# ISIS High Field Spectrometer

# Design Issues …

# Design Criteria

- Order of magnitude rate improvement
- Optimised for longitudinal experiments
- 100G transverse field for calibration
- Configured for ‘flypast’ for small samples
- Order of magnitude increase in field (~5T)
- 300mm bore, stray field 5G at ~2m, homogeneity: 0.01% (over 40x40x5mm), stability: $<10^{-6}$
- Multihit TDCs with 1ns timing (for RF)
- Capable of accepting a dilution fridge

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# Design Challenges (I)

- Highly segmented detector array
  - 25Mev/hr (32 detectors, deadtime limited)
  - 250Mev/hr (320 detectors, muons available!)
- Highly integrated detector electronics
  - (ISIS DAE-II, using LeCroy MTD133b TDC chip)
- Detectors operate over a wide field range
  - Curved positron trajectories in high fields - problems with multiple counting, missed counts, etc,
  - Stray field on PMTs altering efficiency
- Beamline design
  - Deliver stable spot size over wide field range
  - Spot size in ZF to match MuSR (15x8 mm FWHM)
  - Configured for ‘flypast’:
  - (vacuum vessel continuous through instrument)

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# Design Challenges (II)

- Magnet configuration:
  split pair – good: cryogenics (vertical access), ‘flypast’
  bad: max field (~2-3T), stray field, TF, cost
  solenoid – good: max field (~7T), stray field, TF, cost
  bad: cryogenics (horizontal fridge!?), ‘flypast’
- Shielding required for stray field:
  Active – expensive, but works over entire field range
  Passive – cheap, but ~1T effective minimum field
- TF can be integrated into solenoid design
- ZF compensation desirable

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