

# Snowmass Neutrino Frontier Town Hall

## 17 July 2020 @ 10h00 ED

Notes from Cindy Lin and Louis Strigari

Lin notes:

### **Introduction: Huber**

Snowmass Advisory group comprises the executive group and representatives from various other groups.

The Neutrino frontier is divided into various topical groups, with each topical group having 4 co-conveners. Highly encourage participation.

2 pages of LOI due August 30th. Will help facilitate planning by conveners. LOI process intended to make sure no topic gets left out. Does not have to explain physics in any detail. Most topics cross cut between groups. Topical conveners deal with organizing these. Snowmass contributions (due 2021) can be any length, but summary is highly encouraged since there are so many papers to be read.

Snowmass21.org is a good starting point to find any information. Calendar & slides page. Join the mailing list, if nothing else (big announcements). Slack channel is intended for discussions.

October for all Frontier meeting, around March next year for a special Neutrino Frontier meeting

Broad questions for the panelists to consider. Experimental, theoretical, and structure  
How do we maintain the necessary breath of physics for everyone and ensure that all the effort has enough resources? + other questions on slides

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### **Connections between the computing and neutrino frontier: Himmel**

- There are many connections between neutrinos and computing.
- Requires special programming skills to optimize data taking and analyses
- How do we use the tools developed outside of physics to help us improve how we do physics? HEP is behind in “big data.”
- Guide to computing frontier
  - Topical group introduction
  - Room to determine how quantum computing is important to neutrino frontier
- Timescale considered is ~10 years since the technology can change so fast

- While most of the frontiers are thinking of future, computing is relevant for the current experiments
- How to get involved
  - Need input from the other frontiers
  - Submit an LOI on what you're doing and what you will need in terms of computing
  - Participate in workshop
- Information on how to get touch
- David Christian: Why won't event parallelism continue to be sufficient to let us continue to benefit from advances in computing power (increasing number of cores); is the answer only that memory is limited and our events are large?
  - That's a piece of it, we still need to achieve effective parallelism. Right now we just run multiple processes How to actually parallelize is very tricky and is a focus of the group.
- Jaehoon Yu: Are there any plans for a new fundamental technological advanced needed to support HEP?
  - There are a lot of people thinking about these things. In the world of neutrinos, the challenge is large individual events. Don't know where the line is between fundamental advance and advancing what already exists.
  - David Christian: An example of using what already exists is use of GPUs.

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### **EPPS: Kopp**

- The European Strategy update
  - In 2018 call for proposal
  - Whitepaper for large scale projects, along with smaller contributions from smaller experiments. Similar to Snowmass process.
  - Town Hall in 2018. Most of the Euro community together and wrote a joint proposal.
  - Late 2018, deadline for submission; met in Granada for open symposium and issues a Physics Briefing Book
  - Strategy session
  - Spring 2020 meeting input was condensed in recommendations
  - Recommendation for particle physics in general, but also for CERN: CERN plays a major role in European strategy, though it is not an update directly for CERN, concerns CERN due to overlap with future of collider physics
- Overview
  - 2 statements on major developments from the 2013 strategy: these are the priority
  - 3 statements on general considerations for 2020 update
    - Strengthen the european PP ecosystem that complements CERN work well
  - 2 statements on high-priority future initiatives
    - Higgs factory

- R&D for accelerator technologies
  - 4 statements on other essential scientific activities
    - Funding for other activities will likely not come from CERN budget, no major financial contributions
    - Only support in the know-how and infrastructure
  - 2 statements on synergies with neighboring fields
  - 3 statements on organizational issues
    - Results should be as freely accessible as possible
  - 4 statements on environmental and societal impact
- Main recommendation in collider physics
  - Main chunk in the portfolio
  - 100 km ring
  - Distant future 100 TeV pp collider
  - E+e- collider as possible - linear vs CERN like collider
  - Geological survey
  - Main push is towards e+e- collider in circular. CLIC technology will be kept alive because it's interesting and can be a backup when something goes wrong with the circular collider. Also depends on what other nations are going ahead with in their future experiments
  - These are really really huge experiments. ~\$20B Euro. Annual budget for CERN is ~\$1B Euro. Extra funding will be required.
  - Keep unique infrastructure alive. Should not suck up the entirety of resources.
- The statement on neutrinos (see statement in slide 6)
- Interpretation
  - Strong recommendation to continue neutrino activities
  - Do not expect significant changes to US programs from Euro
  - DUNE and LBNF mentioned explicitly to receive major funding
  - Other non-collider activities are interesting but not deemed worthy for funding through CERN
- Personal opinion
  - Neutrino platform at the moment is strictly hardware development, no money for scientific personnel
  - Would make sense to move towards analysis platform once DUNE is running
  - Should also include neutrino theory
- Ruben Saakyan: In Granada, there was sizeable renewed enthusiasm in muon collider studies and their connection with neutrino physics via nuSTORM. Is the focus on FCC(ee/hh) an indication that this is not something CERN is willing to pursue?
  - This is not a high priority at the moment. ~\$1M scale, giving what the strategy is recommended, there will probably not be any funding contribution. This will require to be done at CERN with CERN funding, so it's likely not be top of the agenda. Can change though. CERN counsel can deviate from recommendation, but requires really good reasoning

- Jeffrey Eldred: It seems like European Strategy statement mentioning US & Japan long-baseline neutrino programs, but not the proposed ESS neutrino program. Does that mean that the ESS neutrino program is specifically not recommended?
  - The difference is these are not CERN projects. The facility will be built and the collaboration will handle everything else. But does not require considerable effort continent-wide.

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## SEC NF

- Current status
  - EC member siwht neutrino background and interest
  - Email list
  - 3-month leadership terms with dedicated topical groups
- Short term goals
  - Regularly hold meetings
  - Encourage EC members to participate in the snowmass process
- Long term goals
  - Share ideas, help plan for the future of neutrino physics education and research
  - Help with the LOI
  - Provide reports to EC scientists about the progress in snowmass process

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## First panel: Physics goals and motivation

# Physics Goals and Motivation

**Panelists:** André de Gouvea, Chris Marshall, Josh Spitz, Lindley Winslow

## Questions:

- How are the limitations of existing neutrino sources and detectors affecting our physics reach?
- What kinds of new physics searches should we prioritize, especially considering that there are no decisive hints regarding what lies beyond the standard model from other fundamental physics experiments?
- What can neutrino physics do for other fields of science and technology?

## Roundtable

- Andre de Gouvea

- The big question about physics is we kind of know where we going, but what will we do afterwards. The main issues is we have a very successful phenom understanding of the physics but we're not sure if hta'ts correct. How much do we know for sure there is nothing beyond 3-flavors. We're in a precision era, if you ask yourself 'how do we know there's nothing missing?' we don't! The rela challenge going forward is not precision but how do we overdo these experiments with the same precision so we know there's nothing missing. What should we be looking for with priority, the answer is we don't know. We cna make strawmen and set bounds on those. We're suppose to respond to what might come up in the next 5 to 10 years in order to make progress.
- Chris Marshall (U of Rochester)
  - What awaits young physicists?
  - Doing exp with heavy nuclei. The limitation of current exp. One of the big limitations of going beyond is the
  - Tau nu is very interesting and we know very little about it
- Josh Spitz (U of Michigan)
  - Muon nu oscillating to tau nu. Tau nu are indeed very interesting. A lot of time it's not just bigger exp. It's not the uncertainty that are holding most exp back. There are a lot of technology that exist that are not being utilized
  - Spallation neutron source can be a dark matter production power house
  - Some of the best accelerators are just starting to host neutrino exp. Those paradigm shifts are important for the advancement
- Lindley Winslow
  - Coming from double beta decay, new physics
  - Technologies real comes into play for neutrino physics
  - Thes divisions between the technology and fields is hurting neutrino physics.
  - If you require small budget, then it's not as bad. But if you require a large budge, it's really difficult and can hurt the exp.
- Brajesh Choudhary: Question to Andre: What beyond DUNE and HK? Where are we going? We know that DUNE and HK would not answer all the questions. Your thoughts please.
  - Hopefully this is what comes out of Snowmass. Prepare to look at different possibilities. It would be very tempting with the upcoming technology to think if we can do bigger and better. If we pretend DUNE and HK don't see anything exciting, we need to ask ourselves how we we do better? Better nu beams?
  - Would be great to have a high energy nue beam. How to make this high quality?
  - Possible once DUNE and HK start running, we run into the issues of high systematic, need to understand our beams better.
  - In that case, what comes next? How do we do better?
  - Snowmass should ask "how much better can we do?" "what other doors can we open with better technology?"
- Kendall Mahn: Do we have a sense of how limited the nu tau appearance constraints from atm (esp HK, DUNE, and IceCube in the future?)

- Doug Cowen: With its upgrade, IceCube will be able to measure atmospheric  $\nu_{\mu}$  oscillations to better than 10%. Current measurements (SK, OPERA, IceCube) are at about 30%.
- Kevin Kelly: @Kendall — DUNE will be able to study  $\nu_{\mu}$  →  $\nu_{\tau}$  in the beam at the ~5% level.
- Kendall Mahn: @Kevin, do you know how that helps us constrain or not unitarity?
- Maury Goodman: I think Kendall was distinguishing between  $\nu_{\tau}$  appearance and  $\nu_{\mu}$  disappearance.
- Joshua Barrow: Branching off from Josh Spitz: Leveraging existing and future BES instruments and facilities provides excellent opportunities for parasitic, small, fast, fundamental physics searches using neutrinos and neutrons, and should be pursued in earnest by the larger community. It also makes the synergy between the nuclear and particle physics ever greater, encouraging collaboration and robust science.
- Matthew Toups: Spallation neutron sources are not the only facilities that can act as a potential powerhouse of dark matter production. Don't forget other intense proton beams at FNAL and CERN that can drive such programs.
  - Eric D. Zimmerman: SNS may be able to make a definitive test of the  $\bar{\nu}_{\mu}$  appearance anomalies too.
- Bob Svoboda: DUNE will begin operations (fingers crossed) during this next P5 period. It is very important that P5 address what the future of the LBNF/DUNE program might be. Future programs must start during this upcoming P5 era to be realized on a realistic timescale. What should P5 do to make sure this happens?
- Matt Toups: I think as part of the Snowmass process, we should change our thinking at stopped pion/muon sources away from small, parasitic measurements/searches to large, dedicated measurements/searches focused on particle physics goals/priorities

#### Large DM exp as neutrino telescopes

- The Neutrino floor, which is bad for DM experiments, can be an opportunity for neutrino studies.
- Very low threshold for neutrino floor; good for solar, supernova, geo neutrinos.
- Should have synergistic effort between the neutrino and DM efforts
- From Jaehoon Yu to Everyone: 11:16 AM
  - There have been several efforts in DUNE already for DM searches both beam based and cosmogenic origin.

#### NuSTEC

- See statement on the agenda
- Multidisciplinary labs and institutions are successful in bridging between HEP and nu, but it's not always possible to
- Propose formally joint funding opportunities between nu and HEP, bridge major DOE projects
- Doojin:

- Adding to Jae's comment, I would bring such efforts described in section 8.8 of the DUNE TDR. <https://arxiv.org/pdf/2002.03005.pdf>.

#### ESS Neutrino Super Beam

- Propose increase to 5 MW beams from the ESS linac
- High neutrino beam intensity allows for operation exclusively at the 2nd neutrino oscillation maximum
- Extensive high intensity frontier physics program for nuSTORM
- Same ring can be used as a compressor ring in the first stage of a nuFactory

#### Allan Stone

- Think about how to better communicate results outside of the exclusionary within the science field(s). How to convey clear results.

Joshua Barrow: NuSTEC question (I think partially answered): Do you see current, integrated, collaboration-specific funding schemes for general experimental computation/analysis work, generators work, and model/data validation work done across neutrino/BSM fields as a sustainable effort within current collaboration structures for our current and future scientific needs without specific interdisciplinary HEP funding for these important (sub)projects?

- Kendall Mahn: @Josh, there was an interesting program in the UK for HEP postdocs to help computationally. (maybe that points to clear collaborative efforts with other fields, let me find the link)

Josh Spitz: in the era of COVID, how do we help? Just goin about the day by day neutrino work, seems to have very little impact on society

- Elisa: About CV19: simulation of epidemic is similar to shower evolution in the atmosphere. Data analysis is also an area where we can help. And then there is the technology side, for example on the digital contact tracing.
- Michael Mooney: @Josh good point about the value of physicists contributing to COVID-19 research/treatment where possible. There have been some contributions to this effort by particle physicists in our community - e.g. <https://www.fnal.gov/pub/about/covid19/> (surely not an exhaustive/complete list)
- kazuhiko terao: Also imaging using ML for COVID is something particle and other physicists do :)
- Vivek Jain: <https://home.cern/news/news/knowledge-sharing/latest-news-cern-against-covid-19-task-force>
- Tanaz Mohayai: @Josh, you brought up a great point. A group of my Fermilab colleagues and I were involved with this ventilator project: <http://mvm.care>.
- Tom Junk: The main arXiv page has a search for articles on COVID. Browsing through some of the contributions, there are submissions from HEP people on epidemiology, and many other interesting articles ranging from things like effectiveness of remote learning and interpretation of test results.

- Mark Messier: These are very interesting. I think part of the answer of how to help with COVID is to recognize the important mental health impacts on our students (UG and GS) and colleagues do our best to help them navigate how one continues to educate and do science with all the additional stresses of COVID.
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Funding and career opportunity restrictions can be difficult in this nuclear/HEP/nu world. It's not clear what the optimal solution is.

Jeffrey Eldred: Update of Fermilab proton sources:  
<https://indico.fnal.gov/event/23352/contributions/185569/>

Bob Svoboda: Hi Doojin and Jaehoon. Section 8.8 mostly discusses what can be done with the existing program. What I was referring to is what we want to do with upgrades/changes to the current facility. It is important to start to address this question.

Jaehoon Yu: Bob, you are absolutely right, and I agree with you 100%. I see what is in section 8.8. just the beginning and is showcasing what can be done in the future program.

Jeffrey Eldred: There is the a proposal to have at Fermilab spallation-like a ~MW 2 GeV proton source. A ~MW 12 or 16 GeV that would feed a short-baseline program and/or muon decay-in-flight program. And the possibility of exceeding 2.4 MW 120 GeV proton program for the long-baseline program. I'm interested in the guidance that comes from the Snowmass process as to which aspects to be prioritized in the design.

For the short-baseline neutrino program, there is the possibility of using multiple accelerator sources with multiple detectors. The 8 GeV BnB program + the LBNF 120 GeV program + a new ~12 GeV program can all be detected by the same fleet of near detectors from multiple angles and distances. I don't know if there is a physics case for it though. I can be contacted at [jseldred@fnal.gov](mailto:jseldred@fnal.gov)

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## **2nd panel: Theory**

Alexander Friedland (SLAC, nu and astrophysics)

- Connection of nu theory to broader exp side
- Connection of nu theory in broader US theory portfolio

Carlo Giunti (Torino)

- Hoping for the exp to find mass ordering
- CP violation
- Must be able to improve precision
- Must be able to improve the sensitivity
- We also need to make sure we go beyond just precision searches; consider the physics beyond just the standard physics

Irene Tamborra

- What can we do to go beyond?

- We must take advantage of synergy
- We are reaching the stage where we can combine the efforts of nu and DM
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*Snowmass EC Leadership Meeting Interlude*

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**Expanding physics opportunities**

- Leverage the neutrino facility capabilities for precision measurements and beyond
- BSM topical group is a good start
- Broader HEP community to increase interests in BSM and nu
- Strength the measurements and their reflections into MC tools
- What capabilities must future facilities provide to accomplish all of these strategically

Ensuring a successful implementation of HEP strategic plan

- Be dynamic plan to reflex the impacts from COVID19
- What are the plan and timeline for this process?

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**Keeping the balance: new vs existing**

- Reaching full sensitivity of current exp measurements should be very high priority. Make sure beam time and analysis efforts are supported.

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Alexander Friedland: Small experiments that support the advancements should be supported because they are so crucial. Raise this issue and advocate for them.

Strigari notes:

Worcester:

We will cover the following items today

- i) Plans for town hall next week
- ii) Topical Group reports, focusing on LOIs received and a requested
- iii) NF Workshop site selection committee report

Reminder of upcoming workshops and town hall

Town Hall: Probably have to go with Fermilab Zoom license for > 500 people.

The town hall discussion will be arranged around 3 primary questions:

- 1) Physics goals
- 2) Theory and Neutrinos

### 3) Structure of the program

About 16 questions as of 7/10/2020

19 requests for 3 minute comments. May redirect some of these to LOIs if there's not enough time.

Outline of structure of Town Hall: Short presentations, Panel discussions (likely drawn from topical conveners, including early career panelists). Panelists will respond to submitted questions, followed by open mic discussion.

Parno: Report from NF05 Mini-workshop

Workshop on direct neutrino mass measurements, focus on next 5-10 years.

Attending were largely nuclear physicists from US and Europe.

Started out with colloquium, followed by discussion of isotopes and discussion of systematics

The meeting was set up using a Stanford zoom meeting (max 500 participants, with 2 co hosts)

Did not require registration.

Used SNOWMASS indico pages

Presenters shared screens and videos, participants raised hands and got questions from Slack.

Video recorded to cloud, enabling auto transcription. New video for each speaker.

About 75 attendees, including many people who do not work in this area.

Discussion involving 5-10 people.

Talks went overtime mostly due to questions and discussion. Lots of discussion about LOIs.

Focus on individual experimental efforts in next 5-10 years.

Discussion topics:

How are results affected by cosmology?

Limits from molecular tritium sources?

Technical challenges for experiments.

Questions about spectral calculations from PTOLEMY.

LOI ideas for experiments or measurements with non-standard isotopes. Hopefully a few LOIs out of this.

Attendees plan to attend future NF05 workshops.

Lessons Learned:

- 1) Ahead of time allow speakers to test
- 2) Some participants dial in early-- host should log in early
- 3) Host received a lot of communication over Zoom
- 4) Valuable to have a lot of discussion time
- 5) Co-host in case of internet glitch
- 6) Slack back channel very useful.
- 7) Clear instructions to speakers were very important. In this case emphasized that the talks should be forward looking.

Questions from Klein: Can slides be posted online? What is the plan for discussion of cosmological bounds on neutrino mass?

Parno: Most of this probably happens in cosmic frontier.

Scholberg: Perhaps in neutrinos from natural sources

Klein: It would be an oversight by us if we don't put this bound somewhere

Denton: CF has probes of fundamental physics, including measurements of neutrino mass.

Scholberg: Ivonna is liaison to CF

Mocioiu: We should certainly have it in our frontier

Baha: We should call it "induction" from cosmology.

Tali: I'm liaison to CF. Sounds like something I can be useful for.

Scholberg: Tali and Ivonne should get together

Gann: In NF, do we agree it should be in NF04?

Scholberg: Probably, yes

Tamborra, O'Sullivan: They have it in their group

Coloma: An LOI has significant overlap with CF (BSM from neutrinos). Most constraints however come from cosmology.

Worcester: One purpose of LOIs is to help us organize topics and future speakers. Liaisons should bring appropriate LOIs to attention of other frontiers (and vice versa).

Huber: Want the neutrino section to be complementary, i.e. text from NF should coordinate with that from CF.

Worcester: Make sure discussions are had to make final text consistent.

Parno: Should we write a report on mini-workshop?

Scholberg: Put this in a chapter, probably not necessary.

Worcester: Only do it if it's useful

Topical Group reports:

NF01:

Denton:

No LOIs related to them. Expect some from T2K, Nova, DUNE, and other major experiments. Will solicit T2K/Nova joint analysis, future experiments like Hyper-K, JUNO, T2HKK, theory models and relation to global fits.

Talked about a meeting scheduled and formats. Thinking about 6 90 minute meetings, with 3 20 minute talks each, starting in September. 2 days on current picture, 2 days on mid term picture, 2 days on long terms. Still putting together a speaker list. Should have significant overlap with meetings from other groups.

Worcester: Think about reasons and goals from precision.

Denton: Revisit previous SNOWMASS documents

NF02:

Machado:

Question for the Town Hall: How can we use experimental data, and how should data releases go?

LOIs: reaching out to community working on sterile related topics. Already started inside DUNE, coordinating with NF03. Setting up a spreadsheet for people who could be interested in submitting.

Tali: Is there a planned meeting?

Pedro: Probably in September/October. Need to start working out the details.

Worcester: Should be in the slides from previous meeting.

NF03:

Coloma:

Received LOI on self-interactions and Lab searches for keV sterile neutrinos. Significant overlap for CF with the former. Latter more laboratory focused.

2 CEvNS LOIs, one generic, one specific for CONNIE.

Question of exactly where these go, deal with the topical conveners.

FCC-ee; probably better fit with energy frontier.

Expect LOIs from DUNE BSM, heavy neutral lepton searches (exchanged with a specific group of phenomenologists), radioactive sources for magnetic moments, and ALPs at neutrino experiments.

Question from Pilar regarding naming of files: easy to identify LOIs directly to NF03. What about others that have just NFO. Where do these belong?

Sousa: If you get '0' no topic selected.

Scholberg: Probably just have to go through them one by one.

Sousa: Organization makes sense, but not easy to understand.

Scholberg: Format does not all multiple topic groups. Template has boxes they can click.

Sousa: Multiple Frontiers, but multiples topics not allowed.

Machado: Showed website outlining how LOIs submitted

Parno: Could we include physics content of each topical group in dropdown menu?

Scholberg: We can ask

Worcester: Probably just to make things easy across frontiers. Though not sure how hard if it is to change.

NF04:

O'Sullivan:

No direct LOIs yet for NF04. Have gone through a round of solicitations. Have targeted experiments and theorists for LOIs that they would like. Would expect LOIs from SNO+, JUNO, Theta, Hyper-K, IceCube (they are planning 10-12 LOIs, expect heavy cross listing), and P1 neutrino telescopes in pacific ocean.

On theory side, received interest in signing up for channel.

Tamborra: Many theorists interested, though nothing yet. But it's still early.

O'Sullivan: Workshop will be near December and January, probably in beginning of January. Hopefully will finalized details at next NF meeting.

Gann: Should we make public the list of LOIs that we receive? Maybe useful for theorists to self-organize. Authors can check that the LOIs are in the group that they think is the most relevant

Worcester: It's all on the wiki. Could link which ones are associated with a given topical group.

Huber: What feedback do we give people who submit LOIs? A list like Gabriel suggests can help communicate this to authors

NF05:

Parno: talked to experimentalists/theorists, using mini workshops to advertise LOI process. Though nothing yet directly related to them for LOIs

NF06:

Baha: Contacting experimentalists, nuclear (specifically with INT), and astrophysicists. No direct LOIs yet.

Getting interest from HEP.

Want to hear about relevant measurements over all energy regimes, operational concerns for theory and software, and neutrinos from natural sources.

Planning workshop for September 3 and 4. Appears to be no conflict with these dates.

Would like to include (in addition to neutrino scattering) the role of electron scattering data and collate the plans for the different ongoing efforts. Use this to determine what we can learn about nuclear, astro.

Worcester: Expect an LOI from NuSTEC

Huber: Should expect have 2-3 LOIs from them

NF07:

Bowden: No specific LOIs for NF07 yet.

Considering coordinating a single LOI from the Applied Antineutrino community to highlight connections with HEP. An example is the effort from CEvNS.

An LOI from study group on the utilities of neutrinos. Workshop at the end of July will focus on this topic.

Anticipate significant overlap with other groups, such as sterile, artificial sources, and oscillation

NF08:

Mocioiu: Received one LOI about computing oscillation probabilities in matter. Overlap with other groups as well. Will solicit generically a request for LOIs. Waiting to hear from Town Hall about interested topics.

Are planning a future meeting with other theory topical groups, in order to better coordinate LOIs and future meetings.

Question: When can we see the questions submitted to the town hall?

Scholberg; Will send them out in the next couple of days.

Mocioiu: Biggest task to coordinate with other topical subgroups.

NF09:

Fields:

No direct LOIs from them yet. A couple of submitted LOIs have relevance for them.

Soliciting LOIs from various groups listed on indico slides.

Smaller groups will submit LOIs, including reactors measurements, and tau appearance with accelerators.

Planning a workshop October 5-7, pushed after LOI deadline. A 3 hour zoom meeting each morning. Thinking about agenda items to overlap with submitted LOIs.

Discussion of having a joint session with another topical groups.

Would like to announce their dates for a meeting as soon as possible. (already on the calendar)

Worcester: Do we expect an LOI from PIP-III?

Fields: On going discussion at Fermilab, probably would be submitted to accelerator group.

Tali: Any LOIs from Cr-51 sources?

Link: I plan to submit one

Scholberg: Also one from Oak Ridge.

NF10:

Klein: One LOI relevant for NF10 on CONNIE on CEvNS. Conveners are finalizing list of people that they will solicit requests from.

Report on NF site selection:

Gann: 5 candidate proposals to host NF workshop. Seems unlikely meeting would be fully in person. Hybrid scenario seems most challenging. Each site asked if they would be willing to host virtual meeting, largely positive responses received.

Huber: Do we need to make a decision soon that this will be entirely online? Other groups seem to also be hinting at this

Baha: Maybe overlap with March meeting doing computational works. Should decide maybe something like 2 months ahead of time.

Klein: Should we plan on it completely virtual? Then if world allows we could flip to in person.

Huber: Bringing back students for small likely not smooth, maybe by Spring campuses won't have any students on campus. Maybe shelve the idea of in person meeting.

Worcester: Should we pick a proposal that would help coordinate for a virtual meeting, then knowing by Jan we could convert to in person.

Link: How much lead time does each proposal need to cancel meeting?

Gann: Should we plan fully remote, then revise in early Jan about a possible in person conversion.

Worcester: Whatever group is chosen would be part of the LOC. They would be on the hook for evaluating the in person Jan meeting. Would leave fewer options.

Gann: Agree that we should pick a date and site asap.

Scholberg: Dates and sites seem correlated.

Gann will email proposal leads to ask if they are ok with a planned virtual meeting, with possibility to change to in person around Jan.