# FTPC'98

**Argenda :**

**Physics motivation for FTPC**

**Hardware :**

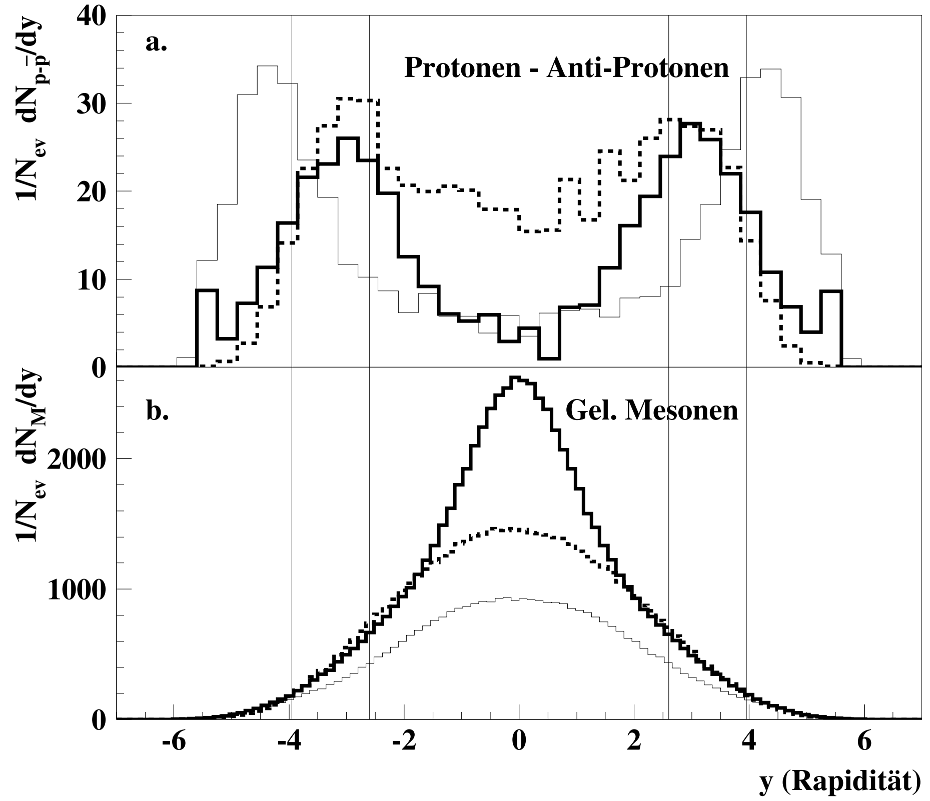
- a -> Design + Constuction
- b -> Electronic + DAQ

**MPP - contribution :**

- a -> Hardware
- b -> Software

# Physics motivation I

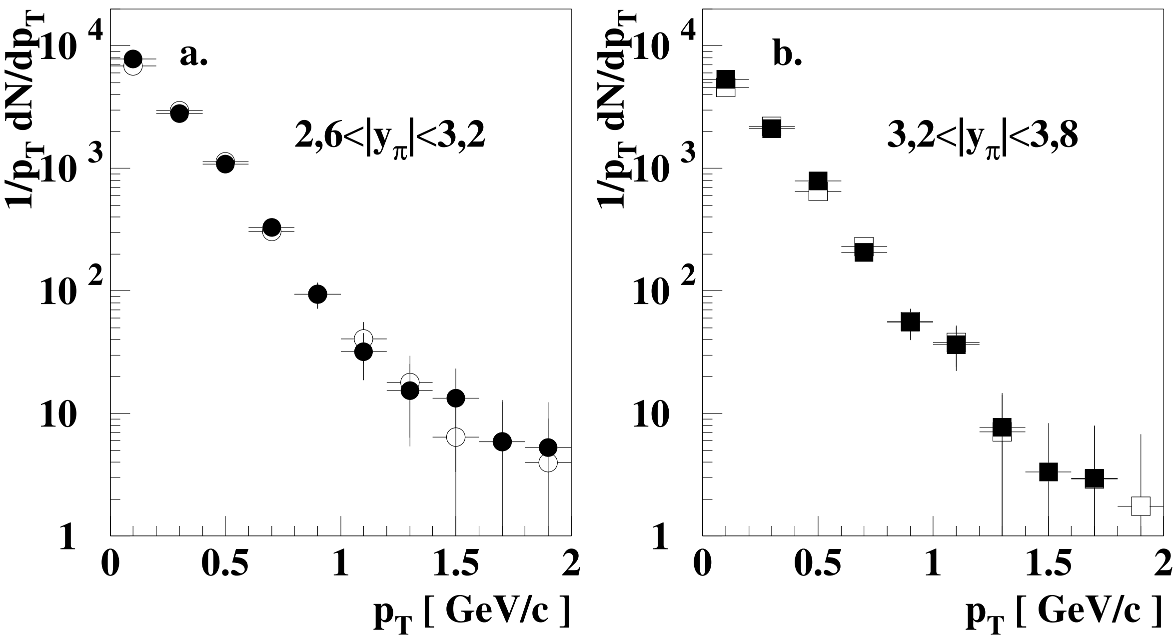
## a ) Enlarge rapidity coverage for STAR



# Physics motivation II

## b) E by E measurement

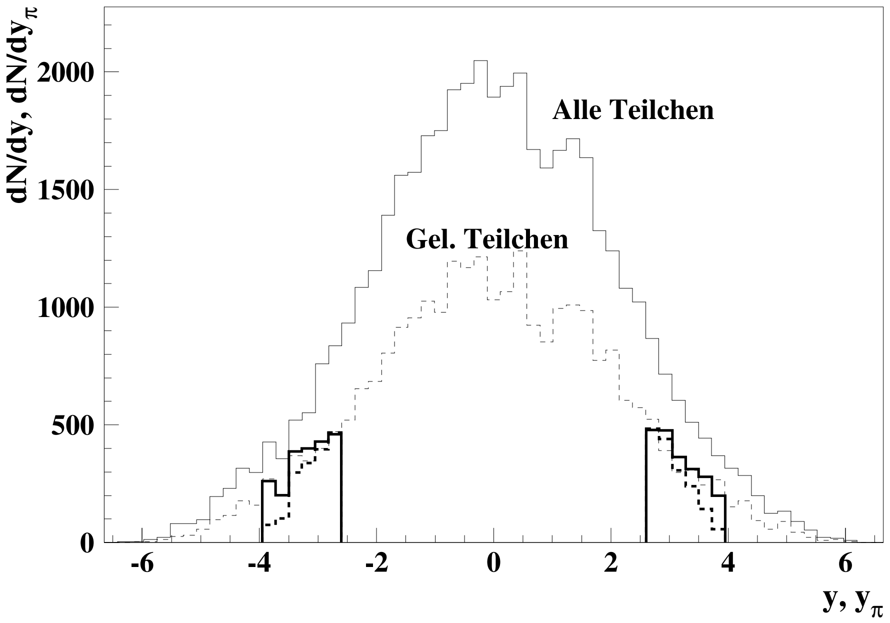
1 -> $P_t$




-> Extract $<P_t>$ E by E with an accuracy of **10-14 %**

# Physics motivation III

## 2 -> dN/dy

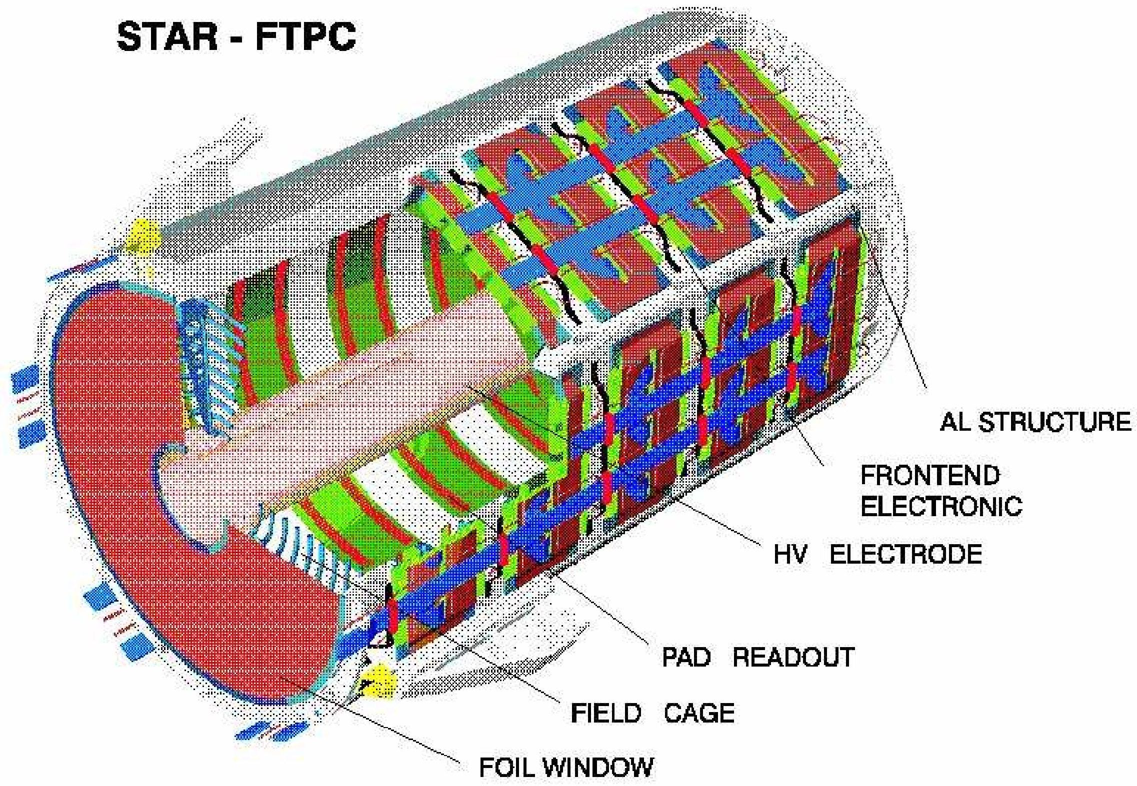



c) h+ ,h- measurement .

d) Asymmetric systems p + Au or Si + Au .

e) Strangeness ($V_0$ - tagging).

# Hardware I



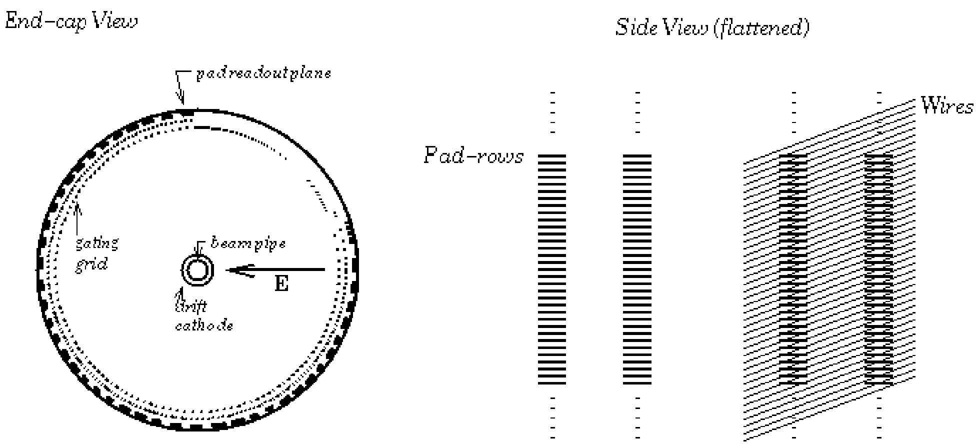

**a ->** No endcap readout because tracks to parallel.

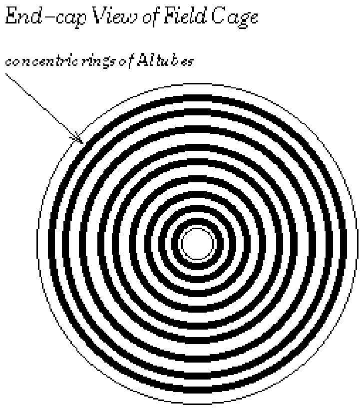
**b ->** Radial drift field to get a suffient postion and two-track resolution in and high multiplicity enviroment .

**c ->** Cool gas (Ar $Co_2$ ) with small diffusion.

# Hardware II

**Radial TPC with Pad Readout**




**d ->** Pad readout **o**f the drift chambers with an cros - sing angle of 17 $^{o}$ for the sense wires

**e ->** Test's with MS + GEM and PESTOV-glas

# Hardware III

**FTPC layout :**

1. **2 * FTPC 's with radial drift field**
2. **Each FTPC consists of :**
   a) **5 rings each in 6 segments**
   b) **10 pad rows**
   c) **~ 10000 pads**

**Front -end -electronic (FEE)**

1. (preamp. + shaper) **+** ( SCA + ADC)
2. **64 channel per FEE -card (~315 )**

**Data acquisition :**

**Same as for the TPC .**

# Summary

**Hardware contribution of MPP :**

-> Complete **design , constuction and build -ing of both FTPC's**

- **- The mechanial support structure 's**
- **- Field cage's**
- **- Readout chamber's**

-> **Design of the lasersystem for the FTPC 's**

-> New **FEE-card design for** FTPC

-> **FEE -cards for both** TPC **and** FTPC ,

Today **of 4375 cards are manfacured .**

**Software contribution of MPP :**

-> **Analysis software :**

- **- Complete simulation chain.**
- **- Complete physics analysis.**

# Software I

## Status : simulation

**Event-Generator**

informaton on: particle-type, momentum

**GSTAR/g2t**

propagating particles through the detctor

**FTPC-Fast-Simulator**

dithering of the GSTAR-hits according to limited det. resol.

**Tracking-Program**

reconstructing tracks from hit-positions

**Momentum-Rec.-Prog.**

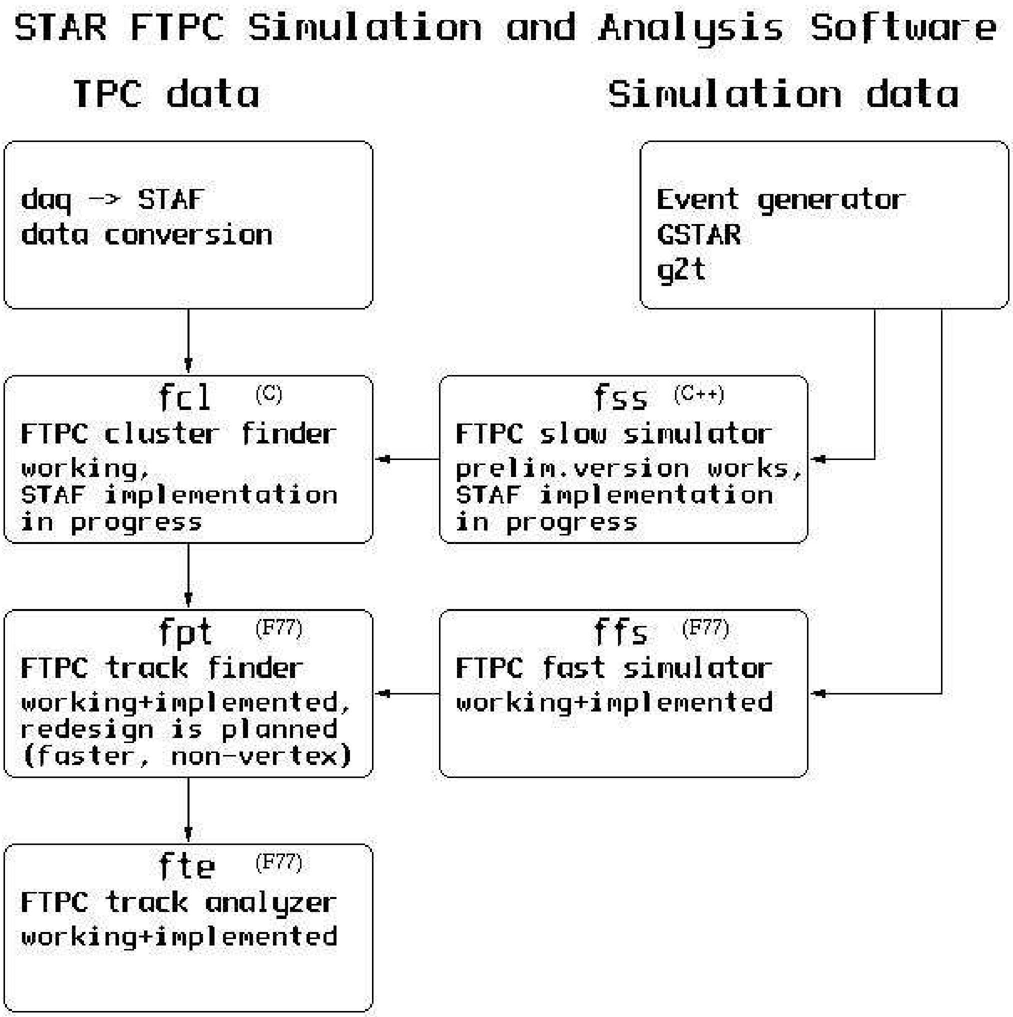
reconstructing the momenta and charge-sign from the rec. tracks

**a-> Most programs in F77**

**b-> Time for one physics event ~ 15-20 min.**

# Software II

## Status : analysis software



# Software III

**Future plans :**

a -> Reduce time for cluster finder with decon - volution to ~ sec.

b -> Reduce time for tracking + mom. fit ~ sec. by using a fast conformal mapping algho .

c -> Switch from F77 coding to C++ coding.

d-> Adding $V_o$ tagger .

e -> Do the above in a way that a 3. level trig - ger is possible with this software .

**Collaboration with :**

Franfurt: D.Roehricht,D.Schmischke,C.Struck

Heidelberg : V.Lindenstruth

Rice : P.Yepes

Yale : B.Lasiuk , T.Ullrich

# Manpower at MPP

**MPI Director : N.Schmitz**

**Group Leader : V.Eckhardt ,P.Seyboth**

**Hardware:**

**V.Eckhardt,H.Huemmler,H.Fessler,R.Markstaller, E.Schaefer,A.Schuettauf,P.Seyboth**

**Software :**

**H.Huemmler,R.Markstaller,E.Schaefer A.Schuettauf,J.Seyboth**

**Support :**

**MPP -Workshop**

**MPP-Construction office**

**MPP-Elektronic devision**

## STAR-FTPC -Collaboration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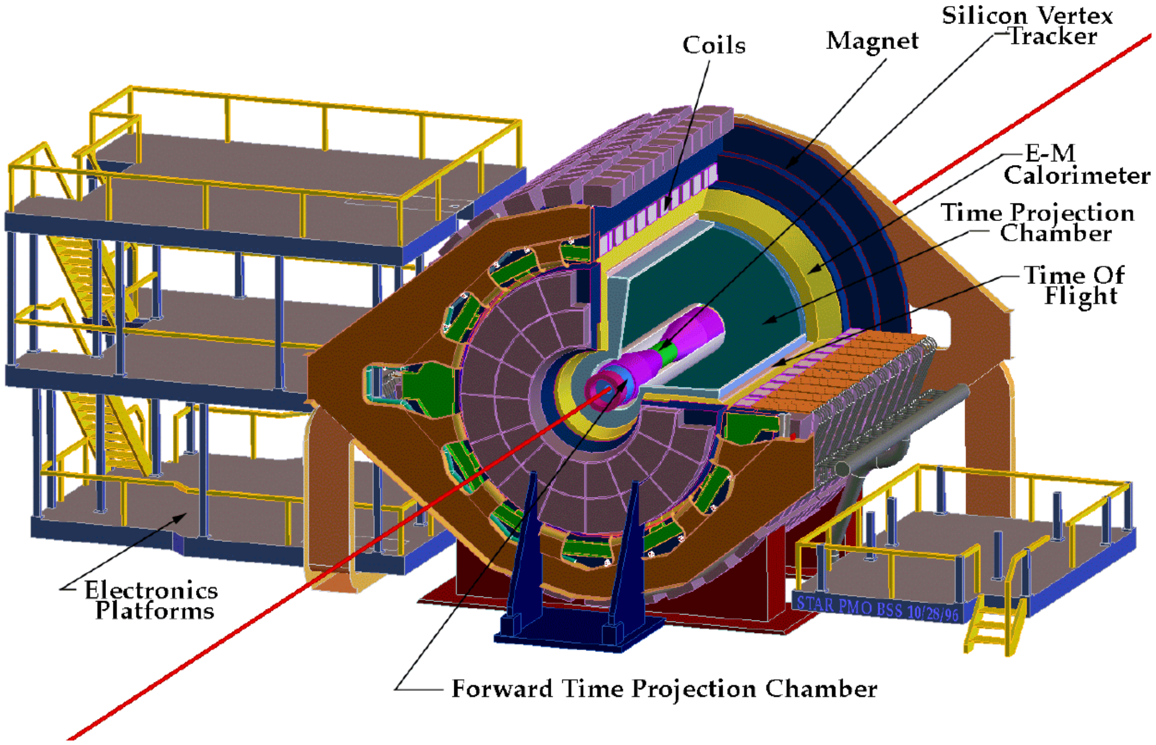
# STAR Detector




**RHIC** =: $\sqrt{s} = 200\,\mathrm{GeV}\ /\ n$

**Partic.** =: **p up to Au.**

**STAR** =: **Search for QGP in hadronic channels.**

Table 2: FTPC design parameters

| PARAMETER | VALUE |
|---|---|
| **Configuration** | |
| # of TPC | 2 |
| # of pad rows per TPC | 10 |
| # of sectors per pad row | 6 |
| # of pads per sector | $2 \times 160$ |
| **Volume** | |
| inner radius | 8.0 cm |
| outer radius | 31.0 cm |
| chamber length | 120.0 cm ($\|z\| = 150 - 270$ cm) |
| acceptance | $\eta$=2.5 - 4.0 ($\theta$=2.0$^o$ - 9.3$^o$) |
| **Field** | |
| drift cathode voltage | 10-15 kV |
| drift electrical field | 240-1400 V/cm (radial, $\perp$ beam ) |
| solenoid magnetic field | 0.5 T ( $\|$ beam ) |
| **Gas** | |
| gas mixture | Ar(50%)-$CO_2$(50%) |
| drift velocity | 0.3 - 2.0 cm/$\mu$ s |
| trans. diffusion $D_T$ | 100-130 $\mu$ m/$\sqrt{cm}$ |
| long. diffusion $D_L$ | 100-130 $\mu$ m/$\sqrt{\text{cm}}$ |
| Lorentz angle | 4 deg. |
| gas gain | $\sim$ 1-2$\times10^3$ (gain doubling per $\Delta V_a = +100$V ) |
| **Readout** | |
| total # of pads | $\sim$ 19200 |
| # of time bins per pad | 256 |
| pad pitch | $\sim$ 1.9 mm |
| pad length | 20 mm |
| pad capacitance | $\sim$ 10 pF |
| shaping time (FWHM) | 400 ns |
| SCA sampling rate | 5 MHz |
| SCA time bin size | 200 ns |
| ADC dynamic range | 8 bits |

Table 6.2: FTPC Construction Schedule

| Nr. | Component/task | Days | Start | End |
|---|---|---|---|---|
| 1 | STAR -FTPC | 519 | 01.08.97 | 28.07.99 |
| 2 | Electronic FEE Boards | 366 | 01.08.97 | 25.12.98 |
| 10 | Readout- and DAQ-Boards | 130 | 01.10.98 | 31.03.99 |
| 12 | Monitor Electronics | 100 | 02.01.98 | 21.05.98 |
| 14 | Chamber Body | 421 | 15.08.97 | 26.03.99 |
| 19 | Field Cage | 126 | 15.08.97 | 06.02.98 |
| 23 | Readout Chambers | 431 | 15.10.97 | 09.06.99 |
| 30 | Electronic Cooling | 100 | 01.05.98 | 17.09.98 |
| 33 | Laser System | 163 | 17.08.98 | 31.03.99 |
| 35 | Auxiliary Equipment | 60 | 01.04.98 | 23.06.98 |
| 41 | Test Equipment | 101 | 01.05.98 | 18.09.98 |
| 45 | Assembly (MPI) | 60 | 01.04.99 | 23.06.99 |
| 51 | Transport Equipment | 30 | 01.10.98 | 11.11.98 |
| 54 | Transport (to BNL) | 20 | 01.07.99 | 28.07.99 |

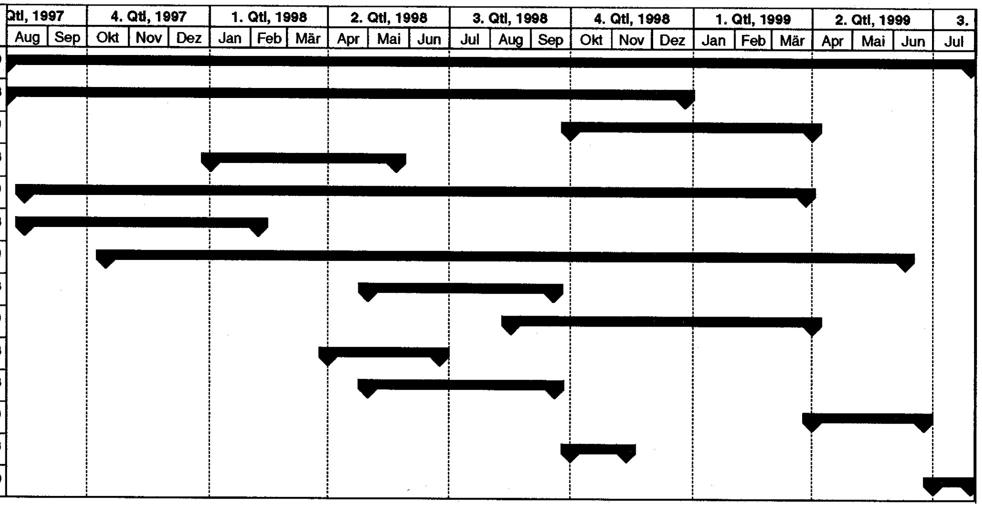



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Figure 34: FTPC Construction Schedule.

## Current status of STAR