Modulators

Snowmass 2005 Working Group 2

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For WG2 Collaborators

Modulator Baseline

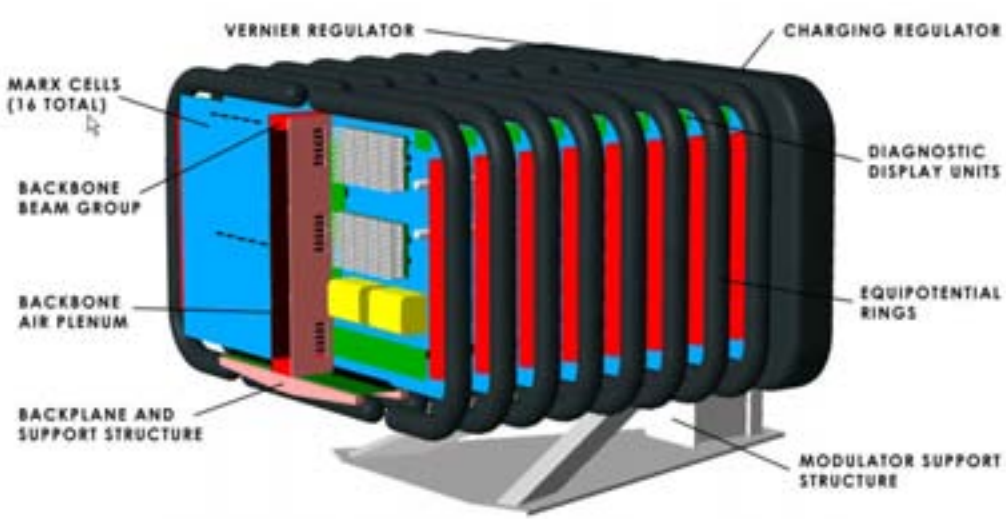
- Choice based on experience
  - Pulse Transformer
    - 10 units have been built, 3 by FNAL and 7 by industry (PPT with components from ABB, FUG, Poynting).
    - 8 modulators are in operation – no major reliability problems
    - 10 mod-years operating experience.
    - FNAL working on a more cost efficient and compact design, SLAC building new dual IGBT switch.
- Choice based on potential cost savings and improved performance.
  - Marx Generator
    - Modular transformerless design under development stressing high availability by 1/n redundancy.
    - Appears to have lowest cost potential by ~40-50%.

Reasons for Marx

- Solid state 1/n redundant modular design for inherent High Availability, reliability.
  - Highly repetitive IGBT modules (90,000) cheap to manufacture.
  - Eliminating transformer saves size, weight and cost, improves energy efficiency.
  - Air cooled cabinet with heat exchanger – no oil.
  - Smallest footprint of all contenders 2x2x1.5m.
  - Easiest to install, service by robotic system.
  - Smaller cable plant by 4X, major cost benefit.
  - Could reside in single tunnel with klystron although twin tunnels preferred.
- First full demonstration scheduled for FY06.

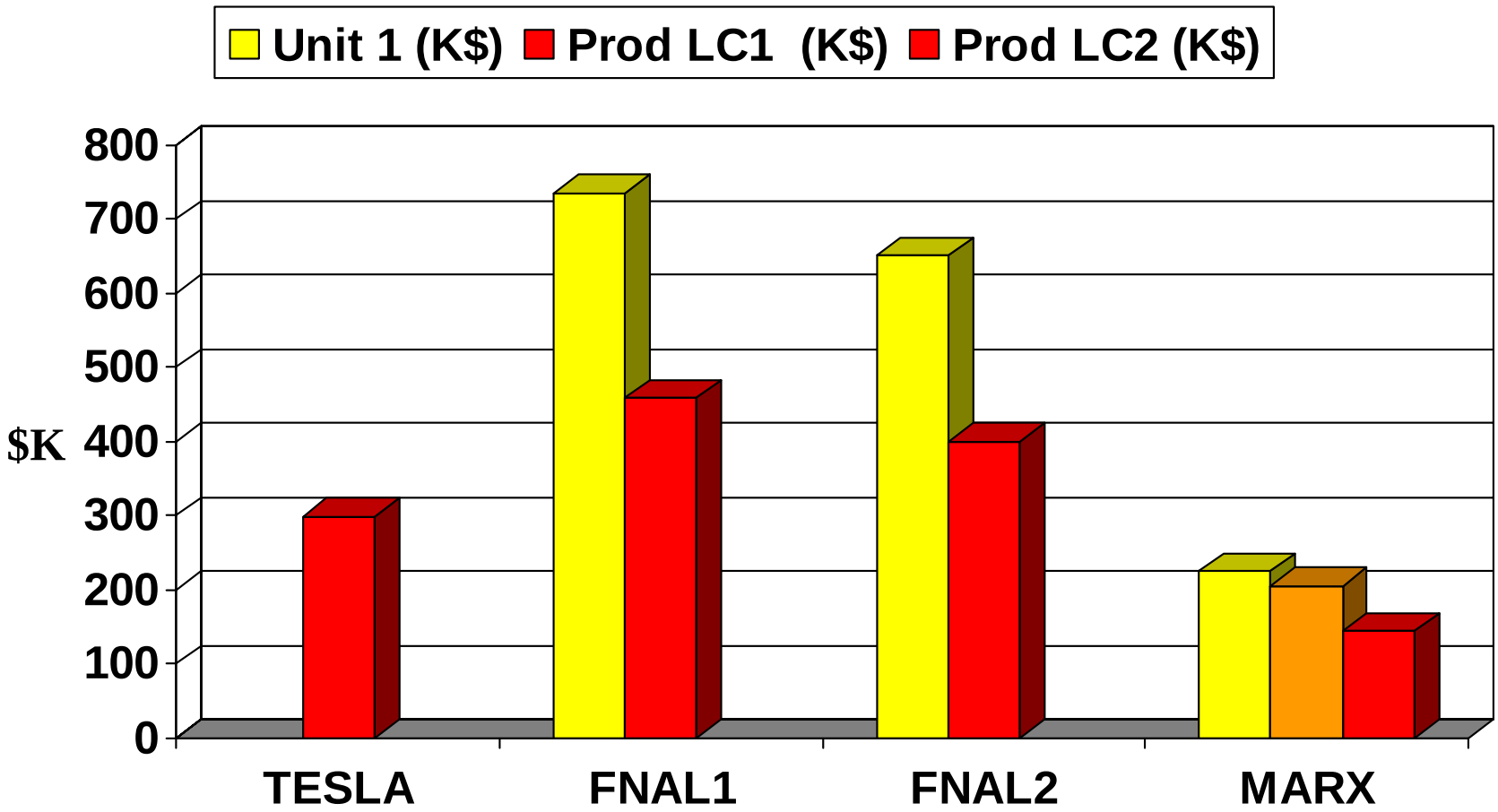
TESLA Baseline and Marx

FNAL Modulator at TTF



MARX MODULATOR - MECHANICAL DETAIL

Modulator Unit 1 vs. 572 Unit Avg. Production Cost Estimates



Other R&D

- R&D needed on 120KV single cable distribution, klystron protection scheme.
- Three Marx SBIR Phase I proposals awarded.
- DTI Direct Switch due end 06 for evaluation at SLAC.
- SNS HVCM being staged, optimized, evaluated at SLAC L-Band Test Facility.