

**Memorandum of Understanding  
between the LIGO Laboratory and U.K. Partners in the  
Advanced LIGO Plus (A+) Detector Upgrade Project**

**THIS MEMORANDUM OF UNDERSTANDING (MOU) IS MADE ON [ 28 April 2020] BETWEEN:**

1. The **LIGO Laboratory**, which is operated for the **U.S. National Science Foundation** by the **California Institute of Technology** and **Massachusetts Institute of Technology** and whose Directorate is located at MC100-36, 1200 California Boulevard, Pasadena, California 91125 USA ("**LIGO**," "**NSF**," "**Caltech**," "**MIT**," or "**US Partner**")

**AND**

2. **The University of Birmingham**, whose principal office is at Edgbaston, Birmingham B15 2TT, UK ("**Birmingham**" or "**UK Partner**");
3. **Cardiff University** established under royal charter whose administrative offices are at 30-36 Newport Rd, Cardiff, CF24 0DE, UK ("**Cardiff**" or "**UK Partner**"); and
4. **The University Court of the University of Glasgow** a charitable body registered in Scotland under registration number SC004401 and having its main administrative offices at University Avenue, Glasgow, G12 8QQ, UK ("**Glasgow**" or "**UK Partner**"); and
5. **The University of Strathclyde** incorporated by Royal Charter, a charitable body registered in Scotland with registration number SCO15263 and having its Principal Office at 16 Richmond Street, Glasgow, G1 1XQ, UK ("**Strathclyde**" or "**UK Partner**"); and
6. **THE SCIENCE AND TECHNOLOGY FACILITIES COUNCIL as part of UNITED KINGDOM RESEARCH AND INNOVATION**, one of whose offices is at The Rutherford Appleton Laboratory, Harwell Oxford, Didcot, OX11 0QX ("**STFC**" or "**UK Partner**")

(each a **Party** and together the **Parties**)

**BACKGROUND**

The Parties wish to enter into this MOU to record their mutual understanding in relation to the upgrade of the LIGO Observatories and specifically to record the role of the UK Partners in the design, construction and operation of the Project, as enabled by a grant received from the United Kingdom Research and Innovation for this purpose.

**1. DEFINITIONS**

- 1.1 **Advanced LIGO** means the second phase of a series of projects undertaken by the LIGO Laboratory.
- 1.2 **Advanced LIGO Plus** or **A+** or the **Project** means the development, construction and commissioning of scientific apparatus in order to achieve the intended upgrade of the Detectors.

- 1.3 **ALUK** means the UK Partners to this MOU including STFC, Birmingham, Cardiff, Glasgow and Strathclyde and 'members of ALUK' shall refer to each of the UK Partners to this MOU.
- 1.4 **Arising IP** shall mean any Intellectual Property which is generated or first reduced to practice by any Party or Parties directly as a result of the work undertaken in accordance with the Project.
- 1.5 **Background IP** shall mean any Intellectual Property excluding Arising IP owned or controlled by any Party prior to commencement of or independently from the Project, and which the owning Party contributes or uses in the course of performing its part of the Project.
- 1.6 **Caltech** means California Institute of Technology 1200 E California Blvd, Pasadena, CA 91125, United States
- 1.7 **Data** means the information recorded as a result of operation of the Detectors, whether raw or subsequently processed in order to allow scientific analysis.
- 1.8 **Detector** means one of the two gravitational wave detectors, one located at each of the two LIGO Observatories and 'Detectors' refers to both of them.
- 1.9 **Engineering activities** means the development, design, construction, integration, and testing of equipment, and provision of necessary documentation.
- 1.10 **Equipment** mean any items, whether hardware or software owned or procured by a UK Partner or Partners specifically for the purpose of the Project and which are to be supplied under this MOU to one or more of the US Partner(s) under the Project.
- 1.11 **Intellectual Property** shall mean intellectual property of any description including but not limited to all inventions, designs, information, specifications, formulae, improvements, discoveries, know-how, data, processes, methods, techniques and the intellectual property rights therein, including but not limited to, patents, copyrights, database rights, design rights (registered and unregistered), trade marks, trade names and service marks, applications for any of the above.
- 1.12 **LIGO Laboratory** means the United States national facility for gravitational wave research, providing opportunities for the broader scientific community to participate in detector development, observations, and data analysis based at Caltech, MIT, and the two LIGO Observatories. Caltech and MIT share prime responsibility for the operation of the LIGO Laboratory and for the design and construction of upgrades, under the terms of a Cooperative Agreement between Caltech and NSF.
- 1.13 **LIGO Laboratory Systems Group** means the body appointed by the LIGO Laboratory to be responsible the management of systems engineering for the Detectors and therefore ultimately responsible for decisions on all technical matters in relationship to the Project.
- 1.14 **LIGO Observatories** means the twin facilities operated by the LIGO Laboratory, housing one gravitational wave detector per site namely at Livingston, Louisiana and Hanford, Washington.
- 1.15 **LSC** means the 'LIGO Scientific Collaboration' which is an international consortium of academic and research organizations that contribute to: dissemination of data from gravitational wave detectors; data analysis; the scientific operation of the LIGO Observatories; and research and development in support of upgrades to the LIGO Observatories. These activities are together known as the LSC Program. The organization of the LSC and its governance are defined in its Charter and By-laws (<https://ligo.org/about/governance.php>). The UK Partners are a members of the German-British GEO Consortium which is in turn a member of LSC.
- 1.16 **MIT** means Massachusetts Institute of Technology 185 Albany St. NW22-295, Cambridge, MA. 0213, United States of America (a "US Partner").

- 1.17 **NSF** means the United States National Science Foundation.
- 1.18 **Requirements** means the parameters agreed between the Parties for the Equipment and any planned activities, including interfaces, technical performance and schedule.

## **2. THE UNDERSTANDING ON THE CONSTITUTION OF THE PROJECT**

- 2.1 Lead funding for the Project has been provided by the NSF to Caltech and MIT. Lead responsibility for design and implementation of the Project is provided by the LIGO Laboratory, under a cooperative agreement with the NSF.
- 2.2 The UK Partners are self-funded by grant awards from the UK funding agency United Kingdom Research and Innovation and shall participate in the Project through provision of Equipment and Engineering activities and as set out in this MOU.
- 2.3 The UK Partners will each be granted roles in the governance of the Project, commensurate with their contributions, as reasonably determined by the LIGO Laboratory.
- 2.4 The UK Partners to the Project will participate in the Project including management of the development, design, construction, integration, and testing of equipment, and the planning for observations. In particular:
- (a) UK Partners will have opportunities equal to those of LIGO Laboratory staff to serve as subsystem leaders, subsystem scientists and other appropriate roles related to design, construction and operation of the Detectors; and
  - (b) UK Partners have rights to use all Data through continued participation in the LSC Program.
- 2.5 Change control for the Project is managed through the LIGO Laboratory Systems Group and implemented through a series of technical and design requirements reviews following procedures set out in LIGO-M1500263. The UK Partners will be invited and consulted for all reviews that affect the UK Partners' technical scope, changes in schedule, or where there is a change in the science goals. Any changes affecting a UK Partner's Equipment or Engineering activities shall be expressly agreed by the UK Partner before such changes are implemented.

## **3. THE UNDERSTANDING ON LIABILITIES, RIGHTS and RESPONSIBILITIES (EQUIPMENT)**

- 3.1 Each UK Partner shall use its reasonable endeavours to ensure that all Equipment supplied under this MOU will be consistent with the Requirements.
- 3.2 Equipment supplied by the UK Partner(s) and delivered to one of the LIGO Observatories, Caltech, or MIT will be made available to the LIGO Laboratory for sole use in the Project. Full legal title to the Equipment will transfer to LIGO Laboratory on notification of readiness to despatch the Equipment. In the event that Caltech, MIT and / or the LIGO Laboratory wish to use the Equipment for other purposes, such purposes shall require to be agreed in writing with the relevant UK Partner. Costs and procedures associated with shipping, customs duties and clearances shall be as agreed between the relevant UK Partner and the recipient of such Equipment (from time to time and as the case may be).
- 3.3 No warranties are provided by the UK Partners in relation to any Equipment or the Engineering activities provided under this MOU or in relation to any reports, data, drawings, diagrams, and/or any other information whatsoever which may be supplied under this MOU, including in relation to the Equipment. To the fullest extent permitted by law, the UK Partners disclaim all liability arising

from the use of the Equipment and any reports, data, drawings, diagrams, and/or any other information provided in connection with this MOU.

- 3.4 Caltech and the LIGO Laboratory shall ensure that the Equipment is safe and suitable for its purpose prior to any such use and shall be solely responsible for any use of the Equipment, any loss, liability or damage including, but not limited to, liability for death or personal injury, damage to property and any third party claim incurred or suffered by or imposed upon the UK Partners directly or indirectly as a result of, or in connection with the use of the Equipment on the Project, the installation of the Equipment and / or subsequent decommissioning of the Equipment.
- 3.5 Caltech and the LIGO Laboratory shall be responsible for any costs associated with repairs, decommissioning and disposal of the Equipment, as well as any costs associated with modifications of the Equipment post-delivery.
- 3.6 Publication and publicity for results should be in accordance with LSC Charter and By-laws, where appropriate.

#### **4. THE UNDERSTANDING ON EXCHANGE OF CONFIDENTIAL INFORMATION**

- 4.1 The Parties confirm that they do not intend to exchange confidential information under this MOU. In order to achieve this, the Parties accept that it may be necessary from time to time to provide redacted versions of Project documentation. Should it become essential to share confidential information, it is understood that the relevant Parties shall enter into a separate confidentiality agreement.

#### **5. THE UNDERSTANDING ON INTELLECTUAL PROPERTY**

- 5.1 It is not expected that Intellectual Property shall be generated in the Project.
- 5.2 In the event Arising IP is conceived or first actually reduced to practice by a UK Partner at the LIGO Laboratory facilities, that Party shall inform the director of the LIGO Laboratory. In such an event a legally binding agreement separate from this MOU may be required. It is, however, expected that this separate agreement shall permit each of the other Parties the right to use such Arising IP for non-commercial research purposes on a royalty free basis.
- 5.3 All Background IP used or supplied to another Party in connection with the Project shall remain the property of the Party introducing the same and may only be used by the recipient Party / Parties for the purposes of the Project.

#### **6. THE UNDERSTANDING ON GENERAL MATTERS**

- 6.1 It is understood that any Party may terminate its participation in the Project or the MOU, without liability, by providing formal written notice to the other Parties.
- 6.2 This MOU shall commence on the last date of signature hereto and shall remain in full force and effect until the Detectors cease to operate or the Parties decide to put a new agreement in place in respect of the Project.
- 6.3 Nothing in this MOU shall create, imply or evidence any partnership or joint venture between the parties or the relationship between them of principal and agent or employers and employee.
- 6.4 The rights and remedies provided under this MOU are in addition to, and do not limit, any other rights or remedies provided by law. Each Party acknowledges and agrees that damages alone

may not be an adequate remedy for breach by another Party and the non-defaulting Party shall be entitled to seek the remedies of injunction, specific performance or other equitable relief for any threatened or actual breach of those clauses.

- 6.5 Unless it is expressly stated otherwise, this MOU does not give rise to any rights for a third party to enforce any of its terms. This MOU may be amended by the Parties without the need for any third party consent.
- 6.6 This MOU is not exhaustive, is not intended to be legally binding between the Parties, and replaces the MOU for Advanced LIGO which was dated 4 May 2006.

**Signed for and on behalf of the Parties:**

**LIGO Laboratory**

Name: Dr. David H. Reitze

Position: LIGO Laboratory Executive Director and Advanced LIGO Plus Principal Investigator

Signature: 

Date: 16 April 2020

Name: Dr. Albert Lazzarini

Position: LIGO Laboratory Deputy Director and Advanced LIGO Plus Co-Investigator

Signature:

Date: 16 April 2020

Name: Dr. Michael E. Zucker

Position: Advanced LIGO Plus Project Leader and Co-Investigator

Signature: 

Date: 16 April, 2020

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The University of Birmingham

Name:

Position:

Signature:

Date:

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Cardiff University

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The University Court of the University of Glasgow

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The University of Strathclyde

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The Science and Technology Facilities Council

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