SLAC workshop 7-10 July 2009
WP1: microwave based accelerators

Status of CLIC X-band high-power components

G. Riddone, 08.07.2009

(contribution from A. Olyunin and I. Syratchev)

Overview

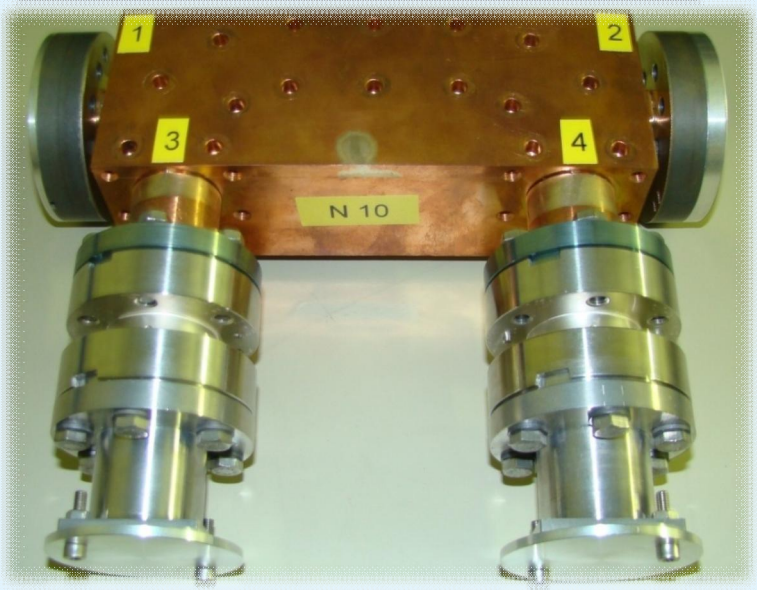
Areas	Type	Design	Supplier	Ordered
Conventional devices for several areas	50 dB directional couplers 3 dB hybrid 3 dB H-plane splitter Dry stainless steel RF load Waveguide E/H bends RF flanges (CERN design)	Gycom CERN CERN CERN CERN CERN	Gycom CINEL, IHEP VDL VDL, CINEL, Heeze Several CINEL	10 15 10 15 5
TBTS	Attenuator/splitter (0->1) RF phase shifter (360 °)	Gycom Gycom	Gycom Gycom	3 1
Stand alone power source, PSI.	H10 -> H01 mode converter RF/vacuum valve (A. Grudiev)	Gycom/ SLAC SLAC	Both RF and mechanical design exist at 11.4 GHz	CEA/ Saclay
PETS on-off	3 port waveguide junction (T-splitter) contact free high power movable short circuit tunable reflector RF network	CERN	Under design	
CLIC Module	Choke mode flange	CERN	CERN	2

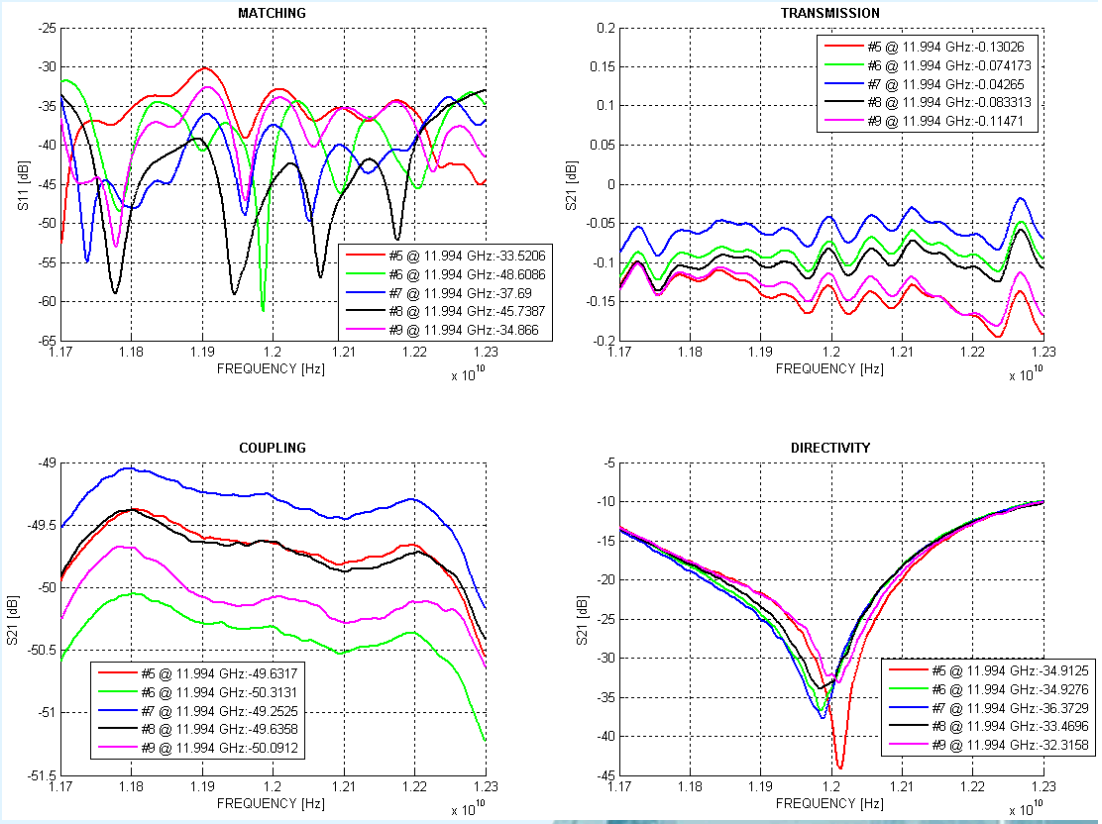
Components needed for several collaborators: KEK and SLAC, as well as PSI (XFEL), Trieste (Elettra), TERA foundation

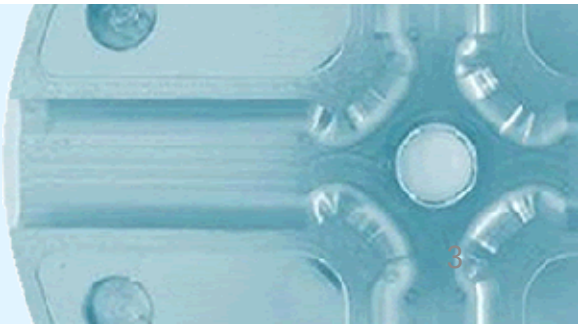
Directional couplers

First order completed (10 units)

New specification under preparation (aim at more compact design) for 5 additional units to covers needs from the collaborators

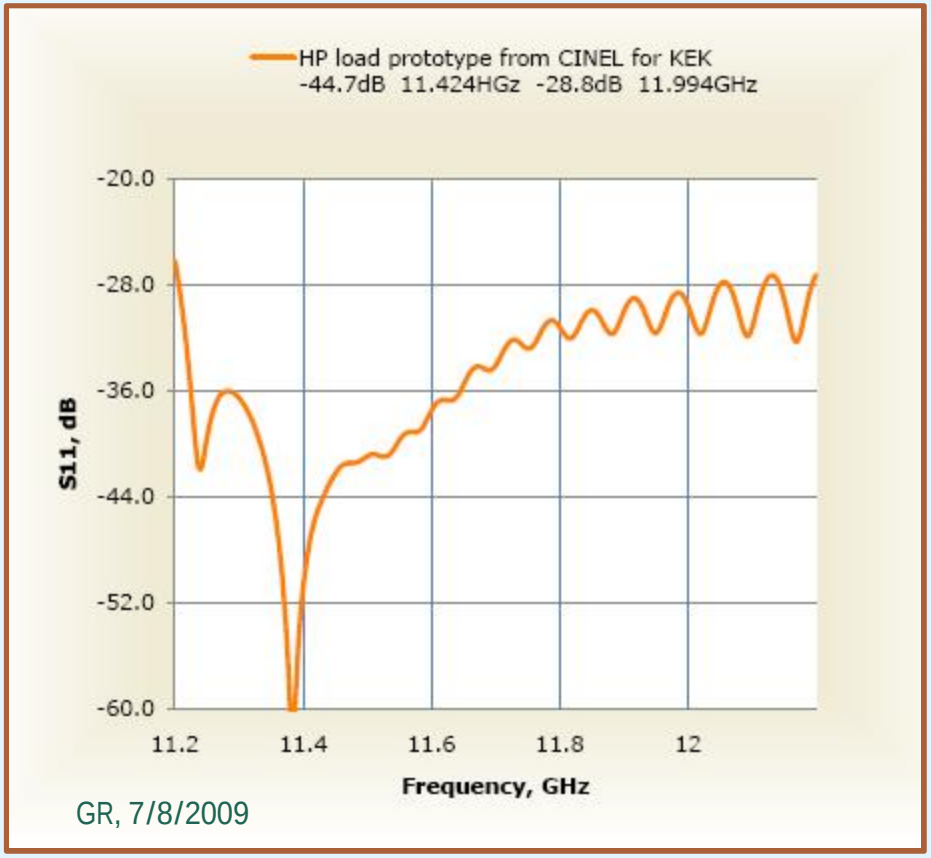






Dry stainless steel RF loads

The two halves of the load



GR, 7/8/2009

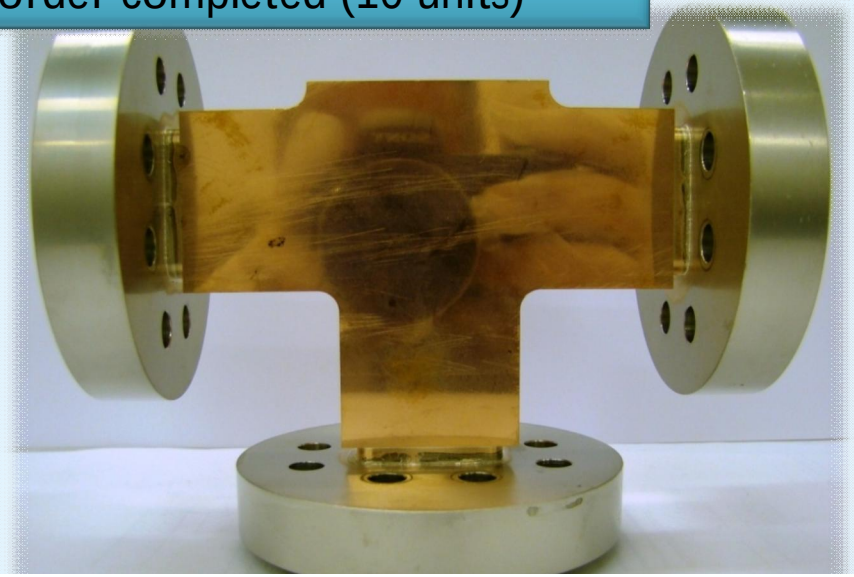
10 loads received from CINEL and VDL (material AISI316LN)

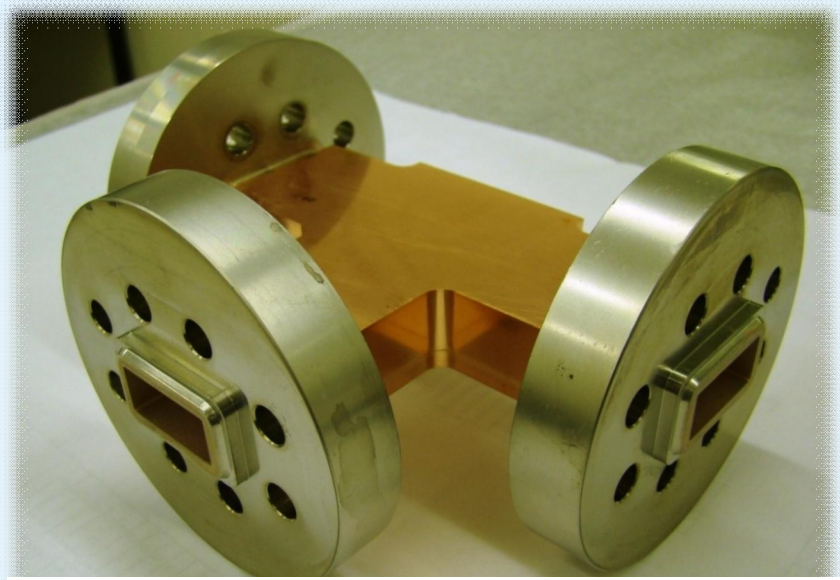
To improve performance ➔ changed material magnetic stainless steel SS430 – 5 additional loads from CINEL and Heeze under fabrication (2 available at CERN for testing at KEK/SLAC)

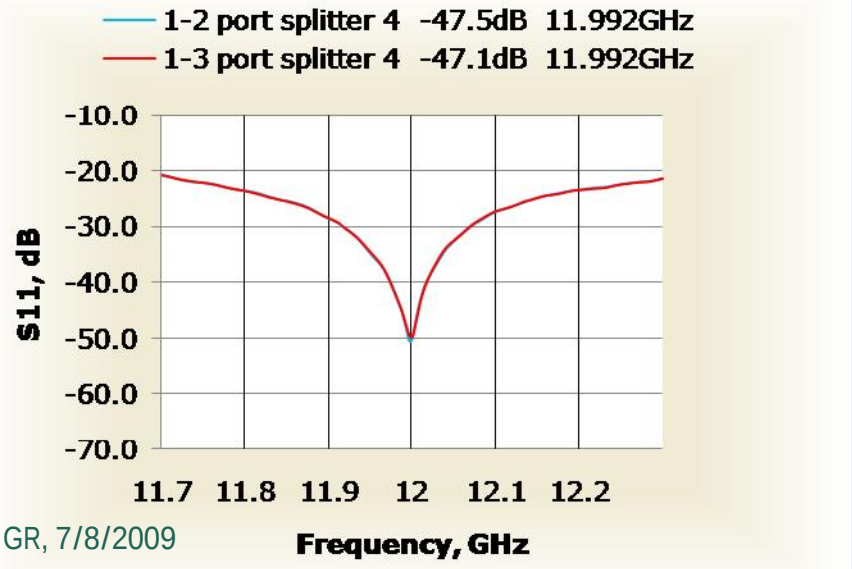
3rd order will have to be foreseen for collaborators

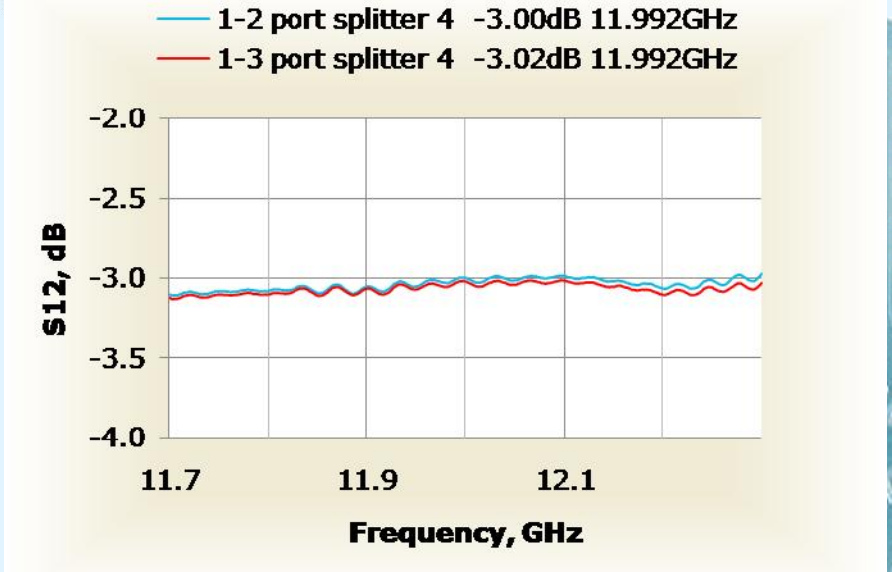
3 dB H-plane splitters

order completed (10 units)



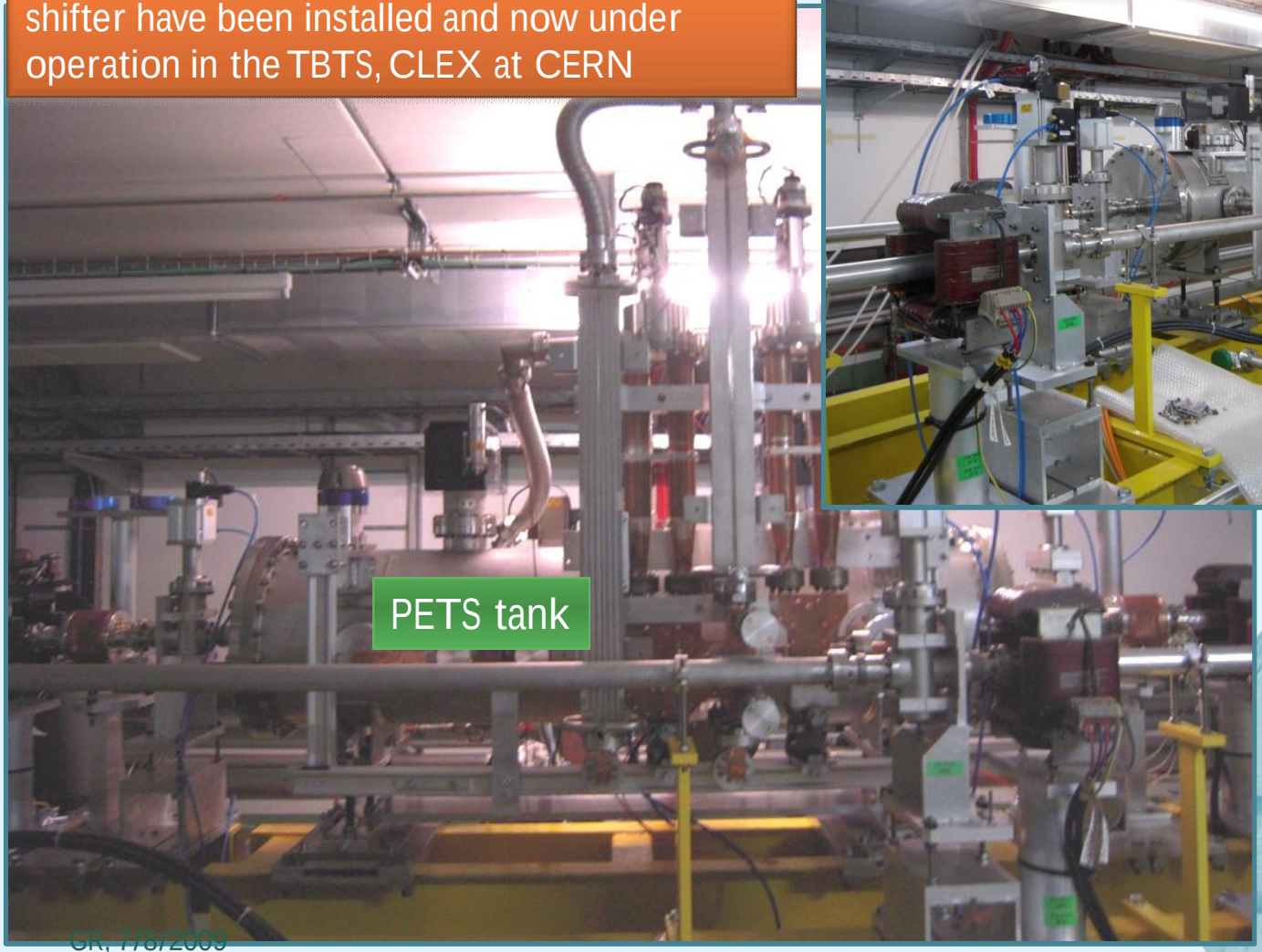






Two-beam test stand in CLEX

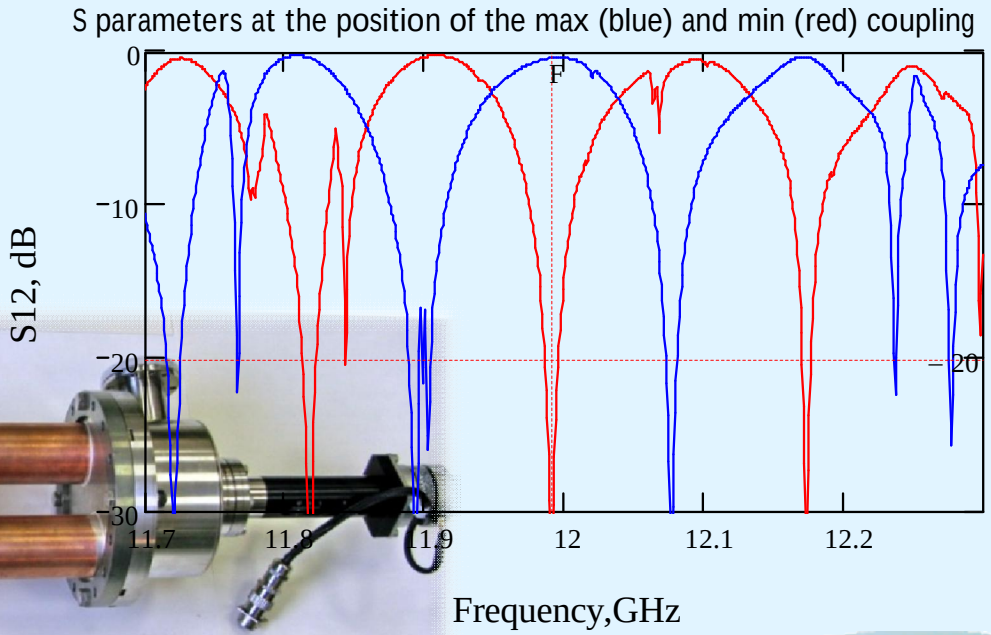
A number of RF components: directional couplers, loads, variable splitter and phase shifter have been installed and now under operation in the TBTS, CLEX at CERN



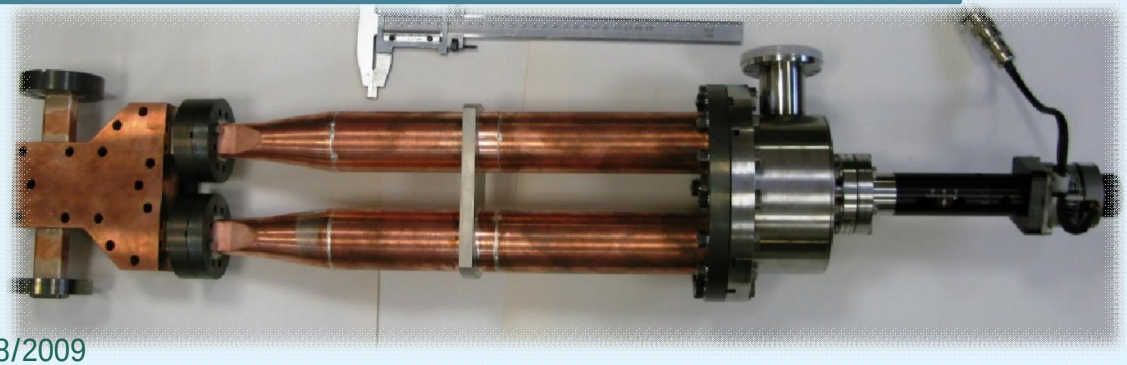
Attenuator/phase shifter

order completed (3 attenuators and 1 phase shifter)

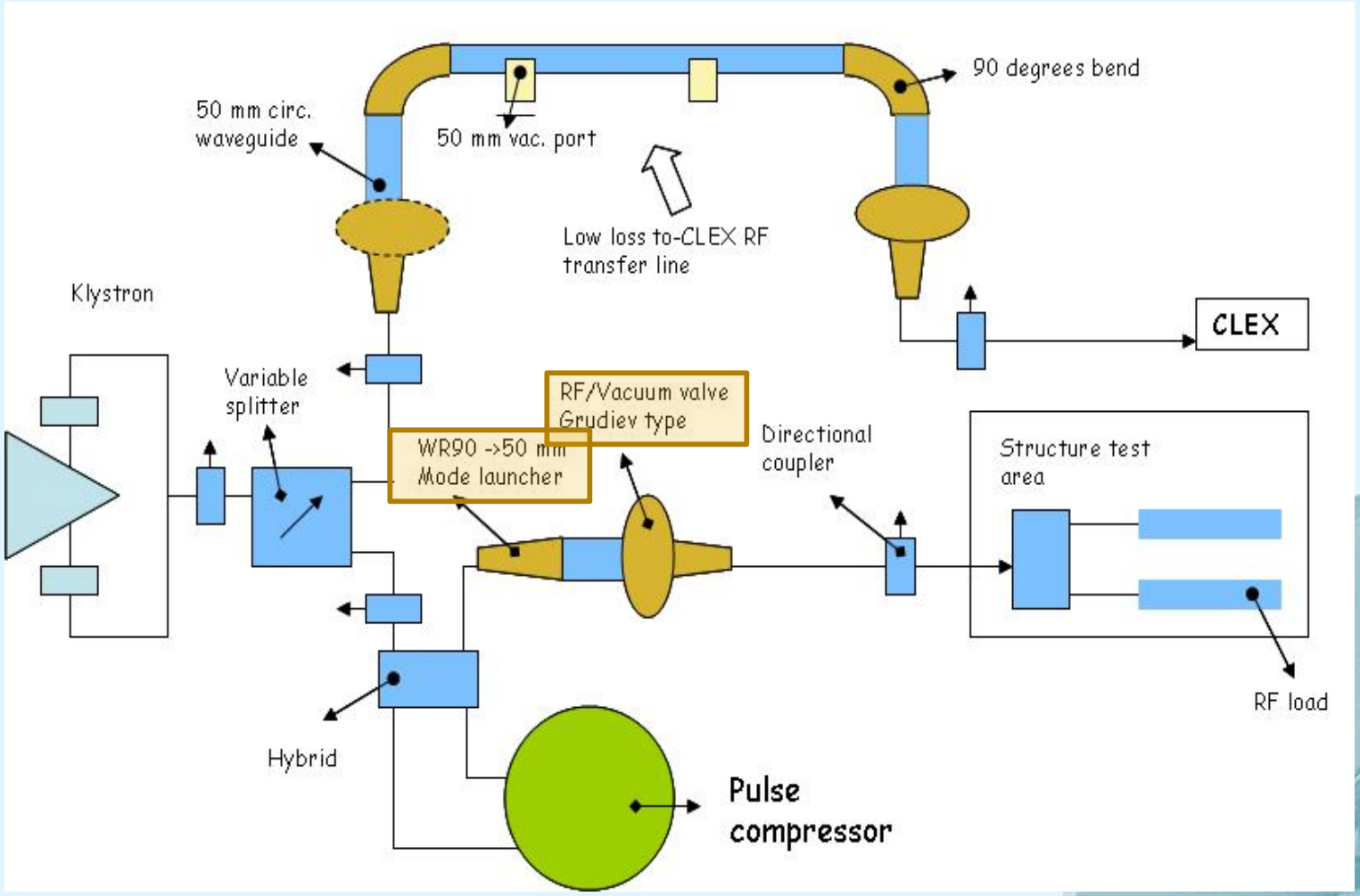
Attenuator (Variable high power RF power splitter)



Phase shifter (Variable high power RF phase shifter)

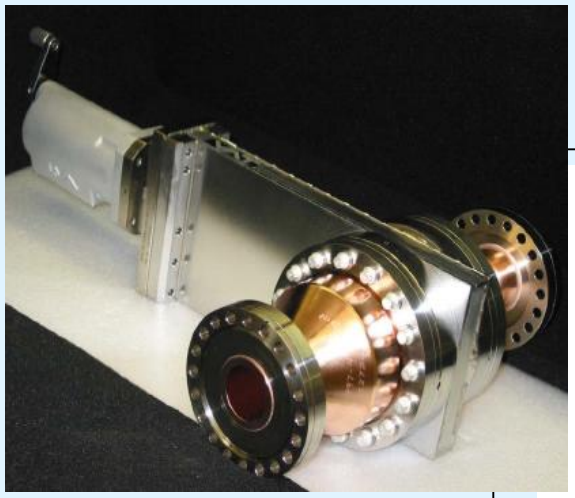


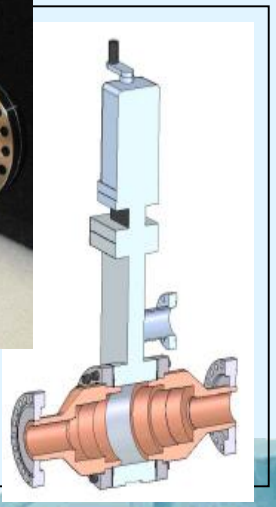
12 GHz stand alone RF power source waveguide network layout



12 GHz stand alone RF power source waveguide network layout

11.4 H10 -> H01 mode converter
SLAC design



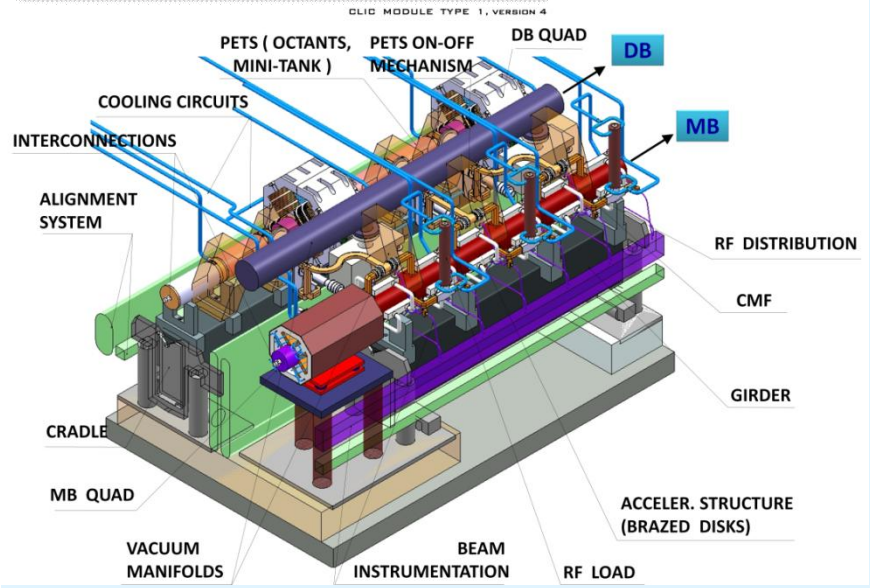


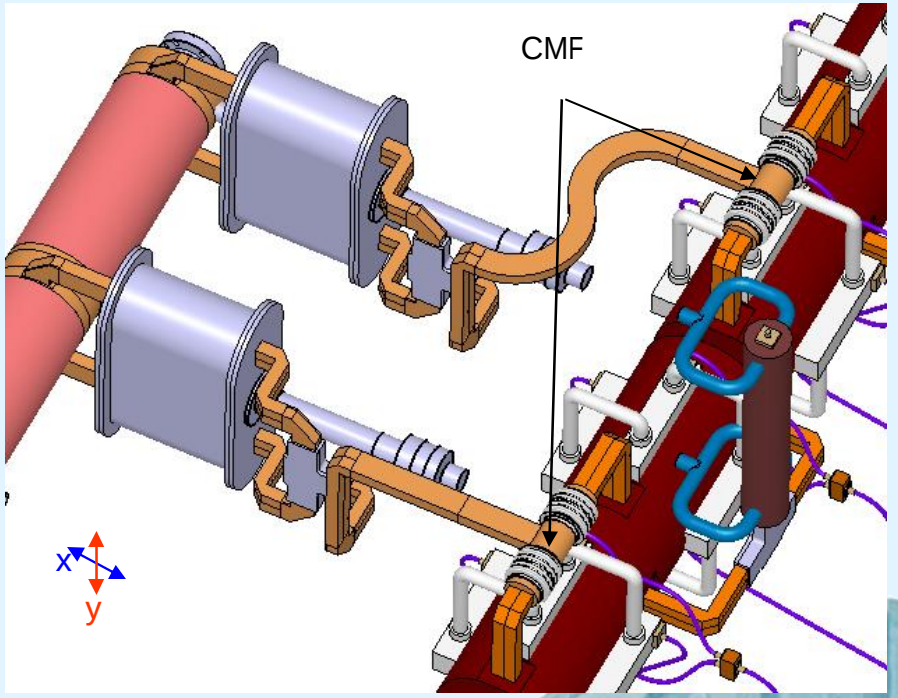
11.4 GHz Gate valve
(Grudiev type)
SLAC design – rescaled to 12 GHz

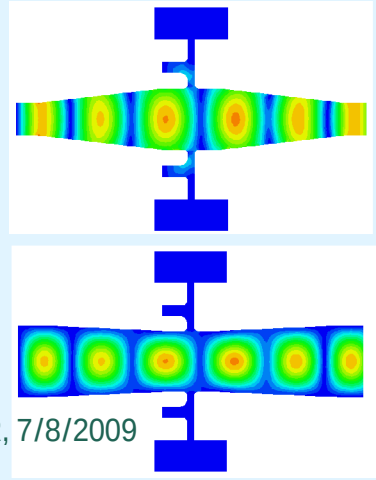
H10 -> H01 mode converter
CERN design (needed for PETS on-off)

CLIC waveguide network

CLIC two-beam module







Dynamic range for the accepted performance (S11< -45 dB)

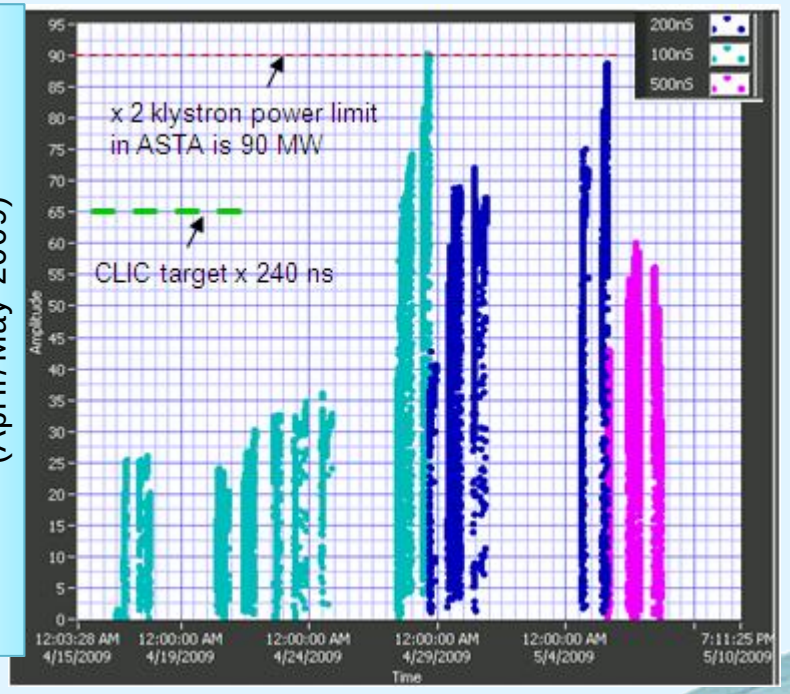
- X – shift: ± 0.25 mm
- Y – shift: ± 0.5 mm
- Z – shift: ± 0.5 mm
- Twist: < 5^0

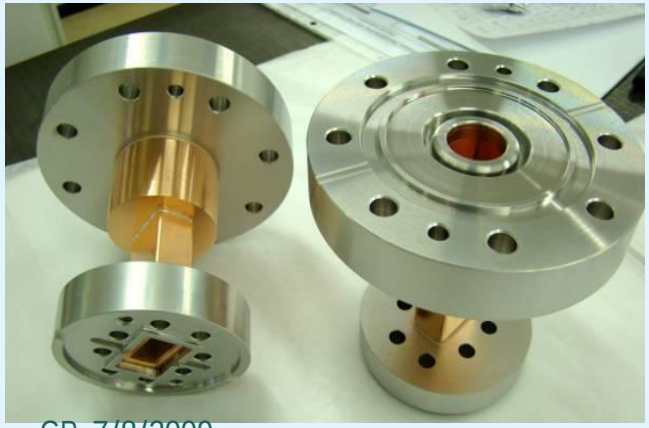
To allow the independent transverse alignment of the two linacs in CLIC, the special, contact-free choke mode flanges (CMF) are planned to be used

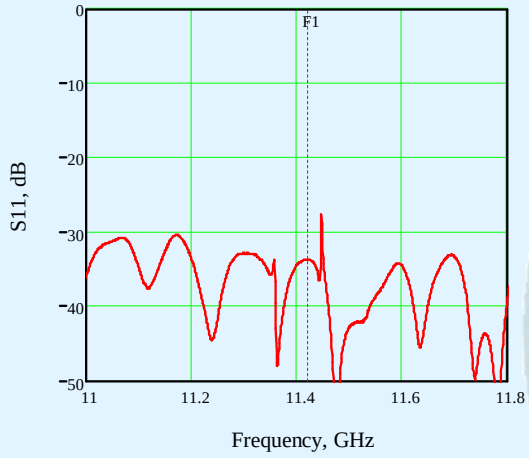
CLIC waveguide network

11.424 GHz choke mode flange prototype (2 units) – no adjustment capability

CMF high power tests at SLAC (April/May 2009)







Next step
11.424 GHz choke mode flange with adjustment capability is under design

Conclusions

- An extensive program for X-band RF waveguides components development have been established in CERN.
- We have designed, fabricated and received all the components necessary to start the high RF power operation of the TBTS and the first stage of the TBL. A number of them are already installed and are in operation.
- First loads in SS43 for KEK and SLAC available in the coming weeks.
- New simplified designed for the PETS on-off mechanism (based on proven components) is under way. The test in the TBTS is foreseen 1Q 2010
- Recently, in Europe, the X-band activity has significantly grown. The number of Labs have expressed their interests in using the X-band technology for their needs. New orders have been launched to cover needs from different collaborators.