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Dr. Ricardo M. O. Galvão
Director
National Institute for Space
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Av. dos Astronautas, 1.758 -
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CEP 12227-010
São José dos Campos - SP
Brazil

Our ref. D/OPS/2018-070

Darmstadt, 08/01/2019

Subject: GNSS Sensor Station Network Extension and Data Exchange

Dear Sirs,

Thank you for your letter dated 18/12/2018.

ESA confirms that the updated schedule as presented in your letter is acceptable.

With this, we are pleased to have reached an agreement on, and look forward to commencing, our cooperation for the GNSS sensor station network extension and data exchange.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'Rolf Densing'.

Dr. Rolf Densing
Director of Operations

São José dos Campos
December 18, 2018

Dr. Rolf Densing
Director
ESOC
Robert-Bosch-Str. 5
64293 Darmstadt, Germany

Dear Dr. Densing,

Thank you for your letter dated August 23, 2018, proposing to define the terms and modalities regarding the GNSS sensor station network extension and data exchange.

It is our pleasure to inform you that your proposition is acceptable to INPE and AEB. Although, due to the time our letter took to be delivered, a modification on the proposed schedule is necessary. Below, we present an updated schedule that accommodates the delays.

ID		Indicative Schedule
1	Letter of Agreement (LoA) received by INPE/AEB	Nov. 2018
2	INPE's and AEB's Affirmative Reply	Dec. 2018
3	Shipment of GNSS sensor station equipment	Dec/Jan. 2018
4	Installation, test and initial operation of the equipment installed by an ESA expert with local support by INPE	Feb/Mar. 2018
5	Start of regular operation of the station	Mar. 2018

If you are willing to accept the updated schedule, INPE and AEB agree and hereby confirm that your letter and this letter will constitute a mutual understanding of this cooperation.

Sincerely yours,



Ricardo Galvão
Director
INPE



José Raimundo Coelho
President
AEB



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Our ref. D/OPS /2018-043

Darmstadt, 23/08/2018

Subject: GNSS sensor station network extension and data exchange

Dear Dr Galvão,

The European Space Agency (ESA) and the Brazilian Government have concluded an Agreement concerning space cooperation for peaceful purposes, which entered into force on 17 May 2004 and was extended up to 17 May 2025. Article 4 of that Agreement provides that Brazil designates the Brazilian Space Agency (AEB) for the implementation of the Agreement and that AEB may designate other institutions to develop specific cooperative activities.

In a document signed on October 13, 2017, the European Space Agency (ESA) and Brazilian Space Agency (AEB) of the Federative Republic of Brazil, the latter jointly with its designated institution, the National Institute for Space Research (INPE), have confirmed their mutual interest in pursuing an international effort for the utilization of Global Navigation Satellite Systems (GNSS).

These GNSS systems are rapidly evolving, with an increasing number of satellites and signals globally available. For Galileo in particular, Europe is well on its way to completing the final 30 satellite constellation, with the European Space Agency (ESA) taking an important role in the Galileo program, for the development of the IOV/FOC system and the completion of the whole Galileo constellation.

Addition of new sites to its GNSS sensor stations network, in order to achieve a global and homogeneous coverage in an environment of continuously evolving GNSS systems, would enable ESA to maintain highest precision orbit and clock services that are fundamental to many space missions.



Against this background, ESA and INPE, as designated institution of AEB, (ESA and INPE hereafter referred to as “ Partner”), share complementary interests in the implementation of the efforts mutually agreed in the Letter of Intent, and INPE has expressed their readiness to engage in the effort of hosting ESA’s sensor equipment and providing associated services under terms and modalities as specified in this Letter.

1. Purpose

The purpose of this Letter is to define the terms and modalities of the cooperation between ESA and INPE relevant to the hosting by INPE of ESA GNSS equipment and exchange of measurement data.

2. Responsibilities

- 2.1 ESA will provide, export and transport to INPE one (1) GNSS receiver and one (1) GNSS antenna including all necessary cables (hereinafter referred to as the “ESA Equipment”).
- 2.2 INPE will identify the GNSS station operated under its authority that can be made available for hosting the ESA Equipment and conducting data transfer and exchange. The GNSS station made available by INPE is identified in Appendix I, which may be updated in writing by the Points of Contact identified in Section 5.
- 2.3 INPE will use the GNSS Sensor Station Hosting Requirements (DHSO-SYS-SS-0001-HSO-GN) as a guideline for installation, operations support and maintenance of the ESA Equipment during the entire hosting period, with the objective of allowing for a (near) real-time exchange of GNSS raw measurements. To this end, INPE will provide access by NTRIP, FTP and HTTP to ESA's receiver.
- 2.4 ESA will:
 - a) retrieve, process and archive DATA (as defined in Section 3) originating from the ESA Equipment;
 - b) make DATA available to INPE in accordance with Section 3;
 - c) ensure a continuous and uninterrupted operation of the ESA Equipment. In case of necessary changes to the ESA Equipment and configuration, due notice will be given to INPE prior to a change and
 - d) provide INPE with continuous flow of 15’ RINEX data and with GNSS bitstream of data using NTRIP protocol from a station NTRIP server to an INPE NTRIP caster.
- 2.5 INPE will, upon ESA’s request, export and transport any of the ESA Equipment provided under this Letter back to ESA within one (1) month of the request, at ESA expenses (via a courier, e.g. FedEx, DHL, UPS, other..).



3. Use of DATA

The following terms of use will be applied to the GNSS sensor station raw data (collectively referred to as “DATA”) made available by ESA to INPE (without requiring interaction from AEB) under this Letter:

- 3.1 ESA grants INPE the right to make use of the DATA for scientific research and non-commercial purposes. Any use beyond this scope will have to be agreed in writing by ESA.
- 3.2 DATA will not be made available by INPE to any third parties, except for the entities identified in Appendix II (“Related Entities”), the list of which may be updated by the Points of Contacts nominated in Section 5 below. INPE will ensure that the terms of use set forth in this present Section will be applied also in case it makes DATA available to the Related Entities.
- 3.3 Publications based on the DATA will be coordinated in advance between ESA and INPE. When issuing such a publication, INPE will ensure that the publication gives proper credit to ESA’s contribution.
- 3.4 ESA does not guarantee the quality and accuracy of its DATA nor its suitability for any purpose.

4. Schedule

ESA and INPE will work towards an installation of the ESA Equipment and beginning of DATA exchange by November 2018.

Indicative Schedule for the Cooperation

The following PLAN-OF-WORK is expressed in terms of a schedule that indicates events that are committed to a timeline, intended to serve as a main guideline that tries to indicate how and when each main event related to this cooperation is expected to occur and eventually evolve to subsequent ones, till completion of the objectives of this cooperative effort.

ID	Activity	Indicative Schedule
1	Letter of Agreement (LoA) sent by ESA	Aug. 2018
2	INPE’s affirmative reply	Sep. 2018
3	Shipment of GNSS sensor station equipment.	Sep. 2018
4	Installation, test and initial operation of the equipment installed by an ESA expert with local support by INPE	Oct. 2018
5	Start of regular operation of the station	Nov. 2018



5. Points of Contact

5.1 ESA and INPE designate the following persons as points of contact for the purposes of implementing this Letter. ESA and INPE may change their respective point of contact by written notice.

5.2 Points of Contact

Management

INPE: Adriana Cursino Thomé Head of International Relations Affairs (SCRIN) SGAB/INPE	ESA: Werner Enderle Head of Navigation Office (OPS-GN) ESOC/ESA
Av. dos Astronautas, 1758 São José dos Campos – SP Brazil – CEP 12.227-010 Tel : +55 12 3208-7618 E-mail: adriana.thome@inpe.br	Robert Bosch Strasse 5 64293 Darmstadt, Germany Tel: +49 6151 90 2272 Fax: +49 6151 90 3431 E-mail: werner.enderle@esa.int

Technical

INPE: Hermann Ribeiro Image Generation Division (DGI) OBT/INPE	ESA: Rene Zandbergen Navigation Office (HSO-GN) ESOC/ESA
Rod. Presidente Dutra, Km 40, s/n CEP 12630 000, Cachoeira Paulista, SP, Brazil Tel.: + 55 12 3186 9330 E-Mail: hermann.ribeiro@inpe.br	Robert Bosch Strasse 5 64293 Darmstadt, Germany Tel: +49 6151 90 2236 Fax: +49 6151 90 3412 E-mail: rene.zandbergen@esa.int

Operational

INPE Josiane Mafra Head of the Image Generation Division (DGI) OBT/INPE	ESA: Mark van Kints (VisionSpace contractor) Navigation Office (HSO-GN) ESOC/ESA
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6. Financial Aspects

ESA and INPE will each bear the costs of discharging their respective responsibilities under this Letter, including the costs of travel and subsistence of its own personnel as well as exportation and transportation, including tax and custom fee and transport insurance, and information for which each Partner is responsible. This implies that no exchange of funds will take place under this Letter. Should either Partner encounter budgetary problems that may affect the activities to be carried out under this Letter, the Partner encountering the problems will notify and consult with the other Partner as soon as possible.

7. Public Information

- 7.1 ESA and INPE will each retain the right to release public information regarding their own activities under this Letter, but will coordinate with each other in advance concerning releasing to the public information that relates to the other Partner's responsibilities or activities under this Letter.
- 7.2 When releasing public information regarding results generated in implementation of this Letter, ESA and INPE will acknowledge in the publication that such results have been obtained pursuant to joint INPE and ESA efforts under this Letter.

8. Miscellaneous

- 8.1 Each Partner may request, when providing information under this Letter to the other Partner, not to disclose such information to any third party without prior approval. The information concerned will be properly marked as "proprietary information" or with an equivalent designation.
- 8.2 With regard to the activities undertaken under this Letter neither Partner will make any claim against the other with respect to damages or loss of any kind except in the case that such a damage or loss arises through gross negligence or willful misconduct of the other Partner.
- 8.3 Any issue in the interpretation or implementation of this Letter that is not resolved by the Points of Contacts in Section 5 will be submitted to the Director of INPE and to the ESA Director General, or their designees, for an amicable resolution. Should ESA and INPE fail to resolve the issue through consultation the dispute will be resolved in a manner to be agreed by the Director of INPE, the President of AEB and the ESA Director General.

9. Period of applicability, Amendment and Termination

9.1 This Letter will become applicable upon the date of INPE's and AEB's affirmative reply and will remain applicable for five (5) years. Unless INPE or ESA indicate their intention to terminate this Letter in writing at least 3 months prior to the expiration of its initial or extended period of applicability, the period of applicability of this Letter will be automatically extended for further periods of one year each, starting from the end of the initial or any extended term, under the same conditions. The Letter may be amended at any time, executed in writing by authorized representatives of INPE and ESA.

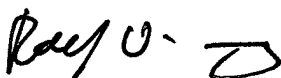
9.2 INPE or ESA may also terminate this Letter:

- at any time upon written notice three (3) months prior to the expected termination date or
- at any time upon written notice, if any of the governmental permits or approvals necessary for the activities related to or under the Letter has not been obtained or has lapsed.

9.3 Sections 3, 6, 7 and 8 of this Letter concerning, respectively, use of DATA, financial aspects, public information, intellectual property, and miscellaneous (non-disclosure, liability, consultation) will continue to apply after the termination of the Letter.

If the above terms and conditions are acceptable to AEB and INPE, I propose that this Letter, together with INPE's and AEB's affirmative reply, document our joint understanding as to the implementation of this endeavour.

Yours sincerely,



Dr Rolf Densing
Director of Operations



Appendix I: List of stations for which data is exchanged

In accordance with Section 2, the station that is made available by INPE to ESA for hosting the ESA Equipment and for transfer and exchange of data is identified here below. In principle, in terms of acting as a bit stream source to INPE, it is understood that CHPE GNSS receiver would be capable of acting as an NTRIP server to be configured for streaming out data to an INPE provided NTRIP caster node.

Table: List of Stations Provided by INPE

Station Name	Identification hosting site	Mount Point of NTRIP	Approximate Position in Latitude and Longitude (degrees)
CHPE	Image Generating Division (DGI)	Image Generating Division (DGI)	22° 40' 56.5" S 45° 00' 08.9" W



Appendix II: List of Related Entities

In accordance with Section 3, the table below lists the Related Entities to which INPE may provide DATA under conditions set forth in this Letter.

Table: List of the Related Entities

Sender	Entities	Point Contact	of Purpose Note	or Start Date – Usage of Data	End Date – Usage of Date
				TBD TBD	TBD TBD



Dr José Raimundo Coelho
President
Brazilian Space Agency
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Our ref. D/OPS /2018-043

Darmstadt, 23/08/2018

Subject: GNSS sensor station network extension and data exchange

Dear Dr Coelho,

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Against this background, ESA and INPE, as designated institution of AEB, (ESA and INPE hereafter referred to as “ Partner”), share complementary interests in the implementation of the efforts mutually agreed in the Letter of Intent, and INPE has expressed their readiness to engage in the effort of hosting ESA’s sensor equipment and providing associated services under terms and modalities as specified in this Letter.

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ID		Indicative Schedule
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Operational

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- 9.2 INPE or ESA may also terminate this Letter:
- at any time upon written notice three (3) months prior to the expected termination date or
 - at any time upon written notice, if any of the governmental permits or approvals necessary for the activities related to or under the Letter has not been obtained or has lapsed.
- 9.3 Sections 3, 6, 7 and 8 of this Letter concerning, respectively, use of DATA, financial aspects, public information, intellectual property, and miscellaneous (non-disclosure, liability, consultation) will continue to apply after the termination of the Letter.

If the above terms and conditions are acceptable to AEB and INPE, I propose that this Letter, together with INPE's and AEB's affirmative reply, document our joint understanding as to the implementation of this endeavour.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'Rolf Densing'.

Dr Rolf Densing
Director of Operations



Appendix I: List of stations for which data is exchanged

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Appendix II: List of Related Entities

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