A Progress Report to the Nuclear Physics Division
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Investigation of Rare Particle Production in High Energy Nuclear Collisions

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Summary

Our program is an investigation of the hadronization process through experimental measurement of rare particle production in high energy nuclear interactions. These interactions provide an environment similar in energy density to the conditions in the Big Bang. We are currently involved in two major experiments to study this environment, E896 at the AGS and STAR at RHIC. We have completed our first physics running of E896, a search for the H dibaryon and measurement of hyperon production in AuAu collisions, and are in the process of analyzing the data. We have prototyped the STAR trigger and are in the process of fabricating its components and installing them in the STAR detector.

DISCLAIMER

DISCLAIMER

A. Progress Report

The University of California Space Sciences group is the lead institution for E896 (Co-Spokesman H.Crawford) and is also responsible for the design, implementation, and operation of the trigger system for the STAR experiment (Solenoidal Tracker at RHIC, the Relativistic Heavy Ion Collider) at the Brookhaven National Laboratory (BNL). Our group took as its major E896 hardware responsibilities the superconducting dipole magnet (Sweeper) and the Distributed Drift Chamber (DDC) described below. After the engineering run in Jan. 1997 we also took responsibility for the DDC front end electronics. Our STAR hardware responsibilities originally included all logic electronics and now include the front end electronics for the central trigger barrel scintillator array as well.

A.1. E896

Experiment E896 at the Brookhaven National Laboratory AGS is a search for the H dibaryon and for short-lived strange matter, and an investigation of hyperon production in 11 GeV/nucleon AuAu collisions. The H dibaryon is the lightest example of strange matter, predicted to exist as a 6-quark object (uuddss) within the framework of the MIT bag model (Jaffe 1977). Many experiments have been performed to find the H, but so far no unambiguous signals have been reported (Aoki 90; Belz 96,97; Longacre 98; Stotzer 97). Observations of possible double-hypernuclei events have suggested constraints on the mass of the H (Aoki 91) but are still ambiguous. New experiments at the AGS will provide much cleaner investigations of the existence of double hypernuclei, but these are still in progress. Searches for long-lived strange matter have set stringent limits on its production in heavy ion collisions (Beavis 95). We have completed our first physics run for E896 in April 1998, a dataset which should contain between 10 and 50 identifiable H particles if the theoretical predictions are correct (Dover 91).

E896 is designed to identify an H particle through its decay, into either Σp, $\Lambda p\pi$, or Λn decay channels. It is designed to have significant (>100x predicted yield) sensitivity for a range of H lifetimes of $\sim 1\text{cm} < c\tau < 100\text{cm}$. The experiment consists of two topological signature detectors (a 15 layer Silicon drift array (SDDA) and a 144 plane drift chamber (DDC)) as well as beam detectors to identify and vector the beam onto the target, multiplicity detectors to determine interaction centrality (multiplicity), and particle identification detectors to verify proton-pion identity through Time-of-Flight. In addition, a high efficiency neutron detector is used for redundant identification of the Σ through its neutron decay channel. The apparatus as staged in the April 1998 run is shown in Figure 1.

The SDDA is primarily the responsibility of Wayne State University, University of Texas (Austin), Ohio State University, and BNL. Rice University is responsible for the TOF system. University of Catania (Italy) is responsible for the neutron detector (MUFFINS). Carnegie Mellon University is responsible for the DDC gas system and the multiplicity detector (MLT). BNL is responsible for the Beam Vector Detector (BVD). Goddard Space Flight Center and Johns Hopkins University combined to provide the trigger system, with hardware provided in large part from UC/SSL. The DDC and Sweeper magnets are the responsibility of UC/SSL.

We had an engineering run in January 1997, whose results were reported at two conferences (Kaplan 97; Crawford 98). In this run it was determined that the sweeper magnet, provided under contract with Oxford Instruments in England, did not meet its specifications and operated at only 350A current, rather than the design goal of 525A. This led to a compromised data set dominated by excessive track density in the DDC. The FEE electronics suffered from excessive noise during this run as well. The Jan. 1997 run included a single SDDA detector and 120 planes of the DDC. All other detector systems were complete.

Much of FY98 was devoted to repairing and completing apparatus for the 1998 run. This included fabrication of the full SDDA detector set of 15 layers of Silicon drift detector. These drift detectors are the prototype detectors for the STAR Silicon Vertex Tracker (SVT), and as a STAR prototype received much attention from the STAR group as well as the electronics group at BNL, where Radeca made the E896 run a priority for the system.

The DDC FEE cards were all rebuilt and tested in FY98, in a combination of UC/SSL-UTA-UCLA efforts, leading to a much quieter dataset in the Apr98 run. UC/SSL redesigned the high voltage distribution system so that we could control DDC planes individually via remote switches, rather than in groups of 12 as for Jan. 97. This meant that we could "lose" a single plane of the DDC without bringing down a 12 plane module.

The April 1998 run went extremely well, with the Oxford dipole, the Sweeper, operating at 95% design field or 6.1T. The 15 layer SDDA performed well in this field and integrated $>5x10^5$ central AuAu collisions on tape. The full 144 plane DDC also operated well, integrating $>10^8$ central AuAu collisions using much improved electronics. The predicted signals are shown in Figure 2. The datasets are called the DDC dataset and the SDDA dataset, sharing beam counter and centrality selection data and scalers. The DDC data set includes the TOF and MUFFINS data as well. The difference in dataset size was a result of the fact that the DDC data acquisition was designed for speed, allowing in excess of 1000 events per "spill", while the SDDA system, being a prototype for STAR, was much more conservative and allowed only a few events per spill because each event contained a full non-zero-suppressed readout.

Our DDC analysis is expected to require three passes through the full dataset: a first pass to see if a signal stands out, a second pass to improve our efficiency for finding and fitting the signatures, and a final pass to get the best mass resolution and to get the cross sections correct. As soon as the run was over, we froze the current version of the DDC analysis software, which included the finder and fitter portions of both the Λ and the H search code, and began a pass through the data at the BNL Physics Analysis Farm to search for events fitting our signatures. This pass was only 1-2% efficient overall at finding Λ particles, and has proven valuable primarily as a tool for tuning the next pass software. The analysis concept is shown in Figure 3, in which the modular approach to the task is apparent. We then continued code development in preparation for a second pass. Much of the preparation included "final" calibrations of the DDC, and we now have the efficiency per plane (Figure 4) and position resolution (Figure 5) as shown.

We are in the process of staging a proton calibration run at this time whose goals are to give final tune parameters for the DDC tracking as well as calibration for the TOF. We expect to integrate ~10^6 Λ particles which will be used to verify our ability to find Λs efficiently and to measure the polarization parameters for Λs produced in pBe collisions. Both the cross section (Blobel 74) and the polarization (Tonse 94) for Λs from pBe have been measured previously by others, thereby providing a benchmark for our methods. This run is expected to last two weeks.

A.2. STAR

The goal of the STAR experiment is to uncover evidence for the formation of a plasma made up of essentially free quarks and gluons such as was expected to prevail in the early universe just prior to hadron formation. The final state signature of this plasma state is not clearly understood, however. The process of initial hadronization from the plasma may well be masked by subsequent interactions among the produced hadrons in an expanding and cooling hadron gas phase. A possible unambiguous signature of this phase may be the formation of a large (baryon number A>10) multi-quark nugget of strange matter. Or it may come in the form of non-statistical fluctuations in the phase space populations of particles. We have been charged with providing a trigger system flexible enough to encompass a broad range of possible signature states, allowing selection of any combination of particles in the final state distribution.

Our solution for the design of the STAR trigger is a multi-level, modular, pipelined system relying on high speed programmable gate arrays followed by fast standard processor farms. There are three levels that make use of the fast trigger detectors; Level 0, which receives data from the detectors and accepts events, and Levels 1 and 2, which are two sets of veto processing units that reduce the primary trigger rate. The major difference between Level 1 and Level 2 is the available time and input data. These first three trigger levels are implemented in VME, using a mix of custom designed boards and commercial CPUs. Level 0, the 1st layer of trigger electronics, consists of two pieces; a tree of data storage and management (DSM) boards, where the output from one layer feeds the next, and a trigger control unit (TCU). Level 0 processes the trigger data for every RHIC crossing and initiates data taking if the event is interesting.

The DSM board constitutes a data receiver and memory for the digital signals from the three fast trigger detectors shown in Figure 6, the central trigger barrel (CTB), multiplicity wire chamber (MWC), and zero degree calorimeter (ZDC). These boards also form the receivers for the Electromagnetic Calorimeter (EMC) tower signals when that detector is installed, constituting a very powerful addition to the trigger detector set. Each board has 128 input bits, 32 output bits, a 64K memory and a field programmable gate array (FPGA) capable of computing simple sums, minima, et cetera. The TCU accepts data from the DSM tree and compares the bits with a pre-scale value to determine if an interaction of interest occurred. When an interaction of interest occurs, the TCU issues it a token and passes that token and information concerning the handling for that event to the trigger-clock distribution (TCD) network. The TCDs subsequently send this information to the detector systems. The TCU will not accept a new event unless there is a token available in the pool. Once a token is assigned to an event it stays with that data set until the event is written to tape by the data acquisition group (DAQ) or aborted. At this point the token is returned to the pool. Note: the TCU issues aborts produced by higher levels of the trigger system as DAQ is not informed that an event has occurred until it has passed all three levels. The number of tokens is chosen based on the amount of resources available in the trigger system so no event gets stuck waiting to be processed.

A.2.1 System Test

On May 3 of this year the UC-SSL members of the trigger (TRG) group met with representatives from the data acquisition (DAQ), Slow Controls (SC), and TPC groups to outline the objectives for the STAR system test. The following goals were agreed upon:

1) pass event information from TRG (level 2) to DAQ via the TRG-DAQ interface module (TDI)
2) have TRG execute command line calls to issue triggers
3) test data flow from SC to the DAQ receiver boards (RCVR) via HDLC/RDO/optical-fiber links
4) complete the data flow chain from the issued trigger through the RCVR board to the token return link from DAQ
5) pass data over SCI link to NT processors to mockup Level 3

To accomplish these tasks, the TRG group has begun assembling the apparatus necessary to achieve these goals in the electronics room, adjacent to the STAR hall at RHIC. At this time the 9U and 6U VME crates, corresponding to VME-6 and VME-8 in Figure 7, have been installed, certified by EH&S, and are currently in operation. The MVME 2306 processors corresponding to L1CTL, L2CTL and TDI-T in Figure 7 have been purchased, configured, and installed. The L2CTL module is currently coded to pass a 2048kB buffer to the TDI-T module which in turns places that same information in the memory of the TDI-D via an SCI link and queues a message to DAQ indicating the arrival of, and pointers to, that simulated event data thereby accomplishing goal 1. The L1CTL is currently running a preliminary version of the TRG code that is able to issue a token to a mockup of the TCU module which subsequently simulates the issuing of a trigger by firing a TTL level one shot, thus accomplishing goal 2 outlined above. A prototype TCU has been fabricated, the test schedule and dates for incorporating into the system test are discussed in Section B2 below. Goal 3 does not involve the TRG group, but for the sake of completeness it should be mentioned that it has been accomplished. Meanwhile, the PDC backplane card that busses the P3 backplanes between VME-6 and VME-7, thereby providing the physical interface between the TCU and TCD modules, has been fabricated and is currently being tested with the production TCD modules. Finally to accomplish goal 4, the TRG group must complete the link between L1CTL and L2CTL and interface the TCU and TCD modules as discussed above.

A.2.2 Electronics

During the last year the Central Trigger Barrel (CTB) successfully passed its mechanical design review, and is now in full scale production. The CTB bases were designed, prototyped and are being manufactured by UC/SSL group at LBL. All the analog electronics was moved off the detectors onto VME boards, and the responsibility for all the electronics, both analog and digital, was moved to the UC/SSL group. A system was designed that integrates nicely with the existing trigger design.

During the last year the responsibility for the multi-wire chamber (MWC) electronics was removed from the STAR baseline and moved to the Nuclear Sciences Division at the Lawrence Berkeley National Laboratory (LBNL). An electronics system has been designed by the TPC electronics and Trigger groups together. Prototype MWC front-end electronics cards have been designed, prototyped and are now involved in a larger scale test on a TPC sector.

Our work on the data storage and manipulation board (DSM) restarted late this year after an eighteen month shutdown in the STAR trigger electronics design effort. We have updated the CAD description of this board for known errors and changes in functionality and are currently producing a new production prototype board.

The Trigger Control Unit was fabricated in 1997 but its test procedures were put on hold during the trigger electronics design moratorium. The unit is fully loaded and has been smoke-checked, but its real functionality will not be tested until October 1998.

A.2.3 Software

In May 1998 we produced a preliminary set of software for the STAR system test (see System Test section above). This code was used to test various communications paths within the trigger system.

B. Expected Progress in FY99

B.1. E896

Our primary goal is to complete data analysis of the April 1998 datasets for both the DDC and SDDA. We expect to complete the zero suppression pass through the SDDA dataset by the end of September, and to complete Pass2 analysis of the DDC by the end of October 1998. This will allow us to make a definitive statement about the H in our datasets by the end of the calendar year. We consider this an essential milestone in determining whether we will request a second data taking run in the Spring of 1999, to coincide with the RHIC accelerator tune-up run. Note that E896 was originally approved for 1000 data taking hours, but that the short (4 week) run in April 1998 and the shorter (2 weeks - caused by magnet problems) engineering run in Jan. 1997 have produced less than 500 hours of data so far.

The SDDA zero suppression pass is being done at UTA in the Hoffmann group using a portion of our On-line computer system. Results of this pass will reduce the data volume by approximately 1/100. The zero suppressed data will then be distributed to WSU and OSU for analysis - tracking, particle identification, cross section calculations. Preliminary results are to be presented at the DNP meeting in October. Final results will include cascade and $\Lambda/\bar{\Lambda}$ cross sections in addition to the H search.

The bulk of the DDC analysis is being performed at UTA, UCLA, and BNL. TOF analysis is being done at Rice, and MUFFINS analysis at Catania. Beam vectoring and centrality studies are being done at CMU and BNL. The modules of the analysis package have been developed and are now being fine tuned for efficiency and resolution. Overall direction is provided by UC/SSL and the rest of the collaboration.

We have produced a full simulation chain and used the measured resolution of the detectors to embed Λ and H particles in a subset of the real data. This allows us to study the efficiency of our finding and fitting code, analyzing the embedded data to see how well we recover the known signals that we embedded. Our immediate plans call for simultaneously analyzing the Pass1 dataset for H and lambda signals while we test and improve the code efficiency on these embedded data samples.

We have begun Armenteros (Armenteros 54) analysis of a small sample of our data in which the events are selected as neutral decays in the DDC whose net momentum vector points back to the target. This sample was selected with a fast, low efficiency filter, and clearly shows the structure expected from decay of the lambda particles. It is also clear that there is significant background. The H signal is expected to appear near $\alpha=0$ with a Q dependent $p_{\perp}$ peak and width, since $M(\Sigma)\sim M(p)$ in the Σp decay channel and $M(\Lambda)\sim M(p\pi)$ in the $\Lambda p\pi$ decay channel.

The cuts we are now tuning include the goodness of fit for the topological signature, the beam vector onto the target, and the pointing of the net momentum vector of the decay products onto the target. Once we have fully tuned the tracking code, we can select a subset of the Λ that do not point to the target as indicating possible candidates for H decay through the lambda-p-pi channel. Since our primary decay channel is the H->sigma-p decay, we need to improve our sigma efficiency by tuning the filter that finds kinks in the negative track indicating the decay sigma->npi.

B.2. STAR

B.2.1 System Test

As the new fiscal year begins, the trigger group (TRG) group is completing the implementation of a SCRAMNET fiber optic link between VME-6 and VME-8 as shown in Figure 7. Once implemented, data read by the L1CTL from the TCU will be block transferred via the SCRAMNET modules into VME-8 and placed in the L2CTL memory and become available for transfer to the VME-9 (DAQ) via the TRG-DAQ interface modules (TDI). We expect the SCRAMNET link to be operational by early to mid November. The TRG group expect to finish testing the entire TCU-PDC-TCD chain and complete goal 4 by mid December.

During the first two quarters of FY99 the TRG group will continue to upgrade system test hardware and software. Scheduled hardware upgrades include isolating the TRG processors from the general network with the installation and configuration of a network switch, implementing a multi-port I/O server to connect the main TRG workstation to all VME processors. Scheduled software upgrades include automating the inter-process communication between the TRG Workstation and L1IO processor in VME-6, completing the communication between the ONL TRG_client and the TRG TRG_server processes. A rudimentary beta version that will allow limited run control by the ONL process is expected by Christmas of this year. The TRG group also intends to upgrade its test facilities at LBL to mirror the facilities at BNL. During the third quarter of FY99 the TRG group will install the production models of the DSM and RHIC Clock Controller (RCC), and move the TRG software to its final working version. The final quarter will be spent using beam to work out problems with the triggering software and determining the effectiveness of different triggering algorithms developed for the level 0, 1 and 2 trigger.

B.2.2 Electronics

Early FY99 the manufacture of the CTB bases will be completed and they will be shipped to Rice University for installation in the trays. Once the individual detectors are all complete the UC/SSL group will be overseeing their installation at RHIC, along with the high voltage system and all the cables. The electronics will first go through a preliminary design review (PDR) in September 1998, after which two custom VME boards will be built and tested. There will then be a final design review (FDR) before the full set of boards is produced. The full electronics system will then be tested and installed on the platform by the STAR magnet. When STAR starts up we will be responsible for the day-to-day running and maintenance of this detector.

The MWC system is no longer part of the STAR baseline. However we are trying to get it re-included for STAR start-up. If that effort is successful the UC/SSL group will again be responsible for the installation, testing and monitoring of this electronics at STAR.

Over the next few months prototypes of the updated DSM board will be built and tested, both individually and chained together. The DSM interface card (DSMI) will also be designed and prototyped. We expect to be able to go into production for 75 DSM boards late in 1998. In 1999 the boards will then be loaded, fully tested for functionality and robustness and finally installed at STAR in time for RHIC turn on. The UC/SSL group will then be responsible for configuring and maintaining the DSM system in STAR.

Before the eighteen month shutdown on trigger VME board development the trigger control unit was designed, prototyped and built, but not tested. While the new DSM boards are being built we plan to test the TCU and get the minimal functionality working. At this point the board will be delivered to BNL to be used in a system test with the data acquisition and TPC front-end electronics groups. Meanwhile, at SSL, we will continue testing a second TCU until we are sure that all the functionality is fully working. At this point the board will then be tested with the DSM boards in a mini trigger system test. This should happen before the order is placed for the full set of DSM boards. Finally, the fully-working TCU will be installed at STAR with the DSM system.

The RHIC clock and control (RCC) board, and the RHIC clock fanout (RCF) boards, receive the RHIC clock from RHIC and distribute it to the DSM and TCU boards. The TCU then distributes this clock to the rest of the STAR electronics system. Last year these boards were designed. In the coming year they will be built, tested and made to work with the full DSM/TCU system. They will be installed at STAR along with the rest of the trigger system.

B.2.3 Software

Over the next few months this code will be upgraded for a more complete system test. It will include the SCI and SCRAMNET network communications paths, the trigger-DAQ interface code and the trigger-on-line interface code. Gradually, as the TCU is added into the system test, the code needs to include functionality for reading and controlling this board. Finally, the software for reading and controlling the DSM boards will be added. At this point the software will have evolved into its final state, ready for STAR to start taking data.

Over the coming year it is the responsibility of the trigger group as a whole to design, write and test the code for monitoring the trigger detectors and evaluating the performance of the trigger system when STAR starts up. This evaluation will be an important task once STAR starts taking data in the second half of 1999.

As the RHIC turn-on approaches, the SSL group is beginning to concentrate its physics analysis efforts in the exotic particle subgroup within the STAR Spectra physics working group (PWG). This subgroup is a natural extension of the rare particle searches that the group has been involved with over the last decade at the AGS. The experience that the SSL group has gained in analyzing those previous experiments should be invaluable help in identifying possible rare particle signatures. As principal members in the STAR trigger group, the SSL group is also uniquely positioned to attack one of the major challenges that confronts this (and other PWGs) subgroup. That challenge being, to separate the processes of interest from the large number of background interactions at the trigger level. While we realize that this problem will exist to some degree even to the final analysis, the benefit of increasing the signal to noise ratio at the trigger level can not be underestimated.

The exotic particle subgroup is currently in the process of studying different event topologies that we have identified for heavy Strangelet candidates. The immediate goal is to determine the set of attributes for an event that must be included in the data storage tape (DST) format which will allow a high confidence level of identifying the most interesting events (e.g. those containing heavy strangelets). Future tasks include analyzing a set of simulated events seeded with strangelet candidates and testing different analysis techniques on that set of events. An example analysis technique would be a dE/dx.vs.P analysis of those events. The STAR TPC provides a measurement of the energy deposition (dE/dx) for the various tracks in an event. Coupled with the momentum (P) determined by the curvature of the tracks in the magnetic field provided by the solenoid, tracks from normal matter will centered on one of the prominent Bethe-Bloch curves. Heavy strange matter candidates will not fall on those curves, but are expected to concentrate in the upper right corner of such a plot.

B.2.4 Schedule

We show in Figure 8 the overall trigger installation schedule, noting that we expect to have the full trigger in place and tested by mid-April 1999.

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"Light nuclei production in relativistic Au + Nucleus collisions" M.J.Bennett et al, (The E878 Collaboration), Phys.Rev.C, (1998)

B. Conference Proceedings and Other Publications

"H Particle Searches with Heavy Ions", H.J. Crawford, Nuclear Physics A639, (1998)

"Low Pt Particle Spectra and Strangelet Search from Au+Au Collisions: Final Results from BNL-AGS Experiment E878", M.J. Bennett for the E878 Collaboration, Advances in Nuclear Dynamics 4, Proceedings of the 14th Winter Workshop on Nuclear Dynamics, January 31-February 7, 1998, Snowbird, Utah, USA

FIGURE CAPTIONS

Figure 1: Schematic layout of E896, showing the two magnets (sweeper and analyzer), the beam vector detector (BVD), the two tracking detectors (Silicon Drift Detector Array and Distributed Drift Chamber) and the Time-of-Flight (TOF) walls and MUFFINS used for particle identification. The target is in the front portion of the sweeper magnet. The multiplicity detector (MLT) sits inside the sweeper gap just downstream of the target on the face of a W collimator.

Figure 2: This figure gives the number of each type of particle expected to be reconstructible from the dataset indicated. The Silicon Drift Detector Array is sensitive to very short lifetime low rapidity H particles, while the Distributed Drift Chamber is sensitive to higher rapidity somewhat longer lifetimes ($c\tau \gtrsim 4$cm).

Figure 3: Analysis module chain showing the steps taken in analyzing the distributed drift chamber (DDC) dataset. This chain concentrates on DDC modules but also includes Beam Vector Detector, Time-of-Flight, and neutron detector (MUFFINS) analysis modules to form a complete picture of each event.

Figure 4: DDC per-plane efficiency including effects of outlier rejection in forming tracks. Note the low efficiency in the first 12 planes and the last 12 planes and the broader distribution of planes 13-72 compared to the planes 72-132. The first 72 planes are 6 modules of 12 planes each having 3mm wire spacing and cell depth, while the last 72 planes have 4mm spacing and depth. Our momemtum resolution is best in tracking segments having significant numbers of hits in planes 72-132.

Figure 5: DDC position resolution in the 8mm cells (4mm wire spacing) portion of the chamber, planes 72-144. Note that this resolution is always better than 200 microns and is better than 100 microns for a large portion of the TDC dynamic range.

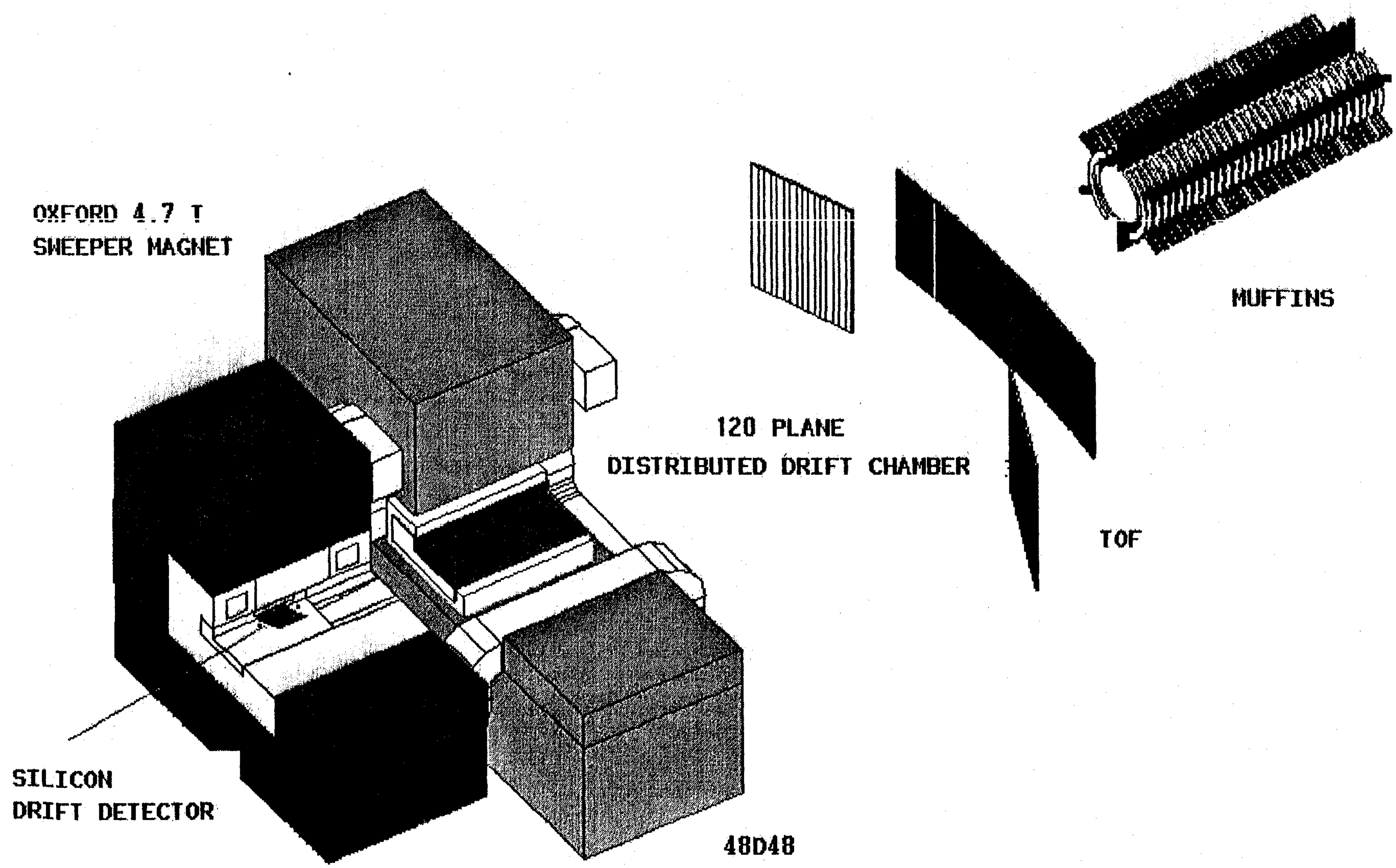
6. Schematic diagram of the STAR trigger detectors showing the central trigger barrel (CTB), a cylindrical array of 240 scintillator slats, each viewed by a single Hamamatsu R5946 mesh dynode photomultiplier tube, to count charged particles passing through the scintillator; the multi-wire proportional chamber (MWC), a collection of 7680 wires each of which acts as a separate counter to record passage of particles through the Time-Projection-

Chamber endcap; and the zero-degree-calorimeter, a 6 interaction-length deep hadron calorimeter designed to count neutrons liberated in the collisions into a small cone centered on 0 degrees. These, with the upgrade Electromagnetic Calorimeter are the fast trigger detectors for STAR.

7. Schematic diagram of the full electronics system for the STAR trigger. The fast detector and logic electronics are shown, along with the interfaces to the TCD and DAQ systems.

8. Gannt chart for completion of the STAR trigger.

BNL–AGS E896 EXPERIMENTAL LAYOUT



7/98 HjC

Expected Signals from April 1998 Run

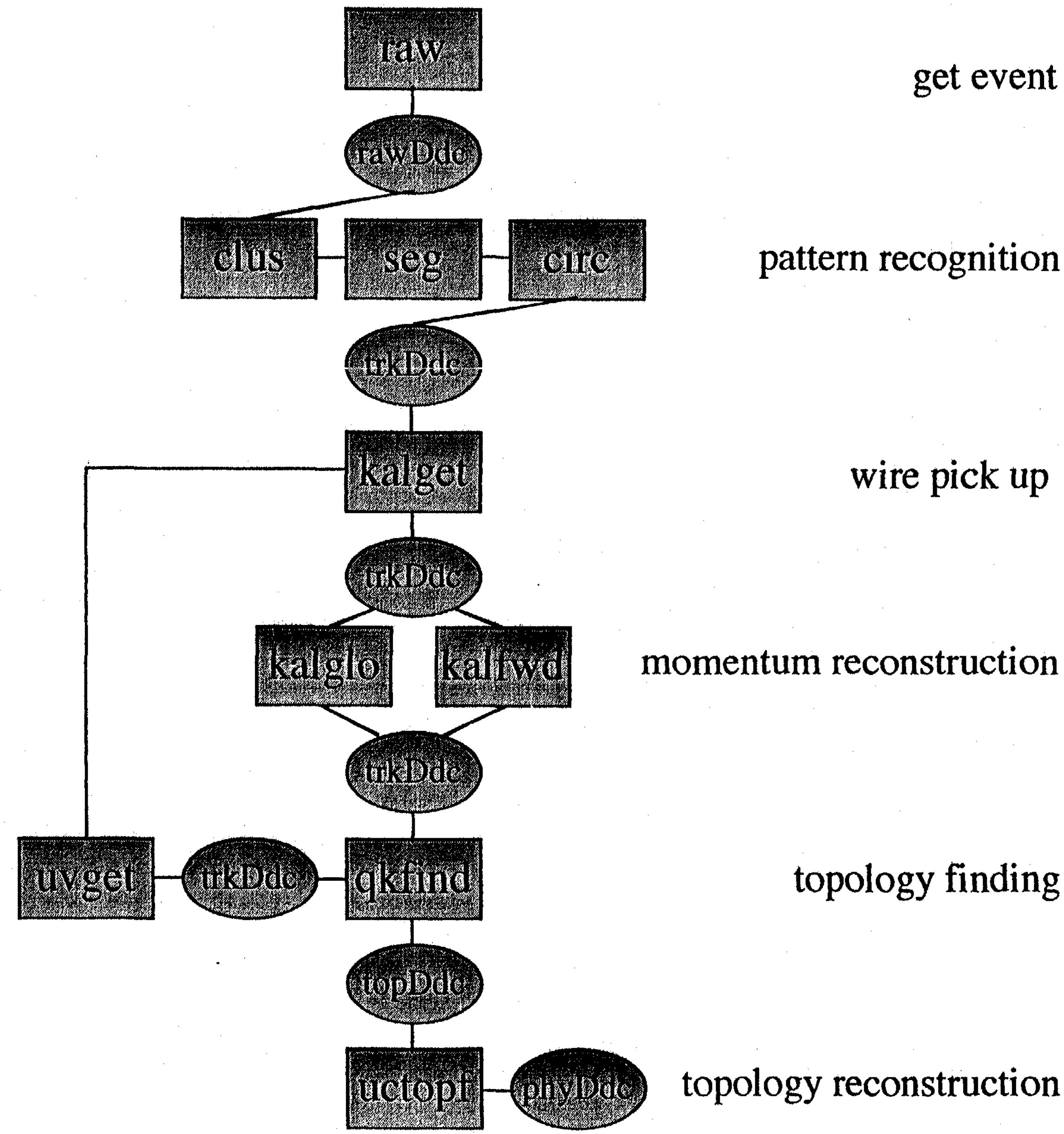
10^8 central AuAu collisions on tape for DDC

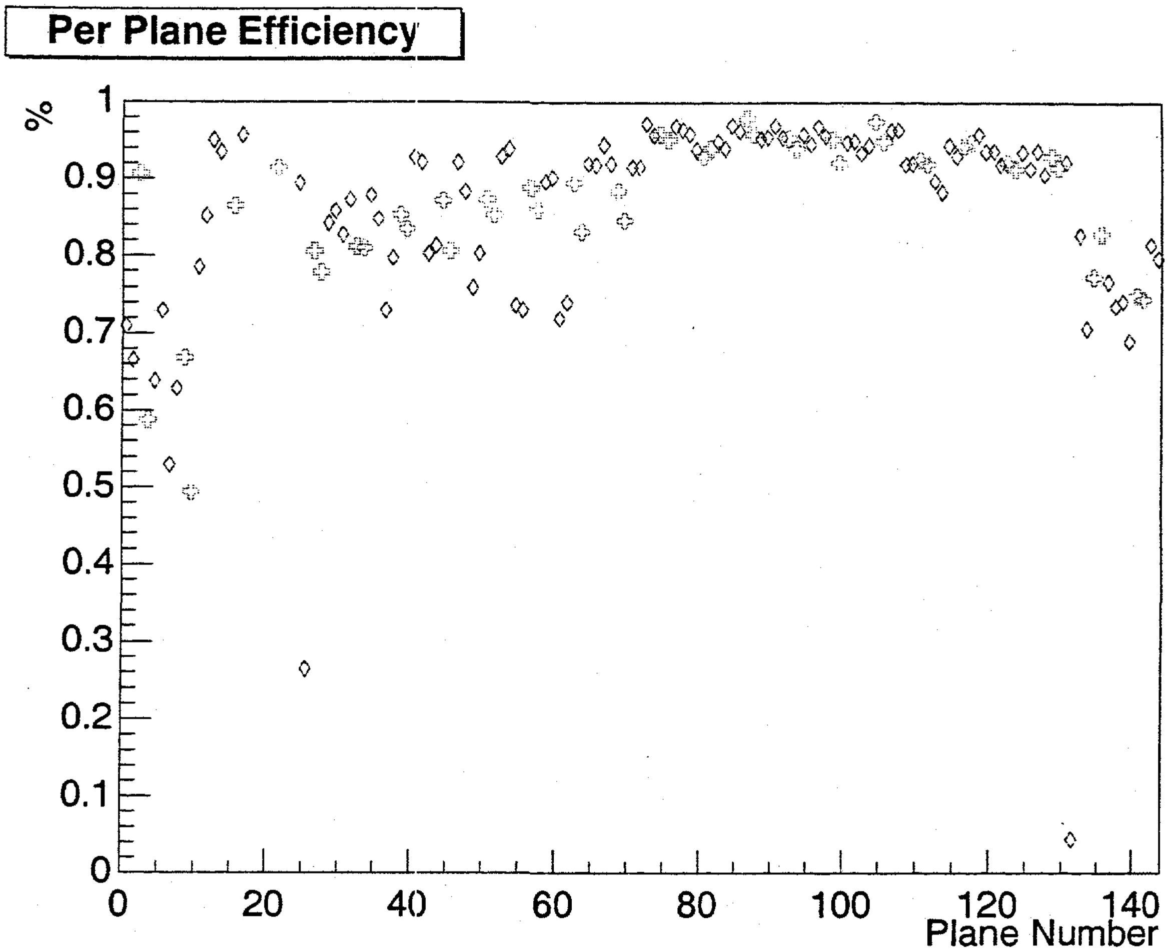
expected signals (all vertices in DDC):
- ~50 H decays (mid to high rapidity)
- ~10^6 Λ decays
- ~10^4 two-Λ events (with both vertices)
- ~10^6 k-short

$5x10^5$ central collisions on tape for SDDA

expected signals:
- ~20 H decays (low rapidity)
- ~$5x10^5$ Λ decays
- ~3000 $\bar{\Lambda}$ decays
- ~500 Ξ

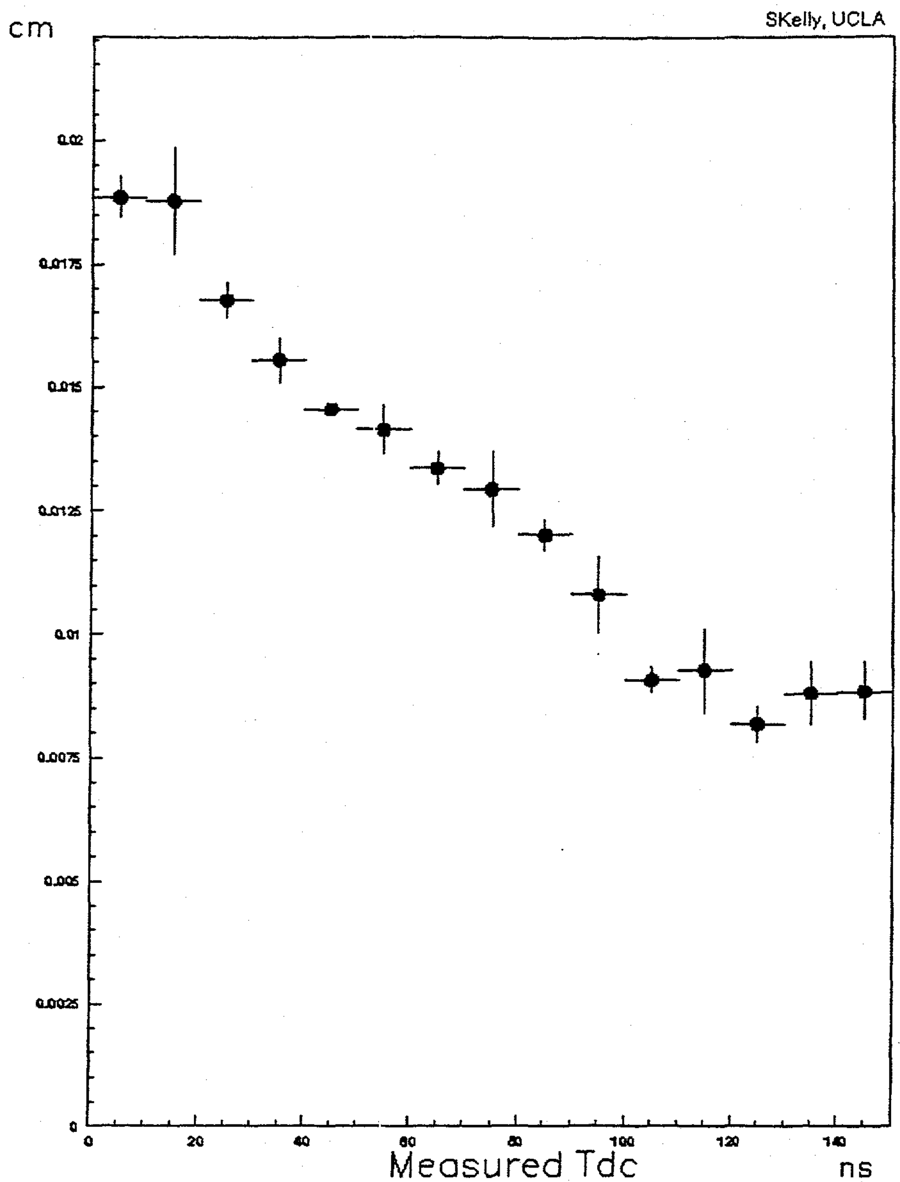
UCX Analysis Package



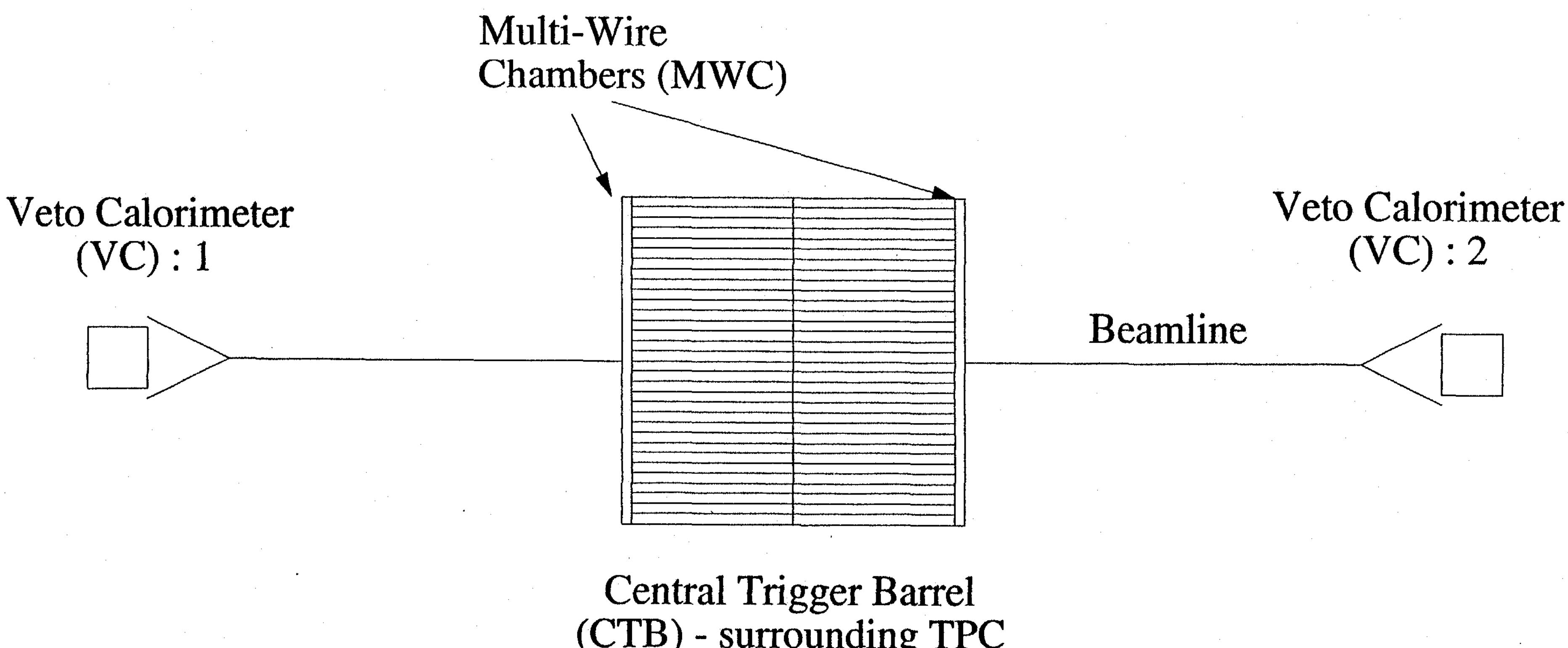


Per Plane Efficiency
%
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
20
40
60
80
100
120
140
Plane Number

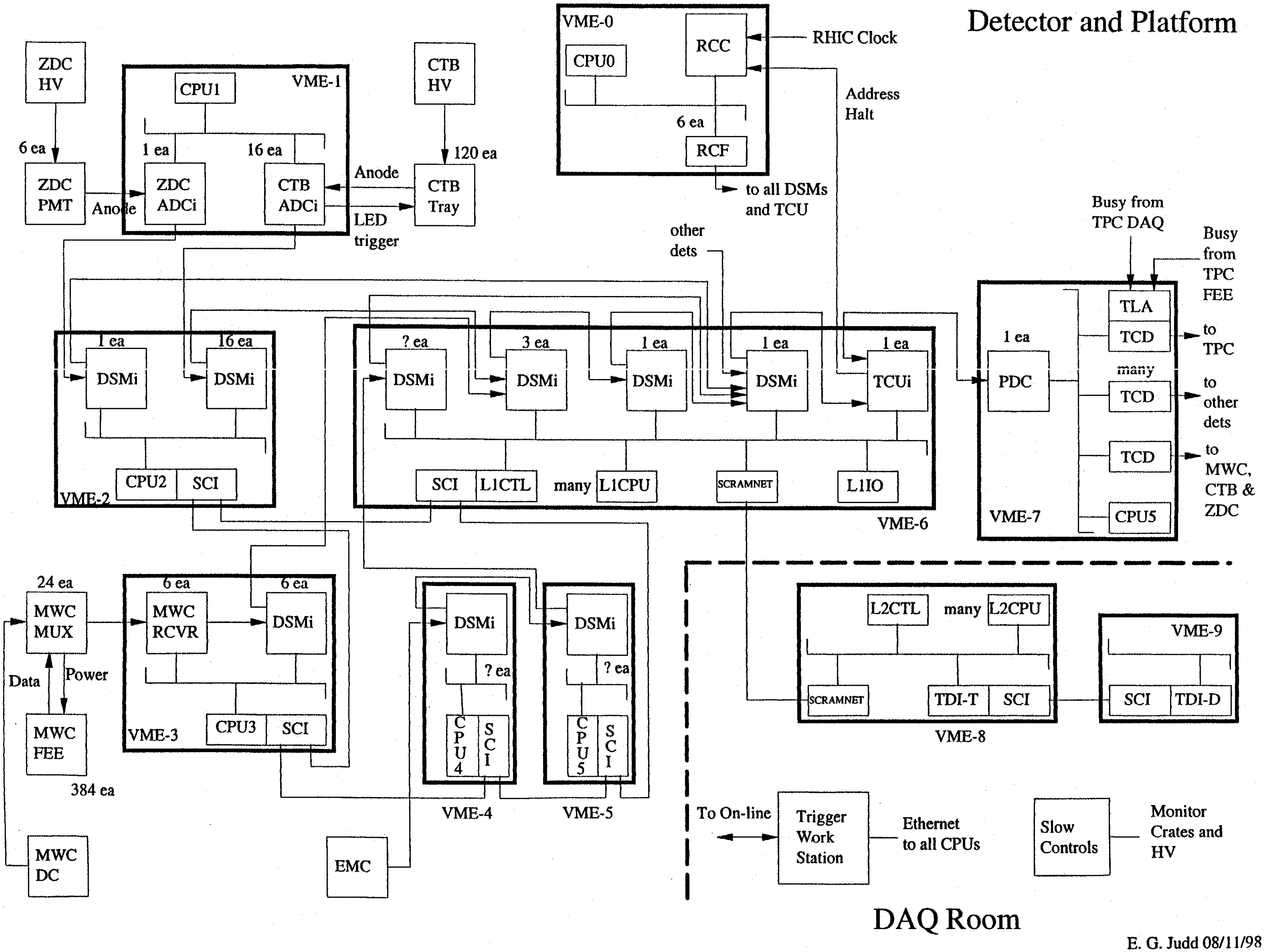
Postition Resolution 8mm Drift Cells



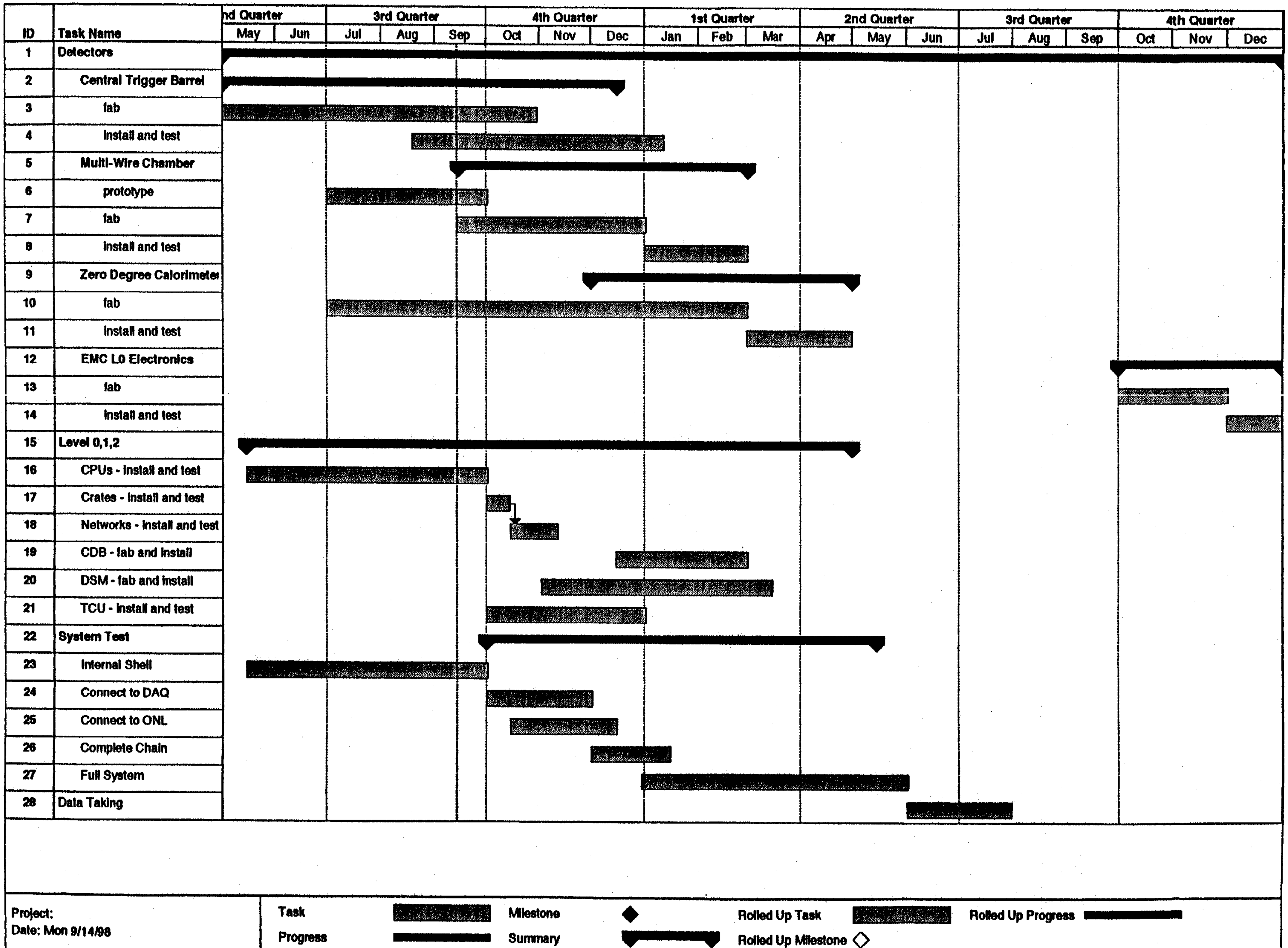
STAR Trigger Detectors



E.G. Judd 03/18/97



Detector and Platform
ZDC HV
6 ea
ZDC PMT
Anode
VME-1
CPU1
1 ea
16 ea
ZDC ADCi
CTB ADCi
CTB HV
120 ea
Anode
CTB Tray
LED trigger
VME-0
CPU0
RCC
RHIC Clock
Address Halt
6 ea
RCF
to all DSMs and TCU
other dets
Busy from TPC DAQ
Busy from TPC FEE
VME-2
1 ea
16 ea
DSMi
DSMi
CPU2
SCI
VME-6
? ea
3 ea
1 ea
1 ea
1 ea
DSMi
DSMi
DSMi
DSMi
TCUi
SCI
L1CTL
many
L1CPU
SCRAMNET
L1IO
VME-7
1 ea
PDC
TLA
TCD
to TPC
many
TCD
to other dets
TCD
to MWC, CTB & ZDC
CPU5
24 ea
MWC MUX
Data
Power
MWC FEE
384 ea
MWC DC
VME-3
6 ea
6 ea
MWC RCVR
DSMi
CPU3
SCI
EMC
VME-4
DSMi
? ea
CPU4
SCI
VME-5
DSMi
? ea
CPU5
SCI
VME-8
L2CTL
many
L2CPU
SCRAMNET
TDI-T
SCI
VME-9
SCI
TDI-D
To On-line
Trigger Work Station
Ethernet to all CPUs
Slow Controls
Monitor Crates and HV
DAQ Room
E. G. Judd 08/11/98


ID
Task Name
nd Quarter
3rd Quarter
4th Quarter
1st Quarter
2nd Quarter
3rd Quarter
4th Quarter
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
1 Detectors
2 Central Trigger Barrel
3 fab
4 Install and test
5 Multi-Wire Chamber
6 prototype
7 fab
8 Install and test
9 Zero Degree Calorimeter
10 fab
11 Install and test
12 EMC L0 Electronics
13 fab
14 Install and test
15 Level 0,1,2
16 CPUs - Install and test
17 Crates - Install and test
18 Networks - Install and test
19 CDB - fab and install
20 DSM - fab and install
21 TCU - Install and test
22 System Test
23 Internal Shell
24 Connect to DAQ
25 Connect to ONL
26 Complete Chain
27 Full System
28 Data Taking
Project:
Date: Mon 9/14/98
Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress