Australian Government
Australian Radiation Protection and Nuclear Safety Agency

Radiation Protection Standard for Maximum Exposure Levels to Radiofrequency Fields - 3 kHz to 300 GHz (2002) (RPS3)
Proposed Amendment to Schedule 5 - Table of Amendments (comparison)

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25	**4.4 Compliance of mobile or portable transmitting equipment (100 kHz to 2.5 GHz)** Mobile or portable transmitting equipment may be designed to be used close to the body. This can result in exposure of a small portion of the user's body and produces fields with a highly non-uniform spatial distribution. In such circumstances it is practicable to determine compliance from a consideration of equipment parameters and conditions of use. Detailed compliance provisions are given and discussed in Schedule 5. The provisions of Schedule 5 apply only to mobile or portable transmitting equipment that emits RF fields at frequencies between 100 kHz and 2500 MHz.	**4.4 Compliance of mobile or portable transmitting equipment (100 kHz to 6 GHz)** Mobile or portable transmitting equipment may be designed to be used close to the body. This can result in exposure of a small portion of the user's body and produces fields with a highly non-uniform spatial distribution. In such circumstances it is practicable to determine compliance from a consideration of equipment parameters and conditions of use. Detailed compliance provisions are given and discussed in Schedule 5. The provisions of Schedule 5 apply only to mobile or portable transmitting equipment that emits RF fields at frequencies between 100 kHz and 6 GHz.
59	**Schedule 5** **Compliance of Mobile or Portable Transmitting Equipment (100 kHz To 2500 MHz)** **S5.1 GENERAL** Mobile or portable transmitting equipment may be designed to be used close to the body. This can result in illumination of a small portion of the user's body and produces fields with a highly non-uniform spatial distribution. In such circumstances it is practicable to determine compliance from a consideration of equipment parameters and conditions of use. Table S1 summarises the detailed requirements of this Schedule. These provisions apply only to transmitting equipment that emits RF fields at frequencies between 100 kHz and 2500 MHz. **S5.2 EQUIPMENT INTENDED FOR USE BY AWARE USERS** **S5.2.1 Application** Sub-section S5.2 provides a means, based on equipment and usage parameters, to readily determine compliance with the spatial peak SAR restrictions of Table 2 for occupational exposure. This sub-section applies to equipment operated by aware users.	**Schedule 5** **Compliance of Mobile or Portable Transmitting Equipment (100 kHz To 6 GHz)** **S5.1 GENERAL** Mobile or portable transmitting equipment may be designed to be used close to the body. This can result in illumination of a small portion of the user's body and produces fields with a highly non-uniform spatial distribution. In such circumstances it is practicable to determine compliance from a consideration of equipment parameters and conditions of use. Table S1 summarises the detailed requirements of this Schedule. These provisions apply only to transmitting equipment that emits RF fields at frequencies between 100 kHz and 6 GHz. **S5.2 EQUIPMENT INTENDED FOR USE BY AWARE USERS** **S5.2.1 Application** Sub-section S5.2 provides a means, based on equipment mean power output and usage parameters, to readily determine compliance with the spatial peak SAR restrictions of Table 2 for occupational exposure. This sub-section applies to equipment operated by aware users.

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59	**S5.2.3 Equipment with mean power output exceeding 100 mW** The evaluation of mobile or portable transmitting equipment for compliance with this Standard is not required where: (a) it operates on a push-to-talk basis; (b) it is used by an aware user; (c) it is operated with a transmit duty factor of 50% or less averaged over a six minute period; (d) it does not exceed the power levels of Table S2; and (e) normal operation entails the antenna or other radiating structure being separated from the user's body by not less than 2.5 cm. Where the above provisions are not satisfied, testing or mathematical modelling to demonstrate compliance with the spatial peak SAR restrictions as specified for the Occupational category in Table 2 of this Standard must be undertaken. Such measurements or calculations should be based on normal use spatial relationships between the equipment and user.	**S5.2.3 Equipment with mean power output exceeding 100 mW** The evaluation of mobile or portable transmitting equipment for compliance with this Standard is not required where it can be demonstrated that in normal use the mean power output does not exceed the alternative low-power exclusion levels as defined in IEC 62479 (2010) when calculated for the occupational spatial peak SAR limit of 10 W/kg over a 10 g averaging mass. The equations used to calculate the alternative low-power exclusion levels are provided in sub-section 5.4. Where the above provision is not satisfied, testing or mathematical modelling to demonstrate compliance with the spatial peak SAR restrictions as specified for the Occupational category in Table 2 of this Standard must be undertaken. Such measurements or calculations should be based on normal use spatial relationships between the equipment and user.
60	The compliance of transmitting equipment may be assessed, via the derived reference levels for the occupational category of Tables 7 and 8 by direct measurement or evaluation in accordance with the recommendations of AS/NZS2772.2 or other appropriate guidelines where the power output exceeds the levels of Table S2 and normal operation entails the antenna or other radiating structure being separated from the user's body by not less than 20 cm.	The compliance of transmitting equipment is assessed against the derived reference levels for the occupational category of Tables 7 and 8 of this Standard when: • the power output exceeds 100 mW; and • normal operation entails the antenna or other radiating structure being separated from the user's body by not less than 20 cm. The compliance assessment may be by direct measurement or evaluation in accordance with the recommendations of AS/NZS 2772.2 or other appropriate guidelines.
60	S5.3.1 Application Sub-section S5.3 provides a means, based on equipment and usage parameters, to readily determine compliance with the spatial peak SAR restrictions of Table 2 for general public exposure of certain portable or mobile equipment. This sub-section has application to equipment intended for operation by general public users.	S5.3.1 Application Sub-section S5.3 provides a means, based on equipment mean power output and usage parameters, to readily determine compliance with the spatial peak SAR restrictions of Table 2 for general public exposure of certain portable or mobile equipment. This sub-section has application to equipment intended for operation by general public users.
60	S5.3.2 Equipment with mean output power not exceeding 20 mW	S5.3.2 Equipment with mean power output not exceeding 20 mW
60	S5.3.3 Equipment with mean output power exceeding 20 mW The evaluation of mobile or portable transmitting equipment for compliance with this Standard is not required where:	S5.3.3 Equipment with mean power output exceeding 20 mW The evaluation of mobile or portable transmitting equipment for compliance with this Standard is not required where it can be demonstrated that in normal use the

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	(a) it operates on a push-to-talk basis; (b) it is operated with a transmit duty factor of 50% or less averaged over a six minute period; (c) it does not exceed one fifth (20%) of the power levels of Table S2; and (d) normal operation entails the antenna or other radiating structure being separated from the user's body by not less than 2.5 cm. The evaluation of mobile or portable transmitting equipment for compliance with this Standard is not required where the output power delivered to the antenna does not exceed the levels of Table S2 and normal operation entails the antenna or other radiating structure being separated from the user's body by not less than 20 cm. Where the above provisions are not satisfied, testing or mathematical modelling to demonstrate compliance with the spatial peak SAR restrictions specified for the general public users category in Table S2 of this Standard must be undertaken. Such measurements or calculations should be based on normal use spatial relationships between the equipment and user.	mean power output does not exceed the alternative low-power exclusion levels as defined in IEC 62479 (2010) when calculated for the general public spatial peak SAR limit of 2 W/kg over a 10 g averaging mass. The equations used to calculate the alternative low-power exclusion levels are provided in sub-section 5.4. Where the above provision is not satisfied, testing or mathematical modelling to demonstrate compliance with the spatial peak SAR restrictions specified for the general public users category in Table 2 of this Standard must be undertaken. Such measurements or calculations should be based on normal use spatial relationships between the equipment and user.
61	The compliance of transmitting equipment may be assessed, via the reference levels specified for the general public users category in Tables 7 and 8 of this Standard, by direct measurement or evaluation in accordance with the recommendations of AS/NZS 2772.2 or other appropriate guidelines where the power output exceeds the levels of Table S2; and normal operation entails the antenna or other radiating structure being separated from the user's body by not less than 20 cm.	The compliance of transmitting equipment is assessed against the reference levels specified for the general public users category in Tables 7 and 8 of this Standard when: • the power output exceeds 20 mW; and • normal operation entails the antenna or other radiating structure being separated from the user's body by not less than 20 cm. The compliance assessment may be by direct measurement or evaluation in accordance with the recommendations of AS/NZS 2772.2 or other appropriate guidelines.
61	**Table S1 – Equipment parameters** **Aware user exposure** Push-to-talk & mean power < Table S2 & duty factor < 50 % & separation > 2.5 cm Mean power > Table S2 & separation > 20 cm	**Table S1 – Equipment parameters** **Aware user exposure** Mean power < alternative low-power exclusion level of IEC 62479 for SAR_{max} = 10 W/kg Mean power > 100 mW & separation > 20 cm

<table>
<tr><th>Page no</th><th>Original Text</th><th>Proposed Amendment</th></tr>
<tr><td></td><td>General public exposure

Push-to-talk & mean power < 1/5

Mean power > Table S2 & separation > 20 cm

Mean power > Table S2 & separation > 20 cm

NOTE: Fixed or vehicle mounted transmitting equipment should be installed in accordance with AS/NZS 4346</td><td>General public exposure

mean power < alternative low-power exclusion level of IEC 62479 for SAR_{max} = 2 W/kg

Mean power > 20 mW & separation > 20 cm

Mean power > 20 mW & separation > 20 cm

DELETE NOTE: ~~NOTE: Fixed or vehicle mounted transmitting equipment should be installed in accordance with AS/NZS 4346~~</td></tr>
<tr><td>62</td><td>TABLE S2

THRESHOLD LEVELS FOR TESTING

<table><tr><th colspan="3">Operating frequency range</th><th>Nominal mean output power (W)</th></tr><tr><td>100 kHz</td><td>to</td><td>450 MHz</td><td>7</td></tr><tr><td>450 MHz</td><td>to</td><td>2500 MHz</td><td>3150 / f</td></tr></table>
NOTES:
1 For the purpose of this Schedule, mean power is as defined in ITU Radio Regulations as the average power over an interval of time which is long compared with the lowest modulating frequency (except for pulse-modulated or intermittent transmissions where mean power is to be taken as peak-envelope-power (PEP) multiplied by duty factor . For duty factors of less than 5 %, mean power is to be taken as 5 % of PEP).

2 f is the frequency in MHz.</td><td>Replace Table S2 with the following:

S5.4 Alternative Low-Power Exclusion Levels

An empirical equation developed by Sayem et al. (2009) may be used to calculate threshold power levels for wireless devices used close to the body and operating at frequencies from 300 MHz to 6 GHz. The derivation of alternative low-power exclusion levels based on these equations is described in Annex B of the International Standard IEC 62479 (2010).

For a wireless device with a free space antenna bandwidth of BW percent located at a distance of s millimeters from the user's body the alternative low-power exclusion level P_{max}' is defined by:

$$P_{max}' = \exp [As + Bs^2 + C \ln (BW) + D]. \quad (1)$$

The parameters A, B, C and D are third order polynomials of frequency. For compliance with the general public spatial peak SAR limit SAR_{max} = 2 W/kg averaged over a mass of 10 g the parameters may be calculated using the following formulae:

$$A = (-0.4588 f^3 + 4.407 f^2 - 6.112 f + 2.497) / 100 \quad (2)$$

$$B = (0.1160 f^3 - 1.402 f^2 + 3.504 f - 0.4367) / 1000 \quad (3)$$

$$C = (-0.1333 f^3 + 11.98 f^2 - 110.8 f + 301.4) / 1000 \quad (4)$$

$$D = -0.03540 f^3 + 0.5023 f^2 - 2.297 f + 6.104 \quad (5)$$</td></tr>
</table>

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		where *f* is the frequency in GHz. For compliance with other SAR limits also using an averaging mass of 10 g the final P_{max}' value is multiplied by a factor of SAR_{max} / 2 W/kg. For example, for the occupational spatial peak in the head and torso limit P_{max}' is multiplied by a factor of 10 / 2 = 5. NOTES: 1 For the purpose of this Schedule, mean power is as defined in ITU Radio Regulations as the average power over an interval of time which is long compared with the lowest modulating frequency (except for pulse-modulated or intermittent transmissions where mean power is to be taken as peak-envelope-power (PEP) multiplied by duty factor. For duty factors of less than 5 %, mean power is to be taken as 5 % of PEP). 2 The derivation of alternative low-power exclusion levels is described in Annex B of the International Standard IEC 62479 (2010), *Assessment of the compliance of low-power electronic and electrical equipment with the basic restrictions related to human exposure to electromagnetic fields (10 MHz to 300 GHz)*, published by the International Electrotechnical Commission, Geneva Switzerland. 3 The original paper on which the IEC 62479 derivation is based was published by Sayem, A.T.M., Douglas, M.G., Schmid, G., Petric, B. and Ali, M. (2009) *Correlating threshold power with free-space bandwidth for low-directivity antennas* IEEE Transactions on Electromagnetic Compatibility 51(1): 25. 4 Fixed or vehicle mounted transmitting equipment should be installed in accordance with AS/NZS 4346.