

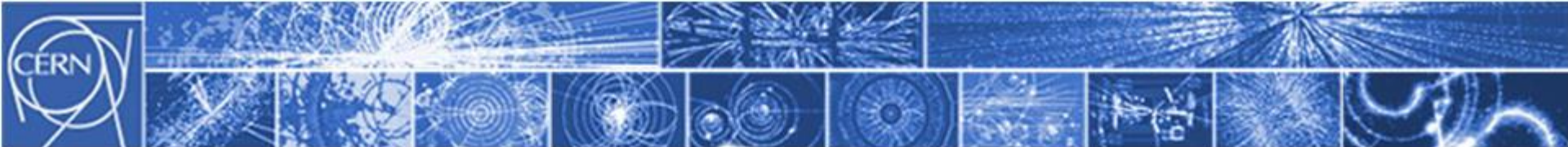
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Additional CIBU connection for LBDS in IR6

N.Magnin

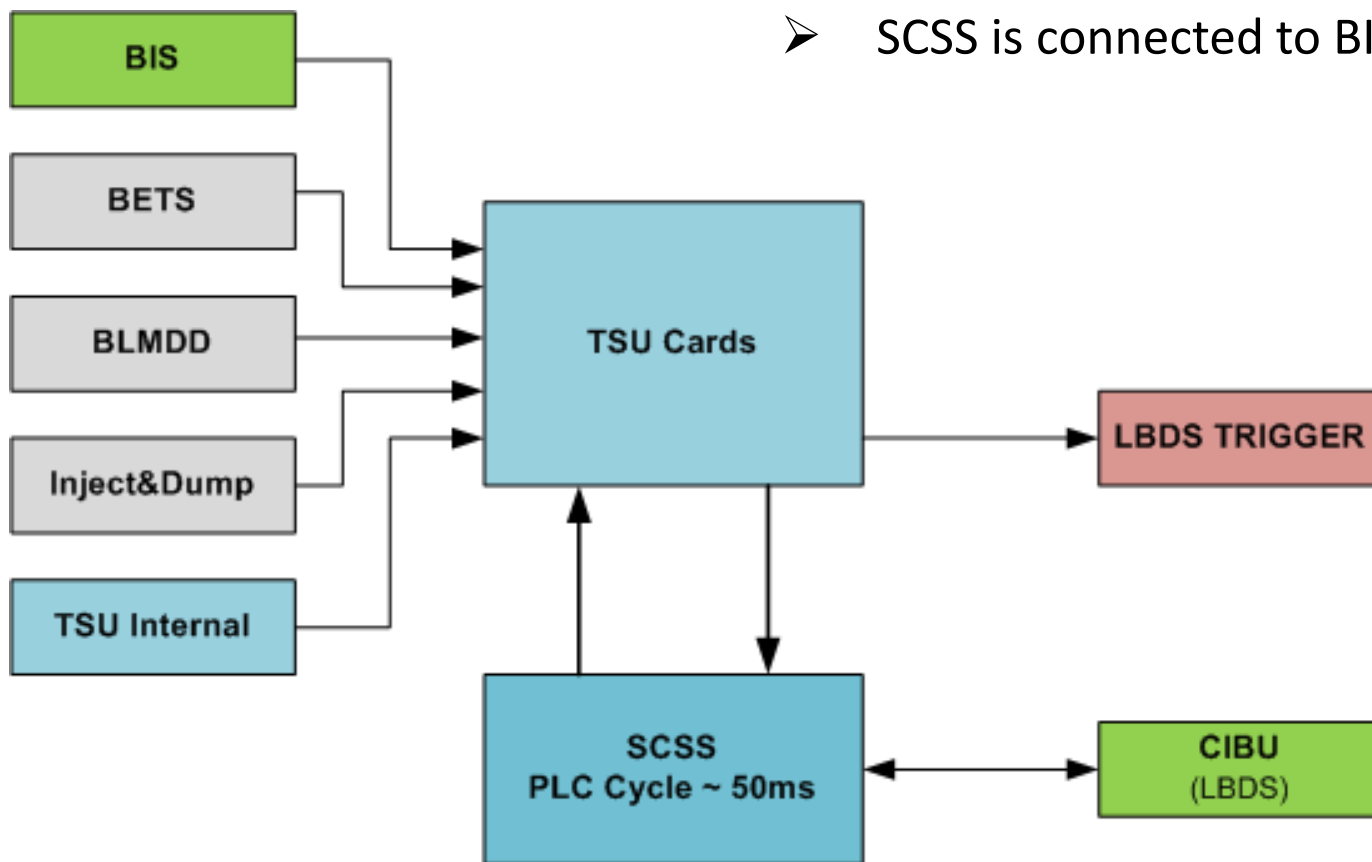
MPP meeting - 27.05.2011

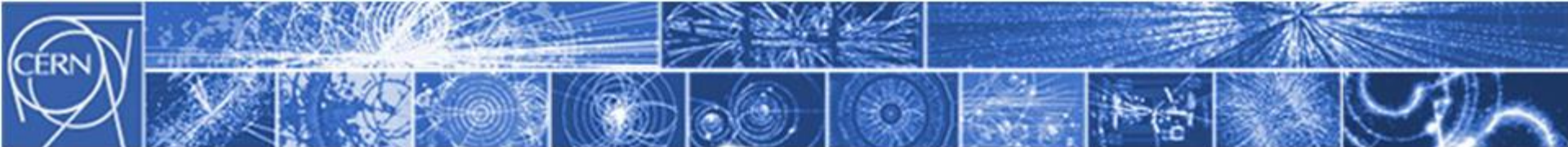


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LBDS connections to BIS overview

- TSU has 6 clients (BIS **input only**)
- SCSS (**slow**) is monitoring TSU state
- SCSS is connected to BIS (**in/out**)



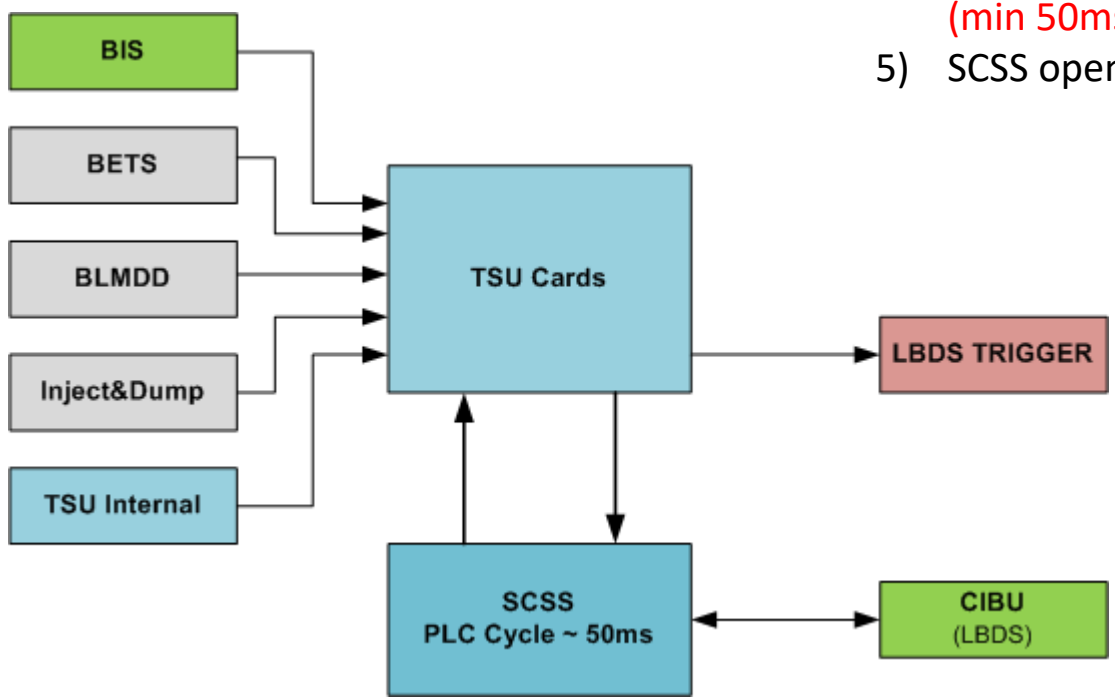


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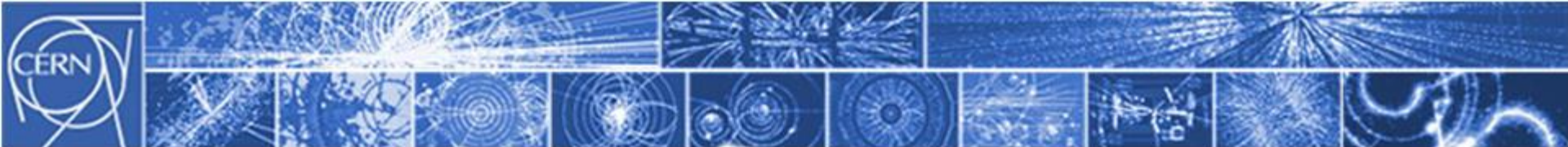
Case study: TSU BIS client request

Sequence of events:

- 1) BIS is opened (any client around LHC)
(Dumped event is sent)
- 2) TSU detects BIS client request
- 3) TSU sends LBDS trigger
- 4) SCSS detects TSU not ready
(min 50ms delay)
- 5) SCSS opens LBDS BIS loops



Sequence is OK

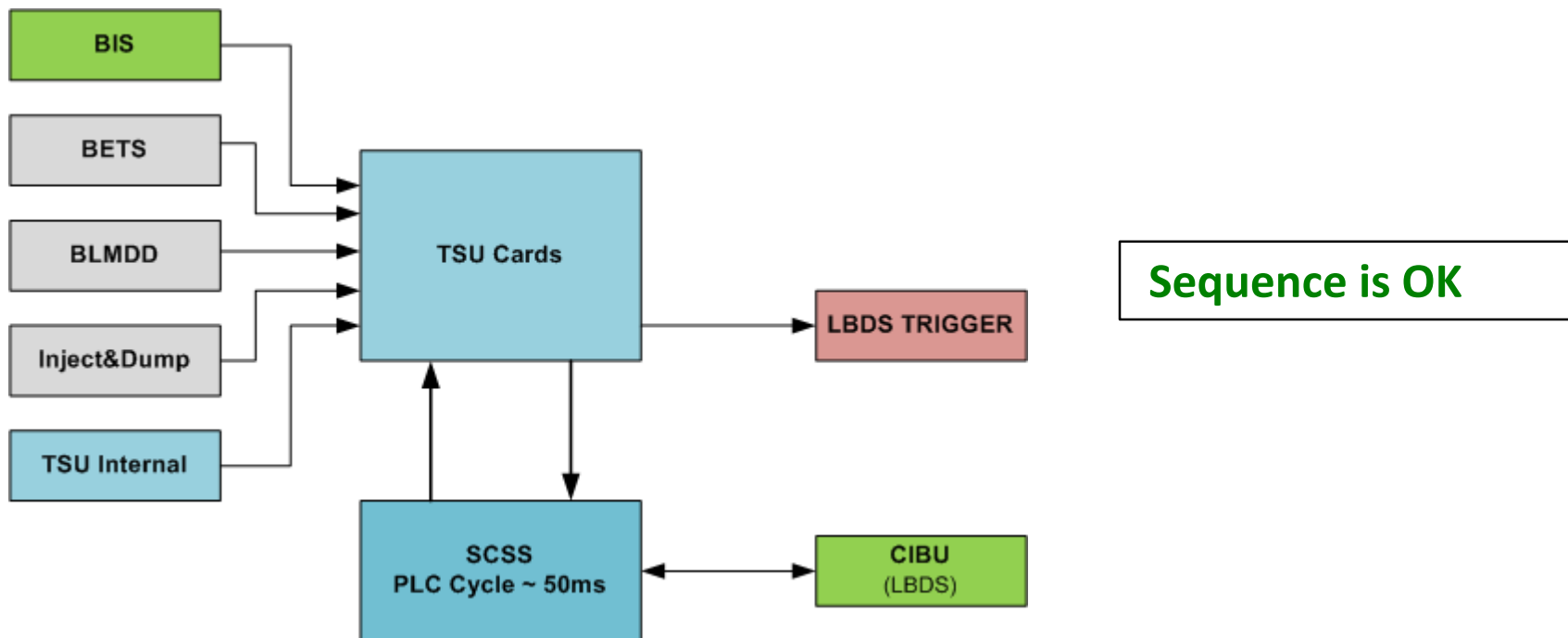


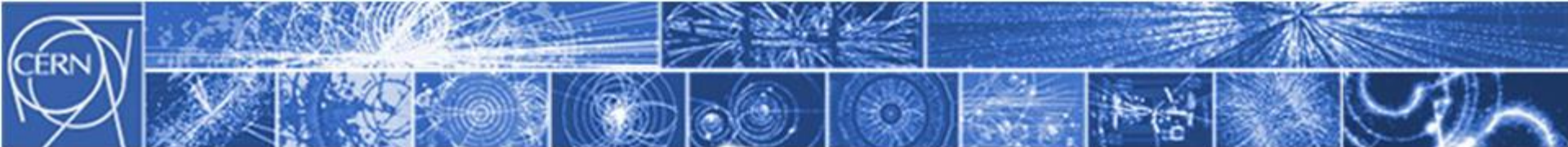
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Case study: SCSS request

Sequence of events:

- 1) SCSS detects a problem
- 2) SCSS opens LBDS BIS loops
(Dumped event is sent)
- 3) TSU detects BIS client request
- 4) TSU sends LBDS trigger



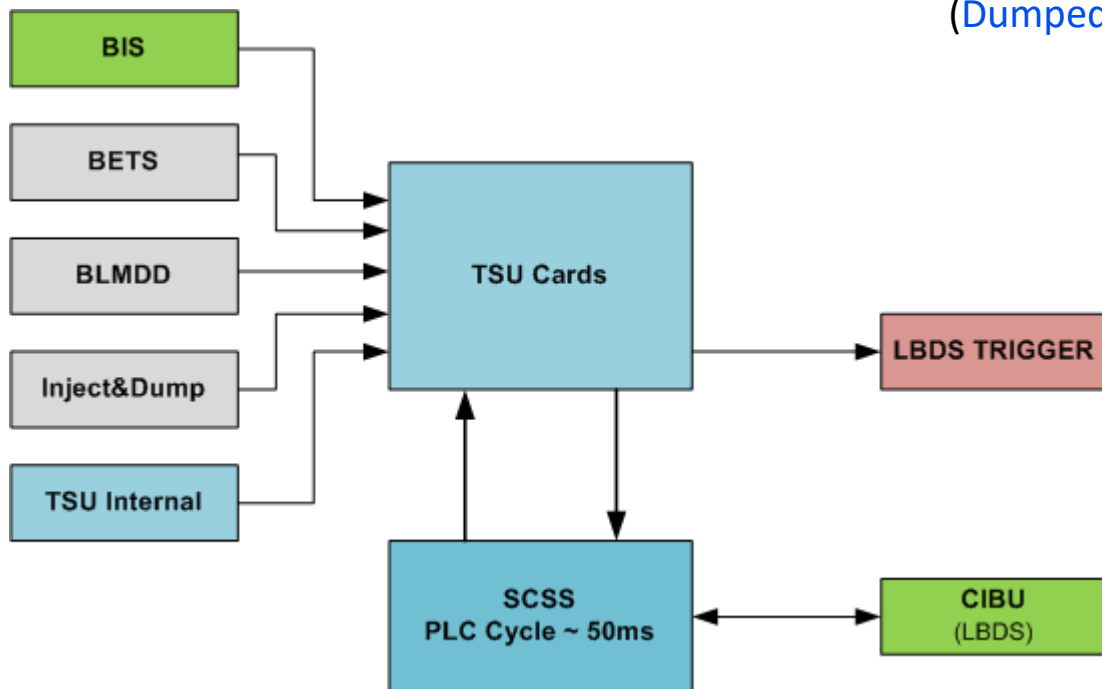


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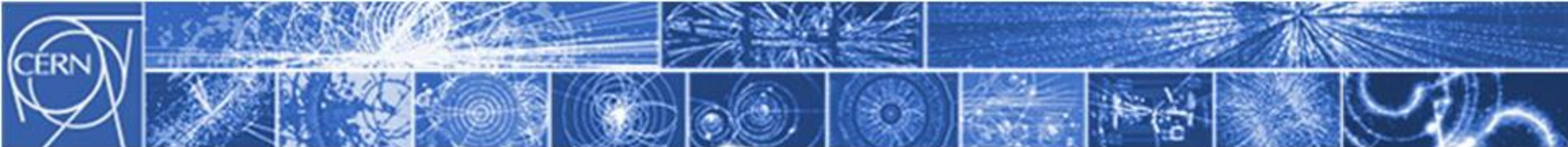
Case study: TSU other clients request

Sequence of events:

- 1) TSU detects a client request (not BIS)
- 2) TSU sends LBDS trigger
- 3) SCSS detects TSU not ready
(min 50ms delay)
- 4) SCSS opens LBDS BIS loops
(Dumped event is sent)



Sequence is BAD:
BIS opened >50ms after
LBDS trigger !!!



Problems: Who is first BIS client ?

The LBDS opening BIS late, other BIS clients can open BIS earlier.

Example: Dump of beam 1, 25.05.2011 02:43:02

BRF goes off and losses detected during dump

Sequence of events:

- 1) BRF goes off at point 6
- 2) TSU detects loss of BRF
- 3) **TSU sends LBDS trigger**
- 4) Beam dumped with some losses
- 5) BLM opens BIS
(**Dumped event is sent**)
- 6) SCSS detects TSU not ready (**min 50ms delay**)
- 7) SCSS opens LBDS BIS loops

Trace in LHC logbook:

Global Post Mortem Event

Event Timestamp: 25/05/11 02:43:02.838

Fill Number: 1805

Accelerator / beam mode: PROTON PHYSICS / STABLE BEAMS

Energy: 3500160 [GeV]

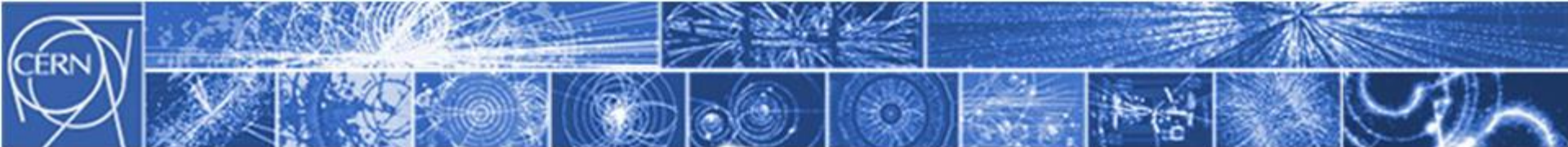
Intensity B1/B2: 11019 / 11044 [e¹⁰ charges]

Event Category / Classification: PROTECTION_DUMP /
MULTIPLE_SYSTEM_DUMP

First BIC input Triggered: First USR_PERMIT change:

Ch 11-BLM_MS K: A T -> F on CIB.UA63.L6.B2

Result: BLM appears as first client instead of LBDS !



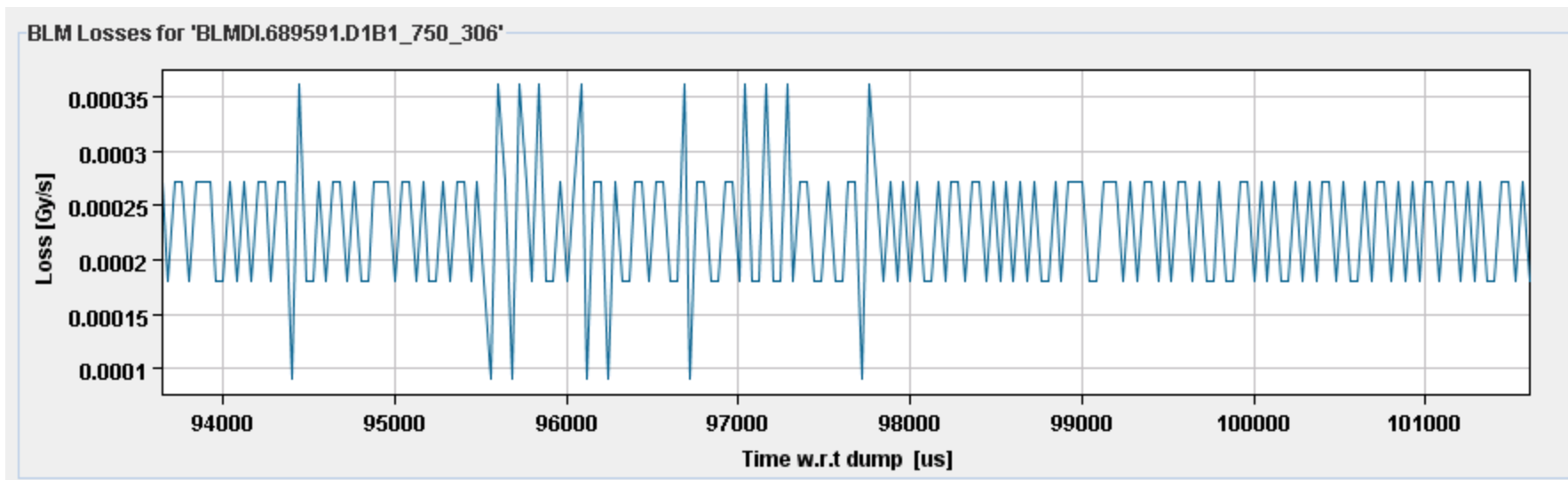
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Problems: Beam dumped event is late

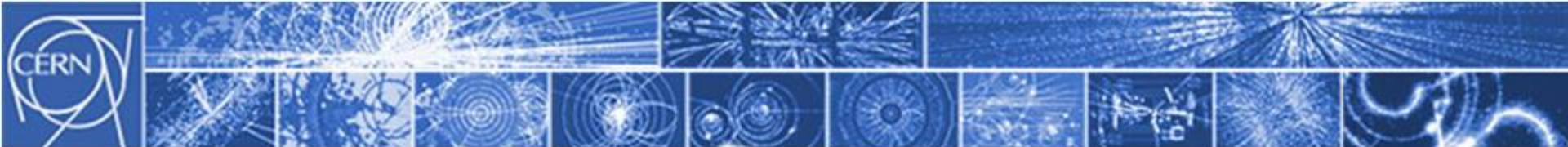
The LBDS BIS opening late, the **Beam dumped event** is sent late.
This is a problem for some LHC control equipments that react on this event.

Example: Dump of beam 1, 07.05.2011 - 14:00:57

BLM post operation buffers for XPOC system



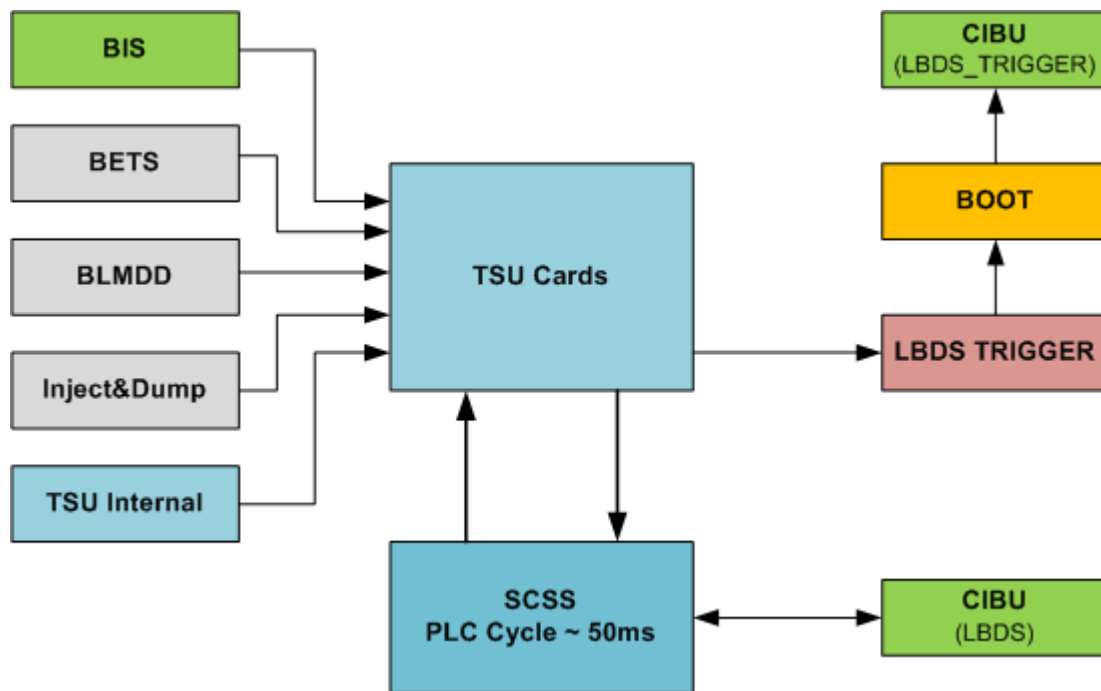
Result: BLM buffers contain data acquired *~100ms* after dump !
XPOC system failed on BLM timestamp error .



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Proposed solution

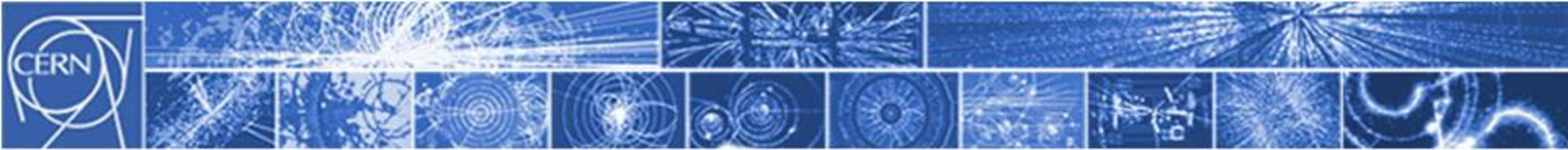
To open the LBDS BIS earlier after LBDS trigger:



Add CIBU crates for new
“LBDS_TRIGGER” client

Add “BOOT” crates.
(BIS Opening On Trigger)

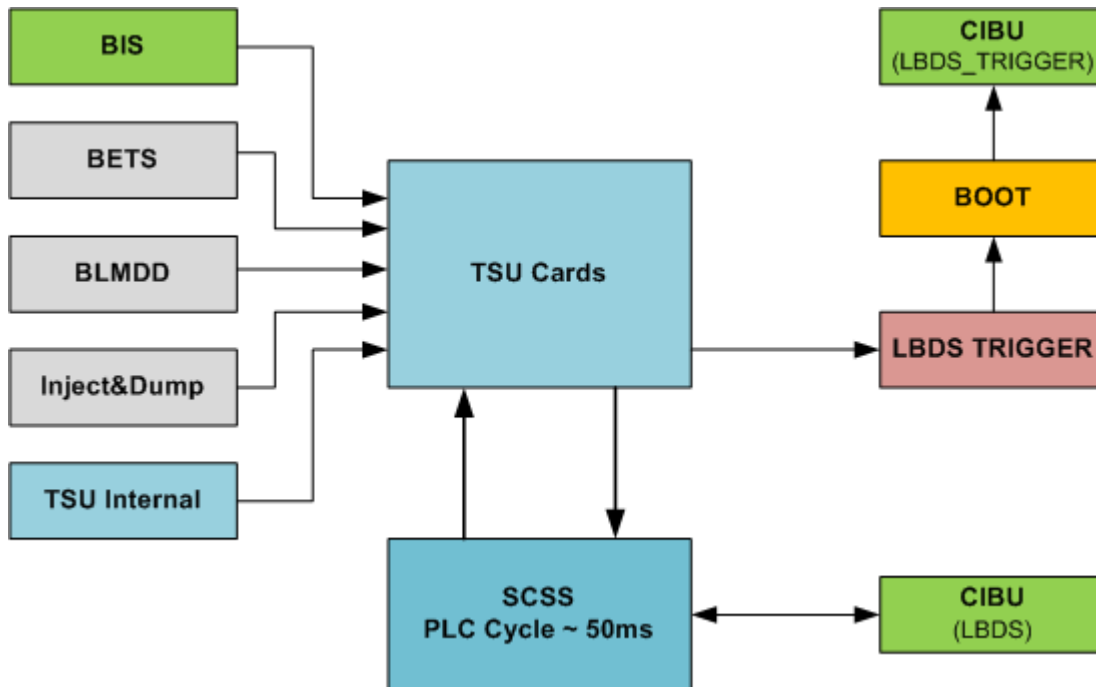
The BIS is opened after each LBDS trigger for a short duration (min 200ms).
This gives enough time to SCSS to react and open the LBDS BIS loops.



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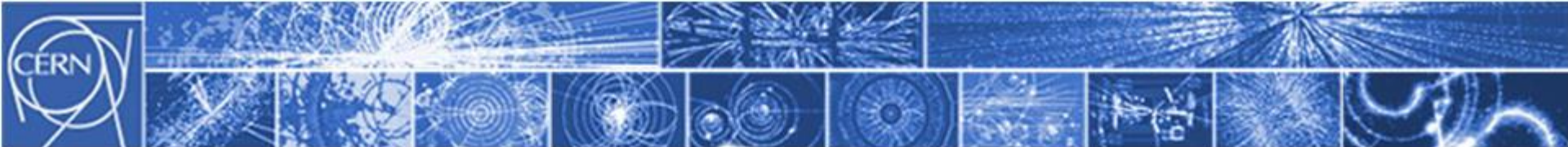
Case study: TSU client request (new)

Sequence of events:



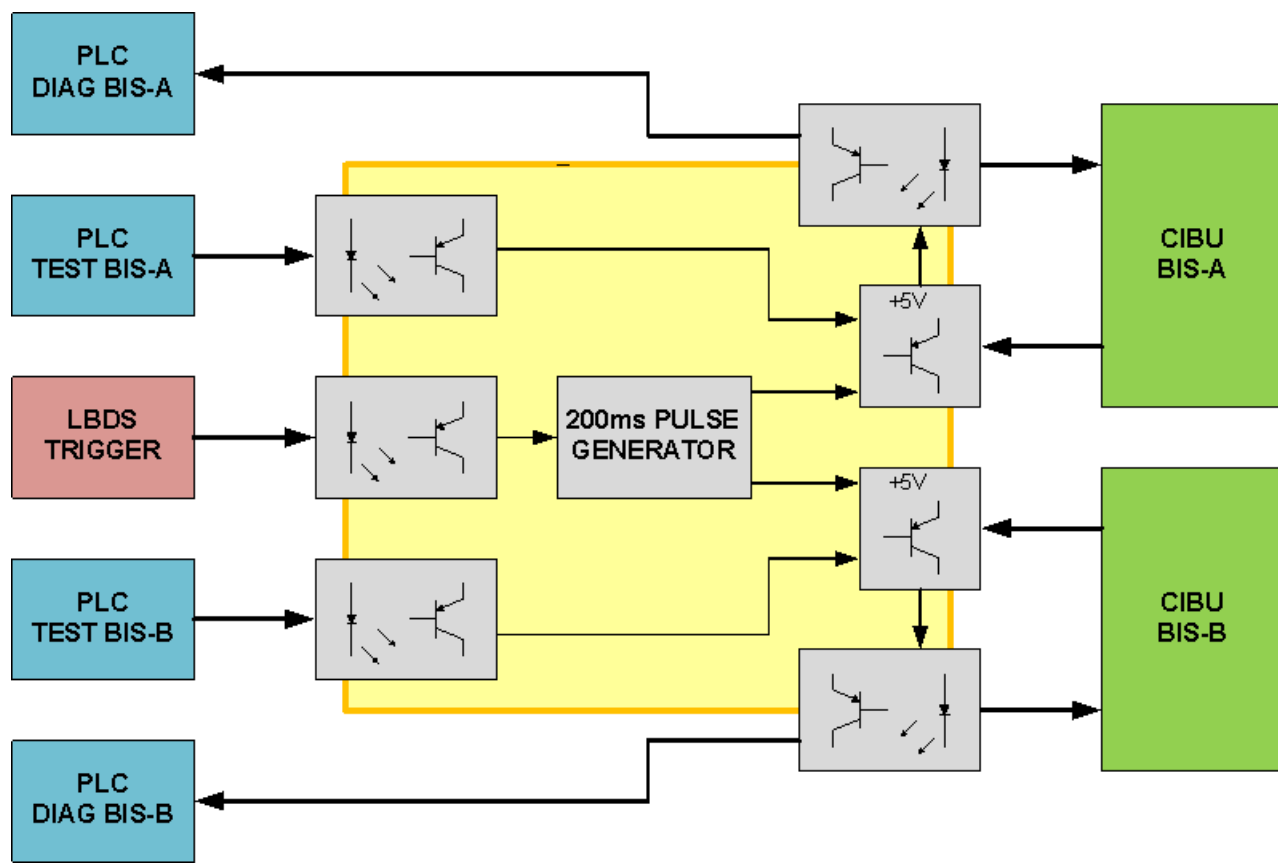
- 1) TSU detects a client request
- 2) TSU sends LBDS trigger
- 3) BOOT detects LBDS trigger
- 4) BOOT opens *LBDS_TRIGGER* BIS
- 5) (Dumped event is sent)
- 6) SCSS detects TSU not ready (min 50ms delay)
- 7) SCSS opens *LBDS* BIS
- 8) BOOT closes back *LBDS_TRIGGER* BIS (min 150ms delay)

Sequence is OK



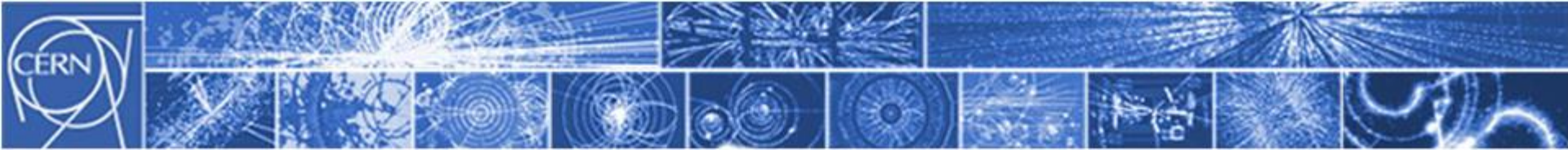
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BOOT card: Block diagram



Features:

- Input for LBDS trigger (with opto-coupler)
- Pulse generator
- Connection to CIBU (**without** opto-coupler: we must provide the current to CIBU input)
- Input/output for SCSS to check BIS loops (with opto-coupler)



Realisation: How long is needed ?

Before TS:

- EC:

- Design/prototype of BOOT card: ~1 week
- Production of min. 3 cards: ~2 weeks (?)
- Tests and Validation in LAB: ~2 days

- BIS:

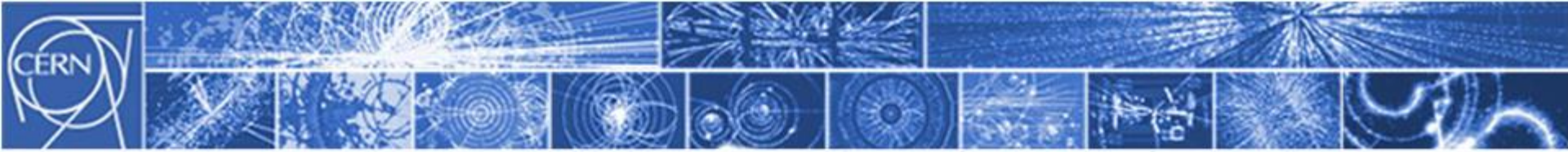
- Review schematics of BOOT card
- Prepare two new CIBU

During TS:

- EC/BIS:

- Install two CIBU and BOOT systems in LHC: 1 day
- Commissioning of new BIS connection: 1 day

More than 3 week needed (optimistic...)



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Conclusion

This problem is **not a safety issue** for LHC.

...But it generates **post operation diagnosis problems** and add some **confusion** in the understanding of beam dump event history.

=> We should find a solution ASAP

Questions:

Is the proposed solution satisfactory ?

If yes, is it reasonable to plan this for next TS (20.06.2011 – 22.06.2011) ?