

# The RD50-MPW4 CMOS Pixel Sensor: Performance Post-Irradiation

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The RD50-MPW4, the latest HV-CMOS pixel sensor of the former CERN-RD50-CMOS group, enhances radiation tolerance, granularity, and timing resolution for future experiments like the HL-LHC and FCC. Fabricated by LFoundry in December 2023 using a 150nm CMOS process, it features a  $64 \times 64$  pixel matrix with a  $62 \times 62 \mu m^2$  pitch and employs a column-drain readout architecture. The previous model, RD50-MPW3, faced noise coupling issues between the digital periphery and pixels, limiting threshold settings to  $gtrsim 5ke^-$  and restricting operation to the matrix's top half.

The RD50-MPW4 addresses these issues by separating power domains for the digital and analog components, allowing more sensitive threshold settings and enabling full matrix operation. A new backside biasing scheme and improved guard ring structure further support bias voltages up to 500V, enhancing radiation hardness.

Tests with unirradiated samples showed  $>99.9\%$  efficiency,  $\sim 16 \mu m$  spatial resolution, and  $\sim 10 ns$  timing resolution. Several samples were irradiated at JSI to fluences from  $10^{14}$  to  $10^{16} n_{eq}/cm^2$ . This presentation covers IV measurements and injection scans at varying temperatures before and after annealing, along with results from the latest test beam campaign at DESY, comparing irradiated and non-irradiated samples and demonstrating the sensor's suitability for high-radiation environments.

## Type of presentation (in-person/online)

in-person presentation

## Type of presentation (I. scientific results or II. project proposal)

I. Presentation on scientific results

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