Summary of yesterday’s WG1

proton driver (4)
tracking technique (1)
FFAG (5)
RLA (2)
fast ramping synchrotron (1)
(discussion on Saturday’s summary)

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Proton driver (1-2)

- Lattice for 8 and 30 GeV proton drivers (**G. H. Rees**)
  - ISIS upgrade as 8 GeV 50Hz machine, possibly developed to 4MW.
    - 60 degree cells and cancellation of sextupole in an arc
    - Common gradient magnet with fast trim Q.
  - CERN design of 30 GeV, 8.33Hz machine.
    - 72 degree cells
    - Acceptance of 170 pi mm-mrad with 75 mm bore radius.
  - Total cost are 10% less than SPL.
- Performance studies on transitionless proton driver lattice (**C. Johnstone**)
  - Definition of two types of transitionless lattices.
    - Missing dipole FODO and strong focusing FMC
  - DA enhancement of a sextupole corrected lattice.
    - It is not true with random errors of Quadrupole magnets.

Proton driver (3-4)

- Proton driver at BNL (**W.T.Weng**)
  - Upgrade of AGS
    - Increase repetition rate: 2s -> 0.4s -> 0.2s.
    - Increase total number of batches from the booster.
    - Beam power: 0.14MW -> 1MW -> 4MW.
  - Another path to 4MW
    - AGS with SCL, plus 2.5 GeV accumulator
  - Tunnel design to shoot a beam from the hill to South Dakota.
- Proton driver in Japan (**S. Machida**)
  - Multi purpose facility, not just for a proton driver.
  - Minimize beam loss or reduce beam power.
    - 4kW for RCS collimator and 7.5kW for 50GeV MR ESS.
  - Major accelerator components of 50GeV MR are already ordered.
  - Two stage path to 4MW.

Tracking technique

- Muon simulations using Boris type algorithms (**G. Penn**)
  - Boris scheme integrate vector and matrix terms separately.
  - Error analysis taking an example of 10T uniform solenoid.
    - Runge-Kutta gives errors proportional to the distance step.
  - Typical speed up of factor 4 compared with R-K.

FFAG (1-2)

- Beam dynamics studies of FFAG (**A. Sato**)
  - PRISM: FFAG based phase rotator to obtain narrow energy spread of muons.
  - FFAG 3D tracking simulation with GEANT3.21
    - 3D magnet field map generated by TOSCA.
    - Phase rotation using saw tooth RF.
  - POP FFAG studies and status of 150MeV FFAG at KEK.
- Recent FFAG studies (**D. Neuffer**)
  - DIMAD calculation agrees with Japanese design.
  - Non-scaling FFAG by Carol has good linear optics behavior.
  - Dejan’s 10-20 GeV FFAG gives stable momentum range of +/-40%.
    - Large geometric aberration.
  - Alternative scenario might be linac up to 1GeV and FFAG 1 to 20 GeV.

FFAG (3-4)

- FFAG with high frequency RF for rapid acceleration (**C. Johnstone**)
  - High frequency RF option for FFAG accelerator.
  - Single frequency of “over-voltaged” RF with optimized phase of each cavity.
  - An example is that 200MHz and 40% over-voltage cavities with dual harmonics RF gives 5 turn acceleration.
  - Another choice gives10 turns acceleration with 100 MHz RF.
- Ionization cooling in FFAG (**H. Schnoeuer and B. Autin**)
  - Use 25mm Li absorber as windows in cavities.
    - The ratio of emittance over particle number is improved by 20%.
  - ACCSIM simulation confirmed the simple estimate.
  - It depends on lattice design.

FFAG (5)

- Muon acceleration with FFAGs (**S. Machida**)
  - Lattice structure is changed from triplet to singlet FODO.
  - Japanese scheme uses 4 FFAG with low RF frequency (a few MHz).
  - Low frequency single harmonic RF gives huge RF bucket.
    - Acceleration is completed with a quarter of synchrotron oscillation.

RLA (1-2)

- Muon acceleration in re-circulating linacs (**A. Bogacz**)
  - RLA scheme based on 200MHz superconducting linac
  - Three improvements. All suppress the emittance degradation.
    - Smooth transition from the cooler to spreader/recombiner.
    - Making a short section in spreader/recombiner.
    - Optimized linac optics for multi pass beams.
  - Comparison of longitudinal dynamics between RLA and (Dejan's) FFAG.
    - Both shows energy compression.
    - Beam loading is more severe in FFAG.
- Initial tests of 201MHz superconducting cavity (**D. Hartill**)
  - Superconducting cavity development between Cornell and CERN.
  - Cornell test pit construction is completed.
  - Nb/Cu cavity arrives at Cornell and initial tests are done.
  - The first result shows that Q is more than 10^{10} and E_{acc}=3MV/m.
    - However, cable burned out.

Fast ramping synchrotron

- Muon acceleration with TESLA RF and fast ramping synchrotrons (**D. Summers**)
  - Muon acceleration with very fast ramping synchrotron. An example is that 2 to 20 GeV/c machine with 30 orbits.
  - 1.7T, 400MHz RF gives 84% survival.
    - oriented silicon steel of 10 microns.
    - Peak power is 45MW but average is only 24 kW because of very low duty factor (1/2000).
  - Power source of magnets is 115kV x 81kA, which costs 6 millions.
  - Higher energy accelerators such as 20 to 180 GeV/c and 180 to 1600 GeV/c are also possible.
    - Superconducting RF (TESLA RF) makes sense for higher energy accelerator.