Special Siting Session

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ILC GDE meeting
ОИЯИ, Дубна, 05.06.2008

Conventional Facilities and Siting Workshop - Дубна, 04-06.06.08

Goals of the workshop:

- *examine* the CFS requirements for ILC reference
- *examine* cost drivers (process cooling water etc.),
  - **Are these connected to the site configuration?**
- *develop* possible alternative sites and configurations,
  - **e.g. shallow sites and single-tunnel**
- *evaluate* alternative layouts
  - **reduce cost**
  - **study performance/cost trade-offs**

RDR Conventional Facilities Scope:

- 72.5 km tunnels ~ 100-150 meters underground
- 13 major shafts > 9 meter diameter
- 443 K cu. m. underground excavation: caverns, alcoves, halls
- 92 surface “buildings”, 52.7 K sq. meters = 567 K sq-ft

(Partial) Conventional Facilities Requirements:

Stability:

- **Floor stability better than 100 nm rms above 1 Hz.**

Thermal:

- **Air temperature below 40 ºC**
- **input cooling water temperature 30 ºC ± 2 ºC**

Shielding:

- **7 m shielding ok for worker occupancy**

Electrical Power:

- **total power consumption: 216 MW**
- **75 MW for main linac RF**

- Are these requirements correct?
- Can we *reduce cost* by challenging Stability, Thermal, Radiation… requirements?

Value Engineering:

1. Challenge each requirement –
   - **focus on those which have big impact on design**
2. Bring all affected 'parties' together to understand the 'minimal set' of requirements
   - **needed to do the job → keeping nominal scope**
   - **without undue increase in risk**
3. Develop design strategy consensus
   - **where do we go from here?**
4. Unite in support of consensus:
   - **a UNIFORM (teamwork) approach to site development**

What are the BASIC CF&S requirements?

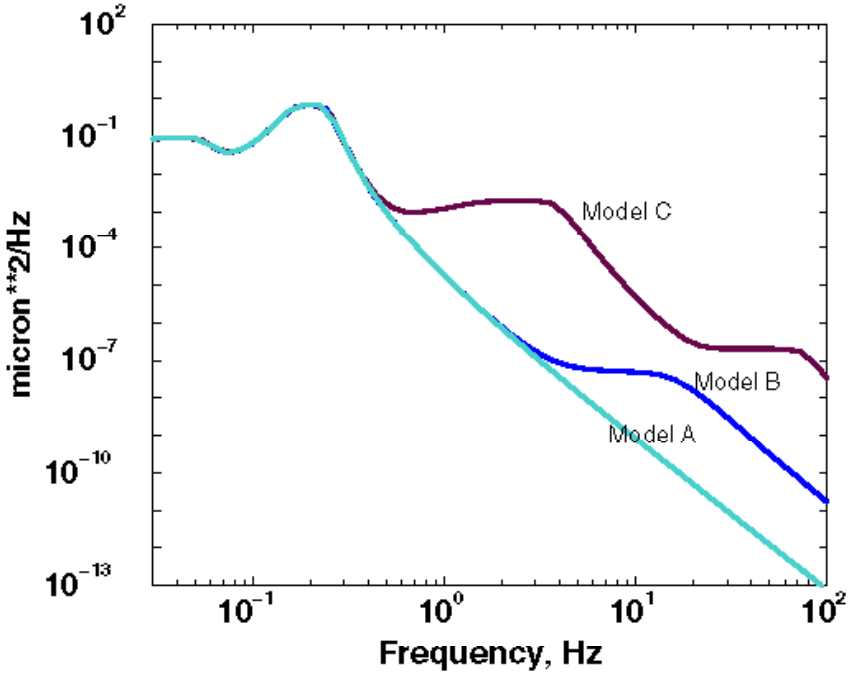
BASIC ≡ Most cost effective; best performance / cost ratio

Two examples:

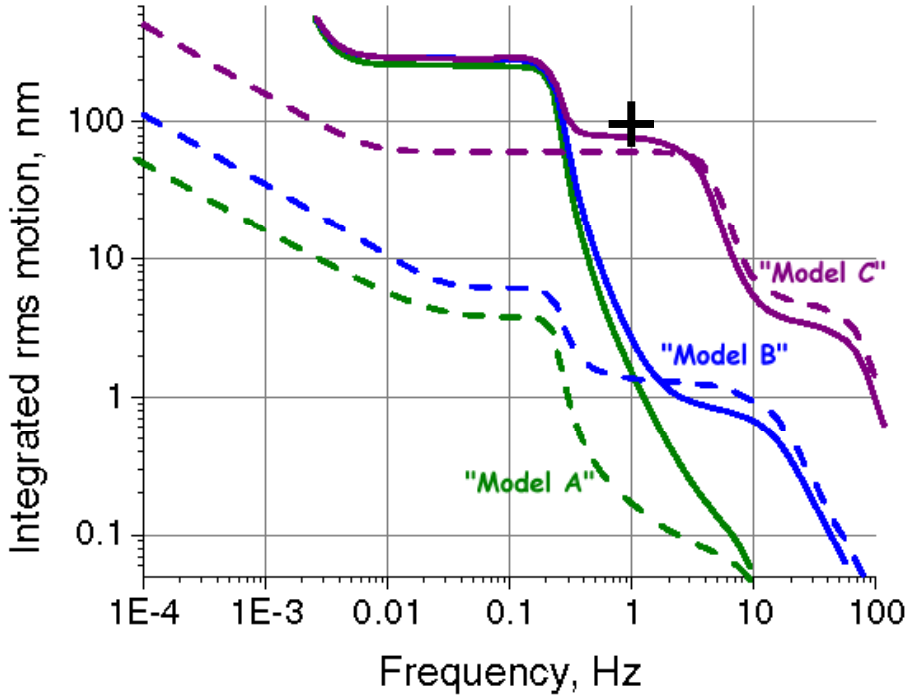
- Focus Group B: Utilities (infrastructure)
  - **(This afternoon)**
- Vibration:
  - **Much studied for the 'TRC' (2002) to compare warm / cold accelerator technology**
    - TRC = Technical Review Committee
  - **detailed work needed for RDR baseline**
  - →

Vibration Models for TRC:

- Absolute Spectra



- Integrated Absolute spectra
- Relative (ΔL~50m) spectra (dashed)
- + → 100nm at 1Hz



Vibration Models (2):

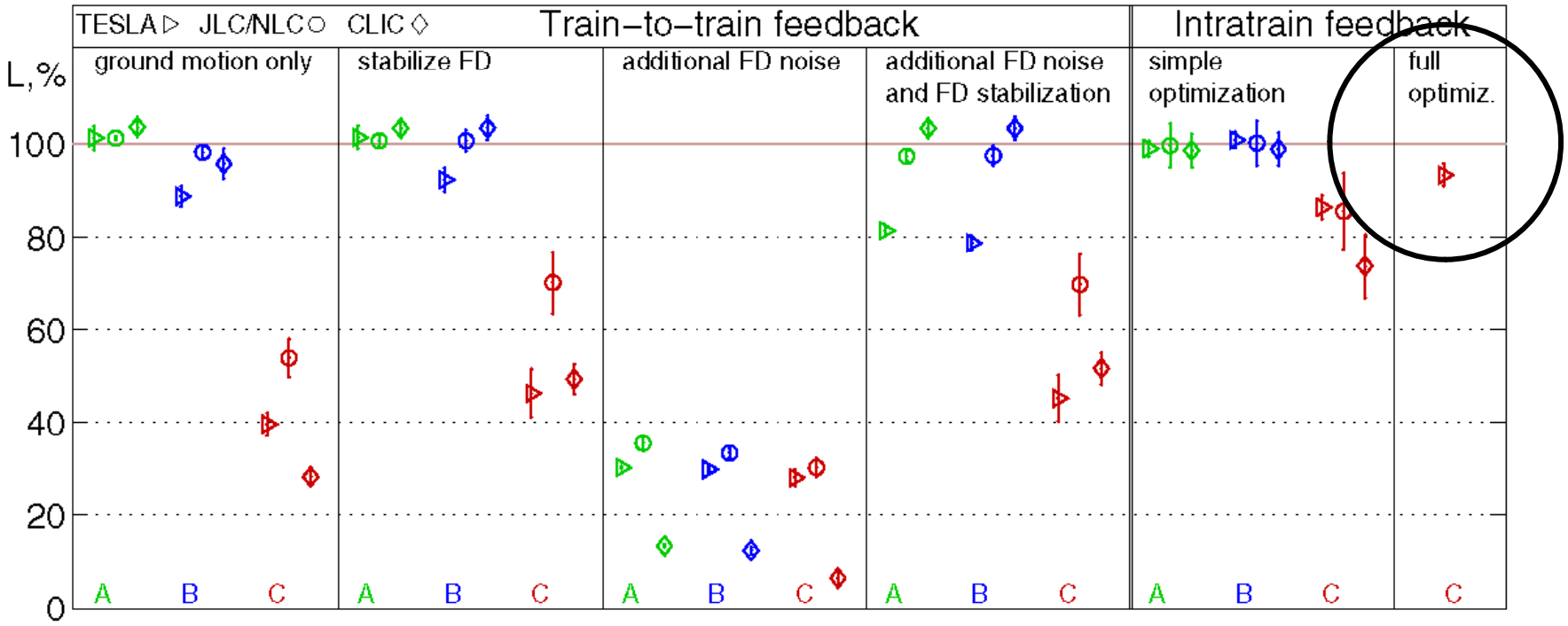
- A → Deep LEP tunnel
- B → shallow semi-urban SLAC tunnel
- C → urban water-borne HERA tunnel
  - **C is one of the worst vibration environments studied**
  - **('K' is a little better than C.)**

- Will the RDR – ILC work with C?
  - **YES.**

- Does this affect cost?
  - **YES.**
  - **ILC can be adapted to a wide variety of sites!**
    - (Vibration issues should be broadly de-emphasized)

Impact on Luminosity

- TRC Luminosity tuning/feedback simulations for:
  - **TESLA, JLC/NLC, CLIC**



Other CF&S Requirements:

Example:

Damping Ring Tunnel Environmental
(Tom Lackowski 12.2007)

(most not cost drivers)

(Thursday PM session)

Air /space Temperature (Deg C)
Air/space stratified temperature rise (Deg C)(or N/A if not required)
Air/space Temperature Stability (+ - Deg C)(or N/A if not required)
Air/space temperature gradient between large caverns (Deg C)(or N/A if not re
Dew Point Temperature (Deg C)(or N/A if not required)
Maximum Relative Humidity (%)(or N/A if not required)
Minimum Relative Humidity (%)(or N/A if not required)
Technical Equipment Heat Load to Air (KW)
Non-Technical Equipment Heat Load to Air (KW) (Xmfrs, pumps, lights etc)
Technical Equipment Heat Load to CHW (KW/& ave Delta T or flow) or ***see separate list***
Technical Equipment Heat Load to LCW (KW/& ave Delta T or flow) or ***see separate list***
CHW-cooled Technical Equipment pressure drop (Bar)
LCW-cooled Technical Equipment pressure drop (Bar)
Water cooled component **location** (***separate list***)
Water Cooled Component interface at valve only (Y/N)
Ventilation -ODH purge (Y/N - Cu. M /Hr if Yes)
Ventilation requirement due to equipment (mph)
No of People
Pressurization requirement

The Dubna meeting: PM plan

- The RDR represents a consensus design, which reconciled inputs from our accelerator designers / engineers
  - **'bottom's up design'**
  - **CFS just one aspect**

- We believe a more cost-effective design, based on the RDR, is possible and necessary in order to 'optimize' the ILC design
  - **(some *sacrifices* may be necessary)**
  - **Started at this workshop**

PM Assumptions:

- There exists a ‘minimal design’ that satisfies all scope requirements and allows cost comparisons for ‘optional’ features
  - **Not a trivial concept due to design optimization and consolidation already in RDR**
  - **The ‘value engineered’ design**
- The shallow machine is more cost-effective
  - **Effective reliability strategy for single tunnel layout NOT done for RDR – due to time / resource limitations**
- The process can be done within the ‘consensus – building’ context established for RDR
  - **Our community must buy-in and participate**
  - **UNIFORM approach to siting**

Uniform Site Approach

- RDR is our baseline
  - **strong, valid cost and design basis**
- the ‘uniform’ approach provides an opportunity for a less constrained design

- Specific goals for this workshop:

A. ‘Quantify cost impact for near-surface scenarios’

B. Develop ‘parametric models for infrastructure requirements’

C. Study ‘alternate layouts at specific sites’

D. ‘catalog cost increments and performance (risk) impact’