

## **Input Coupler For Cornell ERL Main Linac**

## ABSTRACT

Main linac cryomodule of the Cornell ERL consists of 7-cell cavities operating at 1300 MHz in CW mode. Each cavity has a single coaxial type input coupler with fixed coupling,  $Q_{ext} = 2 \times 10^7$ . The input coupler will operate at RF power up to 5 kW at full reflection. The coupler design is based on the design of TTF-III input coupler with appropriate modifications and with taking into account the Cornell experience with couplers for ERL Injector. Unlike that of the TTF-III coupler, the cold assembly of the ERL main linac input coupler does not have bellows, which makes it stiff so the antenna orientation is not changing during cool down. Mechanical flexibility, necessary to accommodate large lateral movement of the cavity inside the vacuum vessel during cool down, is achieved by using two bellows insertions both in inner and outer tubes of warm coaxial line. The inner tube of the warm coaxial line is cooled with air to improve power handling capability.

## **Coupler Parameters**

Frequency	1300 MHz
$Q_{\rm ext}$	2×10 <sup>7</sup>
Maximum RF Power	5 kW CW (full reflection)
Possible Lateral Shift between Cold and Warm Parts	10 mm

## Static and Dynamic Heat Loads of Input Coupler

	Static Heat Load	Heat Load at Full RF Power
To 2 K	0.03 W	0.16 W
To 5 K	1.55 W	1.94 W
To 80 K	2.26 W	9.33 W



ERL Main Linac Cavity with Input Coupler



For main linac, RF power requirements are determined by microphonics (+ possible beam loss, beam return time errors, etc.)



2 ext

Dependence of the  $\mathcal{Q}_{\text{ext}}$  on Antenna Position



Temperature Distribution along Outer Conductor of the Coupler



Temperature Distribution along Inner Conductor of the Coupler





Inner Conductor is Cooled by Compressed Air (Cooling Manifold Not Shown)



Mechanical Flexibility

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