Dear Contributor,

Thank you for participating in the public consultation of the ICNIRP draft guidelines.

Please note that it is important that ICNIRP understands exactly the points that you are making. To facilitate our task and avoid misunderstandings, please:

* be concise
* be precise
* provide supporting evidence (reference to publication, etc.) if available and helpful.

**How to complete the comments table:**

Please use 1 row per comment. If required, please add extra rows to the table.

This response document asks you to provide your ‘comment’, your ‘proposed change’, and the ‘context’ to this comment and proposed change. What is meant by these is the following:

**Comment :** A brief statement describing the issue that you have identified (and that you would like ICNIRP to take into account in the final version of the guidelines).

**Proposed Change:** A brief statement describing how you would like the document changed to account for this issue.

**Context:** A brief statement identifying relevant documents in support of your comment and proposed change.

**Please, provide your details below as per the online form and the provision of the privacy policy**

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| --- | --- | --- |
| Last name, first name: Rowley, Jack | Email address: Your email address. | Affiliation (if relevant): GSMA |
| If you are providing these comments officially **on behalf** of an organization/company, please name this here: GSMA | | |
| I hereby agree that, for the purpose of transparency, **my identity (last and first names, affiliation and organization where relevant) will be displayed** on the ICNIRP website after the consultation phase along with my comments.  I want my comments to be displayed anonymously. | | |

|  | **Document**  **(Guidelines, App A,**  **App B)** | **Line Number**  **#** | **Type of comment (General/ Technical/ Editorial)** | **Comment. Proposed change. Context.** |
| --- | --- | --- | --- | --- |
| **1** | Guidelines | 20-21 | General | We recommend that ICNIRP consider regular (annual is suggested) statements that guidelines remain valid. A less-technical summary would also be helpful for policy makers wanting to understand the ICNIRP update process and outcomes. This should be published with the final Guidelines. For examples, see the European Commission approach: https://ec.europa.eu/health/scientific\_committees/policy/opinions\_plain\_language\_en  Add: ICNIRP will annually confirm that the guidelines remain valid.  For the 1998 guidelines, statements that they remain valid were made only in 2009 and 2017. In an area with constant new research it may not be clear to all stakeholders that the limits remain valid. |
| **2** | Guidelines | 44 | Editorial | Consistency of language is important for understanding by stakeholders. We suggest use of ‚adverse‘ as used at line 24 throughout.  ... known ~~harmful~~ adverse health effects  Clarity |
| **3** | Guidelines | 55 | Editorial | Add adverse  cause the adverse health effect  Clarity |
| **4** | Guidelines | 61 | Editorial | Add adverse  cause the adverse health effect  Clarity |
| **5** | Guidelines | 79 | Technical | It is difficult to prove ‚worst-case exposure conditions‘ so we propose an alternative description  ...under actual maximum exposure conditions‘  Clarity |
| **6** | Guidelines | 96 | Editorial | The Guidelines do not explicitly state that the public limits apply 24x7x365.  The public exposure limits in these guidelines for human exposure to RF-EMF are designed to provide protection for all age groups, including children, on a continuous (24 hours a day/seven days a week whole of life) basis.  Clarity. Wording based on Health Canada fact sheet. |
| 7 | Guidelines | 135 | Editorial | specific absorption rate differs from 1998 terminology  Specific energy absorption rate (SAR).  Consistency |

Add further rows if needed. For this copy the above row.

And paste it here.

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| **8** | Guidelines | 152 | Technical | The equivalent incident power density (Seq) does not appear to be defined.  Provide a definition.  Clarity |
| **9** | Guidelines | 156 | Editorial | The quantities in Table 1 are defined in Appendix A and it would helpful if this was indicated. It would also be helpful for a Glossary to be developed similar to the 1998 guidelines. .  Add: (Note: See Appendix A for the definitions of these quantities).  Clarity |
| **10** | Guidelines | 156 | Editorial | Frequency is denoted by *f* but this symbol is not used in the Tables.  Use *f* symbol in the tables.  Consistency |
| **11** | Guidelines | 156 | Editorial | Hinc should be added to Table 3.  Add Hinc to the Table. .  Consistency |
| **12** | Guidelines | 190 | Technical | Add new sentence on modulation to address scientific discussion about whether modulation is significant.  Based on SCENIHR 2015 add: ‘Several interaction mechanisms are well established and these enable extrapolation of scientific results to establish limit values for the entire frequency range regardless of signal modulations.‘  There has been scientific discusson about whether modulation is important to the possibility of adverse health effects (Juutilainen et al., 2011; Balzano et al, 2008; Davis et al, 2010; Kowalczuk et al., 2010; Foster et al, 2004 ). It was addressd by SCENIHR (2015):  ‚*Several interaction mechanisms are well established. These enable extrapolation of scientific results to the entire frequency range and wide-band health risk assessment. They have been used to formulate guidelines limiting exposures to EMF in the entirefrequency range from static fields to 300GHz. A number of studies proposed other candidate mechanisms. However, none that operates in humans at levels of exposure found in the everyday environment has been firmly identified and experimentally validated nor do they enable concluding on potential health risks at other exposure conditions both with regard to amplitude and/or frequency’*  It would be helpful to stakeholders to have ICNIRP comment on the topic. Other relevant references:  Review of possible modulation-dependent biological effects of radiofrequency fields, Juutilainen, et al., Bioelectromagnetics, 32(7):511–534, October 2011  The brain is not a radio receiver for wireless phone signals: Human tissue does not demodulate a modulated radiofrequency carrier, Davis, et al., Comptes Rendus Physique, 11(9-10):585-591, November-December 2010  Absence of nonlinear responses in cells and tissues exposed to RF energy at mobile phone frequencies using a doubly resonant cavity, Kowalczuk, et al., Bioelectromagnetics, 31(7):556-565, Oct 2010  A doubly resonant cavity for detection of RF demodulation by living cells, Balzano, et al., Bioelectromagnetics, 29(2):81 - 91, February 2008  Biological Effects of Radiofrequency Fields: Does Modulation Matter?, Foster, et al., Radiation Research, 162(2):219–225, August 2004 |
| **13** | Guidelines | 260 | Editorial | Reference is made to ACGIH, 2017 but the Reference list includes only ACGIH, 2018a and ACGIH, 2018b..  Correct the reference.  Clarity |
| **14** | Guidelines | 319 | Editorial | Reference missing Yarmolenko et al. 2011.  Insert reference.  Consistency |
| **15** | Guidelines | 365 | Technical | It is not clear whether this phrase ‚ ICNIRP assumes actual exposures (such as from radio-communications sources)‘ refers to the sources or the signals produced by such sources. .  Clarify the meaning.  Clarity |
| **16** | Guidelines | 429 and 617 | Editorial | The sentence in line 429 states “To be compliant with the present guidelines, exposure cannot exceed any of the retrictions described below....”however line 617 states “For the purpose of these guidelines, compliance is demonstrated if either the relevant reference levels or basic restrictions are complied with....”.  Clarify the meaning.  Clarity |
| **17** | Guidelines | 432 | Editorial | Insert adverse.  do not cause any known adverse health effect...  Clarity |
| **18** | Guidelines | 434-437 | Technical | Many countries using these guidelines have warm climates. It would be helpful if ICNIRP provided additional commentary on the extent to which the guidelines have considered the influence of climate in settig both the public and worker limits.  Clarify the relevance of climate factors for worker and public exposures.  Moore et al, 2017 provides some data for worker exposures.  (Effect of adverse environmental conditions and protective clothing on temperature rise in a human body exposed to radiofrequency electromagnetic fields, Moore, et al., Bioelectromagnetics, 38(5):356-363, July 2017) |
| **19** | Guidelines | 437 | Editorial | Reference is made to ACGIH, 2017 but the Reference list includes only ACGIH, 2018a and ACGIH, 2018b.  Correct the reference.  Clarity |
| **20** | Guidelines | 643-646 | Technical | Discussion of near-field/far-field regions should be amended for consistency with ITU publications and recent research. The present text is more appropriate to antenna pattern formation than field impedance. “D“ should be the maximum linear dimension of the anntena.  The conventional approach is that the reactive near-field extends to about λ m, the reactive-radiating near-field extends to about 3λ, the radiating near-field extends from 3λ to about 2D2/λ m and the radiating far-field begins at 2D2/λ m. The radiating near-field region only exists if the maximum linear dimension D of the antenna is large compared with the wavelength λ. However, recent research suggests that reactive near-field boundary may be smaller (Colombi et al., 2018).  See section 6.3 in ITU-T K.61 (2008) and RF Energy Absorption by Biological Tissues in Close Proximity to mmW 5G Wireless Equipment, Colombi, et al., IEEE Access:1-1, 5 January 2018. |
| **21** | Guidelines | 655 | Editorial | Insert adversely.  To adversely affect health.  Clarity |
| **22** | Guidelines | 657 | Editorial | Insert adversely.  adversely impact on health .  Clarity |
| **23** | Guidelines | 670 | Editorial | Insert adversely .  not adversely impact on health .  Clarity |
| **24** | Guidelines | 697 | Editorial | Two Equations in Table 5 have a negative sign (-) before the number 0.177, however the text font makes it difficult to see the “-“ from the “f”.  Distinguish the “f” and the “-“ .  Clarity |
| **25** | Guidelines | 709 | Editorial | Note 4 says 66-30 GHz, should be 6 -30 GHz .  6-30 GHz.  Correction |
| **26** | Guidelines | 720 | Editorial | Two Equations in Table 6 have a negative sign (-) before the number 0.177, however the text font makes it difficult to see the “-“ from the “f”.  Distinguish the “f” and the “-“.  Clarity |
| **27** | Guidelines | 770 | Editorial | Add the frequency range .  source in the frequency range 100 kHz -110 MHz..  Clarity |
| **28** | Guidelines | 818-822 | General | It is difficult to demonstrate ‚worst-case‘ so alternative wording suggested. Delete final pair of words that seem unneccesary .  The below reference level summation formulae assume highest exposure conditions among the fields from multiple sources. As a result, typical exposure situations may in practice require less restrictive exposure levels than indicated by the formulae for the reference levels (but would require compliance to be demonstrated with basic restrictions ~~demonstrate this~~)..  Clarity |
| **29** | Appendix A | 17 | Editorial | Insert thresolds. Abbreviation not used in the Guidelines. .  operational adverse health effects thresholds (OAHETs).  Missing word. Add abbreviation to the Guidelines. |
| **30** | Appendix A | 50 | Technical | The term „adiabatic“ refers to the lack of energy transfer from an object to its surroundings. This does not account for energy transfer within the object (where there is thermal conduction) and so the term „adiabatic“ is not relavant to equation 2.4..  Replace „Under the adiabatic condition where no heat diffusion occurs ...“ with „Under the situation where heat conduction is not significant ...“  Clarity. |
| **31** | Appendix A | 53 | Technical | SAR should be calculated at the instant that energy is input to the system. .  Replace equation 2.4 with „SAR = c dT/dt | t=0“ (Note: In the formatting of this equation the d’s are partial d’s and t=0 is subscript).  This is an equation that is often used improperly and leads to large errors in estimation of SAR. It should be emphasised that the calculation be done at t=0 (that is, by looking at the initial slope of T with time). In the calculation of SAR, many researchers use this equation and look at temperature rise over say two minutes when it should be performed within no more than the first few seconds. SAR can easily be underestimated by a factor of two or more when the equation is used improperly for animal tissue |
| **32** | Appendix A | 250 | Technical | The statement „‘normothermic‘ range“ has not been specified. . .  ICNIRP should add the temperature range at which normothermia applies. .  Guidance to the reader is desired to understand the operational adverse threshold for core body temperature. As an example, if normothermia is defined as the range 36.5 degC to 37.5 degC (an example range), then the statement at line 260-261 “to keep the body core temperature within +1 degC of normothermia” implies that the body core temperature could rise to 38.5 degC. Is this a correct interpretation of ICNIRP’s intent? |
| **33** | Appendix A | 336 | Editorial | ...worst case.  ... highest exposure condition....  Alternative wording that may be better understood. |
| **34** | Appendix A | 347 | Editorial | ...worst case.  ... highest exposure condition....  Alternative wording that may be better understood. |
| **35** | Appendix A | 522 | Editorial | ...worst case.  ... highest exposure condition....  Alternative wording that may be better understood. |
| **36** | Appendix A | 631 | Editorial | ...worst case.  ... highest exposure condition....  Alternative wording that may be better understood. |
| **37** | Appendix A | 677 | Editorial | dry skin and the dry skin ~~reported in the de-fact database~~ (Gabriel, 1996)...  ...dry skin and the dry skin (Gabriel, 1996)....  Clarity |
| **38** | Guidelines | 646-649 | General | Edit to this text. .  Delete the latter “input from the compliance community is required to determine which of these field types is most appropriate for a given exposure...  The community has only developed assessment methods according to information from relevant industries. |
| **39** | Guidelines | 375-379 | Technical | “However, as the maximum and thus worst-case temperature elevation from >6 to 300 GHz is close to the skin, exposure that will restrict temperature elevation to below the operational adverse health effect threshold for Type-1 tissue (5 °C) will also restrict temperature elevation to below the Type-2 tissue threshold (2 °C).”  This sentence does not adequately explain why it is sufficint to consider only the 5 °C increase in Type-1 tissue.  Additional details including numerical data and references should be added.  Clarity |
| **40** | Guidelines | 827 | Editorial | Add ‚should be‘.  And local SAR and transmitted power density values should be added according to ..  Correction |
| **41** | Appendix A | 250 | Editorial | ““Occupation whole body exposure” should be “occupational ...”..  “Occupational whole body exposure...“  Correction |
| **42** | Appendix A | 370 | Editorial | “ Side length of 2.15 mm” should be “... 2.15 cm”..  Side length of 2.15 cm...”  Clarity |