



# Main Linac EDR: Cavity & Cryomodule Discussion

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DESY



# ILC EDR: Just a few Questions:

- Engineering view
  - What detail is required?
  - What part of the system do we need freeze at which time?
  - Where can I insert changes (to be cheaper, better...) without affecting other components?
  - If there is a influence to some system, what is the impact?
  - Whom do I have to talk to anyway?!?
- Topic view:
  - What are the test needed to put forward a change request?
  - What is the mechanism to make the proposal a baseline (or part of the EDR)?



## ILC EDR: Just a few more Questions:

- Project view:
  - Is there a benefit to the project from this change?
  - What level of detail is required for the EDR?
  - What is the timeline?
  - Have we developed models for this EDR process e.g. for the industrialization or organizing the whole endeavour?
  - Is there a way of re-prioritizing efforts?
- These are only a very few of those being raised....



# Basic Approach

- Work forward...
  - **What are tests needed to prove my design change?**
    - E.g. Cavity shape change necessitates a beam test
      - See TTF experience.
    - Life-time testing
      - E.g. large-grain cavities in pulsed operation
    - Integrated systems test
      - E.g. vibration measurement on the center quadrupole and detailed comparison with the recent measurements of the TTF III modules and supports
    - When can we expect the results?
- Working backward
  - **What is latest date for choosing gradient?**
    - E.g. site layout
  - **When is the freeze of the module design?**
    - Can one define the maximum space for a component and still proceed with the design?
      - Mechanical part of the tuner system
    - Are there things still changeable after that without major impact?
      - E.g. shield tubing sizes



# Request for Information

- Too complex to rely on individual's knowledge of the project
  - **Therefore formalization required**
  - **Facilitate input in project tools e.g. RDB database**
- Request to Technical Groups
  - **Provide information on topic under (re-)design**
    - Description
    - Justification
    - Estimated impact on
      - other components/systems
      - Classification: Severe, significant, minor, none
      - Time needed to re-design
    - Estimated deadline
    - Estimated effort e.g.
      - manpower and investment
      - Test needed
        - » to prove validity e.g. feasibility, lifetime, beam tests, integrated systems test
        - » Test deferrable to the period after project approval
    - Provide deadlines for severe (significant,...) changes required by other systems components
      - in second iteration as a crosscheck
- Request to CF&S
  - **Provide some major deadlines**
    - When do we have to specify the linac length?
- Request to project management
  - **Advise on developing industrialization models**



## Simple example: Cryo pipe sizes

- Description
  - **Cryo tubing inside the module**
- Justification
  - **Optimise design**
- Impact
  - **Other components in module**
  - **minor**
  - **3 month (?)**
- Deadline
  - **possibly even after EDR**
- Effort
  - **thorough crosscheck with 3D design model**
  - **Helium flow simulations**
  - **Test needed**
    - Confirm flow simulations in any module test stand



## Simple examples: Large-grain niobium material

- Description
  - **Use large crystal material for cavities**
- Justification
  - **Lower cost**
- Impact on other systems:
  - **none**
  - **influence on preparation is external to the project (done by companies)**
- Deadline:
  - **Before cavity order**
- Effort
  - **reasonable number of cavities (10-30)**
  - **Test needed:**
    - Performance, Feasibility of tank welding (should be a no-brainer)
    - Module test: can be done after EDR



## Simple Example: Linac Gradient

- Impact on other systems:
  - **CF&S**
  - **severe**
  - **~1 year re-design for everybody...**
- Deadline:
  - **End of 2008 (year before EDR)**
- Effort:
  - **Significant number of cavities**
  - **Next-generation cavity preparation infrastructure**
  - **Tests**
    - Execute S0/S1 plan,
- Remark: Estimation by EC – which made life somewhat simpler...





## Complex example: Cavity shape

- Impact on other systems
  - **depends on strategy: Increase linac gradient or increase cavity yield**
- Estimated deadline:
  - ???
- Effort
  - **several cavities**
  - **Tests needed:**
    - Feasibility: Multi-cell performance
    - Beam test: HOM damping
    - Systems test if full package including coupler and tuner is used



# Input for Project Tools

Topics	Description	Justification	Impact on other systems (severe, significant, minor, none)	Impact on whom	Time needed for re-design	Expected deadline (proposer)	Expected deadline (affected systems)	Test needed before decision	Test possible after decision	Remark
Gradient choice	Define ILC gradient		severe	CF&s	~1year	end of 2008		S0/S1		Defined by EC
Large-grain	Change niobium for cavities		small	cavity manufacturer		Before cavity order		performance test on multi-cells, make high-power test, build 10 cavities, demonstrate cost benefit	built pre-production	
Cavity Shape	Ichiro as alternative	Two options: Higher yield, shorter linac	Two options: Increase linac gradient or increase yield					Performance demonstration, beam test		
Corrections to shield piping		Optimise design	small	components inside module	3 month	can be post-EDR				

- The information should guide the development of an overall ILC planning
  - need pre-defined categories
  - process of getting the data should provide crosscheck via affected systems/components



# Summary

- Interesting and positive discussion
- Need to channel the inputs
- Request for input from technical systems
- A process used for approaching the complexity of this topic has been proposed
- Prepare for use of project tools