



Horizon Prize

COLLABORATIVE
SPECTRUM
SHARING

RULES OF CONTEST



The mere fact of participating in the contest means that the contestant knows and fully accepts the present Rules.

1. OBJECTIVES PURSUED

The data rates and the number of users of mobile communications have increased dramatically during the last two decades. The industry predicts an exponential increase of data traffic to continue at least until 2020 and most likely the rapid expansion will persist beyond that due to new applications and increases push towards Internet of Things. The available spectrum is one of the crucial limiting factors for enabling new services and driving the development of wireless systems, especially if cells become smaller and more numerous, and if many objects require low cost, energy efficient connections. Recently the traditional command-and-control approach and even spectrum auctioning methods have been questioned by research community and some of the leading edge regulators and companies. This has led to a vigorous research on alternatives for spectrum access and licensing regimes. This research is often labelled under terms Dynamic Spectrum Access (DSA), cognitive radio (CR) networking, and spectrum sharing (SA).

The economical and societal importance of the spectrum allocations and need to consider new flexible methods for sharing and spectrum access has been stated by several high-level consensus reports that include also recent communiqués from PCAST (U.S. President's Council of Advisors on Science and Technology) and European Commission. Generally it is stated that novel methods that go beyond classical licensed cellular systems and unlicensed Wi-Fi type of solutions should be developed and considered as long as they are made economically viable and increase the efficient use of spectrum resources.

Although over a decade of research in this domain has generated literally thousands of papers, there has been much less practical experimentation and serious move towards commercial deployments. Most of the research literature is extremely theoretically oriented, and a significant amount of work is focusing on few niche topics such as information theoretical considerations, spectrum sensing, and dynamic auctions. Papers considering practical system aspects, experimentation, and measurements are in minority in the vast literature in this domain. In the practical domain the main emphasis has been on enabling the use of so-called TV White Spaces (TVWS). In fact, FCC (US) and Ofcom (UK) have been in the notable forefront of releasing regulation and test licenses in this domain. However, this progress should be seen as only the first steps towards more advanced techniques to open the spectrum gridlock. Moreover, in TVWS domain all the existing standards and regulatory actions have been exclusively focused to centralized database solutions. In Europe there has been extensive investment in the framework of projects, which cover research topics in this field. While a number of those have included practical elements and experimentation, challenges remain in converting those elements into realistic and innovative solutions

In general, the distributed, terminal centric, or other disruptive ideas have not been considered at the system level and are not mature enough for regulatory actions due to the uncertainty of their performance. Taking into account the above mentioned limitations in the research landscape and a lack of demonstrated system capabilities, it is clear that there should be more research that considers disruptive spectrum access and sharing methods, which go beyond the traditional cellular evolution, and database based sharing methods. Moreover, it is necessary to foster experimental R&D and early proof-of-concept development to encourage innovation, business, and regulation in the domain of collaborative sharing of spectrum

Taking into account the above background, the objective of this inducement prize is to provide innovative yet implementable solutions enabling a significant efficiency improvement in the usage of scarce spectrum resources. The aim is to unlock the expected capacity crunch of wireless networks faced with booming traffic and usages. The prize will reward excellence in demonstrating one or several innovative methods focusing on the provision of empowerment of local user communities with decentralised spectrum management capabilities through "collaborative spectrum sharing".

2. EXPECTED RESULTS

In general, existing efforts have been focusing on centralized database solutions. In the meantime, the distributed, terminal centric, or other disruptive ideas have not been considered at the system level and are not mature enough for regulatory actions due to the uncertainty of their performance. Taking into account the above mentioned limitations in the research landscape and a lack of demonstrated system capabilities, the target is to show technical feasibility of disruptive spectrum access and sharing methods, which go beyond the traditional cellular evolution, and centralised sharing approaches. A novel sharing scheme is targeted to enhance the performance and deployment of small cell systems, to contribute positively to the development of low cost, energy efficient systems. Fostering experimental R&D development encouraging, technological, business, and regulation innovation in the domain of collaborative sharing of spectrum are related objectives.

The solution shall enable a significant increase in spectrum sharing and reuse. Feasibility of the proposed concepts needs to be shown through experimental results beyond those obtained through early proof-of-concept development. They should not be limited by the currently applicable spectrum regulations. It should also help overcoming the heterogeneous nature of spectrum access implementation in Europe, especially for cross border situations. It has to demonstrate societal and economic benefits for Europe with a clear innovation potential, business opportunities, and where applicable, required modernisation of European regulation in the domain of collaborative sharing of spectrum.

3. AWARD CRITERIA

As already specified in the Work Programme, and following the evaluation, the prize will be awarded to the contestants who, in the opinion of the expert panel, demonstrate(s) the solution that best addresses the below award criteria:

- The solution is completed by the contestants, with a substantial part based of experimental results.
- The solution demonstrates innovative technology or methods that have the potential of unlocking access to spectrum for all stakeholders. As a minimum, these have to be based on non-traditional spectrum management methodologies and demonstrate feasibility of pure collaborative decentralised methods based on terminal level information or collaboration.
- The solution demonstrates a significant improvement over the state of the art (SoA) technologies in terms of shared spectrum usage metrics. As a minimum, this will address:
 - Full system level evaluation, with maximisation of number of users sharing a portion of spectrum. Benefit and efficiency covers the full system perspective, including technological aspects and required sharing policy. Optimisation of single parameter only or limited set thereof (spectral efficiency in bps/Hz or spatial efficiency in bps/Hz/m²) is not deemed sufficient;
 - Evaluation results must be based on realistic use cases scenarios in terms of statistical service mix and of user distribution and motion over the area where spectrum sharing is considered. The system perspective includes the performance penalties imposed by operational conditions, i.e. signalling overhead or interference effects.
 - Under similar use case scenarios, technologies and systems currently deployed or being standardised (3G/4G systems) are shown to be significantly less efficient by a factor of at least 20%
- The contestants provide evidence of how the solution could be made economically viable (i.e. can be implemented at reasonable cost) and acceptable from a policy perspective. Studies based only on theory and/or simulation, as well as studies based on only a proof-of-principle work or such very early research prototypes will not be deemed competitive.
- The contestants have the capability and plan to demonstrate the solution in larger-scale or as a part of possible testbed(s).

The solution must show that under similar use scenarios that the contestants are using, the current best practices that are deployed or are in standardisation (e.g. WCDMA / LTE, LTE-A, IEEE 802.11x domain) are significantly less efficient. The new systems should be at least 20% more efficient than the current SoA, based on key metrics selected by the contestants. Contestants are highly recommended to make such transparent comparison themselves as a part of their submission.

Although the contestants are allowed to select their key performance metrics, they are required to use a set of comprehensive and realistic metrics under realistic use-scenarios. Any solution that is using a single set of metrics (such as link spectral efficiency in bit/s/Hz) will be less attractive and will not be deemed competitive.

The entries must demonstrate credible scalability, i.e. even the very efficient and attractive solution that works for 100 nodes is not acceptable if it is doubtful that it can be scaled to commercially significant scale (e.g. density, interference etc.)

At the evaluation phase, the expert panel will assess each submitted solution against a number of award criteria and sub-criteria. The expert panel will then mark each solution up to a maximum number of points per sub-criterion. The breakdown of maximum scores is indicated in the table below.

Criterion	Sub-criterion	Max points
Technical Assessment		70
	Full system level evaluation & Performance characteristics	40
	Technological innovation	15
	Openness, scalability and integration	15
Economic viability and policy considerations		30
	Economic feasibility	15
	Regulatory and policy perspective	15
Total		100

Table indicating the award criteria and sub-criteria, and their respective maximum scores.

3.1. Assessment guidance

Full system level evaluation & Performance characteristics: Will be assessed based on significant key performance indicators and requirements included in the award criteria, level of completeness, improvement over the current status quo (available technologies, policies and business models) and quantified advantage compared to traditional spectrum usage scenario(s), shown with experimental results.

Technological innovation: Solutions that include significantly new & disruptive approach on distributing and sharing spectrum, combination of techniques/policies with credible arguments or further optimizations can get a higher score in this sub-criterion.

Openness, scalability and integration: The solution has to be open to 3rd party integration, larger scale demonstrations or as a part of possible testbed(s) and demonstrate scalability.

Economic feasibility: Rates how feasible the solution is in terms of economic and commercial perspective and how likely it is to provide a credible roadmap towards realistically deployable technology within reasonable time-scale.

Regulatory and policy perspective: Rates how feasible the solution is in terms of regulation/policy and how likely it is to be acceptable for the major stakeholders.

3.2. Expert panel rules

An expert panel will assess the entries¹ and select the winner in compliance with the contest rules. The panel will be composed of 4 to 5 experts appointed by, but independent from the European Commission (EC). These experts will have various profiles and backgrounds and come from varied countries/regions. The experts of the panel will be selected so as to encompass a full complement of skills and knowledge and ensure a robust and fair assessment of the submissions. The panel will evaluate the entries and make recommendations to the Commission, which will take the final decision on the winner of the contest.

The names of the members of the expert panel for each phase will be announced at a later stage. Contestants should not contact the expert panel for any reason in connection with the contest at the risk of being disqualified.

The EC reserves the right not to disclose the identity of the experts even if these may be disclosed post award. The experts must declare that no conflict of interest exists and that they will inform the Commission if any such conflict should arise in the course of their duties

The decisions of the expert panel are final, binding and not subject to challenge.

Contestants will need to submit the documentation required to support the fulfilment of the award criteria. The responsibility of completing the necessary assessments of the solution lies with the contestants.

The European Commission will directly launch and manage the contest and award one prize based on the judgement of independent experts. The prize will be awarded to the legal entity (representing either an individual or group) that demonstrates a solution which best addresses all the evaluation criteria.

If no entry is, in the opinion of the expert panel, of sufficient quality, no prize will be awarded.

4. ARRANGEMENTS AND FINAL DATES FOR THE REGISTRATION OF CONTESTANTS, IF REQUIRED, AND ARRANGEMENTS AND FINAL DATES FOR THE SUBMISSION OF ENTRIES

The timeline² of the contest is presented in the following table:

Stage	Deadline
Start of registration	28-05-2015
Deadline for registration	30-09-2015
Deadline for submissions	17-12-2015

¹ Entries (entry) refers to the application submission form package.

² This is an indicative timeline. The Director-General responsible may decide to open the call up to one month prior to or after the envisaged date of opening.

The winner of the contest will be publicly announced in a public award ceremony around end June/beginning July 2016.

The prize contest will follow a 2-phase approach:

- **1st phase:** a 1-page short summary of no more than 2000 characters can be sent by electronic mail to the Commission in accordance with specific procedures noted in the relevant web page announcement. Through this first phase of the registration contestants signal their intention to submit an entry before the submission deadline of the contest. This will enable to target communication activities better and to set up a realistic size and competent expert panel covering the relevant sectors for evaluation. Furthermore, contestants can receive important information for communication purposes of the prize contest via the contest call coordinator. Taking into account the above, it is to be noted that this registration step is highly recommended whilst not mandatory.
- **2nd phase:** This phase is taking place after the end of the optional registration phase and refers to entry submission. Entries must consist of a summary of no more than 40 pages (font to be used: Times New Roman 10 or 12) and may include annexes. The expert panel will be instructed to disregard any pages exceeding this limit. Contestants must present in as concise a manner as possible³ but are otherwise free to present such solutions in the way that they consider best satisfies the award criteria. Data sets and other clarifications that can be used when quantifying the results of the suggested solutions in terms of key performance metrics, as well as the demonstrated achievements, shall be provided in the annex.

5. AMOUNT OF PRIZE(S) INCLUDING SPECIFIC AMOUNT FOR EACH PRIZE, IF APPLICABLE

There will be only one winning entry, with a prize of 500 000 to be awarded. If no entry is, in the opinion of the expert panel, fulfilling the minimum criteria and of sufficient quality, no prize will be awarded.

Winner is responsible for payment of taxes and charges applicable when using the prize money.

Contestants enter at their own risk and costs. The EC will not be held liable for any costs or risks arising from taking part in this contest. The contestants should obtain all necessary insurance as necessary to take part in this project.

6. ARRANGEMENT FOR THE PAYMENT OF THE PRIZE TO THE WINNER AFTER ITS AWARD

Award will be paid in one instalment. Prize money will be paid after the award ceremony by bank transfer, provided the winner has submitted the required evidence as regards its eligibility.

7. CONDITIONS FOR CANCELLATION OF THE CONTEST, IF ANY

The Commission has the right to terminate the contest before its closing date without any obligation to indemnify contestants in case the objective of the contest has been achieved by a non-registered or non-eligible contestant.

The Commission has the right to decide not to award any prize if no entries are received or if no

³ Covering in a consistent manner the award criteria, as presented in Table of Section 3.

entries are to be awarded by the expert panel. This can apply only to inducement prizes.

In the event that the expert panel concludes that none of the proposed entries satisfies a credible path towards an innovative and significant increase of spectrum use efficiency, the contest may be cancelled.

8. CONDITIONS FOR PARTICIPATION

The contestant must not have received any other Union prize before that is the subject of the current contest. All information given by the contestant in the entry must be correct and complete.

8.1. Eligibility criteria

The contest will be open to legal entities established in an EU Member State or in countries associated with Horizon 2020.

The entry is to be submitted by an SME or non-profit organisation acting alone or together with other entities which are part of the same team.

Exclusion criteria foreseen in the provisions of articles 106(1), 107, 108 and 109 of the Financial Regulation (regulation 966/2012) will apply.

8.2. Exclusion criteria

Contestant will be excluded from participating in the contest if they fall under any of the following situations⁴:

The contestant:

a) is bankrupt or being wound up, is having its affairs administered by the courts, has entered into an arrangement with creditors, has suspended business activities, is the subject of proceedings concerning those matters, or is in any analogous situation arising from a similar procedure provided for in national legislation or regulations;

b) has been convicted of an offence concerning professional conduct by a judgment of a competent authority of a Member State which has the force of res judicata;

c) has been guilty of grave professional misconduct proven by any means which the European Union bodies can justify including by decisions of the European Investment Bank and international organisations;

d) is not in compliance with all its obligations relating to the payment of social security contributions and the payment of taxes in accordance with the legal provisions of the country in which it is established, with those of the country of the authorising officer responsible and those of the country where the activity is to be implemented;

e) has been the subject of a judgement which has the force of res judicata for fraud, corruption, involvement in a criminal organisation, money laundering or any other illegal activity, where such activity is detrimental to the Union's financial interests;

f) is subject to an administrative penalty for being guilty of misrepresenting the information required as a condition of participation in a procurement procedure or another grant award procedure or failing to supply this information, or having been declared to be in serious breach of its obligations under

⁴ Contestants which are in one of the situations referred to in Article 106(1) and Articles 107, 108 and 109 of the Financial Regulation are excluded from participating in the contest.

contracts or agreements covered by the Union's budget. Natural persons with power of representation, decision-making or control over one of the contestants that are legal entities, must not be in the situations referred to in b) and e) above.

Contestants must:

g) have no conflict of interests in connection with the prize; a conflict of interests could arise in particular as a result of economic interests, political or national affinity, family, emotional life or any other shared interest;

h) inform the European Commission, without delay, of any situation considered a conflict of interests or which could give rise to a conflict of interests;

i) have not been granted, and will not grant, have not sought and will not seek, have not attempted and will not attempt to obtain, and have not accepted and will not accept any advantage, financial or in kind, to or from any party whatsoever, where such advantage constitutes an illegal practice or involves corruption, either directly or indirectly, inasmuch as it is an incentive or reward relating to the award of the prize;

In case of award of a prize, the following evidence shall be provided upon request and within the time limit set by the European Commission:

For situations described in (a), (b) and (e), production of a recent extract from the judicial record is required or, failing that, a recent equivalent document issued by a judicial or administrative authority in the country of origin or provenance showing that those requirements are satisfied. Where the contestant is a legal person and the national legislation of the country in which the contestant is established does not allow the provision of such documents for legal persons, the documents should be provided for natural persons, such as the company directors or any person with powers of representation, decision making or control in relation to the contestant.

For the situation described in point (d) above, recent certificates or letters issued by the competent authorities of the State concerned are required. These documents must provide evidence covering all taxes and social security contributions for which the contestant is liable, including for example, VAT, income tax (natural persons only), company tax (legal persons only) and social security contributions.

For any of the situations (a), (b), (d) or (e), where any document described in the two paragraphs above is not issued in the country concerned, it may be replaced by a sworn or, failing that, a solemn statement made by the interested party before a judicial or administrative authority, a notary or a qualified professional body in his country of origin or provenance.

If the contestant is a legal person, information on the natural persons with power of representation, decision making or control over the legal person shall be provided only upon request by the European Commission.

8.3. Sole liability of contestants

The Commission may not be held responsible for any claim relating to the activities carried out in the framework of the contest by the contestant. The Commission shall not be held liable for any damage caused or sustained by any of the contestants, including any damage caused to third parties as a consequence of or during the implementation of the activities related to the contest.

8.4. Checks and audits

The contestants accept that, if they are awarded a prize, the Commission, OLAF and the Court of Auditors may carry out checks and audits in relation to the contest and the received prize.

8.5. Publicity

8.5.1. Publicity by the winner of the prize

The contestants accept, if they are awarded a prize, to promote the action and its results, by providing targeted information to multiple audiences (including the media and the public) in a strategic and effective manner.

Unless the Commission requests or agrees otherwise or unless it is impossible, any communication activity related to the action (including in electronic form, via social media, etc.) must:

(a) display the EU emblem and

(b) include the following text:

“This action has been awarded the prize [name of the prize] from the European Union’s Horizon 2020 research and innovation programme”.

When displayed together with another logo, the EU emblem must have appropriate prominence.

For the purposes of its obligations, the winner of the prize may use the EU emblem without first obtaining approval from the Commission. This does not, however, give it the right to exclusive use. Moreover, the winner of the prize may not appropriate the EU emblem or any similar trademark or logo, either by registration or by any other means.

8.5.2. Publicity by the Commission

The Commission may use, for its communication and publicising activities, information relating to the action, documents notably summaries for publication and public deliverables as well as any other material, such as pictures or audio-visual material that it receives from the winner of the prize (including in electronic form).

The Commission will publish the name of the winner, its locality, the amount of the prize and its nature and purpose and that the contestant may request the Commission to waive such publication if disclosure risks threatening its security and safety or harm its commercial interest.

Photos and videos taken by the Commission either in preparation of the award ceremony or during the award ceremony are the sole property of the Commission.

8.6. Processing of personal data

Registration and submission of entry shall be made in writing, which implies by letter or by electronic means (as specified in the rules of the contest), provided that they are non-discriminatory in nature and ensure integrity, confidentiality and protection of personal data. All personal data contained in the entry shall be processed in accordance with Regulation (EC) No 45/2001 of the European Parliament and of the Council (OJ L8 of 12.01.2001, p1) on the protection of individuals with regard to the processing of personal data by the Community institutions and bodies and on the free movement of such data. Such data shall be processed by the Controller solely in connection with the implementation and follow-up of the entry of the winner, without prejudice to a possible transmission to the bodies in charge of a monitoring or inspection task in accordance with European Community and European Union legislation.

Contestants may, on written request, gain access to their personal data and correct any information that is inaccurate or incomplete. They should address any questions regarding the processing of their personal data to the Controller, via the contact person announced in the rules of the contest. Please send in addition a scanned copy of your letter to the email address announced in the rules of the contest.

Contestants may, at any time, lodge a complaint against the processing of their personal data with the European Data Protection Supervisor.

The Commission shall be authorised to publish, in whatever form and on or by whatever medium, the

following information:

- The name of winner(s);
- The locality of winner(s);
- The general purpose of the activities of the winner(s) in relation to the award of the prize, in the form of the summary provided by the winner(s);
- The amount of the prize awarded.

8.7. Applicable law and competent jurisdiction

The contest is governed by the applicable Union law complemented, where necessary, by the law of Belgium. The General Court or, on appeal, the Court of Justice of the European Union, shall have sole jurisdiction to hear any dispute between the Union and any contestant concerning the interpretation, entry or validity of the rules of this contest, if such dispute cannot be settled amicably.

If international organisations are eligible, this general rule may be complemented by the special conditions proposed in the model grant agreement on dispute settlement - arbitration and applicable law.

8.8. Applicability of penalties

By virtue of Article 212 of Commission Delegated Regulation (EU) No 1268/2012 of 29 October 2012 on the rules of application of Regulation (EU, Euratom) No 966/2012 of the European Parliament and of the Council of 25 October 2012 on the financial rules applicable to the general budget of the Union and with due regard to the principle of proportionality, a contestant which has committed irregularities or fraud, has made false declarations shall be liable to:

(a) administrative penalties consisting of exclusion from all contracts, grants and contests financed by the Union budget for a maximum of five years from the date on which the infringement is established and confirmed following a contradictory procedure with the contestant; and/or

(b) financial penalties of 2% to 10% of the value of the prize.

In the event of another infringement within five years following the establishment of the first infringement, the period of exclusion under point (a) may be extended to 10 years and the range of the rate referred to in point (b) may be increased to 4% to 20%.

8.9. Dissemination and exploitation obligations

Obligations regarding dissemination of results laid down in Title III of the rules for participation and dissemination in Horizon 2020 (Regulation 1290/2013) apply, as well as any additional rules provided in the Work Programme.

