MAGNET, BEAM PIPE, TUNE, AND TRIGGER

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TWIST magnet status

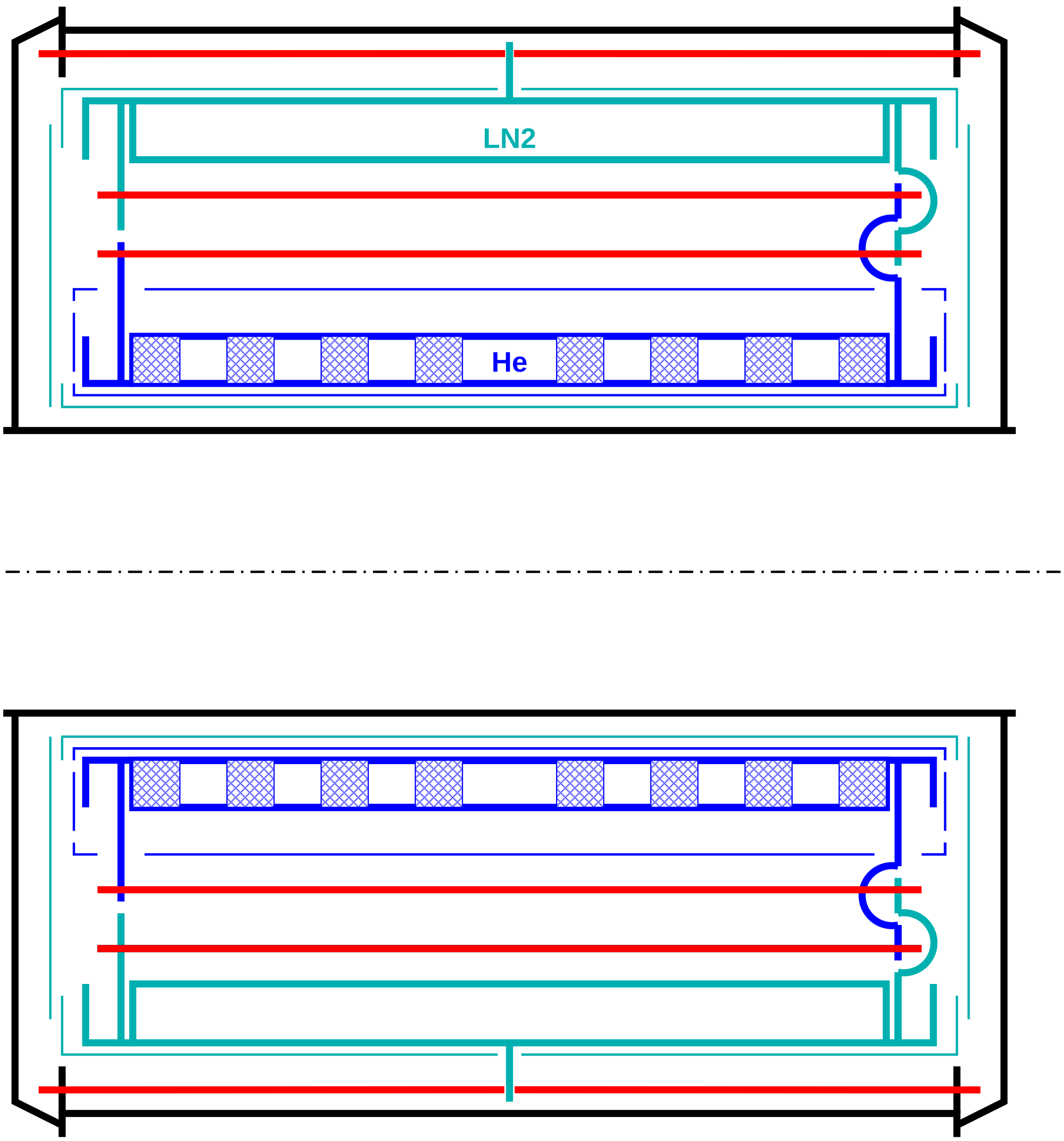

Figure 1: Schematic of longitudinal support struts (G10/fibreglass with stainless threaded end fittings, in red), connecting 4.2 K He vessel and coils (blue) to 77 K LN_2 vessel (blue-green) and LN_2 vessel to vacuum chamber (black).

TWIST magnet status

Solenoid during initial field map and tests in yoke:

- showed significant asymmetry at half of nominal field.
  (http://stoney.phys.ualberta.ca/~e614/Projects/E614MECHANICAL/00021/)
- quenched when removal of power leads (a significant heat source) was attempted. Leads appeared to be clamped with magnet on.

Solenoid following warmup and removal of end flanges:

- longitudinal struts had many loose nuts (one completely missing), which had at one time been tack-welded to flanges.
- seemed to be missing one of four longitudinal struts between He and N_2 vessels.
- appears to have tight radial struts, but is not very concentric (symmetric) in the cylindrical components.

Used replacement struts have been received from CryoMag and are being installed and tensioned.

Beam pipe and tune for commissioning

Three situations with different requirements and uses:

1. before re-installation of solenoid in yoke (July-August?)
   $\Rightarrow$ detector (half) stack on cart downstream of yoke.
   - assume only higher momentum particles (cloud μ^+, π^+, e^+).
   - no vacuum beam pipe extension is necessary.
   - beam size will be large ($\phi = 15$ cm?).
   - range straggling allows muon stops over entire detector system.
   - muons can be stopped in thicker target at either end of stack.
   - nearly straight tracks possible above 120 MeV/c.
   - general chamber commissioning and relative alignment tests.
2. following re-installation of solenoid in yoke, with field off
   $\Rightarrow$ detector stack can be roughly in final position.
   - surface muons through upstream half of detector.
   - backward straight positron tracks.
   - simple beam pipe extension could be arranged.
   - useful to test muon ranging into target using target PCs.
   - matching of straight muon tracks to straight positron tracks.
3. following solenoid positioning in yoke and initial field mapping (September-December?)
   $\Rightarrow$ field may be turned on, yoke endcaps must be in place.
   - need complete non-magnetic beam pipe extension.
   - need beam scintillator and trigger counters (being designed).
   - helical tracks, beam-chamber and field-chamber alignment, ρ?

Tunes should be easy to arrange. In situation 1, some adjustment is required to improve beam size.

Non-magnetic beam pipe extension

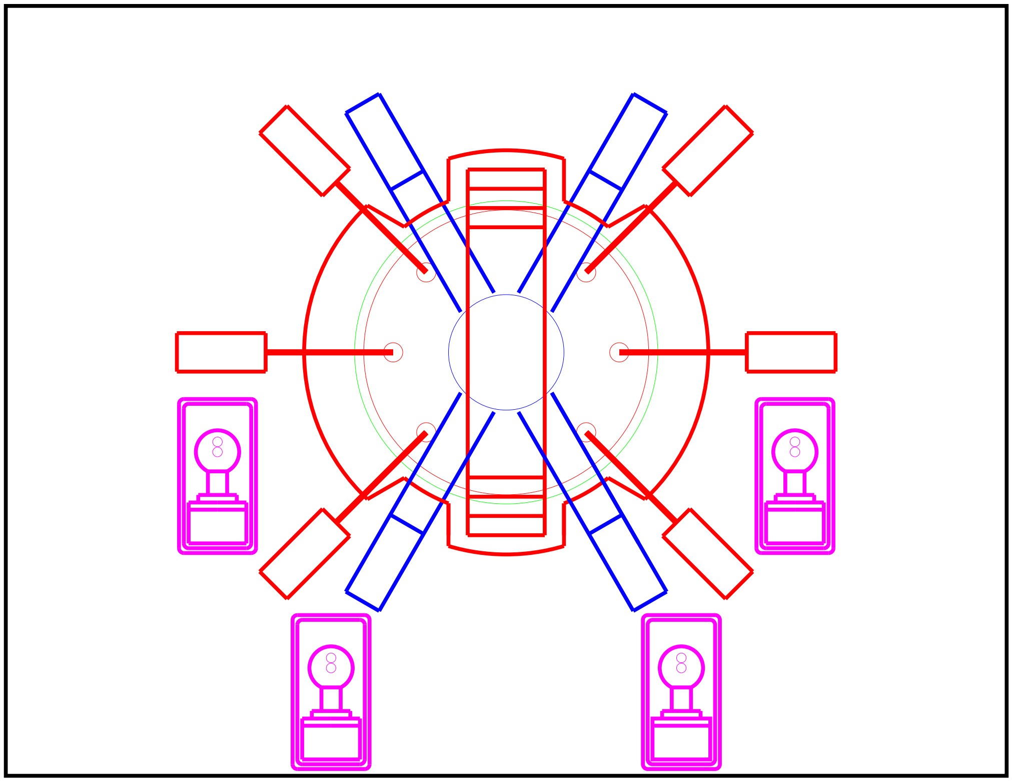

Figure 2: Upstream end view of beam pipe and trigger scintillator arrangement showing also film degrader and alignment cameras. In blue is the beam pipe extension and support. In red is shown the scintillators, their support system, and the film canister degrader. The alignment cameras and optics are in magenta. All are mounted on a rectangular aluminum plate (black) which is attached and indexed to the steel of the yoke end cap.

Non-magnetic beam pipe extension

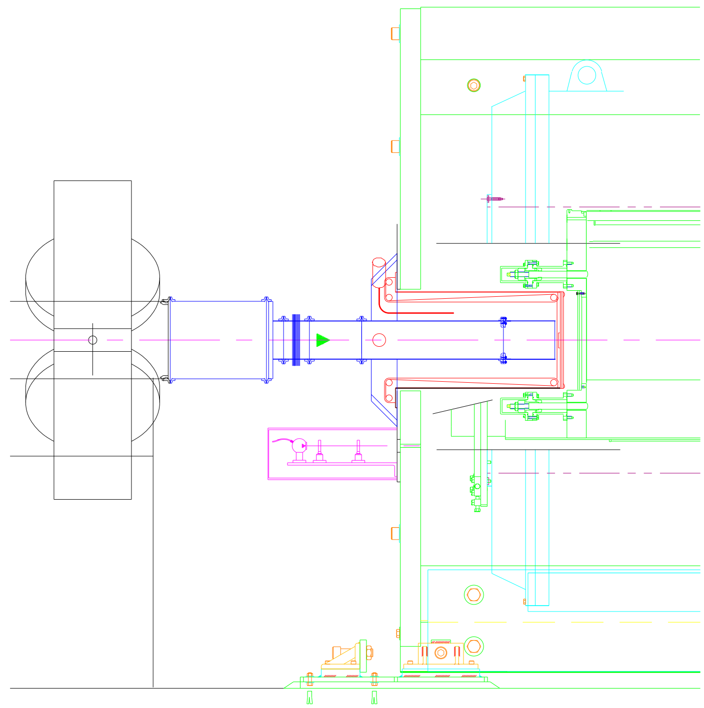

Figure 3: Side elevation view of beam pipe and trigger scintillator arrangement showing also film degrader and alignment cameras. Colors correspond to the upstream end view diagram.

Trigger scintillators for commissioning

The TRIUMF scintillator shop has a selection of used scintillators which can be borrowed to suit our purposes. For situation 1:

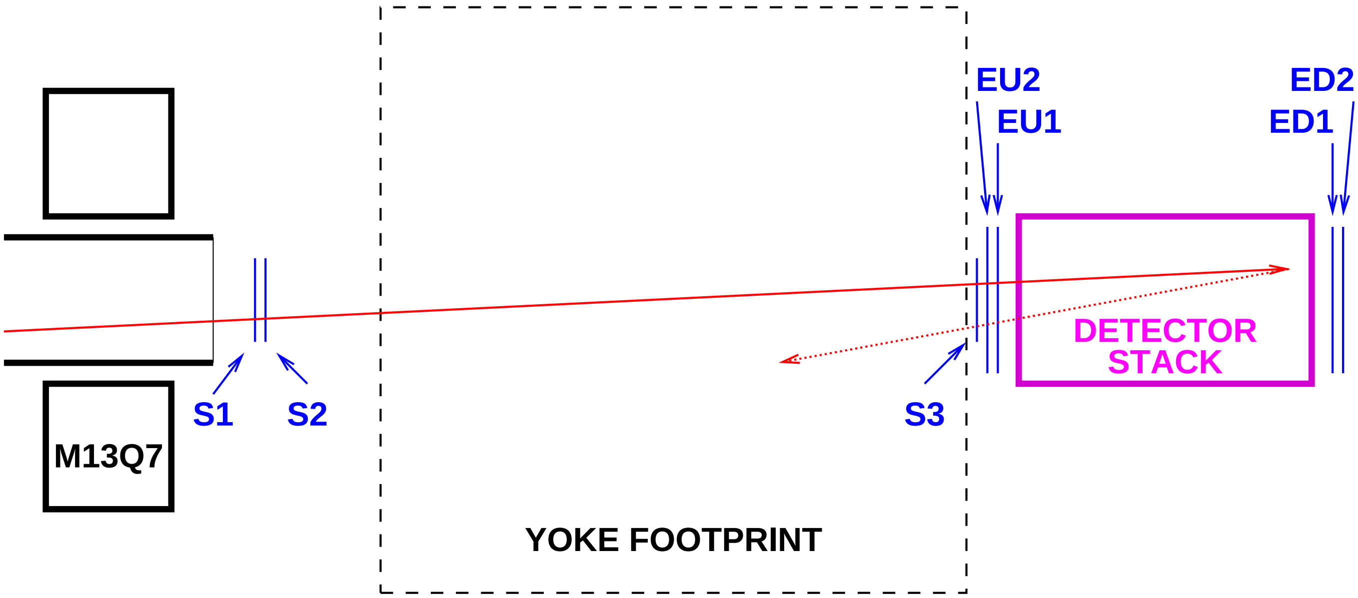

Figure 4: Detector and trigger scintillator arrangement downstream of yoke.

- higher momentum particles have enough range to eliminate need for beam pipe extension (range of 120 MeV/c π is 8 $\mathrm{g \cdot cm^{-2}}$ of carbon).
- momentum can be lowered and/or degrader can be inserted to stop some π or μ throughout detector stack.
- S1·S2·S3(·EU1) defines a beam particle.
- Ex1·Ex2·$\overline{(\mathrm{S1}+\mathrm{S2})}$, x$\in$ [U, D] for upstream or downstream, defines a decay positron.