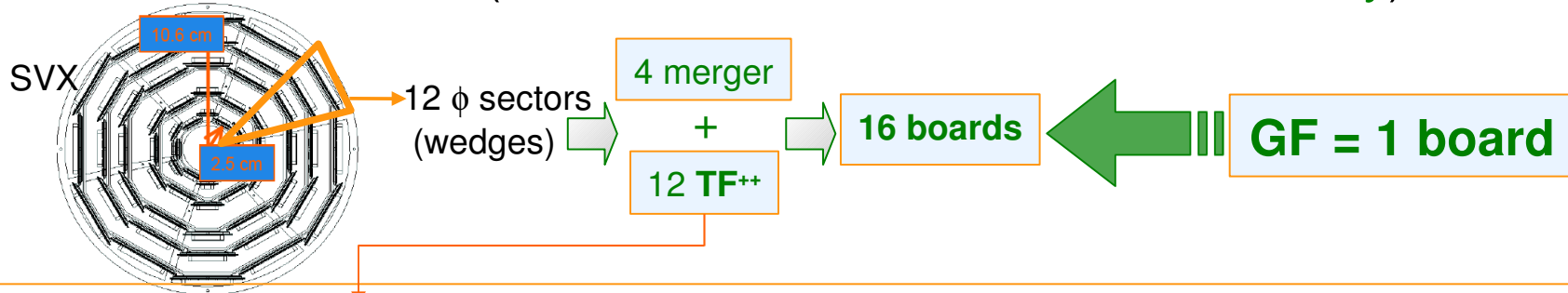# GigaFitter:
the last SVT upgrade at CDF

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GigaFitter : __online__ tracking processor developed as upgrade of CDF trigger system to
- allow SVT based trigger to take data **at high instantaneous luminosity**
- improve the physic reach (increased track reconstruction efficiency)

SVX

10.6 cm

2.5 cm

12 φ sectors (wedges)

4 merger
+
12 **TF⁺⁺**

16 boards

GF = 1 board

TF⁺⁺ limits:
- Patterns bank requires very large memory ➡ Number of patterns limited
- Limited fits per road
- Limited AM size ➡ Reduced acceptance
- Limited number of possible fits ➡ Less efficiency

GF features:
- Full hit resolution for linear fit scalar products
- Many sets to recover particular conditions ➡ More SVT acceptance
- Enough computing power to fit all combinations of SVX layers ➡ More efficiency
- 6 fit lines/wedge ➡ More speed

GF algorithm
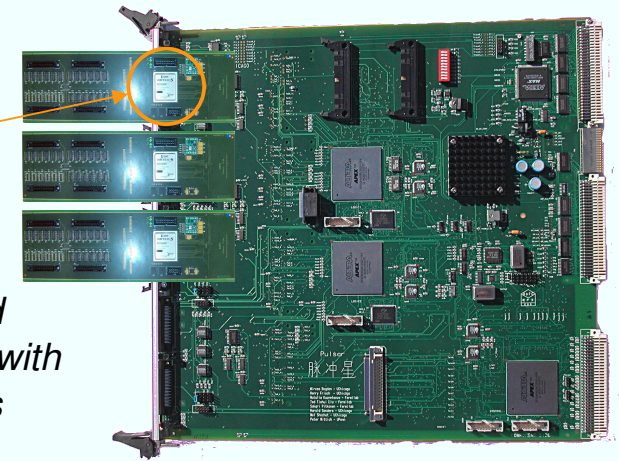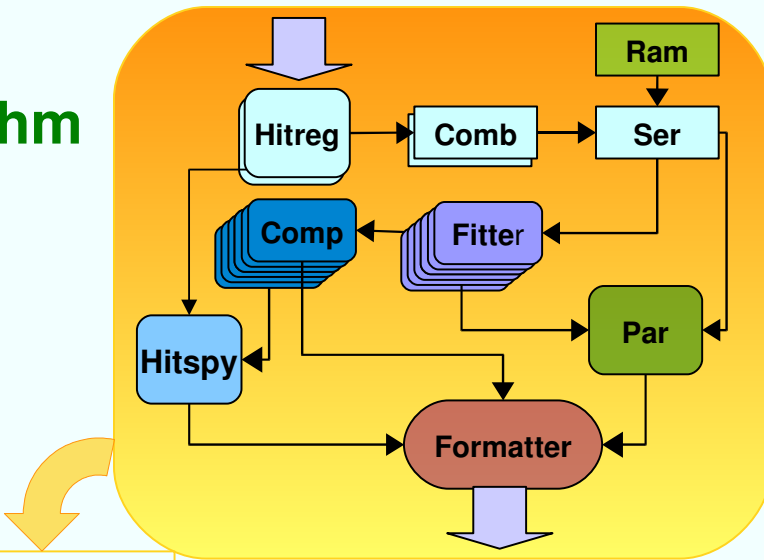
Virtex5 is provided with 640 DSP cells with 18x25 bit multipliers

Single fit line is subdivided in two pipelined steps:

· **Receive** hits from a road found in the AM.**Compute** all combinations of hits.

· **Fit** all combinations in parallel, cut on χ2 .**Select** the best fit among several good
  → 1 fit/clock cycle

Parallelism:

Up to 3 fit lines on the same wedge → 3 fits/clock cycle

4 independent fit blocks, one for each input → 12 fits/clock cycle

Final system has 3 parallel GF processors **36 fits/clock cycle**

Preliminary test 1 mezzanine (GF: basic fit line =1 fit/6 clock cycle @ 120MHz)
• *GF has a fixed minimum latency of ~400ns, like TF++ that increases its latency for complex events*
• *GF is* *fast* *enough to limit latency for all kind of events*