Resolutions for different detector pitches

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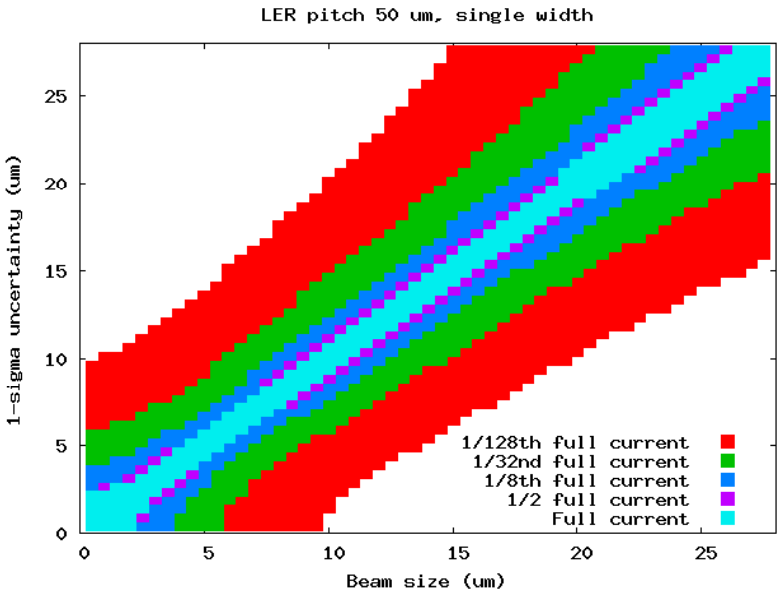
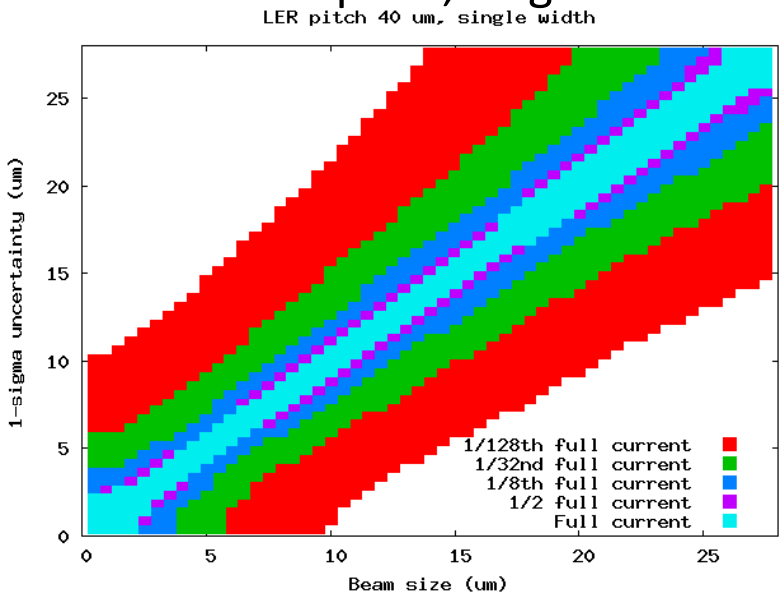
- Assume 59x10 um URA
- 20 um Au on 500 um diamond mask
- Single width (75 um) detectors, except for 13 um case, which is assumed to be double width (two shifted, overlapping 25 um pixel detectors)
- LER:
  - 200 um Be window
  - At full current (3.6 A, 2500 bunches) get 2000 photons/25 um pixel on average
- HER:
  - 200 um Be window + 1.4 cm Be filter
  - At full current (2.6 A, 2500 bunches) get 1300 photons/25 um pixel on average

LER

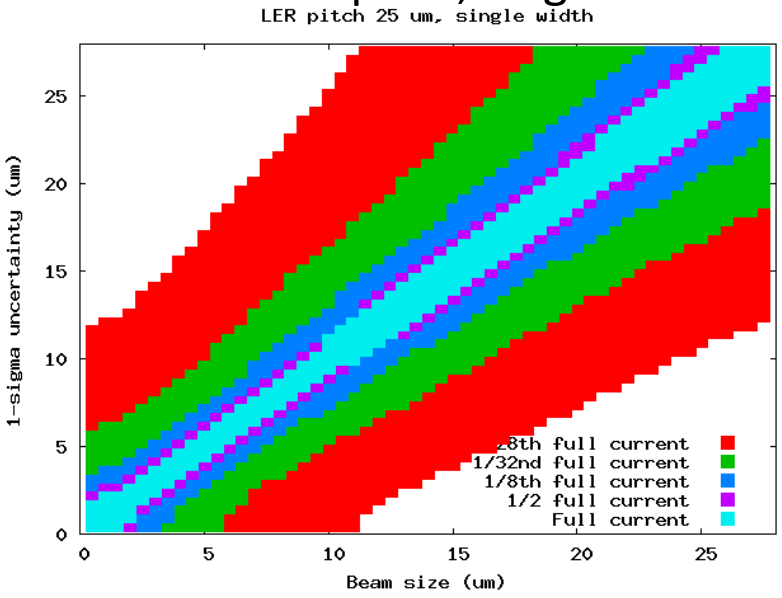
50 um pitch, single width



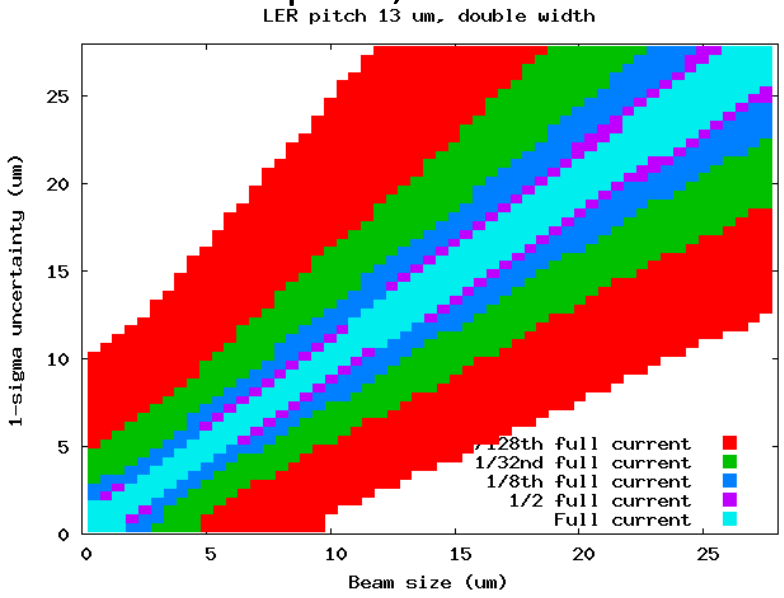
40 um pitch, single width



25 um pitch, single width

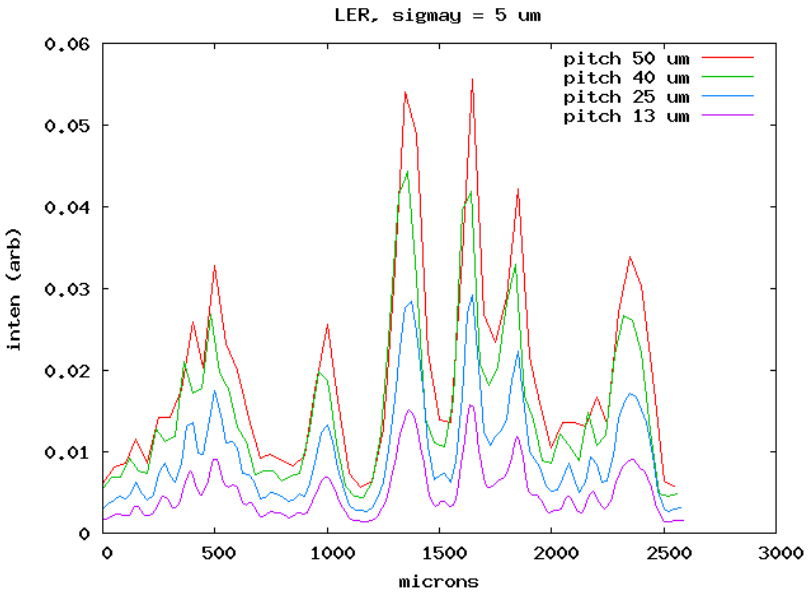


13 um pitch, double width

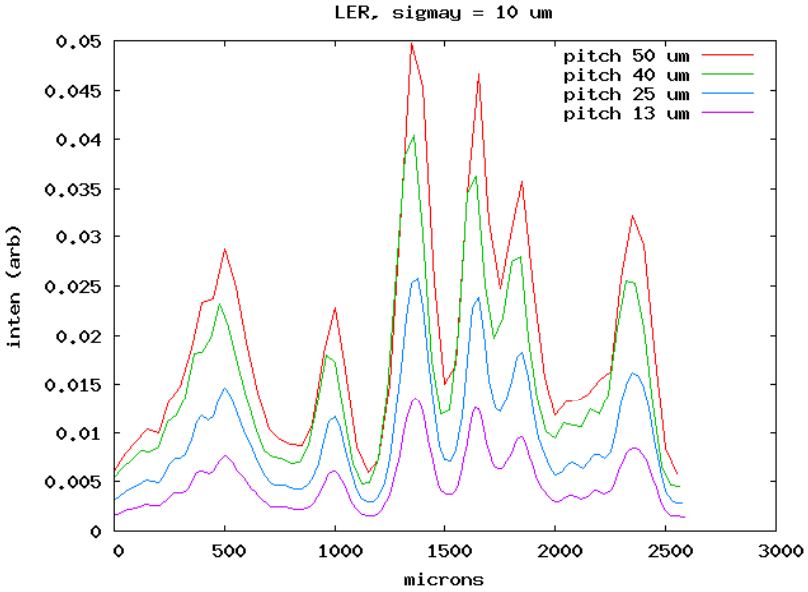


LER

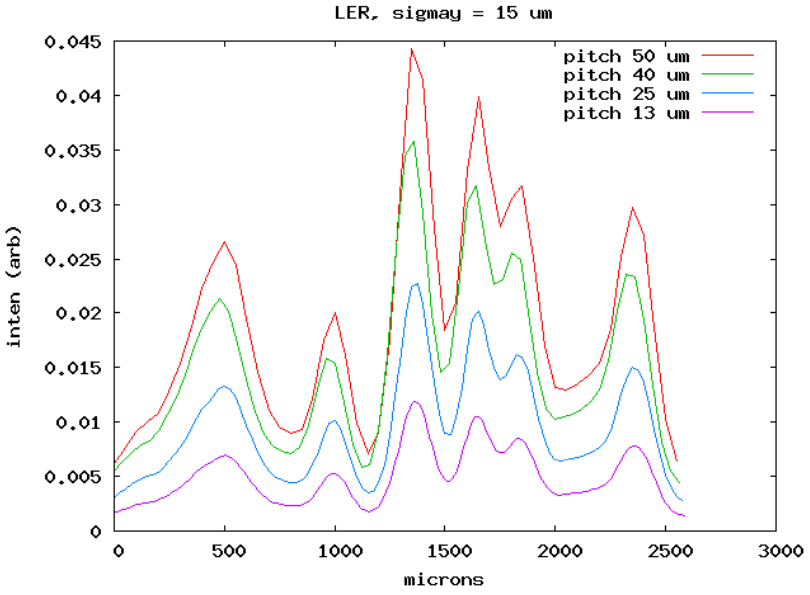
5 um beam size



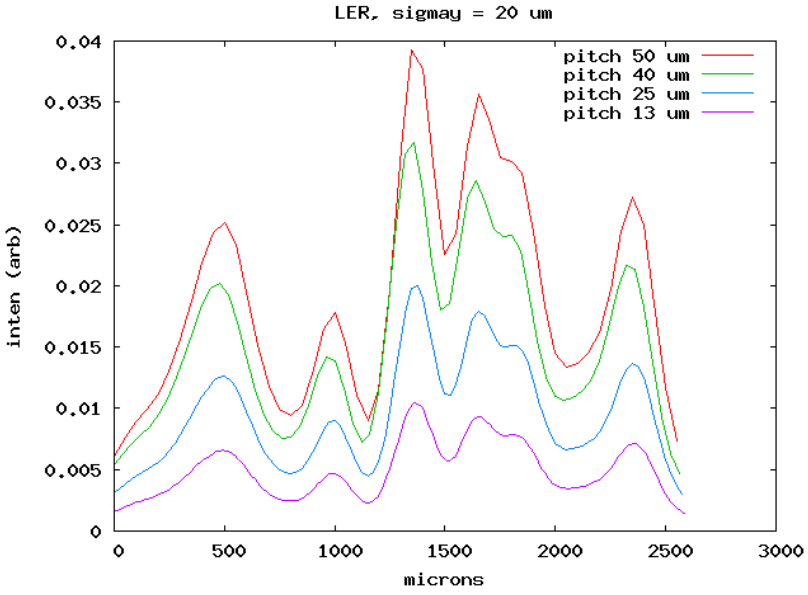
10 um beam size



15 um beam size

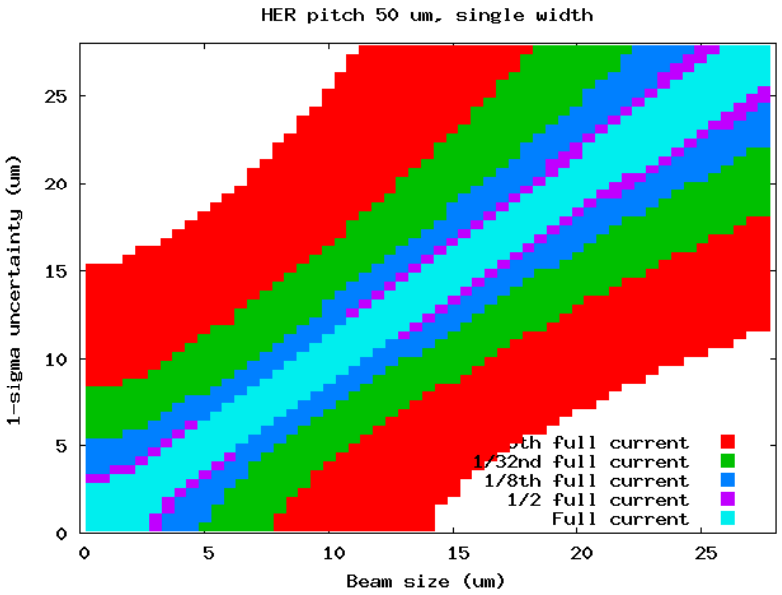


20 um beam size

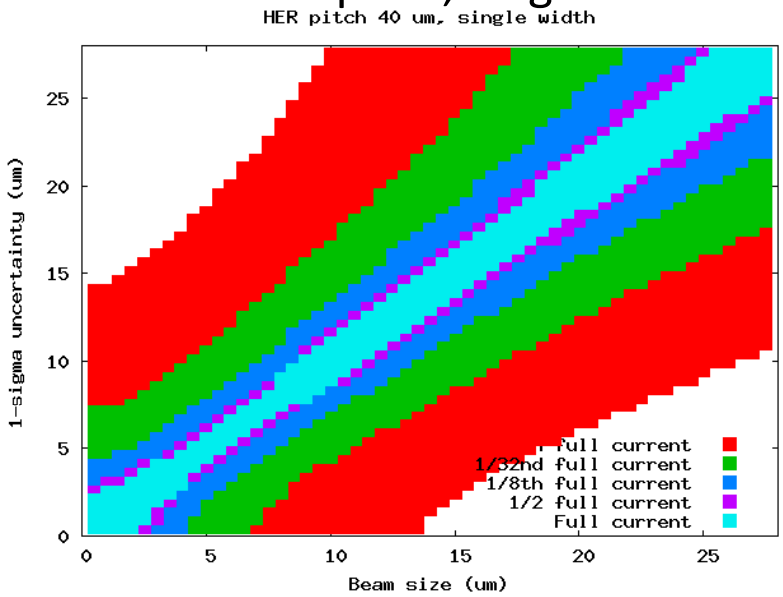


HER

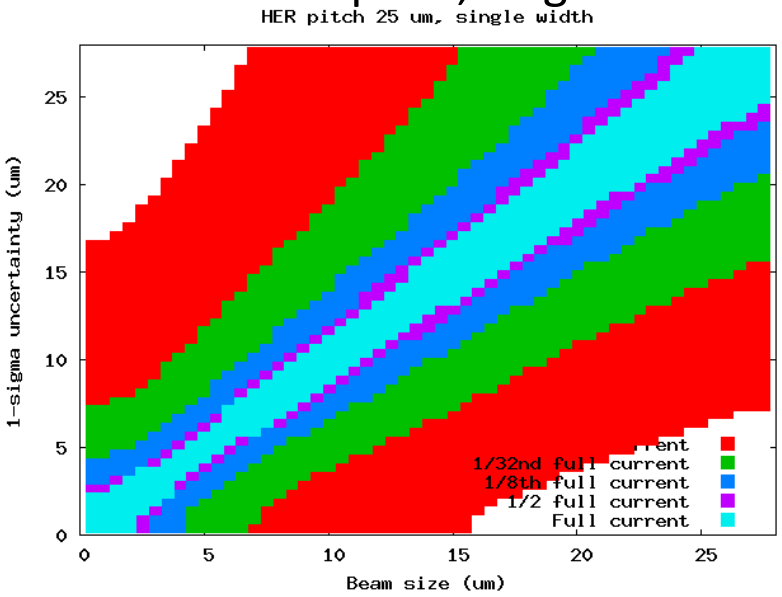
50 um pitch, single width



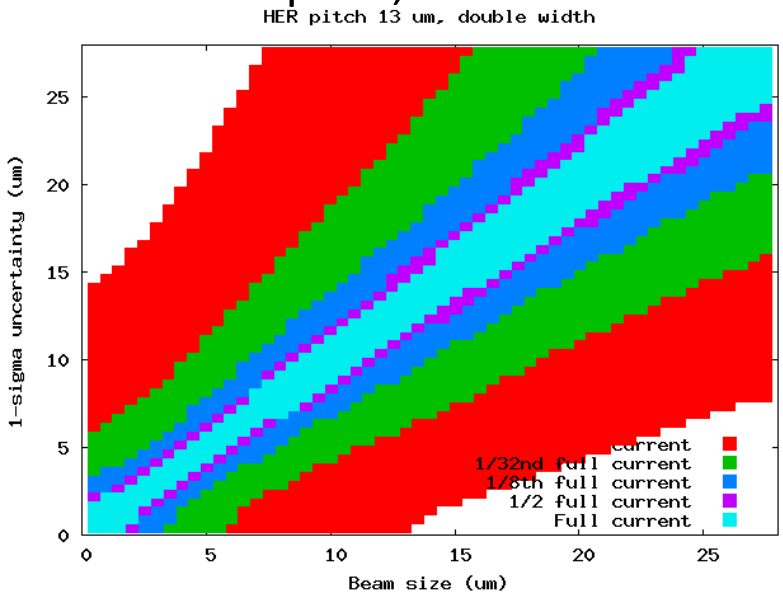
40 um pitch, single width



25 um pitch, single width

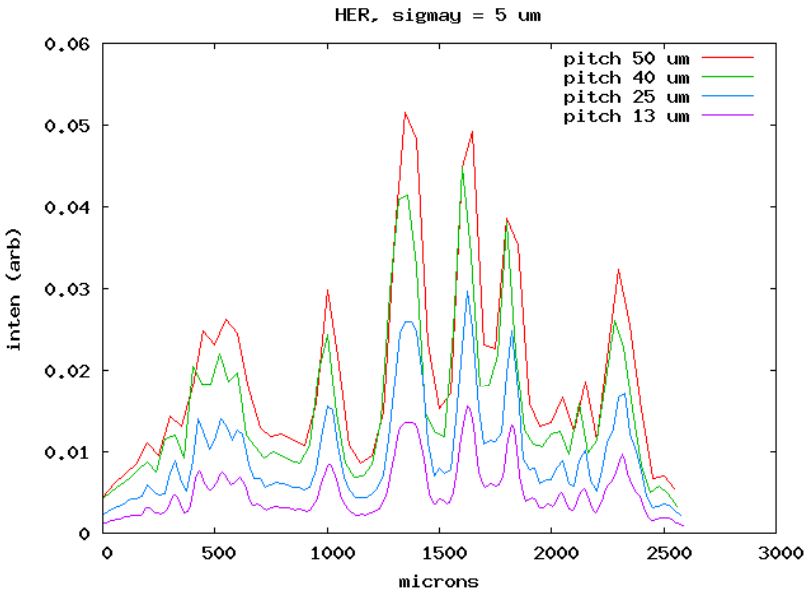


13 um pitch, double width

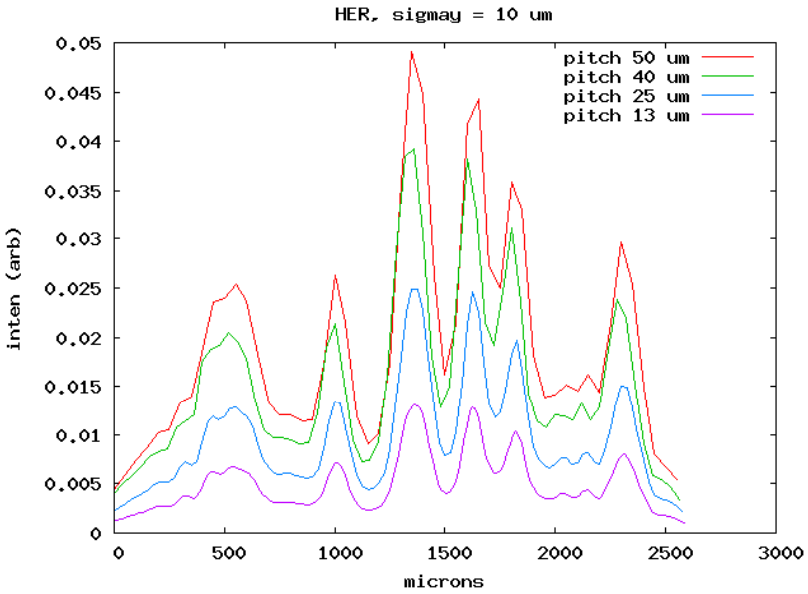


HER

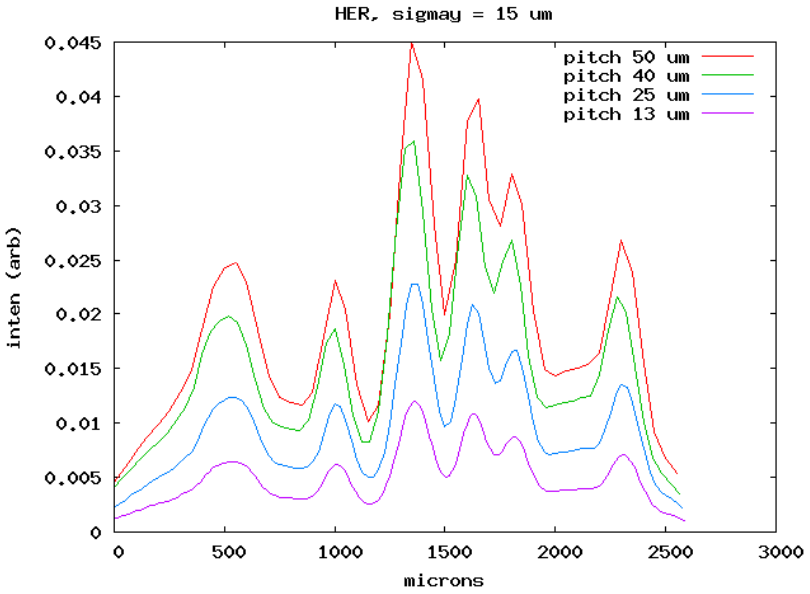
5 um beam size



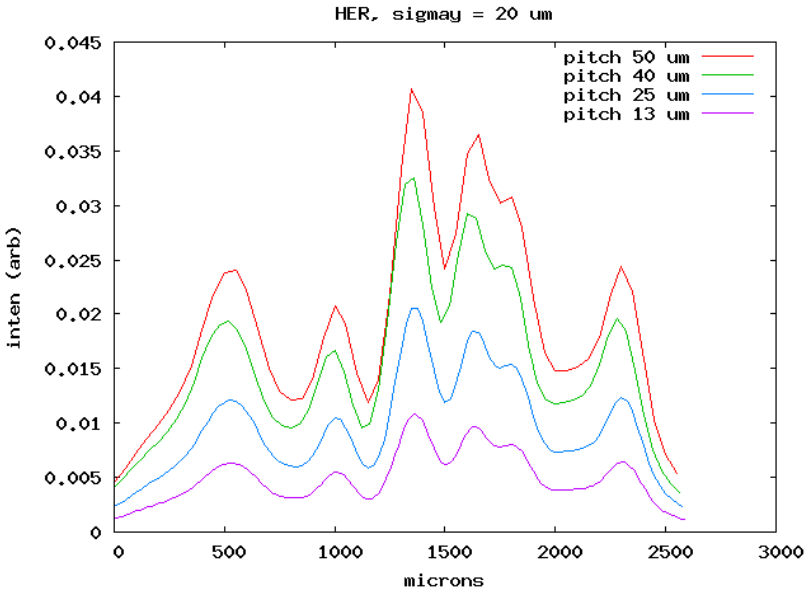
10 um beam size



15 um beam size



20 um beam size



Impressions

- Going to smaller pixel sizes helps below 10 um, and is actually counterproductive above that.
  - Fewer photons/pixel outweighs finer resolution?
- This pattern may be too crude to really make use of finer resolution pixels
  - Should try finer-featured patterns, and single pinholes
- Still, in principle, finer resolution SHOULD be better…
  - 10 um beam size at 3x magnification → 1sigma of beam is 30 um at detector. Seems like this should guide the detector pitch choice.