STAR Trigger System

- **Requirements**
- **Implementation**
- **Performance during Summer 2000 Gold-Gold Running**

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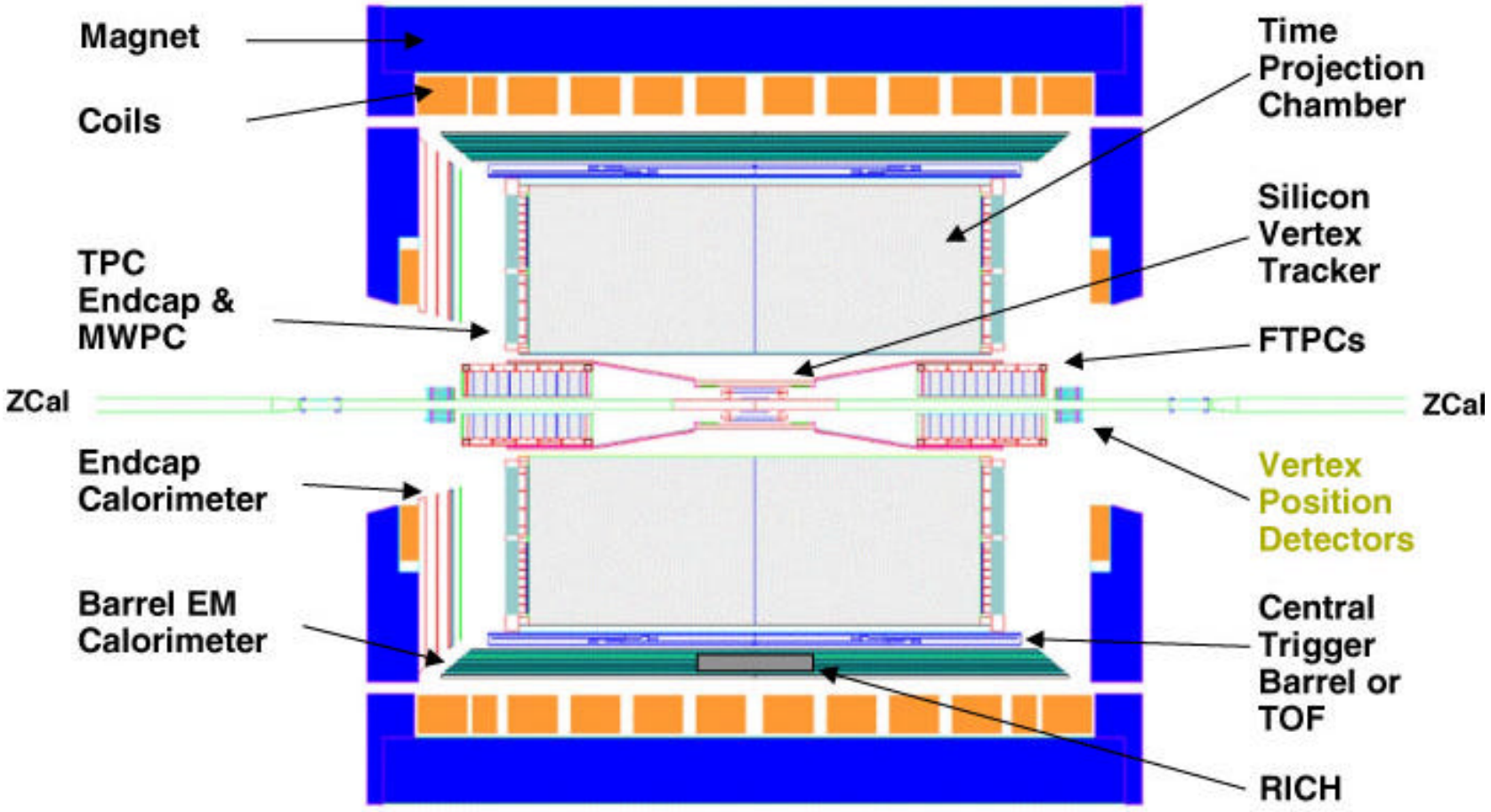
STAR Detector System

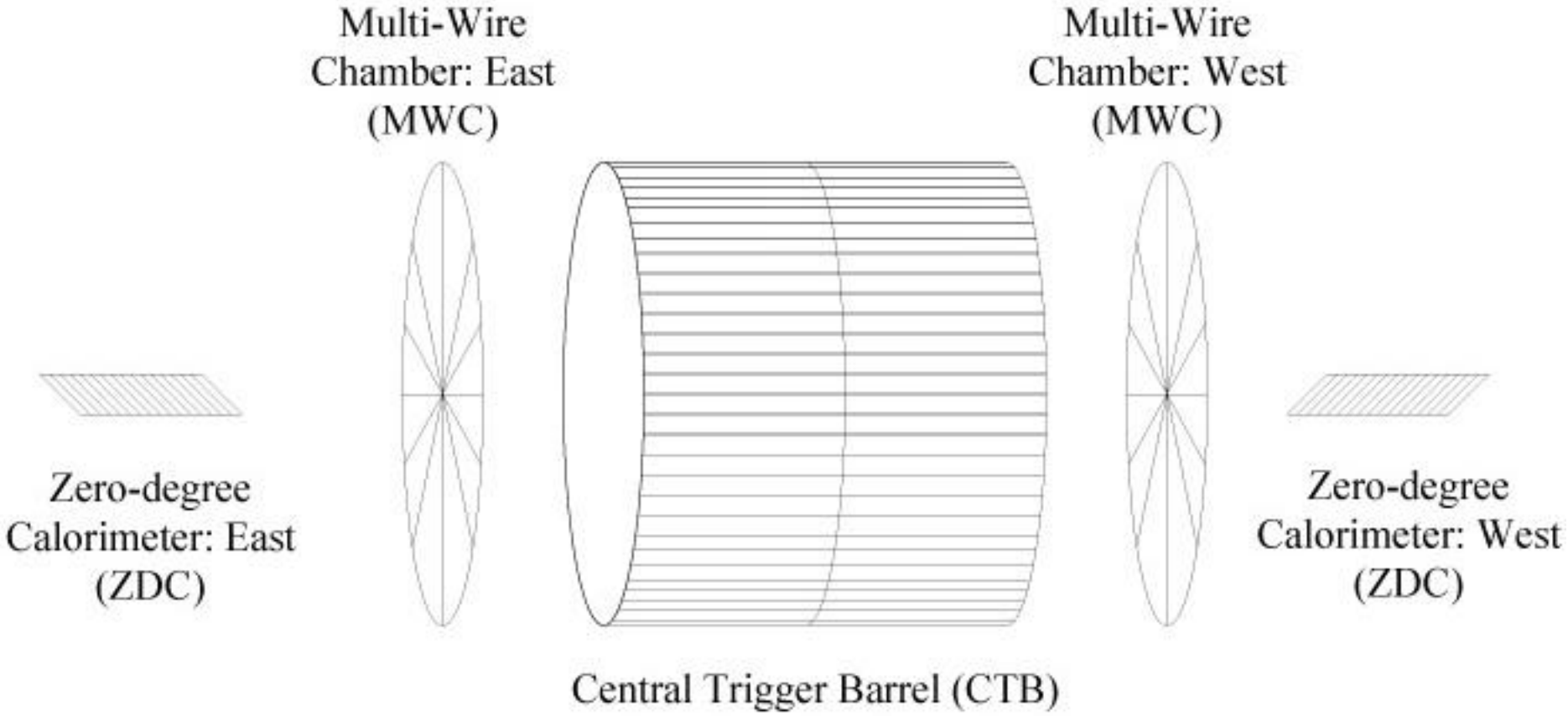


Picture provided by J.H. Thomas

Requirements for Triggering

- **Look at EVERY RHIC bunch crossing**
- **Physics**
  - **Multiplicity greater than threshold value**
  - **ZDCs (East and West) see at least one neutron each**
  - **Abort if further analysis shows the event is NOT really interesting**
- **Calibrations**
  - **Laser and Pulser …**
  - **On demand or automatically**
- **Mechanics**
  - **Detectors and DAQ alive**
  - **Issue triggers within 1.4 ms of the interaction**
  - **Blue and Yellow Ring bunches filled**

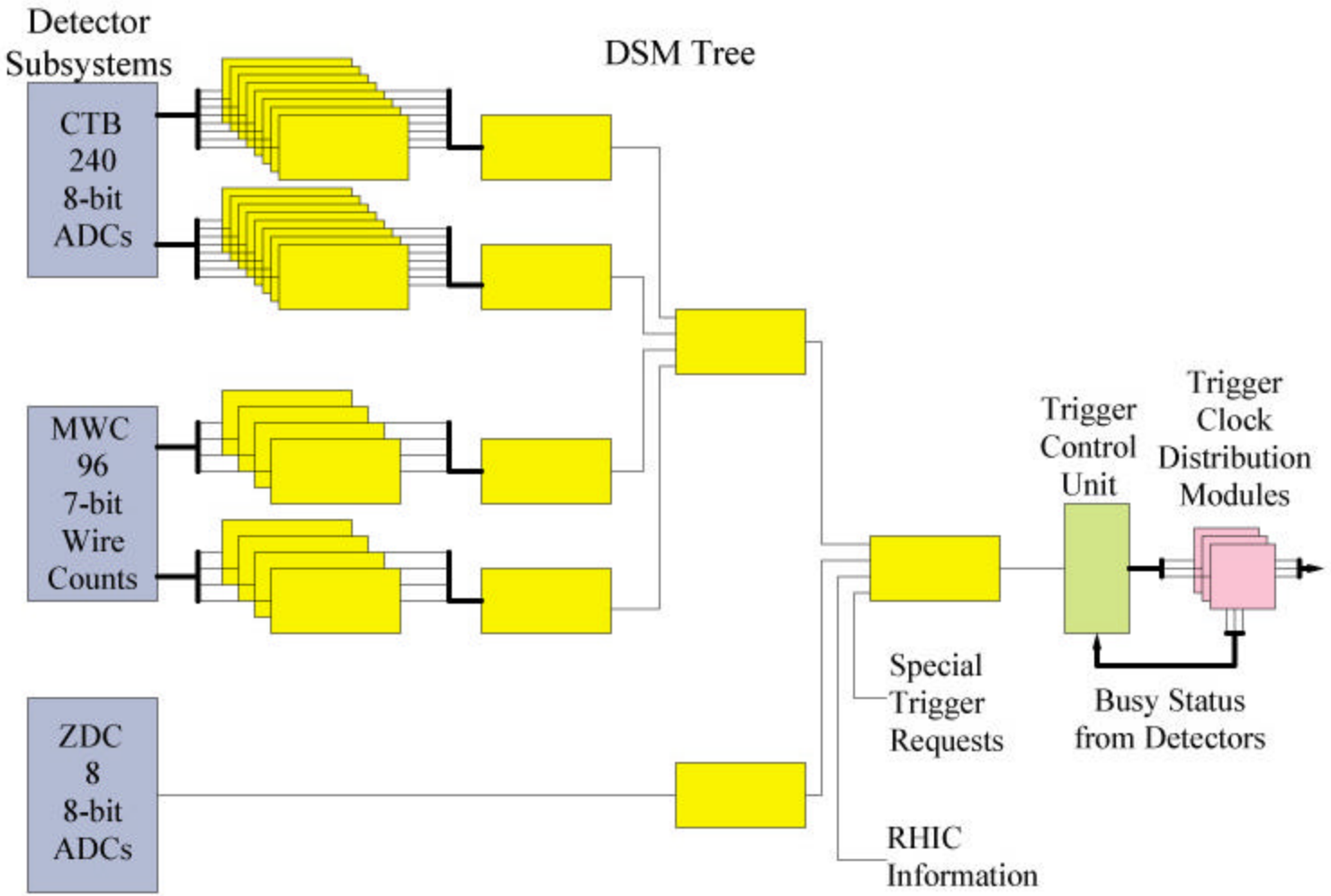
Trigger Detectors



Trigger Implementation

- **Level 0 – Initial Event Acceptance**
  - **Pipelined Synchronous Digital System**
    - Every time the RHIC clock ticks, new trigger data is digitized.
    - Existing data moves to the next layer in the pipeline.
  - **Four layers of data analysis.**
    - Sum all ADC values to calculate total multiplicity.
    - Compare total multiplicity and ZDC signals to thresholds.
  - **Final layer – Decision Time**
    - Combine final physics information with detector LIVE/BUSY status and issue triggers.
- **Levels 1 and 2 – Abort Accepted Events**
  - **While an event is being digitized (TPC takes 5 ms) re-analyze trigger data to see if event should be kept or aborted.**

Level 0 Analysis Tree



Summer 2000 Triggers

- **"Minimum Bias"**
  - **ZDC East and West thresholds set to lower edge of single neutron peak.**
  - **REQUIRE: Coincidence between ZDC East and West**
- **"Central"**
  - **CTB Highest threshold set to upper 15%**
  - **REQUIRE: Minimum Bias + CTB multiplicity over threshold**
  - **REQUIRE: CTB multiplicity over threshold**
- **"Peripheral"**
  - **Back-to-Back track pairs show up as one hit on the North side and one on the South side of the CTB**
  - **REQUIRE: 1 or 2 pairs of back-to-back tracks ONLY**

Conclusions

- **STAR Trigger installed with basic functionality for Summer 2000 AuAu Running**
- **Trigger performed well:**
  - **Triggered on combinations of ZDC coincidences and a wide range of multiplicities for Central Collisions program**
  - **Investigated a wide variety of geometrical triggers for the Peripheral Collisions program.**
- **Upgrades for next year:**
  - **Level 1 and 2 CPU farms for improved rejection**