

Annex A

A summary of ICNIRP 2020 and ICNIRP 1998 limits applicable for the general public of relevance for this paper are provided in Table A.1 to Table A.5. These are only provided in this Annex for convenience; the ICNIRP guidelines provide exhaustive and detailed information (ICNIRP, 2020a), (ICNIRP, 1998).

Table A.1 ICNIRP 2020 basic restrictions from >400 MHz to 300 GHz applicable for the general public.

	Whole-body exposure	Local exposure	
Quantity	Specific absorption rate ($SAR_{wb,lim}$, W/kg)	Specific absorption rate ($SAR_{local,lim}$, W/kg)	Absorbed power density ($S_{tr,lim}$, W/m ²)
Frequency	>400 MHz – 300 GHz	>400 MHz – 6 GHz	>6 GHz – 300 GHz
Limit values	0.08	2	20
Notes	Time average: 30 min Averaging mass: whole-body mass	Time average: 6 min Averaging mass: 10 g The limit value in this table is given for exposed areas such as head and torso. For limb exposure, the limit is twice the value specified above	Time average: 6 min Spatial average: <ul style="list-style-type: none"> • 4 cm² (6–300 GHz) • 1 cm² (>30–300 GHz). The limit applicable for this averaging area is twice the value specified above

Table A.2 ICNIRP 2020 reference levels from >400 MHz to 300 GHz applicable for the general public.

	Whole-body exposure		Local exposure		
Quantity	Incident power density ($S_{inc,lim}$, W/m ²)		Incident power density ($S_{inc,lim}$, W/m ²)		
Frequency	>400 MHz – 2 GHz	>2 – 300 GHz	>400 MHz – 2 GHz	>2– 6 GHz	>6 – 300 GHz
Limit values	$f/200$	10	$0.058f^{0.86}$	40	$55/(f_G^{0.177})$
Notes	<p>f is in MHz</p> <p>Time average: 30 min</p> <p>Spatial average: an area corresponding to the whole-body surface</p> <p>For frequencies >400 MHz – 2 GHz and within the reactive near-field, compliance is to be determined based on the assessment of both electric and magnetic field strength (instead of incident power density) based on the following limits: $E_{lim} = 1.375f^{0.5}$, $H_{lim} = 0.0037f^{0.5}$</p> <p>For frequencies >2 GHz and within the reactive near-field, compliance is to be determined using the basic restrictions</p>		<p>f is in MHz, f_G is in GHz</p> <p>Time average: 6 min</p> <p>Spatial average:</p> <ul style="list-style-type: none"> • 4 cm² (6 – 300 GHz) • 1 cm² (>30 – 300 GHz) <p>The limit applicable for this averaging area is twice the value specified above</p> <ul style="list-style-type: none"> • spatial peak (>400 MHz – 6 GHz) <p>For frequencies >400 MHz – 2 GHz and within the reactive near-field, compliance is to be determined based on the assessment of both electric and magnetic field strength (instead of incident power density) based on the following limits: $E_{lim} = 4.72f^{0.43}$, $H_{lim} = 0.0123f^{0.43}$</p> <p>For frequencies >2 GHz and within the reactive near-field, compliance is to be determined using the basic restrictions</p>		

Table A.3 ICNIRP 2020 localized basic restrictions and reference levels from >400 MHz to 300 GHz applicable for the general public and for exposure intervals < 6 minutes.

	Basic restrictions		Reference Levels		
Quantity	Specific absorption energy ($SA_{local,lim}$, J/kg)	Absorbed energy density ($H_{tr,lim}$, kJ/m ²)	Incident energy density ($U_{inc,lim}$, kJ/m ²)		
Frequency	>400 MHz – 6 GHz	>6 GHz – 300 GHz	>400 MHz – 2 GHz	>2 – 6 GHz	>6 – 300 GHz
Limit values	$0.72[0.05 + 0.95(t/360)^{0.5}]$	$7.2[0.05 + 0.95(t/360)^{0.5}]$	$0.058f^{0.86} * 0.36[0.05 + 0.95(t/360)^{0.5}]$	$40 * 0.36[0.05 + 0.95(t/360)^{0.5}]$	$55/(f_G^{0.177}) * 0.36 * [0.05 + 0.95(t/360)^{0.5}]$
Notes	<p>$t < 360$ is time interval in seconds</p> <p>Averaging mass: 10 g</p> <p>The limit value is given for exposed areas such as head and torso. For limb exposure, the limit is twice the value specified above</p>	<p>$t < 360$ is time interval in seconds</p> <p>Spatial average:</p> <ul style="list-style-type: none"> • 4 cm² (6–300 GHz) • 1 cm² (>30–300 GHz) <p>The limit applicable for this averaging area is twice the value specified above</p>	<p>f is in MHz, f_G is in GHz</p> <p>Spatial average:</p> <ul style="list-style-type: none"> • 4 cm² (6 – 300 GHz) • 1 cm² (>30 – 300 GHz) <p>The limit applicable for this averaging area is twice the value specified above</p> <ul style="list-style-type: none"> • spatial peak (>400 MHz – 6 GHz) <p>For frequencies >400 MHz and within the reactive near-field, compliance is to be determined using the basic restrictions</p>		

Table A.4 ICNIRP 1998 basic restrictions from >400 MHz to 300 GHz applicable for the general public.

	Whole-body exposure	Local exposure	
Quantity	Specific absorption rate ($SAR_{wb,lim}$, W/kg)	Specific absorption rate ($SAR_{local,lim}$, W/kg)	Incident power density ($S_{inc,lim}$, W/m ²)
Frequency	>400 MHz – 10 GHz	>400 MHz – 10 GHz	>10 GHz – 300 GHz
Limit values	0.08	2	10
Notes	Time average: 6 min Averaging mass: whole-body mass	Time average: 6 min Averaging mass: 10 g The limit value in this table is given for exposed areas such as head and torso. For limb exposure, the limit is twice the value specified above	Time average: $68/f^{1.05}$ minutes where f is the frequency in GHz Spatial average: 20 cm ² ICNIRP 1998 does not explicitly differentiate between whole-body and localized exposure above 10 GHz.

Table A.5 ICNIRP 1998 reference levels from >400 MHz to 300 GHz applicable for the general public.

Quantity	Incident power density ($S_{inc,lim}$, W/m ²)	
Frequency	>400 MHz – 2 GHz	>2 – 300 GHz
Limit values	$f/200$	10
Notes	<p style="text-align: center;">f is in MHz</p> <p style="text-align: center;">Time average:</p> <ul style="list-style-type: none"> • 6 min (400 MHz – 10 GHz) • $68/f^{1.05}$ (10 GHz – 300 GHz) <p>Spatial average: According to ICNIRP 1998 “The reference levels are intended to be spatially averaged values over the entire body of the exposed individual”. However, for practical applications, when SAR cannot be assessed, compliance with the localized limits is shown by means of the reference levels applied as spatial peak values. That is, a single limit is used to address both spatial-peak and spatially averaged evaluations.</p> <p>In the near-field, reference levels in terms of electric and magnetic field strength need to be used and their contributions have to be considered separately.</p>	