Future research paths to ultimate performances

We could improve:

1. **Cavity structure**:

2. **Materials**:

3. **Phenomena comprehension**:

Future research paths to ultimate performances

We can improve:

1. **Cavity structure**:
    - Low beta
    - Intermediate beta
    - Beta 1
    - Low frequency (e.g. 200 MHz cavities)

Back

Future research paths to ultimate performances

We could improve:

1. **Cavity structure**:

2. **Materials**:

3. **Phenomena comprehension**:

Future research paths to ultimate performances

We can improve:

2. Materials:

2.1 Bulk Nb

- Nb High RRR, lower RRR?

2.2 Film Nb/Cu:

- New deposition tecniques: ECR, Arc, UM-Sputtering, Diode Sputtering

2.3 Higher TC

- MgB2 ?
- **A15**: Nb_3Sn, Mo-Re, V_3Si?

Back

Future research paths to ultimate performances

We could improve:

1. **Cavity structure**:

2. **Materials**:

3. **Phenomena comprehension**:

Future research paths to ultimate performances

We can improve:

3. **Phenomena comprehension**:

3.1 Clear experimental correlation between cavity performance and processing paramenters

3.2 Influence of additional problems:

3.3 Fundamental theory:

Future research paths to ultimate performances

We can improve:

3. **Phenomena comprehension**:

3.1 A more estensive and clear experimental correlation between cavity performance and processing paramenters

- Low H_{pk} Q-slope, Middle H_{pk} Q-slope, High H_{pk} Q-slope Vs resonator history (EP, BCP, Annealing T and t,)
- What is dependentent of Eacc? R_{BCS} or R_{RES}?

Back

Future research paths to ultimate performances

We can improve:

3. **Phenomena comprehension**:

3.1 Clear experimental correlation between cavity performance and processing paramenters

3.2 **Influence of non intrinsic problems:**

3.3 Fundamental theory:

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We can improve:

3. **Phenomenon comprehension**:

3.2 Influence of non intrinsic problems:

- Oxygen diffusing into niobium?
- Anodized cavities?
- Oxygen as diffusion barrier?
- Is Hydrogen fully excluded?

Back

Future research paths to ultimate performances

We can improve:

3. **Phenomena comprehension**:

3.1 Clear experimental correlation between cavity performance and processing paramenters

3.2 **Influence of non intrinsic problems:**

3.3 Fundamental theory:

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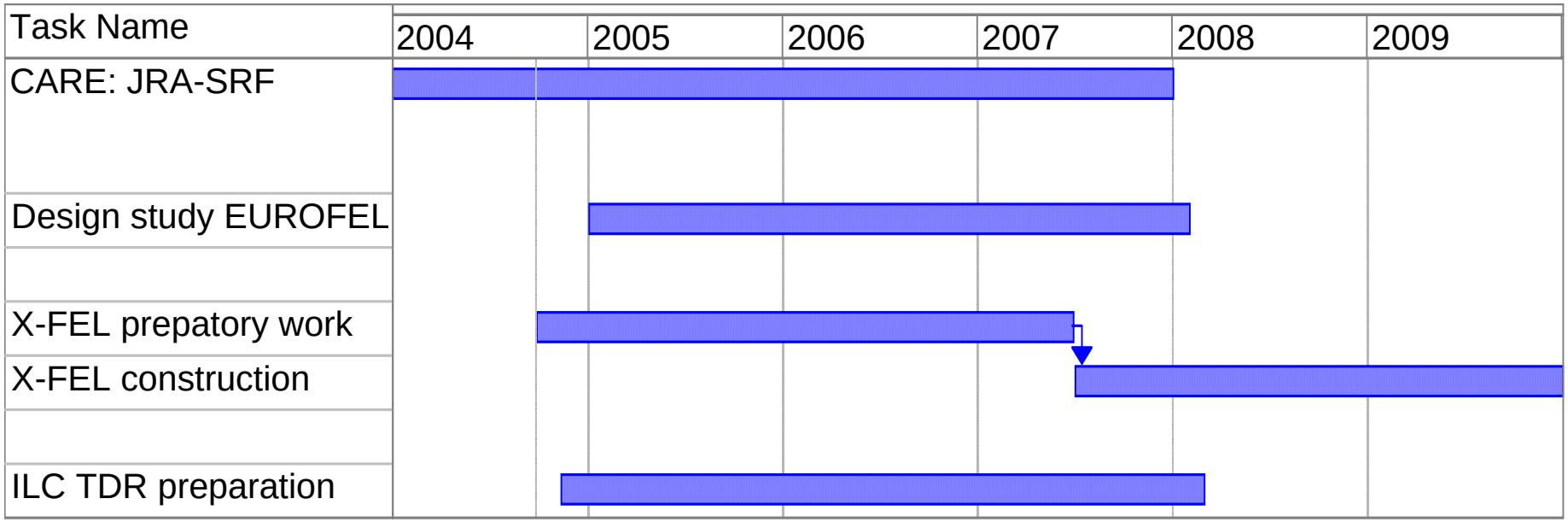
We can improve:

3. Phenomena comprehension:

3.3 Fundamental theory:

- Extension of the R_{BCS} formula to a field dependent regime
- Does the Nb critical current plays a role?
- Is K_{GL} really independent of field?
- What's more important among H_{C1}, H_C and H_{C2}?
- Will H_{SH} somehow help? $H_{SH}(RF) > H_{SH}(DC)$?



Short term items must be finished

R&D for SRF, short term 1 (project oriented)

- Establish best treatment parameters for:
  - Electro-polishing
  - High pressure water cleaning
  - Clean-room assembly
  - RF conditioning

==> CARE activity

R&D for SRF: short term 2 (project oriented)

- QA method for
  - Nb sheet quality
  - EP
  - High pressure water
  - Clean-room assembly
- Industrialization of linac components

==> X-FEL preparatory work

R&D for SRF: medium / long term

- Theory
  - Critical Nb rf field: Hc1, Hc, Hc2, Hsh ?
- Experimental determination of max H
  - High power short pulse experiment
- Nature of Q slope
  - Measure Hc3,

==> PhD, post doc

R&D for SRF: long term

- Superconductor other than Nb
- Thin film for Q0 improvement

==> PhD, post doc

Final comments

- Very useful workshop, lots of information and discussion
- Intensive exchange of technical information
- Substantial reports about fundamental issues of SRF physics
- “Fresh blood” from university of Wisconsin
- New subgrup established about
  - theory of SRF physics and
  - coordination of experiments to intrinsic properties of SRF bulk and film material (coordinator P.Bauer)

- **Lets thank Kwang-Je Kim for organization**
- **Lets continue this way**