

Plans for XFEL Cryomodules

Rolf Lange –DESY-

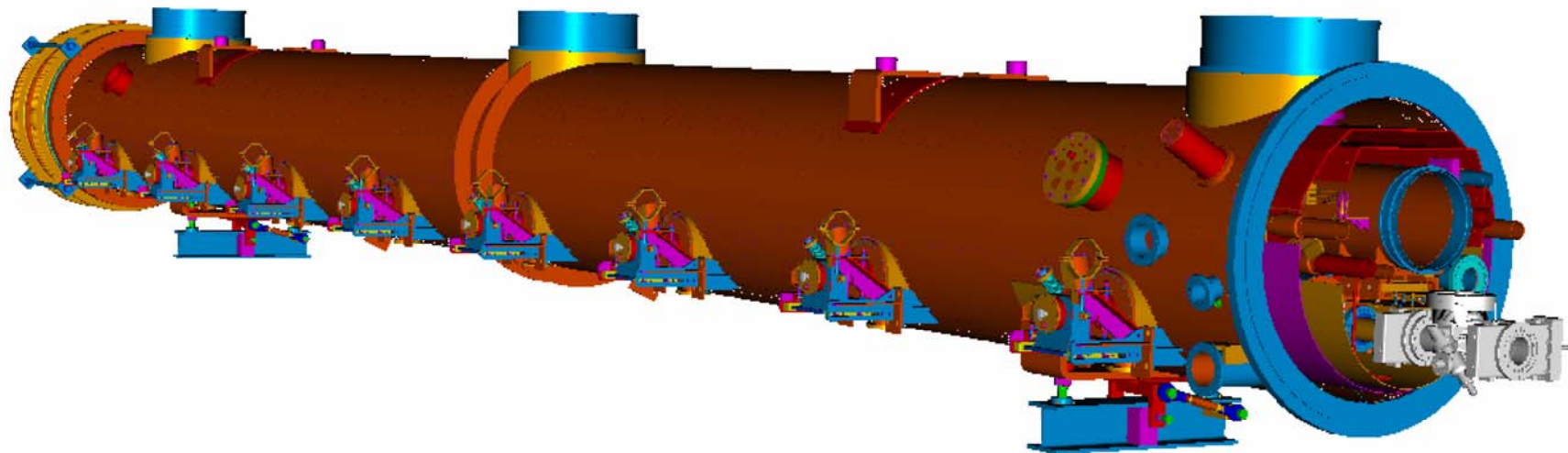
3rd T4CM – Type IV ILC Cryomodule-Meeting

Monday 22 January 07 – Wednesday 24 January 07

INFN Milano –Laboratorio LASA

Goal:

Order late 08 complete XFEL Preseries Cryomodules



What we have

➔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 $>25\text{MV/m}$
- 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

What we have

➔XFEL Module is based on TESLA Type 3 Module

We have

- Results Module 6 on CMTB delayed, but after 5 thermal cycles everything o.K. (exception 2 cavities didn't reach expected rf performance)
- preliminary *Industry Design and Assembly Study* for Module 6 of type 3 from:
 - NOELL:Known and discussed =>design and assembly o.K
 - ACCEL:Still missing(but partly known) =>design and assembly o.K
- Modules 8 and 9 of type 3+ ➔design close to XFEL design
- Design very close to XFEL-module finished (for M10, M11 and M12)
- Specifications/drawings available

What is still needed

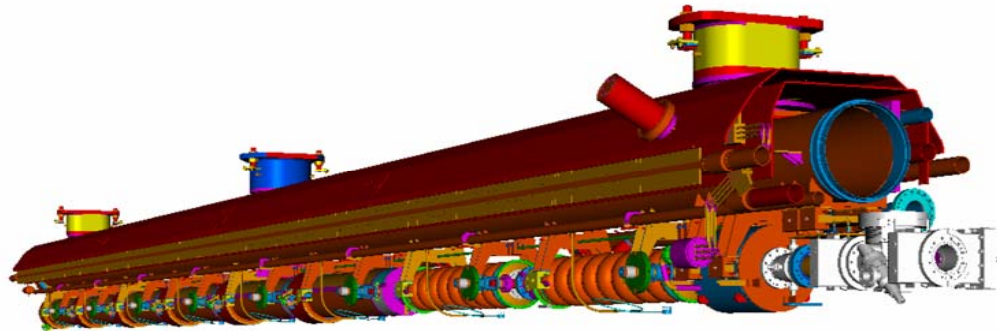
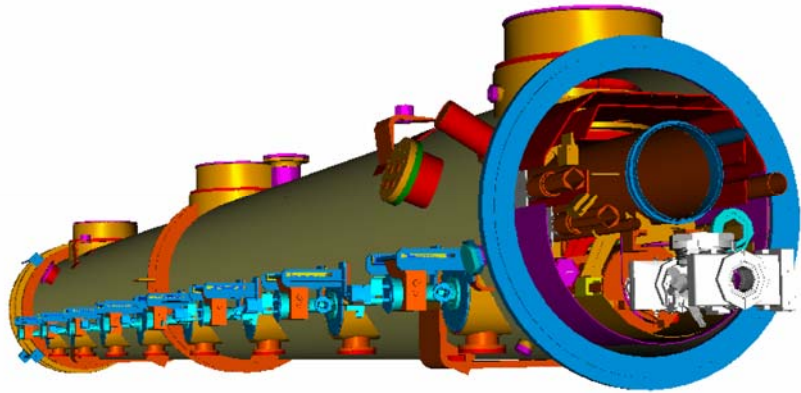
Needed

- Result M6 on CMTB after 10 thermal cycles →mid Feb-07
- Final calculation diameter 70mm 2 phase tube (cw option)
- Transit support (solvable, first proposals by NOELL)
- Transportation/installations 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 modules joined by ext. authority(TÜV)

Finally

- Delivery of complete modules by industry

**On the way to XFEL design:
First step to XFEL design: Modules M8 and M9 Type 3+**



Next Modules 2006-2009

Status:18-Jan-07 R. Lange MKS

Order at Zanon Dec-05

2 cryostats
cold mass/vac-vessel
Delivery Jan-07

M8

M9

Order at A, B May-07

2 x 2 cryostats
cold mass/vac-vessel
Delivery Feb/Mar-08

XMP1A

XMP1B

Delivery May-08

XMP2A

XMP2B

Order at ? (Sep-08)

3 Pre-cryostats
complete modules
Delivery Jul-09

XMV1

XMV2

XMV3

→ Parallel IHEP

XMP1I

more?

Goal:

Modify for Type3+

Must:Compatible with

Type3(spare TTF)

Learn specification

M8 assembly joined by industry

Goal:

Qualify

2(3) vendors for

improved design

XFEL-prototype

assembly by industry

Goal:

Qualify

2(3) vendors for

XFEL prototype

best solution

Goal:

Production and

Test of 3 complete

Preseries modules

Delivered by industry

Status 18-Jan-07: Next Cold Mass/Vacuum Vessel Orders

**Goal: Qualify vendor beside Zanon
Order 2 x 2 Cryomodules**

- **XMP1A/2A (Modules 10/13) and XMP1B/2B (Module 11/14)**
 - Results Module 6 delayed (mainly thermal cycles)
 - Design very close to XFEL-Module finished
 - Not included: Transit support and increased two phase tube diameter**
 - Specification/drawings available (problems EDMS/IDEAS solved)
 - Preparation/call for tender Feb-07 in any case
 - Place order May-07
 - Delivery Feb-08

Additional/parallel offer IHEP

- **XMP1I (Module 12) in-kind contribution of IHEP**
 - Final decision end Jan-07**
 - Material/Production within EN13445 and..**
 - Delivery early-08**

Next cryomodules assemblies/repairs/orders Status: 18-Dec-06 R. Lange MKS

Plan Dec-06	required performance	assembly/ disass/repair	material	Modifications (Ideas)	tests on/ usage for	comments
M6 TTF-III	35MV/m operational?	assembly May-06	Complete	tuner motor, piezo EP-cav. HOM-abs	CMTB/ FLASH ACC6	Industry Design/ assembly study
M7 TTF-II	23MV/m operational	assembly Nov-06 delay	Complete	fast tuning (cavities mixed)	CMTB/ FLASH ACC3	Industry Design/ assembly study?
M5 TTF-III	>25MV/m	repair tuner May-07	Complete	fast tuning Tuner repair only	CMTB/ FLASH ACC5	depends on schedule FLASH
M3*/3** TTF-II	23MV/m operational	disass. M3*? ass. M3**?	Complete New cav treatm	fast tuning better performanc	CMTB crash/ spare FLASH	depends on schedule FLASH
M8 TTF-III+	28MV/m operational, spare TTF-III In FLASH	Delivery CM Dec-06, Ass. Sep-07?	Wait for cavities BPM/Mag Tuner HOM-A dev/test	BPM/Mag new and hanging like cav. Lambda spacing, fix center	CMTB/ spare FLASH XFEL tests	Industry Design/ assembly study Assembly by Industry?
M9 TTF-III+	25MV/m operational FNAL	Delivery CM Dec-06 Ass. Aug-07?	see M8 but BPM only + dummy magnet	Modifications M8 No magnet BPM+dummy-ves	SMTF FNAL	Complete kit for FNAL
XMP1A (M10)	Performance ??(~25MV/m)	assembly Feb-08	to be ordered May--07 VendorA	reduced length safe transp/tubing	CMTB/ XFEL tests	Test of cold mass Qualify vendor A
XMP1B (M11)	Performance ??(~25MV/m)	assembly spring-08	to be ordered May-07 VendorB	see XMP1A	CMTB/ XFEL tests	Test of cold mass Qualify vendor B
XMP1I (M12)	Performance ??(~25MV/m)	assembly ??-08	in-kind contrib. Mar-07 VendorC	See XMP1A	CMTB/ XFEL tests	Test of cold mass Qualify IHEB...

**Overview Vertical/CHECHIA-Test of the Cavities
for Modules M6, M7, M3**, M5, M8, M9(FNAL) Status:18-Dec-06 RL-MKS**

Module/ Position in TTF/ Performance	After Vertical- Test qualified for tank weldi	Tested in CHECHIA and qualified	Still required CHECHIA-Tests	Schedule Module Assembly	Schedule Module Test Linac Test
M6/ACC6/Type3 35 MV/m	9	8	0	May/Jun-06	Oct-06 CMTB Aug-07 FLASH
M7/ACC3/Type2 25 MV/m	10	8	0	Nov/Dec-06 Jan-07	Feb-07 CMTB Aug-07 FLASH
M5/ACC5/Type3 >25 MV/m	8	2	0 Tuner-Repair only	Apr/May-07	(May-07 CMTB?) Aug-07 FLASH
M3**/SpareTyp2 / 25 MV/m	2	1	7+1	late-07	Jun-07 CMTB
M8/SpareTyp3+/ 28 MV/m	0	0	8+1	Aug/Sep-07	Oct-07 CMTB
M9/FNAL Typ3+/ 28(25) MV/m	2+2	2	6+1	Aug-07 FNAL	Oct-07 SMTF FNAL
2(3) vendors for 2(3) modules for XFEL Prototype module best/cheapest solution					
XMP1A (vend A)	0	0	0?	Feb-08	Mar-08
XMP1B(vend B)	0	0	0?	Mar-08	Apr-08
XMP1I (IHEP)	0	0	0?	Apr-08	May-08

Possible Sequence for XFEL-Accelerator Modules

Industry	Cavities, tuners, couplers, HOMs, magnet/bpm, ..
DESY	cold test cavities, magnet/bpm, (tuner)
DESY (partially)	cold test of complete cavities (start up, production control)
Industry	vac-vessel, cold mass, etc. string assembly module assembly
DESY	cold test complete module
XFEL	installation in XFEL tunnel
XFEL	commissioning XFEL

Module 6 preliminary quench limits

