LHC
Beam Instrumentation
Synchronous Timing

Progress report
August 2000

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- 1999 Requirements evaluation .
- 2000 Topic to be resolved :

Do we use an updated LEP BST or a TTC System ?

  - Main differences between LEP and LHC Requirements .
  - Analyzed options. > > Preliminary choice.
- Feasibility study.
    - Global TTC Distribution.
    - LHC Tunnel Distribution.
    - B.S.T. Message transmission over TTC.
    - New specific interface design.
- Issues & Planning.

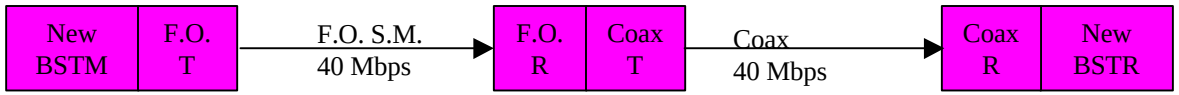
Main differences between LEP and LHC Requirements :

- Number of bunches : 16 $\rightarrow$ 2835
- Minimum bunch Spacing : 335 $\rightarrow$ 25 ns
- Maximum Overall Jitter : 50 $\rightarrow$ 5 ns
- BST Message length : 8 $\rightarrow$ 16 (32) Bytes
- Number of acquisition crates: 60 $\rightarrow$ 300
- Acquisition crates location : US / RE $\rightarrow$ Tunnel (BPM)

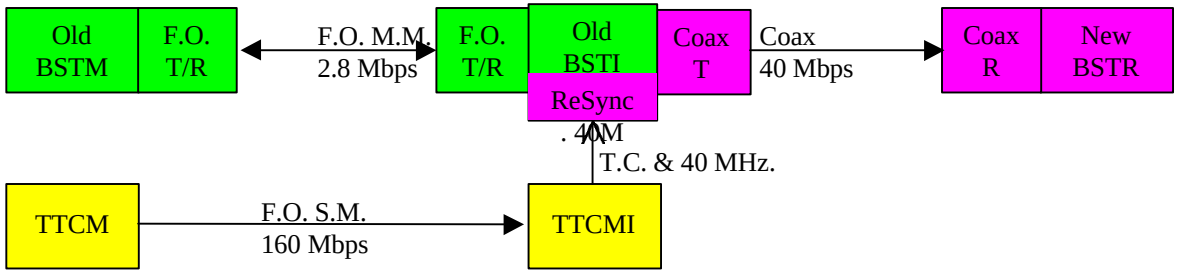
LHC B.S.T. options:

1) New BST Design with F.O. tunnel transmission.

2) New BST Design with Coax Cable tunnel transmission.



3) Reuse of LEP BST with TTC Synchronization & Coax cable.



BST LEP | TTC LHC | New DESIGN

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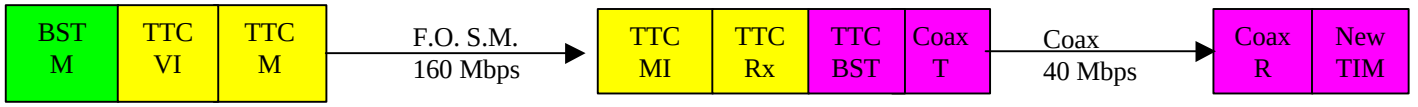
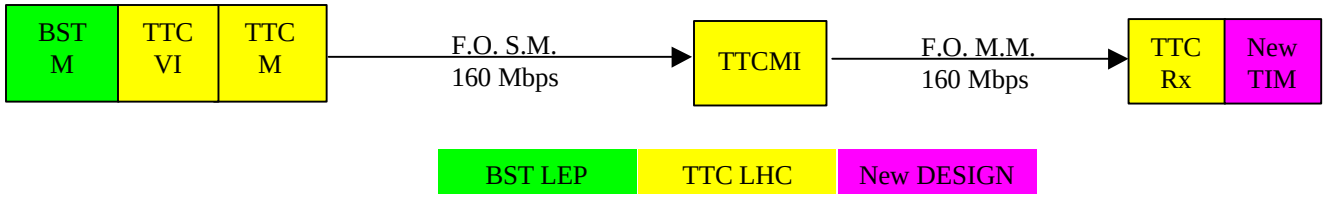
LHC B.S.T. options. (cont'd)

4) LEP BST Master & Full TTC Design with new Local BST Design and Coax tunnel transmission



5) LEP BST Master & Full TTC Design with Coax tunnel transmission.

6) LEP BST Master & Full TTC Design with F.O. tunnel transmission.



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- Preliminary choice : Option # 6 >>>>
- Feasibility study:

Global TTC Distribution .

Tests performed on the distribution of SPS RF signals
(SL/CO + SL/RF + SL/BI + Bruce TAYLOR)

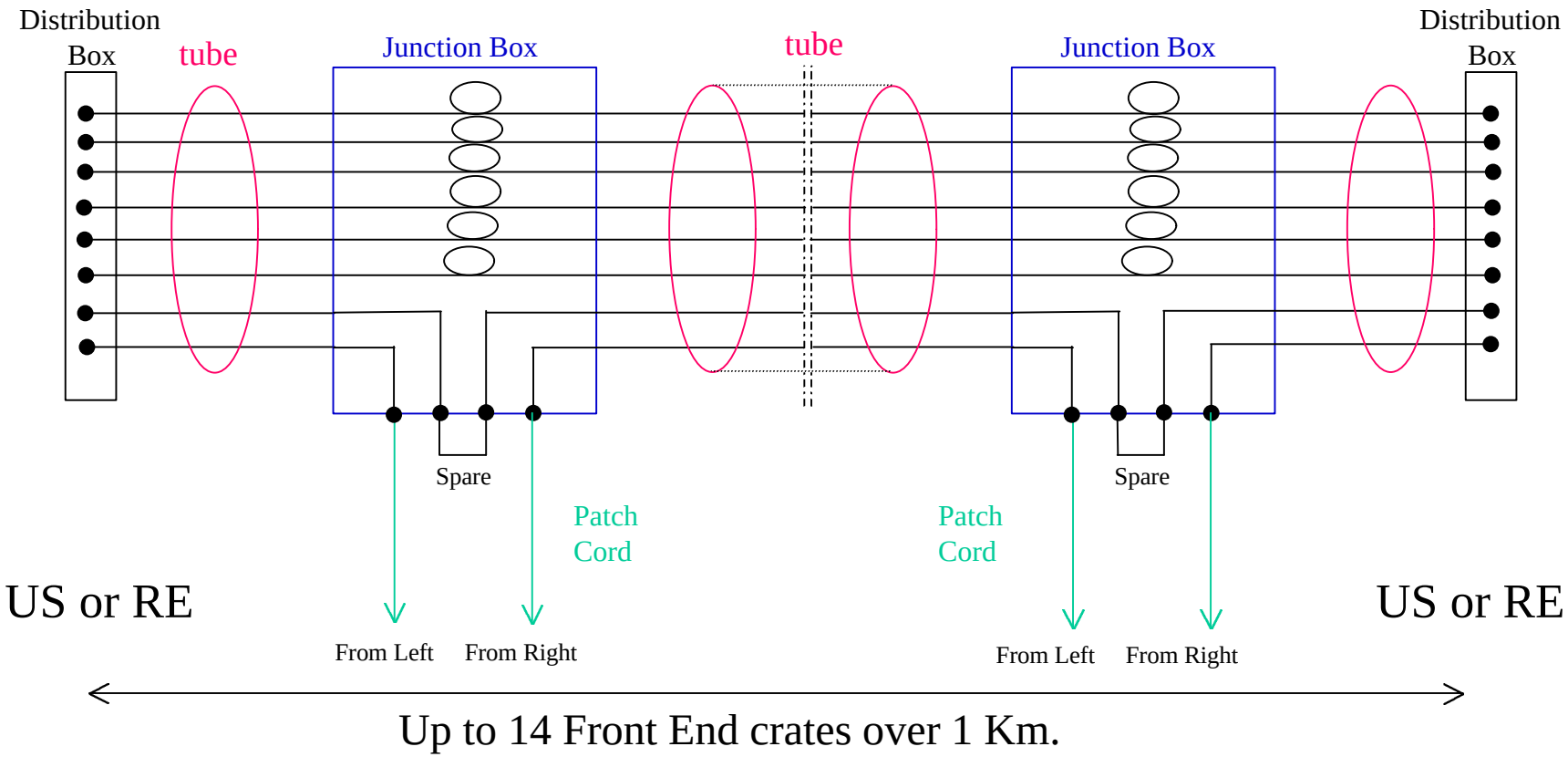
- Test With simulated Signals : OK.
- Test With single cycle: OK after PPL capture range adjustment.
- Problem with LHC Beam during SPS multi cycle:
  - » TTC Transmission system requires continuous clock !

- Feasibility study.(cont'd) :

LHC Tunnel Distribution.

- RADWG agreement for optical fibre transmission.
- Distribution scheme. (SL/BI + SL/CO)
- Radiation Hardness test (SL/CO)
- Installation Procedure.

Tunnel Distribution scheme.



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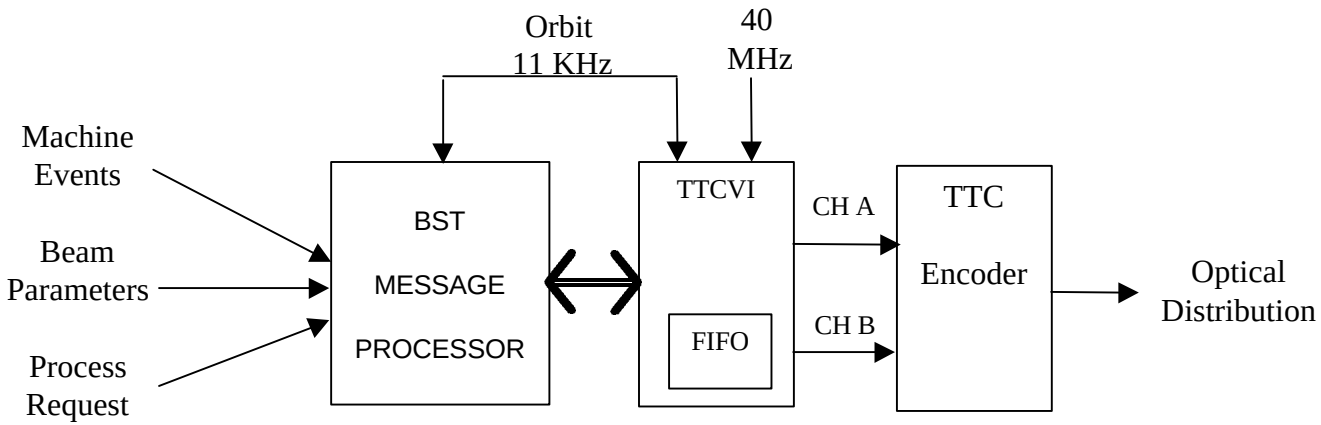
Feasibility study. (cont'd) :

B.S.T. Message transmission over TTC.

- TTCvi module upgraded to cover BST needs (PG. Gallno)
- Transmission of TurnClock over channel A.
- Transmission of 32 bytes message over channel B.
- R.T. Software >> to be done.
- Message bit allocation >> to be specified.

Transmitter Bloc Diagram:



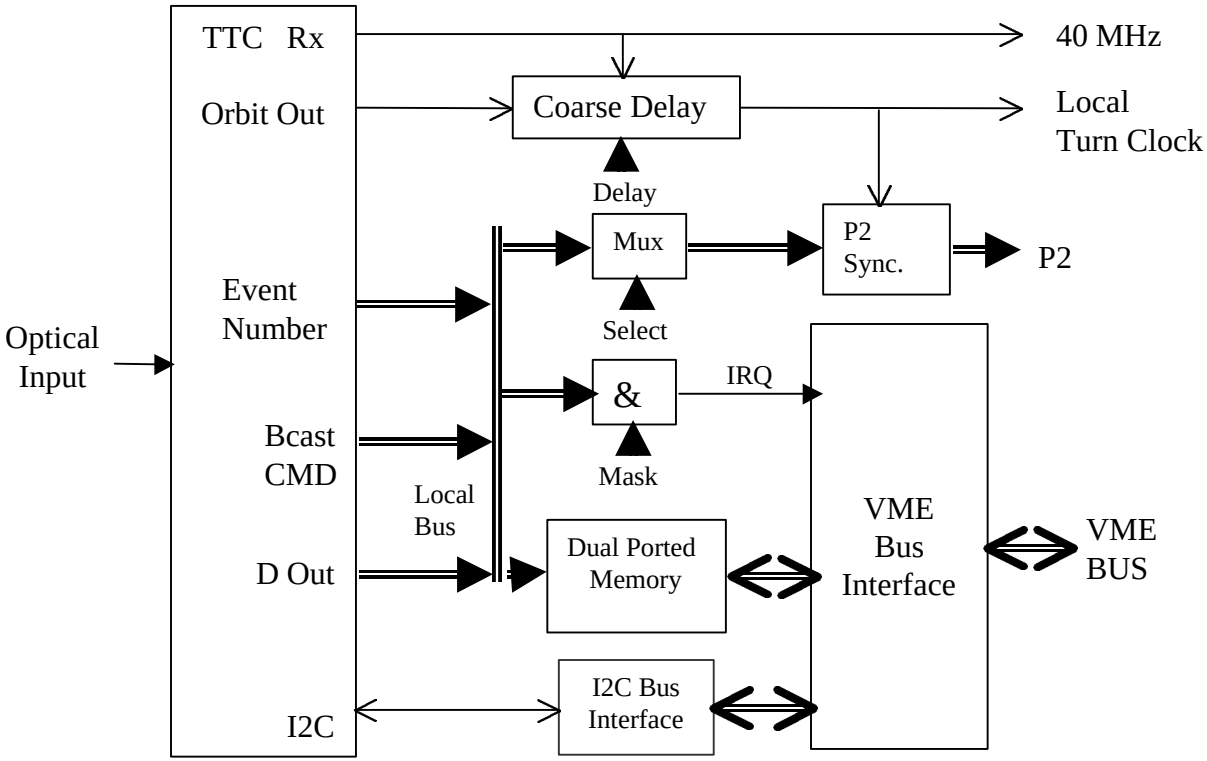
Feasibility study. (cont'd) :

New specific interface design.

TTC Interface Module. (TIM)

- Use TTC Rx mezzanine board.
- Main features:
  - » Fully VME accessible.
  - » Store BST messages in dual ported memory.
  - » Send local IRQ on predefined message receipt.
  - » Send selected byte on P2 connector (Hw Byte).
  - » Additional Turn Clock delay.

TIM bloc diagram



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Issues & Planning.

- TTC / BST Master compatibility ?
- Optical Fibre in the Tunnel ?
- Front End Platform… (VME, PCI,...) ?
- 1 or 2 sets of RF signals ?
- Final proposition. → End 2000
- Final acceptance. → Early 2001
- TIM design. → 2001
- Radiation Hard test. → 2001
- Hardware & Software prototype. → 2002
- 1 st. batch manufacturing, test & installation. → 2003
- TI 8 & 1st LHC Octant Commissioning. → 2004