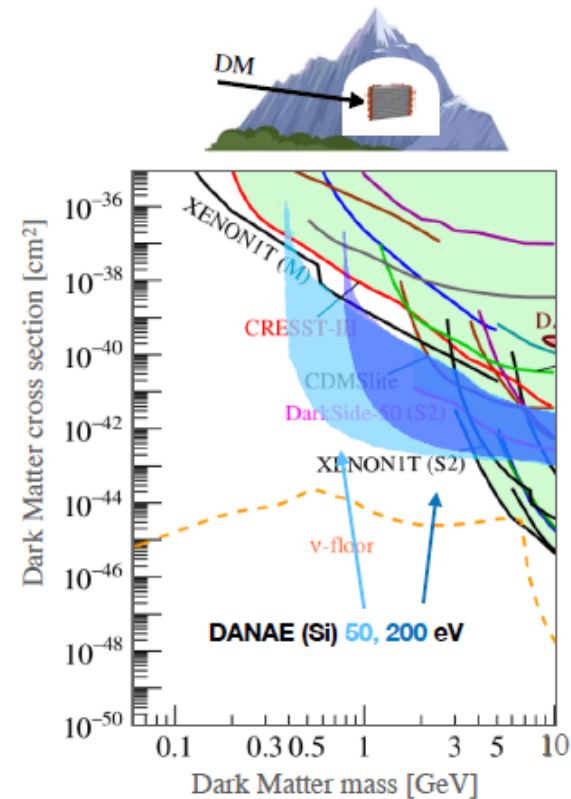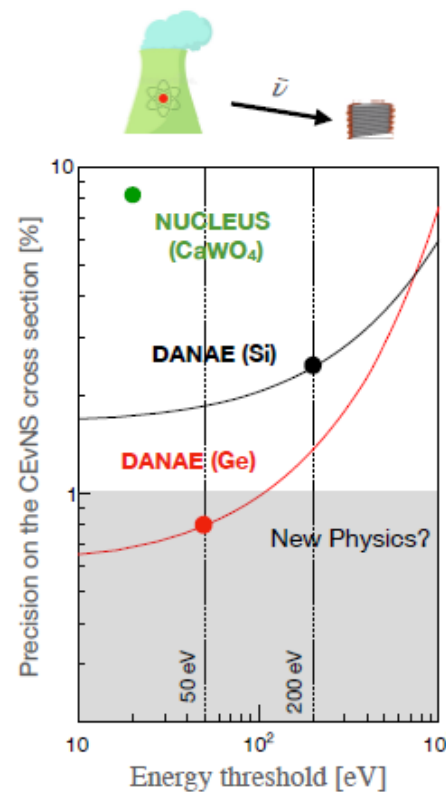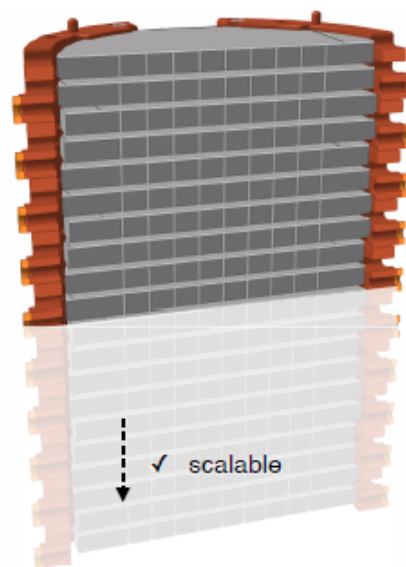# The DANAE detector: Roadmap

BULLKID_DM KOM

Angelo Cruciani

Overview

- DANAE is a ERC CoG project (HI Sapienza + INFN, CNRS, 5 yrs project)

- Goal of the project is the realization of a stack of Bullkid-like detectors with energy threshold between 50-200 eV

- The project involves 2 different substrates: Si for DM, Ge for CNS

The 3 challenges

Demonstrator

Stack

Germanium

To develop a stack of n. 3
3-inch Si wafers
(180 pixels 60 g)

To develop a stack of n. 16
4-inch Si wafers
- each 145 pixels -
- total 2320 pixels -

To develop a stack of
4-inch Ge wafers

Forseen actions & Detector timeline

Already achieved

3inch Si wafer with a threshold energy resolution better than 200 ev

Electrical test of a 4-inch Si wafer

Resonator on Ge tested

Next Milestones

9/2024: Operation of the demonstrator (3 x 3inch Si wafers)

12/2024: Optimization of single pixel design

12/2024: test of Ge dicing

12/2025: Full test of the demonstrator

12/2024: test of a full 4-inch wafer

6/2025: Optimization of Qi, TLS, Tau_QP

12/2026: Test of the demonstrator in low BKG

12/2025: first tests of the stack

12/2025: First test of a diced wafer

12/2026: Stack completed

12/2028: Improvement of En. resolution

Electronics requirement

- **Center frequency**: 0.5-1 GHz
- **Number of RF lines:** 16
- **Bandwidth per RF line:** 300 MHz
- **Number of channels per RF line:** > 150
- **Maximum TX power per channel:** -5 dBm
- **TX Gain per channel:** 0-30 dB with < 1 dB steps
- **TX frequency step per channel:** < 200 Hz
- **Sampling frequency per channel:** selectable from 20 to 100 kSPS
- **ADC Noise level with all channels active at max TX power (loopback):** < -130 dBm/Hz @ 1 kHz.

- Self triggering pulses: data stream linear combination of I and Q streams with user-selected filter coefficients.
- Self triggering noise: at user-selected fixed time intervals.
- External trigger: use trigger from a channel to acquire selected (or all) channels.
- Cross-RFline ext-trigger: use trigger from a channel on a line to acquire waveforms on other lines.
- Data sync and stream from different boards to client computer.
- Data forma: TBD (ROOT or HDF5 ?)
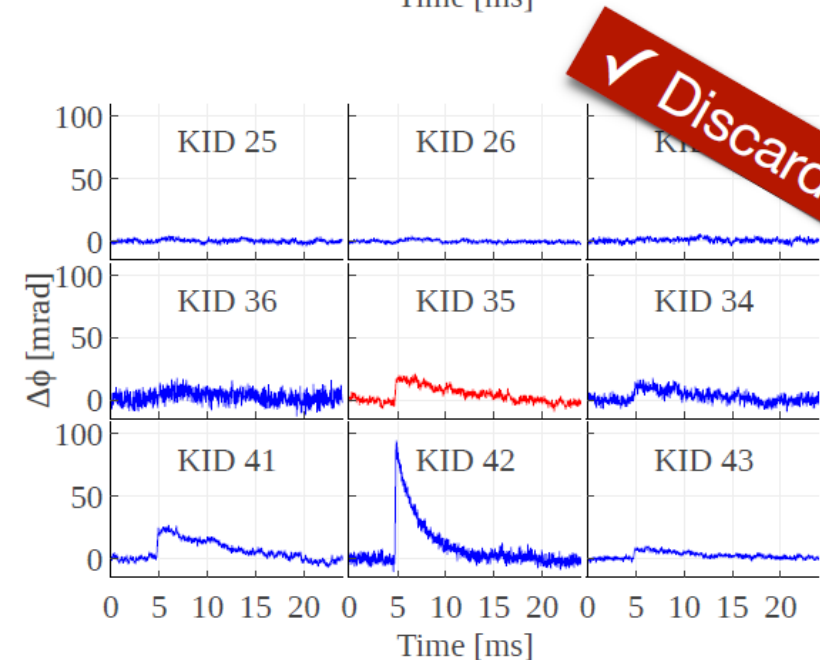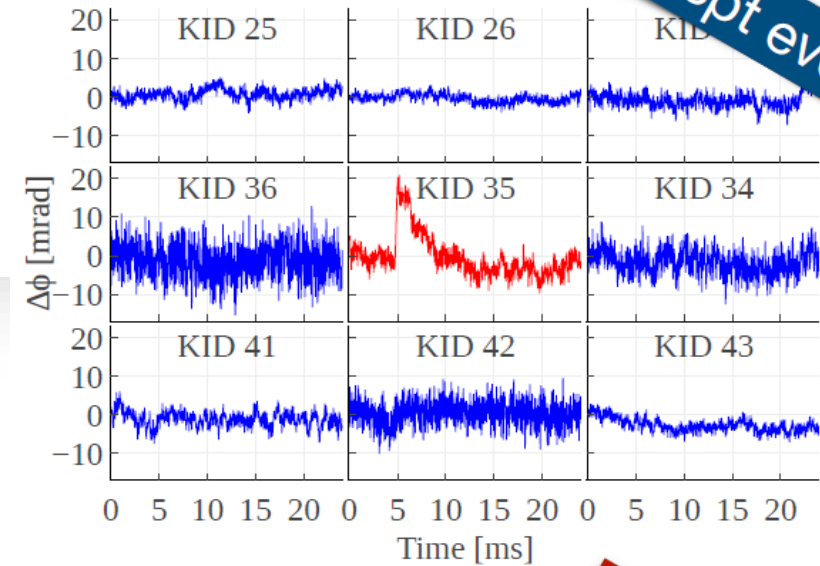
Tentative electronics timeline

- 6/2024: Readout of 1 3-inch wafer (60 pixels)
- 12/2024: Readout of 1 4-inch wafer (150 pixels)
- 12/2026: Readout of 3 4-inch wafer (150 pixels)