内层径迹探测器SIT本底及事例率

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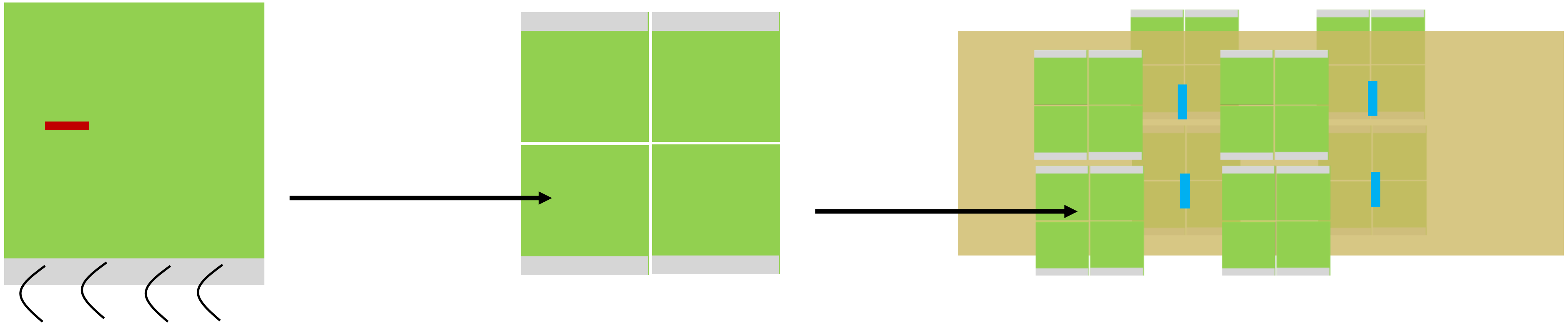
Disclaimer

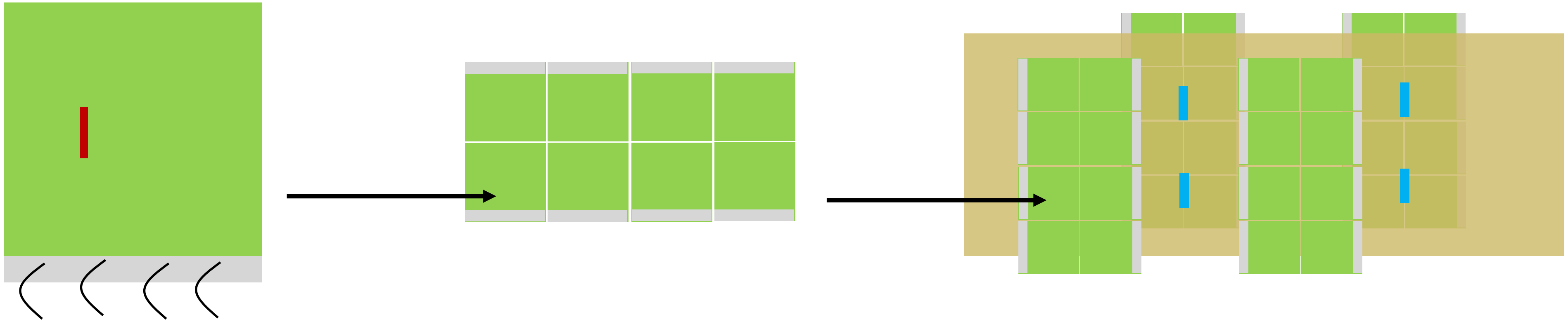
- Old layout consistent with 11 Mar for a preliminary estimation
- Bound to change – but the order of magnitude should not change
  - Endcap will be redesigned -> module may increase due to large overlap
  - Innermost layer may move inward if VTX adopts long-barrel option

Module concept based on future COFFEE?

- Key geometrical size:
  - Chip size: 20mm * 21mm
  - Pixel size: 25 um * 150 um (point resolution in one direction at least <10um)
  - Insensitive area: <~ 20mm * 2mm
- Module consists of 8 chips



2*quad
A la ATLASPix
- NB: gaps!



8 chip module
w/o gap, with
flexibility
- But hard for
chip design

Data rate estimation

Key assumptions: Event rate 112kHz, track multiplicity 100, cluster size 3, bits per hit 48; Beam bkg to be added

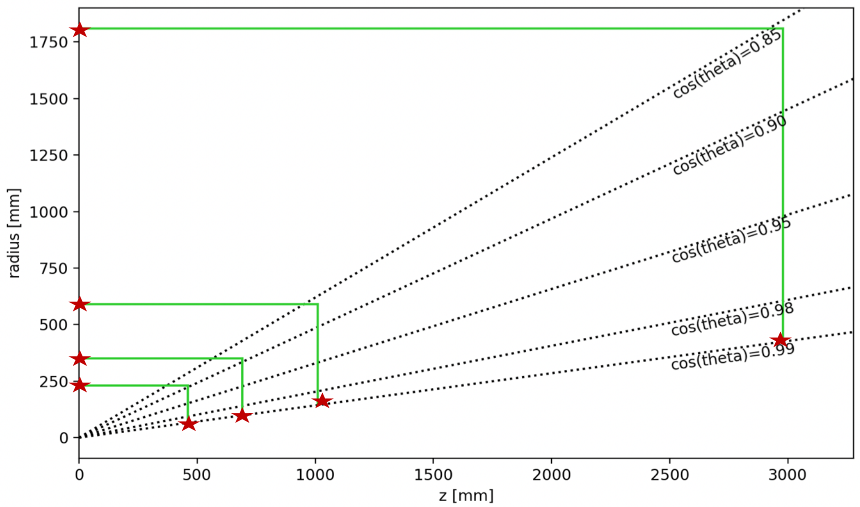
Layer	Hit density [kHz/cm^2]	Data rate /chip [Mbps]	Data rate / module [Mbps]	Data rate / layer [Gbps]
Barrel SIT 1	5.2	1.0	8.0	1.5
SIT 2	2.2	0.43	3.5	1.5
SIT 3	0.79	0.15	1.2	1.4
Endcap SIT 1	1.3	0.24	2.0	0.17
SIT 2	0.57	0.11	0.87	0.17
SIT 3	0.26	0.05	0.41	0.22

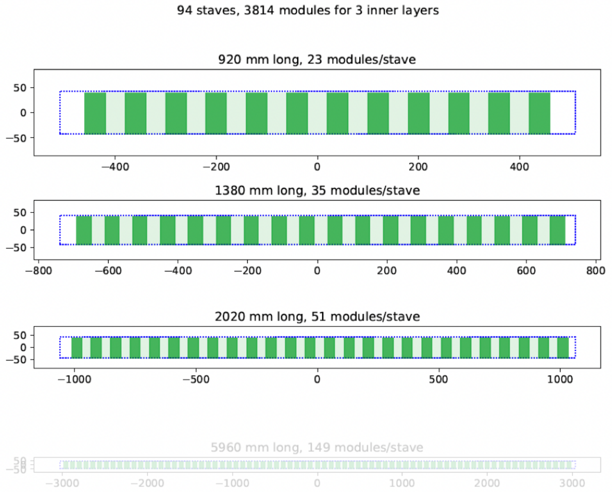
Total data rate: 5.0 Gbps

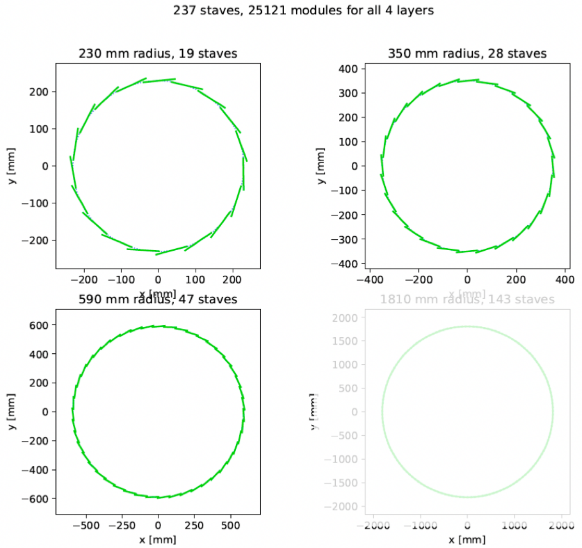
A possible layout and counts of modules - barrel

- Layout is being optimized, subject to change! Just to give a feeling of order of magnitude
  - 94 staves, 3814 modules for 3 inner layers; 237 staves, 25121 modules for all 4 layers

Layer	r [mm]	Z/2 [mm]	# staves	# modules
SIT 1	230	460	19	437
SIT 2	350	690	28	980
SIT 3	590	1010	47	2397
SET	1810	2980	143	21307





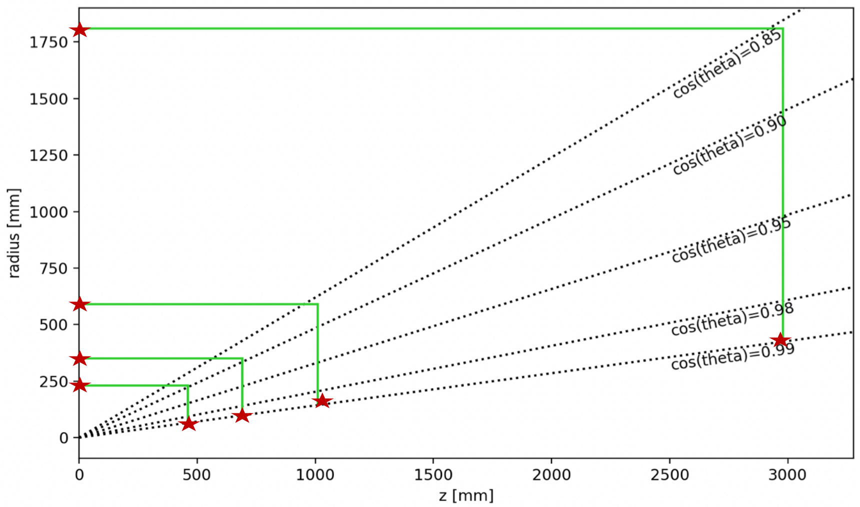


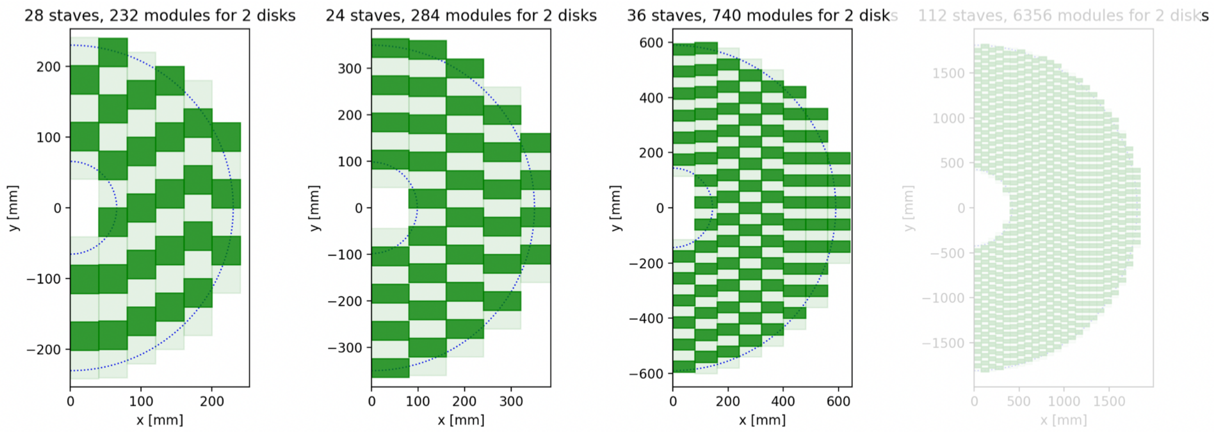
A possible layout and counts of modules - endcap

- Not the actual configuration but just to estimate a count for modules!
  - 88 staves, 1256 modules for 3 inner layers; 200 staves, 7612 modules for all 4 layers

Layer	r [mm]	Z/2 [mm]	# staves	# modules
SIT 1	230	460	28*	232*
SIT 2	350	690	24	284
SIT 3	590	1010	36	740
SET	1810	2980	112	6356

*4-chip modules





beam background

- Only reliable pair production bkg available
  - Negligible > radius of 10cm
- No final plot for beam loss bkg
  - Can be significant especially for innermost layer