**Emittance Measurement Using a Quadrupole Scan**

1. **Generic Quadrupole Scan Procedure**
   * + 1. Take scanning quadrupole OFF loop
       2. Check that beam is centered in scanning quadrupole
       3. Vary quadrupole strength and ensure beam goes through minimum in at least one plane
       4. Adjust macropulse bunch length and/or micropulse repetition frequency to avoid saturation
       5. Start at highest scanning value, close shutter and put quadrupole ON loop
       6. Subtract background and open shutter
       7. Choose appropriate step size and begin to scan quadrupole
       8. Save .pnm for each quadrupole strength
       9. Close shutter, return quadrupole(s) to nominal strengths, put ON loop

Scan QX2F04 using ITV2F06 (QX2F05 and QX2F06 are off)

Scan QX2F03 using ITV2F06 (QX2F04, QX2F05 and QX2F06 are off)

Scan QX6F10 using ITV6F16 (QX6F14, QX6F15 and QX6F16 are off)

Scan QX8F03 using ITV8F04 (QX8F04 is off)

1. **Data Analysis (off-line)**

Choose **one** quadrupole scan and

* + - 1. Extract beam sizes from Beamanizer by:
         1. RMS calculation using Auto ROI

For Cut Level = 0.05

For Cut Level = 0.10

* + - * 1. Taking an edge-to-edge measurement by manually placing cursors

(Note: RMS ≈ edge-to-edge/6)

For **each** quadrupole scan:

* + - 1. Calculate the normalized emittance and Twiss parameters (**) for each set of beam sizes

(How do they compare with multi-slit and multi-monitor measurements? Does the measured emittance evolution around the machine make sense?)

* + - 1. The thin lens approximation for a quadrupole is valid when Lquad << fquad. Is it okay to use this approximation in the 2F region?