European Rover Challenge 2016

Questions & Answers

In accordance with the ERC 2016 Competition Rules:

8.3. Q & A

The Organizer will provide 'European Rover Challenge 2016 Questions & Answers' as a part of the Competition Rules. All arrangements contained therein are ultimately binding – even if they change the Competition Rules. FAQ will be reasonably announced in advance and provided on the Challenge website.

We present following FAQ below. This document is prepared in cooperation with ERC 2016 Judges.

If you have any other questions, contact the Challenge Contact Point (teams@roverchallenge.eu).

LAST UPDATE: May 2nd, 2016

(new: The organisational aspects: Q8-Q10; The technical aspects: Q16-Q53)

The organisational aspects

Q1. Is it allowed for two completely different teams from single institute to compete in the competition?

A1. Yes, it is allowed. The only condition is to have different university coordinators (supervisors).

Q2. Based on the following „University Team Coordinator name and surname, telephone number and e-mail address": should be the member of the team for example some student or should be the secretary of the my faculty.

A2. University Team Coordinator is a supervisor of your team. It should be a person employed at University. This person can be (but not has to be) a member of the team.

Q3. Is it allowed to register a team from more than two different university?

A3. Yes, it is allowed. Does not matter how many universities team is representing, only one supervisor and one team leader must be chosen and presented in submission documents. If it is necessary, supervisors from other universities can be listed as Supporting Supervisor(s) but there is no need to submit contact data to each of them.

Q4. Based on the following 'Team must consist of higher education students and recent graduates only', is it possible to engage a person in the ERC2016 that attends high school (a school is affiliated to the University the team originates from)?

A4. Organisers are allowing for high school students as well as older graduates (more than 1 year after studies) to be a rover Team members. Please highlight those persons in team registration document for Organisers information. Anyway the Team must be affiliated to university.

Q5. Based on the following „Team introduction contains information about Team's experience (e.g. short people profiles, other projects etc.) (max 3 points);" Do we have to provide the profiles and projects of all team members individually or do we have to provide profile for the sub groups (IE electronics department, mechanical department, software department and management)

A5. Information about Team's Experience is short information about each member of your Team – responsibility/role in the Team, short information about experience (background, projects, professional). Also, it is a place to express a Team experience (if you have some) - experiences from other competitions, previous edition of ERC etc. In both parts, please include only most valuable information in context of the Challenges and not exceeding designated space limitation.

Q6. Is there Any registration fee for ERC 2016?

A6. No, there is no registration fee.

Q7. I have completed my graduation In December 2015. Can I participate ERC 2016?

A7. Yes, you can.

Q8. Can I use image in Proposal ?

A8. Yes, you can. But please remember that a proposal is limited up to 6 pages (including a title page).

Q9. What do you mean by "substantial information" in 4.1.1. a) of ERC 2016 Rules?

A9. By "substantial information" we want to receive a clear and precise information why you want to attend the ERC2016. So we suggest that you should clearly describe reasons of participation, what's really important to you - as engineers/designers, etc.

Q10. Will there be any logistic support as in accommodation, transportation etc. from the organizing community?

A10. Yes of course. As usual we will help you with visa applications (sending letters to Polish embassies), helping in selecting the most suitable and preferable accommodation (and sending you the list of it) and regarding transportation we can already suggest our logistic partner: Exposped company - they have experience in servicing rover teams (http://exposped.com.pl/en/1-al-ofirmie.html)

The technical aspects

Q11. Based on the following 'Delivered samples with correct weights in separate (sealed) containers', what do you consider as a 'sealed' container?

A11. Each solution will be evaluated. The ideal sample return container should protect sample from physical, chemical (also gaseous), thermal influences of the environment during transportation.

Q12. Based on the following 'Organizer will provide a map of the Challenge area no later than at the first day of Competition with all reference points', will a map you provide contain terrain shape (represented with isohypse)?

A12. Organisers are planning to deliver 2D map containing representation a land with marked POI obstacles and areas with information on their heights. Any further suggestions will be considered

Q13. Is it allowed to use explosives e.g. in order to deploy a device?

A13. No, it is not allowed, due to safety reasons (esp. operating in indoor environment) of the Challange event. But teams are welcome to present in their documentation innovative, feasible solutions as an additional considerations.

Q14. Based on the Competition Rules, max. WiFi 5.6GHz power is 100mW EIRP. However, it is allowed in Poland to emit up to 1000mW (1W) EIRP power under given standard. Might it be a mistake in the Competition Rules?

A14. Yes it is correct that 5.6Ghz WiFi is allowed up to 1000mW and we are allowing on that as well. It is important to notice that rules are strongly suggesting 2.4Ghz for WiFi communication and only this bandwidth will be monitored for resolving communication problems.

Q15. Is it allowed to use two different rovers during different tasks (as a one team)?

A15. Yes, it is allowed, but such solution should be well documented as for single robot and the same, one budget limit applies for the robot group.

Q16. To what extent are we allowed to modify our rover between the tasks? Is it permitted to change, for example, the entire chassis (with drive, wheels and the rest) and significantly changing shape of the rover?

A16. Yes, it is allowed to modify any part of your system between Challenge trials. It is suggested to modify only functional, useful equipment on the platform to show ergonomics and versatility of the solution.

Q17. Why the max speed of a rover is only 3km/h?

A17. Just for safety reasons. It is worth to point out that this time Trials will be held in indoor environment much closer to the people as on the last editions. We believe that this speed allows you to drive rover more smoothly and stop it exactly when necessary. On the other hand remember that real planetary rovers speed is not more than 4-5cm/s

Q18. Will it be possible to measure physical parameters of soil and detect proteins/aminoacids in the base station, after the task would have been completed?

A18. No, it won't be possibile. You have to complete each the task in specified time, maximum 25 minutes for each task.

Q19. Can we have any information about the kind of terrain we have to dig in? Will it be sandy kind or more compact? will there be any presence of stones?

A19. There will be mostly sandy terrain with possible content of silt and gravel, there will be not heavy compacted soil and there will be not buried stones in the soil, for sure, you will easily avoid surface Stones.

Q20. What type of coordinate system will the waypoint locations be given in?

A20. We will use meters as the coordinate system, generally connected with UTM coordinates: will provide you the coordinates of starting point.

Q21. With the artifical landmarks is there going to be more information provided about what the landmarks will look like?

A21. We would like to discuss this with you - all the teams can participate in detailed definition of the landmarks because we want to allow as many as possible from you to take part in this challenge task. Remember to divide your system to independent parts - detection of the landmarks is only part of that - in meantime you can focus on navigation on any kind of landmarks and when its appearance will be finally defined you can just use dedicated detection algorithm.

Q22. Are we going to be given our starting coordinates and to what accuracy?

A22. POI and landmarks points will be given with about 0.5m accuracy but not worse than 1m.

Q23. Will the landmark specification delivered to the teams include dimensions or only appearences (such as shape, colour...)?

A23. We are going to pro vide you (on the request) as much information as it will be available and reasonable. The purpose is to allow you to take part in task.

Q24. Can we transmit point cloud data from the rover to the base station (not camera streams) for visualization with a dedicated tool?

A24. No, you can't. Point cloud data can provide even more information than 2d image – you cannot use it directly in navigation task.

Q25. What minimum dimensions trench should have?

A25. At least 20 cm of length, 5 cm depth and about 5 cm wide.

Q26. Will there be any frequency checking system or rules to avoid interference?

A26. Yes, there will be communication check before start in each task. Additionally teams' preparation area will be separated from task area (physically, by concrete wall) and some measurements over time will be conducted.

Q27. How many times the rover could be out of 'line of sight' from the base antenna?

A27. The base antenna will be elevated, about 5 meters above ground zero (placed on a balcony but you still need your own mast to place it on flat floor and erect antenna over rail), so there should not be radio shaded areas at all.

Q28. Is the plug socket IEC 60309 will be equipped with a plank against water spray?

A28. We don't foresee any additional difficulties regarding the plug you mentioned. We assume that we'll use a commercial available plug without any extra sealings or your approach meeting those dimentions.

Q29. It is required to provide a very detailed RF Form including RF spectrum and antenna radiation pattern. The question is, can we provide such information based on manufacturer's datasheet only?

A29. Purpose of those rules points are to force you a little to play and understand basics of RF communication. Of course manufacturer information should be enough here but we really suggest to try that on your own and even compare results with datasheet. Most important is to understand what kind of communication system (including antenna) will be enough for you and how to avoid problems witch communication using it.

Q30. Can we use Different radio system for Video transmission (5GHz) whenever our rover will be controlled by (2.4GHz).

A30. Yes, you can. But remember that, all systems must be specified in relevant documents.

Q31. What is the difference between "closed" and "sealed" conteiners of the science task?

A31. Sealed is 'much better closed'. Sealed container should completely isolate sample.

Q32. Will the map provide have scale information?

A32. Yes, map will contain representation in scale and scale information will be provided.

Q33. Will the map provided have elevation contour lines?

A33. Yes, some coarse information about elevation will be provided as a contour lines or/and local cost.

Q34. Will the map provide have a grid in a metric system like the Universal Transverse Mercator (UTM)?

A34. Yes, we will use meters as the coordinate system, generally connected with UTM coordinates: will provide you the coordinates of starting point.

Q35. Is the specific date that the map will be provided set yet? Is it 3 days before the competition or 1 day before the competition?

A35. The final map will be provided not later than 3 days before competitions. However first maps could be delivered earlier after discussions with the teams. Feel free to leave any comments, what is your preferred format and what kind of information would you like to find there - we will review those comments and present you final concept.

Q36. What is the format of the map be provided? Geographic Information System (GIS) format? Paper?

A36. Certainly the hi resolution image of te map will be provided. Delivery of the GIS map (in gis format) or/and cost map (2d map with estimated heights and POI information presented as an image) is considered.

Q37. The rules state: "artificial points for localisation purposes with characteristic hi-visibility labels with characteristic logotype, unique geometric figure and alphanumeric sign matching POI label on the map". Are these artificial points for localization different from the check points A, B, C, D, X that the rover needs to reach in the navigation task? In other words are the artificial points additional points separate from check points A, B, C, D, X?

A37. One of the considered scenarios is to provide you navigation points in places which rover cannot reach to make they well visible. Then check points (A, B, C, D, X) will be flat areas on the ground (allowing rover to drive over and actually reach point) but also specifically marked.

Q38. Will the artificial points for localization purposes have physical color labels in the task arena? What color? Will they all be the same color?

A38. Yes, it is planned to make them in the colour that is easy to filter out from environment (green box effect).

Q39. Will the check points A, B, C, D, X have physical color labels in the task arena? What color? Will they all be the same color? Will the color be the same as the color used for the artificial points for localization purposes? How will they be labelled if the check points are flat? For example will a flag be used? How tall will the flag be? How big will the flag be?

A39. At least it will be flat areas on the ground elevation with similar label as on navigation points. elastic flags could be considered. Height relative to the local ground elevation should be between 0m and 2m and it depends on visibility of the landmark over whole trial area.

Q40. Are we allowed to leave behind a part of our rover. We're planning to develop a mechanism which is similar to the mechanism (like a harpoon) proposed by NASA to collect samples from comet Nucleus ?

A40. Yes, you can but in this case remember about the safety of people around and that sample must be delivered in good condition to start point by the rover. But if there is any option to take this part you would like to leave after the rover - e.g. by dragging it on the tether, we prefer such option.

Q41. What is the soil condition? How does the jury differentiate between soil collected from 15 cm below the surface?

A41. For science task, special area will be prepared where few layers of the different soil will be put. The layers will differ at least by colour. The ideal sample should contain only subsurface soil from 15 cm and more sample is contaminated by surface soil, less points you will get.

Q42. Do we have the posibility to make significant changes on our rover construction after shooting a Promotional Video?

A42. Yes, you can still change your rover but Video should present the same design that documentation and should show us that your rover is operational and on good way to be finished on time so I believe it shouldn't be changed completely.

Q43. We are required to attach a Pre-final Radio Frequency Form to our Preliminary Report. Do we have to contain points f), g), i), j), k) and l) in it?

A43. Surely, you won't be able to deliver all of this information on such preliminary step - the preliminary version of RF form should contain as much information as you can specify and assumptions about the rest (highlighted as an assumptions). For example you can specify what kind of antena are you planning to use, and compare different radiation diagrams, showing us that your assumption is based on some theoretical analysis/experience.

Q44. Which is the minimum guaranteed time we will have between one task and the other? We need this information for the dimensioningof the batteries of the power supply and the time we have to charge them up.

A44. The minimum assumed time is the time of single attempt (of another team) so about 30min. We can suggest you to use smaller batteries to lighten rover but prepare spare ones.

Q45. In our university we have the chance to produce mechanical components, with 3D printing technology, for free. How do we have to take them into account of final cost of the rover? Is the materialcost enough?

A45. Cost of material should be taken into account.

Q46. For the scientific task: scientific optional/additional measurements can be general measurements of the “planet conditions”, for example air temperature/humidity/pressure, magnetic field, wind conditions, etc., or they must be specific for the samples collected?

A46. It have to be related to the sample or sediment/rock where the sample was collected.

Q47. For the navigation task will check points A, B, C, D, and X be visible on the Geographic Information System (GIS) map provided. Will the location of check points be clearly marked on the map to be delivered earlier than 3 days before the competition?

A47. Yes, those points will be placed on the map. Format of the map (if GIS/Gis-like) is still to be defined. Points will be provided on a map 3 days before challenge but we reserve right to change its positions slightly and provide you updated map at least at registration time if some technical issues occurs.

Q48. Will there be more than one team's rover in the competition arena at a time for each task. For example will all teams compete together at the same time for each task.

A48. All tasks will take place in the same time, what means that maximum 4 teams will be operating their rovers. Areas will be spatially separated from each other to avoid accidental problematic situations.

Q49. Is the budget limit for the rover also applied to ground station equipment?

A49. No, budget limit applies only to the rover itself.

Q50. What is the size (or the maximum size) of the area where each task will take place. This is mainly in relation to mapping.

A50. Maximum possible dimensions of challenge arena is 35x50m but this is a place for all the tasks so actual mapping area (for navigational task) should be about half of that.

Q51. How to distinguish project assumption and technical requirement definition?

A51. Requirements are defining mandatory properties and features of your project and should be formulated directly based on rules. Assumptions are technical propositions how you going to meet requirements in your project. Assumptions could be stated in form of single solutions as well as few ideas for further analysis. Second applies especially to early documentation phases – proposals, open points in preliminary

documentation, which are the places to show that your project is based on analysis not on blind decisions.

Full typical specification of requirements are typically collected and traced through whole project (updated in every major step/review) in a table which includes (not all fields are always necessary, sometimes additional are required):

– requirement identifier (for referencing purposes)

– requirement type (mandatory, desirable ,optional)

– requirement keyword (for quicker navigation)

– requirement description

– test method (requirement will be checked by: test, inspection. review of documentation, theoretical analysis)

– compliance (place to put comments about conflicts in requirements, comments if requirements are identified as not justified for project etc. or short comment how requirement will be realised in project)

Example:

|| T-MOB-001 | M | speed limit | ***The rover maximum speed should be not higher than 3 km/h (rules 3.3)*** **| T | low level software limitation ||**
Above could be read as: requirement identifier: e.g. T – technical requirement; MOB – mobility subsystem; requirement no. 001; mandatory; speed limit; The rover maximum speed should be not higher than 3 km/h (which is following rules document paragraph 3.3); will be checked by conducting test (physical check in prepared conditions) and will be realised by limiting maximum speed in speed controller software)

Then assumptions should be placed as a main text, referencing requirements by keyword or id, of your document with justification, why you chose this solution(s) or why you are going to analyse it further. Assumptions could be also written in form of table together or separated with test plan describing how you going to test each requirement-assumption, what equipment will be necessary for that, and what is passing and failing criteria. Of course all above is typically adjusted for each project individually to find best ratio between project and documentation complexity.

As an interesting fact you can imagine that in big satellite projects for every algorithm, interface, model, simulation, test case, cable, part, sensor, element, then mechanism, sub-system, system, support and testing equipment etc. all those points are defined separately in most cases in separated documents, with transparent traceability. You can navigate by identifiers from mission description, general requirements through specific requirement, initial assumptions, analysis, early decisions, simulations, justified decisions, development and manufacturing, test plans, test results, assembly and integration campaigns to installation launch campaign, operations and mission finalisation and disposal.

Q52. According to the rules: what does "Pre-final System Breakdown Structure (pSBS)" mean? What kind of information should I provide for that?

A52. You should present a structure of your rover broke into blocks of subsystems with all dependencies and power/data flow shown.

Q53. Do we have to include RF spectrum analyses in the pre-final form or the final one? Also, how is the pre-final form supposed to be different from the final one

A53. Pre-final is summarising design of your rover while final is presenting what you obtained at the end of the project - so project design description and project implementation description respectively. Of course because teams are on different levels of progress so final documents should contain final update of your work planned and documented i pre-final docs. And the same is about RF forms - doesn't matter whereas you can provide us assumptions, coarse results or final ones, the final document should contain update of this info.