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VNS – Voluntary National Specification 2030/8/3

5.8 GHz Wireless Access Systems operating in the 5725 – 5850 MHz band and systems where channels overlap into the 5725 – 5730 MHz band

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Section 1

Forward

1.1 This Voluntary National Specification ('VNS') is intended to provide guidance on equipment which may be suitable for operating in the 5725 – 5850 MHz band under the licence exemption specified in the Wireless Telegraphy (Exemption and Amendment) (Amendment) Regulations 2017[1] ('the 5.8 WAS/RLAN Regulations') and Interface Requirement 2030.

1.2 ETSI harmonised standard EN 301 893 covers wireless access systems (WAS) including Radio Local Access Network (RLAN) equipment capable of operating in the 5150 – 5350 and 5470 – 5725 bands. However, the frequency band 5725 – 5850 MHz is not within scope of EN 301 893. This VNS is intended to provide guidance in cases where RLAN products operate in the frequency band 5725 – 5850 MHz, and hence are fully or partially outside the scope of EN 301 893.

1.3 This VNS is likely to be superseded if the scope of ETSI EN 301 893 is updated to cover the 5725 – 5850 MHz frequency range. We will keep this situation under review.

1.4 This VNS should not be relied upon as legal advice, or understood as modifying any legal obligations which may otherwise apply. In particular, this VNS is not intended to provide guidance on meeting the requirements of the Radio Equipment Directive 2014/53/EU. Manufacturers and Economic Operators should therefore refer to Radio Equipment Directive 2014/53/EU and seek their own independent advice as to their legal responsibilities. Ofcom makes no representation or warranty, express or implied, with respect to the information contained in the VNS and any liability is therefore expressly disclaimed.

[1] S.I. 2017/746 (available at www.legislation.gov.uk)

Section 2

Scope

2.1 This VNS gives guidance on the minimum technical characteristics for 5.8 GHz Wireless Access Systems (‘WAS’) including Radio Local Access Network (‘RLAN’) equipment.

2.2 This VNS covers radio equipment capable of operating in all or parts of the frequency bands given in table 1.

Table 1: Service Frequency bands

	service frequency bands
Transmit	5 725 MHz to 5 850 MHz
Receive	5 725 MHz to 5 850 MHz

2.3 This VNS also covers WAS/RLAN equipment in the 5470 – 5730 MHz band where nominal channel bandwidth(s) as prescribed in 4.2.2 of ETSI EN 301 893 V2.1.1 (2017-05) fall partly within the 5725 – 5850 MHz band (overlapping channels).

2.4 An overview and intention of 5.8 GHz WAS/RLAN technical rules and parameters can be found in Annex 2.

References

2.5 ETSI EN 301 893 V2.1.1 (2017-05)

2.6 ETSI EN 301 893 V1.8.1 (2015-03)

2.7 ETSI EN 302 502 V2.1.1 (2017-03).

Definitions

Overlapping channels: WAS/RLAN equipment in the 5470 – 5730 MHz band where nominal channel bandwidth(s) as prescribed in 4.2.2 of ETSI EN 301 893 V2.1.1 (2017-05) fall partly within the 5725 – 5850 MHz band within the frequency range 5725 – 5730 MHz**.**

Non-overlapping channels: WAS/RLAN equipment in the 5725 – 5850 MHz band where nominal channel bandwidths as prescribed in 4.2.2 of ETSI EN 301 893 V2.1.1 (2017-05) fall fully within the 5725 – 5850 MHz band.

Refer to section 3.1 of ETSI EN 301 893 V2.1.1 (2017-05) for other definitions.

Symbols

dB	decibel
dBm	dB relative to 1 mW
fc	Carrier frequency
GHz	gigahertz
Hz	hertz
kHz	kilohertz
L	Radar burst length
MHz	megahertz
ms	millisecond
Samples/s	Samples per second
mW	milliwatt
n	Number of channels
g	Channel number

Refer to section 3.2 of ETSI EN 301 893 V2.1.1 (2017-05).

Abbreviations

WAS	Wireless Access Systems
RLAN	Radio Local Area Network
e.i.r.p.	equivalent isotropically radiated power
TPC	Transmit Power Control

Refer to section 3.3 of ETSI EN 301 893 V2.1.1 (2017-05) for other symbols.

Section 3

Minimum technical characteristics of equipment

3.1 This section gives guidance on the minimum technical characteristics for WAS/RLAN equipment operating in the 5.8 GHz band for both non-overlapping and overlapping channels. Table 2 gives detailed guidance on limits for the key technical parameters of WAS/RLAN equipment that may be considered.

Table 2: Minimum technical characteristics of equipment

<table>
<tr><th>Parameter</th><th>Reference</th><th>Limits</th><th>Additional information</th></tr>
<tr><td>Nominal Centre Frequencies</td><td>4.2.1 of ETSI EN 301 893 V2.1.1 (2017-05)</td><td>Use 4.2.1 of ETSI EN 301 893 V2.1.1 (2017-05). Use the following equations in place of equation (1) of ETSI EN 301 893 V2.1.1 (2017-05)

$fc_n = 5\ 160 + (g \times 20)$ MHz,

where $25 \leq g \leq 28$

and

$fc_n = 5\ 160 + 5 + (g \times 20)$ MHz

where $29 \leq g \leq 33$</td><td>Refer to Figure 3 for channelling and channel bonding. While channel numbers (g) follow the format in EN 301 893, it has a direct relationship to the IEEE channel numbering shown in Figure A1</td></tr>
<tr><td>Nominal Channel Bandwidth and Occupied Channel Bandwidth</td><td>4.2.2 of ETSI EN 301 893 V2.1.1 (2017-05)</td><td>Use 4.2.2 of ETSI EN 301 893 V2.1.1 (2017-05)</td><td></td></tr>
<tr><td>RF output power, transmit power control and power density for non-overlapping channels in the 5725 – 5850 MHz band</td><td>4.2.3 of ETSI EN 301 893 V2.1.1 (2017-05)</td><td>Use 4.2.3 of ETSI EN 301 893 V2.1.1 (2017-05), use the following tables in place of tables 2 and 3 from ETSI EN 301 893 V2.1.1 (2017-05),

Table 2: Mean e.i.r.p. limits for RF output power and power density at the highest power level

<table>
<tr><th colspan="2">Mean e.i.r.p. limit (dBm)</th><th colspan="2">Mean e.i.r.p. density limit (dBm/MHz)</th></tr>
<tr><th>with TPC</th><th>without TPC</th><th>with TPC</th><th>without TPC</th></tr>
</table>
</td><td></td></tr>
</table>

<table>
<tr>
<td></td>
<td></td>
<td>
<table>
<tr><td>23</td><td>20</td><td>10</td><td>7</td></tr>
</table>

Table 3: Mean e.i.r.p. limits for RF Output Power at the lowest power level of the TPC range
<table>
<tr><th>Frequency range</th><th>Mean e.i.r.p. (dBm)</th></tr>
<tr><td>5 725 MHz to 5 850 MHz</td><td>17</td></tr>
</table>
</td>
<td></td>
</tr>
<tr>
<td>RF output power, transmit power control and power density for overlapping channels in the 5470 – 5730 MHz band</td>
<td>4.2.3 of ETSI EN 301 893 V2.1.1 (2017-05)</td>
<td>Use 4.2.3 of ETSI EN 301 893 V2.1.1 (2017-05). Refer to the limits for the 5470 – 5725 MHz band</td>
<td>Devices using overlapping channels in the 5470 – 5730 MHz band, can transmit up to 30 dBm / 1 W e.i.r.p.</td>
</tr>
<tr>
<td>Transmitter unwanted emissions</td>
<td>4.2.4 of ETSI EN 301 893 V2.1.1 (2017-05)</td>
<td>Use 4.2.4 of ETSI EN 301 893 V2.1.1 (2017-05)</td>
<td>Where the 5 GHz RLAN bands are referred to this also includes the 5725 – 5850 MHz band</td>
</tr>
<tr>
<td>Receiver spurious</td>
<td>4.2.5 of ETSI EN 301 893 V2.1.1 (2017-05)</td>
<td>Use 4.2.5 of ETSI EN 301 893 V2.1.1 (2017-05)</td>
<td></td>
</tr>
<tr>
<td>Dynamic Frequency Selection</td>
<td>4.2.6 of ETSI EN 301 893 V2.1.1 (2017-05)

4.2.6 ETSI EN 302 502 V2.1.1 (2017-03)</td>
<td>Use 4.2.6 of ETSI EN 301 893 V2.1.1 (2017-05).

For devices using non-overlapping channels in the 5725 – 5850 MHz band, apply tables D.3 a) and D.3 b) from Annex D of ETSI EN 302 502 V2.1.1 (2017-03) instead of tables D.3, D4 and D.5 from Annex D of ETSI EN 301 893 V2.1.1 (2017-05)

For devices using overlapping channels in the 5470 – 5730 MHz band apply both tables D.3 a) and D.3 b) from Annex D of ETSI EN 302 502 V2.1.1 (2017-03) as well as tables D.3, D4 and D.5 from Annex D of ETSI EN 301 893 V2.1.1 (2017-05)</td>
<td>For non-overlapping channels in the 5725 – 5850 MHz band the radar signatures from ETSI EN 302 502 V2.1.1 (2017-03) need to be applied

For overlapping channels in the 5470 – 5850 MHz</td>
</tr>
</table>

			band the radar signatures from both ETSI EN 301 893 V2.1.1 (2017-05) and ETSI EN 302 502 V2.1.1 (2017-03) need to be applied.
Adaptivity	4.2.7 of ETSI EN 301 893 V2.1.1 (2017-05) 4.8 of ETSI EN 301 893 V1.8.1 (2015-03)	Use limits from 4.2.7 ETSI EN 301 893 V2.1.1 (2017-05). Refer to Figure 3 in Annex 1 of this VNS instead of Figure 3 in 4.2.7.3.2.3 of ETSI EN 301 893 V2.1.1 (2017-05) Until 12 June 2018, limits from 4.8 of EN 301 893 V1.8.1 may be used. After that date, only limits from 4.2.7 ETSI EN 301 893 V2.1.1 (2017-05) may be used.	
Receiver Blocking	4.2.8 of ETSI EN 301 893 V2.1.1 (2017-05)	Use limits from 4.2.8 of ETSI EN 301 893 V2.1.1 (2017-05)	
User Access Restrictions	4.2.9 of ETSI EN 301 893 V2.1.1 (2017-05)	Use limits from 4.2.9 of ETSI EN 301 893 V2.1.1 (2017-05)	
Geo-location	4.2.10 of ETSI EN 301 893 V2.1.1 (2017-05)	Use limits from 4.2.10 of ETSI EN 301 893 V2.1.1 (2017-05)	

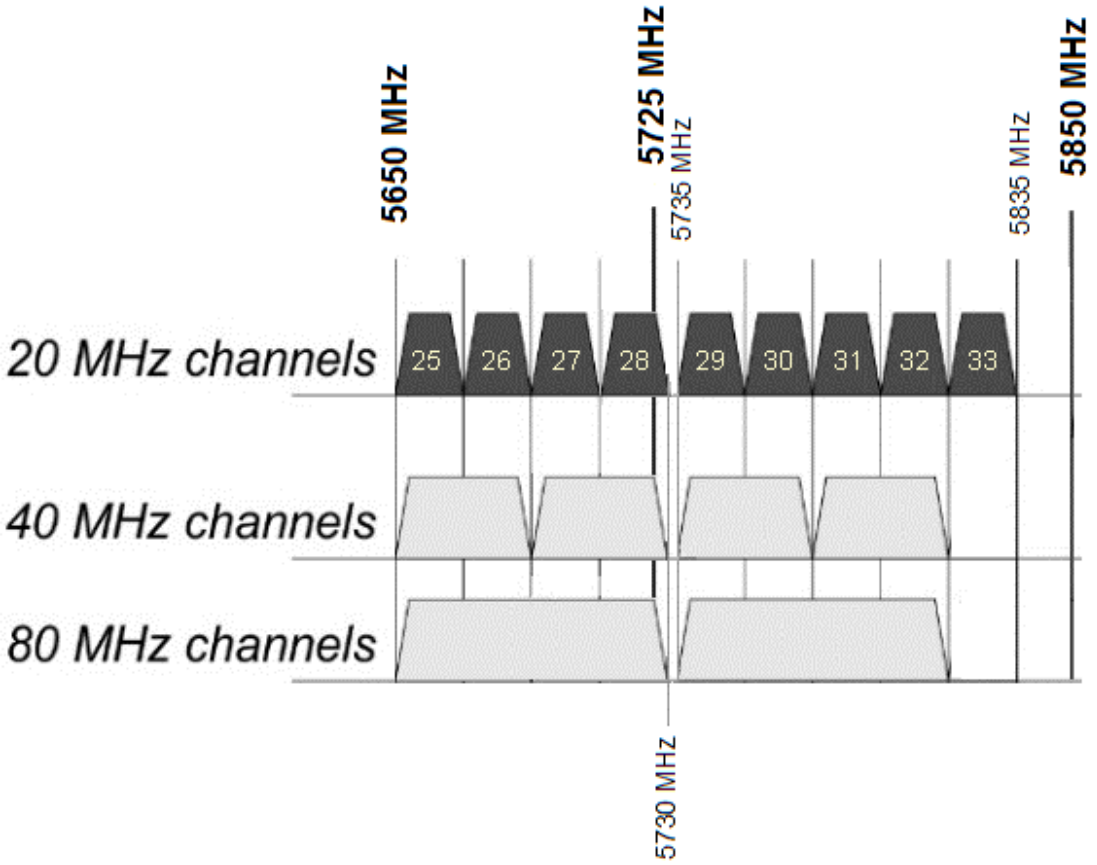
3.2 Where the 5150 – 5350 MHz and 5470 – 5725 MHz frequency ranges are referred to in ETSI EN 301 893 V2.1.1 (2017-05) and ETSI EN 302 502 V2.1.1 (2017-03), appropriate translation may be needed for the 5725 – 5850 MHz band.

Annex 1

Channel Bonding

A1.1 This annex gives an alternative to Figure 3 in 4.2.7.3.2.3 of ETSI EN 301 893 V2.1.1 (2017-05)

Figure 3: Channel Bonding



Annex 2

Overview and Intention of 5.8 GHz WAS/RLAN technical parameters

A2.1 This annex gives an informative overview and intention of the technical characteristics and parameters for 5.8 GHz WAS / RLAN.

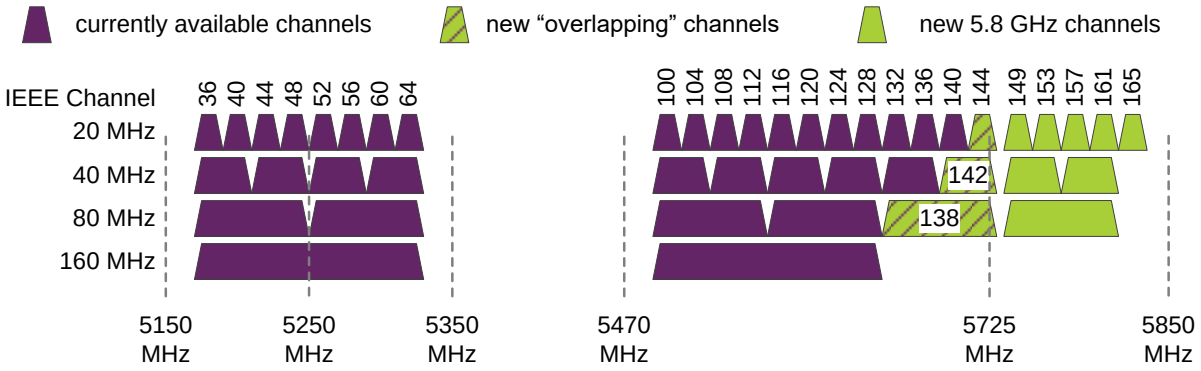


Figure A1: Existing 5 GHz RLAN channels and the new channels we are making available[2]

A2.2 Users of licence-exempt devices need to be aware that there are no guarantees that the spectrum will be free of interference. However, by defining the maximum transmit power, along with other characteristics, this keeps the probability of undue interference low.

A2.3 WAS/RLANs which operate in the 5725 – 5850 sub-band must comply with the technical parameters set out in the Regulations and IR2030. The limits are summarised below in Table A1. In setting this limit, we aimed to authorise the least restrictive conditions which were also appropriately cautious in relation to interference to other services, based on studies at the time. This is to maximise benefits to consumers of Wi-Fi services while avoiding negative impacts on other users.

[2] Note that different channel labels are used compared with ‘Nominal Centre Frequencies’ in section 3 and Figure 3 in Annex 1.

Table A1: Summary of technical parameters for 5725-5850 MHz WAS/RLAN[3]

Radiated Power Limit:	200 mW EIRP
Location Restrictions:	No Fixed Outdoor[4]
Channel access and occupation rules:	Normal WAS/RLAN channel access and occupation rules

A2.4 Although compliance with the above technical parameters is a matter for manufacturers and operators to determine for themselves, certain Dynamic Frequency Selection ('DFS') techniques may be useful in meeting those requirements. The references set out in Table A2 may be helpful in providing a single, overall technique for achieving mitigation for preventing interference to radars.

Table A2: Summary of DFS techniques which may be usefully applied for 5725-5850 MHz WAS/RLAN[5]

DFS requirements inc. detection threshold	ETSI EN 301 893
and	
DFS detection radar patterns	ETSI EN 302 502

A2.5 On matters *other* than the detection of radar test patterns (for example, detection thresholds), the requirements from ETSI EN 301 893 might be usefully applied, in the same way as they apply to the use of Wi-Fi/RLAN/WAS in the 5150 – 5350 MHz and 5470 – 5725 MHz bands.

A2.6 With respect to the detection of radar patterns that should be detected, the requirements of ETSI EN 302 502 (5.8 GHz) standard might usefully be applied. This is a standard currently applicable to higher power fixed broadband covering the 5.8 GHz band, and as such, the patterns already reflect the radar systems that use these specific frequencies.

A2.7 ETSI EN 302 502 is not relevant as far as detection thresholds and other requirements are concerned. This is because ETSI EN 302 502 was designed with higher power fixed equipment in mind.

A2.8 On everything other than radar patterns, the requirements from ETSI EN 301 893 (5.4 GHz), which is a standard designed for Wi-Fi/RLAN/WAS, applies. This will also ensure that equipment used in the 5.8 GHz band may comply with the Radio Equipment Directive.

[3] See Interface requirement 2030

[4] Aeronautical mobile use is not permitted. The apparatus may also be used airborne within an aircraft, only to establish a connection with a station or apparatus within the same aircraft.

[5] See Interface requirement 2030

A2.9 Additionally, for those channels which fall in both the existing 5470 – 5725 MHz Wi-Fi band and the 5725 – 5850 MHz band, the limits summarised below in Table A3 apply.

Table A3: Summary of 'normative' technical parameters for WAS/RLAN channels which have a bandwidth in both 5470-5725 MHz and 5725-5730 MHz only[6]

Radiated Power Limit	1 W EIRP
Location Restrictions	<none>
Channel access and occupation rules:	Normal WAS/RLAN channel access and occupation rules

A2.10 Again, compliance with the technical parameters set out above is a matter for manufacturers and operators to determine for themselves. However, certain DFS techniques may be usefully applied when using frequencies which fall within both the 5740 – 5725 MHz and 5725 – 5730 MHz bands. Table A4 sets out the DFS techniques which may be usefully applied when operating in these frequencies.

Table A4: Summary of DFS techniques which may be usefully applied for WAS/RLAN channels which have a bandwidth in both 5470-5725 MHz and 5725-5730 MHz only[7]

DFS requirements inc. detection threshold	ETSI EN 301 893
and	
DFS detection radar patterns	ETSI EN 301 893 & ETSI EN 302 502

A2.11 Where overlapping channels that fall within frequencies 5725 MHz – 5730 MHz are being used at the higher radiated power level of 1 W EIRP, we would suggest that two forms of mitigation may be appropriate in order to meet the above channel access and occupation rules. The detection thresholds for channels 138, 142 and 144 (equivalent channels: 28, 28+29 or 25+26+27+28, refer to figure 3) are taken from ETSI EN 301 893 (as applied to the 5740 – 5725 MHz band) and the radar patterns (radar test signals) to be detected are taken from both ETSI EN 301 893 and ETSI EN 302 502, as suggested for the 5725 – 5850 MHz band above. We believe that the detection thresholds from ETSI EN 301 893 are more appropriate than those in ETSI EN 302 502 because WAS/RLAN will be limited to a radiated power level of 1 W EIRP. This is the same radiated power level as existing WAS/RLAN equipment operating in the 5470 – 5725 MHz band and lower than the 4 W EIRP radiated power limit for 5.8 GHz BFWA.

[6] IEEE 802.11 channels in both the 5470-5725 and 5725-5730 MHz bands are:
Channel 138: 5650-5730 MHz
Channel 142: 5690-5730 MHz
Channel 144: 5710-5730 MHz
See Interface requirement 2030

[7] See Interface requirement 2030

A2.12 These limits for the 5725 – 5730 MHz frequencies are, overall, more relaxed than those for channels which fall wholly within the 5725 – 5850 MHz band, but this relaxation is justified because the consequent risk of interference to incumbent services in these ‘overlapping channels is low, principally because these channels all have an upper edge at 5730 MHz and so only extend 5 MHz into the 5725 – 5850 MHz band.

Annex 3

Change History

Version	Information about changes
1.0	First published version 13 July 2017

Document history		
V1.0	13 July 2017	Publication