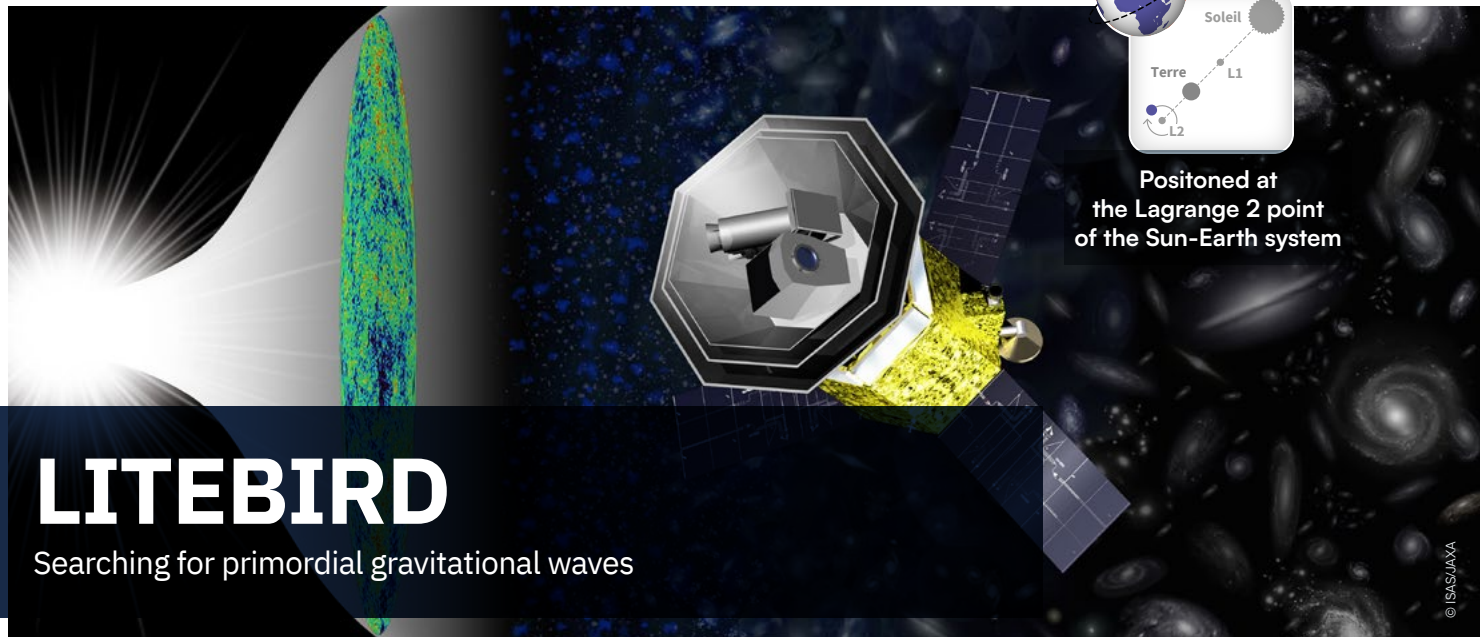


Gravitational waves



Positioned at the Lagrange 2 point of the Sun-Earth system

# LITEBIRD

Searching for primordial gravitational waves

**Scientific leader:** Matthieu Tristram (IJCLab) \*

**Laboratories involved:** APC (Paris), IJCLab (Orsay), LPSC (Grenoble)

**Nature:** space project (CNES)

**Statut:** international project in preparation, mainly funded by Japan (JAXA) and France (CNES)

**Website:** <https://www.isas.jaxa.jp/en/missions/spacecraft/future/litebird.html>

## Scientific objectives

LiteBIRD aims to detect primordial gravitational waves emitted during the cosmic inflation phase (10-38 seconds after the beginning of the Universe). These are expected to leave an imprint in the Cosmic Microwave Background (CMB) in the form of special polarisation patterns, known as "B-modes". Their observation will make it possible to study the primordial Universe at ultra-high energy scales, to better constrain the mechanisms of cosmic inflation, and to test theoretical predictions of quantum gravity or grand unification of forces.

## Resources deployed

- LiteBIRD, a satellite weighing about 2.2 tonnes, will carry three telescopes (low frequency LFT, medium frequency MFT and high frequency HFT) and will be sent to the Lagrange L2 point.
- About 5 000 detectors will make observations of the entire sky's fossil radiation in 15 frequency bands between 35 and 450GHz.
- A complex cryogenic system will cool the telescopes to 5K and the detectors to 100mK.
- Development for space conditions of continuously rotating half-wave blades by magnetic levitation.
- Deployment of a platform for ground calibration and optical measurements in flight conditions (< 4K).

<b>15</b> frequency bands mapping the sky	<b>\$ 500M</b> consolidated cost
<b>3</b> years of operation	<b>12</b> participating countries
<b>5</b> main contributors: Japan, France, Italy, Canada	

### IN2P3 CONTRIBUTIONS

- Design and delivery of the mechanical structure of a prototype refractive telescope to perform the first optical tests. If selected, IN2P3 will provide the mechanical structure for the different models, from the engineering model to the flight model.
- Global thermal modelling of the MFT and HFT telescopes.
- Contribution to the thermal and optical part of the ground segment equipment needed for the calibration phase.
- Leading role in the organisation and management of the pre-light calibration phase on the ground.

## Other french laboratories involved

Irig (CEA Grenoble), Irfu (CEA Saclay), LERMA (Paris), IAP (Paris), IAS (Orsay), Institut Néel (Grenoble), IPAG (Grenoble), IRAP (Toulouse), LAM (Marseille), LESIA (Paris)

**2014**

LiteBIRD is selected as a priority project by the Science Council in Japan

**2015**

Official invitation from JAXA to the European CMB community

**2019**

Selection of LiteBIRD as Large Class Mission by JAXA

**2020-2023**

Feasibility study of the MFT and HFT telescopes led by CNES

**2033**

Expected launch date

**2037**

Expected end of primary mission

\* Since 2019