FCC Test Report

Report No.: AGC00653170601FE03

FCC ID	:	2AFD9C9
APPLICATION PURPOSE	:	Original Equipment
PRODUCT DESIGNATION	:	GSM MOBILE PHONE
BRAND NAME	:	ZOOM
MODEL NAME	:	С9
CLIENT	:	MOVEON TECHNOLOGY LIMITED
DATE OF ISSUE	:	June 14, 2017
STANDARD(S) TEST PROCEDURE(S)	:	FCC Part 15 Rules ANSI C63.10 (2013)
REPORT VERSION	:	V1.0

Attestation of Global Compliance (Shenzhen) Co., Ltd

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Report Revise Record

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	June 14, 2017	Valid	Original Report

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Applicant	MOVEON TECHNOLOGY LIMITED
Address	world trade plaza-A block 3201-3201 fuhong road,futian
Manufacturer	MOVEON TECHNOLOGY LIMITED
Address	world trade plaza-A block 3201-3201 fuhong road,futian
Product Designation	GSM MOBILE PHONE
Brand Name	ZOOM
Test Model	C9
Date of test	June 05, 2017~June 14, 2017
Deviation	None
Condition of Test Sample	Normal
Report Template	AGCRT-US-BR/RF

1. VERIFICATION OF CONFORMITY

We hereby certify that:

The above equipment was tested by Dongguan Precise Testing Service Co., Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10 (2013) and the energy emitted by the sample EUT tested as described in this report is in compliance with radiated emission limits of FCC Rules Part 15.247.

Tested By	donjon »rang	
	Donjon Huang(Huang Dongyang)	June 14, 2017
Reviewed By	Bong xie	
	Bart Xie(Xie Xiaobin)	June 14, 2017
Approved By	Solya shong	
	Solger Zhang(Zhang Hongyi) Authorized Officer	June 14, 2017

2. GENERAL INFORMATION

2.1. PRODUCT DESCRIPTION

The EUT is "Tablet" designed as a "Communication Device". It is designed by way of utilizing the FHSS technology to achieve the system operation.

, , ,	5
Operation Frequency	2.402 GHz to 2.480GHz
Bluetooth Version	V2.1+EDR
Modulation	GFSK, π /4-DQPSK, 8DPSK
Number of channels	79(For BR/EDR)
Hardware Version	H28_MB_V1.0
Software Version	sc6531_3232_3110_H28_C41_ZOOM_YX_ N_V4_20170420
Antenna Designation	PIFA Antenna
Antenna Gain	1.0dBi
Power Supply	DC3.7V by Battery

A major technical description of EUT is described as following

2.2. TABLE OF CARRIER FREQUENCYS

Frequency Band	Channel Number	Frequency
2400~2483.5MHZ	0	2402MHZ
	1	2403MHZ
	•	:
	38	2440 MHZ
	39	2441 MHZ
	40	2442 MHZ
	•	:
	77	2479 MHZ
	78	2480 MHZ

2.3. RECEIVER INPUT BANDWIDTH

The input bandwidth of the receiver is 1.3MHZ, In every connection one Bluetooth device is the master and the other one is slave. The master determines the hopping sequence. The slave follows this sequence. Both devices shift between RX and TX time slot according to the clock of the master. Additionally the type of connection(e.g. single of multislot packet) is set up at the beginning of the connection. The master adapts its hopping frequency and its TX/RX timing according to the packet type of the connection. Also the slave of the connection will use these settings.

Repeating of a packet has no influence on the hopping sequence. The hopping sequence generated by the master of the connection will be followed in any case. That means, a repeated packet will not be send on the same frequency, it is send on the next frequency of the hopping sequence.

2.4. EXAMPLE OF A HOPPING SEQUENCY IN DATA MODE

Example of a 79 hopping sequence in data mode: 40,21,44,23,42,53,46,55,48,33,52,35,50,65,54,67 56,37,60,39,58,69,62,71,64,25,68,27,66,57,70,59 72,29,76,31,74,61,78,63,01,41,05,43,03,73,07,75 09,45,13,47,11,77,15,00,64,49,66,53,68,02,70,06 01, 51, 03, 55, 05, 04

2.5. EQUALLY AVERAGE USE OF FREQUENCIES AND BEHAVIOUR

The generation of the hopping sequence in connection mode depends essentially on two input values: 1. LAP/UAP of the master of the connection.

2. Internal master clock

The LAP(lower address part) are the 24 LSB's of the 48 BD_ADDRESS. The BD_ADDRESS is an unambiguous number of every Bluetooth unit. The UAP(upper address part) are the 24MSB's of the 48BD_ADDRESS

The internal clock of a Bluetooth unit is derived from a free running clock which is never adjusted and is never turned off. For ehavior zation with other units only offset are used. It has no relation to the time of the day. Its resolution is at least half the RX/TX slot length of 312.5us.The clock has a cycle of about one day(23h30).In most case it is implemented as 28 bit counter. For the deriving of the hopping sequence the entire. LAP(24 bits),4LSB's(4bits)(Input 1) and the 27MSB's of the clock(Input 2) are used. With this input values different mathematical procedures(permutations, additions, XOR-operations)are performed to generate te Sequence. This will be done at the beginning of every new transmission.

Regarding short transmissions the Bluetooth system has the following ehavior:

The first connection between the two devices is established, a hopping sequence was generated. For Transmitting the wanted data the complete hopping sequence was not used. The connection ended. The second connection will be established. A new hopping sequence is generated. Due to the fact the Bluetooth clock has a different value, because the period between the two transmission is longer(and it Cannot be shorter) than the minimum resolution of the clock(312.5us).The hopping sequence will always Differ from the first one.

2.6. RELATED SUBMITTAL(S) / GRANT (S)

This submittal(s) (test report) is intended for **FCC ID: 2AFD9C9** filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

2.7. TEST METHODOLOGY

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10 (2013). Radiated testing was performed at an antenna to EUT distance 3 meters.

2.8. SPECIAL ACCESSORIES

Refer to section 5.2.

2.9. EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.

3. MEASUREMENT UNCERTAINTY

Conducted measurement: +/- 2.75dB Radiated measurement: +/- 3.2dB

4. DESCRIPTION OF TEST MODES

NO.	TEST MODE DESCRIPTION
1	Low channel GFSK
2	Middle channel GFSK
3	High channel GFSK
4	Low channel π /4-DQPSK
5	Middle channel π /4-DQPSK
6	High channel π /4-DQPSK
7	Low channel 8DPSK
8	Middle channel 8DPSK
9	High channel 8DPSK
10	Normal Hopping

Note:

1. All the test modes can be supply by Built-in Li-ion battery, only the result of the worst case was recorded in the report, if no other cases.

2. For Radiated Emission, 3axis were chosen for testing for each applicable mode.

5. SYSTEM TEST CONFIGURATION

5.1. CONFIGURATION OF EUT SYSTEM Configuration:



5.2. EQUIPMENT USED IN EUT SYSTEM

ltem	Equipment	Model No.	ID or Specification	Note
1	GSM MOBILE PHONE	C9	2AFD9C9	EUT
2	Adapter	C9	DC5V /0.5A	Accessory
3	Battery	C9	DC3.7V/800mAh	Accessory
4	Earphone	N/A	N/A	Accessory

5.3. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
§15.247	Peak Output Power	Compliant
§15.247	20 dB Bandwidth	Compliant
§15.247	Spurious Emission	Compliant
§15.209	Radiated Emission	Compliant
§15.247	Band Edges	Compliant
§15.207	Conduction Emission	Compliant
§15.247	Number of Hopping Frequency	Compliant
§15.247	Time of Occupancy	Compliant
§15.247	Frequency Separation	Compliant

6. TEST FACILITY

Site	Dongguan Precise Testing Service Co., Ltd.
Location	Building D,Baoding Technology Park,Guangming Road2,Dongcheng District, Dongguan, Guangdong, China,
FCC Registration No.	371540
Description	The test site is constructed and calibrated to meet the FCC requirements in documents ANSI C63.10:2013.

ALL TEST EQUIPMENT LIST

FOR RADIATED EMISSION TEST (BELOW 1GHZ)

Radiated Emission Test Site					
Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Due Calibration
EMI Test Receiver	Rohde & Schwarz	ESCI	101417	July 3, 2016	July 2, 2017
Trilog Broadband Antenna (25M-1GHz)	SCHWARZBECK	VULB9160	9160-3355	July 3, 2016	July 2, 2017
Signal Amplifier	SCHWARZBECK	BBV 9475	9745-0013	July 3, 2016	July 2, 2017
RF Cable	SCHWARZBECK	AK9515E	96221	July 3, 2016	July 2, 2017
3m Anechoic Chamber	CHENGYU	966	PTS-001	June 2, 2017	June 1, 2018
MULTI-DEVICE Positioning Controller	Max-Full	MF-7802	MF780208339	N/A	N/A
Active loop antenna (9K-30MHz)	Schwarzbeck	FMZB1519	1519-038	June 2, 2017	June 1, 2018
Spectrum analyzer	Agilent	E4407B	MY46185649	June 2, 2017	June 1, 2018
Power Probe	R&S	NRP-Z23	100323	July 24,2016	July 23,2017
RF attenuator	N/A	RFA20db	68	N/A	N/A

FOR RADIATED EMISSION TEST (1GHZ ABOVE)

Radiated Emission Test Site						
Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Due Calibration	
EMI Test Receiver	Rohde & Schwarz	ESCI	101417	July 3, 2016	July 2, 2017	
Horn Antenna (1G-18GHz)	SCHWARZBECK	BBHA9120D	9120D-1246	July 10, 2016	July 9, 2017	
Spectrum Analyzer	Agilent	E4411B	MY4511453	July 3, 2016	July 2, 2017	
Signal Amplifier	SCHWARZBECK	BBV 9718	9718-269	July 6, 2016	July 5, 2017	
RF Cable	SCHWARZBECK	AK9515H	96220	July 7, 2016	July 6, 2017	
3m Anechoic Chamber	CHENGYU	966	PTS-001	June 2, 2017	June 1, 2018	
MULTI-DEVICE Positioning Controller	Max-Full	MF-7802	MF780208339	N/A	N/A	

Horn Ant (18G-40GH	lz) Schwarzbe	eck	BBHA 9170	C	9170-181	June 2, 201	7	June 1, 2018
Power Probe	R&S		NRP-Z23		100323	July 24,201	6	July 23,2017
RF attenuator	N/A		RFA20db		68	N/A		N/A
		Condu	cted Emissio	n Te	st Site			
Name of Equipment	Manufacturer	Mo	del Number	Se	rial Number	Last Calibration	Du	e Calibration
EMI Test Receiver	Rohde & Schwarz		ESCI		101417	July 3, 2016	,	July 2, 2017
Artificial Mains Network	Narda		L2-16B	00	0WX31025	July 7, 2016	,	July 6, 2017
Artificial Mains Network (AUX)	Narda		L2-16B	00	0WX31026	July 7, 2016		July 6, 2017
RF Cable	SCHWARZBECK		AK9515E		96222	July 3, 2016		July 2, 2017
Shielded Room	CHENGYU		843		PTS-002	June 2, 2017	J	June 1, 2018

7. PEAK OUTPUT POWER

7.1. MEASUREMENT PROCEDURE

For peak power test:

- 1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
- 2. Set the EUT Work on the top, middle and the bottom operation frequency individually.
- 3. RBW > the 20 dB bandwidth of the emission being measured, VBW \ge RBW.
- 4. Record the maximum power from the Spectrum Analyzer.

For average power test:

- 1. Connect EUT RF output port to power probe through an RF attenuator.
- 2. Connect the power probe to the PC.
- 3. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
- 4. Record the maximum power from the software.

Note: The EUT was tested according for compliance ANSI C63.10 (2013) requirements.

7.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

PEAK POWER TEST SETUP

RF Attenuator





7.3. LIMITS AND MEASUREMENT RESULT

Mode	Frequency (GHz)	Peak Power (dBm)	Applicable Limits (dBm)	Pass or Fail
	2.402	-0.549	30	Pass
GFSK	2.441	0.880	30	Pass
	2.480	0.979	30	Pass

Mode	Frequency (GHz)	Peak Power (dBm)	Applicable Limits (dBm)	Pass or Fail
	2.402	-1.308	30	Pass
π /4-DQPSK	2.441	-0.032	30	Pass
	2.480	-0.072	30	Pass

Mode	Frequency (GHz)	Peak Power (dBm)	Applicable Limits (dBm)	Pass or Fail
	2.402	-1.353	30	Pass
8DPSK	2.441	-0.107	30	Pass
	2.480	-0.091	30	Pass

8. 20DB BANDWIDTH

8.1. MEASUREMENT PROCEDURE

- 1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
- 2, Set the EUT Work on the top, the middle and the bottom operation frequency individually.
- 3. Set Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hoping channel RBW \geq 1% of the 20 dB bandwidth, VBW \geq RBW; Sweep = auto; Detector function = peak
- 4. Set SPA Trace 1 Max hold, then View.

8.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)



8.3. LIMITS AND MEASUREMENT RESULTS

Mode	Channel.	EBW [KHz]	Verdict
GFSK	LCH	832.1	PASS
GFSK	MCH	827.0	PASS
GFSK	НСН	827.4	PASS
π/4DQPSK	LCH	1126	PASS
π/4DQPSK	MCH	1127	PASS
π/4DQPSK	HCH	1128	PASS
8DPSK	LCH	1121	PASS
8DPSK	MCH	1125	PASS
8DPSK	HCH	1140	PASS

Test Graph













9. CONDUCTED SPURIOUS EMISSION

9.1. MEASUREMENT PROCEDURE

- 1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
- 2. Set the EUT Work on the top, the Middle and the bottom operation frequency individually.
- Set the Span = wide enough to capture the peak level of the in-band emission and all spurious emissions from the lowest frequency generated in the EUT up through the 10th harmonic.
 RBW = 100 kHz; VBW ≥ RBW; Sweep = auto; Detector function = peak.
- 4. Set SPA Trace 1 Max hold, then View.

Note: The EUT was tested according for compliance ANSI C63.10 (2013) requirements. Owing to satisfy the requirements of the number of measurement points, we set the RBW=1MHz, VBW > RBW, scan up through 10th harmonic, and consider the tested results as the worst case, if the tested results conform to the requirement, we can deem that the real tested results(set the RBW=100KHz, VBW > RBW) are conform to the requirement.

9.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

The same as described in section 8.2

9.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6

9.4. LIMITS AND MEASUREMENT RESULT

LIMITS AND MEASUREMENT RESULT					
	Measurement Result				
	Test Data	Criteria			
In any 100 KHz Bandwidth Outside the	At least -20dBc than the limit				
frequency band in which the spread spectrum	Specified on the BOTTOM	PASS			
intentional radiator is operating, the radio frequency	Channel				
power that is produce by the intentional radiator					
shall be at least 20 dB below that in 100KHz					
bandwidth within the band that contains the highest					
level of the desired power.	At least -20dBc than the limit	DASS			
In addition, radiation emissions which fall in the	Specified on the TOP Channel	PASS			
restricted bands, as defined in §15.205(a), must also					
comply with the radiated emission limits specified					
in§15.209(a))					

Test Graph

GFSK-LCH	GFSK-LCH
Knyight Spectrum Analyzer - Swegt SA Strotz Firl RUD Rum To Strotz Sector RUD Rum To Strotz Sector Firld Rum To Strotz Sector Firld Rum To	Knyight Spectrum Analyzer - Swept Sa Kny Spectrum Analyzer - Swept Sa Kn
Ref Offset 1 dB Mkr1 2.404 GHz	Ref Offset 1 dB Mkr1 788.54 MHz Next Peak 10 dB/div Ref 11.00 dBm -68.284 dBm
1.50 Center Freq 5.50000000 GHz 110 X 5052	100 Next Pk Right
20 Start Freq 310 410	200 Next Pk Left
6 0 7 0 7 0	
Start 1.000 GHz Stop 10.000 GHz #VBW 300 kHz Sweep 860.1 ms (1001 pts) #Res BW 100 kHz #VBW 300 kHz Sweep 860.1 ms (1001 pts) Auto Man	Start 0.0300 GHz Stop 1.0000 GHz #Res BW 100 kHz #VBW 300 kHz Sweep 92.73 ms (1001 pts) MkrCF
NMM NMM Y Function Function <td>INFINITORY INC. SCU X Y FUNCTION PUNCTION <t< td=""></t<></td>	INFINITORY INC. SCU X Y FUNCTION PUNCTION PUNCTION <t< td=""></t<>
Scale Type	More 1 of 2
ASO STATUS	ASG STATUS

GFSK-LCH	GFSK-MCH
Image: Strate Control Advances - Strate Control Advances	Ch Start Freq 1.0000000000 GHz Start Freq 1.0000000000 GHz Arg Type: Log Perr Truck pres Turk Frequency PB0: part Frequency Arg Type: Sog Perr Truck pres Turk Frequency
10. dB/div Ref 11.00 dBm -56.477 dBm	Peak Ref Offset 1 dB 0.775 dBm 0.775 dBm
125	Right 40 Center Freq 5.50000000 GH2
270 Next Pk	30 Start Freq 40 1.00000000 GHz
Markert	Deta 00 Stop Freq 10.00000000 GHz 10.000 Chi 2000 Chi 200
Start 10.000 CHz Stop 25.000 CHz #Res BW 100 KHz #VBW 300 KHz Sweep 1.434 s (1001 pts) Inne wcoler ros cu x y Function Function worth Function worth	CF Start 1.000 CHz #Res BW 100 Hz #VEW 300 Hz Sweep 860.1 ms (1001 Hz) #WEW 300 Hz #VEW 300 Hz #VEW 300 Hz #VEW 400 Hz
2 N 1 T 237/0 UN2 -38.4/7 dbm 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	erLvi 2 2 40 0n2 07/2 3000 Freq Offset 0 42
	More 8 Scale Type
MISC	MSG

GFSK-MCH	GFSK-MCH
Knynget Spectra Anlyne - Sen 35 Sen 25 Sen	Arryster Store Part Store Part Arryster Store Part Peak Search Marker 1 24.970000000000 GHz Store Part Arry Type: Log-Part Truck 1 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2
Ref Offset 1 dB Mk/T1 851.59 MHz 10 dB/div ef 11.00 dB/m -68.043 dB/m 100 -68.043 dB/m Next Pk Right 100 - -	Ref Offset1 dB MKr1 24,970 GHz 10 dB/dw -56,797 dBm 100 -56,797 dBm
220	
800 1 800	600 400 700
Start 0.0300 GHz Stop 1.0000 GHz Stop 1.0000 GHz #Res BW 100 Hz #VEW 300 kHz Stop 2.73 ms (1001 pts) MkrCF Function width Function width	Start 10.000 GHz Stop 25.000 GHz #Res BW 100 KHz #VBW 300 KHz Stverep 1.434 s (1001 pts) #Res BW 100 KHz #VBW 300 KHz Stverep 1.434 s (1001 pts)
M I I CONSTANT CONSTANT CONSTANT	A T T ASTOCIAL SOLDANDIN MkrRefLvi
More 9 10 11 11 10 10 10 10 10 10 10 10 10 10	More 10 1 of 2
MSG STATUS	MSG



GFSK-HCH		π/4DQPSK-LCH
Knjight Spectrum Annjarr-Tungt SA Knjight Spectrum Annjarr-Tungt SP Knjight Spectrum Annjarr-T	Peak Search	Crystel Spectrum Analyzer - Sweet SA Sever Entr Aug Nurro III 2013 AN bin 16, 2017 Start Frag 1,00000000 GHz Fize Run Fize Run Avg Type: Log-Pwr Trig: Free Run AvgType: Log-Pwr Trig: Free Run AvgTy
Ref Offset 1 dB Mkr1 25.000 GHz 10 dB/div Ref 11.00 dBm -56.133 dBm	Next Peak	Ber Offset 1 dB Mkr1 2.404 GHz Auto Tune 10 dB/div Ref 11.00 dBm -0.570 dBm Auto Tune
120 200 110 110 110	Next Pk Right	100 Center Freq 00 71.510.0000 GHz
200 200 400	Next Pk Left	20 Start Freq 20 1.00000000 GHz
	Marker Delta	OD Stop Freq 10.00000000000000000000000000000000000
Start 10.000 GHz Stop 25.000 GHz #Res BW 100 kHz #VBW 300 kHz Sweep 1.434 s (1001 pts) Mex Mode Trol Sci. X Y Fauction Hot Hardware N 1 2 2000 GHz Fauction Hot Hardware Fauction Hardware	Mkr→CF	Start 1.000 GHz Stop 10.000 GHz CF Step #Res BW 100 kHz #VBW 300 kHz Sweep 860.1 ms (1001 pts) 900.00000 MHz Imm Mode Tre, St.L X Y FARCTON HDTH FARCTON HDTH FARCTON HDTH FARCTON HDTH
	Mkr→RefLvl	FreqOffset
	More 1 of 2	Scale Type
Kana kana kana kana kana kana kana kana		e status

π/4DQPSK-LCH	π/4DQPSK-LCH
Regist Spectrum, Analyse::	By sight Servers Allowers - benef 5A Servers Allowers - benef 5A By Sight Servers Allowers - benef 5A Servers Allowers - benef 5A Marker 1 24.91000000000000000000000000000000000000
10 dialay ker 11.00 dam -00.01 r 40.01 10	16 geladi Ker 11.00 dem
201	200
30 1 30 1 31 1 32 1	(%) (%)
Start 0.0300 GHz Stop 1.0000 GHz #Res BW 100 kHz #VBW 300 kHz Sweep 92.73 ms (1001 pts) Mkr.→CF	Start 10.000 GHz Stop 25.000 GHz #Res BW 100 kHz #VBW 300 kHz Sweep 1.3.34 s (1001 pts) Mikr—CF #VBW 300 kHz Sweep 1.3.44 s (1001 pts)
N 1 1 7 738.10 MHz 458.911 dBm 2 3 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	N 1 7 24910 GHz -55-311 dBm 2 4 4 4 4 3 4 4 4 4 6 4 4 4 4
More 1 of 2	8 More 10 1 of 2
ASC STATUS	NG STATUS



π/4DQPSK-MCH		π/4DQPSK-HCH
Trysight Spectrum Analyzer: Swegt SA SERIES.2011 ALION AUTO 11:47:32 Million 12:02 W Markker: 1 244,993500000000 GHz Frig: Free Run Avg Type: Log-Pwr Tricd: 2 2 2 2 2 2 3 PIO: Fau: Composition Frig: Free Run Avg Type: Log-Pwr Tricd: 2 2 2 2 2 3	Peak Search	
Ref Offset 1 dB Mkr1 24.985 GHz 10 dB/div Ref 11.00 dBm -56.340 dBm	Next Peak	Ref Offset1 dB Mkr1 2.476 GHz Auto Tune 10 dBddiv Ref 11.00 dBm -1.572 dBm Auto Tune
100 000 000	Next Pk Right	100 Center Freq 800 State Sta
00 00 00	Next Pk Left	30 Start Freq 30
	Marker Delta	000 Stop Freq 73 0 0
Start 10.000 GHz Stop 25.000 GHz Stop 25.000 GHz #Res BW 100 kHz #VBW 300 kHz Sweep 1.434 s (1001 pts) Mwi tooging Ficilistic x y Function Function	Mkr→CF	Start 1.000 CHz Stop 10.000 CHz Stop 10.0
N 1 7 24985 GHz -66,340 dBm	Mkr→RefLvl	N 1 f 2.476 GHz -1.572 dBm 3 - - - - - 4 - - - - - - 5 - - - - - 0 Hz 0 Hz 6 - - - - - 0 Hz 0 Hz
	More 1 of 2	Scale Type
MSG		ISG STATUS



	11-48-32 AM Jun 10, 2017	UGN AUTO		ENSE-INT			um Analyzer - Swept SA	Keysight Spec
Peak Search	TRACE 1 2 3 4 5 0	Log-Pwr 10/10	Avg Type	ee Run	Tria: Fr	IHz	89.510000000 N	Marker 1
NextPa	DET			20 dB	#Atten:	IFGain:Low		
Nextre	1 789.51 MHz -68.242 dBm	Mkr					Ref Offset 1 dB Ref 11 00 dBm	10 dB/div
				Ť				Log
Next Pk Rig								
	EL1-21-60 dBm							-19.0
								-29.0
Next Pk L								-39.0
								-49.0
Markey D.		•1-						-59.0
MarkerDe	and a stand of the	had for the second shadowed as the second	موستهما وترسيم مسمو		والسلام والمحافظ	As an a she had a set		-89.0
Mkr→	73 ms (1001 pts)	weep 92.	\$	z	N 300 kH	#VB	00 kHz	#Res BW
	FUNCTION VALUE	TION WIDTH	CTION FUN	R.	Y		SCL X	MKR MODE TRI
				IBm	-68.242	9.51 MHz	f 78	1 N 1 2
Mkr→Ref								3
						_		6
M						_		8
4.								10

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8DPSK-LCH		8DPSK-MCH
Weight Spectrum Adapter: Solid State Strict Strift ALLOR AUTO 11.54 52 AHAo 18, 2817 Warker 1 24,255000000000 CHz Trig: Free Rung Avg Type: Log-Evr Trict: Free Rung Avg Type: Log-Evr With Fact Strift Trig: Free Rung Avg Type: Log-Evr Trict: Free Rung Avg Type: Log-Evr	Peak Search	Start Freq 1.00000000 GHz Strict Intl Autor Auto 119739.4k/bn 19,307 Start Freq 1.00000000 GHz Tig: Pre Ban Avg Type Log-Pwr Tig: Strate Ban
Ref Offset 1 dB 10 dB/div Ref 11.00 dBm -55.770 dBm	Next Peak	Ref Offset 1 dB Mkr1 2.440 GHz Auto Tune 10 dBldiv Ref 11.00 dBm -0.998 dBm
	Next Pk Right	100 Center Freq 000 No.21000
200 .90 .00	Next Pk Left	23.0 Start Freq 33.0 10000000 GHz 40.0
	Marker Delta	Stop Freq Stop Freq Stop Freq 10.00000000 GHz
Start 10.000 CHz Stop 25.000 GHz #Res BW 100 kHz #VBW 300 kHz Sweep 1.434 s (1001 pts) Wm M00E Hr Sk1 x y Farcton Verbill Participation	Mkr→CF	Start 1.000 CHz Stop 10.000 CHz CF step 900 coccord Hz RFK SEW 100 KHz #VEW 300 KHz Sweep 860.11ms (1001 pts) Auto Auto Auto MM IOSE (FS SL) x Y FACTOR: Factors with
N 1 1 7 24265 GHz -55.770 dBm	Mkr→RefLvl	N 1 f 2.440 GHz -0.999 dBm 2 -
	More 1 of 2	Scale Type
		4 TATUS





8DPSK-HCH	
Repute Spectrum Analysis See 15 So AC SERVED IT ALLON AUTO 11 SP 59 A Warrkor 1 24.5550000000000 GHz Trig: Free Run PNDC Fast Arrg Type: Log-Pur Aug/Holds >1010 Tray	All Jun 10, 2017 Peak Search DET PHILING
Ref Offset 1 dB Mkr1 24. 10 dBlolv Ref 11.00 dBm -56.7 10	955 GHz 701 dBm Next Pk Right
20 20 20 20 20 20 20 20 20 20 20 20 20 2	Next Pk Left
	Marker Delta
Start 10.000 GHz Stop 25 #Res BW 100 kHz #VBW 300 kHz Sweep 1.434 s IMM MODE TRC: SCI X Y Function Function Function	5.000 GHz (1001 pts) Mkr→CF
2 N I I A ANY OTA 90.771000	Mkr→RefLvi
7 9 10 11	More 1 of 2
MSC STATUS	

10. RADIATED EMISSION

10.1. MEASUREMENT PROCEDURE

- 1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
- 2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
- 3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
- 4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
- 5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
- 6. For emissions above 1GHz, use 1MHz VBW and RBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer. The EUT was placed on the top of the turntable 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
- 7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum values.
- 8.If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
- 9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High - Low scan is not required in this case.

The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting	
Start ~Stop Frequency	9KHz~150KHz/RB 200Hz for QP	
Start ~Stop Frequency	150KHz~30MHz/RB 9KHz for QP	
Start ~Stop Frequency	30MHz~1000MHz/RB 120KHz for QP	
Start Stan Fraguanay	1GHz~26.5GHz	
Start ~Stop Frequency	1MHz/1MHz for Peak, 1MHz/10Hz for Average	

Receiver Parameter	Setting
Start ~Stop Frequency	9KHz~150KHz/RB 200Hz for QP
Start ~Stop Frequency	150KHz~30MHz/RB 9KHz for QP
Start ~Stop Frequency	30MHz~1000MHz/RB 120KHz for QP

10.2. TEST SETUP



RADIATED EMISSION TEST SETUP 30MHz-1000MHz





10.3. TEST RESULT

RADIATED EMISSION BELOW 30MHZ

No emission found between lowest internal used/generated frequencies to 30MHz.

RADIATED EMISSION BELOW 1GHZ

RADIATED EMISSION TEST- (30MHZ-1GHZ) -HORIZONTAL



No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
	·	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	cm	degree		
1		52.6333	7.84	8.41	16.25	40.00	-23.75	peak			
2		139.9333	1.77	15.17	16.94	43.50	-26.56	peak			
3		353.3333	2.15	18.76	20.91	46.00	-25.09	peak			
4		602.3000	3.03	23.74	26.77	46.00	-19.23	peak			
5	*	835.1000	3.48	27.31	30.79	46.00	-15.21	peak			
6		964.4333	2.59	29.86	32.45	54.00	-21.55	peak			

RESULT: PASS



RADIATED EMISSION TEST- (30MHZ-1GHZ) -VERTICAL

RESULT: PASS

Note: 1. Factor=Antenna Factor + Cable loss, Margin=Measurement-Limit.

2. The "Factor" value can be calculated automatically by software of measurement system.

3. All test modes had been pre-tested. The GFSK mode at low channel is the worst case and recorded in the report.

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector	Comment
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре	Common
			Low Channel (2402	2 MHz)			
4804	63.97	-3.62	60.35	74	-13.65	Pk	Vertical
4804	46.95	-3.62	43.33	54	-10.67	AV	Vertical
7206	61.83	-0.9	60.93	74	-13.07	pk	Vertical
7206	43.72	-0.9	42.82	54	-11.18	AV	Vertical
4804	63.54	-3.64	59.90	74	-14.10	Pk	Horizontal
4804	47.32	-3.64	43.68	54	-10.32	AV	Horizontal
			Mid Channel (2441	l MHz)			
4882	63.04	-3.65	59.39	74	-14.61	Pk	Vertical
4882	46.65	-3.65	43.00	54	-11.00	AV	Vertical
7323	59.72	-0.82	58.90	74	-15.10	Pk	Vertical
7323	43.51	-0.82	42.69	54	-11.31	AV	Vertical
4882	64.63	-3.68	60.95	74	-13.05	Pk	Horizontal
4882	46.10	-3.68	42.42	54	-11.58	AV	Horizontal
			High Channel (248	0 MHz)		-	
4960	64.95	-3.59	61.36	74	-12.64	pk	Vertical
4960	46.52	-3.59	42.93	54	-11.07	AV	Vertical
4960	63.79	-3.59	60.20	74	-13.80	pk	Horizontal
4960	44.62	-3.59	41.03	54	-12.97	AV	Horizontal

RADIATED EMISSION TEST- (ABOVE 1GHZ)

Note:

1) 30MHz~25GHz:(Scan with GFSK, π /4-DQPSK,8DPSK, the worst casw is GFSK Mode)

2) Factor = Antenna Factor + Cable Loss - Pre-amplifier.

Emission Level = Meter Reading + Factor Margin = Emission Leve - Limit

RESULT: PASS

11. BAND EDGE EMISSION

11.1. MEASUREMENT PROCEDURE

- 1. The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100kHz. The video bandwidth is set to 300kHz.
- 2. Transmitter set to the normal hopping mode at 2.4 and 2.4835 GHz.

11.2. TEST SET-UP

Radiated same as 10.2

Conducted set up



Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector	Comment
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре	
			GF	SK			
2399.9	61.20	-12.99	48.21	74	-25.79	peak	Vertical
2399.9	55.51	-12.99	42.52	54	-11.48	AVG	Vertical
2399.9	62.17	-12.99	49.18	74	-24.82	peak	Horizontal
2399.9	53.43	-12.99	40.44	54	-13.56	AVG	Horizontal
2483.6	61.98	-12.78	49.20	74	-24.80	peak	Vertical
2483.6	52.58	-12.78	39.80	54	-14.20	AVG	Vertical
2483.6	63.59	-12.78	50.81	74	-23.19	peak	Horizontal
2483.6	51.54	-12.78	38.76	54	-15.24	AVG	Horizontal
			π/4-D	QPSK			
2399.9	63.46	-12.99	50.47	74	-23.53	peak	Vertical
2399.9	55.37	-12.99	42.38	54	-11.62	AVG	Vertical
2399.9	64.88	-12.99	51.89	74	-22.11	peak	Horizontal
2399.9	52.16	-12.99	39.17	54	-14.83	AVG	Horizontal
2483.6	62.27	-12.78	49.49	74	-24.51	peak	Vertical
2483.6	51.56	-12.78	38.78	54	-15.22	AVG	Vertical
2483.6	61.22	-12.78	48.44	74	-25.56	peak	Horizontal
2483.6	51.20	-12.78	38.42	54	-15.58	AVG	Horizontal
			8DF	PSK			
2399.9	62.77	-12.99	49.78	74	-24.22	peak	Vertical
2399.9	54.78	-12.99	41.79	54	-12.21	AVG	Vertical
2399.9	62.65	-12.99	49.66	74	-24.34	peak	Horizontal
2399.9	52.89	-12.99	39.90	54	-14.10	AVG	Horizontal
2483.6	62.67	-12.78	49.89	74	-24.11	peak	Vertical
2483.6	51.54	-12.78	38.76	54	-15.24	AVG	Vertical
2483.6	62.62	-12.78	49.84	74	-24.16	peak	Horizontal
2483.6	53.59	-12.78	40.81	54	-13.19	AVG	Horizontal

11.3. Radiated TEST RESULT

RESULT: PASS

Note: The other modes radiation emission have enough 20dB margin.

Factor=Antenna Factor + Cable loss - Amplifier gain, Over=Measure-Limit.

The "Factor" value can be calculated automatically by software of measurement system.

11.4 Conducted TEST RESULT

Test Graph



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Note: All modes were tested, only the worst case record in the report.

12. NUMBER OF HOPPING FREQUENCY

12.1. MEASUREMENT PROCEDURE

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum analyzer.
- 3. Set the spectrum analyzer Start = 2.4GHz Stop = 2.4835GHz
- 4. Set the Spectrum Analyzer as RBW>=1%span, VBW>=RBW.

12.2. TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)

Same as described in section 8.2

12.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6

12.4. LIMITS AND MEASUREMENT RESULT

Mode	Channel.	Number of Hopping Channel	Verdict
GFSK	Нор	79	PASS

Note: All modes were tested, only the worst case record in the report.

Test Graph



13. TIME OF OCCUPANCY (DWELL TIME)

13.1. MEASUREMENT PROCEDURE

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

1. Span: Zero span, centered on a hopping channel.

2. RBW shall be \leq channel spacing and where possible RBW should be set >> 1 / T, where T is the expected dwell time per channel.

3. Sweep: As necessary to capture the entire dwell time per hopping channel; where possible use a video trigger and trigger delay so that the transmitted signal starts a little to the right of the start of the plot. The trigger level might need slight adjustment to prevent triggering when the system hops on an adjacent channel; a second plot might be needed with a longer sweep time to show two successive hops on a channel.

4. Detector function: Peak. Trace: Max hold.

5. Use the marker-delta function to determine the transmit time per hop.

6. Repeat the measurement using a longer sweep time to determine the number of hops over the period specified in the requirements. The sweep time shall be equal to, or less than, the period specified in the requirements. Determine the number of hops over the sweep time and calculate the total number of hops in the period specified in the requirements, using the following equation:

(Number of hops in the period specified in the requirements) = (number of hops on spectrum analyzer) \times (period specified in the requirements / analyzer sweep time)

7. The average time of occupancy is calculated from the transmit time per hop multiplied by the number of hops in the period specified in the requirements.

13.2. TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)

Same as described in section 8.2

13.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6

13.4. LIMITS AND MEASUREMENT RESULT

Channel.	Burst Width [ms/hop/ch]	Number of hops in the period specified in the requirements	Dwell Time[ms]	Verdict	Limit (ms)
LCH	2.875	14*6.32	254.38	PASS	400
MCH	2.880	14*6.32	254.8224	PASS	400
HCH	2.880	12*6.32	218.4192	PASS	400

Note: The 8-DPSK modulation is the worst case and recorded in the report.

(period specified in the requirements / analyzer sweep time)=(79*0.4)/5=6.32

(Number of hops in the period specified in the requirements)=6.32* number of hops on spectrum analyzer

Dwell Time= Burst Width*(Number of hops in the period specified in the requirements)

Test Graph





GFSK	-HCH	GFSK-HCH						
Keylight Spectrum Analyzer - Swept SA For Sec. AC Sec. AC Sec. Sec. Sec. Sec. Sec. Sec. Sec. S	ALIGN AUTO 0445747 PH Jun 10, 2017 Avg Type: Log-Pwr Trace 12.2 1 Frequency Trace 12.2 1 Frequency	Conter Freq 2.480000000 GHz: Fast ++- Frequency Frequ						
Ref Offset 1 dB 10 dB/div Ref 11.00 dBm	ΔMkr1 2.880 ms Auto Tune -1.15 dB	10 dB/div Ref 0ffset 1 dB Log dB/div Ref 11.00 dBm						
1.00 Xz	1∆2 ★ Center Freq 2.480000000 GHz	Center Freq Center Freq 2.48000000 GHz						
-9 00	Start Freq 2.480000000 GHz	0.00 Start Freq (30) 2.480000000 GHz						
38.0	Stop Freq 2.48000000 GHz	320 - Stop Freq 2.48000000 GHz						
-690	CF Step 1.00000 MHz Auto Man	es						
	Freq Offset 0 Hz	0 D Freq Offset 0 Hz						
	Scale Type	Scale Type						
Center 2.480000000 GHz Res BW 1.0 MHz #VBW 3.0 MHz	Span 0 Hz Sweep 5.000 ms (1001 pts)	Center 2.480000000 GHz Span 0 Hz Lo Res BW 1.0 MHz #VBW 3.0 MHz Sweep 5.000 s (1001 pts)						

14. FREQUENCY SEPARATION

14.1. MEASUREMENT PROCEDURE

- 1. Place the EUT on the table and set it in transmitting mode
- 2. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum analyzer
- Set Span = wide enough to capture the peaks of two adjacent channels Resolution (or IF) Bandwidth (RBW) ≥ 1% of the span Video (or Average) Bandwidth (VBW) ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold

14.2. TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)

Same as described in section 6.2

14.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6.3

14.4. LIMITS AND MEASUREMENT RESULT

Mode	Channel.	Carrier Frequency Separation [MHz]	Verdict
8DPSK	Нор	0.999	PASS

Note: All modes were tested, only the worst case record in the report.

Test Graph



15. FCC LINE CONDUCTED EMISSION TEST

15.1. LIMITS OF LINE CONDUCTED EMISSION TEST

Frequency	Maximum RF Line Voltage							
Frequency	Q.P.(dBuV)	Average(dBuV)						
150kHz~500kHz	66-56	56-46						
500kHz~5MHz	56	46						
5MHz~30MHz	60	50						

Note:

1. The lower limit shall apply at the transition frequency.

2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

15.2. BLOCK DIAGRAM OF LINE CONDUCTED EMISSION TEST



15.3. PRELIMINARY PROCEDURE OF LINE CONDUCTED EMISSION TEST

- The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
- 2. Support equipment, if needed, was placed as per ANSI C63.10.
- 3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.
- 4. All support equipments received AC120V/60Hz power from a LISN, if any.
- 5. The EUT received DC charging voltage by adapter which received 120V/60Hzpower by a LISN..
- 6. The test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- 7. Analyzer / Receiver scanned from 150 kHz to 30MHz for emissions in each of the test modes.
- 8. During the above scans, the emissions were maximized by cable manipulation.
- 9. The test mode(s) were scanned during the preliminary test.

Then, the EUT configuration and cable configuration of the above highest emission level were recorded for reference of final testing.

15.4. FINAL PROCEDURE OF LINE CONDUCTED EMISSION TEST

- 1. EUT and support equipment was set up on the test bench as per step 2 of the preliminary test.
- A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. If EUT emission level was less –2dB to the A.V. limit in Peak mode, then the emission signal was re-checked using Q.P and Average detector.
- 3. The test data of the worst case condition(s) was reported on the Summary Data page.

15.5. TEST RESULT OF LINE CONDUCTED EMISSION TEST



Line Conducted Emission Test Line 1-L

No.	Freq. (MHz)	Reading_Level (dBuV)			Correct Factor	Measurement (dBuV)			Limit (dBuV)		Margin (dB)		P/F	Comment
		Peak	QP	AVG	dB	Peak	QP	AVG	QP	AVG	QP	AVG		
1	0.2580	40.84		28.00	10.27	51.11		38.27	61.49	51.49	-10.38	-13.22	Р	
2	0.5620	37.98		29.51	10.34	48.32		39.85	56.00	46.00	-7.68	-6.15	Р	
3	1.7019	36.98		24.70	10.32	47.30		35.02	56.00	46.00	-8.70	-10.98	Р	
4	3.6299	36.40		24.06	10.49	46.89		34.55	56.00	46.00	-9.11	-11.45	Р	
5	4.2857	37.23		24.12	10.30	47.53		34.42	56.00	46.00	-8.47	-11.58	Р	
6	18.1018	40.18		26.92	10.12	50.30		37.04	60.00	50.00	-9.70	-12.96	Р	



Line Conducted Emission Test Line 2-N

No. Freq. (MHz)	Reading_Level (dBuV)			Correct Factor	Measurement (dBuV)			Limit (dBuV)		Margin (dB)		P/F	Comment	
	(MHz)	Peak	QP	AVG	dB	Peak	QP	AVG	QP	AVG	QP	AVG		
1	0.5700	37.13		26.23	10.34	47.47		36.57	56.00	46.00	-8.53	-9.43	Р	
2	1.7420	37.78		25.25	10.30	48.08		35.55	56.00	46.00	-7.92	-10.45	Р	
3	2.3820	37.19		24.38	10.38	47.57		34.76	56.00	46.00	-8.43	-11.24	Р	
4	4.3659	36.32		24.68	10.27	46.59		34.95	56.00	46.00	-9.41	-11.05	Ρ	
5	5.2979	39.42		26.67	10.25	49.67		36.92	60.00	50.00	-10.33	-13.08	Р	
6	20.2380	39.42		25.75	10.11	49.53		35.86	60.00	50.00	-10.47	-14.14	Р	

APPENDIX A: PHOTOGRAPHS OF TEST SETUP

FCC LINE CONDUCTED EMISSION TEST SETUP



FCC RADIATED EMISSION TEST SETUP





----END OF REPORT----