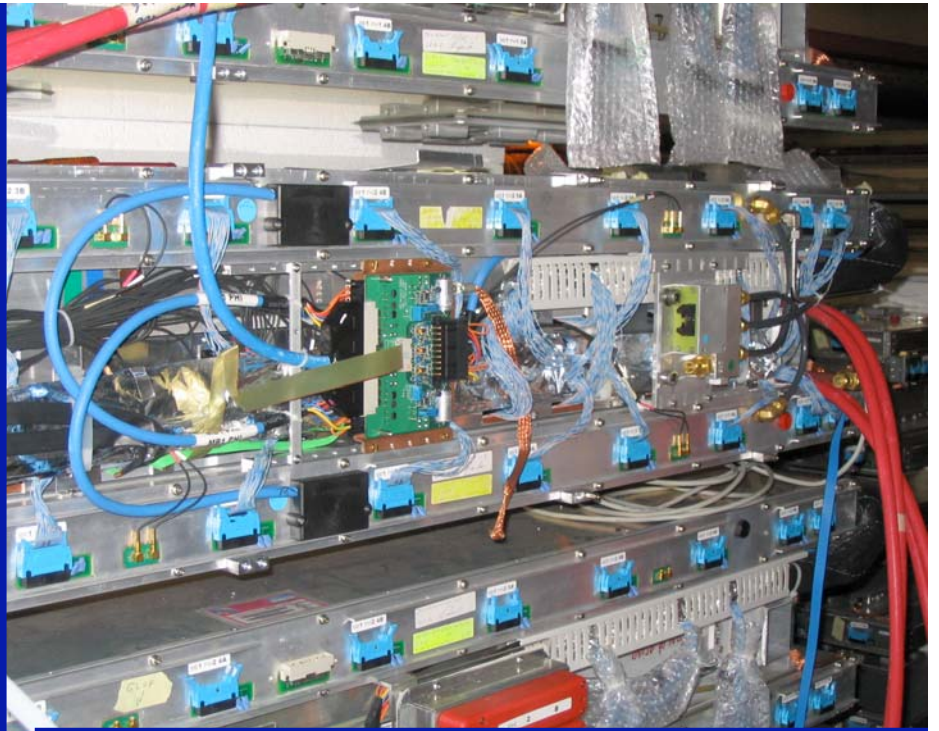
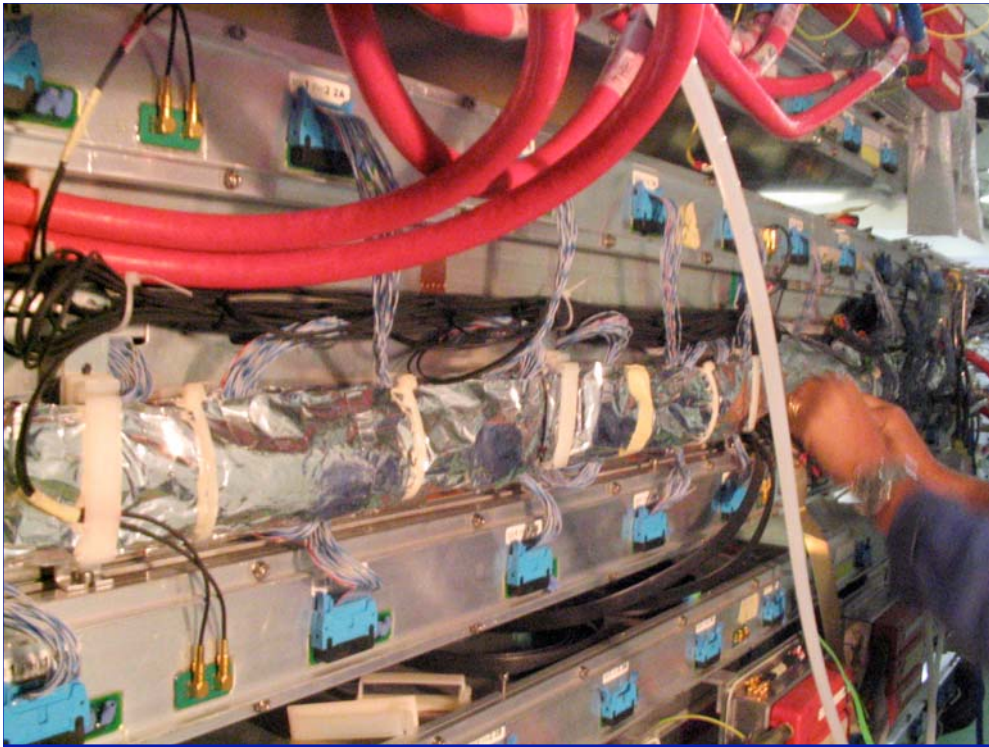


3.5 months of MC assembly in Bologna

A.Perrotta, T.Rovelli, G.P.Siroli, R.Travaglini, MDV





week	assenti	responsabile 1	responsabile 2
22 nov		Riccardo(fino al 24)	Marco(fino al 24)
29 nov		Andrea	Tiziano
6 dic	Riccardo,Tiziano		Marco
13 dic	Tiziano	Riccardo	Andrea
20 dic		Riccardo	Tiziano
27 dic		Gianni	Marco
3 gen	Riccardo, Marco		Tiziano
10 gen		Andrea	Marco
17 gen		Riccardo	Gianni
24 gen		Riccardo	Tiziano
31 gen		Andrea	Marco
7 feb	Riccardo	Gianni	Marco
14 feb		Riccardo	Tiziano
21 feb		Andrea	Marco
28 feb		Gianni	Tiziano
7 mar		Riccardo	Andrea
14 mar	Marco	Gianni(eccetto il 17)	Riccardo
21 mar		Andrea	Marco
28 mar	Marco	Riccardo	Luigi
4 apr		Tiziano	Marco
11 apr			

Andrea, Gianni S., Marco, Riccardo, Tiziano
Luigi, Stefano B, Gianni M.

from Dec to now :
12 effective weeks
9 assembled & tested MC

global production rate: 0.75 MC/week

Week	0	1	2	2,1	3	4	5	6	6.05 (fail)	6.1 (M ship)	6.5 (Inl)	8	9	
MB1 tot	2,5	2	1		0						6			
MB2 tot	2					1	0				2	-1		
MB3 tot	1							0			4	-2	1	
MB4 tot	0										2		0	
Task		full mb2	full mb1	full mb1	add	full mb1	full mb2	add	full mb2	full mb3	add	xchange	full mb3	full mb3
Etichette	6	5	4		3	2	1		0		14?			
Dissipatori TRB lunghi	29		24		19	13	7		0		300		293	286
Dissipatori TRB corti	2		1		0						0	25		
Dist Lunghi con scanalatura	29		24		19	13	7		0		0	307	300	293
Dist Lunghi senza scanalatura	29		24		19	13	7		0		0	396	300	293
Dist Corti con scanalatura	2		1		0						0	25		
Dist Corti senza scanalatura	2		1		0						0	25		
TRB PHI 128	10		7		4	0	4	0	6	1		17	12	7
TRB PHI 32	2		1		0						0			
TRB kapton	10		3	11	7	0	6	0	10	3	-2	162	156	149
End Bus R	6		5		4	3		2		1		120	119	118
End Bus L	6		5		4	3		2		1		120	119	118
TRB THETA	13		11	-1	8	6		4	8	6		16	20	18
CCB	5		4		3	2	14	15		14	2		15	14
cavi soglie	5		4		3	2	13	14		13			12	11
cavi slow control MB1	2		1		0				5					
cavi slow control MB2	2					1		0						
cavi slow control MB3	1								5	4			3	2
cavi slow control MB4	0													
cavi rpc-align Mb1	2		1		0						6			
cavi rpc-align Mb2	2					1		0			2	-1		
cavi rpc-align mb3	0						1			0	4	-2	1	0
cavi rpc-align mb4	0										2			
SB spacers corti	5		4		3	2		1		0	14	-3	10	9
SB spacers lunghi	5		4		3	2		1		0	14	-3	10	9
SB	5		4		3	2		1		0		-3		
Link	4		3		2	1	2	1	15	14			15	14
Cavo Link Mb1	2		1		0						6			
Cavo Link Mb2	0			2		1					2	-1		
Cavo Link Mb3	0			4						3	4	-2	4	3

production rate limited 'cause of low TRB rate

3 weeks not used for lack of TRBs:

9 MC assembled in 9 weeks

(3MB1+3MB2+3MB3)

true assembly rate 1MC/week

breakdown of assembly time: task average times

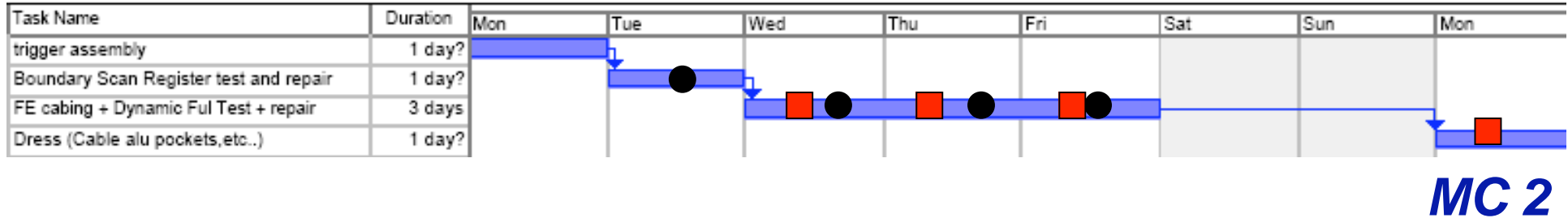
Task Name	Duration	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon
trigger assembly	1 day?	█							
Boundary Scan Register test and repair	1 day?		█						
FE cabling + Dynamic Ful Test + repair	3 days			█	█	█			
Dress (Cable alu pockets, etc..)	1 day?								█

assembly rate limited 'cause of reiterations in dynamic test and board repair/replace

- in average 3 days, min1 max 9
- mainly TRBphi128

projected assembly times:

2 MC concurrently assembled



■ dummy FE

● test system

<1> MC every 4 work days

projected assembly rate 6 MC/month

it needs 14 working TRBs /week /site

improvements?

dynamic full test is performed with the test pulser when the MC is cabled to the FE (signal, test pulse, trigger, RO and control cables)

in such conditions replacing TRBs is a difficult and long operation

introduce an intermediate dynamic test for screening off faulty TRBs (trigger, RO and control cables, i.e. like in BS test)

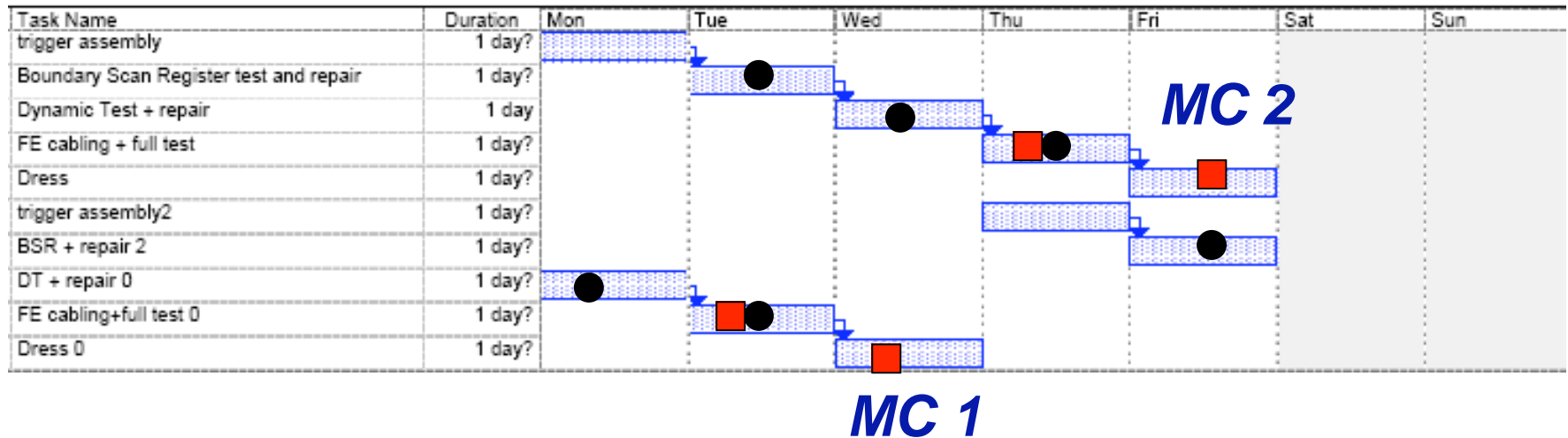
it can be performed with the system embedded BTI emulation BEFORE cabling to the FE

- replacing TRBs is much easier
- no large fluctuations in the test time when MC cabled to FE

This new set-up is already functional

optimized workplan with TRB screening

2 MC concurrently assembled



█ dummy FE

<1> MC every 2.5 work days

● test system

max assembly rate 9 MC/month

it needs 14 working TRBs /week /site

summary

after 3.5 months of MC assembly in Bologna:

- set-up 100% functional and reliable
 - 5 (soon 8) people in shifts of 2/week
- global production rate 0.75 MC/Week
 - limited by low TRB production rate
 - NEED URGENT ACTION
- true assembly rate 1 MC/week
 - limited by TRB fault rate
 - projected assembly rate 6 MC/month (it needs 14 good TRBs/week/site)
- introduction of TRB screening stage can boost the assembly rate (up to 9 MC/month)

faulty-board statistics (1)

good boards installed in 3MB1+3MB2+3MB3:

9 link, 9 SB, 9 CCB

57 ROB

18 TRBtheta, 54 TRBphi128, 6 TRBphi32

faulty boards:

0 link, 2 SB, 2 CCB

1 ROB

2 TRBtheta, 11 TRBphi128, 0 TRBphi32

at 0th order, since the TRBs fail in the dynamic behaviour of BTIs and those are the same in theta and phi boards:

failure rate= $(11+3) / (20+65+6) = (15 \pm 4) \%$

since there are 6 to 7 TRBs in a MC, there is 1 faulty board/MC, i.e. each MC is reiterated twice through the “dynamic-test & repair” stage

faulty-board statistics (2)

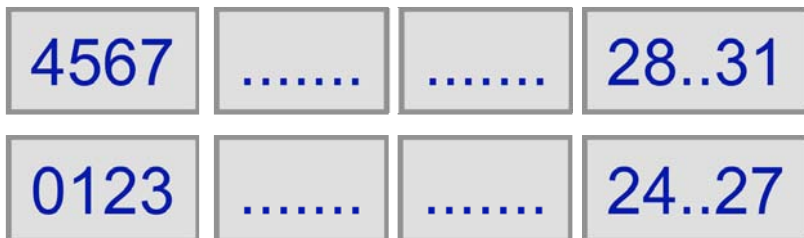
in a closer observation, TRB faults are:

TRBphi128

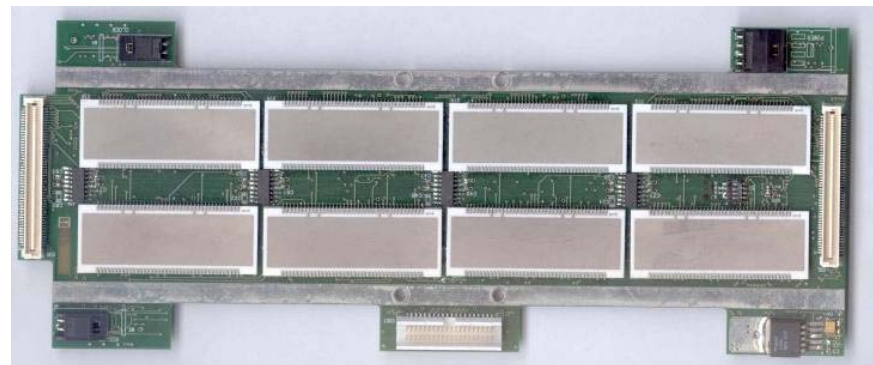
10 times in module with BTI inner 0,1,2,3 connected to PHI1

3 times in module with BTI inner 24,25,26,27 connected to PHI1

1 time in BTI 17 inner connected to PHI1



- faults of BTIs outer connected to PHI2 are NOT observed



TRBtheta

1 Htrig level

1 board with many BTIs

faulty-board statistics (3)

BTI module fault distribution is clearly non-random.

BTI inner modules have a problem.

Since modules are all similar, very likely the problem is in using them and not when producing them

For instance:

- thermal profile during module bonding on TRBs
- problem with traces on TRB PCB (clock distribution, data traces Xtalk, etc..)