R&D proposals for EuCard 2

- SRF basic research (W. Weingarten)
- CTF3 and CTF3+, possible infra - structure for nc rf experiments
- High Gradient research with 12 GHz klystron based test stand

SRF basic research

W. Weingarten

- Preparation of Nb3Sn samples to be validated on quadrupole resonator: Substrates niobium and copper; Coating by thermal diffusion of Sn into Nb in a dedicated furnace and by co-sputtering of Nb and Sn; equipment needed:
  furnace with T ≈ 1100 C, co-sputtering equipment;
  final validation of optimized procedure on 704 MHz mono-cell cavity

Focus on new materials and understanding Q-slopes

<u>Partners and synergies:</u>
Would go well together with proposal from HZB,
704 MHz on loan from CEA

CTF3 and CTF3+

- CTF3 is already a large collaboration
- CTF3 represents important infra structure which can be used by JRA's
- Topics should be in line with CLIC goals

  (Example PSI proposal for wake field monitors)
- Not clear how CTF3 upgrades would fit in this work package
- There are already JRA in Eucard for nc structures

Partners and synergies:
PSI, CEA, Cockcroft, INFN, Uppsala University, …

X-band test stand

- Unique test stand to do high gradient research
  (we are already building one and planning for more)

- Infra structure which can be used by collaborators

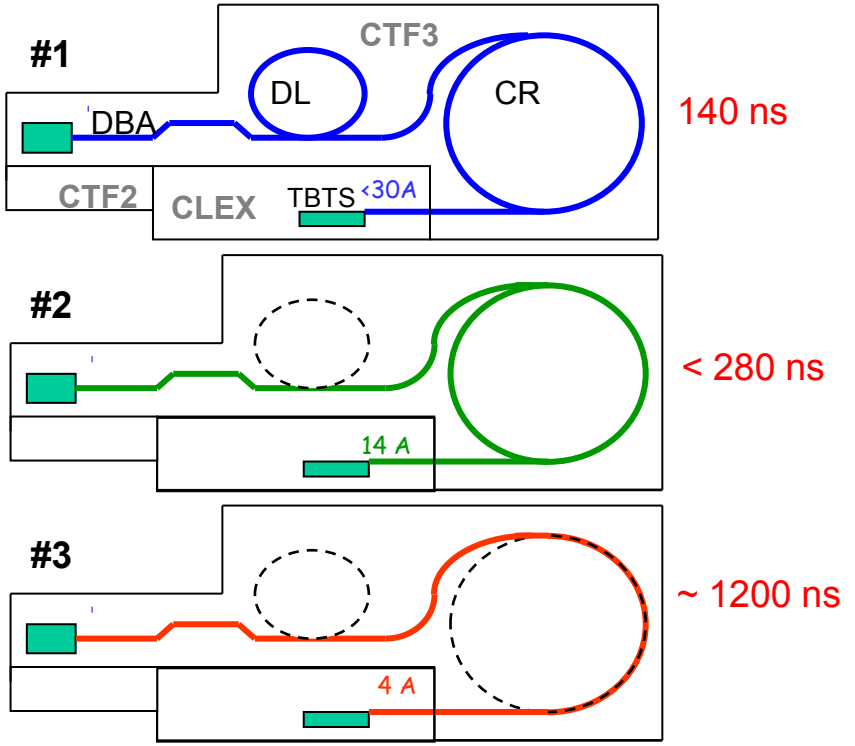
- Several institutes have similar plans: CEA,PSI, Groeningen, Upsalla

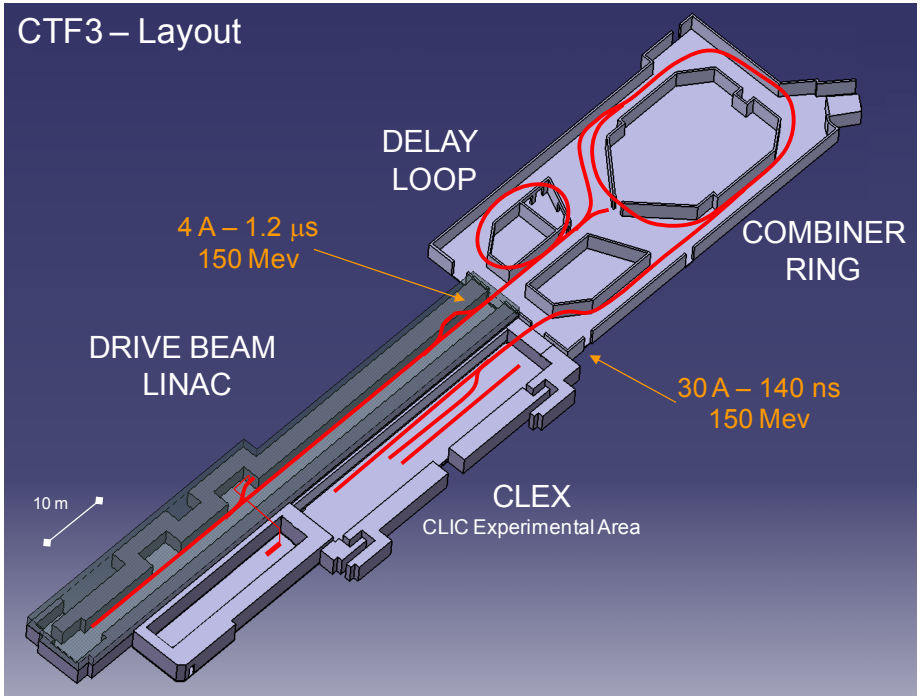
- Topics: Development of a novel 12 GHz pulse compressor and high power rf components
  Solid state drive amplifiers 1-2 kW to replace TWT's
  Low level rf and diagnostics
  High gradient testing of specific structures
  (for example x-band crab cavity)
  Structure preparation and fabrication

<u>Partners and synergies:</u>
PSI, CEA, Cockcroft, Groeningen, Uppsala University,
…

X-band test stand

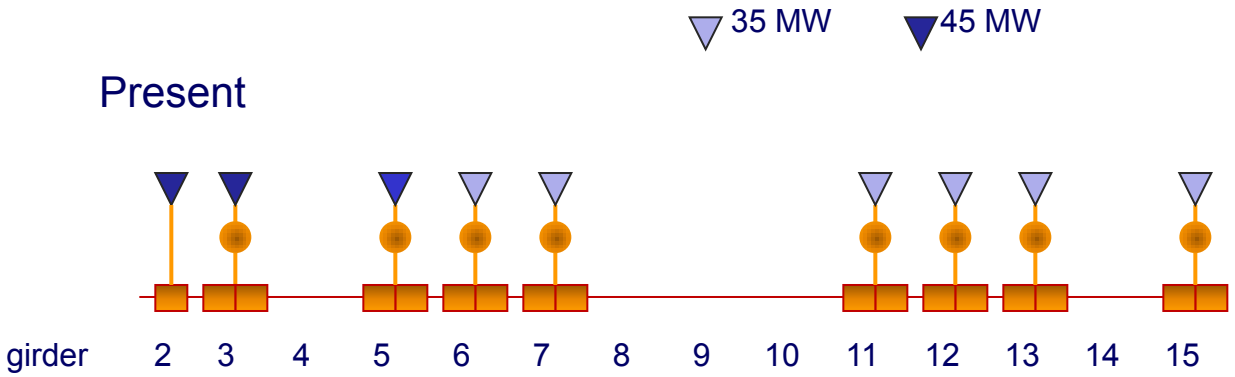
CTF3 limitations





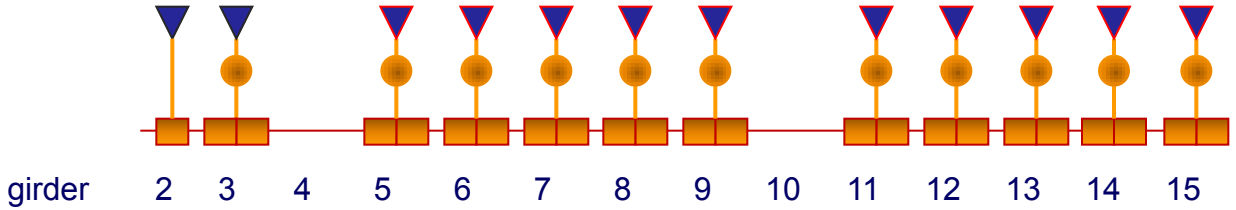
- Combined beam current, limited to ~ 30 A
  (possibly more for shorter pulses)
- Pulse length limited to 140 ns (instead of 240 ns) @ 30 A
  – alternative: 15 A, < 280 ns
- Total drive beam peak power (now ~ 3.5 GW – CLIC 240 GW)

CTF3 beam power upgrade



About 120 MeV
for final beam current of
about 28 A

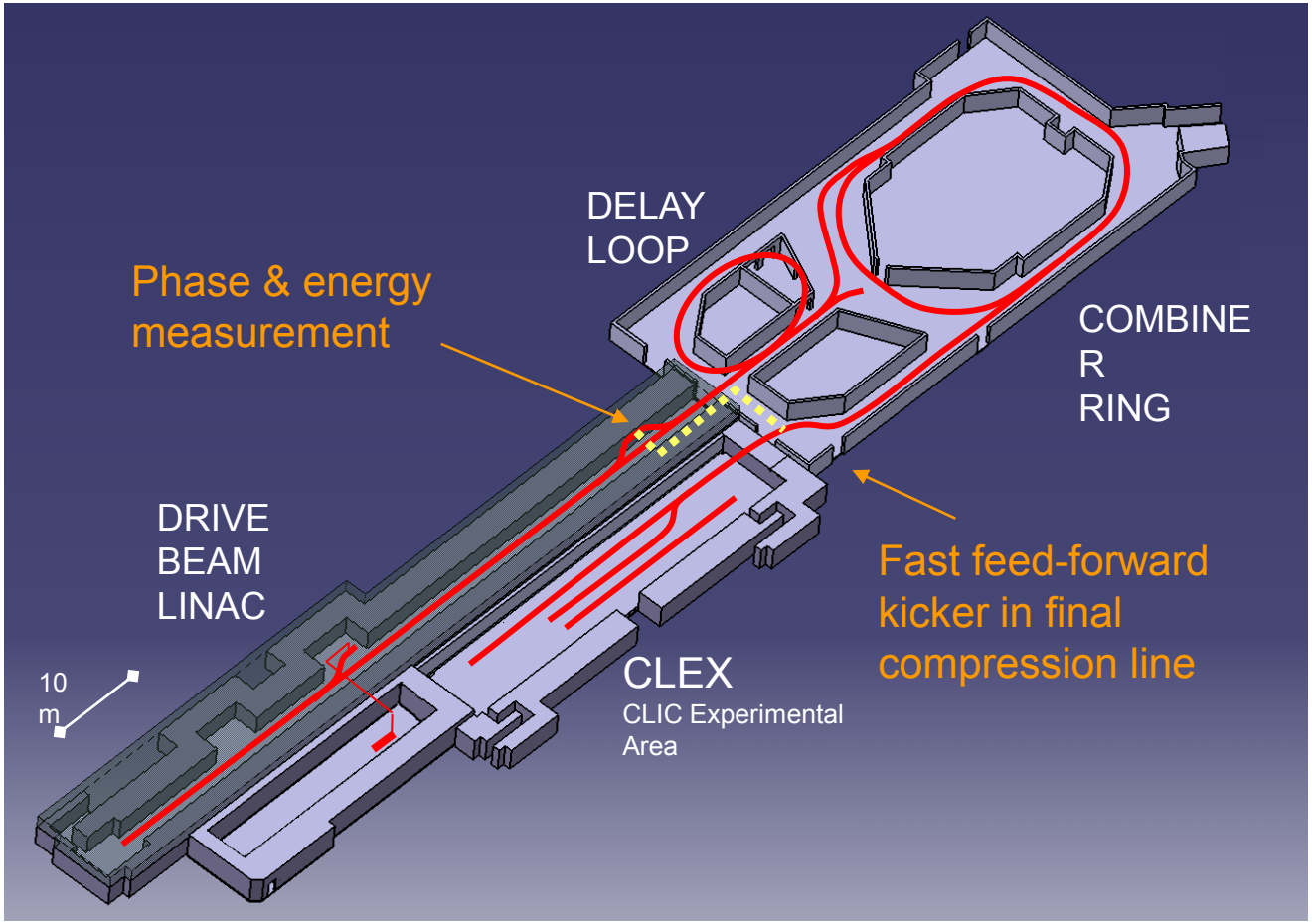
Total beam power 3.3 GW
e.g., enough to feed
24 accel. structures
(final drive beam energy 50 MeV)



About 200 MeV
for final beam current of
about 28 A

Total beam power 5.7 GW
e.g., enough to feed
50 accel. structures
(final beam energy 50 MeV)

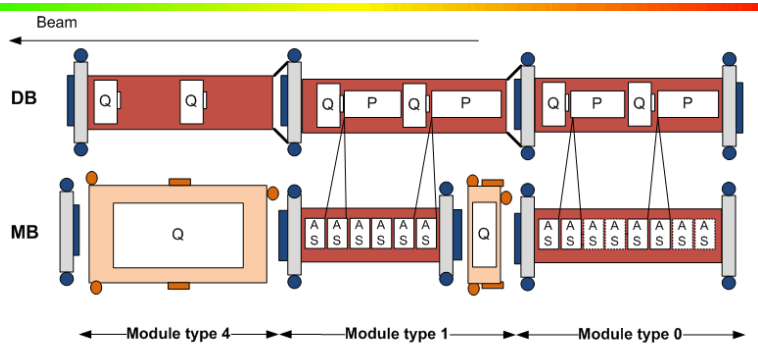
Phase measurements & feed-forward

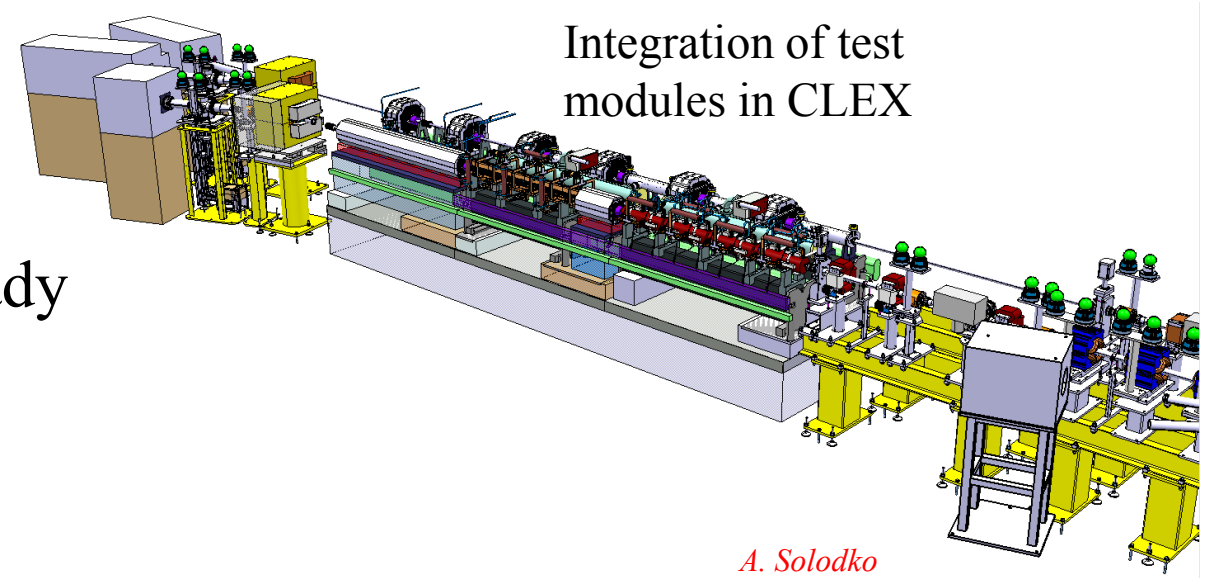


- Phase monitor being developed (FP7) for 2012
- INFN, Oxford University, CERN

CLIC modules in CLEX

- 3 modules to be tested with beam and RF
- module layout compatible with CLEX requirements:
  - double length PETS feeding two accelerating structures
  - accelerating structures with all technical systems and damping features
- First module to be ready by end of 2011
- FP7 involved





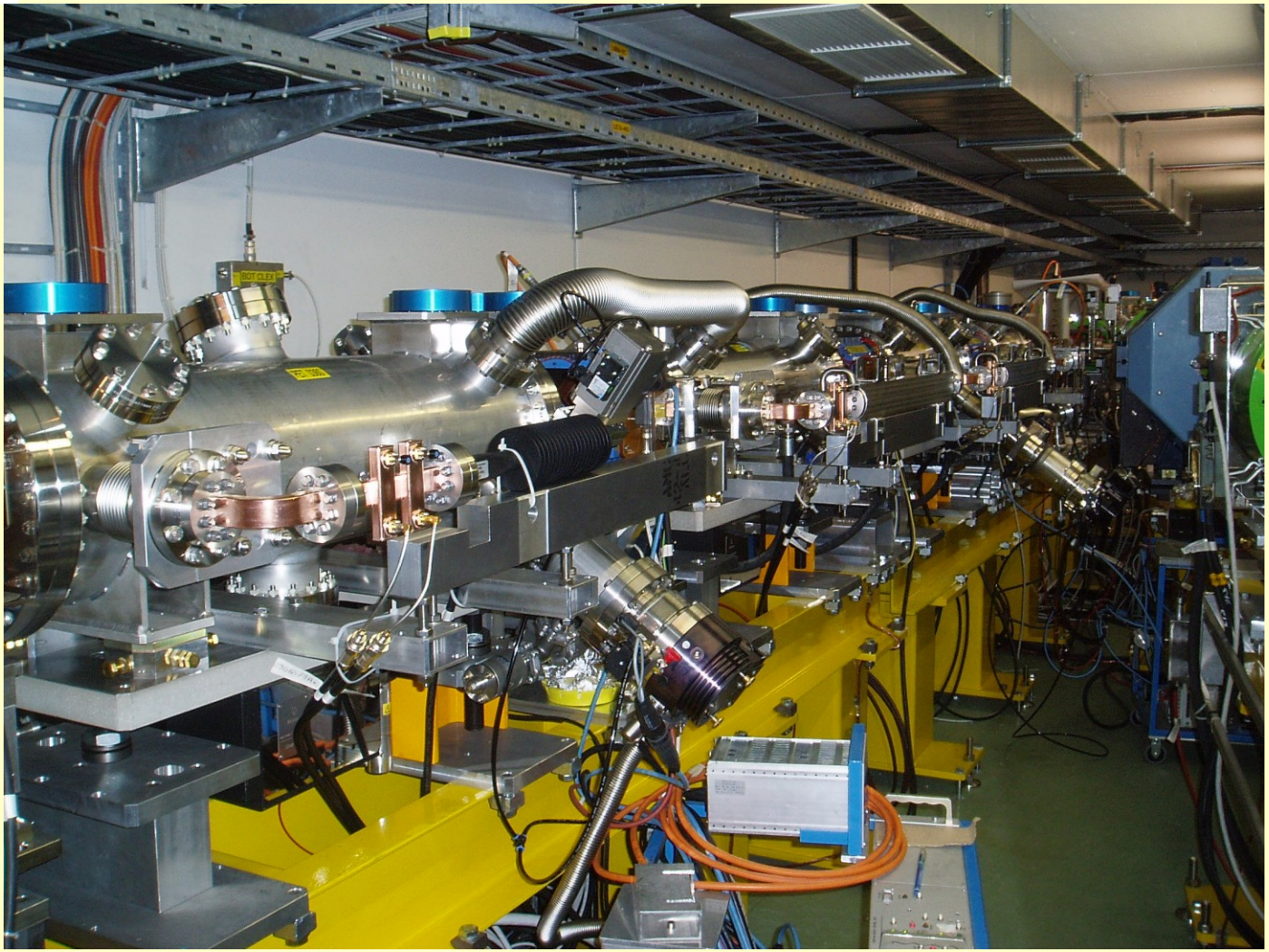
Integration of test modules in CLEX

A. Solodko

Plans for TBL beyond 2012

- Upgrade to TBL+ as a test facility relevant for CLIC TDR work
- 12 GHz power production for structure conditioning
  - less pulses than klystron test stand but:
    - use of ON/OFF mechanism of PETS
    - precondition with klystron and then with beam
    - => develop conditioning scenario for CLIC conditioning with beam
    - conditioning of PETS
- Working experience with a real decelerator
  - Power production as a function of beam parameters, alignment, stability, pulse shape, phase stability, beam loses, failure modes
- Test bed for PETS development, ON/OFF, new designs, etc
- Beam dynamics studies, pulse shaping, feedbacks, etc

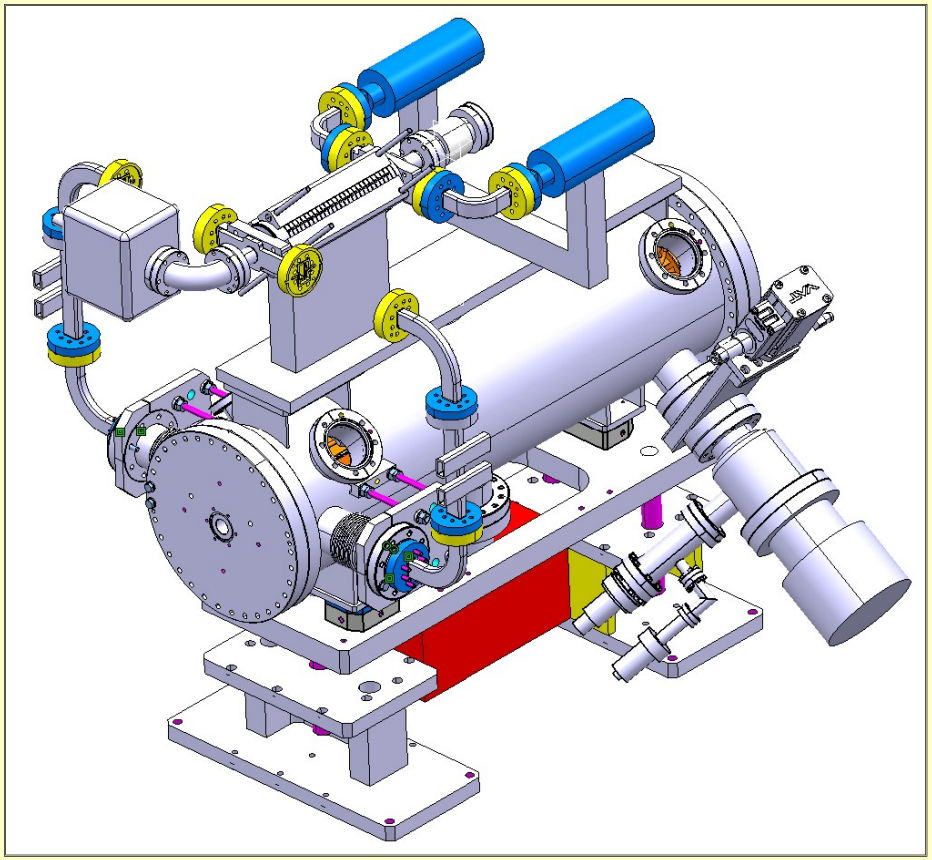
TBL in CLEX

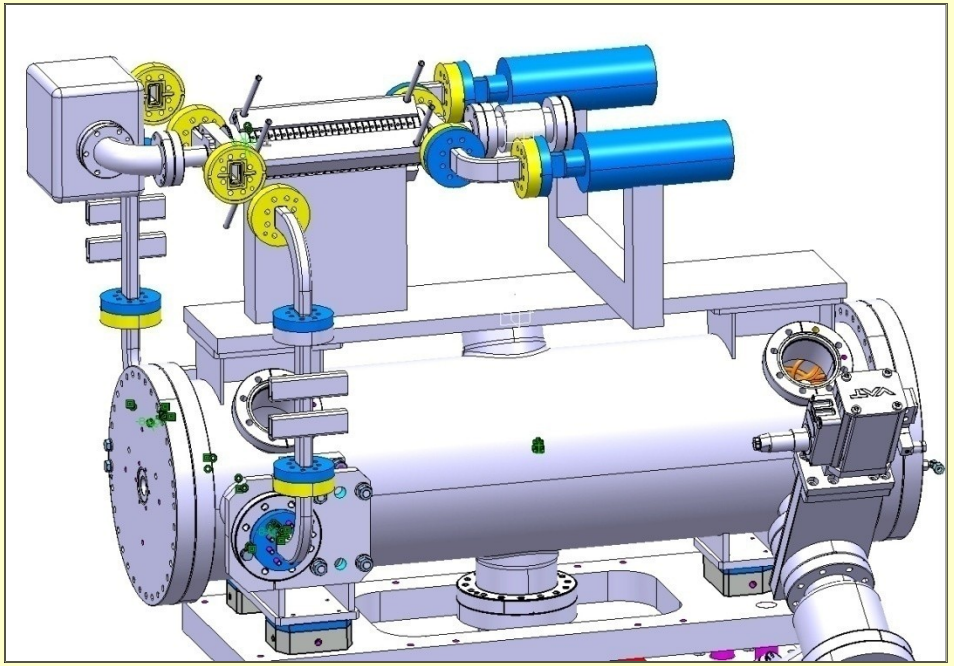


4 PETS tanks installed

Plans for TBL beyond 2012

How could it look like





Conclusions

- SRF topics of thin films and alternative materials is clearly interesting for CERN
- CTF3 and x-band test stand can be a partner to support or anchor some JRA's aiming for high gradient research and nc-topics
- CTF3 upgrade is properly not fitting in to this work package directly
- Need a bit more time to discuss internally given the short notice to come up with proposals