Two Beam Module Program News

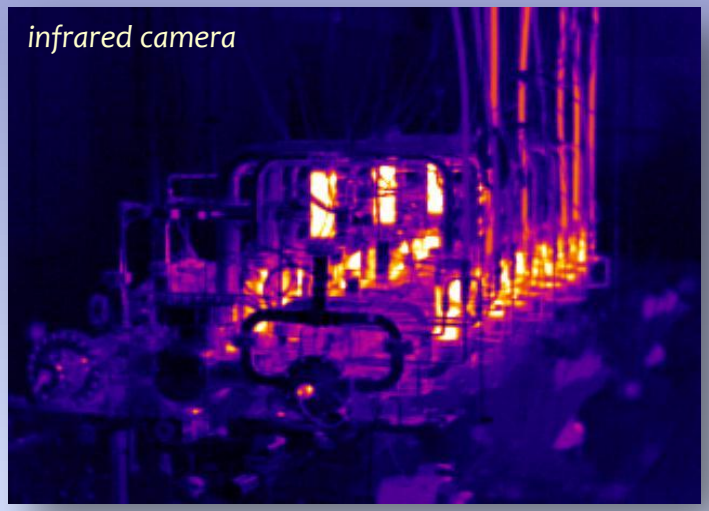
- Organizational changes
- Measurements on the Test Module
- Status of the CLEX module
- Outlook and conclusions

Organizational changes

- Germana left the BE-department and the rf-group as of May 1st
- All activities have been integrated into BE-RF-MK

  (section leader: Olivier Brunner)
- Nuria took on the x-band structure fabrication and development
- Markus and Steffen are responsible for the two beam module program
- Future industrialization studies remain with Philippe, some structure related studies are likely followed up by Nuria

TBM status



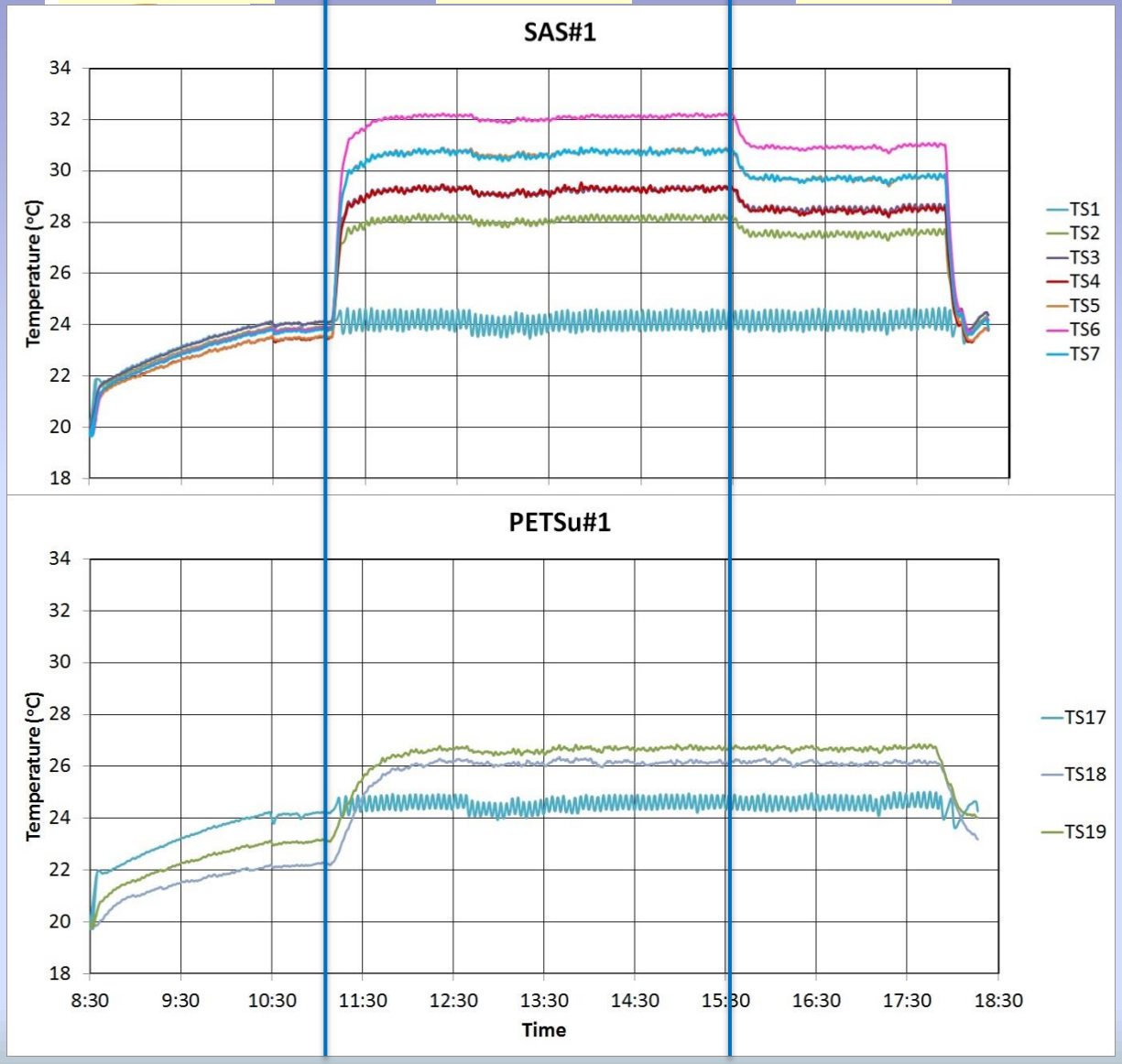
- Mechanical prototype module successfully constructed
- Currently under thermal and alignment testing
- Two more modules under assembly for integrated tests

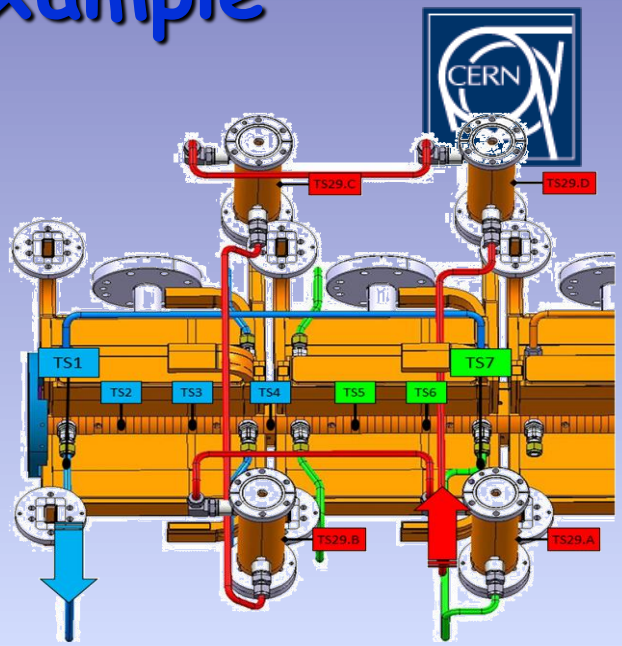
- One module under construction for beam testing in CTF3. Installation will start end of June

- Module test program in the lab until 2015, in CLEX until 2016
- Future plans: Incorporate lesson learned form the test program into the design of next generation modules and industrialization studies

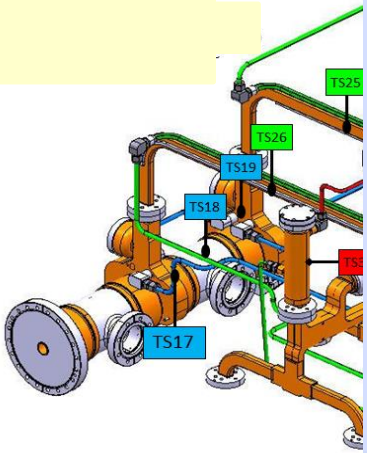
Thermal test data example

Water only | Unloaded | Loaded





Temperature fluctuation: ± 0.2 °C



Temperature evolution (Zero - Unloaded - Loaded conditions)

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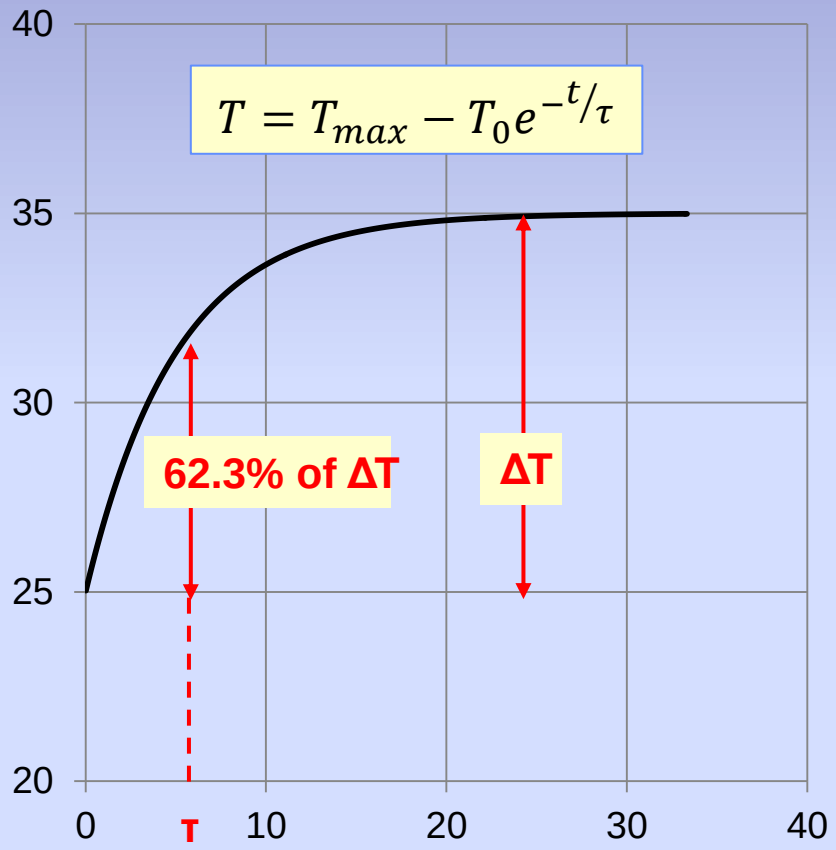
Results

Thermal time constants

Component	Time constant τ (min)
SAS#1	5.16
SAS#2	5.30
SAS#3	5.05
SAS#4	5.08
AS Load 1	1.86
AS Load 2	2.00
AS Load 3	1.90
AS Load 4	1.80
PETSu#1	16.19
PETSu#2	18.83
WG	18.61
RFN Loads	1.80



Results and comparison with FE-simulations

Components' temperatures in steady-state (°C)

	DBQ only			Unloaded			Loaded		
	Experiment	Simulation	*Diff.*	Experiment	Simulation	*Diff.*	Experiment	Simulation	*Diff.*
SAS#1	23.7	24.5	*0.8*	29.5	31.9	*-2.4*	29.0	30.7	*-1.7*
SAS#2	24.3	24.5	*0.2*	32.2	29.7	*2.5*	31.5	29.3	*2.2*
SAS#3	24.4	24.5	*0.1*	32.2	31.8	*0.4*	31.5	31.2	*0.3*
SAS#4	24.2	24.4	*0.2*	32.2	29.2	*3.0*	31.5	29.0	*2.5*
PETSu#1	22.7	23.2	*0.5*	25.9	29.8	*-3.9*	26.4	27.6	*-1.2*
PETSu#2	23.2	23.2	*0.0*	29.4	32.4	*-3.0*	30.1	29.3	*0.8*
DBQ#1	37.6	39.3	*1.7*	34.4	32.2	*2.2*	33.2	31.8	*1.4*
DBQ#2	36.1	38.4	*2.3*	33.6	33.9	*-0.3*	31.8	33.6	*-1.8*

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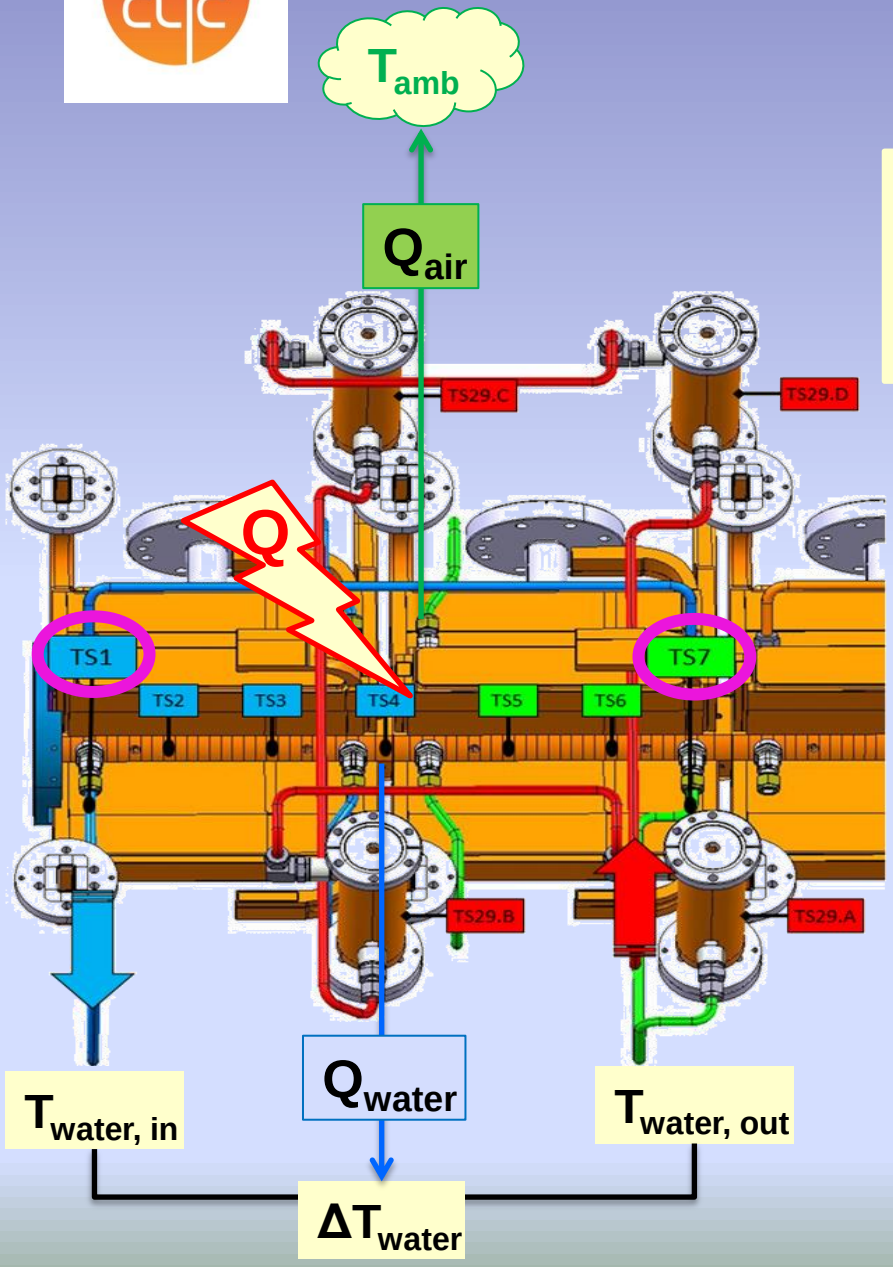
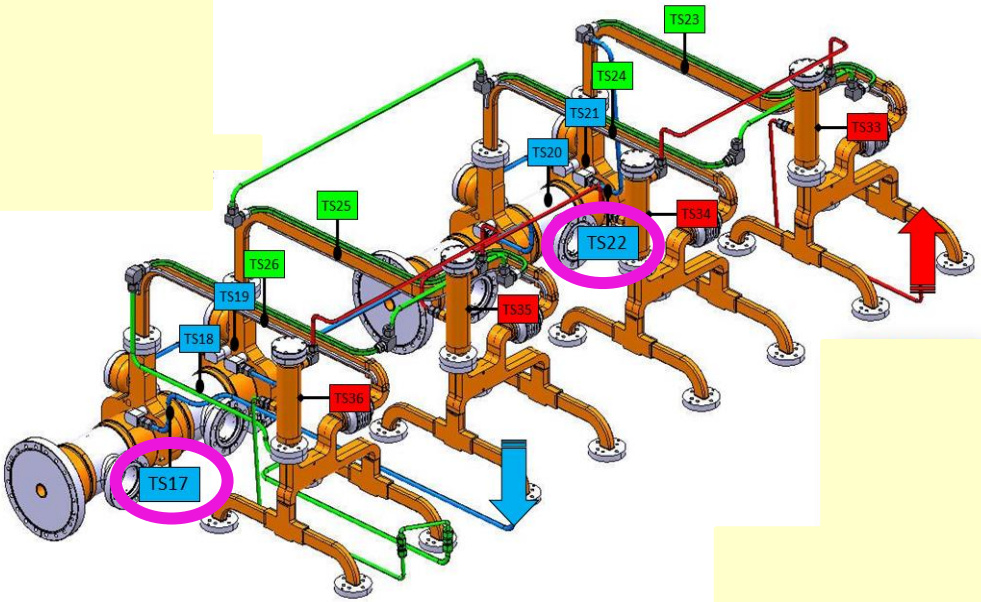
Further analysis





$$\dot{Q}_{water} = \dot{m} c_p (T_{water,out} - T_{water,in})$$

$$\dot{Q}_{air} = h(T_{comp} - T_{amb})A$$

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Further analysis

	$T_{water,in}$ (°C)	$T_{water,out}$ (°C)	ΔT (°C)	Q_{water} (W)	T_{amb} (°C)	T_{comp} (°C)	Q_{air} (W)	Q_{tot} (W)	F (m3/h)	$F_{measured}$ (m3/h)
SAS1	24.12	30.02	5.90	744	20.00	29.16	73	817	0.108	
SAS2	24.44	32.12	7.69	720	20.00	32.18	97	817	0.081	
SAS3	25.05	35.01	9.96	701	20.00	34.53	116	817	0.061	
SAS4	25.12	33.34	8.22	714	20.00	32.94	103	817	0.075	
SAS total									**0.324**	
PETS	24.63	29.37	4.74	267	20.00	27.79	153	420	**0.048**	
Total									**0.373**	**0.311**

- One flow meter measures the total flow
- Flow at each cooling channel (4 SAS and PETS) is not known

Flow meter accuracy: *± 2% measured value*

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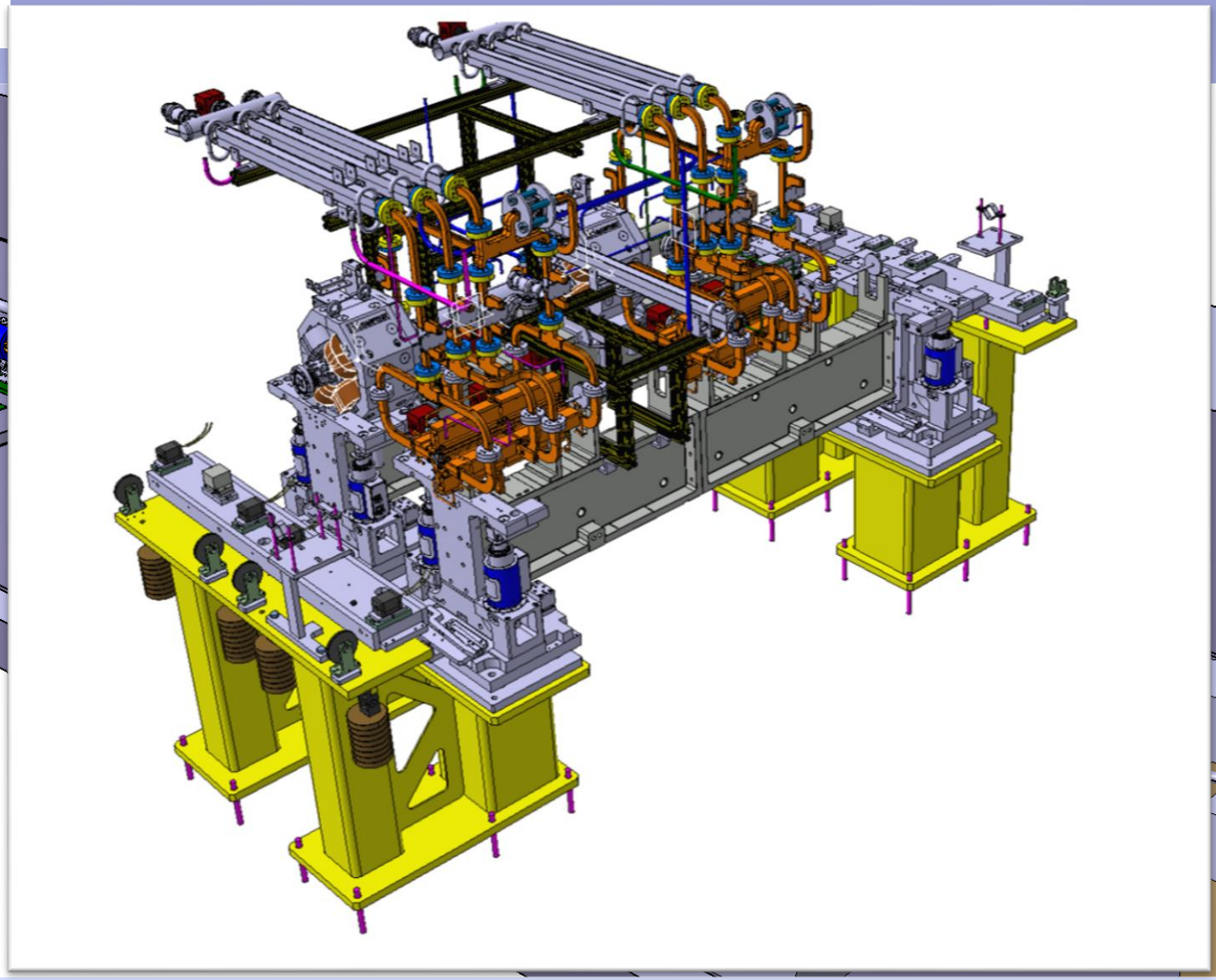
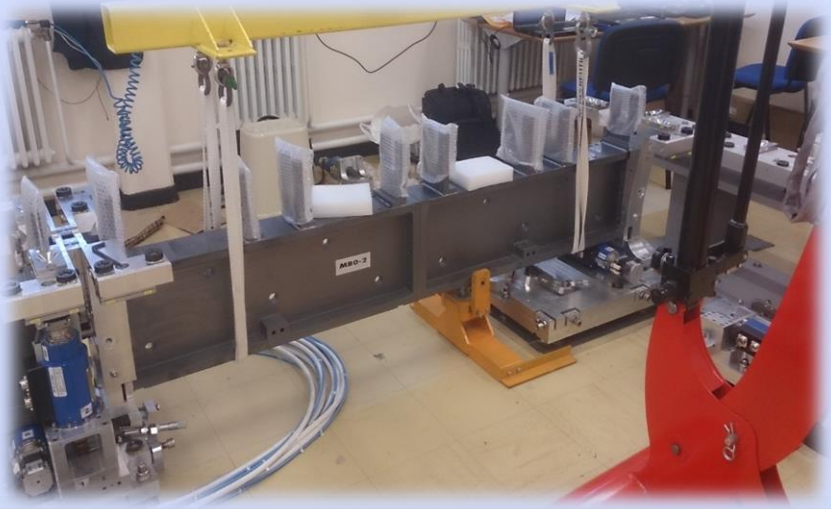
CLEX module installation

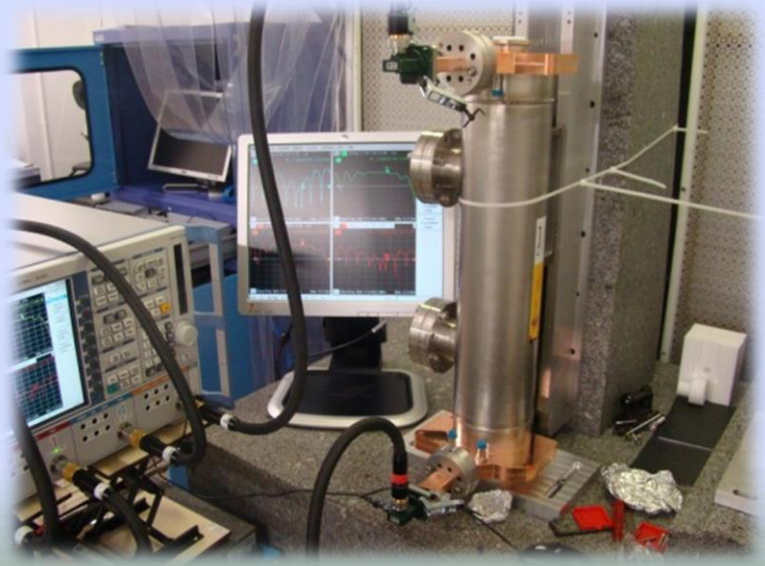


Dmitry Gudkov

CLEX module supporting system received and tested



Status of main components

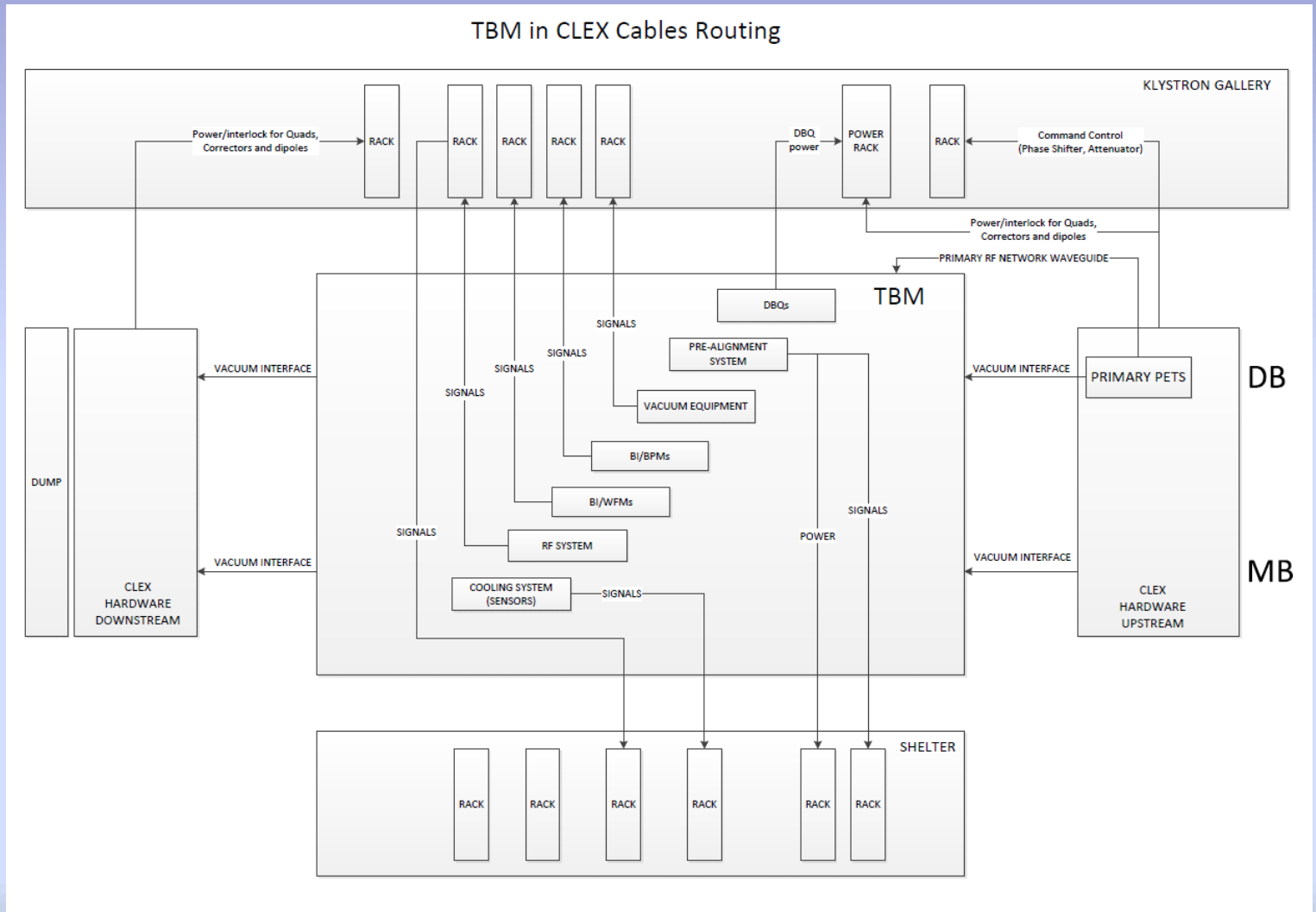


Pets, DB-Quad and girder available
ACC-structures: final brazing steps
Waveguide system: final brazing steps
BPM: rf test and assembly

Missing: some supports, clamps, transition beam chambers

CLEX module installation

Cabling scheme preparations



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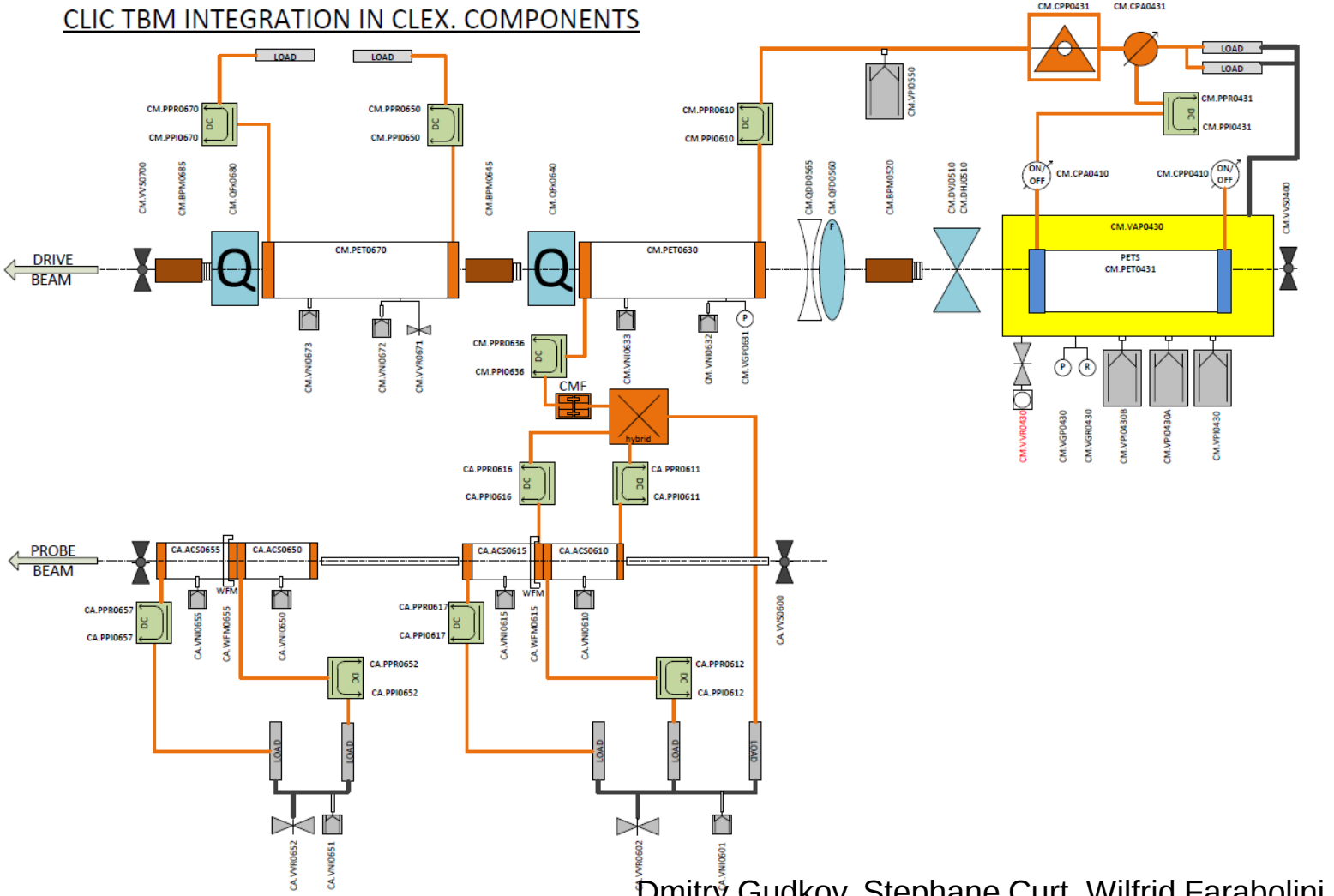
CLEX module installation

Equipment identification and naming for control integration



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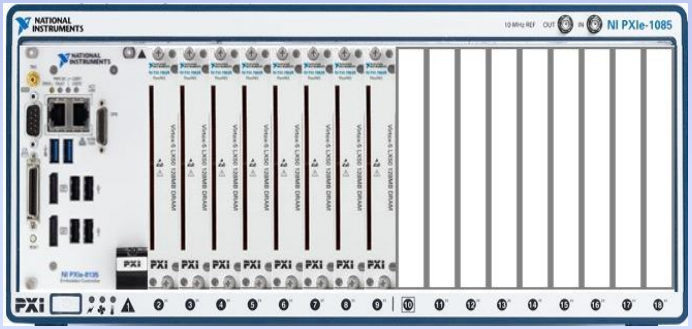
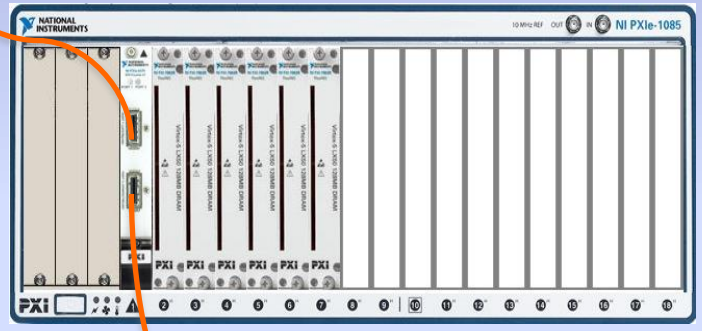
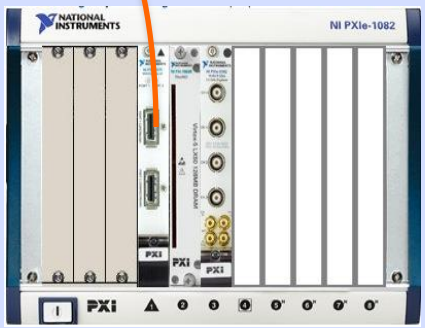
Module electronics for CLIC

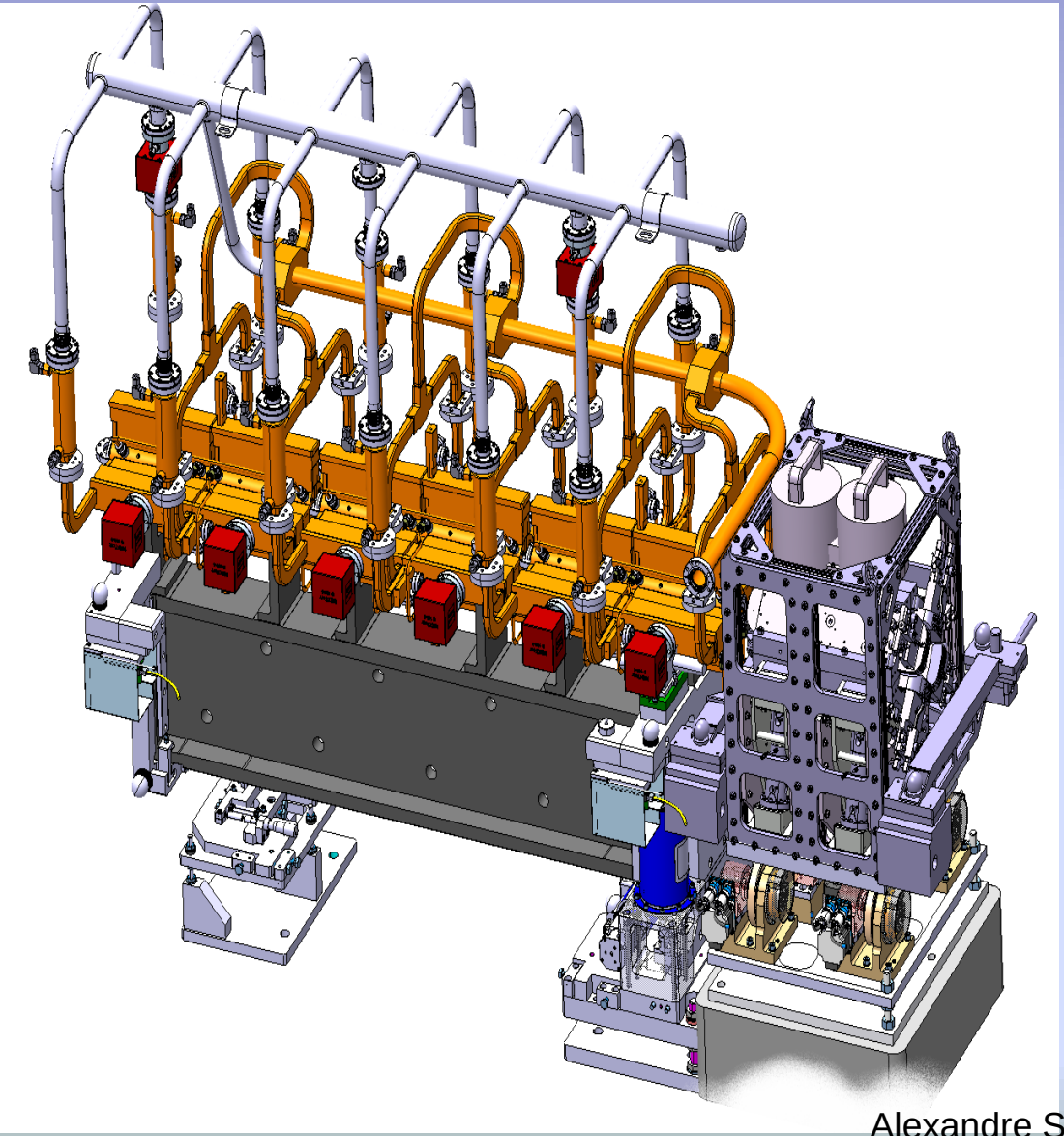
Examples base on NI-hardware, a radiation environment test is planned in CTF3 acquiring rf signals from the CLEX module







Klystron base module design



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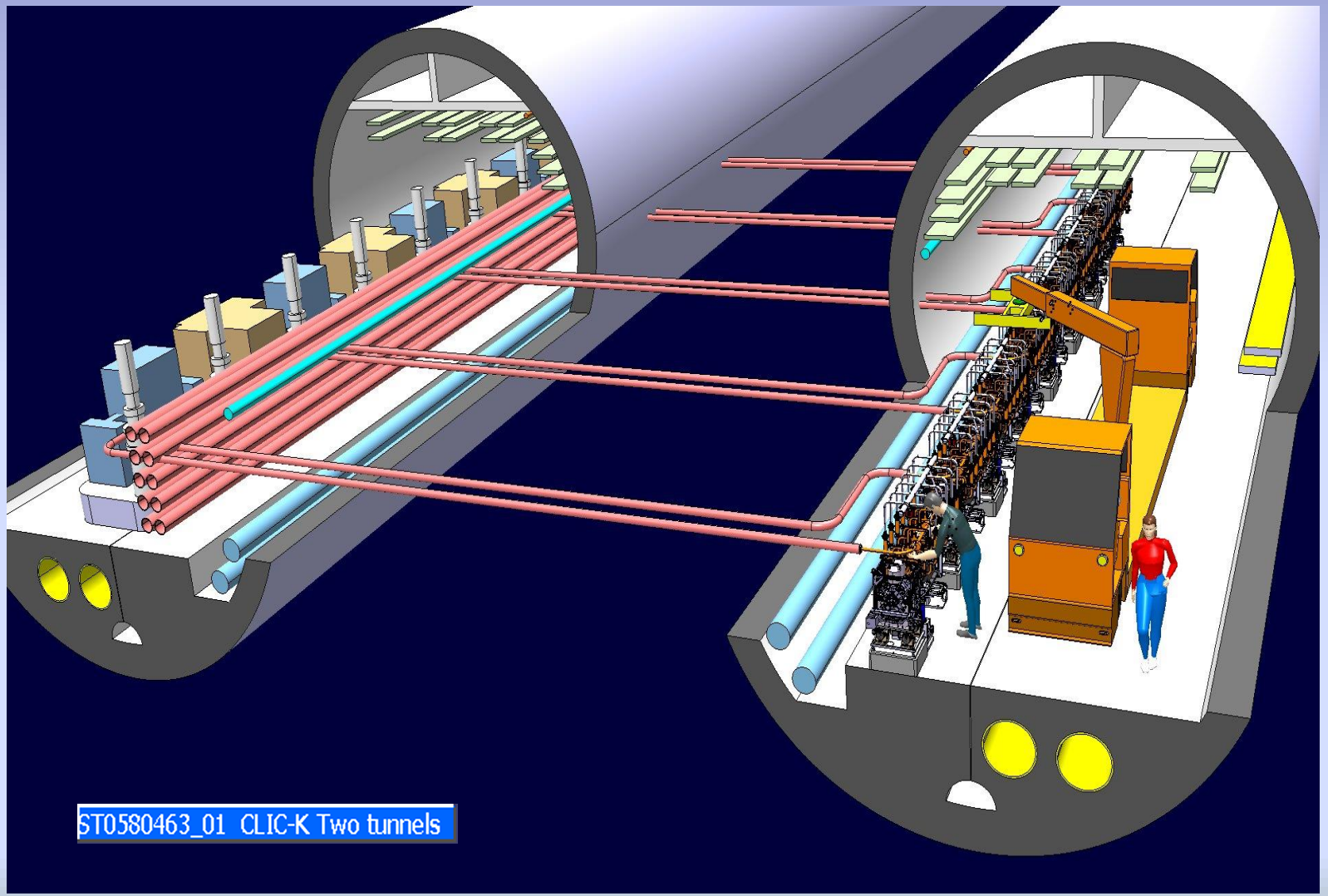
Klystron base module design



Outlook and conclusions

- The two beam module program will continue as advised by the module review committee
- Good progress in analyzing the data taken on the Lab-module (see as well Helene's talk), to be continued
- Highest priority right now is to get the CLEX module installed and start experiments with it
- Will have to review (again) the objectives and configurations of the lab-based module program evolution
- Prepare transition to 'next' generation modules

End

Alexandre Samochkine

Phase 2: Duty cycles tests

STEP	#	INPUT									
		T_{amb} (°C)	v_{air} (m/s)	Q (W)					$T_{i,water}$ (°C)	$\Delta T_{o,water}$ (°C)	
				SAS	*AS Load*	*PETS*	*RFN Load*	*DBQ*		*SAS*	*PETS*
Nominal operation mode	DBQ only	20	0.7	0	0	0	0	150	25	0	0
	Unloaded	20	0.7	820	178	220	178	150	25	10	6
	Loaded	20	0.7	683	137	220	178	150	25	8.3	6
	DBQ only	40	0.7	0	0	0	0	150	25	0	0
	Unloaded	40	0.7	820	178	220	178	150	25	10	6
	Loaded	40	0.7	683	137	220	178	150	25	8.3	6
Failure mode *SAS breakdown*	Loaded	20	0.7	683	137	220	178	150	25	8.3	6
	SAS breakdown	20	0.7	0	27.4	220	178	150	25	0	6
	PETS off	20	0.7	0	27.4	55	0	150	25	0	1.5
	Loaded	20	0.7	683	137	220	178	150	25	8.3	6
	Loaded	40	0.7	683	137	220	178	150	25	8.3	6
	SAS breakdown	40	0.7	0	27.4	220	178	150	25	0	6
	PETS off	40	0.7	0	27.4	55	0	150	25	0	1.5
	Loaded	40	0.7	683	137	220	178	150	25	8.3	6
Failure mode *PETS breakdown*	Loaded	20	0.7	683	137	220	178	150	25	8.3	6
	PETS breakdown	20	0.7	683	137	55	0	150	25	8.3	1.5
	SAS off	20	0.7	0	27.4	55	0	150	25	0	1.5
	Loaded	20	0.7	683	137	220	178	150	25	8.3	6
	Loaded	40	0.7	683	137	220	178	150	25	8.3	6
	PETS breakdown	40	0.7	683	137	55	0	150	25	8.3	1.5
	SAS off	40	0.7	0	27.4	55	0	150	25	0	1.5
	Loaded	40	0.7	683	137	220	178	150	25	8.3	6

* EDMS# 1332627