

Shenzhen Toby Technology Co., Ltd.

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# FCC Radio Test Report FCC ID: 2ABES-KR1409

## **Original Grant**

Report No.		TB-FCC152236
Applicant		Pathway Innovations and Technologies, Inc.
Equipment Und	ler Te	est (EUT)
EUT Name		Document Camera
Model No.	9.9	KR1409 Nillo 100, N1300
Serial No.	:	N/A
Brand Name	:	HoverCam
Receipt Date	-	2017-03-29
Test Date		2017-03-30 to 2017-04-20
Issue Date	÷	2017-04-21
Standards	1010	FCC Part 15: 2016, Subpart C(15.247)
Test Method	:	ANSI C63.10: 2013
Conclusions	61	PASS

In the configuration tested, the EUT complied with the standards specified above,

Test/Witness Engineer

Approved& Authorized

WAN SU foughtin.

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in the report.

TB-RF-074-1.0



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## 1. General Information about EUT

1.1 Client Information

Applicant	(A)	Pathway Innovations and Technologies, Inc.
Address	:	10211 Pacific Mesa Blvd., #412, San Diego, CA 92121, USA
Manufacturer	1	ShenZhen KerunVisual Technology Co., Ltd.
Address	2	6/F, Building 2, Zone S2, 1213 Liuxian Blvd Honghualing Industrial Park Nanshan District, Shenzhen City, China

1.2 General Description of EUT (Equipment Under Test)

EUT Name	:	Document Camera			
Models No.	:	KR1409 Nillo 100, N1300			
Model Difference	1	All these models are identical in the same PCB layout and electrical circuit, the only difference is model name for commercial.			
an B		Operation Frequency:	Bluetooth 4.0(BLE): 2402MHz~2480MHz		
	1	Number of Channel:	Bluetooth 4.0(BLE): 40 channels see note(3)		
Product	3	RF Output Power: 3.329 dBm Conducted Power			
Description	i	Antenna Gain: 4.5 dBi FPC Antenna			
		Modulation Type:	GFSK		
and the		Bit Rate of Transmitter:	1Mbps(GFSK)		
Power Supply	:	AC/DC Adapter (TDX-0902000): Input: AC 100~240V, 50/60Hz, 0.6A. Output: DC 9V, 2.0A.			
Connecting I/O Port(S)	i	Please refer to the User's Manual			

#### Note:

This Test Report is FCC Part 15.247 for Bluetooth BLE, the test procedure follows the FCC KDB 558074 D01 DTS Means Guidance v04.

- (1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
- (2) Antenna information provided by the applicant.
- (3) Channel List:



Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	14	2430	28	2458
01	2404	15	2432	29	2460
02	2406	16	2434	30	2462
03	2408	17	2436	31	2464
04	2410	18	2438	32	2466
05	2412	19	2440	33	2468
06	2414	20	2442	34	2470
07	2416	21	2444	35	2472
08	2418	22	2446	36	2474
09	2420	23	2448	37	2476
10	2422	24	2450	38	2478
11	2424	25	2452	39	2480
12	2426	26	2454		
13	2428	27	2456		

1.3 Block Diagram Showing the Configuration of System Tested

### TX Mode

Adapter

EUT

1.4 Description of Support Units

The EUT has been test as an independent unit.



### 1.5 Description of Test Mode

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned follow was evaluated respectively.

For Conducted Test				
Final Test Mode Description				
Mode 1 TX Mode				

For Radiated Test					
Final Test Mode Description					
Mode 2	TX Mode				
Mode 3 TX Mode (Channel 00/20/39)					

#### Note:

(1) For all test, we have verified the construction and function in typical operation. And all the test modes were carried out with the EUT in transmitting operation in maximum power with all kinds of data rate.

According to ANSI C63.10 standards, the measurements are performed at the highest, middle, lowest available channels, and the worst case data rate as follows:

BLE Mode: GFSK Modulation Transmitting mode.

- (2) During the testing procedure, the continuously transmitting with the maximum power mode was programmed by the customer.
- (3) The EUT is considered a fixed unit; in normal use it was positioned on X-plane. The worst case was found positioned on X-plane. Therefore only the test data of this X-plane was used for radiated emission measurement test.

#### 1.6 Description of Test Software Setting

During testing channel& Power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters of RF setting.

Test Software Version		N/A	TUDE
Frequency	2402 MHz	2442MHz	2480 MHz
BLE GFSK	DEF	DEF	DEF

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## 1.7 Measurement Uncertainty

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

Test Item	Parameters	Expanded Uncertainty (U <sub>Lab</sub> )
	Level Accuracy:	
Conducted Emission	9kHz~150kHz	±3.42 dB
	150kHz to 30MHz	±3.42 dB
Dedicted Emission	Level Accuracy:	
Radiated Emission	9kHz to 30 MHz	±4.60 dB
Dedicted Emission	Level Accuracy:	
Radiated Emission	30MHz to 1000 MHz	±4.40 dB
Radiated Emission	Level Accuracy:	±4.20 dB
naulaleu Emission	Above 1000MHz	±4.20 UD



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#### 1.8 Test Facility

The testing was performed by the Shenzhen Toby Technology Co., Ltd., in their facilities located at:1A/F., Bldg.6, Yusheng Industrial Zone, The National Road No.107 Xixiang Section 467, Xixiang, Bao'an, Shenzhen, Guangdong, China.

At the time of testing, the following bodies accredited the Laboratory:

#### **CNAS (L5813)**

The Laboratory has been accredited by CNAS to ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories for the competence in the field of testing. And the Registration No.: CNAS L5813.

#### FCC List No.: (811562)

The Laboratory is listed in the United States of American Federal Communications Commission (FCC), and the registration number is 811562.

#### IC Registration No.: (11950A-1)

The Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing. The site registration: Site# 11950A-1.

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# 2. Test Summary

Standard Section			ALL DE	
FCC IC		Test Item	Judgment	Remark
15.203		Antenna Requirement	PASS	N/A
15.207(a)	RSS-GEN 7.2.4	Conducted Emission	PASS	N/A
15.205&15.247(d)	RSS-GEN 7.2.2	Band-Edge & Unwanted Emissions into Restricted Frequency	PASS	N/A
15.247(a)(2)	RSS 247 5.2 (1)	6dB Bandwidth	PASS	N/A
15.247(b)(3)	RSS 247 5.4 (4)	Conducted Max Output Power	PASS	N/A
15.247(e)	RSS 247 5.2 (2)	Power Spectral Density	PASS	N/A
15.205, 15.209&15.247(d)	RSS 247 5.5	Transmitter Radiated Spurious &Unwanted Emissions into Restricted Frequency	PASS	N/A

# 3. Test Equipment

## **Conducted Emission Test**

Equipment Manufacturer		Model No.	Serial No.	Last Cal.	Cal. Due Date
EMI Test Receiver	Rohde & Schwarz	ESCI	100321	Jul. 22, 2016	Jul. 21, 2017
RF Switching Unit	Compliance Direction Systems Inc	RSU-A4	34403	Jul. 22, 2016	Jul. 21, 2017
AMN	SCHWARZBECK	NNBL 8226-2	8226-2/164	Jul. 22, 2016	Jul. 21, 2017
LISN	Rohde & Schwarz	ENV216	101131	Jul. 22, 2016	Jul. 21, 2017

## **Radiation Emission Test**

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Due Date	
Spectrum Analyzer	Agilent	E4407B	MY45106456	Jul. 22, 2016	Jul. 21, 2017	
EMI Test Receiver	Rohde & Schwarz		100010/007	Jul. 22, 2016	Jul. 21, 2017	
Bilog Antenna	ETS-LINDGREN	3142E	00117537	Mar. 25, 2017	Mar. 24, 2018	
Bilog Antenna	ETS-LINDGREN	3142E	00117542	Mar. 25, 2017	Mar. 24, 2018	
Horn Antenna	ETS-LINDGREN	3117	00143207	Mar. 25, 2017	Mar. 24, 2018	
Horn Antenna	ETS-LINDGREN	3117	00143209	Mar. 25, 2017	Mar. 24, 2018	
Loop Antenna	Laplace instrument	RF300	0701	Mar. 25, 2017	Mar. 24, 2018	
Pre-amplifier	Sonoma	310N	185903	Mar. 24, 2017	Mar. 23, 2018	
Pre-amplifier	HP	8449B	3008A00849	Mar. 29, 2017	Mar. 28, 2018	
Cable	HUBER+SUHNER	100	SUCOFLEX	Mar. 29, 2017	Mar. 28, 2018	
Positioning Controller	ETS-LINDGREN	2090	N/A	N/A	N/A	

## Antenna Conducted Emission

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Due Date
Spectrum Analyzer	Agilent	E4407B	MY45106456	Jul. 22, 2016	Jul. 21, 2017
Spectrum Analyzer	Rohde & Schwarz	ESCI	100010/007	Jul. 22, 2016	Jul. 21, 2017
Power Meter	Anritsu	ML2495A	25406005	Jul. 22, 2016	Jul. 21, 2017
Power Sensor	Anritsu	ML2411B	25406005	Jul. 22, 2016	Jul. 21, 2017



## 4. Conducted Emission Test

- 4.1 Test Standard and Limit
  - 4.1.1Test Standard FCC Part 15.207
  - 4.1.2 Test Limit

Frequency	Maximum RF Line Voltage (dBµV)				
Frequency	Quasi-peak Level	Average Level			
150kHz~500kHz	66 ~ 56 *	56 ~ 46 *			
500kHz~5MHz	56	46			
5MHz~30MHz	60	50			

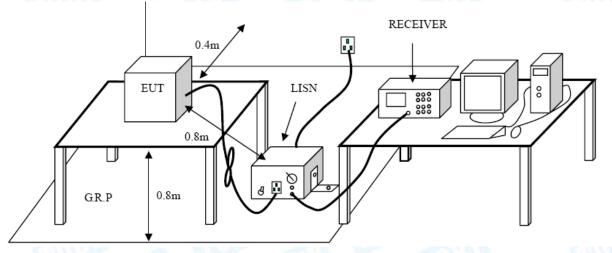
Notes:

(1) \*Decreasing linearly with logarithm of the frequency.

(2) The lower limit shall apply at the transition frequencies.

(3) The limit decrease in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

4.2 Test Setup



## 4.3 Test Procedure

The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.

Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.



I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.

LISN at least 80 cm from nearest part of EUT chassis.

The bandwidth of EMI test receiver is set at 9 kHz, and the test frequency band is from 0.15MHz to 30MHz.

4.4 EUT Operating Mode

Please refer to the description of test mode.

#### 4.5 Test Da5ta

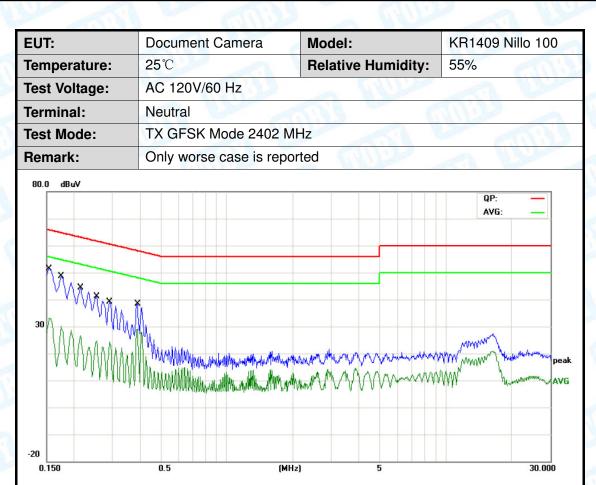
Test data please refer the following pages.



EUT:	Document Camera	Model:	KR1409 Nillo 100
Temperature:	<b>25℃</b>	<b>Relative Humidity:</b>	55%
Test Voltage:	AC 120V/60 Hz		anis -
Terminal:	Line		
Test Mode:	TX GFSK Mode 2402	MHz	2
Remark:	Only worse case is rep	ported	
30		umumumumumumumumumumumumumumumumumumum	QP:
-20			

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1	*	0.1539	40.79	9.93	50.72	65.78	-15.06	QP
2		0.1539	22.80	9.93	32.73	55.78	-23.05	AVG
3		0.1740	37.93	9.97	47.90	64.76	-16.86	QP
4		0.1740	20.11	9.97	30.08	54.76	-24.68	AVG
5		0.2140	33.47	10.02	43.49	63.04	-19.55	QP
6		0.2140	15.68	10.02	25.70	53.04	-27.34	AVG
7		0.2740	27.34	10.02	37.36	60.99	-23.63	QP
8		0.2740	12.83	10.02	22.85	50.99	-28.14	AVG
9		0.2924	27.15	10.02	37.17	60.45	-23.28	QP
10		0.2924	13.64	10.02	23.66	50.45	-26.79	AVG
11		0.3899	26.24	10.02	36.26	58.06	-21.80	QP
12		0.3899	18.41	10.02	28.43	48.06	-19.63	AVG





No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1	*	0.1539	40.63	10.12	50.75	65.78	-15.03	QP
2		0.1539	22.65	10.12	32.77	55.78	-23.01	AVG
3		0.1740	37.85	10.12	47.97	64.76	-16.79	QP
4		0.1740	20.04	10.12	30.16	54.76	-24.60	AVG
5		0.2140	33.40	10.11	43.51	63.04	-19.53	QP
6		0.2140	15.63	10.11	25.74	53.04	-27.30	AVG
7		0.2540	29.53	10.10	39.63	61.62	-21.99	QP
8		0.2540	13.69	10.10	23.79	51.62	-27.83	AVG
9		0.2900	27.59	10.09	37.68	60.52	-22.84	QP
10		0.2900	14.18	10.09	24.27	50.52	-26.25	AVG
11		0.3899	26.32	10.06	36.38	58.06	-21.68	QP
12		0.3899	18.47	10.06	28.53	48.06	-19.53	AVG



EUT:	Document Camera	Model:	KR1409 Nillo 100					
Temperature:	<b>25℃</b>	Relative Humidity:	55%					
Test Voltage:	AC 240V/60 Hz							
Terminal:	Line	Line						
Test Mode:	TX GFSK Mode 2402 MHz							
Remark:	Only worse case is repo	orted						
80.0 dBuV								
30 YMM	M. M	Manna and a start of the start						
-20 0.150	0.5 (1	MHz) 5	30.000					

			Reading	Correct	Measure-			
No.	Mk.	Freq.	Level	Factor	ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1	*	0.1500	49.86	10.12	59.98	65.99	-6.01	QP
2		0.1500	27.79	10.12	37.91	55.99	-18.08	AVG
3		0.1620	47.57	10.12	57.69	65.36	-7.67	QP
4		0.1620	22.19	10.12	32.31	55.36	-23.05	AVG
5		0.1900	42.87	10.12	52.99	64.03	-11.04	QP
6		0.1900	20.89	10.12	31.01	54.03	-23.02	AVG
7		0.2100	39.25	10.12	49.37	63.20	-13.83	QP
8		0.2100	18.13	10.12	28.25	53.20	-24.95	AVG
9		0.2380	37.32	10.11	47.43	62.16	-14.73	QP
10		0.2380	15.95	10.11	26.06	52.16	-26.10	AVG
11		0.2819	33.16	10.09	43.25	60.76	-17.51	QP
12		0.2819	13.32	10.09	23.41	50.76	-27.35	AVG



	Document Camera	Model:	KR1409 Nillo 100
Temperature:	<b>25</b> ℃	Relative Humidity:	55%
Test Voltage:	AC 240V/60 Hz		
Ferminal:	Neutral		
fest Mode:	TX GFSK Mode 2402 MH	Iz	2 194
Remark:	Only worse case is report	ed	3
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX			AVG:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1	*	0.1539	48.69	10.12	58.81	65.78	-6.97	QP
2		0.1539	25.06	10.12	35.18	55.78	-20.60	AVG
3		0.1700	47.21	10.12	57.33	64.96	-7.63	QP
4		0.1700	23.85	10.12	33.97	54.96	-20.99	AVG
5		0.1884	44.88	10.12	55.00	64.10	-9.10	QP
6		0.1884	22.92	10.12	33.04	54.10	-21.06	AVG
7		0.2140	40.61	10.12	50.73	63.04	-12.31	QP
8		0.2140	18.90	10.12	29.02	53.04	-24.02	AVG
9		0.2420	38.65	10.11	48.76	62.02	-13.26	QP
10		0.2420	18.21	10.11	28.32	52.02	-23.70	AVG
11		0.2740	35.42	10.10	45.52	60.99	-15.47	QP
12		0.2740	17.36	10.10	27.46	50.99	-23.53	AVG



## 5. Radiated Emission Test

- 5.1 Test Standard and Limit
  - 5.1.1 Test Standard
    - FCC Part 15.247(d)
  - 5.1.2 Test Limit

#### Radiated Emission Limits (9kHz~1000MHz)

Frequency (MHz	Field Strength (microvolt/meter)	Measurement Distance (meters)	
0.009~0.490	2400/F(KHz)	300	
0.490~1.705	24000/F(KHz)	30	
1.705~30.0	30	30	
30~88	100	3	
88~216	150	3	
216~960	200	3	
Above 960	500	3	

#### Radiated Emission Limit (Above 1000MHz)

Frequency	Distance Met	ers(at 3m)
(MHz)	Peak (dBuV/m)	Average (dBuV/m)
Above 1000	74	54

#### Note:

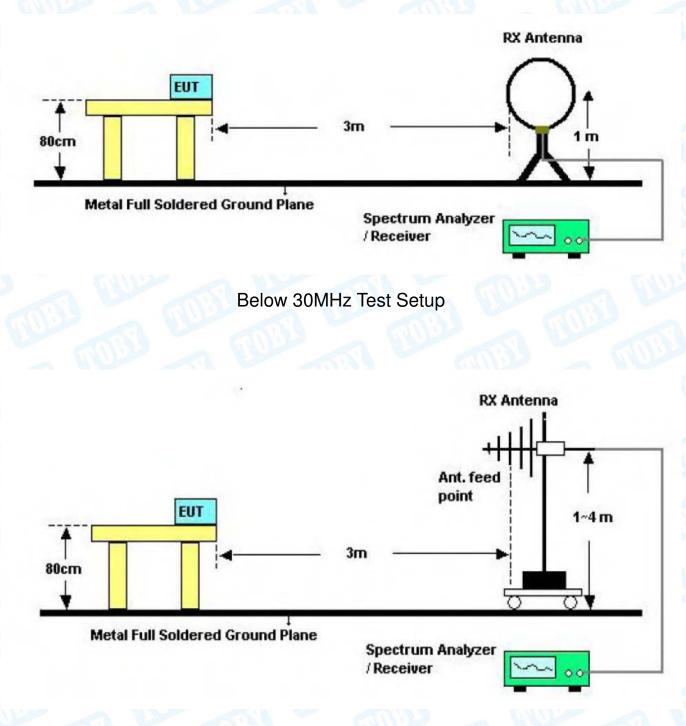
(1) The tighter limit applies at the band edges.

(2) Emission Level (dBuV/m)=20log Emission Level (uV/m)



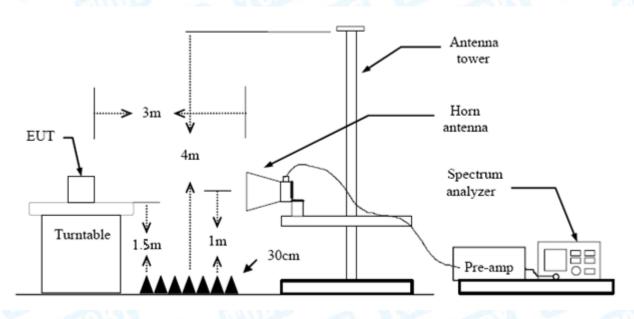
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5.2 Test Setup



Below 1000MHz Test Setup





Above 1GHz Test Setup

#### 5.3 Test Procedure

- (1) The measuring distance of 3m shall be used for measurements at frequency up to 1GHz and above 1 GHz. The EUT was placed on a rotating 0.8m high above ground, the table was rotated 360 degrees to determine the position of the highest radiation.
- (2) Measurements at frequency above 1GHz. The EUT was placed on a rotating 1.5m high above the ground. RF absorbers covered the ground plane with a minimum area of 3.0m by 3.0m between the EUT and measurement receiver antenna. The RF absorber shall not exceed 30cm in high above the conducting floor. The table was rotated 360 degrees to determine the position of the highest radiation.
- (3) The Test antenna shall vary between 1m and 4m, Both Horizontal and Vertical antenna are set to make measurement.
- (4) The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- (5) If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit Bellow 1 GHz, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed. But the Peak Value and average value both need to comply with applicable limit above 1 GHz.
- (6) Testing frequency range below 1GHz the measuring instrument use VBW=120 kHz with Quasi-peak detection.
- (7) Testing frequency range above 1GHz the measuring instrument use RBW=1 MHz and VBW=3 MHz with Peak Detector for Peak Values, and use RBW=1 MHz and VBW=10 Hz with Peak Detector for Average Values.
- (8) For the actual test configuration, please see the test setup photo.



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## 5.4 EUT Operating Condition

The Equipment Under Test was set to Continual Transmitting in maximum power.

5.5 Test Data

Remark: During testing above 1GHz the measuring instrument use RBW=1 MHz and VBW=3 MHz with Peak Detector for Peak Values, and use RBW=1 MHz and VBW=10 Hz with Peak Detector for Average Values. Test data please refer the following pages.

TB-RF-074-1.0



#### 9 KHz~30 MHz

From 9 KHz to 30 MHz: Conclusion: PASS

Note: The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

#### 30MHz~1GHz

EUT:	Document Camera	Model:	KR1409 Nillo 10
Temperature:	<b>25℃</b>	Relative Humidity:	55%
Fest Voltage:	AC 120/60Hz	200	
Ant. Pol.	Horizontal	61102	NUL P
Fest Mode:	BLE TX 2402 Mode		
Remark:	Only worse case is repor	ted	
80.0 dBu∀/m			
30 		(RF)FCC	15C 3M Radiation Margin -6 dB

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		167.2366	50.16	-20.74	29.42	43.50	-14.08	peak
2		202.8103	49.36	-19.87	29.49	43.50	-14.01	peak
3		215.2676	50.58	-19.32	31.26	43.50	-12.24	peak
4		382.5878	52.54	-13.50	39.04	46.00	-6.96	peak
5	*	742.2586	45.88	-6.01	39.87	46.00	-6.13	peak
6		766.0570	43.67	-5.72	37.95	46.00	-8.05	peak

\*:Maximum data x:Over limit !:over margin



EUT:Document CameraModel:KR1409 NilTemperature:25°CRelative Humidity:55%	o 100
Temperature: 25°C Relative Humidity: 55%	
	100
Test Voltage: AC 120/60Hz	
Ant. Pol. Vertical	
Test Mode: BLE TX 2402 Mode	
Remark: Only worse case is reported	
80.0 dBuV/m (RF)FCC 15C 3M Radiation Margin -6 dB 30 4 4 4 4 4 4 4 4 4 4 4 4 4	
-20	1000.000
Reading Correct Measure- No. Mk. Freq. Level Factor ment Limit Over	
dbim	Detector
1 102.0014 57.03 -21.85 35.18 43.50 -8.32	peak
2 114.5146 55.42 -22.12 33.30 43.50 -10.20	peak
3 * 167.2366 61.15 -20.74 40.41 43.50 -3.09	peak
4 191.7450 54.29 -20.45 33.84 43.50 -9.66	peak
5 202.8103 55.03 -19.87 35.16 43.50 -8.34	peak
6 215.2677 53.50 -19.32 34.18 43.50 -9.32	peak

\*:Maximum data x:Over limit !:over margin



#### Above 1GHz

EUT:	Document Can	nera Model:	KR1409 Nillo 10					
Temperature:	<b>25</b> ℃	Relative	Humidity: 55%					
Test Voltage:	AC 120/60Hz	AC 120/60Hz						
Ant. Pol.	Horizontal							
Test Mode:	BLE Mode TX 2	2402 MHz						
Remark:	No report for th prescribed limit	e emission which more	than 10 dB below the					
110.0 dBuV/m								
			(RF) FCC PART 15C (PEAK)					
	2 X		(RF) FCC PART 15C (AVG)					
	1 X							
-10								

Ν	lo.	Mk.	Freq.	Reading Level		Measure- ment	Limit	Over	
			MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		*	4803.379	29.55	13.44	42.99	54.00	-11.01	AVG
2			4803.835	43.27	13.44	56.71	74.00	-17.29	peak



EUT:		Docum	ent Camera	Model:	KR1409 Nillo 100
Temperatu	ire:	<b>25</b> ℃	Call	<b>Relative Humidity</b>	: 55%
Test Voltag	ge:	AC 120	0/60Hz		anise -
Ant. Pol.		Vertica			
Test Mode	:	BLE M	ode TX 2402 MH	lz MVP	
Remark:			ort for the emiss bed limit.	ion which more than 10	dB below the
110.0 dBuV/m	n				
				(RF	) FCC PART 15C (PEAK)
	1 ×			08	F) FCC PART 15C (AVG)
50	2				
	x				
-10					

No	. Mk.	Freq.	Reading Level		Measure- ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4802.512	42.92	13.43	56.35	74.00	-17.65	peak
2	*	4804.930	29.53	13.44	42.97	54.00	-11.03	AVG



EUT	:	Docur	nent Camera	Model:	KR1409 Nillo 100
Tem	perature:	<b>25</b> ℃		Relative Humidity	: 55%
Test	Voltage:	AC 12	0/60Hz		MB29
Ant.	Ant. Pol. Horizontal				
Test	Mode:	BLE N	lode TX 2442 MH	z	
Rem	nark:		oort for the emissic ibed limit.	on which more than 10 d	B below the
110.0	dBuV/m				
				(RF) FC	C PART 15C (PEAK)
	1				
50	>			(RF) F	CC PART 15C (AVG)
	2				
-10					

No	. Mk	. Freq.		Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4883.196	43.84	13.91	57.75	74.00	-16.25	peak
2	*	4883.340	29.81	13.92	43.73	54.00	-10.27	AVG



EUT	:	Docum	ent Camera	Model:	KR1409 Nillo 100
Tem	perature:	<b>25</b> ℃		Relative Humidi	ty: 55%
Test Voltage: AC 120/60Hz					
Ant. Pol. Vertical					
Test	Mode:	BLE M	ode TX 2442 MHz	z ((1)))	
Rem	ark:		ort for the emissic ped limit.	on which more than 10	dB below the
110.0	) dBuV/m				
				IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	F) FCC PART 15C (PEAK)
		2		(F	RF) FCC PART 15C (AVG)
50	> >				
-10	100.000 3550.00	6100.00 8	850.00 11200.00 13	750.00 16300.00 18850.00	21400.00 26500.00 MH

1	No.	Mk.	Freq.	Reading Level		Measure- ment	Limit	Over	
			MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		*	4883.040	29.60	13.91	43.51	54.00	-10.49	AVG
2			4883.598	41.97	13.92	55.89	74.00	-18.11	peak



EUT	:	Docum	ent Camera	Model:	K	R1409 Nillo 100					
Tem	perature:	<b>25</b> ℃		<b>Relative Humidity:</b>		5%					
Test	Voltage:	AC 120	AC 120/60Hz								
Ant.	Pol.	Horizor	Horizontal								
Test	Mode:	BLE M	BLE Mode TX 2480 MHz								
Rem	ark:		No report for the emission which more than 10 dB below the prescribed limit.								
110.0	dBuV/m										
				1	RF) FCC PART	15C (PEAK)					
	1										
50					(RF) FCC PAR	1 15C (AVG)					
	\$	2 K									
-10											

N	o. Mk	. Freq.		Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4959.736	43.84	14.36	58.20	74.00	-15.80	peak
2	*	4960.684	30.05	14.36	44.41	54.00	-9.59	AVG



EUT	:	Docun	nent Camera	Model:	KR1409 Nillo 100						
Tem	perature:	<b>25</b> ℃	60131	<b>Relative Humidity:</b>	55%						
Test	Voltage:	AC 12	0/60Hz		139						
Ant.	Pol.	Vertica	al								
<b>Fest</b>	Mode:	BLE M	lode TX 2480 MHz	z	2 100						
Rem	ark:		No report for the emission which more than 10 dB below the prescribed limit.								
110.0	dBuV/m										
				(RF) FC	PART 15C (PEAK)						
	2	2									
50	>	<		(RF) F	CC PART 15C (AVG)						
30	1										
	×										
-10											

	No.	Mk.	Freq.	Reading Level		Measure- ment	Limit	Over	
			MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		*	4960.360	30.06	14.36	44.42	54.00	-9.58	AVG
2	2		4960.498	43.74	14.36	58.10	74.00	-15.90	peak

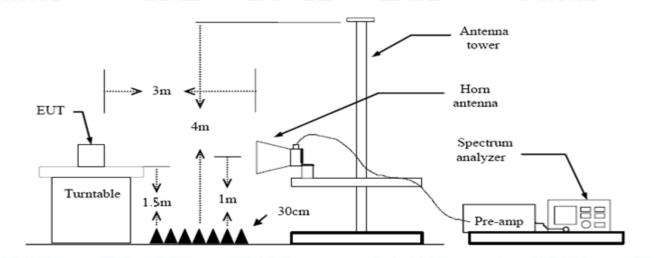


## 6. Restricted Bands Requirement

- 6.1 Test Standard and Limit
  - 6.1.1 Test Standard
    - FCC Part 15.247(d) FCC Part 15.205
  - 6.1.2 Test Limit

Restricted Frequency	Distance Meters(at 3m)				
Band (MHz)	Peak (dBuV/m)	Average (dBuV/m)			
2310 ~2390	74	54			
2483.5 ~2500	74	54			

### 6.2 Test Setup



#### 6.3 Test Procedure

- (1) The measuring distance of 3m shall be used for measurements at frequency up to 1GHz and above 1 GHz. The EUT was placed on a rotating 0.8m high above ground, the table was rotated 360 degrees to determine the position of the highest radiation.
- (2) Measurements at frequency above 1GHz. The EUT was placed on a rotating 1.5m high above the ground. RF absorbers covered the ground plane with a minimum area of 3.0m by 3.0m between the EUT and measurement receiver antenna. The RF absorber shall not exceed 30cm in high above the conducting floor. The table was rotated 360 degrees to determine the position of the highest radiation.
- (3) The Test antenna shall vary between 1m and 4m, Both Horizontal and Vertical antenna are set to make measurement.
- (4) The initial step in collecting conducted emission data is a spectrum analyzer peak detector



mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.

- (5) If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit Bellow 1 GHz, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed. But the Peak Value and average value both need to comply with applicable limit above 1 GHz.
- (6) Testing frequency range below 1GHz the measuring instrument use VBW=120 kHz with Quasi-peak detection.
- (7) Testing frequency range above 1GHz the measuring instrument use RBW=1 MHz and VBW=3 MHz with Peak Detector for Peak Values, and use RBW=1 MHz and VBW=10 Hz with Peak Detector for Average Values.
- (8) For the actual test configuration, please see the test setup photo.

6.4 EUT Operating Condition

The Equipment Under Test was set to Continual Transmitting in maximum power.

6.5 Test Data

Remark: During testing above 1GHz the measuring instrument use RBW=1 MHz and VBW=3 MHz with Peak Detector for Peak Values, and use RBW=1 MHz and VBW=10 Hz with Peak Detector for Average Values.

Test data please refer the following pages.



## (1) Radiation Test

EUT:		Docume	ent Camera	M	odel:		KR1409 N	lillo 100
Temp	erature:	<b>25</b> ℃		Re	elative Humi	dity:	55%	
Test V	/oltage:	AC 120/	60Hz	MUS				
Ant. P	Pol.	Horizont	tal		600	2	2	
Test N	Node:	BLE Mo	de TX 2402	MHz		200	1.5	1
Rema	rk:	N/A		AUR		1936		
110.0	dBuV/m							
							3 X	
						(RF) FCC	PART 15C (PEAK)	l
						(RF) FC	C PART 15C (AVG)	)
50						2 X		
						X		
-10 2313	.000 2323.00	2333.00	2343.00 2353	.00 2363.00	2373.00 2383	3.00 2393	8.00 24	413.00 MHz
No	. Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/n	n <mark>d</mark> B	Detector
1	23	90.000	48.80	0.77	49.57	74.00	-24.43	peak
2	23	90.000	31.83	0.77	32.60	54.00	-21.40	AVG

95.12

91.32

Emission Level= Read Level+ Correct Factor

94.30

90.50

0.82

0.82

2401.800

2402.000

3

4

Х

\*

peak

AVG

**Fundamental Frequency** 

Fundamental Frequency



EUT:	Documer	nt Camera	Model:	Model:		
Temperature:	<b>25</b> ℃	Carlos L	Relative Hun	Relative Humidity:		
Test Voltage:	AC 120/6	60Hz		16	(8M)	
Ant. Pol.	Vertical				-	
Test Mode:	BLE Mod	e TX 2402 M⊦	Iz	2		Lan
Remark:	N/A			-		
110.0 dBuV/m						
					4	
					Ň	
				(RF) FC	C PART 15C (F	EAK)
				State 1 17	CC PART 15C	
50				×		
				2 X		
-10						

N	o. Mk	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		2390.000	50.50	0.77	51.27	74.00	-22.73	peak
2		2390.000	31.41	0.77	32.18	54.00	-21.82	AVG
3	*	2402.000	91.47	0.82	92.29	Fundamental Frequency		AVG
4	Х	2402.100	96.41	0.82	97.23	Fundamental Frequency		peak



-10

2470.000 2480.00

2490.00

2500.00

2510.00

EUT:	Document Camera	Model:	KR1409 Nillo 100
Temperature:	<b>25℃</b>	Relative Humidity:	55%
Test Voltage:	AC 120/60Hz	200	201
Ant. Pol.	Horizontal		AUC
Test Mode:	BLE Mode TX 2480 MHz		
Remark:	N/A		
110.0 dBuV/m			
		(RF) FCC PART 15	C (PEAK)
50		(RF) FCC PART 1	5C (AVG)

No	. Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1	Х	2480.000	93.92	1.15	95.07	Fundamental Frequency		peak
2	*	2480.000	91.14	1.15	92.29	Fundamental Frequency		AVG
3		2483.500	57.04	1.17	58.21	74.00	-15.79	peak
4		2483.500	48.41	1.17	49.58	54.00	-4.42	AVG

2520.00

2530.00

2540.00

2550.00

2570.00 MHz



EUT:	Docur	nent Camer	ra	Model:			KR1409 Nillo 10		00
Temperature:	<b>25</b> ℃	600		Relative Humidity: 55%				1 VS	
Test Voltage:	AC 12	0/60Hz							
Ant. Pol.	Vertica	al		199				1	
Test Mode:	BLE N	lode TX 24	80 MHz		400	2	2	14E	
Remark:	N/A	Charles and the	-		Carrow Carrow	an	33		
110.0 dBu∀/m									
							PART 15C (P C PART 15C (		
50									
-10 2470.000 2480.00	2490.00	2500.00 25	10.00 2520	0.00 253	0.00 254	0.00 255	D.00	2570.00	MHz

No	. Mk	. Freq.	Level	Factor	ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1	Х	2480.000	93.60	1.15	94.75	Fundamental I	Frequency	peak
2	*	2480.000	90.70	1.15	91.85	Fundamental I	Frequency	AVG
3		2483.500	55.97	1.17	57.14	74.00	-16.86	peak
4		2483.500	48.46	1.17	49.63	54.00	-4.37	AVG



## (2) Conducted Test

	Document	Camera	Mode	el:		KR1	409 Nillo
nperature:	<b>25℃</b>	25℃ <b>Re</b>		ive Humic	lity:	55%	
st Voltage:	AC 120/60	Hz	UP				-
st Mode:	BLE Mode	BLE Mode TX 2402MHz / BLE Mode TX 2480MHz					
mark:	The EUT is	programed	in continu	ously trans	smittir	ng mo	de
🔆 Agilent	17:57:50 Apr 20	, 2017					
Ref 15 dBm		Atten 25 dB			Μ		150 GHz 163 dBm
Peak						1	
Log 10							
dB/							
	olay Line						
1 dB -17.	54 dBm			4		•	
DI	Mun Marine	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		~~^^	~~ Ô		horm
-17.5 dBm							
Center 2.362 0	<u> </u>					Cnon	100 MH-
#Res BW 100		#VBV	V 300 kHz	Sw	eep 10.	əpan 4/36 ms	100 MHz 101 pts)
	race Type	X Axis		Amplitude			
1 2	(1) Freq (1) Freq	2.40150 GH 2.39000 GH		2.463 dBm -50.91 dBm			
3 4	(1) Freq (1) Freq	2.40000 GH	z	-42.98 dBm -45.97 dBm			
Januar Agilent	17:55:17 Apr 20	, 2017					
	17:55:17 Apr 20				MI		/950 GHz 136 dBm
Agilent Ref 15 dBm Peak	17:55:17 Apr 20	, 2017 Atten 25 dB			MI		7950 GHz 136 dBm
Ref 15 dBm Peak Log	17:55:17 Apr 20				MI		
Ref 15 dBm Peak Log 10	17:55:17 Apr 20				M		
Ref 15 dBm Peak Log 10 dB/	1 <b>*</b>				MI		
Ref 15 dBm Peak Log 10 dB/ Offst Disp 1 17	17:55:17 Apr 20				M		
Ref 15 dBm Peak Log 10 dB/ Offst 1 -17.	olay Line 79 dBm ₂ ₄				M		
Ref 15 dBm Peak Log dB/ Offst Disp 1 -17. DI	♦ blay Line 79 dBm				M		
Ref 15 dBm Peak Log 10 dB/ Offst 1 dB	olay Line 79 dBm ₂ ₄						
Ref 15 dBm Peak Log 10 dB/ Offst Disp 1 -17. DI -17.8	olay Line 79 dBm ₂ ₄						
Ref 15 dBm Peak Log 10 dB/ Offst Disp 1 -17. dB DI -17.8 dBm	blay Line 79 dBm					2.4	136 dBm *
Ref 15 dBm Peak Log 10 dB/ Offst Disp 1 -17. DI -17.8	blay Line 79 dBm	Atten 25 dB	/ 300 kHz			2.4	136 dBm * * 100 MHz
Ref 15 dBm Peak Log 10 dB/ Offst DISp 1 dB -17. dB DI -17.8 dBm Center 2.52 G #Res BW 100	blay Line 79 dBm 2 dBm 2 dBm 4 db 2 db 2 db 2 db 2 db 2 db 2 db 2 db 2	Atten 25 dB		Amplitude		2.4	136 dBm * * 100 MHz
Ref 15 dBm Peak Log 10 dB/ Offst Disp 117. dB DI -17.8 dBm Center 2.52 G #Res BW 100 Marker Tr 1	Hz kHz (1) Freq	Atten 25 dB	Z	Amplitude 2.436 dBm -49.97 dBm		2.4	136 dBm * * 100 MHz
Ref 15 dBm Peak Log 10 dB/ Offst Disp 1 -17. dB DI -17.8 dBm Center 2.52 G #Res BW 100 Marker Tr 2 3	Diay Line 79 dBm 2 4 2 4 2 4 2 4 2 4 2 4 2 4 2 4 2 4 2 4	Atten 25 dB	z z z	Amplitude 2.436 dBm -49.97 dBm -51.33 dBm		2.4	136 dBm * * 100 MHz
Ref 15 dBm Peak Log 10 dB/ Offst Disp 1 dB -17. dB -17. dB DI -17.8 dBm Center 2.52 G #Res BW 100 Marker Tr 2 3	http://www.communications.com/communications.com/communications.com/communications.com/com/communications.com/com/com/com/com/com/com/com/com/com/	Atten 25 dB	z z z	Amplitude 2.436 dBm -49.97 dBm		2.4	136 dBm * * 100 MHz
Ref 15 dBm Peak Log 10 dB/ Offst DISp 1 dB -17. dB -17. dB DI -17. dB Bm Center 2.52 G #Res BW 100 Marker Tr 2 3	Diay Line 79 dBm 2 4 2 4 2 4 2 4 2 4 2 4 2 4 2 4 2 4 2 4	Atten 25 dB	z z z	Amplitude 2.436 dBm -49.97 dBm -51.33 dBm		2.4	136 dBm * * 100 MHz
Ref 15 dBm Peak Log 10 dB/ Offst DISp 1 dB -17. dB -17. dB DI -17. dB Bm Center 2.52 G #Res BW 100 Marker Tr 2 3	Diay Line 79 dBm 2 4 2 4 2 4 2 4 2 4 2 4 2 4 2 4 2 4 2 4	Atten 25 dB	z z z	Amplitude 2.436 dBm -49.97 dBm -51.33 dBm		2.4	136 dBm * * 100 MHz

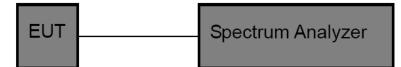


## 7. Bandwidth Test

- 7.1 Test Standard and Limit
  - 7.1.1 Test Standard
    - FCC Part 15.247 (a)(2)
  - 7.1.2 Test Limit

FCC	FCC Part 15 Subpart C(15.247)/RSS-247			
Test Item	Limit	Frequency Range(MHz)		
Bandwidth	>=500 KHz (6dB bandwidth)	2400~2483.5		

7.2 Test Setup



### 7.3 Test Procedure

- (1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- (2) The bandwidth is measured at an amplitude level reduced 6dB from the reference level. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst –case (i.e the widest) bandwidth.
- (3)Measure the channel separation the spectrum analyzer was set to Resolution Bandwidth:100 kHz, and Video Bandwidth:300 kHz, Detector: Peak, Sweep Time set auto.

### 7.4 EUT Operating Condition

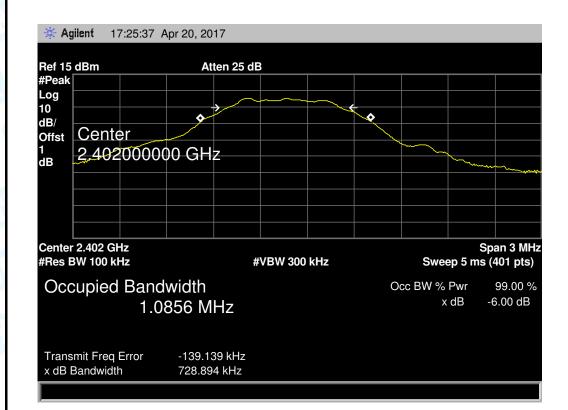
The EUT was set to continuously transmitting in each mode and low, middle and high channel for the test.



## 7.5 Test Data

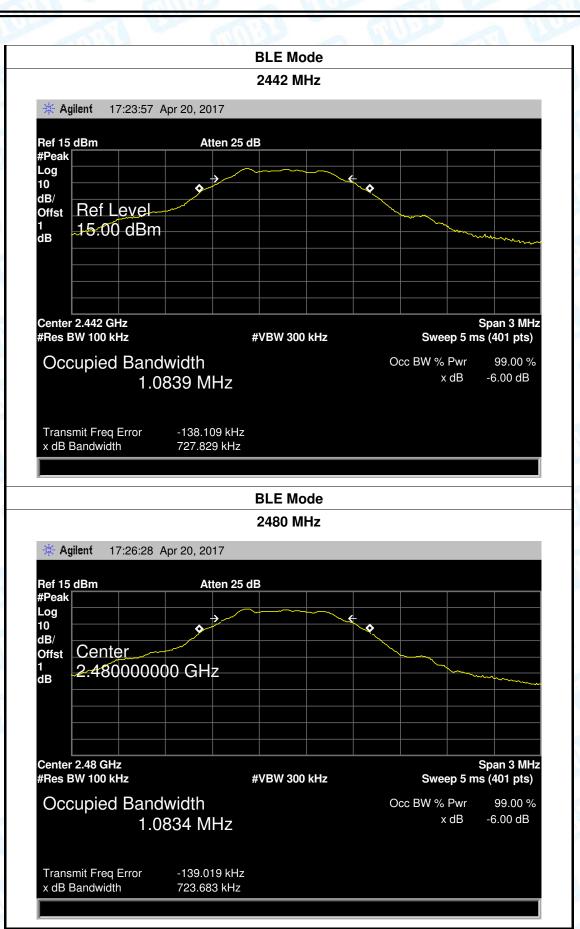
EUT:	Document Camera		Model:	KR1409 Nillo 100
Temperature:	<b>25</b> ℃		Relative Humidity:	55%
Test Voltage:	AC 1	20/60Hz	MUL	a
Test Mode:	BLE	TX Mode		
Channel freque	ency	6dB Bandwidth	99% Bandwidth	Limit
(MHz)		(kHz)	(kHz)	(kHz)
2402		728.894	1085.60	
2442		727.829	1083.90	>=500
2480		723.683	1083.40	
		BLEN	lode	

2402 MHz









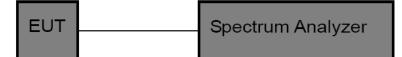


## 8. Peak Output Power Test

- 8.1 Test Standard and Limit
  - 8.1.1 Test Standard
    - FCC Part 15.247 (b)(3)
  - 8.1.2 Test Limit

FCC Part 15 Subpart C(15.247)/RSS-247			
Test Item Limit Frequency Range(MH			
Peak Output Power	1 Watt or 30 dBm	2400~2483.5	

8.2 Test Setup



#### 8.3 Test Procedure

The EUT was directly connected to the Spectrum Analyzer and antenna output port as show in the block diagram above. The measurement is according to section 9.1.1 of KDB 558074 D01 DTS Meas Guidance v04.

- (1) Set the RBW≥DTS Bandwidth
- (2) Set VBW≥3\*RBW
- (3) Set Span≥3\*RBW
- (4) Sweep time=auto
- (5) Detector= peak
- (6) Trace mode= maxhold.
- (7) Allow trace to fully stabilize, and then use peak marker function to determine the peak amplitude level.

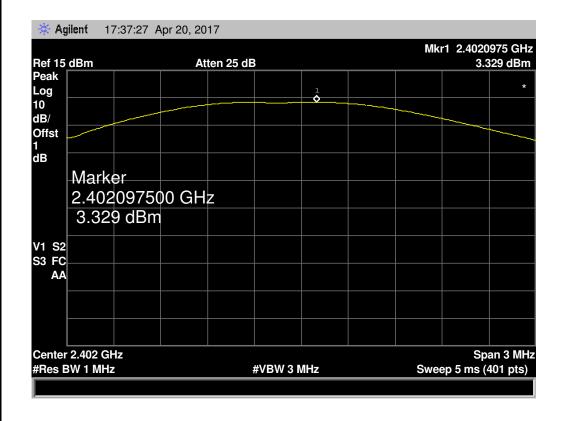
#### 8.4 EUT Operating Condition

The EUT was set to continuously transmitting in the max power during the test.



### 8.5 Test Data

EUT:	Document Camera		Model:	KR14	09 Nillo 100
Temperature:	<b>25℃</b>		Relative Hun	idity: 55%	
Test Voltage:	AC 120/60Hz				U.S.
Test Mode:	BLE TX M	lode	21	anis -	
Channel frequer	ncy (MHz)	Hz) Test Result (dBm)		Limit (	dBm)
2402		3.	329		
2442		2.839		30	)
2480 3.026					
		BLE	Mode	·	
		2402	2 MHz		





BLE Mode				
		2442 MHz		
<b>* Agilent</b> 17:35:49	Apr 20, 2017			
			Mkr1 2.4421125 GH	
Ref 15 dBm	Atten 25	dB	2.839 dBn	
Peak .og			*	
0		<u> </u>		
IB/				
Offst				
l				
Marker				
2.442112				
2.839 dB	m			
/1 S2				
53 FC				
AA				
Center 2.442 GHz		#\/D\// 2 MLI-	Span 3 MH	
Res BW 1 MHz		#VBW 3 MHz	Sweep 5 ms (401 pts)	

## BLE Mode

2480 MHz

				Mkr	1 2.4800825 GH		
Ref 15 dBm	Atten 2	Atten 25 dB			3.026 dBn		
Peak					*		
-og  0							
IB/							
Offst							
B							
Marker			_				
2.480082	500 GHz						
3.026 dB							
0.020 00							
/1 S2							
63 FC			_				
AA							
Center 2.48 GHz					Span 3 MH		
Res BW 1 MHz		#VBW 3	MHz	Swee	p 5 ms (401 pts)		

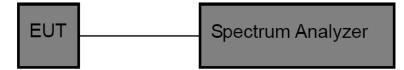


## 9. Power Spectral Density Test

- 9.1 Test Standard and Limit
  - 9.1.1 Test Standard
    - FCC Part 15.247 (e)
  - 9.1.2 Test Limit

FCC Part 15 Subpart C(15.247)					
Test Item Limit Frequency Range(MHz					
Power Spectral Density8dBm(in any 3 kHz)2400~2483.5					

#### 9.2 Test Setup



#### 9.3 Test Procedure

The EUT was directly connected to the Spectrum Analyzer and antenna output port as show in the block diagram above. The measurement according to section 10.2 of KDB 558074 D01 DTS Meas Guidance v04.

- (1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- (2) Set analyser center frequency to DTS channel center frequenyc.
- (3) Set the span to 1.5 times the DTS bandwidth.
- (4) Set the RBW to: 3 kHz
- (5) Set the VBW to: 10 kHz
- (6) Detector: peak
- (7) Sweep time: auto
- (8) Allow trace to fully stabilize. Then use the peak marker function to determine the maximum amplitude level.

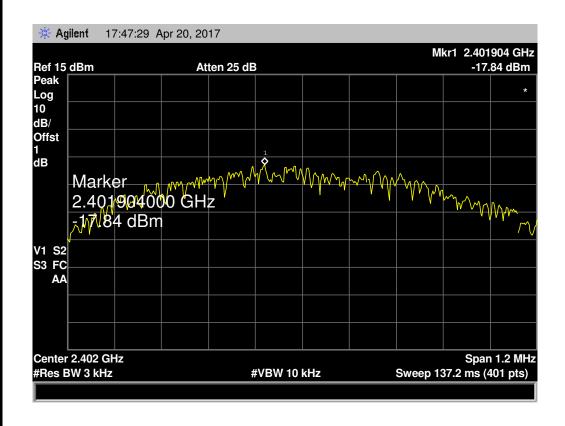
#### 9.4 EUT Operating Condition

The EUT was set to continuously transmitting in each mode and low, Midle and high channel for the test.



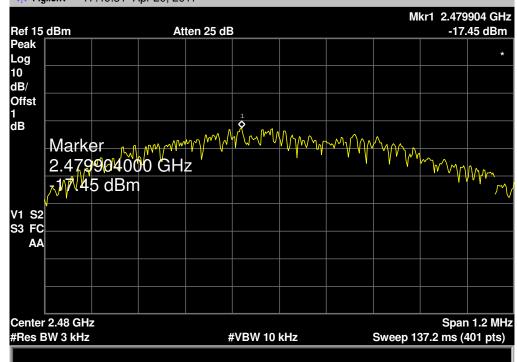
### 9.5 Test Data

EUT:	Documen	Document Camera		Model:		409 Nillo 100
Temperature:	<b>25</b> ℃	Relative Hu		lumidity: 55%		-
Test Voltage:	AC 120/6	AC 120/60Hz				an BL
Test Mode:	BLE TX N	lode	~ 610		3	
Channel Frequency		Power Density L		Lim	it	Result
(MHz)	(MHz)		(dBm)		(dBm)	
2402	2402 -17.84					
2442		-17.17		8		PASS
2480		-17.45				
		BLE	E Mode			
		240	2 MHz			











## 10. Antenna Requirement

#### 10.1 Standard Requirement

#### 10.1.1 Standard

FCC Part 15.203

10.1.2 Requirement

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

#### 10.2 Antenna Connected Construction

The directional gains of the antenna used for transmitting is 4.5dBi, and the antenna de-signed with permanent attachment and no consideration of replacement. Please see the EUT photo for details.

#### 10.3 Result

The EUT antenna is a FPC Antenna. It complies with the standard requirement.

	Antenna Type
3	Permanent attached antenna
	✓ Unique connector antenna
-	Professional installation antenna

-----END OF REPORT-----