Certificate of Test

NCT Co., Ltd. 211-71, Geumgok-ro, Hwaseong-si, Gyeonggi-do, 18511, Korea (Tel: +82-31-323-6070 / Fax: +82-31-323-6071)	Report No.: NW2004-F004 Page (1) / (14)	Your business' success starts with NCT

1. **Client**
   - ○ Name : T&F Global Co., Ltd.
   - ○ Address : 604, 303DONG, 397, SEOKCHEON-RO OJEONG-GU, GYEONGGI-DO, KOREA (303-604, BUCHEON TECHNO PARK SSANGYONG 3CHA, 397, Seokcheon-ro, Bucheon-si, Gyeonggi-do, Korea)
   - ○ Date of Receipt : 2020-03-27

2. **Use of Report :** FCC & IC Approval

3. **Test Sample**
   - ○ Description / Model Name : Rear Seat Entertainment / RSE
   - ○ FCC ID : 2AT7Y-RSE / IC : 26002-RSE

4. **Date of Test :** 2020-03-27 ~ 2020-04-07

5. **Test method used :** FCC Part 15 Subpart E 15.407
   RSS-247 Issue 2(2017-02)

6. **Testing Environment :**
   - ○ Temperature: (25 ± 5) °C, Humidity: Less than 75 % R.H.
   - * Unless specified otherwise in the individual methods, the tests were conducted on ambient conditions.

7. **Test Results :** Refer to the test results

The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
This Test Report cannot be reproduced, except in full
This test report is prepared according to the requirements of ISO / IEC 17025.

Affirmation	**Tested by** Jong-Myoung, Shin (signature)	**Technical Manager** Kyung-Taek, Lee (signature)

April 20, 2020

NCT CO., LTD. (seal)

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1. General Information's

1.1 Test Performed

Laboratory	:	NCT Co., Ltd.
Address	:	211-71, Geumgok-ro, Hwaseong-si, Gyeonggi-do, 18511, Korea
Telephone	:	+82-31-323-6070
Facsimile	:	+82-31-323-6071
FCC Designation No.	:	KR0166
FCC Registration Number	:	409631
IC Site Registration No.	:	25897

2. Information's about Test Item

2.1 Applicant Information

Company name	:	T&F Global Co., Ltd.
Address	:	604, 303DONG, 397, SEOKCHEON-RO OJEONG-GU, GYEONGGI-DO, KOREA (303-604, BUCHEON TECHNO PARK SSANGYONG 3CHA, 397, Seokcheon-ro, Bucheon-si, Gyeonggi-do, Korea)
Telephone / Facsimile	:	+82-2-855-0501 / +82-2-855-0580

2.2 Equipment Under Test (EUT) description

Test item particulars	:	Rear Seat Entertainment
Model and/or type reference	:	RSE
Additional model name	:	-
Serial number	:	Identification
Antenna type and gain	:	Chip Antenna with Max gain : 3.60 dBi
Date (s) of performance of tests:	:	2020-03-27 ~ 2020-04-07
Date of receipt of test item	:	2020-03-27
EUT condition	:	Pre-production, not damaged
EUT Power Source	:	DC 12 V
Type of Modulation	:	OFDM
Firmware version	:	RSE_US_K101_1.0.0 for FCC RSE_CA_K101_1.0.0 for IC
Hardware version	:	1.0
Test software name(version)	:	TeraTerm(4.105)

2.3 Frequency Range

5㎓ Band	802.11a/n_HT20/ac_VHT20 (㎒)	n_HT40/ac_VHT40 (㎒)	Remark
U-NII 1	5 180 ~ 5 240	5 190 ~ 5 230	
U-NII 2A	5 260 ~ 5 320	5 270 ~ 5 310	
U-NII 2C	5 500 ~ 5 700	5 510 ~ 5 670	Not supported in IC
U-NII 3	5 745 ~ 5 825	5 755 ~ 5 795	

2.4 Transmitting Configuration of EUT

Test Mode	Data rate
802.11a	6 ~ 54 Mbps
802.11n_HT20	MCS 0 ~ 7
802.11n_HT40	MCS 0 ~ 7
802.11ac_VHT20	MCS 0 ~ 8
802.11ac_VHT40	MCS 0 ~ 9

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3. Test Report

3.1 Test Summary

Applied	FCC	IC	Test Items	Test Condition	Result
☒	15.407(h)	RSS-GEN(6.3)	Dynamic Frequency Selection	Conducted	C

Note 1: C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable

Note 2: This product will not operate U-NII 2C band in Canada(IC).

The sample was tested according to the following specification: ANSI C63.10:2013, KDB789033 D02 V01, KDB644545 D03

Compliance was determined by specification limits of the applicable standard according to customer requirements.

3.2 Test Report Version

Test Report No.	Date	Description
NW2004-F004	2020-04-20	Initial issue

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3.3 Dynamic Frequency Selection

3.3.1 Channel Move Time and Channel Closing Transmission Time

3.3.1.1 Test Setup

Refer to the APPENDIX I.

3.3.1.2 Applicability

The following table from KDB 905462 D02 v02 lists the applicable requirements for the DFS testing. The device evaluated in this report is considered a client device without radar detection capability

Requirement	Operational Mode		
	Master	Client Without Radar Detection	Client With Radar Detection
Non-Occupancy Period	Yes	Not required	Yes
DFS Detection Threshold	Yes	Not required	Yes
Channel Availability Check Time	Yes	Not required	Not required
U-NII Detection Bandwidth	Yes	Not required	Yes

Table 1. DFS Applicability

Requirement	Operational Mode	
	Master Device or Client with Radar Detection	Client Without Radar Detection
DFS Detection Threshold	Yes	Not required
Channel Closing Transmission Time	Yes	Yes
Channel Move Time	Yes	Yes
U-NII Detection Bandwidth	Yes	Not required

Additional requirements for devices with multiple bandwidth modes	Master Device or Client with Radar Detection	Client Without Radar Detection
U-NII Detection Bandwidth and Statistical Performance Check	All BW modes must be tested	Not required
Channel Move Time and Channel Closing Transmission Time	Test using widest BW mode available	Test using the widest BW mode available for the link
All other tests	Any single BW mode	Not required
Note: Frequencies selected for statistical performance check (Section 7.8.4) should include several frequencies within the radar detection bandwidth and frequencies near the edge of the radar detection bandwidth. For 802.11 devices it is suggested to select frequencies in each of the bonded 20 MHz channels and the channel center frequency.		

Table 1.1 DFS During normal operation

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3.3.1.3 Requirements

KDB 905462 D02 v02 the following are the requirements for Client Devices:

a) A Client Device will not transmit before having received appropriate control signals from a Master Device.
b) A Client Device will stop all its transmissions whenever instructed by a Master Device to which it is associated and will meet the Channel Move Time and Channel Closing Transmission Time requirements. The Client Device will not resume any transmissions until it has again received control signals from a Master Device.
c) If a Client Device is performing In-Service Monitoring and detects a Radar Waveform above the DFS Detection Threshold, it will inform the Master Device. This is equivalent to the Master Device detecting the Radar Waveform and d) through f) of section 5.1.1 apply.
d) Irrespective of Client Device or Master Device detection the Channel Move Time and Channel Closing Transmission Time requirements remain the same.
e) The client test frequency must be monitored to ensure no transmission of any type has occurred for 30 minutes.

Note: If the client moves with the master, the device is considered compliant if nothing appears in the client non-occupancy period test. For devices that shutdown (rather than moving channels), no beacons should appear

Parameter	Value
Non-occupancy period	Minimum 30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds See Note 1.
Channel Closing Transmission Time	200 milliseconds + an Aggregate of 60 milliseconds over remaining 10 second period. See Notes 1 and 2.
U-NII Detection Bandwidth	Minimum 100% of the U-NII 99% transmission power bandwidth. See Note3.
Note 1: Channel Move Time and the Channel Closing Transmission Time should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst. **Note 2:** The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning of the Channel Move Time plus any additional intermittent control signals required to facilitate a Channel move (and aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions. **Note 3:** During the U-NII Detection Bandwidth detection test, radar type 0 should the used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.	

Table 1.2 DFS Response Requirement Values

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3.3.1.4 Parameters of DFS Test Signals

As the EUT is a Client Device with no Radar Detection only Zero type radar pulse is required for the testing. Radar Pulse type 0 was used in the evaluation of the Client device for the purpose of measuring the channel Move Time and the Channel Closing Transmission Time.

Radar Type	Pulse Width (μsec)	PRI (μsec)	Number of Pulses	Minimum Percentage of Successful Detection	Mnimum Number of Trials
0	1	1428	18	See Note 1	See Note 1
1	1	Test A: 15 unique PRI values randomly selected from the list of 23 PRI values in Table 5a	Roundup: $\{(1/360)*(19*10^6 \text{ PRI}_{\mu sec})\}$	60%	30
		Test B: 15 unique PRI values randomly selected within the range of 518-3066 μsec, with a minimum increment of 1 μsec, excluding PRI values selected in Test A			
2	1-5	150-230	23-29	60%	30
3	6-10	200-500	16-18	60%	30
4	11-20	200-500	12-16	60%	30
Aggregate (Radar Types 1-4)				80%	120
Note 1: Short Pulse Radar Type 0 should be used for the detection bandwidth test, channel move time, and channel closing time tests.					

Table 1.3 Short Pulse Radar Test Waveforms

Radar Type	Pulse Width (μsec)	Chirp Width (MHz)	PRI (μsec)	Pulses per Burst	Number of Bursts	Minimum Percentage of Successful Detection	Minimum Trials
5	50-100	5-20	1000-2000	1-3	8-20	80%	30

Table 1.4 Long Pulse Radar Test Waveforms

Radar Type	Pulse Width (μsec)	PRI (μsec)	Pulses Per Hop	Hopping Rate (kHz)	Hopping Sequence Length (msec)	Minimum Percentage of Successful Detection	Minimum Trials
6	1	333	9	0.333	300	70%	30

Table 1.5 Frequency Hopping Radar Test Waveforms

3.3.1.5 Test Procedure

KDB 905462 D02 v02 describes a radiated test setup and a conducted test setup. The conducted test setup was used for this testing.

1. One frequency will be chosen from the Operating Channels of the UUT within the 5250 ~5350 ㎒ or 5470 ~5725 ㎒ bands.
2. The Client Device (EUT) is setup per the diagram in Firure1 and communications between the Master device and the Client is established.
3. An MPEG or data file that is typical for the device is streamed from the Master to the Client to properly load he network.

3.3.1.4 Test Result

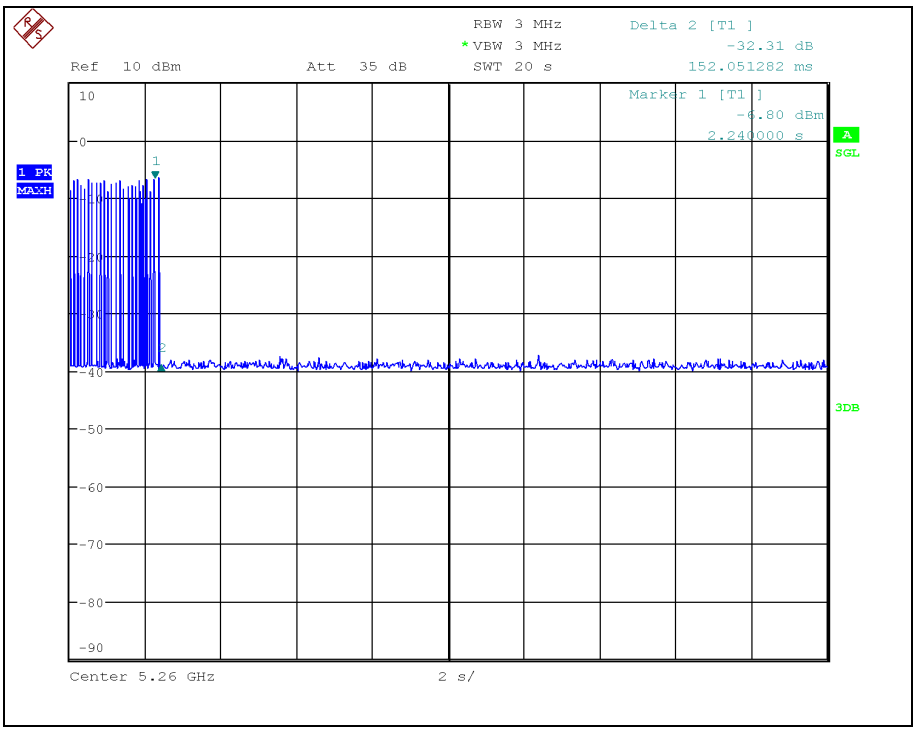
Band	Frequency (㎒)	Channel Move Time (s)		Channel Closing Transmission Time (ms)	
		Result	Limit	Result	Limit
U-NII 2A	**5 290**	0.152	10.00	0.20	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period.
U-NII 2C	**5510**	0.092		0.20	

Note: Channel Closing Transmission Time : 1 * 0.2 ms = 0.2 ms

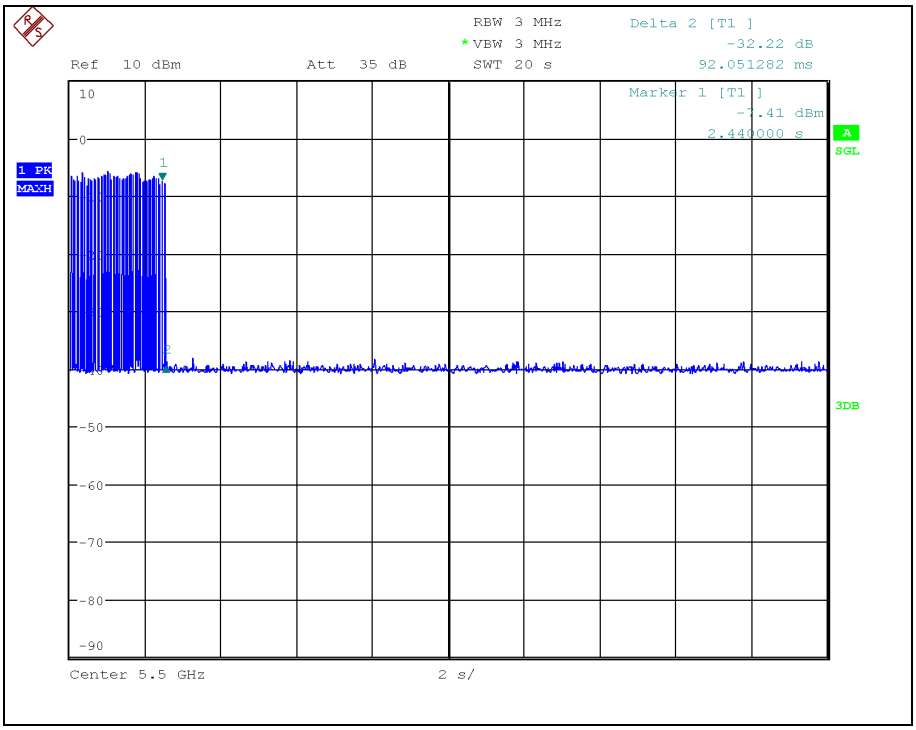
Dwell = S / B
where Dwell is the dwell time per spectrum analyzer sampling bin, S is the sweep time and B is the number of spectrum analyzer sampling bins.
An upper bound of the aggregate duration of the Channel Closing Transmission Time is calculated by:
C = N * Dwell
where C is the Closing Time, N is the number of spectrum analyzer sampling bins showing a U-NII transmission and Dwell is the dwell time per bin.

3.3.1.5 Test Plot

802.11a _ 5 290 ㎒



802.11a _ 5 510 ㎒



APPENDIX I

TEST SETUP

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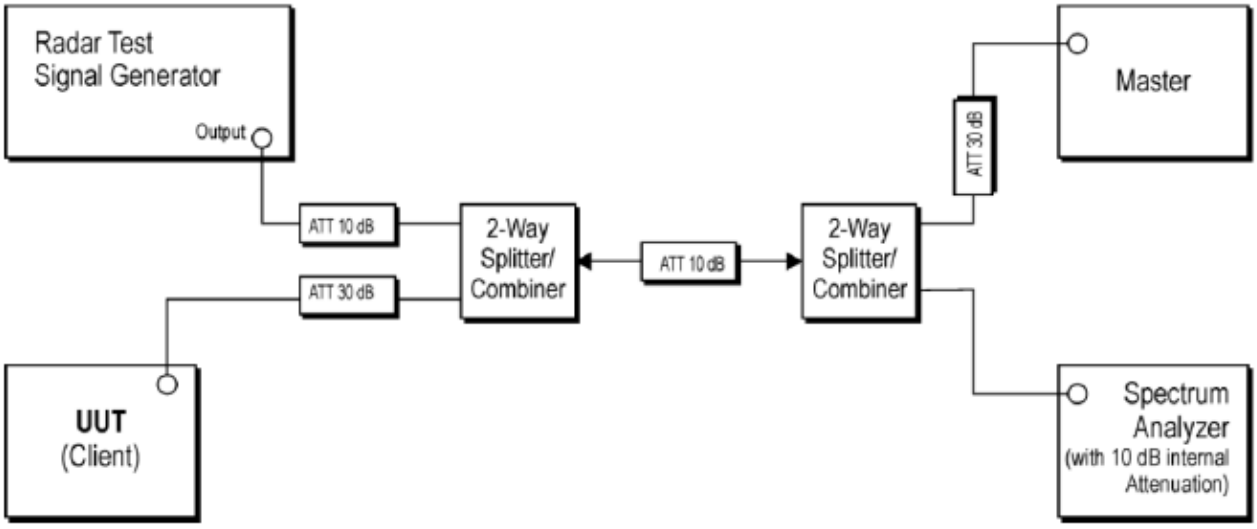
- Test Setup for Client with injection at the Master



APPENDIX II

TEST EQUIPMENT USED FOR TESTS

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	Description	Manufacturer	Serial No.	Model No.	Cal. Date	Next Cal. Date
1	SPECTRUM ANALYZER	R&S	100250	FSU26	2019-09-23	2020-09-23
2	SPECTRUM ANALYZER	R&S	100617	FSP40	2020-03-10	2021-03-10
3	Vector SG	R&S	255563	SMBV100A	2020-03-10	2021-03-10
4	Power supply	GWInstsk	EH120798	PST-3202	2020-03-10	2021-03-10
5	Triple Output DC Power Supply	Agilent	MY40038816	E3631A	2020-03-10	2021-03-10
6	ATTENUATOR	Agilent	08259	8493C	2020-03-11	2021-03-11
7	ATTENUATOR	Weinschel	none	WA1444-14	2020-03-11	2021-03-11
8	ATTENUATOR	Weinschel	none	WA41/12-30-12	2020-03-10	2021-03-10
9	Attenuator	BRACKE	1	BM10060.6	2019-11-15	2020-11-15
10	POWER DIVIDER	Agilent	11664	11636B	2020-03-11	2021-03-11
11	POWER DIVIDER	Agilent	51623	11636B	2020-03-11	2021-03-11
12	STEP ATTENUATOR	HP	2852A00842	8495D	2020-03-11	2021-03-11

Description	Manufacturer	Model No.	Serial No.
Access Point	Synology	MR2200ac	-
Notebook	LENOVO	Ideapad 320	-