SVT status

(Silicon Vertex Tracker)

Impact Parameter L2 Trigger

CHICAGO - GENEVE - PISA -TRIESTE

Tsuyoshi NAKAYA
(U. of Chicago)

1.Physics Motivation and Performance

2.Status of each components.

3.Highlights in SVT projects

4.Status of simulation package.

1.Physics Motivation and Performance.

Physics Motivation:

- B Physics (B->$\pi\pi$ and many other modes)
- b jet tags (Z->$b\bar{b}$, heavy flavor jets and Exotic Search)

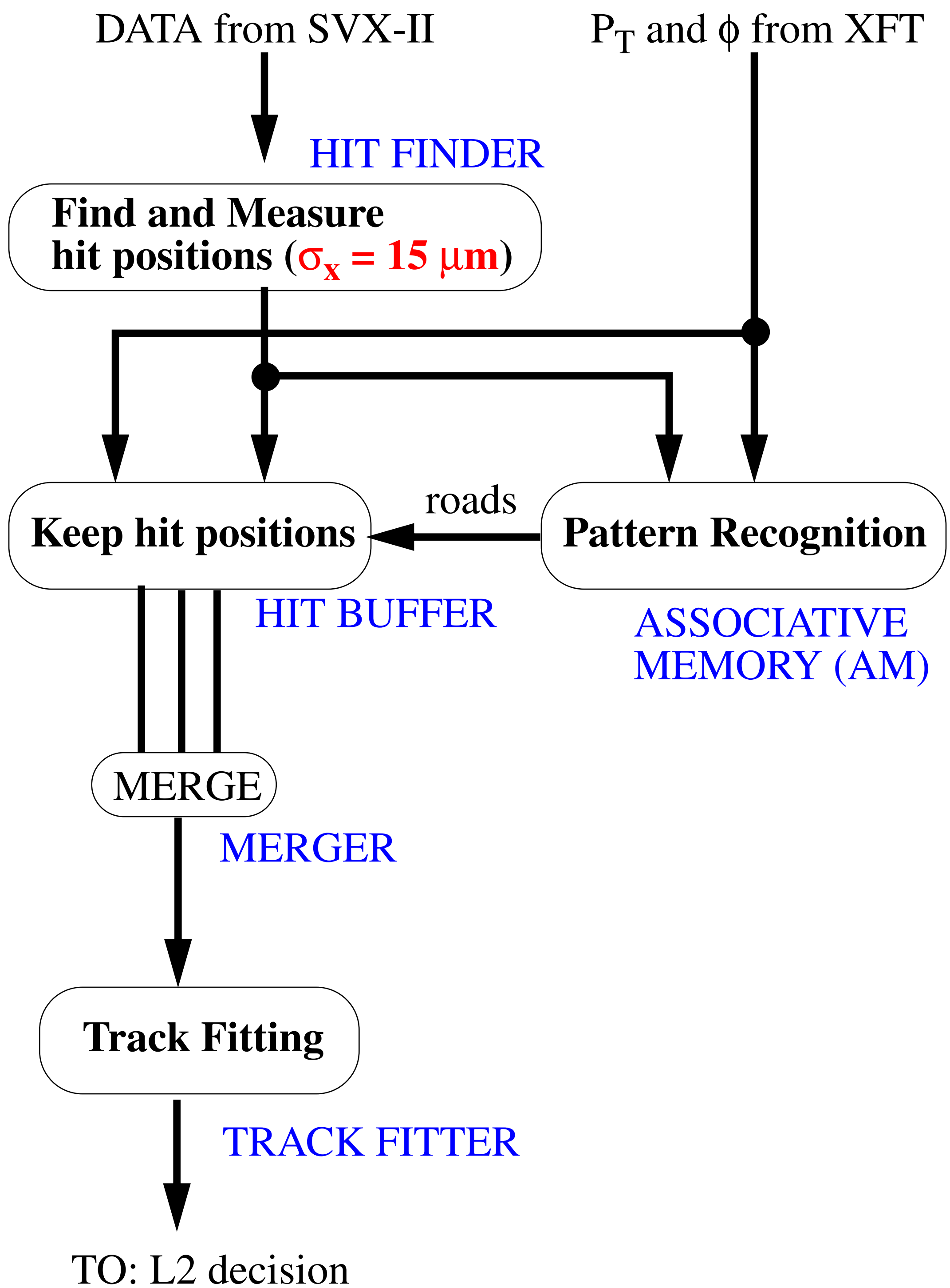
Performance:

- σ_d = **35** μm (at P_T = 2.0 GeV/c)
- σ_ϕ = **1** mrad
- σ_{PT} = **0.30** % P_T^2 (where P_T is in GeV/c)

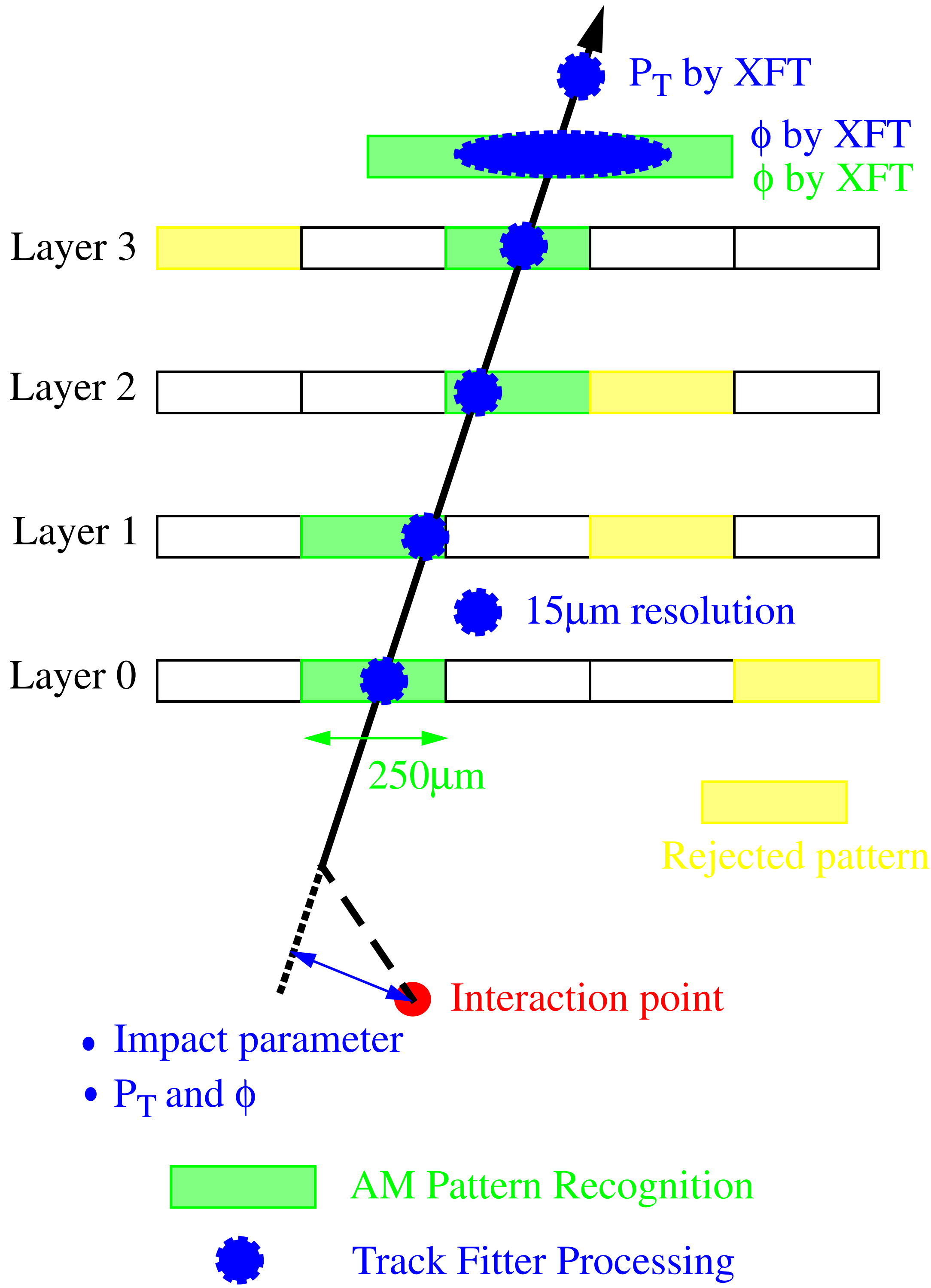
Requirements:

Beam should be parallel to SVX-II (<100 μrad).
Tracks found in XFT with P_T>2GeV/c

SVT Diagram


DATA from SVX-II
P_T and ϕ from XFT
HIT FINDER
Find and Measure
hit positions ($\sigma_x = 15\ \mu m$)
Keep hit positions
roads
Pattern Recognition
HIT BUFFER
ASSOCIATIVE
MEMORY (AM)
MERGE
MERGER
Track Fitting
TRACK FITTER
TO: L2 decision

SVT Function



2.Status of each components

- HIT FINDER:

    Conceptual design complete.

    Hardware design underway (Board layout starts)

- HIT BUFFER

    Prototype built and tested at design speed.

- ASSOCIATIVE MEMORY

    1. AM SEQUENCER:

    Prototype built and tested.

    2.AM CHIP (final 5000 units):

    200 prototypes tested.

    New prototype will run soon with minor improvement.

    3.AM BOARD:

    Prototype with 8 AM chips built and tested.

    Prototype with 128 AM chips is under construction.

- MERGE

    Prototype built and tested at design speed

    Need changes (revised communication protocol)

- TRACK FITTER

    Study conceptual design (processing time < 1μsec):

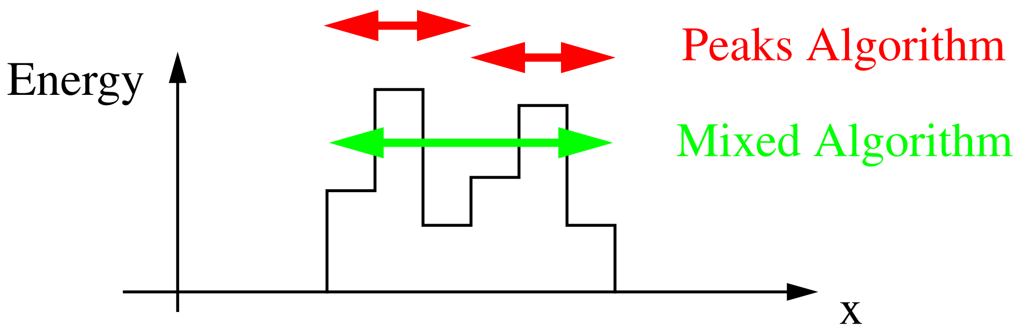
    1. FASTER DSP (200MHz):

    2. Memory Lookup (4M address):

3.Highlights in SVT projects

- HIT FINDER:

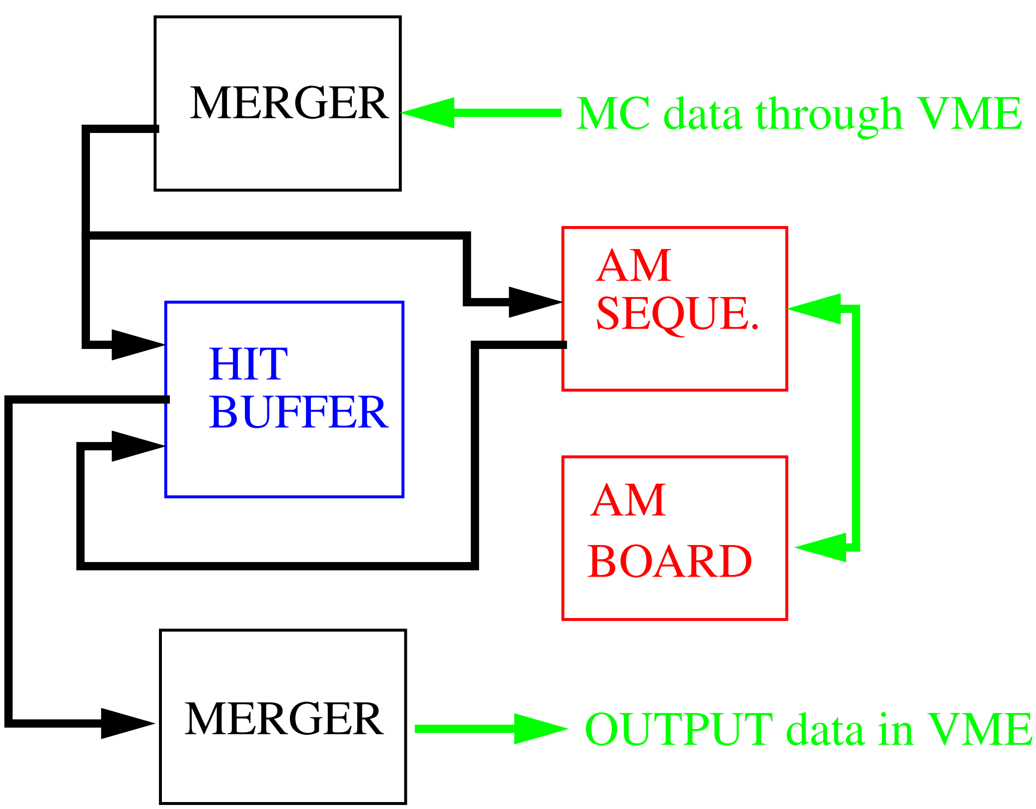
  Two Clustering algorithms:



  Handle a wider (more than 3 strips) cluster and allow for increaed uncertainty in TRACK FITTER.

- HIT BUFFER / AM / MERGER:

  (Integrated system test at PISA)



- TRACK FITTER (Now we have two options.):

LINEAR FITTING (works in 30^{o} in ϕ)

$$p_i = \vec{a}_i \bullet \vec{x} + b_i$$

[p_i : P_T, d, ϕ $\vec{x}$: 4 hit positions and PT, ϕ by XFT]

1. FASTER DSP (1600 MIPS w/ 200MHz):

Texas Instruments TMS320C6x

x10 faster than the DSP on SVT TDR.

5μsec -> 0.5 μsec

2.Memory Lookup (MLU) technique:

$$p_i = \vec{a}_i \bullet \vec{x} + b_i$$

$$p0_i + \delta p_i = \vec{a} \bullet (\vec{x0} + \vec{d}) + b_i$$

$p0_i$: Get with an AM road (300k).

δp_i : Common for all roads (1M).

We have 4 M address patterns in MLU.

Performance study will be done soon with CDF RUN1 data for the above two methods.

4. Status of simulation package.

SVTSIM: (SVT Simulation Package) is written in C.

Now the code is on FNALD (VMS).

Installation into cdfsga (UNIX) is undergoing.

5. Conclusion.

SVT Project is going well.

Elements not yet prototyped will catch up soon.