AF7-rf Draft Report Feedback

We are excited to receive your feedback on the AF-rf Draft Report. Any questions/comments posted here will be replied to publicly. If you prefer to contact us directly please reach out by email.

Sergey Belomesthnykh sbelomes@fnal.gov
Emilio Nanni nanni@slac.stanford.edu
Hans Weise hans.weise@desy.de

Snowmass Info: http://seattlesnowmass2021.net/
Snowmass Schedule: https://indico.fnal.gov/event/22303/
AF7 Discussion Session at Snowmass - July 21st, 8:00 - 9:00 am PDT
AF7 Summary Session at Snowmass - July 23rd

We would like to acknowledge the contributions of the community. Please add your name at the end of the document if you would like to be included in the report's author list.

Please enter you comments, questions and feedback for the AF7-rf Draft Report here:
Name: Question/Comment
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1. Akira Yamamoto (KEK and CERN):
   Acknowledgement:
   - Many thanks for your outstanding effort to reach the AF7 rf Draft Report.

   Comment 1: Page 3, line 10 from the bottom
   - Please consider the following edit, just in case it was referred from the White Paper, titled " Meium-grain niobium SRF cavity production technology for science frontiers and accelerator application" [Ref: 22, G. Myneni et al., in this summary] (it is correctly referred in page 8 [22]. Thanks for your kind understanding).

   Current draft (word) : – medium grade niobium material, …
   Proposal for the update:: - medium **grain** niobium material, …

   Comment 2: Page 9, concerning the prospect for thin-film/coating technology,
   - Just as my personal impression, it might be suggested to add a few words more on prospects for the thin-film and/or multilayer coating technology, in principle to improve the gradient limit with cost-effective approaches. It could be further encouraged for the future in this field.

2. Sergey V. Baryshev (MSU)
   Comment 1: For subsections on page 11 called **Terahertz and sub-THz structures** and **RF breakdown physics**, maybe a few sentences can be added with regard to results

described in Ref.[10.1103/PhysRevLett.123.134801]... something along the lines that short-pulse THz ultrahigh gradient (~1 GV/m) reveals novel physics (beyond conventional breakdown) that in the end can lead to microwave quenching and thus practically limit evergrowing gradient R&D.

Comment 2: Subsection 2.2.2 – there is not a word of solid state source R&D. As far as I am aware, APS-U team is working on replacing klystrons with SS modules. Worth mentioning?

Thanks!

3. Anatoly Krasnykh (SLAC)
   Comment:

   I am proposing to make a slight change in paragraph 2.2.2 " RF Sources"

   The name of paragraph " RF and Unique Pulse Sources".

   The proposed text is as follows.

   High power RF amplifiers and unique pulse sources are often thought of as "known quantities," and while there is an abundance of research activity in accelerating structures, R&D in these components is relatively uncommon. Certainly, industrial development of these components is required to improve the cost/capability challenge for RF and pulse power. However, doing so in isolation from ongoing high power RF research at universities and national laboratories, and the future plans for high energy physics facilities, is not possible. This is because there are not many commercially viable uses for megawatt-class RF amplifiers for example, and the devices that do exist are usually custom-designed for a specific application. It is unreasonable to expect that an industrial supplier will invest their own time and money to reduce cost in anticipation of a single-use system that may (or may not) be assembled decades in the future. Because of the long-time frame, high technical risk, and undefined initial requirements associated with future facilities or future facility upgrades, any reasonable business plan would "price in" the impact of these uncertainties – so when a new facility is proposed, the RF power and pulse systems will be prohibitively expensive. Support for high-risk research in RF sources is desperately needed if we are to realize improvements in cost-capability that would make a dramatic difference. Such an effort must be led by national labs and academia because these institutions can tolerate the long-term risk of this effort. Partnering y with industry will also be critical to ensure that technology transfer is realized early on and address practical challenges to implementing new concepts.

   I would like to include the issues of a MW -level solid state device in this paragraph. A ScandiNova solid state modulator concept is not a unique and a cost effective concept. I think there is room for optimization.

Thank you.

4. Anne-Marie Valente-Feliciano (JLab)
   Section 2.5 Synergies
   " The novel materials and deposition techniques developed for SRF Technology also present a great potential for quantum and device applications"

5. Jean-Luc Vay (LBNL)
   In the introduction and section 2.3.1, I propose the following minor edit:
   change
   "A Beam and Accelerator Modeling Interest Group (BAMIG) was formed, consisting of 25 key players from 13 U.S. laboratories and Universities."
   to
   "A Beam and Accelerator Modeling Interest Group (BAMIG) was formed, consisting of over 80 subscribers to the mailing list, including 25 key players from 13 U.S. laboratories and Universities."
   [see https://indico.fnal.gov/event/22303/contributions/247087/attachments/157708/206461/AccModelingAF1.pptx, slide 2]

6. Rongli Geng (ORNL)
   In section 2.1.1 paragraph on field emission, I propose to the following edit:
   change
   "Field emission (FE) is one of the limiting factors for SRF cavities operating in accelerators. Hence, developing better cryomodule integration techniques, e.g., by employing robot-assisted assembly, and post-integration mitigation methods remain important R&D topics."
   To
   "Field emission (FE) is one of the limiting factors for SRF cavities operating in accelerators. No full-scale SRF cavity has ever been operated at a gradient of > 40 MV/m. Hence, developing new cleaning methods [ref], better cryomodule integration techniques, e.g., by employing robot-assisted assembly, and post-integration mitigation methods remain important R&D topics."

   [ref] AF/SNOWMASS21-AF7_AF7_Rongli_Geng-192.pdf

Feedback from Session:

Sources and Systems -

Modeling -

Cavity Performance -

XL SWFA bullet update

ES People not just eq to maintain what we have

HW EuLDG RD facility Balance

SG Too Many RF facilities - not new - new capabilities

muC needs - cavities NC and SRF, cavity operation in magnetic fields

Need to update roadmaps? Incorporated at next round at end of roadmap

HW - EuLdg B field tests of structures , muC should push

SB _ developing Ilc or other machines - why ilc and not others?

Please enter your Name and Affiliation if you wish to be included as an author of the AF7-rf summary:

Ganapati Myneni
BSCE Systems, Inc. & International Symposium On Hydrogen In Matter (ISOHIM), Yorktown, Virginia,
Old Dominion University, Norfolk Virginia & Jefferson Lab, Norfolk, Virginia

Name: Akira Yamamoto
Affiliation: KEK and CERN

Name: Sergey V. Baryshev
Affiliation: Electrical and Computer Engineering, Michigan State University

Name: Alireza Nassiri
Affiliation: ANL and MSU

David Neuffer
Fermilab, PO Box 500 Batavia IL 60510

Chunguang Jing
Affiliation: Argonne National Laboratory, 9700 S. Cass Ave, Lemont, IL 60439
and Euclid Techlabs LLC, 365 Remington Blvd., Bolingbrook, IL 60440

Xueying Lu
Affiliation: Northern Illinois University, DeKalb, IL 60115
and Argonne National Laboratory, Lemont, IL 60439

Bianca Giaccone
Fermi National Accelerator Laboratory, Batavia, IL 60510

Sam Posen
Fermi National Accelerator Laboratory, Batavia, IL 60510

Matthias Liepe
Cornell University

Anne-Marie Valente-Feliciano
Jefferson Lab

Jean-Luc Vay
Berkeley Lab

Tianhuan Luo
Lawrence Berkeley National Laboratory, Berkeley, CA, 94720

Rongli Geng
Oak Ridge National Laboratory

Pashupati Dhakal
Jefferson Lab

Name
Inst.