University of Birmingham
Tuesday, May 09th, 2000.

Common Track Segment Finder for L1/L2?

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- Erratum (table 1 of L1 feasibility study)
- PROs and CONTRAs of design strategies
- Minimal Solution for common (L1/L2) track segment finding

Erratum I

Number of valid coarse track segments:

Trigger Layer	Cells	Valid Patterns (types)	Valid Masks	Ambiguities
1	000	127	336	26
1	-100	155	191	4
1	00-1	11	0	0
1	100	9	0	0
1	001	133	208	6
2	000	143	671	201
2	-100	243	452	15
2	00-1	36	46	0
2	100	30	49	0
2	001	199	413	16
3	000	169	975	384
3	-100	323	835	31
3	00-1	56	197	0
3	100	50	168	0
3	001	288	799	33
4	000	283	889	307
4	-100	405	370	11
4	00-1	43	22	0
4	100	52	26	0
4	001	393	335	12

track segments with $p_t > 90\ \mathrm{MeV}$ at 20 MHz synchronisation frequency. Blue numbers calculated by M. Plintovic.

Erratum II

E.g. third group has 3000 valid masks including ambiguities but only about 1000 types of masks.

full implementation $\Rightarrow$ 100 ESBs

Resources can be saved by:

- tighter cut on χ^2_{cut}
- neglecting ”seldom” masks
- neglecting redundant patterns
- increasing p_t cut from 90 MeV $\rightarrow$ $100, 120$ MeV

Design Strategy

- Pivot Element(s) on fly
  - + fewer patterns (only types)
  - - t_0 not known
  - - time dependence has to be stored and buffered
- Full Shift Register Analysis (minimal solution in L1 feasibility study)
  - + t_0 known/assumed
  - + no buffering needed
  - - more CAMs needed

Question: Can a full Shift Register Analysis performed on fly?

Common L1/L2 Track Segment Finding

- Speed

  1: At 80 MHz 4 segments per CAM per BC can be found using the multiple match mode $\rightarrow$ sufficient

  2: only 2 cycles for unencoded mode $\rightarrow$ sufficient

- κ-ϕ Lookup

  1: same κ-ϕ tracks in single CAM: only at least one match to be recognised $\rightarrow$ requires 100 bits input (4 ESBs per CAM)

  2: unencoded mode with ORed output lines from several CAMs: optimal for unencoded data transfer to L1 trigger card $\rightarrow$ preferred solution

  3: encoded mode: optimal? only for encoded data transfer to L1 trigger card otherwise decoding necessary $\rightarrow$ number tracks limited

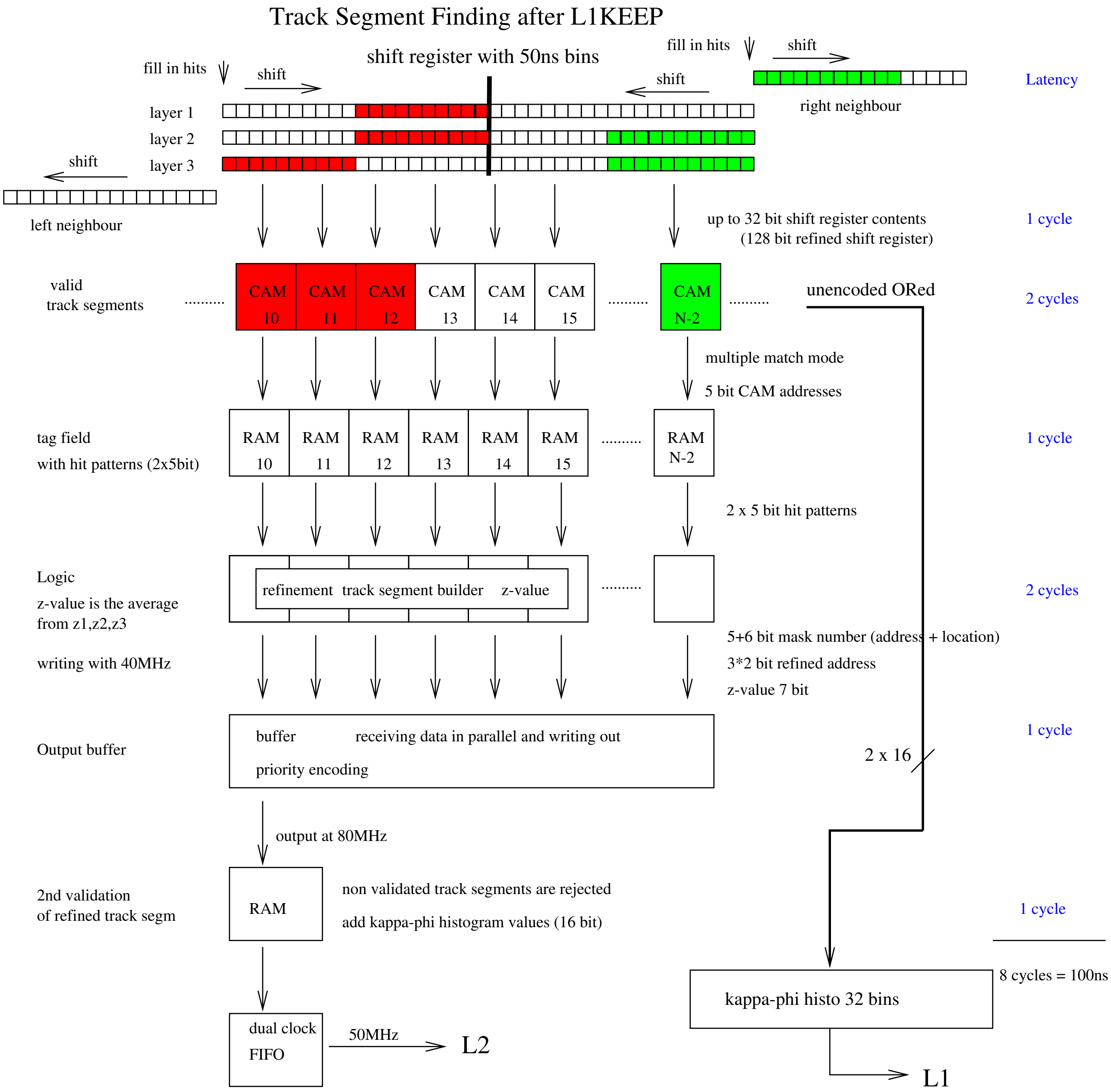
- Efficient usage of resources

  – take same CAMs/ESBs for L1/L2 track segment finding

  – use both unencoded (L1) and encoded (L2) CAM output (both can be configured at the same time)

  – no additional resources needed apart from some LEs

Common L1/L2 Track Finding



Summary

- Simple concept for efficient and common L1/L2 track segment finding presented
  - simultaneous usage of encoded and unencoded mode needs verification
- New estimates on resources: e.g. for third trigger layer 100 ESBs for CAMs + 25-50 ESBs for RAMs (tag field)
- Numbers on valid patterns need verification
- Full algorithm should be programmed