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.

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

|  |  |  |
| --- | --- | --- |
| Last name, first name: Reidenbach, Hans-Dieter | Email address: | Affiliation (if relevant): AK NIR/FS |
| If you are providing these comments officially **on behalf** of an organization/company, please name this here:  Deutsch-schweizerischer Fachverband für Strahlenschutz / German-Swiss Association for Radiation Protection with the support and consent of the following institutions:  o DKE K 764 (contact person: M. Meier (Chair) and Dr. H. Heinrich (Spokeswoman); DKE German Commission for Electrical, Electronic &   Information Technologies of DIN and VDE, K 764: Sicherheit in elektromagnetischen Feldern (Safety in electromagnetic fields),  o IFA (contact person: Dr. C. Alteköster ; Institut für Arbeitsschutz der DGUV/Institute for Occupational Safety and Health of the German Social  Accident Insurance),  o BMAS (contact person: Dr. G. Hilpert; Bundesministerium für Arbeit und Soziales/ Federal Ministry of Labour and Social Affairs),  o NLWKN (contact person: Dr. M. Hoffmann, Dr. H. Brüggemeyer; Niedersächsischer Landesbetrieb für Wasserwirtschaft, Küsten- und   Naturschutz/ Lower Saxony Water Management, Coastal Defence and Nature Conservation Agency),  o BAuA (contact person: Dr. P. Jeschke; Bundesanstalt für Arbeitsschutz und Arbeitsmedizin/ Federal Institute for Occupational Safety and  Health),  o BG ETEM (contact person: Dr. Stephan Joosten; Berufsgenossenschaft Energie Textil Elektro Medienerzeugnisse/employers mutual insurance   association energy textile electro media products),  o AUVA (contact person: Dr. K. Schiessl; Allgemeine Unfallversicherungsanstalt/ Austrian Workers' Compensation Board) | | |
| **x** 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. | | |

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

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| --- | --- | --- | --- | --- | --- | --- |
|  | **Document**  **(Guidelines, App A,**  **App B)** | **Line Number**  **#** | **Type of comment (General/ Technical/ Editorial)** | **Comment** | **Proposed change** | **Context** |
| **1** | Guidelines | 24 | Technical | The term "known adverse health effect", although generally used by experts, should be explained by specifying two examples and term “known” should be replaced by “established”. | "established adverse health effects **like** **hyperthermia or tissue burn due to RF-overexposure**" | The meaning of adverse health effects should be explained to prevent unnecessary inquiries about what ICNIRP Guidelines aim to prevent.  “Established” refers to high quality internationally accepted research results. |
| **2** | Guidelines | 25 | General | The proposed statement that all “known adverse health effects from [...] both short- and long-term“ are mitigated is misleading. Long-term health effects are only discussed in Appendix B (and then classified as not substantiated).  However, their possible existence may not be excluded. Some of the rich research in this area must be acknowledged in the main document of the guidelines instead of having this in the Appendix B. It is not sufficient to just cite SCENIHR and WHO opinions without proper discussion and “hide” citations and a few phrases in the appendix. | Incorporate part of the text of Appendix B or include an explicit reference to Appendix B:  Please add sentence at line 26: A detailed review of the existing literature including an assessment whether the results are substantiated or not is given in Appendix B. | The main document must be comprehensive in means that long term effects are considered by these guidelines, but as literature provides no substantiated effects, separate basic restrictions to protect against long term effects are not given |
| **3** | Guidelines | line 27 | General | What about implants? It is not specified if the guidelines are applicable for persons with metallic implants. | Please add:  “[...] intermediate objects**, i.e. active and passive body worn and/ or implanted medical devices are outside of the scope of these guidelines.”** | Scope of the document must be clear. To prevent unnecessary inquiries a clearly expressed scope is preferred. |
| **4** | Guidelines | 26 | Editorial | Grammar | Either "EMF","EMFs", or “EMF fields” should be used consistently in the text.  "EMF" should be used if another word follows, i.e. "EMF xyz" (e.g. EMF exposure)  "EMFs" should be used if another word precedes EMF, i.e. "xyz EMF" (e.g. radiofrequency EMFs) | consistent wording throughout entire document and appendices |
| **5** | Guidelines | 30-38 | Technical | Medical procedures are beyond the scope of these guidelines AND cosmetic procedures exclude non-medical aesthetic procedures. | line 34: Cosmetic **and non-medical aesthetic** procedures may also utilize radiofrequency EMFs. ICNIRP [...] as a result of cosmetic **or non-medical aesthetic** treatments as subject to these guidelines. | The current expression excludes aesthetic appliances utilizing EMF without an intended medical purpose. |
| **6** | Guidelines | 41 | Editorial |  | Insert a space between ISO and 14117 |  |
| **7** | Guidelines | 48-53 | Technical | Inclusion and exclusion of scientific evidence is not fully understood, especially when change of paradigms are based on unpublished literature or pros and cons are not summarized comprehensibly, i. e. appendix A, line 446& 577, or appendix B line 150. | Please describe exclusion and inclusion of scientific evidence more clearly and in particular how it is applicable to these guidelines. | Stating of how something is supposed to be done does not necessarily result in doing so eventually. |
| **8** | Guidelines | 44, 159, 161, and entire document | Technical | The difference between "harmful effects" and "adverse (health) effects" should be explained. In case of no differences, please use “adverse health effects”. | Please specify “harm” and “adverse health” and use terms consistently. | consistent wording throughout entire document and appendices |
| **9** | Guidelines | 65 | Technical | Add for clarification | Please add:  ”[...] variability in the population **(e.g. age, gender)**, variance […]” |  |
| **10** | Guidelines | 66 | Technical | Add for clarification | Please add:  “[...] environmental factors (e.g. air temperature, **humidity**, clothing), dosimetric uncertainty […]" |  |
| **11** | Guidelines | 95-96 | General | We welcome the statements regarding the protection of fetus. | Please specify protective aims for the respective gestational ages. | Additional specifications may prevent uncertainties in applying these guidelines. |
| **12** | Guidelines | 128-130 | Technical | Reference to the frequency range for nerve stimulation is missing | Please add at line 130:  “[...] (Mir, 2008); **please refer to section 4.3.1**.” |  |
| **13** | Guidelines | 129 | Editorial | dialectric | Please replace by “**dielectric**” |  |
| **14** | Guidelines | 153 | Editorial | To be checked by a native speaker. | "units of watt" instead of "units of watts" |  |
| **15** | Guidelines | 156 | General | The physical quantity of energy density is per SI-unit J/m³ a volume metric and is not used in areal contexts. Therefore it is not adequatly applicable to the addressed physical context.  Using H for mag. field strength as well as for energy density is misleading | We suggest using “WD” for “work density“ instead of “H” for energy density  A quantity given in the SI-Units joule per square metre (J/m2) is named "radiant exposure" and not "energy density" | To restrict confusion. |
| **16** | Guidelines | 156 Table 1 | Technical | Hinc is not explained in table 1 | Cf comment 15, and please add:  **H**inc  Incident plane wave energy density (J⋅m-2) | Table 1 should serve as guide for all basic restrictions and reference levels. |
| **17** | Guidelines | 156, Table 1 | Technical | Seq is not explained further in the document, nor in the appendices | Please add explanation. |  |
| **18** | Guidelines | 156 Table 1 | Technical | "Radiant exposure" is not a unit but a quantity | Add "radiant exposure" in the 1st column after a comma to Transmitted energy density and replace it in the column of units by "joule per square meter" |  |
| **19** | Guidelines | 157 | Editorial |  | Add the chapter number 4.2 |  |
| **20** | Guidelines | 233 | Editorial | humidity is missing, see comment #10 | Please add:  ”[…] such as environmental temperature, **humidity,** clothing**,** and work rate.” |  |
| **21** | Guidelines | 260, 869 | Editorial | ACGIH, 2017 is cited, but in the reference only 2 publications from 2018 (2018a and 2018b) are listed | Clarify or withdraw citation. |  |
| **22** | Guidelines | 272-282 |  | The shift from 6 to 30 min averaging time (duration) is a significant deviation from ICNIRP 1998 Gdl. |  | The fact should be highlighted and thoroughly explained, especially in means of additional evidence. |
| **23** | Guidelines | 287-288 | Technical | For higher penetration depth isn't it true that the largest contribution comes from "conduction"? | “[...] environment through convection **and conduction**; this is [...]” |  |
| **24** | Guidelines | 296, 590 Tab. 2 | Technical | Above 6 GHz now 2 basic restrictions are proposed: wb-SAR and local power density Str.   1. following the discussion in lines 296 ff , body core heating and exceeding wb-SAR seems unlikely, provided Str values are met over the body surface 2. with those proposed restrictions, assessment for wb-SAR will be compulsory for many (upcoming) technologies. How should this be done in practice, if there is (except Brockow et al.) apparently no literature on this subject yet? | Wb-SAR should be applicable from 100 kHz to 6 GHz only with Str applicable between 3 - 300 GHz. | To change the paradigm of using SAR up to 10 GHz we rate the presented scientific evidence (e.g. one study about treatment of Fibromyalgia in a very different frequency range with completely different mechanisms of heat absorption) as nonsufficient and presented too intransparent. Please back up the here presented argumentation similar to IEEE C95.1a from 2010.  Applicability is an important issue. |
| **25** | Guidelines | 319 | Editorial | The citation "Yarmalenko et al." is not included in the references | Add a reference |  |
| **26** | Guidelines | 321 ff | General | Classification of tissue, normothermal temperature, and choice of operational adverse health effect thresholds (OAHET):  1.) The classification of the whole „limb“ as type 1 tissue with a normothermal T of < 33-36 °C (even in **deeply-lying tissue of the thigh**!) is absolutely not plausible and not covered by the cited reference where only superficial (skin) temperature at moderate ambient temperatures are given.  In hot environments temperature at the thigh is comparable to the trunk.  2.) An OAHET of +2°C for brain tissue (type 2, normothermal T of ~38°C) seems to be also quite high and defined only such, that a value of SAR-head 10 W/kg together with a heating factor of 0.1°C/kg\*W still allows for a (quite low) reduction factor of 2. | 1.) OAHET for relative temperature of +5°C for type 1 tissue (skin, whole limbs…) must be reconsidered!  For superficial (skin) temperature over the body in given environmental temperatures see e.g. Deetjen Speckmann, “Physiologie” (6. ed, 2013)  2.) OAHET for brain tissue should be checked for conservativeness. | See also COMMENT #28 DEF. OF LIMBS & SAR-LIMBS, as well COMMENT #36 ON BASELINE TEMPERATURE & RISK MITIGATION ON WORKPLACE |
| **27** | Guidelines | 326 | Editorial |  | Please replace:  "thermo-normal" with "normothermal" |  |
| **28** | Guidelines | 339, Tab. 2 | Technical | The definition of “Limbs”, comprising the upper arm, forearm, hand, thigh, leg and foot leads to problems together with an occ. basic restriction of SAR-limbs 20 W/kg  Even for skin at the limbs, with a possible heating factor of 0.2°C/kg\*W, 4°C might be reached so that only negligible safety or reduction factor is left. | Definition of limbs needs to be more accurate (see IEEE Std C95.1-2005, Annex C.2.2.2. Definition of extremities starting form elbows and knees)  OAHT for relative temperature of +5°C as well as SAR-limbs needs to be reconsidered, also in view of heating factors for limbs. |  |
| **29** | Guidelines | 378-379 | Technical |  | Please add:  “[...] below the type-2 tissue **operational adverse health effect** threshold (2°C).” |  |
| **30** | Guidelines | 382 | Editorial |  | Replace "2.15 x 2.15 cm" with  "2.15 cm x 2.15 cm" |  |
| **31** | Guidelines | 420, 147 | Technical | Why do you use Htr and Str instead of Hinc and Sinc for basic restrictions. | Please specify  1) the differences between transmitted and incidence quantities more precisely and  (2) why transmitted quantities are preferably used. |  |
| **32** | Guidelines | 423-424 | Technical | SA and Htr are conservative in that, under worst-case (adiabatic) conditions, they are not sufficient to raise temperature by 5°C. | Please specify, why do you refer to tissue-type 1 when stating “conservative” and “worst-case conditions” instead of tissue-type 2? | In means of wearing sources in close proximity to the body, e.g. smart body worn appliances like smart glasses, all tissue types should be considered. Therefore a “conservative” and “worst-case condition” should consider tissue type 2 with max. permitted temperature raise of 2°C. |
| **33** | Guidelines | 433, 434 | Technical | What does "...as well as exposure and health more generally," mean? | Please clarify or delete these words. | Referring to a relationship between exposure and health more generally is too vague. |
| **34** | Guidelines | 449 | Editorial | operational adverse threshold | Please add  “[...] operational adverse **health effect** threshold [...]” |  |
| **35** | Guidelines | 478 | Editorial | Probably "Torso" should be written with an upper-case letter. |  |  |
| **36** | Guidelines | Lines 567, 582, 585, Sec. 5.1.6. | General | High OAHET values are based on normothermic conditions, only. For hot environments such as workplaces involving heat or elevated ambient temperatures only vague guidelines for risk mitigation are given, some of which appear unrealistic. How should a worker verify his body (core) temperature while performing a task?  For superficial exposure, discomfort & pain might come as a warning, but VHF and UHF exposure will not be superficial! | Please elaborate on risk mitigation in respect to workplaces with high heat load. | Workplaces with relevant RF-exposure and high heat load may not be adequately covered by these guidelines. |
| **37** | Guidelines | 606 | Editorial |  | for t < 1 **s**, t = 1 **s** must be used |  |
| **38** | Guidelines | 626-627 | Technical |  | Please add:  “[...] averaged over 6 minutes; table 7**, for detailed information refer to Appendix A, 4.6**).” | Provided links to all relevant information at one point. |
| **39** | Guidelines | 631, Tab. 4 | General | It is not discussed here, and thus remains unclear how ICNIRP 2018 (whole-body) reference levels may deviate strongly from ICNIRP 1998 in the kHz and few MHz region, while the basic restrictions have been kept constant. | Discuss (and cite if necessary) basis of change in reference levels. | The document must be comprehensive and must explain significant changes relative to previous guidelines. |
| **40** | Guidelines | 632 | Technical | It is not explained what "reactive and radiative" means | Please add:  “[...] radiative near field**; for detailed information see below**. [...]” |  |
| **41** | Guidelines | 637 | Technical | "due to a range of factors" is too non-specific and should be amended by a few examples. |  |  |
| **42** | Guidelines | 643, 644 | Editorial |  | Please replace "λ/2π" with "λ/(2π)" or "λ/(2⋅π)". |  |
| **43** | Guidelines | 644-645 | Editorial |  | Please explain relevant differences in reactive and radiative nearfield as well as far field. |  |
| **44** | Guidelines | 643-644 | Technical | For occupational sources, the reactive nearfield is expected to be larger in area. Therefore applying far-field reference levels to reactive near-field exposures may lead to an underestimation and hence over exposure. | Please use a more conservative approach to determine the transition from reactive to radiant near-field with “2λ”. | For detailed information please refer to:  Vallauri, R. et al.: “Electromagnetic field zones around an antenna for human exposure assessment”, IEEE Antennas and Propagation Magazine, vol. 57, no. 5, pp. 53-63, 2015. |
| **45** | Guidelines | 644 | Technical | 2D²/λ is not sufficient for mobile antennas |  |  |
| **46** | Guidelines | 661-680 | Technical | ICNIRP guidelines must aim to protect 100% of occupational and general public against adverse health effects.  The statement in line 650-651 severly discredits the protection scheme of these guidelines and hence the credibility of ICNIRP at large. | Please reconsider the frequency ranges, values, or even reduction factors of basic restrictions in order to guarantee that when reference levels are met the respective basic restrictions are not exceeded. |  |
| **47** | Guidelines | table 5, 6 | General | Very difficult to apply and confusing. | Please don’t use links to different tables with various physical quantities and frequency ranges. | To avoid misinterpretation, these guidelines should provide a userfriendly and unambiguous structure and layout. |
| **48** | Guidelines | Table 4, Note 3 and # | Editorial | As stated in these guidelines, explanations in # contradict note 3. | Please add:  “[...] ...; only one is required**; only for far- field exposure**.” | The proposed changed should be accepted to increase logical consistency. |
| **49** | Guidelines | Table 3, Note \* | Technical | If the more general approach to field zones (please refer to comment line 643-644) is accepted, the area covered by reactive near-field is larger. | Therefore, please provide guidance of how to assess occupational exposure and with what physical quantities to comply with. | As currently stated, guidance about what physical quantities to comply with is missing for f > 400 MHz. |
| **50** | Guidelines | Table 5&6 | Editorial | The exponent is not written clearly, as negative sign is very hard to spot. | Please add an additional blank between base “f” and exponent “-0.177”. | Otherwise it is very confusing. |
| **51** | Guidelines | Table 5 | Editorial | Exposure time provided in table header is condratictory. | We suggest:  table 5: >6min  table 6: ≤6min | Otherwise double assessment |
| **52** | Guidelines | Table 5, note 2 | Technical | If the note is applied to table 4, there is a gap for f ≤ 30 MHz. | Please provide additional guidance, with what physical quantities local exposure with f ≤ 30 MHz should comply with. | Guidelines should be clear, consistent and comprehensive. |
| **53** | Guidelines | Table 5, note 4 | Editorial | 66-30 GHz | 6-30 GHz |  |
| **54** | Guidelines | Table 5, note 4 | Editorial | Please specify and perhaps add additional comments. | Please add:  “[...] in space, approximating the **exposed** body surface.” | Otherwise misleading |
| **55** | Guidelines | Table 6 | Editorial | occupational exposure >6-300 GHz | opening square bracket is missing |  |
| **56** | Guidelines | Table 6,  line 722 | Editorial | Please avoid complex numbers due to negative square roots when time intervals are less than 1sec. | Please add:  “1. f is frequency in GHz; ‘t’ is time interval, in seconds; **for t < 1, ‘t = 1’ must be used.**” | Similar to table 3, note 3. |
| **57** | Guidelines | table 6, note 3 | Editorial | Please specify and perhaps add additional comments. | Please add:  “[...] in space, representative the **exposed** body surface.” | Otherwise misleading |
| **58** | Guidelines | Table 6, note 4 | Editorial | Please specify “both” (line 733) more precisely. |  | We assume, that one must calculate Hinc 2times: firstly based on E-value and secondly based on H-value. |
| **59** | Guidelines | 740 | Editorial | Significant change in the consideration of induced currents by extending the frequency range. | Please elaborate on reasons for extending the applicable frequency range down to 100 kHz. | Guidelines should be clear, consistent and comprehensive. |
| **60** | Guidelines | 741 | Technical | It is not explained why a value of 45 mA is recommended instead of e.g. 20 mA, which would be a factor of 5 lower than the 100 mA for occupational. | Please provide additional guidance, why a smaller reduction factor is used. | A reduction factor of 5 is usually applied. |
| **61** | Guidelines | 760 and 774 | Editorial | Inconsistent and not established terminology | Please use established terminology “touch” and replace “point” and “finger”. | consistent wording throughout the guidelines |
| **62** | Guidelines | 807 | Editorial |  | Add a full stop at the end. |  |
| **63** | Guidelines | 823, 833 | Editorial |  | Replace "5.4.1" with "5.4.1." |  |
| **64** | Guidelines | Sec 5.4.2 | Technical | Summation rules are unclear for quantities E, H, and S  Is it max (E,H) and additively S? | Clarify summation rules! Proposed:  > 400 MHz: maximum of assessment in E, H or S  < 400 MHz: E and H must both be satisfied |  |
| **65** | Guidelines | 825-828 | Editorial | Missing index “i” in the denominator of equation 1 and 2. | Replace:  cid:A6FDD608EF306747B51BAF97D010268A@internal.vodafone.com  By:  cid:61A79009DFDA2B45857CE3BD1BCFC511@internal.vodafone.com    Replace:  cid:87A32A8D0AD3144A98F0AFEB14481914@internal.vodafone.com  By: |  |
| **66** | Guidelines | 825-840 | Technical | With coming radio technologies (e.g. small cells, small cell under an umbrella macro cell) it might be necessary to consider the exposure of all frequency bands of different types of sources – nearby and distant sources. Applying only reference levels might be over conservative. Applying only whole body SAR values is not practical for macro cells which will be at a distance of 10 m or 20 m or more.  In such an exposure situation it might be appropriate to consider the exposure of nearby sources using the whole body SAR values and the exposure of distant sources using reference levels. | Replace:  cid:E40BFEC21D1F2F4283183C4B51FF5B7F@internal.vodafone.com    By:  cid:BB2DDE57F809834A969AD2AAA937D734@internal.vodafone.com    Note 1: As the nearby and the distance source might operate at the same frequency both sums should go over the full frequency range.  Note 2: Perhaps similar equations had to be added considering the terms in Eqn. 3 and 4.  Note 3: Perhaps this can also be a note to Eqn. 1 instead of replacing it. | Multi source, multi frequency exposure |
| **67** | Guidelines | 831 | Editorial | Check whether S in *S*tr is used as a vector quantity and therefore has to be written non-italic (cf. table 2) and S bolded? | **S**tr |  |
| **68** | Guidelines | 833-846 | Technical | Clarification is required regarding what restrictions to comply to. | Please add at line 835:  “[...] field strengths should be applied to the field levels **with equations 3-5 to be fulfilled**;” | Guidelines should be clear, consistent and comprehensive. |
| **69** | Guidelines | 853, 861 | Editorial | Cf comment 63 |  |  |
| **70** | Guidelines | 883 | Editorial | German Grammar | Please replace "wärmehaushalt des menschen" with "Wärmehaushalt des Menschen" |  |
| **71** | Guidelines | 899 | Editorial |  | Please add a blank line after line 899 |  |
| **72** | Guidelines | 954 | Editorial | Typing error | Please replace "Biololgy" with "Biology" |  |
| **73** | Guidelines | 963-965 | Editorial |  | Please shift this reference after line 990 and add a space between "guide" and "for" in line 964 |  |
| **74** | Appendix A | 17 | Technical |  | Please add:  “[…] document, the operational adverse health effects **threshold** (OAHETs)” |  |
| **75** | Appendix A | 70 | Editorial | Typing error | Please replace "kg m-1" with "kg⋅m-3" |  |
| **76** | Appendix A | 71, 72 | Editorial |  | Please replace "***S***TR" and "***H***TR" with "***S***tr" and "***H***tr" |  |
| **77** | Appendix A | 85 | Editorial | H\* is not specified | Please specify H\* for further use. |  |
| **78** | Appendix A | 94 | Editorial | Is "strength" the correct technical term or "value"? | Please clarify. |  |
| **79** | Appendix A | 114 | Technical | Does the same exist for TE waves too? |  |  |
| **80** | Appendix A | 135 | Technical |  | Please add:  “[...] heat transfer from the body surface to air **via convection or radiative emission**, including the effect of vasodilation […]” | For clarification purposes |
| **81** | Appendix A | 213-216 | Technical | Due to thermodynamic rules there should be a relationship like "A/V" (A: area, V: volume) | Please provide an equation to describe the relationship described in lines 213-216. | Guidelines should be clear, consistent and comprehensive. |
| **82** | Appendix A | 244 | Technical |  | Please add:  "[…] in term of the whole body average SAR limit **in order to be more conservative**." |  |
| **83** | Appendix A | 273 | Editorial | It is probably 2006a instead of 2006? | Please double check citation. |  |
| **84** | Appendix A | 300 | Editorial |  | Replace "Hirata et al." with "Hirata" |  |
| **85** | Appendix A | 301 | Editorial |  | Replace "Watanabe et al.2007" with "Watanabe et al. 2007a" |  |
| **86** | Appendix A | 326 | Editorial |  | Please add:  “[...] this is that the operational **adverse** health effect thresholds [...]” |  |
| **87** | Appendix A | 366 | Editorial |  | Please add:  "[…] surface tissues for frequencies higher than **about** 6 GHz." | It is not a clear cut frequency, at which physiological considerations change, it’s only a clear cut frequency for the purpose of increasing usability of these guidelines. |
| **88** | Appendix A | 369 Table 3.1 | Editorial |  | Delete all full stops after the single number and provide equal amount of decimal places after zero. |  |
| **89** | Appendix A | 446 | Editorial |  | Please add:  "[...] (Kodera et al. **2018**, unpublished) [...] |  |
| **90** | Appendix A | 446, 456, 976 | Technical | Reference Kodera et al. is unpublished – nevertheless the important reference level for short-time exposure depends (only?) on this work. How can the argument be transparently reviewed if it is not published nor independently validated? | Please wait for published (peer reviewed) results or provide additional references supporting the new operational health effect threshold. | It is not a transparent argument, when references are not commonly accessible. |
| **91** | Appendix A | 481 | Editorial | Typing error, given as an example here | Replace "et al" with "et al." |  |
| **92** | Appendix A | 577 | Technical | Again, an unpublished document!!! | Please add:  “[...] (Kashiwa at al., 2018, **unpublished**).” | What is it about using unpublished observations and hence not peer reviewed RESULTS to support argumentation in guidelines with such an enormous impact?  ICNIRP guidelines are used to shape international as well as national legislation. Please be aware of the obligations coming along with such aspiration! |
| **93** | Appendix A | 617 | Editorial | Clarify whether it is "Hirata et al. (2009a), (2009b) or (2009c)" |  |  |
| **94** | Appendix A | 680 | Editorial | Clarify whether it is "Hirata et al. (2008a) or (2008b)" |  |  |
| **95** | Appendix A | 693 | Editorial |  | Please add:  “[...] reference level is lower than **at** other frequencies." |  |
| **96** | Appendix A | 702 | Editorial |  | Please replace: "λ/2π" with "λ/(2π)" or "λ/(2⋅π)" |  |
| **97** | Appendix A | 705 | Editorial |  | Please add:  "[…] body exponentially decays **theoretically** in the direction […]" |  |
| **98** | Appendix A | 709 | Editorial |  | Replace "2007" with "2007b" |  |
| **99** | Appendix A | 709 | Editorial | Typing error | Replace "Kuhn" with "Kühn" |  |
| **100** | Appendix A | 898-900 | Editorial |  | Please check running order of references: Shift the reference of “Gandhi …” after line 904 (reference Gabriel … 2005. |  |
| **101** | Appendix A | 992 | Editorial | Missing pages of the reference | Please add page numbers:  593-595 (as per BioEM2018 Abstract Book) |  |
| **102** | Appendix A | 996 | Editorial |  | Start with the last name and then add the first letter of the first name for all authors. |  |
| **103** | Appendix B | 5 | Editorial |  | As per Appendix A, please change font style in *Italic*. | Consistency |
| **104** | Appendix B | 47 footnote 1 | Technical | Is it really true that details concerning "substantiated" can be found in the main guidelines? | Please provide detailed information about where to find the promised details. |  |
| **105** | Appendix B | 54 | Technical | Nothing is said on cancer!!! | Please add additional reasoning why cancer is not of importance at this part of your argumentation. | With explanations given in lines 47-54 the reader expects a statement about the significance of cancer in “Health Risk Assessment Literature”. |
| **106** | Appendix B | 150 | General | Blood-brain barrier leakage has been shown not once, but repeatedly. It remains unclear what level of exactness in replication is needed for ICNIRP to acknowledge a result being replicated. | Please reassess risk for blood-brain barrier leakage based on a consistent wording and a clear classification of evidence. | A consistent wording and a clear classification of evidence (and risk) must be found and kept throughout the document. NTP or IARC classifications might be used. |
| **107** | Appendix B | 176 | Technical | It is not clear, what point is made by the statement about eye blinks in means of thickness of eye lid with approx. 0,5 mm in relation to table 3.1 (Appendix A) stating penetration depth of 30 GHz with 0.92 mm, 60 GHz 0.49 mm and 100 GHz 0.35 mm. | Please specify your conclusion, e.g. what effects exactly are precluded by blinking at what blink rates. | Argumentation should be clear and consistent. |
| **108** | Appendix B | 191 | Editorial |  | Please replace "Roschmann" with "Röschmann" |  |
| **109** | Appendix B | 321 | General | While it is stated that ‘Male infertility studies provide “no strong” evidence’ this implies that there is ‘some’ evidence.  This evidence is not sufficiently considered and not properly ranked. | Please reassess risk based on a consistent wording and a clear classification of evidence. | A consistent wording and a clear classification of evidence (and risk) must be found and kept throughout the document. NTP or IARC classifications might be used |
| **110** | Appendix B | 390 | General | Malignant neoplasms in the temporal lobe are actually rising, e.g. in UK | Please include de Vocht, 2016, https://doi.org/10.1016/j.envint.2016.10.019 into discussion and decide transparently about its inclusion. |  |
| **111** | Appendix B | 348 | Technical | There exists a newer draft from the NTP-study. | Please cite the current NTP-(draft) version, when these guidelines are published. |  |
| **112** | Appendix B | 476 | Technical | The results of the German Mobile Telecommunication Research Program (DMF-Project) <http://www.bfs.de/EN/bfs/science-research/results/dmf/dmf_node.html> were not included into the discussion. | Please consider the results from DMF in respect to acute effects, chronic effects, and action mechanisms and decide transparently about its inclusion. |  |

Additional comment only by AK NIR/FS:

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| --- | --- | --- | --- | --- | --- | --- |
| **113** | Guidelines | 825-828, in relation to table 2 | General | SAR is physiologically correct applicable only up to frequencies of 6 GHz, with a transition zone into S (from volume to areal metrics) between 3-6 GHz. Please refer to IEEE C95.1a (2010). | Please replace:  cid:A6FDD608EF306747B51BAF97D010268A@internal.vodafone.com  By: |  |
| **114** | Guidelines | 825-840, in relation to table 2 | General | Cf comment 66 and  SAR is physiologically correct applicable only up to frequencies of 6 GHz, with a transition zone into S (from volume to areal metrics) between 3-6 GHz. Please refer to IEEE C95.1a (2010). | Replace:  cid:E40BFEC21D1F2F4283183C4B51FF5B7F@internal.vodafone.com  By: |  |