DRD3 Workshop on 22-23 March 2023

Expression of Interest for participation in

DRD3 – R&D on Solid State Detectors

Background information: https://indico.cern.ch/event/1214410/

Instructions (Replace or delete the blue example text!)

Fill only one form per institution.

Name of the institution, full address:

Country:

Contact person(s) (full name and email)**:**

- *Person 1, email1*
- *…..*

CERN and other experiments (participation in running experiments & projects)

- ***…****example: RD50, ATLAS, Belle, ITER*

Size of the group interested in the DRD3 activities

(approx. FTE of participation in DRD3)**:**

- *xx FTE (permanent staff)*
- *xx FTE (temporary staff, postdocs, students)*

List of participants (already contracted personnel, as to appear on the proposal):

- *Person 1, email1*
- *Person 2, email2*
- *….*

Technological area(s) of interest within the DRD3 collaboration

In the following, we ask you to fill two tables on resources and free text fields to outline your research interest and the infrastructure/equipment/facilities available at your institution. Based on the ECFA roadmap

and community discussions, we have pre-defined seven technological areas. In case you do not find your planned R&D activity reflected in the proposed technological areas, feel free to add a further line in the tables and comment on them in the free text field.

Note that we are asking you to estimate resources, not to commit to resources. The estimates on financial and personnel resources of individual institutes given in the two tables below will be treated confidentially. Information on research interests, available equipment, and the list of participants will, however, be shared with the (to be formed) DRD3 collaboration.

A. Technological area(s) of interest within the DRD3 collaboration (FTE Table)

*Please mark your interest with the approximate personnel power in FTE/year. In case you foresee a budget profiling over the years, please indicate this accordingly. Split the personnel into permanent (experienced researchers and technical staff) and temporary (students, postdocs, and researchers with limited-duration contracts). Indicate additional personnel you plan to request to the new strategic funding programs with an asterisk **

Technological area	***Resources (FTE per year)*** ***(split into permanent and temporary personnel)*** ***[2024 to 2028]***	
	Permanent *[FTE/year]*	*Temporary* *[FTE/year]*
Monolithic CMOS sensors [ASIC design, TCAD, testing, off-chip electronics (PCB, FPGA), modeling, …]	*5*	*2024-2028: 6* **2025-2028: 4*
Sensors for tracking and calorimetry with space, time and/or energy resolution [4D, 3D, trench detectors, modeling, simulation, …]	*24-26: 4* *27-28: 6*	*24-26: 2* *27-28: 3*
Radiation damage & ultrahigh fluences [Defect characterization, TCAD and other damage simulations, irradiation tests, …]		

New characterization techniques and facilities of common interest [Irradiation and test beam facilities, IBIC, laser testing, ..]		
Non-silicon semiconductor and other material studies [Diamond, SiC, GaN, WBG, ..]		
Interconnect and device fabrication technologies [3D integration, TSV, reduction of pitches, wafer bonding technologies,..]		
Dissemination and outreach [Mobility programs, publications, conferences, training, links to other research fields and industry, IP, website, collaboration admin, …]		

B.Technological area(s) of interest within the DRD3 collaboration (Financial Table)

*Please mark your interest with the approximate financial resources/year. In case you foresee a budget profiling over the years, please indicate this accordingly. Split the finances into operations budget (consumables, investment into sensor production, operation of equipment, …) and capital investments (new infrastructure and equipment, …). Do not include the personnel given in the previous table. Please estimate in kCHF or clearly indicate the currency used. Place new strategic funding you plan to request into separate lines and mark them with an asterisk **

Technological area	***Resources (financial resources per year)*** *(split into operations budget and capital investment)* ***[2024 to 2028]***	
	Operations budget [kCHF/year]	*Capital investment [kCHF/year]*
Monolithic CMOS sensors [ASIC design, TCAD, testing, off-chip electronics (PCB, FPGA), modeling, …]	*100 kCHF*	*200 kCHF* ** >2025: 1 MCHF*

Sensors for tracking and calorimetry with space, time and/or energy resolution [4D, 3D, trench detectors, modeling, simulation, …]	*24-26: 200 kCHF* *27-28: 20 kCHF* **27-28: 400 kCHF*	*24-26: 50 kCHF* *27-28: 50kCHF*
Radiation damage & ultrahigh fluences [Defect characterization, TCAD and other damage simulations, irradiation tests, …]		
New characterization techniques and facilities of common interest [Irradiation and test beam facilities, IBIC, laser testing, ..]		
Non-silicon semiconductor and other material studies [Diamond, SiC, GaN, WBG, ..]		
Interconnect and device fabrication technologies [3D integration, TSV, reduction of pitches, wafer bonding technologies,..]		
Dissemination and outreach [Mobility programs, publications, conferences, training, links to other research fields and industry, IP, website, collaboration admin, …]		

Technological area(s) of interest within the DRD3 collaboration (Free text: Research)

Outline your research interest and your main goals in bulleted format. Indicate planned new strategic RD activities with an asterisk. Do not write more than one page.

CMOS

- ** We are launching a new strategic RD on monolithic CMOS sensors*
    - *Inclusion of fast timing properties in monolithic CMOS sensors (approval pending)*

Radiation damage & ultrahigh fluences

- *Irradiation tests on silicon and silicon carbide sensors up to 10^{18} neq/cm^2*
    - *Goal: Understand limits of operation*
- *DLTS and PL measurements on carbon enriched p-type silicon sensors*
    - *Goal: Produce damage model for defect engineering approaches*

Non-silicon semiconductor

- *Construction of a diamond beam telescope*
    - *Goal: Demonstrate room temperature operation of Diamond 4D telescopes*

Dissemination and outreach

- *Our group would be interested to participate in maintaining the collaboration web site*
- *We are interested to provide training events at our institutions on TCAD simulations*
- *…*

Technological area(s) of interest within the DRD3 collaboration (Free text: Tools)

Outline the equipment available at your institution (split into existing and planned). Indicate planned R&D equipment funded via new strategic R&D programs with an asterisk.

Existing tools:

- *Irradiation facility: 20 MeV protons*
- *Laser based characterization tools (TCT standard, edge and TPA-TCT)*
- *Defect characterization tools (EPR, PL and FTIR)*
- *Probe stations (T-controlled down to -20C, CV, IV)*
- *TCAD Silvaco license and high-end computing infrastructure*
- *….*

Planned tools:

- *New laser facility planned: TPA-TCT for silicon carbide sensor (expected for 2027)*
- **High-end parameter analyzer for CMOS development*

Technological area(s) of interest within the DRD3 collaboration (Free text: Industry)

Outline relationships with industry.

- *We are working closely with company xxxx to produce CMOS sensors.*

Any further comment(s):

- *The above given budget estimates were not discussed with my funding agency yet, we will provide updates as soon as possible regarding the numbers*
- *…*