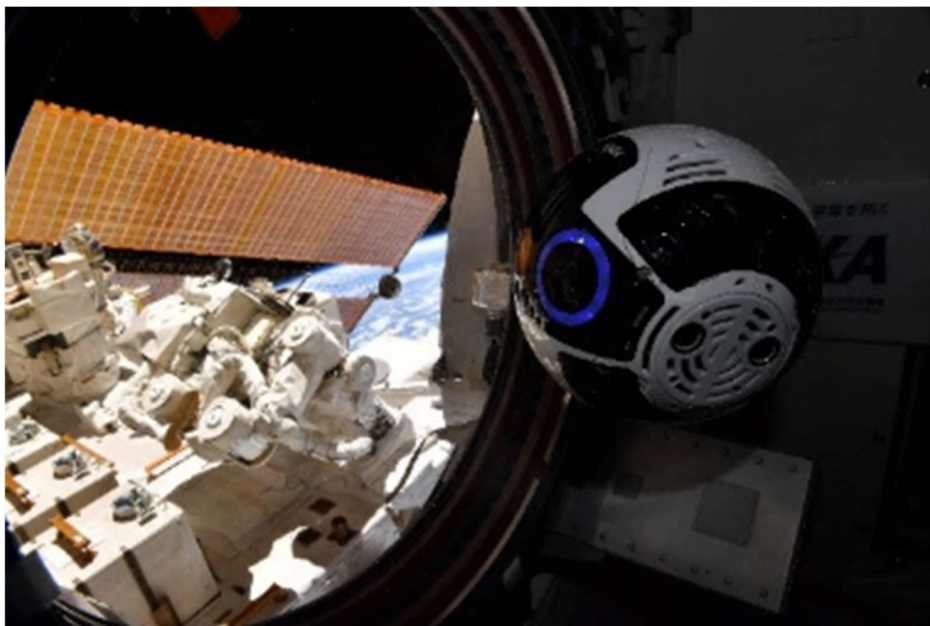


Version 1.1

Release Date: October 5, 2026

7th Kibo Robot Programming Challenge Guidebook



Version 1.1 (October 5, 2026)

Japan Aerospace Exploration Agency (JAXA)

Version 1. 1

Release Date: October 5, 2026

Revision History

Details regarding changes made to the document are shown below.

Revision Date	Version	Paragraph(s)	Revision Location
July 6, 2026	1.0	-	-
October 5, 2026	1.1	2.1, 3.3	Schedule

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1. Introduction

1.1. Kibo-RPC

The Kibo Robot Programming Challenge (Kibo-RPC) is an educational program in which students will solve various problems by moving free-flying robots (Astrobee and Int-Ball2) using their programming skills in a simulation environment and, in the final, in the Japanese Experiment Module (Kibo*) aboard the International Space Station (ISS).

Through interaction with experts in the field of space and the opportunity to observe their work firsthand, students will be able to deepen their understanding and acquire specialized scientific knowledge.

Through this educational program, it is our hope that students will take the initiative to learn the techniques and methods involved in programming and robotics, while honing their STEM (science, technology, engineering, and mathematics) skills.

This program is hosted by the Japan Aerospace Exploration Agency (JAXA) in cooperation with the National Aeronautics and Space Administration (NASA).

*Kibo is pronounced "key-bow" and means "hope" in Japanese.

1.2. Educational Objectives

In this program, by moving actual robots in the ISS based on hypotheses simulated in advance, students will learn about the importance of bridging the gap between simulation and reality when programming.

Students will learn to create programs that are robust enough to handle uncertainties and errors that cannot be easily simulated, such as external disturbances, and which work well in the real world. Through simulations, they will learn the need for multiple program revisions, attitude control for free-flying robots, and how to conduct missions within the ISS.

In the 7th Kibo-RPC, the focus is on relative positions and attitudes, and you will need to develop your program for more accurate positioning and orientation. In addition, route design and team strategy will be more important than in the past, as there are additional factors that will be scored depending on Int-Ball2's route.

1.3. ISS Robots

The ISS is equipped with Astrobee^{*1} free-flying robots and Int-Ball2, a spherical camera drone robot. In the Kibo-RPC, students will create a program to move an Int-Ball2 to designated locations within Kibo.

^{*1} Astrobee will not be used in the competition this time, but will watch the competition.

Astrobee



Figure 1.3-1 Astrobee

Astrobee is NASA's new free-flying robotic system that will help astronauts reduce the time they spend on routine duties, leaving them to focus more on the things that only humans can do.

Working autonomously or via remote control by astronauts, flight controllers, or researchers on the ground, the robots can perform tasks such as taking inventory, documenting experiments, or moving small items or cargo throughout the station.

(<https://www.nasa.gov/astrobee>)

Int-Ball2

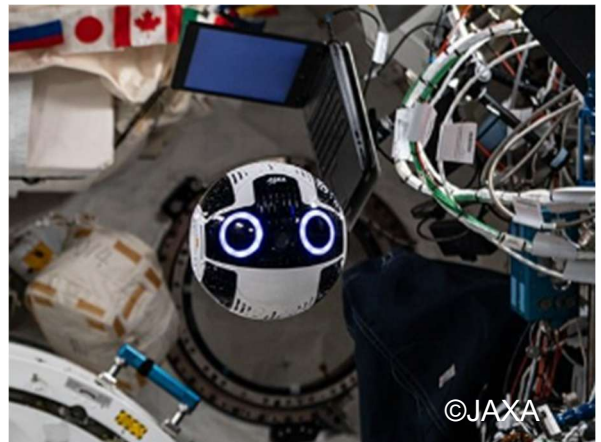


Figure 1.3-2 Int-Ball2

Int-Ball2 is a successor of Int-Ball, free-flying camera drone designed to ultimately eliminate the need for crew members to capture routine video footage aboard the ISS/Kibo.

Similar to current consumer-grade cameras, Int-Ball2 is used by onboard crew to provide flexible views for ground operators.

(<https://fanfun.jaxa.jp/topics/detail/10536.html> (Japanese Only))

2. Event Information

2.1. Event Schedule

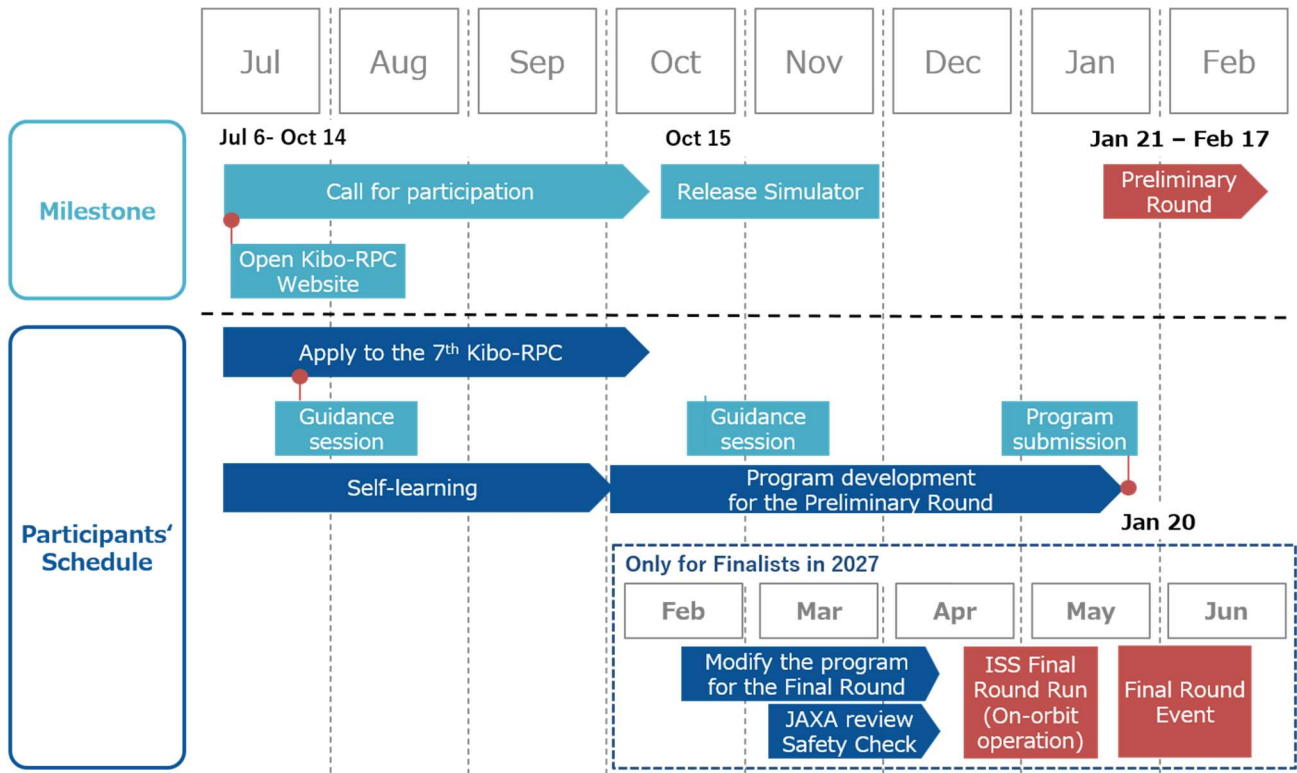


Figure 2.1-1 Entire Event Schedule

Table 2.1-1 Event Explanation *Dates are subject to change.

Category	Explanation
Call for Participation	<u>July 6, 2026 - October 14, 2026</u> A Kibo-RPC Guidance Session/ briefing will be held during this period.
Self-Learning	<u>July-September 2026</u> Self-study is available on the following websites: - Int-Ball2 simulator (released by the Int-Ball2 development team on GitHub) https://github.com/jaxa/Int-Ball2_simulator/tree/melodic https://github.com/jaxa/Int-Ball2_simulator_docker/tree/melodic - ROS wiki ROS Tutorial https://wiki.ros.org/ROS/Tutorials Programming languages used are C++ and Python, but ROS will be used as the main middleware. For details on ROS, please refer to the official tutorial. - C++, Python

	Since you will be using them as programming languages, we recommend you learn them. - Int-Ball2 has limitations on the versions of C++, Python, and ROS (Ubuntu) that can be used due to OS constraints. Int -Ball2 Python 2. Available versions: - C ++: Compiler version g++ (Ubuntu/Linaro 7.5.0-3ubuntu1~18.04) • 7.5.0 - Python: 2.7.17-1~18.04ubuntu1.8 - ROS: ROS Melodic
Program Development	<u>October 2026 to 20 2027</u> - Participants can develop their programs for the preliminary round in the simulator. - A rule book containing detailed game rules will be released at the same time as the simulator.
Preliminary Round (National Qualifiers)	<u>January 21 to February 17 2027</u> Please participate in the Preliminary Round, qualifying competition, hosted by local organization(s)/agencies in each country/region. - Each team should develop its program by the deadline and submit it via the web simulator. - The winning teams (finalists) from each country/region will advance to the ISS Final Round Run. - However, due to limitations on the number of teams that can participate in the ISS Final Round Run, it may be necessary to further narrow down the number of teams from among the national representatives. The number of teams participating in the ISS Final Round Run and the selection method will depend on the astronaut's schedule and will be announced at a later date. - The competition will be judged by local space agency/organization(s) based on scoring elements and game rules set by JAXA, as well as each country's own evaluation criteria. - Detailed information, such as venues and schedules, will be announced by the space agencies/organization(s) of each country/region.
Programming modification (Finalists only)	<u>Early March to mid-April 2027</u> - Finalists must modify their programs in order to install them into Int-Ball2 during the ISS Final Round Run - The simulator for the ISS Final Round Run is scheduled to be released in mid-March.
ISS Final Round Run	<u>Early May 2027</u> Finalists' programs will be installed on ISS Int-Ball2 for the competition. Only the runs of your own team will be available for online viewing, and there will be no announcements regarding scores or ranking at this point.

Final Round Event	<u>June 2027</u> · During the Final Round Event, the game results and rankings of each finalist team from the on-orbit final run are announced. · The competition will be judged based on the scoring elements and game rules set by JAXA.
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2.2. Website and simulator release

The website for the 7th Kibo-RPC will be released on July 6th.

The simulator is scheduled for release in October 15.

Table 2.2-1 Release Schedule

Event	Date
Programming Manual	October 5 2026
Rule Book	October 5 2026
JAXA Web-based Simulation Environment	October 15 2026
Simulation Update for the ISS Final Round Run	Mid-March 2027

The website of the previous Kibo-Robot Programming Challenge

1st: <https://humans-in-space.jaxa.jp/krpc/1st/index.html>

2nd: <https://humans-in-space.jaxa.jp/krpc/2nd/index.html>

3rd: <https://humans-in-space.jaxa.jp/krpc/3rd/index.html>

4th: <https://humans-in-space.jaxa.jp/krpc/4th/index.html>

5th: <https://humans-in-space.jaxa.jp/krpc/5th/>

6th: <https://humans-in-space.jaxa.jp/krpc/6th/>

3. Kibo-RPC Entry Application

Some countries/region participating in the Kibo-RPC may differ in terms of requirements such as nationality, number of persons in a team limit, and age limit for participation, etc. Please check with the space agency in the relevant country/region for details.

3.1. Entry Requirements

Students who live in one of the Kibo-ABC member countries/regions^{*1} or the US (to be confirmed) and who are enrolled in a school up to graduate school in a country/region^{*2} participating in Kibo-RPC (including foreign students) are qualified to enter. Exceptions may be made in cases such as those shown below if approved by the Point of Contact (space agency/organization) (POC) of the country/region participating in the Kibo-RPC in which they reside. If you think that applies to you, please contact your POC.

Special Cases:

1. Non-students may be eligible to compete, as long as they are not professional programmers.
2. Students studying outside their country may be allowed to form a team representing their country in the place where they are studying.

^{*1} Kibo-ABC Member Countries/Regions (in alphabetical order)

Australia, Bangladesh, Cambodia, Indonesia, Japan, Malaysia, Nepal, New Zealand, Republic of the Philippines, Republic of Korea, Singapore, Taiwan, Thailand, United Arab Emirates, Vietnam

Kibo-ABC URL: <https://humans-in-space.jaxa.jp/biz-lab/kuoa/kibo-abc/>

^{*2} Countries/Regions Participating in the 7th Kibo-RPC (as of June 2026)

Australia, Bangladesh, Cambodia, Indonesia, Japan, Malaysia, Nepal, the Philippines, Singapore, Taiwan, Thailand, the United States (TBC), and Vietnam

^{*}Participation from other Kibo-ABC member countries/ region is currently being arranged.

In the 7th Kibo-RPC, **an additional slot has been established to expand the competition internationally and allow students from developing economies and economies in transition that are United Nations Member States which are not "Countries/regions participating in the 7th Kibo-RPC" in ^{*2} above.** This slot was realized in cooperation with the United Nations Office for Outer Space

Affairs (UNOOSA). For details of this slot, please refer to the UNOOSA Website for detailed entry requirements.

- UNOOSA Website

<https://www.unoosa.org/oosa/index.html>

7th Kibo-RPC page on the UNOOSA website and the call for participation will be open soon. Please check the above website or <https://jaxa.krpc.jp/>

See Table 3.1 to see which countries you can apply to participate in.

Table 3.1 Team Categories

Case	Nationality of participants	Location of their School	Means of Participation ^{*1}
1	Kibo-RPC Participating Countries/Region	Kibo-RPC Participating Countries/Region	Apply from the preliminary round of the country/region the team members are from or where the school is located.
2	Kibo-RPC Participating Countries/Region	Kibo-RPC non -participating countries/region	Apply from the preliminary round of the country/region the team members are from.
3	Kibo-RPC non -participating countries/region	Kibo-RPC Participating Countries/Region	Apply from the preliminary round of the country/region where the school is located.
4	Kibo-RPC non -participating countries/region <u>from developing economies and economies in transition</u> ^{*2}	Kibo-RPC non -participating countries/region <u>from developing economies and economies in transition</u> ^{*2}	Apply from the preliminary round through the UNOOSA international slot.
5	Kibo-RPC non -participating countries/region <u>from developing economies and economies in transition</u> ^{*2}	Kibo-RPC non -participating countries/region <u>from developed economies</u> ^{*2}	Apply from the preliminary round through the UNOOSA international slot.
6	Kibo-RPC non -participating countries/region <u>from developed economies</u> ^{*2}	Kibo-RPC non -participating countries/region <u>from developing economies and economies in transition</u> ^{*2}	Apply from the preliminary round through the UNOOSA international slot.

*1 Multiple entries in various preliminary rounds in different countries/region are not allowed.

*2 For country/region classifications, see the [World Economic and Situation Prospects 2026](#) published by United Nations Department of Economic and Social Affairs and other related organizations.

3.2. Team Formation Rules

(1) Team Structure

- A Team must consist of at least 3 and no more than 8 members (Guardians are not counted in the number of team members).
 - ✓ Some participating countries/region may set their own minimum and maximum number of team members. For details, please check with the local organizer(s) in your country/region.
- At least one of the team members must be eligible for one of the cases in Table 3.1.
 - ✓ If the team is eligible for multiple cases, apply to the preliminary round of the case with a smaller number.
Ex) If your team is eligible for both cases 1 and 3, you need to apply from case 1.
- No student may belong to multiple teams.
- After the preliminary round is over and a team has been selected, team members may not be changed.

(2) Team Leader

- Each team shall have a representative to manage the team as leader. A student or guardian (or teacher) on the team may be the team representative.
- The Team Representative is responsible for:
 - ✓ Managing the team's programming progress
 - ✓ Submitting the application forms
 - ✓ Submitting the programs
 - ✓ Communicating and sharing information with the POC in your country/region and secretariat (please make sure to check the correspondence from the POC and secretariat).

(3) Other Conditions

- The following skills and knowledge are preferred but not required*:
 - ✓ Programming languages used are C++ and Python
 - ✓ Knowledge of college-level physics and mathematics

*These skills may be required to deliver results in the competition.

- When applying, please be sure to review the contents of the attached Kibo-RPC Entry Agreement and tick the consent confirmation box on the Application Form.

3.3. Application

(1) Select the URL for the preliminary round of the applicable country/region on the Kibo-RPC website (<https://jaxa.krpc.jp/>), fill in the form, and submit it. Please note that the required items may differ depending on the POC of the preliminary round. The main common items are shown below. We recommend that you have the details ready before you start.

- ✓ Team Name (English)
- ✓ Team Leader: Name (English), age, nationality, affiliation, address, phone number, and email address)
- ✓ Team Sub-leader (optional): Email address (backup contact information)
- ✓ Guardian and Teacher Information (only for teams consisting of high school students and younger): Name, phone number, email address
- ✓ Team Members: Name, age, nationality, affiliation, history of past participation in Kibo-RPC
- ✓ How you learned about Kibo-RPC
- ✓ Team introduction and why you want to participate
- ✓ Consent to the Terms of Participation)

(2) After your application is accepted, you will receive an email containing your login ID and password to access JAXA's web-based simulator and the participants' page on the Kibo-RPC site.

Please allow 3 business days for registration to be completed.

Application deadline:
October 14, 2026, 23:59 (JST)

3.4. Beginner Course

For the 7th K-RPC, in addition to the traditional Regular Course, a Beginner Course will be offered as a side event for beginners. In the Beginner Course, programs will be run on a simulator, similar to the Preliminary Round for the Regular Course. Teams will compete for rankings under an easier game level compared to the Regular Course. These easier conditions consist of fewer checkpoints, and the orientation is not considered. The winning teams (finalists) from each country/region will advance to the final competition. Awards will be given to the top teams, but please note that even if you win, you will not be eligible to participate in the ISS Final Round Run aboard the ISS.

Eligibility:

Teams that meet the following criteria are eligible to participate.

- ✓ **All team members must be junior high school age or younger (at the time of submission).**
- ✓ **All team members are self-proclaimed programming beginners.**
- ✓ **Teams that meet the above two conditions and wish to participate**

* All teams can also participate in the Regular Course. The program submission can be the same for all teams, but it must be submitted to each course separately.

For the rules of the Beginner Course, please refer to the rulebook, which is released in October 5.

4. Game Explanation

4.1. Scenario

*Mission: Crisis on the ISS. Track down the invisible anomaly**

A very slight drop in atmospheric pressure was detected in the system monitoring logs of the International Space Station's Japanese Experiment Module 'Kibo'. While this level of pressure change could be due to an equipment error, if it indicates an air leak, careful investigation is necessary.

The cause has not yet been identified, and it has not been confirmed whether or not there is a leak. At this stage, careful analysis is needed before astronauts can conduct a direct investigation. Therefore, a preliminary inspection will be conducted by operating the Int-Ball2 robot flying inside the ISS.

Based on past operational data and case studies, potential leak locations include joints, hatch areas, and the ends of experimental racks. Checkpoints with AR markers have been installed at each of these potential locations.

Int-Ball2 will visit all checkpoints to collect inspection data. However, leaks are so minute that they are invisible to the naked eye. For inspection cameras and sensors to diagnose correctly, measurements must be taken accurately at the specified positions and orientations. The more accurately you reach the target point, the more accurately you can determine the presence and severity of any abnormalities.

Once all potential locations have been surveyed, the data collected will be integrated and analyzed. This may reveal the true leak location, or it may turn out to be a false alarm. We will try to identify the cause based on the limited information available.

Precisely control Int-Ball2 and uncover the true nature of the anomaly.

*This story is a work of fiction.

4.2. Game Overview

Starting from the docking station, Int-Ball2 moves to several checkpoints where leaks are suspected. At each checkpoint, Int-Ball2 reads the AR markers.

The goal is to read the markers within the time limit and identify the cause of the pressure drop inside Kibo. The mission ends when you reach the goal checkpoint or pass through all checkpoints.

4.3. Game flow

- ① Starting from the docking station.
- ② The position and orientation of the automatically generated checkpoints are processed.
- ③ An efficient route to visit the distributed checkpoints is planned.
- ④ At each checkpoint, the Int-Ball2 position and orientation when reading the AR marker are registered.
- ⑤ The mission is complete when all the points are visited; and the goal checkpoint is reached.
- ⑥ Mission complete report.

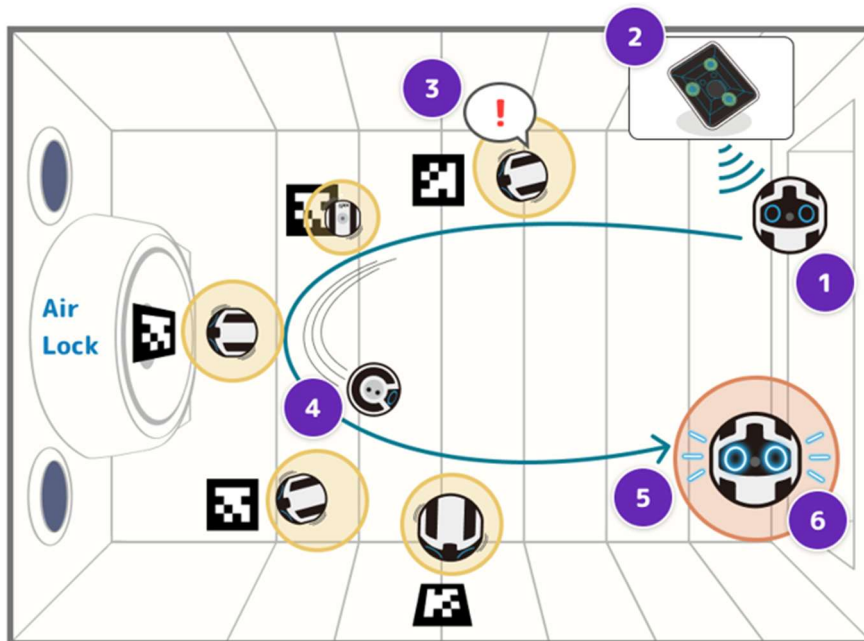


Figure 4.3-1 Game Flow (See rulebook for details)

4.4. Evaluation Criteria

We will evaluate your speed, orientation, and accuracy of recognizing AR markers in each checkpoint.

In the Preliminary Round, simulations will be run in multiple patterns with the same route, and the average of the scores will be the final score. For more details, please refer to the rulebook released in October.

4.5. Information to be released later

The following information will be published in the "Kibo-RPC Rulebook" in October 2026:

1. Starting position and orientation
2. Placement area of each checkpoint
3. Method for determining the passage, waypoint, at each checkpoint
4. Goal point location

5. FAQ

No.	Question content	Answer
1	I want to add a member, or I want to modify the registration details.	You can add more people as long as it's within the maximum number allowed. Please contact the POC by email, including the information below. Similarly, please include the same information if you need to make any changes. ① Team Name ② Names of added/changed members ③ Affiliation of added/changed members ④ Nationalities of added/changed members ⑤ Age of added/changed members ⑥ Past competition participation history of added/changed members
2	I registered to participate, but I haven't been issued an ID or password.	Please allow approximately 3 business days for your registration to be completed. If it takes more time, please contact the POC by email.
3	When can we start developing the program?	The web simulator is scheduled for release in October to develop programs for the qualifiers. Until then, you can self-study and learn about programming in advance on GitHub, etc. (For more details, please see section 2) Additionally, materials distributed in previous years can be downloaded from each Kibo-RPC website for your reference.
4	The description says that "university-level knowledge of physics and mathematics" is required, but can elementary or middle school students participate?	While some aspects of the content require knowledge at a university level, elementary and junior high school students can also participate. In past competitions, there have even been teams consisting solely of elementary school students that competed in the qualifying rounds.

5	I want to get in touch with people from other teams.	Please use the bulletin boards and other features provided in the simulation.
7	I want to use a Mac	You may use a Mac for coding; however, a Mac is not the recommended development environment for this program, so the secretariat cannot provide support.
8	I cannot create the local simulator.	Please program while referring to the Programming Manual, which is scheduled to be released in October. If the issue persists, please provide the following information via the contact form. ③ Execution environment ③ Which command was executed (which step in the manual)? ③ What kind of error was output (output results or logs)?
9	Is this competition divided by academic level, such as elementary school, middle school, high school, or university?	For the 7th tournament, in addition to the Regular Course (which is open to participants of all academic levels) we have added a Beginner Course for junior high school students and below, who are new to the competition. Please see section 3.4 for details. Note that some countries/region may not offer the Beginner Course.
10	I will graduate from school during the program period. Will I still be eligible to participate?	Participation is possible, but you will lose your eligibility upon graduating from school. Your team can continue participating in the tournament as long as graduating members leave the team. The remaining members must maintain at least the minimum number of team members required in their respective country or region. If there are any changes in the team members due to graduation, please inform your country/region representative (POC) along with the team's name.

For more frequently asked questions, please visit the official Kibo-RPC website.

<https://jaxa.krpc.jp/faq>

Terms and Conditions

Applicants must agree to all of the terms below. If you live in the European Union, please agree to the contents of the attached materials.

1. Privacy Policy

- (1) Collected personal information will only be used for the operation of the Kibo-RPC, and possibly used for public relations of JAXA's events and taking surveys on career paths.
- (2) The videos and photos taken at this tournament will be made publicly available.

2. Responsibility of Applicant and Exemption Clause of JAXA

- (1) JAXA will not be liable for any problems that may occur during program participation. Applicants need to take full responsibility for solving issues of this nature that may arise
- (2) Applicants must guarantee that information on the application form and the program code does not violate any legal rights or obligations, such as intellectual property or export control, as applicable. If a legal problem related to the submitted information arises, the applicant will take full responsibility for solving the problem
- (3) If there is a violation of these matters, registration may be canceled, even after registration.

3. Notes

- (1) Underage applicants must first obtain parental consent.
- (2) Do not use the simulator environment provided in the Kibo-RPC for any purpose other than the Kibo-RPC. Sign-on information for accessing the simulator environment will be made available only to the competition applicants. Do not disclose this information to anyone else.
- (3) JAXA may use the program codes and results of the competition for the purpose of public relations and education.

Consent content based on EU GDPR

For the purposes of notification of competition information, sending of prize certificates and commemorative gifts, provide information to POC in countries/regions other than Japan for the purpose of managing the event, JAXA needs to collect your personal data requested in the present form. You may at any time object to the use of your data for this purpose by writing to the following address:

Z-KRPC7@ml.jaxa.jp

You will find below all the detailed information concerning this processing of your personal data and a reminder of your rights, in application of the legislation in force.

JAXA, willing to respect the privacy and protection of personal data of its prospects and clients, complies with the legislation in force regarding the protection of personal data as data controller, and in particular Law no. 78-17 of 6 January 1978 (the "Data Protection Act") and, from 25 May 2018, Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of individuals with regard to the processing of personal data and the free movement of such data (the "GDPR").

PLEASE BE INFORMED THAT THE PERSONAL DATA WILL BE TRANSFERRED TO JAPAN AND POC AND TEAM OF THE PARTICIPATING COUNTRIES/REGIONS FOR THE PURPOSE AS DESCRIBED ABOVE.

You have, under the conditions defined by the Data Protection Act and the GDPR, unless otherwise provided:

- (i) The right to withdraw at any time your consent to the processing implemented by JAXA based on such consent ;
- (ii) The right to obtain from JAXA the confirmation that your personal data are or are not processed and, when they are, access to said personal data as well as to several information on the processing (processing purposes, categories of personal data concerned, recipients or categories of recipients to whom your personal data have been or will be communicated, the retention period of the personal data envisaged or, where this is not possible, the criteria used to determine this duration, etc.)
- (iii) A right of access, rectification and/or erasure of your personal data;
- (iv) The right to receive your personal data provided to JAXA, in a structured, commonly used, and legible format, and the right to transfer this data to another data controller without JAXA having to obstruct it;
- (v) A right of opposition, for legitimate reasons, to the processing of your personal data and the right of opposition to the use of such personal data;
- (vi) The right to request from JAXA the portability of your personal data in the event you wish to obtain the transfer of your personal data to the benefit of another data controller.

You can set, change and revoke at any time guidelines for the retention, erasure, and communication of your personal data after your death. You have the right to appoint a third party to whom your data may be communicated after your death. You agree to inform this third party of your approach.

You may exercise the rights described above by writing to JAXA at the following email address:

Z-KRPC7@ml.jaxa.jp