

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: Shalev Ziva	Email address:	Affiliation (if relevant): Your affiliation
If you are providing these comments officially on behalf of an organization/company, please name this here: The comments are of the Standards Institution of Israel/Technical Committee 5809 – Electromagnetic Compatibility (SII/TC 5809 – Electromagnetic Compatibility)		

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

	Document (Guidelines, App A, App B)	Line Number #	Type of comment (General/ Technical/ Editorial)	Comment	Proposed change	Context
1	Guidelines	Line number	Technical	Insert your comment.		Explain the context of your comment.
2	Guidelines	Line number	Technical	Insert your comment.	Insert your proposed change.	Explain the context of your comment.
3	Guidelines	Line number	Technical	Insert your comment.	Insert your proposed change.	Explain the context of your comment.
4	Guidelines	Line number	Technical	Insert your comment.	Insert your proposed change.	Explain the context of your comment.
5	Guidelines	Line number	Technical	Insert your comment.		
6	Guidelines	Line number	General	Insert your comment.		
7	Guidelines		Technical	Insert your comment.		Explain the context of your comment.

	Document (Guidelines, App A, App B)	Line Number #	Type of comment (General/ Technical/ Editorial)	Comment	Proposed change	Context
1	Guidelines	15–17, 430	Technical	Nerve stimulation induces electric fields within the body, for frequencies up to 10 MHz. ICNIRP 2010 provides also reference exposure levels in the frequency range from 100 kHz up to 10 MHz. It is unacceptable that two ICNIRP 2010 and 2018 Guidelines provide different reference exposure levels for the same RF 100 kHz to 10 MHz. See specific comparison ICNIRP 2018 Table 4, (line 681) vs. ICNIRP 2010 Tables 3 and 4.	Add in the end of line 17: ICNIRP 2010 reference levels are not relevant above 100 kHz. Change and delete in line 430 'To be compliant with the present Guidelines, exposure cannot exceed any of the restrictions described below, nor those for the up to 100 kHz – 10 MHz range of the ICNIRP (2010)...	ICNIRP 2010 and 2018 Guidelines should be consistent. They are frequency oriented, not phenomena: thermal (2018) or electro stimulation effect (2010); see their titles. Even slight difference between these Guidelines is unacceptable in the frequency range 100 kHz to 10 MHz. To avoid confusion, at least ICNIRP 2018 titled 'Guidelines for limiting exposure ... (100 kHz to 300 GHz)' should specify that ICNIRP 2010 titled 'ICNIRP guidelines for limiting exposure ... (1 Hz – 100 kHz)' is not applicable above 100 kHz.
2	Guidelines	35–38	Technical	Inserting 'potential benefits and harms within the context of cultural norms' invites national guidelines, opposite to the global interest, to use worldwide guidelines.	Change: 'ICNIRP treats people exposed to radiofrequency EMF as a result of cosmetic treatments as subject to these guidelines, with any no decisions as to potential exemptions the role of national regulatory bodies, which are better suited to weigh potential benefits and harms within the context of cultural norms.'	There is no scientific risk-difference from RF-EMF among diverse countries or cultures. The main role of the ICNIRP 2018 is to provide international guidelines and not to enable every national regulator to invent its national limits.
3	Guidelines	118	Technical	It is not clear that the 'EMF source' itself (cellular, broadcasting...) influences the complex patterns of fields inside the body.	Change: 'This results in complex patterns of fields inside the body that are heavily dependent on the EMF source signal and frequency'	RF signal is characterised by power, frequency, polarisation, modulation... The word source may mislead. ICNIRP 2018 should focus on EMF received signal, and not the transmitter. See next 2 comments.
4	Guidelines	138	Technical	ICNIRP 2018 should refer to 'absorbed power density (S _{ab}) and not to 'transmitted power density (S _{tr})'. For	Change 'transmitted absorbed power density (S _{trab})' all over the 2018 Guidelines.	The basic ICNIRP restrictions should not refer to the transmitter power, but to the incident power or power absorbed by the human body. In line 373 '(S _{tr})' provides a measure of the power absorbed in

				example In line # 243 we read 'absorbed radiofrequency power' on Str context.		tissue...'. NB: Transmitted power density (Str) was not defined in ICNIRP 1998.
5	Guidelines	146	Technical	ICNIRP 2018 should refer to, 'absorbed energy density (H_{ab} , in $J m^{-2}$), and not to 'transmitted energy density (H_{tr} , in $J m^{-2}$)'. As the character H refers to magnetic field, it is proposed to use J_{ab} for energy density.	Change the definitions of 'transmitted energy density (H_{tr} , in $J m^{-2}$)' to 'absorbed energy density (J_{ab} , in $J m^{-2}$)' all over the 2018 Guidelines.	The basic ICNIRP restrictions should not refer to the transmitted energy, but to the incident energy absorbed by the human body. Transmitted energy density (H_{tr}) was not defined in ICNIRP 1998.
6	Guidelines	156 (Table 1)	Technical	The 2018 Guidelines include new quantity relative to ICNIRP 1998, 'incident plane wave energy density (H_{inc}) ($kJ m^{-2}$)'. Table 1 should define it. Some of the units are bolded (e.g., S_{inc} , H_{tr} and S_{tr}), while others are not bolded (e.g., SA and SAR). Moreover, the same page line line 152 we read, 'Sinc'.	Add a row in Table 1: 'Incident plane wave energy density', ' H_{inc} ', ' $kJ m^{-2}$ '. All over the 2018 Guidelines and Appendixes, be consistent with bold characters.	Consistency. Why the unit of the energy density is once H_{inc} ($kJ m^{-2}$) and then H_{tr} radiant exposure ($J m^{-2}$)? In addition it is not clear how to measure H_{inc} and H_{tr} .
7	Guidelines	289	General	ICNIRP 1998 basic restrictions include power density. Tables 5 and 6 in ICNIRP 1998 do provide power densities for frequencies above 10, till 300 GHz	Delete 'basic restrictions ...have traditionally been limited to frequencies below 10 GHz (e.g. ICNIRP 1998)'.	Even the title of ICNIRP 1998 details 'up to 300 GHz.
8	Guidelines	359, 377–388	Technical	Some Administrations use 1-g cubical mass all over the RF spectrum. Above 30 GHz the penetration depth is smaller; $1 \times 1 cm^2$ 'surface of the cube' is used, therefore, the average exposure should be 1 g (fitting to $1 \times 1 \times 1 cm^3$) and not 10-g. NB: $1 \times 1 cm^2$ and 10-g appear also in ICNIRP 1998, but not 1-g.	Add in line 391 after 'across frequency' and all over the text: 1 g average exposure mass is used to fit the $1 \times 1 cm$ surface of the cube, above 30 GHz.	The averaging schemes 10-g or 1-g cubical mass are most significant for assessing quantitatively the SAR exposure levels. $2.15 \times 2.15 cm$ surface of the cube in line 382 is derived from 10 gr fitting $2.15 \times 2.15 \times 2.15 cm^3 \sim 10 cm^3 = 10 gr$. So, ICNIRP 2018 may propose average exposure mass of 1-g, above 30 GHz.

9	Guidelines	406–408, 510–511, 543–544, 730–731	Technical	‘...exposure from any pulse, group of pulses, or subgroup of pulses in a train, delivered in t seconds, must not exceed the formulae/ threshold/ limits...’ is problematic, as the sum of pulse, group of pulses, or subgroup of pulses may exceed the formulae/ threshold/ limits, even each pulse doesn’t exceed and is compliant.	Add in all these lines ‘...exposure from any pulse, group of pulses, or subgroup of pulses in a train, as well as for the total (sum) of exposures , delivered in t seconds, must not exceed the formulae/ threshold/ limits’.	See Appendix A lines 467–469 clarifying the difference between any and total : ‘For example, if two, 1-second pulses are separated by 1 second, the limits provided by Eqns. 3.5-3.6 must be satisfied for each of the pulses, as well as for the total 3-second pulse-pattern interval’.
10	Guidelines	Sections 4.3.3.2 starting line 396, 5.1.5 line 533, 590 (Table 2), 601 (Table 3)	Technical	The formulas of Specific Absorption (SA) and local transmitted energy density (H_{tr}) and the relation $1/100$ (e.g. 354 and 3.54) are not clear, below and above 6 GHz: SA $500+354(t-1)^{0.5} \text{ J kg}^{-1}$ vs $H_{tr} 5+3.54(t-1)^{0.5} \text{ kJ m}^{-2}$. Difficult to compare the SA at 6 GHz – ΔF (e.g. 5.9 GHz) and H_{tr} at 6 GHz + ΔF (e.g. 6.1 GHz).	Add : clarification examples to calculate SA and H_{tr} , to show continuity at 6 GHz. Thus, as in Table 2, below 6 GHz SAR limits are used for head/torso and limb, but above 6 GHz Str limits are used. Table 3, below 6 GHz SA limits are used, but above 6 GHz Str limits are used.	ICNIRP 1998 provides continuous exposure limits. ICNIRP 2018 is in general also continuous across frequencies. Continuity of exposures along frequency (around 6 GHz) is important to reduce confusion. Readers should understand parameters clearly. See next comment.
11	Guidelines	590 (Table 2), and 601 (Table 3)	Technical	Table 2 uses SAR and S_{tr} (≥ 6 minutes), but Table 3 uses SA and H_{tr} (< 6 minutes); both refer to the same frequency range 400 MHz–300 GHz. How to check continuity at 6 minutes using the different Tables at 359 and 361 seconds?	Add : Provide application examples to calculate for 360 seconds S_{tr} in Table 2, and to calculate SA and H_{tr} in Table 3.	Continuity of exposures along time (around 6 minutes) is important to reduce confusion. The same examples may be used for this comment and the last comment on similar issue, continuity around 6 GHz.
12	Guidelines	601 (Table 3)	Technical	‘electric, magnetic and electromagnetic field’ appears in the title, so no need to repeat it in the Tables. The Table’s title ‘Basic restrictions for electric, magnetic and electromagnetic field exposure ...’ doesn’t fit (Table 3) parameters and units of ‘SA (J kg^{-1})’ and (kJ m^{-2}) H_{tr} ’.	Change the title ‘Basic restrictions for electric, magnetic and electromagnetic field energy exposure ’. Or use all over the Tables 3, 5 and 6 ‘ EMF exposure ’ instead of ‘ electric, magnetic and electromagnetic field ’.	To differentiate among Tables. See similar comment in Table 5 and 6. The Tables’ titles should be precise, or use a general concise term ‘ EMF exposure ’.
13	Guidelines	643-649	Technical	‘...input from the compliance community is required to determine which of these field types is most appropriate for a given exposure’. We find the present definitions of near and	Add and Delete : line 646, ... to antenna diameter and wavelength respectively, in meters (Mazar, 2016, pp 206-207). However, due to a range of factors that impact on the degree to which these	The final version of ICNIRP Guidelines should not include such a sentence. No need of additional inputs from the compliance community. If there are additional inputs from the

				far-field exposure conditions appropriate. Therefore, a Reference, showing the applicability, provides the evidence for deletion. See next comment.	definitions are appropriate for application to the reference levels, input from the compliance community is required to determine which of these field types is most appropriate for a given exposure.	compliance community, add their appropriate text.
14	Appendix A	545-548	Technical	'...input from the compliance community is required to determine which of these field types is most appropriate for a given exposure'. We find the definitions appropriate. See last comment.	Delete: A guide to potential definition of near- and far-field exposure conditions is provided in the main document, but it is expected that determination of such conditions for the application of reference levels would need to be guided by compliance standards organizations.	The final version of ICNIRP Appendix A should not include such text. No need of additional inputs from the compliance community. If there are additional inputs from the compliance community, add their appropriate text.
15	Guidelines	646	Technical	D is correct not only for circular/dish antennas; therefore, the definition should be improved. See (Mazar, 2016, p 206).	Change: antenna diameter largest dimension and wavelength respectively...	Diameter refers only to circles, and dish antennas.
16	Guidelines	649	Technical	In the far-field the electric E and H magnetic field-strengths are related by $E = H/z_0$ where $z_0 = 120 \pi$ (ohms), $z_0 \approx 377$ (ohms). Moreover, the 'incident plane wave power density (Sinc) ($W m^{-2}$) is the (vector) product of E and H .	Add: in the end of line 649 or another place. In the far-field the electric E and H magnetic field-strengths are related by $E = H/z_0$ where $z_0 = 120 \pi$ (ohms), $z_0 \approx 377$ (ohms). Moreover, the 'incident plane wave power density (Sinc) ($W m^{-2}$) is the product of E and H (Mazar, 2016, pp 200–201).	To exemplify, see Table 4 at $f > 30\text{--}400$ MHz for occupational $E = 61$, $H = 0.16$ and for general public $E = 28$ and $H = 0.073$. The relations between E and H are 377 and the 'incident plane wave power density (Sinc) ($W m^{-2}$) equals the product of E and H : $61 \times 0.16 \approx 10$ and $28 \times 0.073 \approx 2$, respectively.
17	Guidelines	675	Editorial	Editorial mistake :one redundant parenthesis.	Correct: ((Hirata et al., 2013).	<i>Errare humanum est</i> (Seneca).
18	Guidelines	681 (Table 4)	Technical	Comparing reference exposure levels at 100 kHz: <u>ICNIRP 2010</u> , 3 kHz–10 MHz, occupational 170 v/m and 80 A/m (Table 3); general public 83 v/m and 21 A/m (Table 4). <u>ICNIRP 2018</u> , 100 kHz–20 MHz, occupational $1220/f(\text{MHz})$ v/m and $4.9/f$	At 100 kHz ICNIRP 2010 and ICNIRP 2018 are in force. The differences are too large : occupational 170 vs 12,200 V/m, and general public 83 vs 5,600 V/m. An explanation is fundamental, or to change the exposure levels. As we cannot change now ICNIRP 2010, we must change now only ICNIRP 2018.	ICNIRP 2018 titled 'Guidelines for limiting exposure ... (100 kHz to 300 GHz) ' and ICNIRP 2010 titled 'ICNIRP guidelines for limiting exposure ... (1 Hz – 100 kHz) are too dissimilar. Both ICNIRP Guidelines should fix identical reference levels for equal frequency. The Guidelines are frequency oriented - not

				<p>A/m; general public 560/f v/m and 2.2/f A/m (Table 4).</p> <p>To indicate the difference at 100 kHz: <u>ICNIRP 2010</u>, occupational 170 v/m and 80 A/m; general public 83 v/m and 21 A/m. <u>ICNIRP 2018</u>, occupational 1220/0.1(MHz) =12,200 v/m and 4.9/f=49 A/m; general public 560/f= 5600 v/m and 2.2/f= 22 A/m.</p>		phenomena oriented (see titles). This revision should solve the inconsistency.
19	Guidelines	681 (Table 4)	Technical	<p>Comparing reference exposure levels at 10 MHz: <u>ICNIRP 2010</u>, 3 kHz–10 MHz, occupational 170 v/m and 80 A/m (Table 3); general public 83 v/m and 21 A/m (Table 4). <u>ICNIRP 2018</u>, 100 kHz–20 MHz, occupational 1220/f(MHz) v/m and 4.9/f A/m; general public 560/f v/m and 2.2/f A/m (Table 4). To indicate the difference at 10 MHz: <u>ICNIRP 2010</u>, occupational 170 v/m and 80 A/m; general public 83 v/m and 21 A/m. <u>ICNIRP 2018</u>, occupational 1220/10(MHz)=122 v/m and 4.9/f=0.49 A/m; general public 560/f= 56 v/m and 2.2/f= 0.22 A/m.</p>	As already proposed, Add in line 17: ICNIRP 2010 reference levels are not relevant above 100 kHz.	ICNIRP 2018 titled 'Guidelines for limiting exposure ... (100 kHz to 300 GHz) ' should specify that ICNIRP 2010 titled 'ICNIRP guidelines for limiting exposure ... (1 HZ – 100 kHz) ' is not applicable above 100 kHz.
20	Appendix A	588–591	Technical	<p>Nerve Stimulation induces electric fields within the body, for frequencies up to 10 MHz. As ICNIRP 2010 provides also reference exposure levels in the frequency range from 100 kHz up to approximately 10 MHz, it is unacceptable that two ICNIRP 2010 and 2018 Guidelines provide different values for the same RF. Even that ICNIRP 2010 reference levels are set to protect against stimulation effects up to 10 MHz, and a reduction factor of 3 was applied to account for uncertainty</p>	Add in the end of line 591: However, ICNIRP 2010 reference exposure levels are not relevant above 100 kHz.	ICNIRP 2010 and ICNIRP 2018 provide different exposure limits in 100 kHz and up to 10 MHz. To avoid confusion, at least ICNIRP 2018 titled 'Guidelines for limiting exposure ... (100 kHz to 300 GHz) ' should specify that ICNIRP 2010 titled 'ICNIRP guidelines for limiting exposure ... (1 HZ – 100 kHz) ' is not applicable above 100 kHz

				associated with the numerical simulation, the proposed text should be added.		
21	Guidelines	681 (Table 4)	Technical	The values of electric E and H magnetic strengths below 30 MHz are not clear. At 20–30 MHz, for occupational E = 61 H = 4.9/f and for general public E = 28 H = 2.2/f. Why E exposures are not function of <i>f</i> , similarly to H ? Or inversly, why H exposures are function of <i>f</i> ?	Add: An explanation is missing. Maybe there is a mistake : at 20-30 MHz $E=1220/f$ or $H: 0.16f$	Even in the near-field E and H are connected; see Maxwell equations (Mazar, 2016, pp 198–199). At ICNIRP 1998, between 10–400 MHz E and H are not dependent on <i>f</i> . However, at 1–10 MHz, $E=87/f^{1/2}$ while $H=0.73/f^{1/2}$. So, maybe no-change is needed, only some clarification.
22	Guidelines	697 (Table 5)	Technical	The Table's title 'Reference levels for local exposure to time varying far-field electric, magnetic and electromagnetic fields, from 100 kHz to 300 GHz...' doesn't fit parameters and units of 'Incident plane wave power density (Sinc) ($W\ m^{-2}$)'	Change the title 'Reference levels for local exposure to time varying far-field electric, magnetic and electromagnetic fields incident plane wave power density exposure, from 100 kHz to 300 GHz...'. Or use all over the Tables 3, 5 and 6 'EMF exposure'.	To differentiate among Tables. See similar comment in Tables 3 and 6.
23	Guidelines	707–708	Technical	Table 5 ($S_{inc} \geq 6$ minutes) 'Note 3. For frequencies >400 MHz to 6 GHz, Table 6 reference levels averaged over 6 minutes are to be used (i.e. $t = 360$ seconds)'. It is not clear how to compare at 6 minutes the $S_{inc} \geq 6$ minutes of Table 5 and the $H_{inc} \leq 6$ minutes; by SAR ($=SA/360$)?	Add: clarification examples for $S_{inc} \geq 6$ minutes and $H_{inc} \leq 6$ minutes to show continuity at 6 minutes in Tables 5 and 6; and for SAR, at $t=360$ seconds.	Continuity of exposures along time (around 6 minutes) is important to reduce confusion at $t = 360$ seconds.
24	Guidelines	709	Editorial	Editorial mistake.	Correct: (6–30 GHz)	<i>Errare humanum est</i> (Seneca).
25	Guidelines	718 (Table 6)	Technical	The Table's title 'Reference levels for local exposure to time varying far-field electric, magnetic and electromagnetic fields, from 100 kHz to 300 GHz...' doesn't fit parameters and units of 'incident plane wave power density (Sinc) ($W\ m^{-2}$)'.	Change the title 'Reference levels for local exposure to time varying far-field electric, magnetic and electromagnetic fields incident plane wave power density exposure, from 100 kHz to 300 GHz ...'. Or use all over the Tables 3, 5 and 6 'EMF exposure'.	To differentiate among Tables. See similar comment in Tables 3 and 5.

26	Guidelines	718 (Table 6)	Editorial	Editorial mistake : missing one parenthesis	Correct: $2.75f-0.177[2.5+1.77(t-1)^{0.5}]$	<i>Errare humanum est</i> (Seneca).
27	Guidelines Appendix A	740 (Table 7) 771		The limb current reference levels at 100 mA and 45 mA, for occupational and general public exposures respectively 'the limb current reference levels at 100 mA and 20 mA, for occupational and general public exposures respectively' There is an inconsistency between the Guidelines Table 7 and Appendix A line 771. The reference level for the general public should be unified in both documents	Correct Appendix A: 'the limb current reference levels at 100 mA and 20 45 mA, for occupational and general public exposures respectively'	In ICNIRP 2018 Guidelines, the rate between occupational and general public exposure is correct $100/45=\sqrt{5}$, as 5 is the rate between powers, SARs and energies. In Appendix A line 771, the current relation between occupational and general public exposure is incorrect $100/20=5$. Moreover, it contradicts Appendix A line 779 'As shown in Eqn. 4.2, the local SAR is proportional to the squared value of the limb current'. Lines 791–792 'the squared value of the limb current is proportional to the local SAR, the squared value of the limb current must be used for time averaging'.
28	Guidelines	753	Technical	There are also large FM broadcasting transmitters at 87.5–108 MHz, the international FM radio broadcasting known as Band II.	Add: large radiofrequency transmitters, such as are found near high power antennas used for broadcasting below 30 MHz and at 87.5–108 MHz.	Significant information.
29	Guidelines	770	Technical	The text 'high-power radiofrequency fields as those emitting greater than 100 V m^{-1} at their source' is not clear! At which distance from the main beam is measured this field-strength?! More rational is to define the eirp of the transmitter, or better to define the field-strength 100 V m^{-1} as the exposure level.	Clarify: ICNIRP here defines high-power radiofrequency exposure fields as those emitting greater than 100 V m^{-1} at their source.	A general comment: all over the Guidelines, ICNIRP should refer to the received and not the transmitted signal, as the Guidelines should provide exposure received levels and not transmitters' limits.
30	Guidelines	863	Technical	The Hinc is the incident energy density not field strength.	Improve: ...reference levels of field strengths incident energy densities should be applied levels.	Even that the ICNIRP 2018 title refers to 'electric, magnetic and electromagnetic fields' the Guidelines should be precise.

31	Guidelines	948	Technical	Insert a Reference, providing evidence to deleting and inserting text in the 2018 Guidelines and Appendix A.	Mazar H, See Mazar (2016). Wiley 'Radio Spectrum Management: Policies, Regulations and Techniques'.	The reference explains the deletion of the sentence in Guidelines lines 646–649 and Appendix A lines 545–548. It also explains (without reference) the antenna diameter (or its largest dimension) Guidelines line 646. The Reference relates field-strengths E and H, and their product to get the 'incident plane wave power density (Sinc), in Guidelines p. 649.
32	Appendix A	633	Technical	The acronym ICRP is not specified	Add in line 633: ... the standard dimensions specified by International Commission on Radiological Protection (ICRP) ...	Consistency is important; acronyms and abbreviations should be specified.
33	Appendix B	190	Technical	... 'specific absorption (SA) value of 4.5 mJ 190 kg ⁻¹ per pulse to reach the 20 mPa auditory sound pressure threshold...'. The symbol mPa was not defined and is not obvious.	Add in line 190: ... 'reach the 20 millipascal (mPa) auditory sound pressure threshold...	Readability.