

(Preliminary) Measurements on TBL PETS tank

CTF3 Collaboration Meeting
January 2009

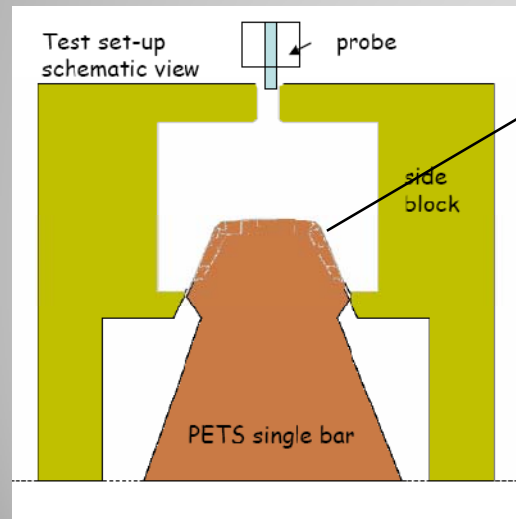
David Carrillo

Outline

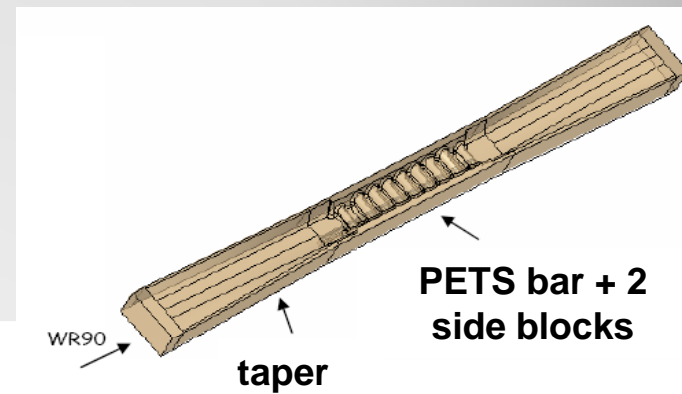
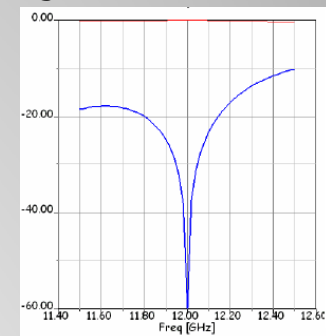
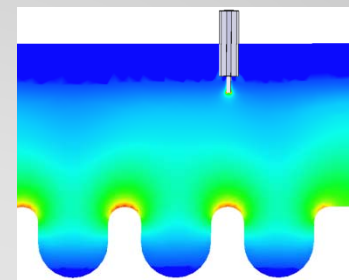
- Single PETS bar measurements
 - Testing device design
 - Measurements
- Eight rods test bench
- First measurements: mode launcher

Single PETS bar measurements: Test device

- A device was designed* to do RF tests of the single PETS bar
- It consists of two side blocks put together with a single PETS bar in order to create inside a mode (TE_{10}) with same phase advance, v_g , etc as the decelerating mode



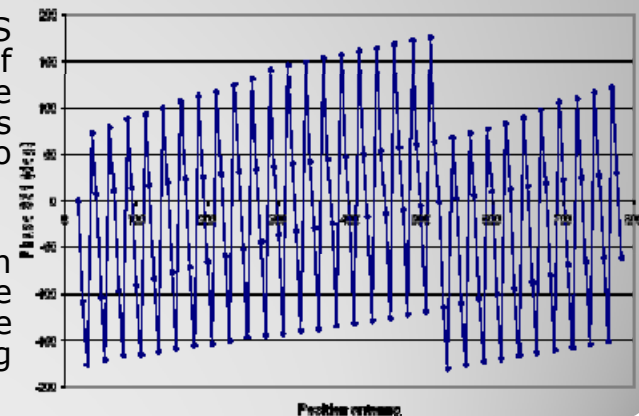
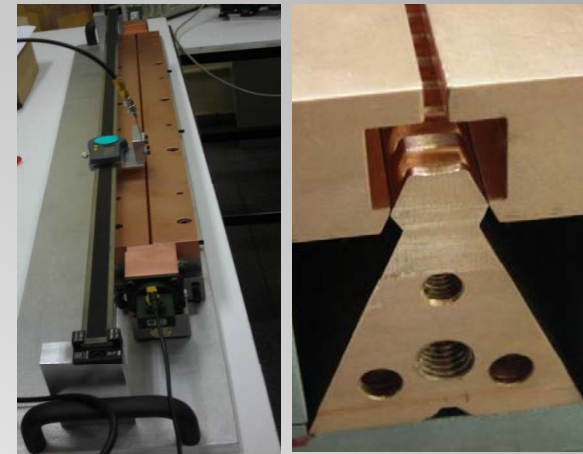
Phase/period=90°
Frequency =11.994 GHz
 $V_g/c=0.466$



**Under Igor Syratchev's supervision*

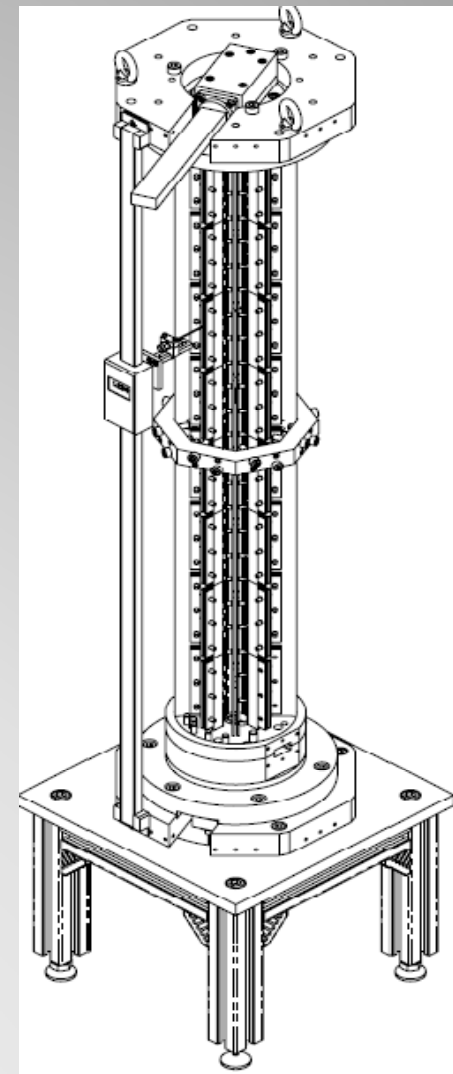
Single PETS bar measurements

- The first 800 mm long bar has been successfully measured with the RF test bench
- There is a -121° phase slip after 770mm (123 cells) displacement, which yields approximately to 89° phase shift per cell (designed for 90°)
- $S_{11}=-33$ dB $S_{21}=S_{12}=-3.2$ dB $S_{22}=-16$ dB
- At 12.062 GHz phase slip is less than 1° along the whole PETS bar. That means a 68 MHz detuning which would produce 13% power lost
- As sharp edges of the device have disappeared, HFSS simulations have been performed: Results show that just if the cross section width of device is 250um shorter, a change of nominal frequency to 12.060 GHz would happen. This could be happening just because the screws are tightened to much (to get a good electrical contact)
- Measurements strongly depend on electrical contact between device and copper rod and we could observe some deformations in the copper. As 3D measuring machine were quite repetitive no more copper rod have been tested using this device



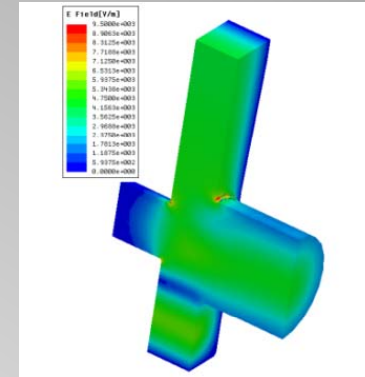
Eight rods RF test bench

- A special test bench has been designed to measure the assembly of rods
- Mode launchers have been optimized to create the working mode in the PETS
- A coaxial antenna will measure the field through the slots between the rods
- First, the mode launchers will be connected together and measured
- Then, the power extractor and the end parts (without the bars) will be measured
- Finally, the complete assembly will be characterized

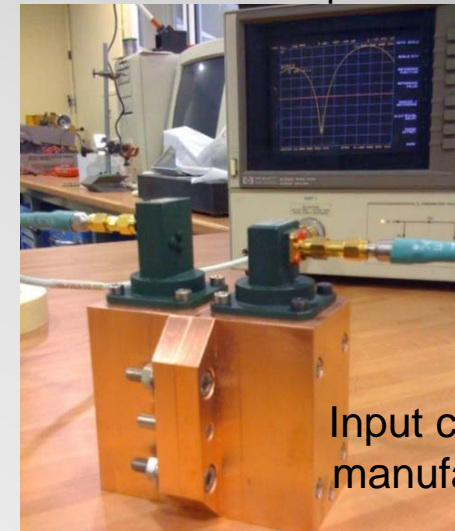


First measurements: mode launcher

- Mode launcher is needed to produce working mode in order to do RF measurements on PETS before final assembly
- Two (equal) mode launchers have been machined
- The two mode launchers have been tested together. $S_{11} = -30\text{dB}$ $S_{22} = -41\text{ dB}$ (Min At 11,989GHz)



HFSS model for input coupler



Input couplers manufactured

Summary

- A custom test bench has been developed to characterize the RF behavior of the first machined copper rod
- Real power loss is expected to be lower because geometric errors of the test bench itself cannot be distinguished from those of the copper rod
- Two mode launchers have been manufactured and measured and they are ok for measuring PETS final assembly
- The complete assembly will be characterized during the following weeks