THE IMPROVEMENT OF THE POWER COUPLER FOR CADS SC SPOKE CAVITIES

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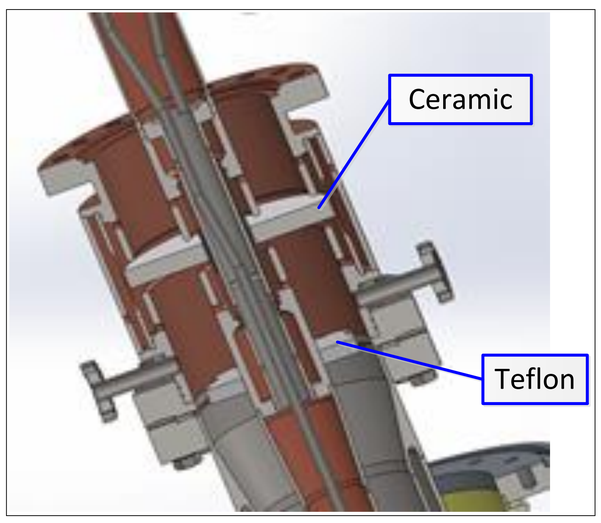
Abstract

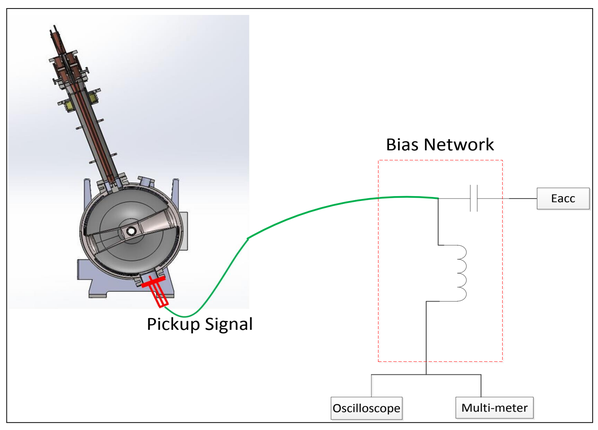
Twenty superconducting spoke cavities mounted in three cryomodules (CM1, CM2 and CM4) were installed in the CADS, a test facility of 10 mA, 25 MeV CW proton linac. Each cavity was equipped with one coaxial type fundamental power coupler (FPC). Fatal window crack was observed during the test cryomodule (TCM) commissioning. Improvements covering the coupler cleaning and assembly procedure, structure and position modifications were thus implemented, aiming to reduce the cavity contamination and avoid the window damaged by cavity FE electrons.

Window damage by cavity field emission

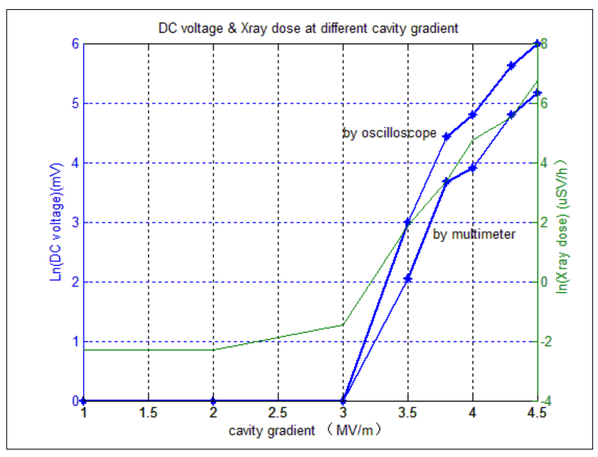
- Fatal window crack was observed during the test cryomodule commissioning. Both the experiments and simulation attributed the window crack to electron bombardment from cavity FE.



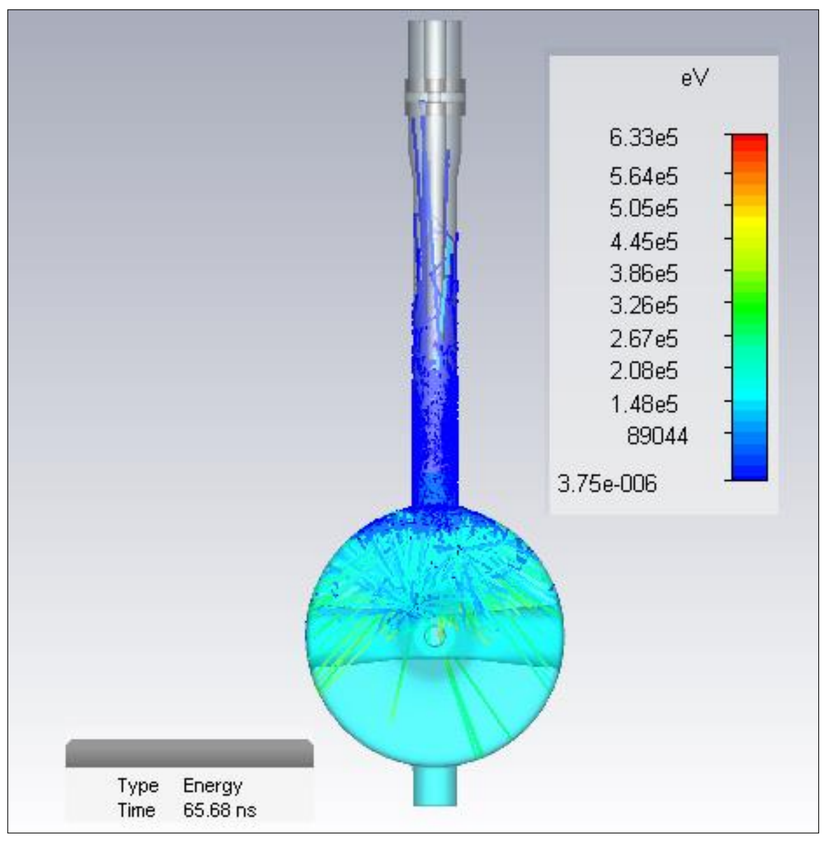
A piece of Teflon plate were put into the area between the ceramic and the coupling port to barrier the FE electrons. We found that the ceramic never cracked after Teflon plate shielding.



A "bias network" was used to pick up the DC voltage from the pickup port.

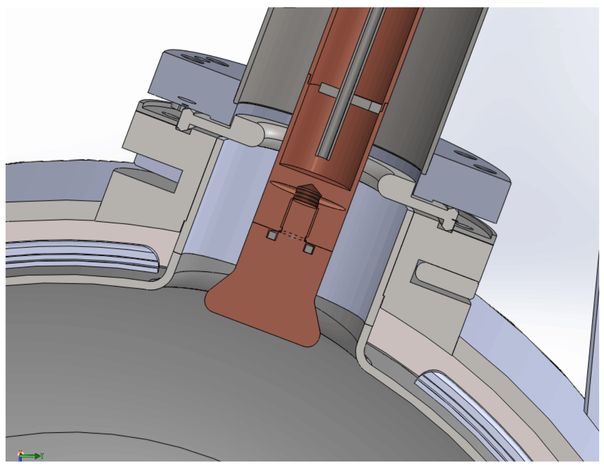


The expected DC voltage was detected once the X-ray dose arising.

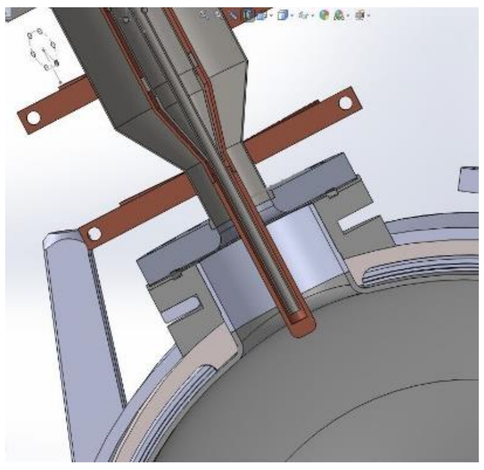


The simulated trajectory of the FE electrons facing the coupler port: the electrons can fly into the FPC through the coupler port and arrive at the window ceramic .

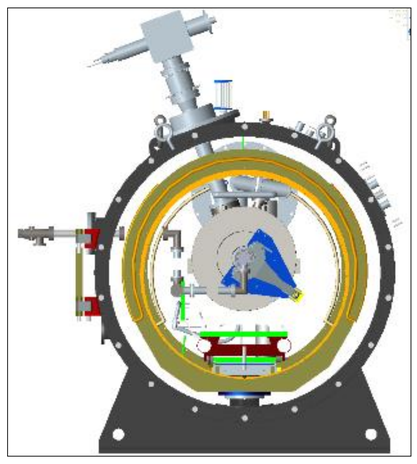
Improvements



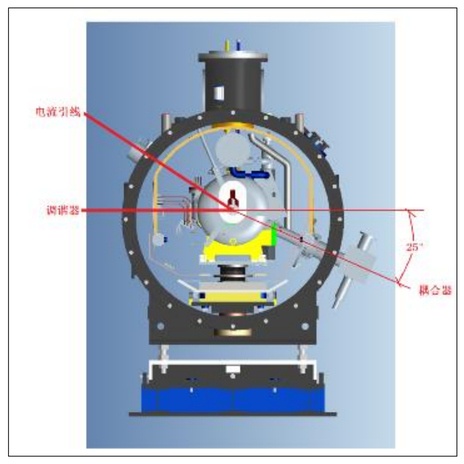
Solution of CM1: Both special gasket and enlarged antenna tip were designed to shield the FE.



Solution of CM2: The diameter of the coupler port was changed from 80 mm to 40 mm.



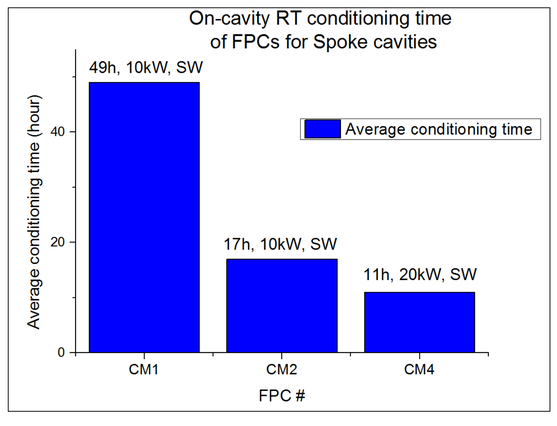
The cross section of TCM, CM1 and CM2: coupler position upside



The cross section of and CM4: coupler position downside

The summarized modifications

	FPCs for CM1	FPCs for CM2	FPCs for CM4
Ultra sonic clean	No	Yes	Yes
Position arranged on cavity	Upside	Upside	Downside
Coupler assembled with cavity in class 10 clean room	No	Yes	Yes



The coupler on-cavity RT conditioning time reduced continuously from CM1 to CM4, which benefited from the improvements.

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