

ThoR H2020 814523



**Horizon 2020 Grant Agreement no: 814523**

**Terahertz end-to-end wireless systems supporting ultra-high data Rate applications**

**ThoR**

**Deliverable D1.7**

**Final Data Management Plan**

Coordinator (EU): Thomas Kürner  
 Organisation: Technische Universität Braunschweig

Coordinator (Japan): Tetsuya Kawanshi  
 Organisation: Waseda University

Start date of project: 01-Jul-2018

Date of issue: 07-Mar-2022  
 Due date: 31-Jan-2022  
 Ref: ThoR\_VIV\_220304\_A\_WP1

**Leader in charge of deliverable: Bruce Napier  
 Vivid Components**

<b>Project co-funded by the European Commission within the Horizon 2020 programme and the National Institute of Information and Communications Technology in Japan (NICT)</b>		
<b>Dissemination level</b>		
<b>PU</b>	<b>Public</b>	<b>X</b>
<b>PP</b>	<b>Restricted to other programme participants (including the Commission Services)</b>	
<b>RE</b>	<b>Restricted to a group specified by the consortium (including the Commission Services)</b>	
<b>CO</b>	<b>Confidential, only for members of the consortium (including the Commission Services)</b>	

## Contents

<b>STATEMENT OF INDEPENDENCE</b> .....	<b>2</b>
<b>EXECUTIVE SUMMARY</b> .....	<b>3</b>
<b>1. DATA SUMMARY</b> .....	<b>4</b>
<b>2. FAIR DATA</b> .....	<b>8</b>
2.1. Making data findable, including provisions for metadata [FAIR data].....	8
2.2. Making data openly accessible [FAIR data].....	9
2.3. Making data interoperable [FAIR data] .....	10
2.4. Increase data re-use (through clarifying licenses) [FAIR data].....	10
<b>3. ALLOCATION OF RESOURCES</b> .....	<b>11</b>
<b>4. DATA SECURITY</b> .....	<b>12</b>
<b>5. ETHICAL ASPECTS</b> .....	<b>12</b>
<b>6. OTHER</b> .....	<b>12</b>

## Change register

Version	Date	Author	Organisation	Changes
A_DRAFT	04-Mar-2022	Bruce Napier	Vivid	Initial
A	07-Mar-2022	Bruce Napier	Vivid	No reviewer changes: typos and formatting only.

Reviewed by Petr Jurčík DTAG A\_DRAFT 07-Mar-2022

## Statement of independence

The work described in this document is genuinely a result of efforts pertaining to the ThoR project. Any external source is properly referenced.

Confirmation by Authors: Bruce Napier Vivid Components  
 [ThoR consortium also provided input]

## **Executive summary**

This document summarises the data management plan which was utilised in the ThoR project, which was based mainly on existing procedures at each partner, and the project management manual (D1.1). This document is based on the mid-term DMP, and has been reviewed and updated by all partners.

The automated tool DMP Online was used to produce this document.

<https://dmponline.dcc.ac.uk>

## 1. Data summary

### **State the purpose of the data collection/generation**

In general, the data collection is in order to facilitate research and development both within the project and for future work.

Individual partner comments include:

CIT

Data is collected to enable future THz antenna and propagation research.

DTAG

Data is collected and generated for future use in DTAG.

Gifu

Data is generated and collected to enable current and future research.

IAF

Data is generated and collected to enable current and future research and development.

Siklu

Data is collected to enable future use by Siklu employees to deliverables and research results

USTUTT

Data is generated and collected to enable current and future research.

Vivid

Contact information for the ThoR Community and Advisory Group

Waseda

Data is collected to enable future THz system research.

TUBS

Data is generated and collected to enable current and future research.

Lille

Data is generated, and saved on several supports, enabling project activities support and future research activities

HRCP

Data is collected and generated for V-band and THz system development.

### **Explain the relation to the objectives of the project**

In general, the data collection is necessary to perform the project work, including dissemination. Individual partner comments include:

CIT

The data will be used for THz antenna and propagation research.

DTAG

The data is/will be used for the analysis and evaluation of 5G and beyond 5G network deployment scenarios.

Gifu

The data will be used for THz and millimetre-wave research.

**IAF**

The data is required for the development and analysis of solid-state THz front ends, components and technologies, which are enabling high-data-rate THz communications.

**Siklu**

The data is likely to be used in the design of future wireless products

**USTUTT**

The data is required for the design of future THz front ends, which are enabling high-data-rate THz communications and research in the field of ultra-high data rate transmissions.

**Vivid**

Necessary for effective dissemination

**Waseda**

The data will be used for THz and millimetre-wave radio system research.

**TUBS**

The data used and collected to enable current and future research and development of THz communication systems including planning algorithms for backhaul/fronthaul links.

**Lille**

The data generated mostly from measurements of the devices and system level evaluation enables project workplans and activities as well as knowhow/expertise development at University of Lille.

**HRCF**

The data is generated and used for evaluation of V-band modems, which are employed for interfacing actual user data to the THz wireless system developed in ThoR.

**Specify the types and formats of data generated/collected**

There are various formats, including:

**CIT**

Data includes experimental results and simulation results of THz antenna and propagation.

**DTAG**

Data includes the measured and simulated results, network design.

**Gifu**

Data includes experimental results and simulation results (CST) related to THz research. This consists of near-field patterns, radiation patterns, transmission results, etc.

**IAF**

Simulation data is generated using EM and RF circuit simulation tools like ADS and CST. Simulation/modelling as well as measurement data of devices is processed using appropriate software tools like Python, Origin, EXCEL etc.

Processed measurement and simulation results of devices and integrated circuits is stored using ASCII text files as well as Touchstone files (usable in conventional RF circuit simulators).

Layouts of devices and circuits are mainly stored in GDSII format. 3D models of devices/modules are stored in STEP format.

**Siklu**

Data includes system design related information (design documents, schematics, PCB layout, etc.), system measurement results

#### USTUTT

Data includes system design-related information generated using EM and RF circuit simulation tools like ADS and CST.

Layouts of devices and circuits are mainly stored in GDSII format.

Data also includes the results of transmission experiments. Measurement data of devices is processed using appropriate software tools like MATLAB.

#### Vivid

Contact information in Microsoft Outlook and Excel

#### Waseda

Data includes experimental results and simulation results related to THz system research.

#### TUBS

Data includes the measured and simulated results, network design

#### Lille

Data includes power measurements (linear, non-linear), phase noise performances, telecom measurements like I/Q/modulated data testing, amplifier, up/down converters characterizations and antenna patterns measurements.

#### HRCF

Experimental results of V-band modem, such as SNR or bit-error rate obtained through evaluation in ASCII format. Design and guidance documents about V-band modem in MS Word or PowerPoint format.

### **Specify if existing data is being re-used (if any)**

No reuse of existing data is being done.

### **Specify the origin of the data**

There are various origins of the data in the project, including:

#### CIT

Data are generated in the course of the experiment and simulation about THz antenna and propagation research in this project.

#### DTAG

Data is generated/created in the simulation tools and network planning tools.

#### Gifu

Data is generated/created in the simulation and experiment.

#### IAF

The data is generated in device modelling, simulation and characterization (see above).

#### Siklu

Data is typically being generated in the course of the project for any advancements done within its scope.

#### USTUTT

Data is generated/created in the simulation tools and by measurements.

#### Vivid

All WP8 data is freely provided by the ThoR Community and Advisory Group.

#### TUBS

Data is generated/created in the simulation tools and network planning tools.

#### Lille

Data is mostly generated during the measurement campaigns of the WP4 (Devices, single or assembly) and WP6 (system-demos) related activities.

#### HRCP

Data is obtained through evaluation of V-band modems combined with some apparatus provided from this project.

### **State the expected size of the data (if known)**

The total amount of data generated in the project is expected to be <100 GB.

### **Outline the data utility: to whom will it be useful**

Partner comments on data utility from their perspectives:

#### CIT

The data is useful for antenna and propagation researchers.

#### DTAG

The data is useful for the network planning engineers.

#### Gifu

The data will be useful for researchers and collaborators of the Gifu University for the future development of terahertz communication systems, new types of antennas, propagation research, etc.

#### IAF

The data will be useful for employees and partners of Fraunhofer IAF for the development of THz devices and systems.

#### Siklu

The data is useful to Siklu employees if deciding to develop products based on the technology investigated in the project

#### USTUTT

The data will be useful for researchers of the University of Stuttgart for the future development of terahertz communication systems.

#### Vivid

This contact information will not be used beyond ThoR.

#### Waseda

The data is useful to researchers and collaborators of the Waseda University for future THz research and standardization.

#### TUBS

The data will be useful for students and researchers at TUBS for studies and the future development of terahertz communication systems.

#### Lille

The data is useful for students, researchers and engineers at Lille partners involved on THz devices measurements/related activities. It contributes to the development of research in this topic at Lille.

#### HRCP

The data is intended to be used by researchers or engineers having interest in V-band modems and IEEE 802.15.3d/e standard.

## 2. FAIR data

### 2.1. Making data findable, including provisions for metadata [FAIR data]

#### Outline the discoverability of data (metadata provision)

Some of the data (such as design documents) is searchable as text. Other types of data, such as schematics, layouts and measurements are not directly searchable but are described by attributes such as filename, or are linked from searchable documents

Re. TUBS SiMoNe data:

Most of the data used and archived at TUBS is background and simulation data implemented in the in-house-developed tool Simulator for Mobile Networks (SiMoNe). This tool stores its data in an SQL data base which is searchable both via SQL commands and through the graphical user interface of SiMoNe. For the exchange of data with partners, import and export routines (with converters) exist enabling the exchange of ASCII data, e.g. which is searchable through filenames.

#### Outline the identifiability of data and refer to standard identification mechanism. Do you make use of persistent and unique identifiers such as Digital Object Identifiers?

The data will have standard identifiers.

#### Outline naming conventions used

All partners will use the agreed ThoR naming conventions as defined in the project management manual (D1.1, section 7.3):

*"In a project of this size, many hundreds of documents will be generated. For ease of use a register of all project documents based on a unique reference based on the document creation date will be included on the website. The initial version will be A; updates B, C etc. will retain the original creation date so that this acts as an identifier.*

*E.g. ThoR\_TUBS\_180715\_B\_WP3 Document title XYZ referring to:*

*ThoR\_<partner>\_<doc creation date (YYMMDD)>\_<version>\_<WP> Document title XYZ*

*Please keep the document title brief and descriptive. If it is a deliverable then simply state the deliverable number and (possibly abbreviated) name.*

*Examples:*

*ThoR\_TUBS\_180823\_A\_WP1 Regular call minutes 2018-08-23*

*ThoR\_DTAG\_181022\_B\_WP2 KO meeting presentation*

*ThoR\_VIV\_180831\_A\_WP1 D1.1 Project management manual"*



### **Outline the approach towards search keyword**

N/A for most of the project data.

Keywords are important for not searchable data. When such data is linked or named, describing keywords should be included.

### **Outline the approach for clear versioning**

Draft versions are indicated with "DRAFT" in the filename.

Issued versions are named A, B, C, etc. as per the naming convention above (D1.1).

Change registers are included on all project documents.

### **Specify standards for metadata creation (if any). If there are no standards in your discipline describe what metadata will be created and how**

N/A

## **2.2. Making data openly accessible [FAIR data]**

Data in public deliverables is available through the deliverables on the project website, as well as through the EC's own portal.

Most data from the project is confidential, for several reasons, including:

- geographic data has licensing conditions.

- network data provided by partners is confidential.

- selected parts of (artificial but still realistic) reference scenario data will be made publicly available through the web page of TUBS and the ThoR website.)

- other data is kept confidential for academic contributions (e.g. contents for journal or conference papers should be unpublished.

- company confidential material.

### **Specify how the data will be made available**

Data will be available through public deliverables, conferences, and journal papers.

The public data is published on the ThoR website and on some members' webpages.

Selected parts of (artificial but still realistic) reference scenario data will be made publicly available through the web page of TUBS and the ThoR website.

**Specify what methods or software tools are needed to access the data? Is documentation about the software needed to access the data included? Is it possible to include the relevant software (e.g. in open source code)?**

Standard tools such as PDF reader and web browser (HTML) are needed to access the public data.

Reference scenario data will be made available in ASCII format along with a format description.

**Specify where the data and associated metadata, documentation and code are deposited**

The data is stored in Powerfolder hosted at the TUBS, and on the ThoR public website.

**Specify how access will be provided in case there are any restrictions**

No restrictions to access public deliverables.

Internal data, which is not publicly available is available through the password-protected Powerfolder at TUBS.

### 2.3. Making data interoperable [FAIR data]

**Assess the interoperability of your data. Specify what data and metadata vocabularies, standards or methodologies you will follow to facilitate interoperability.**

Data is mostly in text format so should pose no limit to interoperability. If non-standard data formats are used, the data format will be described and the document with the description will be made available along the data.

Two-byte characters will be avoided.

**Specify whether you will be using standard vocabulary for all data types present in your data set, to allow inter-disciplinary interoperability? If not, will you provide mapping to more commonly used ontologies?**

ThoR will use standard vocabulary.

If necessary, a mapping will be made available with an accompanying document.

### 2.4. Increase data re-use (through clarifying licenses) [FAIR data]

**Specify how the data will be licenced to permit the widest reuse possible**

No restriction for public data.

Non-public data will be kept confidential.

**Specify when the data will be made available for re-use. If applicable, specify why and for what period a data embargo is needed**

The public data is available via the ThoR website.

Internal data is kept as confidential.

TUBS will also make the public simulation scenarios available via TUBS and ThoR website.

No restrictions in terms of lifetime of the data. Good scientific practice rules will be followed, which will keep data available for a period of at least 10 years.

**Specify whether the data produced and/or used in the project is useable by third parties, in particular after the end of the project? If the re-use of some data is restricted, explain why**

Public data may be re-used if properly cited.

**Describe data quality assurance processes**

Data quality is assured by the review process as described in D1.1 project management manual.

**Specify the length of time for which the data will remain re-usable**

No restriction on reusability of public data.

Good scientific practice suggests data be available for a period of at least 10 years.

### **3. Allocation of resources**

**Estimate the costs for making your data FAIR. Describe how you intend to cover these costs**

Costs TBD

These costs will be borne by the individual partners as necessary.

**Clearly identify responsibilities for data management in your project**

Each partner to be responsible for its own data management as per this document and D1.1.

TUBS administrators for SiMoNe and Powerfolder will be responsible for maintaining the data. Bruce Napier (Vivid) will maintain the mailing lists and contact info.

**Describe costs and potential value of long term preservation**

N/A

#### **4. Data security**

**Address data recovery as well as secure storage and transfer of sensitive data**

Partners each have internal back-up procedures.

For project documents on Powerfolder, the data is backed-up and mirrored to back-up servers.

#### **5. Ethical aspects**

**To be covered in the context of the ethics review, ethics section of DoA and ethics deliverables. Include references and related technical aspects if not covered by the former**

N/A

#### **6. Other**

**Refer to other national/funder/sectorial/departmental procedures for data management that you are using (if any)**

N/A