



RPC Trigger Progress Report

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for
Bari, Helsinki, Lappeenranta, Warsaw*

*CMS Electronics and Tridas Week
Trigger Meeting
CERN, November 9, 2004*



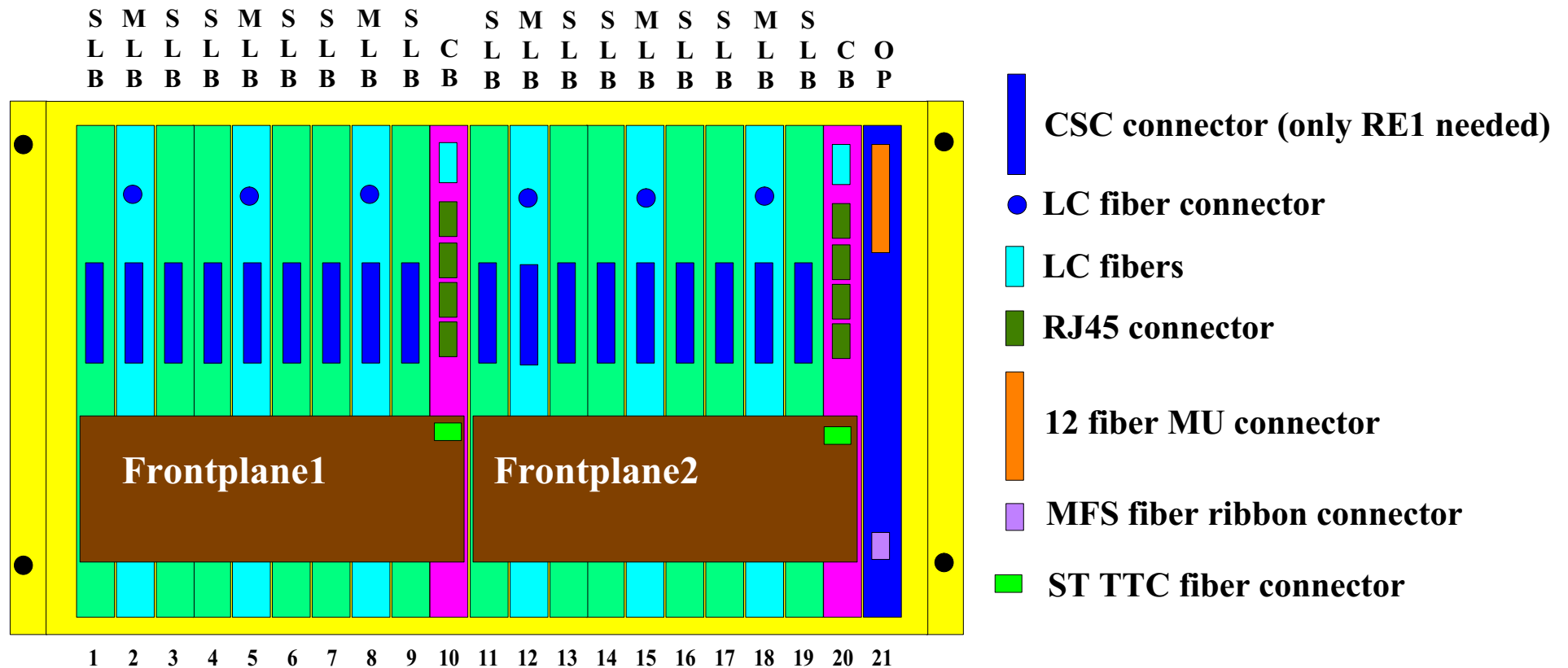
- * **UXC55 RPC Trigger Electronics**
- * **USC55 RPC Trigger Electronics**
- * **milestones**



UXC RPC Trigger Electronics - Link System



Link Box (Euro crate) - 124 needed





UXC RPC Trigger Electronics - Link System



Inventory of Link System

	MLB	SLB	CB	BP	FP	LBox
full system	684	1124	248	124	246	124
staged system	444	788	192	96	192	96

MLB - Master Link Board

SLB - Slave Link Board

CB - Control Board

BP - Backplane Board

FP - Frontplane Board

LBox - Euro Link Box

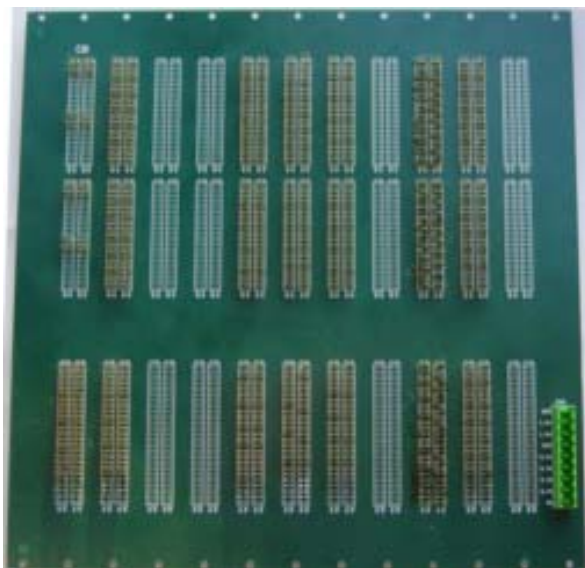
staged - w/o re11, re5, re4; re1, re2, re3 for eta<1.6



UXC RPC Trigger Electronics - Link System



Set of LBox boards tested June(CERN), July(Bari), October 2004 (CERN)
(thanks to Bari and Endcap RPC teams for their support !)



BP
(one per LBox needed)



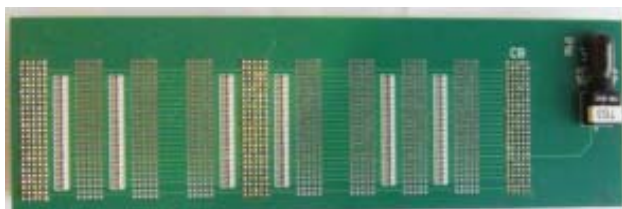
LB
(~16 per LBox needed)



CB
(2 per LBox needed)



PO
(needed one per each
~six LBox)



FP (2 per LBox needed)

(LB - Link Board - it can be configured as MLB or SLB)

Oct2004 Link system BeamTests web page:

<http://pccms9.igf.fuw.edu.pl/users/tb/CMS/Oct2004BeamTests/>



UXC RPC Trigger Electronics - Link System



2004 Synch tests (1)



Set of 4 LBs, 1 CB + DCS chain to optical FEC



**Splitter Board + Optorec Board
(TB receiver used: opto rec, deser, FPGA)**



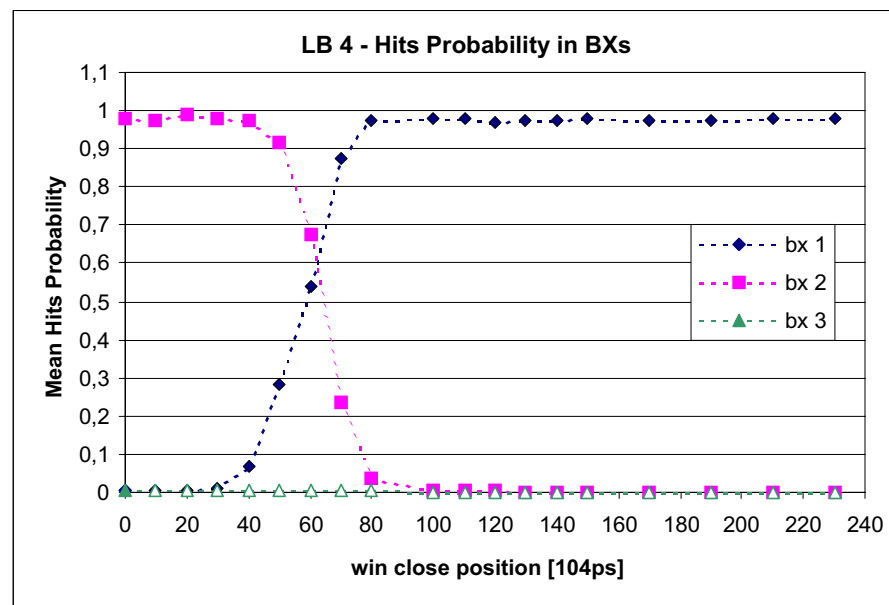
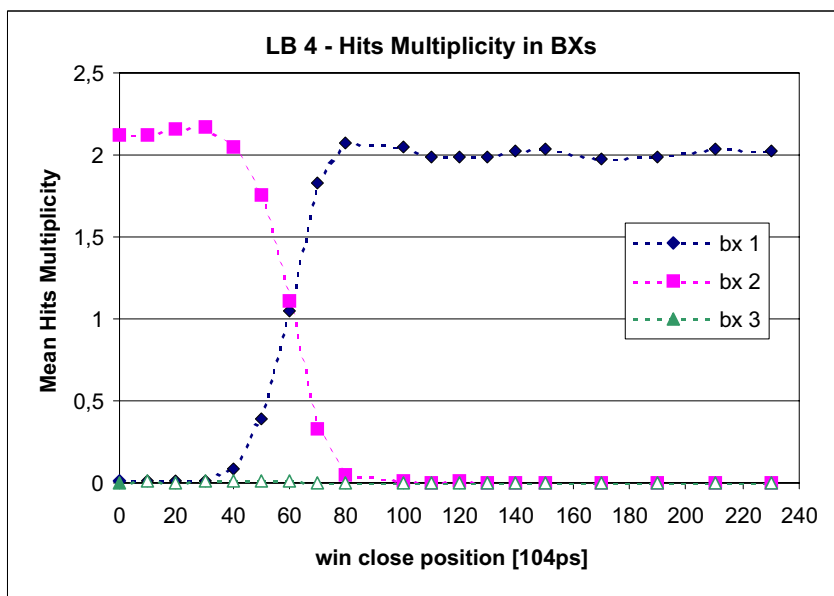
UXC RPC Trigger Electronics - Link System



2004 Synch tests (2) - in H2 with endcap RPC chambers

Synchronisation Window analysis with LB diagnostics and DCS optical chain

Endcap RPCs



Very good timing behaviour



UXC RPC Trigger Electronics - Link System



2004 Synch tests (3) - in GIF with barrel RPC chambers

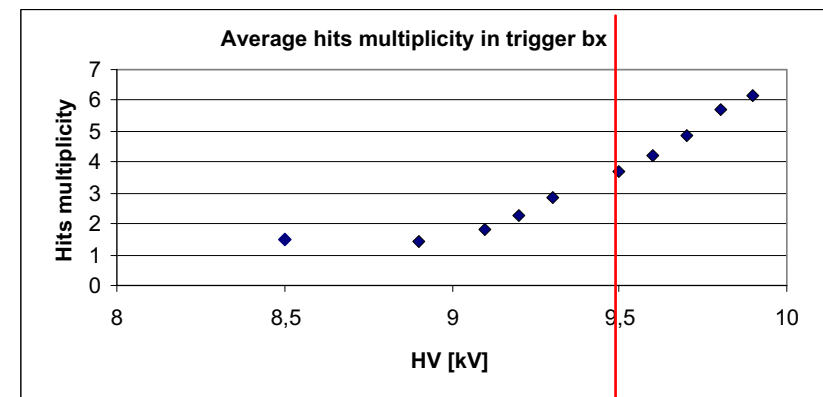
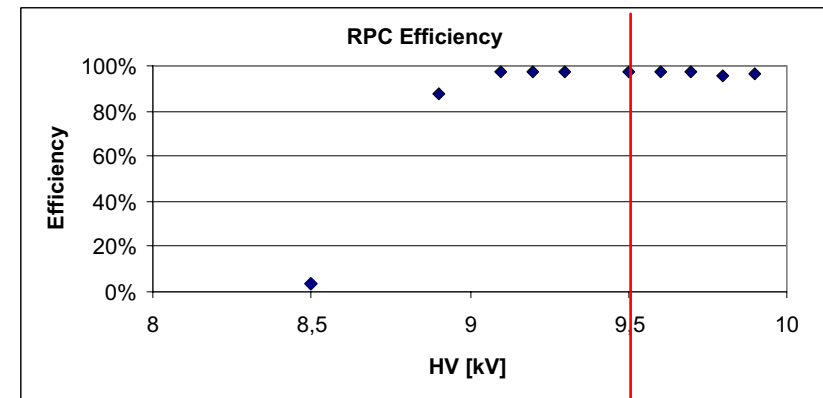
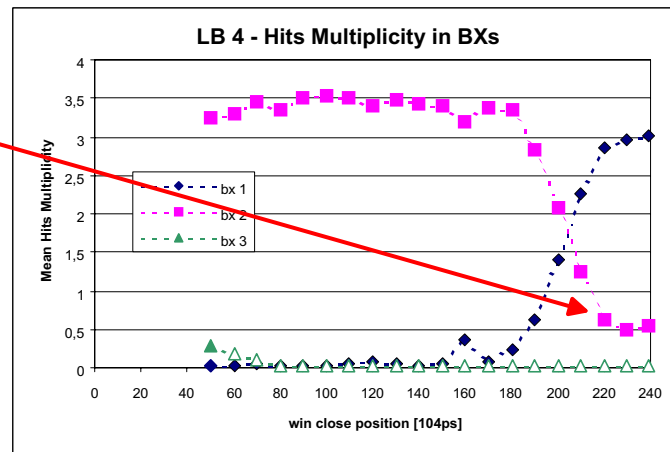
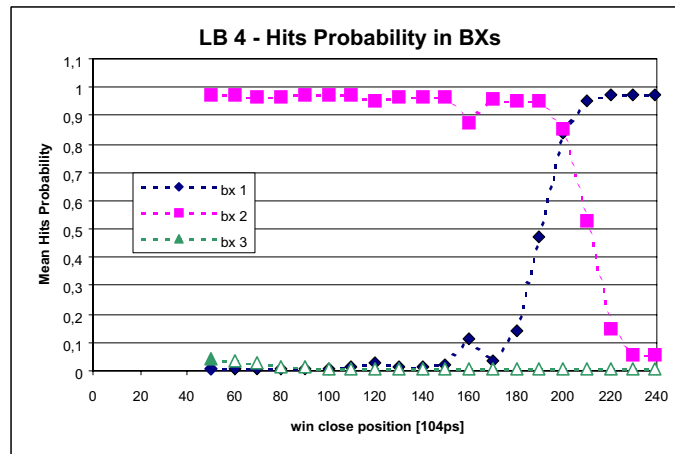
Synchronisation window analysis with LB diagnostics and DCS optical chain

Explanation:

Barrel RPCs

HV=9.5kV much above working point,
large clusters with tails in next BX

10% hits found
in next BX

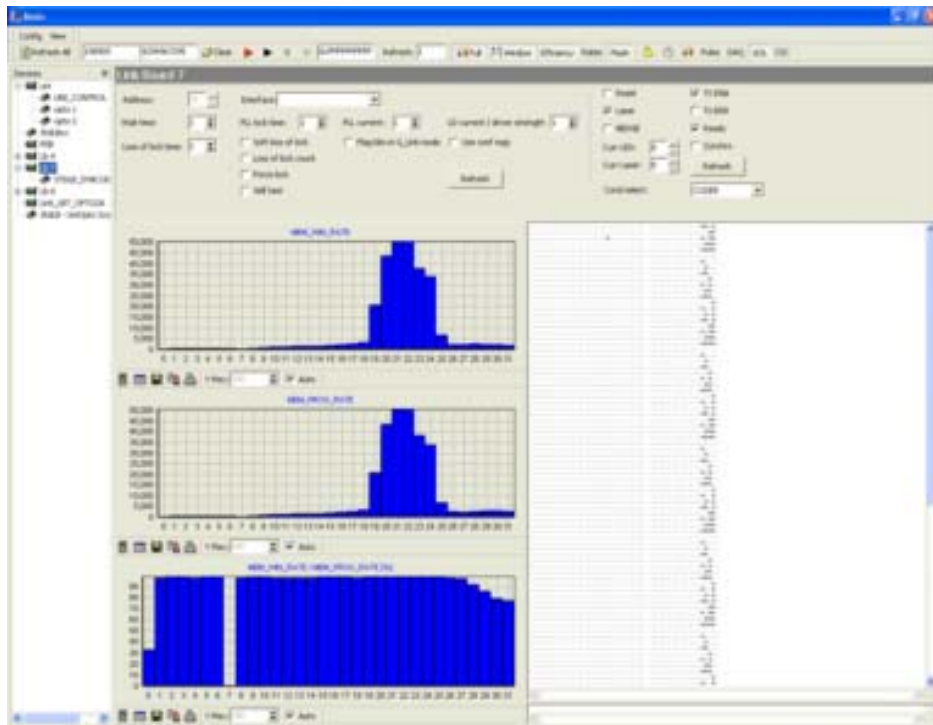




UXC RPC Trigger Electronics - Link System

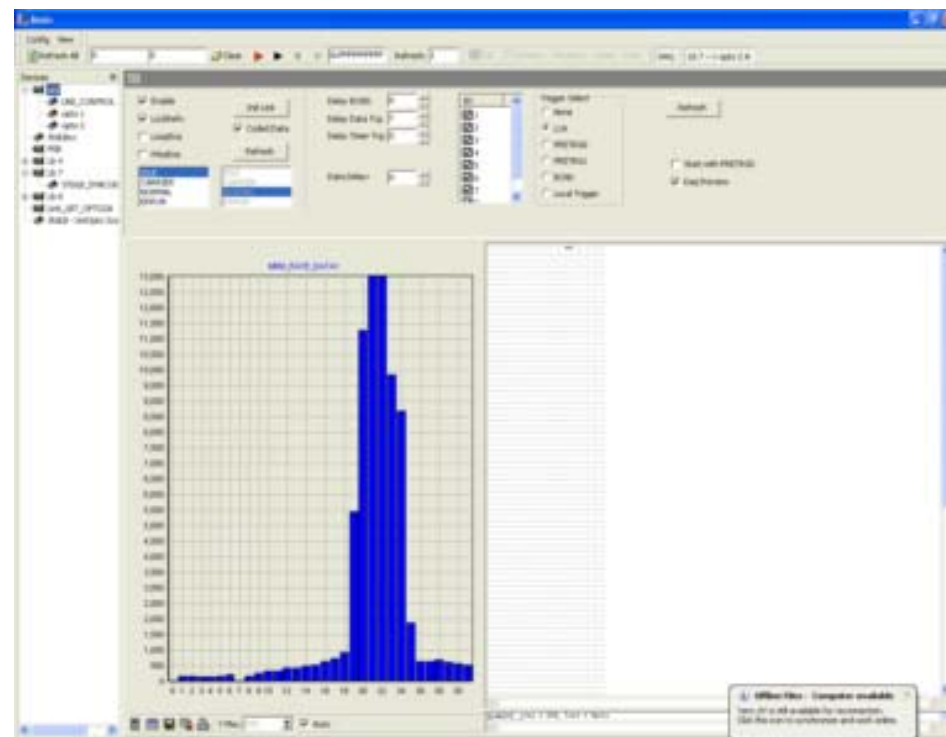


2004 Synch tests (4) - on H2 with CSC



Beam muons seen on LB diagnostics

Beam muons seen after long fiber transmission on Optorec Board (TB receiver used: opto rec, deser, FPGA) no difference in data streams!





UXC RPC Trigger Electronics - Link System



2004 Synch tests (5) - on H2 with CSC



Cable connection to the CSC TMB Board

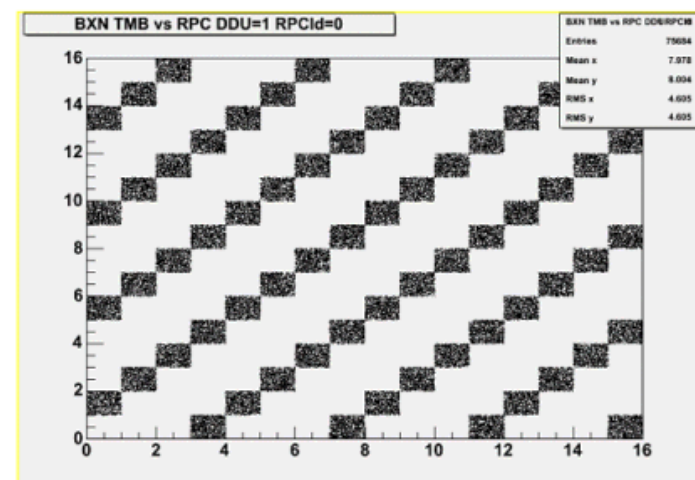
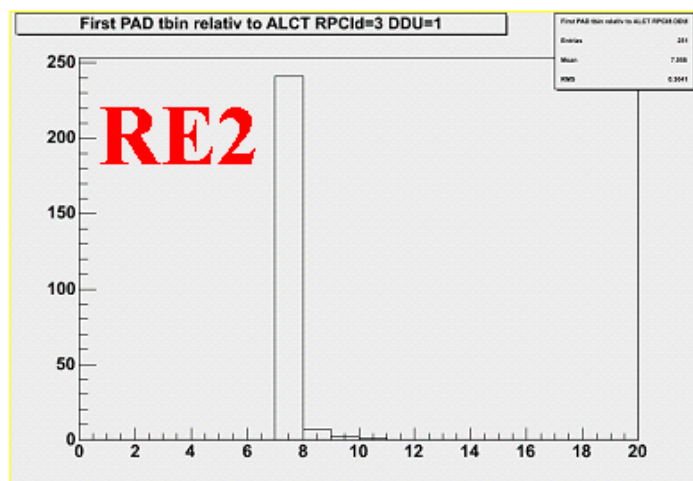
* TMB readout and LB readout see the same data and BXN numbers!

but differences in RPC data positioning in TMB and LB pipeline - to be understood

(Karol Bunkowski's analysis of CSC data)

Jay Hauser analysis ->
and conclusion:

- RPC Link Board to RAT-TMB data transmission worked well ...



http://www.physics.ucla.edu/~hauser/tb04/0410_rpc_rat.ppt



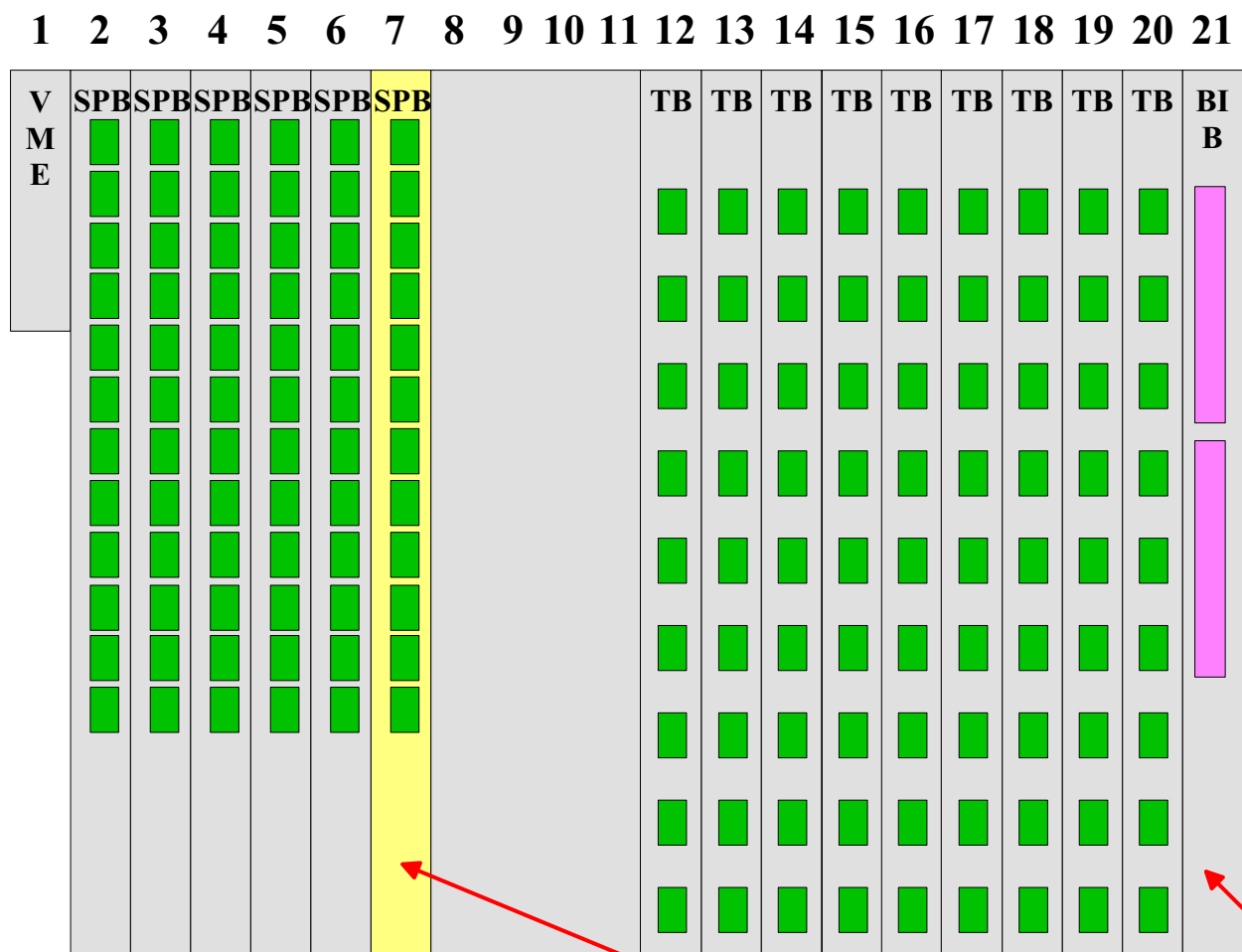
UXC RPC Trigger Electronics - Link System



- * **Synch tests show that Link System can go to preproduction phase**
-> the design is being transferred to Lappeenranta
- * **Synch test 2004 version docs - web page:**
http://pccms9.igf.fuw.edu.pl/users/tb/CMS/Link_System/working_design_2004_tests/
- * **Schematics revision made and ready for preproduction - web page**
http://pccms9.igf.fuw.edu.pl/users/tb/CMS/Link_System/preproduction/
- * **Two full (16 LBs) crates needed for February 2005**
(commissioning of Barrel, Endcap RPCs) - preproduction version



USC RPC Trigger Electronics - Trigger Crate



spare SPB

Backplane VME
Interface and Trigger
Crate sorter connectors



USC RPC Trigger Electronics



USC RPC Trigger Electronics - Inventory

	per Crate	Total	Comments
Trigger Crate		12	
Splitter Board	5	60	
Trigger Board	9	108	
Backplane Interface Board	1	12	
Backplane	1	12	
Vme Controller	1	12	
Sorter Crate		1	
Splitter Board	3	3	
Readout Concentrator Board	3	3	Ecal DCC
DCS Board	3	3	Tracker CCS



USC RPC Trigger Electronics - Splitter Boards



	RPC(all)	HO	Total
Quad Splitter	192	24	216
Dual Splitter	420	60	480

Splitters Board (SPB) = 4 quad + 8 dual splitters

**60 + spares (9) SPBs needed
(5 SPBs per RPC Trigger Crate)**



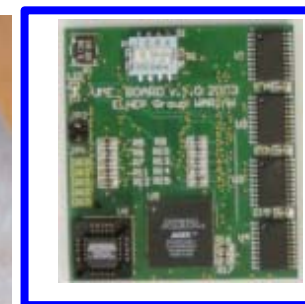
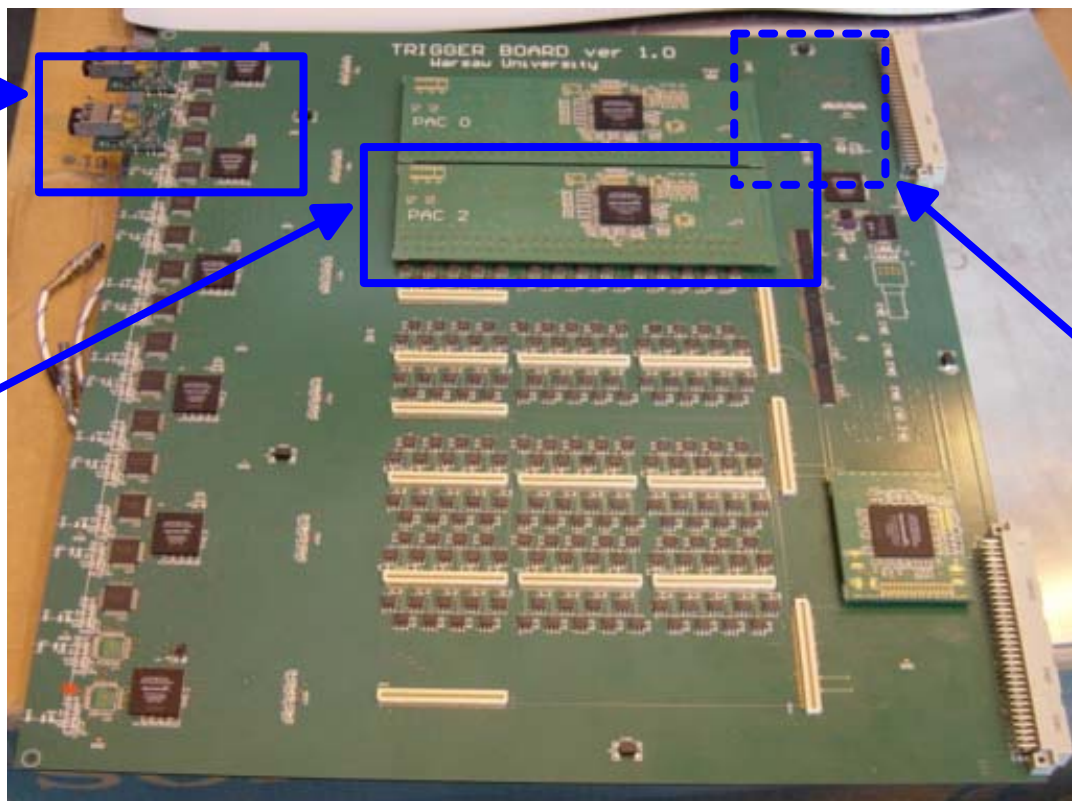
USC RPC Trigger Electronics - Splitter Boards



**Preproduction SPB tested and
successfully used
during 2004 Synch tests**

Ready for production

optical input
(custom receiver,
TLk 2501. FPGA)
- tested on Optorec
board
PAC mezzanine







VME mezzanine
(on other side)
- tested

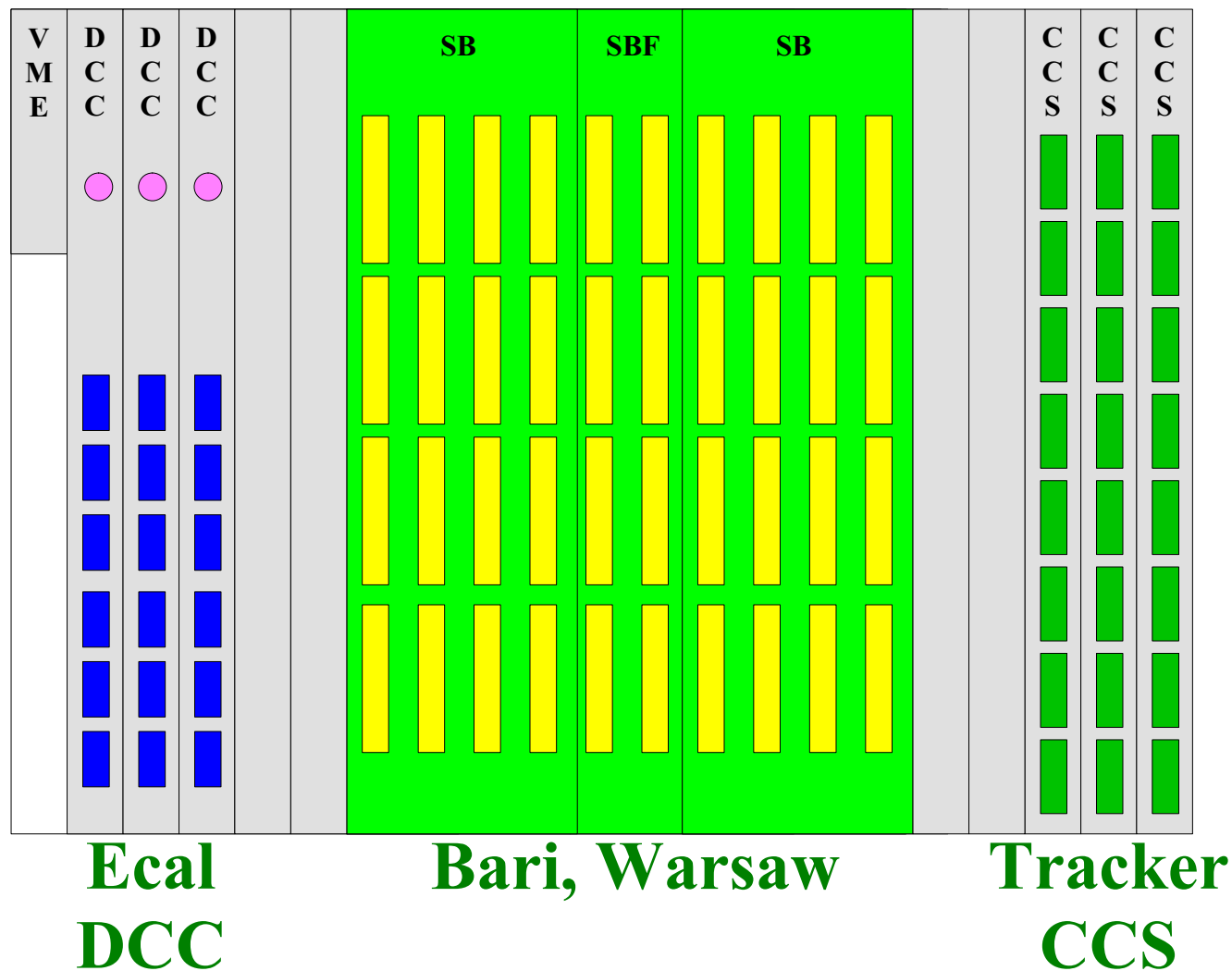
TB, PAC mezzanine - under tests
(an mistake with docking connectors for VME mezzanine occurred - new VME
mezzanine will be delivered today)



USC RPC Trigger Electronics - Sorter Crate



-  data connectors from Trigger Crates
-  TTC Connector
-  NGK ribbon connector from TC's
-  NGK ribbon connector from DCS redundant chain

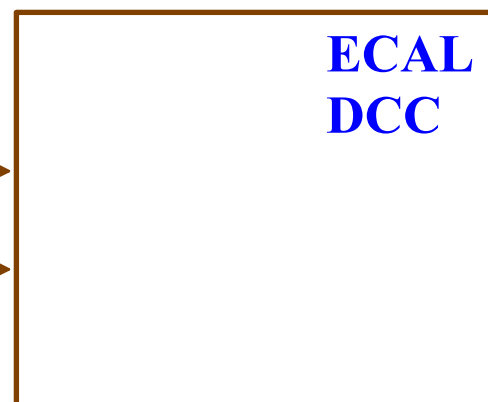
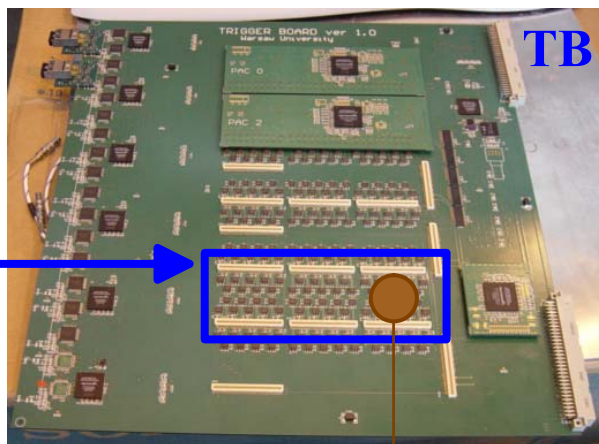




USC RPC Trigger Electronics - Readout



Readout
mezzanine
with **GOH**
- firmware is being
designed



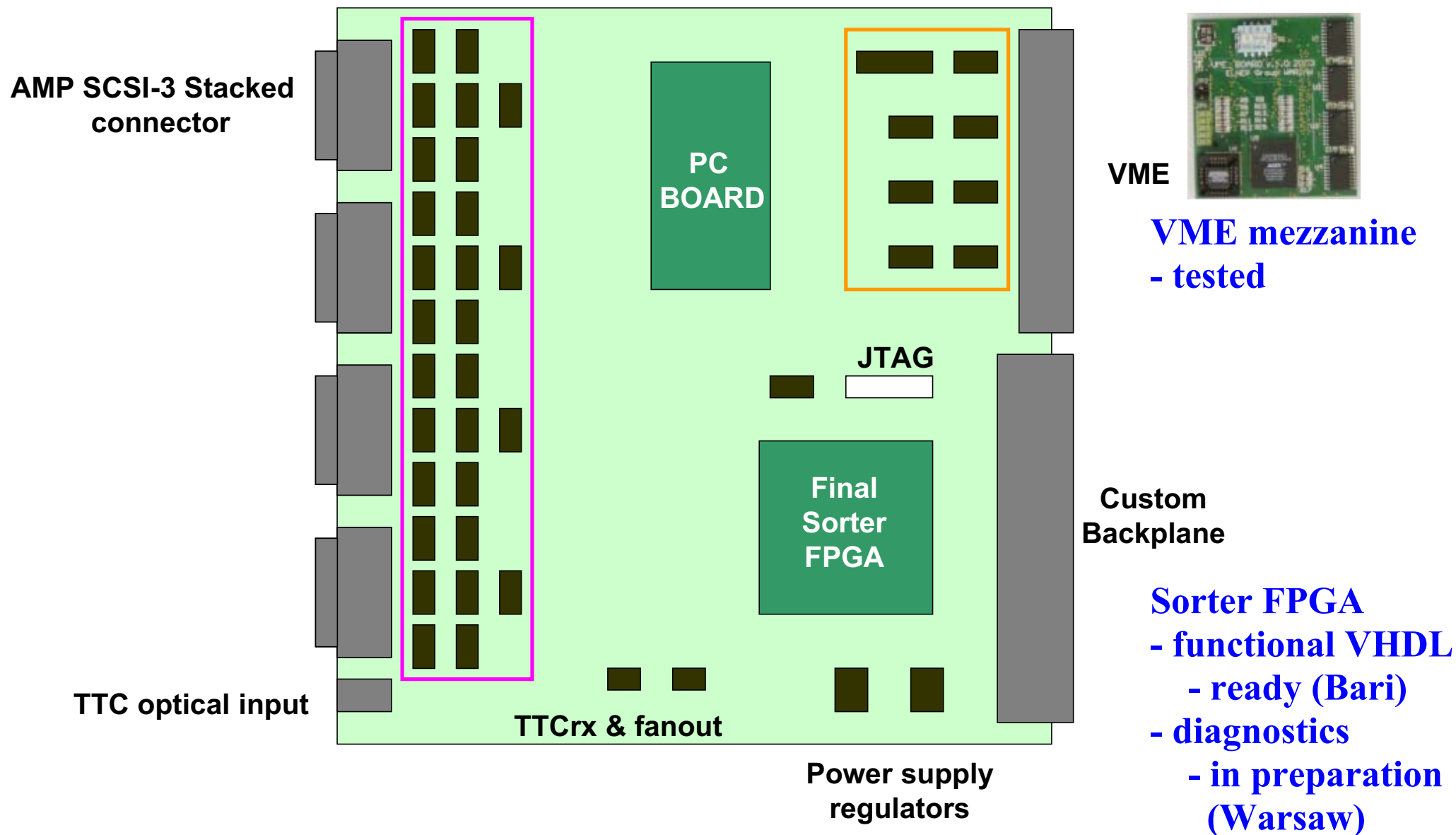
Participation in
Ecal DCC
firmware design
Event Merger/Builder



Slink tests
last October



USC RPC Trigger Electronics - Sorter





RPC Trigger Milestones



	<i>item</i>	<i>milestone</i>	<i>date</i>	<i>comment</i>
RPC	Link Board	Production start	Sep-03	delayed Jan-05
RPC	Trigger Bd	PPP done	Dec-03	delayed Apr-04
RPC	Sorter Bd	Design done	Aug-03	delayed Jul-04
RPC	R/O Bd	PPP done	Dec-04	included on TB
RPC	Trigger Crate	Proto done	Feb-03	delayed Apr-04
RPC	Link Board	Production done	Mar-04	delayed Aug-05
RPC	Trigger Bd	Production start	Jun-04	delayed Sep-04
RPC	Splitter Bd	Production start	Oct-04	
RPC	System	System test (2crates)	Mar-05	
RPC	Trigger Bd	Produced & tested	Dec-05	
RPC	R/O Bd	Produced & tested	Dec-05	included on TB
RPC	Trigger Crate	Produced & tested	Dec-05	
RPC	Sorter Bd	Produced & tested	Dec-05	