An overview of the hardware part of the structure development campaign as seen on 2-7-2004

Walter Wuensch
2-7-2004

Our goal is to demonstrate in the coming years full-performance extended operation of prototype accelerating structures, transfer structures and the high-power waveguide system.

The crux of the matter is to balance
speed/probability of success/cost
and
risk-taking/methodical advance

Presented here are a representative set of steps to arrive at our goal which are (I think) a good compromise based on a limited knowledge of boundary conditions.

Good or bad, we do not know how things will work out – and most decisions will be based on results of tests we haven't done yet.
That said, I am sure that we can pull a few more rabbits out of hats and make most of this presentation obsolete.

It is difficult to make predictions,

especially about the future.

J. M. Keynes

Typical time errors are $\pm\, \boldsymbol{\pi}\sqrt{N_{\text{years}}}$ months

Accelerating Structures

CTF2 duplicates (3.5 mm geometry, 30 cells)

Cu 2π/3, π/2, W, Mo to make direct comparisons to CTFII and X-band results. First extended runs to learn about stability issues.

Copper 30 GHz HDS and circular reference structure

Begin move to correct iris range and shape and first test of the HDS geometry. Test of our ability to predict achievable gradient.

Improved Mo/W/bi-metal iris (still 3.5 mm geometry, 30 cells)

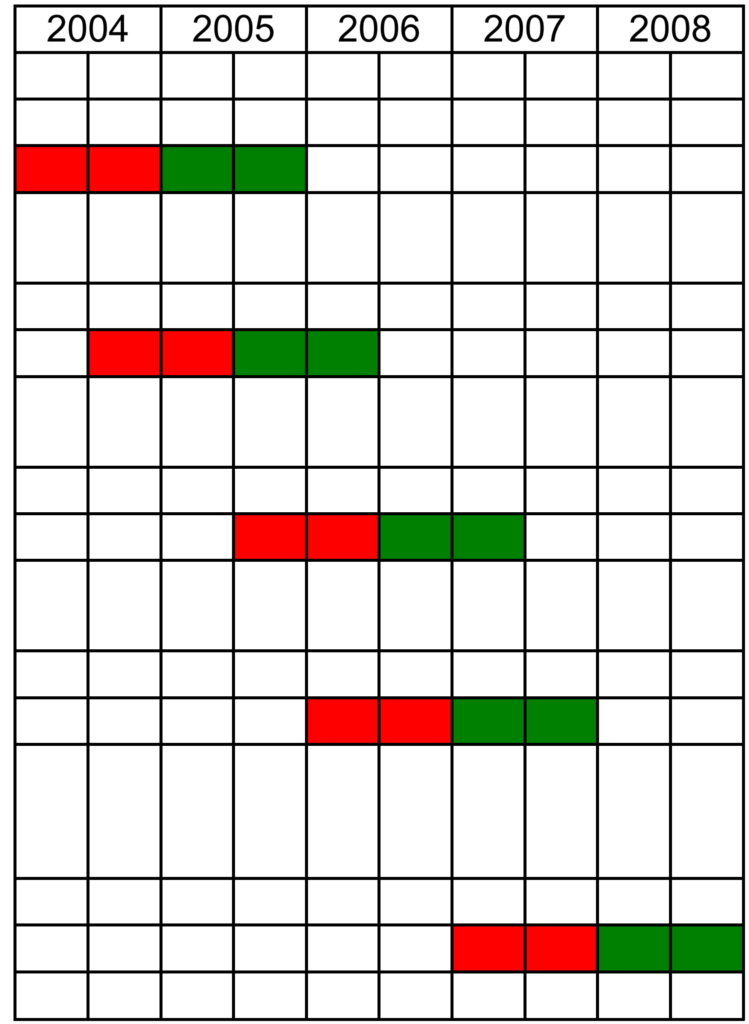
Includes extended running, two structures each of Mo and W. Old iris range is used to make a direct comparison of materials.

Improved Mo/W/bi-metal with correct iris range,shape and structure length

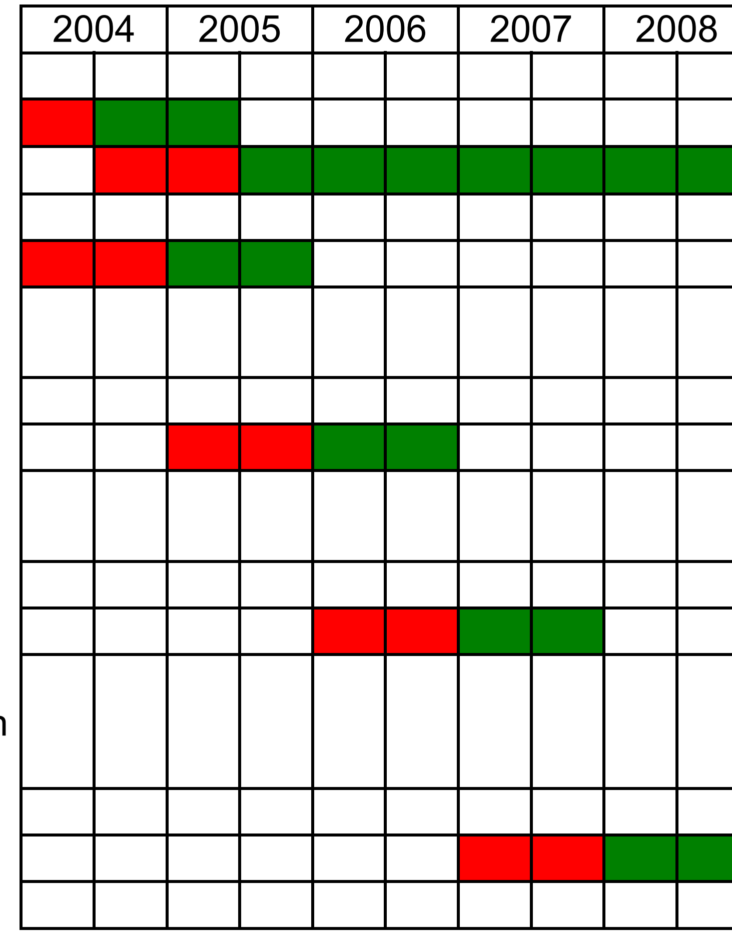
Includes extended running, two structures each of Mo and W. Real iris range is now used to give more accurate estimate of gradient, but circular geometry maintained for simplicity.

Bi-metal HDS

The full Monty. Includes extended running, two structures.



Transfer structures



CTF3 30 GHz power station

Copper, underway

Mo/Cu, as needed to deal with damage as it occurs

Coupler test

Low power, CLIC prototype, with all associated measurement test pieces.

CLIC prototype structure, low power, with dimmer

True geometry but shorter, copper, low-power, with all associated measurement test pieces, dimmer demonstration under vacuum

CLIC prototype structure, high power, with booster

Full length, fully featured, ready for beam with input coupler for rf input to boost fields. Tests high power, beam/structure interaction, extraction efficiency. Two structures, extended operation.

For TBL, probably scaled geometry

Need about fourteen

Waveguides, test areas and computation

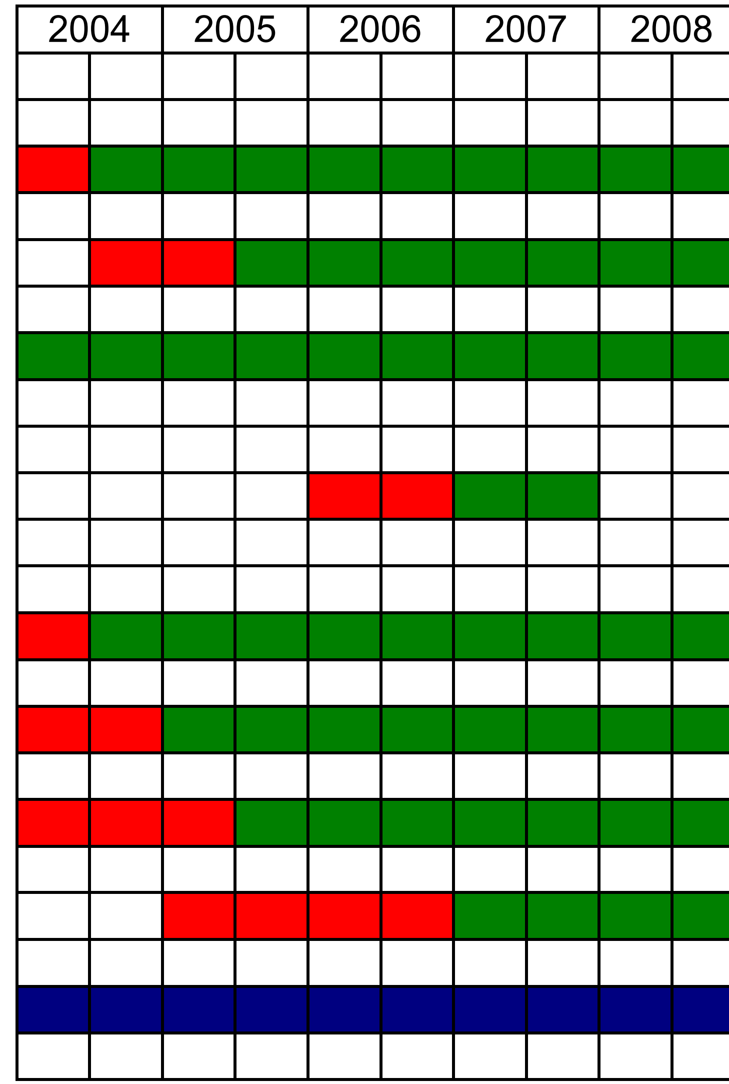
High-Power waveguide system

- Power transfer line
- Pulse compressor
- Rectangular wg components
- CLIC prototype power distribution

Test areas and diagnostics

- Mid-linac power station
- CTFII accelerating structure test stand
- Breakdown DAQ system
- Two-beam test stand (Sweden?)

Computation



Technology development

Pulsed surface heating
- Laser (TS)
- Ultrasound
- Rf cavity, (Dubna, ?)

High gradients
- DC spark tests (TS)

Complex geometries
- Fabrication (core,TS)
- Measurement (TS)

Materials
- Copper alloys (core and TS)
- Refractory metals (core and TS)
- Multi-metalics (core and TS)
- Ceramics for absorbers (?)

Preparation techniques
- Chemistry (TS)
- Thermal (TS and Saclay)
- Exotics - glow discharge, laser, particle bombardment

Consequences of completion by 2008

Production rate: about five structures per year

Testing rate: about five one-month 24/7 tests per year

Structure team must *at least* be maintained at current level