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? – ~~Y /~~ **N** Siklu welcomes and strongly supports the introduction of the "Shared Site Exemption", especially for radiators with highly directional antennas (>29dBi). The new wording means that licensees (of radiators eligible for this Exemption), will be able to rely on vendors' EMF guidance for a *specific* radiator, rather than carry out complex calculations or costly measurements for a cluster of radiators. We believe this will increase compliance with the proposed EMF Licence Condition, and ultimately public safety Siklu encourages Ofcom to further extend the definition of "Relevant Radio Equipment", and include radiators with *both* EIRP>10W, *and* conducted transmit power higher than 20mW. In other words, the proposed EMF Licence condition should not apply to radiators with either EIRP≤10W or conducted transmit power ≤ 20mW. This suggestion is based on: 1. The Basic Restriction as defined in ICNIRP 1998, Table 5, refers to 10W/m^2, and further stipulates that the power density, "averaged over 1cm^2, should not exceed 20 times" that. A conducted transmitted power of up to 20mW over 1cm^2 waveguide is equivalent to power density of 20mW/cm^2, or 200W/m^2, and hence automatically complies with the Basic Restriction. 2. BS EN 50385, which specifies 20mW as the threshold for EMF compliance.
Question 2: Please provide feedback on the additions and clarifications to our 'Guidance on EMF Compliance and Enforcement', giving reasons for your response.	Confidential? – Y / N
Question 3: Please provide feedback on the trial version of our EMF calculator, giving reasons for your response.	Confidential? – ~~Y /~~ **N** Siklu believes the proposed EMF Calculator may grossly over-estimate the exclusion zone, and is therefore too conservative to be useful. Please refer to the next page for more details.

Please complete this form in full and return to EMFImplementation@ofcom.org.uk.

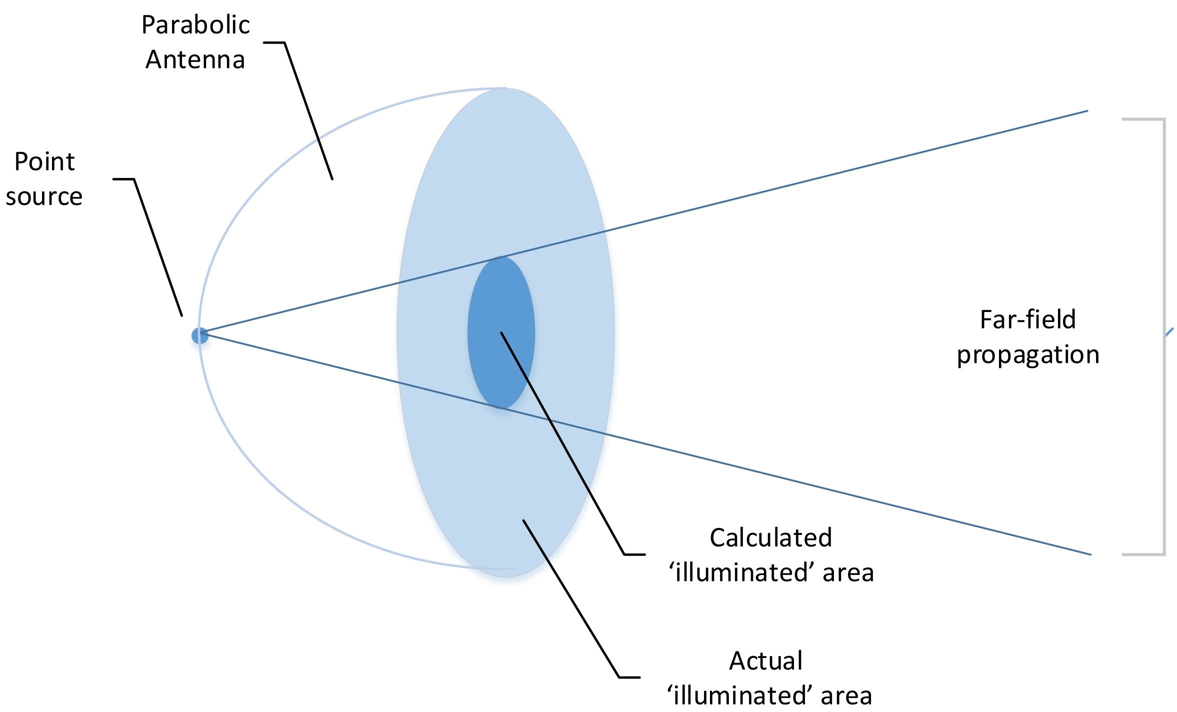
<u>Siklu Communication's Response to Q3 in Detail</u>

Ofcom is proposing an EMF calculator, with a declared aim of "enable(ing) many licensees, installers and users to check easily whether the use of their radio equipment is likely to comply with the ICNIRP general public limits ". Siklu finds that the proposed calculator is so conservative, that it will instead lead "many licensees, installers, and users" to:

- Hugely over-estimate the required exclusion zone, and
- In some cases, believe a radiator does not comply with the ICNIRP limits, whereas in fact, it does.

The problem with the Proposed EMF Calculator are two-fold. First, it ***assumes the exclusion zone is in the far field***. It therefore uses far-field propagation modelling, whereas in many instances, the exclusion zone lies in the near-field. Second, it ***assumes a point source***, effectively ignoring the antenna aperture.

Because of these assumptions, the Proposed Calculator fails when the transmission beam-width is narrower than the antenna aperture. In these cases, the assumptions of a point source and far-field propagation, lead to exaggerated and over-estimated power densities. This is because the 'illuminated' area (that is, the area over which the transmitted power is distributed) is actually much larger than calculated, and therefore the power density is correspondingly much lower than calculated. Here is an illustration:



By way of example, consider a radiator operating at 80GHz, with a conducted transmit power of 0.1W and a 65cm parabolic antenna. At 80GHz, this antenna has a gain of 50dBi and a transmission beam-width of 0.45°. The radome is 30cm from the waveguide.

Here is a very approximate calculation, designed to illustrate geometrically how the Proposed Calculator proceeds in such a case.

Assuming a point source, and a transmission beam-width of 0.45°, the radius R of the illuminated area at the radome (30cm away) is: 30·tan(0.45°/2) = 0.12cm. Therefore, the illuminated area, πR^2, is approximately $0.04cm^2$. It follows that the power density across this area is 0.1W / $0.04cm^2$ = $25,000W/m^2$. That is, 3 orders of magnitude higher than the Basic Restriction of $10W/m^2$.

However, it is well known that the transmitted power is distributed approximately uniformly across the antenna aperture (radome), whose area (for 65cm antenna) is $0.33m^2$. Thus the (uniform) power density at the radome is: 0.1W / $0.33m^2$ = $0.3W/m^2$. In reality, the power distribution is not quite uniform, and a computer simulation shows that it is more intense by approximately 10dB at the antenna boresight, compared to the average. Factoring this in, we arrive at $3W/m^2$, which is below the Basic Restriction.

In this example, **the Proposed Calculater over-estimates the power density by 4 orders of magnitude**, which (Siklu argues) is not acceptable.

Turning our attention to the exclusion zone, we can use the same geometric model to estimate at what distance the Proposed Calculator would deem the Basic Restriction met. That is when the power density is $10W/m^2$. Given a conducted transmit power of 0.1W, this request an 'illuminated' area of 0.1/10 = $0.01m^2$. This corresponds to a radius of 0.056m, which is 0.056/tan(0.45°/2) = 14.3m away from the antenna. Indeed, using the Proposed Calculator with:

- power 10,000W (0.1W plus 50dBi for antenna gain) in cell D5, and
- frequency 80,000MHz in cell D6

yields an exclusion zone of 14.27m, which matches very accurately our geometric approximation.

In contrast, as discussed above, a computer simulation for this specific case derives an exclusion zone 0m, because the maximum power density at the antenna radome is only $3W/m^2$, which is lower than the Basic Restriction of $10W/m^2$.

In summary, the Proposed Calculator may grossly over-estimate the exclusion zone because it assumes a point-source and far-field propagation, and neglects to take into account the antenna aperture. This is particularly the case with highly-directional antennas. We showed a specific example (corresponding to an actual radiator popular in the UK), demonstrating that the Proposed Calculator indicates an exclusion zone in excess of 14m, whereas in fact, no exclusion zone at all is required to meet the ICNIRP Basic Restriction.

Siklu feels that Ofcom would be wrong to release the Proposed Calculator as is, given its limitations, and should find a way to improve its accuracy and applicability. To this end, Siklu suggests working the antenna aperture into any exclusion zone calculation.