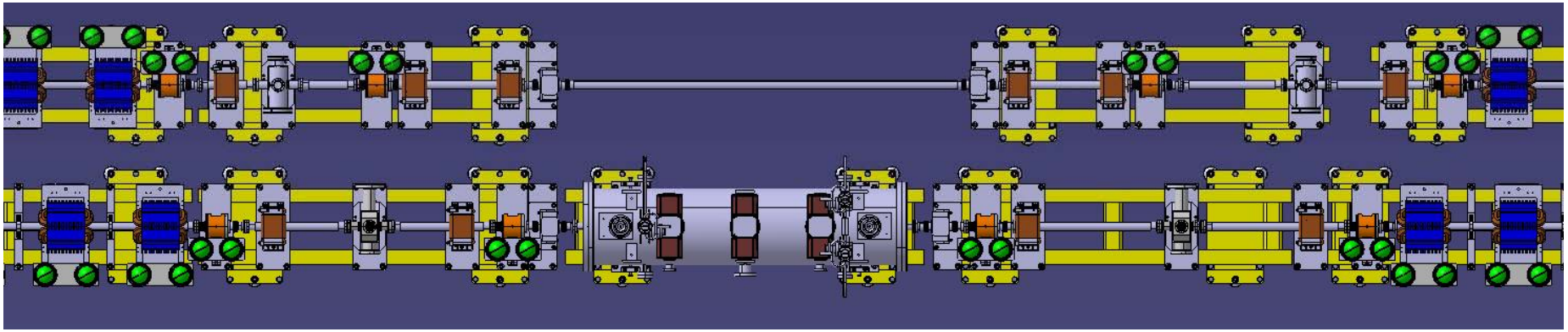
TBTS Design issues and status

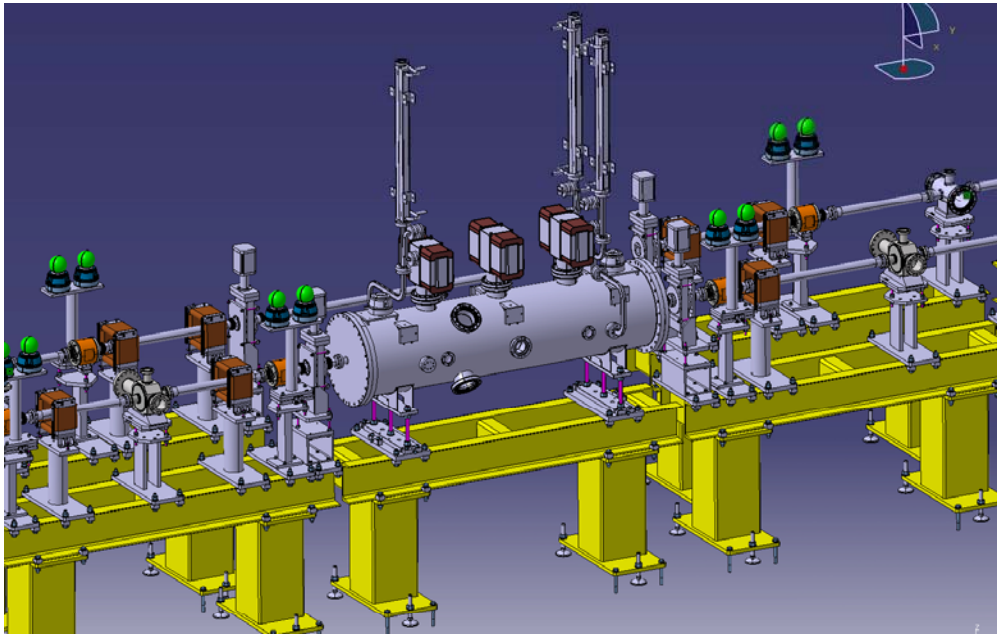
I. Syratchev

PETS target is to generate reliably 136 MW x 250 ns RF pulses

		Test areas		
		X-band klystron test stand at SLAC	Two beam test stand CLEX, CERN	Test beam line CLEX, CERN
		Access to the high power and full pulse length: 250 ns x 300 MW. High rep. rate. RF source driven.	Access to the high power (~200 MW) Pulse length limited to 140 ns. Low rep. rate. Beam driven.	
Objectives	The ultimate PETS high RF power performance	●	●	
	RF power generation from the drive beam		●	●
	Demonstration of the ON/OFF capability		●	
	Study/benchmarking of the beam dynamic in decelerator			●
	Testing of the special RF components	●	●	
PETS design specifics		Scaled (12->11.424) CLIC PETS. Active length **0.23m** Two couplers.	CLIC PETS. Active length **1.0m**. Two couplers	CLIC PETS. Active length **0.8m**. One coupler
Origin and availability		CERN, summer 2008.	CERN, autumn 2008.	CIEMAT, Spain, autumn 2008.

Integration layout for the phase I – PETS power production tests.



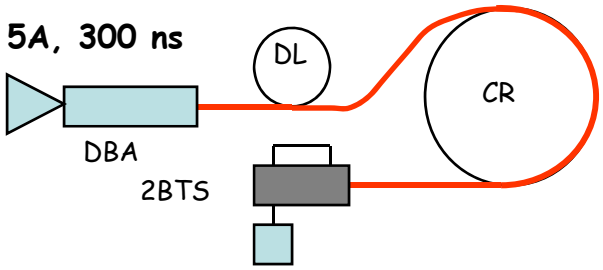


CLEX 2BTS:
Drive beam: 12GHz, 140ns, 30 A (max)
CLIC PETS, active length 1.0 m,
135 MW will be produced with 20.8 A beam.
Access to 270 MW (30 A)

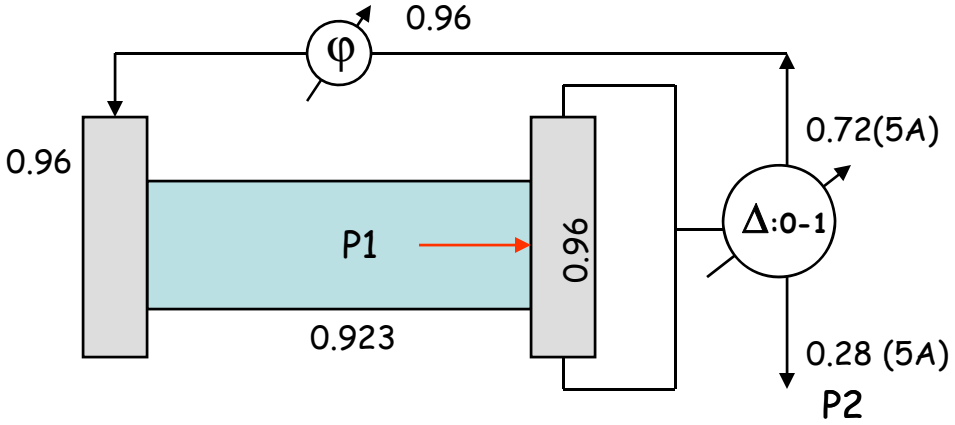
Possible PETS configurations:
#1. PETS/ no damping material
#2. PETS/ with damping material
#3. PETS with recirculation (access to the full pulse length and power)

Phase 1: PETS with re-circulation

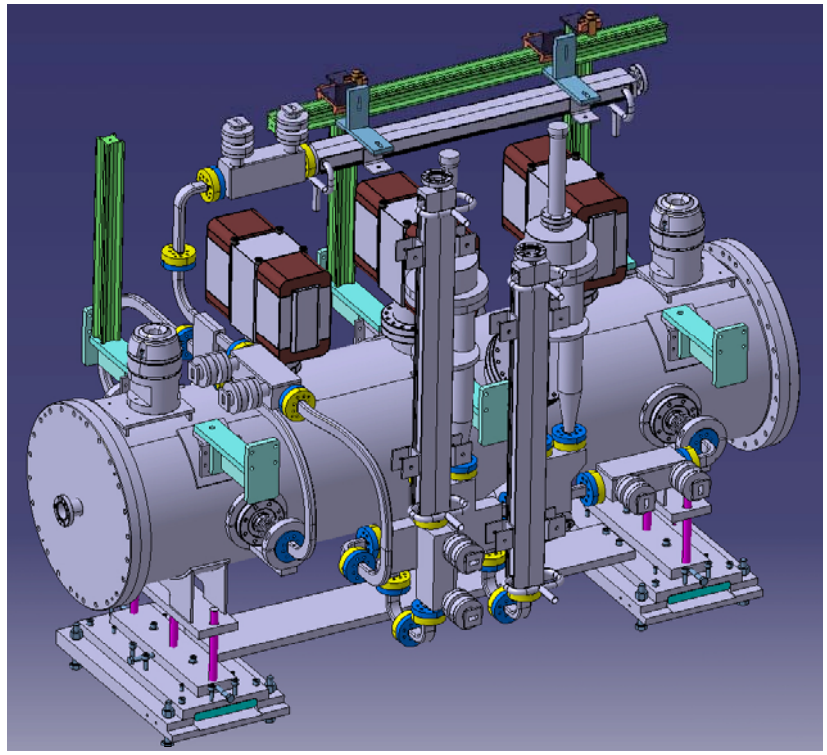
In the CTF3 the PETS high power mode (high current) is limited in the pulse length by 140 ns. The re-circulation is a method to increase significantly power production and thus the drive beam current can be used directly from DBA (5A, 3GHz). In this case current pulse can be increased up to 300-400 ns.



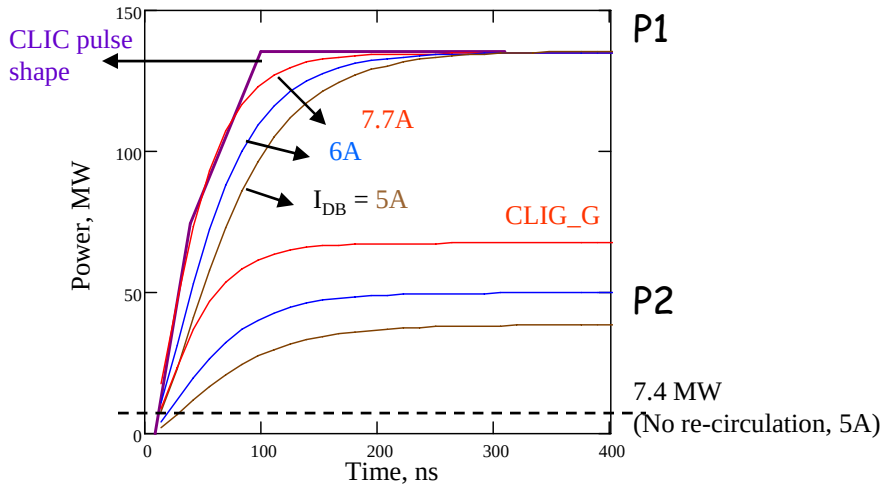
PETS with recirculation schematic:



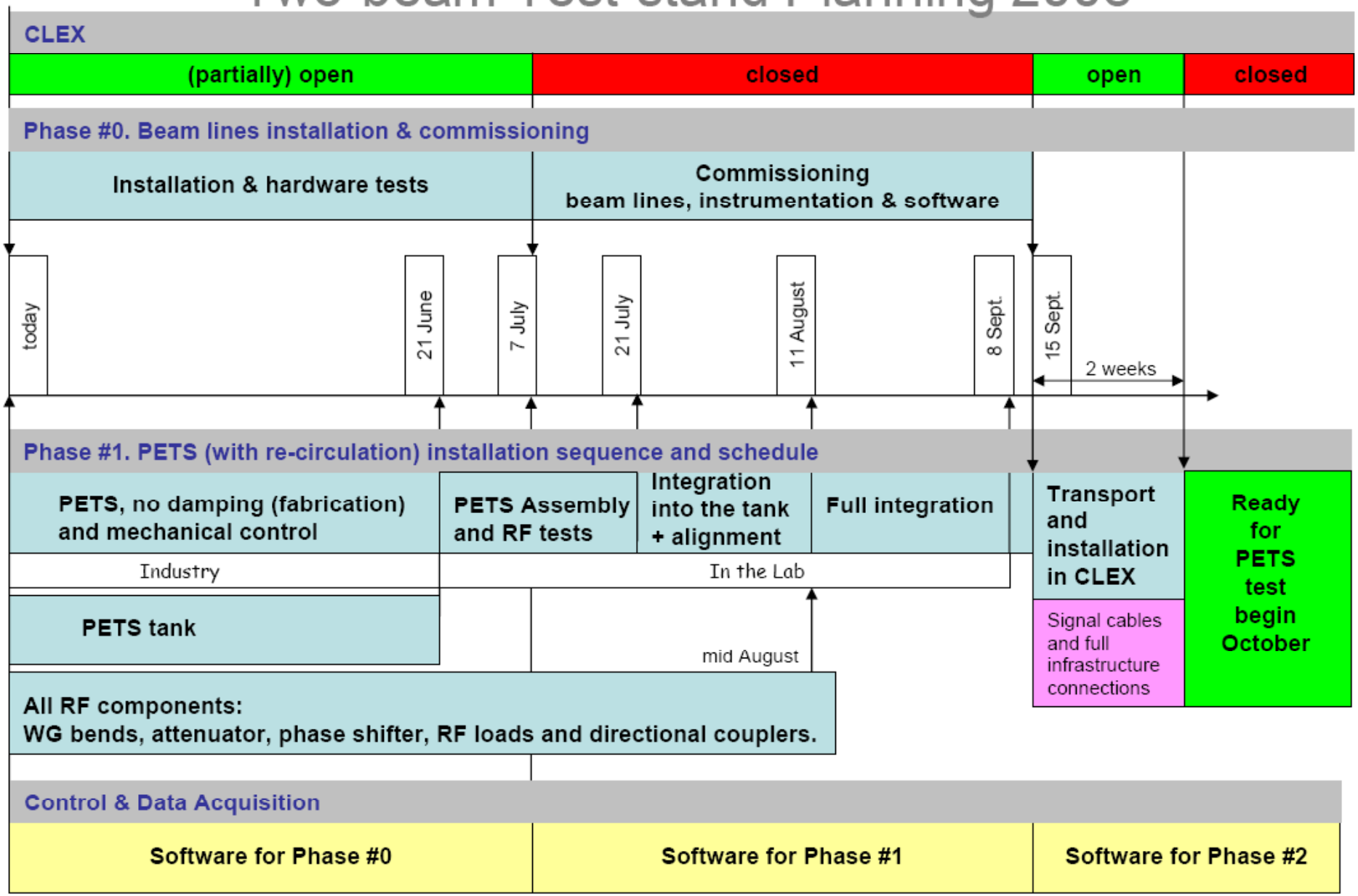
T =13.9ns
η =0.82
L_{PETS}=1 m
L_{WG} = 1.8 m



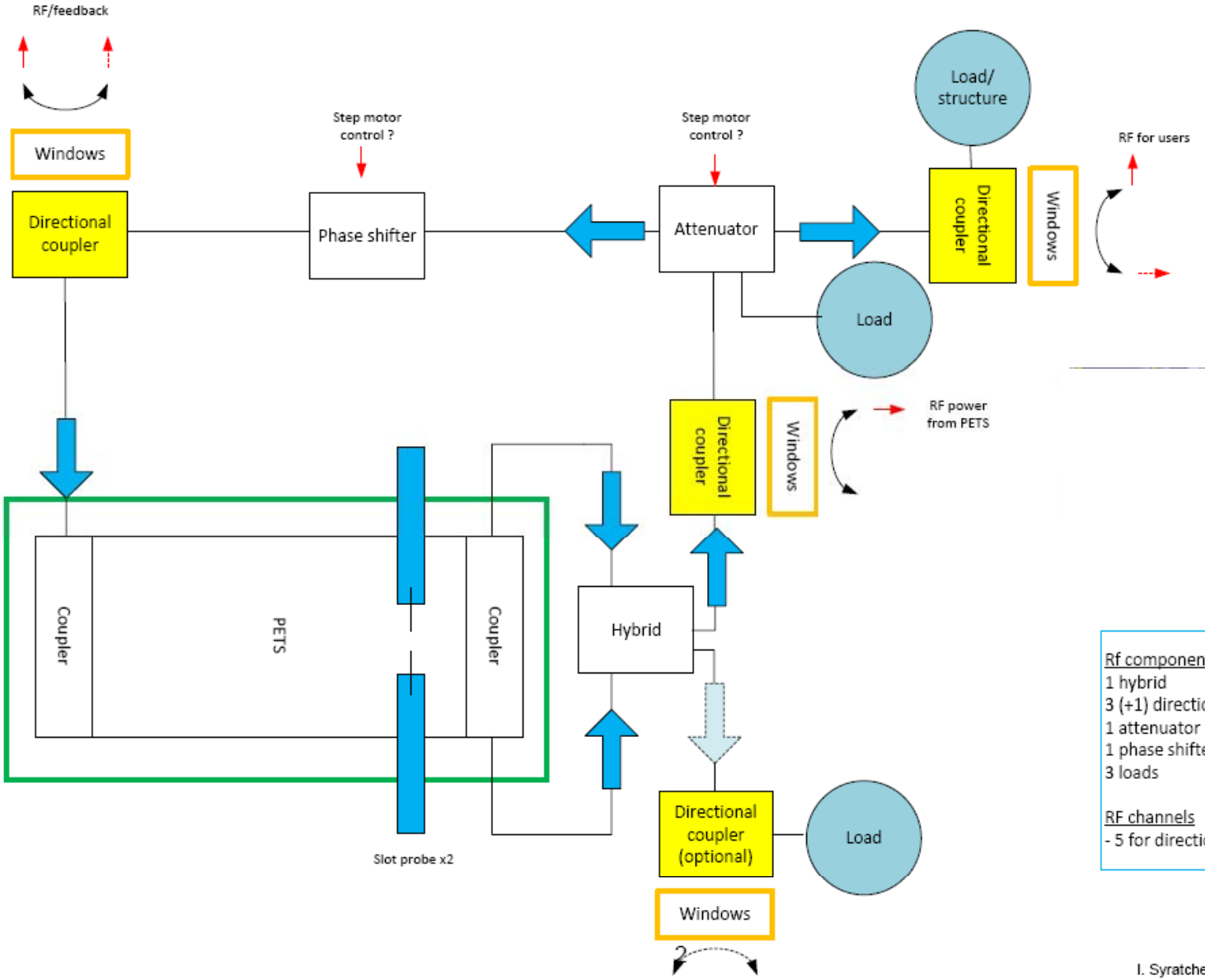
Optimized (coupling) RF pulse shapes



Two-beam Test-stand Planning 2008



Two beam test stand – Phase 1, PETS with recirculation



Rf components:
1 hybrid
3 (+1) directional couplers with windows
1 attenuator
1 phase shifter
3 loads

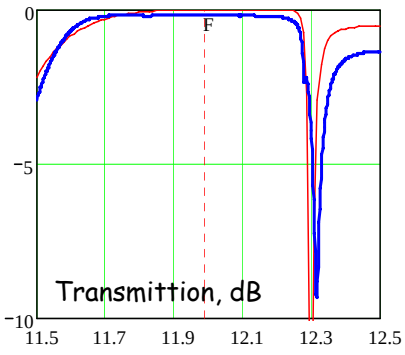
RF channels
- 5 for directional couplers

I. Syratchev, G. Riddone, last update 20080317

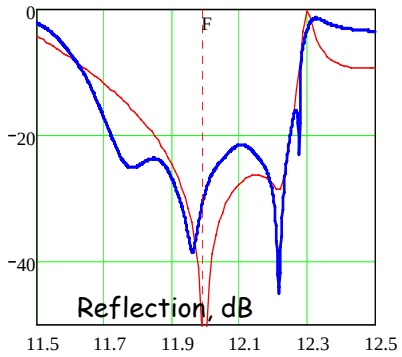
12 GHz PETS hardware status (to date)

PETS Power couplers (~ready)

Measured data, (before brazing) couplers face-to-face: blue. HFSS simulations for 1 coupler: red



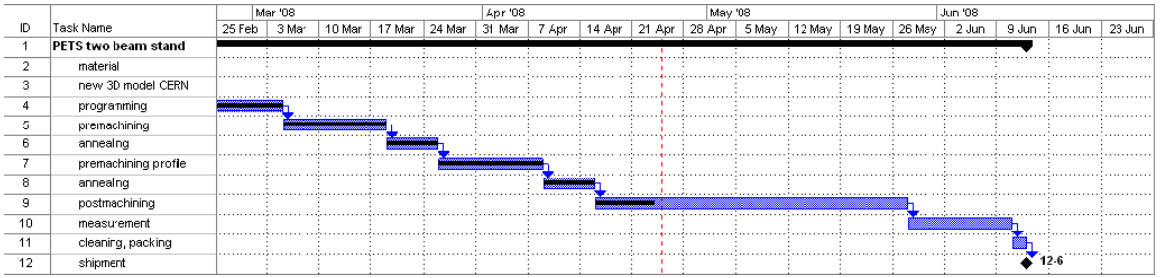
Frequency, GHz



Frequency, GHz

PETS cooling and assembly systems (under schedule)

8 PETS bars (supplied by VDL, Holland): at CERN in June



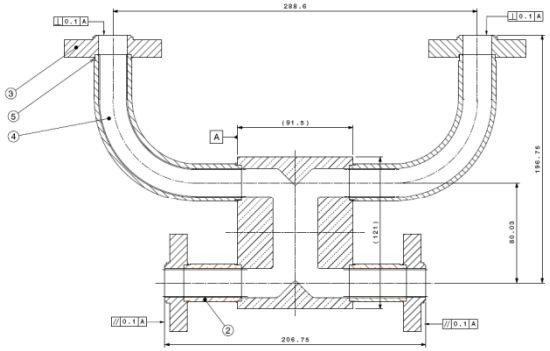
PETS tanks (x2, manufactured in Pakistan): under leak test, at CERN in June

12 GHz RF components status (to date)

Directional coupler

GYCOM, Russia

Hybrids

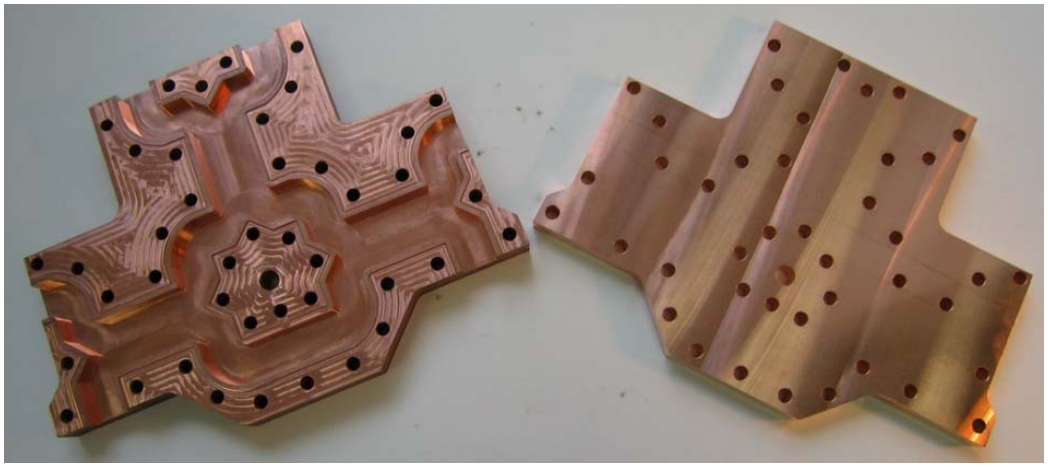


RF and mechanical design, CERN
Fabrication in CINEL, Italy
First prototype in May
Series (x4) in June

Dry (stainless steel) RF load

RF and mechanical design, CERN
Fabrication in CINEL, Italy and VDL, Holland
Prototypes under completion
Series (x8) at CERN in July

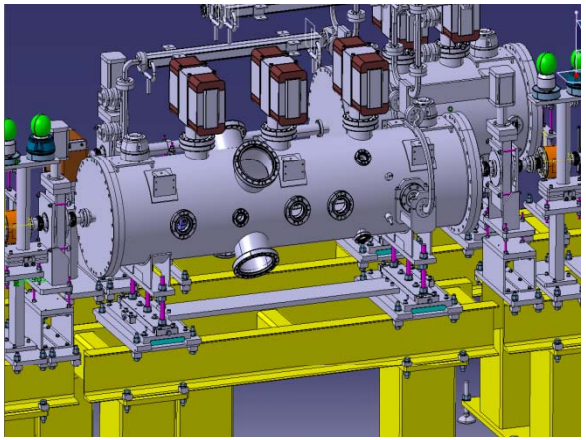
Attenuator/splitter

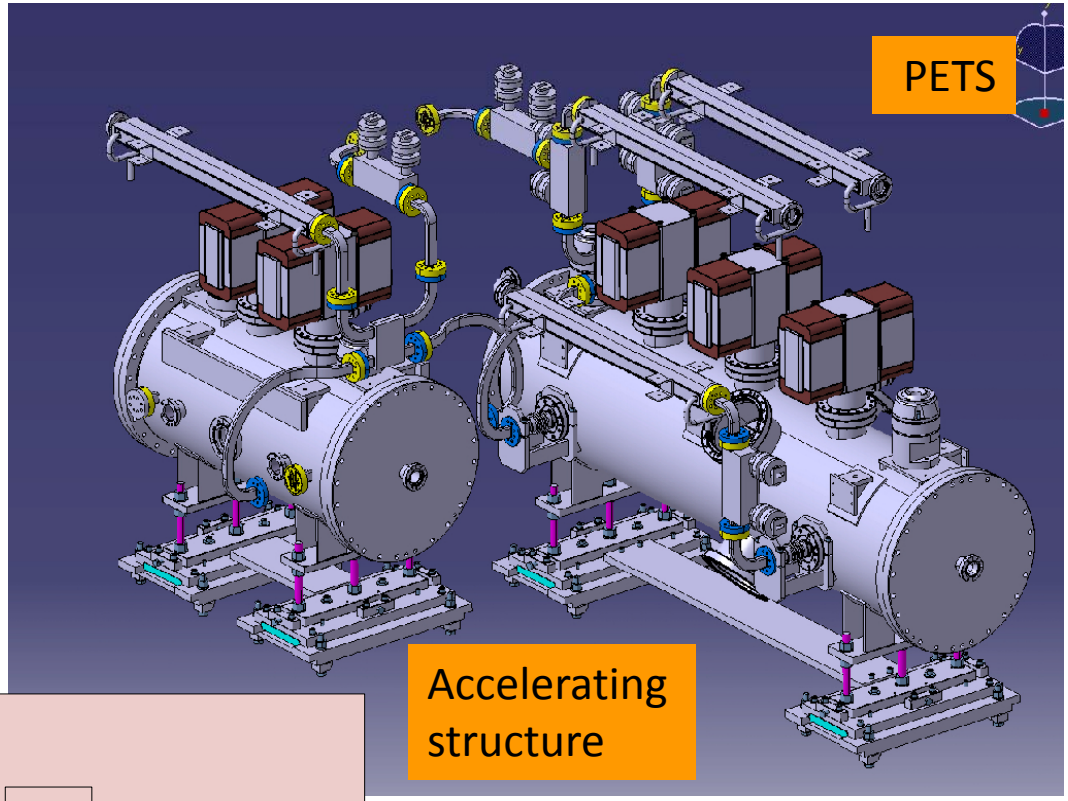


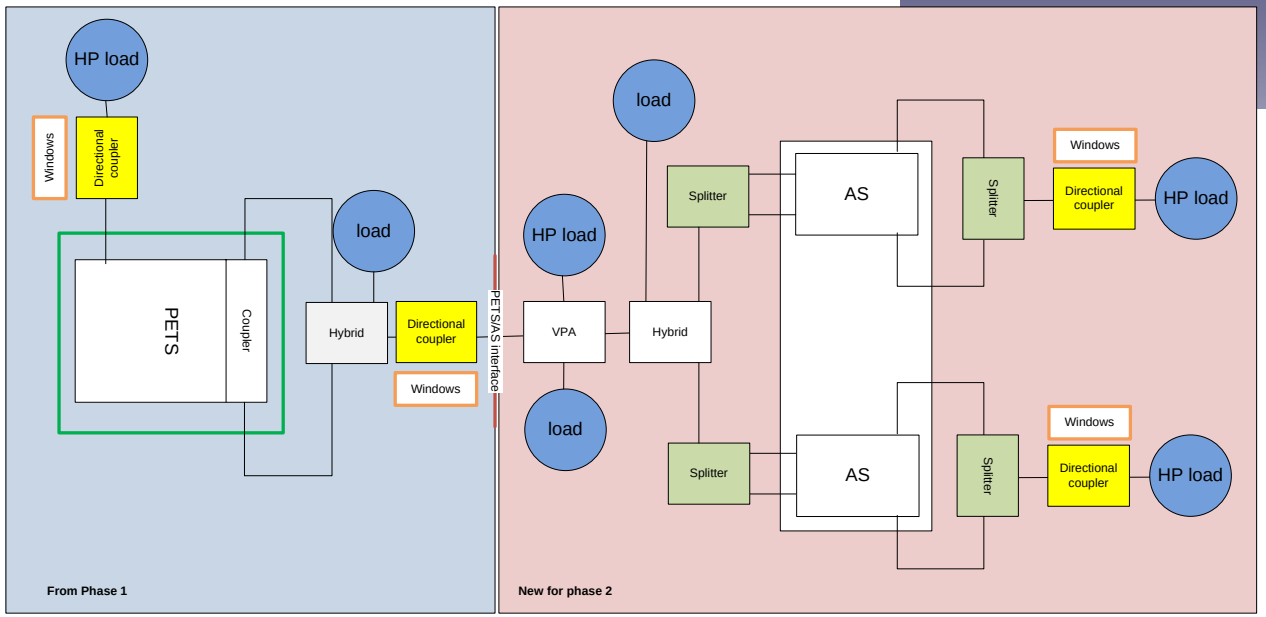
Scaled from 30 GHz CERN version.
GYCOM Russia.

First prototype in may
Second unit in Jul
Series (x2) in Aug

PHASE 2: Two-beam acceleration







I. Syratchev, G. Riddone, last update 20080417