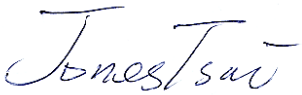
Variant FCC RF Test Report

APPLICANT	:	DELL Inc.
EQUIPMENT	:	Tablet PC
BRAND NAME	:	Dell
MODEL NAME	:	T02D; T02D003
TYPE NAME	:	T02D003
FCC ID	:	E2K-T02D003
STANDARD	:	FCC Part 15 Subpart C §15.247
CLASSIFICATION	:	(DSS) Spread Spectrum Transmitter

This is a variant report which is only valid together with the original test report. The product was received on Jul. 09, 2014 and testing was completed on Sep. 14, 2014. We, SPORTON INTERNATIONAL (KUNSHAN) INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures and the testing has shown the tested sample to be in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL (KUNSHAN) INC., the test report shall not be reproduced except in full.

Reviewed by: Joseph Lin / Supervisor



Approved by: Jones Tsai / Manager

Testing Laboratory
2627

SPORTON INTERNATIONAL (KUNSHAN) INC.
No. 3-2, PingXiang Road, Kunshan, Jiangsu Province, P.R.C.

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR431806-02A	Rev. 01	This is a variant report for T02D; T02D003. The product equality declaration could be refer to Appendix B. Based on the similarity between two models, only the worst cases of radiated spurious emission from original test report (Sporton Report Number FR431806A) were verified for the differences.	Oct. 23, 2014

SUMMARY OF TEST RESULT

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
3.1	15.247(d)	RSS-210 A8.5	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 10.77 dB at 2483.500 MHz

1 General Description

1.1 Applicant

DELL Inc.
One Dell Way, Round Rock, Texas 78682, United States

1.2 Manufacturer

DELL Inc.
One Dell Way, Round Rock, Texas 78682, United States

1.3 Feature of Equipment Under Test

Product Feature	
Equipment	Tablet PC
Brand Name	Dell
Model Name	T02D; T02D003
Type Name	T02D003
FCC ID	E2K-T02D003
EUT supports Radios application	WLAN 2.4GHz 802.11b/g/n HT20/HT40/ WLAN 5GHz 802.11a/n HT20/HT40/ WLAN 5GHz 802.11ac VHT20/VHT40/VHT80/ Bluetooth v3.0 + EDR/Bluetooth v4.0 LE
HW Version	MP
SW Version	YTP802A110830
EUT Stage	Identical Prototype

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.4 Product Specification of Equipment Under Test

Product Specification subjective to this standard	
Tx/Rx Frequency Range	2402 MHz ~ 2480 MHz
Number of Channels	79
Carrier Frequency of Each Channel	2402+n*1 MHz; n=0~78
Antenna Type	IFA Antenna
Type of Modulation	Bluetooth BR (1Mbps) : GFSK Bluetooth EDR (2Mbps) : π/4-DQPSK Bluetooth EDR (3Mbps) : 8-DPSK

1.5 Modification of EUT

No modifications are made to the EUT during all test items.

1.6 Testing Location

Test Site	SPORTON INTERNATIONAL (KUNSHAN) INC.	
Test Site Location	No. 3-2, PingXiang Road, Kunshan, Jiangsu Province, P.R.C. TEL: +86-0512-5790-0158 FAX: +86-0512-5790-0958	
Test Site No.	**Sporton Site No.**	**FCC/IC Registration No.**
	03CH01-KS	149928/4086E-1

Note: The test site complies with ANSI C63.4 2003 requirement.

1.7 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15 Subpart C §15.247
- FCC Public Notice DA 00-705
- ANSI C63.4-2003

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

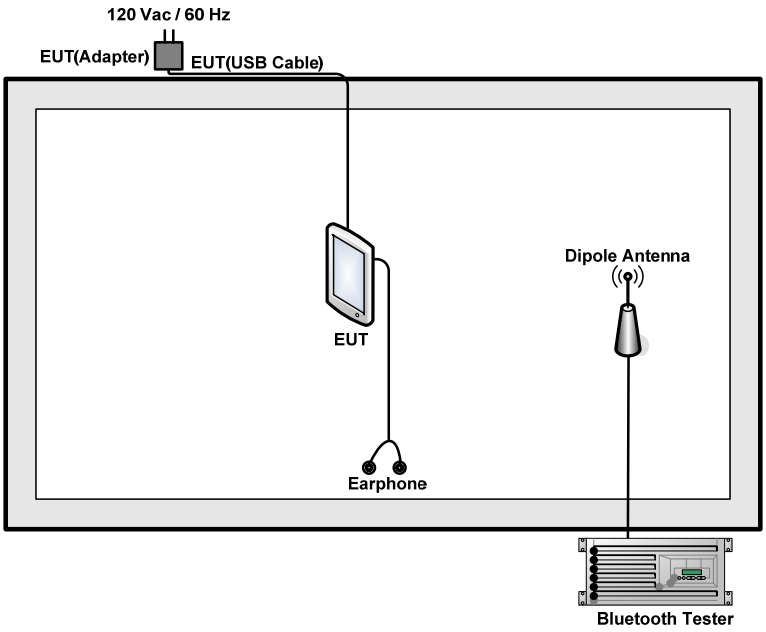
2 Test Configuration of Equipment Under Test

2.1 Test Mode

The following summary table is showing all test modes to demonstrate in compliance with the standard.

Summary table of Test Cases	
Test Item	**Data Rate / Modulation**
Radiated	**Bluetooth BR 1Mbps GFSK**
Test Cases	Mode 1: CH78_2480 MHz
Remark: For radiated test cases, the tests were performed with adapter, earphone and USB cable.	

2.2 Connection Diagram of Test System



2.3 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Bluetooth Base Station	R&S	CBT	N/A	N/A	Unshielded, 1.8 m
2.	Earphone	Lenovo	SH100	FCC DoC	Unshielded, 1.6 m	N/A

2.4 EUT Operation Test Setup

For Bluetooth function, the engineering test program was provided and enabled to make EUT connect with Bluetooth base station to continuous transmit/receive.

3 Test Result

3.1 Radiated Band Edges and Spurious Emission Measurement

3.1.1 Limit of Radiated Band Edges and Spurious Emission

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. In addition, radiated emissions which fall in the restricted bands must also comply with the FCC section 15.209 limits as below.

Frequency (MHz)	Field Strength (microvolts/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

3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

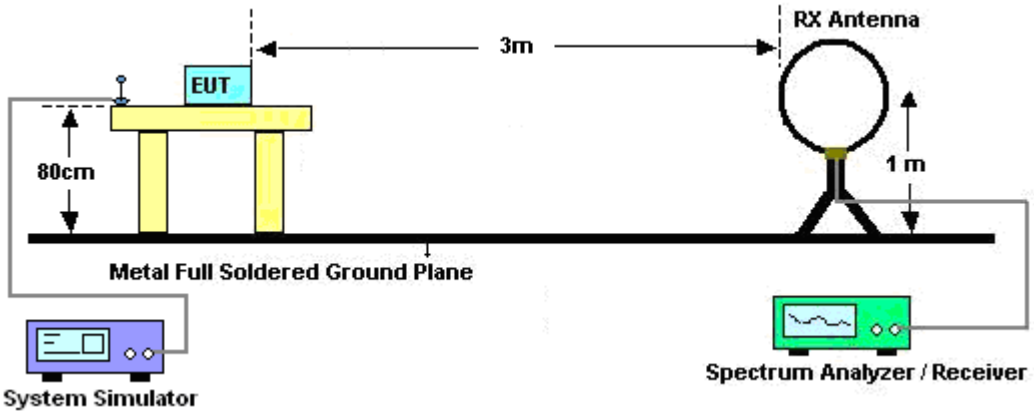
3.1.3 Test Procedures

1. The testing follows the guidelines in Spurious Radiated Emissions of FCC Public Notice DA 00-705 Measurement Guidelines.
1. The EUT was placed on a turntable with 0.8 meter above ground.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
4. Set to the maximum power setting and enable the EUT transmit continuously.
5. Use the following spectrum analyzer settings:
   (1) Span shall wide enough to fully capture the emission being measured;
   (2) Set RBW=100 kHz for f < 1 GHz, RBW=1MHz for f>1GHz ; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold for peak
   (3) For average measurement: use duty cycle correction factor method per 15.35(c).
   Duty cycle = On time/100 milliseconds
   On time = $N_1*L_1+N_2*L_2+...+N_{n-1}*LN_{n-1}+N_n*L_n$
   Where N_1 is number of type 1 pulses, L_1 is length of type 1 pulses, etc.
   Average Emission Level = Peak Emission Level + 20*log(Duty cycle)
6. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

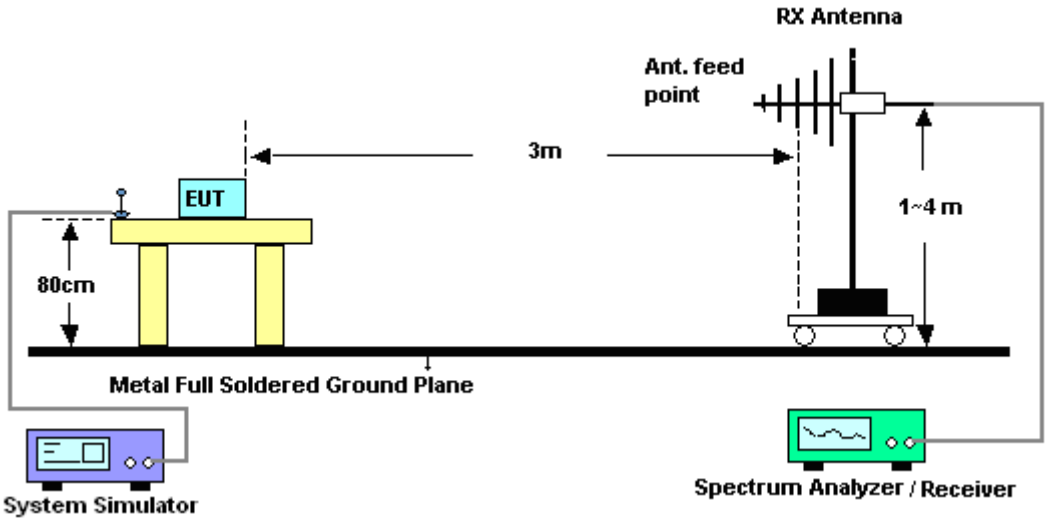
Note: The average levels were calculated from the peak level corrected with duty cycle correction factor (-24.73dB) derived from 20log (dwell time/100ms). This correction is only for signals that hop with the fundamental signal, such as band-edge and harmonic. Other spurious signals that are independent of the hopping signal would not use this correction.

3.1.4 Test Setup

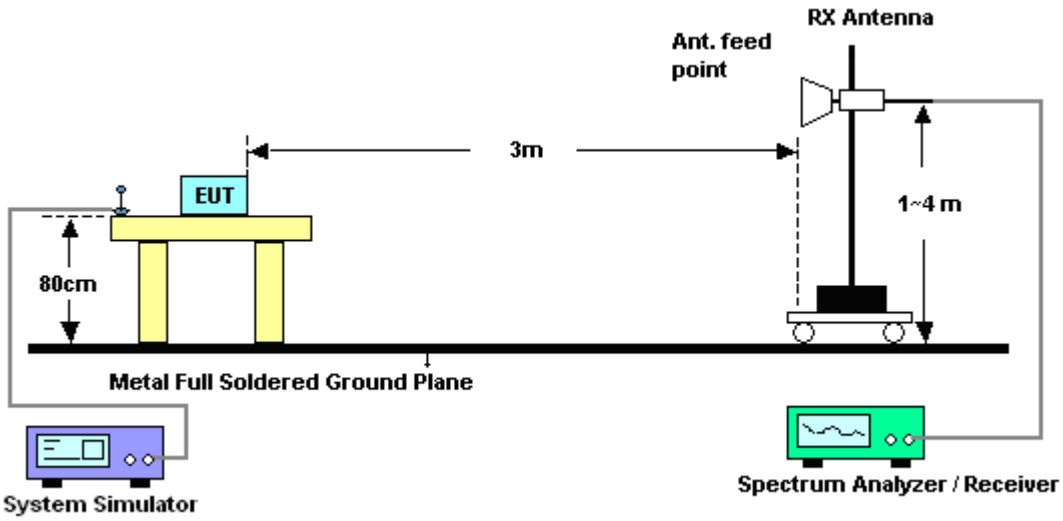
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz

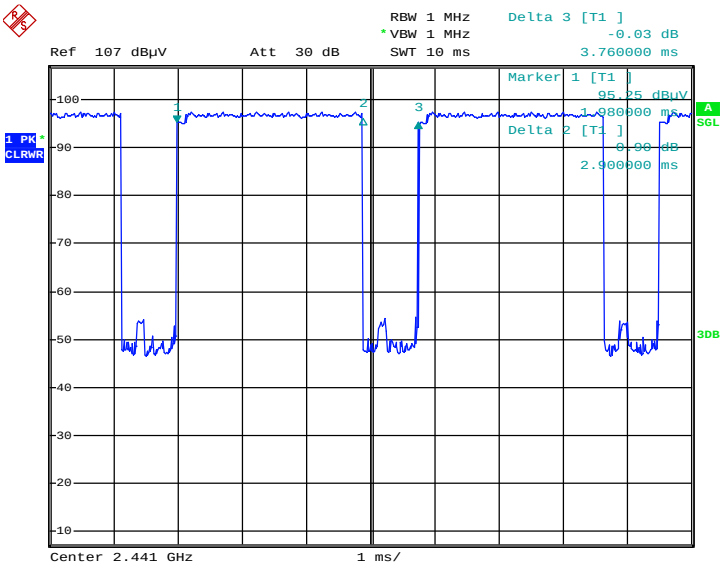


3.1.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

3.1.6 Duty cycle correction factor for average measurement

DH5 on time (One Pulse) Plot on Channel 78



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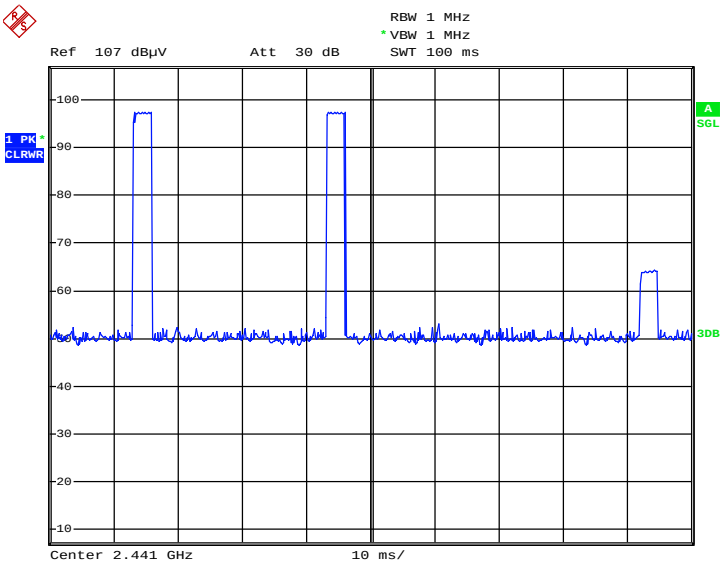
DH5 on time (Count Pulses) Plot on Channel 78



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Note:

1. Worst case Duty cycle = on time/100 milliseconds = 2 * 2.90 / 100 = 5.80 %
2. Worst case Duty cycle correction factor = 20*log(Duty cycle) = -24.73 dB
3. DH5 has the highest duty cycle worst case and is reported.

Duty Cycle Correction Factor Consideration for AFH mode:

Bluetooth normal hopping rate is 1600Hz and reduced to 800Hz in AFH mode; due to the reduced number of hopping frequencies, with the same packet configuration the dwell time in each channel frequency within 100msec period is longer in AFH mode than normal mode.

In AFH mode, the minimum hopping frequencies are 20, to get the longest dwell time DH5 packet is observed; the period to have DH5 packet completing one hopping sequence is

2.90 ms x 20 channels = 58.0 ms

There cannot be 2 complete hopping sequences within 100ms period, considering the random hopping behavior, maximum 2 hops can be possibly observed within the period. [100ms / 57.6ms] = 2 hops

Thus, the maximum possible ON time:

2.90 ms x 2 = 5.80 ms

Worst case Duty Cycle Correction factor, which is derived from the maximum possible ON time,

20 x log(5.80 ms/100ms) = -24.73 dB

3.1.7 Test Result of Radiated Spurious at Band Edges

Test Mode :	1Mbps	**Temperature :**	22~23°C
Test Channel :	78	**Relative Humidity :**	40~41%
		Test Engineer :	Jun Liu

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	**Level (dBµV/m)**	**Over Limit (dB)**	**Limit Line (dBµV/m)**	**Read Level (dBµV)**	**Antenna Factor (dB)**	**Cable Loss (dB)**	**Preamp Factor (dB)**	**Ant Pos (cm)**	**Table Pos (deg)**	**Remark**
2483.5	63.23	-10.77	74	59.86	33.01	3.65	33.29	111	129	Peak
2483.5	38.50	-15.50	54	-	-	-	-	-	-	Average

ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	**Level (dBµV/m)**	**Over Limit (dB)**	**Limit Line (dBµV/m)**	**Read Level (dBµV)**	**Antenna Factor (dB)**	**Cable Loss (dB)**	**Preamp Factor (dB)**	**Ant Pos (cm)**	**Table Pos (deg)**	**Remark**
2483.5	62.88	-11.12	74	59.51	33.01	3.65	33.29	100	93	Peak
2483.5	38.15	-15.85	54	-	-	-	-	-	-	Average

Note: Average Emission Level = Peak Emission Level + duty cycle correction factor(-24.73dB)

3.1.8 Test Result of Radiated Spurious Emission (30MHz ~ 10th Harmonic)

Test Mode :	1Mbps	**Temperature :**	22~23°C
Test Channel :	78	**Relative Humidity :**	40~41%
Test Engineer :	Jun Liu	**Polarization :**	Horizontal
Remark :	1. 2480 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
31.94	23.83	-16.17	40	40.36	16.55	0.5	33.58	100	158	Peak
88.2	27.2	-16.3	43.5	51.65	8.3	0.87	33.62	-	-	Peak
137.67	24.43	-19.07	43.5	45.9	11.05	1.07	33.59	-	-	Peak
179.38	26	-17.5	43.5	49.88	8.47	1.22	33.57	-	-	Peak
481.05	21.84	-24.16	46	36.11	16.89	2	33.16	-	-	Peak
684.75	20.86	-25.14	46	32.19	19.2	2.37	32.9	-	-	Peak
2480	102.26	-	-	98.89	33.01	3.65	33.29	111	129	Peak
2480	77.53	-	-	-	-	-	-	111	129	Average
4960	46.21	-27.79	74	39.48	35.2	5.33	33.8	100	25	Peak
7440	47.71	-26.29	74	38.87	36.27	6.75	34.18	100	194	Peak

Note: 1. Other harmonics are lower than background noise.

2. Average Emission Level = Peak Emission Level + duty cycle correction factor(-24.73)

Test Mode :	1Mbps	Temperature :	22~23°C
Test Channel :	78	Relative Humidity :	40~41%
Test Engineer :	Jun Liu	Polarization :	Vertical
Remark :	1. 2480 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
34.85	26.99	-13.01	40	44.96	15.1	0.54	33.61	-	-	Peak
66.86	27.82	-12.18	40	55.4	5.25	0.76	33.59	100	41	Peak
170.65	25.57	-17.93	43.5	48.8	9.14	1.2	33.57	-	-	Peak
234.67	23.78	-22.22	46	44.6	11.23	1.42	33.47	-	-	Peak
434.49	20.84	-25.16	46	35.92	16.22	1.93	33.23	-	-	Peak
748.77	23.62	-22.38	46	34.05	19.89	2.46	32.78	-	-	Peak
2480	102.78	-	-	99.41	33.01	3.65	33.29	100	93	Peak
2480	78.05	-	-	-	-	-	-	100	93	Average
4960	46.34	-27.66	74	39.61	35.2	5.33	33.8	100	201	Peak
7440	47.79	-26.21	74	38.95	36.27	6.75	34.18	100	61	Peak

Note: 1. Other harmonics are lower than background noise.

2. Average Emission Level = Peak Emission Level + duty cycle correction factor(-24.73)

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
EMI Test Receiver	R&S	ESCI	100534	9kHz~3GHz	Nov. 05, 2013	Sep. 14, 2014	Nov. 04, 2014	Radiation (03CH01-KS)
Spectrum Analyzer	R&S	FSP30	101399	9kHz~30GHz	May 04, 2014	Sep. 14, 2014	May 03, 2015	Radiation (03CH01-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Oct. 09, 2013	Sep. 14, 2014	Oct. 08, 2014	Radiation (03CH01-KS)
Bilog Antenna	SCHAFFNER	CBL6112D	23182	25MHz~2GHz	Jan. 08, 2014	Sep. 14, 2014	Jan. 07, 2015	Radiation (03CH01-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	75959	1GHz~18GHz	Jan. 08, 2014	Sep. 14, 2014	Jan. 07, 2015	Radiation (03CH01-KS)
Active Horn Antenna	com-power	AHA-118	701030	1GHz~18GHz	Nov. 18, 2013	Sep. 14, 2014	Nov. 17, 2014	Radiation (03CH01-KS)
SHF-EHF Horn	Schwarzbeck	BBHA 9170	BBHA170249	15GHz~40GHz	Mar. 10, 2014	Sep. 14, 2014	Mar. 09, 2015	Radiation (03CH01-KS)
Amplifier	com-power	PA-103A	161073	1MHz~1GHz	May 04, 2014	Sep. 14, 2014	May 03, 2015	Radiation (03CH01-KS)
Amplifier	Agilent	8449B	3008A02371	1GHz~26.5GHz	Dec. 10, 2013	Sep. 14, 2014	Dec. 09, 2014	Radiation (03CH01-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Sep. 14, 2014	NCR	Radiation (03CH01-KS)
Turn Table	MF	MF7802	N/A	0~360 degree	NCR	Sep. 14, 2014	NCR	Radiation (03CH01-KS)

5 Uncertainty of Evaluation

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**2.5**

Appendix B. Product Equality Declaration

Declaration

Model Information:	
Applicant's Name:	**BYD Precision Manufacture Co., Ltd.**
Applicant's Business Address:	**No.3001, Baohe Road, Baolong Industrial, Longgang, Shenzhen, 518116, P.R.China**
Model Name:	**T02D**
HW version:	**MP**
SW version:	**YTP802A110830**

Description:

We**(BYD)**declare，

The main differences conducted to 2nd source as below:

1. Add 2nd source adapter P/N LA10EUNM130(for EU) & LA10USNM130(for US);
2. Add 2nd source LCD P/N T09ADFC08002A;

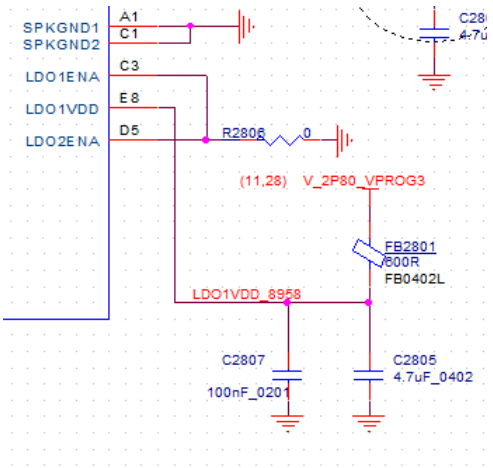
Hardware change history is list below

Date	Version	Hardware	Change Note
2014/3/31	01	DVT-B	Initial version
2014/6/15	02	MP	Refer to below part1

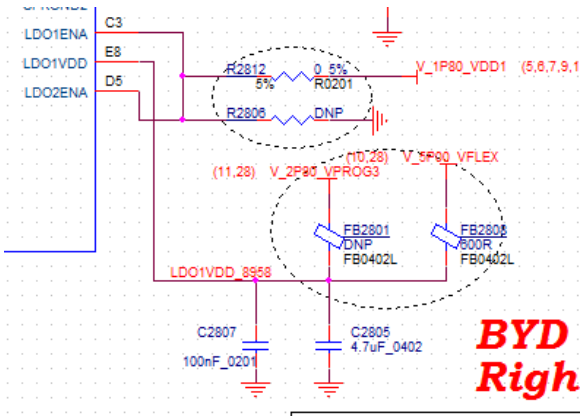
Part1

1、AVDD1&DCVDD Changed to internal LDO to improve power consumption and resolve earphone detect issue.

DVT-B

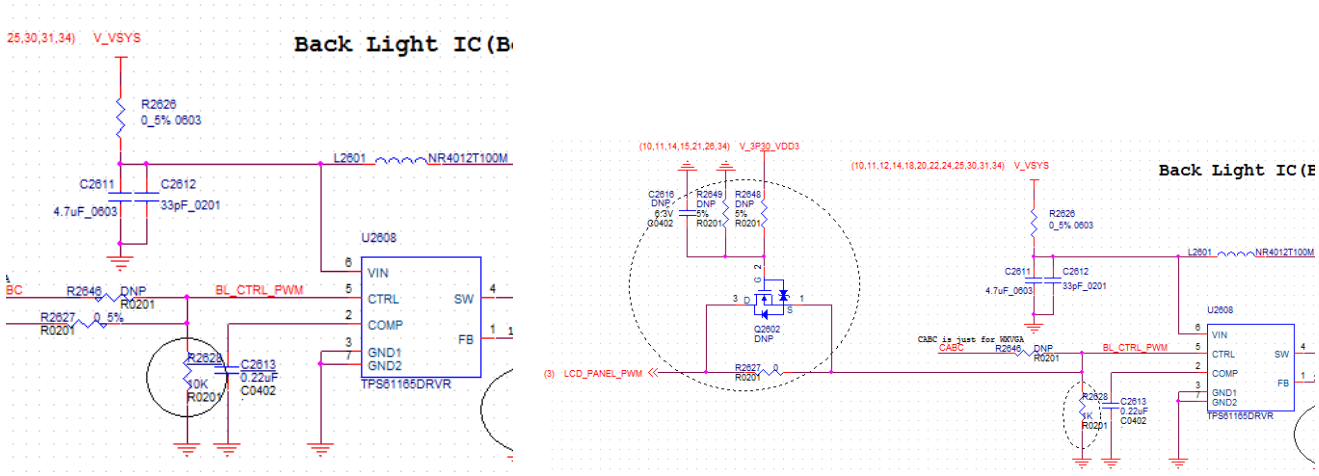


MP



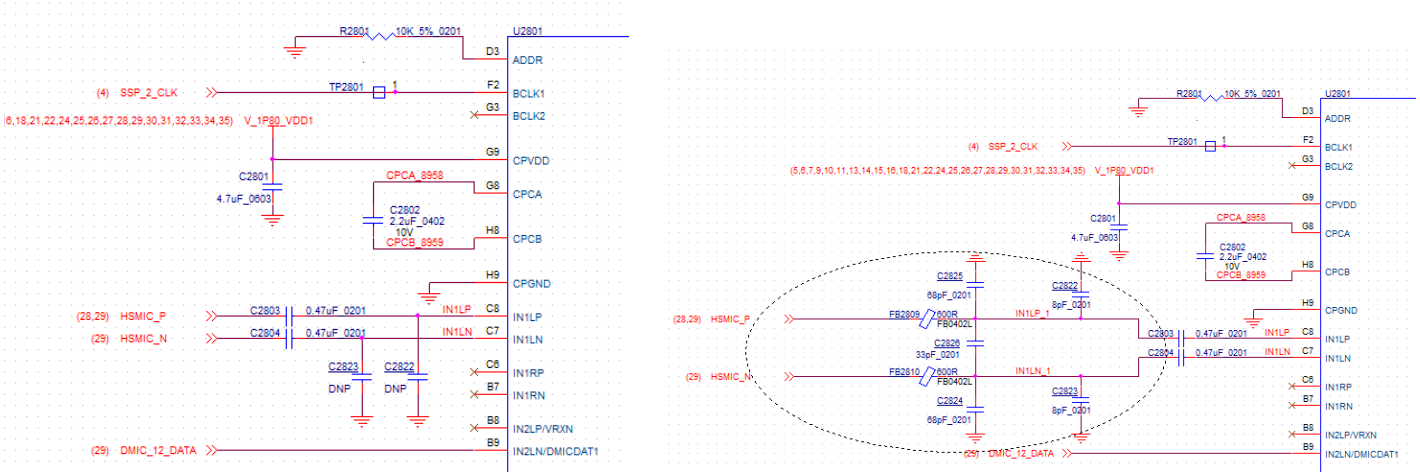
2、Change R2628 from 10K to 1K for LCD flicker while power on. And add reserve circuit to avoid LCD flick issue if the current solution is not OK.

DVT-B **MP**



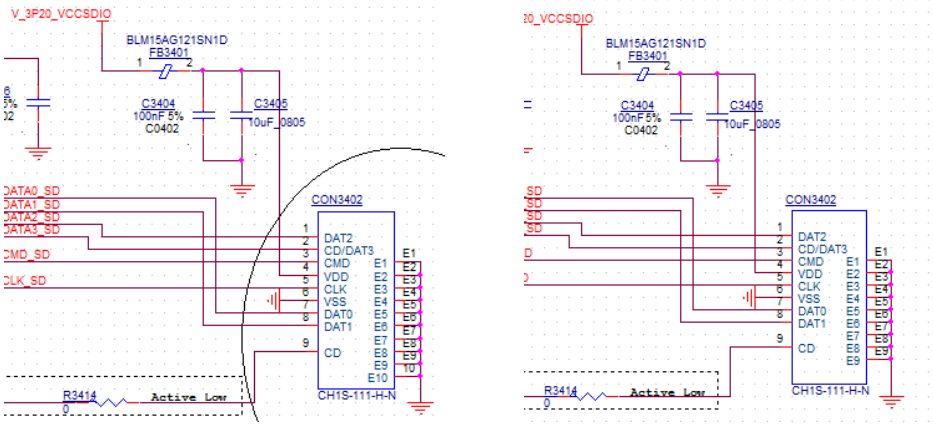
3、ADD C2822,C2823,C2824,C2825,C2826,FB2809,FB2810 to filter TDMA Noise.

DVT-B **MP**



4、Delete pin E10,because this pin is easily short to SD card's frame GND and after del E10 pin it will not influence the reliability.

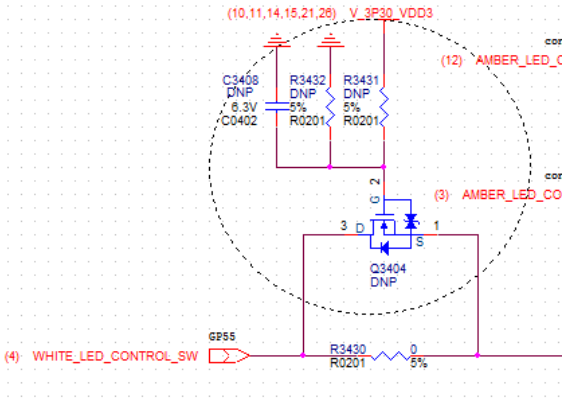
DVT-B **MP**



5、Reserve a circuit to solve LED blink when press power button to power on issue.

DVT-B

MP



This declaration is issued to: *Sporton International Inc.*

Person responsible for making this statement.

Name/Surname: 宋万方

Position/Title: **Certificate Engineer**

Address/Location: **No.3001,Baohe Road, Baolong Industrial, Longgang, Shenzhen, 518116，P.R., China**

Issue Date: **2014/9/12**