

Memorandum of Understanding

For

IRNSS Navigation Receiver Field Trial and Data Collection

Between

**Space Applications Centre
Indian Space Research Organization
Department of Space, Government of India
Ahmedabad - 380015**

And

**THE UNIVERSITY OF BURDWAN
RAJBATI, BURDWAN, WEST BENGAL, 713104**





This MOU is entered into on 7th day of December, 2015

BETWEEN

Space Applications Centre, Jodhpur Tekra, Ambawadi Vistar P.O., Ahmedabad, 380015, a centre of Indian Space Research Organization, Department of Space, Government Of India (hereinafter called "SAC" which expression shall where the context so admits include its successors and permitted assignees) of the one part,

AND

THE UNIVERSITY OF BURDWAN, RAJBATI, BURDWAN, WEST BENGAL, 713104

1.0 Preamble:

Whereas, Space Applications Centre (hereinafter referred to as "SAC" which expression shall where the context so admits include its successors and permitted assignees) of the one part and "THE UNIVERSITY OF BURDWAN" (hereinafter referred to as "BU" which expression shall where the context so admits include its successors and permitted assignees) of the one part BU, both are parties to this MoU;

Whereas, SAC is involved in design and development of space-borne instruments for ISRO missions and development and operationalization of applications of space technology for national development. The applications cover communication, broadcasting, navigation, disaster monitoring, meteorology, oceanography, environment monitoring and natural resources survey. SAC designs and develops all the transponders for the INSAT and GSAT series of communication satellites and the optical and microwave sensors for IRS series of remote sensing satellites, Navigation payloads for IRNSS and GAGAN programme. Further, SAC develops the ground transmit/receive systems (earth stations/ ground terminals) and data/image processing systems;

Whereas, The University of Burdwan is a leading University in West Bengal engaged in teaching and research in different fields of knowledge and learning. One of the fields of training and research of the University is use of space based technologies and satellite based navigation systems (GNSS, hereinafter). The University has a GNSS laboratory used for training and research purposes and is willing to extend the activities using IRNSS and GAGAN.





2.0 Effective Date and Duration of MoU: This MoU is effective from the date of its signing and is valid for a duration 2 (Two) years from the date of signing. It may be extended further in writing based on mutual consent.

3.0 Scope of MoU:

Scope of the MoU involves Site identification, site preparation, and Installation of the IRNSS receiver. IRNSS Navigation Data collection and analysis to be carried out on regular basis for verification and for other mutually agreed topics of research for both parties. Depending upon the requirement certain scientific experiments can be planned and executed within overall MoU umbrella. With mutual consent, both the Parties can extend the period of data collection and observation locations (sites).

4.0 Methodology:

4.1 Suitable Site Selection

4.2 Installation and commissioning of IRNSS Receiver

4.3 Continuous IRNSS and GPS data logging, analysis of the data

4.4 Transmission of IRNSS and GPS data to SAC as and when demanded by SAC
Data transmission mechanism can be mutually worked out.

5.0 Deliverables:

5.1 SAC deliverables { i, ii & iii through ACCORD Software & Systems Pvt. Ltd }

- i. IRNSS receiver and data processing systems as detailed in Annexure-1.
(Delivery @ site)
- ii. Number of receiver units allocated as per SAC receiver Allocation committee's recommendation in view of your response to EOI for IRNSS Receiver deployment
- iii. User and operations manual (Delivery @ site)
- iv. Format for Quarterly (Every Three months) status report

5.2 BU deliverables

- i. All necessary logistics so that IRNSS Receiver shall be established to collect positional data in raw and RINEX format received from IRNSS, GPS constellation with 1 sec update rate
- ii. Send a Quarterly status Report on usage/performance of receiver to SAC in a prescribed format.
- iii. Send the Receiver data to SAC as and when asked for

6.0 Guidelines on Receiver / Data Usage:

The data is to be used strictly for internal research purpose only. The Receiver is for experimentation and field trial only and should not be used for any operational purpose. IRNSS constellation is evolving and has not been declared operational for Position Navigation and Time. So the results/performance of IRNSS should be viewed in that context.

7.0 Responsibility of Each Party:

SAC and BU shall jointly work towards IRNSS system verification using data collected from IRNSS receivers. In addition, following are the specific responsibilities.

7.1 BU:

- 7.1.1 All the logistics support, site identification, site preparation, required for setting up of IRNSS Receiver will be provided by BU.
- 7.1.2 Installation of the IRNSS Receiver at the site will be carried out by ACCORD SYSTEMS
- 7.1.3 Utmost care to be taken in handling the IRNSS Receiver.
- 7.1.4 Send the Receiver Data to SAC when asked for
- 7.1.5 Safety and security of the IRNSS Receiver
- 7.1.6 IRNSS data reception, processing, archival to be done by BU.

7.2 SAC:

- 7.2.1 SAC will provide IRNSS Receiver Unit(s) and Receiver operation manual(s) on returnable basis (As detailed in Annexure-1)
- 7.2.2 SAC will provide technical assistance to BU in working out modalities of
 - Data collection, data sharing, etc.
- 7.2.3 SAC will provide technical assistance to BU in proper operation and maintenance of IRNSS Receiver
- 7.2.4 SAC will provide technical assistance to BU in identifying appropriate research areas considering capabilities of this Receiver

8.0 Project schedule:

- 8.1 Selection of Suitable Site(s) within 10 days from the date of signing MoU by BU
- 8.2 Installation and Commissioning of IRNSS Receiver by M/S ACCORD.

8.3 Regular data collection and analysis will be carried out for the duration of the MoU from the date of Installation and Commissioning of IRNSS Receiver

9.0 Training:

M/S ACCORD will provide necessary training and guidelines for site identification, receiver operations. SAC will provide guidelines for data collection, processing and data transfer

10.0 Project Monitoring:

- 10.1 SAC and BU shall identify focal person(s) who shall be responsible for organizational matters and interfacing for day to day operation, such as functioning of IRNSS Receiver, security etc. Each party shall pursue its independent research using data from these IRNSS Receiver, with mutual consultation.
- 10.2 A periodic Quarterly status report should be generated by BU regarding Receiver operations. A User meet to share results, experience will be held at SAC every six months.

11.0 Functionaries

1. Dr Anindya BOSE, Scientific Officer (Selection Grade), (BU Focal Persons)
Department of Physics, The University of Burdwan, Golapbag, Burdwan 713 104
2. Dr Joydeep Chakravorty, Scientific Officer (Sr Scale)
Department of Physics, The University of Burdwan, Golapbag, Burdwan 713 104
1. ATUL P. SHUKLA, Group Head, DCTG/SNAA, (SAC Focal persons)
2. YAGNESH R. PATEL, Sci/Engr-SF, SNTD/DCTG

12.0 Confidentiality:

- 12.1 During the tenure of MoU and thereafter both parties undertake on their behalf and on behalf of their employees/representatives to maintain strict confidentiality and prevent disclosure thereof of all the information and data exchanged/generated pertaining to this agreement. However, the data may be published and shared jointly for scientific publication after mutual consent in writing.
- 12.2 BU will not disclose any research result and Foreground information, generated out of or involving the data, its derivative or information thereof from the IRNSS

Receiver established (at given site) as per terms of this MoU to any third party without seeking prior written permission.

13.0 Intellectual Property Rights :

All the research results and foreground information as well as foreground Intellectual Property Rights, generated out of or involving the data, its derivative or information thereof, from IRNSS Receiver and sites established as per terms of this MoU whether or not legally protected, shall be owned by SAC. BU will be free to use such data for their internal R&D purposes with intimation to SAC.

Notwithstanding any provisions mentioned above or any future licensing agreements, SAC shall be deemed to have all rights including non-exclusive, irrecoverable and royalty-free license for the unlimited development and use of any and all Foreground information and Foreground Intellectual Property Rights, generated out of or involving the data, its derivative or information thereof, from the IRNSS Receiver established (at given site) as per terms of this MoU, whether or not legally protected, for the purposes of its own applications.

14.0 Change In Scope of Work:

Any change in scope of work would be with mutual consent of both the parties in writing.

15.0 Modifications to MoU:

- 15.1 Any amendment or modifications of this MOU shall be in writing by both parties.
- 15.2 The modifications/changes shall be effective from the date on which they are made/ executed, unless otherwise agreed to.

16.0 Force Majeure:

Neither party shall be held responsible for non-fulfillment of their respective obligation under this MoU due to circumstances beyond their control but not limited to war, flood, cyclones, riots, strikes etc. If such condition continues beyond six months, the parties shall then mutually decide about the future course of action. Either party shall intimate each other of any such event.

17.0 Indemnity:

BU shall exercise reasonable skill, care and diligence in the performance of this MoU activity and indemnify and keep indemnified SAC in respect of any loss, damage or claim howsoever arising out of related to breach of MoU, statutory duty or negligence by BU or

its employees, agents or subcontractors in relation to the performance or otherwise of the services to be provided under this MoU.

18.0 Termination of MoU:

18.1 During the validity of the MoU, if it is found that if the IRNSS system is not in use, misuse or due care is not taken, SAC has right to dismantle/uninstall the IRNSS Receiver established as per terms of this MoU with intimation to BU.

18.2 Similarly if BU considers it necessary to dismantle the IRNSS Receiver established as per terms of this MoU for unavoidable reason at a given site, BU will try to provide an alternate site for the IRNSS observations and facilitate SAC to relocate IRNSS Receiver. If however, BU fails in providing such alternate, SAC will be free to dismantle/uninstall and remove the IRNSS Receiver established as per terms of this MoU along with accessories.

19.0 Arbitration:

In the event of any dispute or difference between the parties hereto, such disputes or differences shall be resolved amicably jointly by Director, SAC and Registrar, BU

20.0 Jurisdiction: Ahmedabad shall be the jurisdiction.

In witness whereof, the parties hereto have signed this MOU on the

Tapan H. Misra
7/12/15

(Shri TAPAN MISRA)

Director,

Space Applications Centre (SAC),

Ahmedabad

तपन मिश्रा / TAPAN MISRA

निदेशक / Director

अंतरिक्ष उपयोग केंद्र (इसरो)

Space Applications Centre (ISRO)

भारत सरकार / Government of India

अहमदाबाद / Ahmedabad-380 016.

(Dr D K Panja)

Registrar,

The University of Burdwan

Burdwan

REGISTRAR

THE UNIVERSITY OF BURDWAN

BURDWAN-713104



APC

Anindya Bose
(DR ANINDYA BOSE)

APC

Annexure-1

List of deliverables for (1 set of) IRNSS/GPS/SBAS Receiver

| Sl. No. | Item Description | Qty |
|---------|---|-----|
| 1. | IRNSS/GPS/SBAS Receiver | 1 |
| 2. | AC-DC Adapter | 1 |
| 3. | DC-DC Adapter | 1 |
| 4. | Antenna | 1 |
| 5. | Antenna base plate | 1 |
| 6. | Antenna mounting rod | 1 |
| 7. | Battery | 1 |
| 8. | Charger for battery | 1 |
| 9. | TNC (M) to TNC (M), 15 m low-loss RF cable | 1 |
| 10. | TNC (M) to TNC (M), 2 m low-loss RF cable | 1 |
| 11. | SMA (M) to SMA (M), 2 m RF cable | 2 |
| 12. | Cat5E Ethernet cable | 1 |
| 13. | RS232-USB converter cable | 1 |
| 14. | DC-DC adapter input cable | 1 |
| 15. | DC-DC adapter output cable | 1 |
| 16. | Battery to receiver power cable | 1 |
| 17. | Car Cigarette connector to receiver power cable | 1 |
| 18. | 3 Pin AC power cable for charger | 1 |
| 19. | User Guide | 1 |
| 20. | CD containing GUI & other drivers | 1 |
| 21. | M4 Allen key | 1 |
| 22. | Adjustable Spanner | 1 |
| 23. | M4 Allen screws with nuts for receiver | 4 |
| 24. | M4 Allen screws with nuts for DC-DC adapter | 4 |
| 25. | M4 Allen screws with nuts for antenna | 4 |
| 26. | Carry Case | 1 |
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