# Round Table Panel Discussion Topics and Speakers

General Introduction

Please prepare 5 slides per topic and leave some time for panel and audience discussion. If appropriate try and make comments about estimated costs and estimated timelines for development efforts.

# Energy and Luminosity Frontier SRF R&D

**Session 1: Cost round tables – H. Padamsee**

**10 topics, 15 -­‐ 20 minutes each, total 3 hours.**

1. Introduction to Session: General pathways for future cost reduction, near term, long term. What is the possible impact to HEP accelerators at the energy and intensity frontiers? **(Hasan)**
2. What is the cost of 250 GeV (380 GeV) Higgs (Top) Factory as a start-­‐up mode for ILC? Discuss the cost as a fraction of ILC cost. An earlier estimate by Nick Walker had this fraction as 65%. **(Nick Walker, Solyak, Yamamoto)**
3. What is the cost benefit to ILC of increasing the design gradient from 31.5 to 35 MV/m at a Q > 10^10? What is the cost benefit for higher gradients, e.g. 40 – 50 MV/m with higher Q’s. What is the cost benefit of developing Nb-­‐Cu technology (thin films or composite materials) **(Solyak)**
4. If gradients beyond 50 MV/m can be realized in the long term, what it the expected cost benefit for say Nb3Sn at 60 – 80 MV/m? Is there any cost benefit for 4.2 K operation? **(Posen, Liepe)**
5. What is the total rf requirement for FCC Higgs Factory? How many 400 MHz and 800 MHz total will be required? What are the development challenges? What is the cost impact of films, Nb3Sn and N-­‐doping (high Q) technologies for FCC? **(Gerigk, Aull, Posen)**
6. What is the cost impact of increasing ILC luminosity from its design value by a factor of 2. One approach to increasing luminosity is to increase the beam rf pulse length to 1.6 ms from 0.8 ms and accelerate a train of 1600 bunches. This doubles the beam power. With higher Q is it possible to trade lower refrigerator cost for higher RF power cost? Is the impact of high beam power a concern? **(Nikolai Solyak)**
7. What are the pros and cons for long term cost reduction via Nb materials using large grain Nb? What are the best case and worst case scenarios for total cost reduction. Also, single cell cavities of explosion bonded Nb-­‐Cu have been fabricated and tested to 40 MV/m. What is the anticipated material and fabrication cost saving of using explosion bonded Nb-­‐Cu over Nb? **(Geng, C. Reece, Yamamoto)**
8. What is the expected impact for improved EP technique, such as Vertical EP or HF free EP?) What is the recommended development program? **(Liepe, Yamamoto)**
9. What are the main cost drivers for SRF PIP-­‐III linac option? **(Wu)**

# Session 2: Technical Round Tables, evolutionary developments- ­ ‐ A. Grassellino

What is a recommended development program (include cost estimate and timeline) for demonstrating 35 and then 40 MV/m in 9-­‐cell cavities at a Q >1.5\*10^10, in vertical test and cryomodule? **(Grassellino)**

LCLS-­‐II represents an important milestone for demonstration of high Q CW machines. What are the next steps and validating milestones towards high duty factor/CW machines of different frequencies with high Q and mid-­‐high gradients? With bulk Nb? With Nb3Sn? Comment on timelines. Comment on developments needs for doping, flux losses etc. **(Reece, Liepe, Posen, Grassellino)**

New shape cavity development, Low-­‐Loss, Ichiro, LSF, Re-­‐entrant cavities have demonstrated single cells to reach 55 MV/m at Q of 10^10. What is the recommended future development program for demonstrating 50 MV/m in a 9-­‐cell cavity of advanced shape? **(Geng, Solyak, Welander)**

What is the timeline and milestone path to a machine with films technology with Eacc >16 MV/m, and Q>1.5e10? **(Wu, Aull, Reece, Liepe)**

What are the state of the art and the new ideas to pursue abatement of field emission in vertical test and cryomodules? **(Wu, Kelly, Geng, Padamsee, Martinello)**

# Session 3: Technical Round Tables, transformational-­‐A.Romanenko

What are the ultimate Q and gradient limitations in SRF cavities? What breakthrough ideas, materials, surface structures should we pursue to reach revolutionary gradients and quality factors?

# (Kubo, Romanenko, Posen, Checchin, Gurevich, Sauls, Xiaoxing, Padamsee)

Fundamental understanding of surface nanostructure and superconducting properties via advanced measurements/characterization of samples has played a crucial role in making progress with SRF cavities performance. What further studies and breakthrough techniques should be pursued for further understanding of cavity performance? **(Romanenko, Iavarone, Lee, Reece, Zasadzinski)**