FWO DMP Template - Flemish Standard Data Management Plan

Project supervisors (from application round 2018 onwards) and fellows (from application round 2020 onwards) will, upon being awarded their project or fellowship, be invited to develop their answers to the data management related questions into a DMP. The FWO expects a **completed DMP no later than 6 months after the official start date** of the project or fellowship. The DMP should not be submitted to FWO but to the research co-ordination office of the host institute; FWO may request the DMP in a random check.

At the end of the project, the **final version of the DMP** has to be added to the final report of the project; this should be submitted to FWO by the supervisor-spokesperson through FWO's e-portal. This DMP may of course have been updated since its first version. The DMP is an element in the final evaluation of the project by the relevant expert panel. Both the DMP submitted within the first 6 months after the start date and the final DMP may use this template.

The DMP template used by the Research Foundation Flanders (FWO) corresponds with the Flemish Standard Data Management Plan. This Flemish Standard DMP was developed by the Flemish Research Data Network (FRDN) Task Force DMP which comprises representatives of all Flemish funders and research institutions. This is a standardized DMP template based on the previous FWO template that contains the core requirements for data management planning. To increase understanding and facilitate completion of the DMP, a standardized **glossary** of definitions and abbreviations is available via the following link.

1. General Project Information	
Name Grant Holder & ORCID	Aitor del Rivero Cortazar (0000-0003-2408-8687)
Contributor name(s) (+ ORCID) & roles	Georges Gielen (0000-0002-4061-9428) - Promotor Carolina Mora Lopez (0000-0003-4200-0001) – Co-promotor Bogdan Raducanu (0000-0003-2207-6260) – Advisor
Project number[1] & title	IAS: PL Health 00000026905 - PhD Aitor del Rivero Cortazar “Enabling high-throughput multimodal sensing in 3D cell cultures using novel CMOS circuits”
Funder(s) GrantID[2]	1S85723N
Affiliation(s)	**X** KU Leuven ☐ Universiteit Antwerpen ☐ Universiteit Gent ☐ Universiteit Hasselt ☐ Vrije Universiteit Brussel **X** Other: IMEC Provide ROR[3] identifier when possible: 05f950310 (KUL) , 02kcbn207 (IMEC)

[1] “Project number” refers to the institutional project number. This question is optional since not every institution has an internal project number different from the GrantID. Applicants can only provide one project number.

[2] Funder(s) GrantID refers to the number of the DMP at the funder(s), here one can specify multiple GrantIDs if multiple funding sources were used.

[3] Research Organization Registry Community. https://ror.org/

Please provide a short project description	Medicine is evolving towards personalization but at a slow pace because developing a single drug cost over 2 billion USD. To significantly reduce the costs, 3D cell cultures can be used in the nonclinical in-vitro experiments. These cultures model the human body in a more accurate way than their 2D counterparts, so clinical studies become more successful afterward. However, there are no scalable multielectrode arrays (MEAs) that can interface 3D cultures and electronic circuits to achieve cell resolution multimodal sensing. Therefore, the goal of the project is to enable high scalability of IMEC's perforated 3D MEAs, which today suffer from a limited number of electrodes, degraded signal quality, limited functionality, and low yield. However, the small bridges between the sensing nodes of the 3D MEA make it very challenging to resolve those limitations. By using novel CMOS techniques and circuits, the goal is to increase the electrode number, the recording performance, and integrate diverse functionalities: recording, stimulation, impedance monitoring and spectroscopy, electrochemical, and optical detection. The outcome of the research will be the first demonstration of a fully-scalable active perforated 3D MEA for organoid monitoring and cell identification. The project will generate circuit schematics, testbenches, and layouts during the design phase; a Chip after fabrication; and experimental results during experimentation.

2. Research Data Summary

List and describe all datasets or research materials that you plan to generate/collect or reuse during your research project. For each dataset or data type (observational, experimental etc.), provide a short name & description (sufficient for yourself to know what data it is about), indicate whether the data are newly generated/collected or reused, digital or physical, also indicate the type of the data (the kind of content), its technical format (file extension), and an estimate of the upper limit of the volume of the data[4].

				ONLY FOR DIGITAL DATA	*ONLY FOR DIGITAL DATA*	*ONLY FOR DIGITAL DATA*	*ONLY FOR PHYSICAL DATA*
Dataset Name	Description	New or Reused	Digital or Physical	Digital Data Type	Digital Data Format	Digital Data Volume (MB, GB, TB)	Physical Volume
Cadence Virtuoso Libraries	Schematics, testbenches, and layout of the chip submodules	☒ Generate new data ☐ Reuse existing data	☒ Digital ☐ Physical	☐ Observational ☐ Experimental ☐ Compiled/ aggregated data ☐ Simulation data ☒ Software ☐ Other ☐ NA	☐ .por ☐ .xml ☐ .tab ☐ .csv ☐ .pdf ☐ .txt ☐ .rtf ☐ .dwg ☐ .tab ☐ .gml ☒ other: .oa ☐ NA	☒ < 100 MB ☐ < 1 GB ☐ < 100 GB ☐ < 1 TB ☐ < 5 TB ☐ < 10 TB ☐ < 50 TB ☐ > 50 TB ☐ NA	
Cadence Virtuoso simulation results	Sweeps, optimization, and corners simulation results	☒ Generate new data ☐ Reuse existing data	☒ Digital ☐ Physical	☐ Observational ☐ Experimental ☐ Compiled/ aggregated data ☒ Simulation data ☐ Software ☐ Other ☐ NA	☐ .por ☐ .xml ☐ .tab ☒ .csv ☐ .pdf ☐ .txt ☐ .rtf ☐ .dwg ☐ .tab	☐ < 100 MB ☐ < 1 GB ☒ < 100 GB ☐ < 1 TB ☐ < 5 TB ☐ < 10 TB ☐ < 50 TB ☐ > 50 TB ☐ NA	

[4] Add rows for each dataset you want to describe.

					☐ .gml ☐ other: .oa ☐ NA		
Manufactured chip	CMOS chip for in-vitro cell testing	☒ Generate new data ☐ Reuse existing data	☐ Digital ☒ Physical	☐ Observational ☐ Experimental ☐ Compiled/ aggregated data ☐ Simulation data ☐ Software ☒ Other: Hardware ☐ NA	☐ .por ☐ .xml ☐ .tab ☐ .csv ☐ .pdf ☐ .txt ☐ .rtf ☐ .dwg ☐ .tab ☐ .gml ☐ other: ☐ NA	☐ < 100 MB ☐ < 1 GB ☐ < 100 GB ☐ < 1 TB ☐ < 5 TB ☐ < 10 TB ☐ < 50 TB ☐ > 50 TB ☐ NA	~mm^3
Electrical characterization of the chip results	Collection of data coming from the full electrical testing of the CMOS circuits to verify the functionality and performance of the	☒ Generate new data ☐ Reuse existing data	☒ Digital ☐ Physical	☐ Observational ☒ Experimental ☐ Compiled/ aggregated data ☐ Simulation data ☐ Software ☐ Other ☐ NA	☐ .por ☐ .xml ☐ .tab ☐ .csv ☐ .pdf ☐ .txt ☐ .rtf ☐ .dwg ☐ .tab ☐ .gml ☒ other: binary ☐ NA	☐ < 100 MB ☐ < 1 GB ☐ < 100 GB ☒ < 1 TB ☐ < 5 TB ☐ < 10 TB ☐ < 50 TB ☐ > 50 TB ☐ NA	

	different modalities						
In-vitro testing results	Collection of data coming from the testing and validation of the fully fabricated and packaged 3D MEAs using 3D cell cultures or organoids	☒ Generate new data ☐ Reuse existing data	☒ Digital ☐ Physical	☐ Observational ☒ Experimental ☐ Compiled/ aggregated data ☐ Simulation data ☐ Software ☐ Other ☐ NA	☐ .por ☐ .xml ☐ .tab ☐ .csv ☐ .pdf ☐ .txt ☐ .rtf ☐ .dwg ☐ .tab ☐ .gml ☒ other: binary ☐ NA	☐ < 100 MB ☐ < 1 GB ☐ < 100 GB ☒ < 1 TB ☐ < 5 TB ☐ < 10 TB ☐ < 50 TB ☐ > 50 TB ☐ NA	
Supporting scripts	For Cadence configuration, and system modeling	☒ Generate new data ☐ Reuse existing data	☒ Digital ☐ Physical	☐ Observational ☐ Experimental ☐ Compiled/ aggregated data ☐ Simulation data ☒ Software ☐ Other ☐ NA	☐ .por ☐ .xml ☐ .tab ☐ .csv ☐ .pdf ☐ .txt ☐ .rtf ☐ .dwg ☐ .tab ☐ .gml ☒ other: .sdb, .py ☐ NA	☒ < 100 MB ☐ < 1 GB ☐ < 100 GB ☐ < 1 TB ☐ < 5 TB ☐ < 10 TB ☐ < 50 TB ☐ > 50 TB ☐ NA	

IMEC IP Design Blocks	Schematics, testbenches, and layout designed previously at IMEC	☐ Generate new data ☒ Reuse existing data	☒ Digital ☐ Physical	☐ Observational ☐ Experimental ☐ Compiled/ aggregated data ☒ Simulation data ☒ Software ☐ Other ☐ NA	☐ .por ☐ .xml ☐ .tab ☐ .csv ☐ .pdf ☐ .txt ☐ .rtf ☐ .dwg ☐ .tab ☐ .gml ☒ other: .oa ☐ NA	☒ < 100 MB ☐ < 1 GB ☐ < 100 GB ☐ < 1 TB ☐ < 5 TB ☐ < 10 TB ☐ < 50 TB ☐ > 50 TB ☐ NA	
Digital Design Specification	Detailed report describing the requirements of the digital design	☒ Generate new data ☐ Reuse existing data	☒ Digital ☐ Physical	☐ Observational ☐ Experimental ☐ Compiled/ aggregated data ☐ Simulation data ☐ Software ☒ Other ☐ NA	☐ .por ☐ .xml ☐ .tab ☐ .csv ☒ .pdf ☐ .txt ☐ .rtf ☐ .dwg ☐ .tab ☐ .gml ☐ other: ☐ NA	☒ < 100 MB ☐ < 1 GB ☐ < 100 GB ☐ < 1 TB ☐ < 5 TB ☐ < 10 TB ☐ < 50 TB ☐ > 50 TB ☐ NA	

GUIDANCE: *DATA CAN BE DIGITAL OR PHYSICAL (FOR EXAMPLE BIOBANK, BIOLOGICAL SAMPLES, …). DATA TYPE: DATA ARE OFTEN GROUPED BY TYPE (OBSERVATIONAL, EXPERIMENTAL ETC.), FORMAT AND/OR COLLECTION/GENERATION METHOD.* *EXAMPLES OF DATA TYPES: OBSERVATIONAL (E.G. SURVEY RESULTS, SENSOR READINGS, SENSORY OBSERVATIONS); EXPERIMENTAL (E.G. MICROSCOPY, SPECTROSCOPY, CHROMATOGRAMS, GENE SEQUENCES); COMPILED/AGGREGATED DATA[5] (E.G. TEXT & DATA MINING, DERIVED VARIABLES, 3D MODELLING); SIMULATION DATA (E.G. CLIMATE MODELS); SOFTWARE, ETC.* *EXAMPLES OF DATA FORMATS: TABULAR DATA (.POR,. SPSS, STRUCTURED TEXT OR MARK-UP FILE XML, .TAB, .CSV), TEXTUAL DATA (.RTF, .XML, .TXT), GEOSPATIAL DATA (.DWG,. GML, ..), IMAGE DATA, AUDIO DATA, VIDEO DATA, DOCUMENTATION & COMPUTATIONAL SCRIPT.* *DIGITAL DATA VOLUME: PLEASE ESTIMATE THE UPPER LIMIT OF THE VOLUME OF THE DATA PER DATASET OR DATA TYPE.* *PHYSICAL VOLUME: PLEASE ESTIMATE THE PHYSICAL VOLUME OF THE RESEARCH MATERIALS (FOR EXAMPLE THE NUMBER OF RELEVANT BIOLOGICAL SAMPLES THAT NEED TO BE STORED AND PRESERVED DURING THE PROJECT AND/OR AFTER).*	
If you reuse existing data, please specify the source, preferably by using a persistent identifier (e.g. DOI, Handle, URL etc.) per dataset or data type.	IMEC IP Design Blocks (confidential files stored in IMEC servers)
Are there any ethical issues concerning the creation and/or use of the data (e.g. experiments on humans or animals, dual use)? If so, please describe these issues further and refer to specific datasets or data types when appropriate.	☐ Yes, human subject data ☐ Yes, animal data ☐ Yes, dual use ☒ No If yes, please describe:

[5] These data are generated by combining multiple existing datasets.

Will you process personal data[6]? If so, briefly describe the kind of personal data you will use. Please refer to specific datasets or data types when appropriate. If available, add the reference to your file in your host institution's privacy register.	☐ Yes ☒ No If yes: - Short description of the kind of personal data that will be used: - Privacy Registry Reference:
Does your work have potential for commercial valorization (e.g. tech transfer, for example spin-offs, commercial exploitation, …)? If so, please comment per dataset or data type where appropriate.	☒ Yes ☐ No If yes, please comment: Options will be explored with the IMEC's and KU Leuven Tech Transfer Offices. Valorization possibilities align with the Flanders 2025 objectives on personalized medicine and brain disease modeling. Cadence Virtuoso Library – IP of Design Blocks might be licensed to IMEC partners Manufactured chip – can be commercialized after the redesign to improve yield
Do existing 3rd party agreements restrict exploitation or dissemination of the data you (re)use (e.g. Material/Data transfer agreements, research collaboration agreements)? If so, please explain to what data they relate and what restrictions are in place.	☐ Yes ☒ No If yes, please explain:
Are there any other legal issues, such as intellectual property rights and ownership, to be managed related to the data you (re)use? If so, please explain to what data they relate and which restrictions will be asserted.	☐ Yes ☒ No If yes, please explain:

[6] See Glossary Flemish Standard Data Management Plan

3. Documentation and Metadata	
Clearly describe what approach will be followed to capture the accompanying information necessary to keep **data understandable and usable**, for yourself and others, now and in the future (e.g. in terms of documentation levels and types required, procedures used, Electronic Lab Notebooks, README.txt files, Codebook.tsv etc. where this information is recorded).	The generated files are stored in a structured file organization system in Sharepoint and Cliosoft. Sharepoint contains the following folders: 1. Literature and benchmarking: contains a PDF version of articles/books in the thesis that are cited in the thesis, and a summary presentation of all literature studied. 2. Progress and review meetings: contains the presentations of all progress meetings. 3. Presentations: contains final presentations (oral defences, FWO application, conferences) 4. Own publications and patents: contains the PDF and the original Word/LaTeX files of the journal publications and patents related to the PhD. It also contains the relevant Cadence Virtuoso simulation results, and electrical and in-vivo characterization results to support any clarification about the published work. 5. Scripts: contains scripts for system modeling in Python. A README.txt details software pre-requisites and instructions to run the scripts. All functions are described by their snippets. 6. Chip Design: contains 1) the scripts and config files for Cadence configuration in OCEAN, SKILL, SDB, and Python; 2) the Digital Design Specification. Cliosoft: Contains a Cadence library for each system block (e.g. Pixel). Each library contains all necessary cells whose name indicates the function of the cell (e.g. LNA) and their testbench schematic (e.g. tb_LNA). The cells include the necessary schematics, maestro, config, and layout files, ready for execution.

Will a metadata standard be used to make it easier to **find and reuse the data**? If so, please specify which metadata standard will be used. If not, please specify which metadata will be created to make the data easier to find and reuse. *REPOSITORIES COULD ASK TO DELIVER METADATA IN A CERTAIN FORMAT, WITH SPECIFIED ONTOLOGIES AND VOCABULARIES, I.E. STANDARD LISTS WITH UNIQUE IDENTIFIERS.*	☒ Yes ☐ No If yes, please specify (where appropriate per dataset or data type) which metadata standard will be used: Standard Sharepoint and Cliosoft metadata including timestamp, commit/check-in comments, etc. Additional methods such as RDA are not necessary in the Circuits and System Design community since we do not handle large datasets. If no, please specify (where appropriate per dataset or data type) which metadata will be created:

4. Data Storage & Back-up during the Research Project	
Where will the data be stored?	Sharepoint and Cliosoft at internal IMEC servers
How will the data be backed up? *WHAT STORAGE AND BACKUP PROCEDURES WILL BE IN PLACE TO PREVENT DATA LOSS? DESCRIBE THE LOCATIONS, STORAGE MEDIA AND PROCEDURES THAT WILL BE USED FOR STORING AND BACKING UP DIGITAL AND NON-DIGITAL DATA DURING RESEARCH.*[7] *REFER TO INSTITUTION-SPECIFIC POLICIES REGARDING BACKUP PROCEDURES WHEN APPROPRIATE.*	Standard Microsoft Sharepoint and Cliosoft robust and automatic back-up, supervised the IMEC ICT Team.

[7] Source: Ghent University Generic DMP Evaluation Rubric: https://osf.io/2z5g3/

Is there currently sufficient storage & backup capacity during the project? If yes, specify concisely. If no or insufficient storage or backup capacities are available, then explain how this will be taken care of.	☒ Yes ☐ No If yes, please specify concisely: SharePoint and Cliosoft have enough storage available. Additional storage can be requested to the IMEC'S ICT Team, if necessary. If no, please specify:
How will you ensure that the data are securely stored and not accessed or modified by unauthorized persons? *CLEARLY DESCRIBE THE MEASURES (IN TERMS OF PHYSICAL SECURITY, NETWORK SECURITY, AND SECURITY OF COMPUTER SYSTEMS AND FILES) THAT WILL BE TAKEN TO ENSURE THAT STORED AND TRANSFERRED DATA ARE SAFE.* [7]	Azure Information Protection avoids unauthorized access to SharePoint files. These files are treated as Confidential by default. Access is granted only to the PhD student and his advisors. Cliosoft's project folder access is also granted only to the PhD student and his advisors. Besides, it can only be accessed from devices connected to IMEC'S network. Its content is treated as Confidential. All project files are accessed from an IMEC computer with CyberArk security and regular updates and protection set up by the ICT Team. The computer is locked when it is not being used behind biometrics (fingerprint) and PIN login.
What are the expected costs for data storage and backup during the research project? How will these costs be covered?	Costs are covered by IMEC

5. Data Preservation after the end of the Research Project

Which data will be retained for at least five years (or longer, in agreement with other retention policies that are applicable) after the end of the project? In case some data cannot be preserved, clearly state the reasons for this (e.g. legal or contractual restrictions, storage/budget issues, institutional policies...).	The content of SharePoint and Cliosoft are retained for at least 10 years following the KU Leuven policy. The two SharePoint folders containing the literature and benchmarking, and the progress meetings presentations might be removed since they don't support publications and are unlikely to be reused within the research unit.
Where will these data be archived (stored and curated for the long-term)?	SharePoint and Cliosoft
What are the expected costs for data preservation during the expected retention period? How will these costs be covered?	Costs are covered by IMEC

6. Data Sharing and Reuse	
Will the data (or part of the data) be made available for reuse after/during the project? Please explain per dataset or data type which data will be made available. *NOTE THAT 'AVAILABLE' DOES NOT NECESSARILY MEAN THAT THE DATA SET BECOMES OPENLY AVAILABLE, CONDITIONS FOR ACCESS AND USE MAY APPLY. AVAILABILITY IN THIS QUESTION THUS ENTAILS BOTH OPEN & RESTRICTED ACCESS. FOR MORE INFORMATION: HTTPS://WIKI.SURFNET.NL/DISPLAY/STANDARDS/INFO-EU-REPO/#INFOEUREPO-ACCESSRIGHTS*	☐ Yes, in an Open Access repository ☐ Yes, in a restricted access repository (after approval, institutional access only, …) ☒ No (closed access) ☐ Other, please specify:
If access is restricted, please specify who will be able to access the data and under what conditions.	Only IMEC employees authorized by Carolina Mora Lopez will be able to access Cadence files and the Digital Design Specification document. Simulation and experimental data might be available upon request by a third party (e.g. to clarify published articles) after the promotors' approval. Scripts that are unrelated to IMEC's IP and are not subject to valorization could be made available for Open Access after the promotors' approval if they are useful for the research community.
Are there any factors that restrict or prevent the sharing of (some of) the data (e.g. as defined in an agreement with a 3rd party, legal restrictions)? Please explain per dataset or data type where appropriate.	☐ Yes, privacy aspects ☒ Yes, intellectual property rights ☐ Yes, ethical aspects ☐ Yes, aspects of dual use ☐ Yes, other ☐ No If yes, please specify: IMEC's IP

Where will the data be made available? If already known, please provide a repository per dataset or data type.	Sharepoint and Cliosoft at internal IMEC servers
When will the data be made available? *THIS COULD BE A SPECIFIC DATE (DD/MM/YYYY) OR AN INDICATION SUCH AS 'UPON PUBLICATION OF RESEARCH RESULTS'.*	Upon completion of the PhD
Which data usage licenses are you going to provide? If none, please explain why. *A DATA USAGE LICENSE INDICATES WHETHER THE DATA CAN BE REUSED OR NOT AND UNDER WHAT CONDITIONS. IF NO LICENCE IS GRANTED, THE DATA ARE IN A GREY ZONE AND CANNOT BE LEGALLY REUSED. DO NOTE THAT YOU MAY ONLY RELEASE DATA UNDER A LICENCE CHOSEN BY YOURSELF IF IT DOES NOT ALREADY FALL UNDER ANOTHER LICENCE THAT MIGHT PROHIBIT THAT.* *EXAMPLE ANSWER: E.G. "DATA FROM THE PROJECT THAT CAN BE SHARED WILL BE MADE AVAILABLE UNDER A CREATIVE COMMONS ATTRIBUTION LICENSE (CC-BY 4.0), SO THAT USERS HAVE TO GIVE CREDIT TO THE ORIGINAL DATA CREATORS."* [8]	Copyright following IMEC's and KU Leuven policies.
Do you intend to add a PID/DOI/accession number to your dataset(s)? If already available, please provide it here. *INDICATE WHETHER YOU INTEND TO ADD A PERSISTENT AND UNIQUE IDENTIFIER IN ORDER TO IDENTIFY AND RETRIEVE THE DATA.*	☐ Yes ☒ No If yes:

[8] Source: Ghent University Generic DMP Evaluation Rubric: https://osf.io/2z5g3/

What are the expected costs for data sharing? How will these costs be covered?	No additional costs

7. Responsibilities	
Who will manage data documentation and metadata during the research project?	The PhD student, Aitor del Rivero Cortazar
Who will manage data storage and backup during the research project?	The PhD student, Aitor del Rivero Cortazar The co-promotor, Carolina Mora Lopez The IMEC's ICT Team
Who will manage data preservation and sharing?	The co-promotor, Carolina Mora Lopez The IMEC's ICT Team
Who will update and implement this DMP?	The PhD student, Aitor del Rivero Cortazar