

RADIO TEST REPORT ETSI EN 300 220-1 V2.4.1(2012-05) ETSI EN 300 220-2 V2.4.1(2012-05)

Product :Ajax FireProtectTrade Name :AJAXModel Name :Ajax FireProtectSerial Model :N/AReport No. :NTEK-2016NT09108863R

Prepared for

Ajax Systems Inc

910 Foulk Rd., Wilmington, DE 19803, United States

Prepared by

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TEST RESULT CERTIFICATION

Applicant's name:	Ajax Systems Inc
Address:	910 Foulk Rd., Wilmington, DE 19803, United States
Manufacturer's Name:	Research and Production Enterprise "Ajax"LLC
Address:	04073, Ukraine, Kyiv, Sklyarenko, 5
Product description	
Product name:	Ajax FireProtect
Trademark:	AJAX
Model and/or type reference :	Ajax FireProtect
Serial Model :	N/A
Rating(s):	DC 3.0V

This device described above has been tested by Shenzhen NTEK, and the test results show that the equipment under test (EUT) is in compliance with the 1999/5/EC R&TTE Directive Art.3.2 requirements. And it is applicable only to the tested sample identified in the report.

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Date of fest		
Date (s) of performance of tests	10 Sep. 2016 ~15 Oct. 2016	
Date of Issue	15 Oct. 2016	
Test Result	Pass	

Testing Engineer

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Technical Manager

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Authorized Signatory :

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1. Summary Of Test Results

Test procedures according to the technical standards: ETSI EN 300 220-1 V2.4.1 (2012-05)

ETSI EN 300 220-2 V2.4.1 (2012-05)

Clause	Description of Test Item	Results(Pass/Fail)	N.T(Not Test)
25	Transmitter Parar	neters 🛆 🛛 🛆	5. 5.
7.1	Frequency error and frequency drift	* * *	N.T A
7.2	Average power		N.T
7.3	Effective radiated power	Pass	the the
7.4	Spread spectrum modulation		N.T
7.5	Transient power	Pass	2 2
7.6	Adjacent channel power		N.T
7.7	Modulation bandwidth	Pass	5 5
7.8	spurious emissions	Pass	4 4
7.9	Frequency stability under low-voltage conditions	2 2 2	N.T
7.10	Duty cycle	Pass	AT AT
7.11	Time-out-timer	4 4 4	N.T
	Receiver Param	eters	4 4
8.1	Receiver sensitivity	5 5 5	N.T
8.2	Receiver LBT threshold	at at at	N.T
8.3	Adjacent channel selectivity	5 5 S	N.T
8.4	Blocking	t t t	t t
8.5	Spurious response rejection		N.T
8.6	Receiver spurious radiation		



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1.1 Test Facility

NTEK Testing Technology Co., Ltd. Add. : 1/F, Building E, Fenda Science Park, Sanwei Community, Xixiang Street, Bao'an District, Shenzhen P.R. China

FCC Registered No.: 791972 IC Registered No.: 9270A-1

CNAS Registration No.:L5516

1.2 Measurement Uncertainty

The reported uncertainty of measurement $\mathbf{y} \pm \mathbf{U}$, where expended uncertainty \mathbf{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 the state	Uncertainty
1	Conducted Emission Test	±1.38dB 💉 💉
2	RF power, conducted	±0.16dB
3	Spurious emissions, conducted	±0.21dB
4	All emissions, radiated (<1G)	±4.68dB
5	All emissions, radiated (>1G)	±4.89dB
6	Temperature	±0.5°C
7.0	Humidity	±2%

2. General Information

2.1 General Description Of EUT

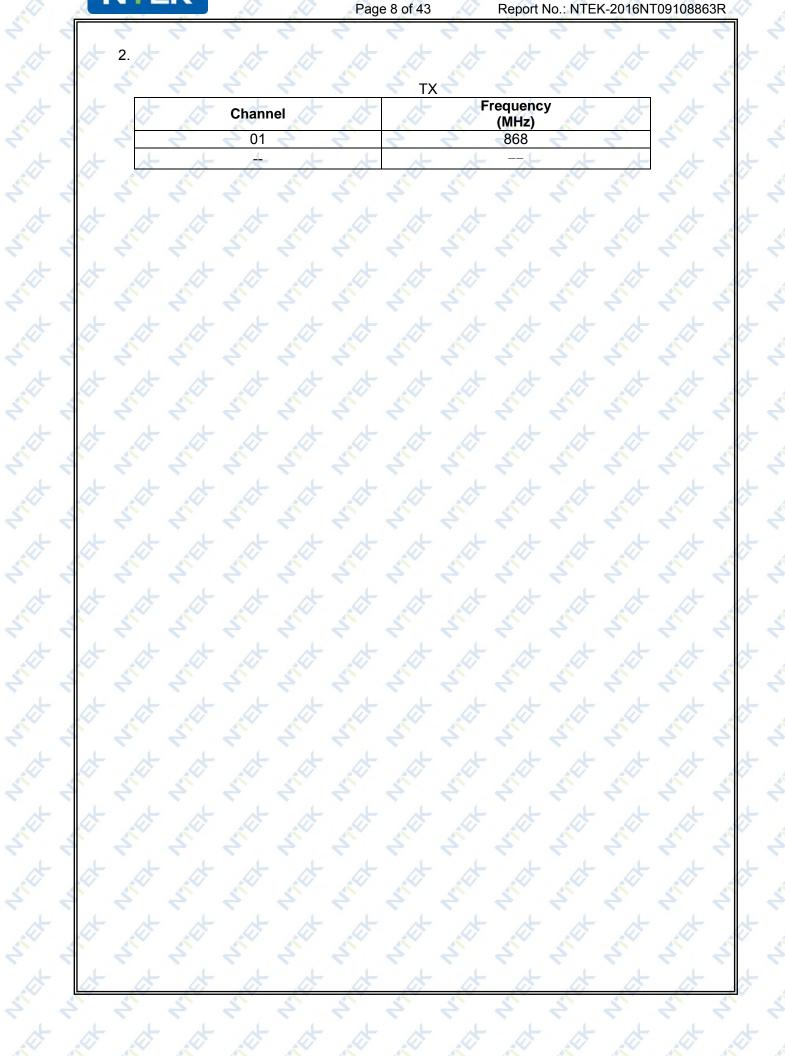
Equipment	Ajax FireProtect
Brand Name	AJAX I I I I I I I I I I I
Model Name.	Ajax FireProtect
Serial Model	N/A
Model Difference	N/A
	The EUT is Ajax FireProtect
	Operation Frequency: 868MHz
	Channel number 1 channel
	Modulation Type: C FSK
	Antenna Gain(Peak) -10dBi
	Antenna Designation: Built-in helical antenna
Product Description	Receiver Classification: Class 3
	Power Rating: DC 3V
	Based on the application, features, or specification exhibited in User's Manual, the EUT is considered as an ITE/Computing Device. More details of EUT technical specification, please refer to the User's Manual.
Channel List	Refer to below
Adapter	N/A C C C C C C
Battery	DC 3V
Hardware Version	N/A
Software Version	N/A A A A A A A A

Note:

- 1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
- 2. This device power supply is supplied by a power generation mechanism, tested using an adjustable power supply 5V voltage test.



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2.2 Description Of Test Conditions

E-1 EUT-TX

1.Block diagram of transmitter



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2.2.1 Test Conditions and Channel

TX Test ConditionsNormal Test ConditionsExtreme Test ConditionsTemperature25°C-20°C - 50°CRelative Humidity20% - 75%N/A			
	TX Test Conditions	Normal Test Conditions	Extreme Test Conditions
Relative Humidity 20% - 75% N/A	Temperature	25°C	-20°C - 50°C
	Relative Humidity	20% - 75%	N/A
Supply Voltage DC 3.0V DC 2.7-3.5V	Supply Voltage	DC 3.0V	DC 2.7-3.5V

Note:

- (1) For tests at extreme temperatures, measurements shall be made in accordance with the procedures specified in clause 5.4.1.2, at the upper and lower temperatures of the range as follow: temperature: -20°C - 50°C;
- (2) For the Leclanché or lithium type battery: 0.85 times the nominal voltage of the battery; for the mercury or nickel-cadmium type of battery: 0.9 times the nominal voltage of the battery. In both cases, the upper extreme test voltage shall be 1.15 times the nominal voltage of the battery.

The upper extreme voltage shall be declared by the equipment provider if different from the nominal voltage.

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



2.3 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	Mfr/Brand	Model/Type No.	Series No. Note	e
E-1	Ajax FireProtect	AJAX	Ajax FireProtect	<u> </u>	3
t.	t t t	at at	to to to	\$ \$ \$	
2	5 5 .	5 5	2 2 2	2 2 2	-
t i	t t t	A A	t t	t at at	
	5 5	5 5	2 2 2	2 2 3	~
Item	Shielded Type	Ferrite Core	Length	Note	>
x .		4 4			
2	2 2 .	5 2	1 1 1	1 1 1	Y
dt.	t at at	at at	at at at	* * *	
2		5 2	1 1 1 1 1	21 21 21	2
\$t	t t t	t t	st st st	* * *	

Note:

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

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2.4	Equipments	List For All Test Items
-----	------------	-------------------------

tem	EQUIPMENT TYPE	Manufacturer	Type No.	Serial No.	Calibrated un
1	EMI Test Receiver	R&S	ESPI7	101318	2017.06.27
2	Bilog Antenna	TESEQ	CBL6111D	31216	2017.08.23
3	Turn Table	EM	SC100_1	60531	N/A
4	Antnna Mast	SEM S	SC100	N/A	N/A
5	Horn Antenna	EM	EM-AH-1018 0	2011071402	2017.08.23
6	HF Cable	~N/A ~	R-01	N/A	2017.06.27
7	HF Cable	N/A	R-02	N/A	2017.06.27
8	50Ω Coaxial Switch	Anritsu	MP59B	6200983705	2017.06.27
9	LF Cable	N/A	R-03	N/A	2017.06.27
10	Broadband Preamplifier	SCHWARZB ECK	BBV9718	9718-218	2016.12.24
11	Pre-Amplifier	EM	EM30180	60538	2016.12.24
12	Spectrum Analyzer	Agilent	E4407B	MY45108040	2017.06.27
13	Filter	TRILTHIC	2400MHz	29	2016.11.18
14	Attenuator	Weinschel	33-10-33	AR4010	2016.11.18
15	Attenuator	Weinschel	24-20-34	BP4485	2016.11.18
16	Spectrum Analyzer	Agilent	E4440A	MY46186938	2016.11.18
17	ESG VETCTOR SIGNAL GENERAROR	Agilent	E4438C	MY45093347	2017.06.27
18	PSG Analog Signal Generator	Agilent	E8257D	MY51110112	2017.08.07
19	Power Splitter	Mini-Circuits	ZN2PD-63-S	SF02510142 8	2016.12.08
20	Coupler	Mini-Circuits	ZADC-10-63- S+	SF79410141 0	2016.12.08
21	Cable	<u> </u>	RF-01	N/A	2016.11.18
22	Cable	N/A	RF-02	N/A	2016.11.18
23	Power Splitter	Mini-Circuits/ USA	ZN2PD-63-S +	SF02510142 8	2016.12.08
24	Directional Coupler	MCLI/USA	CB11-20	0D2L51502	2017.08.12
25	Attenuator 🔨 💉	Agilent	8495B	MY42147029	2016.11.19
26	MXA Signal Analyzer	Agilent	N9020A	MY49100060	2016.11.18
27	Passive Loop Antenna	ETS-LINDGE REN	6512	165355	2016.12.23
28	Power Meter	Agilent	E4419B	MY45102538	2017.07.30
29	Power Sensor	Agilent	E9301A	MY41495644	2017.07.30
30	Power Sensor	Agilent	E9301A	US39212148	2017.07.30

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3. Frequency error and frequency drift

3.1 Applied procedures / limit

The frequency error and drift shall not exceed the values given in table 1 or 2 under normal and extreme conditions.

Table 1: Frequency error for systems with channel spacings of less than or equal to 25 kHz

		Freque	ency error limit	(kHz)	
Channelization	47 MHz	47 MHz to 137 MHz	137 MHz to 300 MHz	300 MHz to 500 MHz	500 MHz to 1000 MHz
Channelized systems	±10	±10	±10	±12	±12.5
Note : Eor equir	oment having a	channel spaci	ng of 12.5 kHz	or less the f	requency error

quipment having a channel spacing of 12,5 kHz or less, the frequ limit shall not exceed 50 % of the channel spacing.50 % of the channel spacing.

Table 2: Frequency error for all other systems

(Operating frequency	Fr	equency error	r limit (ppi	m),seen	ote
A A	≤ 1 000 MHz			±100	A CAL	A A

NOTE: The frequency error measured shall not exceed the designated frequency band.

3.1.1 Measuring Instruments and Setting

The following table is the setting of Spectrum Analyzer.

Spectrum Analyzer	Setting
Attenuation	10~20dB
Span Frequency	500kHz
RB	
VB	30 kHz
Detector	Peak
Trace	Peak 50 sweeps



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3.1.2 Test Procedures

a)Connected the antenna port to the Spectrum Analyzer via a Attenuator,

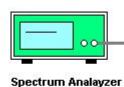
b)Set center frequency of spectrum analyzer = operating carrier frequency.

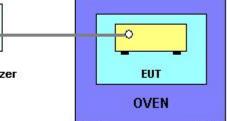
set the Spectrum Analyzer as below:

Resolution BW: 10 kHz Video BW: 30 kHz Span: 500 kHz

c)When the trace completed, find the peak value of the power envelope and record the frequency. The above procedure shall be performed at normal and extreme test conditions.d. The measurement shall be repeated at the lowest, the middle, and the highest channel of the stated frequency range. These measurements shall also be performed at normal and extreme test conditions.

3.1.3 Test Setup Layout





3.1.4 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.



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3.1.5 TEST RESULTS

EUT :	Ajax FireProtect		Model Name :	Ajax FireProtect	
Temperature :	26°C	4	Relative Humidity	/:60 %	
Pressure :	1012 hPa 🍼 🚽	5	Test Voltage :	N/A	2 2
Test Mode :	N/A	A	t t	+ + +	1
		24 D			

Note: the equipment is not capable of producing an unmodulated carrier.

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4. Effective radiated power

4.1 Applied procedures / limit

Frequency Bands/frequencies	Applications	Maximum radiated power, e.r.p. / power spectral density	Channel spacing	Spectrum access and mitigation requirement (e.g. Duty cycle or LBT + AFA)
26,995 MHz, 27,045 MHz, 27,095 MHz, 27,145 MHz,	Model control	100 mW	10 kHz	No restriction
27,195 MHz 34,995 MHz to 35,225 MHz			10 kHz	
40,665 MHz, 40,675 MHz, 40,685 MHz, 40,695 MHz			10 kHz	
26,957 MHz to 27,283 MHz	Non-specific use	10 mW	No requirement	No restriction
40,660 MHz to 40,700 MHz	Non-specific use	10 mW	No requirement	No restriction
138,200 MHz to 138,450 MHz	Non-specific use	10 mW	No requirement	1 % (see note 3)
169,400 MHz to 169,475 MHz	Tracking and tracing	500 mW	≤50 kHz	1 % (see note 3)
169,400 MHz to 169,475 MHz	Meter Reading	500 mW	≤50 kHz	10 %
169,475 MHz to 169,4875 MHz	Social alarms	10 mW	12,5 kHz	0,1 %
169,5875 MHz to 169,6000 MHz	Social alarms	10 mW	12,5 kHz	0,1 %
433,050 MHz to 434,790 MHz	Non-specific use	10 mW	No requirement	10 %
(see note 4)			-	(see note 3)

4.1.1 Measuring Instruments and Setting

The following table is the setting of the power meter.

Spectrum Analyzer	Setting
Attenuation	Auto
Start Frequency	25 MHz L L L L L L
Stop Frequency	1000 MHz
Detector 🔶 🔶	Positive Peak
Sweep Time	Auto
RB/VB	100 kHz/100 kHz

4.1.2 Test Procedures

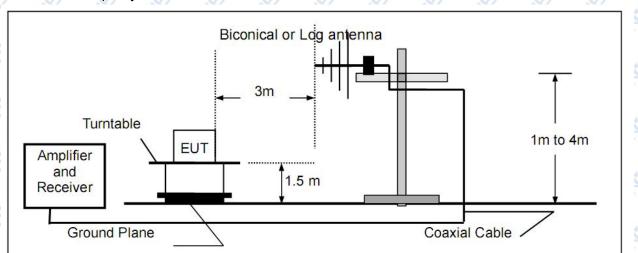
EUT was placed on a 1.5m outdoor wooden table. The search antenna is placed at 3m distances from the EUT and search antenna height is from 1-4m. With the transmitter operating at continuously mode, the turntable was slowly rotated to locate the direction of maximum emission. Once maximum direction is determined, the search antenna was raised and lowered in both vertical and horizontal polarizations.

The EUT was removed from the turntable and replaced with a linearly polarized antenna connected to a calibrated RF signal generator. The RF generator was set to a measured emission frequency and the search antenna was raised and lowered to produced a maximum received reading. The generator output was increased to match the radiated emission reading measured previously, and the result expressed in dB E.I.R.P. or ERP.



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4.1.4 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.



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4.1.5 TEST RESULTS

		~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~		~			
EUT :	Ajax FireProtect		Model Name	:	Ajax FireP	Protect	
Temperature :	26°C		Relative Hurr	nidity :	60 %	4	A .
Pressure :	1012 hPa 🍼	5 5	Test Voltage	:	DC 3.0V	5.	5 5
Test Mode :	TX Mode	×	t t	t	t	t	×

Frequency	Ant	Reading	S.G.	ERP factor	Measure Result	Measure Result	Limits	
(MHz)	Η/V	(dBm)	(dBm)	(dB)	(dBm)	(mW)	(mW)	RESULT
868	PH.	-32.25	17.11	40.89	-8.47	0.14	10	PASS
868	V	-28.69	16.33	41.26	-3.76	0.42	10	PASS

Note: Measure Result (dBm) = Reading (dBm) + ERP Factor (dB) - S.G. (dBm)



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4.2. Frequency stability under low voltage conditions

4.3 Applied procedures / limit

This test is for battery operated equipment only. The equipment shall either:

- a) remain on channel, for channelized equipment within the limits stated in clause 5.1.1, or within the assigned operating frequency band, for non-channelized equipment, whilst the radiated or conducted power is greater than the spurious emission limits; or
- b) the equipment cease to function below the providers declared operating voltage.
- 4.3.1 Measuring Instruments and Setting

The following table is the setting of Spectrum Analyzer.

Spectrum Analyzer	Setting	
Attenuation	10~20dB	
Span Frequency	500kHz	
RB	10 kHz	
VB A A	30 kHz 🗡	
Detector	Peak	
Trace	Peak 50 sweeps	



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4.3.2 Test Procedures

a)Connected the antenna port to the Spectrum Analyzer via a Attenuator,

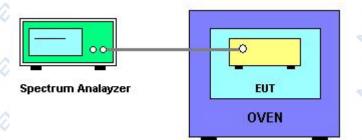
b)Set center frequency of spectrum analyzer = operating carrier frequency.

set the Spectrum Analyzer as below:

Resolution BW: 10 kHz Video BW: 30 kHz Span: 500 kHz

c)When the trace completed, find the peak value of the power envelope and record the frequency. The above procedure shall be performed at normal and extreme test conditions.d. The measurement shall be repeated at the lowest, the middle, and the highest channel of the stated frequency range. These measurements shall also be performed at normal and extreme test conditions.

4.3.3 Test Setup Layout



4.3.4 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.



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4.3.5 TEST RESULTS

1	4.3.5 TEST RESU	ILTS of the the	in the second se	t et et	set set set
	EUT :	Ajax FireProtect		Model Name :	Ajax FireProtect
	Temperature :	26 °C	~	Relative Humidity :	60 %
	Pressure :	1012 hPa 🧢 🛛 🔶	5	Test Voltage :	N/A 🗧 🧲 🧹
	Test Mode :	TX Mode		x x x	t t t
11	L'IN L'IN	1 1 1 1 1	25	L'IN LIN	

NIEt

Sup	ply Voltage	Mea	asured Fi	requency[[MHz]	Frequ	ency Error	(ppm)
.st	Vnom	at -	868.011			37.41		
2 4	/ _{nom} -10%	2	868	8.013	2	~	40.35	5
	/ _{nom} -20%	A. C.	868	8.015	A. C.	N. S.	43.65	N. C.
	/ _{nom} -30%	X	Funct	ion lose	1 t	X	X	L L
	Limit			25'N	±100p	pm	ANY .	L'ÉV
At .	Result	at the	at the	A	Pas	s	and the	A
4 7	* * *	4	24	24	1	1	4	4
	S S	Stor .	S.C.	5. CO	S.C.	Sill	Sill .	S.C.
dt .	d d	t	t	t	t	t	t	Ì.Jt
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At .	A A	. Ct	. At	A	A	and the	and the	A.
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at	at at	at	at	At	t	at	at	A
5 4		E.	5	2	2	2	5	5
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A	at at	At	A	t	at	at	t	A

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5. Spurious emissions – Transmitter (25- 1000MHz)

5.1 Applied procedures / limit

	47 MHz to 74 MHz		
Stata	87.5 MHz to 118 MHz	Other frequencies	Frequencies
Slale	174 MHz to 230 MHz	≤ 1 000 MHz	> 1 000 MHz
	470 MHz to 862 MHz		
Operating	4 nW /-54dBm	250 nW/-36dBm	1 µW /-30dBm
Standby	2 nW /-57dBm	2 nW /-57dBm	20 nW /-47dBm
		State 87.5 MHz to 118 MHz 174 MHz to 230 MHz 470 MHz to 862 MHz Operating 4 nW /-54dBm	State 87.5 MHz to 118 MHz Other frequencies 174 MHz to 230 MHz ≤ 1 000 MHz 470 MHz to 862 MHz Operating 4 nW /-54dBm 250 nW/-36dBm

5.1.1 Measuring Instruments and Setting

The following table is the setting of the Spectrum Analyzer.

Spectrum Analyzer	Setting
Attenuation	
Start Frequency	
Stop Frequency	1000 MHz
Detector 🤿 🔷	Positive Peak
Sweep Time	Auto
RB/VB	100 kHz/100 kHz

5.1.2 Test Procedures

- a. The EUT was placed on the top of the turntable in open test site area.
- b. The test shall be made in the transmitting mode. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
- c. This measurement shall be repeated with the transmitter in standby mode where applicable.
- d. For 30~1000MHz spurious emissions measurement, the broad band bi-log receiving antenna was placed 3 meters far away from the turntable.
- e. The broadband receiving antenna was fixed on the same height with the EUT to find each suspected emissions of both horizontal and vertical polarization. Each recorded suspected value is indicated as Read Level (Raw).
- f. Replace the EUT by standard antenna and feed the RF port by signal generator.
- g. Adjust the frequency of the signal generator to the suspected emission and slightly rotate the turntable to locate the position with maximum reading.
- h. Adjust the power level of the signal generator to reach the same reading with Read Level (Raw).
- i. The level of the spurious emission is the power level of (8) plus the gain of the standard antenna in dBi and minus the loss of the cable used between the signal generator and the standard antenna.
- j. If the level calculated in (9) is higher than limit by more than 6dB, then lower the RBW of the spectrum analyzer to 30KHz. If the level of this emission does not change by more than 2dB, then it is taken as narrowband emission, otherwise, wideband emission.
- k. The measurement shall be repeated at the lowest and the highest channel of the stated frequency range.

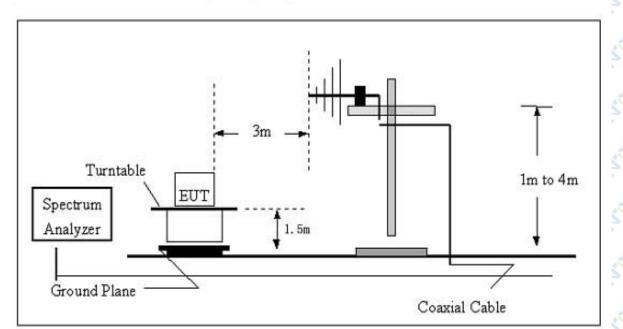


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5.1.3 Test Setup Layout

(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz



5.1.4 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.1.5 Results of Standby Mode Spurious Emissions

For the initial investigation on standby mode and receiving mode, no significant differences in spurious emissions were observed between these 2 modes. So test data for standby mode was omitted in this section.

5.1.6 TEST RESULTS (25MHz ~ 1000MHz)

EUT :	Ajax FireProtect	7 7	Model Name :	Ajax FireProtect
Temperature :	24 °C		Relative Humidity :	54%
Pressure :	1010 hPa 🤶	2 2	Test Voltage :	DC 3.0V
Test Mode :	TX 🔶 🔶	×	x x x	* * *
Gi Gi Gi			si di di	di di di

Polar	Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector
(H/V)	(MHz)	(dBm)	(dB)	(dBm)	(dBm)	(dB)	Туре
V	63.5587	-87.26	5.75	-78.61	-54	-24.61	peak
V	72.4875	-84.36	8.65	-74.6	-54	-20.6	peak
V	77.6985	-86.39	9.76	-74.55	-36	-38.55	peak
V	154.2365	-85.3	11.84	-73.41	-36	-37.41	peak
V	197.6584	-90.57	11.89	-73.13	-54	-19.13	peak
V	853.2456	-91.68	17.44	-73.02	-54	-19.02	peak
Н	33.2545	-84.26	18.66	-74.95	-36	-38.95	peak
H	71.2259	-87.59	9.31	-77.01	-54	-23.01	peak
H	153.2665	-91.22	10.58	-79.84	-36	-43.84	peak
Н	187.6987	-86.59	11.38	-75.2	-54	-21.2	peak
H	206.2362	-86.69	11.39	-71.87	-54	-17.87	peak
H	881.2369	-82.04	14.82	-67.22	-36	-31.22	peak

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



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6. Spurious emissions – Transmitter (Above 1000MHZ)

6.1 Applied procedures / limit

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6.1.1 Measuring Instruments and Setting

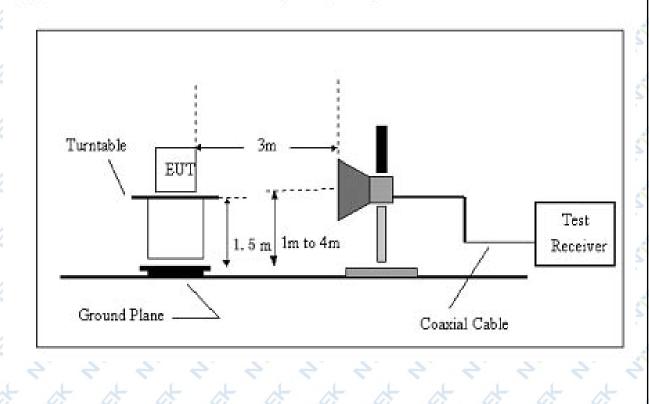
The following table is the setti	ng of the Spectrum Analyzer.
Spectrum Analyzer	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier frequency
Detector	Positive Peak
Sweep Time	Auto
RB / VB	1 MHz / 1 MHz

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- 6.1.2 Test Procedures
- a. The EUT was placed on the top of the turntable in open test site area.
- b. The test shall be made in the transmitting mode. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
- c. This measurement shall be repeated with the transmitter in standby mode where applicable.
- d. For 30~1000MHz spurious emissions measurement, the broad band bi-log receiving antenna was placed 3 meters far away from the turntable.
- e. The broadband receiving antenna was fixed on the same height with the EUT to find each suspected emissions of both horizontal and vertical polarization. Each recorded suspected value is indicated as Read Level (Raw).
- f. Replace the EUT by standard antenna and feed the RF port by signal generator.
- g. Adjust the frequency of the signal generator to the suspected emission and slightly rotate the turntable to locate the position with maximum reading.
- h. Adjust the power level of the signal generator to reach the same reading with Read Level (Raw).
- i. The level of the spurious emission is the power level of (8) plus the gain of the standard antenna in dBi and minus the loss of the cable used between the signal generator and the standard antenna.
- j. If the level calculated in (9) is higher than limit by more than 6dB, then lower the RBW of the spectrum analyzer to 30KHz. If the level of this emission does not change by more than 2dB, then it is taken as narrowband emission, otherwise, wideband emission.
- k. The measurement shall be repeated at the lowest and the highest channel of the stated frequency range.
- 6.1.3 Test Setup Layout
 - (B) Radiated Emission Test Set-Up Frequency Above 1 GHz





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- 6.1.4 EUT Operation during Test
- The EUT was programmed to be in continuously transmitting mode.
- 6.1.5 Results of Standby Mode Spurious Emissions

For the initial investigation on standby mode and receiving mode, no significant differences in spurious emissions were observed between these mode. So test data for standby mode was omitted in this section.

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6.1.6 TEST RESULTS

2. 2.	2. 2.	2 2		2. 2. 2.	2
EUT :	Ajax FireProtect	, t	Model Name :	Ajax FireProtect	
Temperature :	26°C	NY A	Relative Humidity :	53 %	
Pressure :	1012 hPa 🤝	4 4	Test Voltage :	DC 3.0V 🤿 💎	~
Test Mode :	TX 🖉	AT .			

Polar	Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detecto
(H/V)	(MHz)	(dBm)	(dB)	(dBm)	(dBm)	(dB)	Туре
V	1124.23	-61.25	-4.92	-66.17	-30	-36.17	peak
V	1657.56	-63.25	<-1.84	-65.09	-30	-35.09	peak
V	2326.15	-62.17	-1.27	-63.44 🤜	-30	-33.44	peak
V	2874.36	-60.23	7.58	-52.65	-30	-22.65	peak
V	3351.27	-61.77	8.75	-53.02	-30	-23.02	peak
V	4530.26	-59.36	9.68	-49.68	-30	-19.68	peak
H	1234.58	-62.47	-5.62	-68.09	-30	-38.09	peak
Н	2364.11	-63.58	-1.65	-65.23	-30	-35.23	peak
Ŧ	2874.20	-64.26	3.69	-60.57	-30	-30.57	peak
H	3874.05	-63.28	5.32	-57.96	-30	-27.96	peak
H	4657.52	-63.12	9.68	-53.44	-30	-23.44	peak
H	4921.34	-66.28	14.3	-51.98	-30	-21.98	peak

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



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7. Duty cycle

7.1 Applied procedures / limit

In a period of 1 hour the duty cycle shall not exceed the class values given in table 13.

Table '	3: Duty cycle	
	class	
cycle class		utv

Duty cycle class	Duty cycle ratio
7 7 1 7 7	0,1 %
2 4	1,0 %
5 53 5 5	
4 4	Up to 100 %
	Duty cycle class

7.1.1 TEST RESULTS

1	EUT :	Ajax FireProtect	Model Name :	Ajax FireProtect
	Temperature :	26°C 🔿 🔿 🤿	Relative Humidity :	53 %
	Pressure :	1012 hPa	Normal Test Voltage :	DC 3.0V
	Test Mode :	TX	7 7	4 4 4 4

Test Result

	Duty Cycle			Limit	2		Result		
K	Class 3	Ś	S.C.	10%	S.C.	1. Contraction of the second s	Complies	S.C	

The duty cycle is simply the on time divided by the period:

The duration of one cycle = 65.29ms

 $T_{ON(one hop)1}=0.735ms$, $T_{ON(one hop)2}=1ms$, $T_{ON(one hop)3}=1.121ms$

T_{ON}=0.735*13+1*15+1.121*1=25.676ms

Ton(total)=25.676 *10000=256760ms

Tp=`one`hour=3600000ms, Duty Cycle=Ton/Tp=256760/3600000*100%=7.13%

Note: Customer declared when the number of transmitting is less than 10000 Per hour, the duty cycle of EUT is less than 10%.

This product is manually pressed to launch a cycle of waveform 2.8ms (Tx on + Tx off), to assess the most pressing one hour 15,000 times, the power supply of the product is pressed, it then must click once again there will be a next time launch is not continuously transmitted.



8. Transient power

8.1 Applied procedures / limit

At all frequencies where the emission levels measured in step 1 exceed the spurious domain limits (clause 7.8.3), the power level measured in step 1 shall not exceed the power level measured in Step 2 by more than 3 dB.

8.1.1 Test Procedures

Step 1

The transmitter shall be operated with powering on and off (e.g. by switching between active and standby state) at least 5 times within a maximum period of 60 seconds. The recommended powering on- and off-time is at least 1 s respectively. If other on- and off-times are used, this shall be stated in th test report.

The measured power level shall be recorded for the measurement period covering at least 5 powering on and off events for the measurement receiver setting above and below the wanted channel. If the resulting maximum power level in step 1 is above the spurious domain limit (clause 7.8.3), the second measurement step shall be performed.

Step 2

In the second measurement, the procedure shall be repeated with the same settings of the measuring receiver, whereas

the transmitter shall be set on continuous transmission. If this is not possible, the measurements shall be carried out in a period shorter than the duration of the modulated transmitted burst.

The measured power level shall be recorded for the measurement period identical to the one in step 1 for the measurement receiver setting above and below the wanted channel.

Measurement step 1 shall be repeated within the spectrum mask every 120 kHz from the primarily adjusted point to both sides of the wanted frequencies, until either it is clearly ascertained that no powe increases or limit exceeding appear, or until the frequency offset to the wanted frequency exceeds 2 MHz.



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8.1.2 Test Result

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	8.1.2 Test Result	t at at		the the	At .	t the
4 4	EUT :	Ajax FireProtect	Mode	el Name :	Ajax FireProt	ect
AT I	Temperature :	26°C	Relat	tive Humidity :	53 %	
5 3	Pressure :	1012 hPa	S Test '	Voltage : [DC 3.0V 🔿	5 5
, t	Test Mode :	TX			4	at at
Star 1		St St	Star Star	Star Star	5 5	2 2 2
X	Channel Spacing	Step 1	Step 2	∆(Step 1-Step2)	Limit	Results

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~	Channel			(Step		
4	Spacing	Step 1	Step 2	∆(Step 1-Step2)	Limit	Results
4	(times)	(dBm)	(dBm)	dB	dB	(P/F)
At	1-	-9.215	-8.24	0.975	3	PASS
	2	-9.025	-8.26	0.765	3	PASS
	3	-9.124	-8.21	0.914	3	PASS
	4	-9.107	-8.04	1.067	3	PASS
	~ 5 ~	-9.112	-8.16	0.952	3 <	PASS
	R R		A A	A A	R R	
5	4 4	7 7	4 4	4 4	4 4	4 5
A.		F JE JE			AT &	F JF
	4. 4.	4.4	4. 4.	5. 5.	5. 5.	4 4
1	AT &			AT AT	AT &	t st
	4. 4.	2. 2	5 6	2. 2.	4. 4.	4 4
\$		* A A	A A	At At	AT A	* *
	5 5		4 4	4 4 A	5 5	~ ~
A	at a	* & &	t t	at at	t i	t st
	2 2	2. 2.	L. L.	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	5 5	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
A	at a	* * *	t t	at at	at a	t at
	S' S'		L' L'	SIV SIV	<u> </u>	× × 2
	At 1	* * *	t t	t t	int i	* *
	ST ST	St St	St St	Str Str	<u>``</u> ``````````````````````````````````	5 2
t	· t ·	+ + +	t t	t t	· t	t t
and the state	Stor St	Stor Stor	St St.	Nº Nº	St. St	
L	T T	+ + + +		t t	T T	t t
A A A	A A	t sict sich	Anter Anter	AND	Nº A	at which a
to to to	4 4		~ ~ ~ ~	< < <	4 4	
A.	AT &		AT AT	A A	AT &	
-	5 5	2 2	4 4	2 2	4 4	the
A A A	AT A			A A	AT &	x x
	2. 2.	4. 4.	4. 4.	2. 2.	4. 4.	2. 4
	at a	to to t	to to	at at	dt d	*
5	J 7	J 2	J' J'	1 1 1 V	5 5	2 2
A	A	* * *	t t	A A	A	* *
X	AN AN				NY N	

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9. Adjacent channel power

9.1 Applied procedures / limit

These measurements are applicable to narrowband systems.

Adjacent channel power limits applicable to narrowband systems

* * * *	Channel separation < 20 kHz	Channel separation ≥ 20 kHz
Normal test conditions	10 µW	200 nW
Extreme test conditions	μ 32 μW	∟ _ 640 nW _
NOTE: These limits also apply	to spread spectrum equipment.	

9.2 Test Procedures

- a) The transmitter shall be operated at the carrier power determined under normal test conditions.
 - The output of the transmitter shall be linked to the input of the "receiver" by a connecting device such that the impedancepresented to the transmitter is 50 Ω and the level at the "receiver input" is appropriate
- b) With the transmitter unmodulated, the tuning of the "receiver" shall be adjusted so that a maximum response is obtained. This is the 0 dB response point. The "receiver" attenuator setting and the reading of the meter shall be recorded. If an unmodulated carrier cannot be obtained, then the measurement shall be made with the transmitter modulated with the normal test signal as appropriate, in which case this fact shall be recorded in test reports.
- c) The transmitter shall be modulated by a normal test signal as appropriate.
- d) The "receiver" variable attenuator shall be adjusted to obtain the same meter reading as in step b), or a known relation to it.
- e) The ratio of the adjacent channel power to the carrier power is the difference between the attenuator settings in steps b) and d), corrected for any differences in the reading of the meter.

9.3 Test Result

G = G = G		67	67 67 67	67 67	67
EUT :	Ajax FireProtect	5 3	Model Name :	Ajax FireProtect	
Temperature :	26°C	L.	Relative Humidity :	53 %	
Pressure :	1012 hPa		Test Voltage :	N/A	
Test Mode :	N/A	2 2	4.4	2 2 6	

Note: These measurements are applicable to narrowband systems.



10. Modulation bandwidth

10.1 Applied procedures / limit

Emission Limits of the modulated signal

	Reference Bandwidth (RBW)	Limit	Lower envelope point minimum frequency	Upper envelope point maximum frequency
6	1 kHz	1 uW	fe, lower	fe, upper
L	1 kHz	250 nW	(fe, lower - 200 kHz)	(fe, upper + 200 kHz)
0	🔨 10 kHz 🛛 🔨	250 nW	(fe, lower - 400 kHz)	(fe, upper + 400 kHz)
	100 kHz	250 nW	(fe, lower - 1 000 kHz)	(fe, upper + 1000kHz)

In table , fe, lower and fe, upper are the lower and upper edges of the band in which the equipment operates.

10.2 Measuring Instruments and Setting

Spectrum	n Analyzer	Setting
Attenuati	on 🤝 💦	Auto
Detector		Positive Peak
Sweep T	me 💉 🔥	Auto
RB	~ ~ ~	1KHZ, 10KHz, 100KHz
VB	Y Y	3RB

10.3 Test Procedures In clauses 7.2 or 7.3

10.4 Test Result



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		1	* * *	
EUT :	Ajax FireProtect	N 1	Model Name :	Ajax FireProtect
Temperature :	26°C		Relative Humidity :	53 %
Pressure :	1012 hPa		Normal Test Voltage :	DC 3.0V
Test Mode :	TX	.L		

Test Conditions :

 Upper envelope point maximum frequency	Max Vaule (dBm)	Limit	Reference Bandwidth (RBW)	Result
(fe, upper + 200 kHz)	-58.39	-30dBm	1KHz	PASS
(fe, upper + 400 kHz)	-58.10	-36dBm	10KHz	PASS
(fe, upper + 1 000 kHz)	-55.15	-36dBm	100KHz	PASS
> (fe, upper + 1 000 kHz)	-56.27	-36dBm	100KHz	PASS

Lower envelope point minimum frequency	Max Vaule (dBm)	Limit	Reference Bandwidth (RBW)	Result
(fe, lower - 200 kHz)	-56.26	-30dBm	▲ 1KHz	PASS
(fe, lower - 400 kHz)	-56.38	-36dBm	10KHz	PASS
(fe, lower - 1 000 kHz)	-59.35	-36dBm	100KHz	PASS
< (fe, lower - 1 000 kHz)	-60.40	-36dBm	100KHz	PASS
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Upper envelope point maximum frequency	Max Vaule (dBm)	Limit	Reference Bandwidth (RBW)	Result
(fe, upper + 200 kHz)	-56.49	-30dBm	1KHz 🔨	PASS
(fe, upper + 400 kHz)	-58.21	-36dBm	10KHz	PASS
(fe, upper + 1 000 kHz)	-59.26	-36dBm	100KHz	PASS
> (fe, upper + 1 000 kHz)	-58.30	-36dBm	100KHz	PASS



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Lower envelope point minimum frequency	Max Vaule (dBm)	Limit	Reference Bandwidth (RBW)	Result
(fe, lower - 200 kHz)	-55.14	-30dBm	1KHz	PASS
(fe, lower - 400 kHz)	-56.26	-36dBm	10KHz	PASS
(fe, lower - 1 000 kHz)	-57.30	-36dBm	100KHz	PASS
< (fe, lower - 1 000 kHz)	-60.28	-36dBm	100KHz	PASS

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Upper envelope point maximum frequency	Max Vaule (dBm)	Limit	Reference Bandwidth (RBW)	Result
(fe, upper + 200 kHz)	-57.27	-30dBm	1KHz	PASS
(fe, upper + 400 kHz)	-55.49	-36dBm	10KHz	PASS
(fe, upper + 1 000 kHz)	-57.24	-36dBm	100KHz	PASS
> (fe, upper + 1 000 kHz)	-55.36	-36dBm	100KHz	PASS

Lower envelope point minimum frequency	Max Vaule (dBm)	Limit	Reference Bandwidth (RBW)	Result
(fe, lower - 200 kHz)	-58.31	-30dBm	1KHz	PASS
(fe, lower - 400 kHz)	-57.46	-36dBm	10KHz	PASS
(fe, lower - 1 000 kHz)	-56.38	-36dBm	100KHz	PASS
< (fe, lower - 1 000 kHz)	-64.46	-36dBm	100KHz	PASS

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	Upper envelope point maximum frequency	Max Vaule (dBm)	Limit	Reference Bandwidth (RBW)	Result
(1	fe, upper + 200 kHz)	-58.40	-30dBm	1KHz	PASS
(1	fe, upper + 400 kHz)	-56.36	-36dBm	10KHz	PASS
(1	fe, upper + 1 000 kHz)	-55.27	-36dBm	100KHz	PASS
;	> (fe, upper + 1 000 kHz)	-58.40	-36dBm	100KHz	PASS



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Lower envelope point minimum frequency	Max Vaule (dBm)	Limit	Reference Bandwidth (RBW)	Result		
(fe, lower - 200 kHz)	-57.36	-30dBm	1KHz	PASS		
(fe, lower - 400 kHz)	-56.69	-36dBm	10KHz	PASS		
(fe, lower - 1 000 kHz)	-55.45	-36dBm	100KHz	PASS		
< (fe, lower - 1 000 kHz)	-58.40	-36dBm	100KHz	PASS		
1 2 2	2 2	2 2	1 1º	2 2		

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Upper envelope point maximum frequency	Max Vaule (dBm)	Limit	Reference Bandwidth (RBW)	Result
(fe, upper + 200 kHz)	-58.16	-30dBm	1KHz	PASS
(fe, upper + 400 kHz)	-60.30	-36dBm	10KHz	PASS
(fe, upper + 1 000 kHz)	-57.42	-36dBm	100KHz	PASS
> (fe, upper + 1 000 kHz)	-58.28	-36dBm	100KHz	PASS

Lower envelope point minimum frequency	Max Vaule (dBm)	Limit	Reference Bandwidth (RBW)	Result
(fe, lower - 200 kHz)	-56.30	-30dBm	1KHz	PASS
(fe, lower - 400 kHz)	-57.46	-36dBm	10KHz	PASS
(fe, lower - 1 000 kHz)	-56.32	-36dBm	100KHz	PASS
< (fe, lower - 1 000 kHz)	-58.58	-36dBm	100KHz	PASS

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11. Blocking

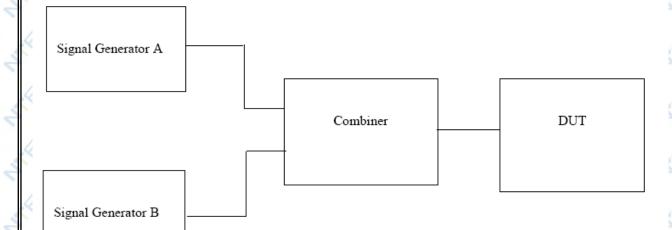
11.1 Applied procedures / limit

Receiver category	Frequency offset	Limit Limit
2 21 2 6	🚽 🔶 ±2 MHz 🔶 🔶	≥84 dB -A (note 2)
1 2 1	±2 MHz	≥35 dB -A (note 2)
535	±2 MHz	≥24 dB -A (note 2)
	±10 MHz	≥84 dB -A (note 2)
2	±10 MHz	≥60 dB -A (note 2)
	±10 MHz	≥44 dB -A (note 2)

NOTE 1: The limits apply also for the repeated tests in case of equipment using LBT or category 1 receivers, reduced by 13 dB or 40 dB, respectively, to account for the increased wanted signal level.

NOTE 2: A = 10 log (BWkHz / 16 kHz) BW is the receiver bandwidth.

11.2 Method of measurement

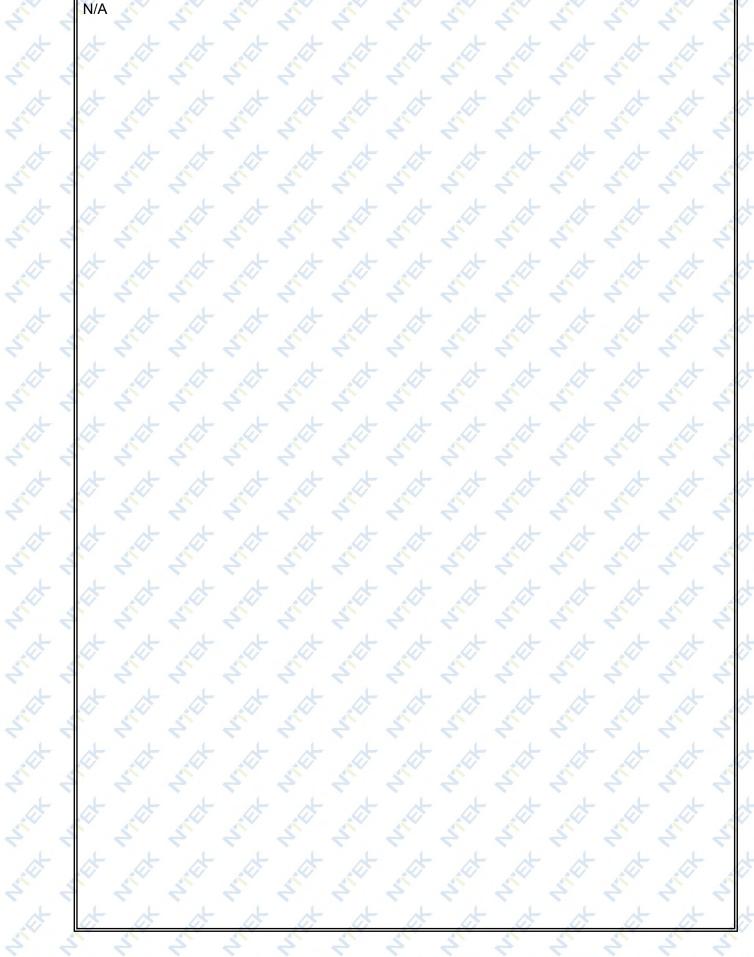


11.3 Test Procedures In clauses EN 300 220-1 8.4.2



11.4 Test Result: N/A

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12. Spurious emissions – Receiver (30-1000MHz)

12.1 Applied procedures / limit

Clause	Test Item	Frequency(MHz)	Limit	
	Spurious emissions	25-1000	-57dBm 💉	1
4.3.5	(radiated)	Above 1000	-47dBm	

12.1.1 Measuring Instruments and Setting

The following table is the setting of the Spectrum Analyzer.

Spectrum Analyzer	Setting
Attenuation	Auto
Start Frequency	25 MHz
Stop Frequency	1000 MHz
Detector	Positive Peak
Sweep Time	Auto
RB / VB	100 kHz/100 kHz

12.1.2 Test Procedures

- a. The EUT was placed on the top of the turntable in open test site area.
- b. The test shall be made in the receiving mode. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
- c. For 30~1000MHz spurious emissions measurement, the broad band bi-log receiving antenna was placed 3 meters far away from the turntable.
- d. The broadband receiving antenna was fixed on the same height with the EUT to find each suspected emissions of both horizontal and vertical polarization. Each recorded suspected value is indicated as Read Level (Raw).
- e. Replace the EUT by standard antenna and feed the RF port by signal generator.
- f. Adjust the frequency of the signal generator to the suspected emission and slightly rotate the turntable to locate the position with maximum reading.
- g. Adjust the power level of the signal generator to reach the same reading with Read Level (Raw).
- h. The level of the spurious emission is the power level of (7) plus the gain of the standard antenna in dBi and minus the loss of the cable used between the signal generator and the standard antenna.
- i. The measurement shall be repeated at the lowest and the highest channel of the stated frequency range.

12.1.3 Test Setup Layout

This test setup layout is the same as that shown in section 5.1.3

12.1.4 EUT Operation during Test

The EUT was programmed to be in continuously receiving mode.



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The sector 12.1.5 TEST RESULTS (25MHz-1000MHz)

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EUT : Temperature :	Ajax FireProtect 26°C	t.	Model Name Relative Hun		Ajax Fire 53 %	Protect	t	
Pressure :	1012 hPa		Test Voltage	-	DC 3.0V	2	2	V
Test Mode :	N/A	A	* *	4	4	1	1	
5 5	1 1 1 1	5	5	SI	S	S	5	ľ
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13. Spurious emissions – Receiver (above 1000MHz)

13.1 Applied procedures / limit

-	Clause	Test Item	Frequency(MHz)	Limit
Γ		🔨 Spurious emissions 🔨	25-1000	57dBm
	4.3.5	(narrowband)	Above 1000	-47dBm

13.1.1 Measuring Instruments and Setting

Please refer to section 9.1.1 in this report. The following table is the setting of the Spectrum Analyzer.

Spectrum Analyzer	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	12750 MHz
Detector	Positive Peak
Sweep Time	Auto
RB / VB	1MHz / 1MHz

13.1.2 Test Procedures

- a. The EUT was placed on the top of the turntable in open test site area.
- b. The test shall be made in the receiving mode. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
- c. For 30~1000MHz spurious emissions measurement, the broad band bi-log receiving antenna was placed 3 meters far away from the turntable.
- d. The broadband receiving antenna was fixed on the same height with the EUT to find each suspected emissions of both horizontal and vertical polarization. Each recorded suspected value is indicated as Read Level (Raw).
- e. Replace the EUT by standard antenna and feed the RF port by signal generator.
- f. Adjust the frequency of the signal generator to the suspected emission and slightly rotate the turntable to locate the position with maximum reading.
- g. Adjust the power level of the signal generator to reach the same reading with Read Level (Raw).
- h. The level of the spurious emission is the power level of (7) plus the gain of the standard antenna in dBi and minus the loss of the cable used between the signal generator and the standard antenna.
- i. The measurement shall be repeated at the lowest and the highest channel of the stated frequency range.

13.1.3 Test Setup Layout

This test setup layout is the same as that shown in section 6.1.3

13.1.4 EUT Operation during Test

The EUT was programmed to be in continuously receiving mode.

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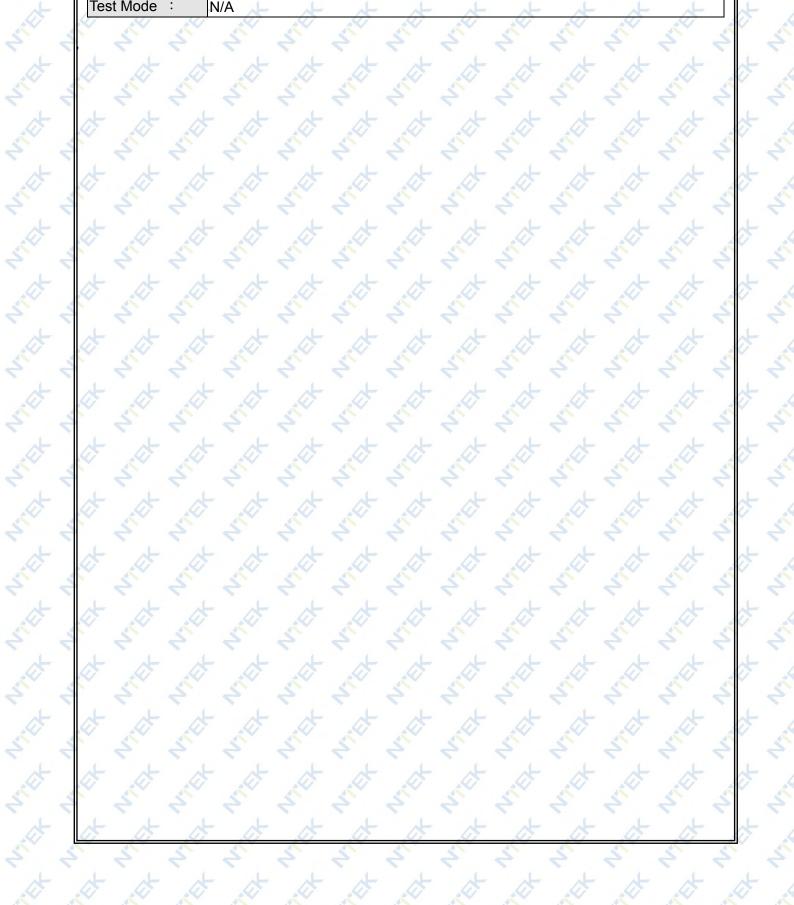
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KAN W 13.1.5 TEST RESULTS (Above 1000MHz)

AT WHET

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A	1 T	at at	at at	t t	A	A	1	L	10.1



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