FCC Measurement/Technical Report on

Infotainment Controller
VCE CDC

FCC ID: NT8-VCECDC
IC: 3043A-VCECDC

Test Report Reference: MDE_VIS_1910_FCC_04

Test Laboratory:
7layers GmbH
Borsigstrasse 11
40880 Ratingen
Germany

DAkkS Deutsche Akkreditierungsstelle
D-PL-12140-01-01
D-PL-12140-01-02
D-PL-12140-01-03

Note:
The following test results relate only to the devices specified in this document. This report shall not be reproduced in parts without the written approval of the test laboratory.

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1 APPLIED STANDARDS AND TEST SUMMARY

1.1 APPLIED STANDARDS

Type of Authorization
Certification for an Intentional Radiator (Digital Device / Spread Spectrum).

Applicable FCC Rules

Prepared in accordance with the requirements of FCC Rules and Regulations as listed in 47 CFR Ch.1 Parts 2 and 15 (10-1-23 Edition). The following subparts are applicable to the results in this test report.

Part 2, Subpart J - Equipment Authorization Procedures, Certification

Part 15, Subpart C – Intentional Radiators

§ 15.201 Equipment authorization requirement

§ 15.207 Conducted limits

§ 15.209 Radiated emission limits; general requirements

Part 15, Subpart E – Unlicensed National Information Infrastructure Devices

§ 15.403 Definitions

§ 15.407 General technical requirements

Note:
The tests were selected and performed with reference to the FCC KDB "Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E, 789033 D02 General U-NII Test Procedures New Rules v02r01, 2017-12-14".
and
"GUIDELINES FOR COMPLIANCE TESTING OF UNLICENSED NATIONAL INFORMATION INFRASTRUCTURE 6 GHz (U-NII) DEVICES PART 15, SUBPART E, 987594 D02 U-NII 6GHz EMC Measurement v01r01, 2021-02-04".

ANSI C63.10-2013 is applied.

1.2 FCC-IC CORRELATION TABLE

Correlation of measurement requirements for UNII / LE-LAN (e.g. WLAN 5 GHz) equipment from FCC and IC

UNII equipment

Measurement	FCC reference	IC reference
Conducted emissions on AC Mains	§ 15.207	RSS-Gen Issue 5 & AMD 1 & AMD 2: 8.8
Occupied bandwidth	§ 15.403 (26 dB) / § 15.407 (e) (6 dB)	RSS-247 Issue 3: 6.2.1.1, 6.2.2.1, 6.2.3.1 (99%) RSS-247 Issue 3: 6.2.4.2 (6 dB) RSS-248 Issue 2: 4.4
Maximum conducted output power	§ 15.407 (a) (1) to (8), (11)	RSS-247 Issue 3: 6.2.1.1, 6.2.2.1, 6.2.3.1, 6.2.4.2 RSS-248 Issue 2: 4.5
Maximum power spectral density	§ 15.407 (a) (1) to (8), (12)	RSS-247 Issue 3: 6.2.1.1, 6.2.2.1, 6.2.3.1, 6.2.4.1 RSS-248 Issue 2: 4.5
Transmitter undesirable emissions; General Field Strength Limits, Restricted Bands, In-Band Emissions	§ 15.407 (b) § 15.209 (a)	RSS-Gen Issue 5: 6.13/8.9/8.10; RSS-247 Issue 3: 3.3/6.2 6.2.1.2, 6.2.2.2, 6.2.3.2, 6.2.4.2 RSS-248 Issue 2: 4.6
Frequency stability	§ 15.407 (g)	RSS-Gen Issue 5: 6.11/8.11
Transmit Power Control (TPC) and Dynamic Frequency Selection (DFS)	§ 15.407 (h)	RSS-247 Issue 3: 6.2.2.1, 6.2.3.1, 6.3
Antenna requirement	§ 15.203 / 15.204 § 15.407 (a) (9)	RSS-Gen Issue 5 & AMD 1 & AMD 2: 8.3
Contention Based Protocol	§ 15.407 (d) (6)	RSS-248 Issue 2: 4.7
Receiver spurious emissions	–	-

1.3 MEASUREMENT SUMMARY

47 CFR CHAPTER I FCC PART 15 Subpart E §15.407	FCC §15.31, §15.403 (i)			
26 dB Bandwidth The measurement was performed according to ANSI C63.10, chapter 12.4.1			Final Result	
OP-Mode Radio Technology, Operating Frequency, Subband	Setup	Date	FCC	IC
WLAN a, high, U-NII-1	S01_AF01	2024-03-05	Performed	N/A
WLAN a, high, U-NII-3	S01_AM01	2024-09-13	Performed	N/A
WLAN a, low, U-NII-1	S01_AF01	2024-03-05	Performed	N/A
WLAN a, low, U-NII-3	S01_AM01	2024-09-13	Performed	N/A
WLAN a, mid, U-NII-1	S01_AF01	2024-03-05	Performed	N/A
WLAN a, mid, U-NII-3	S01_AM01	2024-09-13	Performed	N/A
WLAN ac 20 MHz, high, U-NII-1	S01_AF01	2024-03-05	Performed	N/A
WLAN ac 20 MHz, high, U-NII-3	S01_AM01	2024-09-13	Performed	N/A
WLAN ac 20 MHz, low, U-NII-1	S01_AF01	2024-03-05	Performed	N/A
WLAN ac 20 MHz, low, U-NII-3	S01_AM01	2024-09-13	Performed	N/A
WLAN ac 20 MHz, mid, U-NII-1	S01_AF01	2024-03-05	Performed	N/A
WLAN ac 20 MHz, mid, U-NII-3	S01_AM01	2024-09-13	Performed	N/A
WLAN ac 40 MHz, high, U-NII-1	S01_AF01	2024-03-06	Performed	N/A
WLAN ac 40 MHz, high, U-NII-3	S01_AM01	2024-09-13	Performed	N/A
WLAN ac 40 MHz, low, U-NII-1	S01_AF01	2024-03-06	Performed	N/A
WLAN ac 40 MHz, low, U-NII-3	S01_AM01	2024-09-13	Performed	N/A
WLAN ac 80 MHz, low, U-NII-3	S01_AM01	2024-09-13	Performed	N/A
WLAN ac 80 MHz, mid, U-NII-1	S01_AF01	2024-03-06	Performed	N/A
WLAN n 20 MHz, high, U-NII-1	S01_AF01	2024-03-05	Performed	N/A
WLAN n 20 MHz, high, U-NII-3	S01_AM01	2024-09-13	Performed	N/A
WLAN n 20 MHz, low, U-NII-1	S01_AF01	2024-03-05	Performed	N/A
WLAN n 20 MHz, low, U-NII-3	S01_AM01	2024-09-13	Performed	N/A
WLAN n 20 MHz, mid, U-NII-1	S01_AF01	2024-03-05	Performed	N/A
WLAN n 20 MHz, mid, U-NII-3	S01_AM01	2024-09-13	Performed	N/A
WLAN n 40 MHz, high, U-NII-1	S01_AF01	2024-03-06	Performed	N/A
WLAN n 40 MHz, high, U-NII-3	S01_AM01	2024-09-13	Performed	N/A
WLAN n 40 MHz, low, U-NII-1	S01_AF01	2024-03-06	Performed	N/A
WLAN n 40 MHz, low, U-NII-3	S01_AM01	2024-09-13	Performed	N/A

47 CFR CHAPTER I FCC PART 15 Subpart E §15.407 | FCC §15.31, §15.407 (e)

6 dB Bandwidth

The measurement was performed according to ANSI C63.10, chapter 6.9.2 | Final Result

OP-Mode Radio Technology, Operating Frequency, Subband	Setup	Date	FCC	IC
WLAN a, high, U-NII-3	S01_AM01	2024-09-13	Passed	Passed
WLAN a, low, U-NII-3	S01_AM01	2024-09-13	Passed	Passed
WLAN a, mid, U-NII-3	S01_AM01	2024-09-13	Passed	Passed
WLAN ac 20 MHz, high, U-NII-3	S01_AM01	2024-09-13	Passed	Passed
WLAN ac 20 MHz, low, U-NII-3	S01_AM01	2024-09-13	Passed	Passed
WLAN ac 20 MHz, mid, U-NII-3	S01_AM01	2024-09-13	Passed	Passed
WLAN ac 40 MHz, high, U-NII-3	S01_AM01	2024-09-13	Passed	Passed
WLAN ac 40 MHz, low, U-NII-3	S01_AM01	2024-09-13	Passed	Passed
WLAN ac 80 MHz, low, U-NII-3	S01_AM01	2024-09-13	Passed	Passed
WLAN n 20 MHz, high, U-NII-3	S01_AM01	2024-09-13	Passed	Passed
WLAN n 20 MHz, low, U-NII-3	S01_AM01	2024-09-13	Passed	Passed
WLAN n 20 MHz, mid, U-NII-3	S01_AM01	2024-09-13	Passed	Passed
WLAN n 40 MHz, high, U-NII-3	S01_AM01	2024-09-13	Passed	Passed
WLAN n 40 MHz, low, U-NII-3	S01_AM01	2024-09-13	Passed	Passed

47 CFR CHAPTER I FCC PART 15 Subpart E §15.407 | FCC §15.31, IC RSS 247 Ch. 6.2.x

99 % Bandwidth

The measurement was performed according to ANSI C63.10, chapter 12.4.2 (6.9.3) | Final Result

OP-Mode Radio Technology, Operating Frequency, Subband	Setup	Date	FCC	IC
WLAN a, high, U-NII-1	S01_AM01	2024-09-03	N/A	Performed
WLAN a, high, U-NII-3	S01_AM01	2024-09-13	N/A	Performed
WLAN a, low, U-NII-1	S01_AM01	2024-09-03	N/A	Performed
WLAN a, low, U-NII-3	S01_AM01	2024-09-13	N/A	Performed
WLAN a, mid, U-NII-1	S01_AM01	2024-09-03	N/A	Performed
WLAN a, mid, U-NII-3	S01_AM01	2024-09-13	N/A	Performed
WLAN ac 20 MHz, high, U-NII-1	S01_AM01	2024-09-03	N/A	Performed
WLAN ac 20 MHz, high, U-NII-3	S01_AM01	2024-09-13	N/A	Performed
WLAN ac 20 MHz, low, U-NII-1	S01_AM01	2024-09-03	N/A	Performed
WLAN ac 20 MHz, low, U-NII-3	S01_AM01	2024-09-13	N/A	Performed
WLAN ac 20 MHz, mid, U-NII-1	S01_AM01	2024-09-03	N/A	Performed
WLAN ac 20 MHz, mid, U-NII-3	S01_AM01	2024-09-13	N/A	Performed
WLAN ac 40 MHz, high, U-NII-1	S01_AM01	2024-09-03	N/A	Performed
WLAN ac 40 MHz, high, U-NII-3	S01_AM01	2024-09-13	N/A	Performed
WLAN ac 40 MHz, low, U-NII-1	S01_AM01	2024-09-03	N/A	Performed
WLAN ac 40 MHz, low, U-NII-3	S01_AM01	2024-09-13	N/A	Performed
WLAN ac 80 MHz, low, U-NII-3	S01_AM01	2024-09-13	N/A	Performed

47 CFR CHAPTER I FCC PART 15 Subpart E §15.407	FCC §15.31, IC RSS 247 Ch. 6.2.x

99 % Bandwidth

The measurement was performed according to ANSI C63.10, chapter 12.4.2 (6.9.3) — Final Result

OP-Mode Radio Technology, Operating Frequency, Subband	Setup	Date	FCC	IC
WLAN ac 80 MHz, mid, U-NII-1	S01_AM01	2024-09-03	N/A	Performed
WLAN n 20 MHz, high, U-NII-1	S01_AM01	2024-09-03	N/A	Performed
WLAN n 20 MHz, high, U-NII-3	S01_AM01	2024-09-13	N/A	Performed
WLAN n 20 MHz, low, U-NII-1	S01_AM01	2024-09-03	N/A	Performed
WLAN n 20 MHz, low, U-NII-3	S01_AM01	2024-09-13	N/A	Performed
WLAN n 20 MHz, mid, U-NII-1	S01_AM01	2024-09-03	N/A	Performed
WLAN n 20 MHz, mid, U-NII-3	S01_AM01	2024-09-13	N/A	Performed
WLAN n 40 MHz, high, U-NII-1	S01_AM01	2024-09-03	N/A	Performed
WLAN n 40 MHz, high, U-NII-3	S01_AM01	2024-09-13	N/A	Performed
WLAN n 40 MHz, low, U-NII-1	S01_AM01	2024-09-03	N/A	Performed
WLAN n 40 MHz, low, U-NII-3	S01_AM01	2024-09-13	N/A	Performed

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Maximum Conducted Output Power

The measurement was performed according to ANSI C63.10, chapter 12.3.3.2 — Final Result

OP-Mode Radio Technology, Operating Frequency, Subband	Setup	Date	FCC	IC
WLAN a, high, U-NII-1	S01_AF01	2024-03-05	Passed	Passed
WLAN a, high, U-NII-3	S01_AM01	2024-09-13	Passed	Passed
WLAN a, low, U-NII-1	S01_AF01	2024-03-05	Passed	Passed
WLAN a, low, U-NII-3	S01_AM01	2024-09-13	Passed	Passed
WLAN a, mid, U-NII-1	S01_AF01	2024-03-05	Passed	Passed
WLAN a, mid, U-NII-3	S01_AM01	2024-09-13	Passed	Passed
WLAN ac 20 MHz, high, U-NII-1	S01_AF01	2024-03-05	Passed	Passed
WLAN ac 20 MHz, high, U-NII-3	S01_AM01	2024-09-13	Passed	Passed
WLAN ac 20 MHz, low, U-NII-1	S01_AF01	2024-03-05	Passed	Passed
WLAN ac 20 MHz, low, U-NII-3	S01_AM01	2024-09-13	Passed	Passed
WLAN ac 20 MHz, mid, U-NII-1	S01_AF01	2024-03-05	Passed	Passed
WLAN ac 20 MHz, mid, U-NII-3	S01_AM01	2024-09-13	Passed	Passed
WLAN ac 40 MHz, high, U-NII-1	S01_AF01	2024-03-06	Passed	Passed
WLAN ac 40 MHz, high, U-NII-3	S01_AM01	2024-09-13	Passed	Passed
WLAN ac 40 MHz, low, U-NII-1	S01_AF01	2024-03-06	Passed	Passed
WLAN ac 40 MHz, low, U-NII-3	S01_AM01	2024-09-13	Passed	Passed
WLAN ac 80 MHz, low, U-NII-3	S01_AM01	2024-09-13	Passed	Passed
WLAN ac 80 MHz, mid, U-NII-1	S01_AF01	2024-03-06	Passed	Passed
WLAN n 20 MHz, high, U-NII-1	S01_AF01	2024-03-05	Passed	Passed
WLAN n 20 MHz, high, U-NII-3	S01_AM01	2024-09-13	Passed	Passed

47 CFR CHAPTER I FCC PART 15 Subpart E §15.407	FCC §15.31, §15.407 (a)(1)			
Maximum Conducted Output Power The measurement was performed according to ANSI C63.10, chapter 12.3.3.2			Final Result	
OP-Mode Radio Technology, Operating Frequency, Subband	Setup	Date	FCC	IC
WLAN n 20 MHz, low, U-NII-1	S01_AF01	2024-03-05	Passed	Passed
WLAN n 20 MHz, low, U-NII-3	S01_AM01	2024-09-13	Passed	Passed
WLAN n 20 MHz, mid, U-NII-1	S01_AF01	2024-03-05	Passed	Passed
WLAN n 20 MHz, mid, U-NII-3	S01_AM01	2024-09-13	Passed	Passed
WLAN n 40 MHz, high, U-NII-1	S01_AF01	2024-03-06	Passed	Passed
WLAN n 40 MHz, high, U-NII-3	S01_AM01	2024-09-13	Passed	Passed
WLAN n 40 MHz, low, U-NII-1	S01_AF01	2024-03-06	Passed	Passed
WLAN n 40 MHz, low, U-NII-3	S01_AM01	2024-09-13	Passed	Passed

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Peak Power Spectral Density The measurement was performed according to ANSI C63.10, chapter 12.5 (SA-3)			Final Result	
OP-Mode Radio Technology, Operating Frequency, Subband	Setup	Date	FCC	IC
WLAN a, high, U-NII-1	S01_AF01	2024-03-05	Passed	Passed
WLAN a, high, U-NII-3	S01_AM01	2024-09-13	Passed	Passed
WLAN a, low, U-NII-1	S01_AF01	2024-03-05	Passed	Passed
WLAN a, low, U-NII-3	S01_AM01	2024-09-13	Passed	Passed
WLAN a, mid, U-NII-1	S01_AF01	2024-03-05	Passed	Passed
WLAN a, mid, U-NII-3	S01_AM01	2024-09-13	Passed	Passed
WLAN ac 20 MHz, high, U-NII-1	S01_AF01	2024-03-05	Passed	Passed
WLAN ac 20 MHz, high, U-NII-3	S01_AM01	2024-09-13	Passed	Passed
WLAN ac 20 MHz, low, U-NII-1	S01_AF01	2024-03-05	Passed	Passed
WLAN ac 20 MHz, low, U-NII-3	S01_AM01	2024-09-13	Passed	Passed
WLAN ac 20 MHz, mid, U-NII-1	S01_AF01	2024-03-05	Passed	Passed
WLAN ac 20 MHz, mid, U-NII-3	S01_AM01	2024-09-13	Passed	Passed
WLAN ac 40 MHz, high, U-NII-1	S01_AF01	2024-03-06	Passed	Passed
WLAN ac 40 MHz, high, U-NII-3	S01_AM01	2024-09-13	Passed	Passed
WLAN ac 40 MHz, low, U-NII-1	S01_AF01	2024-03-06	Passed	Passed
WLAN ac 40 MHz, low, U-NII-3	S01_AM01	2024-09-13	Passed	Passed
WLAN ac 80 MHz, low, U-NII-3	S01_AM01	2024-09-13	Passed	Passed
WLAN ac 80 MHz, mid, U-NII-1	S01_AF01	2024-03-06	Passed	Passed
WLAN n 20 MHz, high, U-NII-1	S01_AF01	2024-03-05	Passed	Passed
WLAN n 20 MHz, high, U-NII-3	S01_AM01	2024-09-13	Passed	Passed
WLAN n 20 MHz, low, U-NII-1	S01_AF01	2024-03-05	Passed	Passed
WLAN n 20 MHz, low, U-NII-3	S01_AM01	2024-09-13	Passed	Passed
WLAN n 20 MHz, mid, U-NII-1	S01_AF01	2024-03-05	Passed	Passed

47 CFR CHAPTER I FCC PART 15 Subpart E §15.407	FCC §15.31, §15.407 (a) (1),(5)

Peak Power Spectral Density

The measurement was performed according to ANSI C63.10, chapter 12.5 (SA-3)

Final Result

OP-Mode Radio Technology, Operating Frequency, Subband	Setup	Date	FCC	IC
WLAN n 20 MHz, mid, U-NII-3	S01_AM01	2024-09-13	Passed	Passed
WLAN n 40 MHz, high, U-NII-1	S01_AF01	2024-03-06	Passed	Passed
WLAN n 40 MHz, high, U-NII-3	S01_AM01	2024-09-13	Passed	Passed
WLAN n 40 MHz, low, U-NII-1	S01_AF01	2024-03-06	Passed	Passed
WLAN n 40 MHz, low, U-NII-3	S01_AM01	2024-09-13	Passed	Passed

47 CFR CHAPTER I FCC PART 15 Subpart E §15.407	FCC §15.407 (b), (1),(2),(3),(4); FCC §15.205, §15.209, §15.407 (b) (5),(6)

Undesirable Emissions; General Field Strength Limits

The measurement was performed according to ANSI C63.10, chapter 6.4, 6.5, 6.6.5

Final Result

OP-Mode Radio Technology, Operating Frequency, Measurement range, Subband	Setup	Date	FCC	IC
WLAN a, high, 1GHz - 26GHz, U-NII-1	S01_AB01	2024-04-13	Passed	Passed
WLAN a, high, 1GHz - 26GHz, U-NII-3	S01_AB01	2024-04-13	Passed	Passed
WLAN a, low, 1GHz - 26GHz, U-NII-1	S01_AB01	2024-03-12	Passed	Passed
WLAN a, low, 1GHz - 26GHz, U-NII-3	S01_AB01	2024-04-13	Passed	Passed
WLAN a, low, 9kHz - 30MHz, U-NII-1	S01_AB01	2024-03-14	Passed	Passed
WLAN a, mid, 1GHz - 26GHz, U-NII-1	S01_AB01	2024-04-13	Passed	Passed
WLAN a, mid, 1GHz - 26GHz, U-NII-3	S01_AB01	2024-04-13	Passed	Passed
WLAN a, mid, 26GHz - 40GHz, U-NII-1	S01_AB01	2024-04-13	Passed	Passed
WLAN a, mid, 26GHz - 40GHz, U-NII-3	S01_AB01	2024-04-13	Passed	Passed
WLAN a, mid, 30MHz - 1GHz, U-NII-1	S01_AB01	2024-04-13	Passed	Passed
WLAN a, mid, 30MHz - 1GHz, U-NII-3	S01_AB01	2024-04-13	Passed	Passed
WLAN n 20 MHz, high, 1GHz - 26GHz, U-NII-1 Remark: 1GHz-18GHz tested	S01_AB01	2024-04-03	Passed	Passed
WLAN n 20 MHz, high, 1GHz - 26GHz, U-NII-3 Remark: 1GHz-18GHz tested	S01_AB01	2024-04-19	Passed	Passed
WLAN n 20 MHz, low, 1GHz - 26GHz, U-NII-1 Remark: 1GHz-18GHz tested	S01_AB01	2024-03-31	Passed	Passed
WLAN n 20 MHz, low, 1GHz - 26GHz, U-NII-3 Remark: 1GHz-18GHz tested	S01_AB01	2024-04-19	Passed	Passed
WLAN n 20 MHz, mid, 1GHz - 26GHz, U-NII-1 Remark: 1GHz-18GHz tested	S01_AB01	2024-04-03	Passed	Passed
WLAN n 20 MHz, mid, 1GHz - 26GHz, U-NII-3 Remark: 1GHz-18GHz tested	S01_AB01	2024-04-19	Passed	Passed
WLAN n 40 MHz, high, 1GHz - 26GHz, U-NII-1	S01_AB01	2024-04-19	Passed	Passed
WLAN n 40 MHz, high, 1GHz - 26GHz, U-NII-3	S01_AB01	2024-04-19	Passed	Passed
WLAN n 40 MHz, high, 30MHz - 1GHz, U-NII-3	S01_AB01	2024-04-19	Passed	Passed
WLAN n 40 MHz, low, 1GHz - 26GHz, U-NII-1	S01_AB01	2024-04-19	Passed	Passed
WLAN n 40 MHz, low, 1GHz - 26GHz, U-NII-3	S01_AB01	2024-04-19	Passed	Passed

47 CFR CHAPTER I FCC PART 15 Subpart E §15.407	FCC §15.407 (b), (1),(2),(3),(4); FCC §15.205, §15.209, §15.407 (b) (5),(6)

Undesirable Emissions; General Field Strength Limits

The measurement was performed according to ANSI C63.10, chapter 6.4, 6.5, 6.6.5 — Final Result

OP-Mode Radio Technology, Operating Frequency, Measurement range, Subband	Setup	Date	FCC	IC
WLAN n 40 MHz, low, 30MHz - 1GHz, U-NII-1	S01_AB01	2024-04-19	Passed	Passed
WLAN n 40 MHz, low, 9kHz - 30MHz, U-NII-1	S01_AB01	2024-03-14	Passed	Passed

47 CFR CHAPTER I FCC PART 15 Subpart E §15.407	FCC §15.407 (b), (1),(2),(3),(4)

Band Edge

The measurement was performed according to ANSI C63.10, chapter 6.6.5 — Final Result

OP-Mode Radio Technology, Operating Frequency, Subband	Setup	Date	FCC	IC
WLAN a, high, U-NII-3	S01_AB01	2024-04-01	Passed	Passed
WLAN a, low, U-NII-1	S01_AB01	2024-03-12	Passed	Passed
WLAN a, low, U-NII-3	S01_AB01	2024-03-28	Passed	Passed
WLAN ac 20 MHz, high, U-NII-3	S01_AB01	2024-04-09	Passed	Passed
WLAN ac 20 MHz, low, U-NII-1	S01_AB01	2024-04-09	Passed	Passed
WLAN ac 20 MHz, low, U-NII-3	S01_AB01	2024-04-09	Passed	Passed
WLAN ac 40 MHz, high, U-NII-3	S01_AB01	2024-04-09	Passed	Passed
WLAN ac 40 MHz, low, U-NII-1	S01_AB01	2024-04-11	Passed	Passed
WLAN ac 40 MHz, low, U-NII-3	S01_AB01	2024-06-08	Passed	Passed
WLAN ac 80 MHz, low, U-NII-3	S01_AB01	2024-04-24	Passed	Passed
WLAN ac 80 MHz, mid, U-NII-1	S01_AB01	2024-04-15	Passed	Passed
WLAN n 20 MHz, high, U-NII-3	S01_AB01	2024-04-14	Passed	Passed
WLAN n 20 MHz, low, U-NII-1	S01_AB01	2024-03-31	Passed	Passed
WLAN n 20 MHz, low, U-NII-3	S01_AB01	2024-04-09	Passed	Passed
WLAN n 40 MHz, high, U-NII-3	S01_AB01	2024-04-08	Passed	Passed
WLAN n 40 MHz, low, U-NII-1	S01_AB01	2024-04-04	Passed	Passed
WLAN n 40 MHz, low, U-NII-3	S01_AB01	2024-04-08	Passed	Passed

N/A: Not applicable
N/P: Not performed

2 REVISION HISTORY / SIGNATURES

Report version control			
Version	**Release date**	**Change Description**	**Version validity**
initial	2024-09-19	--	valid
--	--	--	--

COMMENT: -

(responsible for accreditation scope)
Dipl.-Ing. Robert Machulec

(responsible for testing and report)
MSc. Joel Asongwe

7 layers GmbH, Borsigstr. 11
40880 Ratingen, Germany
Phone +49 (0)2102 749 0

3 ADMINISTRATIVE DATA

3.1 TESTING LABORATORY

Company Name:	7layers GmbH
Address:	Borsigstr. 11 40880 Ratingen Germany

The test facility is accredited by the following accreditation organisation:

Laboratory accreditation no:	DAkkS D-PL-12140-01-01| -02 | -03
FCC Designation Number:	DE0015
FCC Test Firm Registration:	929146
ISED CAB Identifier	DE0007; ISED#: 3699A
Responsible for accreditation scope:	Dipl.-Ing. Robert Machulec
Report Template Version:	2023-09-29

3.2 PROJECT DATA

Responsible for testing and report:	MSc. Joel Asongwe
Employees who performed the tests:	documented internally at 7Layers
Date of Report:	2024-09-19
Testing Period:	2024-03-05 to 2024-09-13

3.3 APPLICANT DATA

Company Name:	Visteon Corporation
Address:	One Village Center Drive Van Buren Township, MI, 48111 United States
Contact Person:	Mr. Martin Tapankov

3.4 MANUFACTURER DATA

Company Name:	please see Applicant Data
Address:	
Contact Person:	

4 TEST OBJECT DATA

4.1 GENERAL EUT DESCRIPTION

Kind of Device product description	The device is an Infotainment controller with Bluetooth and WiFi connectivity supporting reception of AM/FM and DAB broadcasts.
Product name	Infotainment Controller
Type	VCE CDC
Declared EUT data by the supplier	
Voltage Type	DC (vehicular battery)
Voltage Level	14.4 V
Antenna / Gain	External / 0.5 dBi
Tested Modulation Type	OFDM
Specific product description for the EUT	The EUT supports Wi-Fi 5 GHz. For WLAN the EUT is supporting followings bands and modes in the 5 GHz band: - WLAN a-mode 20 MHz - WLAN n-mode 20 MHz and n 40 MHz (SISO) - WLAN ac-mode 20 MHz, 40 MHz, and 80 MHz (SISO) The U-NII bands 1 and 3 are supported
EUT ports (connected cables during testing):	- Wi-Fi/Bluetooth antenna (connected to ANC 1) - AM/FM/DAB tuner antenna (connected to ANC 2) - Cable harness (connected to AUX 1) - 2x USB (connected to AUX 1) - 4x Camera (connected to AUX 1) - 3x Display (connected to AUX 1) - 5x Ethernet 100Base-T1 (connected to AUX 1)
Tested datarates	WLAN a: 6 Mbit WLAN n: MCS 0 WLAN ac: MCS 0
Special software used for testing	The Qualcomm Radio Control Tool (QRCT) is used to put the EUT into test mode.

4.2 EUT MAIN COMPONENTS

Sample Name	Sample Code	Description
EUT ab01	DE1105017ab01	Radiated sample
Sample Parameter	Value	
Serial No.	T23286090	
HW Version	VPMBEF-19C034-AJ	
SW Version	3.16.7	
Comment	-	

Sample Name	Sample Code	Description
EUT af01	DE1105017af01	Conducted sample
Sample Parameter	Value	
Serial No.	T23286087	
HW Version	VPMBEF-19C034-AJ	
SW Version	3.16.7	
Comment	External antenna replaced by SMA connector	

Sample Name	Sample Code	Description
EUT am01	DE1105017am01	Conducted sample
Sample Parameter	Value	
Serial No.	T23286093	
HW Version	VPMBEF-19C034-AJ	
SW Version	3.16.7	
Comment	External antenna replaced by SMA connector	

NOTE:The short description is used to simplify the identification of the EUT in this test report.

4.3 ANCILLARY EQUIPMENT

For the purposes of this test report, ancillary equipment is defined as equipment which is used in conjunction with the EUT to provide operational and control features to the EUT. It is necessary to configure the system in a typical fashion, as a customer would normally use it. But nevertheless Ancillary Equipment can influence the test results.

Device	Details (Manufacturer, Type Model, OUT Code)	Description
ANC 1	TE Connectivity, 23311706/920 638-001, -	Wi-Fi/Bluetooth antenna with cable type: Dacar 302
ANC 2	TE Connectivity, 23311779/920 447-011 (Base) 224 729 86 (Rod, 400 mm), -	Tuner antenna

4.4 AUXILIARY EQUIPMENT

For the purposes of this test report, auxiliary equipment is defined as equipment which is used temporarily to enable operational and control features especially used for the tests of the EUT which is not used during normal operation or equipment that is used during the tests in combination with the EUT but is not subject of this test report. It is necessary to configure the system in a typical fashion, as a customer would normally use it.
But nevertheless Auxiliary Equipment can influence the test results.

Device	Details (Manufacturer, Type Model, HW, SW, S/N)	Description
AUX 1	Visteon, -, Version 1.0, -, -	Test box

4.5 EUT SETUPS

This chapter describes the combination of EUTs and equipment used for testing. The rationale for selecting the EUTs, ancillary and auxiliary equipment and interconnecting cables, is to test a representative configuration meeting the requirements of the referenced standards.

Setup	Combination of EUTs	Description and Rationale
S01_AM01	EUT am01, ANC 2, AUX 1	Conducted setup
S01_AB01	EUT ab01, ANC 1, ANC 2, AUX 1	Radiated setup
S01_AF01	EUT af01, ANC 2, AUX 1	Conducted setup

4.6 OPERATING MODES / TEST CHANNELS

This chapter describes the operating modes of the EUTs used for testing.

U-NII-Subband 1 5150 - 5250 MHz			**U-NII-Subband 3 5725 - 5850 MHz**			**Nom. BW**
low	**mid**	**high**	**low**	**mid**	**high**	**20 MHz**
36	40	48	149	157	165	**Ch.-No.**
5180	5200	5240	5745	5785	5825	**MHz**

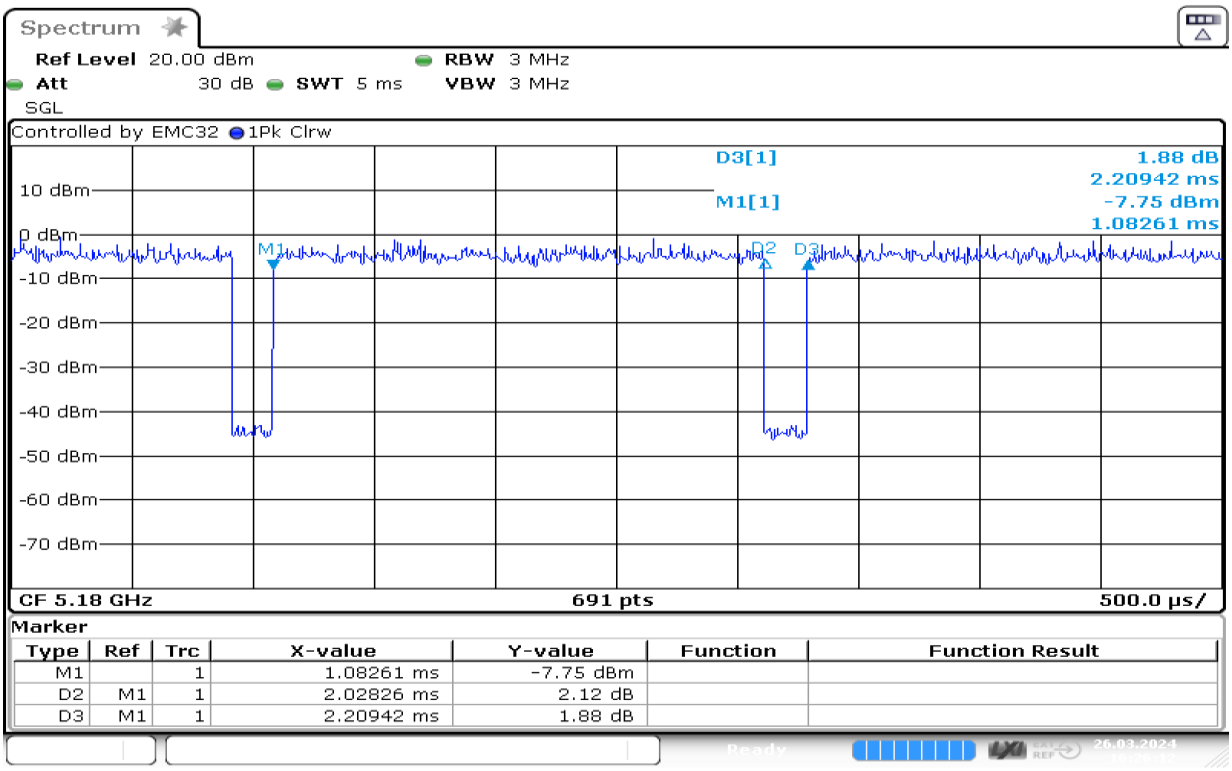
low	**mid**	**high**	**low**	**mid**	**high**	**40 MHz**
38	-	46	151	-	159	**Ch.-No.**
5190	-	5230	5755	-	5795	**MHz**

low	**mid**	**high**	**low**	**mid**	**high**	**80 MHz**
-	42	-	155	-	-	**Ch.-No.**
-	5210	-	5775	-	-	**MHz**

4.7 DUTY CYCLE

Test Mode	T_{on+off} (µs)	T_{on} (µs)	Duty cycle (%)
WLAN a	2209	2028	91
WLAN n 20	2050	1883	91
WLAN n 40	1073	916	85
WLAN ac 20	2050	1897	92
WLAN ac 40	1038	929	89
WLAN ac 80	564	455	80

WLAN a



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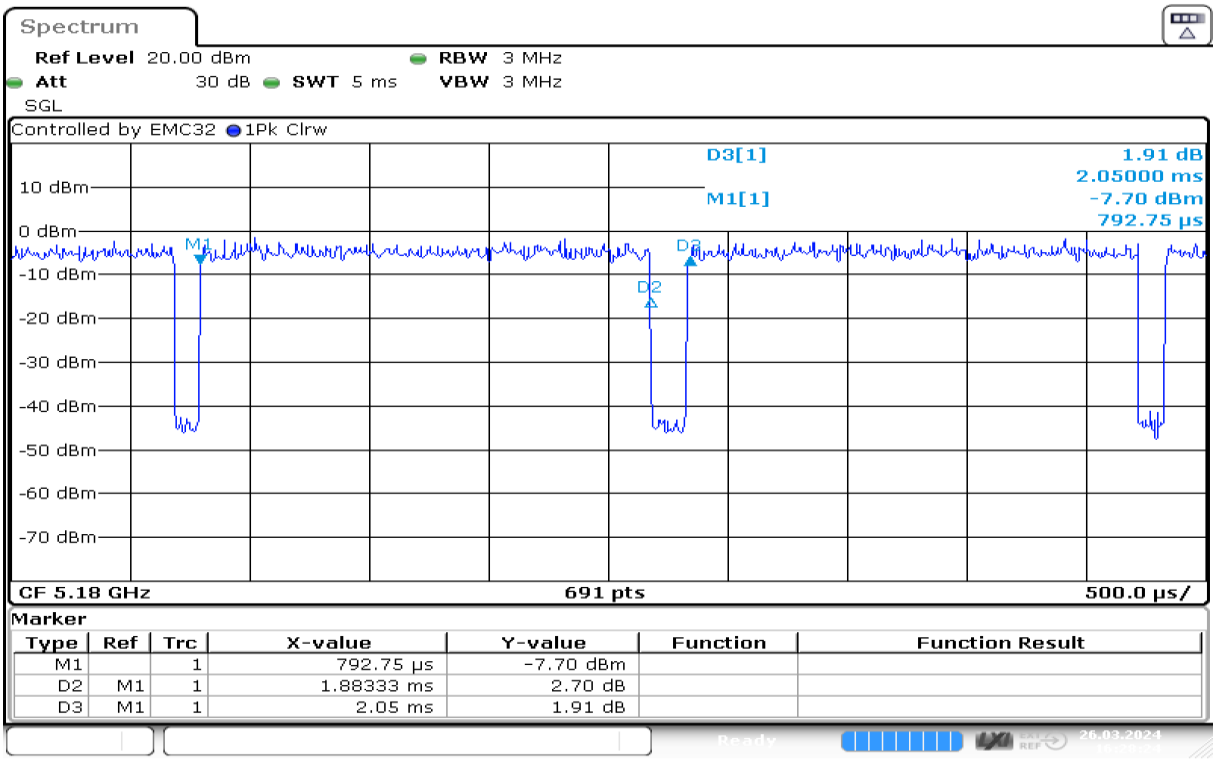
WLAN n 20



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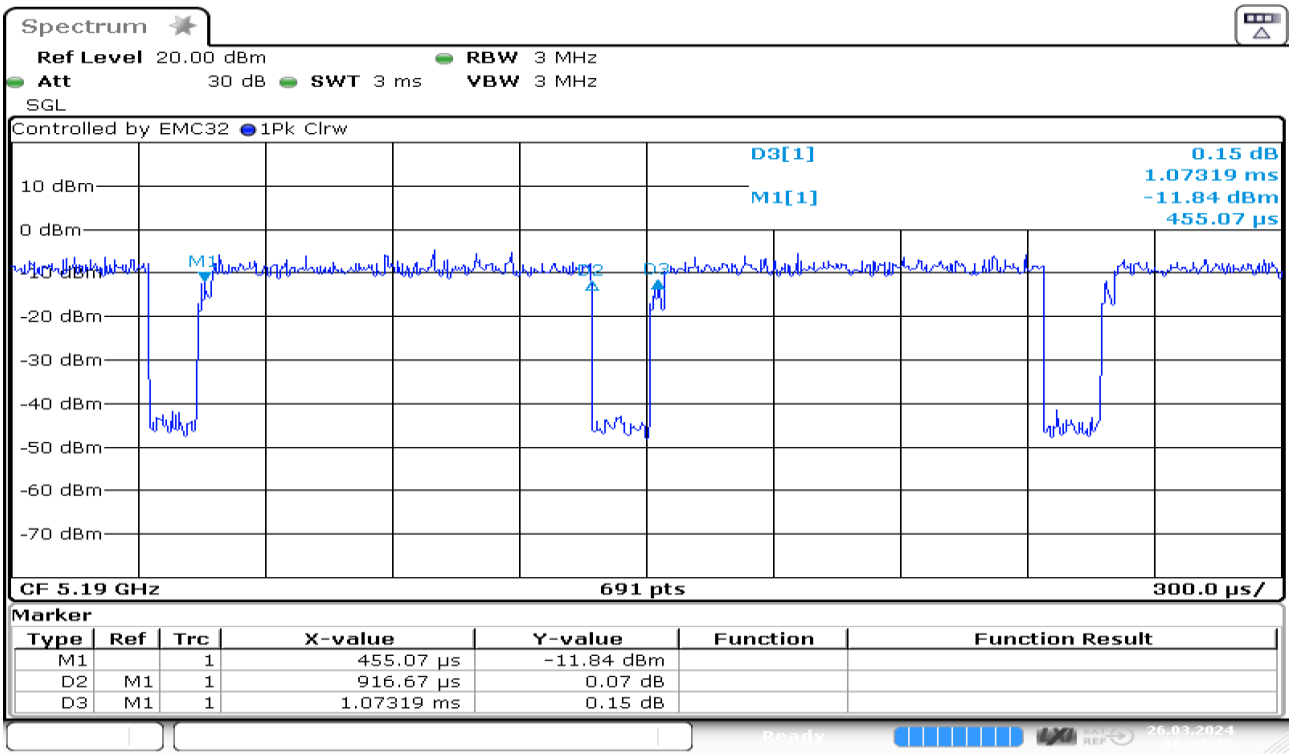
WLAN n 40



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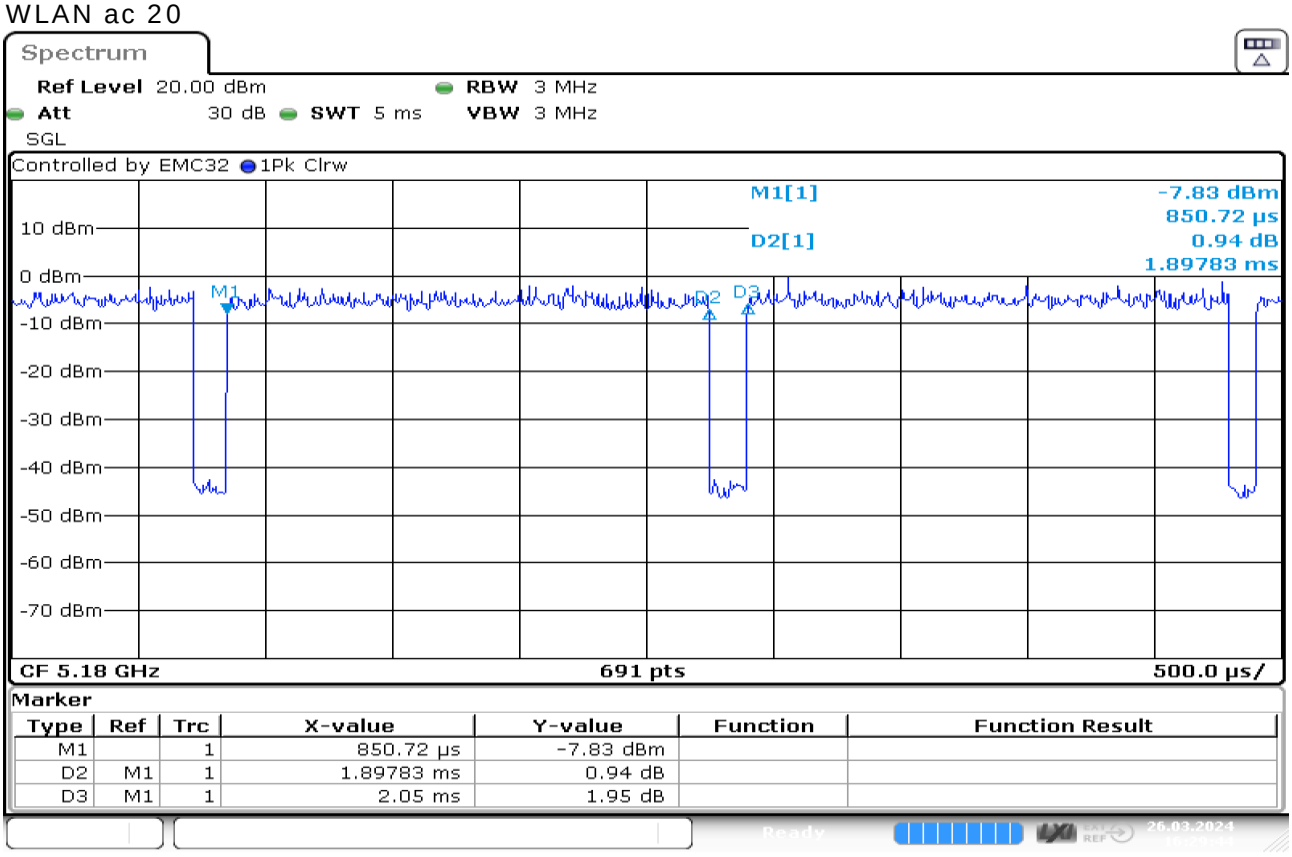
WLAN ac 20



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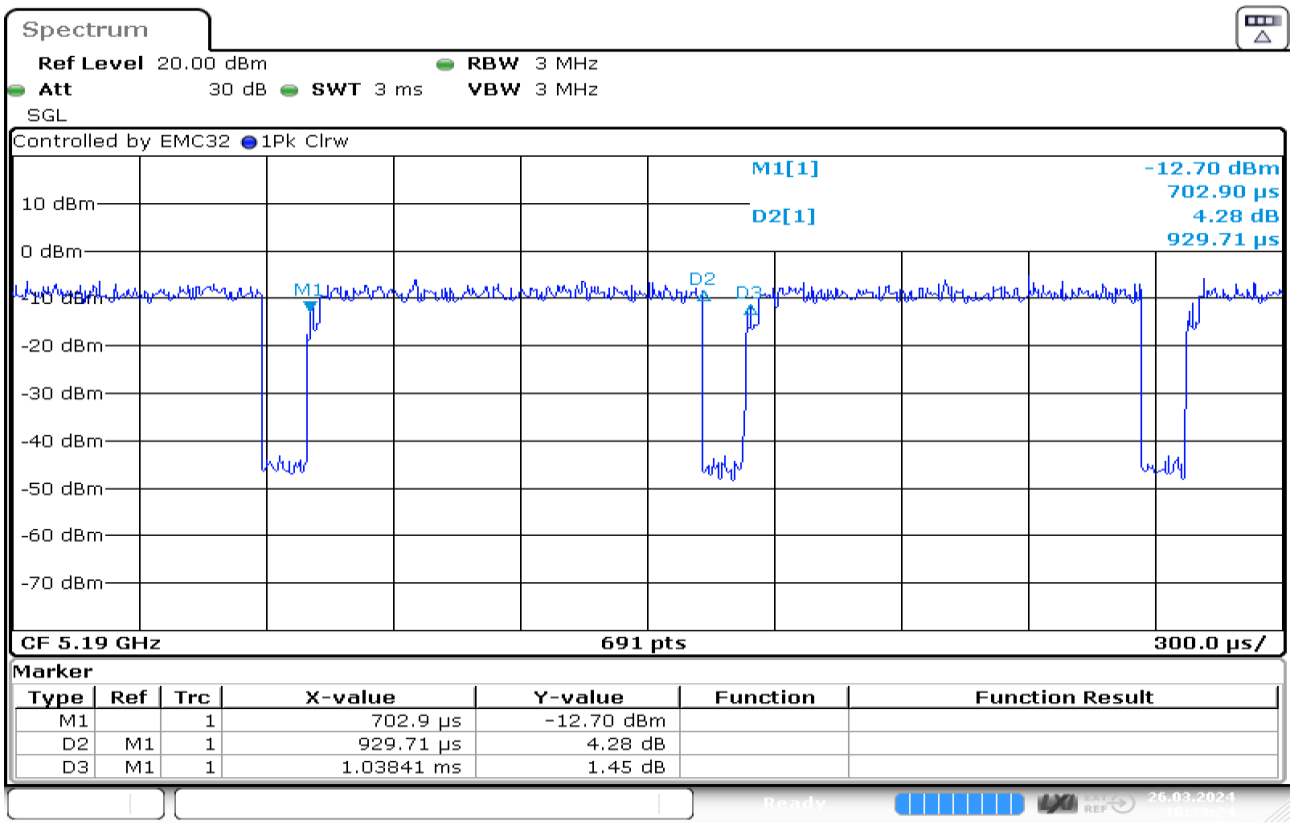
WLAN ac 40



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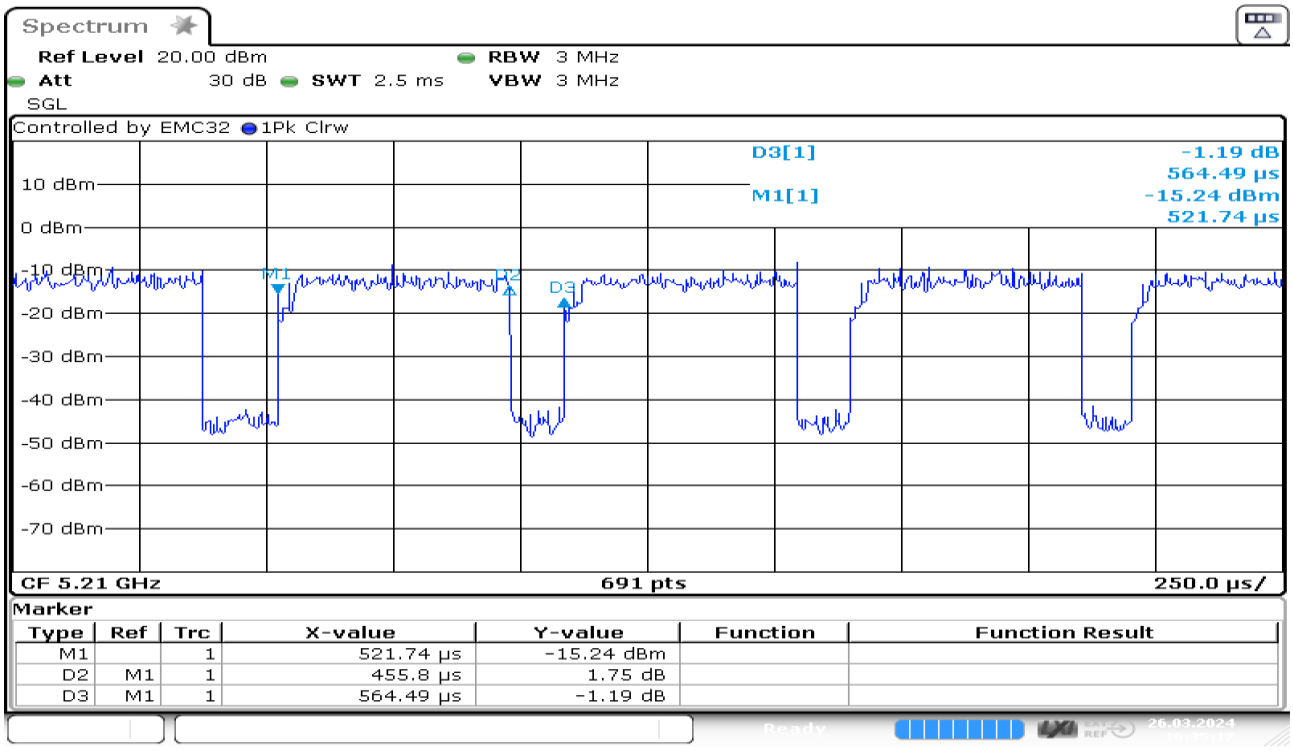
WLAN ac 80



Date: 26.MAR.2024 16:35:17

4.8 PRODUCT LABELLING

4.8.1 FCC ID LABEL

Please refer to the documentation of the applicant.

4.8.2 LOCATION OF THE LABEL ON THE EUT

Please refer to the documentation of the applicant.

5 TEST RESULTS

5.1 26 DB BANDWIDTH

Standard FCC Part 15 Subpart E

The test was performed according to:
ANSI C63.10, chapter 12.4.1

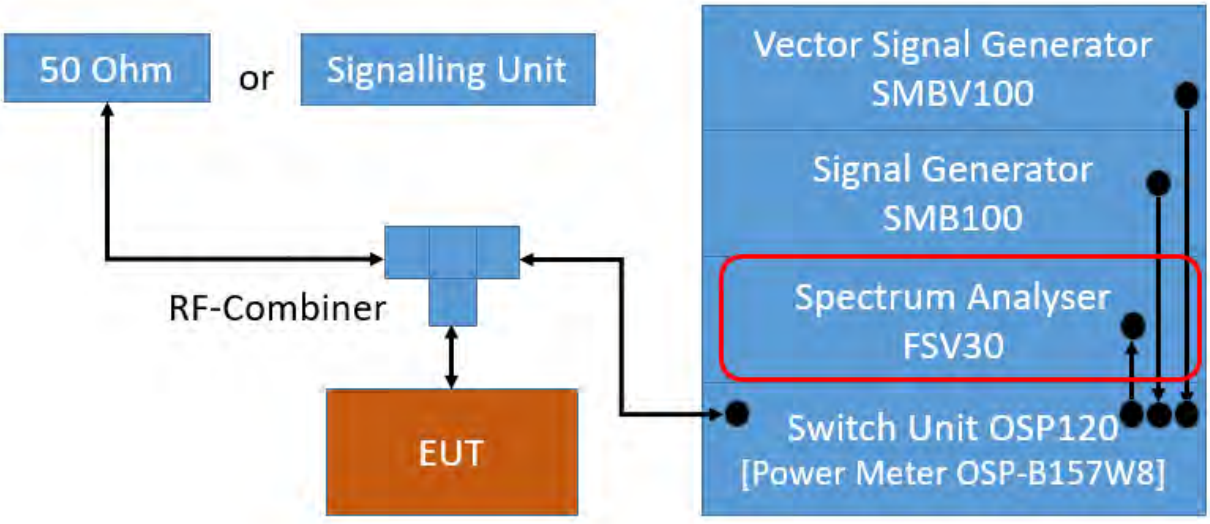
5.1.1 TEST DESCRIPTION

The Equipment Under Test (EUT) was set up to perform the occupied bandwidth measurements.
The reference level is the level of the highest amplitude signal observed from the transmitter at either the fundamental frequency or first-order modulation products in all typical modes of operation, including the unmodulated carrier, even if atypical.
The results recorded were measured with the modulation which produce the worst-case (widest) emission bandwidth.

The EUT was connected to the test system as described in the block diagram below. The complete attenuation of the measurement path is known and considered.

Analyzer settings:

- Resolution Bandwidth (RBW): initially approx. 1 % of nominal emission bandwidth
- Video Bandwidth (VBW): > RBW
- Span: 40 / 80 / 160 / 320 MHz (for 20 / 40 / 80 / 160 MHz nominal bandwidth)
- Trace: Maxhold
- Sweeps: Until the trace is stable
- Sweeptime: Auto
- Detector: Peak



TS8997; Occupied Channel Bandwidth 6 dB / 26 dB / 99 %

5.1.2 TEST REQUIREMENTS / LIMITS

FCC Part 15, Subpart E
There exist no applicable limits. The test was performed to determine the limits for the "Maximum Conducted Output Power" and DFS test cases.
Therefore no result was applied.

5.1.3 TEST PROTOCOL

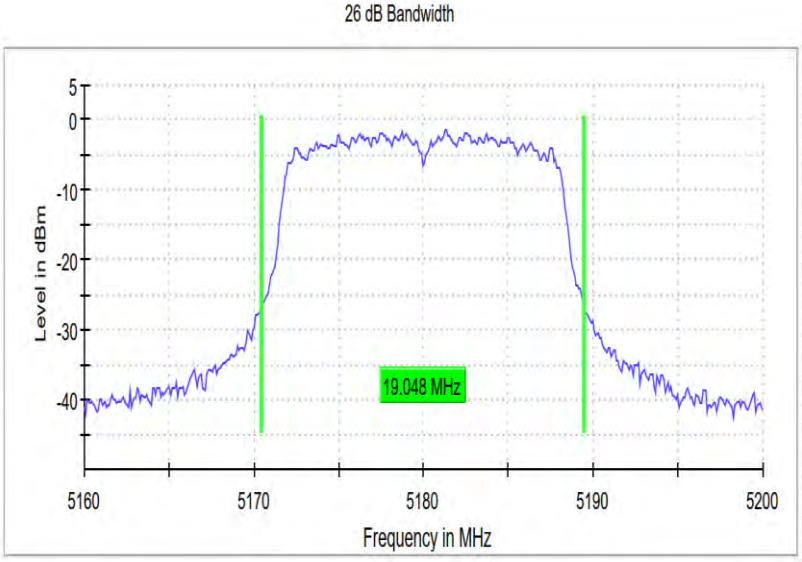
Ambient temperature: 23-24 °C
Air Pressure: 998-1001 hPa
Humidity: 39-43 %

Radio Technology	Subband	Operating Frequency	26 dB Bandwidth [MHz]
WLAN a	U-NII-1	low	19.0
WLAN a	U-NII-1	mid	19.2
WLAN a	U-NII-1	high	19.1
WLAN a	U-NII-3	low	20.1
WLAN a	U-NII-3	mid	19.7
WLAN a	U-NII-3	high	19.6
WLAN n 20 MHz	U-NII-1	low	20.0
WLAN n 20 MHz	U-NII-1	mid	20.1
WLAN n 20 MHz	U-NII-1	high	20.0
WLAN n 20 MHz	U-NII-3	low	20.3
WLAN n 20 MHz	U-NII-3	mid	20.3
WLAN n 20 MHz	U-NII-3	high	20.1
WLAN n 40 MHz	U-NII-1	low	40.5
WLAN n 40 MHz	U-NII-1	high	40.8
WLAN n 40 MHz	U-NII-3	low	41.1
WLAN n 40 MHz	U-NII-3	high	42.6
WLAN ac 20 MHz	U-NII-1	low	20.1
WLAN ac 20 MHz	U-NII-1	mid	20.1
WLAN ac 20 MHz	U-NII-1	high	20.1
WLAN ac 20 MHz	U-NII-3	low	20.3
WLAN ac 20 MHz	U-NII-3	mid	20.2
WLAN ac 20 MHz	U-NII-3	high	20.0
WLAN ac 40 MHz	U-NII-1	low	42.3
WLAN ac 40 MHz	U-NII-1	high	40.3
WLAN ac 40 MHz	U-NII-3	low	44.7
WLAN ac 40 MHz	U-NII-3	high	44.0
WLAN ac 80 MHz	U-NII-1	mid	82.8
WLAN ac 80 MHz	U-NII-3	mid	91.0

Remark: Please see next sub-clause for the measurement plot.

5.1.4 MEASUREMENT PLOT (EXAMPLE PLOT, SHOWING WORST CASE, IF APPLICABLE)

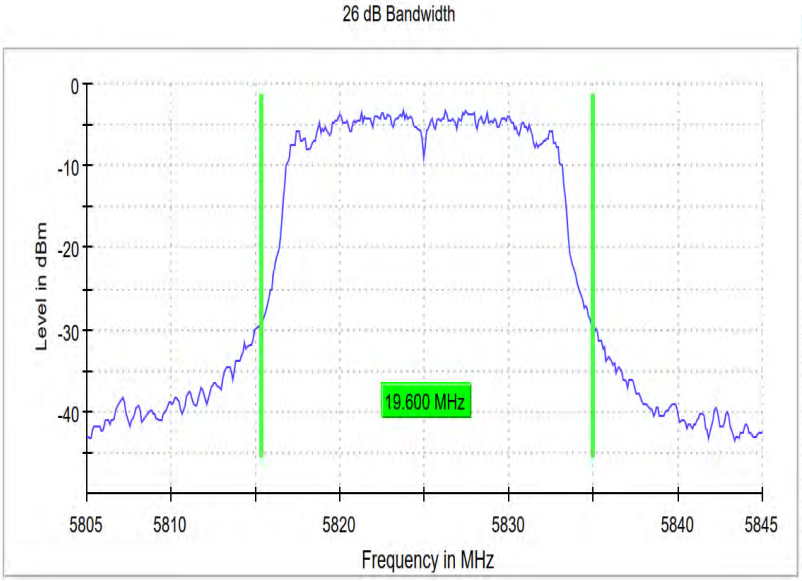
Radio Technology = WLAN a, Operating Frequency = low, Subband = U-NII-1 (S01_AF01)



Measurement

Setting	Instrument Value	Target Value
Start Frequency	5.16000 GHz	5.16000 GHz
Stop Frequency	5.20000 GHz	5.20000 GHz
Span	40.000 MHz	40.000 MHz
RBW	200.000 kHz	~ 200.000 kHz
VBW	1.000 MHz	>= 600.000 kHz
SweepPoints	400	~ 400
Sweeptime	1.000 ms	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	Sweep	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	68 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.00 dB	0.30 dB

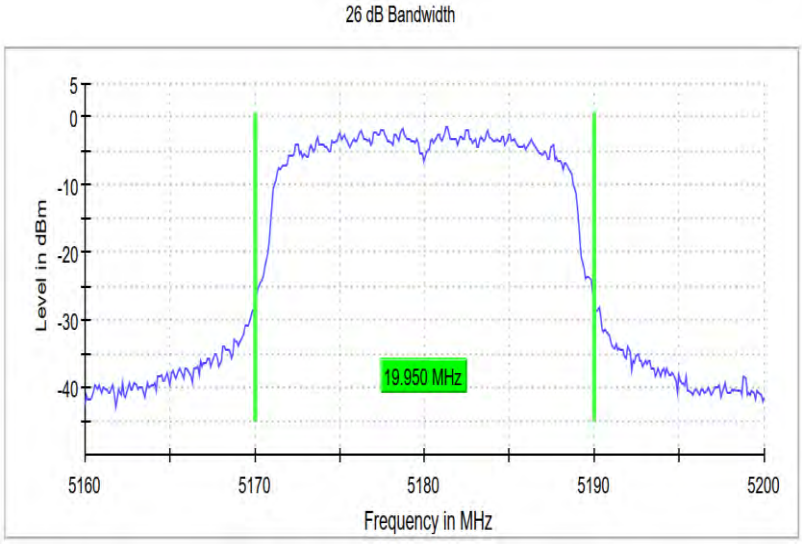
Radio Technology = WLAN a, Operating Frequency = high, Subband = U-NII-3 (S01_AM01)



Measurement

Setting	Instrument Value	Target Value
Start Frequency	5.80500 GHz	5.80500 GHz
Stop Frequency	5.84500 GHz	5.84500 GHz
Span	40.000 MHz	40.000 MHz
RBW	200.000 kHz	~ 200.000 kHz
VBW	1.000 MHz	>= 600.000 kHz
SweepPoints	400	~ 400
Sweeptime	28.477 µs	AUTO
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	103 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.23 dB	0.30 dB

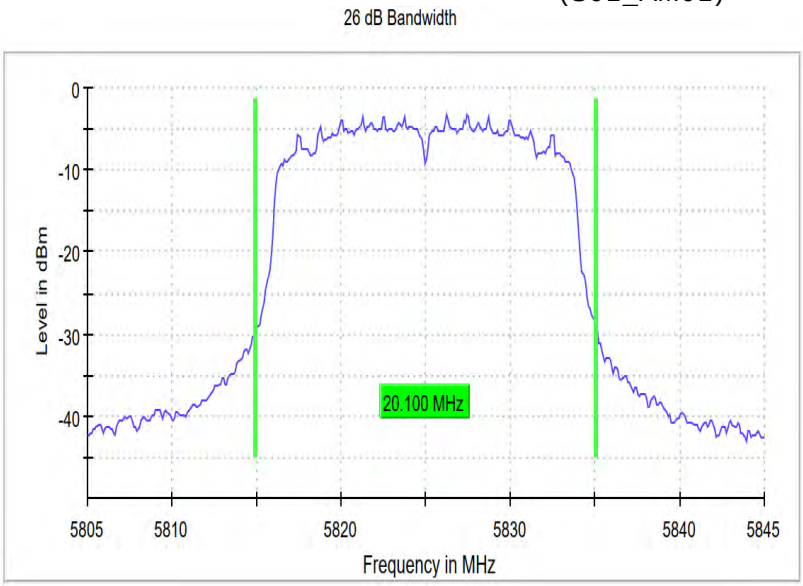
Radio Technology = WLAN n 20 MHz, Operating Frequency = low, Subband = U-NII-1 (S01_AF01)



Measurement

Setting	Instrument Value	Target Value
Start Frequency	5.16000 GHz	5.16000 GHz
Stop Frequency	5.20000 GHz	5.20000 GHz
Span	40.000 MHz	40.000 MHz
RBW	200.000 kHz	~ 200.000 kHz
VBW	1.000 MHz	>= 600.000 kHz
SweepPoints	400	~ 400
Sweeptime	1.000 ms	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	Sweep	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	77 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.28 dB	0.30 dB

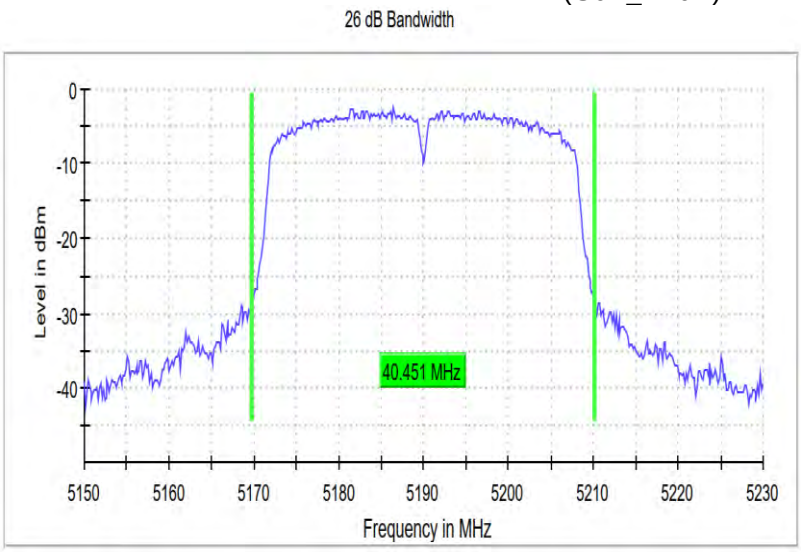
Radio Technology = WLAN n 20 MHz, Operating Frequency = high, Subband = U-NII-3 (S01_AM01)



Measurement

Setting	Instrument Value	Target Value
Start Frequency	5.80500 GHz	5.80500 GHz
Stop Frequency	5.84500 GHz	5.84500 GHz
Span	40.000 MHz	40.000 MHz
RBW	200.000 kHz	~ 200.000 kHz
VBW	1.000 MHz	>= 600.000 kHz
SweepPoints	400	~ 400
Sweeptime	28.477 µs	AUTO
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	78 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.00 dB	0.30 dB

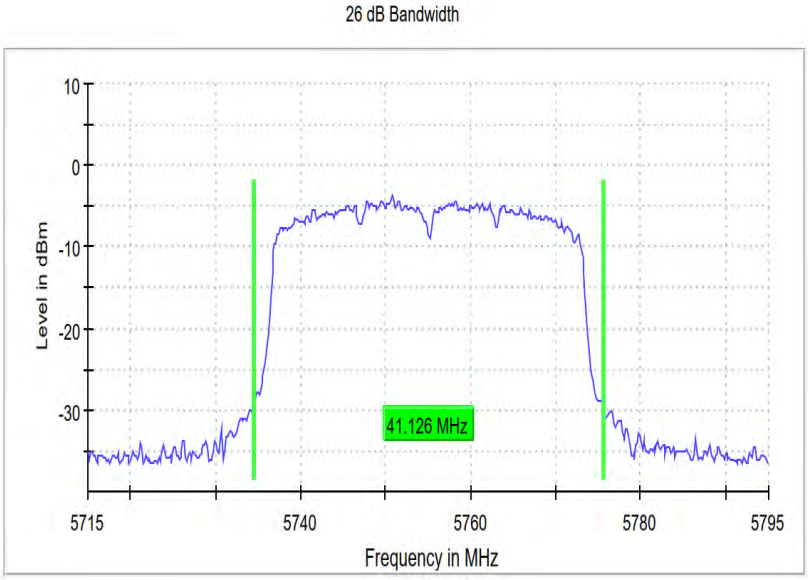
Radio Technology = WLAN n 40 MHz, Operating Frequency = low, Subband = U-NII-1 (S01_AF01)



Measurement

Setting	Instrument Value	Target Value
Start Frequency	5.15000 GHz	5.15000 GHz
Stop Frequency	5.23000 GHz	5.23000 GHz
Span	80.000 MHz	80.000 MHz
RBW	300.000 kHz	~ 400.000 kHz
VBW	1.000 MHz	>= 900.000 kHz
SweepPoints	533	~ 533
Sweeptime	1.000 ms	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	Sweep	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	107 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.21 dB	0.30 dB

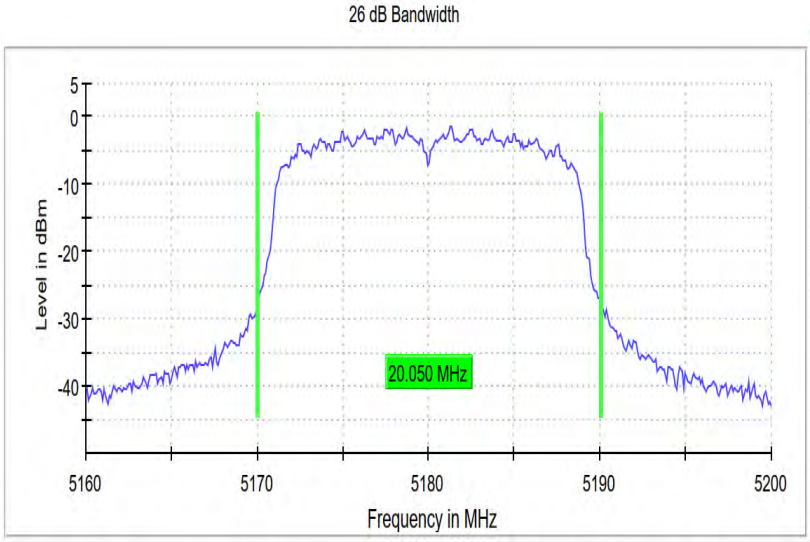
Radio Technology = WLAN n 40 MHz, Operating Frequency = low, Subband = U-NII-3 (S01_AM01)



Measurement

Setting	Instrument Value	Target Value
Start Frequency	5.71500 GHz	5.71500 GHz
Stop Frequency	5.79500 GHz	5.79500 GHz
Span	80.000 MHz	80.000 MHz
RBW	300.000 kHz	~ 400.000 kHz
VBW	1.000 MHz	>= 900.000 kHz
SweepPoints	533	~ 533
Sweeptime	31.621 µs	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	100 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.00 dB	0.30 dB

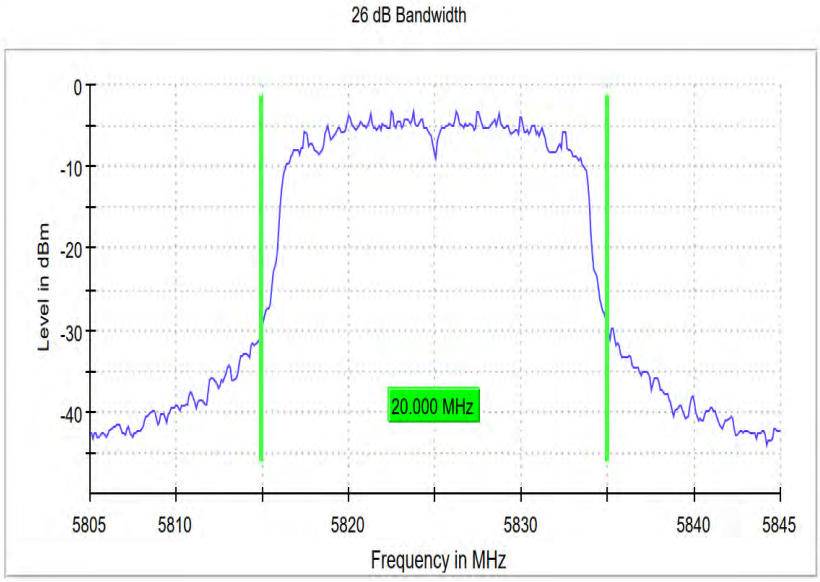
Radio Technology = WLAN ac 20 MHz, Operating Frequency = low, Subband = U-NII-1 (S01_AF01)



Measurement

Setting	Instrument Value	Target Value
Start Frequency	5.16000 GHz	5.16000 GHz
Stop Frequency	5.20000 GHz	5.20000 GHz
Span	40.000 MHz	40.000 MHz
RBW	200.000 kHz	~ 200.000 kHz
VBW	1.000 MHz	>= 600.000 kHz
SweepPoints	400	~ 400
Sweeptime	1.000 ms	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	Sweep	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	69 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.10 dB	0.30 dB

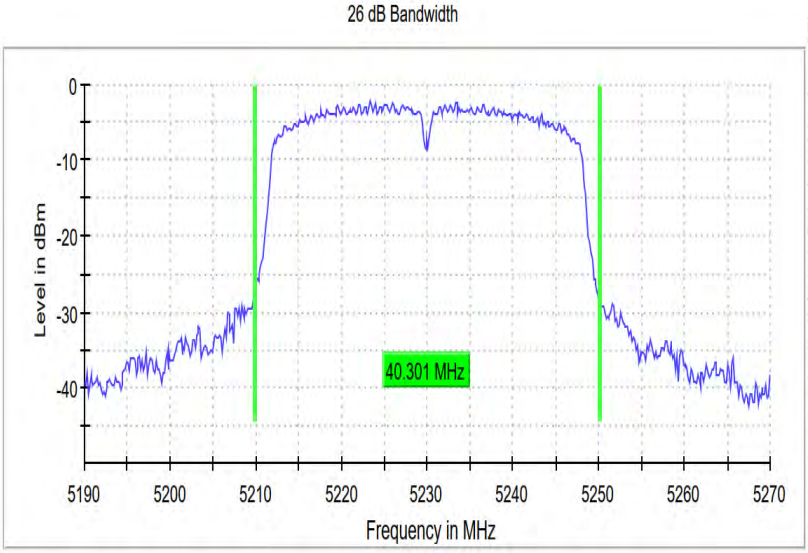
Radio Technology = WLAN ac 20 MHz, Operating Frequency = high, Subband = U-NII-3 (S01_AM01)



Measurement

Setting	Instrument Value	Target Value
Start Frequency	5.80500 GHz	5.80500 GHz
Stop Frequency	5.84500 GHz	5.84500 GHz
Span	40.000 MHz	40.000 MHz
RBW	200.000 kHz	~ 200.000 kHz
VBW	1.000 MHz	>= 600.000 kHz
SweepPoints	400	~ 400
Sweeptime	28.477 µs	AUTO
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	55 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.12 dB	0.30 dB

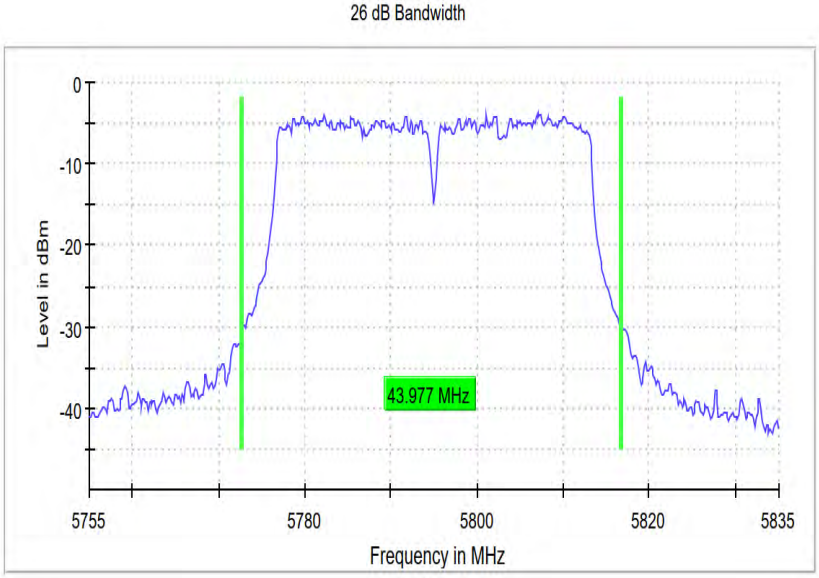
Radio Technology = WLAN ac 40 MHz, Operating Frequency = high, Subband = U-NII-1 (S01_AF01)



Measurement

Setting	Instrument Value	Target Value
Start Frequency	5.19000 GHz	5.19000 GHz
Stop Frequency	5.27000 GHz	5.27000 GHz
Span	80.000 MHz	80.000 MHz
RBW	300.000 kHz	~ 400.000 kHz
VBW	1.000 MHz	>= 900.000 kHz
SweepPoints	533	~ 533
Sweeptime	1.000 ms	AUTO
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	0.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	Sweep	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	117 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.19 dB	0.30 dB

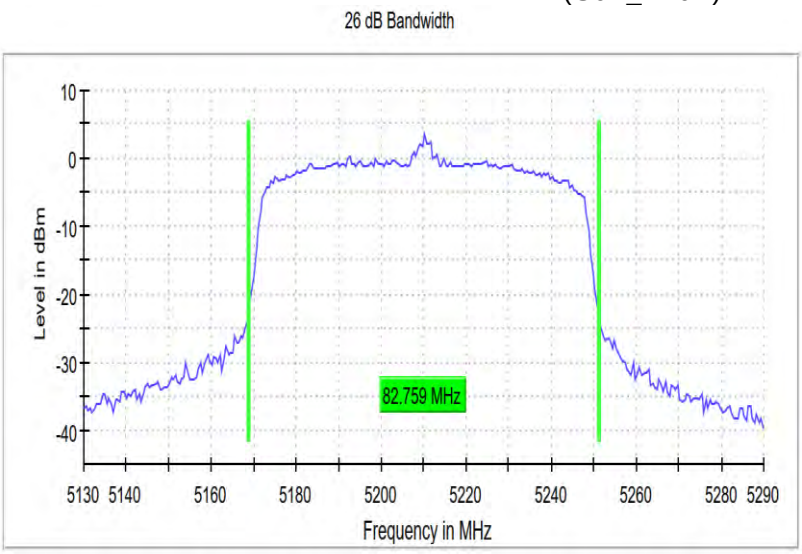
Radio Technology = WLAN ac 40 MHz, Operating Frequency = high, Subband = U-NII-3 (S01_AM01)



Measurement

Setting	Instrument Value	Target Value
Start Frequency	5.75500 GHz	5.75500 GHz
Stop Frequency	5.83500 GHz	5.83500 GHz
Span	80.000 MHz	80.000 MHz
RBW	300.000 kHz	~ 400.000 kHz
VBW	1.000 MHz	>= 900.000 kHz
SweepPoints	533	~ 533
Sweeptime	31.621 µs	AUTO
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	92 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.10 dB	0.30 dB

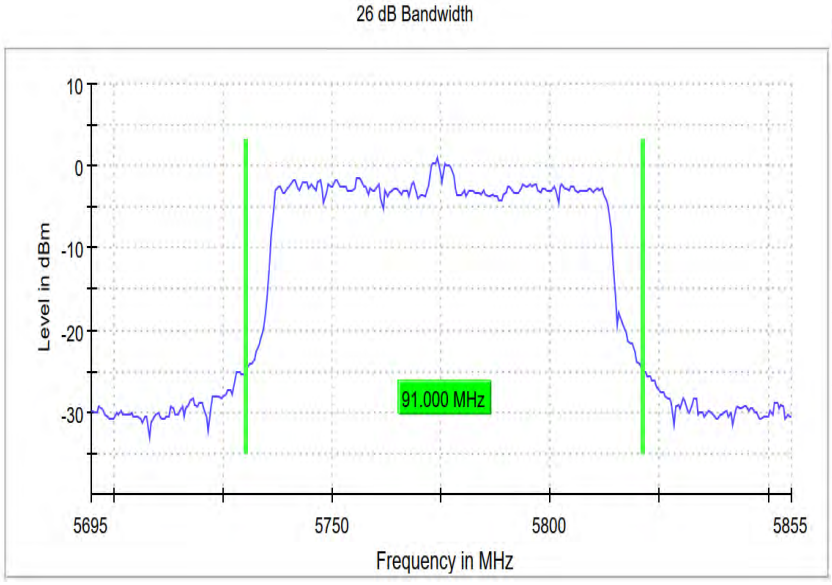
Radio Technology = WLAN ac 80 MHz, Operating Frequency = mid, Subband = U-NII-1 (S01_AF01)



Measurement

Setting	Instrument Value	Target Value
Start Frequency	5.13000 GHz	5.13000 GHz
Stop Frequency	5.29000 GHz	5.29000 GHz
Span	160.000 MHz	160.000 MHz
RBW	1.000 MHz	~ 800.000 kHz
VBW	3.000 MHz	>= 3.000 MHz
SweepPoints	320	~ 320
Sweeptime	1.000 ms	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	Sweep	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	60 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.00 dB	0.30 dB

Radio Technology = WLAN ac 80 MHz, Operating Frequency = low, Subband = U-NII-3 (S01_AM01)



Measurement

Setting	Instrument Value	Target Value
Start Frequency	5.69500 GHz	5.69500 GHz
Stop Frequency	5.85500 GHz	5.85500 GHz
Span	160.000 MHz	160.000 MHz
RBW	1.000 MHz	~ 800.000 kHz
VBW	3.000 MHz	>= 3.000 MHz
SweepPoints	320	~ 320
Sweeptime	22.875 µs	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	95 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.00 dB	0.30 dB

5.1.5 TEST EQUIPMENT USED

- R&S TS8997

5.2 6 DB BANDWIDTH

Standard FCC Part 15 Subpart E

The test was performed according to:
ANSI C63.10, chapter 6.9.2

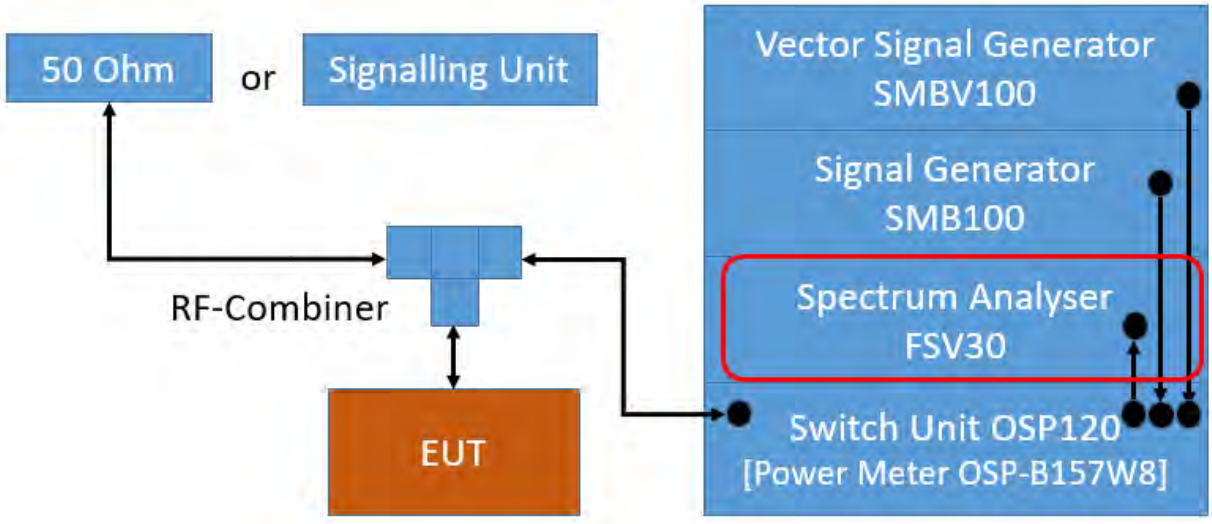
5.2.1 TEST DESCRIPTION

The Equipment Under Test (EUT) was setup in a shielded room to perform the occupied bandwidth measurements.
The reference level is the level of the highest amplitude signal observed from the transmitter at either the fundamental frequency or first-order modulation products in all typical modes of operation, including the unmodulated carrier, even if atypical.
The results recorded were measured with the modulation which produce the worst-case (smallest) emission bandwidth.

The EUT was connected to the test system as described in the block diagram below. The complete attenuation of the measurement path is known and considered.

Analyzer settings:

- Resolution Bandwidth (RBW): 100 kHz
- Video Bandwidth (VBW): 300 kHz
- Span: 40 / 80 / 160 / 320 MHz (for 20 / 40 / 80 / 160 MHz nominal bandwidth))
- Trace: Maxhold
- Sweeps: Until the trace is stable
- Sweeptime: Auto
- Detector: Peak



TS8997; Occupied Channel Bandwidth 6 dB / 26 dB / 99 %

5.2.2 TEST REQUIREMENTS / LIMITS

FCC Part 15, Subpart E, §15.407 (e)
Within the 5.725-5.850 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

5.2.3 TEST PROTOCOL

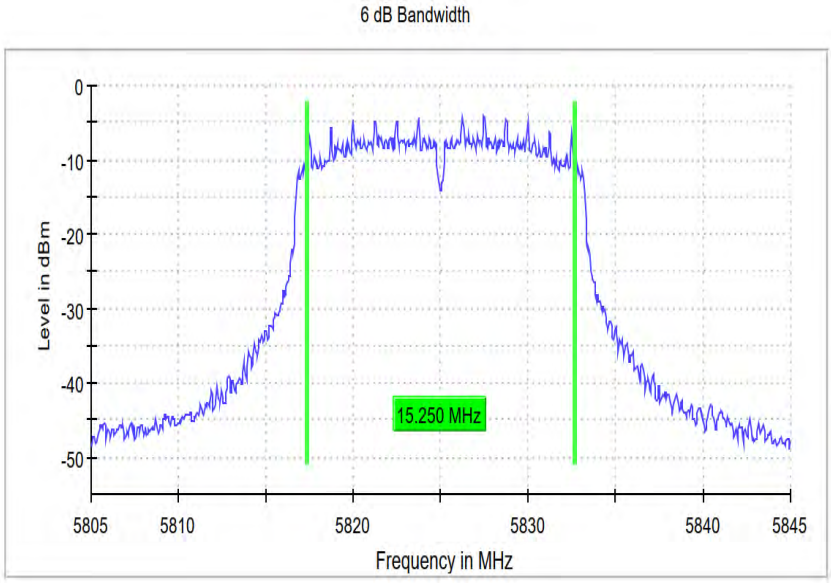
Ambient temperature:	23 °C
Air Pressure:	999 hPa
Humidity:	39 %

Radio Technology	Operating Frequency	6 dB Bandwidth [MHz]	Limit [MHz]	Margin [MHz]
WLAN a	low	15.5	0.5	14.95
WLAN a	mid	15.5	0.5	14.95
WLAN a	high	15.3	0.5	14.75
WLAN n 20 MHz	low	15.3	0.5	14.75
WLAN n 20 MHz	mid	15.5	0.5	15.00
WLAN n 20 MHz	high	15.5	0.5	15.00
WLAN n 40 MHz	low	35.2	0.5	34.65
WLAN n 40 MHz	high	35.2	0.5	34.65
WLAN ac 20 MHz	low	15.5	0.5	15.00
WLAN ac 20 MHz	mid	15.8	0.5	15.25
WLAN ac 20 MHz	high	15.5	0.5	15.00
WLAN ac 40 MHz	low	36.6	0.5	36.05
WLAN ac 40 MHz	high	36.6	0.5	36.05
WLAN ac 80 MHz	mid	76.6	0.5	76.05

Remark: Please see next sub-clause for the measurement plot.

5.2.4 MEASUREMENT PLOT (EXAMPLE PLOT, SHOWING WORST CASE, IF APPLICABLE)

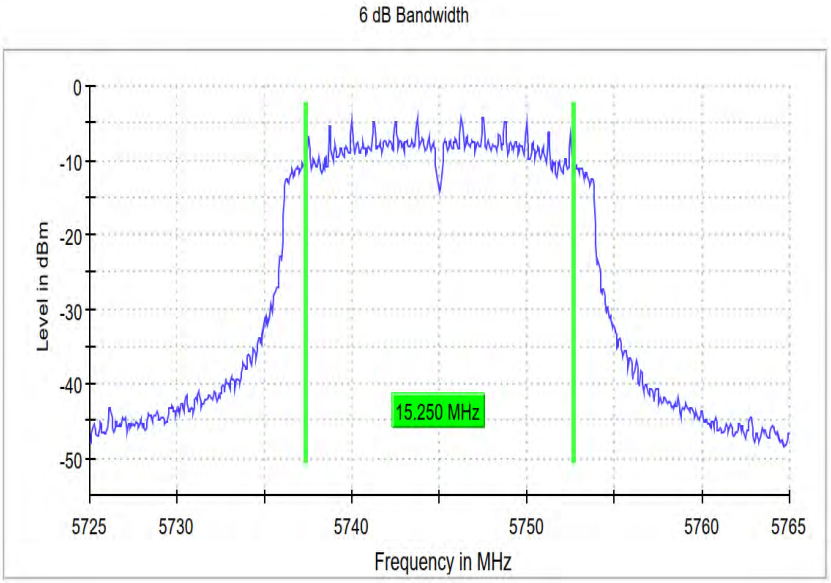
Radio Technology = WLAN a, Operating Frequency = high, Subband = U-NII-3 (S01_AM01)



Measurement

Setting	Instrument Value	Target Value
Start Frequency	5.80500 GHz	5.80500 GHz
Stop Frequency	5.84500 GHz	5.84500 GHz
Span	40.000 MHz	40.000 MHz
RBW	100.000 kHz	~ 100.000 kHz
VBW	300.000 kHz	~ 300.000 kHz
SweepPoints	800	~ 800
Sweeptime	56.836 µs	AUTO
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	83 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.13 dB	0.30 dB

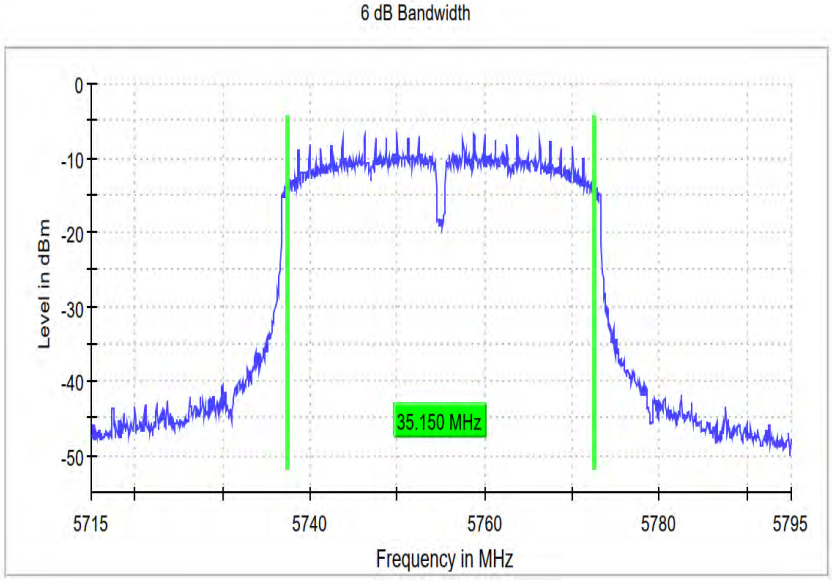
Radio Technology = WLAN n 20 MHz, Operating Frequency = low, Subband = U-NII-3 (S01_AM01)



Measurement

Setting	Instrument Value	Target Value
Start Frequency	5.72500 GHz	5.72500 GHz
Stop Frequency	5.76500 GHz	5.76500 GHz
Span	40.000 MHz	40.000 MHz
RBW	100.000 kHz	~ 100.000 kHz
VBW	300.000 kHz	~ 300.000 kHz
SweepPoints	800	~ 800
Sweeptime	56.836 µs	AUTO
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	91 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.00 dB	0.30 dB

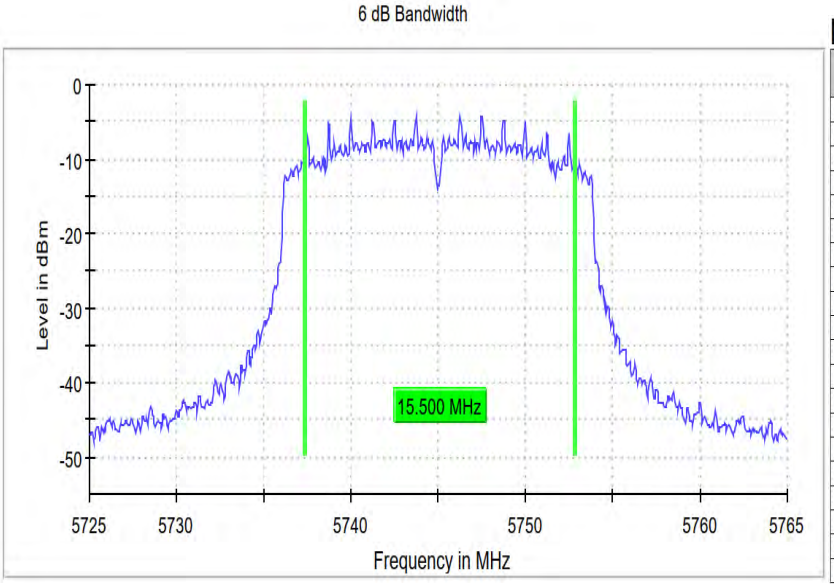
Radio Technology = WLAN n 40 MHz, Operating Frequency = low, Subband = U-NII-3 (S01_AM01)



Measurement

Setting	Instrument Value	Target Value
Start Frequency	5.71500 GHz	5.71500 GHz
Stop Frequency	5.79500 GHz	5.79500 GHz
Span	80.000 MHz	80.000 MHz
RBW	100.000 kHz	~ 100.000 kHz
VBW	300.000 kHz	~ 300.000 kHz
SweepPoints	1600	~ 1600
Sweeptime	94.727 µs	AUTO
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	108 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.15 dB	0.30 dB

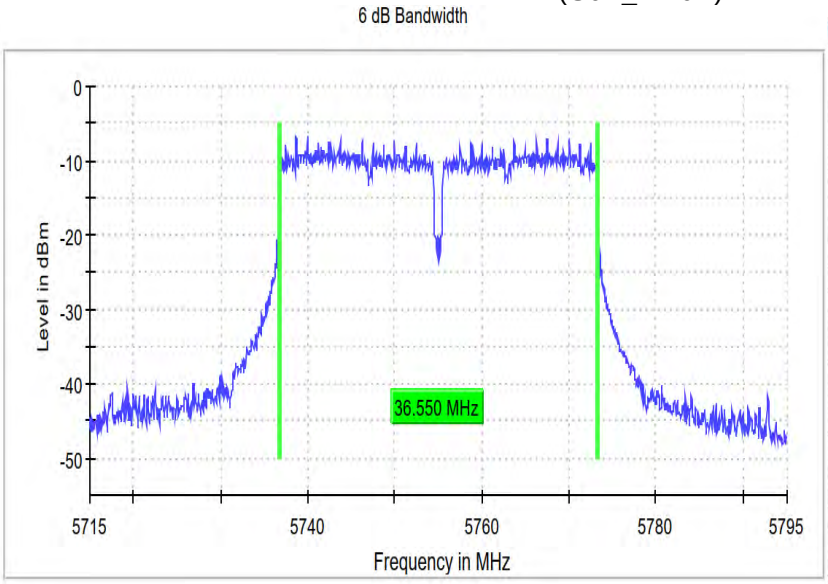
Radio Technology = WLAN ac 20 MHz, Operating Frequency = low, Subband = U-NII-3 (S01_AM01)



Measurement

Setting	Instrument Value	Target Value
Start Frequency	5.72500 GHz	5.72500 GHz
Stop Frequency	5.76500 GHz	5.76500 GHz
Span	40.000 MHz	40.000 MHz
RBW	100.000 kHz	~ 100.000 kHz
VBW	300.000 kHz	~ 300.000 kHz
SweepPoints	800	~ 800
Sweeptime	56.836 µs	AUTO
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	89 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.00 dB	0.30 dB

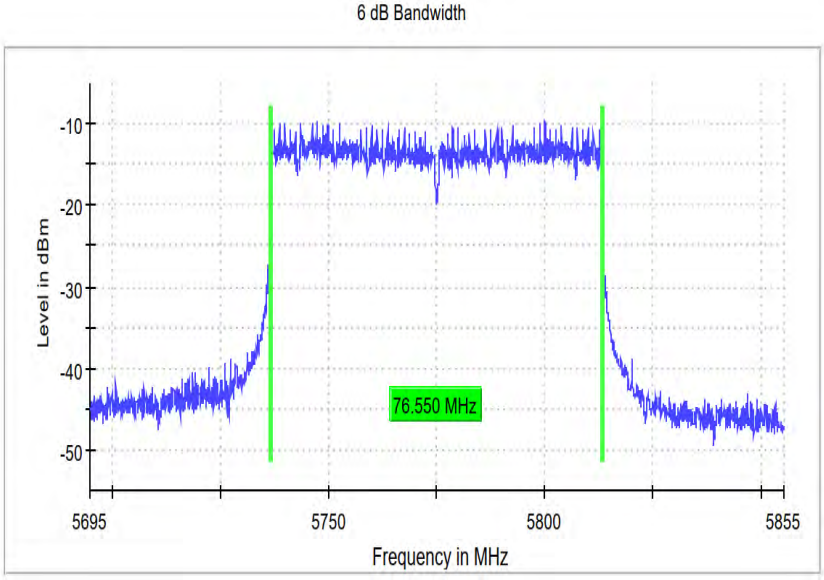
Radio Technology = WLAN ac 40 MHz, Operating Frequency = low, Subband = U-NII-3 (S01_AM01)



Measurement

Setting	Instrument Value	Target Value
Start Frequency	5.71500 GHz	5.71500 GHz
Stop Frequency	5.79500 GHz	5.79500 GHz
Span	80.000 MHz	80.000 MHz
RBW	100.000 kHz	~ 100.000 kHz
VBW	300.000 kHz	~ 300.000 kHz
SweepPoints	1600	~ 1600
Sweeptime	94.727 µs	AUTO
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	121 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.28 dB	0.30 dB

Radio Technology = WLAN ac 80 MHz, Operating Frequency = low, Subband = U-NII-3 (S01_AM01)



Measurement

Setting	Instrument Value	Target Value
Start Frequency	5.69500 GHz	5.69500 GHz
Stop Frequency	5.85500 GHz	5.85500 GHz
Span	160.000 MHz	160.000 MHz
RBW	100.000 kHz	~ 100.000 kHz
VBW	300.000 kHz	~ 300.000 kHz
SweepPoints	3200	~ 3200
Sweeptime	189.453 µs	AUTO
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	107 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.12 dB	0.30 dB

5.2.5 TEST EQUIPMENT USED

- R&S TS8997

5.3 99 % BANDWIDTH

Standard FCC Part 15 Subpart E

The test was performed according to:
ANSI C63.10, chapter 12.4.2 (6.9.3)

5.3.1 TEST DESCRIPTION

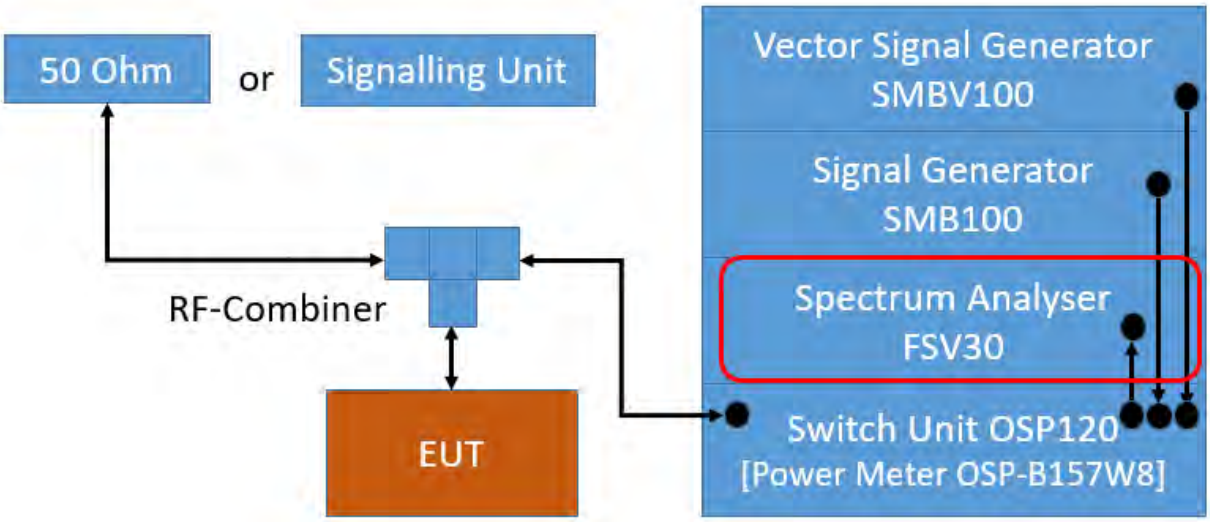
The Equipment Under Test (EUT) was set up to perform the occupied bandwidth measurements.
The reference level is the level of the highest amplitude signal observed from the transmitter at either the fundamental frequency or first-order modulation products in all typical modes of operation, including the unmodulated carrier, even if atypical.
The results recorded were measured with the modulation which produce the worst-case (widest) emission bandwidth.

The EUT was connected to the test system as described in the block diagram below. The complete attenuation of the measurement path is known and considered.

Analyzer settings:

- Resolution Bandwidth (RBW): approx. ≥ 1 % of the span, but not below
- Video Bandwidth (VBW): ≥ 3 times the RBW
- Span: 40 / 80 / 160 / 320 MHz (for 20 / 40 / 80 / 160 MHz nominal bandwidth)
- Trace: Maxhold
- Sweeps: Until the trace is stable
- Sweeptime: Auto
- Detector: Peak

The 99 % measurement function of the spectrum analyser function was used to determine the 99 % bandwidth.



TS8997; Occupied Channel Bandwidth 6 dB / 26 dB / 99 %

5.3.2 TEST REQUIREMENTS / LIMITS

No applicable limit.
The test was performed to determine the limits for the "Maximum Conducted Output Power" and DFS test cases.

5.3.3 TEST PROTOCOL

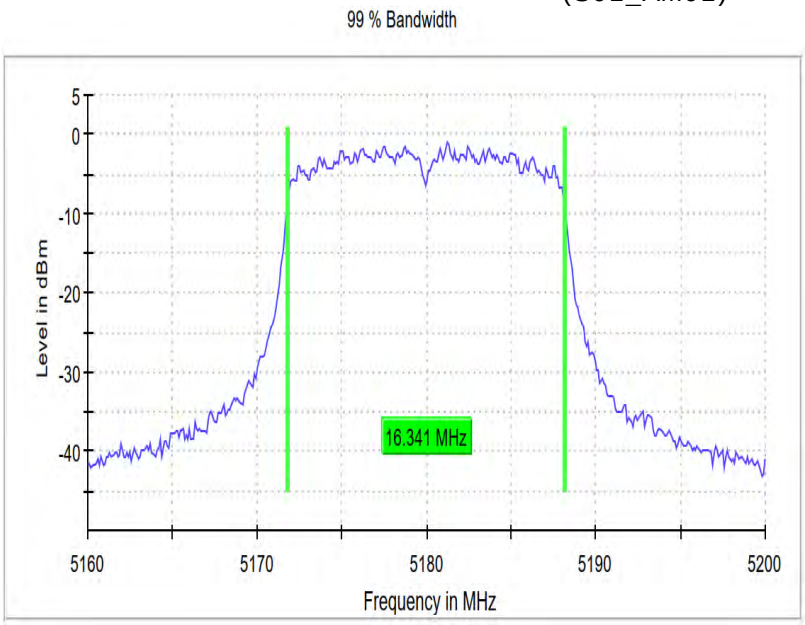
Ambient temperature: 24 °C
Air Pressure: 1002 hPa
Humidity: 41 %

Radio Technology	Subband	Operating Frequency	99% Bandwidth [MHz]
WLAN a	U-NII-1	low	16.3
WLAN a	U-NII-1	mid	16.3
WLAN a	U-NII-1	high	16.3
WLAN a	U-NII-3	low	16.3
WLAN a	U-NII-3	mid	16.3
WLAN a	U-NII-3	high	16.3
WLAN n 20 MHz	U-NII-1	low	17.4
WLAN n 20 MHz	U-NII-1	mid	17.4
WLAN n 20 MHz	U-NII-1	high	17.4
WLAN n 20 MHz	U-NII-3	low	17.5
WLAN n 20 MHz	U-NII-3	mid	17.5
WLAN n 20 MHz	U-NII-3	high	17.5
WLAN n 40 MHz	U-NII-1	low	36.1
WLAN n 40 MHz	U-NII-1	high	36.1
WLAN n 40 MHz	U-NII-3	low	36.0
WLAN n 40 MHz	U-NII-3	high	36.3
WLAN ac 20 MHz	U-NII-1	low	17.4
WLAN ac 20 MHz	U-NII-1	mid	17.4
WLAN ac 20 MHz	U-NII-1	high	17.4
WLAN ac 20 MHz	U-NII-3	low	17.4
WLAN ac 20 MHz	U-NII-3	mid	17.5
WLAN ac 20 MHz	U-NII-3	high	17.5
WLAN ac 40 MHz	U-NII-1	low	36.9
WLAN ac 40 MHz	U-NII-1	high	36.9
WLAN ac 40 MHz	U-NII-3	low	36.8
WLAN ac 40 MHz	U-NII-3	high	36.8
WLAN ac 80 MHz	U-NII-1	mid	76.7
WLAN ac 80 MHz	U-NII-3	mid	76.5

Remark: Please see next sub-clause for the measurement plot.

5.3.4 MEASUREMENT PLOT (EXAMPLE PLOT, SHOWING WORST CASE, IF APPLICABLE)

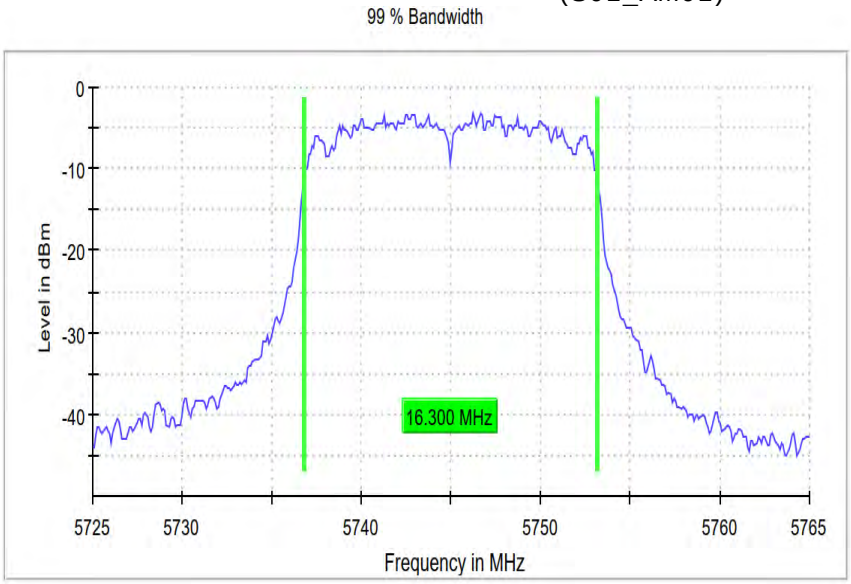
Radio Technology = WLAN a, Operating Frequency = low, Subband = U-NII-1 (S01_AM01)



Measurement

Setting	Instrument Value	Target Value
Start Frequency	5.16000 GHz	5.16000 GHz
Stop Frequency	5.20000 GHz	5.20000 GHz
Span	40.000 MHz	40.000 MHz
RBW	200.000 kHz	>= 200.000 kHz
VBW	1.000 MHz	>= 600.000 kHz
SweepPoints	400	~ 400
Sweeptime	1.000 ms	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	Sweep	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	56 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.25 dB	0.30 dB

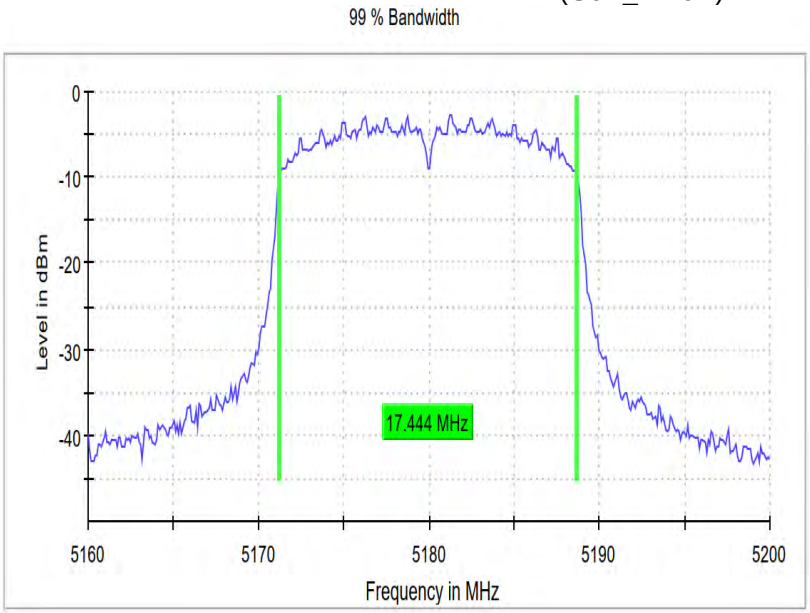
Radio Technology = WLAN a, Operating Frequency = low, Subband = U-NII-3 (S01_AM01)



Measurement

Setting	Instrument Value	Target Value
Start Frequency	5.72500 GHz	5.72500 GHz
Stop Frequency	5.76500 GHz	5.76500 GHz
Span	40.000 MHz	40.000 MHz
RBW	200.000 kHz	>= 200.000 kHz
VBW	1.000 MHz	>= 600.000 kHz
SweepPoints	400	~ 400
Sweeptime	28.477 µs	AUTO
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	77 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.02 dB	0.30 dB

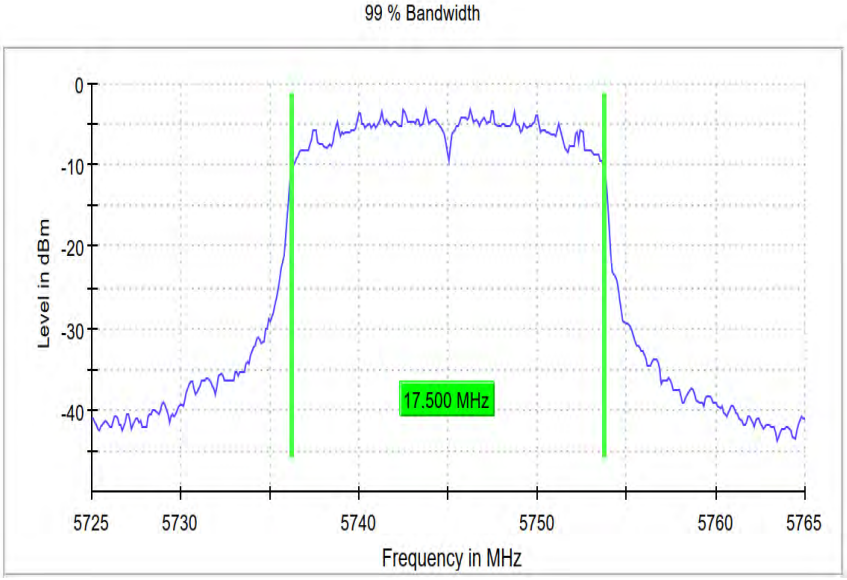
Radio Technology = WLAN n 20 MHz, Operating Frequency = low, Subband = U-NII-1 (S01_AM01)



Measurement

Setting	Instrument Value	Target Value
Start Frequency	5.16000 GHz	5.16000 GHz
Stop Frequency	5.20000 GHz	5.20000 GHz
Span	40.000 MHz	40.000 MHz
RBW	200.000 kHz	>= 200.000 kHz
VBW	1.000 MHz	>= 600.000 kHz
SweepPoints	400	~ 400
Sweeptime	1.000 ms	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	Sweep	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	55 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.03 dB	0.30 dB

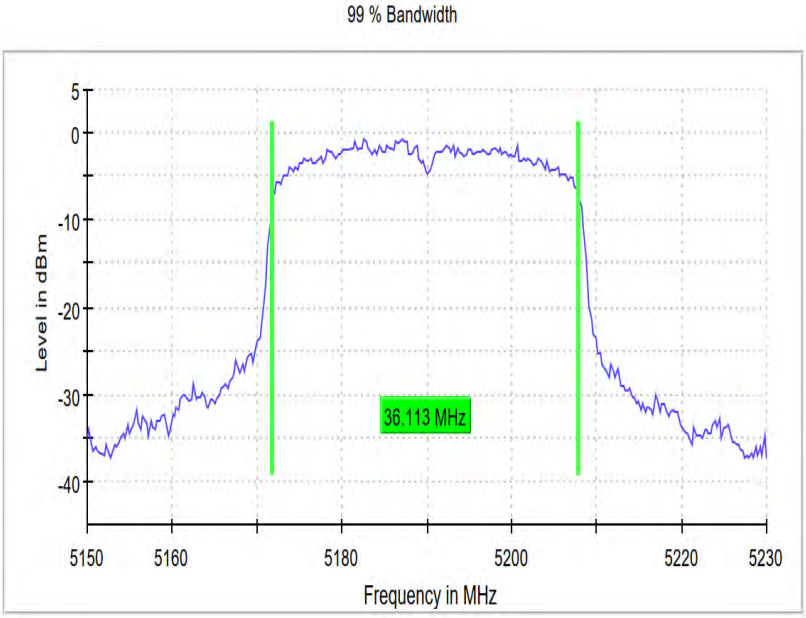
Radio Technology = WLAN n 20 MHz, Operating Frequency = low, Subband = U-NII-3 (S01_AM01)



Measurement

Setting	Instrument Value	Target Value
Start Frequency	5.72500 GHz	5.72500 GHz
Stop Frequency	5.76500 GHz	5.76500 GHz
Span	40.000 MHz	40.000 MHz
RBW	200.000 kHz	>= 200.000 kHz
VBW	1.000 MHz	>= 600.000 kHz
SweepPoints	400	~ 400
Sweeptime	28.477 µs	AUTO
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	58 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.28 dB	0.30 dB

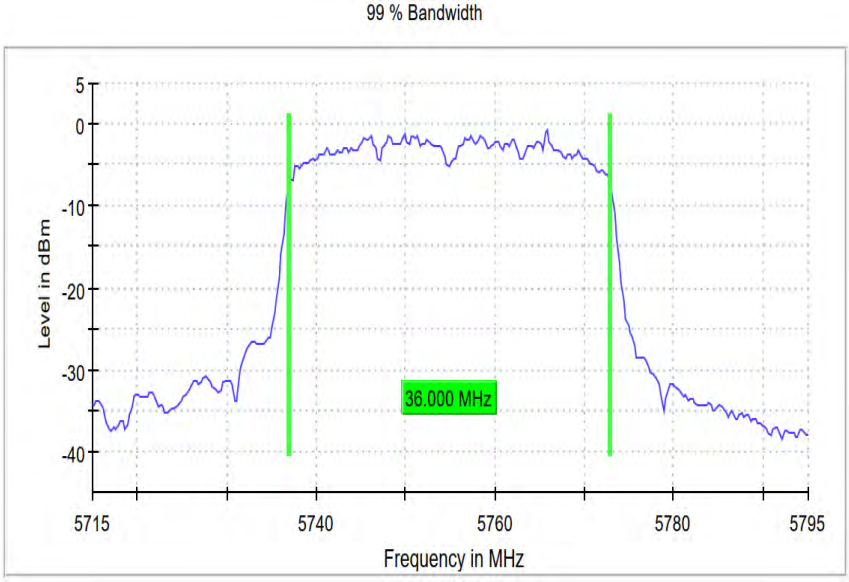
Radio Technology = WLAN n 40 MHz, Operating Frequency = low, Subband = U-NII-1 (S01_AM01)



Measurement

Setting	Instrument Value	Target Value
Start Frequency	5.15000 GHz	5.15000 GHz
Stop Frequency	5.23000 GHz	5.23000 GHz
Span	80.000 MHz	80.000 MHz
RBW	500.000 kHz	>= 400.000 kHz
VBW	2.000 MHz	>= 1.500 MHz
SweepPoints	320	~ 320
Sweeptime	1.000 ms	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	Sweep	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	105 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.00 dB	0.30 dB

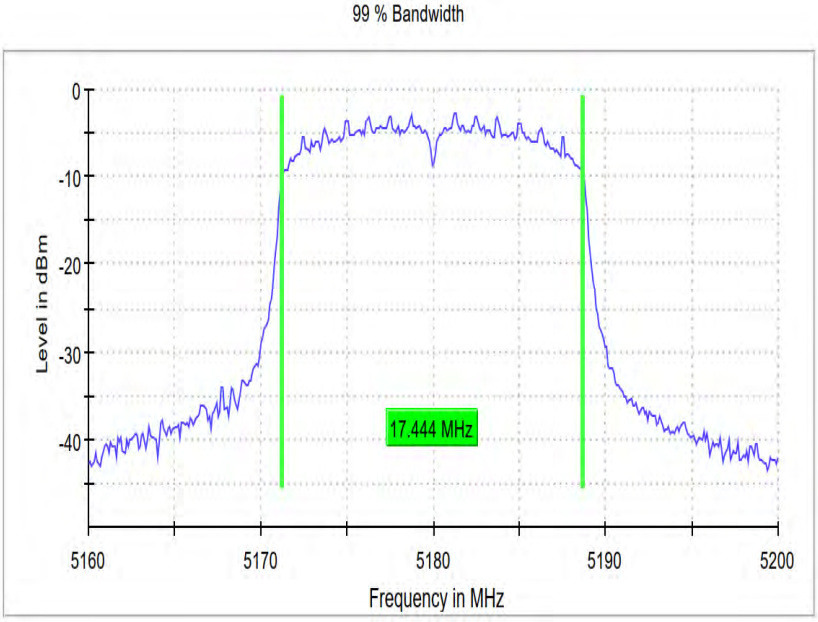
Radio Technology = WLAN n 40 MHz, Operating Frequency = low, Subband = U-NII-3 (S01_AM01)



Measurement

Setting	Instrument Value	Target Value
Start Frequency	5.71500 GHz	5.71500 GHz
Stop Frequency	5.79500 GHz	5.79500 GHz
Span	80.000 MHz	80.000 MHz
RBW	500.000 kHz	>= 400.000 kHz
VBW	2.000 MHz	>= 1.500 MHz
SweepPoints	320	~ 320
Sweeptime	18.906 µs	AUTO
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	115 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.00 dB	0.30 dB

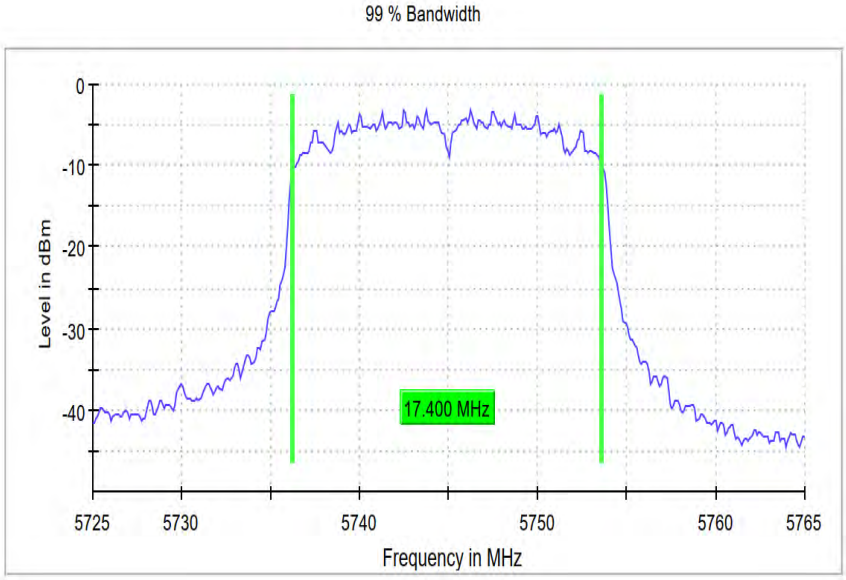
Radio Technology = WLAN ac 20 MHz, Operating Frequency = low, Subband = U-NII-1 (S01_AM01)



Measurement

Setting	Instrument Value	Target Value
Start Frequency	5.16000 GHz	5.16000 GHz
Stop Frequency	5.20000 GHz	5.20000 GHz
Span	40.000 MHz	40.000 MHz
RBW	200.000 kHz	>= 200.000 kHz
VBW	1.000 MHz	>= 600.000 kHz
SweepPoints	400	~ 400
Sweeptime	1.000 ms	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	Sweep	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	62 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.01 dB	0.30 dB

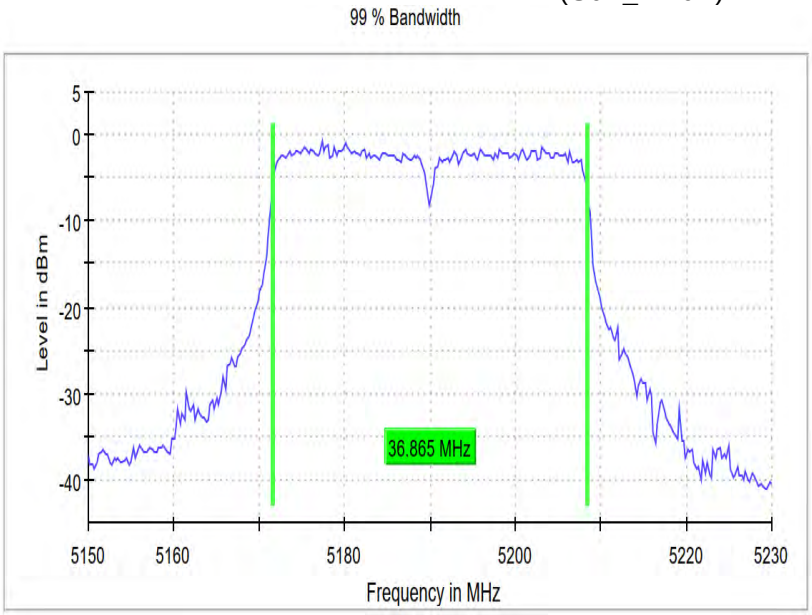
Radio Technology = WLAN ac 20 MHz, Operating Frequency = low, Subband = U-NII-3 (S01_AM01)



Measurement

Setting	Instrument Value	Target Value
Start Frequency	5.72500 GHz	5.72500 GHz
Stop Frequency	5.76500 GHz	5.76500 GHz
Span	40.000 MHz	40.000 MHz
RBW	200.000 kHz	>= 200.000 kHz
VBW	1.000 MHz	>= 600.000 kHz
SweepPoints	400	~ 400
Sweeptime	28.477 µs	AUTO
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	48 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.00 dB	0.30 dB

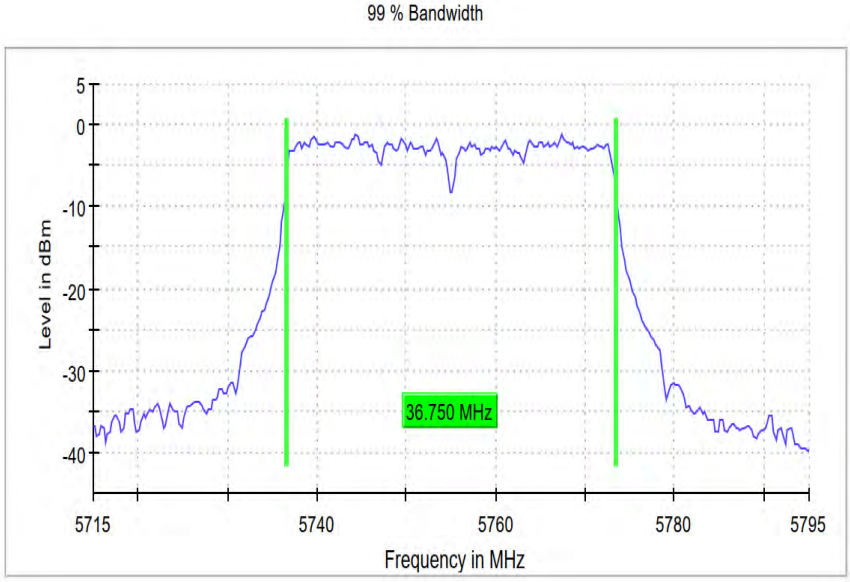
Radio Technology = WLAN ac 40 MHz, Operating Frequency = low, Subband = U-NII-1 (S01_AM01)



Measurement

Setting	Instrument Value	Target Value
Start Frequency	5.15000 GHz	5.15000 GHz
Stop Frequency	5.23000 GHz	5.23000 GHz
Span	80.000 MHz	80.000 MHz
RBW	500.000 kHz	>= 400.000 kHz
VBW	2.000 MHz	>= 1.500 MHz
SweepPoints	320	~ 320
Sweeptime	1.000 ms	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	Sweep	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	101 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.00 dB	0.30 dB

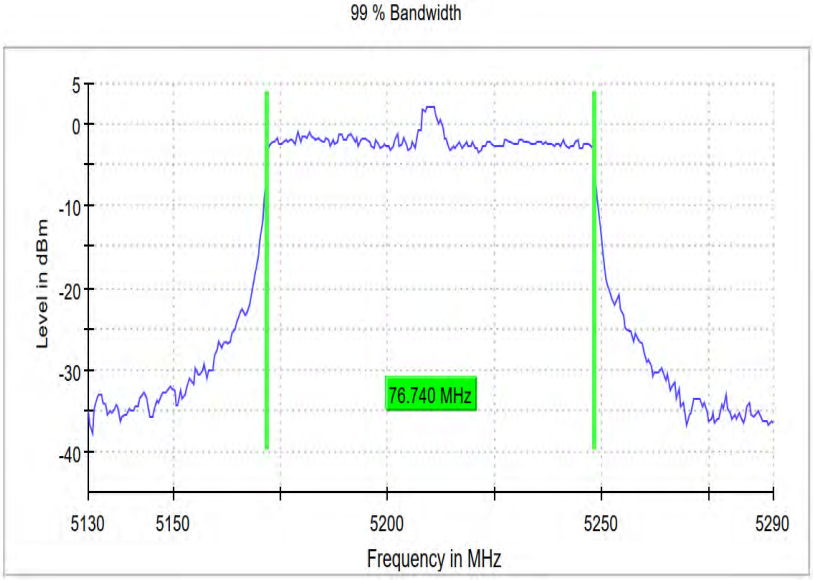
Radio Technology = WLAN ac 40 MHz, Operating Frequency = low, Subband = U-NII-3 (S01_AM01)



Measurement

Setting	Instrument Value	Target Value
Start Frequency	5.71500 GHz	5.71500 GHz
Stop Frequency	5.79500 GHz	5.79500 GHz
Span	80.000 MHz	80.000 MHz
RBW	500.000 kHz	>= 400.000 kHz
VBW	2.000 MHz	>= 1.500 MHz
SweepPoints	320	~ 320
Sweeptime	18.906 µs	AUTO
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	89 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.14 dB	0.30 dB

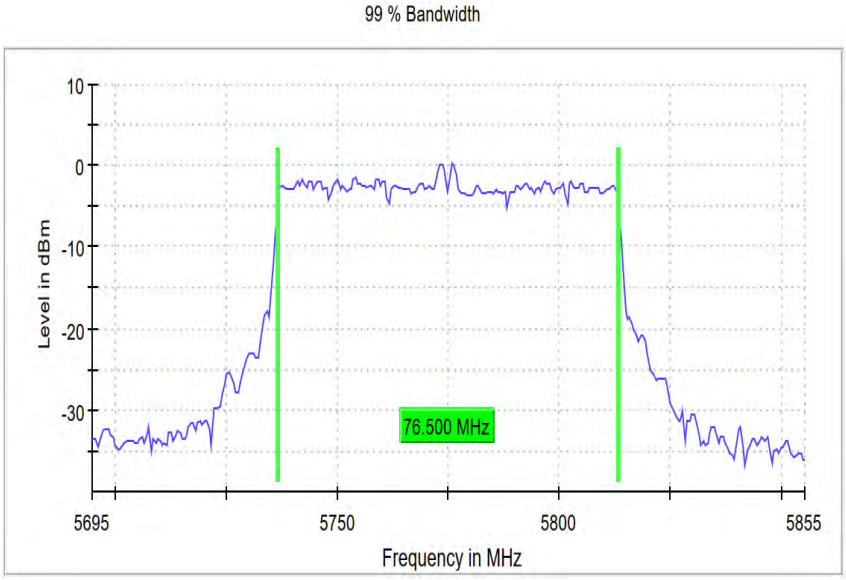
Radio Technology = WLAN ac 80 MHz, Operating Frequency = mid, Subband = U-NII-1 (S01_AM01)



Measurement

Setting	Instrument Value	Target Value
Start Frequency	5.13000 GHz	5.13000 GHz
Stop Frequency	5.29000 GHz	5.29000 GHz
Span	160.000 MHz	160.000 MHz
RBW	1.000 MHz	>= 800.000 kHz
VBW	3.000 MHz	>= 3.000 MHz
SweepPoints	320	~ 320
Sweeptime	1.000 ms	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	Sweep	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	86 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.21 dB	0.30 dB

Radio Technology = WLAN ac 80 MHz, Operating Frequency = low, Subband = U-NII-3 (S01_AM01)



Measurement

Setting	Instrument Value	Target Value
Start Frequency	5.69500 GHz	5.69500 GHz
Stop Frequency	5.85500 GHz	5.85500 GHz
Span	160.000 MHz	160.000 MHz
RBW	1.000 MHz	>= 800.000 kHz
VBW	3.000 MHz	>= 3.000 MHz
SweepPoints	320	~ 320
Sweeptime	22.875 µs	AUTO
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	95 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.27 dB	0.30 dB

5.3.5 TEST EQUIPMENT USED

- R&S TS8997

5.4 MAXIMUM CONDUCTED OUTPUT POWER

Standard FCC Part 15 Subpart E

The test was performed according to:
ANSI C63.10, chapter 12.3.3.2

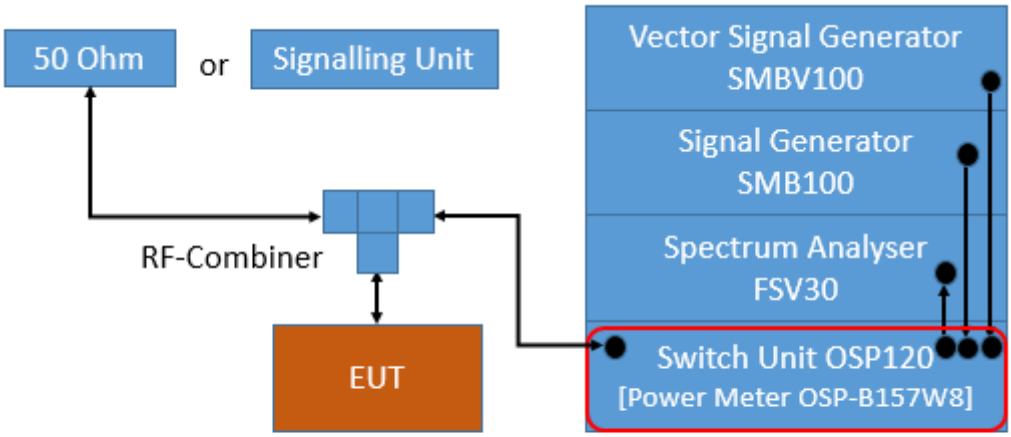
5.4.1 TEST DESCRIPTION

The Equipment Under Test (EUT) was set up to perform the output power measurements. The results recorded were measured with the modulation which produces the worst-case (highest) output power

For U-NII bands 1, 2A, 2C, 3:
The EUT was connected to the test system as described in the block diagram below. The complete attenuation of the measurement path is known and considered.

The OSP-B157W is a gated RF average power meter with a signal bandwidth > 300 MHz.

Note:
The measurement was performed according FCC Public Note "Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E, 789033 D02", method PM-G.



TS8997; Maximum Conducted Output Power

Attenuation of measurement path

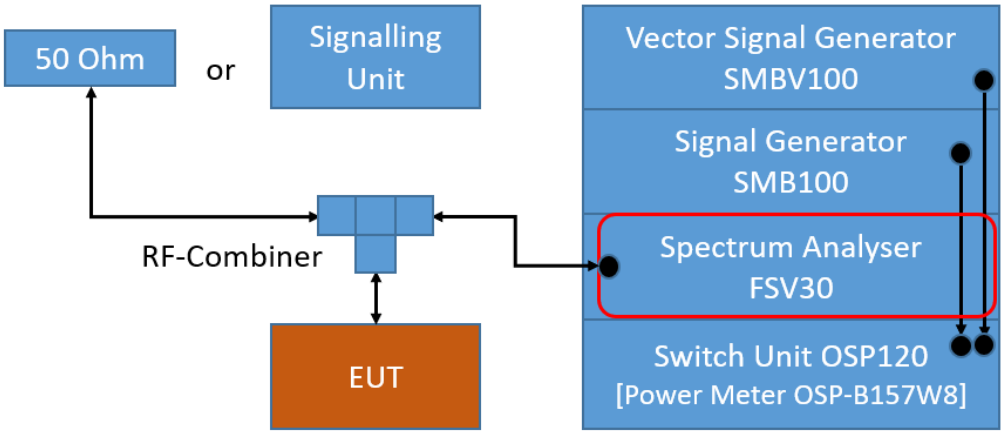
For U-NII bands 5,6,7,8:
The EUT was connected to the test system as described in the block diagram below. The complete attenuation of the measurement path is known and considered.

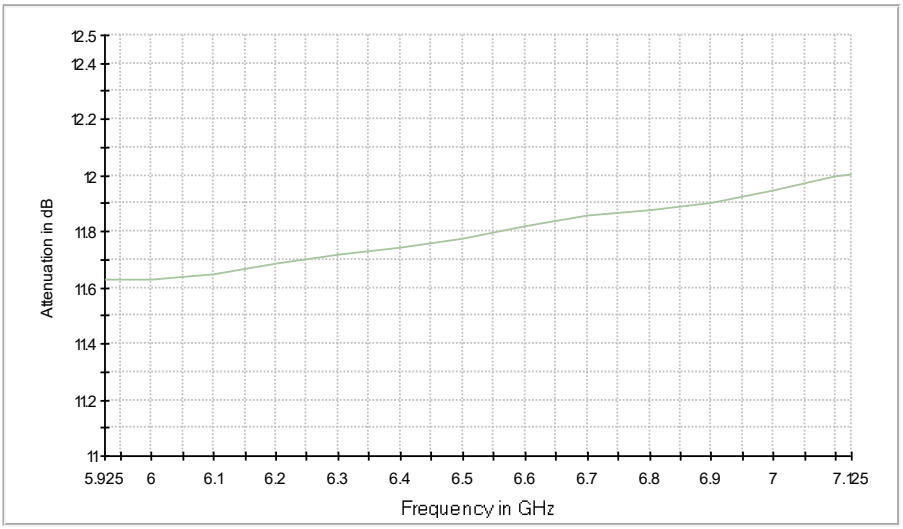
Analyzer settings:

- Resolution Bandwidth (RBW): 1 MHz
- Video Bandwidth (VBW): 3 MHz
- Trace: Average, RMS power averaging mode
- Sweeps: at least 100
- Sweeptime: Auto
- Detector: RMS
- Trigger: free run (DC >98 %) or gated mode (DC< 98 %)

See worst case result plots for details

Note:
The measurement was performed according FCC Public Note "Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E, 789033 D02", method SA-1.





Attenuation of measurement path

5.4.2 TEST REQUIREMENTS / LIMITS

A) FCC

FCC Part 15, Subpart E, §15.407 (a) (1) (i): Outdoor access point:
For systems using digital modulation techniques in the 5.15 − 5.25 GHz bands:
Limit: 1 W (30 dBm) provided the maximum antenna gain does not exceed 6 dBi.
The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).
§15.407 (a) (1) (ii): Indoor access point:
Limit: 1 W (30 dBm) provided the maximum antenna gain does not exceed 6 dBi.
§15.407 (a) (1) (iii): Fixed point-to-point access points:
Limit: 1 W (30 dBm) provided the maximum antenna gain does not exceed 23 dBi.
§15.407 (a) (1) (iv): Client devices:
Limit: 250 mW (24 dBm) provided the maximum antenna gain does not exceed 6 dBi.

FCC Part 15, Subpart E, §15.407 (a) (2)
For systems using digital modulation techniques in the 5.25 − 5.35 GHz and 5.47 − 5.725 GHz bands:
Limit: 250 mW (24 dBm) or 11 dBm + 10 log (26 dB bandwidth/MHz) whatever is the lesser.

FCC Part 15, Subpart E, §15.407 (a) (3):
For systems using digital modulation techniques in the 5.725 − 5.850 GHz bands:
Limit: 1 W (30 dBm) provided the maximum antenna gain does not exceed 6 dBi. The antenna gain limitation is not applicable for fixed point-to-point devices.

FCC Part 15, Subpart E, §15.407 (a) (4):
For a standard power access point and fixed client devices in the 5.925 − 6.425 GHz and 6.525 − 6.875 GHz bands:
Limit: 4 W (36 dBm) e.i.r.p.
For outdoor devices, the maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

FCC Part 15, Subpart E, §15.407 (a) (5):
For an indoor access point in the 5.925 − 7.125 GHz bands:
Limit: 1 W (30 dBm)e.i.r.p.

FCC Part 15, Subpart E, §15.407 (a) (6):
For a subordinate device operating under an indoor access point in the 5.925 − 7.125 GHz bands:
Limit: 1 W (30 dBm)e.i.r.p.

FCC Part 15, Subpart E, §15.407 (a) (7):
For a client device, except for fixed client devices, operating under standard power access point in the 5.925-6.425 GHz and 6.525-6.875 GHz bands:
Limit: 1 W (30 dBm)e.i.r.p.
The client device must limit it's power to no more than 6 dB below its associated standard power access point's authorized transmit power.

FCC Part 15, Subpart E, §15.407 (a) (8):
For client devices operating under the control of an indoor access point in the 5.925 − 7.125 GHz bands:
Limit: 250 mW (24 dBm)e.i.r.p.

FCC Part 15, Subpart E, §15.407 (a) (11):
The maximum conducted output power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage.

B) IC
Different frequency bands and limits apply, as compared to the FCC requirements.

All frequency bands: B is the 99% emission bandwidth in MHz.

RSS-247, 6.2.1.1, Band 5150-5250 MHz, indoor operation only, except for OEM devices installed by vehicle manufacturers:

Limits:
For OEM devices installed in vehicles, the maximum e.i.r.p. shall not exceed 30 mW or 1.76 + 10 $\log_{10}$B, dBm, whichever is less. Devices shall implement transmitter power control (TPC) in order to have the capability to operate at least 3 dB below the maximum permitted e.i.r.p. of 30 mW. (e.i.r.p.)

Other devices: 200 mW (23 dBm) or 10 + 10 $\log_{10}$B [dBm], whichever power is less.

RSS-247, 6.2.2.1, Band 5250-5350 MHz:
Limits:
For OEM devices installed in vehicles, the maximum e.i.r.p. shall not exceed 30 mW or 1.76 + 10 $\log_{10}$B, dBm, whichever is less. Devices shall implement TPC in order to have the capability to operate at least 3 dB below the maximum permitted e.i.r.p. of 30 mW.
Devices, other devices than installed in vehicles:
Maximum conducted Power: 250 mW (24 dBm) or 11 + 10 log10 B [dBm], whichever power is less.
e.i.r.p.: 1.0 W (30 dBm) or 17 + 10 log10 B [dBm], whichever power is less.

Outdoor fixed devices with a maximum e.i.r.p. greater than 200 mW shall comply with the following e.i.r.p. at different elevations, where θ is the angle above the local horizontal plane (of the Earth) as shown below:

i.-13 dBW/MHzfor 0°≤ θ< 8°
ii.-13 −0.716 (θ-8) dBW/MHzfor 8° ≤ θ< 40°
iii.-35.9 −1.22 (θ-40) dBW/MHzfor 40° ≤ θ ≤45°
iv.-42 dBW/MHzfor θ > 45°

RSS-247, 6.2.3.1, Bands 5470-5600 MHz and 5650-5725 MHz:
Limits:
Maximum conducted Power: 250 mW (24 dBm) or 11 + 10 log10 B [dBm], whichever power is less.
e.i.r.p.: 1.0 W (30 dBm) or 17 + 10 log10 B [dBm], whichever power is less.

Note: Devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

RSS-247, 6.2.4.1, Band 5725-5850 MHz:
Limits:
Maximum conducted Power: 1 W (30 dBm)
e.i.r.p.: 4 W (36 dBm)

5.4.3 TEST PROTOCOL

Ambient temperature: 23-24 °C
Air Pressure: 998-1001 hPa
Humidity: 39-43 %

WLAN a-Mode; 20 MHz; 6 Mbit/s

U-NII-Subband	TX Freq. [MHz]	Cond. Power [dBm]	EIRP [dBm]	FCC Cond. Limit [dBm]	Margin [dB]	FCC EIRP Limit [dBm]	Margin [dB]	ISED Cond. Limit [dBm]	Margin [dB]	ISED EIRP Limit [dBm]	Margin [dB]
1	5180	7.7	8.2	24.0	16.3	30.0	21.8	N/A	-	N/A	-
	5200	8.0	8.5	24.0	16.0	30.0	21.5	N/A	-	N/A	-
	5240	8.0	8.5	24.0	16.0	30.0	21.5	N/A	-	N/A	-
3	5745	7.5	7.5	30.0	22.5	36.0	28.5	30.0	22.5	36.0	28.5
	5785	7.4	7.4	30.0	22.6	36.0	28.6	30.0	22.6	36.0	28.6
	5825	7.3	7.3	30.0	22.7	36.0	28.7	30.0	22.7	36.0	28.7

WLAN n-Mode; 20 MHz; MCS 0; SISO

U-NII-Subband	TX Freq. [MHz]	Cond. Power [dBm]	EIRP [dBm]	FCC Cond. Limit [dBm]	Margin [dB]	FCC EIRP Limit [dBm]	Margin [dB]	ISED Cond. Limit [dBm]	Margin [dB]	ISED EIRP Limit [dBm]	Margin [dB]
1	5180	7.4	7.9	24.0	16.6	30.0	22.1	N/A	-	N/A	-
	5200	7.8	8.3	24.0	16.2	30.0	21.7	N/A	-	N/A	-
	5240	7.7	8.2	24.0	16.3	30.0	21.8	N/A	-	N/A	-
3	5745	7.5	7.5	30.0	22.5	36.0	28.5	30.0	22.5	36.0	28.5
	5785	7.2	7.2	30.0	22.8	36.0	28.8	30.0	22.8	36.0	28.8
	5825	7.0	7.0	30.0	23.0	36.0	29.0	30.0	23.0	36.0	29.0

WLAN n-Mode; 40 MHz; MCS 0; SISO

U-NII-Subband	TX Freq. [MHz]	Cond. Power [dBm]	EIRP [dBm]	FCC Cond. Limit [dBm]	Margin [dB]	FCC EIRP Limit [dBm]	Margin [dB]	ISED Cond. Limit [dBm]	Margin [dB]	ISED EIRP Limit [dBm]	Margin [dB]
1	5190	8.1	8.6	24.0	15.9	30.0	21.4	N/A	-	N/A	-
	5230	8.4	8.9	24.0	15.6	30.0	21.1	N/A	-	N/A	-
3	5755	8.0	8.0	30.0	22.0	36.0	28.0	30.0	22.0	36.0	28.0
	5795	7.8	7.8	30.0	22.2	36.0	28.2	30.0	22.2	36.0	28.2

WLAN ac-Mode; 20 MHz; MCS 0; SISO

U-NII-Subband	TX Freq. [MHz]	Cond. Power [dBm]	EIRP [dBm]	FCC Cond. Limit [dBm]	Margin [dB]	FCC EIRP Limit [dBm]	Margin [dB]	ISED Cond. Limit [dBm]	Margin [dB]	ISED EIRP Limit [dBm]	Margin [dB]
1	5180	7.4	7.9	24.0	16.6	30.0	22.1	N/A	-	N/A	-
	5200	7.8	8.3	24.0	16.2	30.0	21.7	N/A	-	N/A	-
	5240	7.7	8.2	24.0	16.3	30.0	21.8	N/A	-	N/A	-
3	5745	7.4	7.4	30.0	22.6	36.0	28.6	30.0	22.6	36.0	28.6
	5785	7.3	7.3	30.0	22.7	36.0	28.7	30.0	22.7	36.0	28.7
	5825	7.0	7.0	30.0	23.0	36.0	29.0	30.0	23.0	36.0	29.0

WLAN ac-Mode; 40 MHz; MCS 0;
SISO

U-NII-Subband	TX Freq. [MHz]	Cond. Power [dBm]	EIRP [dBm]	FCC Cond. Limit [dBm]	Margin [dB]	FCC EIRP Limit [dBm]	Margin [dB]	ISED Cond. Limit [dBm]	Margin [dB]	ISED EIRP Limit [dBm]	Margin [dB]
1	5190	8.1	8.6	24.0	15.9	30.0	21.4	N/A	-	N/A	-
	5230	8.4	8.9	24.0	15.6	30.0	21.1	N/A	-	N/A	-
3	5755	8.2	8.2	30.0	21.8	36.0	27.8	30.0	21.8	36.0	27.8
	5795	8.0	8.0	30.0	22.0	36.0	28.0	30.0	22.0	36.0	28.0

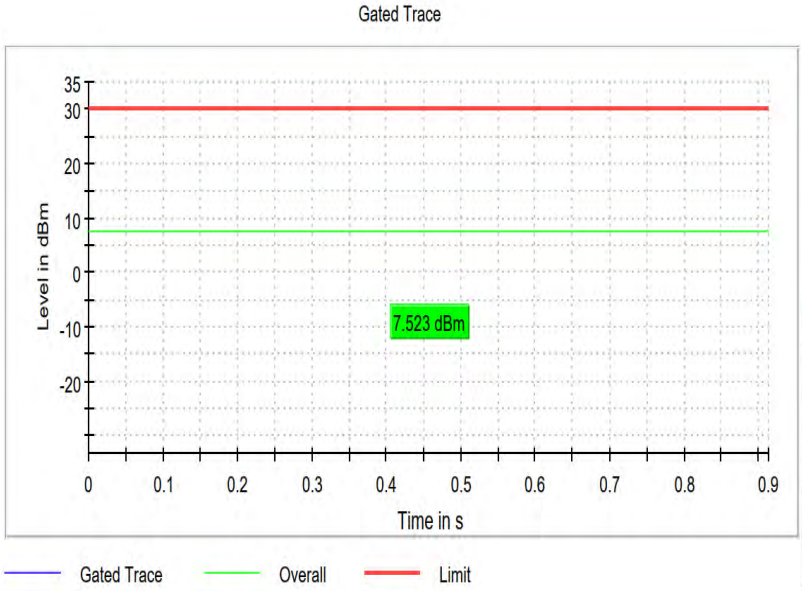
WLAN ac-Mode; 80 MHz; MCS 0;
SISO

U-NII-Subband	TX Freq. [MHz]	Cond. Power [dBm]	EIRP [dBm]	FCC Cond. Limit [dBm]	Margin [dB]	FCC EIRP Limit [dBm]	Margin [dB]	ISED Cond. Limit [dBm]	Margin [dB]	ISED EIRP Limit [dBm]	Margin [dB]
1	5210	7.9	8.4	24.0	16.1	30.0	21.6	N/A	-	N/A	-
3	5775	8.1	8.1	30.0	21.9	36.0	27.9	30.0	21.9	36.0	27.9

Remark: Please see next sub-clause for the measurement plot.

5.4.4 MEASUREMENT PLOT (EXAMPLE PLOT, SHOWING WORST CASE, IF APPLICABLE)

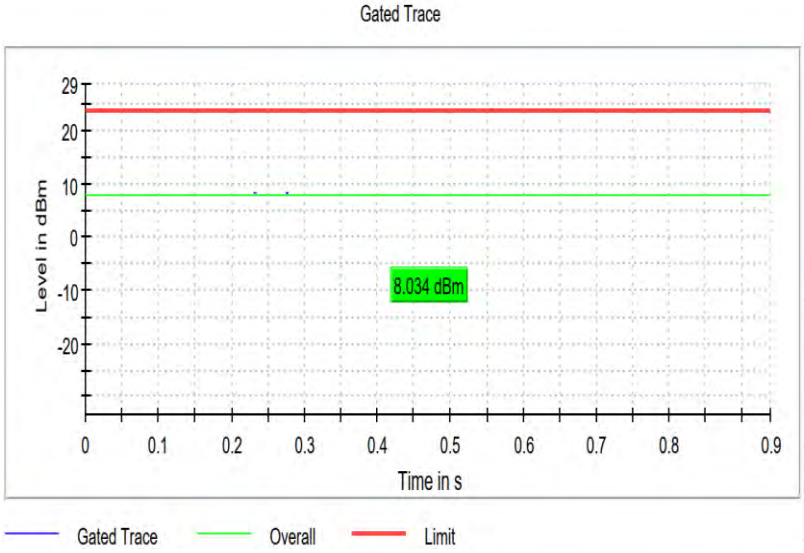
Radio Technology = WLAN a, Operating Frequency = low, Subband = U-NII-3 (S01_AM01)



OSP PowerMeter settings

Setting	Instrument Value	Target Value
Measurement Time	1.000 s	1.000 s
Points	1000000	1000000
Time resolution	1.000 µs	1.000 µs

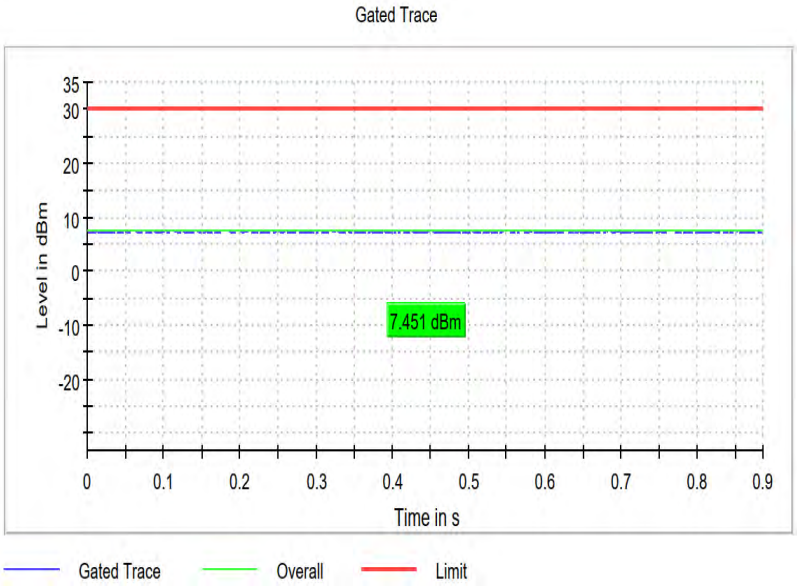
Radio Technology = WLAN a, Operating Frequency = mid, Subband = U-NII-1 (S01_AF01)



OSP PowerMeter settings

Setting	Instrument Value	Target Value
Measurement Time	1.000 s	1.000 s
Points	1000000	1000000
Time resolution	1.000 µs	1.000 µs

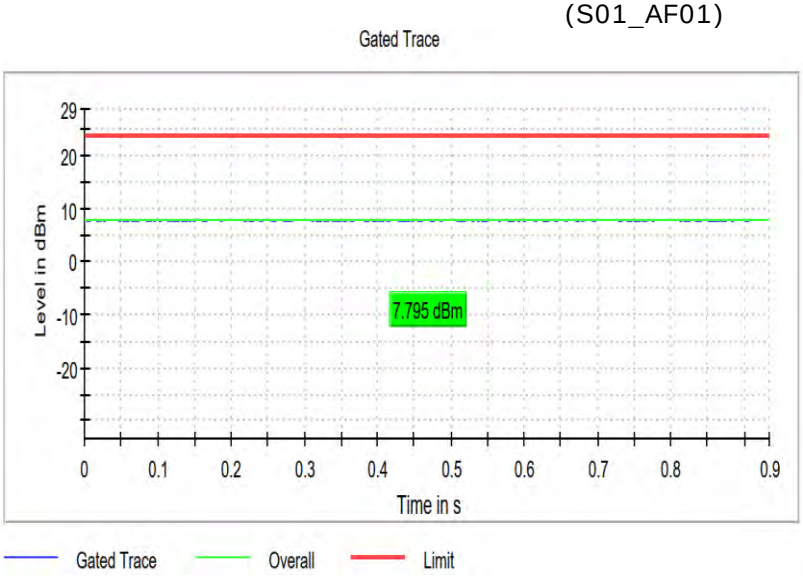
Radio Technology = WLAN n 20 MHz, Operating Frequency = low, Subband = U-NII-3 (S01_AM01)



OSP PowerMeter settings

Setting	Instrument Value	Target Value
Measurement Time	1.000 s	1.000 s
Points	1000000	1000000
Time resolution	1.000 µs	1.000 µs

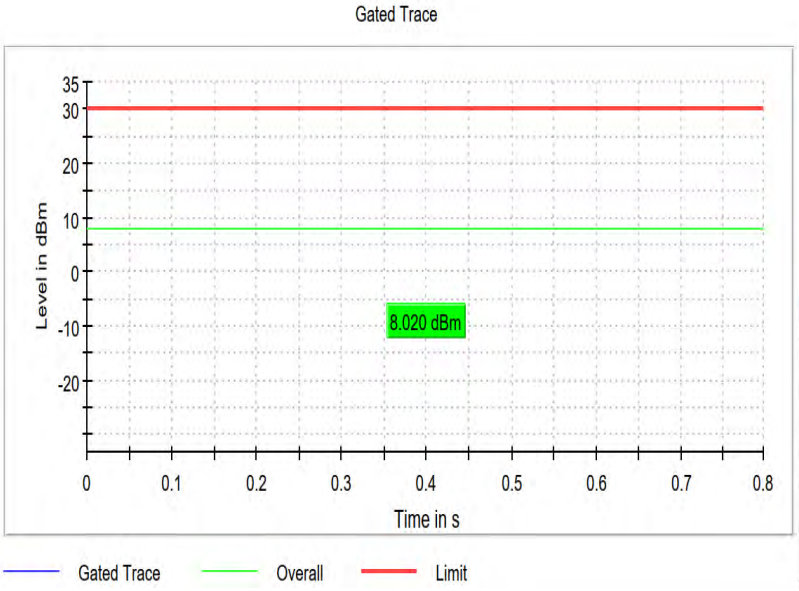
Radio Technology = WLAN n 20 MHz, Operating Frequency = mid, Subband = U-NII-1 (S01_AF01)



OSP PowerMeter settings

Setting	Instrument Value	Target Value
Measurement Time	1.000 s	1.000 s
Points	1000000	1000000
Time resolution	1.000 µs	1.000 µs

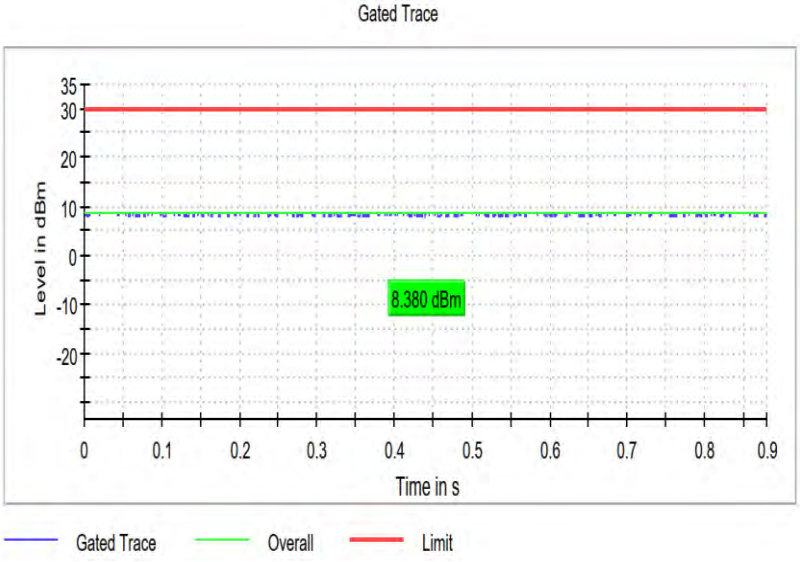
Radio Technology = WLAN n 40 MHz, Operating Frequency = low, Subband = U-NII-3 (S01_AM01)



OSP PowerMeter settings

Setting	Instrument Value	Target Value
Measurement Time	1.000 s	1.000 s
Points	1000000	1000000
Time resolution	1.000 µs	1.000 µs

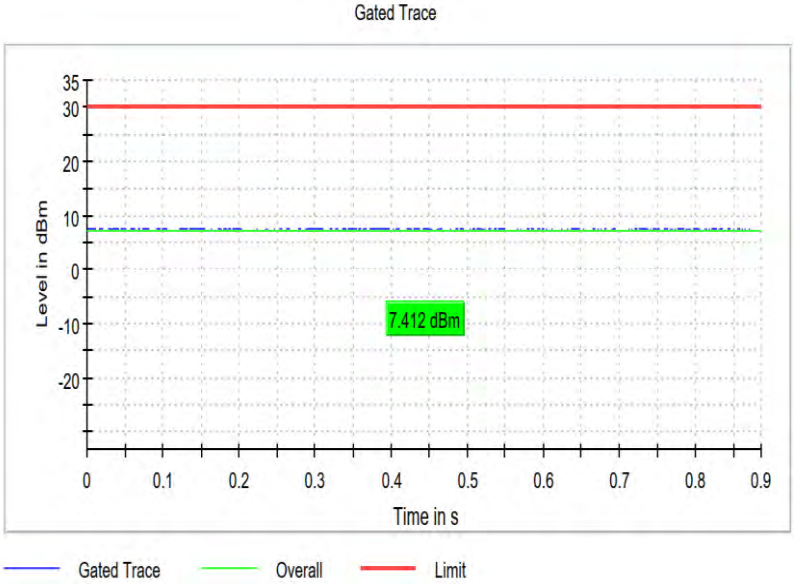
Radio Technology = WLAN n 40 MHz, Operating Frequency = high, Subband = U-NII-1 (S01_AF01)



OSP PowerMeter settings

Setting	Instrument Value	Target Value
Measurement Time	1.000 s	1.000 s
Points	1000000	1000000
Time resolution	1.000 µs	1.000 µs

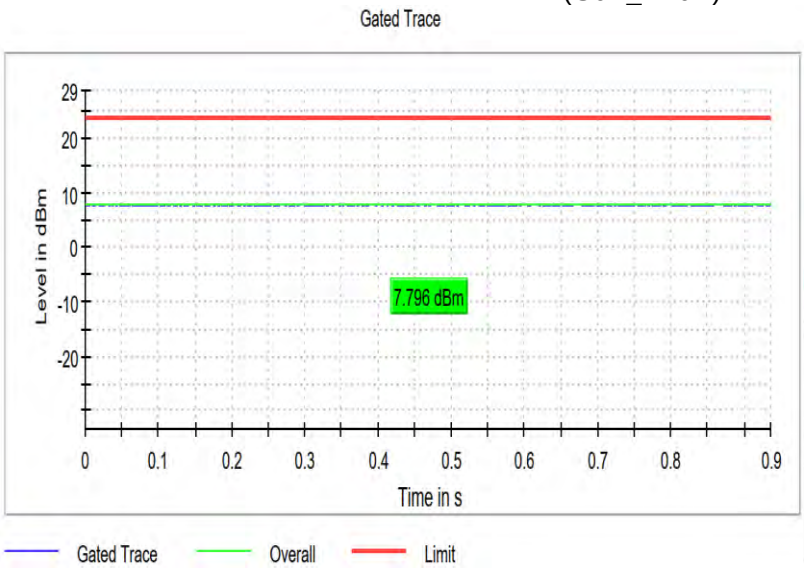
Radio Technology = WLAN ac 20 MHz, Operating Frequency = low, Subband = U-NII-3 (S01_AM01)



OSP PowerMeter settings

Setting	Instrument Value	Target Value
Measurement Time	1.000 s	1.000 s
Points	1000000	1000000
Time resolution	1.000 µs	1.000 µs

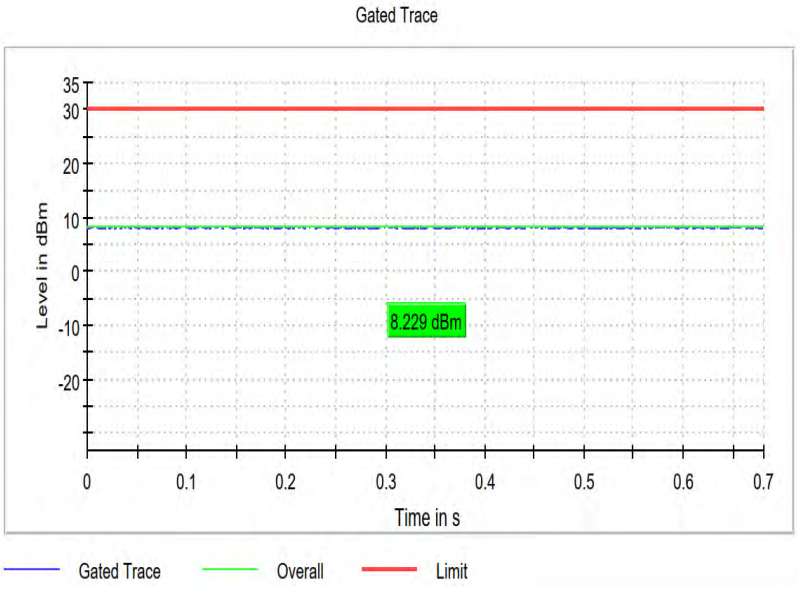
Radio Technology = WLAN ac 20 MHz, Operating Frequency = mid, Subband = U-NII-1 (S01_AF01)



OSP PowerMeter settings

Setting	Instrument Value	Target Value
Measurement Time	1.000 s	1.000 s
Points	1000000	1000000
Time resolution	1.000 µs	1.000 µs

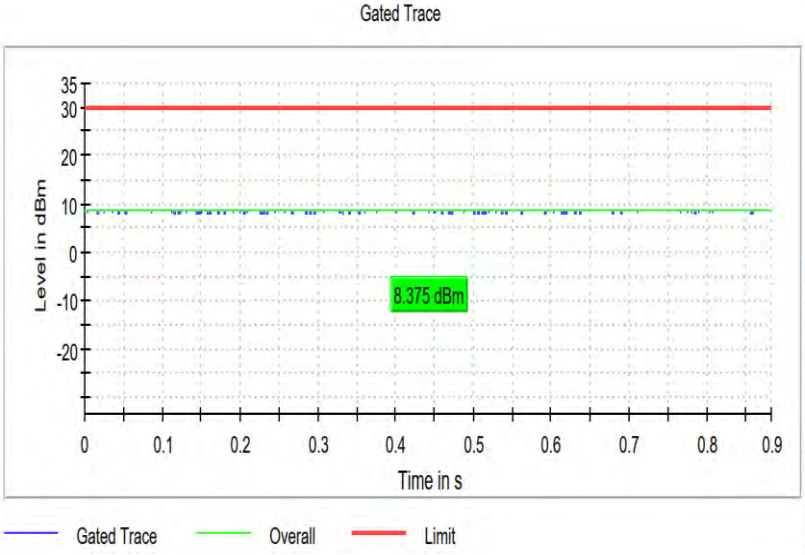
Radio Technology = WLAN ac 40 MHz, Operating Frequency = low, Subband = U-NII-3 (S01_AM01)



OSP PowerMeter settings

Setting	Instrument Value	Target Value
Measurement Time	1.000 s	1.000 s
Points	1000000	1000000
Time resolution	1.000 µs	1.000 µs

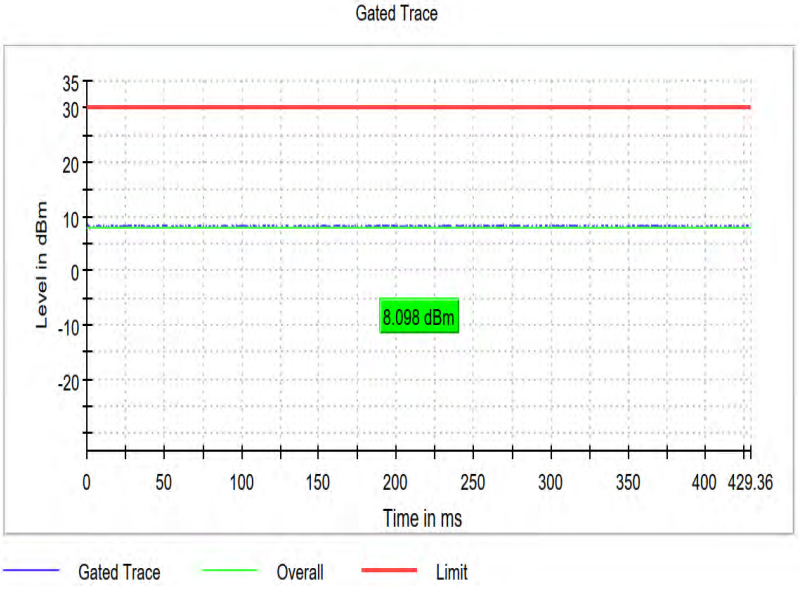
Radio Technology = WLAN ac 40 MHz, Operating Frequency = high, Subband = U-NII-1 (S01_AF01)



OSP PowerMeter settings

Setting	Instrument Value	Target Value
Measurement Time	1.000 s	1.000 s
Points	1000000	1000000
Time resolution	1.000 µs	1.000 µs

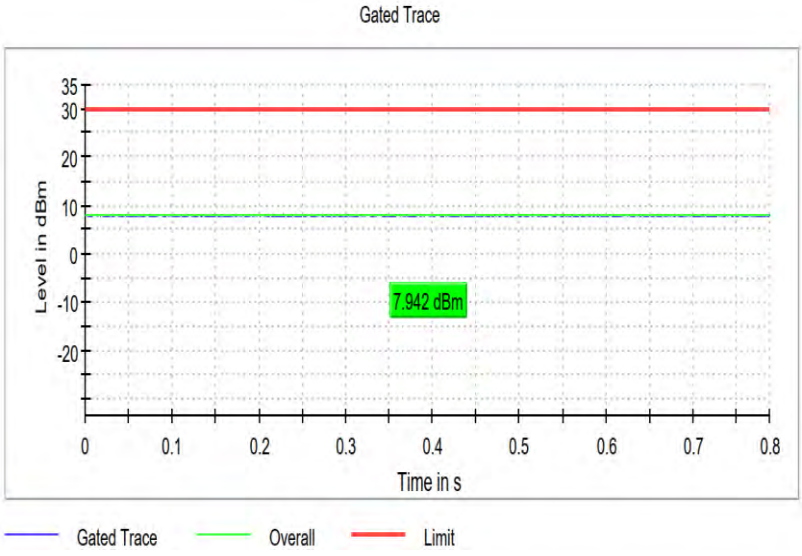
Radio Technology = WLAN ac 80 MHz, Operating Frequency = low, Subband = U-NII-3 (S01_AM01)



OSP PowerMeter settings

Setting	Instrument Value	Target Value
Measurement Time	1.000 s	1.000 s
Points	1000000	1000000
Time resolution	1.000 µs	1.000 µs

Radio Technology = WLAN ac 80 MHz, Operating Frequency = mid, Subband = U-NII-1 (S01_AF01)



OSP PowerMeter settings

Setting	Instrument Value	Target Value
Measurement Time	1.000 s	1.000 s
Points	1000000	1000000
Time resolution	1.000 µs	1.000 µs

5.4.5 TEST EQUIPMENT USED

- R&S TS8997