# CMS Trigger Upgrade Synchronization and Link Board (SLB)

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# SLB – what is ?

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## SLB

*Cette page d'homonymie répertorie les différents sujets et articles partageant un même nom.*

**SLB** est un sigle de trois lettres qui signifie :

- *Îles Salomon*
  - selon la norme ISO 3166-1 alpha-3 (liste des codes pays) ;
  - selon la liste des codes pays utilisés par l'OTAN, alpha-3 ;
- *Sindikad Labourerien Breizh*, un syndicat breton.
- Server Load Balancing, système informatique répartiteur de charge.
- *Sport Lisboa e Benfica*, club de football de Lisbonne.
- *Schlumberger*, SLB est le libellé de l'indice boursier de *Schlumberger*.
- *Synchronization and Link Board* , a mezzanine for alignment of trigger primitives of Calorimeter Trigger of the CMS experiment (CERN, LHC)

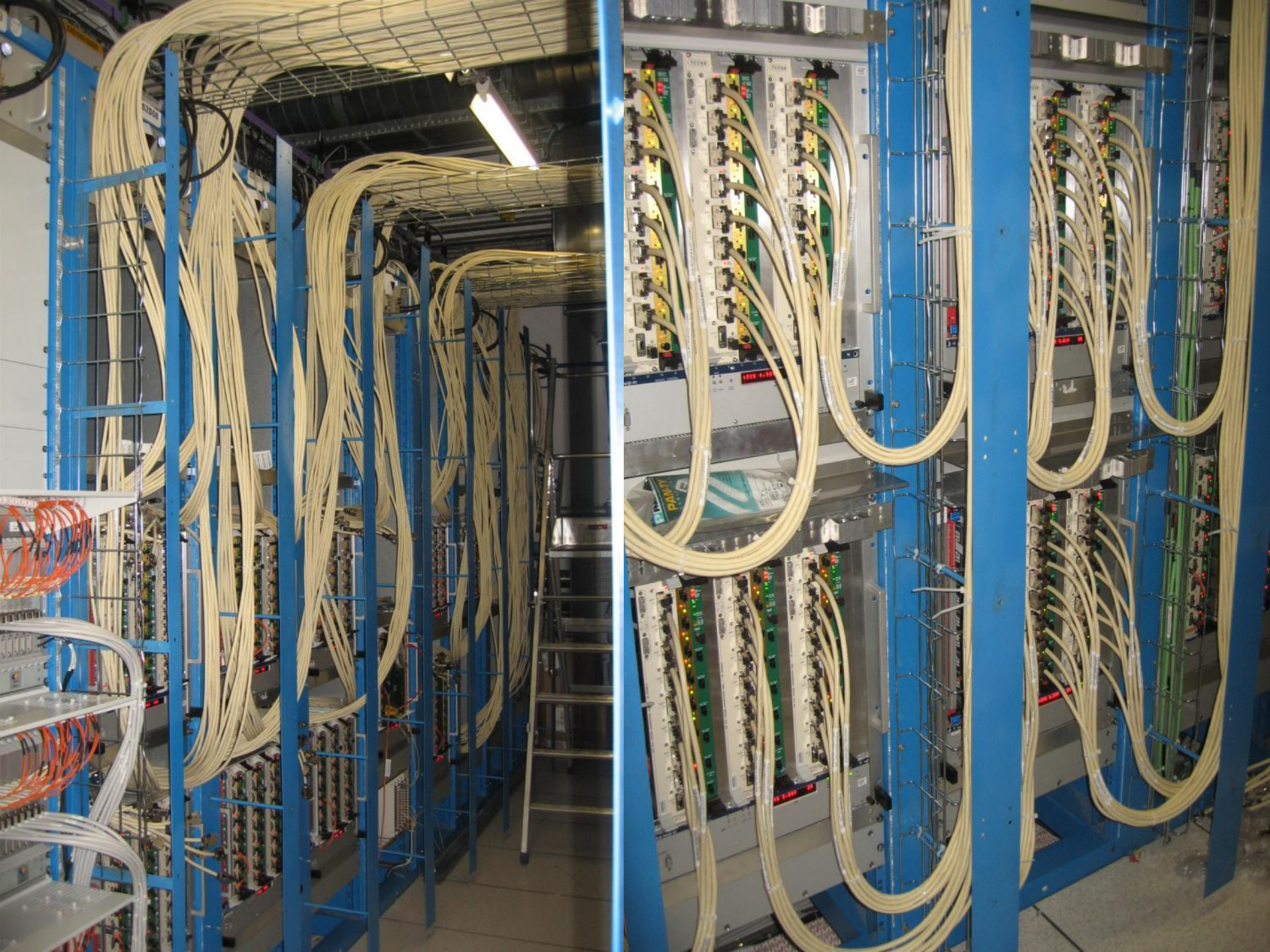
Catégories : Homonymie | Sigle de 3 caractères

# SLB – Functional Description

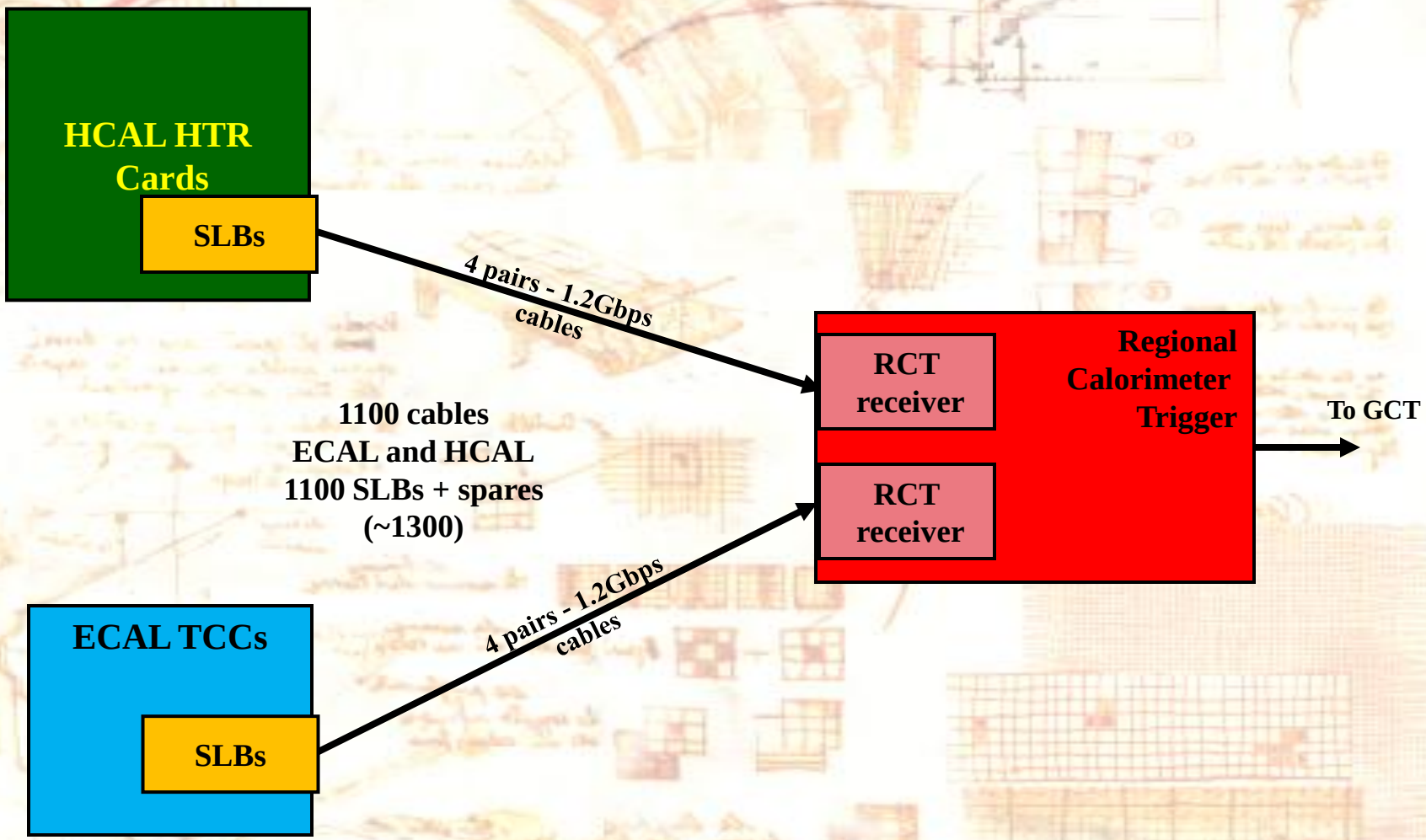
- Receives 9 bit data @ 40 MHz / TT
- Each SLB houses 8 TT
- Align Trigger Data using the LHC Orbit bunch structure to determine the BX position using internal histograms
- FIFO stage to compensate fiber length differences, deserialisers lock delays and to guarantee the alignment of data sent to the RT from both ECAL and HCAL.
- 2 TT data merging + Hamming code prior to send it over the high speed link
- 4 High speed links (1.2Gb/s each)


**Produced: 1300**

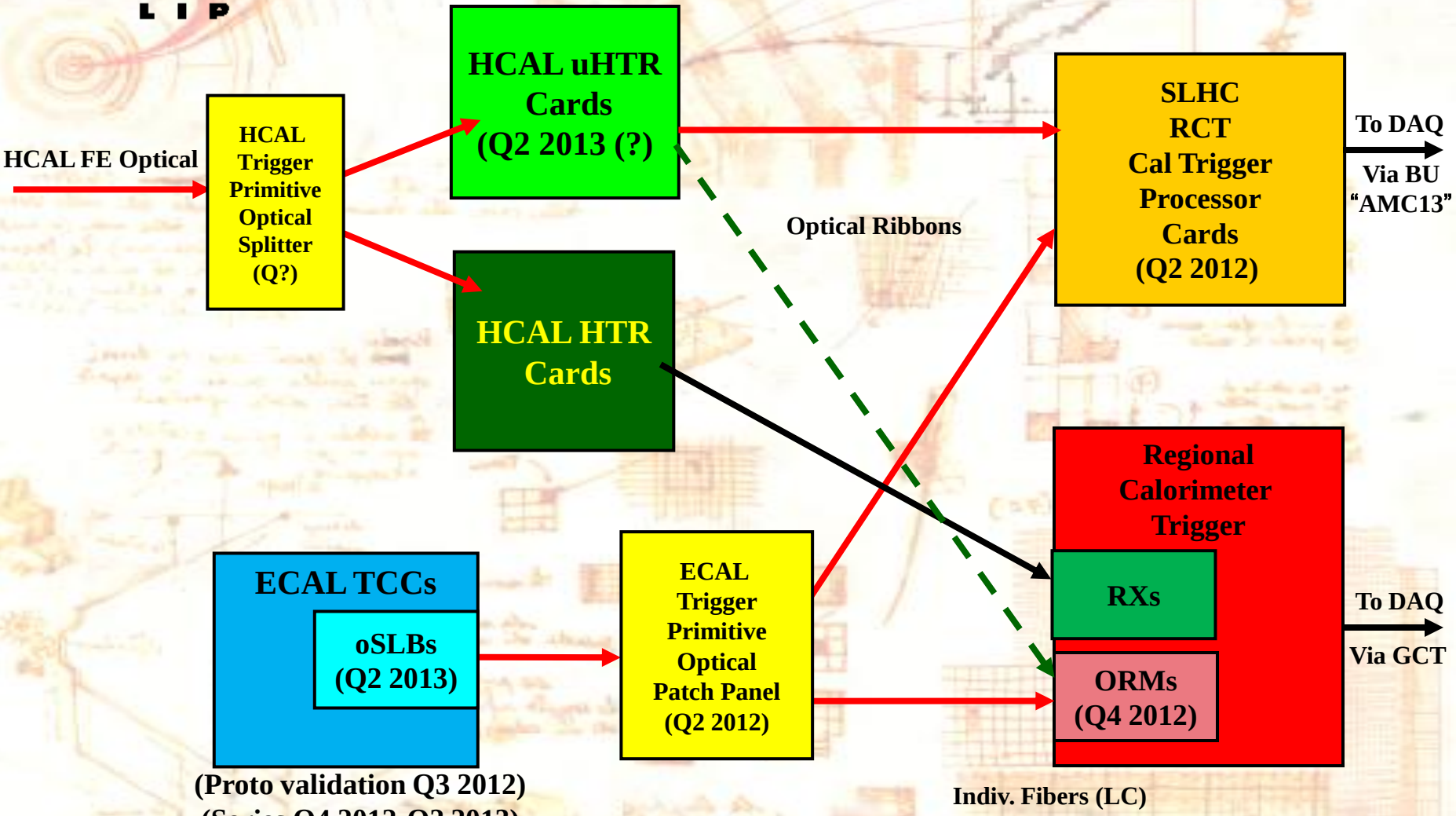
**In use :~1110**



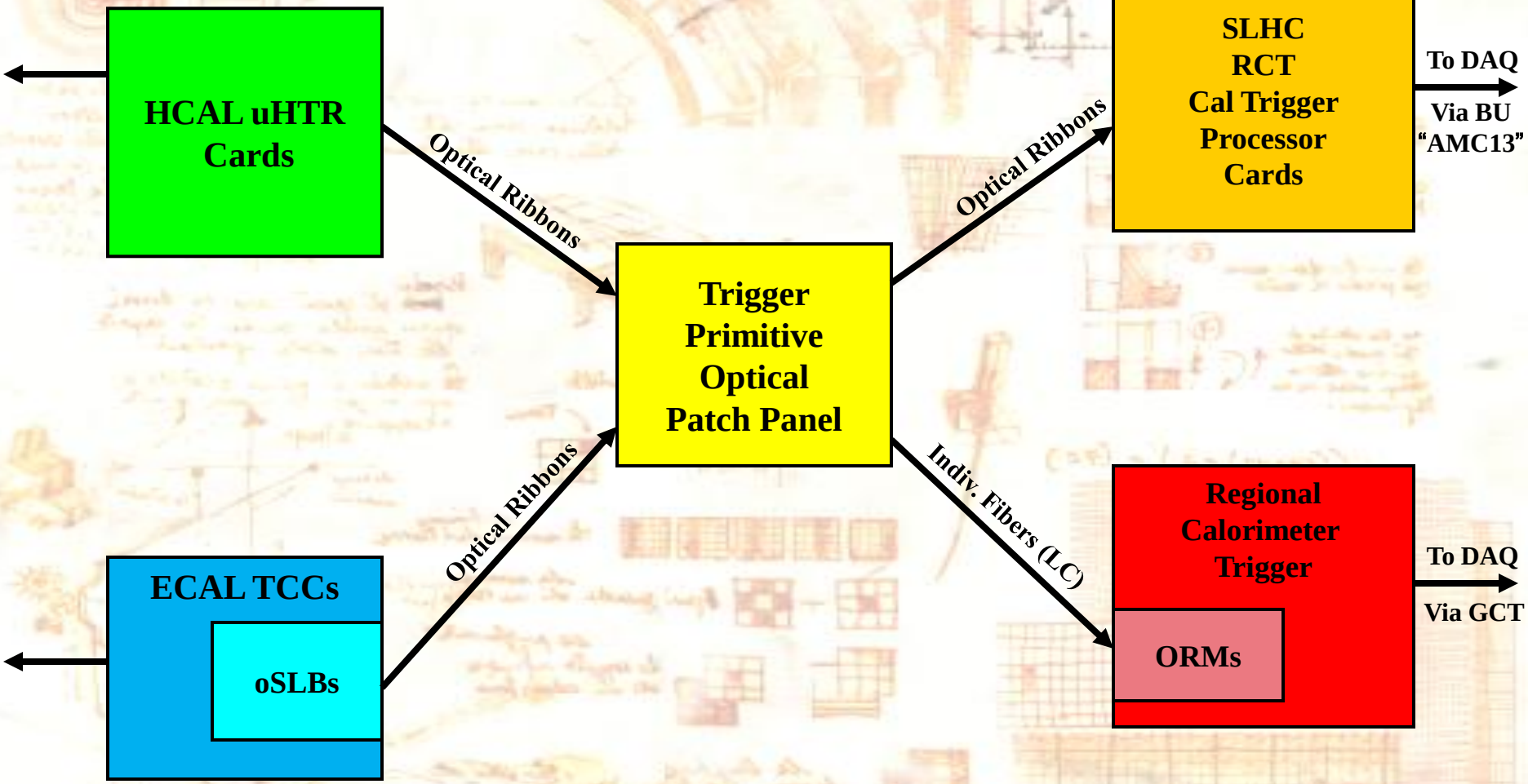
# Present TPG path



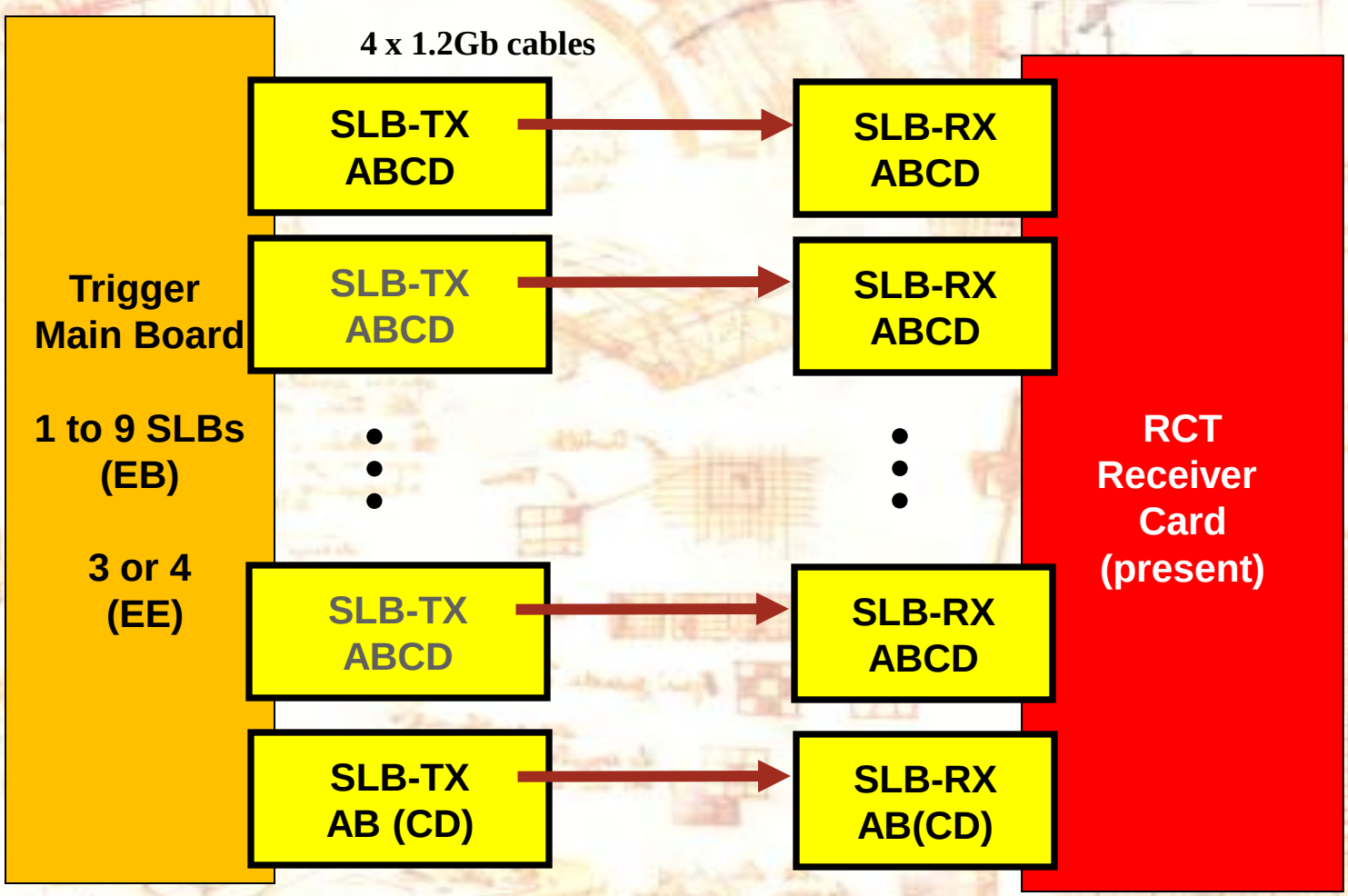
# Upgrade step 1



# TPG High speed links overview

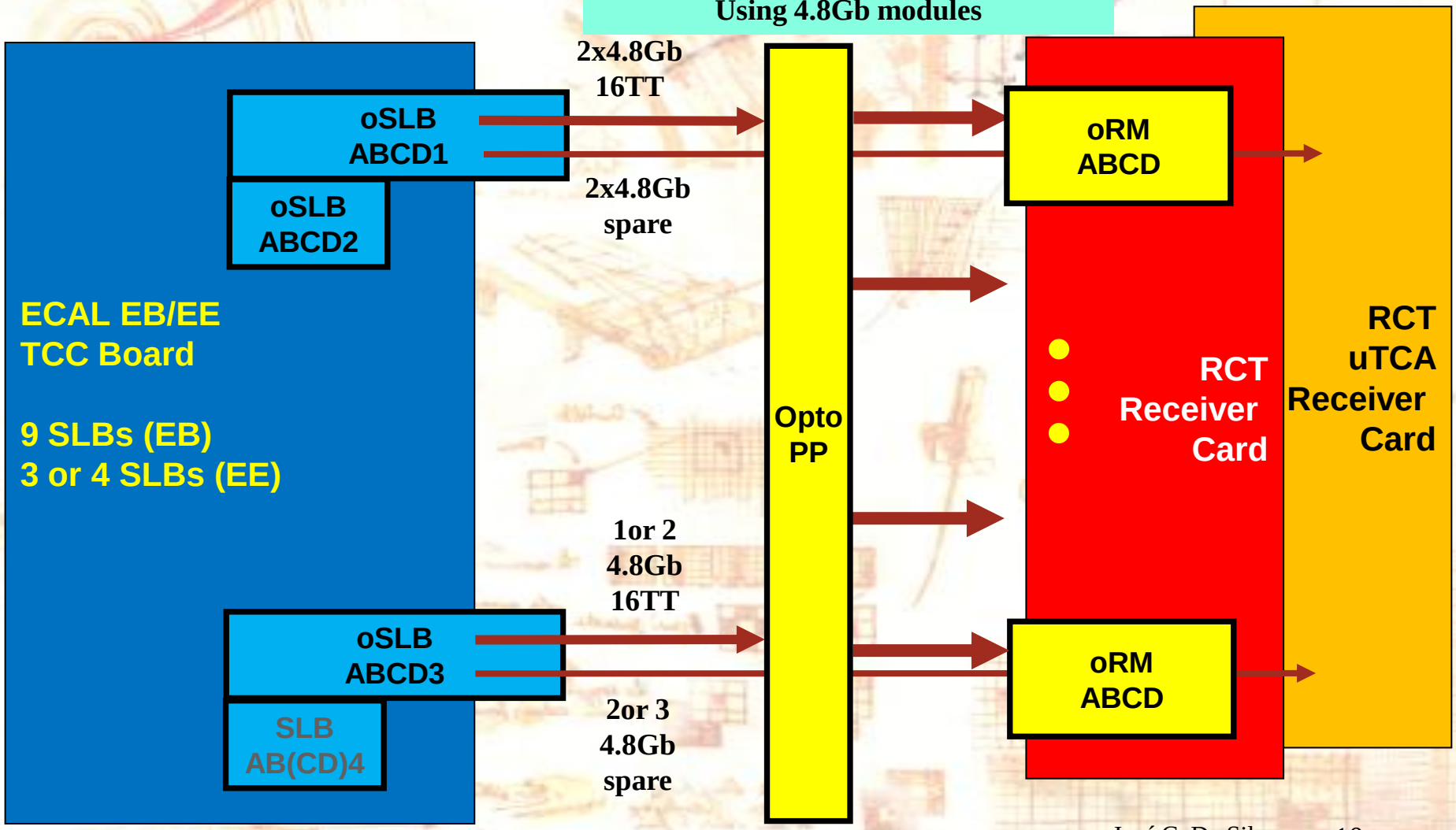


# SLB Basic Connection



# "Adopted" oSLB solution for ECAL

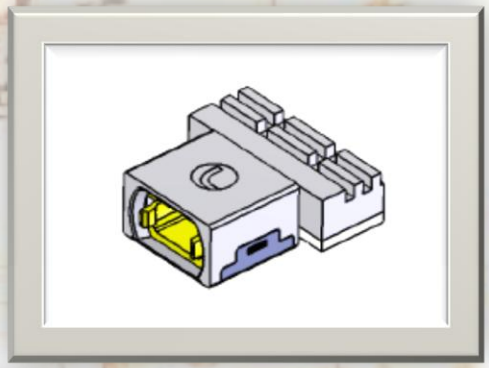
**Replace 2 SLBs by one "2slot" oSLB**
**Using 4.8Gb modules**

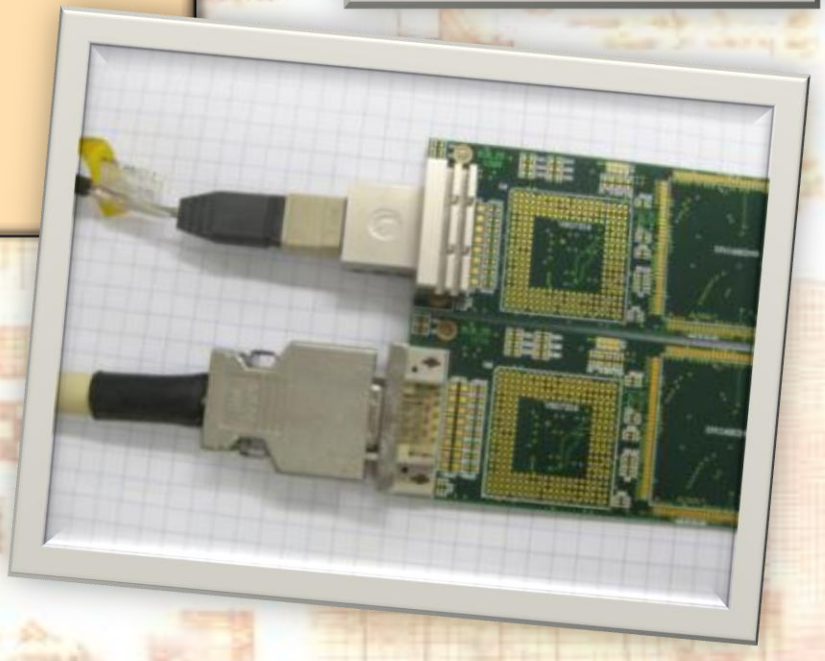


# oSLB "hot points"

- Xloom optical solution under study:
  - 4 TX - 4RX (up to 5Gbps) 500 EURO/Piece
- Pro's:
  - mechanics, number of channels (4 tx/rx @ 5gbps)
  - Israeli-CERN fund for (partial) payment || END||
    - Open window to study TX or RX versions
- Con's:
  - Small company issues
  - Still poor input on these devices (ongoing)

- Xloom devices production received(4 units)
- BER measurement tests to be done





# oSLB "hot points"

- Fujitsu "microgiga" optical solution under study:
  - 4 TX - 4RX (up to 5Gbps) 255 EURO/Piece (!)
- Pro's:
  - Price
  - mechanics, number of channels (4 tx/rx @ 5gbps)
  - Optical Module External to the oSLB
  - Fujitsu "company name" (2000 units sold)
- Con's:
  - Infiniband connector dimensions
  - Modification on front panels mechanics of TCCs

- Fujitsu components ordered (4 units)
- BER measurement tests to be done

**IMPORTANT :**

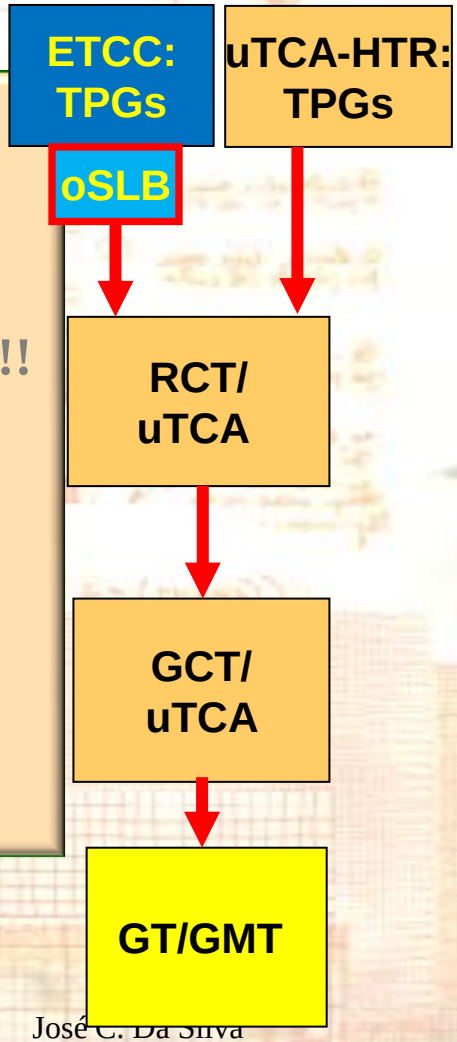
- Both solutions have the same Footprint on the SLBs

# Production count :

- produce ONLY the final count (ECAL) of oSLBs + spares
  - 1 to 1 = 324 EB, 252 EE (576)
  - 2 or 1 = 180 EB , 180 EE (360) = ~200 Links gain!!
  - 3 or 2 = 108 EB (3), 144(2) EE (252) = ~320 Links gain!!
    - (~500-700 euros savings per oSLB)

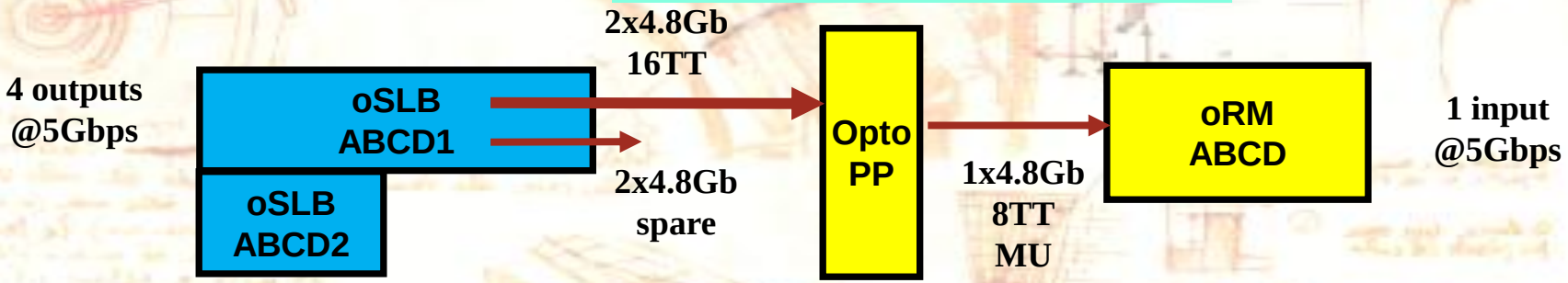
- Cost effective!
  - ~200Euro/ oSLB + 250 EUR/microgiga adaptor
    - Cost estimate:~ 450 Euro / oSLB/optics
    - + 90K USD for optical bundles and adaptors

  - production covers the ECAL final needs (400Pcs)



# Optical PP connections

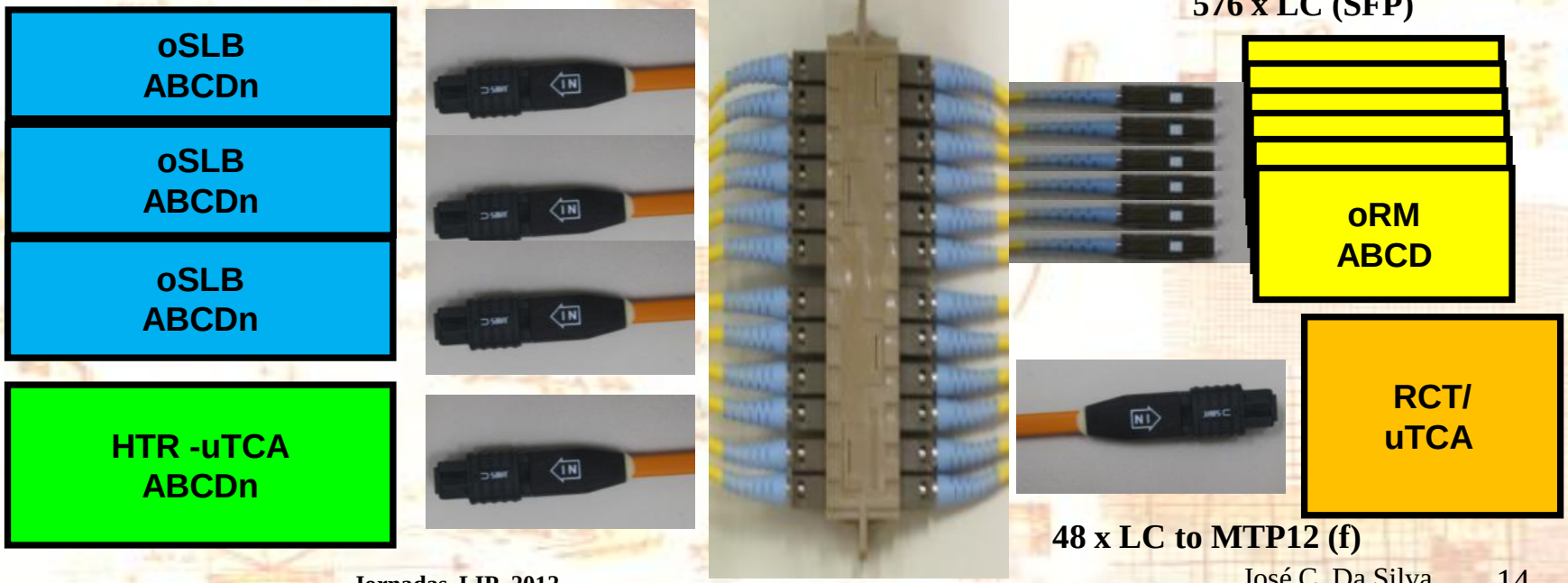
**Replace 2 SLBs by one 2slots oSLB**
**Using 4.8Gb modules**




**324 x MTP4 female to LC**

**96 blocks of 12 LC-LC**

**576 x LC (SFP)**

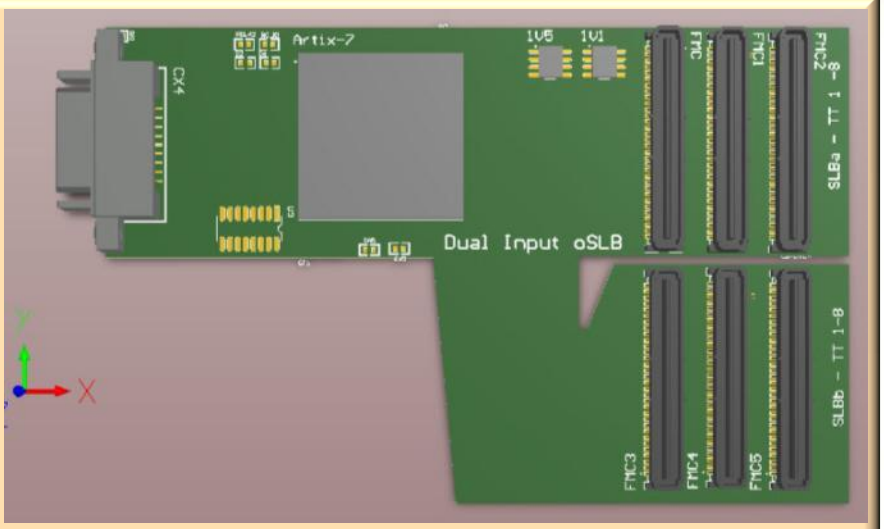



**48 x LC to MTP12 (f)**

# oSLB proto design

- "Dual input" SLB Layout

- Use latest FPGA technology : Kintex
  - 400x XC7K160T-1FBG676C @160$
  - 400x XC7K70T-1FBG676C @100$
  - 3v3 Compatible with present design
  - Reduced impact on design
  - *Reduced the cost by 100 USD*
    Kintex 7 FPGA)




- **Kintex7 Available in August 2012**

  - Rev A Prototype validation up to August 2012 (10 units)
    - Can use a larger but same footprint FPGA for the proto oSLB validation
    -
    - SLB TEST bench installation in 904 (started)
    - Optical test bench using also ML605 (Xilinx Dev Kit)

# •Production Planning:

- •Finish oSLB prototype Aug. 2012
  - •Wisconsin starts design/production of oRMs
- •Validation of Prototype oSLB & ORM complete by end of 2012.
- •Funding required for oSLB & ORM production by Jan. 2013, production starts.
  - •No money….all slips down the hill!!!
- •Production of oSLB & ORM complete by June 2013
  - •Production testing of first oSLB & ORM production units starts June 2013
    - •Fiber Plant installed by July/August 2013 (purchase in January 2013)!!
  - •ECAL TCC & RCT RC Front Panel Modifications complete by July 2013
- •Installation of oSLBs & ORMs starts July 2013
  - •Production testing of oSLB & ORM done by September 2013
    - •Installation finished by end of.
      - •System commissioned by May 2014.

# OBRIGADO

## Other SLBs:



SOUNDS LIKE BRISBANE