Phase 1 Tasks
International Scoping Study:
Machine Working Group

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Proton Driver

- **Examine candidate machine types for 4 MW operation**
  - **FFAG (scaling and/or non-scaling)**
  - **Linac (SPL and/or Fermilab approach)**
  - **Synchrotron (J-PARC and/or AGS approach)**

    - **consider**
      - **beam current limitations (injection,acceleration, activation)**
      - **bunch length limitations and schemes to handle (1-3 ns)**
      - **repetition rate limitations (power, vacuum chamber,…)**
      - **tolerances (field errors, alignment, RF stability,…)**
      - **practical limitations on beam energy, if any (e.g., RF power)**

- **Compare and contrast Superbeam and Neutrino Factory requirements**

Target/Capture/Decay

- Production rates as *f(E)* for C, Ni, Hg
  - do reality check with HARP data if possible
- Target limitations for 4 MW operation
  - use guidance from FEA and experiments
    - consider bunch intensity, spacing, repetition rate
- Implications of 1 vs. 3 ns bunches on delivered beam
- Superbeam vs. Neutrino Factory comparisons
  - required emittance and focusing
  - horn vs. solenoid capture
    - energy range of interest
  - choice of target material

Bunching/Φ Rotation/Cooling (1)

- Compare performance of existing schemes (KEK, CERN, U.S.-FS 2b)
  - use common proton driver and target configuration(s)
  - consider possibility of both signs simultaneously
  - conclusions will require cost comparisons, which will come later
- Evaluate implications of reduced V_{RF} for each scheme
  - take V_{max} = 0.75 V_{des} and 0.5 V_{des}
    - re-optimize system based on new V_{max}, changing lattice, absorber, no. of cavities, etc.
- Optimize Φ Rotation/Bunching with lower gradients and/or fewer frequencies
  - evaluate performance
  - costs will come later

Bunching/Φ Rotation/Cooling (2)

- Evaluate trade-offs between cooling efficacy and downstream acceptance
  - consider several values of downstream acceptance (longitudinal and transverse)
    - small, medium, and large (or extra-large?)
    - see how much can cooling channel be simplified
  - develop agreed-upon figure-of-merit (e.g., μ/P_{prot})
  - consider need/merits of longitudinal cooling
  - costs will come later
- Evaluate performance issues and limitations
  - absorbers (LH_2, LiH, Be or plastic)
    - consider implications of both sign muons
  - RF windows
  - interactions with Target group recommended for this topic

Acceleration

- **Compare different schemes *on an even footing***
  - **RLA, scaling FFAG, non-scaling FFAG, linac**
    - **consider implications of keeping both sign muons**
- **Prepare scenarios with different values of acceptance**
  - **transverse and longitudinal**
    - **small, medium, large (or extra-large?)**
  - **these will be used later to assess cost vs. acceptance**
- **Consider matching between acceleration subsystems**
  - **are there simplifications in using fewer types of machines?**

Storage Ring

- Design implications of final energy (20 vs. 50 GeV)
- Optics requirements vs. beam emittance
  - arcs, injection and decay straight sections
- Implications of keeping both sign muons
  - can there be both injection and decay optics in this case?
- Implications of two simultaneous baselines
- Radiation issues at 10^{21} useful neutrinos per year
  - liner vs. open-midplane magnets
- Cost implications of design will be dealt with later

Organization

- **Strawman organizer names (updated)**
  - Driver: Garoby, Kirk, Mori, Prior
  - Target: Lettry, McDonald
  - Phase rotation/Bunching/Cooling: Fernow, Yoshimura
  - Acceleration: Berg, Mori, Prior
  - Storage Ring: Johnstone, Keil, Rees

  - names in green not yet confirmed

Summary

- We need to get web pages set up and encourage the task groups to start meeting regularly
  - I have asked Juan Gallardo and Scott Berg to help with this
- We need to firm up plans for topics and speakers for CERN meeting (see my later presentation)
  - we need a web registration page ASAP with an indication of who will attend our Working Group
- Must remind all task coordinators that we need ingredients for ongoing accelerator R&D program
  - this should be prioritized and filtered such that it appears "finite"