

DT AMC13 requirement

Goal: send triggers from TwinMux to DT TCDS system through the AMC-13

- ❖ We need to use the AMC13 european T3 (TCDS_CPMT3 board) (https://edms.cern.ch/file/1395177/1/EDA-02857-V3-0_sch.pdf) outputs to send a trigger signal that will be connected to the LPM trigger input LEMO. This trigger signal is called technical trigger in what follows.
- ❖ The technical trigger is a TTL signal that provides a 25 ns width positive logic one when active. It will output through the LM1 LEMO connector in the TCDS_CPMT3 schematics.
- ❖ LM1 output will be the logic OR of the following signals:
$$\text{LM1} = \text{TRG0} \text{ OR } \text{TRG1} \text{ OR } \text{TRGTWM}$$

Where:

- ❖ TRG0: is the trigger signal received from the LM4 input. It should be delayed a programmable amount of Bunch Crossings (BXs, LHCclock period).
 - ❖ TRG1: is the trigger signal received from the LM3 input. It should be delayed a programmable amount of Bunch Crossings (BXs, LHCclock period).
 - ❖ TRGTWM: is the trigger signal generated from the trigger signals of each of the TwinMux boards in the uTCA crate. The TwinMux board is the DT AMCs, we will have up to 12 TwinMux per crate. TRGTWM should also be delayed by a programmable amount of BXs.
-
- ❖ The link between TwinMux and AMC-13, established through P3, will stay normally at low level and as soon as a trigger will be generated by the TwinMux it will go to high level for 25 ns. More consecutive triggers are allowed.
 - ❖ Both in TwinMux and AMC-13, P3 port is route on Standard IO pins. AMC-13 shall receive the triggers from the 12 TwinMuxs and apply the needed logic for generating the TRGTWM signal.
 - ❖ This logic will correspond to a LUT of 12 inputs (corresponding to each of the TwinMux) and 1 output (TRGTWM).
 - ❖ It should be possible to program this LUT as well as the TRG0 and TRGTWM delays through the IPBUS interface.

Fig.1 shows the level of LM1 output of T3 in case in the LUT is implemented a combinatorial logic function that requires the concurrent trigger of two or

more TwinMuxs. In the example the output goes high at BX 4 in which TwinMuxes in slots 4 and 7 fire.

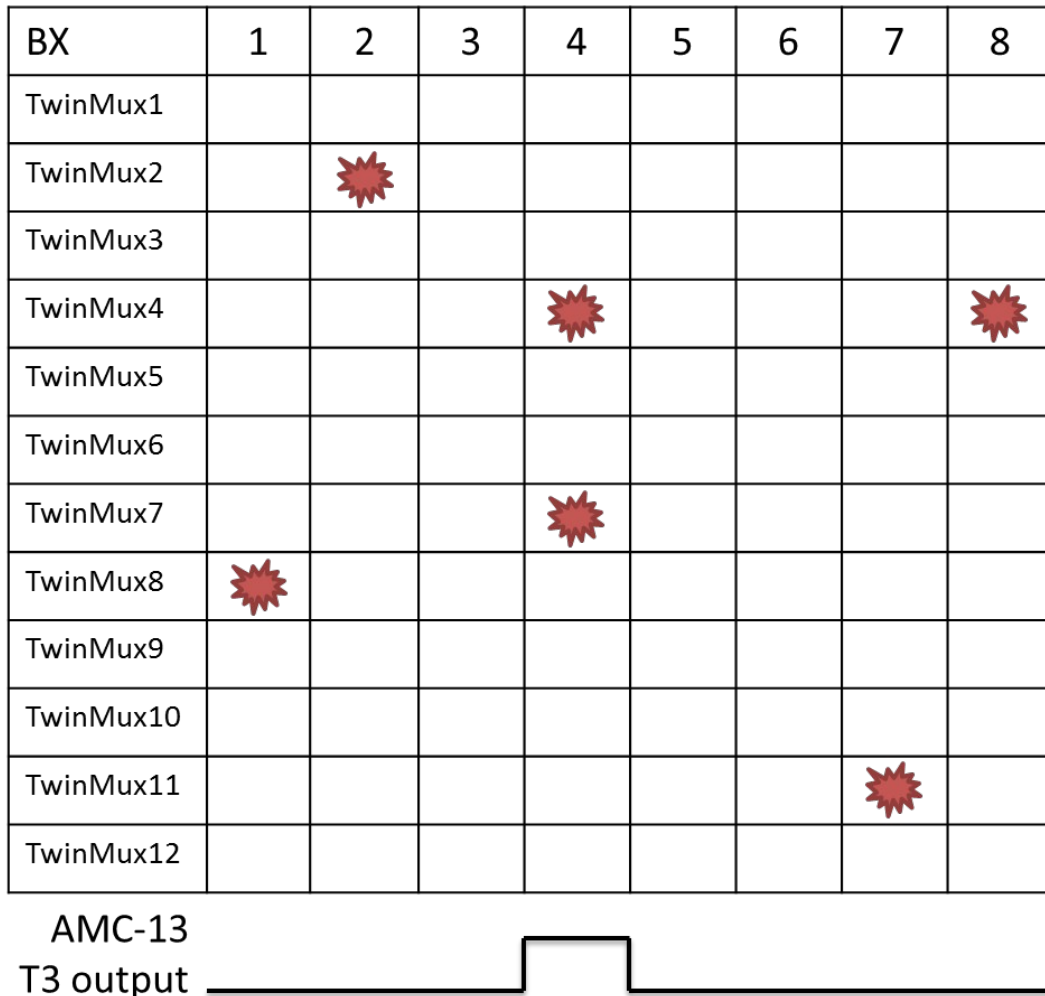


Fig. 1

The LUT implementing such combinatorial function can be represented by the 4096 (2^{12}) bit vector. The file

<https://espace2013.cern.ch/CMS-TM7/Document%20Repository/TT.txt>

contains the vector associated with the LUT of the running example. The first column is the vector index (from 0 to 4095), the second is again the vector index but in binary format and the last column is the actual value of the vector at the given index. Therefore the update of the LUT should be done changing a total of $4096/32=128$ IPBus registers.