

FWO DMP Template - Flemish Standard Data Management Plan

Version KU Leuven

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 | Ahmed Khalil - https://orcid.org/my-orcid?orcid=0000-0002-7971-8781 |
| Contributor name(s) (+ ORCID) & roles | |
| Project number ¹ & title | 1SHDN24N - VISIBLE TO NEAR-INFRARED INTEGRATED ULTRA-BROADBAND ACOUSTO-OPTIC ISOLATORS |
| Funder(s) GrantID ² | SB Fellowship 1SHDN24N |
| Affiliation(s) | <input checked="" type="checkbox"/> KU Leuven <input type="checkbox"/> Universiteit Antwerpen <input type="checkbox"/> Universiteit Gent <input type="checkbox"/> Universiteit Hasselt <input type="checkbox"/> Vrije Universiteit Brussel <input checked="" type="checkbox"/> Other: imec ROR identifier KU Leuven: 05f950310 |

¹ “Project number” refers to the institutional project number. This question is optional. 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.

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| Please provide a short project description | <p>Integrated optical non-reciprocity has been a long-sought goal by many researchers around the world. The integration of different optical components has made it necessary to replace the traditional bulky magneto-optic-based isolators and circulators. However, developing a practical integrated nonreciprocal device is a fundamental problem. Achieving nonreciprocity is limited to a set of interactions that are always accompanied by insertion loss, high power consumption, and limited bandwidth. Recently, acousto-optic interaction has shown great promise toward on-chip nonreciprocity. In this project, we aim to fill a missing gap in the operational wavelength ranges and elevate the current state-of-the-art integrated isolators into new scales in terms of bandwidth, footprint, isolation strength, and power consumption. This is done by introducing a novel concept, namely, acoustic phased array for integrated ultra-broadband optical isolation for visible and near-infrared. This project represents a significant step forward in the advancement of practical and scalable acousto-optic nonreciprocal devices, which have numerous applications in fields such as optical coherence tomography, LiDAR systems, and data communication.</p> |
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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 ³.

| Dataset Name | Description | New or Reused | Digital or Physical | ONLY FOR DIGITAL DATA | ONLY FOR DIGITAL DATA | ONLY FOR DIGITAL DATA | ONLY FOR PHYSICAL DATA |
|--|--|---|--|---|----------------------------------|---|------------------------|
| | | | | Digital Data Type | Digital Data Format | Digital Data Volume (MB, GB, TB) | Physical Volume |
| Simulation code for modelling the device: <i>ISO_SimCode</i> | Codes to model the electrical and optical response of the acoustic transducers. This includes (Mason_Model/FDFD/Tapered_Coupler) | <input checked="" type="checkbox"/> Generate new data <input type="checkbox"/> Reuse existing data | <input checked="" type="checkbox"/> Digital <input type="checkbox"/> Physical | <input type="checkbox"/> Audiovisual <input type="checkbox"/> Images <input type="checkbox"/> Sound <input type="checkbox"/> Numerical <input type="checkbox"/> Textual <input type="checkbox"/> Model <input checked="" type="checkbox"/> Software <input type="checkbox"/> Other: | Matlab -*.m Mathematica-*.*nb | <input checked="" type="checkbox"/> < 1 GB <input type="checkbox"/> < 100 GB <input type="checkbox"/> < 1 TB <input type="checkbox"/> < 5 TB <input type="checkbox"/> > 5 TB <input type="checkbox"/> NA | |
| Simulation Results generated by the codes: <i>ISO_SimCode_Results</i> | Figures generated using the self-written code. | <input checked="" type="checkbox"/> Generate new data <input type="checkbox"/> Reuse existing data | <input checked="" type="checkbox"/> Digital <input type="checkbox"/> Physical | <input type="checkbox"/> Audiovisual <input checked="" type="checkbox"/> Images <input type="checkbox"/> Sound <input checked="" type="checkbox"/> Numerical <input type="checkbox"/> Textual <input type="checkbox"/> Model <input type="checkbox"/> Software <input type="checkbox"/> Other: | *.png *.jpeg *.fig | <input type="checkbox"/> < 1 GB <input checked="" type="checkbox"/> < 100 GB <input type="checkbox"/> < 1 TB <input type="checkbox"/> < 5 TB <input type="checkbox"/> > 5 TB <input type="checkbox"/> NA | |
| Results-free | Ready-to-use | <input checked="" type="checkbox"/> Generate new | <input checked="" type="checkbox"/> Digital | <input type="checkbox"/> Audiovisual | COMSOL: | <input type="checkbox"/> < 1 GB | |

³ Add rows for each dataset you want to describe.

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| simulation base files: <i>ISO_SimBase</i> | base simulation files for 3 rd party physics simulation packages. | data <input type="checkbox"/> Reuse existing data | <input type="checkbox"/> Physical | <input type="checkbox"/> Images <input type="checkbox"/> Sound <input checked="" type="checkbox"/> Numerical <input type="checkbox"/> Textual <input type="checkbox"/> Model <input checked="" type="checkbox"/> Software <input type="checkbox"/> Other: | *.mph Lumerical: *.lsf *.lms *.fsp ADS: *.dds | <input checked="" type="checkbox"/> < 100 GB <input type="checkbox"/> < 1 TB <input type="checkbox"/> < 5 TB <input type="checkbox"/> > 5 TB <input type="checkbox"/> NA | |
| Layout designs for the different stack layers <i>ISO_Layout</i> | Designs that are required to fabricate the device using different fabrication techniques and processes | <input checked="" type="checkbox"/> Generate new data <input type="checkbox"/> Reuse existing data | <input checked="" type="checkbox"/> Digital <input type="checkbox"/> Physical | <input type="checkbox"/> Audiovisual <input type="checkbox"/> Images <input type="checkbox"/> Sound <input type="checkbox"/> Numerical <input type="checkbox"/> Textual <input type="checkbox"/> Model <input checked="" type="checkbox"/> Software <input type="checkbox"/> Other: | *.GDS *.OASIS | <input type="checkbox"/> < 1 GB <input checked="" type="checkbox"/> < 100 GB <input type="checkbox"/> < 1 TB <input type="checkbox"/> < 5 TB <input type="checkbox"/> > 5 TB <input type="checkbox"/> NA | |
| Results generated by the 3 rd party physics simulation packages. <i>ISO_SimBase _Results</i> | Figures generated using 3 rd party physics simulation packages. | <input checked="" type="checkbox"/> Generate new data <input type="checkbox"/> Reuse existing data | <input checked="" type="checkbox"/> Digital <input type="checkbox"/> Physical | <input type="checkbox"/> Audiovisual <input checked="" type="checkbox"/> Images <input type="checkbox"/> Sound <input type="checkbox"/> Numerical <input type="checkbox"/> Textual <input type="checkbox"/> Model <input type="checkbox"/> Software <input type="checkbox"/> Other: | *.png *.jpeg *.fig | <input type="checkbox"/> < 1 GB <input type="checkbox"/> < 100 GB <input checked="" type="checkbox"/> < 1 TB <input type="checkbox"/> < 5 TB <input type="checkbox"/> > 5 TB <input type="checkbox"/> NA | |
| Experimental Results : <i>ISO_ExpRes</i> | Figures generated using 3 rd party physics simulation packages. | <input checked="" type="checkbox"/> Generate new data <input type="checkbox"/> Reuse existing data | <input checked="" type="checkbox"/> Digital <input checked="" type="checkbox"/> Physical | <input type="checkbox"/> Audiovisual <input checked="" type="checkbox"/> Images <input type="checkbox"/> Sound <input checked="" type="checkbox"/> Numerical <input type="checkbox"/> Textual <input type="checkbox"/> Model | *.png *.jpeg *.fig *.sp | <input type="checkbox"/> < 1 GB <input type="checkbox"/> < 100 GB <input type="checkbox"/> < 1 TB <input checked="" type="checkbox"/> < 5 TB | |

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|--|--|--|--|--|--|--|--|
| | | | | <input type="checkbox"/> Software <input type="checkbox"/> Other: | | <input type="checkbox"/> > 5 TB <input type="checkbox"/> NA | |
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GUIDANCE:
The data description forms the basis of your entire DMP, so make sure it is detailed and complete. It includes digital and physical data and encompasses the whole spectrum ranging from raw data to processed and analysed data including analysis scripts and code. Physical data are all materials that need proper management because they are valuable, difficult to replace and/or ethical issues are associated. Materials that are not considered data in an RDM context include your own manuscripts, theses and presentations; documentation is an integral part of your datasets and should be described under documentation/metadata.
[RDM Guidance on data](#)

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| 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. | |
| 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, refer to specific datasets or data types when appropriate and provide the relevant ethical approval number. | <input type="checkbox"/> Yes, human subject data; provide SMEC or EC approval number: <input type="checkbox"/> Yes, animal data; provide ECD reference number: <input type="checkbox"/> Yes, dual use; provide approval number: <input checked="" type="checkbox"/> No Additional information: |
| Will you process personal data ⁴ ? If so, please refer to specific datasets or data types when appropriate and provide the KU Leuven or UZ Leuven privacy register number (G or S number). | <input type="checkbox"/> Yes (provide PRET G-number or EC S-number below) <input checked="" type="checkbox"/> No Additional information: |

⁴ See Glossary Flemish Standard Data Management Plan

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| <p>Does your work have potential for commercial valorization (e.g. tech transfer, for example spin-offs, commercial exploitation, ...)?</p> <p>If so, please comment per dataset or data type where appropriate.</p> | <p><input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>If yes, please comment:</p> <p>Layout designs : the layout are the files necessary to manufacture the device under research.</p> |
| <p>Do existing 3rd party agreements restrict exploitation or dissemination of the data you (re)use (e.g. Material/Data transfer agreements, research collaboration agreements)?</p> <p>If so, please explain to what data they relate and what restrictions are in place.</p> | <p><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p> <p>If yes, please explain:</p> |
| <p>Are there any other legal issues, such as intellectual property rights and ownership, to be managed related to the data you (re)use?</p> <p>If so, please explain to what data they relate and which restrictions will be asserted.</p> | <p><input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>If yes, please explain:</p> <p>There are multiple patents related to this work under the ownership of imec & KU Leuven.</p> |

3. Documentation and Metadata

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| <p>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).</p> <p><i>RDM guidance on documentation and metadata.</i></p> | |
| <p>Will a metadata standard be used to make it easier to find and reuse the data?</p> <p>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.</p> <p><i>REPOSITORIES COULD ASK TO DELIVER METADATA IN A CERTAIN FORMAT, WITH SPECIFIED ONTOLOGIES AND VOCABULARIES, I.E. STANDARD LISTS WITH UNIQUE IDENTIFIERS.</i></p> | <p><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p> <p>If yes, please specify (where appropriate per dataset or data type) which metadata standard will be used:</p> <p>If no, please specify (where appropriate per dataset or data type) which metadata will be created:</p> <p>Where relevant, an adapted Dublin Core Metadata standard will be used. The fields are already described above.</p> |

4. Data Storage & Back-up during the Research Project

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| <p>Where will the data be stored?</p> <p><i>Consult the interactive KU Leuven storage guide to find the most suitable storage solution for your data.</i></p> | <p> <input type="checkbox"/> Shared network drive (J-drive) <input type="checkbox"/> Personal network drive (I-drive) <input type="checkbox"/> OneDrive (KU Leuven) <input checked="" type="checkbox"/> Sharepoint online <input type="checkbox"/> Sharepoint on-premis <input type="checkbox"/> Large Volume Storage <input type="checkbox"/> Digital Vault <input checked="" type="checkbox"/> Other: imec sharepoint, imec OneDrive and imec data server units </p> |
| <p>How will the data be backed up?</p> <p><i>WHAT STORAGE AND BACKUP PROCEDURES WILL BE IN PLACE TO PREVENT DATA LOSS?</i></p> | <p> <input type="checkbox"/> Standard back-up provided by KU Leuven ICTS for my storage solution <input type="checkbox"/> Personal back-ups I make (specify) <input checked="" type="checkbox"/> Other (specify) </p> <p>During the project data will benefit from an automatic back-up:</p> <ul style="list-style-type: none"> - This is managed by Microsoft: The imec sharepoint is hosted on the Microsoft Cloud, which is a high available environment. Information on this environment is never automatically deleted, removal of specific information should be managed by the business. - If information is removed from this environment, it is moved to a "Recycle Bin". From this Recycle Bin it can still be restored by the user for a period of 93 days (or an admin in case the Recycle Bin was emptied). - After these 93 days, items are deleted, and Microsoft will keep a backup for 14 additional days. During this period restoration can still be requested through a Microsoft ticket. - After these 14 additional days, the data is permanently removed. |
| <p>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.</p> | <p> <input checked="" type="checkbox"/> Yes, at imec data servers, which are expanded at any point it is necessary. <input type="checkbox"/> No </p> <p>If no, please specify:</p> |

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| <p>How will you ensure that the data are securely stored and not accessed or modified by unauthorized persons?</p> <p><i>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.</i></p> <p><u>Guidance on security for research data</u></p> | <p>Data on SharePoint will benefit from the following security services:</p> <ul style="list-style-type: none"> - User-authentication, multifactor authentication can be activated. <ul style="list-style-type: none"> • All logins to imec environments are protected by a strong password (minimal 14 characters) combined with multi factor authentication. - Versioning system <ul style="list-style-type: none"> • Versioning is enabled by default on our SharePoint/Teams' environment. This can be modified by workspace owner and is under full responsibility by the business user. - System-encryption <ul style="list-style-type: none"> • This is managed by Microsoft as outlined in this article: Cloud data security measures in SharePoint & OneDrive - SharePoint in Microsoft 365 Microsoft Docs • Making sure that data is shared with the right people is the responsibility by the business user. • Confidential data will be user encrypted in addition to this: <ul style="list-style-type: none"> ▪ When creating documents (.docx, .xlsx, .pptx), the user is forced to assign an information classification label to the document (Public / Restricted / Confidential / Strictly Confidential) based on the sensitivity of the information. ▪ While this label provides a (visual) marker on the sensitivity level of the information, it will not encrypt the document by default. |
| <p>What are the expected costs for data storage and backup during the research project? How will these costs be covered?</p> | <p>Storage is available at imec at no added cost to the project.</p> |

5. Data Preservation after the end of the Research Project

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| <p>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...).</p> <p><u>Guidance on data preservation</u></p> | <p><input checked="" type="checkbox"/> All data will be preserved for 10 years according to KU Leuven RDM policy</p> <p><input type="checkbox"/> All data will be preserved for 25 years according to CTC recommendations for clinical trials with medicinal products for human use and for clinical experiments on humans</p> <p><input type="checkbox"/> Certain data cannot be kept for 10 years (explain)</p> |
| <p>Where will these data be archived (stored and curated for the long-term)?</p> <p><u>Dedicated data repositories</u> are often the best place to preserve your data. Data not suitable for preservation in a repository can be stored using a KU Leuven storage solution, consult the <u>interactive KU Leuven storage guide</u>.</p> | <p><input type="checkbox"/> KU Leuven RDR</p> <p><input checked="" type="checkbox"/> Large Volume Storage (longterm for large volumes)</p> <p><input type="checkbox"/> Shared network drive (J-drive)</p> <p><input checked="" type="checkbox"/> Other (specify): imec sharepoint, OneDrive and data server units. After the standard retention period of 5 years, data will be subjected to evaluation. This will include weighing the potential value versus the costs of keeping it available. Decisions will be made by the data owners, in close collaboration with ICT service responsables for archiving.</p> |
| <p>What are the expected costs for data preservation during the expected retention period? How will these costs be covered?</p> | |

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/#INFO-EU-REPO-ACCESSRIGHTS](https://wiki.surfnet.nl/display/STANDARDS/INFO-EU-REPO/#INFO-EU-REPO-ACCESSRIGHTS)

- ☐ Yes, as open data
- ☐ Yes, as embargoed data (temporary restriction)
- ☒ Yes, as restricted data (upon approval, or institutional access only)
- ☐ No (closed access)
- ☐ Other, please specify:

Some of the data can be provided to a third party under reasonable request (e.g. for publications or other collaboration possibilities).

If access is restricted, please specify who will be able to access the data and under what conditions.

Internal imec employees related to the project can have access. Any external employee could get partial access under a reasonable request (e.g. for publications or other collaboration possibilities).

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:

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| Where will the data be made available? If already known, please provide a repository per dataset or data type. | <input checked="" type="checkbox"/> KU Leuven RDR <input type="checkbox"/> Other data repository (specify) <input type="checkbox"/> Other (specify) |
| When will the data be made available? | <input checked="" type="checkbox"/> Upon publication of research results <input type="checkbox"/> Specific date (specify) <input checked="" type="checkbox"/> Other (specify) Upon publication, if it does not conflict with ongoing intellectual property protection procedures. |
| Which data usage licenses are you going to provide? If none, please explain why. <i>A DATA USAGE LICENSE INDICATES WHETHER THE DATA CAN BE REUSED OR NOT AND UNDER WHAT CONDITIONS. IF NO LICENSE 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.</i> Check the RDR guidance on licences for data and software sources code or consult the License selector tool to help you choose. | <input type="checkbox"/> CC-BY 4.0 (data) <input type="checkbox"/> Data Transfer Agreement (restricted data) <input checked="" type="checkbox"/> MIT licence (code) <input checked="" type="checkbox"/> GNU GPL-3.0 (code) <input type="checkbox"/> Other (specify) |
| Do you intend to add a PID/DOI/accession number to your dataset(s)? If already available, please provide it here. <i>INDICATE WHETHER YOU INTEND TO ADD A PERSISTENT AND UNIQUE IDENTIFIER IN ORDER TO IDENTIFY AND RETRIEVE THE DATA.</i> | <input type="checkbox"/> Yes, a PID will be added upon deposit in a data repository <input type="checkbox"/> My dataset already has a PID <input checked="" type="checkbox"/> No |
| What are the expected costs for data sharing? How will these costs be covered? | These costs will be covered in project overhead, except in case of circumstances that can be considered out of the ordinary. |

7. Responsibilities

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| Who will manage data documentation and metadata during the research project? | Ahmed Khalil, Pol Van Dorpe |
| Who will manage data storage and backup during the research project? | Ahmed Khalil, Pol Van Dorpe |
| Who will manage data preservation and sharing? | Ahmed Khalil, Pol Van Dorpe |
| Who will update and implement this DMP? | Ahmed Khalil |