



▪ CERN-RD50 CMOS Working Group

– Programme to study and develop monolithic CMOS sensors with

- High granularity
- High radiation tolerance
- LFoundry 150 nm HV-CMOS

– Our programme includes

- ASIC design
- TCAD simulations
- DAQ development
- Performance evaluation

– **Involved resources**

- **>40 people**
- **15 institutes**



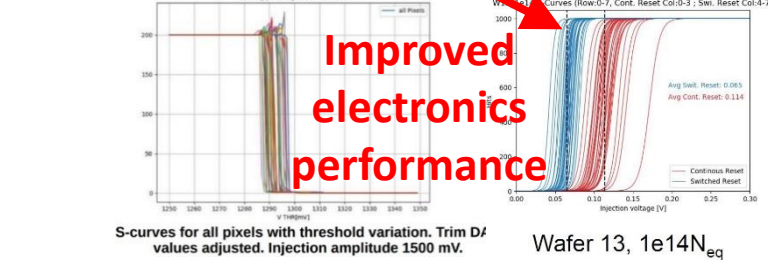
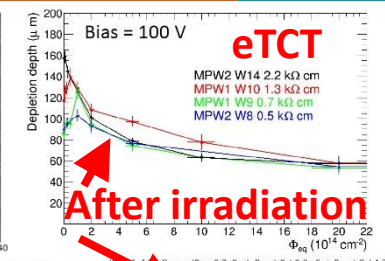
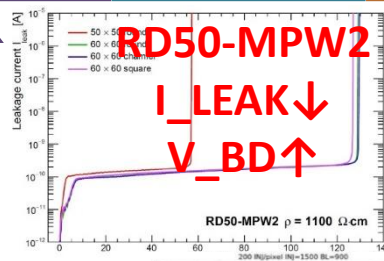
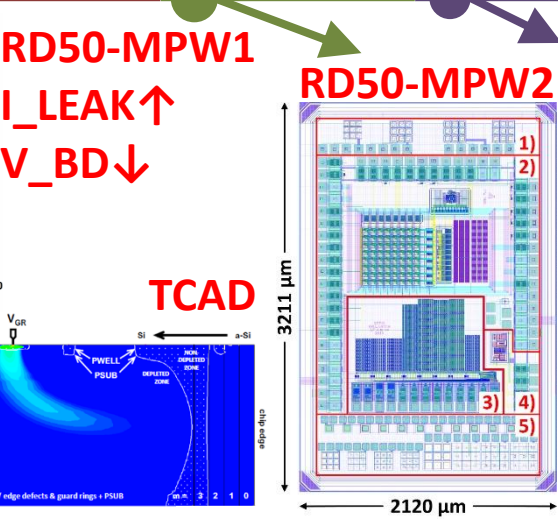
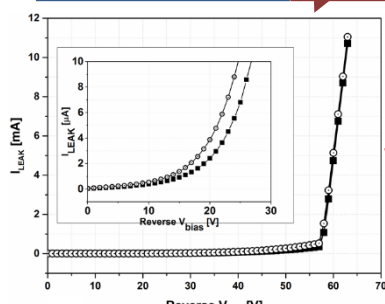
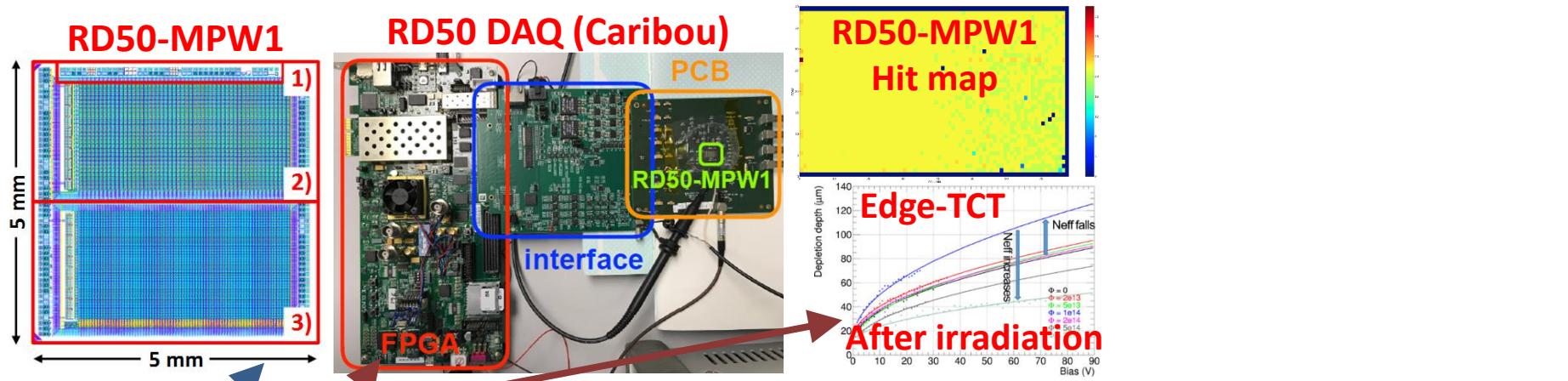


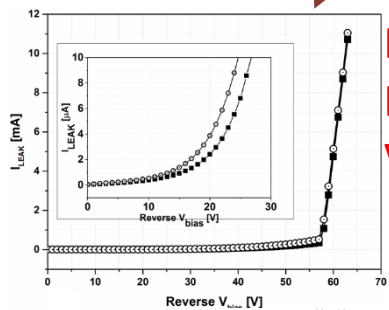
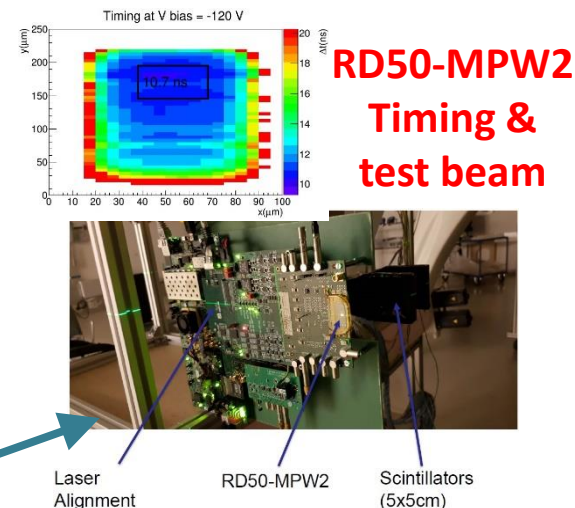
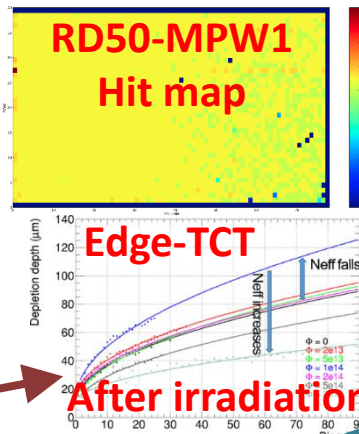
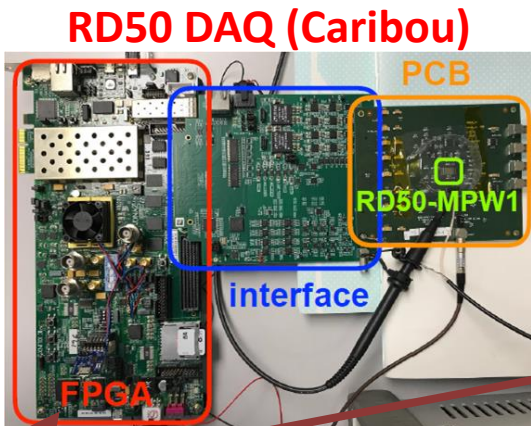
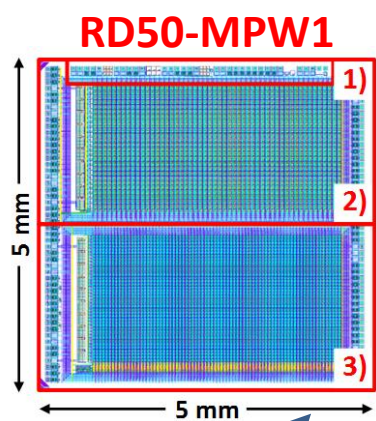
- **Weekly meetings**

- Thursdays @ 11:00 h CERN time

- **e-groups**

- rd50-cmos-general@cern.ch
- rd50-cmos-design@cern.ch
- rd50-cmos-daq-and-testing@cern.ch

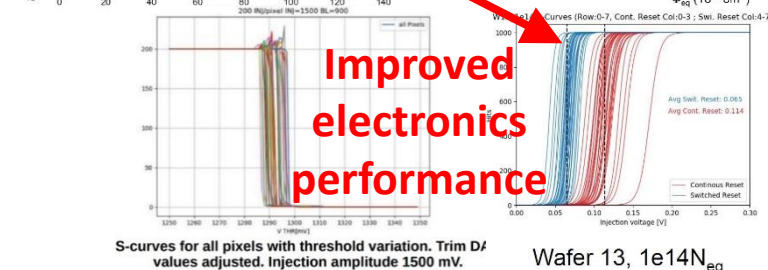
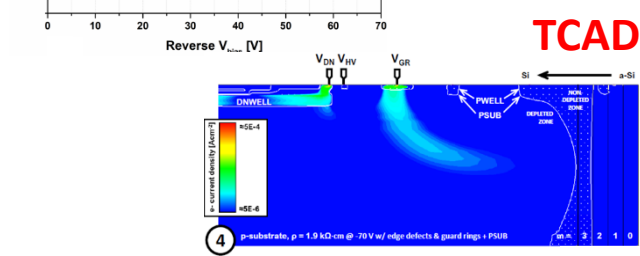
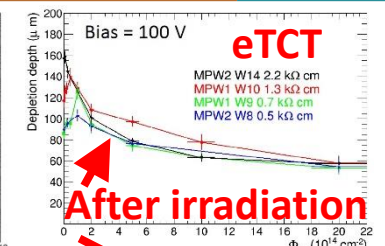
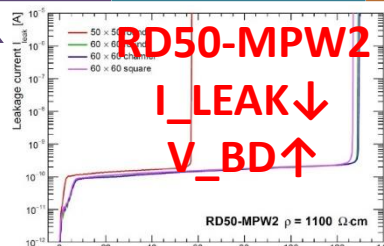


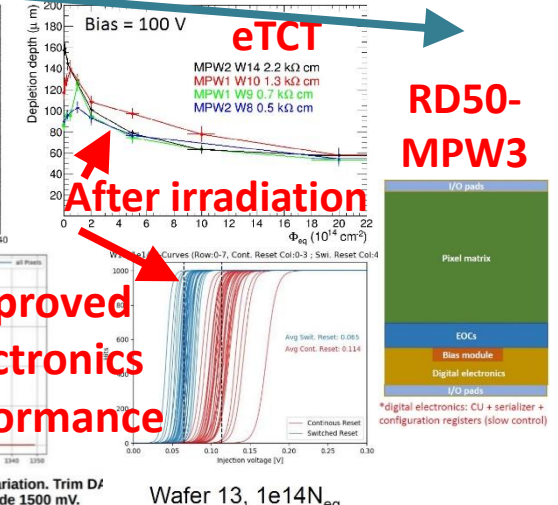
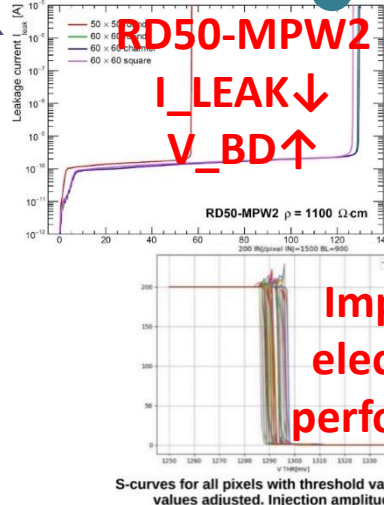
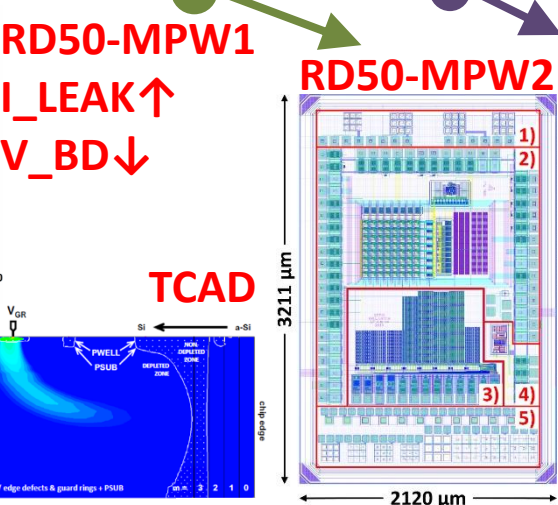
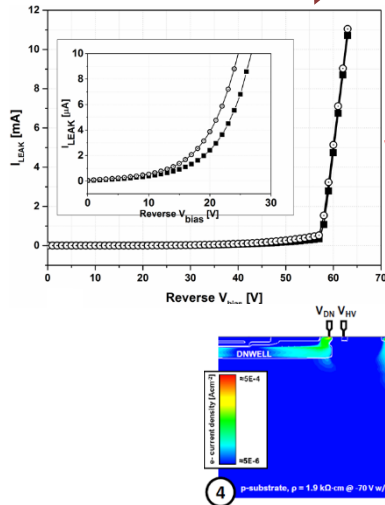
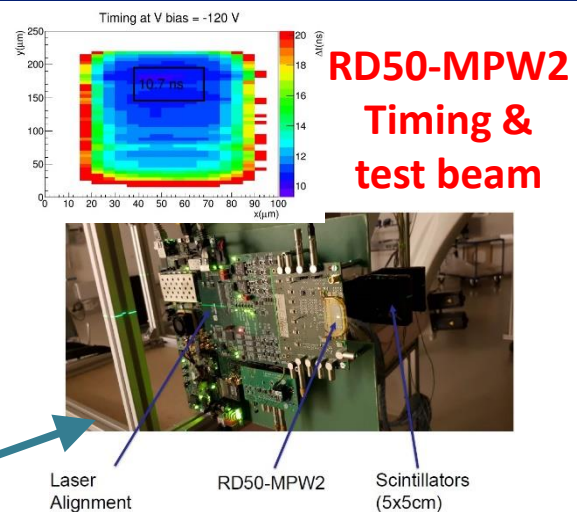
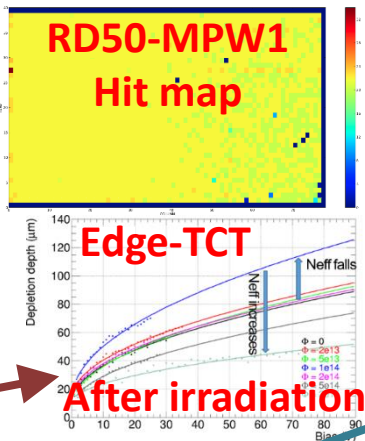
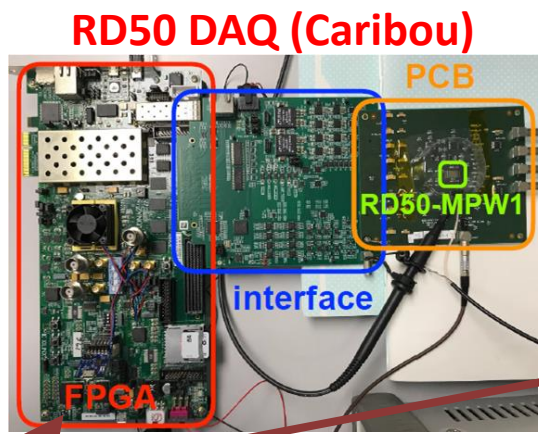
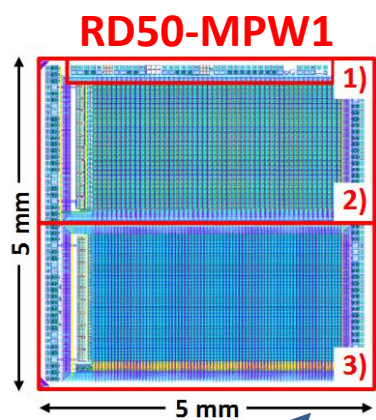


RD50-MPW1

$I_{LEAK} \uparrow$

$V_{BD} \downarrow$







▪ RD50-MPW2

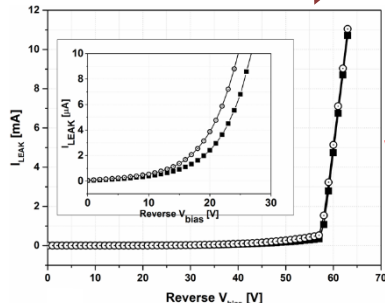
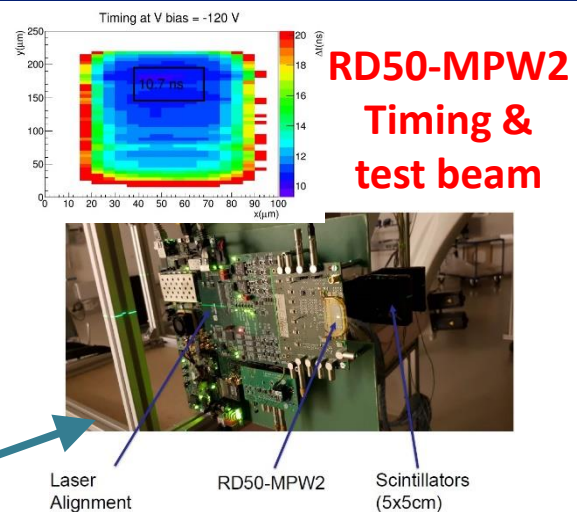
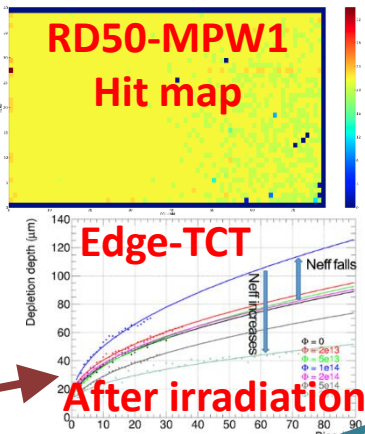
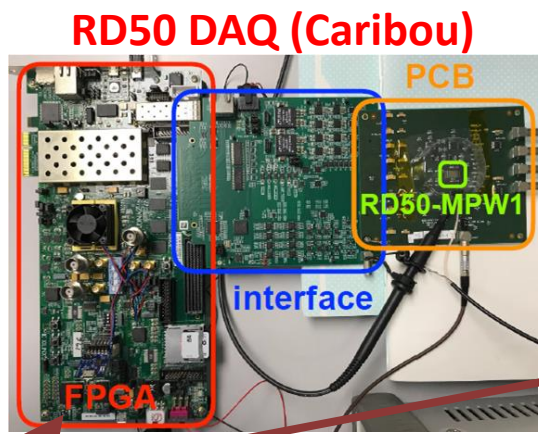
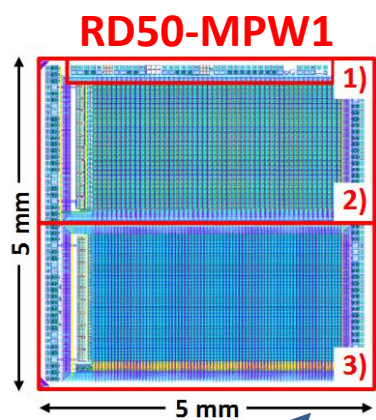
- We have even more results
 - Test beams
 - Accurate time resolution measurements
 - SEE and CCE measurements

▪ RD50-MPW3

- Chip contents
 - Optimised FE-I3 style matrix
 - Perhaps also structures to study new sensor cross-sections and improved time resolution
- Chip size → ~5 mm x 5 mm
- Chip resistivity → A few high resistivities (~several 100 $\Omega\cdot\text{cm}$, ~a few $\text{k}\Omega\cdot\text{cm}$)
- Chip submission → Q4 2021 (non-binding reservation with the foundry)
- Chip evaluation programme
 - Diodes and readout electronics before and after irradiation to high fluence in the lab
 - Peripheral readout electronics
 - Chip characterisation (including irradiated samples?) in test beams



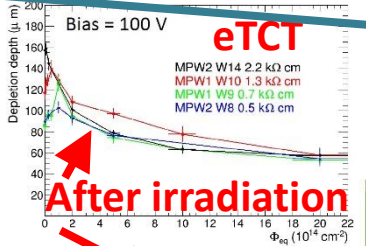
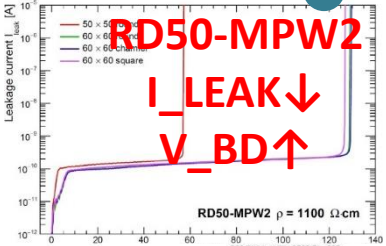
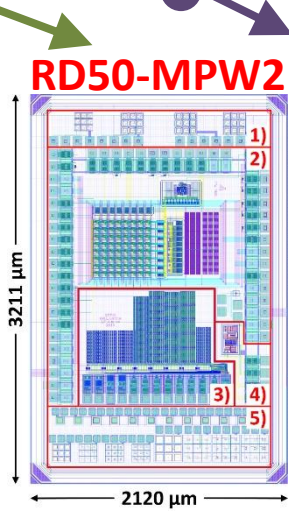
- **RD50 prolongation request – May 2018**
 - **M1:** Characterization of the diodes and readout electronics of unirradiated and irradiated RD50-MPW1 samples (Q4/2018) → **Achieved**
 - **M1.2 (new):** Design and submission of RD50-MPW2 (Q1/2019) → **Achieved**
 - **M1.3 (new):** Characterization of unirradiated and irradiated RD50-MPW2 samples (Q1/2020 → Q2/2021) → **Ongoing**
 - **M1.4 (new):** Design and submission of RD50-MPW3 (Q4/2021) → **Ongoing**
 - **M2:** Design and submission for fabrication of RD50-ENGRUN1 (Q4/2018)
 - **M3:** Characterization of unirradiated and irradiated RD50-ENGRUN1 samples (Q3/2019, Q3/2020)
 - **M4:** Characterization of irradiated backside biased RD50-ENGRUN1 samples for operation beyond $10^{16} n_{eq}/cm$ (Q4/2020)
 - **M5:** Studies of stitching process options (Q4/2021)
 - **M6:** Characterization of unirradiated and irradiated stitched samples (Q4/2022)



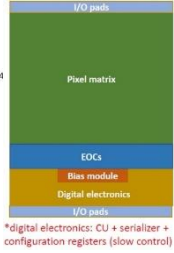
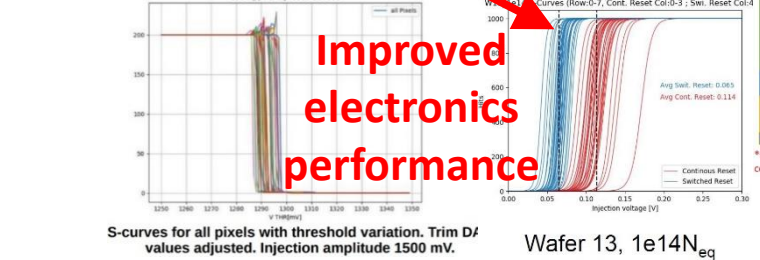
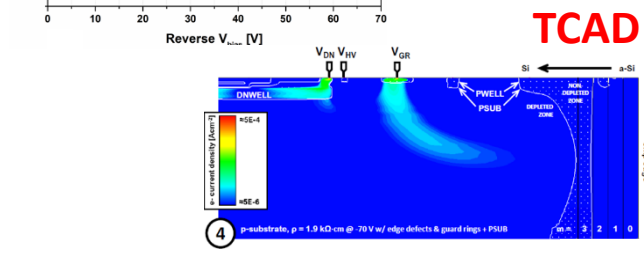
RD50-MPW1

$I_{LEAK} \uparrow$

$V_{BD} \downarrow$



RD50-MPW3



*digital electronics: CU + serializer + configuration registers (slow control)

