Dipole Bending Magnet Design do-it-yourself tutorial part 1

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Point of the exercise

- Use equations and concepts seen in lectures
- Learn from each other
- Get to the end once
- Use back of the envelope calculations to get initial design concept
- Ask questions

Task 1: Design a dipole bending magnet for a lightsource

- Input:
 - Circumference ~200 m, free to choose
 - Beam energy ~3 GeV electrons
 - Assume FODO type lattice with average $\beta(s) \approx 20$ m and ε_{χ} = 10 nm rad
- Design output
 - Bending radius
 - Magnetic field
 - Length
 - Magnet opening
 - Should your magnet be superconducting? Why or why not?

Task 2: Design a dipole bending magnet for a proton collider

- Input:
 - Circumference ~4 km, free to choose
 - Beam energy ~275 GeV protons
 - Assume FODO type lattice with average $\beta(s) \approx 50$ m and ε_x = 3 mm mrad
- Design output
 - Bending radius
 - Magnetic field
 - Length
 - Magnet opening
 - Should your magnet be superconducting? Why or why not?

Additional things to consider

- Cost? Production and operating
- Space? Diagnostic, injection, mechanical supports
- Other constraints?