

## RF ASSEMBLIES / SUBASSEMBLIES

# High-Power Couplers, Ceramic Windows, Antennas, Doorknob Transitions

PMB designs and manufactures RF assemblies and subassemblies for research facilities and laboratories, as well as medical equipment manufacturers.

## The Challenge

High-power couplers are generally a **fundamental component of linear accelerating and superconducting structures** in research and testing environments. They can also be described as complex devices which allow the **transfer of power from the source to the cavity**, without altering the cavity's overall performance. They are the critical component linking the external environment with the cavity.

Recent advances and **breakthroughs in superconducting cavity technology** have almost made cavity performances reach theoretical field limits. However, these experimental results can only be obtained if the entire environment is at a similar performance level.

The ultrahigh vacuum and optimal thermal transitions challenges impose **stringent design, manufacture**, preparation, mounting and pre-conditioning processes. Usually, required performances in the research field are high and result from an optimal coordination between all the given interdependent parameters.

High-power couplers have the following main functions:

- Transferring the power from the source, the klystron, to the cavity
- Matching the source impedance with the cavity impedance and avoiding power waste
- Separating the source vacuum from the cavity vacuum (transition guaranteed by a RF ceramic window)
- Limiting RF thermal dissipation with a thermal transition from the ambient to the cavity temperature

Depending on the type of accelerating structure, the beam characteristics and the choice of technology, we can work together to **choose the right design and manufacturing technique**.

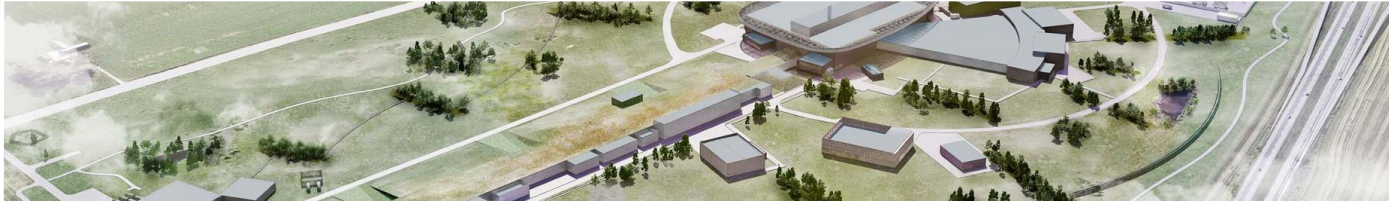


**Industry:** Science, Research

**Technology:** Ultra-High Vacuum / Brazing / Welding / Copper Coating

**Product & Services:** High-Power Couplers / Doorknob Transitions / RF Window & Antenna / Cooled Double-Wall Tubes

# A PMB Success: the ESS Project



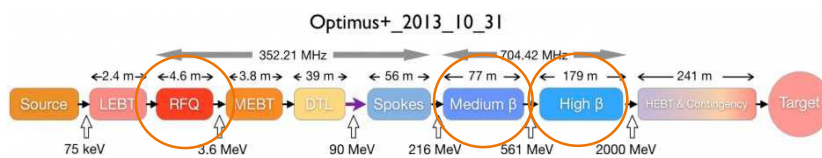
We provide the ESS designing & prototyping partners IPN-Orsay and CEA Saclay with high-power RF couplers of 352.21 MHz and 704MHz and we are currently manufacturing 160 additional ones to be finished next year.

The European Spallation Source (ESS) was established in 2015 and consists of a multi-disciplinary research center, based on the **world's most powerful neutron source**. These neutrons are produced in a superconducting and accelerating structure and then led through pulsed beams into research instruments. The final installation will be completed by 2015.

We have worked with the CEA & IPNO teams to manufacture the following components:

	Radio Frequency Quadrupole (RF window with its antenna)	<ul style="list-style-type: none"> <li>• First structure to shape the bunches and first accelerating cavity, the RFQ has a significant effect on the quality of the beam throughout the rest of the machine</li> </ul>
	Medium Beta Doorknob Transition	<ul style="list-style-type: none"> <li>• Forms part of the power couplers that equip the medium beta cavity of the prototype cryomodule and allows RF matching between the coupler and the RF power source</li> </ul>
	High Beta Cooled Double-Wall Tube	<ul style="list-style-type: none"> <li>• Forms part of the power couplers that equip the high beta cavity of the prototype cryomodule and keeps a coaxial configuration between ambient &amp; cold-cavity temperatures</li> </ul>

## ESS Accelerator Schematic



LEBT: Low energy Beam Transport  
 RFQ: Radio-Frequency Quadrupole  
 MEBT: Medium Energy Beam Transport  
 DTL: Drift Tube Linac  
 HEBT: High-Energy Beam Transport



**PMB Coupler for the ESS Project**

Depending on our customer's requirements, we are able to **adapt our technical approach** and manufacturing techniques to give the highest performing product possible.

**About PMB:** As part of the industrial company ALCEN, PMB's expertise is mainly focused on all technologies relating to particle acceleration (ultra high vacuum, electromagnetic simulation, particle matter interaction). We are capable of providing customized components and systems for a variety of industries, as well as preventive and corrective qualified maintenance of all machines.

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