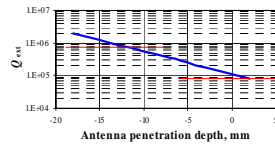
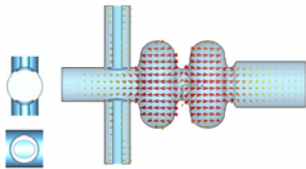


Design of High Power Input Coupler for Cornell ERL Injector Cavities

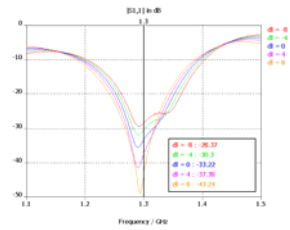
ThP54

V. Veshcherevich, S. Belomestnykh, M. Liepe, V. Medjizade, H. Padamsee, V. Shemelin (Cornell University, Ithaca, NY, USA), N. Sobenin, (MEPhI, Moscow, Russia), and A. Zavadtsev (Introscan, Moscow, Russia)

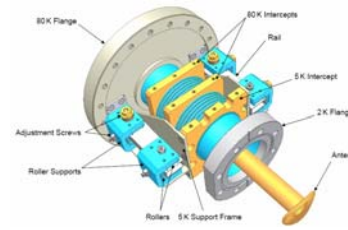
The design choice for ERL injector cavity: a twin coupler, i.e. a system of two identical couplers. This is a remedy to reduce RF power per coupler, coupling to the cavity, and the transverse kick to the beam.



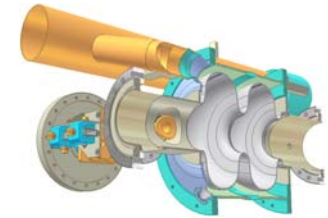
Dependence of the Q_{ext} on antenna position



Reflection from the coupler for different antenna positions



Cold part of the coupler



Cold part of the coupler connected to the injector cavity

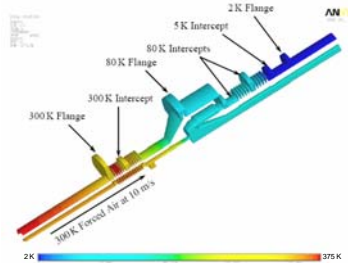
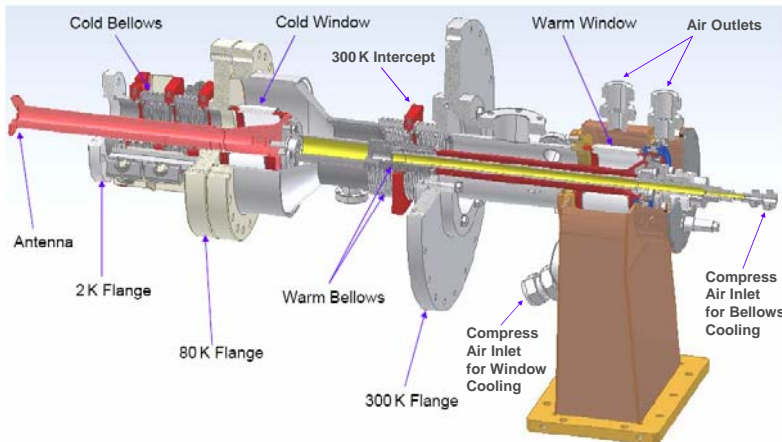
Parameters of a Single Coupler

Central frequency	1300 MHz
Bandwidth	±10 MHz
Maximum power transferred to matched load	75 kW
Number of ceramic windows	2
Cold coaxial line impedance	60 Ohm
Warm coaxial line impedance	46 Ohm
Coaxial line OD	62 mm
Q_{ext} range	$9.2 \cdot 10^3 \dots 8.2 \cdot 10^7$
Antenna stroke	≥ 15 mm
Heat leak to 2 K	< 0.2 W
Heat leak to 4.2 K	< 3 W
Heat leak to 80 K	< 75 W

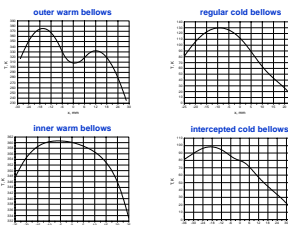
Major Changes from TTF-III Design:

1. The cold part was completely redesigned using a 62 mm, 60 Ohm coaxial line for stronger coupling, better power handling and avoiding multipacting.
2. Antenna tip was enlarged and shaped for stronger coupling.
3. "Cold" window was enlarged to the size of "warm" window.
4. Outer conductor bellows design was improved for better cooling.
5. Air cooling of the warm inner conductor bellows was added.

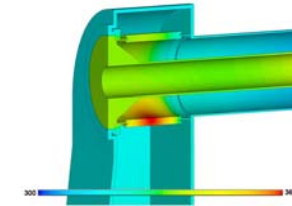
COUPLER DESIGN



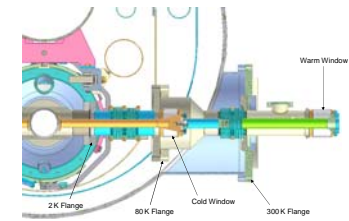
Temperature distribution on the coupler (results of ANSYS simulations)



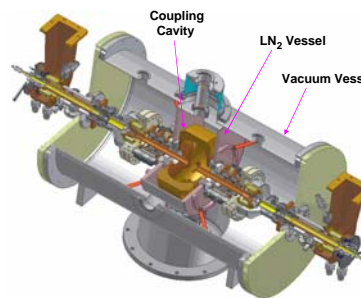
Temperature distribution on bellows



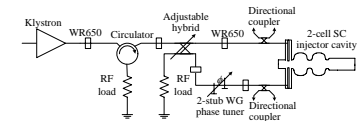
Temperature of warm ceramic window will not exceed 90°C, but due to irregular heating local cooling by compressed air is required.



Coupler mounted in the cryomodule



Nitrogen cryostat with coupling cavity for high power coupler tests



RF power splitting scheme for ERL injector cavity

STATUS

Building of the couplers has been ordered from CPI/Beverly. First two couplers are scheduled to be delivered to Cornell for tests in the beginning of 2006.