MD procedure for IP aperture scans

MD goals

- quantify Babar background sensitivity to IP x & y angles for
  - single beams (HER & LER separately, moderate currents)
  - collisions (moderate currents, then high currents)
  and determine the optimum angles (from the background viewpoint)

- cross-calibrate
  - LIPP & HIPP BPMs
  - Babar luminous & boost angles
  against support-tube (ST) BPMs

- determine LER IP angles → center of luminosity monitor
  - absolute angles (from ST BPMs) at moderate current
  - reference angles (from HIPP & LIPP), corrected for high-current operation
Measurement sequence: outline

- **Setup**
  - colliding beams, offset by-2 patterns at 300 mA ea.

- **Single-beam scans: Babar on**
  - **HER**
    1. XP scan, then YP scan @ 300 mA, offset pattern
    2. with XP & YP at optimum, raise $I_H$ as high as it will go (gap transient)
  - **LER**
    1. XP scan, then YP scan @ 300 mA, offset pattern
    2. with XP & YP at optimum, raise $I_L$ as high as it will go (gap transient)

- **Luminosity-monitor scans: Babar on**
  - **YP(e+) scan, then XP(e+) scan @ 300 mA (offset patterns)**

- **Measure current-dependence of L/HIPP-ST correlation**
  - with XP/YP (e+) centered, trickle $I_H$ & $I_L$ to their gap-transient limits
  - fill BPM gaps (straight by-2), inject up to nominal current

- **Background scans @ high current: XP(e-), YP(e+), XP(e+), YP(e-)**
Setup

Operating procedure: general

- manual scans, CRR plots vs time (for single beams, perhaps autoscan too)
- monitor angles with ST BPMs, LIPP/HIPP orbit fits & monitoring fbks
- monitor temps & vacuum throughout the scans
- trickle, Babar on (incl. DAQ, with background-enriched trigger)

Initial setup: colliding beams, offset patterns, trickle, Babar on

- bunch patterns
  - LER: by-2, 300 mA, buckets 400-3400. BPM measdef @ bucket 3200
  - HER: by-2, 300 mA, buckets 0-3000. BPM measdef @ bucket 200
- private BPM calibrations, yielding RAW ~ 1000 counts for PR02 BPMS 7052 to 8012, 3024 to 2203
- set initial IP angles (use orbit fit on ST BPMs)
  - LER \(XP = 9.25\) mrad (ST BPMS) \(YP = -1.1\) mrad (ST BPMS)
  - HER \(XP = -16.7\) mrad (ST BPMS) \(YP = +1.1\) mrad (ST BPMS)
- optimize luminosity on tunes
- turn Babar on, save configs & orbits
Single-beam background scans:
procedure

- **HER single-beam scans**
  - **XP scan**
    1. check YP at correct initial value
    2. scan XP; document knob closure; reset YP to initial value during scan if needed
  - **YP scan**
    1. as above (XP ↔ YP), starting at optimal XP value
  - **Time & knob closure permitting, autoscan XP & YP with finer steps**
  - **With XP & YP @ bgd optimum, \( I_H \) → as high as it will go (HER gap transient)**

- **LER single-beam scans**
  - **optimize tunes on lifetime**
  - **XP scan**
    1. check YP at correct initial value
    2. scan XP; document knob closure;
    3. adjust tunes on lifetime at every step
    4. reset YP to initial value during scan if needed
  - **YP scan**
    1. as above (XP ↔ YP), starting at optimal XP value
  - **With YP & YP at optimum, \( I_H \) → as high as it will go (LER gap transient)**
Luminosity-monitor locator scans: procedure

○ Setup
  ○ colliding beams, offset by-2 patterns at 300 mA ea, trickle, Babar on
  ○ optimize tunes on luminosity + background

○ Scan HER-LER YP manually (multiknob fbk)
  ○ IPXY stays on throughout → faster stabilisation
  ○ at each step, check XP remains at initial setting

○ Set YP to optimum; scan LER XP manually (Multiknob fbk)
  ○ reset YP to optimum @ each step
  ○ optimize tunes @ each step
  ○ still need some settle time @ each step (suspend CRR plot!)
Suggested scan ranges

- **LER**
  - $XP(ST)$: 7.5 to 10.3 mrad, steps ~ 0.3 mrad
  - $YP(ST)$: -3.5 to +0.5 mrad, steps ~ 0.5 mrad

- **HER**
  - $XP(ST)$: -17.7 to -15.7, steps ~ 0.2 mrad
  - $YP(ST)$: -0.5 to +3.5 mrad, steps ~ 0.5 mrad
Appendix: CRR plot files & data sets

- CRR button files
  - BBR_BKG_LERIPORB
  - BBR_BKG_HERIPORB

- All data in PHYSICS_DATA:[pep2.char.05mar07]