



RADIO TEST REPORT-BLE

ETSI EN 300 328 V2.2.2:2019

Product : Translation machine

Trade Name : N/A

Model Name : T4

Report No. : LTR2502057E01

Prepared for

Shenzhen MSAI Technology Co., Ltd.

Factory 401, Building C11, Xin 'an Second Industrial Zone, GuxingCommunity,
Xixiang Street, Baoan District, Shenzhen

Prepared by

Guangdong Lintek Certification Group Co., Ltd.

Room 318, No.116-2, Guanlan Road, Fucheng Street, Longhua District,
Shenzhen, Guangdong, China

TEST RESULT CERTIFICATION

Applicant's name : Shenzhen MSAI Technology Co., Ltd.
Address : Factory 401, Building C11, Xin 'an Second Industrial Zone,
GuxingCommunity, Xixiang Street, Baoan District, Shenzhen
Manufacture's name : Shenzhen MSAI Technology Co., Ltd.
Address : Factory 401, Building C11, Xin 'an Second Industrial Zone,
GuxingCommunity, Xixiang Street, Baoan District, Shenzhen

Product description

Product name : Translation machine
Trademark : N/A
Model and/or type reference : T4
Serial Model : T4
Rating(s)..... : DC5V 1A

Standards..... : ETSI EN 300 328 V2.2.2:2019

Date of Test

Date (s) of performance of tests..... : 2024-04-19 to 2024-04-30
Date of Issue..... : 2025-02-26
Test Result..... : **Pass**

Tested by : _____
Sunny Yuan

Approved by : _____
Kevin Huang



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1. GENERAL INFORMATION

1.1 GENERAL DESCRIPTION OF EUT

Equipment	Translation machine	
Brand Name	N/A	
Model Name.	T4	
Serial Model	T4	
Product Description	Operation Frequency:	2402~2480 MHz
	Modulation Type:	GFSK
	Adaptive/non-adaptive	Adaptive equipment
	Number Of Channel	Please see Note 2.
	Antenna Designation:	PCB Antenna
	Antenna Gain(Peak)	1.0 dBi
Channel List	Refer to below	
Input	DC5V 1A	
Battery	N/A	
I/O Ports	Refer to users manual	
Hardware Version	V1.0	
Software Version	V1.0	

This report is amended from the previous report LTR24041965E27, which was issued on Apr. 30, 2024, due to below amendments:

- Updated Applicant and Address: Shenzhen MSAI Technology Co., Ltd.

Factory 401, Building C11, Xin 'an Second Industrial Zone, GuxingCommunity, Xixiang Street, Baoan District, Shenzhen

- Added additional photo

No test requirement.

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

2.

Channel	Frequency (MHz)
00	2402
01	2404
.....	
.....	
.....	...
.....	
38	2478
39	2480

1.2 Information about the EUT

a) The type of modulation used by the equipment:

☐ FHSS

☒ other forms of modulation: DSSS

b) In case of FHSS modulation:

- In case of non-Adaptive Frequency Hopping equipment:

The number of Hopping Frequencies:

- In case of Adaptive Frequency Hopping Equipment:

The maximum number of Hopping Frequencies:

The minimum number of Hopping Frequencies:

The Dwell Time:

The Minimum Channel Occupation Time:

c) Adaptive / non-adaptive equipment:

☐ non-adaptive Equipment

☒ adaptive Equipment without the possibility to switch to a non-adaptive mode

☐ adaptive Equipment which can also operate in a non-adaptive mode

d) In case of adaptive equipment:

The Channel Occupancy Time implemented by the equipment:

☒ The equipment has implemented an LBT based DAA mechanism

- In case of equipment using modulation different from FHSS:

☐ The equipment is Frame Based equipment

☒ The equipment is Load Based equipment

☐ The equipment can switch dynamically between Frame Based and Load Based equipment

The CCA time implemented by the equipment:

The value q as referred to in clause 4.3.2.5.2.2.2

- ☐ The equipment has implemented an non-LBT based DAA mechanism
- ☐ The equipment can operate in more than one adaptive mode

e) In case of non-adaptive Equipment:

The maximum RF Output Power (e.i.r.p.):

The maximum (corresponding) Duty Cycle:

Equipment with dynamic behaviour, that behaviour is described here. (e.g. the different combinations of duty cycle and corresponding power levels to be declared):

f) The worst case operational mode for each of the following tests:

- RF Output Power
GFSK
- Power Spectral Density
GFSK
- Duty cycle, Tx-Sequence, Tx-gap
GFSK
- Dwell time, Minimum Frequency Occupation & Hopping Sequence (only for FHSS equipment)
N/A
- Hopping Frequency Separation (only for FHSS equipment)
N/A
- Medium Utilisation
N/A
- Adaptivity & Receiver Blocking
GFSK
- Occupied Channel Bandwidth
GFSK
- Transmitter unwanted emissions in the OOB domain
GFSK
- Transmitter unwanted emissions in the spurious domain
GFSK
- Receiver spurious emissions
GFSK

g) The different transmit operating modes (tick all that apply):

- ☒ Operating mode 1: Single Antenna Equipment
- ☒ Equipment with only 1 antenna
- ☐ Equipment with 2 diversity antennas but only 1 antenna active at any moment in time
- ☐ Smart Antenna Systems with 2 or more antennas, but operating in a (legacy) mode where only 1 antenna is used. (e.g. IEEE 802.11™ [i.3] legacy mode in smart antenna systems)

- ☐ Operating mode 2: Smart Antenna Systems - Multiple Antennas without beam forming
- ☐ Single spatial stream / Standard throughput / (e.g. IEEE 802.11™ [i.3] legacy mode)
- ☐ High Throughput (> 1 spatial stream) using Occupied Channel Bandwidth 1
- ☐ High Throughput (> 1 spatial stream) using Occupied Channel Bandwidth 2

NOTE: Add more lines if more channel bandwidths are supported.

- ☐ Operating mode 3: Smart Antenna Systems - Multiple Antennas with beam forming
- ☐ Single spatial stream / Standard throughput (e.g. IEEE 802.11™ [i.3] legacy mode)
- ☐ High Throughput (> 1 spatial stream) using Occupied Channel Bandwidth 1
- ☐ High Throughput (> 1 spatial stream) using Occupied Channel Bandwidth 2

NOTE: Add more lines if more channel bandwidths are supported.

h) In case of Smart Antenna Systems:

- The number of Receive chains:
- The number of Transmit chains:

- ☐ symmetrical power distribution
- ☐ asymmetrical power distribution

In case of beam forming, the maximum beam forming gain:

NOTE: Beam forming gain does not include the basic gain of a single antenna.

i) Operating Frequency Range(s) of the equipment:

- Operating Frequency Range 1: 2402 MHz to 2480 MHz

NOTE: Add more lines if more Frequency Ranges are supported.

j) Occupied Channel Bandwidth(s):

Occupied Channel Bandwidth: 1.06MHz

NOTE: Add more lines if more channel bandwidths are supported.

k) Type of Equipment (stand-alone, combined, plug-in radio device, etc.):

- ☒ Stand-alone
- ☐ Combined Equipment (Equipment where the radio part is fully integrated within another type of equipment)
- ☐ Plug-in radio device (Equipment intended for a variety of host systems)
- ☐ Other

l) The extreme operating conditions that apply to the equipment:

Operating temperature range: -10° C to 40° C

Operating voltage range: ☐ AC ☒ DC

Details provided are for the:

- ☒ stand-alone equipment
☐ combined (or host) equipment
☐ test jig

m) The intended combination(s) of the radio equipment power settings and one or more antenna assemblies and their corresponding e.i.r.p levels:

• Antenna Type

- ☒ PCB Antenna

Antenna Gain: 1.0 dBi

If applicable, additional beamforming gain (excluding basic antenna gain):

- ☐ Temporary RF connector provided
☐ No temporary RF connector provided
☐ Dedicated Antennas (equipment with antenna connector)
☐ Single power level with corresponding antenna(s)
☐ Multiple power settings and corresponding antenna(s)

Number of different Power Levels:

Power Level 1:

Power Level 2:

Power Level 3:

NOTE 1: Add more lines in case the equipment has more power levels.

NOTE 2: These power levels are conducted power levels (at antenna connector).

n) The nominal voltages of the stand-alone radio equipment or the nominal voltages of the combined (host) equipment or test jig in case of plug-in devices:

Details provided are for the:

- ☒ stand-alone equipment
☐ combined (or host) equipment
☐ test jig

Supply Voltage

- ☒ AC mains State AC voltage
☐ DC State DC voltage :

In case of DC, indicate the type of power source

- ☐ Internal Power Supply
☒ External Power Supply or AC/DC adapter
☐ Battery:
☐ Other:

o) Describe the test modes available which can facilitate testing:

N/A

p) The equipment type (e.g. Bluetooth®, IEEE 802.11™ [i.3], proprietary, etc.):

Bluetooth

1.3 TEST CONDITIONS AND CHANNEL

	Normal Test Conditions	Extreme Test Conditions
Temperature	15°C - 35°C	-10°C ~ 40°C Note: (1)
Relative Humidity	20% - 75%	N/A
Supply Voltage	5Vdc	5Vdc

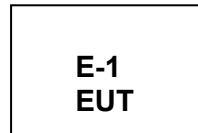
Test Channel	EUT Channel	Test Frequency (MHz)
lowest	CH00	2402
middle	CH19	2440
highest	CH39	2480

Note:

(1) The HT 40°C and LT -10°C was declared by manufacturer, The EUT couldn't be operate normally with higher or lower temperature.

(2) The measurements are performed at the highest, middle, lowest available channels.

1.4 DESCRIPTION OF TEST CONDITIONS



1.5 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Brand	Model/Type No.	Series No.	Note
E-1	Translation machine	N/A	T4	sagatronics ultra, sagatronics edge, sagatronics pro	EUT

Item	Shielded Type	Ferrite Core	Length	Note

Note:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.

1.6 EQUIPMENTS LIST FOR ALL TEST ITEMS

EQUIPMENT TYPE	Manufacturer	Type No.	Serial No.	Calibrated until
EMI Test Receiver	R&S	ESPI7	101318	2024.05.05
Bilog Antenna	TESEQ	CBL6111D	31216	2024.05.05
Turn Table	EM	SC100_1	60531	N/A
Antnna Mast	EM	SC100	N/A	N/A
Horn Antenna	EM	EM-AH-10180	2011071402	2024.05.05
HF Cable	N/A	R-01	N/A	2024.05.05
HF Cable	N/A	R-02	N/A	2024.05.05
50Ω Coaxial Switch	Anritsu	MP59B	6200983705	2024.05.05
LF Cable	N/A	R-03	N/A	2024.05.05
Broadband Preamplifier	SCHWARZB ECK	BBV9718	9718-218	2024.05.05
Pre-Amplifier	EM	EM30180	60538	2024.05.05
Spectrum Analyzer	Agilent	E4407B	MY45108040	2024.05.05
Filter	TRILTHIC	2400MHz	29	2024.05.05
Attenuator	Weinschel	33-10-33	AR4010	2024.05.05
Attenuator	Weinschel	24-20-34	BP4485	2024.05.05
Spectrum Analyzer	Agilent	E4440A	MY46186938	2024.05.05
ESG VETCTOR SIGNAL GENERAROR	Agilent	E4438C	MY45093347	2024.05.05
PSG Analog Signal Generator	Agilent	E8257D	MY51110112	2024.05.05
Power Splitter	Mini-Circuits	ZN2PD-63-S+	SF025101428	2024.05.05
Coupler	Mini-Circuits	ZADC-10-63-S+	SF794101410	2024.05.05
Cable	N/A	RF-01	N/A	2024.05.05
Cable	N/A	RF-02	N/A	2024.05.05
Power Splitter	Mini-Circuits/USA	ZN2PD-63-S+	SF025101428	2024.05.05
Directional Coupler	MCLI/USA	CB11-20	0D2L51502	2024.05.05
Attenuator	Agilent	8495B	MY42147029	2024.05.05
MXA Signal Analyzer	Agilent	N9020A	MY49100060	2024.05.05
Passive Loop Antenna	ETS-LINDGEREN	6512	165355	2024.05.05
Power Meter	Agilent	E4419B	MY45102538	2024.05.05
Power Sensor	Agilent	E9301A	MY41495644	2024.05.05
Power Sensor	Agilent	E9301A	US39212148	2024.05.05
X-series USB Peak and Average Power Sensor	Agilent	U2021XA	MY54080020	2024.05.05
X-series USB Peak and Average Power Sensor	Agilent	U2021XA	MY54110001	2024.05.05
X-series USB Peak and Average Power Sensor	Agilent	U2021XA	MY53480008	2024.05.05
X-series USB Peak and Average Power Sensor	Agilent	U2021XA	MY54080019	2024.05.05

2. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

ETSI EN 300 328 V2.2.2:2019		
Clause	Test Item	Results
TRANSMITTER PARAMETERS		
4.3.2.1	RF Output Power	Pass
4.3.2.2	Power Spectral Density	Pass
4.3.2.3	Duty cycle, Tx-Sequence, Tx-gap	Not Applicable (See Note 1/2)
4.3.2.4	Medium Utilization (MU) factor	Not Applicable (See Note 1/2)
4.3.2.5	Adaptivity	Not Applicable (See Note 1)
4.3.2.6	Occupied Channel Bandwidth	Pass
4.3.2.7	Transmitter unwanted emission in the OOB domain	Pass
4.3.2.8	Transmitter unwanted emissions in the spurious domain	Pass
RECEIVER PARAMETERS		
4.3.2.9	Receiver Spurious Emissions	Pass
4.3.2.10	Receiver Blocking	Not Applicable (See Note 1)

Note:

1. These requirements do not apply for equipment with a maximum declared RF output power of less than 10 dBm EIRP or for equipment when operating in a mode where the RF output power is less than 10 dBm EIRP.
2. These requirements apply to non-adaptive frequency hopping equipment or to adaptive frequency hopping equipment operating in a non-adaptive mode

2.1 TEST FACILITY

2.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately **95** % .

No.	Item	Uncertainty
1	Radio Frequency	$\pm 1.38\text{dB}$
2	Total RF power, conducted	$\pm 0.16\text{dB}$
3	RF power density, conducted	$\pm 0.16\text{dB}$
4	All emissions, radiated	$\pm 0.21\text{dB}$
5	Temperature	$\pm 0.5^{\circ}\text{C}$
6	Humidity	$\pm 2\%$
7	DC and low Frequency voltages	$\pm 0.04\%$

2.3 MAXIMUM MEASUREMENT UNCERTAINTY

(FOR ETSI EN 300 328)

For the test methods, according to ETSI EN 300 328 standard, the measurement uncertainty figures shall be calculated in accordance with ETR 100 028-1[4] and shall correspond to an expansion factor(coverage factor) $k=1.96$ or $k=2$ (which provide confidence levels of respectively **95 %** and **95.45 %** in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)).

Maximum measurement uncertainty

No.	Item	Uncertainty
1	Radio Frequency	$\pm 1 \times 10^{-5}$
2	Total RF power, conducted	$\pm 1,5$ dB
3	RF power density, conducted	± 3 dB
4	All emissions, radiated	± 6 dB
5	Temperature	± 1 °C
6	Humidity	± 5 %
7	DC and low Frequency voltages	± 3 %

3. TEST PROCEDURES AND RESULTS

3.1 EQUIVALENT ISOTROPIC RADIATED POWER

3.1.1 LIMITS OF EQUIVALENT ISOTROPIC RADIATED POWER

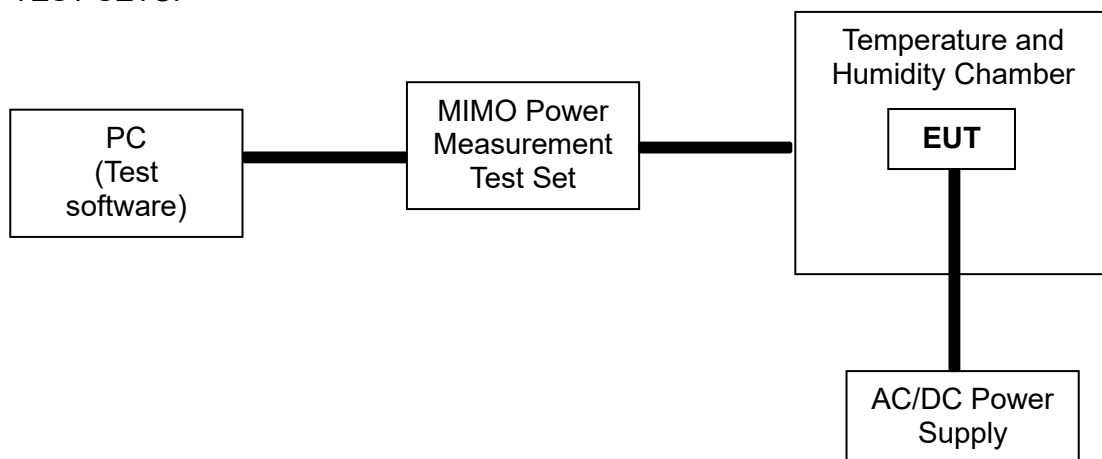
RF OUTPUT POWER	
Condition	Limit
☐ Non-adaptive frequency hopping systems	Equal to or less than the value declared by the supplier. This declared value shall be equal to or less than 20 dBm.
☒ Adaptive frequency hopping systems	20dBm

3.1.2 TEST PROCEDURE

Refer to chapter 5.3.2.2 of ETSI EN 300 328 V2.2.2:2019

Measurement	
☒ Conducted measurement	☐ Radiated measurement

3.1.3 TEST SETUP



3.1.4 TEST RESULTS

EUT :	Translation machine	Model Name :	T4
Temperature :	25°C	Relative Humidity:	60 %
Pressure :	1012 hPa	Test Voltage :	5Vdc
Test Mode :	TX Low channel / Middle Channel / High Channel		

TEST CONDITIONS				Total e.i.r.p (dBm)		
				Low Channel	Middle channel	High Channel
T nom (°C)	20.00	V nom (V)	3.7	-2.09	-2.15	-2.29
T min (°C)	-10.00	V max (V)	4.2	-2.16	-2.52	-2.68
		V min (V)	3.5	-2.92	-2.77	-2.56
T max (°C)	40.00	V max (V)	4.2	-2.56	-2.36	-2.13
		V min (V)	3.5	-2.89	-2.58	-2.92
Max RF Power				-2.09		
Limits				20dBm (-10dBW)		
Result				Complies		

Note: Power measurement, actual measurement for 53 Burst power.

3.2. PEAK POWER DENSITY

3.2.1 LIMITS OF POWER SPECTRAL DENSITY

RF OUTPUT POWER	
Condition	Limit
All types of equipment	10 dBm/MHz

3.2.2 TEST PROCEDURE

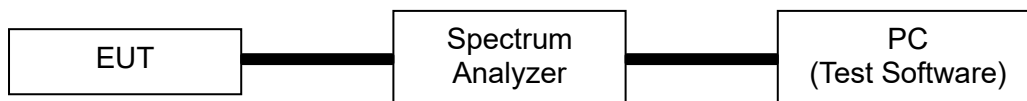
Refer to chapter 5.3.3.2 of ETSI EN 300 328 V2.2.2:2019

Measurement	
☒ Conducted measurement	☐ Radiated measurement

The setting of the Spectrum Analyzer

Start Frequency	2400MHz
Stop Frequency	2483.5MHz
Detector	RMS
Sweep Point / Sweep Time	> 8350 / Auto
RBW / VBW	10KHz / 30KHz

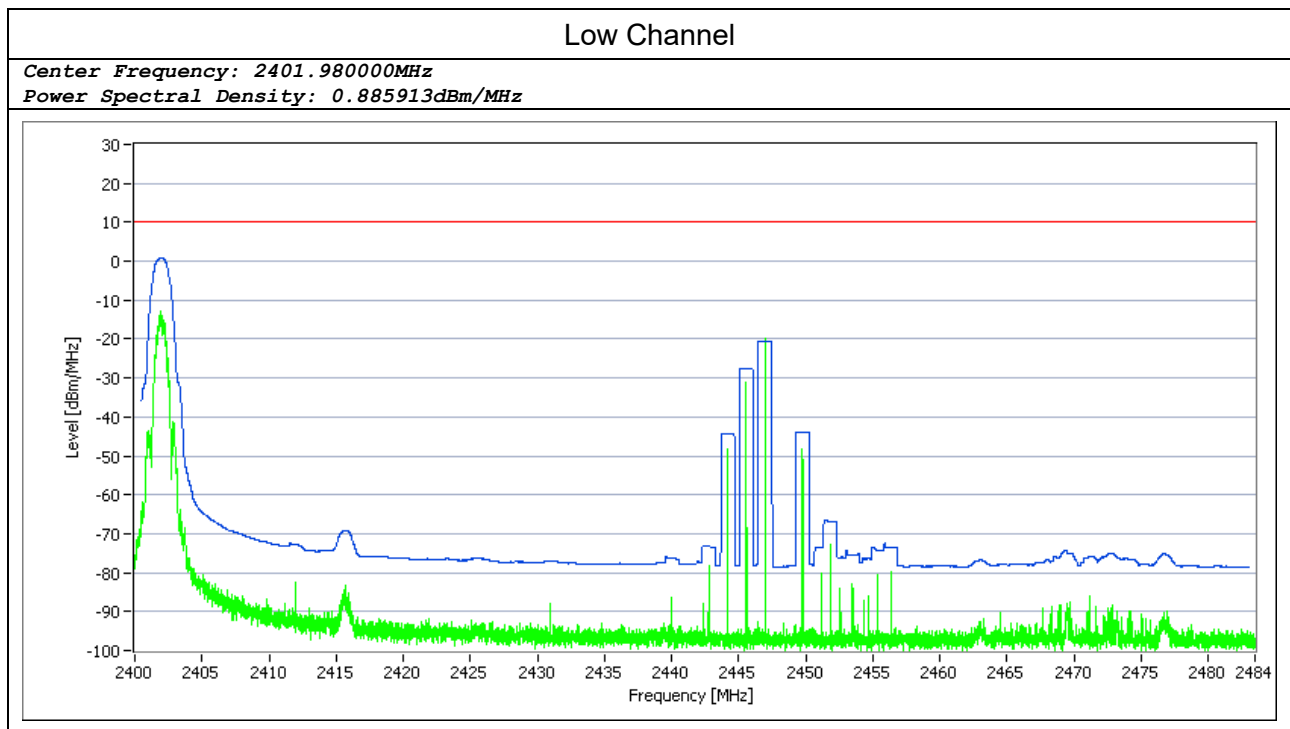
3.2.3 TEST SETUP



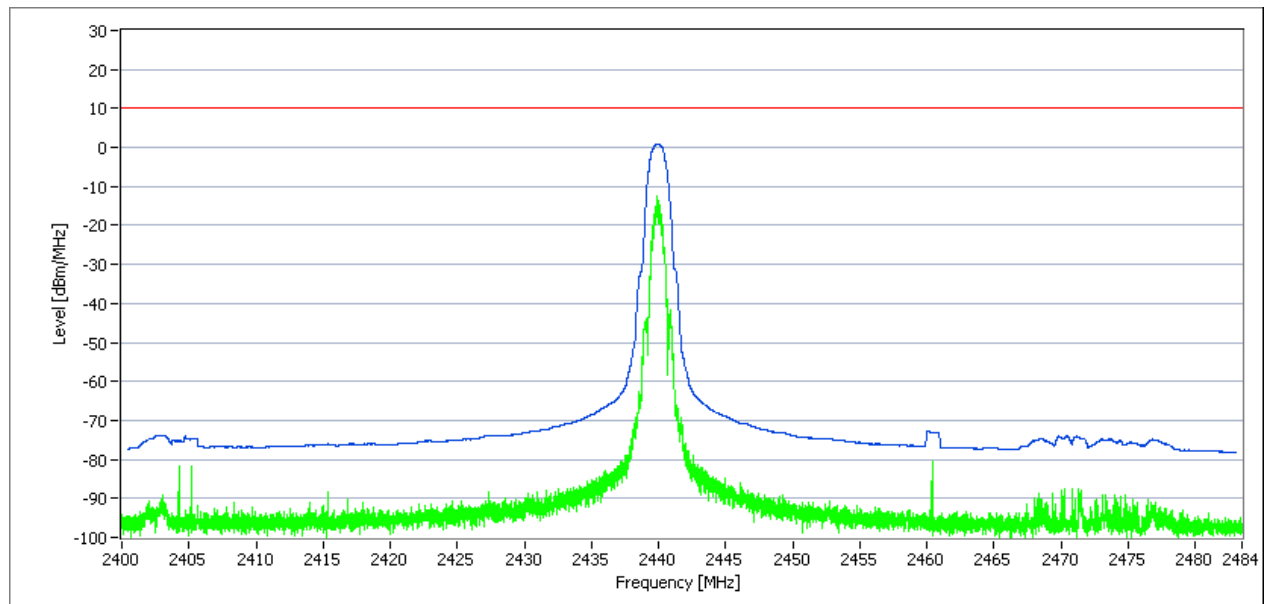
3.2.4 TEST RESULTS

EUT :	Translation machine	Model Name :	T4
Temperature :	25°C	Relative Humidity:	60 %
Pressure :	1012 hPa	Test Voltage :	5Vdc
Test Mode :	TX		

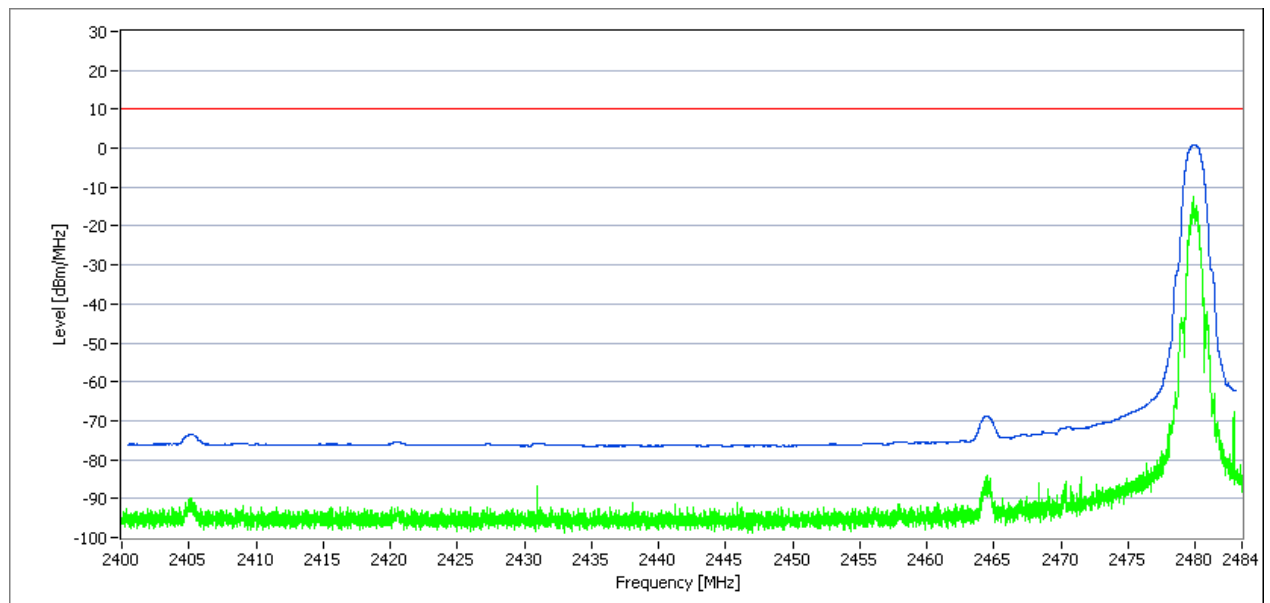
Channel Frequency (MHz)	Power Density (dBm/MHz)	Limit (dBm/1 MHz) (E.I.R.P)	PASS/FAIL
2402	0.885	10	PASS
2440	0.922	10	PASS
2480	0.923	10	PASS



Middle Channel

*Center Frequency: 2439.970000MHz**Power Spectral Density: 0.920655dBm/MHz*

High Channel

*Center Frequency: 2479.960000MHz**Power Spectral Density: 0.923807dBm/MHz*

3.3. OCCUPIED CHANNEL BANDWIDTH

3.3.1 LIMITS OF OCCUPIED CHANNEL BANDWIDTH

OCCUPIED CHANNEL BANDWIDTH		
Condition		Limit
All types of equipment		Shall fall completely within the band 2400 to 2483.5 MHz
Additional requirement	For non-adaptive using wide band modulations other than FHSS system and E.I.R.P >10 dBm	Less than 20 MHz
	For non-adaptive frequency hopping system and E.I.R.P >10 dBm	Less than 5 MHz

3.3.2 TEST PROCEDURE

Refer to chapter 5.3.8.2 of ETSI EN 300 328 V2.2.2:2019

Measurement	
☒ Conducted measurement	☐ Radiated measurement

The setting of the Spectrum Analyzer

Center Frequency	The centre frequency of the channel under test
Frequency Span	2 × Occupied Channel Bandwidth (e.g. 40 MHz for a 20 MHz channel)
Detector	RMS
RBW	~ 1 % of the span without going below 1 % (30KHz)
VBW	3 × RBW (100KHz)
Trace	Max hold

3.3.3 DEVIATION FROM TEST STANDARD

No deviation

3.3.4 TEST SETUP

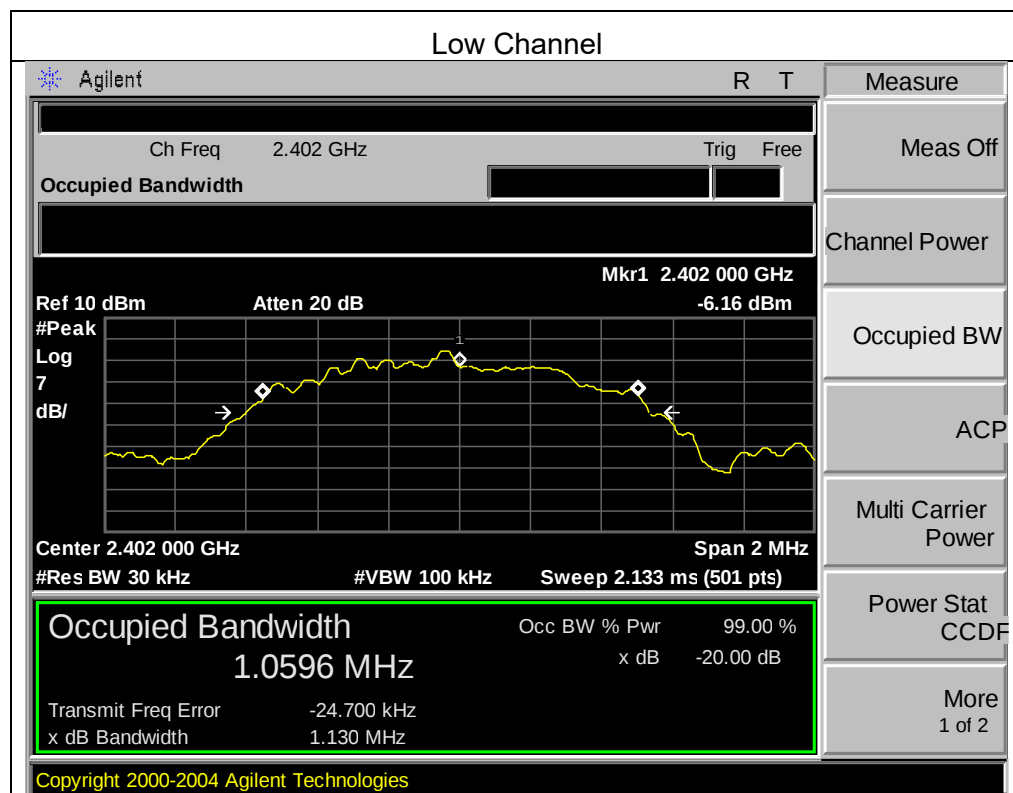


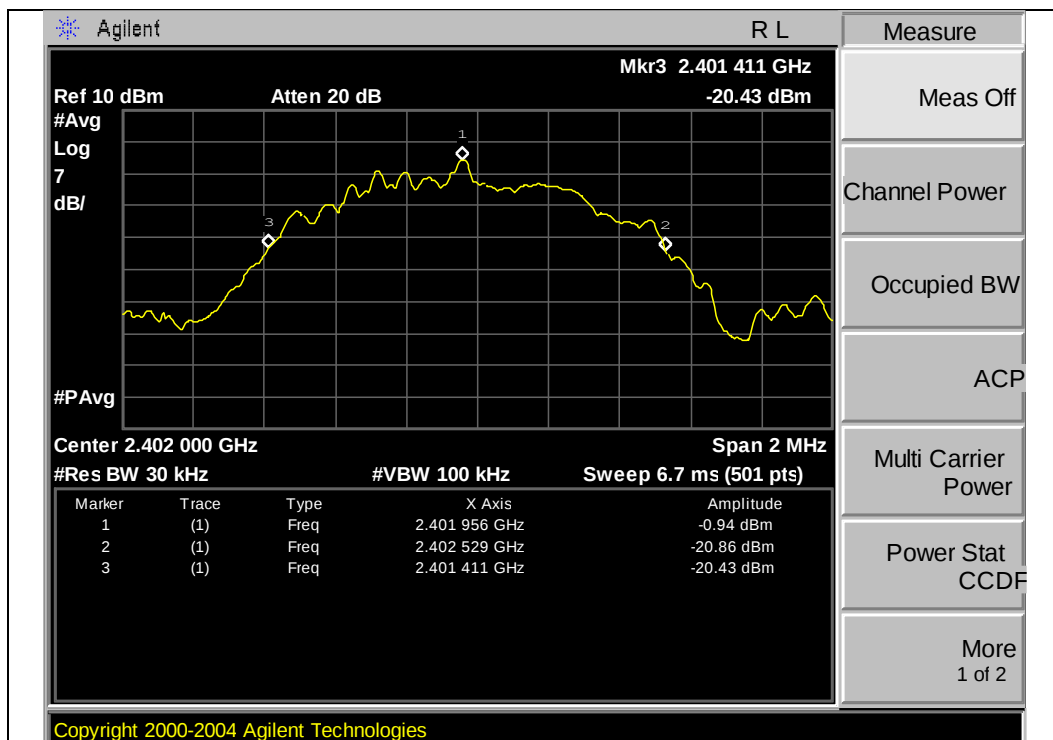
These measurements only were performed at normal test conditions. The measurement shall be performed only on the lowest and the highest frequency within the stated frequency range. In case of conducted measurements the transmitter shall be connected to the measuring equipment via a suitable attenuator. Controlling software has been activated to set the EUT on specific status.

3.3.5 TEST RESULTS

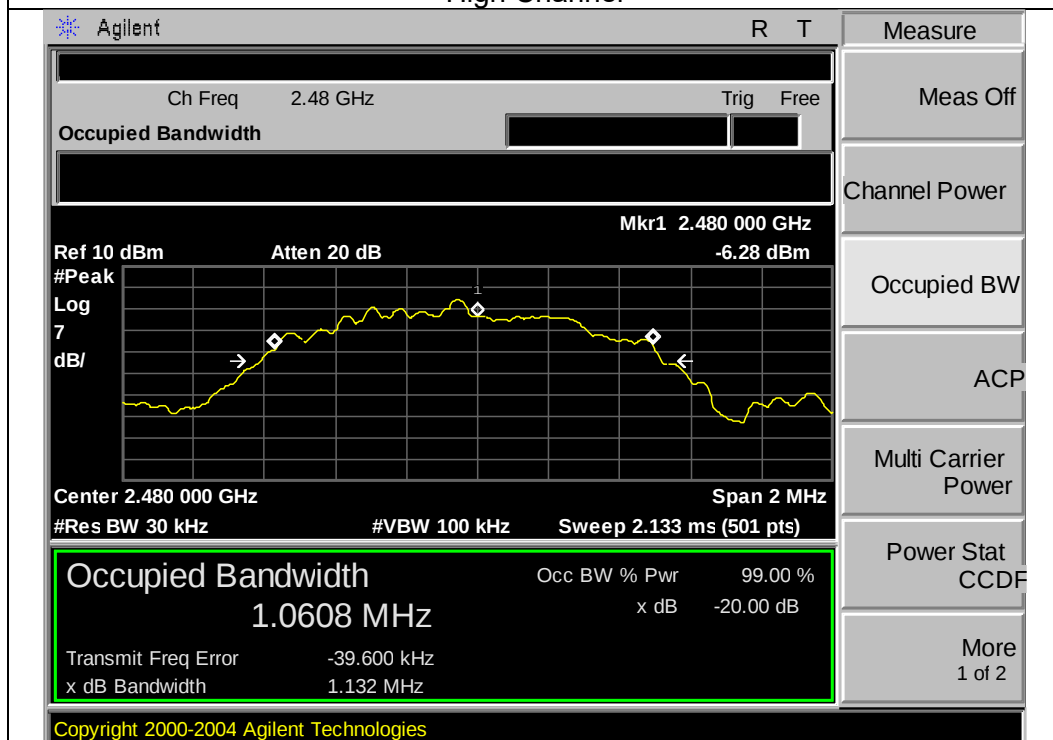
EUT :	Translation machine	Model Name :	T4
Temperature :	25°C	Relative Humidity :	60 %
Pressure :	1012 hPa	Test Voltage :	5Vdc
Test Mode :	TX		

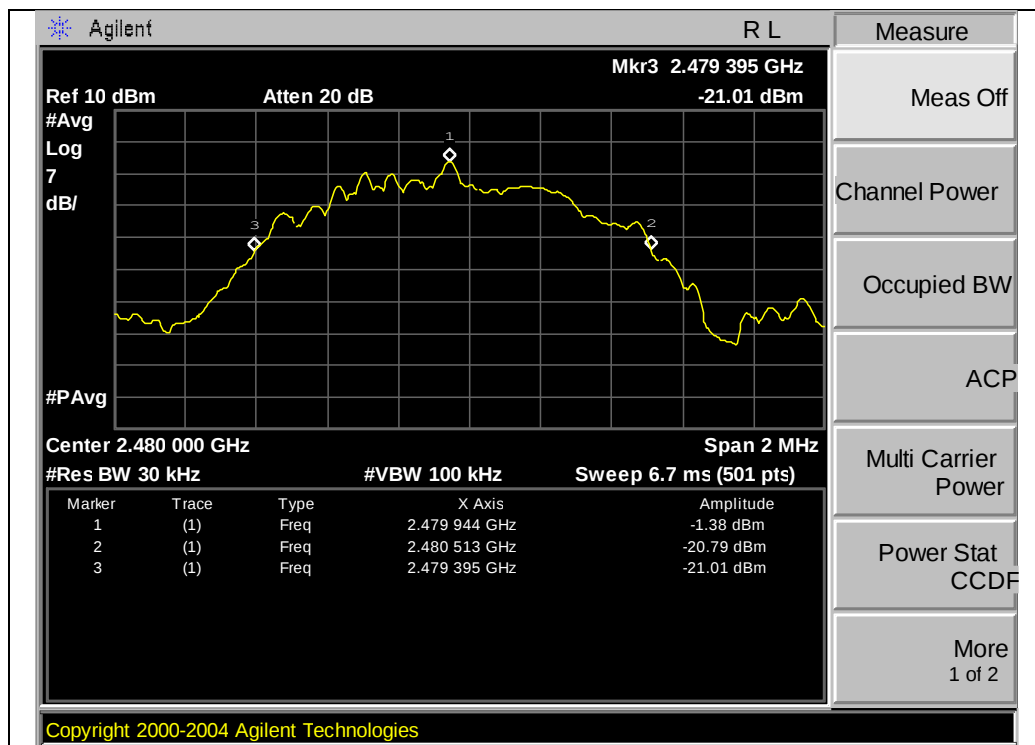
CHANNEL	CHANNEL FREQUENCY (MHz)	99%OCCUPIED BANDWIDTH (MHz)	Measured frequencies		Limit	PASS /FAIL
			FL (MHz)	FH (MHz)		
00	2402	1.06	2401.41	2402.53	FL>2400MHz and FH<2483.5 MHz	PASS
39	2480	1.06	2479.40	2480.51		PASS





High Channel

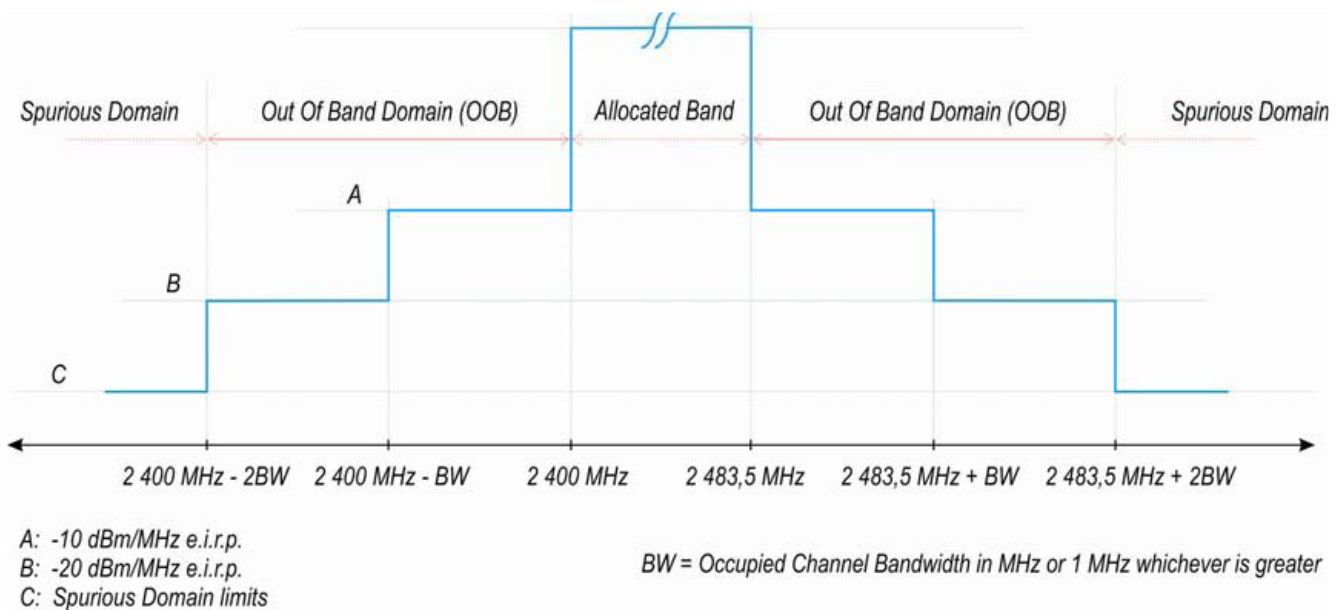




3.4. TRANSMITTER UNWANTED EMISSIONS IN THE OUT-OF-BAND DOMAIN

3.4.1 LIMITS OF TRANSMITTER UNWANTED EMISSIONS IN THE OUT-OF-BAND DOMAIN

TRANSMITTER UNWANTED EMISSIONS IN THE OUT-OF-BAND DOMAIN	
Condition	Limit
Under all test conditions	The transmitter unwanted emissions in the out-of-band domain but outside the allocated band, shall not exceed the values provided by the mask in below figure.



3.4.2 TEST PROCEDURE

Refer to chapter 5.3.9.2 of ETSI EN 300 328 V2.2.2:2019

Measurement	
☒ Conducted measurement	☐ Radiated measurement

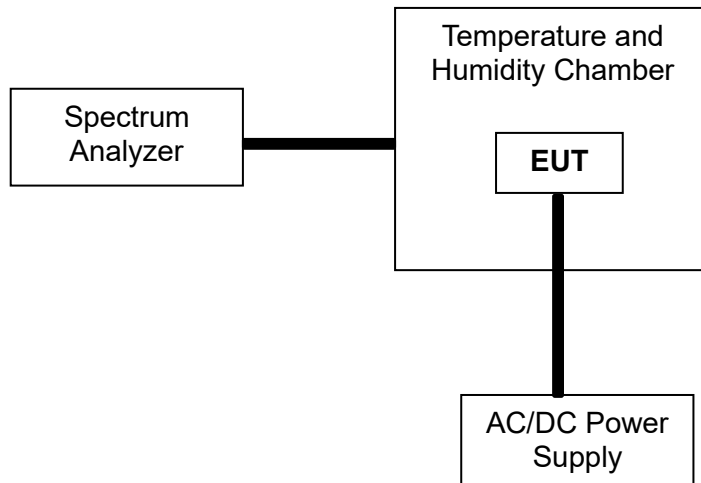
The setting of the Spectrum Analyzer

Span	0Hz
Filter Mode	Channel Filter
Trace Mode	Clear/Write
Trigger Mode	Video Trigger
Detector	RMS
Sweep Point / Sweep Mode	5000 / Continuous
RBW / VBW	1MHz / 3MHz

3.4.3 DEVIATION FROM TEST STANDARD

No deviation

3.4.4 TEST SETUP



The measurements were performed at normal environmental conditions and shall be repeated at the extremes of the operating temperature and voltage range. The measurement was performed at the lowest and the highest channel on which the equipment can operate. The equipment was configured to operate under its worst case situation with respect to output power. In case of conducted measurements the transmitter shall be connected to the measuring equipment via a suitable attenuator. The power source of the EUT has to be conducted with the power supply for voltage change. The frequency has to be recorded for the right and left end above threshold of highest and lowest channel respectively.

3.4.5 TEST RESULTS

EUT :	Translation machine	Model Name :	T4
Temperature :	24 °C	Relative Humidity :	54%
Pressure :	1010 hPa	Test Power :	5Vdc
Test Mode :	TX		

Channel frequency				2402MHz		2480MHz	
Test condition				OOB Emission(MHz)		OOB Emission(MHz)	
				2400-BW ~2400	2400-2BW ~2400-BW	2483.5 ~ 2483.5+BW	2483.5+BW ~ 2483.5+2BW
				Maximum power (dBm)	Maximum power (dBm)	Maximum power (dBm)	Maximum power (dBm)
T nom (°C)	20.00	V nom (V)	3.7	-54.6	-64.5	-60.1	-54.2
T min (°C)	-10.00	V max (V)	4.2	-54.2	-64.3	-60.2	-54.6
		V min (V)	3.5	-54.7	-64.6	-60.3	-54.4
T max (°C)	40.00	V max (V)	4.2	-54.6	-64.5	-60.5	-54.3
		V min (V)	3.5	-54.5	-64.7	-60.4	-54.1
Limits				-10.00	-20.00	-10.00	-20.00
PASS/FAIL				PASS	PASS	PASS	PASS

Low channel Test Plot



High channel Test Plot



Note: Only the worst plots were recorded in this report.

3.5. ADAPTIVE (CHANNEL ACCESS MECHANISM)

3.5.1 APPLICABILITY OF ADAPTIVE REQUIREMENTS AND LILT FOR WIDE BAND MODULATION TECHNIQUES

Requirement	Operational Mode			
	Non-LBT based Detect and Avoid	LBT based Detect and Avoid		
		Frame Based Equipment	Load Based Equipment (CCA using 'energy detect')	Load Based Equipment (CCA not using any of the mechanisms referenced as note 2)
Minimum Clear Channel Assessment (CCA) Time	NA	20 us (see note 1)	(see note 2)	20 us (see note 1)
Maximum Channel Occupancy (COT) Time	40 ms	1ms to 10 ms	(see note 2)	$(13/32) \cdot q$ ms (see note 3)
Minimum Idle Period	5 us	5% of COT	(see note 2)	NA
Extended CCA check	NA	NA	(see note 2)	$R \cdot CCA$ (see note 4)
Short Control Signalling Transmissions	Maximum duty cycle of 10% within an observation period of 50 ms (see note 5)			

Note 1: The CCA time used by the equipment shall be declared by the supplier.

Note 2: Load Based Equipment may implement an LBT based spectrum sharing mechanism based on the Clear Channel Assessment (CCA) mode using energy detect, as described in IEEE Std.

802.11™-2007 clauses 9,15,18 or 19, in IEEE Std. 802.11n™ -2009 clauses 9,11 and 20 or in IEEE Std. 802.15.4™ -2011, clauses 4 and 5.

Note 3: q is selected by the manufacturer in the range [4...32]

Note 4: The value of R shall be randomly selected in the range [1...q]

Note 5: Adaptive equipment may or may not have Short Control Signaling Transmissions.

Interference threshold level

Maximum transmit power (P_H) EIRP dBm	Threshold Level (TL) (see note 1 and 2)
20	-70 dBm / MHz

Note 1: $TL = -70 \text{ dBm / MHz} + 20 - PH$ (assuming a 0 dBi receive antenna and PH specified in dBm e.i.r.p)

Note 2: Transmitter the CCA threshold level (TL) shall be equal or lower than -70 dBm / MHz at the input to the receiver (assuming a 0 dBi receive antenna).

3.5.2 TEST PROCEDURE

Refer to chapter 5.3.7.2 of ETSI EN 300 328 V2.2.2:2019

Measurement	
☒ Conducted measurement	☐ Radiated measurement

Step 1:

The UUT may connect to a companion device during the test. The interference signal generator, the blocking signal generator, the spectrum analyser, the UUT and the companion device are connected using a set-up equivalent to the example given by figure 5 although the interference and blocking signal generator do not generate any signals at this point in time. The spectrum analyser is used to monitor the transmissions of the UUT in response to the interfering and the blocking signals.

Adjust the received signal level (wanted signal from the companion device) at the UUT to the value defined in table 6

The analyzer shall be set as follows:

- RBW: $\geq$ Occupied Channel Bandwidth (if the analyser does not support this setting, the highest available setting shall be used) (8MHz)
- VBW: $3 \times$ RBW (if the analyser does not support this setting, the highest available setting shall be used) (28MHz)
- Detector Mode: RMS
- Centre Frequency: Equal to the centre frequency of the operating channel
- Span: 0 Hz
- Sweep time: $>$ Channel Occupancy Time of the UUT
- Trace Mode: Clear/Write
- Trigger Mode: Video

Step 2:

Configure the UUT for normal transmissions with a sufficiently high payload to allow demonstration of compliance of the adaptive mechanism on the channel being tested

Using the procedure defined in clause 5.3.7.2.1.4, it shall be verified that the UUT complies with the maximum Channel Occupancy Time and minimum Idle Period

Step 3: Adding the interference signal

A 100 % duty cycle interference signal is injected on the current operating channel of the UUT. This interference signal shall be a band limited noise signal which has a flat power spectral density, and shall have a bandwidth greater than the Occupied Channel Bandwidth of the UUT. The maximum ripple of this interfering signal shall be $\pm 1,5$ dB within the Occupied Channel Bandwidth and the power spectral density.

Step 4: Verification of reaction to the interference signal

The spectrum analyser shall be used to monitor the transmissions of the UUT on the selected operating channel with the interfering signal injected. This may require the spectrum analyser sweep to be triggered by the start of the interfering signal.

Using the procedure defined in clause 5.3.7.2.1.4, it shall be verified that:

The UUT shall stop transmissions on the current operating channel being tested.

Apart from Short Control Signalling Transmissions (see iii) below), there shall be no subsequent transmissions on this operating channel for a (silent)

period defined in clause 4.3.2.5.1.2 step 2. After that, the UUT may have normal transmissions again for the duration of a single Channel Occupancy Time period. Because the interference signal is still present, another silent period as defined in clause 4.3.2.5.1.2 step 2 needs to be included. This sequence is repeated as long as the interfering signal is present.

The UUT may continue to have Short Control Signalling Transmissions on the operating channel while the interference signal is present. These transmissions shall comply with the limits

Alternatively, the equipment may switch to a non-adaptive mode

Step 5: Adding the blocking signal

With the interfering signal present, a 100 % duty cycle CW signal is inserted as the blocking signal

Repeat step 4 to verify that the UUT does not resume any normal transmissions

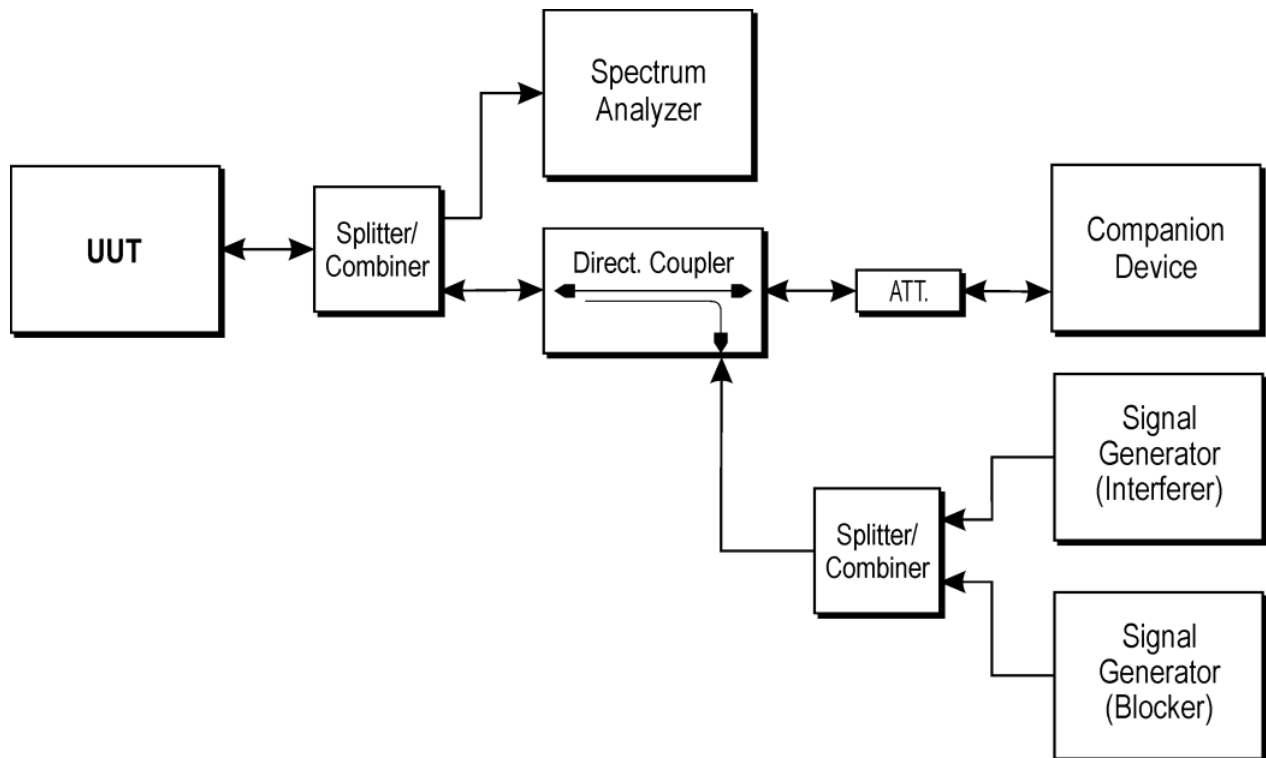
Step 6: Removing the interference and blocking signal

On removal of the interference and blocking signal the UUT is allowed to start transmissions again on this channel however, it shall be verified that this shall only be done after the period defined in clause 4.3.2.5.1.2 step 2.

Step 7:

The steps 2 to 6 shall be repeated for each of the frequencies to be tested.

3.5.3 TEST SETUP CONFIGURATION



3.5.4 LIST OF MEASUREMENTS

UUT operational Mode		
Frame Based Equipment	Load Based Equipment (CCA using 'energy detect')	Load Based Equipment (CCA not using any of the mechanisms referenced)
	V	

Clause	Test Parameter	Remarks	PASS/FAIL
4.3.2.5.2.2.1	Adaptive (Frame Based Equipment)	Not Applicable	N/A
4.3.2.5.2.2.2	Adaptive (Load Based Equipment)	N/A	N/A
4.3.2.5.3	Short Control Signaling Transmissions	N/A	N/A

3.5.5 INTERFERENCE THRESHOLD LEVEL

EUT :	Translation machine	Model Name :	T4
Temperature :	24 °C	Relative Humidity :	54%
Pressure :	1010 hPa	Test Power :	N/A
Test Mode :	N/A		

3.6. TRANSMITTER UNWANTED EMISSIONS IN THE SPURIOUS DOMAIN

3.6.1 LIMITS OF TRANSMITTER UNWANTED EMISSIONS IN THE SPURIOUS DOMAIN

TRANSMITTER UNWANTED EMISSIONS IN THE SPURIOUS DOMAIN		
Frequency Range	Maximum Power Limit (E.R.P.(≤1 GHz) E.I.R.P.(> 1 GHz))	Bandwidth
30 MHz to 47 MHz	-36dBm	100 kHz
47 MHz to 74 MHz	-54dBm	100 kHz
74 MHz to 87.5 MHz	-36dBm	100 kHz
87.5 MHz to 118 MHz	-54dBm	100 kHz
118 MHz to 174 MHz	-36dBm	100 kHz
174 MHz to 230 MHz	-54dBm	100 kHz
230 MHz to 470 MHz	-36dBm	100 kHz
470 MHz to 862 MHz	-54dBm	100 kHz
862 MHz to 1 GHz	-36dBm	100 kHz
1 GHz ~ 12.75 GHz	-30dBm	1 MHz

3.6.2 TEST PROCEDURE

Refer to chapter 5.3.10.2 of ETSI EN 300 328 V2.2.2:2019

Measurement	
☐ Conducted measurement	☒ Radiated measurement

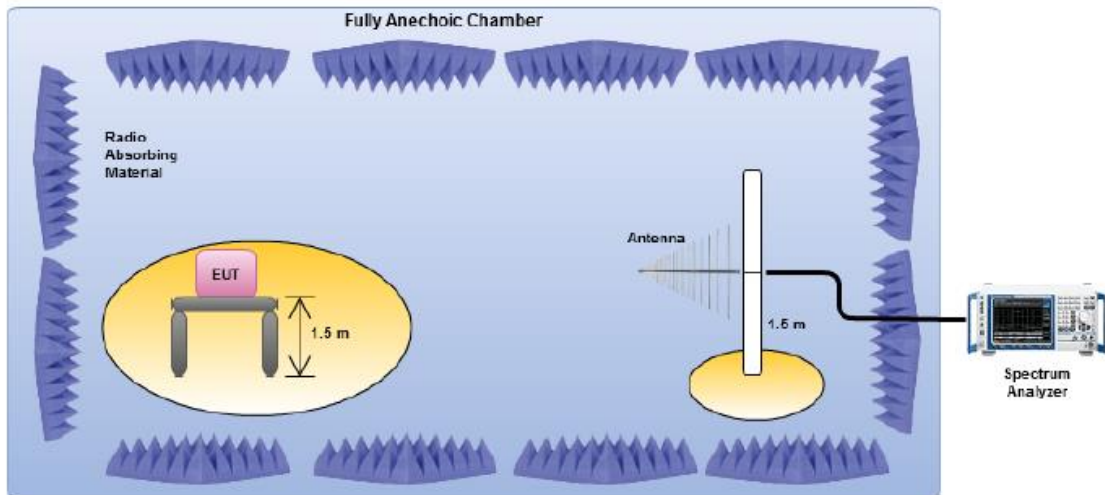
The setting of the Spectrum Analyzer

RBW	100K(<1GHz) / 1M(>1GHz)
VBW	300K(<1GHz) / 3M(>1GHz)

3.6.3 DEVIATION FROM TEST STANDARD

No deviation

3.6.4 TEST SETUP



1. For the actual test configuration, please refer to the related Item in this test report (Photographs of the Test Configuration).
2. The measurements were performed when normal hopping was disabled. In this case measurements were performed when operating at the lowest and the highest hopping frequency.
3. The equipment was configured to operate under its worst case situation with respect to output power.
4. The test setup has been constructed as the normal use condition. Controlling software has been activated to set the EUT on specific status.

BELOW 1 GHz WORST- CASE DATA(30 MHz ~ 1GHz)

EUT :	Translation machine	Model Name :	T4
Temperature :	25°C	Relative Humidity :	60 %
Pressure :	1012 hPa	Test Voltage :	5Vdc
Test Mode :	TX		

Polar (H/V)	Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Remark
	(MHz)	(dBm)	(dB)	(dBm)	(dBm)	(dB)	
V	85.801	-89.43	28.43	-61	-54	-7	peak
V	150.3411	-75.23	22.24	-52.99	-36	-16.99	peak
V	224.357	-85.87	24.39	-61.48	-54	-7.48	peak
V	274.3627	-70.38	22.43	-47.95	-36	-11.95	peak
V	494.3274	-74.32	29.22	-45.1	-36	-9.1	peak
V	601.4227	-94.49	34.58	-59.91	-54	-5.91	peak
H	125.0571	-85.87	26.33	-59.54	-54	-5.54	peak
H	176.5255	-71.53	18.69	-52.84	-36	-16.84	peak
H	213.2345	-83.52	24.35	-59.17	-54	-5.17	peak
H	315.2365	-73.112	23.14	-49.972	-36	-13.972	peak
H	425.2474	-73.78	27.83	-45.95	-36	-9.95	peak
H	705.3478	-89.23	30.7	-58.53	-54	-4.53	peak

Remark:
 Absolute Level= ReadingLevel+ Factor, Margin= Absolute Level - Limit

ABOVE 1 GHz WORST- CASE DATA (1GHz ~ 12.75GHz)

EUT :	Translation machine	Model Name :	T4
Temperature :	25°C	Relative Humidity :	60 %
Pressure :	1012 hPa	Test Voltage :	5Vdc
Test Mode :	TX		

Polar (H/V)	Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Remark
	(MHz)	(dBm)	(dB)	(dBm)	(dBm)	(dB)	
operation frequency:2402							
V	4804.001	-47.21	8.47	-38.74	-30	-8.74	peak
V	7206.240	-52.48	10.53	-41.95	-30	-11.95	peak
H	4804.140	-48.37	8.47	-39.9	-30	-9.9	peak
H	7206.230	-53.47	10.55	-42.92	-30	-12.92	peak
operation frequency:2440							
V	4882.162	-49.74	8.47	-41.27	-30	-11.27	peak
V	7323.130	-52.39	10.52	-41.87	-30	-11.87	peak
H	4882.257	-49.94	8.46	-41.48	-30	-11.48	peak
H	7323.120	-52.23	10.53	-41.7	-30	-11.7	peak
operation frequency:2480							
V	4960.210	-50.65	8.46	-42.19	-30	-12.19	peak
V	7440.250	-51.34	10.51	-40.83	-30	-10.83	peak
H	4960.150	-51.95	8.44	-43.51	-30	-13.51	peak
H	7440.260	-53.67	10.52	-43.15	-30	-13.15	peak
Remark: Absolute Level= ReadingLevel+ Factor, Margin= Limit- Absolute Level							

3.7. RECEIVER SPURIOUS RADIATION

3.7.1 LIMITS OF RECEIVER SPURIOUS RADIATION

RECEIVER SPURIOUS EMISSIONS		
Frequency Range	Maximum Power Limit (E.R.P.(≤ 1 GHz) E.I.R.P.(> 1 GHz))	Measurement Bandwidth
30 MHz ~ 1 GHz	-57dBm	100KHz
1 GHz ~ 12.75 GHz	-47dBm	1MHz

3.7.2 TEST PROCEDURE

Refer to chapter 5.3.11.2 of ETSI EN 300 328 V2.2.2:2019

Measurement	
☐ Conducted measurement	☒ Radiated measurement

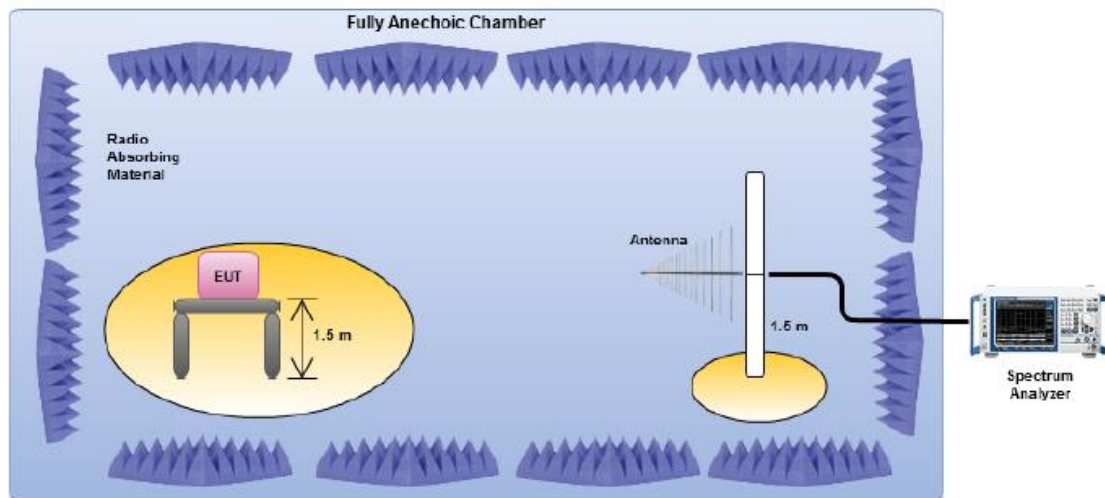
The setting of the Spectrum Analyzer

RBW	100K(< 1GHz) / 1M(> 1GHz)
VBW	300K(< 1GHz) / 3M(> 1GHz)

3.7.3 DEVIATION FROM TEST STANDARD

No deviation

3.7.4 TEST SETUP



1. For the actual test configuration, please refer to the related Item in this test report (Photographs of the Test Configuration).
2. Testing was performed when the equipment was in a receive-only mode.
3. The measurements were performed when normal hopping was disabled. In this case measurements were performed when operating at the lowest and the highest hopping frequency.
4. The test setup has been constructed as the normal use condition. Controlling software has been activated to set the EUT on specific status.

RX BELOW 1 GHz WORST- CASE DATA(30 MHz ~ 1GHz)

EUT :	Translation machine	Model Name :	T4
Temperature :	25°C	Relative Humidity :	60 %
Pressure :	1012 hPa	Test Voltage :	5Vdc
Test Mode :	RX Mode		

Polar (H/V)	Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Remark
	(MHz)	(dBm)	(dB)	(dBm)	(dBm)	(dB)	
V	84.471	-90.44	26.21	-64.23	-57	-7.23	peak
V	101.25	-91.43	18.83	-72.6	-57	-15.6	peak
V	189.3254	-88.95	24.48	-64.47	-57	-7.47	peak
V	353.5417	-94.23	27.43	-66.8	-57	-9.8	peak
V	551.3454	-95.95	31.46	-64.49	-57	-7.49	peak
V	742.3577	-96.623	34.55	-62.073	-57	-5.073	peak
H	87.257	-91.57	27.92	-63.65	-57	-6.65	peak
H	135.7514	-95.71	17.84	-77.87	-57	-20.87	peak
H	255.347	-97.54	21.01	-76.53	-57	-19.53	peak
H	368.1175	-93.47	25.35	-68.12	-57	-11.12	peak
H	455.3667	-96.19	29.69	-66.5	-57	-9.5	peak
H	675.5857	-97.49	33.43	-64.06	-57	-7.06	peak

Remark:
 Absolute Level= ReadingLevel+ Factor, Margin= Absolute Level - Limit

EUT :	Translation machine	Model Name :	T4
Temperature :	24 °C	Relative Humidity	54%
Pressure :	1010 hPa	Test Power :	5Vdc
Test Mode :	RX Mode		

Polar (H/V)	Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Remark
	(MHz)	(dBm)	(dB)	(dBm)	(dBm)	(dB)	
V	1125.15	-63.45	-4.12	-67.57	-47	-20.57	peak
V	2201.355	-64.84	-1.01	-65.85	-47	-18.85	peak
V	3285.42	-64.73	-0.49	-65.22	-47	-18.22	peak
V	4511.224	-65.42	8.38	-57.04	-47	-10.04	peak
V	6055.315	-68.94	9.55	-59.39	-47	-12.39	peak
V	8052.164	-67.63	10.48	-57.15	-47	-10.15	peak
H	1245.3	-65.48	-4.82	-70.3	-47	-23.3	peak
H	2125.45	-65.92	-0.85	-66.77	-47	-19.77	peak
H	3110.58	-68.04	4.48	-63.56	-47	-16.56	peak
H	5256.524	-67.07	6.12	-60.95	-47	-13.95	peak
H	7258.352	-69.74	10.48	-59.26	-47	-12.26	peak
H	9132.371	-74.78	18.43	-56.35	-47	-9.35	peak

Remark:
 Absolute Level= ReadingLevel+ Factor, Margin= Absolute Level - Limit

3.8. RECEIVER BLOCKING

3.8.1 LIMITS OF RECEIVER BLOCKING

Adaptive equipment using wide band modulations other than FHSS, shall comply with the requirements defined in non-LBT based DAA or LBT based DAA in the presence of a blocking signal with characteristics as provided in below table.

Equipment Type (LBT/ non-LBT)	Wanted signal mean power from companion device	Blocking signal frequency [MHz]	Blocking signal power [MHz]	Type interfering signal
LBT	Sufficient to maintain the link (see note 2)	2395 or 2488.5 (see note 1)	30	CW
Non-LBT	-30 dBm			
NOTE 1: The highest blocking frequency shall be used for testing the lowest operating channel, while the lowest blocking frequency shall be used for testing the highest operating channel.				
NOTE 2: A typical value which can be used in most cases is -50 dBm /MHz.				

3.8.2 TEST PROCEDURE

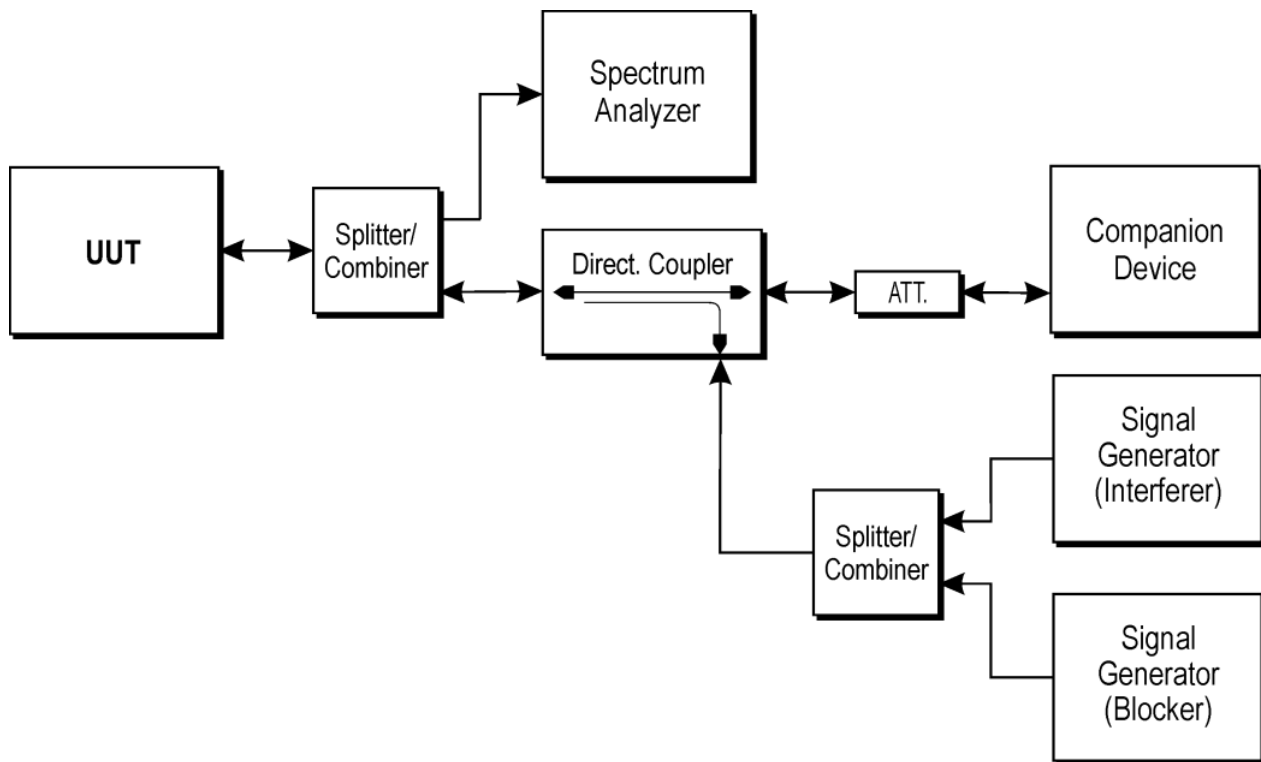
Refer to chapter 5.3.7.2.1 of ETSI EN 300 328 V2.2.2:2019

Measurement	
☒ Conducted measurement	☐ Radiated measurement

3.8.3 DEVIATION FROM TEST STANDARD

No deviation

3.8.4 TEST SETUP



3.8.5 TEST RESULTS

EUT :	Translation machine	Model Name :	T4
Temperature :	26°C	Relative Humidity :	60 %
Pressure :	1012 hPa	Test Voltage :	N/A
Test Mode :	N/A		

4. EUT TEST PHOTO



Fig.01



Fig.02



Fig.03

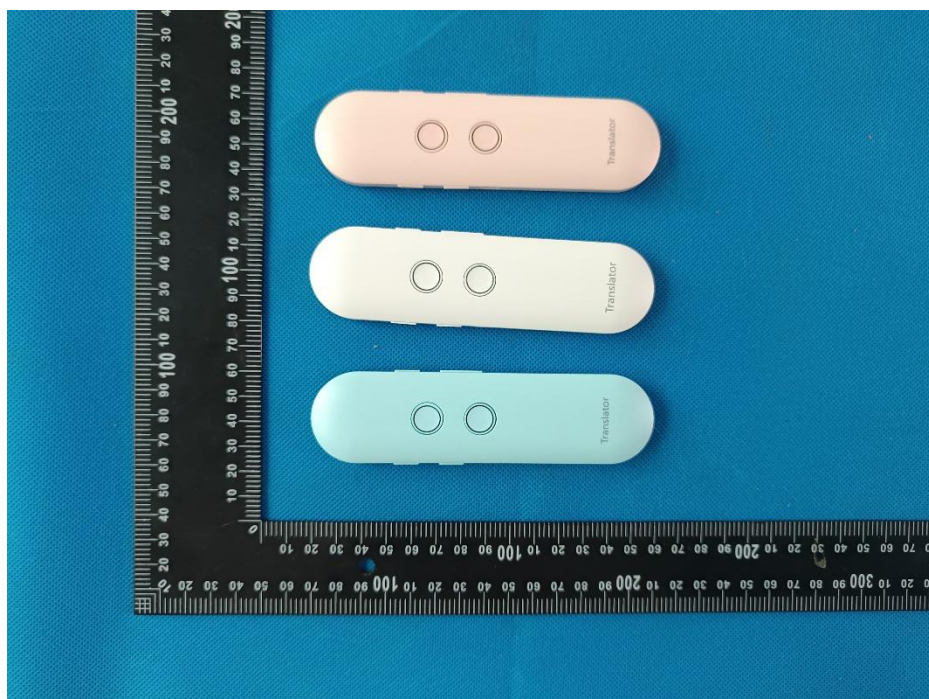


Fig.04

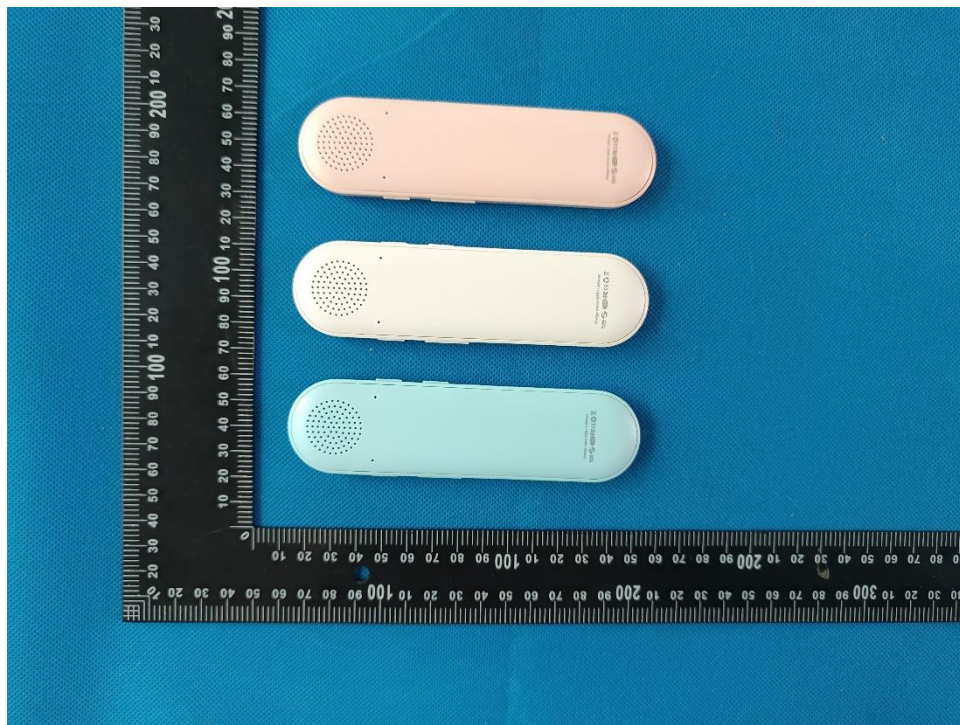


Fig.05



Fig.06

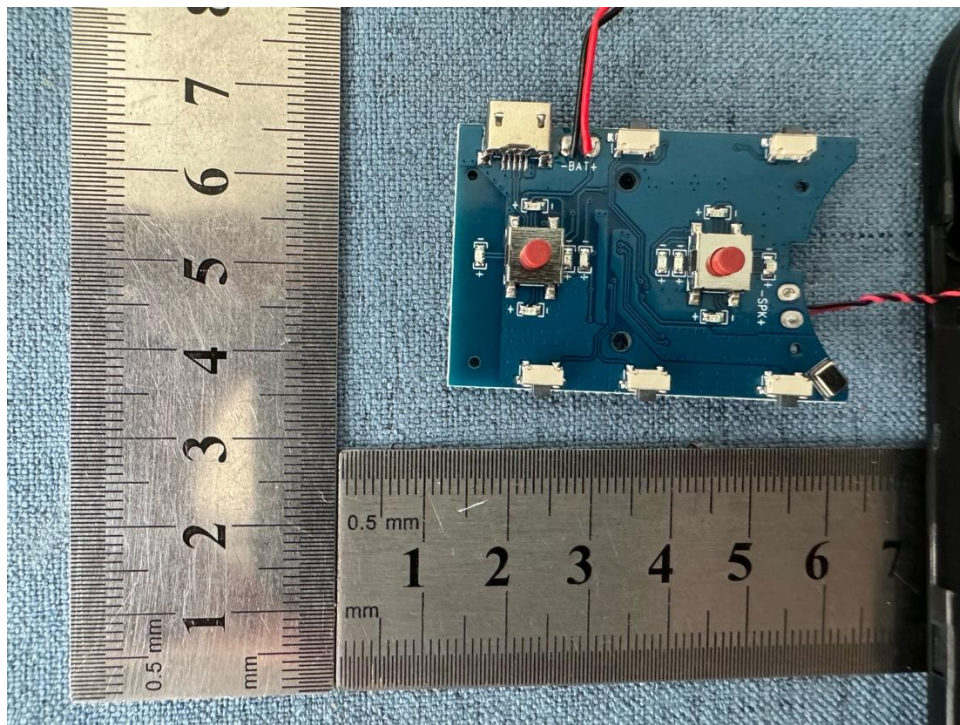


Fig.07

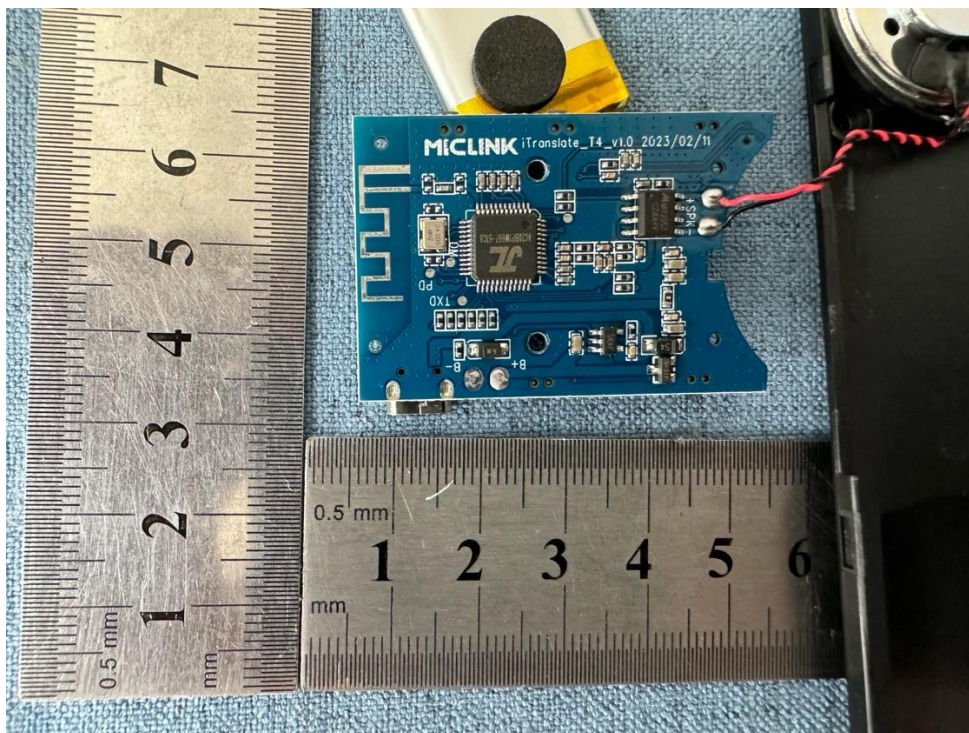


Fig.08

*****End of Report *****