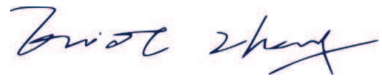


Prüfbericht-Nr.: Test Report No.:	50302126 001	Auftrags-Nr.: Order No.:	244167515	Seite 1 von 50 Page 1 of 50
Kunden-Referenz-Nr.: Client Reference No.:	414830	Auftragsdatum: Order date.:	23.08.2019	
Auftraggeber: Client:	Fluke Corporation 6920 Seaway Blvd, EVERETT WA 98203, USA			
Prüfgegenstand: Test item:	Thermal Imager			
Bezeichnung / Typ-Nr.: Identification / Type No.:	TiS20+			
Auftrags-Inhalt: Order content:	Certificate of Conformity Approval (AK) for RED			
Prüfgrundlage: Test specification:	EN 300 328 V2.1.1:2016 EN 301 489-1 V2.1.1:2017 EN 301 489-17 V3.1.1:2017		EN 61326-1:2013 EN 61010-1:2010 EN 50566:2017	
Wareneingangsdatum: Date of receipt:	21.08.2019			
Prüfmuster-Nr.: Test sample No.:	A000978575-006,007			
Prüfzeitraum: Testing period:	Refer to test report			
Ort der Prüfung: Place of testing:	MRT Technology (Suzhou) Co., Ltd.			
Prüflaboratorium: Testing laboratory:	TÜV Rheinland (Shanghai) Co., Ltd.			
Prüfergebnis*: Test result*:	Pass			
geprüft von / tested by:		kontrolliert von / reviewed by:		
				
31.10.2019 Datum Date	Hongfei Wu / PE Name/Stellung Name/Position	31.10.2019 Datum Date	Elliot Zhang / Reviewer Name/Stellung Name/Position	
	Unterschrift Signature		Unterschrift Signature	
Sonstiges / Other:				
This report only evaluates EN 300 328 V2.1.1:2016. For other requirements of RED 2014/53/EU, please refer to Clause 6.				
Zustand des Prüfgegenstandes bei Anlieferung: Condition of the test item at delivery:		Prüfmuster vollständig und unbeschädigt Test item complete and undamaged		
* Legende: 1 = sehr gut 2 = gut 3 = befriedigend P(ass) = entspricht o.g. Prüfgrundlage(n) Legend: 1 = very good 2 = good 3 = satisfactory P(ass) = passed a.m. test specifications(s)		4 = ausreichend 5 = mangelhaft N/A = nicht anwendbar N/T = nicht getestet 4 = sufficient 5 = poor N/A = not applicable N/T = not tested		
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.				

TEST SUMMARY

5.1.1 RF OUTPUT POWER*RESULT: PASS***5.1.2 POWER SPECTRAL DENSITY***RESULT: PASS***5.1.3 DUTY CYCLE, TX-SEQUENCE, TX-GAP***RESULT: N/A***5.1.4 MEDIUM UTILIZATION FACTOR***RESULT: N/A***5.1.5 ADAPTIVITY***RESULT: PASS***5.1.6 OCCUPIED CHANNEL BANDWIDTH***RESULT: PASS***5.1.7 TRANSMITTER UNWANTED EMISSIONS IN THE OOB DOMAIN***RESULT: PASS***5.1.8 TRANSMITTER UNWANTED EMISSIONS IN THE SPURIOUS DOMAIN***RESULT: PASS***5.2.1 RECEIVER SPURIOUS EMISSIONS***RESULT: PASS***5.2.2 RECEIVER BLOCKING***RESULT: PASS***6.1.1 ELECTRICAL SAFETY REQUIREMENT***RESULT: PASS***6.1.2 HUMAN EXPOSURE TO EM FIELDS***RESULT: PASS***6.2.1 ELECTROMAGNETIC COMPATIBILITY REQUIREMENT***RESULT: PASS*

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1. General Remarks

1.1 Complementary Materials

Null.

1.2 Test Specifications

The following standards were applied.

Table 1: Applied Standard and Test Levels

Radio
EN 300 328 V2.1.1:2016

2. Test Sites

2.1 Test Facilities

MRT Technology (Suzhou) Co., Ltd.
D8 Building, Youxin Industrial Park, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China

The used test equipment is in accordance with CISPR 16-1 series standards for measurement of radio interference.

2.2 List of Test and Measurement Instruments

Table 2: List of Test and Measurement Equipment

RF Output Power

Instrument	Manufacturer	Type No.	Asset No.	Cali. Due Date
Power Meter	Agilent	U2021XA	MRTSUE06030	16.11.2019
Programmable Temperature & Humidity Chamber	BAOYT	BYH-1500L	MRTSUE06051	16.11.2019
Thermohygrometer	Testo	608-H1	MRTSUE06401	08.08.2020

Power Spectral Density, Occupied Channel Bandwidth, Transmitter Unwanted Emissions in the OOB Domain

Instrument	Manufacturer	Type No.	Asset No.	Cali. Due Date
Spectrum Analyzer	Agilent	N9020A	MRTSUE06106	15.04.2020
Thermohygrometer	Testo	608-H1	MRTSUE06401	08.08.2020

Adaptivity

Instrument	Manufacturer	Type No.	Asset No.	Cali. Due Date
Spectrum Analyzer	Agilent	N9020A	MRTSUE06106	15.04.2020
EXA Signal Analyzer	Keysight	N9010B	MRTSUE06457	18.07.2020
Vector Signal Generator	Agilent	E4438C	MRTSUE06026	16.11.2019
Vector Signal Generator	Agilent	E4438C	MRTSUE06081	16.11.2019
Directional Coupler	Narda	4216-20	MRTSUE06065	26.03.2020
Power Splitter	Mini-Circuits	ZFRSC-123-S+	MRTSUE06122	N/A
Thermohygrometer	Testo	608-H1	MRTSUE06402	08.08.2020

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Transmitter Unwanted Emissions in the Spurious Domain, Receiver Spurious Emissions

Instrument	Manufacturer	Type No.	Asset No.	Cali. Due Date
EMI Test Receiver	R&S	ESR7	MRTSUE06001	01.08.2020
PXA Signal Analyzer	Keysight	N9030B	MRTSUE06395	25.09.2019
Microwave System Amplifier	Agilent	83017A	MRTSUE06076	16.11.2019
Preamplifier	Schwarzbeck	BBV 9721	MRTSUE06121	11.06.2020
Bilog Period Antenna	Schwarzbeck	VULB 9168	MRTSUE06172	11.04.2020
Broad Band Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06023	19.10.2019
Thermohygrometer	Testo	608-H1	MRTSUE06403	08.08.2020
Anechoic Chamber	TDK	Chamber-AC1	MRTSUE06212	30.04.2020

Receiver Blocking

Instrument	Manufacturer	Type No.	Asset No.	Cali. Due Date
Vector Signal Generator	Agilent	E4438C	MRTSUE06026	16.11.2019
Spectrum Analyzer	Agilent	N9020A	MRTSUE06106	15.04.2020
EXA Signal Analyzer	Keysight	N9010B	MRTSUE06457	18.07.2020
Directional Coupler	Narda	4216-20	MRTSUE06065	26.03.2020
Wideband Radio Communication Tester	R&S	CMW 500	MRTSUE06243	16.11.2019
Power Splitter	Mini-Circuits	ZFRSC-123-S+	MRTSUE06122	N/A
Thermohygrometer	Testo	608-H1	MRTSUE06402	08.08.2020

2.3 Measurement Uncertainty

Table 3: Emission Measurement Uncertainty

Parameter	Uncertainty
Occupied Channel Bandwidth	$\pm 5 \%$
RF output power, conducted	$\pm 1.5 \text{ dB}$
Power Spectral Density, conducted	$\pm 3 \text{ dB}$
Unwanted Emissions, conducted	$\pm 3 \text{ dB}$
All emissions, radiated	$\pm 6 \text{ dB}$
Temperature	$\pm 1 \%$
Humidity	$\pm 5 \%$
DC and low frequency voltages	$\pm 3 \%$
Time	$\pm 5 \%$
Duty Cycle	$\pm 5 \%$

3. General Product Information

3.1 Product Function and Intended Use

The EUT (Equipment Under Test) is a thermal imager which contains WiFi module. For details refer to the User Manual and Circuit Diagram.

3.2 System Details

Table 4: Technical Specification of EUT

General Description of EUT	
Product Name:	Thermal Imager
Model No.:	TiS20+
Operation Voltage:	DC 7.2V (Li-ion)
operating temperature:	-10~50 °C
Technical Specification of 2.4GHz WiFi	
Frequency Range:	2412 – 2472MHz
Modulation Type:	802.11b: DSSS 802.11g/n-HT20: OFDM
Antenna Type:	Internal Antenna
Antenna Gain:	3.2 dBi
Receiver Category:	1

3.3 Independent Operation Modes

Table 5: Independent Operation Modes

Test Mode			Operating Mode	Channel Number	Channel Frequency [MHz]
Tx	Rx	Normal			
TM1	TM10	TM19	802.11b	1	2412
TM2	TM11	TM20	802.11b	7	2442
TM3	TM12	TM21	802.11b	13	2472
TM4	TM13	TM22	802.11g	1	2412
TM5	TM14	TM23	802.11g	7	2442
TM6	TM15	TM24	802.11g	13	2472
TM7	TM16	TM25	802.11n-HT20	1	2412
TM8	TM17	TM26	802.11n-HT20	7	2442
TM9	TM18	TM27	802.11n-HT20	13	2472

3.4 Noise Suppressing Parts

Refer to schematics.

4. Test Set-up and Operation Modes

4.1 Test Methodology

Radio: The equipment under test (EUT) was configured at its highest power output in order to measure its highest possible radiation and conducted level. The test modes were adapted accordingly in reference to the instructions for use.

4.2 Physical Configuration for Testing

The EUT was designed to get into related working mode with the control of computer.
Notes:

For antenna conducted measurements, the antenna was replaced by a 50Ω antenna connector.

For antenna radiated measurements, the associated cables and computer were removed.

For more details, refer to section: Photographs of the Test Set-Up.

4.3 Test Operation and Test Software

Test software: DutApiWiFi8801BrdigeEth

Table 6: Power parameter value

Operating Mode	Channel Frequency [MHz]	Power Parameter Value	Operating Mode	Channel Frequency [MHz]	Power Parameter Value
802.11b	2412	17	802.11n-HT20	2412	20
	2442	22		2442	24
	2472	17		2472	19
802.11g	2412	22	-	-	-
	2442	25		-	-
	2472	19		-	-

4.4 Special Accessories and Auxiliary Equipment

Null.

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4.5 Countermeasures to achieve EMC Compliance

Null.

5. Test Results RADIO

5.1 Transmitter Parameters

5.1.1 RF output power

RESULT:**PASS**

Date of testing	: 09.09.2019
Ambient temperature	: 25°C
Relative humidity	: 52%
Atmospheric pressure	: 101kPa
Test requirement	: EN 300 328 V2.1.1:2016, clause 4.3.2.2
Test procedure	: EN 300 328 V2.1.1:2016, clause 5.4.2.2
Normal test voltage	: DC 7.2V
Low test temperature	: -10°C
Normal test temperature	: 25°C
High test temperature	: 50°C
Test modes applied	: TM1 to TM9

Table 7: RF output power

Temp. [°C]	Operating Mode	Test Mode	Antenna Gain [dBi]	Ch. No.	Freq. [MHz]	RF Output Power [dBm]	E.I.R.P [dBm]	Limit [dBm]
25	802.11b	TM1	3.2	1	2412	15.43	18.63	20.00
		TM2		7	2442	14.76	17.96	20.00
		TM3		13	2472	15.27	18.47	20.00
	802.11g	TM4		1	2412	16.78	19.98	20.00
		TM5		7	2442	16.75	19.95	20.00
		TM6		13	2472	16.42	19.62	20.00
	802.11n- HT20	TM7		1	2412	16.34	19.54	20.00
		TM8		7	2442	16.23	19.43	20.00
		TM9		13	2472	16.75	19.95	20.00
-10	802.11b	TM1	3.2	1	2412	13.45	16.65	20.00
		TM2		7	2442	15.38	18.58	20.00
		TM3		13	2472	15.02	18.22	20.00
	802.11g	TM4		1	2412	16.44	19.64	20.00
		TM5		7	2442	16.56	19.76	20.00
		TM6		13	2472	16.69	19.89	20.00
	802.11n- HT20	TM7		1	2412	16.08	19.28	20.00
		TM8		7	2442	16.21	19.41	20.00
		TM9		13	2472	16.12	19.32	20.00
50	802.11b	TM1	3.2	1	2412	13.50	16.70	20.00
		TM2		7	2442	13.75	16.95	20.00
		TM3		13	2472	15.17	18.37	20.00
	802.11g	TM4		1	2412	15.88	19.08	20.00
		TM5		7	2442	16.49	19.69	20.00
		TM6		13	2472	16.74	19.94	20.00
	802.11n- HT20	TM7		1	2412	15.52	18.72	20.00
		TM8		7	2442	16.12	19.32	20.00
		TM9		13	2472	16.54	19.74	20.00

Note:

$E.I.R.P = P_{burst} + \text{Antenna Gain.}$

P_{burst} : The highest burst power value measured in observant duration.

5.1.2 Power Spectral Density

RESULT:
PASS

Date of testing : 09.09.2019
 Ambient temperature : 25°C
 Relative humidity : 52%
 Atmospheric pressure : 101kPa
 Test requirement : EN 300 328 V2.1.1:2016, clause 4.3.2.3
 Test procedure : EN 300 328 V2.1.1:2016, clause 5.4.3.2
 Normal test voltage : DC 7.2V
 Test modes applied : TM1 to TM9

Table 8: Power spectral density

Operating Mode	Test Mode	Ch. No.	Freq. [MHz]	Total PSD [dBm/MHz]	Limit [dBm/MHz]
802.11b	TM1	1	2412	9.79	10.00
	TM2	7	2442	9.11	10.00
	TM3	13	2472	9.64	10.00
802.11g	TM4	1	2412	8.80	10.00
	TM5	7	2442	8.36	10.00
	TM6	13	2472	8.63	10.00
802.11n-HT20	TM7	1	2412	8.16	10.00
	TM8	7	2442	7.64	10.00
	TM9	13	2472	8.74	10.00

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Test requirement : EN 300 328 V2.1.1:2016, clause 4.3.2.4

Note:

These requirements apply to non-adaptive equipment or to adaptive equipment when operating in a non-adaptive mode.

Therefore, these measurements are not required.

5.1.4 Medium Utilization Factor

RESULT:**N/A**

Test requirement : EN 300 328 V2.1.1:2016, clause 4.3.2.5

Note:

This requirement does not apply to adaptive equipment unless operating in a non-adaptive mode.

Therefore, assessment of the Medium Utilisation Factor is not required.

5.1.5 Adaptivity

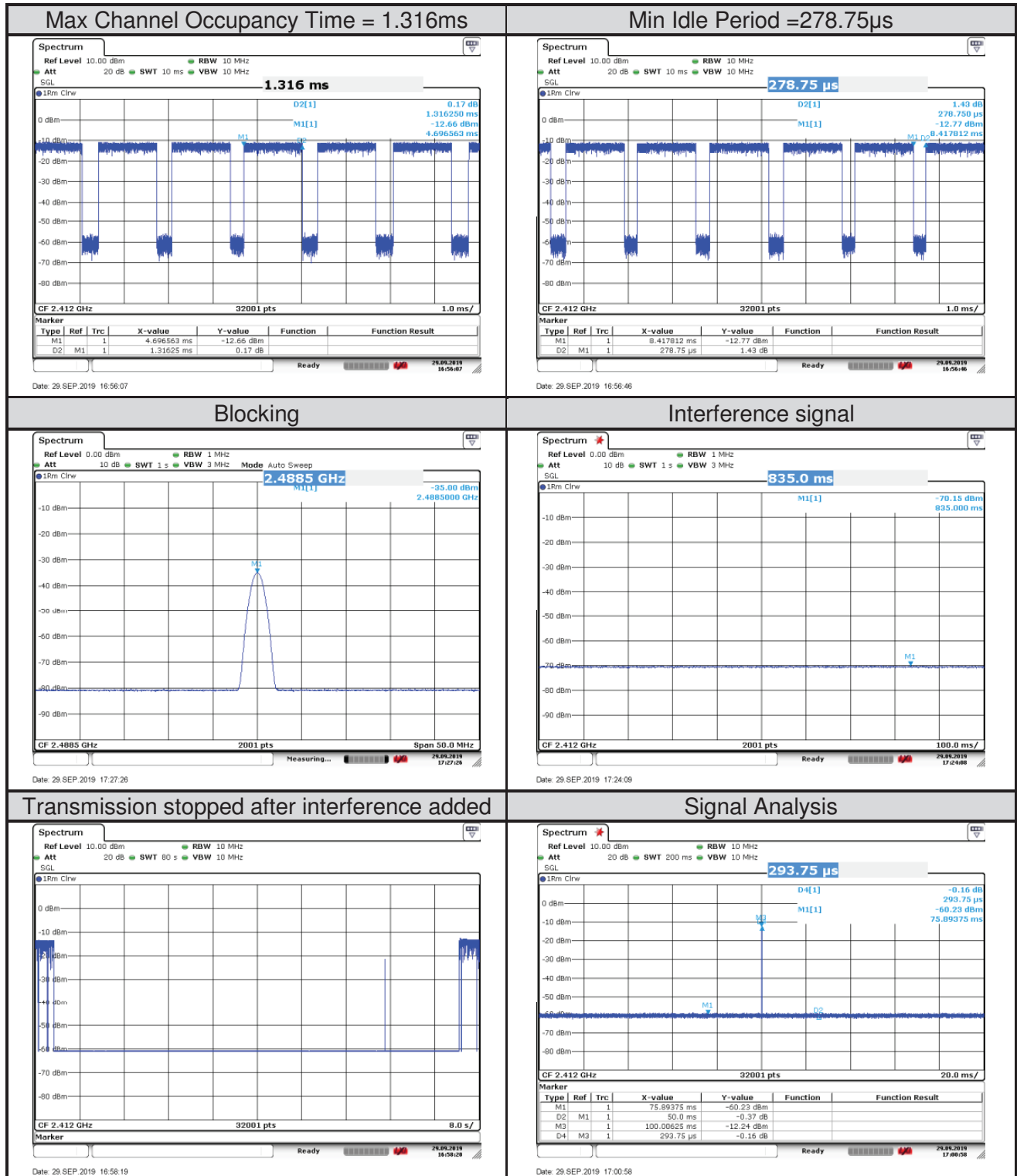
RESULT:
PASS

Date of testing : 29.09.2019
 Ambient temperature : 25°C
 Relative humidity : 52%
 Atmospheric pressure : 101kPa
 Test requirement : EN 300 328 V2.1.1:2016, clause 4.3.2.6
 Test procedure : EN 300 328 V2.1.1:2016, clause 5.4.6.2
 Normal test voltage : DC 7.2V
 Test modes applied : TM19, TM21, TM22, TM24, TM25, TM27

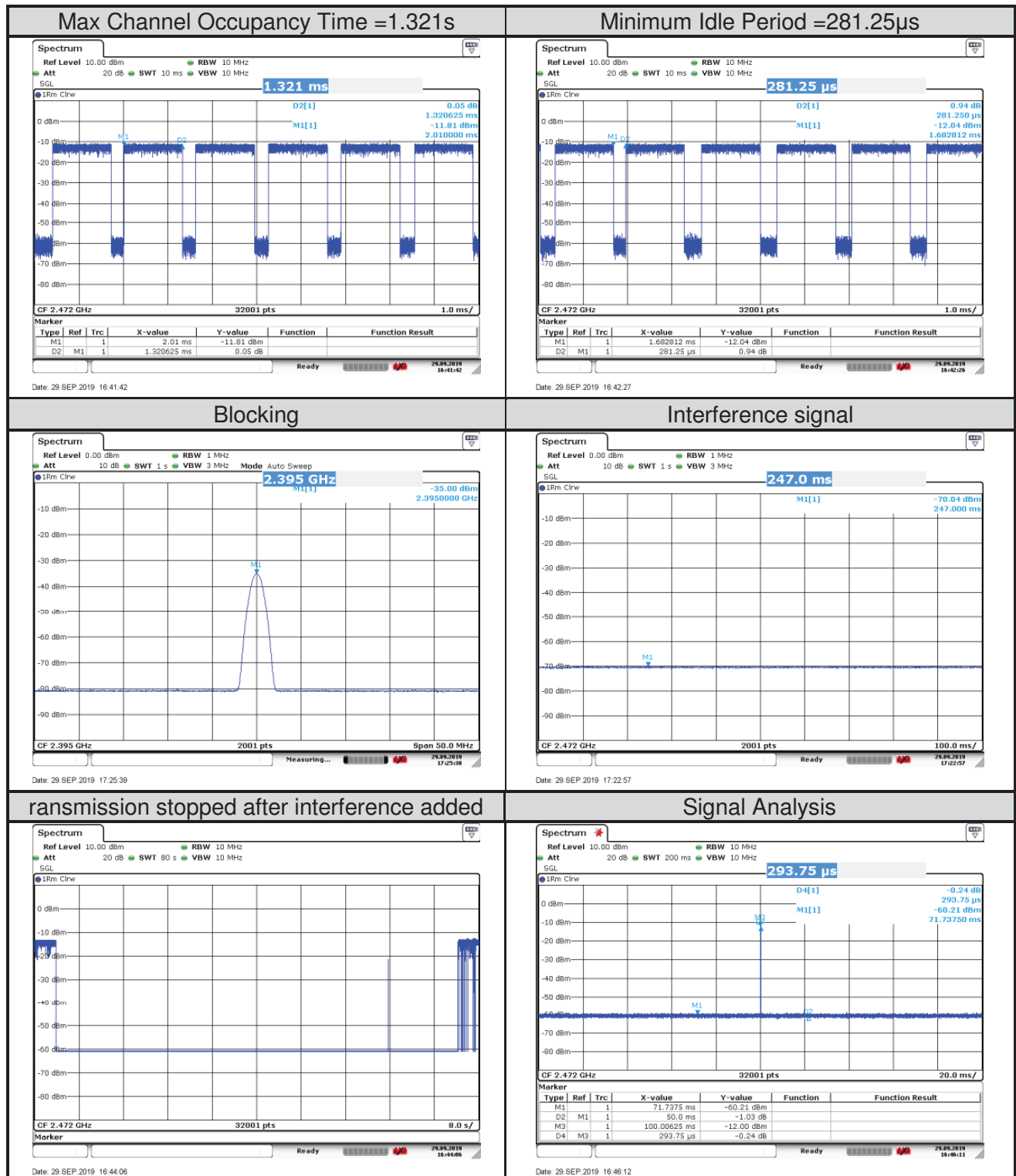
Table 9: Short Control Signalling Transmissions

Operating mode	Channel Frequency [MHz]	Short Control Signalling Transmissions			Limit [%]
		TxOn [µs]	TxOn+TxOff [ms]	TxOn/(TxOn+TxOff) [%]	
802.11b	2412	293.75	50	0.59	<10
	2472	293.75	50	0.59	
802.11g	2412	nf	nf	/	
	2472	nf	nf	/	
802.11n-HT20	2412	nf	nf	/	
	2472	nf	nf	/	

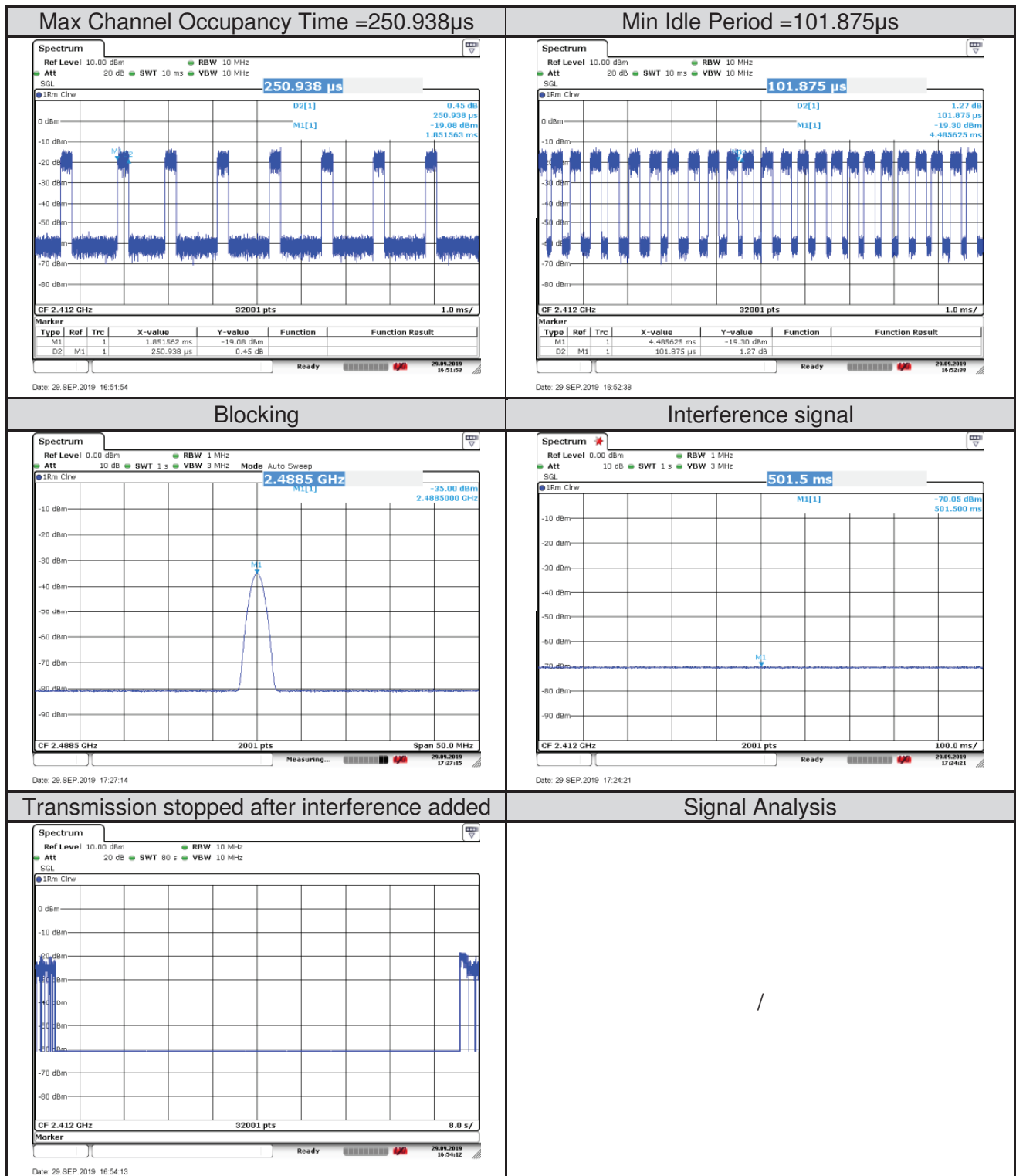
Note: 'nf' means not found.

Figure 1: Adaptivity, TM19


*Note: Due to the max E.I.R.P is 18.63 dBm, the threshold level (TL) should be -68.63dBm/MHz. (TL= -70 dBm/MHz + 10*log(100mW/P_{out})). And actually, the TL used in the test is -70.15 dBm/MHz which is lower than -68.63dBm /MHz.*

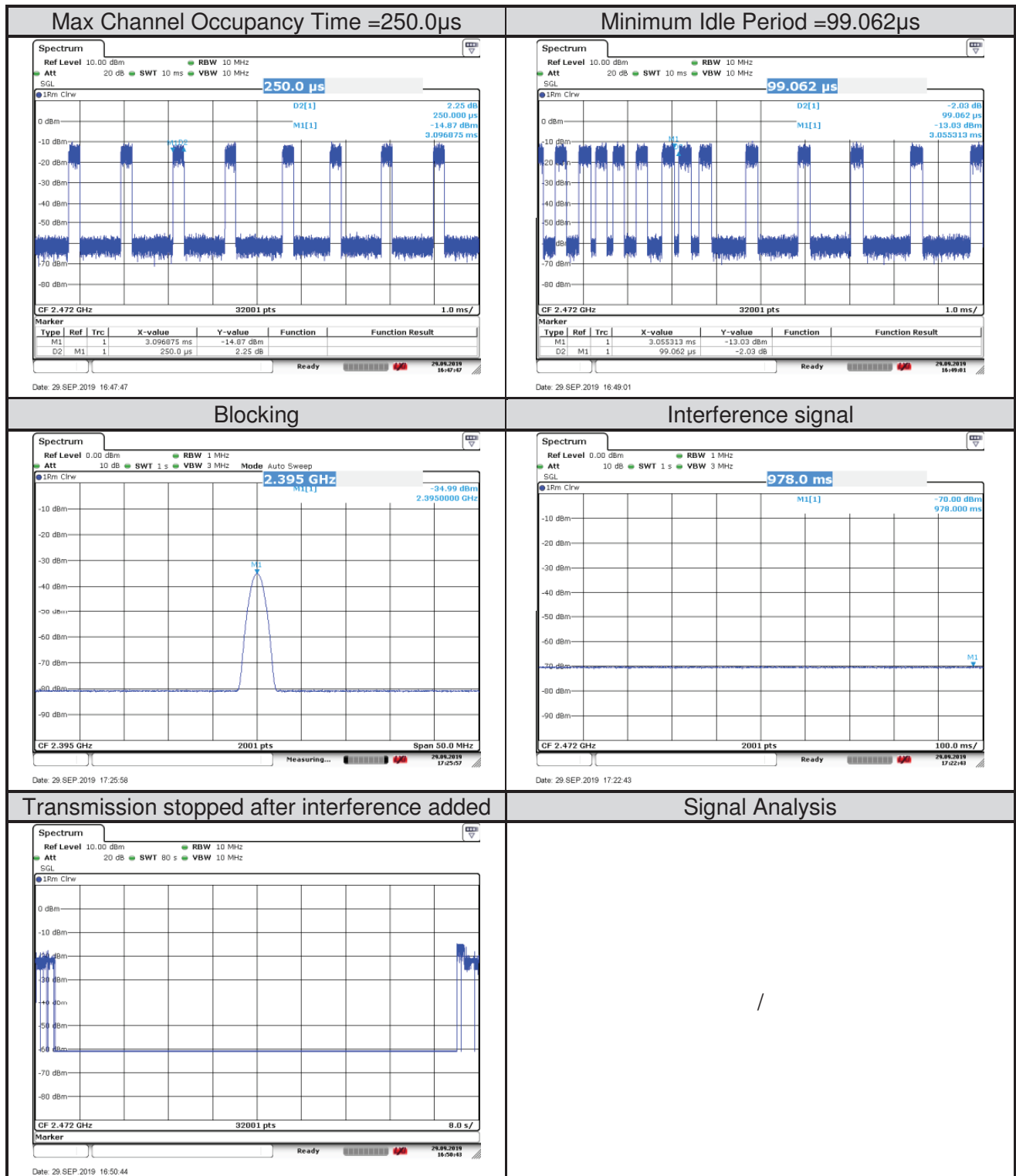
Figure 2: Adaptivity, TM21


*Note: Due to the max E.I.R.P is 18.47dBm, the threshold level (TL) should be -68.47dBm/MHz. (TL= -70 dBm/MHz + 10*log(100mW/P_{out})). And actually, the TL used in the test is -70.04 dBm/MHz which is lower than -68.47dBm /MHz.*

Figure 3: Adaptivity, TM22


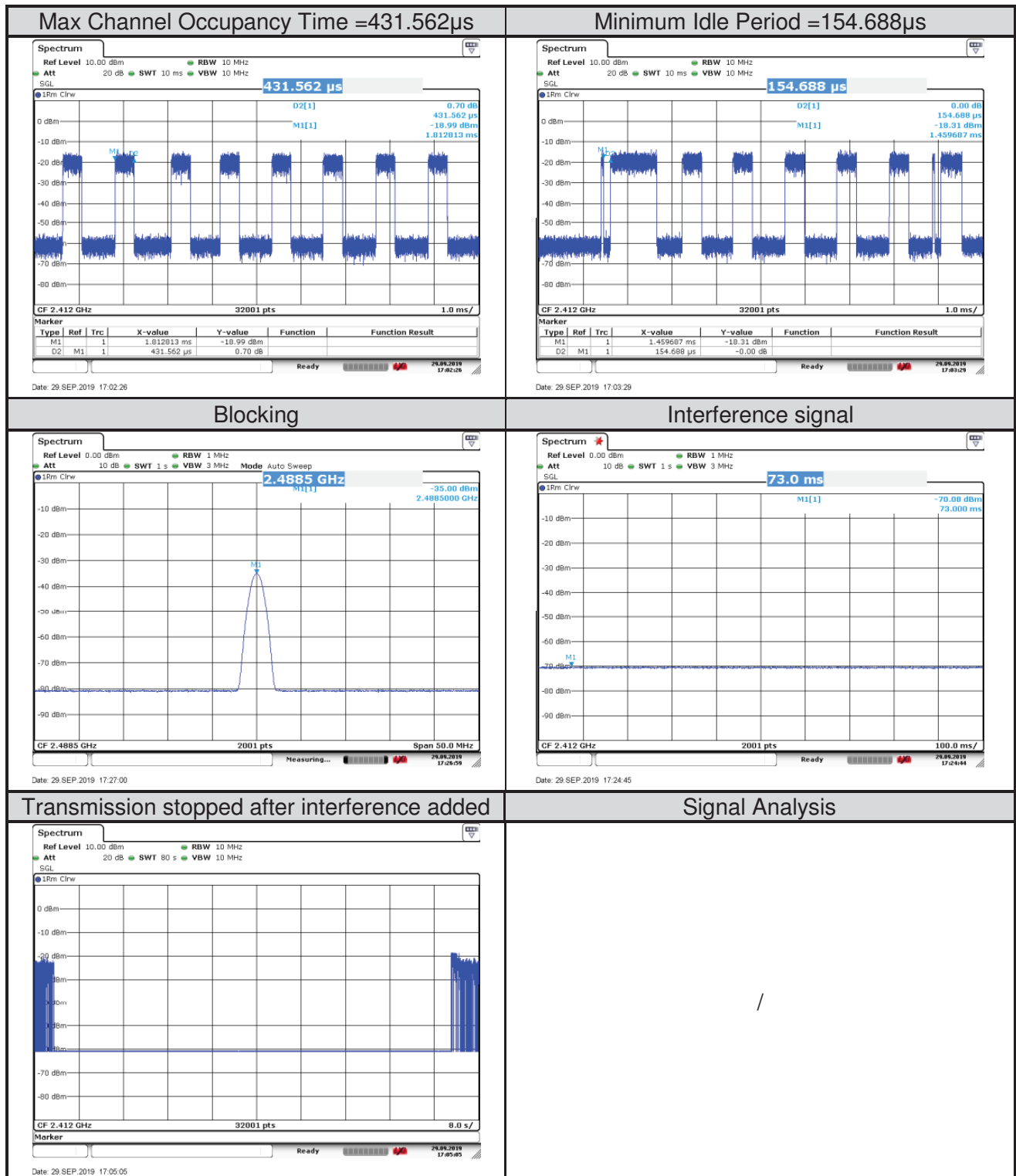
*Note: Due to the max E.I.R.P is 19.98 dBm, the threshold level (TL) should be -69.98dBm/MHz. (TL= -70 dBm/MHz + 10*log(100mW/P_{out})). And actually, the TL used in the test is -70.05 dBm/MHz which is lower than -69.98dBm /MHz.*

Figure 4: Adaptivity, TM24



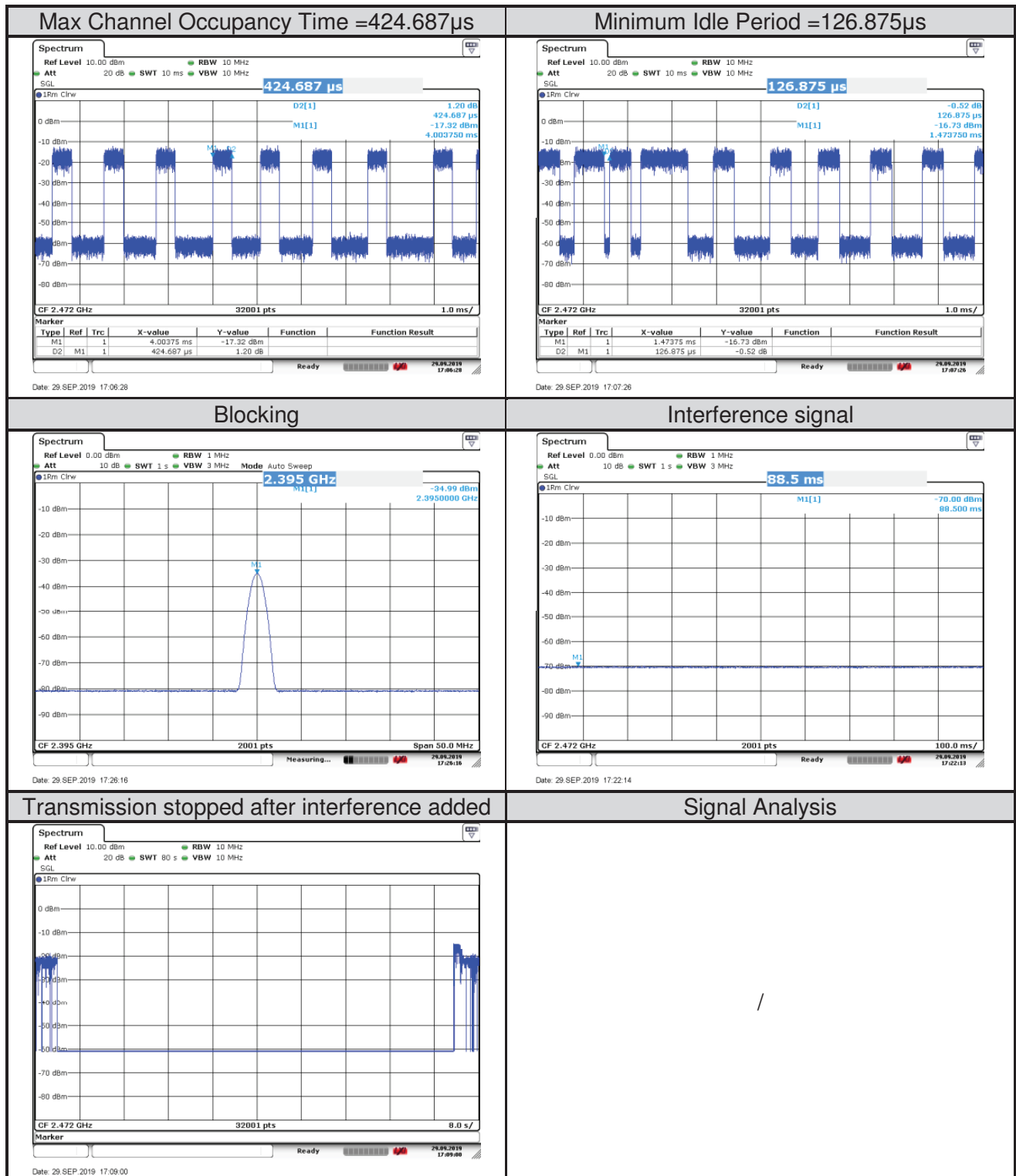
Note: Due to the max E.I.R.P is 19.94 dBm, the threshold level (TL) should be -69.94dBm/MHz. (TL= -70 dBm/MHz + 10*log(100mW/P_{out})). And actually, the TL used in the test is -70.00 dBm/MHz which is lower than -69.94dBm /MHz.

Figure 5: Adaptivity, TM25



Note: Due to the max E.I.R.P is 19.54 dBm, the threshold level (TL) should be -69.54dBm/MHz. (TL= -70 dBm/MHz + 10*log(100mW/P_{out})). And actually, the TL used in the test is -70.08 dBm/MHz which is lower than -69.54dBm /MHz.

Figure 6: Adaptivity, TM27



Note: Due to the max E.I.R.P is 19.95 dBm, the threshold level (TL) should be -69.95dBm/MHz. (TL= -70 dBm/MHz + 10*log(100mW/P_{out})). And actually, the TL used in the test is -70.00 dBm/MHz which is lower than -69.95dBm /MHz.

5.1.6 Occupied Channel Bandwidth

RESULT:**PASS**

Date of testing : 09.09.2019
Ambient temperature : 25°C
Relative humidity : 52%
Atmospheric pressure : 101kPa
Test requirement : EN 300 328 V2.1.1:2016, clause 4.3.2.7
Test procedure : EN 300 328 V2.1.1:2016, clause 5.4.7.2
Normal test voltage : DC 7.2V
Test modes applied : TM1, TM3, TM4, TM6, TM7, TM9

Table 10: Occupied channel bandwidth

Operating Mode	Test Mode	Frequency [MHz]	99% Bandwidth [MHz]	Verdict
802.11b	TM1	2412	13.816	PASS
	TM3	2472	13.641	PASS
802.11g	TM4	2412	17.647	PASS
	TM6	2472	17.128	PASS
802.11n-HT20	TM7	2412	18.150	PASS
	TM9	2472	18.195	PASS

Note:

The Occupied Channel Bandwidth for each frequency shall fall completely within the band given in clause 1 '2,4 GHz to 2,4835 GHz'.

Figure 7: Occupied Channel Bandwidth, TM1



Figure 8: Occupied Channel Bandwidth, TM3

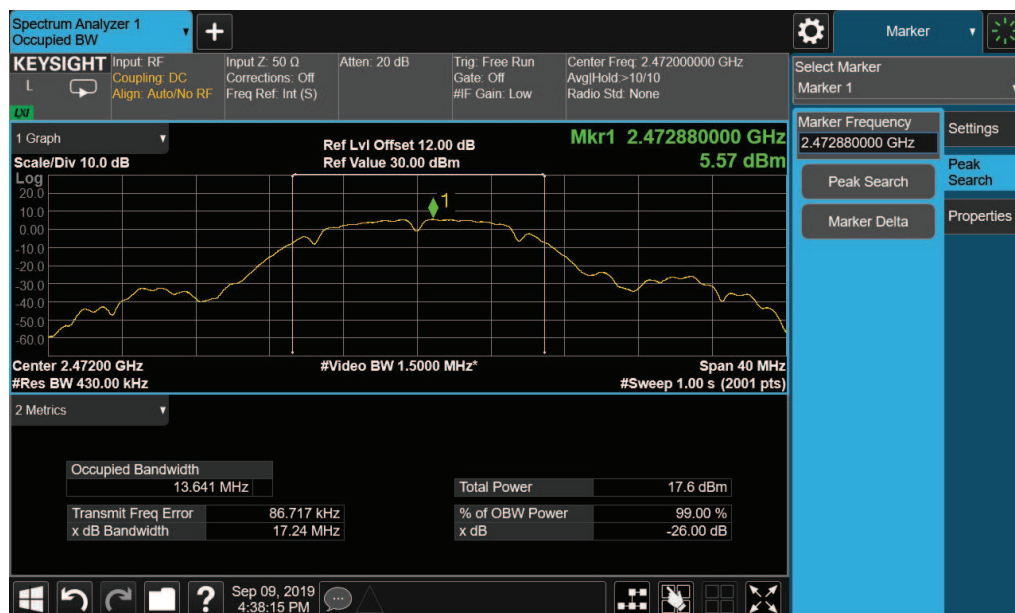


Figure 9: Occupied Channel Bandwidth, TM4

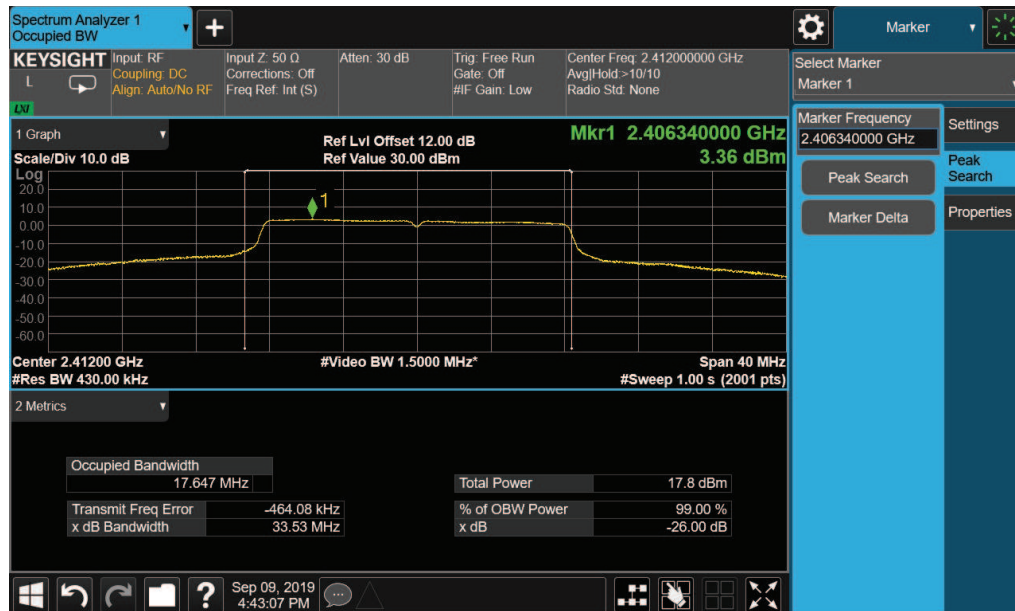


Figure 10: Occupied Channel Bandwidth, TM6

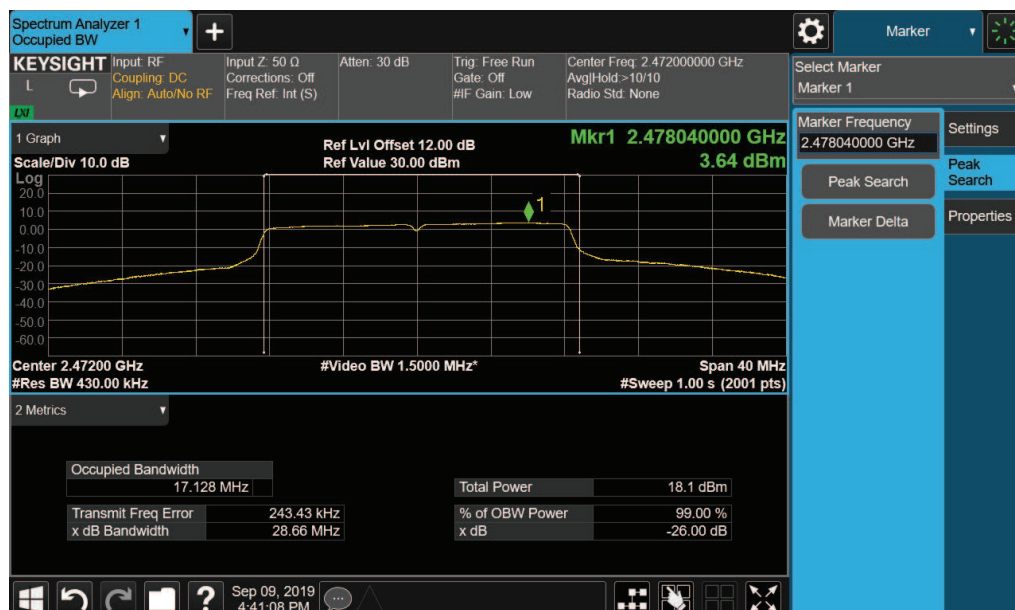


Figure 11: Occupied Channel Bandwidth, TM7

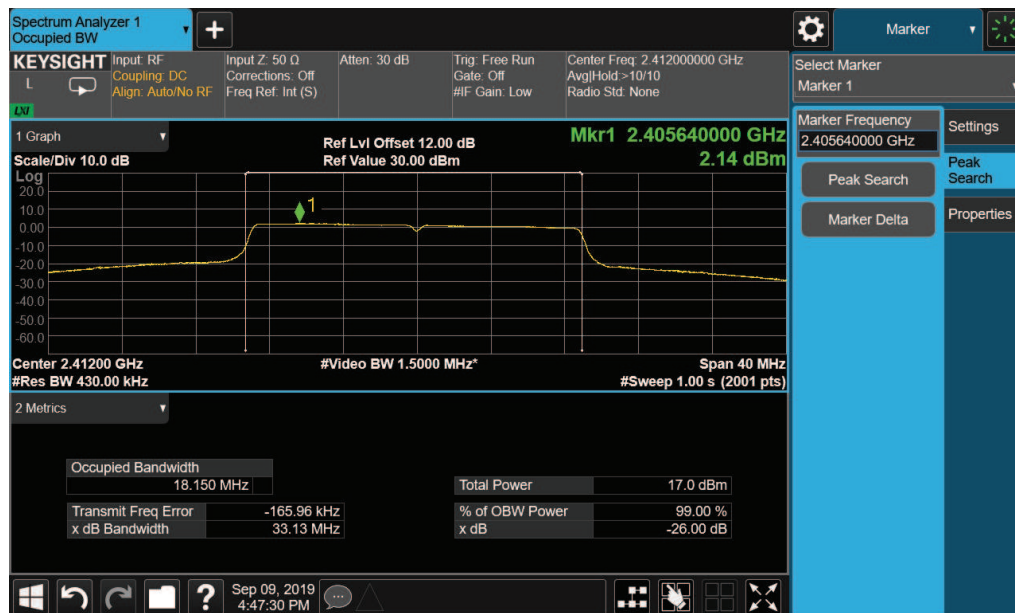
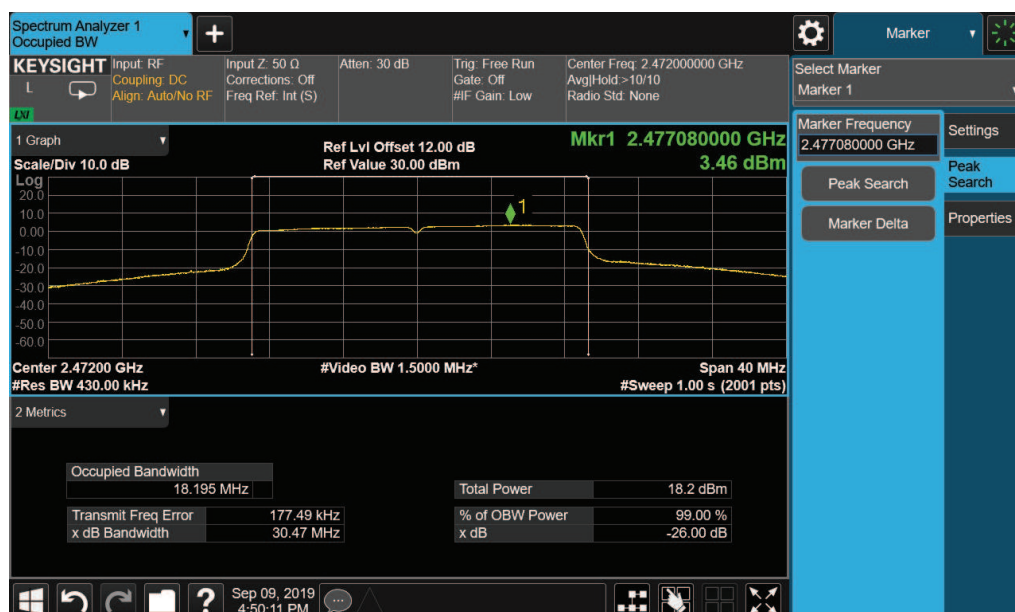


Figure 12: Occupied Channel Bandwidth, TM9



5.1.7 Transmitter unwanted emissions in the OOB domain

RESULT:
PASS

Date of testing : 09.09.2019
 Ambient temperature : 25°C
 Relative humidity : 54%
 Atmospheric pressure : 101kPa
 Test requirement : EN 300 328 V2.1.1:2016, clause 4.3.2.8
 Test procedure : EN 300 328 V2.1.1:2016, clause 5.4.8.2
 Normal test voltage : DC 7.2V
 Test modes applied : TM1, TM3, TM4, TM6, TM7, TM9

Table 11: Transmitter unwanted emissions in the OOB domain

Mode	Domain	Frequency [MHz]	Reading Values [dBm/MHz]	Gain [dBi]	Max measured Values [dBm/MHz]	Limit [dBm/MHz]
TM1	2400-2BW ~ 2400-BW	2385.68	-58.18	3.2	-54.98	-20
	2400-BW ~ 2400	2399.50	-30.72		-27.52	-10
TM3	2483.5 ~ 2483.5+BW	2484.00	-27.66		-24.46	-10
	2483.5+BW ~ 2483.5+2BW	2497.64	-51.28		-48.08	-20
TM4	2400-2BW ~ 2400-BW	2381.85	-36.35		-33.15	-20
	2400-BW ~ 2400	2399.50	-15.19		-11.99	-10
TM6	2483.5 ~ 2483.5+BW	2484.00	-14.77		-11.57	-10
	2483.5+BW ~ 2483.5+2BW	2501.13	-38.07		-34.87	-20
TM7	2400-2BW ~ 2400-BW	2381.35	-37.47		-34.27	-20
	2400-BW ~ 2400	2399.50	-16.59		-13.39	-10
TM9	2483.5 ~ 2483.5+BW	2484.00	-14.27		-11.07	-10
	2483.5+BW ~ 2483.5+2BW	2502.20	-36.94		-33.74	-20

Note:
Max measured Values = Reading Values + Antenna gain

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5.1.8 Transmitter unwanted emissions in the spurious domain**RESULT:****PASS**

Date of testing	: 11.09.2019
Ambient temperature	: 25°C
Relative humidity	: 52%
Atmospheric pressure	: 101kPa
Test requirement	: EN 300 328 V2.1.1:2016, clause 4.3.2.9
Test procedure	: EN 300 328 V2.1.1:2016, clause 5.3.9.2
Normal test voltage	: DC 7.2V
Test modes applied	: TM1, TM3, TM4, TM6, TM7, TM9

Table 12: Transmitter unwanted emissions in the spurious domain

Mode	Freq. [MHz]	Measure Level [dBm]	Reading Level [dBm]	Over Limit [dB]	Limit [dBm]	Correct Factor [dB]	Detector Type	Pol.
TM1	47.960	-59.431	-84.560	-5.431	-54.000	25.129	RMS	H
	191.990	-61.422	-85.154	-7.422	-54.000	23.732	PK	
	4824.625	-43.662	-63.010	-13.662	-30.000	19.348	PK	
	8743.250	-42.806	-69.569	-12.806	-30.000	26.763	PK	
	47.950	-57.885	-78.690	-3.885	-54.000	20.805	RMS	V
	88.570	-62.095	-91.260	-8.095	-54.000	29.165	RMS	
	4824.625	-37.584	-55.898	-7.584	-30.000	18.314	PK	
	10611.500	-38.454	-70.649	-8.454	-30.000	32.195	PK	
TM3	47.850	-59.389	-84.560	-5.389	-54.000	25.171	RMS	H
	61.530	-63.501	-85.640	-9.501	-54.000	22.139	RMS	
	4942.125	-44.235	-63.806	-14.235	-30.000	19.571	PK	
	9195.625	-41.821	-70.880	-11.821	-30.000	29.059	PK	
	47.450	-57.841	-78.650	-3.841	-54.000	20.809	RMS	V
	88.590	-62.114	-91.260	-8.114	-54.000	29.146	RMS	
	4942.125	-40.962	-59.444	-10.962	-30.000	18.482	PK	
	10235.500	-38.849	-69.915	-8.849	-30.000	31.066	PK	
TM4	48.920	-57.621	-82.360	-3.621	-54.000	24.739	RMS	H
	67.840	-57.188	-79.680	-3.188	-54.000	22.492	RMS	
	4818.750	-40.850	-60.263	-10.850	-30.000	19.413	PK	
	9771.375	-40.484	-71.548	-10.484	-30.000	31.064	PK	
	47.450	-57.051	-77.860	-3.051	-54.000	20.809	RMS	V
	88.680	-63.479	-92.540	-9.479	-54.000	29.061	RMS	
	4824.625	-36.625	-54.939	-6.625	-30.000	18.314	PK	
	9818.375	-40.275	-71.545	-10.275	-30.000	31.270	PK	
TM6	47.950	-58.517	-83.650	-4.517	-54.000	25.133	RMS	H
	62.495	-60.941	-83.327	-6.941	-54.000	22.386	PK	
	4953.875	-48.169	-66.766	-18.169	-30.000	18.597	PK	
	10529.250	-38.157	-70.293	-8.157	-30.000	32.136	PK	
	47.950	-57.665	-78.470	-3.665	-54.000	20.805	RMS	V
	88.670	-62.450	-91.520	-8.450	-54.000	29.070	RMS	
	4948.000	-40.840	-59.365	-10.840	-30.000	18.525	PK	
	7415.500	-44.303	-69.087	-14.303	-30.000	24.784	PK	
TM7	47.480	-54.538	-79.850	-0.538	-54.000	25.312	RMS	H
	191.990	-61.519	-85.251	-7.519	-54.000	23.732	PK	
	4830.500	-44.070	-63.487	-14.070	-30.000	19.417	PK	
	10106.250	-39.506	-70.684	-9.506	-30.000	31.178	PK	
	47.450	-57.881	-78.690	-3.881	-54.000	20.809	RMS	V
	88.690	-60.689	-89.740	-6.689	-54.000	29.051	RMS	
	4818.750	-38.226	-56.634	-8.226	-30.000	18.408	PK	
	7327.375	-44.758	-69.137	-14.758	-30.000	24.379	PK	
TM9	47.950	-57.407	-82.540	-3.407	-54.000	25.133	RMS	H
	62.495	-61.044	-83.430	-7.044	-54.000	22.386	PK	
	4942.125	-45.705	-65.276	-15.705	-30.000	19.571	PK	
	9348.375	-41.176	-70.980	-11.176	-30.000	29.804	PK	
	47.950	-57.845	-78.650	-3.845	-54.000	20.805	RMS	V
	88.690	-62.199	-91.250	-8.199	-54.000	29.051	RMS	
	4953.875	-41.392	-59.989	-11.392	-30.000	18.597	PK	
	10605.625	-38.654	-70.791	-8.654	-30.000	32.137	PK	

5.2 Receiver Parameters

5.2.1 Receiver Spurious Emissions

RESULT:**PASS**

Date of testing	: 11.09.2019
Ambient temperature	: 25°C
Relative humidity	: 52%
Atmospheric pressure	: 101kPa
Test requirement	: EN 300 328 V2.1.1:2016, clause 4.3.2.10
Test procedure	: EN 300 328 V2.1.1:2016, clause 5.4.10.2
Normal test voltage	: DC 7.2V
Test modes applied	: TM10, TM12, TM13, TM15, TM16, TM18

Table 13: Receiver Spurious Emissions

Mode	Freq. [MHz]	Measure Level [dBm]	Reading Level [dBm]	Over Limit [dB]	Limit [dBm]	Correct Factor [dB]	Detector Type	Pol.
TM13	47.450	-59.197	-84.520	-2.197	-57.000	25.323	RMS	H
	62.560	-65.140	-87.540	-8.140	-57.000	22.400	RMS	
	167.740	-67.392	-92.310	-10.392	-57.000	24.918	RMS	
	1599.584	-49.244	-57.460	-2.244	-47.000	8.216	RMS	
	2128.440	-56.253	-67.800	-9.253	-47.000	11.547	RMS	
	47.950	-57.795	-78.600	-0.795	-57.000	20.805	RMS	V
	88.250	-58.656	-87.850	-1.656	-57.000	29.194	RMS	
	1593.650	-51.712	-59.680	-4.712	-47.000	7.968	RMS	
	1735.000	-50.927	-59.960	-3.927	-47.000	9.033	RMS	
	2128.500	-48.638	-60.300	-1.638	-47.000	11.662	RMS	
TM15	47.450	-58.197	-83.520	-1.197	-57.000	25.323	RMS	H
	62.460	-64.161	-86.540	-7.161	-57.000	22.379	RMS	
	167.760	-65.622	-90.540	-8.622	-57.000	24.918	RMS	
	1599.850	-51.429	-59.640	-4.429	-47.000	8.211	RMS	
	2128.440	-48.853	-60.400	-1.853	-47.000	11.547	RMS	V
	47.940	-57.425	-78.230	-0.425	-57.000	20.805	RMS	
	88.670	-61.180	-90.250	-4.180	-57.000	29.070	RMS	
	1781.250	-50.961	-60.360	-3.961	-47.000	9.399	RMS	
TM16	2122.000	-53.118	-64.390	-6.118	-47.000	11.272	RMS	H
	47.960	-59.501	-84.630	-2.501	-57.000	25.129	RMS	
	62.150	-64.248	-86.560	-7.248	-57.000	22.312	RMS	
	167.750	-65.292	-90.210	-8.292	-57.000	24.918	RMS	
	1600.320	-50.759	-58.960	-3.759	-47.000	8.201	RMS	
	1752.460	-50.710	-59.680	-3.710	-47.000	8.970	RMS	
	2128.150	-50.809	-62.350	-3.809	-47.000	11.541	RMS	V
	32.910	-62.290	-86.540	-5.290	-57.000	24.250	RMS	
	47.950	-58.845	-79.650	-1.845	-57.000	20.805	RMS	
	62.030	-61.971	-83.650	-4.971	-57.000	21.679	RMS	
	88.690	-60.629	-89.680	-3.629	-57.000	29.051	RMS	
	120.254	-58.253	-84.524	-1.253	-57.000	26.271	RMS	
TM18	1599.250	-51.468	-59.450	-4.468	-47.000	7.982	RMS	H
	2124.000	-49.008	-60.400	-2.008	-47.000	11.392	RMS	
	30.960	-62.984	-89.560	-5.984	-57.000	26.576	RMS	
	48.460	-59.584	-84.520	-2.584	-57.000	24.936	RMS	
	167.760	-63.642	-88.560	-6.642	-57.000	24.918	RMS	
	240.250	-63.846	-90.360	-6.846	-57.000	26.514	RMS	
	1595.300	-50.646	-58.946	-3.646	-47.000	8.300	RMS	V
	2134.000	-49.950	-61.600	-2.950	-47.000	11.650	RMS	
	32.910	-61.390	-85.640	-4.390	-57.000	24.250	RMS	
	47.860	-57.844	-78.650	-0.844	-57.000	20.806	RMS	
	62.150	-61.775	-83.520	-4.775	-57.000	21.745	RMS	
	88.690	-63.459	-92.510	-6.459	-57.000	29.051	RMS	
TM19	1595.400	-51.560	-59.500	-4.560	-47.000	7.940	RMS	H
	1724.500	-48.523	-57.414	-1.523	-47.000	8.891	RMS	
	2127.440	-56.722	-68.320	-9.722	-47.000	11.598	RMS	
	47.950	-58.317	-83.450	-1.317	-57.000	25.133	RMS	
	167.750	-66.332	-91.250	-9.332	-57.000	24.918	RMS	H
	240.250	-63.696	-90.210	-6.696	-57.000	26.514	RMS	
	1599.500	-51.582	-59.800	-4.582	-47.000	8.218	RMS	

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	2128.000	-48.661	-60.200	-1.661	-47.000	11.539	RMS	V
	32.450	-59.734	-82.360	-2.734	-57.000	22.626	RMS	
	50.360	-57.110	-78.150	-0.110	-57.000	21.040	RMS	
	68.310	-59.026	-81.250	-2.026	-57.000	22.224	RMS	
	88.590	-63.214	-92.360	-6.214	-57.000	29.146	RMS	
	1600.120	-50.469	-58.460	-3.469	-47.000	7.991	RMS	
	1770.000	-47.162	-56.570	-0.162	-47.000	9.408	RMS	
	2133.850	-50.527	-62.510	-3.527	-47.000	11.983	RMS	
TM21	47.450	-59.197	-84.520	-2.197	-57.000	25.323	RMS	H
	167.740	-64.642	-89.560	-7.642	-57.000	24.918	RMS	
	240.150	-64.730	-91.260	-7.730	-57.000	26.530	RMS	
	1593.640	-52.956	-61.250	-5.956	-47.000	8.294	RMS	
	2128.000	-49.161	-60.700	-2.161	-47.000	11.539	RMS	
	47.950	-57.425	-78.230	-0.425	-57.000	20.805	RMS	V
	88.690	-60.899	-89.950	-3.899	-57.000	29.051	RMS	
	120.150	-61.527	-87.850	-4.527	-57.000	26.323	RMS	
	167.750	-63.424	-89.650	-6.424	-57.000	26.226	RMS	
	1594.125	-49.983	-57.940	-2.983	-47.000	7.957	RMS	
	1705.260	-50.860	-59.650	-3.860	-47.000	8.790	RMS	
	2134.000	-49.408	-61.400	-2.408	-47.000	11.992	RMS	

5.2.2 Receiver Blocking**RESULT:****PASS**

Date of testing	: 17.09.2019
Ambient temperature	: 25°C
Relative humidity	: 52%
Atmospheric pressure	: 101kPa
Test requirement	: EN 300 328 V2.1.1:2016, clause 4.3.2.11
Test procedure	: EN 300 328 V2.1.1:2016, clause 5.4.11.2
Normal test voltage	: DC 7.2V
Test modes applied	: TM19,TM21, TM22, TM24

Table 14: Receiver Blocking, TM19

P _{min} [dBm]	Wanted signal mean power from companion device [dBm]	Blocking signal frequency [MHz]	Blocking signal power [dBm]	PER [%]	Limit [%]	Verdict
-93	-87	2300	-43.8	0.8	10	Pass
		2330	-43.8	1.6	10	Pass
		2360	-43.8	1.0	10	Pass
		2380	-49.8	1.2	10	Pass
		2503.5	-49.8	1.8	10	Pass
		2523.5	-43.8	1.6	10	Pass
		2553.5	-43.8	1.2	10	Pass
		2583.5	-43.8	1.2	10	Pass
		2613.5	-43.8	2.0	10	Pass
		2643.5	-43.8	1.8	10	Pass
		2673.5	-43.8	2.0	10	Pass

Table 15: Receiver Blocking, TM21

P _{min} [dBm]	Wanted signal mean power from companion device [dBm]	Blocking signal frequency [MHz]	Blocking signal power [dBm]	PER [%]	Limit [%]	Verdict
-95	-89	2300	-43.8	1.8	10	Pass
		2330	-43.8	1.6	10	Pass
		2360	-43.8	1.2	10	Pass
		2380	-49.8	2.2	10	Pass
		2503.5	-49.8	1.8	10	Pass
		2523.5	-43.8	1.8	10	Pass
		2553.5	-43.8	2.0	10	Pass
		2583.5	-43.8	1.6	10	Pass
		2613.5	-43.8	1.6	10	Pass
		2643.5	-43.8	1.6	10	Pass
		2673.5	-43.8	1.4	10	Pass

Table 16: Receiver Blocking, TM22

$P_{\min}$ [dBm]	Wanted signal mean power from companion device [dBm]	Blocking signal frequency [MHz]	Blocking signal power [dBm]	PER [%]	Limit [%]	Verdict
-93	-87	2300	-43.8	0.8	10	Pass
		2330	-43.8	1.8	10	Pass
		2360	-43.8	1.4	10	Pass
		2380	-49.8	1.0	10	Pass
		2503.5	-49.8	1.2	10	Pass
		2523.5	-43.8	2.2	10	Pass
		2553.5	-43.8	1.2	10	Pass
		2583.5	-43.8	1.8	10	Pass
		2613.5	-43.8	2.0	10	Pass
		2643.5	-43.8	1.4	10	Pass
		2673.5	-43.8	2.0	10	Pass

Table 17: Receiver Blocking, TM24

$P_{\min}$ [dBm]	Wanted signal mean power from companion device [dBm]	Blocking signal frequency [MHz]	Blocking signal power [dBm]	PER [%]	Limit [%]	Verdict
-95	-89	2300	-43.8	1.6	10	Pass
		2330	-43.8	1.2	10	Pass
		2360	-43.8	1.8	10	Pass
		2380	-49.8	1.4	10	Pass
		2503.5	-49.8	1.6	10	Pass
		2523.5	-43.8	1.4	10	Pass
		2553.5	-43.8	3.0	10	Pass
		2583.5	-43.8	1.6	10	Pass
		2613.5	-43.8	2.0	10	Pass
		2643.5	-43.8	1.2	10	Pass
		2673.5	-43.8	1.4	10	Pass

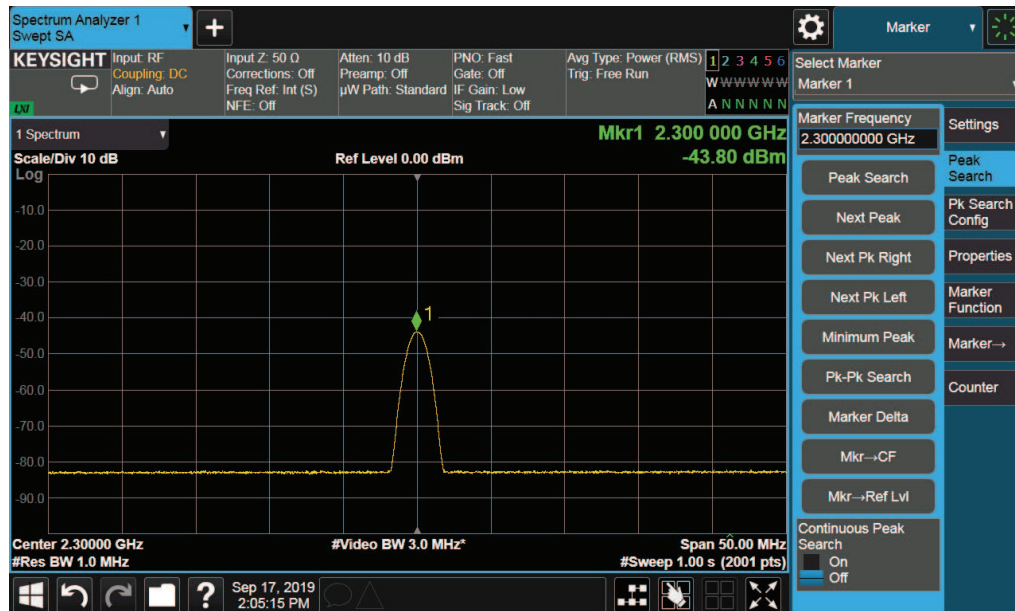
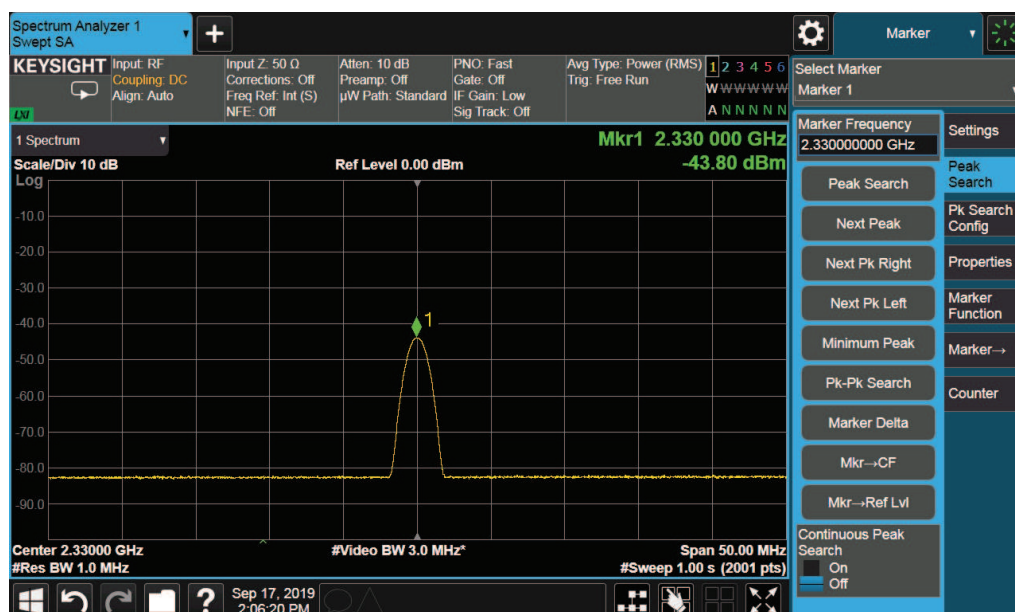
Figure 13: Blocking Signal, 2300MHz

Figure 14: Blocking Signal, 2330MHz


Figure 15: Blocking Signal, 2360MHz

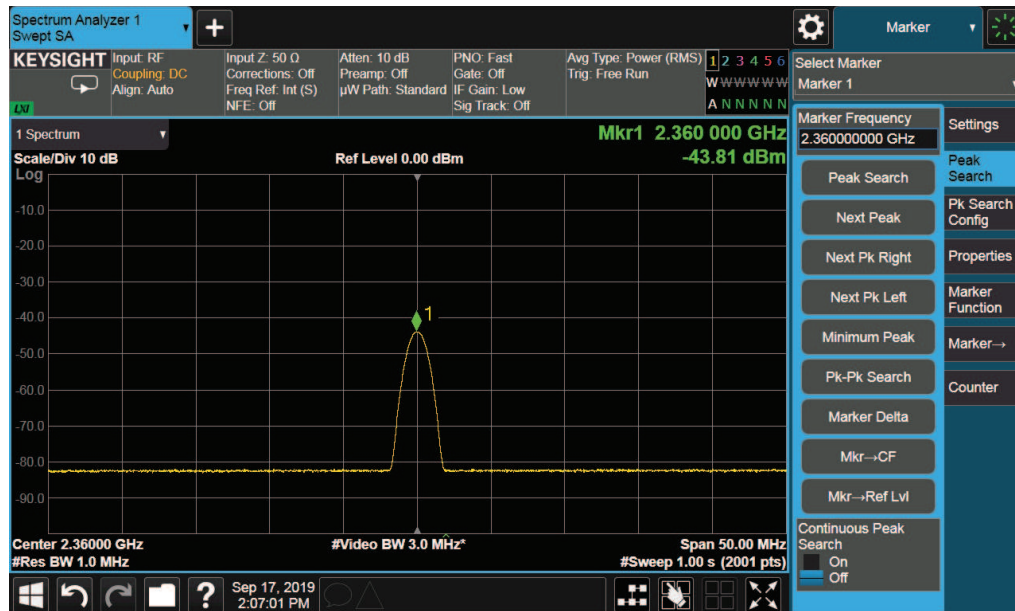


Figure 16: Blocking Signal, 2380MHz

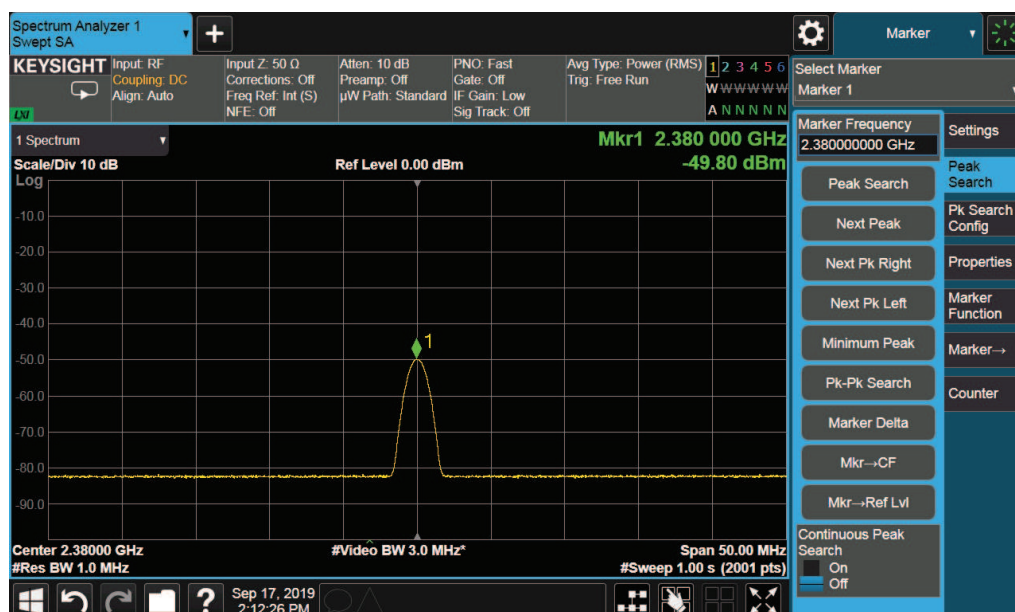


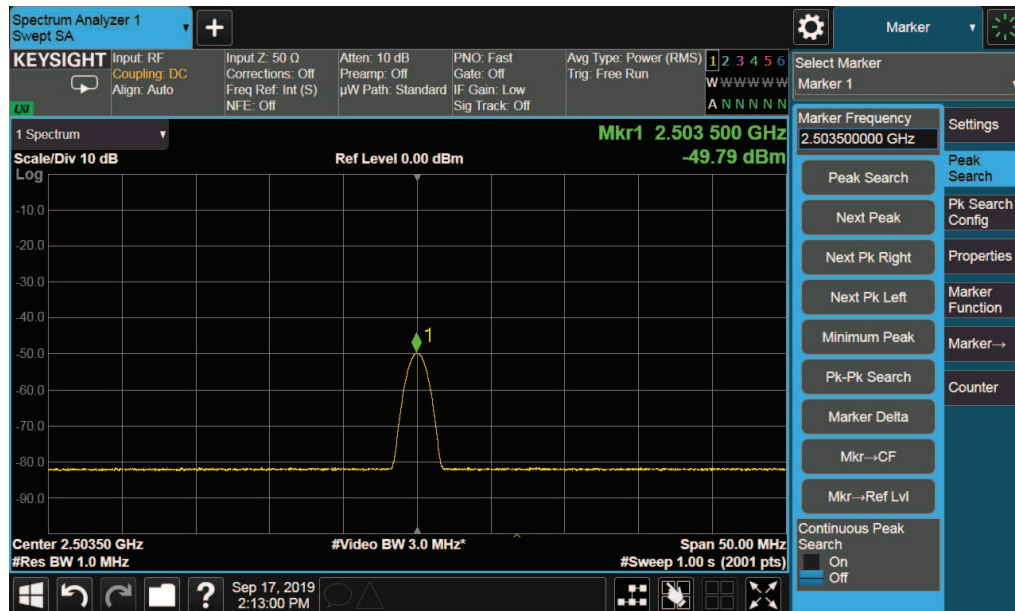
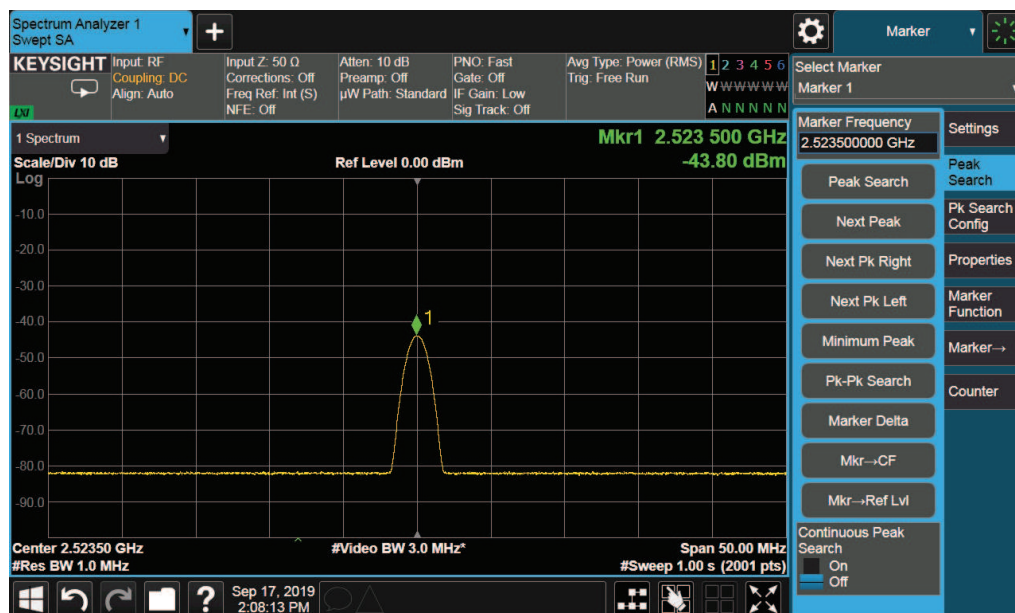
Figure 17: Blocking Signal, 2503.5MHz

Figure 18: Blocking Signal, 2523.5MHz


Figure 19: Blocking Signal, 2553.5MHz

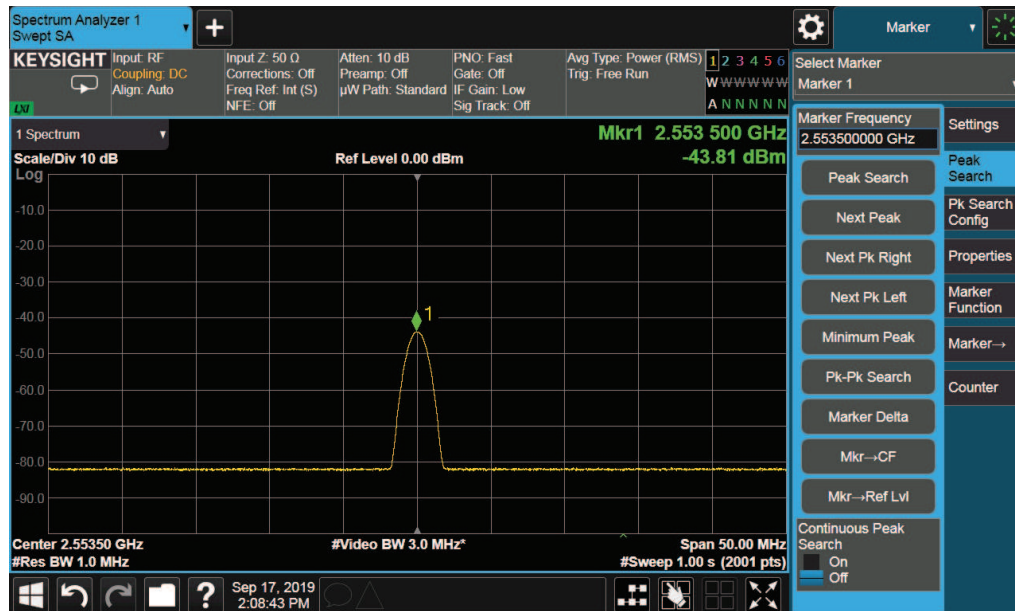


Figure 20: Blocking Signal, 2583.5MHz

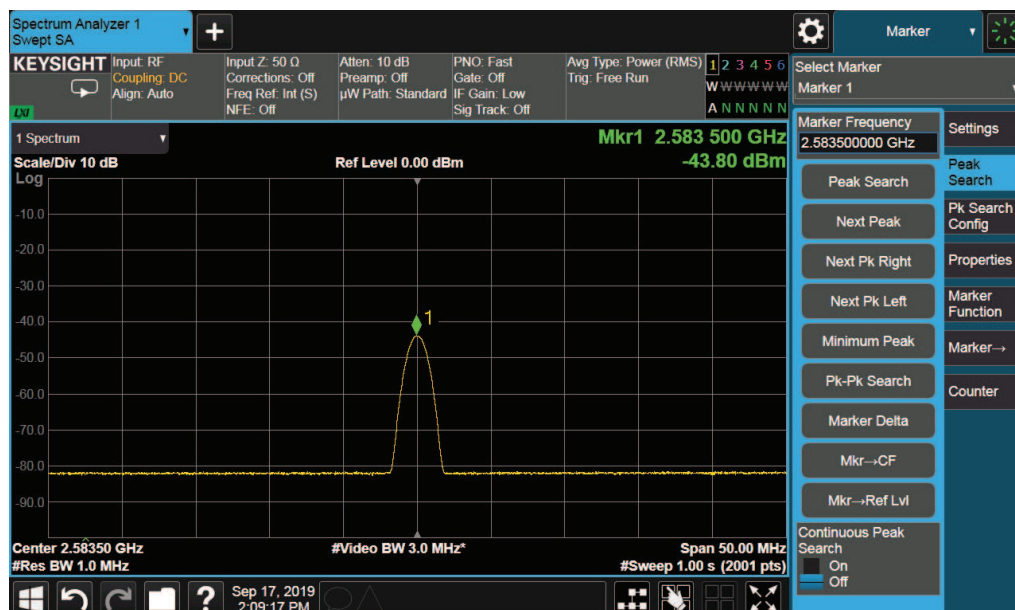


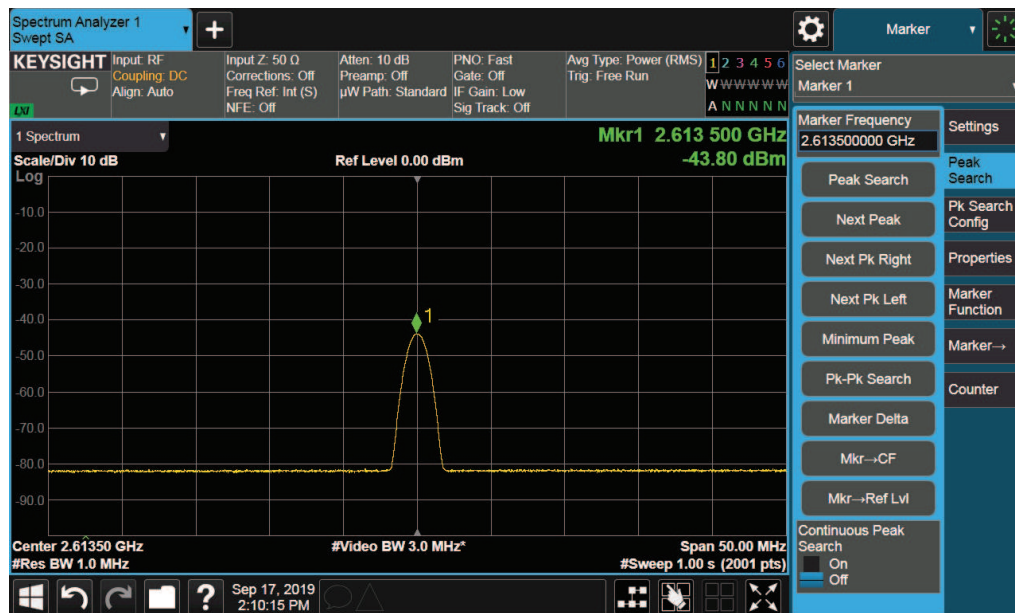
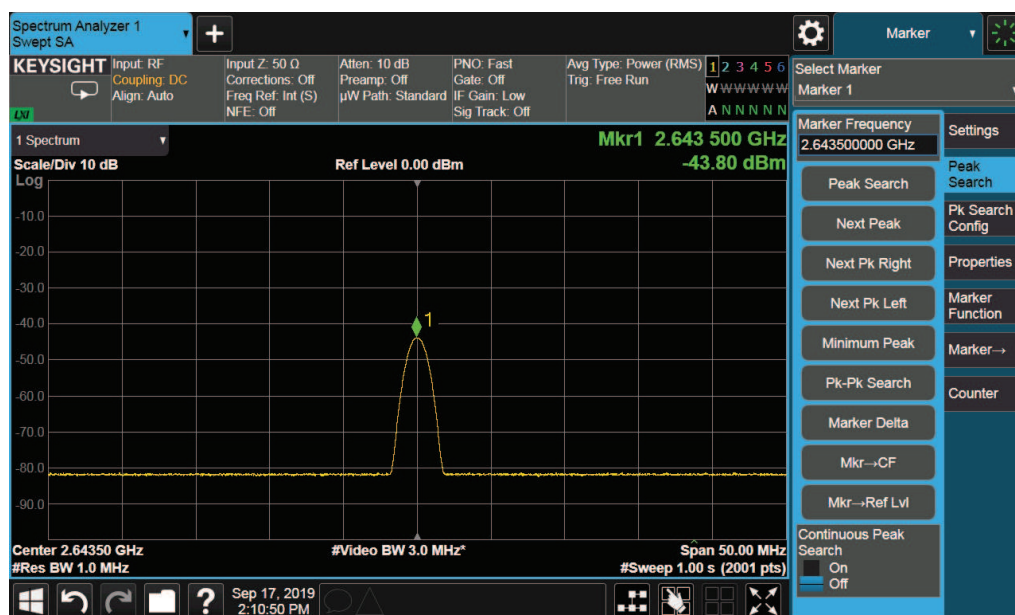
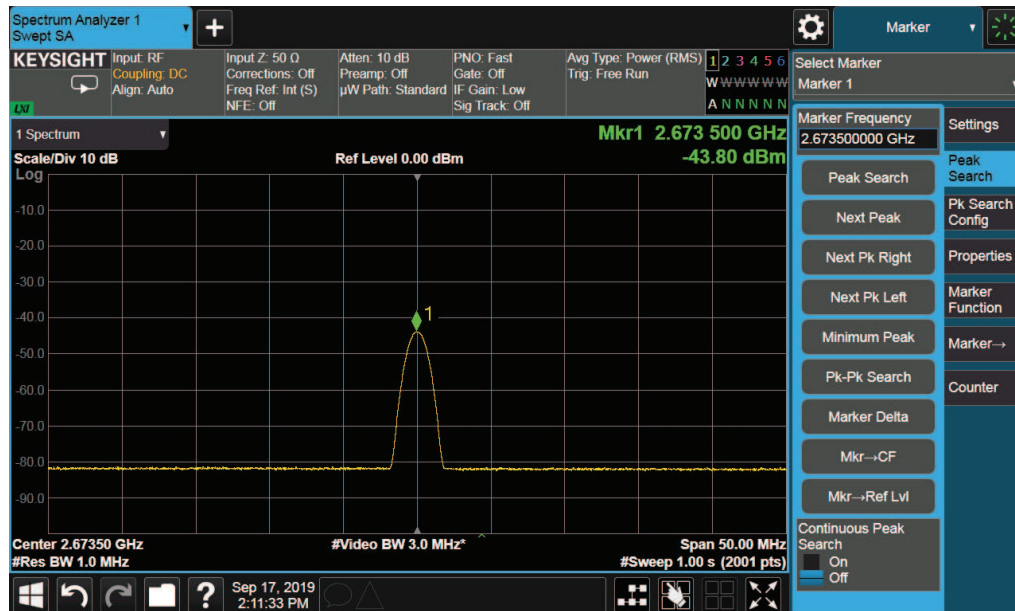
Figure 21: Blocking Signal, 2613.5MHz

Figure 22: Blocking Signal, 2643.5MHz


Figure 23: Blocking Signal, 2673.5MHz



6. Other Evaluation of RED 2014/53/EU

6.1 Article 3.1a

6.1.1 Electrical Safety Requirement

RESULT:**PASS**

Evaluation procedure : EN 61010-1:2010

Test details refer to test report 50297796 001 issued by TUV Rheinland (Shanghai) Co., Ltd.

6.1.2 Human Exposure to EM Fields

RESULT:**PASS**

Evaluation procedure : EN 50566:2017

Test details refer to test report 1908WSU026-E1 issued by MRT Technology (Suzhou) Co., Ltd. which has been reviewed by TUV Rheinland (Shanghai) Co., Ltd.

6.2 Article 3.1b

6.2.1 Electromagnetic Compatibility Requirement

RESULT:**PASS**

Evaluation procedure : EN 61326-1:2013

Test details refer to test report 50287745 001 issued by TUV Rheinland (Shanghai) Co., Ltd.

Evaluation procedure : EN 301 489-1 V2.1.1:2017
EN 301 489-17 V3.1.1:2017

Test details refer to test report 50287791 001 issued by TUV Rheinland (Shanghai) Co., Ltd.

7. Photographs of the Sample and Test Setup

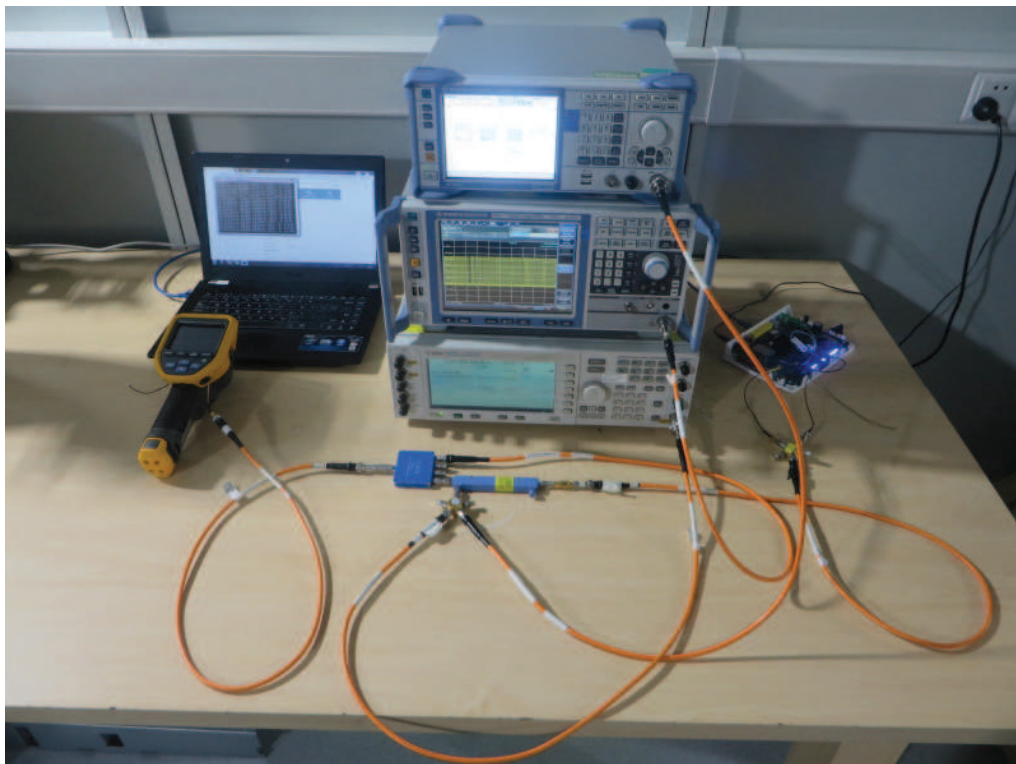
Photograph 1: EUT Photo

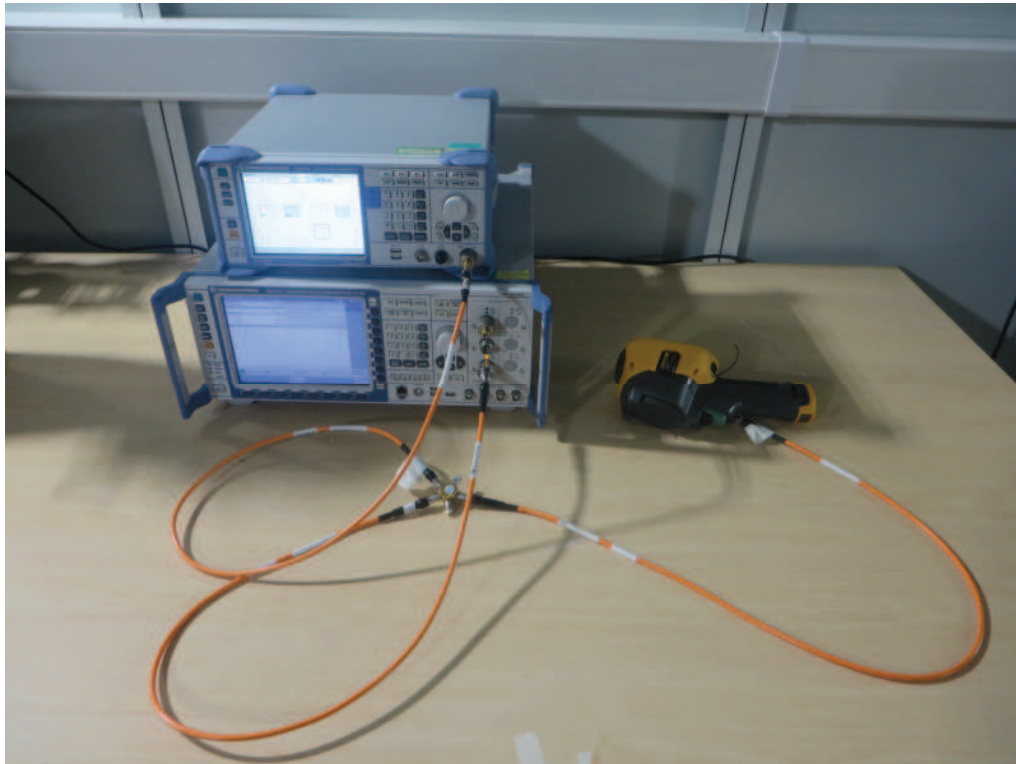


Photograph 2: Set-up for Conducted Test at Antenna Port

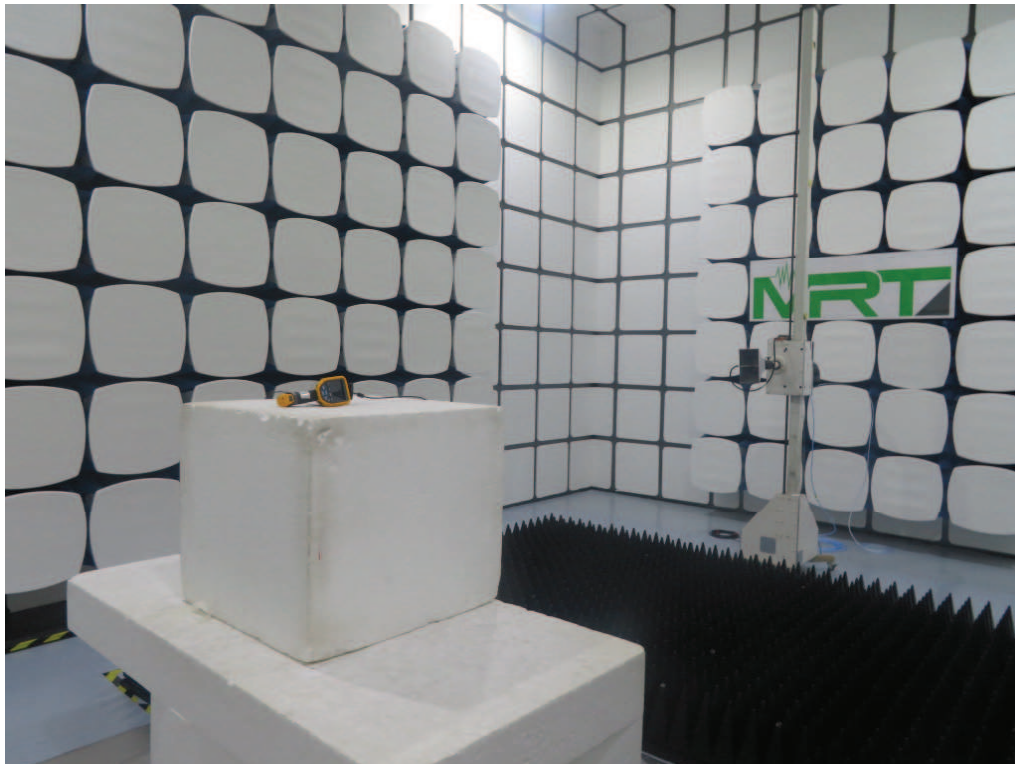


Photograph 3: Set-up for Adaptivity Test



Photograph 4: Set-up for Blocking Test**Photograph 5: Set-up for Radiated Spurious Emission, below 1GHz**

Photograph 6: Set-up for Radiated Spurious Emission, above 1GHz



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