Prüfbericht-Nr.: *Test report no.:*	**CN207CDN 002**	**Auftrags-Nr.:** *Order no.*:	**168285296**	Seite 1 von 20 *Page 1 of 20*
Kunden-Referenz-Nr.: *Client reference no.:*	**N/A**	**Auftragsdatum:** *Order date:*	2020-10-10	
Auftraggeber: *Client:*	Nortek Security&Control LLC 5919 Sea Otter Place,Suite 100,Carlsbad,California, United States			
Prüfgegenstand: *Test item:*	Control Extender			
Bezeichnung / Typ-Nr.: *Identification / Type no.:*	EL-IO-200 (Trademark: ELAN)			
Auftrags-Inhalt: *Order content*:	FCC & IC			
Prüfgrundlage: *Test specification:*	CFR47 FCC Part 15: Subpart C Section 15.407 CFR47 FCC Part 15: Subpart C Section 15.207 CFR47 FCC Part 15: Subpart C Section 15.209 CFR47 FCC Part 2: Section 2.1091		RSS-247 Issue 2 February 2017 RSS-Gen Issue 5 March 2019 RSS-102 Issue 5 March 2015	

Wareneingangsdatum: *Date of sample receipt:*	2020-11-06	Please refer to Photo Document
Prüfmuster-Nr.: *Test sample no:*	A002938509-002~005, 010,011,018,019	
Prüfzeitraum: *Testing period:*	2020-11-09 – 2020-12-17	
Ort der Prüfung: *Place of testing:*	TÜV Rheinland (Shenzhen) Co., Ltd.	
Prüflaboratorium: *Testing laboratory:*	TÜV Rheinland (Shenzhen) Co., Ltd.	
Prüfergebnis*: *Test result*:*	Pass	

geprüft von: *tested by:*	X Bell Hu Signed by: Bell Hu	**genehmigt von:** *authorized by:*	X Winnie Hou Signed by: Winnie Hou
Datum: *Date:* 2021-01-05		**Ausstellungsdatum:** *Issue date:* 2021-01-05	
Stellung / *Position:*	Project Manager	**Stellung** / *Position:*	Technical Certifier

Sonstiges / *Other:* FCC ID: EF400210
IC: 1078A-00210
HVIN: EL-IO-200

Zustand des Prüfgegenstandes bei Anlieferung: Prüfmuster vollständig und unbeschädigt
Condition of the test item at delivery: *Test item complete and undamaged*

* Legende:	1 = sehr gut	2 = gut	3 = befriedigend	4 = ausreichend	5 = mangelhaft
	P(ass) = entspricht o.g. Prüfgrundlage(n)		F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
** Legend:*	*1 = very good*	*2 = good*	*3 = satisfactory*	*4 = sufficient*	*5 = poor*
	P(ass) = passed a.m. test specification(s)		*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*N/T = not tested*

Test Summary

5.1.1 ANTENNA REQUIREMENT
RESULT: Pass

5.1.2 MAXIMUM CONDUCTED OUTPUT POWER
RESULT: Pass

5.1.3 CONDUCTED POWER SPECTRAL DENSITY
RESULT: Pass

5.1.4 FREQUENCY STABILITY
RESULT: Pass

5.1.5 26DB BANDWIDTH, 6DB BANDWIDTH AND 99% BANDWIDTH
RESULT: Pass

5.1.6 RADIATED SPURIOUS EMISSION
RESULT: Pass

5.1.7 CONDUCTED EMISSION ON AC MAINS
RESULT: Pass

Contents

1 General Remarks

1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendix:

Appendix A: Photographs of the Test Set-up

Appendix B: Test Results of Wi-Fi operation for U-NII-1 band

Appendix C: Test Results of Wi-Fi operation for U-NII-3 band and Conducted Emission on AC Mains

2 Test Sites

2.1 Test Facilities

TÜV Rheinland (Shenzhen) Co., Ltd.
No.362, Huanguan Middle Road, Songyuansha Community, Guanhu Subdistrict, Longhua District, Shenzhen, Guangdong, China

FCC Accreditation Designation No.: 694916

ISED wireless device testing laboratory: 25069

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Radio Spectrum Testing (TS8997)				
Equipment	**Manufacturer**	**Model**	**Serial No.**	**Cal. until**
Signal Analyzer	R&S	FSV 40	101441	2021-08-10
OSP	R&S	OSP 150	101017	2021-12-10
Control PC	DELL	OptiPlex 7050	FTJZ9P2	N/A
Test Software	R&S	WMS32 (V11.00.00)	N/A	N/A
Power Meter	R&S	NRP2	107105	2021-12-10
Wideband Power Sensor	R&S	NRP-Z81	105350	2021-12-17
Shielding Room 8#	Albatross	SR8	APC17151-SR8	2021-07-23
Unwanted Emission Testing (TS9975)				
Equipment	**Manufacturer**	**Model**	**Serial No.**	**Cal. until**
EMI Test Receiver	R&S	ESR 7	102021	2021-08-11
Signal Analyzer	R&S	FSV 40	101439	2021-08-10
System Controller Interface	R&S	SCI-100	S10010038	N/A
Filterbank	R&S	Wlan	100759	2021-08-10
OSP	R&S	OSP 120	102040	N/A
Pre-amplifier	R&S	SCU08F1	08320031	2021-08-10
Amplifier	R&S	SCU-18F	180070	2021-08-10
Amplifier	R&S	SCU40A	100475	2021-09-10
Trilog Broadband Antenna (30 MHz - 7 GHz)	Schwarzbeck	VULB 9162	193	2022-08-08
Double-Ridged Antenna (1 -18 GHz)	ETS-LINDGREN	3117	00218717	2022-08-08
Wideband Ridged Horn Antenna (18-40 GHz)	Steatite	QMS-00880	19067	2022-08-08
Active Loop Antenna	Schwarzbeck	FMZB 1513	302	2022-09-13
Wideband Ridged Horn Antenna (12-18 GHz)	Steatite	QMS-00208	18313	2021-09-02
Test software	R&S	EMC32 (V10.60.10)	N/A	N/A
Control PC	Dell	OptiPlex 7050	36NV9P2	N/A
3m Semi-Anechoic Chamber	Albatross	SAC-3m	APC17151-SAC	2021-07-06
Conducted Emission				
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Until**
EMI Test Receiver	R&S	ESR3	102680	2021-05-19
Artificial Mains Network	R&S	ENV216	101445	2021-05-19
EMC32 test software	R&S	EMC32(Ver.10.50.01)	N/A	N/A

2.3 Traceability

All measurement equipment calibrations are traceable to NIM (National Institute of Metrology) or where calibration is performed in other countries, to equivalent nationally recognized standards organizations.

2.4 Calibration

Equipment requiring calibration is calibrated periodically by the manufacturer or according to manufacturer's specifications. Additionally all equipment is verified for proper performance on a regular basics using in house standards or comparisons.

2.5 Measurement Uncertainty

The estimated combined standard uncertainty for radiated emissions and conducted emissions measurements as below table.

Parameter	Uncertainty
Radio Frequency	±1 x 10-7
RF Power (conducted)	±2.5 dB
Radiated Emission of Transmitter, valid up to 26.5 GHz	±6 dB
Radiated Emission of Receiver, valid up to 26.5 GHz	±6 dB
Conducted Emission, (9kHz to 150kHz)/(150kHz to 30MHz)	±3.70 dB / ±3.30 dB
Radiated Emission (3m SAC), 30MHz to 1000MHz	±4.52 dB
Radiated Emission (3m SAC), above 1000MHz	±4.37 dB
Temperature	±1 °C
Humidity	±5 %
Voltage (DC)	±1 %
Voltage (AC, <10kHz)	±2 %

2.6 Location of Original Data

The original copies of all test data taken during actual testing were attached at Appendix A & B & C of this report and delivered to the applicant. A copy has been retained in the TÜV Rheinland (Shenzhen) Co., Ltd. File for certification follow-up purposes.

2.7 Status of Facility Used for Testing

The TÜV Rheinland (Shenzhen) Co., Ltd.Test facility located at No.362, Huanguan Middle Road, Songyuansha Community, Guanhu Subdistrict, Longhua District, Shenzhen, Guangdong, China is listed on the US Federal Communications Commission list of facilities approved to perform measurements.

3 General Product Information

3.1 Product Function and Intended Use

The EUT is a Control Extender, which supports Wi-Fi 802.11 a/b/g/n/ac wireless technologies. The EUT supports the following functions: Wireless access in the 2.4GHz band or 5GHz band.

For details refer to the User Manual, Technical Description and Circuit Diagram.

3.2 Ratings and System Details

Table 2: Technical Specification of EUT

General Information of EUT	Value
Kind of Equipment	Control Extender
Type Designation	EL-IO-200
Trade Mark	ELAN
FCC ID	EF400210
IC	1078A-00210
HVIN	EL-IO-200
Operating Voltage:	DC 5V@2A input via AC/DC adapter DC 48V@0.6A via POE
Testing Voltage	AC 120V@60Hz
Antenna Type	Integral Antenna
Antenna Gain	4.18 dBi for 2.4G/5G Wi-Fi
Power Adapter	Model: SEG0502000P Input: AC 100-240V~50/60Hz, 0.5A Output: DC5V@2A
Technical Specification of Wi-Fi 802.11 a/n/ac	
Operating Frequency	U-NII-1 Band: 5180-5240 MHz U-NII-3 Band: 5745-5825 MHz
Type of Modulation	OFDM(BPSK/QPSK/16QAM/64QAM/256QAM)
Channel Number:	U-NII-1 Band: 4 channels for 20MHz bandwidth 2 channels for 40MHz bandwidth 1 channels for 80MHz bandwidth U-NII-3 Band: 5 channels for 20MHz bandwidth 2 channels for 40MHz bandwidth 1 channels for 80MHz bandwidth
Channel Separation	5 MHz

Table 3: RF Channel and Frequency of Wi-Fi 802.11 a/n/ac

U-NII-1 Band					
RF Channel	20MHz Frequency (MHz)	RF Channel	40MHz Frequency (MHz)	RF Channel	80MHz Frequency (MHz)
36	**5180.00**	**38**	**5190.00**	**42**	**5210.00**
40	**5200.00**	**46**	**5230.00**	/	/
44	5220.00	/	/	/	/
48	**5240.00**	/	/	/	/

U-NII-3 Band					
RF Channel	20MHz Frequency (MHz)	RF Channel	40MHz Frequency (MHz)	RF Channel	80MHz Frequency (MHz)
149	**5745.00**	**151**	**5755.00**	**155**	**5775.00**
153	5765.00	**159**	**5795.00**	/	/
157	**5785.00**	/	/	/	/
161	5805.00	/	/	/	/
165	**5825.00**	/	/	/	/

Test Channel:
CH36, CH40, CH48, CH149, CH157, CH165 for 20MHz;
CH38, CH46, CH151, CH159 for 40MHz
CH 42, CH155 for 80MHz

3.3 Independent Operation Modes

The basic operation modes are:

A. On, Wi-Fi 802.11 a/n/ac wireless transmitting mode
    1. Low channel
    2. Middle channel
    3. High channel
B. On, Wi-Fi 802.11 a/n/ac connecting mode
C. Off

3.4 Noise Generating and Noise Suppressing Parts

Refer to Circuit Diagram for further details.

3.5 Submitted Documents

- FCC/IC Label and Location Info
- User Manual
- Schematics
- PCB Layout

4 Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

Radio Spectrum: 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.

Emission: The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use.

4.2 Test Operation and Test Software

Test operation refers to test setup in chapter 5. All tests were performed according to the procedures in ANSI C63.10: 2013.

According to clause 3.1, all tests were performed on model EL-IO-200 in this report.

4.3 Special Accessories and Auxiliary Equipment

Table 4: List of Accessories and Auxiliary Equipment

Description	Manufacturer	Model	S/N	Rating
Laptop	Lenovo	T480	PF-16A6N8	N/A

4.4 Countermeasures to Achieve EMC Compliance

The test sample which has been tested contained the noise suppression parts as described in the Technical Construction File (TCF).

No additional measures were employed to achieve compliance.

4.5 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test (Below 1GHz)

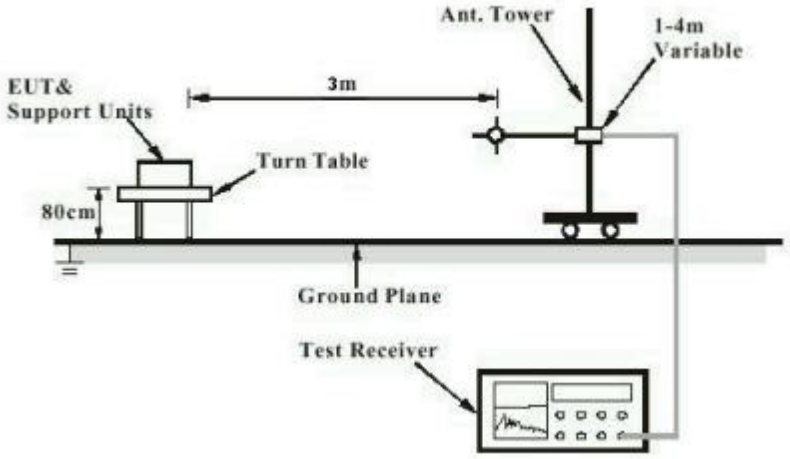


Diagram of Measurement Configuration for Radiation Test (Above 1GHz)

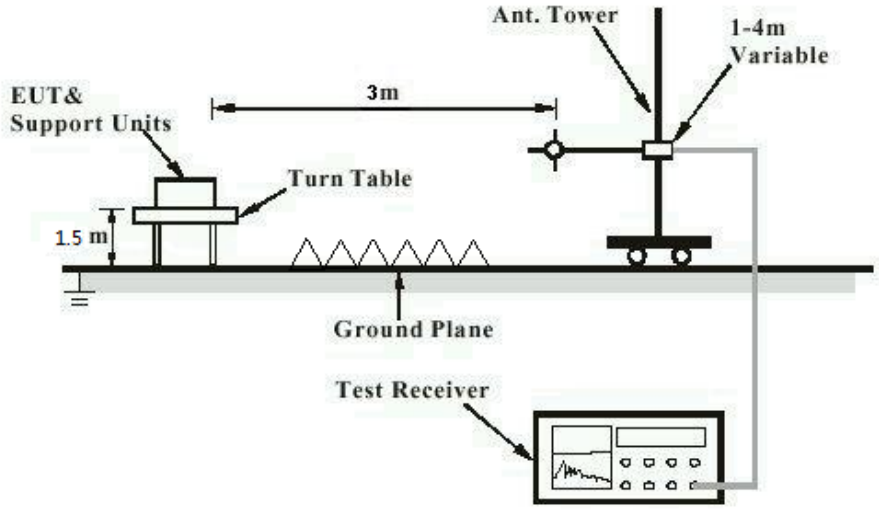


Diagram of Measurement Configuration for Mains Conduction Measurement

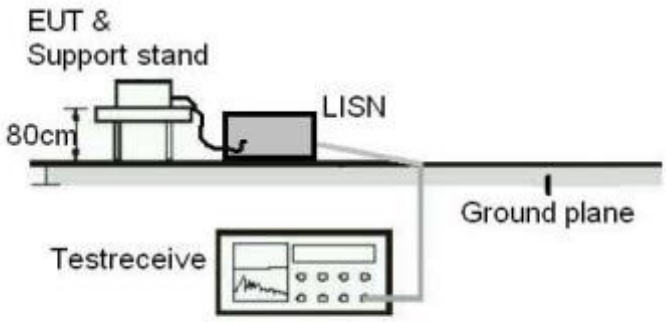
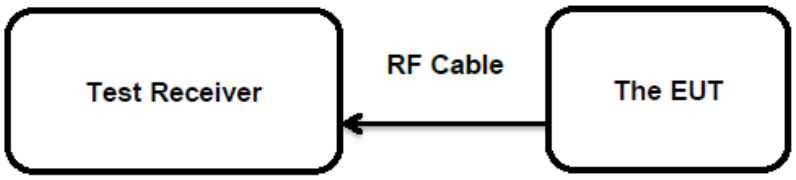


Diagram of Measurement Configuration for Conducted Transmitter Measurement



5 Test Results

5.1 Transmitter Requirement & Test Suites

5.1.1 Antenna Requirement

RESULT: **Pass**

Test Specification
Test standard : FCC Part 15.203

According to the manufacturer declared, the EUT has an integral antenna, the directional gain of antenna is 4.18 dBi, and the antenna connector is designed with permanent attachment and no consideration of replacement. Therefore the EUT is considered sufficient to comply with the provision.

Therefore, the EUT is considered sufficient to comply with the provision.

Refer to EUT Photo for further details.

5.1.2 Maximum Conducted Output Power

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.407(a)(1)&(2)&(4) RSS-247 clause 6.2
Basic standard	:	ANSI C63.10: 2013
Limits	:	FCC: <250mW (24dBm) (5150-5250MHz) <1W (30dBm) (5725-5850MHz) IC: * Max e.i.r.p.<200mW (23dBm) (5150-5250MHz) *200 mW (23dBm) or 10 dBm + 10 logB, where B is the 99% emission bandwidth in MHz, where is lesser. Max conducted output power <1W (30dBm) (5725-5850MHz)
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	2020-12-04 ~ 2020-12-10
Input voltage	:	AC 120V@60Hz
Operation mode	:	A
Test channel	:	Low / Middle / High
Ambient temperature	:	24.2 ℃
Relative humidity	:	52 %
Atmospheric pressure	:	101 kPa

For details refer to following test result.

Table 5: Test Result of Maximum Conducted Output Power, Wi-Fi 802.11 a/n/ac

Test Mode	Frequency Range (MHz)	Test Channel (MHz)	Measured Avg. Power		Limit (dBm)
			(dBm)	(W)	
802.11a	5150-5250	5180	8.13	0.0065	**U-NII-1:** **FCC:** Max conducted output power 250Mw **IC:** * Max e.i.r.p. 200 mW (23dBm) or 10 dBm + 10 logB, where B is the 99% emission bandwidth in MHz, where is lesser. **U-NII-3:** **FCC& IC** Max conducted output power 1W
		5200	12.00	0.0158	
		5240	14.39	0.0275	
	5725-5850	5745	14.25	0.0266	
		5785	15.12	0.0325	
		5825	14.89	0.0308	
802.11n (HT20)	5150-5250	5180	7.97	0.0063	
		5200	11.73	0.0149	
		5240	14.12	0.0258	
	5725-5850	5745	13.82	0.0241	
		5785	14.90	0.0309	
		5825	14.73	0.0297	
802.11n (HT40)	5150-5250	5190	5.00	0.0032	
		5230	13.36	0.0217	
	5725-5850	5755	15.40	0.0347	
		5795	15.55	0.0359	
802.11ac (HT20)	5150-5250	5180	7.93	0.0062	
		5200	11.68	0.0147	
		5240	13.91	0.0246	
	5725-5850	5745	13.77	0.0238	
		5785	14.88	0.0308	
		5825	14.71	0.0296	
802.11ac (HT40)	5150-5250	5190	5.04	0.0032	
		5230	13.44	0.0221	
	5725-5850	5755	15.43	0.0349	
		5795	15.61	0.0364	
802.11ac (HT80)	5150-5250	5210	6.64	0.0046	
	5725-5850	5775	14.83	0.0304	
Maximum Measured Value			15.61	0.0364	-

Note:
1) The cable loss taken into account in results.
2) Antenna gain(G) **4.18** dBi.

5.1.3 Conducted Power Spectral Density

RESULT: **Pass**

Test Specification

Test standard	:	FCC part 15.407(a) RSS-247 clause 6.2
Basic standard	:	ANSI C63.10: 2013 KDB 789033 D02 v01r03
Limits	:	FCC: <11dBm/MHz (5150-5250MHz) <30dBm/500KHz (5725-5850MHz) IC: e.i.r.p. spectral density <10dBm/MHz (5150-5250MHz) <30dBm/500KHz (5725-5850MHz)
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	Refer to test result
Input voltage	:	AC 120V@60Hz
Operation mode	:	A
Test channel	:	Low / Middle / High
Ambient temperature	:	24.2 ℃
Relative humidity	:	52 %
Atmospheric pressure	:	101 kPa

For the measurement records, refer to the appendix B & C.

5.1.4 Frequency Stability

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.407(g) RSS-Gen Clause 6.11
Basic standard	:	ANSI C63.10: 2013
Limits	:	Within assigned bands
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	Refer to test result
Input voltage	:	AC 120V@60Hz
Operation mode	:	A
Test channel	:	Low / Middle / High
Ambient temperature	:	24.2 ℃
Relative humidity	:	52 %
Atmospheric pressure	:	101 kPa

For the measurement records, refer to the appendix B & C.

5.1.5 26dB Bandwidth, 6dB Bandwidth and 99% Bandwidth

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.407(e) RSS-Gen Clause 6.6
Basic standard	:	ANSI C63.10: 2013 KDB 789033 D02 v01r03
Limits	:	No requirement for U-NII-1 band at least 500kHz for U-NII-3 band
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	Refer to test result
Input voltage	:	AC 120V@60Hz
Operation mode	:	A
Test channel	:	Low / Middle / High
Ambient temperature	:	24.2 ℃
Relative humidity	:	52 %
Atmospheric pressure	:	101 kPa

For the measurement records, refer to the appendix B & C.

5.1.6 Radiated Spurious Emission

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.407(b) & FCC Part 15.205 & FCC Part 15.209 RSS-247 clause 6.2 & RSS-GEN clause 8.9 and 8.10
Basic standard	:	ANSI C63.10: 2013 KDB 789033 D02 v01r03
Limits	:	FCC Part 15.209(a) FCC Part 15.407(b)(7) RSS-GEN
Kind of test site	:	3m Semi-anechoic Chamber

Test Setup

Date of testing	:	2020-11-21 ~ 2020-12-01
Input voltage	:	AC 120V@60Hz
Operation mode	:	A
Test channel	:	Low / Middle / High
Ambient temperature	:	Refer to test result
Relative humidity	:	Refer to test result
Atmospheric pressure	:	101 kPa

Remark:
Testing was carried out within frequency range 9kHz to the tenth harmonics. Only the worst case spurious emissions configuration of the each mode were reported.

For the measurement records, refer to the appendix B & C.

5.1.7 Conducted Emission on AC Mains

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.207(a) RSS-GEN clause 8.8
Basic standard	:	ANSI C63.10: 2013
Frequency range	:	0.15 – 30MHz
Limits	:	FCC Part 15.207(a)
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	2020-12-17
Input voltage	:	AC 120V@60Hz
Operation mode	:	B
Earthing	:	Not connected
Ambient temperature	:	Refer to test result
Relative humidity	:	Refer to test result
Atmospheric pressure	:	101 kPa

For the measurement records, refer to the appendix C.

6 Photographs of the Test Set-Up

For photographs of the test set-up, refer to the appendix A.

7 List of Tables