ILC Snowmass Workshop
WG 2 Summary

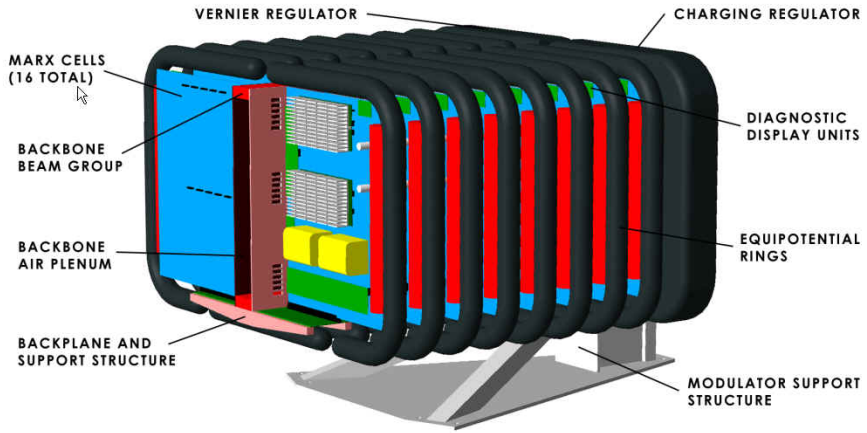
L. Tavian, AT-ACR 2 September 2005

Topics covered by WG 2

- **WG2 : Linac design**
  - » RF design: Modulator, Klystron, RF Distribution and Low Level RF
  - » Cryomodule Design
  - » Cryogenic System Design
  - » Linac Lattice, Tunnel Option, Gradient - Global View

RF Design (1)

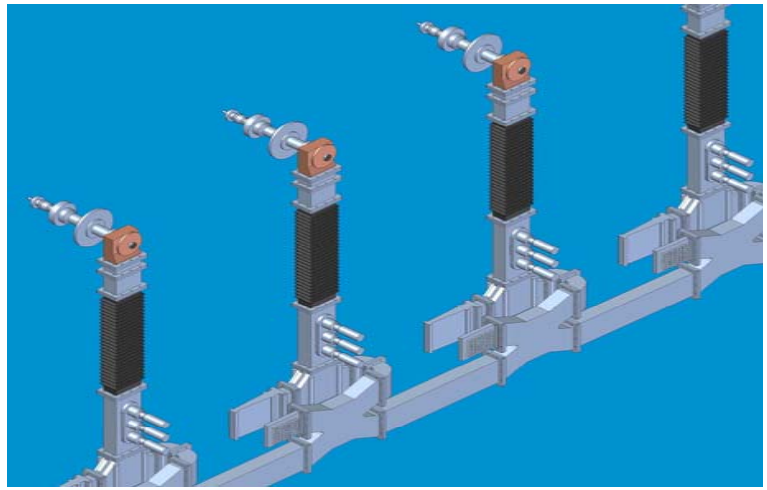
- Modulators:
  - » Choice based on experience: Pulse Transformer
  - » Choice based on potential cost savings (1 to 3) and improved performance: Marx Generator
  - » R&D needed on 120 kV single cable distribution, klystron protection scheme, Marx generator, DTI direct switch.



MARX MODULATOR - MECHANICAL DETAIL

- Klystrons:
  - » 10 MW MBKs should be chosen as sources for baseline,
  - » Alternatives: 10 MW Sheet Beam Klystron (SLAC), 5 MW Inductive Output Tube (CPI) and Low Voltage 10 MW MBK (KEK) are under study/development (several years effort).

RF Design (2)



- RF Distribution
  - » Baseline: The TDR / XFEL RF distribution scheme is a reasonable choice for the BCD with R&D effort to reduce cost and part count.
  - » Alternative: Alternative splitting schemes to be evaluated further for reducing cost (e.g. suppression of the circulators). Additional technology evaluations to increase system efficiency.

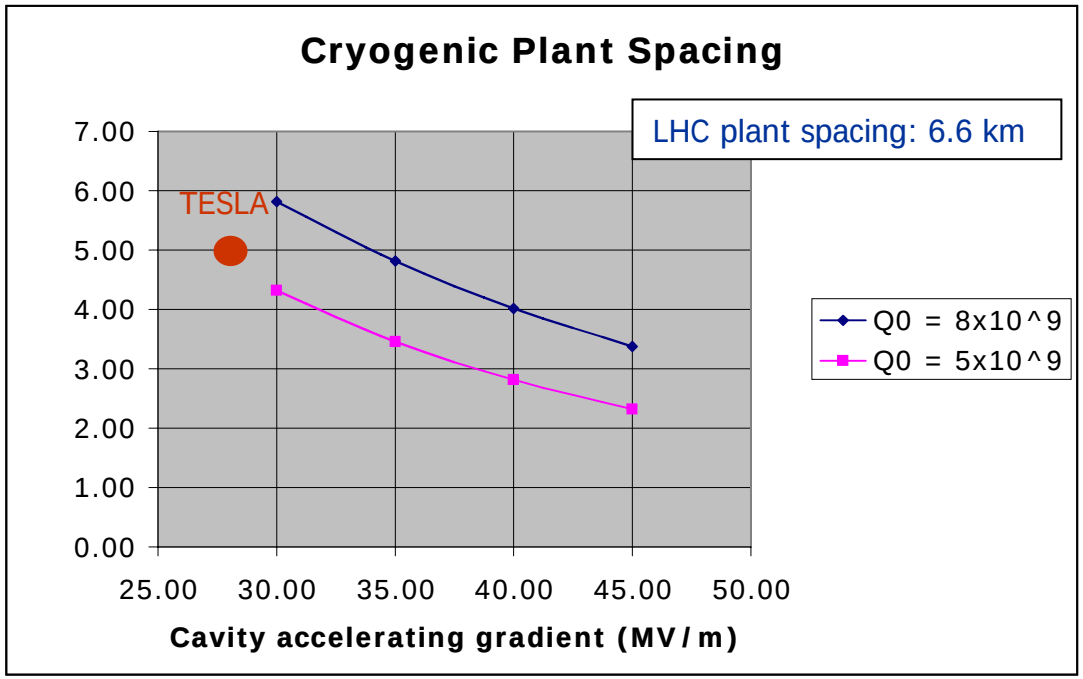
- Low Level RF
  - » LLRF system for VUV-FEL and XFEL retained as the baseline.
  - » R&D issue: Hardware technology follow-up, software architecture, algorithm development and test, availability improvement.

Cryomodule Design

- Take TTF Type III as reference conceptual design (BCD)
- Introduce layout modifications required to fit ILC requirements:
  - » Quadrupole / BPM package at the cryomodule center (symmetry and stability).
  - » Review all the subcomponent design for production cost and MTBF.
  - » Reduce the waste space between cavities for real estate gradient.
- Alternative: Dedicated module for Quad/BPM package

Cryogenic System Design

- **Take LHC/TESLA cryogenic layout as baseline using the pratical limit for cryoplant size (24 kW@4.5 K and 5.2 kW @ 2K).**
- **Options: Deep or surface tunnel. Laser-straight (highly recommended) or horizontal tunnel.**



- **Alternative: R&D on larger cryoplants (increase of plant spacing) , on efficiency improvement, on distribution on 2K refrigeration (doubling of plant spacing).**

Linac Design

- Linac Lattice:
  - » Choice based on experience and multiple cross-checked calculations (TESLA TDR like lattice) with continuously curved or segmented linac: One quad per two, 12-cavity cryomodules or three, 8-cavity cryomodules.
  - » Choice based on potential cost savings (need R&D): Lattice with larger quad spacing and reduced number of BPM (use of beam position information from cavities).
  - » Bending option (site dependant) requires additional bending magnets
  - » Aperture option: New shape cavities with smaller radius (~30 mm) and new Quad design with smaller radius (~18 mm).

- Tunnel issue
  - » 1 versus 2 tunnels: 2 tunnel option is less cost effective but is highly recommended
  - » Deep versus surface tunnel: Site dependant issue which impose to carry both options until site is selected.

- Gradient – Global view
  - » Minimize cost (optimum at ~ 40 mV/m)
  - » Provide extended physics reach:
    - Choose gradient somewhat lower (~30 MV/m) than thought achievable so higher energies are reachable at lower beam current (~ luminosity).
    - Use highest gradient cavities available at time of machine construction.