Your response

Question	Your response
Question 1: Please provide feedback on the additions, amendments and clarifications we have made to the wording of the licence condition to implement our decisions on the scope of the licence condition in our October 2020 Statement, giving reasons for your response.	Confidential? – No Licence condition 4 – Emergency Situations **We are pleased to see the exemption for emergency use** as there may be circumstances where compliance would make successful communication impossible. Licence condition 6 – Records **The additional burden of calculating field strengths with the current spreadsheet is excessive for radio amateurs.** Amateurs typically operate on multiple frequency bands, using multiple transmission modes and multiple antennas. In many case licensees will need to calculate safe power levels for each mode, band and antenna. **As discussed below, we estimate that amateur licensees may have to perform in excess of 200 calculations to produce records for their station.** **This licence condition is not appropriately worded for most licensees, particularly amateurs**. **Ofcom should be clear** in the licence that **compliance is required with ICNIRP reference levels**, **not ICNIRP basic restrictions**, as some of the latter cannot be measured in practice eg current density in the head. Licence condition 7 – Guidance on compliance and enforcement **Ofcom is poor at communicating** with licensees, many of whom may well be blissfully unaware of this current series of consultations. **The Guidance document should form part of the licence** rather than existing as a separate document, at risk of update without licensee notification.

Question 2: Please provide feedback on the additions and clarifications to our 'Guidance on EMF Compliance and Enforcement', giving reasons for your response.	Confidential? – No Re A.2.6 • **We encourage Ofcom to co-ordinate with HSE** and other relevant authorities to ensure that compliance with the same version of the ICNIRP Guidelines is required in situations where evaluations for both workers and the general public are needed. Re A.2.8 to A.2.10 • **We do not agree that it is appropriate to categorise family, friends and other visitors to licensee properties as members of the 'General Public'.** This appears not to be the case in other countries with EMF compliance requirements, where it is accepted that the property is a controlled area. **The effect of such a categorisation would be to require analysis of propagation into licensees own homes and gardens.** • Licensees will have the ability to make family members and friends aware of risks and of suitable mitigation, such as keeping away from antennas while in use ie **licensees can provide training**. They may well also be in a position to know whether family members and friends are likely to be particularly susceptible to EMF because of health or other issues. **We believe that licensees should be able to document training and keep records showing compliance with ICNIRP occupational levels over their homes, gardens and other areas which are not public rights of way.** • Ofcom is already aware, as can be seen from studies published on its own website, that there is attenuation of RF signals when entering buildings. Should Ofcom decide to continue with the proposed categorisation they should **provide licensees with tools that enable the calculation of RF field strengths within their homes** as well as in the open air. Re A.2.16 • **As we note below, the calculator is not adequate for this purpose if used as intended.** Re A2.17 • **None of the standards mentioned are readily accessible** to the majority of licensees due to their high cost. We believe methods set out in ITU documents may be appropriate. **Ofcom should also include any suitable ITU documents such as ITU-T K.52 and**

	K.61, which are freely available. • **As explained below, while we commend Ofcom for providing a compliance tool, the current Ofcom calculator, if used as intended, does not produce accurate results.** Ofcom appears to require alternate calculators perform better than its own tool. Re A2.18 The **methodology set out in standards documents appears not to be appropriate for amateur licensees**. In addition, we can find no suitable test equipment. Commercially available test equipment varies from simple meters that give fictional readings (eg a low cost "5Hz to 3500 MHz" EMF meter which is almost completely insensitive to signals at 144 and 434 MHz even when held close to the transmit antenna) to lab-grade test equipment that is unaffordably costly (from around £2500 plus annual calibration costs). If both E and H fields need measuring, as apparently required by ICNIRP 2020, test equipment costs roughly double to around £5000.
Question 3: Please provide feedback on the trial version of our EMF calculator, giving reasons for your response.	Confidential? – No • **Ofcom is to be commended for making the spreadsheet available**. It will be essential for amateurs have a suitable tool available however we feel that it **needs improvement to be fully usable**. • The spreadsheet may be **suitable for simple use cases** eg PMR with simple setup using single band and mode. As explained below, **the complexity and scale of assessments will be high for amateurs**. • **The spreadsheet is far too conservative, particularly if instructions to ignore antenna patterns are followed**. The ICNIRP Guidelines already have many built-in safety margins, more so for 'public' exposures. • **Additional margins generated by conservative calculations risk the hobby.** Many amateurs already limit transmit powers in the

interests of good RF 'hygiene' but this will need to be formalised to generate suitable records. **Amateurs are fighting against a tide of rising RF noise** generated by devices Ofcom feels unable to act against, so may **not have much margin before communication becomes impossible.**

- We believe that the **spreadsheet design is in error by including ground reflections**. **Ofcom seems out of step with other administrations**. It is notable that the IARU's ICNIRPcalc programme does not include ground reflections yet its results are accepted as accurate by administrations in other countries.

I. **Monopole and beam antennas for VHF, UHF and SHF are virtually always mounted at height** and, as exposures will be in the far field, have a distinct radiation pattern. Both monopole and beam type antennas radiate so **little signal at the steep angle needed for a nearby ground reflection** that **any ground reflections can be ignored**.

II. Where **ground mounted VHF, UHF & SHF antennas** are in use at, these are used for satellite and Earth-Moon-Earth communications and **point towards the sky**. These types of application use high gain antennas that radiate little out of the main lobe, so would **produce virtually no ground reflections.**

III. A large proportion of amateurs (around half in a survey of our members) use **ground mounted vertical MF/HF antennas**. Ofcom will doubtless be aware that, **at radiation angles below the Pseudo-Brewster Angle, ground reflections tend to cancel direct path signals**. Consequently the field experienced by a human at ground level will tend to be reduced rather than boosted by any reflections.

IV. **Antennas mounted on or attached to homes are typically mounted above roof level**, so **exposures of upper-floor occupants** are likely to be the limiting factors. In this situation **path losses for reflections would be high**, as reflection paths would be much longer than direct paths, scattered and further attenuated by passing though roof and top floor ceiling, then twice through other floors and lower floor ceilings.

V. In the case of **MF/HF antennas mounted above ground**, these are typically at heights that mean the **safety distances**

are easily met. Any errors due to ignoring ground reflections seem unlikely to have a real-world impact.

VI. In **suburban and urban environments** the presence and amplitude of **ground reflections are likely to be negatively affected by the presence of nearby structures, clutter, overhead cabling etc.**

- Most **amateurs use a range of bands, antennas and operating modes**. Antennas are often multiband, with different gain on each band and different feeder losses. Different transmission modes have different RMS power values. Consequently, **the number of evaluations required will be large**.

- We estimate that **over 200 calculations** will **be required** to document a reasonable typical station. **Active amateurs often use 12 or more bands, 3 or more modes and 4 or more antennas**, although not all modes and antennas will be used on every band.

- The **workflow for a single evaluation (single band, antenna & mode)** is likely to be as follows:
    - Determine antenna gain on band in question
    - Estimate feeder length
    - Determine feeder type
    - Determine feeder loss on band in question
    - Calculate EIRP
    - Estimate & apply mode derating factor (starting with worst-case mode)
    - Estimate & apply duty cycle derating factor over 6 minutes
    - Calculate effective EIRP
    - Insert EIRP and frequency into Ofcom tool
    - If safety distance is inconveniently high, iteratively reduce EIRP until desired safety distance is found
        - Reverse calculate safe power level from EIRP

- Document the transmission parameters, and safe power level if appropriate, on a separate document. Attach printout or screenshot of Ofcom tool results.
- If worst case mode safety distance is acceptable, document other modes as also acceptable and start calculations for next band,
- If worst case mode safety distance was not acceptable, start calculations for next mode.

- E**xisting EMF safety software**, including VK3UM's EMR Calculator and ICNIRPcalc v1.5 from the Interernational Amateur Radio Union (IARU) **include antenna performance data** for a large number of antennas. **Ofcom should add this feature*** to their compliance tool or it will risk poor quality records following errors in calculating and transcribing EIRP.

- **The spreadsheet needs the ability to calculate EIRP, given input TX power in Watts, feeder loss in dB and, as described above, antenna type** (or alternately antenna gain in dBi).*

- **It also needs comment fields to allow input of mode, antenna details, date etc, so sheets become self-documenting when printed.***

- **Ofcom should provide an alternate safe power level sheet** in the calculation tool. In many situations it would be **more practical to calculate a safe power** level at a fixed distance, eg so that changing antenna height or physical protection measures could be considered.

* We note that the RSGB are preparing a variation of the spreadsheet providing many, if not all, of these features. **We encourage Ofcom to work with the RSGB to incorporate these features in the Ofcom calculator.**