Power consumption

- Urgent (overdue) to provide solid “final” numbers for IBL design
- Impact on services, stave thermal performance etc.

Analog current

- 350-380 mA for standard configuration file, even after irradiation.
- No analog problems seen at this current
- However, this translates to 13-14 uA/pixel
  - Target was 10 uA/pixel
  - Probably can be achieved with optimization
  - But not good to change standard settings at this point
- Therefore:
  - Define baseline analog as 350-380 mA/ chip
  - Maximum analog 20 uA/pixel = 540 mA/ chip
  - Do not expect to ever operate at maximum. Not clear what system design should do with such value

Digital current

- Nice agreement between simulation and measurement

Simulation @1.2V

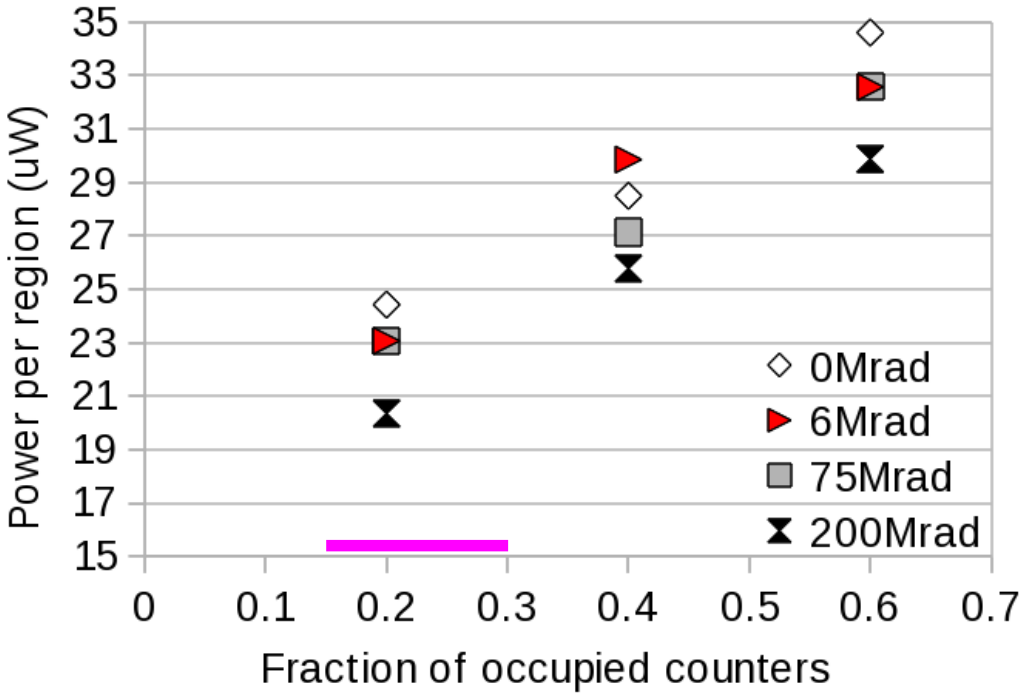
Average power for 4-pixel region at IBL occupancy (MC hits)

Simulation type	Power (avg) [uW]
ETS[1]	42.28
Spectre[2]	25.19
Ultarasim(s)[2]	24.69
Ultarasim(a)[2]	24.73
Ultarasim(ms)[2]	35.12
HSIM[1]	27.64
HSIM[2]	30.98

Parasitic extraction done width [1]PEX

Measurement @1.2V

Occupancy faked with periodic charge injection



Approx. IBL range

Digital current

- Take IBL max occupancy value
  - 140 mA /chip at 1.2V
  - Scales to 30% higher at 1.5V (measured)

Current consumption summary

- Analog 350-380 mA
- Digital 140-180 mA
- Total: 490-560 mA

- Can be as high as 720 mA by maxing analog settings, but no use-case for that
- Can alternatively be further reduced by further optimizing analog biases.
- No significant change with radiation for either analog or digital.

Power consumption

- This depends on supply voltage
- Baseline is to use on-chip LDO regulators that tolerate input voltage as high as 2.5V.
- Assuming supply voltage at chip in the range 1.7V to 2.0V, Power consumption is:
  - 0.83 - 1.12 w/chip

- (that's 0.25 – 0.33 W/cm^2)

FE-I4B Design review

- April 28
- Input needed:
  - List of tests (attached to agenda page)
    - Need to update. RSVP what tests are complete, which are in progress
  - List of unresolved problems:
    - Double peak in BCID distribution
    - Ref2fast errors
    - ShuLDO output resistance discrepancy
    - What else?
  - Need a talk summarizing status of all existing modules.
    - Plus all test beam / radioactive source / cosmic ray results
  - Charge scale calibration.
    - Using sources, and MIPS.