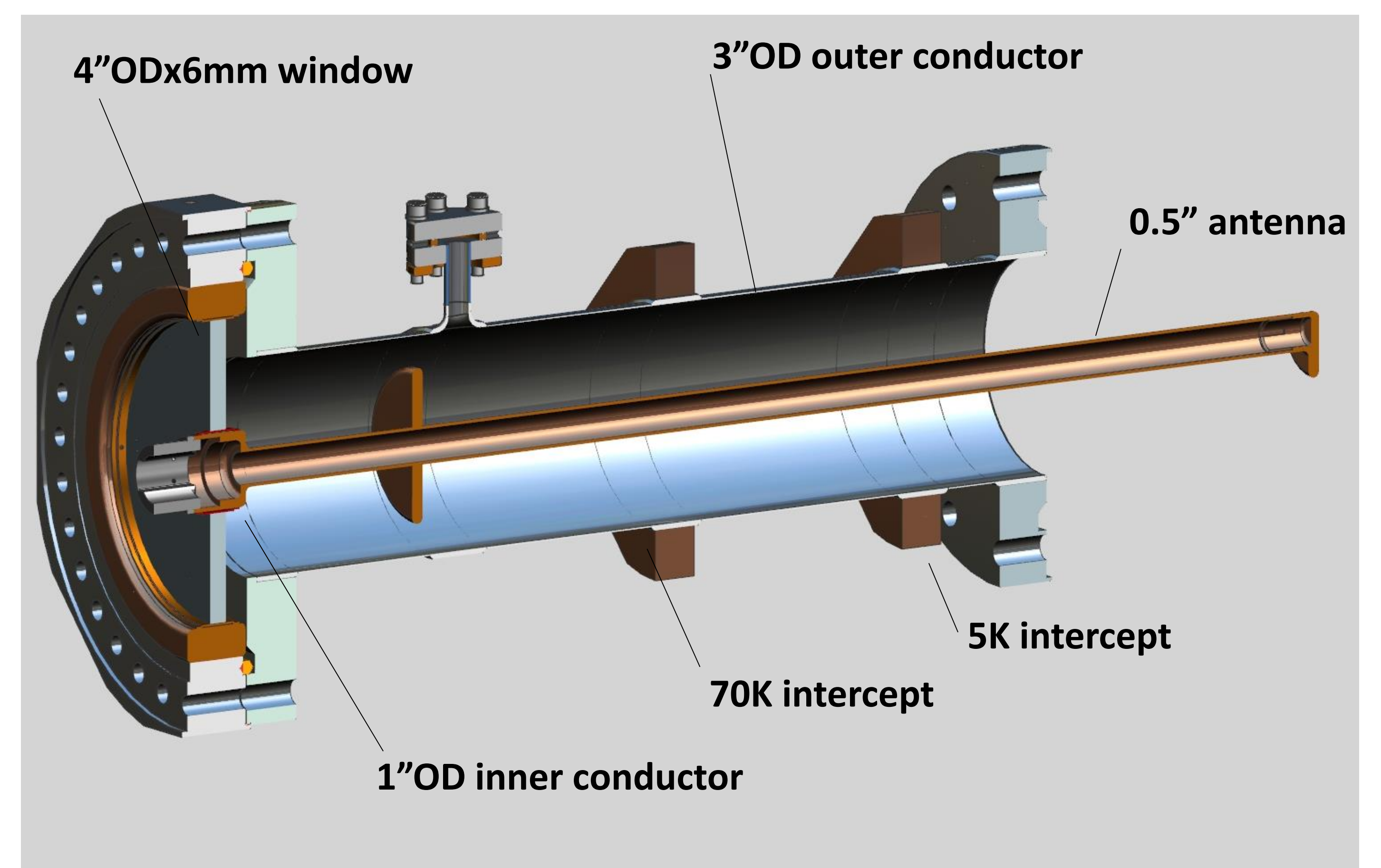
Main components of Coupler Vacuum part EM shields version



We prepared two versions of 650 MHz coupler vacuum parts: one with electromagnetic (EM) and another with copper coated outer conductor.

The first version consists of a 4 inch OD stainless steel outer conductor with a wall thickness of 0.6 mm, 3" diameter copper EM shields, a 0.5 inch OD copper antenna, and a 4" OD and 6 mm thick ceramic window. To prevent possible cavity contamination with copper flakes the inside surface of an outer conductor is not coated with copper. The coupler outer conductor has two thermal intercepts (at "5K" and "80K") located between cavity flange and ceramic window. In order to reduce secondary electron emission the vacuum side of the ceramic window is coated with TiN. The copper antenna is hollow. It is cooled with dry compressed air. Matching element is placed on the antenna. It will also shield ceramic window surface from charged particles.

Main components of Coupler Vacuum part copper coated outer conductor version



This version of coupler vacuum part consists of a 3" OD stainless steel outer conductor with a wall thickness of 0.6 mm, a copper antenna, and a ceramic window. The inside surface of an outer conductor is coated with copper.

We use the same ceramic window with antenna assembly on both versions.

CONCLUSIONS

The design of the 650 MHz Main Coupler for PXIE has been updated based on tests results of 325 MHz couplers and on new ideas.