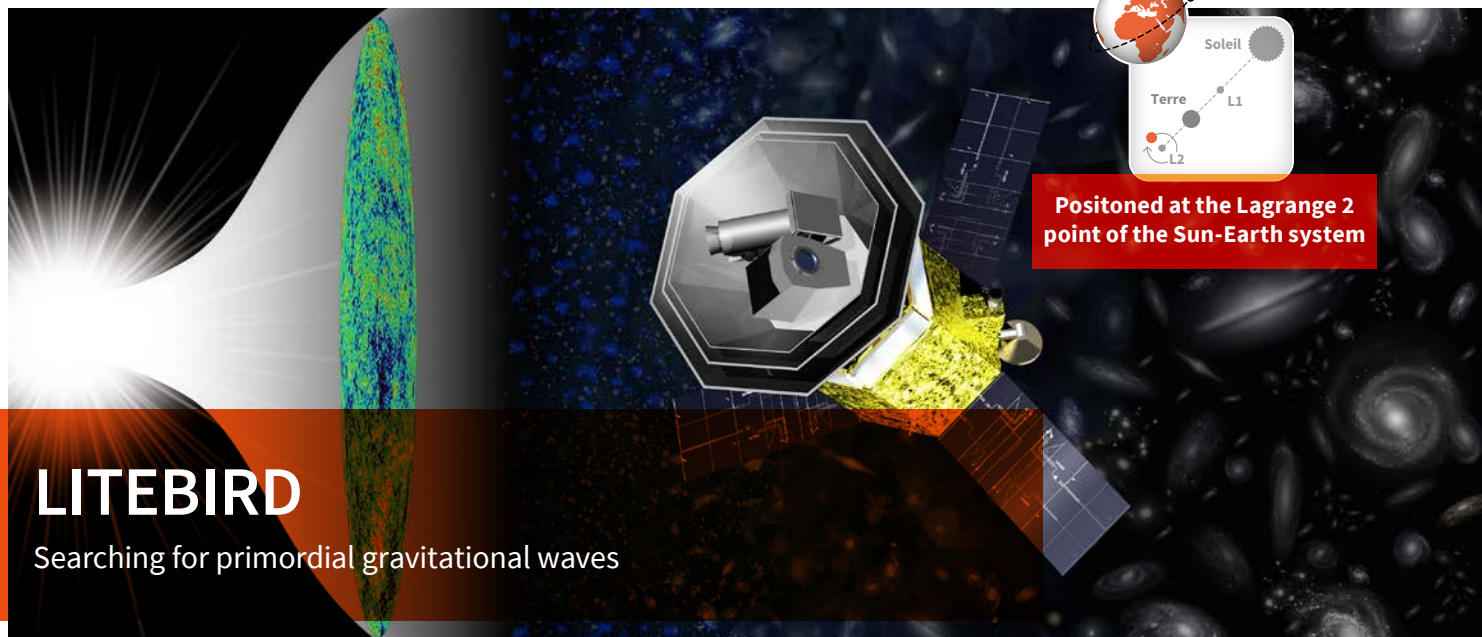


Gravitational waves



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

LITEBIRD

Searching for primordial gravitational waves

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- **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:** <http://litebird.jp/eng/>

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 450 GHz.
- A complex cryogenic system will cool the telescopes to 5 K and the detectors to 100 mK.
- 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 ($< 4K$).

15 frequency bands mapping the sky

3 years of operation

12 participating countries

500 million dollars (consolidated cost)

5 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

2030

Expected launch date

2034

Expected end of primary mission