Run plan

K. Yonehara

Goal of the run plan

- Make a rigid run plan to have a consensus of the experiment in collaborators
- Run plan will be documented to minimize misunderstanding and mismatching in collaborators
- Run plan must have a brief manual of the system so that everyone can easily control the system

Scientific goal in this test

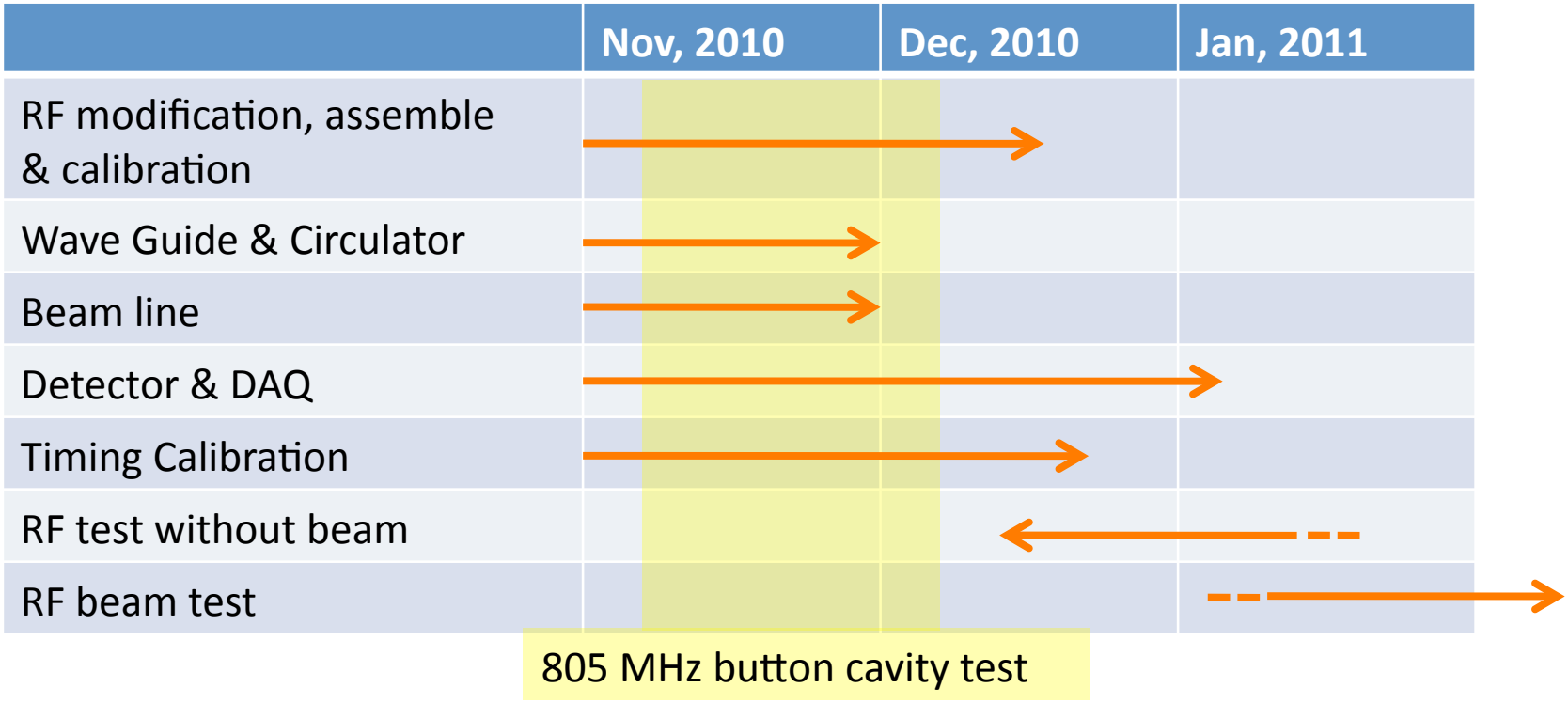
RF field must be recovered in few nano seconds

1. DC to 800 MHz, Hydrogen breaks down at E/P = 14. It indicates we can use DC data as a framework to explain results.
   Need higher frequency measurements to test frequency dependence
2. Electrons move with a velocity, $v = \mu E_{rf}$. Current $J = nev$
   Power dissipation due to electrons in phase with RF and dissipate energy through inelastic collisions = $j \times E_{rf} = (ne\mu E_{rf})E_{rf}$
   Measurements with beam verify mobility numbers and verify our loss calculation
3. Electrons recombine with positive ions and removed. If this is very fast they don't load cavity, if slow cause trouble
   Beam measurement will give the recombination rate
4. Solution: use electronegative gas(es) to capture electrons and form negative ions
   Beam measurement will verify attachment rate
5. A+e →A^- heavy negative ions. How long do these hang around and do they cause the breakdown voltage of the cavity to be lowered
   Beam measurement will give necessary answers

Feasibility including with hydrogen safety analysis also need to be answered

Time table of HPRF beam test

Time duration: 3~4 months



Beam tuning by AD: 2 wks

Collaborators

Total: 24 collaborators

Blue: satisfy all requirements to access to the MTA

Alan Bross, Al Moretti, David Neuffer, Milorad Popovic, Gennady Romanov,
Vladimir Shiltsev, Alvin Tollestrup, Katsuya Yonehara (Fermilab)

Chuck Ankenbrandt, Gene Flanagan, Rolland Johnson, Grigory Kazakevitch,
James Maloney, Masa Notani (Muons, Inc)

Ben Freemire, Pierrick Hanlet, Daniel Kaplan, Yagmur Torun (IIT)

Moses Chung (Handong Global Univ.)

Giulia Collura (Politecnico di Torino)

Andreas Jansson (European Spallation Source)

Leo Jenner, Ajit Kurup (Imperial College)

Giovanni Pauletta (Univ. of Udine)

Regulations

- People must follow “two persons rule” when they work in the MTA hall
  - No injury please
- Check status of MTA by Yonehara, Moretti or Hanlet before enter the hall
  - Is Hydrogen gas removed?
  - Is Klystron off?
  - Is beam off?
  - Is HV off?
- We will assign people who manipulates gas system (“Pressure safety orientation” is required)
  - Currently, Yonehara and Hanlet satisfy all requirements
- During experimental mode, we will have a briefing every afternoon (1pm in WH13 cafeteria)
- All data will be uploaded on the DB site
- Use electronic log system to live the status

No Beam test

- Check new RF system (2~3 weeks)
  - Pressure sealing
  - Diagnostic system
  - Resonance condition
  - Calibration
  - Conditioning
- Pressure dependence (2 days)
  - Breakdown probability curve
  - Check precursor light
  - Take breakdown signal with finer time resolution (50 ~ 100 ps)

- Gas species dependence (6 days)
  - He, N2
  - H2 + N2
  - (H2 + SF6)
- Any other test?
  - TPB
  - Electrode material dependence
  - etc

Beam test

- Beam tuning in the MTA
  - Empty RF cavity + 2mmϕ Collimator + Scintillator
- First beam shot
  - GH_2 (p=1000 psi) + no RF power
- Beam test
  - GH_2 (p=1000 psi) + RF field (20 MV/m)

- Beam intensity dependence
  - Find the maximum acceptable beam intensity
- Gas pressure dependence
  - 400 psi, 1400 psi
- Gas species dependence
  - He
  - N2
  - H2+N2
  - H2+SF6

To do list

- Document Run plan by the end of this month
- Document ORC (and MOU) by the end of this month
- Timing calibration test