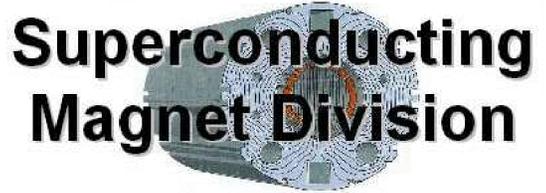
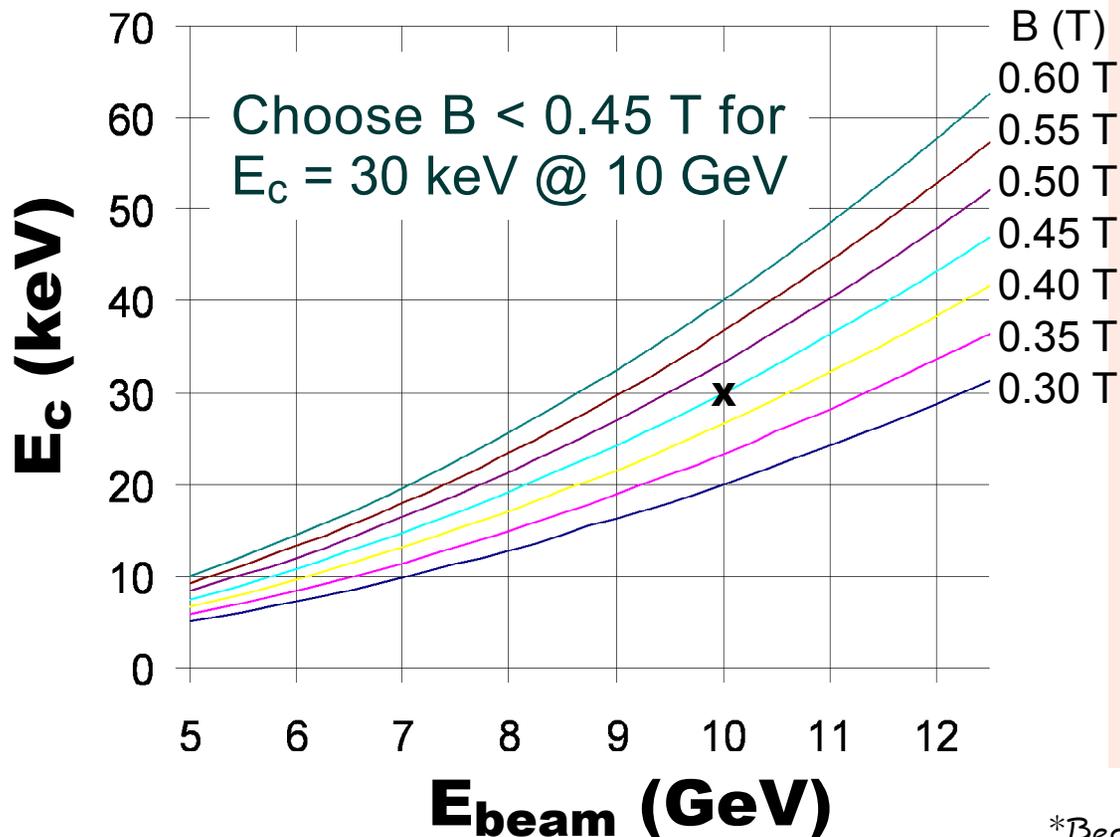


Some eRHIC IR Layout Musings & Observations



$$E_c \cong \frac{2}{3} B \text{ [T]} E^2 \text{ [GeV}^2\text{]}$$

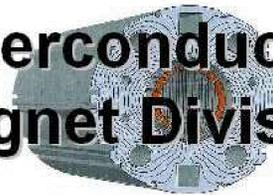


The original HERA design had $E_c < 40 \text{ keV}$ to stay below k-edge for tungsten. HERA-II pushed E_c to 140 keV and in retrospect this may not have been wise in that the synrad optimization is then very difficult. For eRHIC design if we keep $B < 0.45 \text{ T}$ then $E_c < 30 \text{ keV}^*$ for $E < 10 \text{ GeV}$ from the e-beam separation magnets near the IP.

*Beam tails in quadrupoles sample higher fields. So 30 keV choice actually gives us needed margin for a realistic case.

Some eRHIC IR Layout Musings & Observations Continued...

Superconducting
Magnet Division

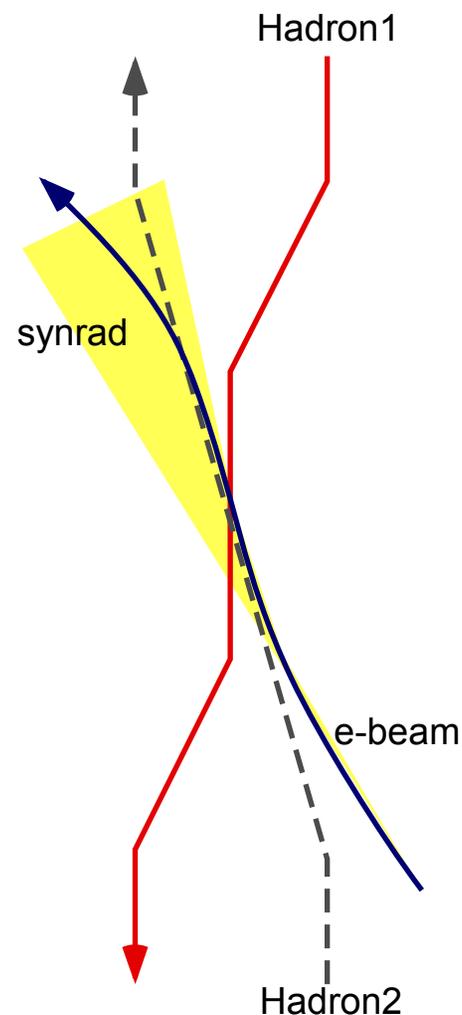


To avoid synrad background issues a macroscopic, i.e. 5 mr, crossing angle would be very nice. But...

$$\frac{\sigma = 50 \mu\text{m}}{\beta = 25 \text{ cm}} \cong 0.2 \text{ mr is allowed!}$$

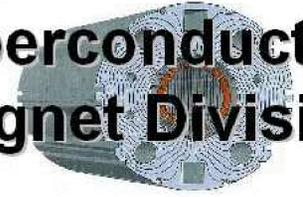
To avoid luminosity loss can we reasonably use Crab cavities for the e-beam?

If so then suggest crossing the hadron beams and having the e-beam follow approximately the non-colliding hadron beam. This maximizes clear aperture for unused hadron beam (since need synrad keep-away anyway). Avoid interference by offsetting eRHIC collision point from present RHIC symmetry and increasing β^* for unused beam.



Some eRHIC IR Layout Musings & Observations Continued...

Superconducting
Magnet Division



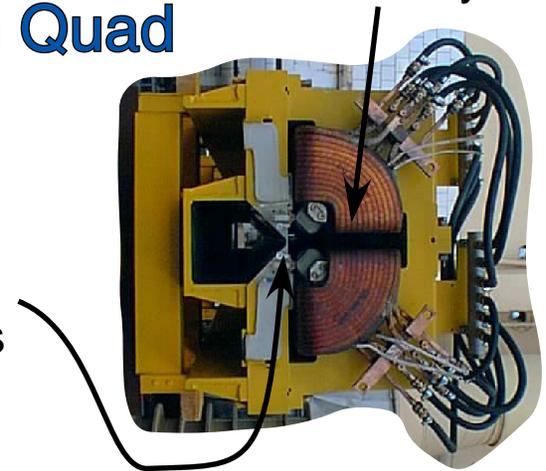
For e-beam β^ use triplet quadrupoles starting inside experiment (e.g. HERA-II & BEPC-II) that are aligned with e-beam trajectory. Coil packages should have skew-quadrupole, and dipole correctors and probably at least a lumped anti-solenoid (to make spin matching easier).*

So finish e-beam focusing before the hadron triplet starts. To achieve small β^ for the colliding hadron beam will probably want to consider using a Magnetic Septum Quadrupole (MSQ) at the beginning of the hadron triplet. Use warm magnets as much as possible (<1.5 T dipoles) for hadrons to provide convenient "spectrometer" function.*

**GM, Magnetic
Septum Quad**

Coil gap
for synrad

Septum
between e
& p beams



HERA-II Magnet