
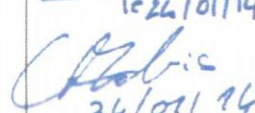
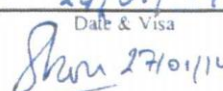
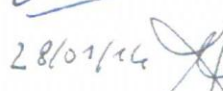
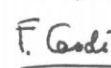


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## MICROSCOPE Science Cooperation Rules

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Agreed by :		Date & Visa



## 1. Introduction

### 1.1 Overview

The Microscope space mission aims at testing the Equivalence Principle (EP) through one of its major consequence, the Universality of Free Fall that is to say the equivalence between the inertial mass and the gravitational mass, with an accuracy better than  $10^{-15}$  i.e. more than two orders of magnitude better than the present on-ground experiments.

Concerning the mission exploitation, ONERA is responsible for the Microscope Scientific Mission Centre (CMS-M) which distributes all mission data and relevant information to the scientific community. CNES is involved in the satellite performance analysis for the achievement of the EP test. The mission has also been open to complementary scientific applications by enlarging the Science Working Group (SWG, see annex 1). Furthermore, additional participants may be invited to join the as-yet selected scientists.

Meeting the scientific goals of the mission will require a coordinated interaction among these participants (e.g. data sharing, interactive data analysis, joint publications...) which has to be established in advance. In order to detect the tiny acceleration of  $8.10^{-15}\text{ms}^{-2}$  necessary to confirm or infirm any possible EP violation signal, a very thorough analysis of the in orbit residual perturbations of the test mass motions is needed. The results dramatically depend on the satellite, the instrument and the operation data, at the same time. This is why any information on these three elements has to freely circulate inside the CMS-M, provided that their dissemination is supervised during the whole processing of the data. So, while encouraging the openness of the project, principles and ground rules are hereunder settled to manage the scientific investigations, the publications and more generally the mission communication.

### 1.2 Scope

This document is an agreement between the Microscope PI, Co-PI, CoIs and the associated scientists, as well as the SWG<sup>1</sup> and SPG<sup>2</sup> members (as presented in section 3) with respect to the science policy and the data rights of the Microscope mission.

It aims at:

- Strengthening the scientific collaboration on the Microscope mission exploitation.
- Encouraging communications, publications and proper recognition of anyone contribution.
- Setting guidelines to achieve the best scientific and technical accuracy in the individual or coordinated publications and making sure that all information about the SWG and the SPG activities and/or Microscope data public release is accurate and traceable.

It covers a timeframe including the development and operation phases of the project till the end of the proprietary period (see section 6).

### 1.3 Revisions

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<sup>1</sup> SWG : Science Working Group

<sup>2</sup> SPG : Science Performance Group

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This document may be revised as needed to accommodate changes in the Microscope science investigation. Revisions will require the approval of the PI, co-PI and CNES.

#### **1.4 Reference documents :**

Reference documents include:

- Microscope Science Management Plan (MIC-GP-G-9-5503-ONE, 7 Jan. 2013), approved by the Mission Steering Committee during the meeting on 12 November 2012,
- Microscope ESA-CNES agreement, 21 June 2001.

### **2. Principles of the scientific activities**

The main logic of the scientific activities relies on some principles:

- The result of the mission is based on experimental measurements which will need numerous and repetitive validation periods in different environmental conditions.
- The analysis of the measurements will require a complete understanding of the instrument operation, of the experimental procedures and of the operational conditions; in that way, subsystem data and instrument data will have to be considered in an integrated manner for the scientific interpretation.
- The nature of the mission is such that the data products can only be generated from an analysis of a full set of data (in particular, data acquired over the whole duration of the mission need to be used to calibrate and remove systematic effects). Therefore the distribution of partial sets of data before the complete set is processed will be avoided.
- The experimental results will lead or not to a violation signal of the Equivalence Principle (EP), measured with an accuracy finely characterized for each experimental conditions ( $10^{-15}$  and better is expected). The reliability of the performances depending on the instrument characteristics as well as on the satellite and system will have to be jointly approved by scientists and engineers.
- The results will be discussed and approved by the SWG; they can then give rise to various theoretical interpretations coming from different scientific communities.
- Interactions with experts in phenomenology are needed to sustain the results with respect to various extended theories of gravitation and to envisage the perspectives of the Microscope experiment.

### **3. Microscope scientific collaboration**

#### **Scientific actors**

The following persons and bodies are involved in the scientific activities of the Microscope mission as defined and detailed in the document "Microscope science management plan":

- The Principal Investigator (PI), the co-Principal Investigator (co-PI) and the co-Investigators (co-Is),

- The Science Working Group (SWG) whose composition is given in Annex 1 (in particular, it includes the PI, Co-PI and Co-Is mentioned above),
- The Science and Performance Group (SPG),
- The Performance Working Group (PWG), active only during the development phase,
- The Group of Experts (GEX) of the CECT (Centre d'Expertise sur la Compensation de Trainée/ Drag-free expert group).

In addition, the SWG members will be given the possibility to head scientific collaborations. The members of these collaborations who are not Co-Is are called Associated Scientists.

### **Responsibilities for data management**

All along the orbit, each of the four inertial sensors will provide six scientific measurements corresponding to the electrostatic forces and torques applied to each test mass. In addition, many other data will provide information on the environment of the masses, on the instrument operation and on the satellite behaviour.

All these data will be processed by the SPG to different levels, raw data, level 0 data (N0), level 1 data (N1) and level 2 data (N2), under the responsibility of the PI and Co-PI.

The Microscope scientific mission centre, CMS-M<sup>3</sup>, at ONERA insures two functions: on one hand the payload operational functions during the mission, and on the other hand the scientific data management, processing and archiving during and after the mission. In addition to its expertise on the instrument, the scientific and technical team of ONERA develops, together with the Observatoire de la Côte d'Azur (OCA), dedicated scientific tools for the data processing.

The SPG is especially in charge of producing the data files to be archived and distributed by the CMS-M. During the mission and before the release of the data to the community, the SPG will carry out the following activities with the help of the GEX:

- The supervision and the optimization of the mission operation programme, in particular during the calibration sessions and the science measurement sessions; the SPG informs the SWG and gets feedback from it,
- The scientific expertise of the experiment, of the instrument, of its environment and its sensitivity,
- The validation of the data (as compared with the claimed accuracy), including the experiment environment, the operation of all the involved systems, the needed assumptions and the methods used in the processing.
- The processing of the data from level 0 to 1, and level 1 to 2, leading to the EP test results.

The SWG under the PI's chairmanship pronounces the validation of the data after reporting by the SPG and authorise the diffusion of the data (N1 and N2 levels) to the general scientific community.

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<sup>3</sup> CMS-M: Centre de Mission Scientifique Microscope

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## **Addition and deletion of collaboration team members**

Addition of new SWG and/or SPG members will be possible provided that they have the approval of the chair of SWG. New members will typically be proposed by SWG or SPG members.

Call for ideas and proposals will also be released to enlarge the scientific community interested in the data processing and exploitation. Scientists who bring a dedicated expertise and take the responsibility of an important specific task in the project may be nominated as Co-Investigators (Co-Is) by the SWG. They will participate to the SWG.

All addition and deletion of the SWG members will be reflected in updates of the annex 1.

## **4. Data products**

Various types of data products generated during the development and the in orbit phases of the mission are considered here:

- Mission documentation (CNES, OCA, and ONERA's reports for instance), detailed scientific and technical information concerning the space and the ground segments which are produced during the development and the in orbit phase; they are necessary for the mission scientific exploitation and are considered as data products;
- Technical and scientific data: these are the deliverables resulting from the mission which will be made available to the community at large and which will form the basis for scientific research and publications,
- Scientific publications which are intended to appear in the scientific literature, having undergone scientific validation and peer review (refereed and no-refereed journals, proceedings, electronic archives, chapter of a book ...),
- Public relation materials whose purpose is to maintain the public at large informed of the progress and scientific results of the mission, and which are normally distributed through the written and visual media (e.g. press release, newsletters, newspaper, magazines, TV).

## **5. Data access and distribution**

Until the data processing has reached a sufficient level of maturity, the Microscope data products will not be disclosed outside the scope of the Microscope scientific collaboration without the agreement of the SWG.

The conditions in which the information and the data concerning the mission are provided by the CMS-M to the scientific partners are described in the Non Disclosure Agreement (NDA) presented in Annex 3. The NDA applies to:

- The Science and Performance Group (SPG) members
- The Science Working Group (SWG) members, including the PI, the co-PI, the Co-Is.

The SWG and SPG members are responsible for the associated scientists they may head.

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The NDA covers the development phase of the project and the proprietary period of the space mission operations. It terminates at the end of the proprietary period, when all the validated level 1 data (N1) and level 2 data (N2) are provided to the scientific community with the tools and auxiliary data to transform the N1a data to the different levels of data<sup>4</sup>.

The SWG members will be required to notify the SWG about their plans for collaborations using Microscope data, by submitting, prior to the distribution of the data, lists of scientists associated to the collaborations that they are heading, and in case of Co-Is the science objectives pursued in these collaborations.

During the proprietary period (see section 6), in case, if any, of proposed use of the data leading to unfair competition, for instance on the benefit of a team outside the Microscope community, the SWG has the right to « veto » Co-I's proposals for collaborative use of the Microscope data.

## **6. Proprietary and Distribution periods**

This agreement is in accordance with the ESA policy (as laid down in ESA/C(89)95 Rev.1), where the scientific data products should be available for distribution to the community one year after completion of the nominal mission. "Completion of the nominal mission" is here interpreted as the time when the calibration of the data has reached a sufficient maturity to guarantee that the general scientific community receives a solid validated product, containing only well understood and documented data.

### **Proprietary period**

The proprietary period includes the development period and the validation period completed by one year at most. The duration of the proprietary period can be shortened under decision of the SWG.

The development period starts at the T-SAGE Instrument Critical Design Review and ends at the beginning of the validation period.

The validation period starts with the reception on Earth of the first Microscope data and ends when the first coherent set of data of the whole mission, usable to perform scientific analysis, has been properly calibrated and its meaning has been confirmed (N2c data).

The validation of the data is pronounced by the SWG and the PI, after reporting by the SPG.

During the proprietary period, the data are not released outside the SPG and the SWG and publications are possible under approval by the PI, in compliance with the data rights described in section 5.

### **Distribution period**

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<sup>4</sup> Precise definition of the data levels are given in the Science Management Plan.



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The distribution period starts at the end of the proprietary period. Then, the Microscope mission data are announced to be publicly distributed by the CMS-M. It corresponds to the expiration of the NDA.

The SWG ensures that all calibrated science data and appropriate housekeeping data will be distributed to the public.

The CMS-M will archive and distribute exclusively all the data and processing algorithms necessary to obtain the data from one level to the upper one at least during five years after the end of the mission.

Each contributor retains the right to use and distribute the algorithms that he/she has developed for the CMS, for any other purposes.

The procurement of the data will be conditioned to the commitment to properly credit the mission as described in section 7.

## **7. Data and publication policy**

The general policy for data product release is the following:

- CNES as the satellite provider, ONERA as the payload provider and ESA as the cold-gas microthrusters provider have rights to use and distribute data from the Microscope mission related to their contribution, under the general guidelines expressed in this document.
- Scientific results obtained with Microscope data are made available to the scientific community in general through publication in appropriate refereed journals or other established channels of communication.
- Any publication and reports using Microscope data shall include a suitable acknowledgement of the services afforded by the Microscope partners. In particular, any scientific publication must at least mention in the acknowledgements "This work is based on observations made with T-Sage instrument embarked on the CNES-ESA-ONERA-CNRS-OCA Microscope mission". In the abstract, the words "Microscope" and "T-Sage" must be used.
- The PI and his co-authors shall publish within the shortest possible delay the mission results concerning the main mission objective, the EP test, and the associated performance of the instrument.
- During the proprietary period, preliminary results can be published by the PI, Co-PI, Co-Is and the SPG and SWG members after formal approval by the PI.
- Papers written during the proprietary period by Co-Is and associated scientists will have to be posted on a private web page for internal referring by other SPG or SWG members during a minimum period of 2 months, before approval by the PI and then submission for publication.
- Co-authors come under the responsibility of the main author. Nevertheless, any paper, submitted during the proprietary period, must include as Co-authors, PI, Co-PI and T-Sage

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builders or CMS-M contributors according to the nature of the information used in the publication.

- Papers related to the Instrument and mission Performance must include authors from the T-Sage instrument builders or CMS-M contributors in the first three authors. Any report or publication of results obtained from the use of Microscope data, or any other information from the Microscope mission shall indicate that the results were obtained from the CNES-ESA-ONERA-CNRS-OCA Microscope mission.

## **8. Public and Educational Outreach Policy**

The use of the Microscope data for Public and Educational Outreach purposes is strongly encouraged.

CNES has the overall responsibility for planning and carrying out outreach and public relations activities related to the Microscope mission.

The Microscope Steering Committee members coordinate among themselves in advance concerning public information activities related to their responsibilities.

The Microscope Steering Committee members retain the right to release public information on the portion of the activities they fund and manage. The Microscope PI and SWG members shall actively contribute to outreach and public relations activities. Material suitable for release to the public or participation in media events shall also be made available upon CNES or ONERA request and shall be at the disposal of the Microscope Steering Committee members in order to support their respective communication plan.

In addition, the PI and the SWG members shall provide the Microscope Steering Committee members with a copy of their entire Public Outreach product.



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## Annex 1

### Composition of the Science Working Group (SWG)

The composition of the MICROSCOPE SWG as approved by the Steering Committee, on 2013 January the 16<sup>th</sup>, is the following :

- The PI (ONERA) who is the Chairperson: Pierre Touboul
- The co-PI (OCA): Gilles Metris
- The ZARM co-I: Claus Lämmerzahl
- The DLR co-I: HansJörg Dittus
- Five scientific representatives of the following scientific themes:
  1. General Relativity and Gravitation : Thibault Damour (co-Chairperson)
  2. Fundamental Interactions : Pierre Fayet
  3. Interdisciplinary Physics : Serge Reynaud
  4. Earth gravity field: Isabelle Panet
  5. Aeronomy : Peter Visser
- One European scientist representative of similar space missions: Timothy Sumner

Permanent guests of the SWG are:

- The CNES Fundamental Physics coordinator: Sylvie Léon-Hirtz
- The CMS-M (Centre de Mission Scientifique) manager: Manuel Rodrigues
- The CNES project manager: Michel Bach

The ONERA payload manager and the CNES GEX (Group of Experts) chairman, Alain Robert, are invited to the SWG meetings when needed.

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## Annex 2

### **Composition of the Science Performance Group (SPG):**

The composition of the SPG is the following:

- The PI and the Co-PI (co-chairmen)
- The CMS manager. (coordinator)
- MICROSCOPE experts from ONERA, OCA and ZARM
- The chairman of the CNES expert group (GEX).

The present participants of the Performance Working Group (PWG) are members of the SPG.

Additional scientific members, working continuously in the data processing, can be added to the SPG after approval by the chairmen.

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### **Annex 3**

#### **Non disclosure agreement (NDA)**

Scientific partnership is encouraged to develop scientific activities in the frame of the Microscope mission data processing and exploitation. The purpose of this NDA is to define the conditions in which the information and the data concerning the mission are provided by the CMS-M (Microscope Scientific Mission Centre) to the scientific partners, so that they can be easily accessible while avoiding unauthorized dissemination.

Considering that

- ONERA is in charge of the definition, the development and the qualification of the payload of the Microscope space mission,
- ONERA is in charge of the operation of the CMS-M in Palaiseau,
- ONERA has acquired the whole set of data of the mission, reports and information on the space and ground segments provided by CNES and has acquired dedicated experience in the domain of these data processes,

The Scientific partners acknowledge that the information to be received from CMS-M is of confidential nature during the development phase of the project and the proprietary period of the space mission operations.

The term "Confidential Information" shall mean any of the information of scientific, technological, know-how interest, disclosed by the CMS-M to the scientific partners in electronic, oral, visual, written form, or learnt by observation or examination, in the frame of the Microscope data analysis, processing and exploitation.

In particular, information included in CNES, ESA, OCA or ONERA reports concerning the Microscope mission (status confirmed by its nomenclature) is reputed Confidential even without any stamps.

All Data down-linked from the Microscope satellite or obtained from these data are also Confidential whatever are the process and the author of the processing.

Within the term of this Agreement and after its expiration, the scientific partners have the obligation to protect the received Confidential Information pursuant to the following provisions:

- To keep the information strictly confidential with the same manner as they use to treat their own confidential information of similar importance;
- Not to use them in whole or in part, for any other purpose than the declared activity concerning the Microscope data processing and exploitation;
- Not to disclose them to any third party without the previous written authorization of the CMS-M, represented by the PI, the Co-PI or the CMS-M Manager, and to provide that such third party complies in writing with the same confidentiality obligations;
- Never to copy, or otherwise to reproduce, them except for the need of the mentioned

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Microscope activity, nor to publish totally or partially, without the previous written authorization of the PI.

The CMS-M is free to provide to the partners the level of Confidential Information it considers adequate for the purpose of their scientific activities.

The obligations will not apply to Confidential Information for which the partners are able to show promptly and/or to provide documentary evidence that the information is already in the public domain, or in its possession prior to the disclosure by the CMS-M, or is independently and in good faith developed by the partners without use of any of the Confidential Information. The burden of showing that any Confidential Information is within the foregoing exceptions shall rest on the partner.

All Confidential Information disclosed to the partner in accordance with this agreement remains the exclusive property of the partners, without prejudice to third parties' rights.

In case of a publication using unauthorised dissemination of data or information, the SWG might ask the editors to withdraw the paper if this happens during the proprietary phase.

Any dispute regarding publications rights, authorship and order of authors in a paper, that cannot be resolved at the PI level, will be handled by the SWG with the assistance of CNES.

Any data right violation will be jointly handled by the SPG and the SWG but could lead to the removal of individuals from the access to the Confidential Information of the mission. When the parties are unable to resolve the issue within a period of two months, the disagreement will be referred to the Microscope Steering Committee. Any disagreement that cannot be resolved at this level will be submitted for settlement to the President of CNES.

This agreement expires at the end of the proprietary phase, that means when the Microscope mission data are announced to be distributed publicly by the CMS-M; this will happen no longer than one year after the validation of the overall mission data.