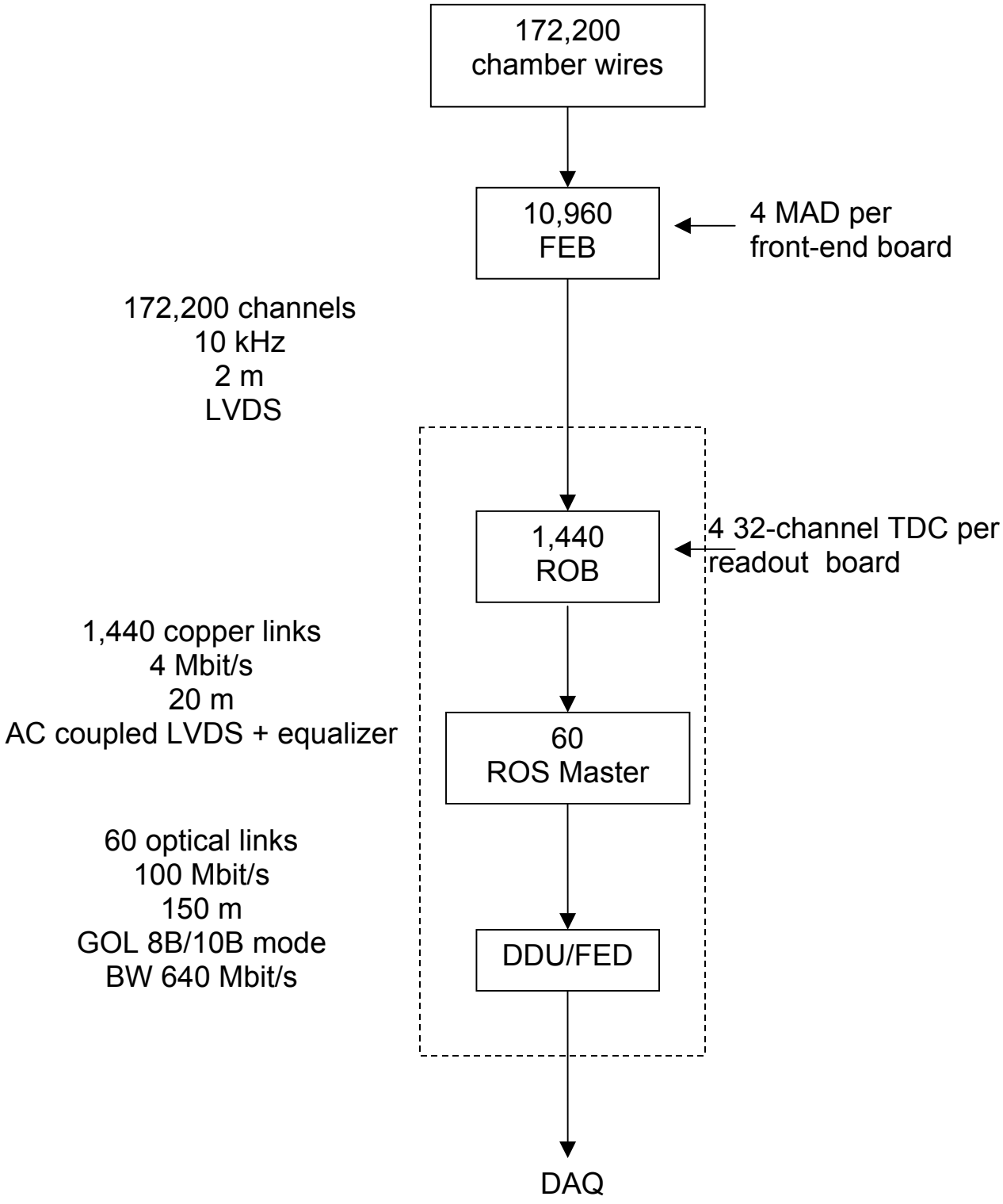
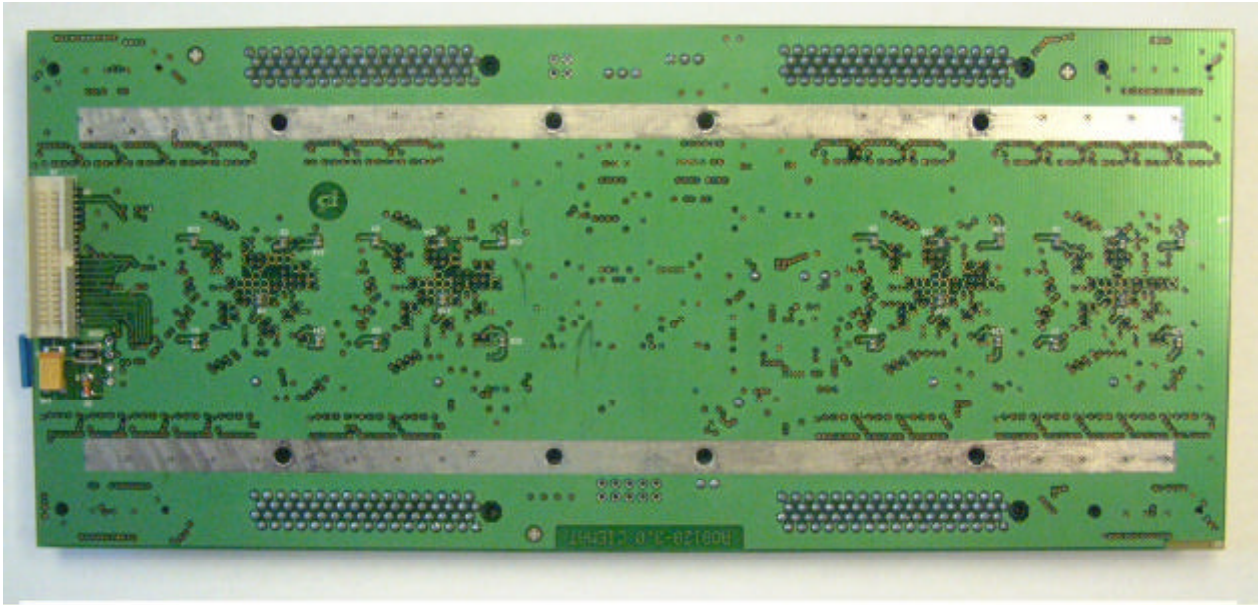
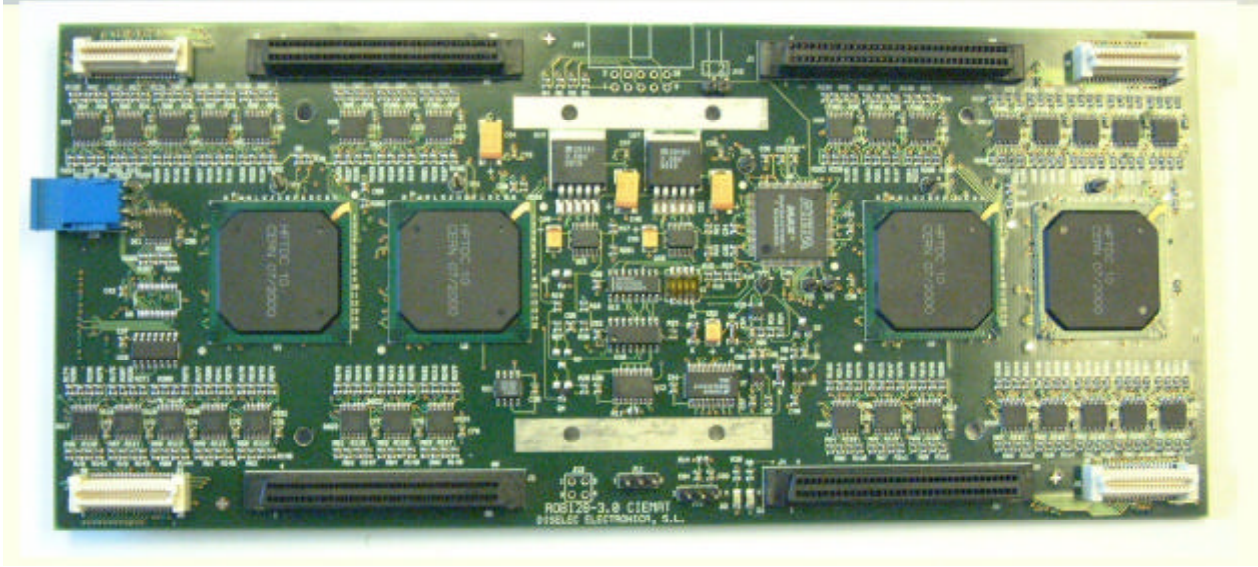
DT Readout system overview






ROBIZE-3.0 CIEMAT
BIBELEC ELECTRONICA, S.L.

ROB TESTING SUMMARY

Several tests have been performed to validate ROB design and insure proper operation even in adverse conditions.

+ Irradiation of some devices at Cyclotron Research Centre (UCL):

$5x10^{10}$ p.cm^{-2} of 60 MeV protons.

- Differential receivers (DS90LV048A): **No SEU**.
- Regulators (MIC29151-3.3BU, MIC39151-2.5BU): **$\Delta V < 1\%$.**
- HPTDC v.1.1: Recoverable SEU rate expected **<1/day** in the whole detector.

+ Neighbour channels crosstalk:

Time measurement shift in one ROB channel due to neighbour channel signals.

- Always below half HPTDC bin resolution: **$< \pm 0.35$ ns** (set-up resolution).

+ LV regulators temperature dependence:

- Negligible variations due to temperature **(< 5mV/30ºC).**

+ Temperature cycling

Small slope cycles: 5 min/ ºC.
Ambient temperature from 0ºC to 70ºC.
ROB continuously operated and monitored.

- All devices bear perfectly temperature conditions.
- Small time shift: **900 ps/70ºC**. Max. Variation **~40ps/ºC.**

+ Lifetime test:

- ROB fully operational at 105ºC ambient temperature going on at the moment.
- Frequently operated and status monitored.

Single Event Effects Measurements on the Electronics for the CMS Muon Barrel Detector at LHC

S. Agosteo[1], L. Castellani[2], G. D'Angelo[1], F. Dal Corso[2], G. M. Dallavalle[3], M. De Giorgi[2], C. Fernandez[4], F. Gonella[2], I. Lippi[2], J. Marin[4], R. Martinelli[2], A. Montanari[3], F. Odorici[3], J. C. Oller[4], M. Pegoraro[2], G. Torromeo[3], R. Travaglini[3], M. Verlato[2], C. Willmott[4] and P. Zotto[5]

1) Dip. di Ingegneria Nucleare (CESNEF) del Politecnico di Milano, Italy
2) Dip. di Fisica dell'Università and sez. INFN di Padova, Italy
3) Dip. di Fisica dell'Università and sez. INFN di Bologna, Italy
4) CIEMAT - División de Física de Partículas, Madrid, Spain
5) Dip. di Fisica del Politecnico di Milano and sez. INFN di Padova, Italy

(Submitted to Nuclear Instruments and Methods A)

Abstract

Several irradiation tests of the electronics of the CMS barrel muon detector were performed using neutrons, protons and heavy ions. The Single Event Upset rate on some tested devices was measured, while upper limits were obtained for devices having experienced no failure.

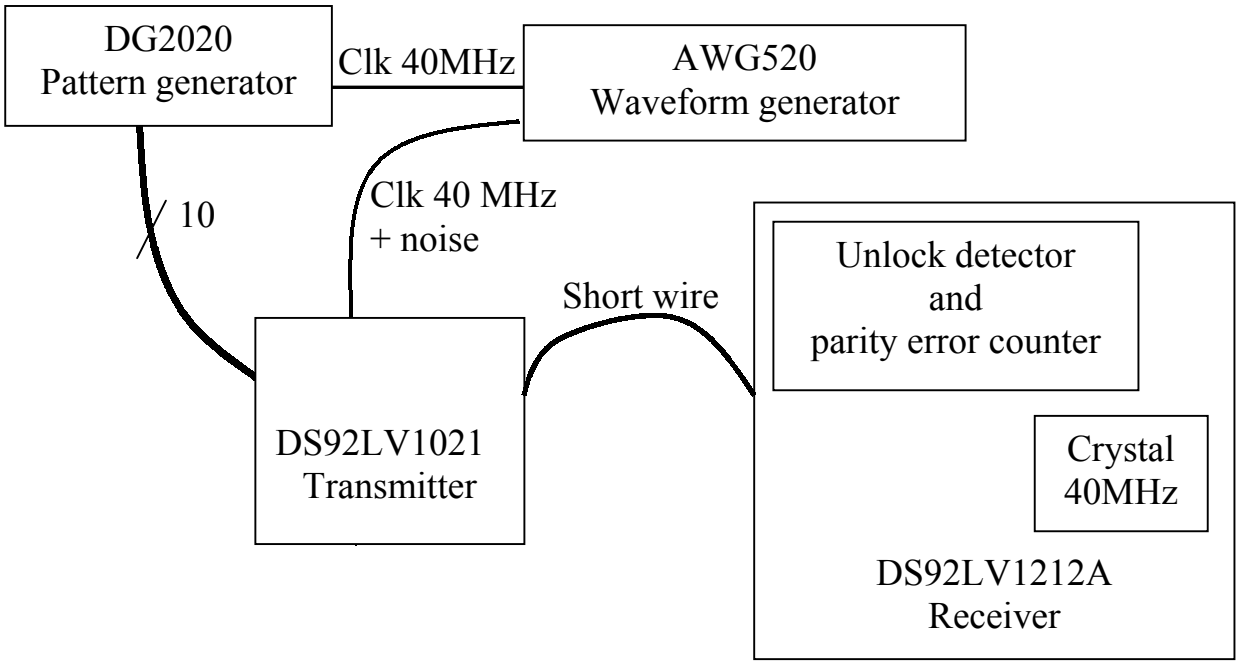
Single Event Transients on front-end electronics and destructive effects on the HV distribution electronics were observed.

Overcurrent protection and error correction circuits were included in the irradiated boards and were tested.

+ LVDS link (DS92LV1021 - DS92LV1212A) jitter tolerance:

Operation at 40 MHz ⇒ 480 Mb/s

Max. jitter	Rms	Failure rate
± 600 ps	130 ps	$< 5\ 10^{-13}$
± 800 ps	170 ps	$= 5\ 10^{-12}$
± 900 ps	190 ps	$= 10^{-9}$



TESTS BEAMS

Oct. 01: test beam at GIF (Gamma Irradiation Facility, CERN)

MB2 chamber operated under real gas and voltage conditions.

Two different types of beam:

- non structured and 1200 triggers/s
- **25 ns structured and 5200 triggers/s**

→ ***Validation with overlapping triggers***

With and without gamma background during acquisition.

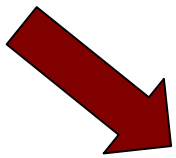
★ **No significant errors were found neither in HPTDC nor in the ROB design.**

★ **TDC can stand high hit rates, including noisy channels (~MHz).**

ROB PRODUCTION PLANS

- **HPTDCs 2nd Engineering run**

1200 pieces available Nov. 2002



- **Assembly** will be split in several stages during this and next year:

10 u. June 2002 → TEST
120 u. November 2002
620 u. January 2003
750 u. June 2003

- **Testing** of these robs will be made at two levels:

INDUSTRY: Acceptance test
Conductive and functional testing.

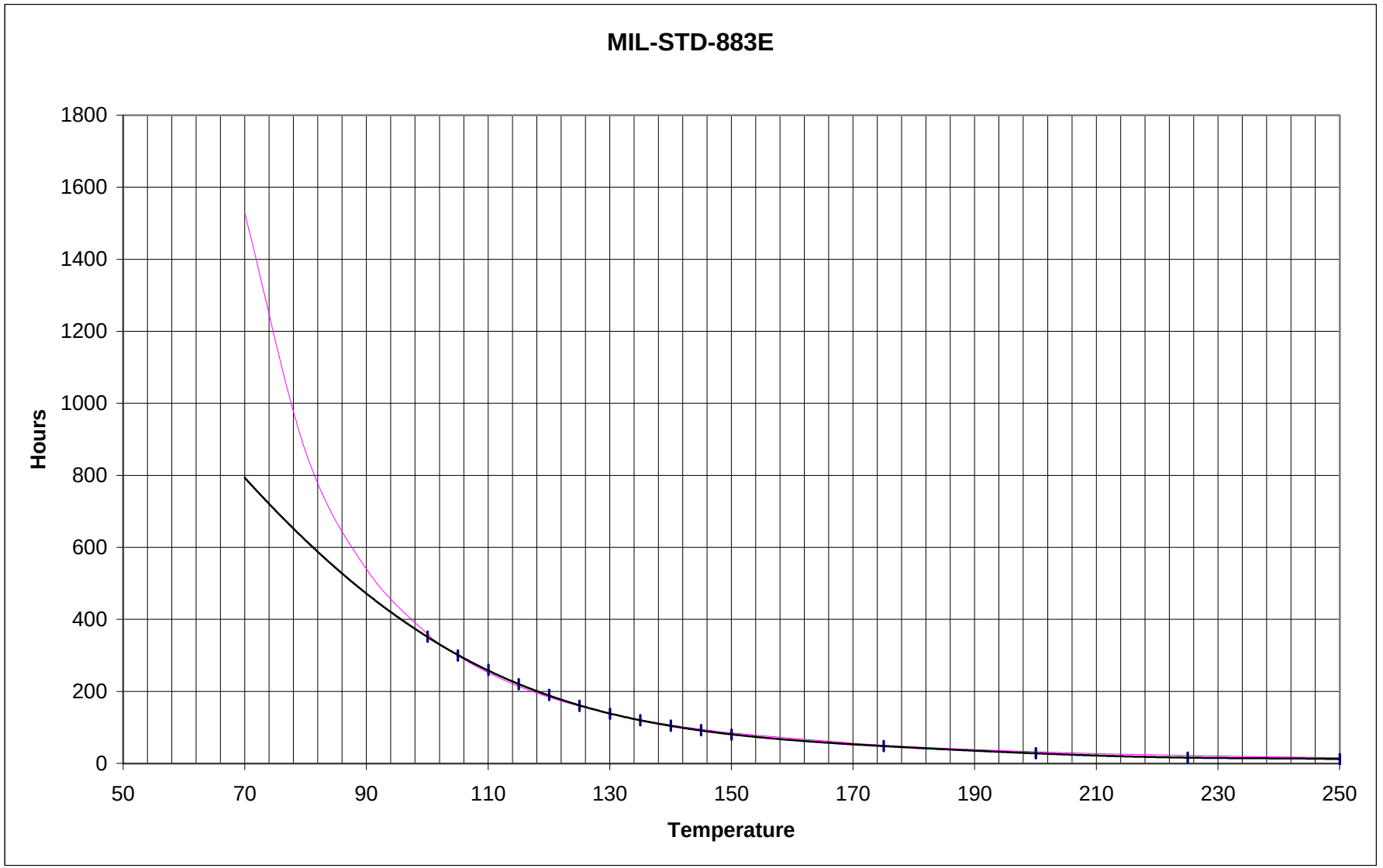
CIEMAT: Validation and insure proper operation: BURN-IN

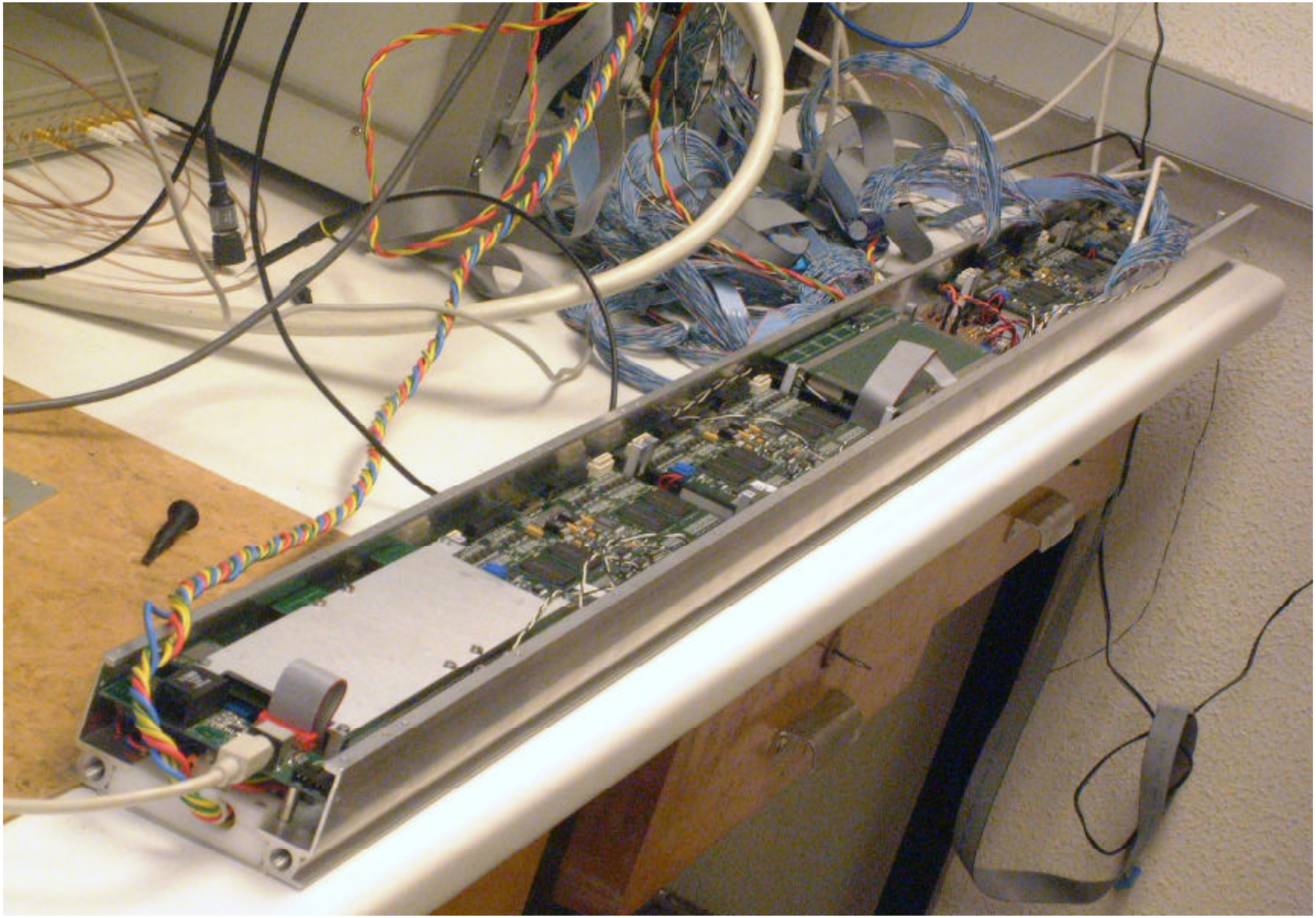
ROB burn in plan

Burn in will be done initially in our Lab using a rack specially developed for this purpose:

- 70ºC / 1 month
- 168 ROB's per batch
- Powered and clocked
- Basic check once every day
- Full test every 2 weeks with test pulses and triggers
- Dead boards repaired, re- burn in and put in spare box
- Learn on the process (failure modes, rates) and adjust timing

C. Willmott May 2002


MIL-STD-883E
Hours
1800
1600
1400
1200
1000
800
600
400
200
0
50
70
90
110
130
150
170
190
210
230
250
Temperature



Minicrate Production

To produce minicrates it is required:

Mechanical parts

- Production start Nov 2002

Readout Boards (ROB)

- PCB production will be launched by July 2002.
- Assembly will wait for HPTDC 2nd engineering run: 1200 pieces to be delivered by Oct-Nov 2002.

Trigger Board (TRB)

- Production start depends on BTIM production. Contract with Metallux just signed.

Chamber Control Board/Server Board (CCB/SB)

- Ready for production. Now CCB waiting for QPLL solution: end 2002.

Link board

- Ready