Summary of ALCOR test in Torino + SEU insights

02.04.2024

new production ALCOR test - summary

- 23 boards tested (B31-B54)
- 6 faulty boards (of which 5 have already chip replaced) to be tested again
  - 3 had shorts on one chip (2 analog , 1 digital)
  - 1 had shorts on both chips (1 analog 1 digital)
  - 1 has one chip not aligning (I_dig low)
  - 1 glitch reset at room temperature on one chip
- test in climatic chamber:
  - overall good stability until negative temperatures
  - for each board we kept track at which temperature we were getting glitch reset (mostly in -15 C → -20 C)
  - in general we had all boards with glitch reset at -20 C (but sometimes one of the chips was immune to this effect)

- next step: re-test the 5(+1) board with replaced chips

TEST :
- TDC scan
- thr scan (2 polarities * 2 gains)
- temperatures from 25 C -> -20 C

SEU "analysis"

Comments:

- bit transitions are dominated by '1→0' for all kind of registers
- the number of bit flips is 1, we had only 1 case on BCR where the word had 2 bits transition (BCR 6 0x3d →0x4039)

- # SEU:
  - 28 ECCR
  - 43 BCR (of which 1 is double)
  - 31 PCR (=/= 24, value from Pietro slide)
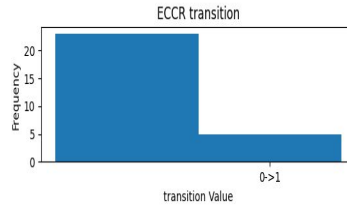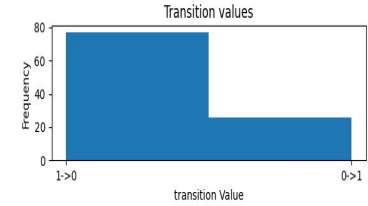- Using numbers from Pietro slides, with this new value for PCR we get
  - XS = 3.26e-15 cm2/bit (old: 2.5)
  - MTBF = 190 hr (old: 250 hr)

To-Do: study bit flips to reset value (with this data and with improved settings in next SEU test)
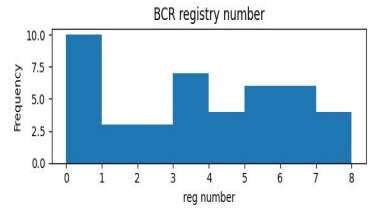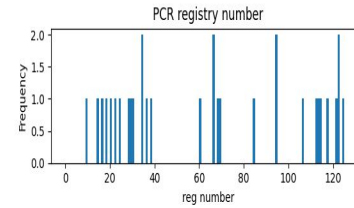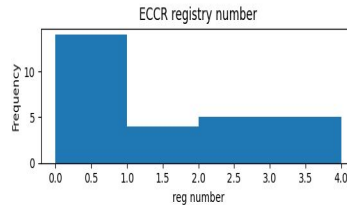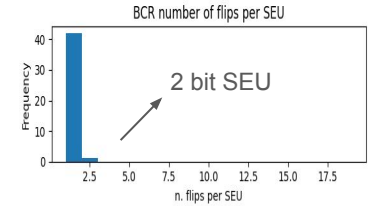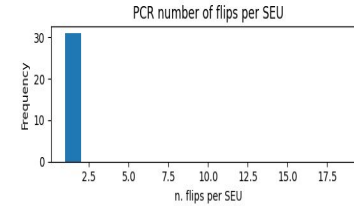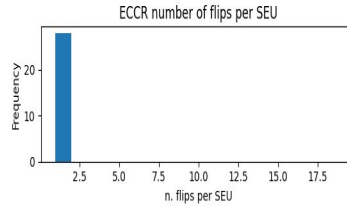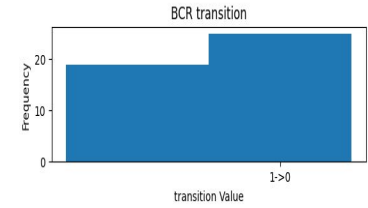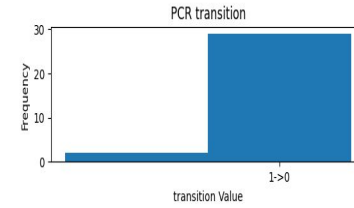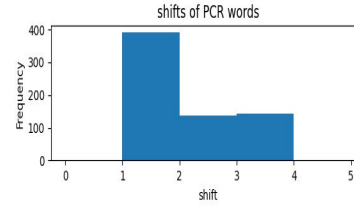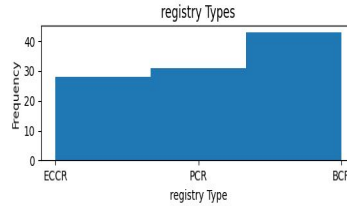
SEU insights - few special cases

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PCR reads same value on 16 registries
15/12/2023-21:02:10 !-SEU! detected PCR112 REF: 0x7777 FOUND: 0x200
15/12/2023-21:02:10 !-SEU! detected PCR113 REF: 0x8888 FOUND: 0x200
15/12/2023-21:02:10 !-SEU! detected PCR114 REF: 0xffff FOUND: 0x200
15/12/2023-21:02:10 !-SEU! detected PCR115 REF: 0x202 FOUND: 0x200
15/12/2023-21:02:10 !-SEU! detected PCR116 REF: 0x7777 FOUND: 0x200
15/12/2023-21:02:10 !-SEU! detected PCR117 REF: 0x8888 FOUND: 0x200
15/12/2023-21:02:10 !-SEU! detected PCR118 REF: 0xffff FOUND: 0x200
15/12/2023-21:02:10 !-SEU! detected PCR119 REF: 0x202 FOUND: 0x200
15/12/2023-21:02:10 !-SEU! detected PCR120 REF: 0x7777 FOUND: 0x200
15/12/2023-21:02:10 !-SEU! detected PCR121 REF: 0x8888 FOUND: 0x200
15/12/2023-21:02:10 !-SEU! detected PCR122 REF: 0xffff FOUND: 0x200
15/12/2023-21:02:10 !-SEU! detected PCR123 REF: 0x202 FOUND: 0x200
15/12/2023-21:02:10 !-SEU! detected PCR124 REF: 0x7777 FOUND: 0x200
15/12/2023-21:02:10 !-SEU! detected PCR125 REF: 0x8888 FOUND: 0x200
15/12/2023-21:02:10 !-SEU! detected PCR126 REF: 0xffff FOUND: 0x200
15/12/2023-21:02:10 !-SEU! detected PCR127 REF: 0x202 FOUND: 0x200
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BCR 5 0xc72c 0x202
BCR 5 0xc72c 0x202
BCR 0 0x3d 0x200
BCR 0 0x3d 0x202
BCR 3 0xc72c 0x202

SPI misalignment

ECCR 1 0xb01b 0x2
ECCR 0 0xb01b 0x2
ECCR 3 0xb01b 0x2

PCR0 transition

PCR1 transition

PCR2 transition

PCR3 transition