FWO DMP Template

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.

1. General Information	
Name applicant	Tjonnie Guang Feng Li
FWO Project Number & Title	Curving Spacetime Curvature: Hunting for Gravitational Lensing of Gravitational Waves
Affiliation	☒ KU Leuven ☐ Universiteit Antwerpen ☐ Universiteit Gent ☐ Universiteit Hasselt ☐ Vrije Universiteit Brussel ☐ Other:
2. Data description	
Will you generate/collect new data and/or make use of existing data?	☒ Generate new data ☒ Reuse existing data

Describe the origin, type and format of the data (per dataset) and its (estimated) volume *If you **reuse** existing data, specify the **source** of these data.* *Distinguish data **types** (the kind of content) from data **formats** (the technical format).*	<u>Reused data</u> All data generated and recorded by the current generation of ground-based laser-interferometer gravitational-wave detectors are recorded in gravitational-wave frame (GWF) files. These files typically contain data from a number of sources bundled into a single, time-stamped set, along with the metadata for each channel. (~10TB) Analysis results in the form of propability distributions are stored as compressed (hdf5) format with metadata associated to each column. (~5GB) Simulation results, in the form of complex magnification functions, are stored as compressed (hdf5) format with metadata associated to each column. (~50GB)

3. Ethical and legal issues	
Will you use personal data? If so, shortly describe the kind of personal data you will use AND add the reference to your file in your host institution's privacy register. *In case your host institution does not (yet) have a privacy register, a reference is not yet required of course; please add the reference once the privacy register is in place in your host institution.*	☐ Yes X No If yes: - Privacy Registry Reference: - Short description of the kind of personal data that will be used:
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, add the reference to the formal approval by the relevant ethical review committee(s).	☐ Yes X No If yes: - Reference to ethical committee approval:

Does your work possibly result in research data with potential for tech transfer and valorisation? Will IP restrictions be claimed for the data you created? If so, for what data and which restrictions will be asserted?	☐ Yes ☒ No If yes, please comment:
Do existing 3rd party agreements restrict dissemination or exploitation of the data you (re)use? If so, to what data do they relate and what restrictions are in place?	☐ Yes ☒ No If yes, please comment:

4. Documentation and metadata	
What documentation will be provided to enable understanding and reuse of the data collected/generated in this project?	Detector data are documented extensively through the Gravitational-Wave Open Science Center, which releases, archives, and serves gravitational-wave data to the broader scientific community and to the public, and to provide the information and tools necessary to understand and use the data. Analysis results and simulation data will be documented through the metadata, accompanying publications and release notes of the supplementary material.
Will a metadata standard be used? If so, describe in detail which standard will be used. If not, state in detail which metadata will be created to make the data easy/easier to find and reuse.	☐ Yes ☒ No If yes, please specify:

5. Data storage & backup during the FWO project	
Where will the data be stored?	The data coming directly from the detectors are stored on servers hosted by the institutes of the LIGO-Virgo-KAGRA collaboration. The output data from analyses on detector data are also stored on these servers. Data from simulations are stored in servers at the Department of Physics & Astronomy.

How will the data be backed up?	The data from the servers in the LIGO-Virgo-KAGRA collaboration and Department of Physics & Astronomy are subject to regular back-up, according to the international and KU Leuven security standards.
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 no, please specify: There is sufficient storage and back-up capacity for the project. If more storage would be needed, this is taken on by the research group working budget.
What are the expected costs for data storage and backup during the project? How will these costs be covered? *Although FWO has no earmarked budget at its disposal to support correct research data management, FWO allows for part of* ***the allocated project budget*** *to be used to cover the cost incurred.*	Data-storage and backup costs are provided for by the LIGO-Virgo-KAGRA collaboration and the Department of Physics & Astronomy. No additional costs are expected.
Data security: how will you ensure that the data are securely stored and not accessed or modified by unauthorized persons?	The data are stored on LIGO-Virgo-KAGRA collaboration and Department of Physics & Astronomy network servers following international and KU Leuven security standards; all data are secured with access restrictions on file-system level.

6. Data preservation after the end of the FWO project FWO expects that data generated during the project are retained for a period of minimally 5 years after the end of the project, in as far as legal and contractual agreements allow.	
Which data will be retained for the expected 5 year period after the end of the project? In case only a selection of the data can/will be preserved, clearly state the reasons for this (legal or contractual restrictions, physical preservation issues, …).	All created data (analysis and simulation data) will be retained for at least 5 years after the end of the project through storage of the LIGO-Virgo-KAGRA Collaboration or the Department of Physics & Astronomy.

Where will these data be archived (= stored for the long term)?	All created data (analysis and simulation data) will be archived through storage of the LIGO-Virgo-KAGRA Collaboration or the Department of Physics & Astronomy.
What are the expected costs for data preservation during these 5 years? How will the costs be covered? *Although FWO has no earmarked budget at its disposal to support correct research data management, FWO allows for part of* ***the allocated project budget*** *to be used to cover the cost incurred.*	Data-storage and backup costs are provided for by the LIGO-Virgo-KAGRA collaboration and the Department of Physics & Astronomy working budget. No additional costs are expected.

7. Data sharing and reuse	
Are there any factors restricting or preventing the sharing of (some of) the data (e.g. as defined in an agreement with a 3rd party, legal restrictions)?	X Yes ☐ No If yes, please specify: Data from the LIGO-Virgo-KAGRA Collaboration are subject to a proprietary period, which is set by agreements between the collaboration and various funding agencies. Beyond this proprietary period The Gravitational-Wave Open Science Center (GWOSC) fulfills our commitment to release, archive, and serve gravitational-wave data to the broader scientific community and to the public.
Which data will be made available after the end of the project?	After the end of the project, data from the detectors will be made available through the GWOSC (see above). Moreover, simulation data relevant for publications will be made available for full reproducibility.
Where/how will the data be made available for reuse?	X In an Open Access repository ☐ In a restricted access repository X Upon request by mail ☐ Other (specify):

When will the data be made available?	Data from the detectors will be made available according to a Data Management Plan, which can be found in https://dcc.ligo.org/LIGO-M1000066/public . Simulation data will be made available upon publication of the results. Journal publications will be made available on the journal website, ArXiv (open-access) and the KU Leuven tool Lirias.
Who will be able to access the data and under what conditions?	When released, the data will be accessible to anybody without any restriction beyond the restrictions imposed by the journal.
What are the expected costs for data sharing? How will these costs be covered? *Although FWO has no earmarked budget at its disposal to support correct research data management, FWO allows for part of* ***the allocated project budget*** *to be used to cover the cost incurred.*	Data-storage and backup costs are provided for by the LIGO-Virgo-KAGRA collaboration and the Department of Physics & Astronomy working budget. No additional costs are expected.

8. Responsibilities	
Who will be responsible for the data documentation & metadata?	The Gravitational-Wave Open Science Center (GWOSC) is committed to release, archive, and serve gravitational-wave data to the broader scientific community and to the public, and to provide the information and tools necessary to understand and use the data. The project PI is responsible for data documentation and metadata for simulation results.
Who will be responsible for data storage & back up during the project?	The project PI and the System management team from The Gravitational-Wave Open Science Center (GWOSC) and the Department of Physics & Astronomy.
Who will be responsible for ensuring data preservation and sharing?	The project PI and the System management team from The Gravitational-Wave Open Science Center (GWOSC) and the Department of Physics & Astronomy.

Who bears the end responsibility for updating & implementing this DMP? *Default response: The PI bears the overall responsibility for updating & implementing this DMP*	The PI bears the end responsibility of updating & implementing this DMP.