Status of trigger chamber production

ATLAS

LHCC Comprehensive Review

July 2-3, 2001

S. Patricelli

University of Naples and INFN

Outline

- Barrel trigger chambers (RPC)
  - RPC description
  - Organization of production
  - Production status
  - Front-end electronic production status
- End-Cap trigger chambers (TGC)
  - Chamber production status
  - Quality Control of chambers with Cosmic Rays
  - Front-end electronic production status

RPC Basic Unit

To cover 3.500 m^2:

1004 Standard Units

16 different dimensions

97% coverage

132 Special Units

(with holes for alignment bars)

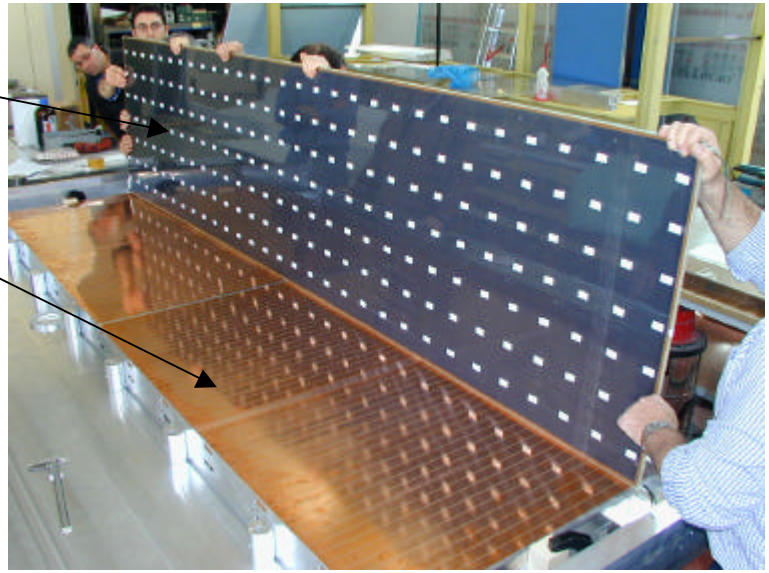
4 different dimensions

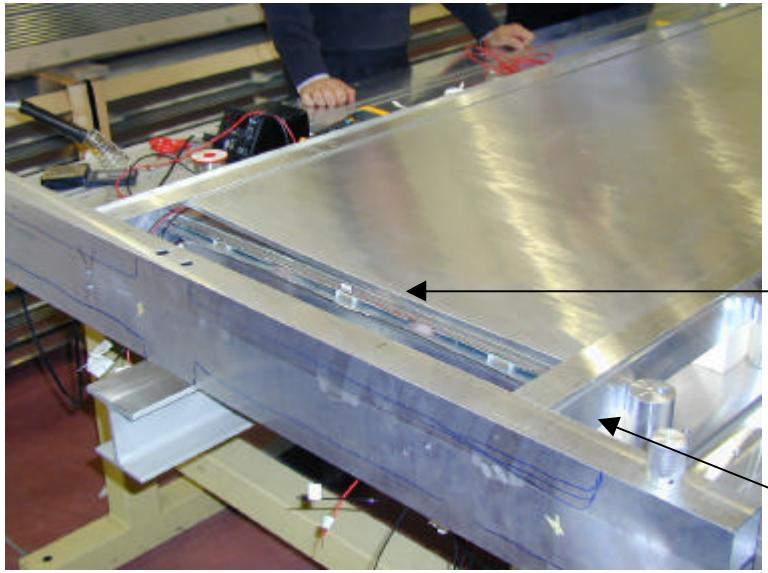
3% coverage

One Unit is a double sandwich

Gas volumes

Cu readout electrode panels



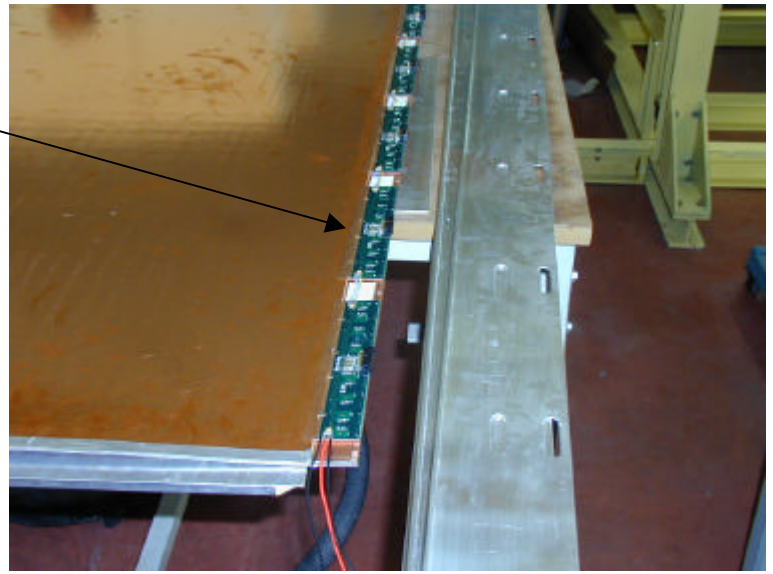


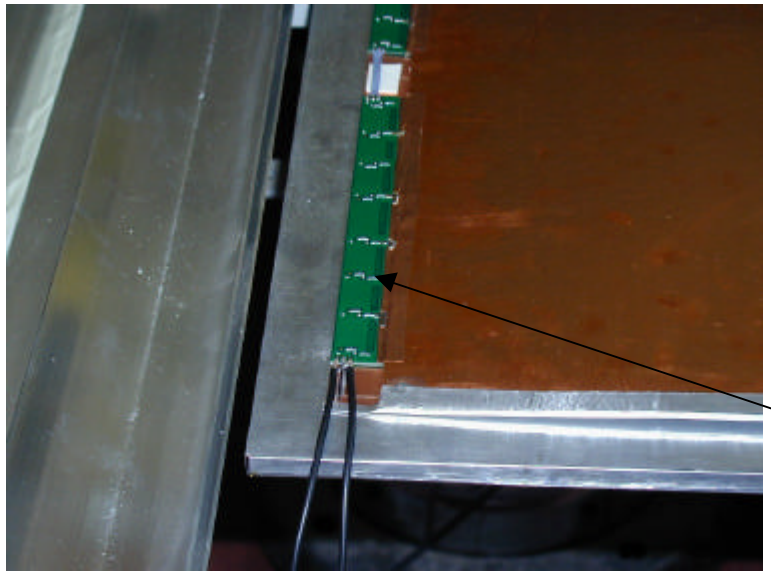
Paper honeycomb and Al support panels (Faraday cage)

Al lateral profiles

Front-End electronic is inside

Front-End boards with 8ch GaAs
3 stage amplifier and discriminator





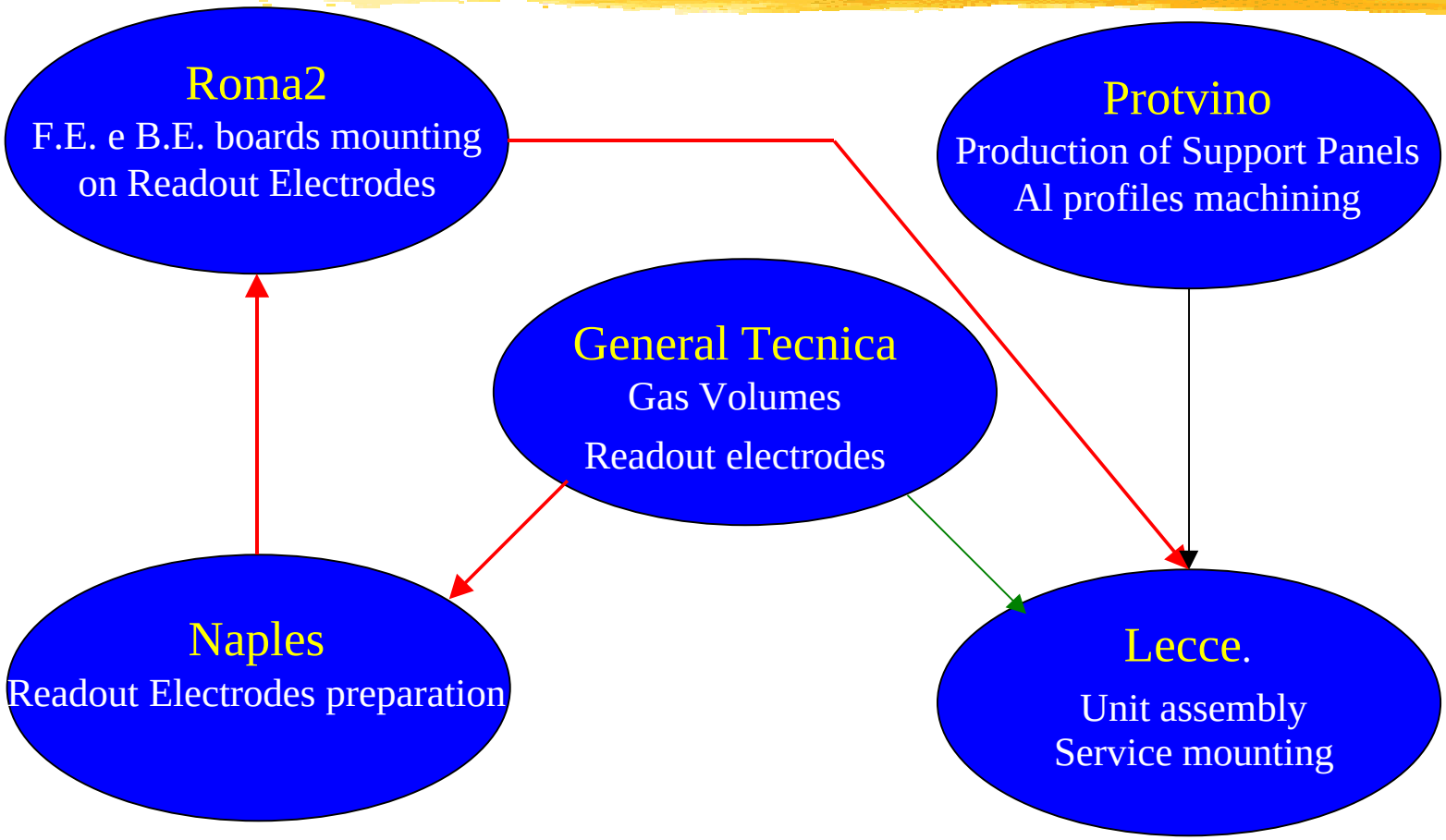
Back-End boards with terminating resistors and test pulse distribution

Production principles

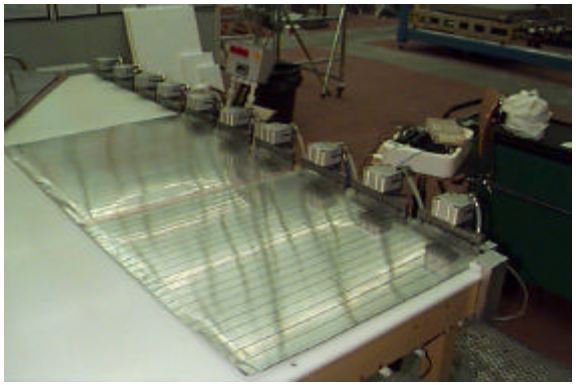
- Bakelite plates: 7.360
- Gas volumes: 3.680
- Electrode readout panels: 8.560
- F.E. and B.E. Boards: 48.148
  - Readout channels: 385.184

- All parts are produced by industry.
- To avoid duplication of tools and have higher efficiency in production, all additional works on detector parts are done in only one site.

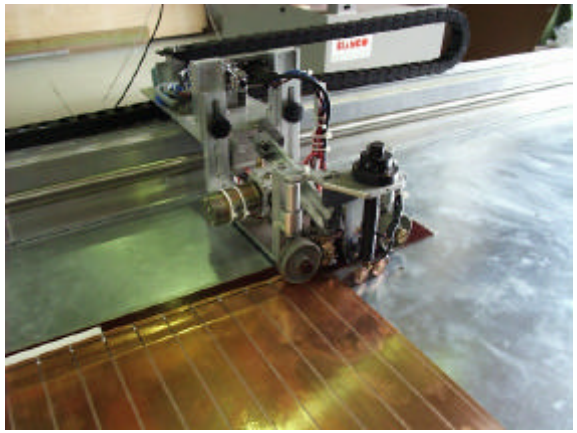
Production flow chart



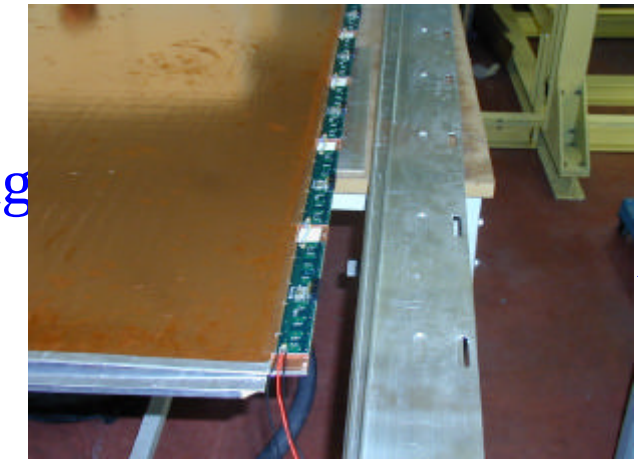
Readout panels preparation



(Rome 2)



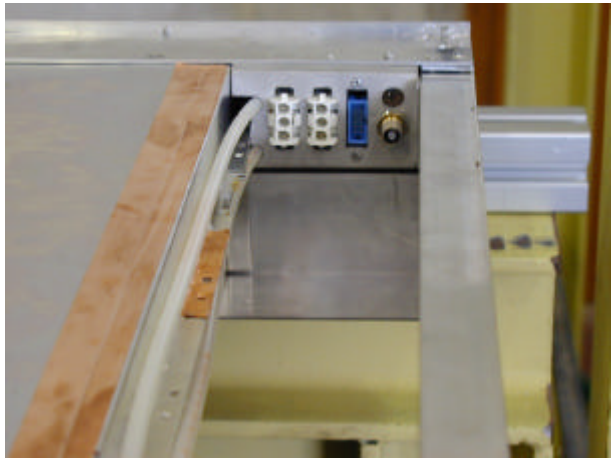
Precison holes punching
(Naples)



Front-End board
mounting
(Rome 2)

Unit assembly in Lecce

Services mounted →



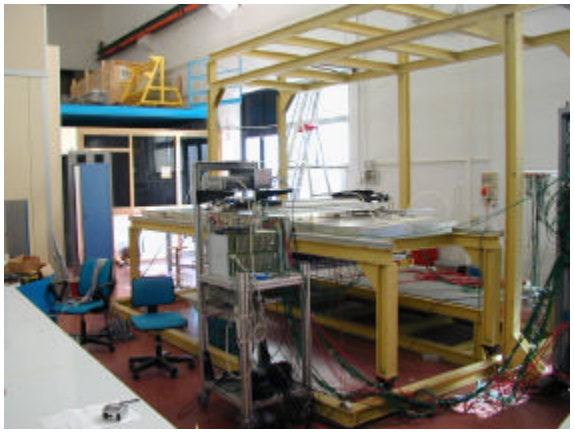
Applying pressure with pneumatic tool ↑

← On transport and storage fixture

RPC Quality Assurance

Three test stations are operational

Tracking of CR is done with RPCs or Drift Chambers



Lecce

Roma2

Naples

Each station allows the simultaneous test of 8 Units

Pre-production

- A set of three BMS Units was assembled last year as a first test of assembly.
- Front-End and Back-End boards for these Units are not the final ones.
- Main goals of this preproduction were:
  - define all tools necessary for the assembly phase.
  - finalize services for the Units.

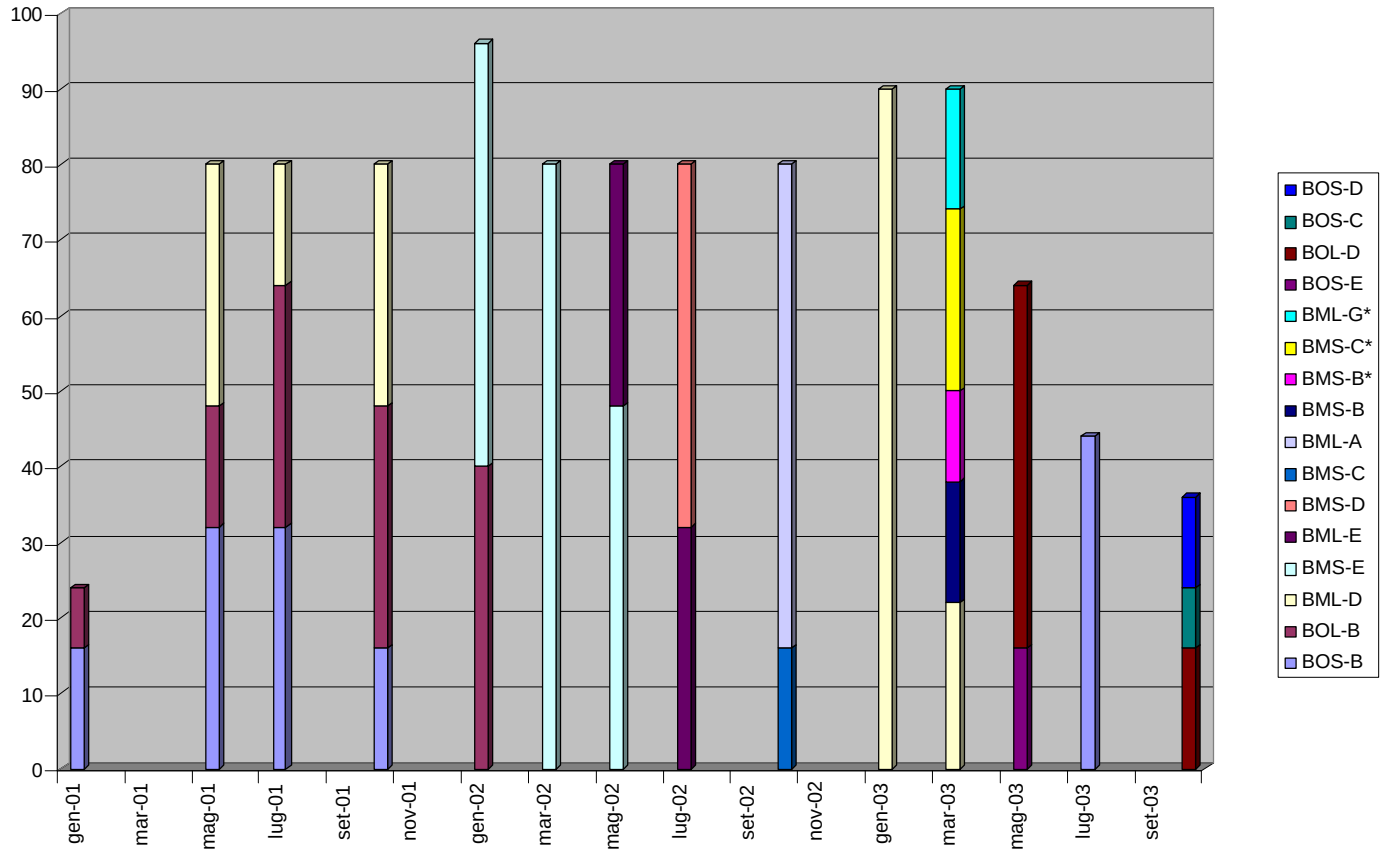
Start of production (1)

- Due to delay of tender procedures for Front-End boards production (inside the detectors!) the decision was taken to start production with a special order for 1.500 boards.
- The delivery of these boards had 2 months delay.
- These boards have allowed the (almost completed) production of 24 Units, 16 for BOS and 8 for BOL chambers (largest size).

Start of production (2)

- All assembly tools and procedures for assembly of Units are now done or understood.
- Production database (MS Access) is operational.
- Unit assembly rate: 3 Units/day. Not a bottleneck.
- A new assembly hall (no delay in production) is being prepared in Lecce.

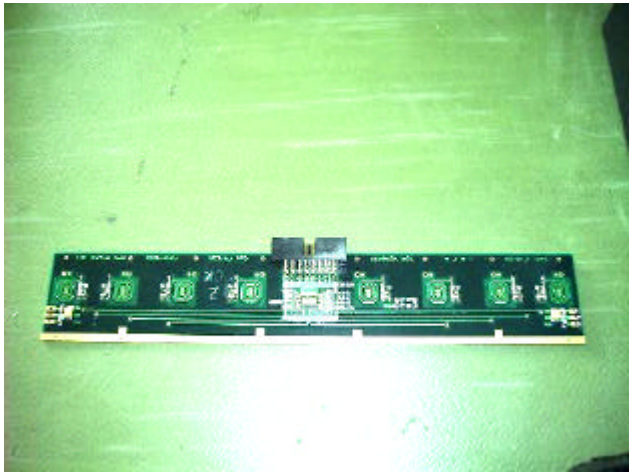
RPC Production Schedule



Mass production

Bakelite plates:	on schedule
Electrode readout panels:	on schedule
GaAs Front-End chips:	produced (50.000)
Support panels:	on schedule
Al profiles:	produced and machined
Gas volumes:	2-3 months stand-by to implement higher Q.C. (next talk)
Front-End Boards:	4-5 months delay (from industry)

Front-end boards status



- GaAs chip with 8 channels 3 stage amplifier & comparator (GIGA).
- All 50k chips produced
- 1st DC test done by DELTA

- PC boards are of 3 different dimensions produced by Zener (Italy)
- Chip bonding 2nd DC test done by industry in Microtel (Italy)
- Delivery at Roma 2

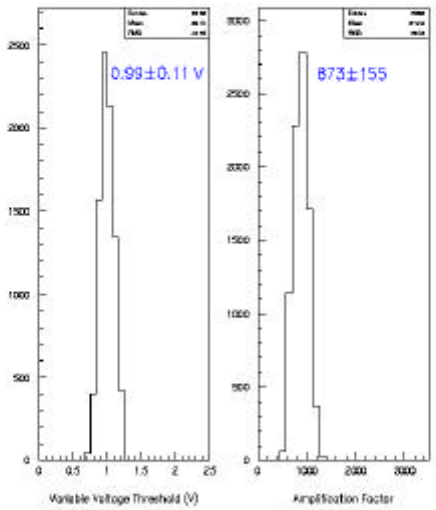
Front-end boards test

- AC test devoted to check the dynamic functionality of all channels and used to build the database
- In future also thermal cycle

- Disagnostic Set Up to used to find recurring defects caused by wafer and chip handling
  - Yield on present production
    - 1102/1400 = 78.8 %

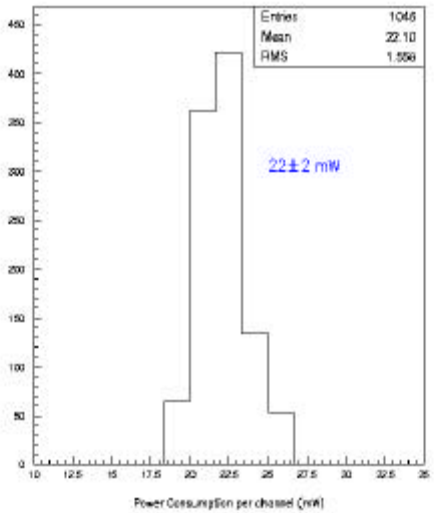
Front-end boards test results

'Response Dispersion' and the corresponding Amplification Factor



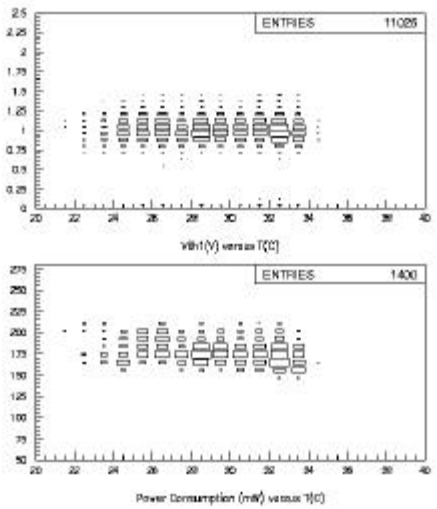
B.Liberti

Power Consumption per channel



B.Liberti

No significant Temperature dependence



B.Liberti

RPC Summary

- Production tools are ready.
- Production procedures are understood.
- Q.C. during gas volume production is being improved.
- Cosmic ray test stations operational.
- Mass production has started.
- Front-end PC boards are of good quality but have 4-5 months delay which will influence Units assembly.

- Schedule is tight but still possible to finish by 2003.