

Questions from the Document with IEEE 802 answers.

Q1: *Are there any other major medium- to long-term spectrum management issues that this review should be considering? Are there any other significant technological or market developments that this review should be aware of when developing its thinking?*

The IEEE 802 and other bodies are continuously evolving radio transmission and modulation methods. For example, IEEE 802 would like to bring to Ofcom's attention two new groups that have started under the IEEE 802 umbrella.

One is IEEE 802.22, which is concentrating on developing a standard for the re-use of TV Bands spectrum. The primary users and industry are working together to come up with viable solutions for the effective use of fallow or under-utilized TV bands spectrum. The initial program intends to find cognitive, licence-exempt methods of coexisting with TV broadcast signals for fixed wireless broadband distribution.

The other is IEEE 802.16h Task Group on License-Exempt Coexistence which focuses on coexistence among license-exempt systems based on IEEE Standard 802.16 and to facilitate coexistence with primary users.

Q2: *Do you believe it is useful to publish a compendium of issues? How frequently should it be published? What information should be included?*

IEEE 802 believes it would be useful to publish a compendium of issues and this may be best served on an annual basis. A compendium of this kind would offer opportunity for feedback and advance notice of future consultations.

Q3: *Are there any other issues of sufficient significance to merit mention in this document?*

We would invite Ofcom to designate an official liaison to relevant IEEE 802 groups.

Q6: *Are there other areas, apart from those identified above, where trading and liberalisation should be restricted? Are there areas identified above where you believe the trading and liberalisation could be fully implemented?*

Where liberalization is implemented, Ofcom should review the spectrum interference requirements before a change of use is granted.

Q7: *Do you agree with Ofcom's approach to providing spectrum for licence-exempt use?*

While the consultation describes what appears to be a good model for predicting usage for 5-10 years, our recommendation is that the issue of licence-exempt spectrum usage be reviewed on a regular basis to account for changes in technologies, applications and demand. For instance,

- Unlicensed applications are changing rapidly and new applications like security, voice and video may require more dedicated bandwidth per connection.
- Technological advancements may improve efficiencies and will require flexible rules for implementation.

Q8: *Is Ofcom's proposed methodology to estimate the amount of spectrum needed likely to deliver the right results?*

The Review mentions "By restricting spectrum for licence-exempt use to short-range applications, the likely demand, at least over the short to medium term can be determined." Our interpretation of this clause is that Ofcom is limiting technological performance in order to estimate the amount of economic demand.

Demand should not be artificially limited for the purpose of usage prediction. Performance limits should be based on interference, coexistence and safety characteristics. Technological innovations may be hampered by this restrictive approach. Use cases for licence-exempt devices include lower rate long-range applications or high rate short-range applications dependent on higher powers.

Q9: *What is the appropriate timing and frequency bands for making available any additional spectrum for licence-exempt use that might be needed?*

Whenever Ofcom is considering allocating additional license-exempt spectrum, IEEE 802 suggests the following:

- Globally harmonized spectrum is crucial to gaining the benefits of economies of scale, which are passed on to consumers through reduced product costs. In addition, harmonization simplifies international use of licensed-exempt technologies by global travelers. IEEE 802 recommends that Ofcom give priority to opening spectrum that has clear potential for global harmonization.
- Spectrum adjacent to current allocations allow manufacturers the ability to extend existing radios, which results in reduced costs.
- Lower frequency spectrum is highly desirable, where propagation characteristics are more favorable.

Q11: *Is the approach set out here, and in Annex H, for developing technology-neutral spectrum usage rights appropriate? Are there alternatives?*

IEEE 802 supports the Ofcom approach to developing technology-neutral spectrum usage rights.

Q13: *To what extent should Ofcom intervene in promoting innovation?*

We support Ofcom's efforts to promote a level playing field, with a technology neutral approach, providing opportunities for deployment of innovative technologies. IEEE 802 believes this will encourage the development of spectrum efficient systems and services.

Q14: *Do you agree with Ofcom's proposed approach to harmonisation?*

IEEE 802 does not have a position on economic policy methods.

Q15: *Can you foresee any problems with the proposed approach to harmonization other than those listed above?*

The effort to harmonize globally or regionally should be balanced against the economic impact of harmful interference to other spectrum users. A decision on protection criteria for existing

spectrum users should consider the entire body of analysis available, and not be based on a single study or a small selection of available studies.

Q16: *Do you agree with Ofcom's proposal to continue with division by frequency as the primary method of dividing the spectrum?*

The historical method continues to be effective with presently available technologies. Innovation may result in new technologies for which division by frequency is less appropriate as a method for managing spectrum.

Q17: *Is Ofcom's approach of not Intervening to mandate entitlements in time (aka cognitive radio) appropriate?*

The particular case of cognitive radio operation you have described, namely: "A radio which can sense when a piece of spectrum is not being used, adapt itself to fit the spectrum, transmit briefly and then move onto the next free piece of spectrum." is one efficient method of utilizing spectrum.

Innovative methods are showing other possibilities of operation on a non-interfering basis. IEEE 802 envisions implementations of "cognitive radio behavior" which may differ somewhat from the approach(s) presently being considered by Ofcom. We believe that rulemaking related to cognitive radio solutions should permit implementations which are not limited to Ofcom's present definition of cognitive radio operation.