



**Announcement of Opportunity (AO)
for Sounding Rockets
A platform for your experiments**



**Indian Space Research Organisation
Bangalore- 560 231**

Announcement of Opportunity (AO) to national and international science community for Scientific Experiments using Sounding Rockets

Indian Space Research Organisation (ISRO) of Department of Space (DOS), Government of India solicits proposals in response to this 'Announcement of Opportunity' for scientific payloads on its Sounding Rockets.

ISRO is conducting Sounding Rocket launches periodically from its launching station at Thumba (TERLS – Thumba Equatorial Rocket Launching Station), a place near southern tip of India very close to Earth's magnetic equator for atmospheric studies by launching probes to reach high altitude regions, which are inaccessible by balloons and satellites. More than 3500 Sounding Rocket launches have been successfully carried out by ISRO since 1963 with several scientific experiments with national and international participation. The TERLS Range is dedicated to the United Nations since 1968 and all member countries of the UN are welcome to use this facility for scientific research.

TERLS being an ideal location close to equator and one of the very few locations in the world having capability to launch Sounding Rockets, several research projects can be undertaken by using data from atmospheric and ionospheric probes. ISRO is offering its Sounding Rockets to carry scientific payloads for conducting experiments in 60 to 110 km region of the Atmosphere from its launch station at Thumba.

Research Avenues

- * Aerosol experiments
- * Middle atmospheric winds, temperature and composition
- * Meteor smoke particle detection
- * Ionospheric electron density, irregularities and ion composition
- * Plasma, solar and astrophysics
- * Airglow and electro glows of outer planets
- * Plasma bubble studies
- * Radio propagation studies
- * Vapor / Tri Methyl Aluminum (TMA) trail studies

The above mentioned research avenues are suggestive but not exhaustive. Proposals with innovative ideas in the realms of atmospheric and space sciences, astronomy and astrophysics are solicited.

Sounding Rocket's capabilities

The payload of a Sounding Rocket consists of nose cone, payload cylinder, ejection and / or separation mechanism, mounting decks, avionics systems and scientific instrument. The capability of Rohini (RH) series of Sounding Rockets are given below:

Table 1: Sounding Rocket's capabilities

Rocket	Instrument mass and Altitude (Nominal)	Payload Envelope*	Power**	Total Flight Duration (Nominal)
RH 200	5 kg, 60 km	115 mm diameter x 100 mm	28 W @ 28 V	250 s
RH 300 MkII	20 kg, 110 km	280 mm diameter x 500 mm	80 W @ 28 V	320 s

* Instrument volume with supporting avionics within payload volume

** Power availability will be finalized based on the requirements of the scientific payloads

Several payload deployment mechanisms, including nosecone ejection, boom deployment, door ejection and chemical release are available. The launch station has S-Band Telemetry Station and C-Band & S-Band tracking Radars with Real Time Data Processing and data uplink system. However, the vehicle configuration can be fine-tuned based on the requirements of the scientific instrument. Currently, there are no provisions for recovering the payload.

Purpose of this AO

Proposals are solicited from National and International Scientific Community for innovative payloads for scientific experiments to study the middle and upper atmospheric regions.

This AO for Sounding Rocket Experiments is open to scientists from member nations of the United Nations.

The Proposals

Each proposal shall clearly identify a Principal Investigator (PI) and a Lead Funding Agency (LFA) for the proposed scientific instrument. The proposals shall clearly spell out the experiments and the extent of participation from ISRO for integration of the scientific instrument to the sounding rocket.

The proposers are expected to be currently involved in atmospheric or Ionospheric studies / the development of science instruments / willing to develop scientific experiments and have access to associated facilities for test and instrument calibration. The Principal Investigator of the proposal should be capable of (i) providing necessary details of the payload and its mission objectives and (ii) assembling a capable payload team and lead the team to deliver a flight-qualified instrument.

There could be limited opportunities for collaborating with teams in India based on mutual interest. The proposers are strongly encouraged for sharing of science data, interpretation and publications.

All proposals should be submitted through the respective space agencies/Institutions/Research Laboratories and must be signed by an official authorised to certify, support and sponsor of the investigation as well as the management and financial aspects, on behalf of the space agency/Institution/Research Laboratories.

The Proposal in both 'word' and 'pdf' formats are to be submitted by post and email to:

Director
Space Science Programme Office,
ISRO HQ, Antariksh Bhavan,
New BEL Road,
Bangalore-560 231
Email: sr-ao@isro.gov.in

The confirmation upon the receipt of the proposal will be sent by e-mail. Questions and clarifications, if any, may be send to the address above.

The format for preparation of proposal is given in Annexure-I and the guidelines for development of instrument/payload is given in Annexure-II.

Selection process

ISRO will constitute a 'Selection Committee' to screen the proposals and select them based on scientific benefits and technical content. Proposers who satisfy the eligibility criteria and whose proposal is recommended for further consideration by the Selection Committee, will be intimated by email.

Special Notes

1. There will be no exchange of funds between ISRO and the Proposer.
2. The launch schedule of selected instrument/payloads will be intimated to the proposers by ISRO.
3. For details on (1) Guidelines for development of instrument/ payload and (2) Proposal preparation format please visit www.isro.gov.in
4. Additional changes / modifications (if any) in the proposal submission process (prior to submission deadline) will be made visible on the ISRO website. Proposing teams are expected to regularly check ISRO website (www.isro.gov.in) to additional details and updates.
5. ISRO reserves the right to select or not to select any scientific instrument/ payload under this program and shall not be held liable.

Last Date

The last date for receiving the proposal is 31 December, 2019.

Annexure-I

Proposal Preparation Format

1. Cover Page should include the following:
 - Complete Title of the Proposal
 - Signature, Name and address of Principal Investigator including e-mail, telephone and fax numbers
 - Name of Co-PIs, their address, e-mails etc.
 - Name of the country
2. Executive Summary of the proposal (~Two A4 size pages in 12 point font size)

(A brief description of the proposal stating the broad scientific objectives and specific aims of the proposed work. It should include a concise description of scientific instrument/payload design and methods for realising the hardware and software components)
3. Science objectives including statement of hypothesis and how it will be addressed
4. Expected outcome of the experiment
5. Basic concept and description of the scientific instrument/payload instrumentation (include line diagrams or schematic) with details on measurement procedure.
6. Description of heritage and past experience in scientific instrument /payload development, if any
7. Broad specifications of the payload/experiment including dimensions, volume, weight, power, parameters to be measured (including measurement accuracies), data rates etc.
8. Anticipated new technology development to realise the scientific instrument /payload and back up strategies in the event of non-availability of the expected technology
9. Need for any laboratory research or ground based, air borne or other activities for the development of the instrument and its operation during the mission
10. Design approach and specifications, development process, test, evaluation and calibration procedures
11. Development strategy i.e., stages of laboratory model, engineering model, flight model etc.

12. Performance characteristics of the integrated scientific instrument /payload in terms of its fulfilling the proposed scientific objectives
13. Plans for data processing, management and archival
14. Description of required post-launch ground operation support
15. Description of scientific instrument/payload interfaces with drawings
16. Proposed ejection mode of scientific instrument/payload / dispensing system / spin requirements, if any
17. Time schedules and critical path
18. Procedure to monitor and review the progress of the development as per schedule and the quality assurance aspects
19. Mode of participation in the final integration, testing, calibration and checkout
20. Complete list of names, with affiliation and e-mail addresses of the Co-Investigators with specification of their expertise and roles in the scientific instrument /Payload development

Annexure II

Guidelines for development of instrument/ payload

- 1 Payload to be configured as a functionally standalone system. Mass & dimensions to be limited to the values given in Table 1. Any waiver for mechanical interface/ mass to be obtained from ISRO prior to design finalisation.
2. Payload should be able to operate using 28V power bus (RAW power) provided from the Rocket power pack.
3. RF payload frequency/ power & sensitivity to be finalised after payload interference study with the existing RF elements in the Rocket.
4. D-Type/ Circular MIL grade connectors to be used for electrical interface.
5. Electrical interface & mechanical interface will be made available by ISRO 3 months prior to the targeted launch date, to initiate interface preparation at the launch vehicle side. Further changes in the interface details are not allowed.
8. Dummy mass/ balancing with identical mass and footprint are to be made available by PI in case of non-readiness of the system (after the realisation of vehicle interfaces) for launch.
9. Payloads to be qualified / acceptance tested to the environmental test levels specified for Rohini Sounding Rockets.
10. MOU to be signed between ISRO HQ and payload agencies.