



Ofcom Consultation:

Proposed measures to require compliance with international guidelines for limiting exposure to electromagnetic fields (EMF)

Response by the Radio Society of Great Britain

June 5, 2020

The Radio Society of Great Britain (RSGB, www.rsgb.org) writes on behalf of its members and the wider Amateur Radio community in the UK.

Amateur Radio is a science-based technical hobby enjoyed by over three million people worldwide. It is fully recognised by the International Telecommunication Union (ITU) and is listed in the ITU Radio Regulations as the 'Amateur Service' and the 'Amateur Satellite Service'. RSGB participates in ITU conferences and is recognised as one of the leading national Amateur Radio organisations.

The Amateur Radio community in the UK already has a strong awareness of electromagnetic fields (EMF) in relation to antennas, propagation, licensing and safety. The current Amateur Licence already includes a schedule Note about EMF exposures [1].

We note that the present consultation has been largely prompted by public concerns about 5G, most of which are known to be unfounded. Nonetheless, RSGB takes EMF Safety very responsibly. We support the ICNIRP 2020 Guidelines [2] and welcome the opportunity to enhance our own guidance to Radio Amateurs.

However, RSGB is deeply concerned on both regulatory and technical grounds with the burdensome and disproportionate approach taken by the Ofcom proposals [3]. Specific areas of concern are highlighted in our answers to the consultation questions. Our response is supported by detailed factual evidence in the Annexes.

In their impact upon Amateur Radio, the current Ofcom proposals do not meet the statutory criteria for objective justification. Ofcom admits that it is not aware of any cases where the ICNIRP Guidelines have been breached [3, para 4.11]; RSGB is likewise not aware of any such cases involving Amateur Radio. Those same observations were made 30 years ago, and formed the justification for the 'light touch' approach of the licence Note which remains equally valid today.

The proposed changes would have a damaging effect upon Amateur Radio in the UK while delivering little or no improvement in terms of EMF Safety.

Instead, RSGB offers a straightforward and constructive alternative (Annex 1): to continue the proven 'light touch' approach of the Amateur Radio Licence with only appropriate minor updates. To complement this, RSGB will develop further training and guidance materials (Annex 5) for EMF Safety, and invites Ofcom to do the same in its Guidance for Amateur Licensees [4].

Consultation Questions & Answers

Question 1: Do you agree with our proposal to take steps to mitigate risks related to EMF and be in a position to hold licensees, installers and users to account if issues are identified? Please explain the reasons for your response.

RSGB fully supports the ICNIRP Guidelines [2] and the principle that Radio Amateurs need to be aware of the risks relating to EMF exposure, and of the ways to mitigate those risks.

But RSGB does not agree with Ofcom's proposals to implement that principle by adding a major enforceable condition to Amateur licences. The main points are set out below; each one is supported by detailed evidence in the respective Annexes.

Point 6 below offers a constructive alternative to handle this matter.

1. Statutory Requirements

The Communications Act 2003 [5] and the Wireless Telegraphy Act 2006 [6] together require that regulatory interventions by Ofcom:

- Must be proportionate, objectively justifiable, and targeted only at cases in which action is needed; and
- Must not impose burdens which are unnecessary.

For the Amateur Services, RSGB believes that the proposed enforcement regime will fail to meet any of those statutory requirements (Annex 2.1).

2. Lack of Objective Justification

The Amateur Licence includes a long-standing requirement that safety precautions should be taken against "radio frequency radiation". When this 'light touch' approach was originally introduced in 1992 [7] it was accepted by the National Radiological Protection Board (the predecessor of Public Health England) as being proportionate to the low levels of risk arising from Amateur Radio activities (Annex 2.3).

Nothing has changed to affect that judgement. Ofcom admits [3, para 4.11] that "we are not aware of any cases where the ICNIRP Guidelines have been breached." RSGB is likewise not aware of any such cases involving Amateur Radio. Therefore, as far as the Amateur Services are concerned, the current proposals do not meet the statutory test for objective justification.

3. Lack of Impact Assessment

RSGB strongly disputes the claim [3, paras 6.22-27] that the consultation document comprises its own impact assessment. Those six paragraphs are purely descriptive, not addressing any of the specific proposals; and elsewhere in the document the word "impact" is scarcely to be found. In fact, the document contains no impact assessment at all.

RSGB requests publication of the Equality Impact Assessment cited in paras 6.25-6.27, and of all other Ofcom documents related to the impact of the current proposals upon different identifiable groups of licensees.

4. Disproportionate

We emphasise that the impact of these proposed changes upon the Amateur Radio Services will be disproportionate to the related risks of harm. Ofcom already acknowledges this risk to be small (see point 2 above). In our view, therefore (Annex 3):

- The administrative impact of the proposed regulations upon the Amateur Radio Services would be considerable, the more so because individual Amateurs typically have several different use-cases (frequency bands, power, antennas, modes; at home or away), each of which would require detailed documentation;

Because Amateur Radio is by definition an experimental pursuit, the administrative impact would also be continual and open-ended;

- The operational impact would be highly disruptive until all necessary EMF assessments had been completed – and almost all would merely confirm that no operational changes are required.

5. Discriminatory

Those onerous and disproportionate regulatory demands would fall most heavily upon the sector of spectrum users who are least equipped to meet them: the non-commercial sector, which includes some 60,000 individual Radio Amateurs. This raises strong questions about discrimination.

We note in Annex 2.2 that the Ofcom proposals appear to be double regulation for commercial spectrum users. The Health and Safety at Work Etc Act already includes a general duty for protection of the public as well [8]. The ICNIRP Guidelines are already implemented by specific regulations under that Act [9, 10] and by compliance with Planning regulations [11] (see Annex 2.2 for details). Commercial licensees will thus have procedures for assessments and filing already in hand.

But non-commercial licensees will not. The new and burdensome regulatory impact would thus fall most heavily upon those who have the fewest resources to meet those demands. In our view that would constitute discrimination – all the more so because Ofcom admits there is no objective evidence that the Amateur Services require such regulations (see point 2 above).

6. A Constructive and Proven Alternative

RSGB strongly recommends a continuation of the 'light touch' regulation of EMF Safety within the Amateur Licence, which has been proven over the past 30 years (details in Annex 2.3).

In line with that evidence and the need for a more proportionate approach, in Annex 1 we propose a more appropriate amendment of the existing Note to Schedule A of the Amateur Licence concerning EMF Safety, updating the terminology to directly reference the latest ICNIRP Guidelines [2].

To complement this, RSGB intends to update and enhance its own guidance on EMF Safety (Annex 5) and is also ready to discuss a future revision of Ofcom's Amateur Licence Guidance [4] which currently does not address the topic.

Question 2: Do you agree with our proposal

a) to include a condition in spectrum authorisations requiring compliance with the basic restrictions for general public exposure identified in the ICNIRP Guidelines

In principle, RSGB strongly supports the appropriate and technically correct application of ICNIRP 2020 Guidelines.

But RSGB finds it impossible to agree with the manner in which Ofcom proposes to achieve this within the Amateur Licence. We also find many serious technical and drafting errors within the proposal (see below and Annex 4 for details).

Question 2: Do you agree with our proposal

b) that this condition should apply to equipment operating at powers greater than 10 Watts?

This part of the Ofcom proposals contains many serious technical and drafting errors. Regardless of any other merits, RSGB finds it impossible to support the proposal in its present form.

Ofcom's approach to achieving EMF Safety through power regulation is undermined by a lack of clarity about basic concepts summarised below.

- Serious technical errors in making reference to the ICNIRP Guidelines [2];
- Definition of "power": for ICNIRP compliance purposes, "power" must be clearly defined as Average Power during the appropriately defined period of several minutes [2]. This is not made clear;
- Indiscriminate use of the "EIRP" concept to regulate EMF exposures. At very short distances from an antenna, this method of calculating field strengths will frequently produce inaccurate results that could be either overestimates or underestimates. To make this methodology mandatory creates a severe risk of unsafe advice and actions – none of which must ever be allowed;
- Definition of a "site", and resulting lack of consideration about Mobile and Temporary operation which will affect numerous users, not least the Emergency Services – and of course Radio Amateurs;
- Differences between supervised and unsupervised operation.

Further details of each of these points are given in Annex 4.

Question 3: Do you agree with our proposed guidance on EMF compliance and enforcement? Please explain the reasons for your response.

Again, RSGB regrets that it is impossible to agree with the proposed “guidance” which is seen to contain further elements of regulation. The potentially helpful advice about achieving compliance is overbalanced by a heavy emphasis on enforcement and penalties.

1. Overall Approach

“Guidance”, by its very nature, cannot include further elements of regulation. The enforcement provisions of the Wireless Telegraphy Act 2006 [6] and their applicability under criminal law already apply equally to all parts of the licence; they are set out already on Ofcom’s website as applying generally to all users. It is incorrect to include them again within one part of the licence.

It also implies that enforcement may be particularly applied in this specific area. That appears threatening, and might also encourage unfounded accusations against individual Amateur licensees (of the type that have already been made about 5G).

2. Enforcement

RSGB already has reason to be sceptical of Ofcom’s capability to enforce any such licence conditions. The expertise required to inspect an Amateur station with regard to EMF compliance goes far beyond that needed to survey a mobile phone base station.

3. A Constructive and Proven Alternative

Instead of Ofcom’s minatory form of “guidance”, RSGB is enhancing its own training and guidance material (Annex 5). This is intended to complement a continuation of the existing ‘light touch’ regulatory approach within the Amateur Licence itself.

While taking account of any general guidance that Ofcom can provide, RSGB guidance will be more specific – and thus much more valuable – to Amateur Radio installations. Annex 5 outlines the types of guidance that will be developed.



Annexes and References

Additional material forming part of the RSGB response can be found on the following pages.

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Annex 1: Alternative Amendment to the Existing Amateur Licence

Ofcom licenses amateur radio in the UK using a number of key elements:

- UK Amateur Licence conditions (for Foundation, Intermediate, Full and foreign visitors) [1];
- Ofcom Guidance for the UK Amateur Licence [4];
- Variations of the licence to facilitate repeaters, gateways, beacons and a small number of 'special research permits'.

The present consultation directly concerns only the core Amateur Licence [1]. With respect to EMF Safety, the licence currently includes the following Note, applicable to all holders and power levels:

"In all frequency bands, high intensities of radio frequency radiation may be harmful and safety precautions should be taken. Advice concerning safe levels of exposure to radio frequency radiation is provided by Public Health England."

This condition reflects the 'light touch' approach to regulation of EMF Safety within the Amateur licence that has proven successful for 30 years, needing only the most minor of amendments and updates. This has been supported by RSGB in terms of information and training (Annex 5).

We remind Ofcom that this approach, along with the original text of the licence Note [7], was agreed by the National Radiological Protection Board (the predecessor of Public Health England) as being proportionate to the objective level of risk. As established in response to Question 1, nothing has changed to affect that view.

In line with that evidence, and in line with the need for a proportionate approach, RSGB recommends the following strategy:

- A modest update to the existing Note to Schedule A of the Amateur Licence concerning EMF Safety (**proposed new wording in red**):

In all frequency bands, high intensities of radio frequency radiation may be harmful and safety precautions should be taken. **Guidelines for limiting exposure to radio frequency radiation are provided by the International Commission on Non Ionizing Radiation Protection (ICNIRP).**

To be complemented by:

- New, non-mandatory guidance from Ofcom about EMF Safety in Amateur Radio (noting that the current Ofcom Guidance for the UK Amateur Licence [4] is silent on this topic).
- New and enhanced training materials from RSGB to raise awareness of EMF Safety among Radio Amateurs, and to help with EMF assessment (Annex 5).

Taken together, these measures will meet all rational requirements for EMF Safety in the Amateur Radio Services.

Annex 2: Statutory Issues and Proven Precedent

This Annex identifies the statutory requirements for new regulatory interventions by Ofcom. It also relates the history of the current 'light touch' approach to EMF Safety in the current Amateur Licence.

1. Statutory Requirements

The Communications Act 2003 [5] requires that regulatory interventions by Ofcom must be:

- “proportionate”; and
 - “targeted only at cases in which action is needed”;
- and that Ofcom has a duty to ensure its regulatory work:
- “does not involve the imposition of burdens which are unnecessary”.

Furthermore, the Wireless Telegraphy Act 2006 [6] establishes that licence terms, provisions and limitations must be:

- “objectively justifiable”, “proportionate” and “non-discriminatory”.

RSGB does not consider that the proposed enforcement regime will meet those legal requirements regarding their specific effects upon Amateur Radio.

2. Multiple Regulation

For commercial spectrum users, the Ofcom proposals appear to constitute multiple regulation. Although this is not directly the business of RSGB, we make this point to emphasise that the impact of any new regulations would fall most heavily upon non-commercial spectrum users, including Radio Amateurs.

The Health and Safety at Work Etc Act regulates the workplace activities of all commercial spectrum users. But Section 3 of that Act also establishes a general duty for protection of the public in general [8]:

General duties of employers and self-employed to persons other than their employees.
(1) *It shall be the duty of every employer to conduct his undertaking in such a way as to ensure, so far as is reasonably practicable, that **persons not in his employment** who may be affected thereby are not thereby exposed to risks to their health or safety.*

For commercial spectrum users, compliance with the ICNIRP Guidelines is already implemented by the related Control of Electro-magnetic Fields at Work Regulations 2016 (CEMFAW) [9]. In HSE terminology, ‘Exposure Limit Values’ are legal limitations that are directly based on the ICNIRP Basic Restrictions. ‘Action Levels’, relating to quantities that can be measured more easily, are directly based on ICNIRP Reference Levels and have the same purpose. For further explanation, see the HSE Guide to the CEMFAW Regulations [10].

ICNIRP Guidelines are also implemented by the mobile network operators, by a voluntary agreement under the Code of Best Practice on Mobile Network Development [11]. Under this code, the EMF Safety section of which was developed together with Public Health England, ‘ICNIRP compliance certificates’ are routinely submitted in Planning applications, and are required by local authorities under their own codes.

Therefore commercial spectrum users are already well equipped to make the EMF Safety assessments required by the CEMFAW Regulations and by Planning Control regulations where applicable.

But non-commercial spectrum users – including Radio Amateurs – are not. The full implications of this point are examined in Annex 3.

3. Proven Precedent for Amateur Radio

There is a long-standing requirement in the Amateur Licences that safety precautions should be taken against “radio frequency radiation” in line with Public Health England (PHE) recommendations [1]. This is also noted in the Ofcom FAQs [12, page 3]. The syllabus for the Amateur licence examinations also covers this topic.

This ‘light touch’ approach was originally introduced in the early 1990s [7] following consultations between the Radiocommunications Agency (predecessor of Ofcom), the National Radiological Protection Board (NRPB, predecessor of Public Health England) and RSGB. It was agreed by all three bodies as being proportionate to the low levels of risk arising from Amateur Radio activities.

In the following 30 years, nothing has objectively changed to affect that judgement.

We note that Ofcom’s proposal has arisen because of current health concerns relating to 5G; but in the consultation document [3, para 4.11] Ofcom explicitly admits that it is not aware of any cases (including 5G) where the ICNIRP Guidelines have been breached. RSGB is likewise not aware of any such cases involving Amateur Radio.

In short, the proposal does not meet Ofcom’s own criteria for evidence-based regulation. On the contrary, RSGB concludes that the existing ‘light touch’ regulation has proved successful and remains fit for purpose.

However, RSGB does welcome this opportunity to review and enhance its existing information and training materials about EMF Safety. Work has already started on this and we will be pleased to co-operate further with Ofcom in updating its Guidance for Amateur Licensees about this topic [4].

Annex 3: Impact and Discrimination

The consultation document [3] overlooks the significant and selective impact upon those members of the public who are Radio Amateurs. This also raises serious questions of discrimination.

RSGB and Ofcom have worked hard together to make Amateur Radio available and accessible to all sectors of the public. The tone and the content of the proposed regulations place that good work under threat.

1. Impact Vastly Outweighs Benefit

It is claimed [3, para 6.22] that the consultation document comprises its own impact assessment. If so, that assessment is seriously deficient in ignoring the impact upon Amateur Radio.

There are some 60,000 Amateur Radio licensees in the UK, with perhaps 30,000 individuals currently 'active' in some sense. The proposed regulations would require each of those individuals to spend a considerable amount of time and effort in preparing paperwork and assessments. Unlike many commercial spectrum users, individual Amateurs typically have several different use-cases (frequency bands, power, antennas, modes; at home or away), each one of which would require detailed documentation. Essentially, such a demand would be continual and open-ended.

In addition, we are deeply concerned that the regulations would deter the welcome influx of newcomers to Amateur Radio via the Foundation licence, thus undermining the future of much-needed RF-related skills and understanding in the UK.

The proposed regulations would interrupt the activities of every active (and prospective) Radio Amateur until those assessments had been completed, because it would be a criminal offence to go on the air without having done so. Yet almost none of those assessments would ever be examined by Ofcom (who do not even have resources to investigate existing levels of EMC complaints that Radio Amateurs have raised).

It has also been established in response to Question 1 that, for Amateur Radio, there will be little or no actual benefit in terms of EMF Safety because the risks are already low. Therefore there is no case for demanding that ICNIRP compliance assessments must be made in advance of any question arising.

RSGB training materials will help Amateurs to understand when an informal assessment might be required, and will help to show them how to do that – but a formal, mandatory assessment should only be triggered in the same way as an EMC investigation, when an actual question has arisen.

2. Discrimination

In all other respects, Radio Amateurs are ordinary members of the public. They have no access to any professional resources. The unreasonable demands being placed upon each of those 60,000 individuals – under threat of criminal sanctions – along with the lack of either an objective or an administrative need, in our opinion constitute a strong case for discrimination.

The proposed regulations would place even more discriminatory demands upon those members of the Amateur Radio population who would have particular difficulty in fulfilling the complicated requirements. These groups would include (in no particular order) the partially sighted, the disabled, the young, the vulnerable and the elderly.



We note with particular interest that the professed purpose of Ofcom's Equality Impact Assessments is "making sure that we are meeting our principal duty of furthering the interests of citizens and consumers, regardless of their background and identity." [3, para 6.26]. Therefore...

RSGB requests immediate disclosure of Ofcom's Equality Impact Assessment for the proposed regulations, along with all other assessments that have been carried out pertaining to these proposals.

Annex 4: ICNIRP and other EMF Safety Topics

This Annex draws attention to several drafting errors, conceptual errors and/or omissions, potentially leading to serious unintended consequences for EMF Safety.

Many of these issues arise from Ofcom's current preoccupation with 5G base stations, overlooking many other types of licensed spectrum users – including Radio Amateurs.

1. Power and EIRP

Concepts used in the regulation of “emissions” for radio communication purposes are not automatically transferable into regulations for EMF Safety.

- **Unclear use of “power”**

For radio communication, “power” is normally assumed to mean Peak Envelope Power. However, for ICNIRP compliance purposes “power” must be defined as Average Power during the appropriately defined period of several minutes [3]. This is nowhere made clear.

- **Misunderstanding of “EIRP”**

EIRP is defined only for purposes of communication over long distances, where antenna gain in a given direction is correctly assumed to be constant in value [13 a-c]. But EMF Safety is mostly concerned with the near-field region close to the antenna, where field strengths are usually highest but antenna gain is no longer constant. Depending on the type of antenna, local field strengths in the near field may vary either upward or downward from values calculated using the far-field EIRP formula.

To make this methodology mandatory thus creates a severe risk of unsafe advice and actions – none of which must ever be allowed.

2. ICNIRP Guidelines

The key licence condition in the current proposals is paragraph 4.30 [3]. This contains errors in citing the ICNIRP Guidelines [2].

- It is categorically incorrect to require that “...the total emissions from all radio equipment on the site is [*sic*] below the basic restrictions...” ICNIRP Basic Restrictions do not apply to emissions; they apply to any EMF exposures that might result.
- There is insufficient recognition that EMF exposures can only occur where people are actually present. That condition is implicit in all of the ICNIRP Guidelines, but when defining the scope of regulations it needs to be recognised explicitly. The control measures necessary to achieve this are a different issue (see 4 below).
- In the same sentence of para 4.30, only Table 4 contains Basic Restrictions. Table 5 contains Reference Levels (“5” may be a typing error).
- For assessment of a multi-transmitter site, the licence condition must specifically require the ICNIRP methodology for the ‘Simultaneous Exposure to Multiple Frequency Fields’ [2].

We also note that no operator at or near a multi-transmitter site can make a valid assessment unless the proposed regulation includes a duty upon every operator at that site to disclose the necessary information to others.

3. Mobile and Temporary Operation

Mobile and other forms of temporary operation are not addressed at all by the proposed regulations (except for mobile phone handsets). This is part of the wider lack of clarity identified above, about the meaning and implications of the term “site”.

For mobile transmissions when in motion, there is no “site” in any meaningful sense. It is legally unclear what mobile operators – any mobile operators, Radio Amateurs included – are expected to do to achieve ICNIRP compliance.

It should also be noted that operators of mobile and portable equipment routinely take advantage of “good radio locations” that are already shared by a fixed site nearby. Under the proposed regulations, the operator(s) of the fixed site would have made an EMF assessment, but other nearby users could have no idea how close the predicted exposures come to the ICNIRP Reference Levels.

It is not suggested that any of those scenarios constitutes a danger; but as written, the proposed licence condition creates uncertainty for all the users affected. They cannot know what the law expects of them, and have no practical means of finding out.

Those affected by the uncertainty in the present proposals include the Emergency Services; the Media, the Banks and others with their vehicle mounted satellite dishes; and mobile and temporary operations in general – including Amateur Radio operators.

4. Supervised and Unsupervised Operation

In terms of EMF Safety, the proposed regulations fail to recognise any difference between supervised and unsupervised operation. On-site supervision can be of great value in the protection of individuals and the public against excessive EMF exposures. A trained supervising operator is uniquely placed to take all necessary actions:

- Confirm, before transmitting, that no persons are present at a location where an ICNIRP Basic Restriction or Reference Level could be exceeded; and then
- Exercise appropriate control over transmissions taking place.

Usefully, supervised operation is already defined in the Amateur Licence: “[where] operation of the Radio Equipment is carried out in the presence of and under the direct supervision of the Licensee”. In practical terms, the vast majority of Amateur Radio activities would thus be able to use the advantages of supervised operation to help ensure EMF Safety.

The same concept of supervised operation would also clarify what can be realistically expected of mobile operators (see point 3 above).

RSGB intends to pursue this concept in its own training and guidance material for Radio Amateurs (Annex 5).

Annex 5: RSGB Training Proposals

RSGB already includes RF Safety, including EMF exposure, within its formal training syllabus and is already taking this opportunity to develop additional guidance and training materials to enhance awareness of EMF Safety issues.

These proposals complement our recommendation that Ofcom should retain its proven ‘light touch’ regulatory approach to this topic.

The intention is to support individual Radio Amateurs in taking personal responsibility for the protection of themselves, their family, friends and neighbours, and any other members of the public who might be affected by their Amateur Radio activities.

1. Radio Amateur Examination Syllabus

The contribution of the existing Radio Amateur Examinations towards promoting EMF Safety should not be overlooked. The Syllabus [14], which was last updated in September 2019, directly addresses the safety issues related to EMF exposure. Our Foundation entry-level (which is limited to 10W PEP) includes the following syllabus items:

- *8D1: Recall that the main health effect of exposure to electromagnetic radiation is heating of body tissue and that the eyes are particularly susceptible to damage.*
- *8D2: Recall that guidance on safe levels of RF radiation is available from government and international bodies, Public Health England and the International Commission on Non-Ionizing Radiation Protection (ICNIRP).*
- *8D3: Recall what a waveguide is and why it is unwise to look down a microwave frequency waveguide or to stand close to or in front of high-gain antennas as they may be in use.*

These “Recall” items and the related examination questions require the candidate to demonstrate that they know a fact.

Moving up through Intermediate and finally to Full level, the syllabus reiterates the need to be aware of the guidance issued by ICNIRP, and to have a deeper understanding of the issues of RF exposure including to members of the public:

- *8D1: Recall that the International Commission for Non-Ionizing Radiation Protection (ICNIRP) produces guidance for exposure to Radio Frequency fields.*
- *8D1: Understand it is not advisable to exceed the recommended safe exposure levels and that this is particularly applicable at locations open to the public.*

In the syllabus, the term “Understand” calls for a more detailed knowledge of the subject, fully appreciating why the point is correct and the range of circumstances in which it is relevant and applicable. Typically, candidates will need to make judgements or apply good practice to a wider range of circumstances.

2. Beyond Exams – Tailored Assistance and Guidance

This section outlines some possible topics to be covered in RSGB's package of enhanced guidance and learning materials. This caters for existing longer-established amateurs who may not be currently in the formal exam and training course system.

- **Audiences and Delivery**

Material would be made available for all three levels of the UK Amateur licence.

Media for delivery will include leaflets, talks, videos, software tools, and articles in RSGB's *Radcom* magazine, which is delivered to 20,000 RSGB members. In some respects, this would emulate the assistance we already provide for EMC matters.

Materials will also be tailored to specific interest groups within the Amateur Radio community (bearing in mind that practical EMF Safety is very frequency-specific). For example, RSGB plans to update and re-publish the comprehensive information about microwave EMF Safety that first appeared in the *RSGB Microwave Handbook* [15].

- **Concepts**

Each of the following points would be delivered at an appropriate technical level for the three classes of Amateur licence.

- ICNIRP Guidelines, Basic Restrictions and Reference Levels; basic reasons why Reference Levels in particular vary with frequency
- Understanding responsibilities and that EMF Safety is targeted at people (not locations or equipment)
- Good practice in EMF Safety (making links to good practice in RF engineering and in EMC 'housekeeping')

- **Practical Topics**

Each topic area would be developed with the aid of practical examples and materials to support Amateurs in making their own EMF Safety assessments.

- Indoor EMF Safety
- Outdoor Antennas and EMF Safety
- Special features of portable and mobile operation
- Special features of HF operation
- Special features of VHF/UHF operation
- Special features of microwave operation.

References

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- [12] Ofcom, Consultation on New EMF Licence Condition - FAQs (revised 7 April 2020):
https://www.ofcom.org.uk/data/assets/pdf_file/0026/193625/emf-faqs.pdf
- [13] (a) Harald Friis, "A Note on a Simple Transmission Formula," Proc. IRE, 34, 1946, pp. 254-256. This is the fundamental paper upon which the entire E(I)RP concept is based. It is only applicable for plane waves in free space; which only applies in the far field of any antenna and categorically excludes the near field.
(b) https://en.wikipedia.org/wiki/Effective_radiated_power Unlike many other sources, Wikipedia clearly emphasises that the "EIRP" concept only applies to the far field.
(c) ITU Radio Regulations, 1.160–1.162.
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