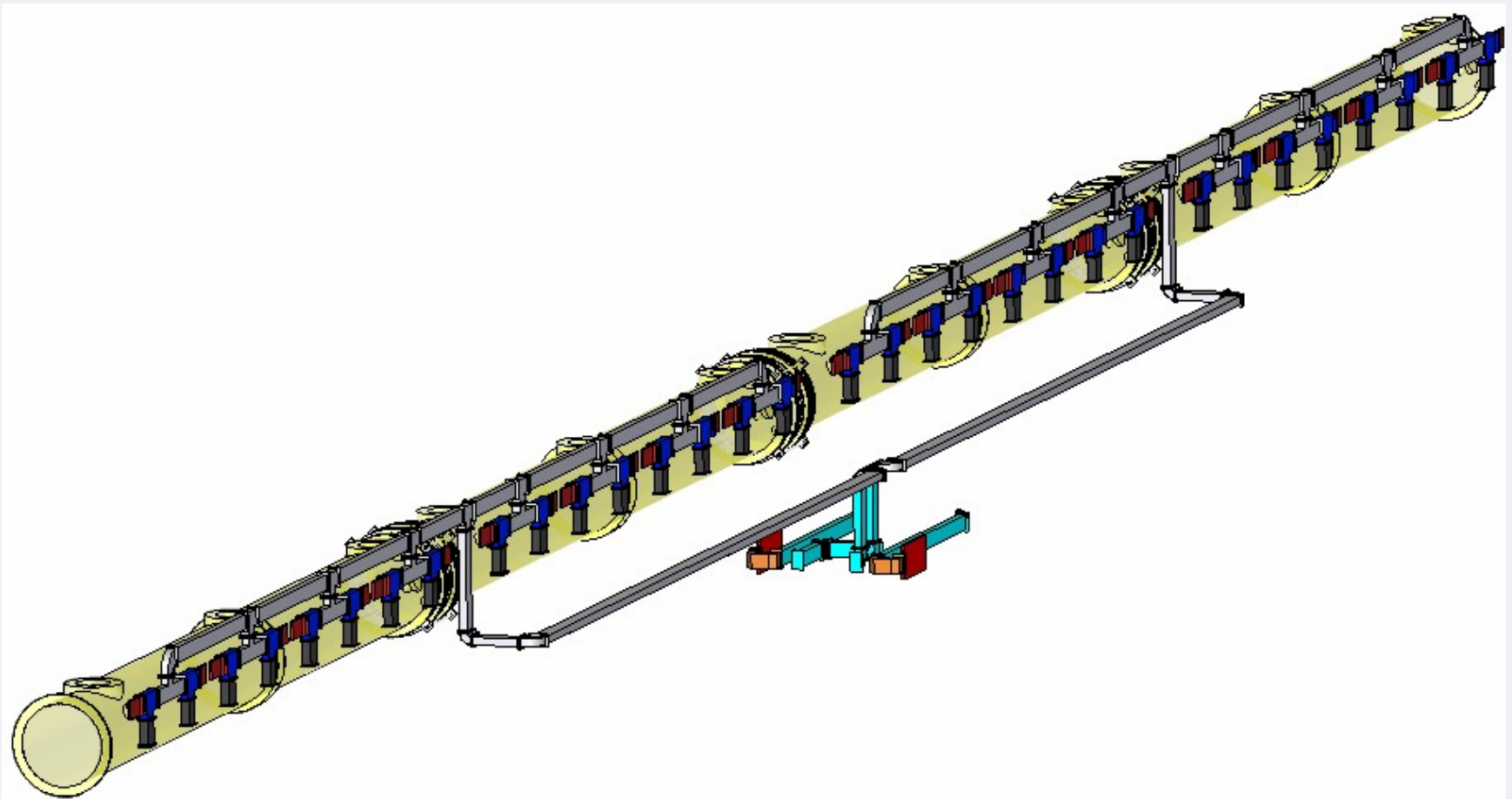


XFEL waveguide distribution and more...

V.Katalev

Waveguide distribution for XFEL

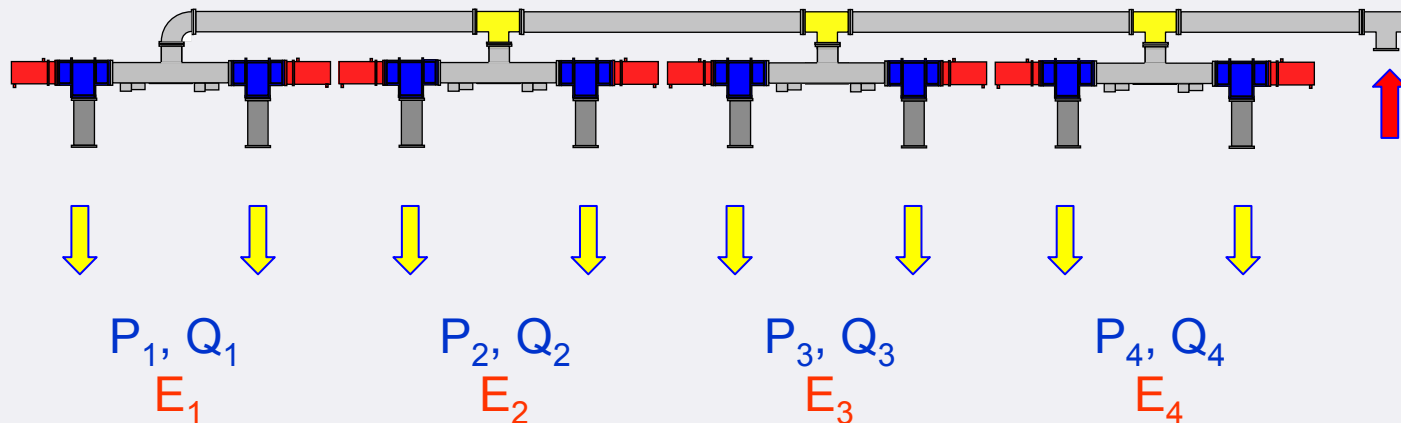


Waveguide distribution for XFEL

Combined system with asymmetric shunt tees

is tunable waveguide system!

There is no more the "weak cavity" limit in cryomodule!



Cavity gradient range from 18 to 35 MV/m
(from above limited by circulator only)

Waveguide distribution for XFEL

Isolator

(s.p.a. FERRITE, St.Petersburg)

(Circulator with integrated dummy load)



<i>Peak input power, kW</i>	350
<i>Average power, kW</i>	5
<i>Frequency, GHz</i>	1.3
<i>Min isolation, dB</i>	>30
<i>Max insertion loss, dB</i>	≤0.08
<i>Input SWR</i>	1.15
<i>(for full reflection and every phase)</i>	

Waveguide distribution for XFEL

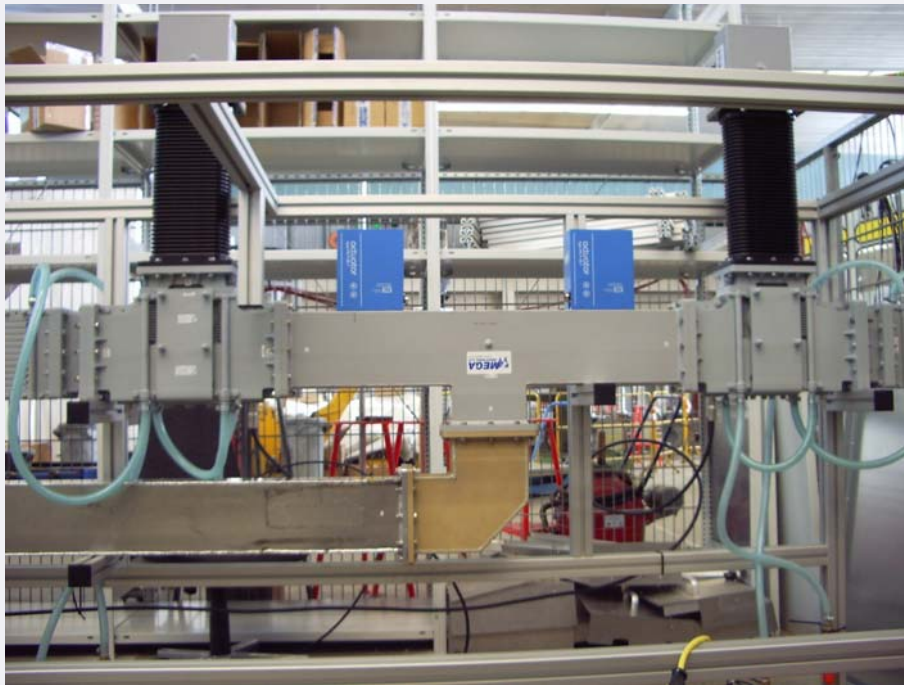
Symmetric Shunt Tee with integrated Phase Shifters

(MEGA Ind, US & Micro Plus, Bulgaria)



Waveguide distribution for XFEL

Binary cell of the waveguide distribution system for FLASH cryomodule
(prototype of the XFEL distribution system)



Waveguide distribution for XFEL

Fixed phaseshifter

(MEGA Ind, US)



SWR < 1.04
 $\varphi = 62^\circ - 64^\circ$

Waveguide distribution for FLASH

Waveguide distribution for ACC6 (XFEL prototype)



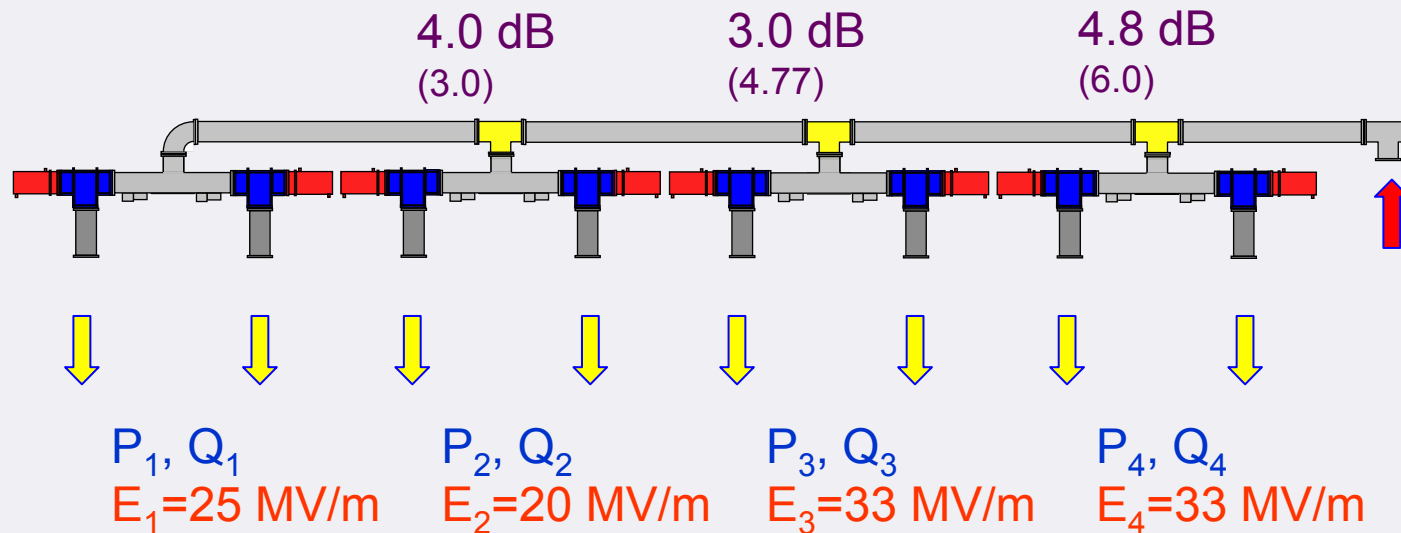
Waveguide distribution for FLASH

Waveguide distribution for ACC6 (XFEL prototype)



Waveguide distribution for FLASH

Waveguide distribution for ACC6 (XFEL prototype)



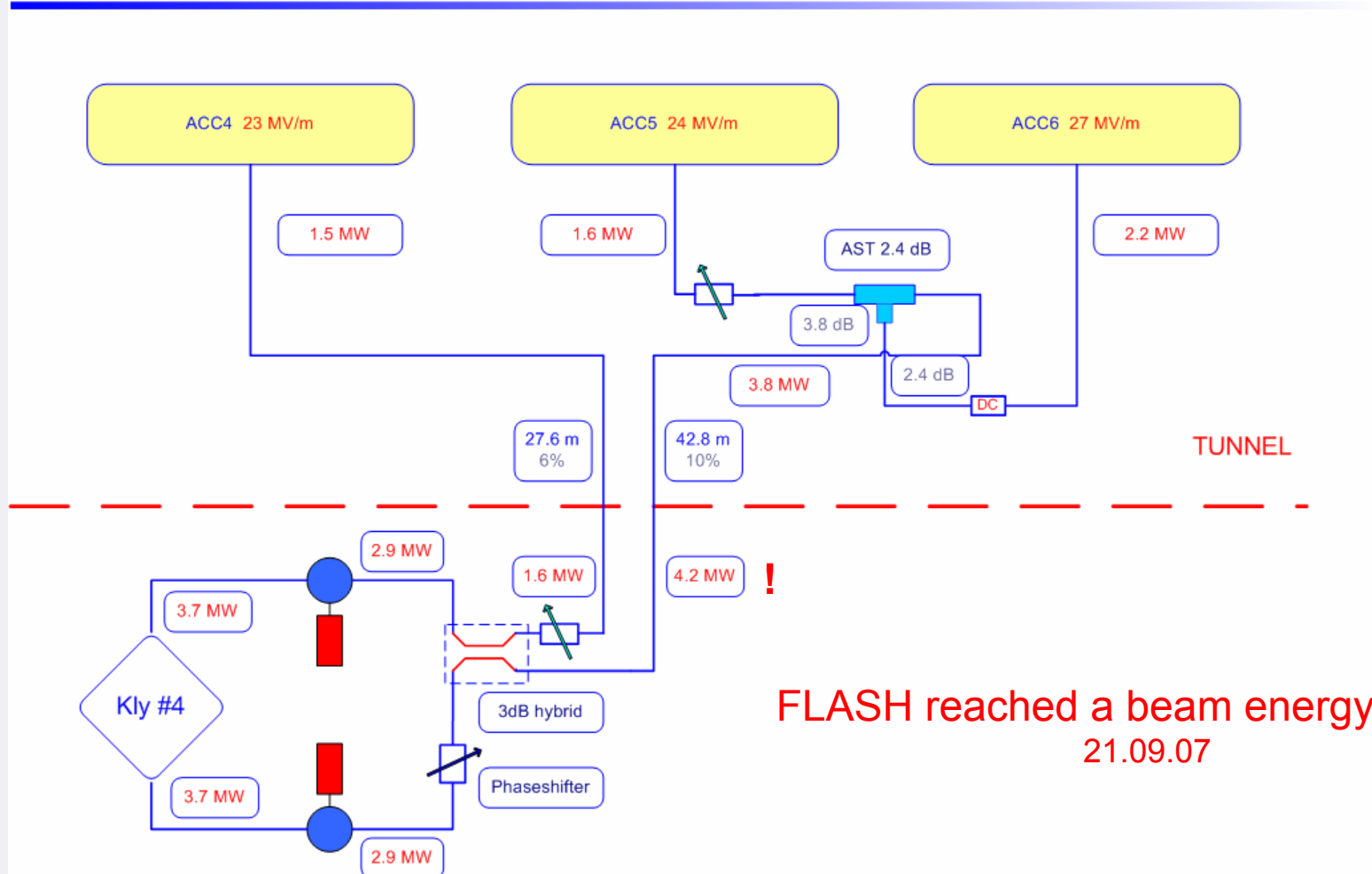
Waveguide distribution for FLASH

Waveguide distribution for ACC6 (XFEL prototype)

	ACC6 25,4 MV/m		211 MeV				152 MeV			
Pin, MW	2,01		RF power		OK					
Qext	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0		
A, dB	7,85	7,54	8,16	8,31	12,27	12,03	10,28	10,37		
Pcav, kW	330,3	354,7	307,5	297,1	119,4	126,1	188,7	184,9	1908,7	104
Ecav, MV/m	30,48	31,59	29,41	28,91	18,32	18,84	23,04	22,80	25,4	MV/m
	Cav 1	Cav 2	Cav 3	Cav 4	Cav 5	Cav 6	Cav 7	Cav 8		

Waveguide distribution for FLASH

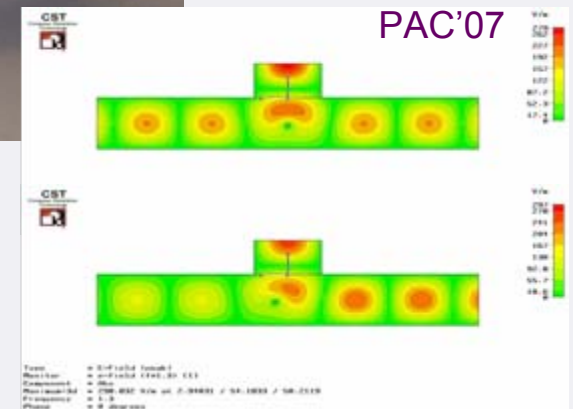
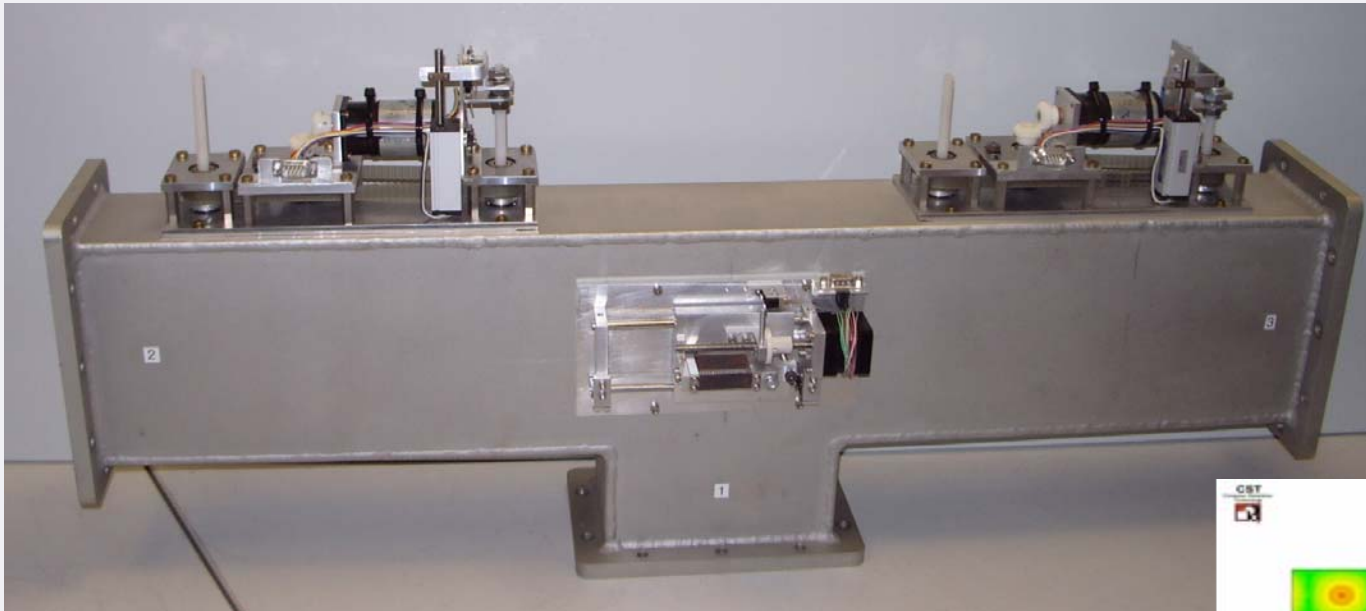
Waveguide distribution for klystron #4 (status 06.08.07)



FLASH reached a beam energy 1 GeV!
21.09.07

Waveguide components

Phase-compensated Power Splitter (tunable)



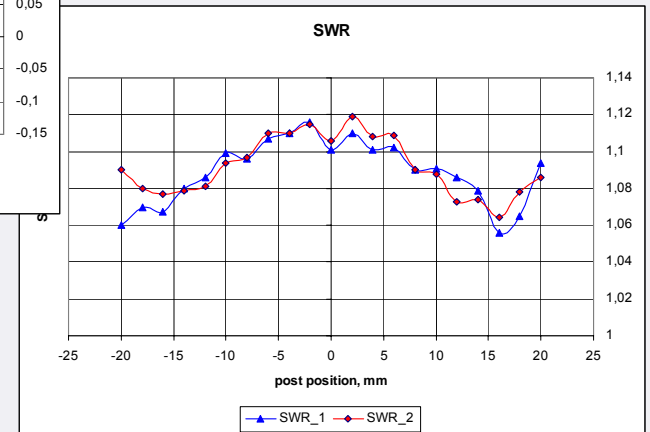
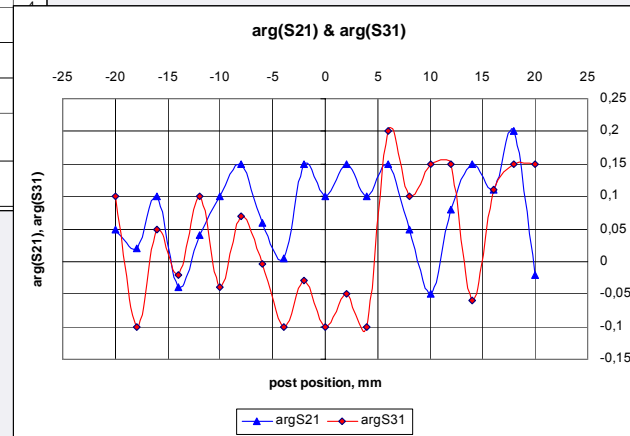
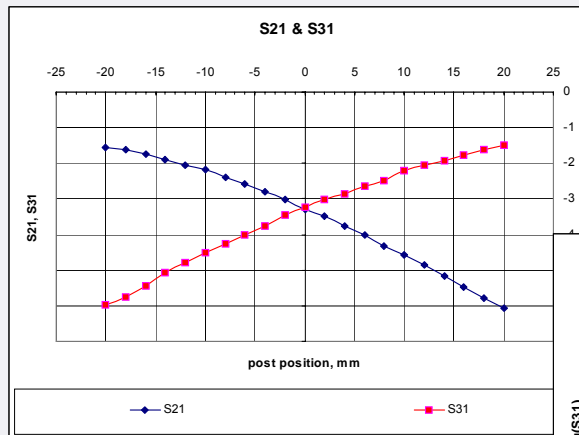
Waveguide components

Phase-compensated Power Splitter (tunable)

LLRF measurement

For ± 20 mm post position

$\Rightarrow \pm 4.5$ dB & $\pm 0.2^\circ$ between outputs



SUMMARY

Results

- Prototypes of all waveguide components are present
- Prototype of XFEL distribution works for FLASH

To be done next year

- To create Waveguide Assembly and Test Facility (WATF) at DESY site to produce more 100 waveguide distributions for XFEL
- To prepare specification (with final dimensions and tolerances) of all waveguide components for industry
- To investigate a dry air filling of waveguide
- To continue an investigation of waveguide components
- and more...