Comments regarding meeting

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Questions / To-Dos

Atomic beam simulations

1. **Distributions and optics**

   1.1. Velocity distributions at: target, BRP (Breit–Rabi polarimeter), and transition units.

   1.2. Radial/azimuthal profiles at target and BRP:

      1.2.1. Are the distributions uniform?

      1.2.2. Do they show structure vs. azimuthal angle, are they axially symmetric around the beam axis?

      1.2.3. How do profiles change if, e.g., the last ABS magnet is transversely displaced?

   1.3. Transverse acceptance:

      1.3.1. What is the accepted transverse-velocity distribution?

      1.3.2. Would it make sense to add a transverse velocity to the longitudinal one?

2. **Physics models and parameters**

   2.1. Attenuation parameter:

      2.1.1. What is it?

      2.1.2. How does changing it affect the results?

      2.1.3. What attenuation options exist?

   2.2. Density and flux:

      2.2.1. Which equations are used to calculate the density?

      2.2.2. How is the conversion from density to flux done in the code?

   2.3. Magnetics:

      2.3.1. How is the pole-tip field calculated from the magnetization J of the materials?

      2.3.2. What are the numerical values of the tranmissions for states 1-4 to the target and to the BRP detector using the 1.5 T pole tip field and the updated values?

   2.4. Beam kinematics:

      2.4.1. Why is the maximum velocity generated not exactly 1807 m/s as in the input file?

3. **Event generator**

   3.1. How exactly is the event generator working?

3.2. Does each simulation start from the same seed to eliminate statistical fluctuations?

3.3. What are its different options doing?

3.4. Is the event generator described in the HJET design paper?

4. **Geometry and operational assumptions**

4.1. The RF transitions should consistently take place at the longitudinal center of each transition unit.

4.2. The inner diameter of a transition unit is assumed to be $\varnothing = 30\,\mathrm{mm}$. Atoms that intercept this cylinder are removed from the atomic beam.

5. **Simulation variations to diagnose discrepancies**

5.1. Reduce acceptance in the first magnet by a factor of 2.

5.2. Use ideal transition efficiencies of 1.

5.3. Reduce the size of beam blockers in the BRP.

BRP analysis

1. Check individual states from atomic simulations to identify the issue why with simulated beam from atomic tracking tracking, the equation system doesn't solve, while it solves correctly with known inputs.

2. Signal at target for all 16 combinations of RF transitions should be checked. Should be the same for all of them.