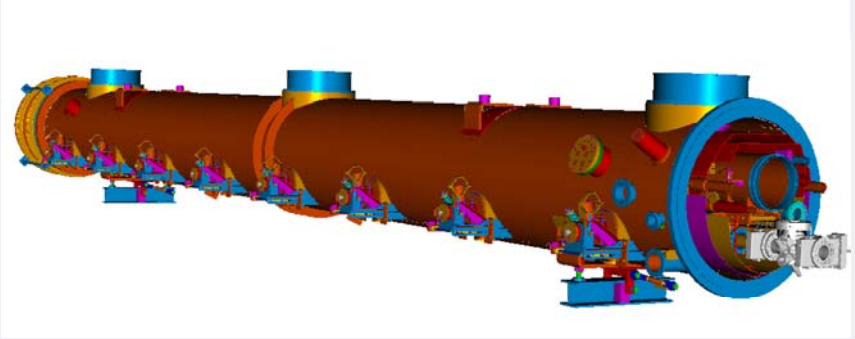
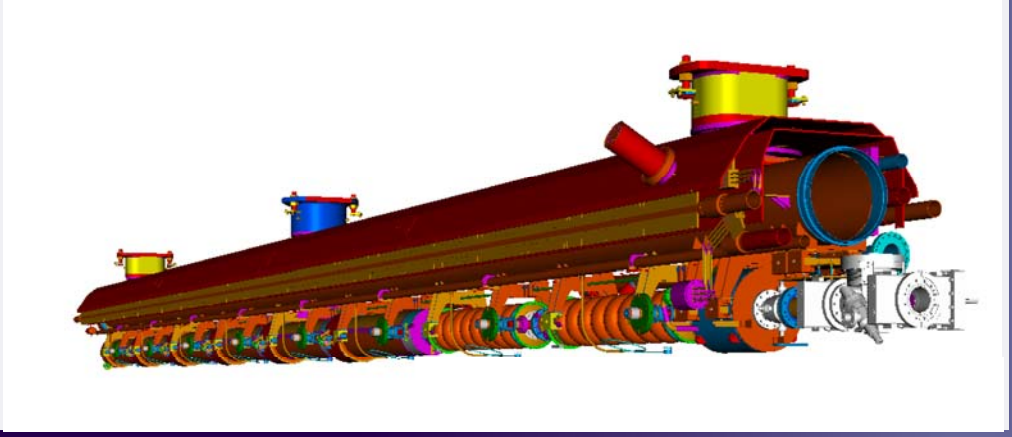
Module Industrialisation for XFEL



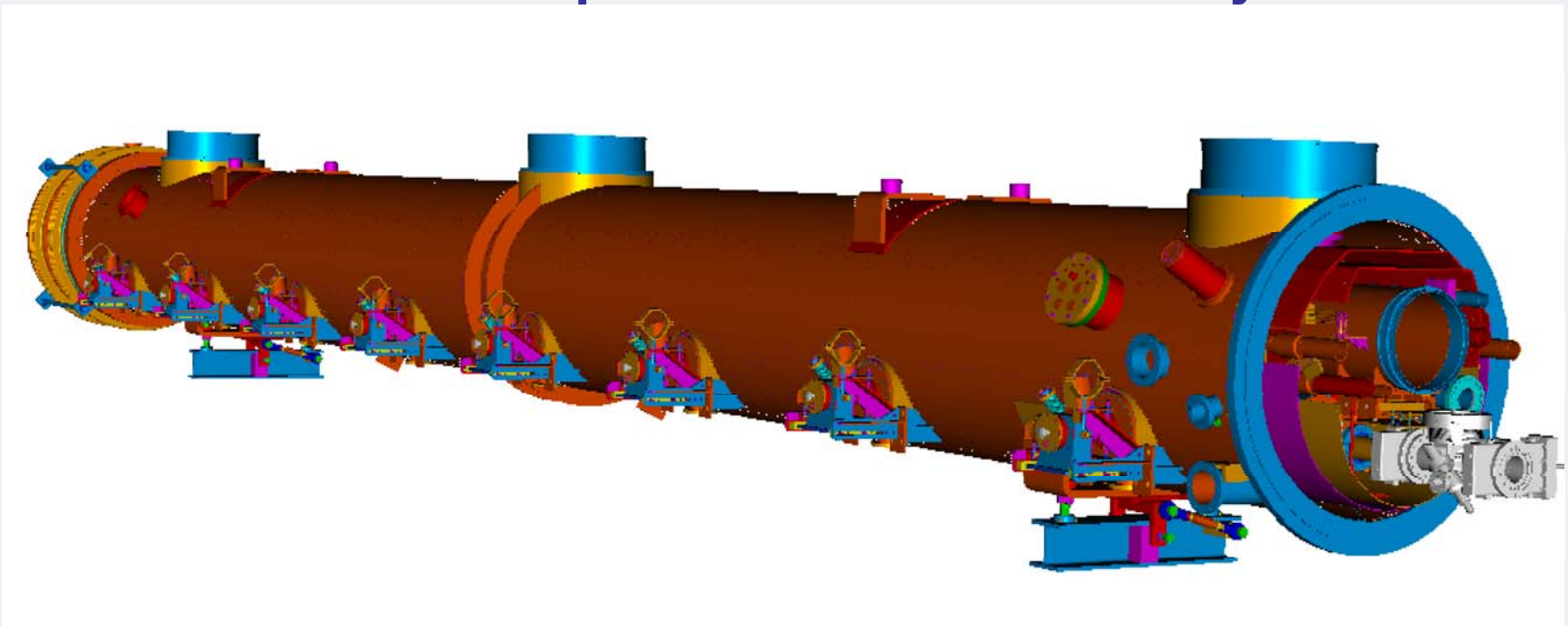
How to proceed with the production
of a complete accelerator cryomodule
delivered by industry
within a given tight time schedule



Module Industrialisation for XFEL

Goal:

Order late 08 complete XFEL Preseries Cryomodules



➔XFEL Module is based on TESLA Type 3 Module

We have

- **-built 3 type 3 modules (M4, M5 and M6)**
- **-well defined procedures for assembly, installation and operation**
- **-averaged gradients for all these modules >25MV/m**
- **-low static heat losses for all modules**
- **-cavity/magnet axes and coupler antennas get/keep their expected positions**
- **-long time operational experiences in TTF2/FLASH with M4 and M5 (4 years)**
- **-vibration measurements inside/outside during assembly and operation**
- **-introduced cavity fast tuning in M6**
- **-introduced new Phytron motor for cavity slow tuning in M6**

➔XFEL Module is based on TESLA Type 3 Module

We have cont.

-Results Module 6 on CMTB after 11 thermal cycles

everything o.K. (exception: 2 cavities didn‘t reach expected rf performance)

-Industry Design and Assembly Study

for Module 6 of type 3 from:

NOELL: =>design and assembly o.K

ACCEL: =>design and assembly o.K

Proposals for solutions safe module transport

-Modules 8 and 9 of type 3+ ➔design close to XFEL design

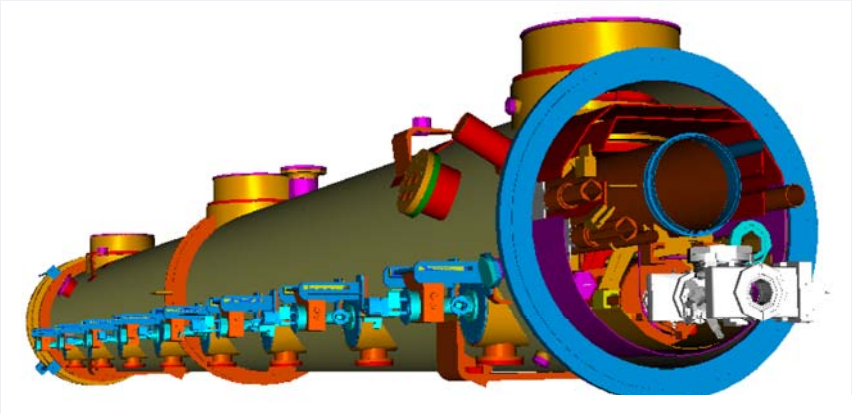
-Design for XFEL-prototype module finished (for M10, M11 and M12)

Specifications/drawings available

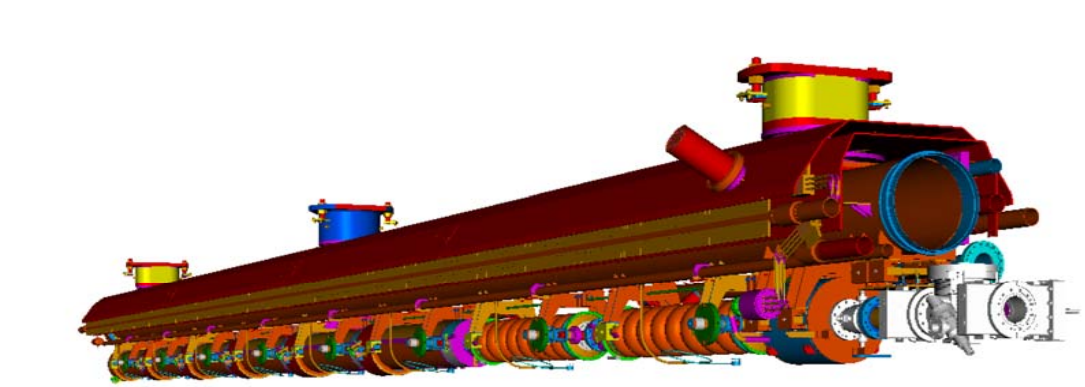
Ordering now

On the way to the final XFEL module design:

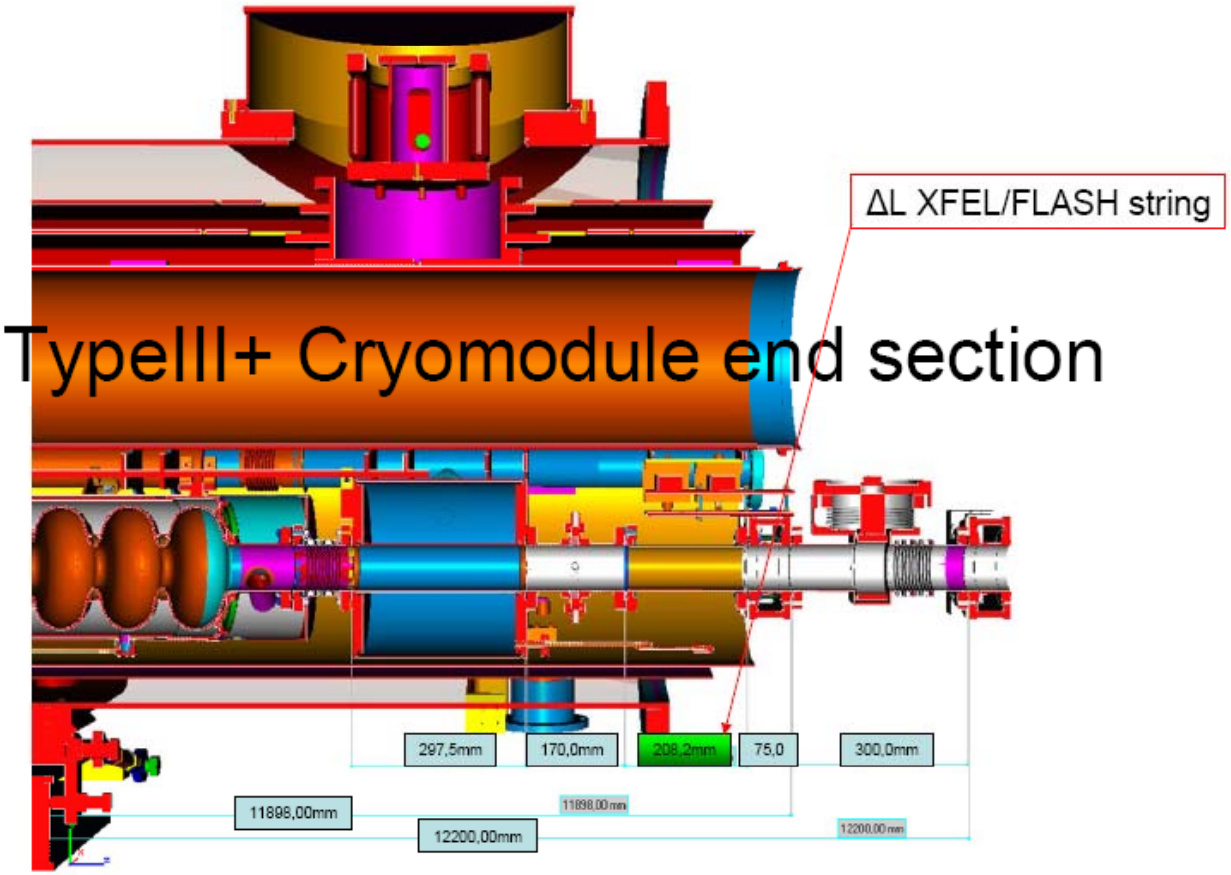
First step towards XFEL design: Modules M8 and M9 of type 3+



-correct Lambda spacing (cw-option)
-new magnet/bpm, curr. lead
2K cooling
supports like cavities
-new HOM-Abs. between modules
-pull cavities for tuning→piezo force
➔Must:FLASH compatibel



Module Type 3+ (M8 and M9)



02-Nov-2006

XFEL X-Ray Free-Electron Laser

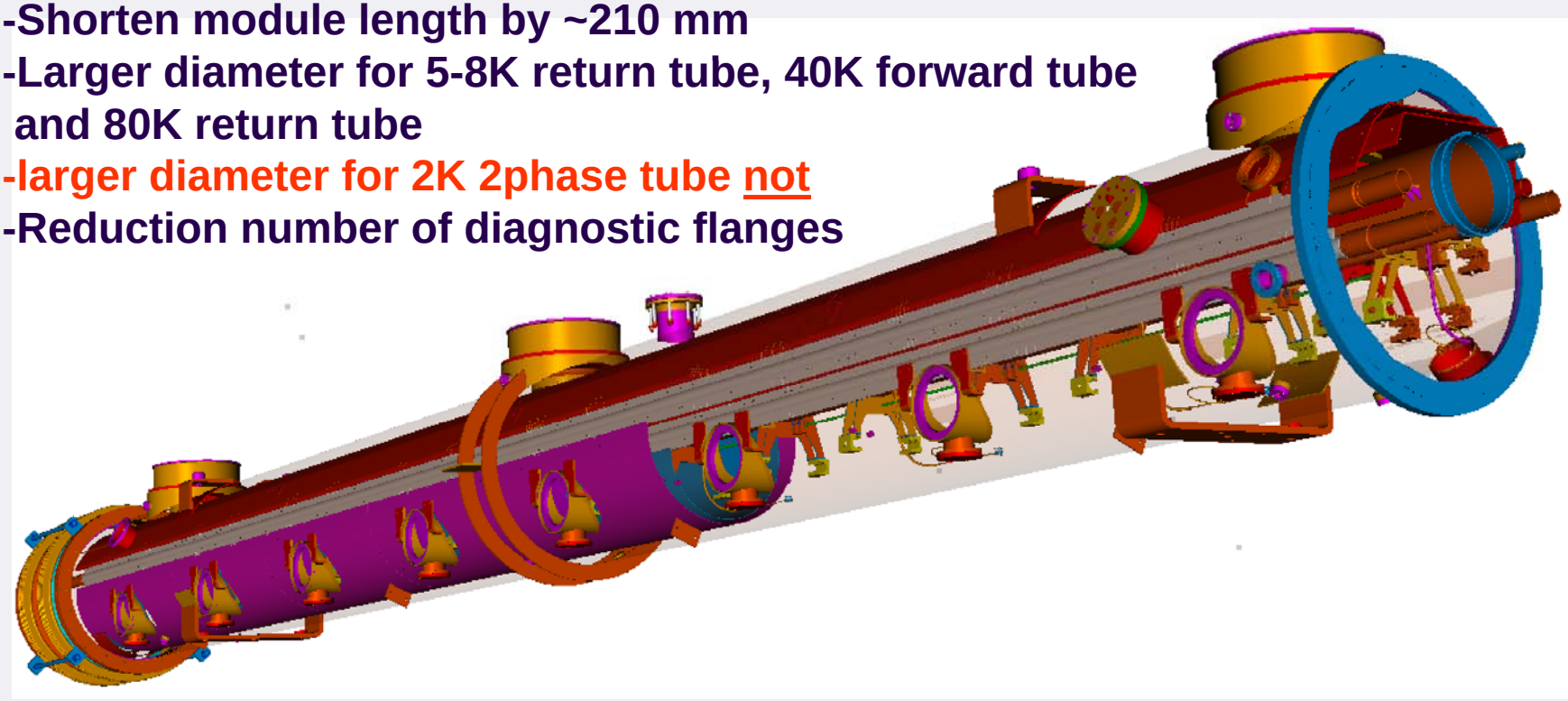
K. Jensch -MKS1-
7

On the way for final XFEL module design

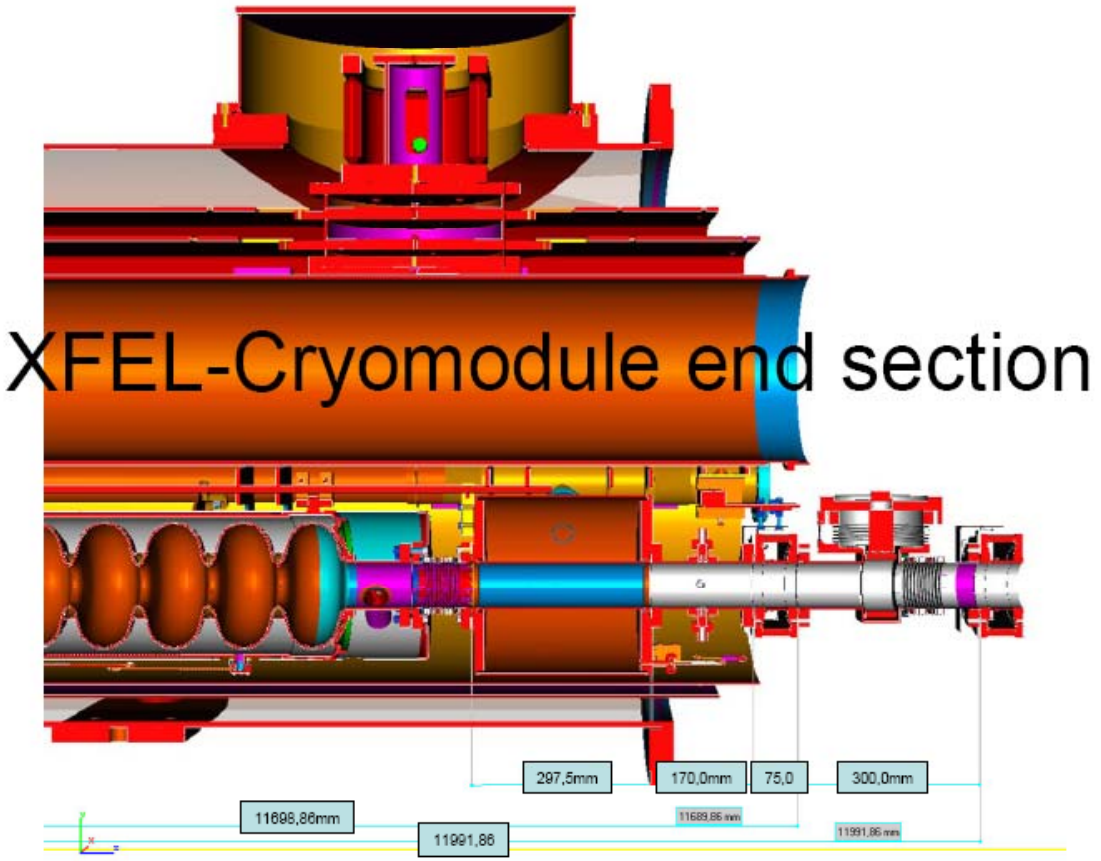
Second step towards XFEL design: M10-M12 XFEL-prototypes

Additional modifications for the XFEL prototype module:

- **-Shorten module length by ~210 mm**
- **-Larger diameter for 5-8K return tube, 40K forward tube and 80K return tube**
- **-larger diameter for 2K 2phase tube not**
- **-Reduction number of diagnostic flanges**



On the way for final XFEL module design



Needed

- -Final calculation for diameter 70mm 2 phase tube (>90mm impacts design!)
- -Transit support (solvable, first proposals by NOELL/ACCEL)
- -Transportation/installations tests in tunnel mock-up
- -New weldings/connections
- -M8 assembly (string and cryostat) with active part by industry
- -Qualify more than 1 vendor for module cryostats
- -Production of prototype cryostats joined by ext. authority TÜV-Nord
- -Result M8 on CMTB (results M9 at FNAL?)
- -Destructive test M3* on CMTB joined by TÜV-Nord

Finally

- -Delivery of complete XFEL accelerator modules by industry

Next Modules 2006-2009

Status:18-Jan-07 R. Lange MKS

Order at Zanon
2 cryostats
cold mass/vac-vessel
Delivery Jan-07

M8

M9

➔Parallel IHEP
In-kind contrib.

Order at A, B May-07
2 (x 2) cryostats
cold mass/vac-vessel
Delivery May-08

XMP1A

XMP1B

XMP1I

Still time?

XMP2A

XMP2B

more?

Order at ? (Oct-08)
Preseries-cryostats
complete modules
Delivery Jul-09

XMV1
XMV2
XMV3
XMV4

Goal:
Modify for Type3+
Must:Compatible with
Type3(spare TTF)
Learn specification
Try EN13445 without ext. author
M8 assembly joined by industry

Goal:
Qualify
2(3) vendors for
improved design
XFEL-prototype
Joined by TÜV
assembly by industry

Goal:
Qualify
2(3) vendors for
XFEL prototype
best solution

Goal:
Production and
Test of 2(4) complete
preseries modules
Delivered by industry

Posssible Sequence for XFEL-Accelerator Modules

Industry	**Cavities, tuners, couplers,HOMs, magnet/bpm, etc**	
XFEL(DESY)	**cold test all cavities, magnet/bpm, (tuner? BPM?)**	
XFEL(DESY) **(partially**	**cold test of complete cavities** **(only start up, production control)**	
Industry **2 lines**	**vac-vessel, cold mass, etc.** **string assembly** **module assembly**	
XFEL(DESY)	**cold test of modules**	**(1 module/week)**
XFEL	**installation in XFEL tunnel**	
XFEL	**commissioning XFEL**	