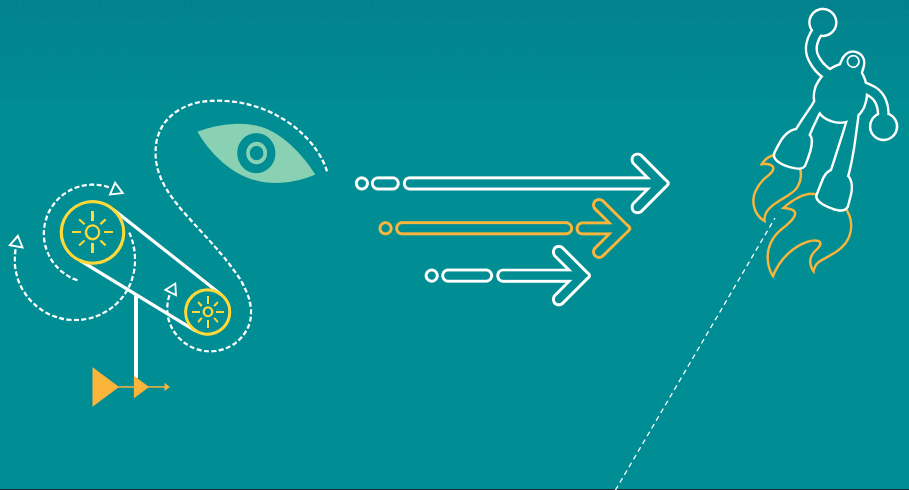
高通RF技术期刊2016-03-31

Qualcomm Technologies, Inc.



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Revision History

Revision	Date	Description
A	Mar 2016	Initial release

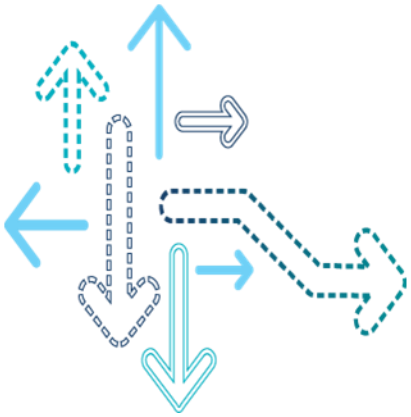
Note: There is no Rev. I, O, Q, S, X, or Z per Mil. standards.

Contents

- RF HW
- RF SW

1. TDD LTE Power Control -- Relative Power Tolerance Issue
2. How to power VBATT of PA with QFE3100
3. RF5425 Current Leakage issue
4. QPA miscellaneous calibration failure issue

RF HW



RF HW case filing

- There will be some change on RF HW problem area on early April time frame. Below is new table:
- 射频HW case的Problem Area在2016年4月份会有所改变，如下表所示：

PA1	PA2	PA3
RF Hardware	Transceiver	GSM
		CDMA
		WCDMA
		TDS
		LTE
		Coexistence
		Cal/NV
		other
	RFFE	QPA/Switch/PAMID
		Antenna Tuner
		QLN/DRX modules
		ET/APT
		Char/Cal/NV
		Other
	Antenna/EMC	EMC/Radiated Desense
		SAR
		TIS/TRP
		other

TDD LTE Power Control -- Relative Power Tolerance Issue

- **Platform**: All with MIPI RFFE
- **适用平台**：All with MIPI RFFE

- **Symptom**: UE failed to pass TDD LTE B38/40/41 power control relative power tolerance (3GPP 36.521-1, 6.3.5.2) test case. UE TX power didn't increase monotonously with 1dB step during ramp up test.

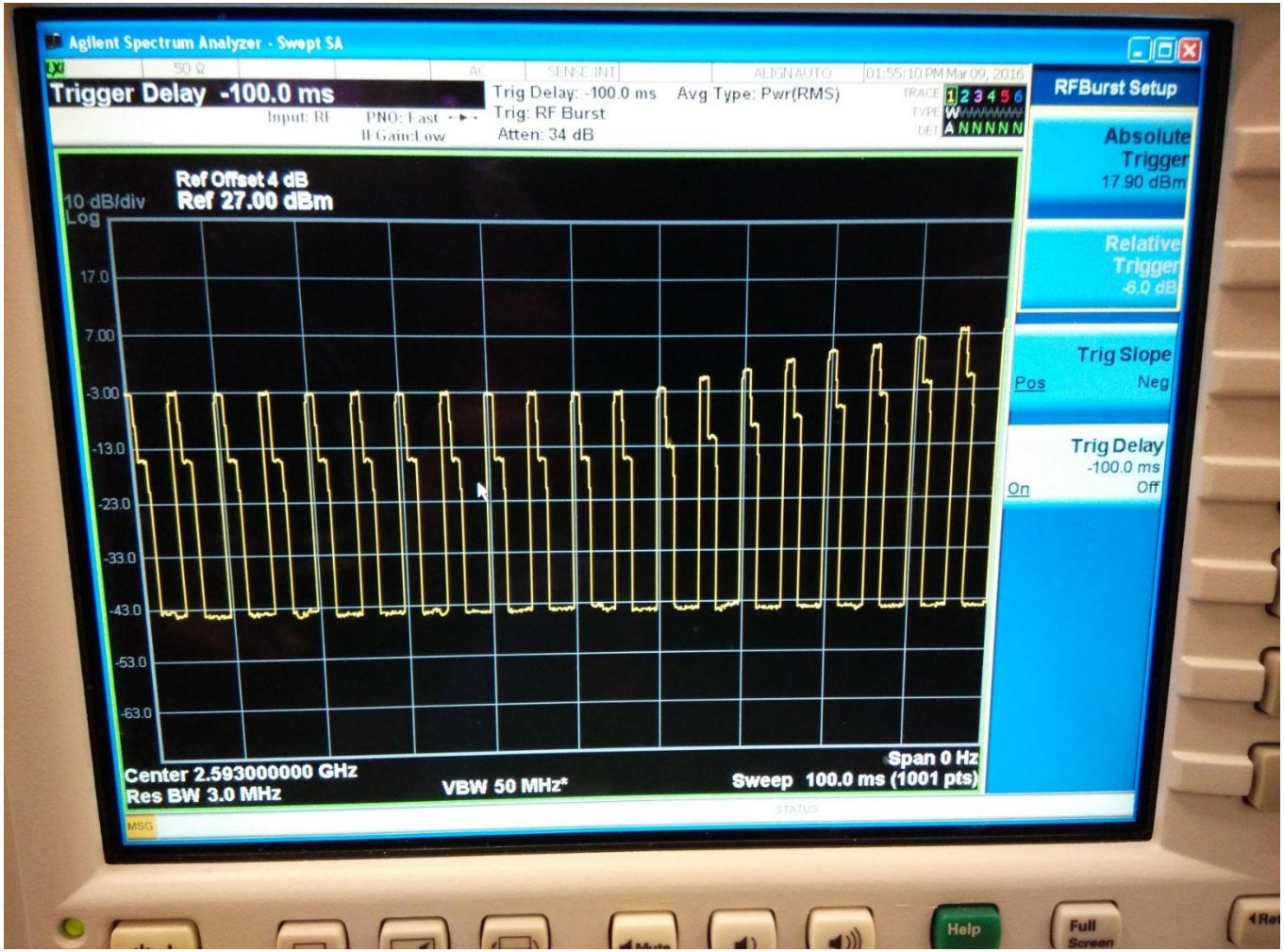
- **问题描述**：手机在TDD LTE B38/40/41 功率控制-相对功率控制容限(TS 36.521, 6.3.5.2)测试失败。在Ramp Up测试中，手机发射功率并不是步进1dB单调上升。

- **Analysis**: By using the spectrum analyzer, we can see the TX power in sub-frame 2 and 7 is much larger than sub-frame 3 and 8 (see result in next slide). But according to 3GPP, the TX power in sub-frame 3 and 8 should be 1dB larger than sub-frame 2 and 7.

- **问题分析**：通过频谱仪可以看出，手机在第2和第7子帧的功率远大于第3和第8子帧（测试结果详见下一页）。但是根据3GPP规范，手机在第3和第8子帧里的功率应该是比第2和第7子帧分别增加1dB。

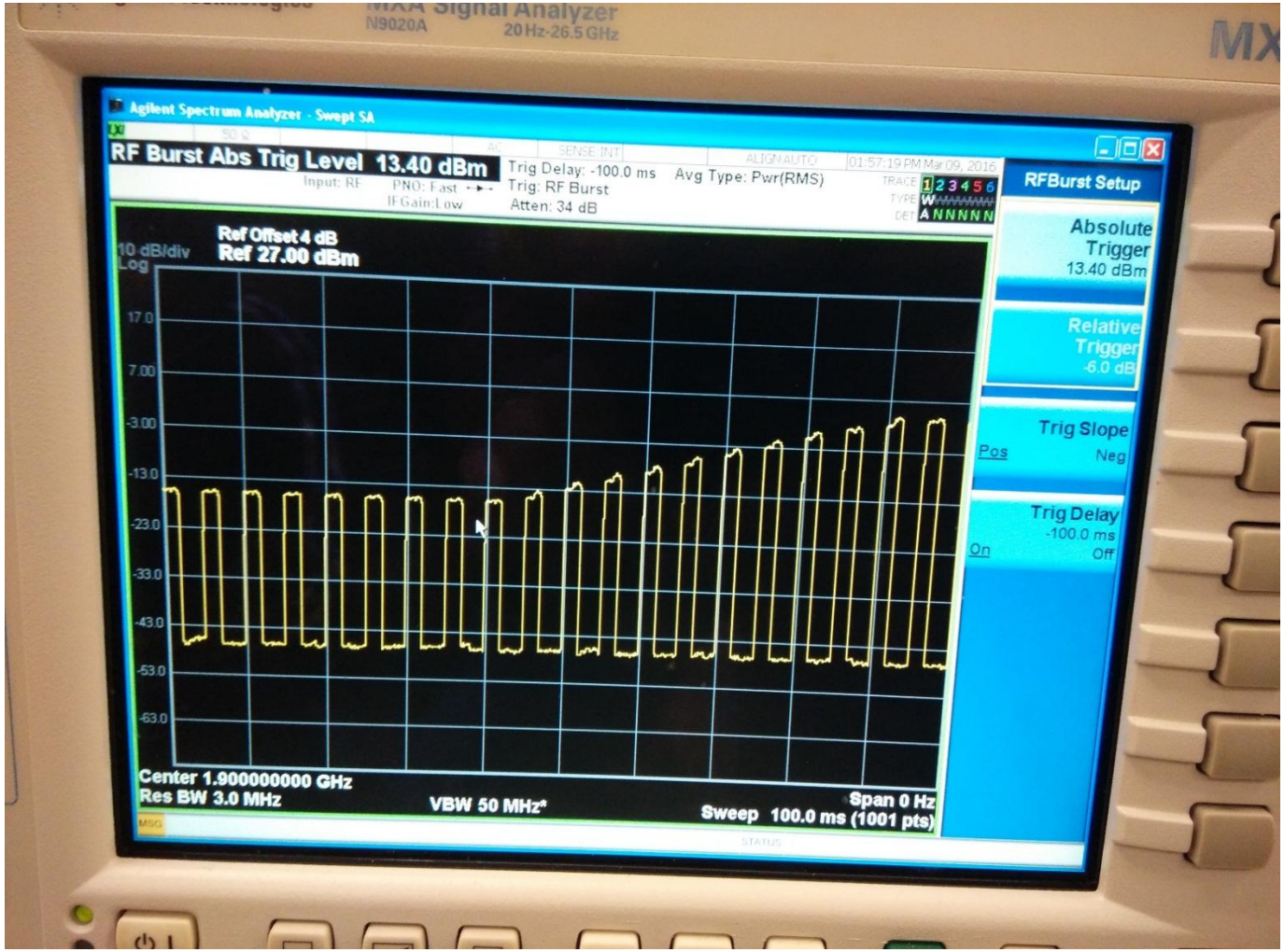
TDD LTE Power Control -- Relative Power Tolerance Issue

- We use B41 as an example. B41 failure spectrum.
- 我们用B41做为例子。下图是B41测试失败时截取的频谱。



TDD LTE Power Control -- Relative Power Tolerance Issue

- B39 pass spectrum.
- B39测试通过时的频谱。



TDD LTE Power Control -- Relative Power Tolerance Issue

- TQF6297H MIPI register setting.
- TQF6297H MIPI寄存器设置。

Recommended MIPI Register Settings

Mode of Operation	Pin Routing	Register 0	Register 1
Sleep	N/A	0x00	X = Don't care
Band 41N TX HPM	9	0x1C	0xBF
Band 41N TX LPM	9	0x1E	0X9D
Band 41N TX LPM (0dBm)	9	0x1E	0x53
Band 38 RX	10 to 6	0x30	X = Don't care
Band 40 RX	12 to 7	0x28	X = Don't care
Band 41N RX	9 to 6	0x38	X = Don't care

- In B41 Tx RF driver code, ASM TQF6297H is configured with port 4. Port 4 will set Register 0 to 0x1C which is high gain of LTE B41:
- 在B41的Tx RF驱动代码部分,配置了TQF6297H开关并使用了port4. 在TQF6297H开关的驱动代码中,port4会将Register0配置为0x1C,这对应于B41的高增益状态。

```
{
  RFDEVICE_ASM,
  GEN_ASM /* ASM_SP6T */,  /* NAME  TQF6297H */
  2,  /* DEVICE_MODULE_TYPE_INSTANCE */
  0 /*Warning: Not specified*/,  /* PHY_PATH_NUM */
  {
    0  /* Orig setting:  */,  /* INTF_REV */
    (0x0286 << 22)/*mfg_id*/ | (0x1C << 14)/*prd_id*/ | (4)/*port_num*/,  /* PORT_NUM */
    0,  /* Array Filler */
    0,  /* Array Filler */
    0,  /* Array Filler */
    0,  /* Array Filler */
  },
},
```

TDD LTE Power Control -- Relative Power Tolerance Issue

- Port 4 in ASM TQF6297H driver code:
- Port 4 在TQF6297H开关驱动中的设置：

```
static uint8 rfdevice_asm_tqf6297_asm_on_regs[RFDEVICE_ASM_TQF6297_ASM_ON_NUM_REGS] =  {0x00, };
static int16 rfdevice_asm_tqf6297_asm_on_data[RFDEVICE_ASM_TQF6297_NUM_PORTS][RFDEVICE_ASM_TQF6297_ASM_ON_NUM_REGS] =
{
  { /* PORT NUM: 0 *//* B41 Rx*/
    0x38,
  },
  { /* PORT NUM: 1 *//* B40 Rx*/
    0x28,
  },
  { /* PORT NUM: 2 *//* B38 Rx*/
    0x30,
  },
  { /* PORT NUM: 3 *//* B7 Tx*/
    0x24,
  },
  { /* PORT NUM: 4 *//* B41 Tx*/
    0x1c,
  },
```

- So For each Tx slot, if ASM code set register 0 to 0x1C later than PA code setting of register0, then the PA will switch to high gain mode and lead to this issue.
- 因此，在每个Tx时隙，如果ASM配置代码将Reg0设置为0x1C的动作发生在PA设置Reg0的动作后面，那么PA将切换到高增益状态并产生这种问题。

TDD LTE Power Control -- Relative Power Tolerance Issue

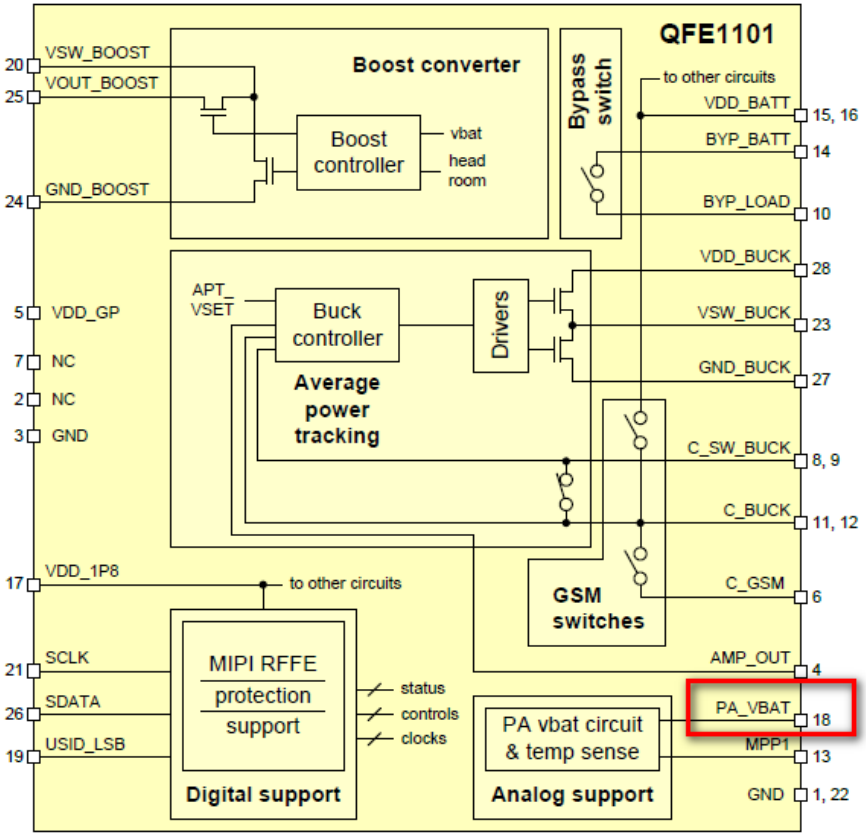
- **Root Cause**: TQF6297H is used in customer design. This HCPA integrate HB PA and switch and B40 filter and B41 narrow band filter inside. From it's datasheet, Tx band is using Register 0 to control and Rx band is using Register 0 to control as well. Customer configure TQF6297 PA and TQF6297 ASM in Tx RF driver which lead to ASM setting of Register 0 will overwrite PA setting of Register 0 and cause PA range jumping. The result is wrong PA range during sub-frame 2 and 7 For TDD band. There is no need to configure TQF6297 ASM in Tx RF driver part.
- **问题原因**: 客户使用了TQF6297H这颗PA. 这颗PA内部集成了高频PA,开关以及B40和B41窄带的滤波器。从它的datasheet看，Tx和Rx都使用到了Reg0来控制。客户驱动中在TDD频段的Tx驱动代码里面对PA和ASM模组都进行了配置。而ASM和PA共用了Reg0。对ASM进行配置会把PA range的配置信息覆盖而进入高增益状态，从而导致了手机在第2和第7子帧的发射功率大于第3和第8子帧。实际上B38/40/41的Tx驱动部分并不需要配置ASM。
- **Solution**: Remove the ASM part configure for TDD band's Tx driver code in RFC.
- **解决办法**：删除TDD频段Tx驱动部分关于ASM的配置代码。

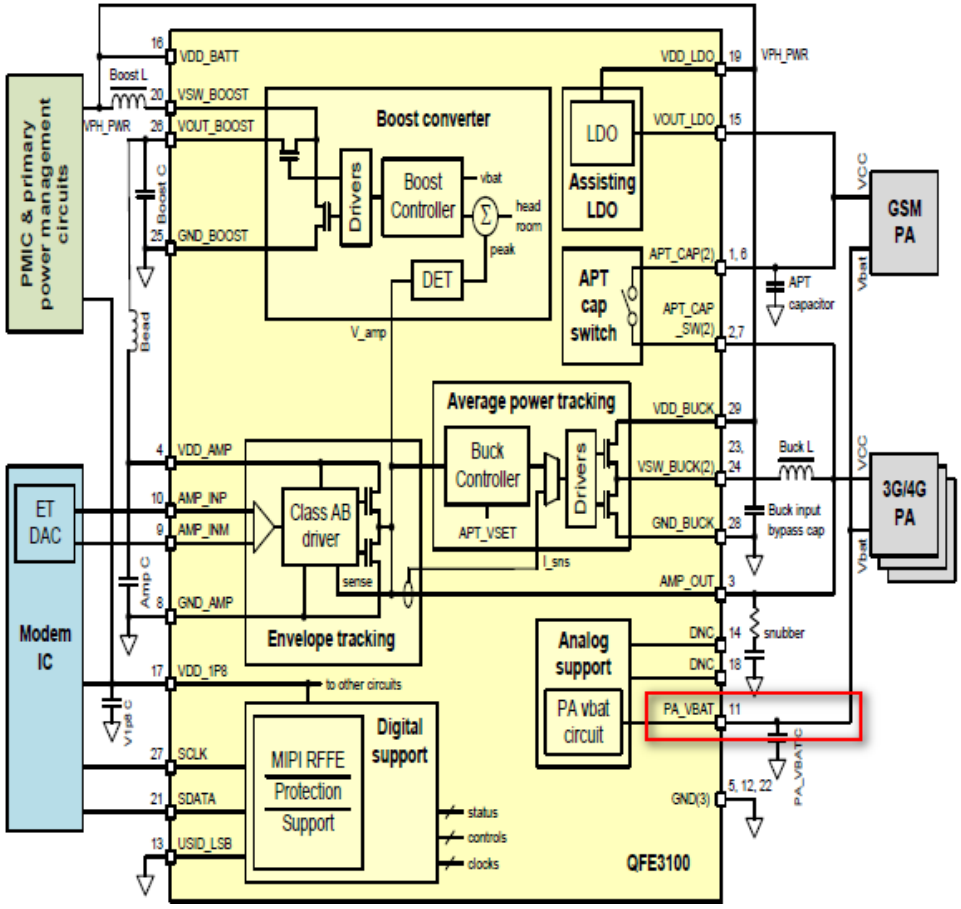
How to power VBATT of PA with QFE3100

- **Platform**: All+QFE3100
- **适用平台**：All+QFE3100

- **Description**: Normally, VBATT pin is used to power APT/ET PA bias, when QFE1100/1101 powers ET PA, VBATT is also powered from QFE1100 PA_VBAT. For some TDD HB PA Modules, for example, sky77807, internal switch is also powered by VBATT. If using PA_VBAT of QFE1100 to power VBATT of PA, PA_VBAT will be pulled down at standby/sleep mode, that cause TDD RX path to be switched off. So such PA is not recommended to be powered from PA_VBAT of QFE1100. But for QFE3100, how to power VBATT pin of PA?
- **问题描述**：APT和ET PA的偏置电路供电一般是VBATT pin，在用QFE1100/1101给PA供电时，VBATT pin用QFE1100/1101的PA_VBAT输出来供。但对于有些TDD HB PA Module，比如SKY77807，内部TX/RX Switch也是用该pin脚供电。那么如果用QFE1100的PA_VBAT供电，且手机处于standby/sleep模式的时候，QFE1100的PA_VBAT电压是被拉低的，就会导致TDD的RX通路断开而工作不正常，因而对于这种PA不建议用QFE1100/1101的PA_VBAT供电。那用QFE3100如何给PA的VBATT供电呢？

How to power VBATT of PA with QFE3100





How to power VBATT of PA with QFE3100

- **Reply**: (1)For QFE3100, PA_VBATT can be always on even in standby/sleep mode. It's different to QFE1100. (2)For APT only PA, VBATT pin can be powered with both VPH_PWR and PA_VBAT of QFE3100. (3)For ET PA，if phone works within 3.0V-4.5V and will shutdown below 3.0V, VBATT pin of PA can be powered from VPH_PWR; if phone still can work below 3.0V, VBATT pin of PA is required to be powered from PA_VBAT of QFE3100，not VPH_PWR, because QFE3100 can make sure VBATT to stay within 3.0V-4.5V and work normally.

- **问题回复**：（1）QFE3100不同于QFE1100/1101，它的PA_VBATT输出可以一直是高电压，甚至在standby/sleep 模式也可以是常高。（2）对于APT only的PA，VBATT pin既可以用VPH_PWR供电， 也可以用QFE3100的PA_VBAT供电。（3）对于ET PA，如果手机电池电压工作在3.0V-4.5V，3.0V以下手机会自动关机，那么VBATT除了可以用QFE3100的PA_VBAT供电，也可以接VPH_PWR供电。如果3.0V以下手机仍然可以工作，给ET PA仍然需要用QFE3100的PA_VBAT供电，不建议用VPH_PWR供电，因为QFE3100可以确保VBATT上的电压处于3.0v-4.5v，以保证ET在低电池电压下仍可以正常工作。

RF5425 Current Leakage issue

- **Platform**: All
- **适用平台**：All

- **Description**: Under sleep mode, RF5425 has 0.3mA current leakage with VBAT and VIO supplied.
- **问题描述**：在睡眠模式下，如果VBAT和VDD_IO都存在，则RF5425会有0.3mA的漏电流。

- **Analysis:** We identify the current leakage issue to the Low Band section of the 5425, and then further lock the issue down to the Register 0 BS bit in the Low Band RFFE. If the bit is set to 1 (default) with VIO applied, Ibat current is ~380uA (@Vbat=3.7V). If the bit is set to 0 with VIO applied, Ibat current is ~4.3uA. The BS bit is only used in the 5427 part, and is used to switch between LB and VLB. The default at power up for BS is 1, so it would have to be explicitly set to 0 to eliminate the current leakage issue.
- **问题分析**: 我们发现漏电流的问题来自5425的低频部分，进一步定位到RFFE寄存器0的BS比特位。当VDD_IO有1.8V供电且该比特位被设置为1（5425PA的缺省值)，则Ibat上的电流为380微安。如果该比特位被设置为0且VDD_IO有1.8V供电，则Ibat上的电流为4.3微安。该比特位仅在5427上用来切换低频和更低频波段。在开机上电后该比特位为1，因此需要将它再初始化一次设置为0来消除漏电问题。

RF5425 Current Leakage issue

- **Solution**: Apply for CR986194 & CR987444.
- **解决办法**：申请CR986194和CR987444。

986194	RFA_DEVICES	Current Consumption in RF5425 is higher than expected, need init PA to OFF after UE bootup
987444	RFA_DEVICES	[3rd party PA init addition for RF5425][rfdevice_pa][JO]3rd party PA init addition for RF5425

QPA miscellaneous calibration failure issue

1 - Tx XPT Swp2 - M Line RGI Compression fail

2 - Tx XPT Swp3 – XPT Swp3 power fail

3- Tx XPT Swp3 – Delta measure power fail

4 - DPD Valid FLag for Requested Power 1700 is FALSE

5 - Max power cal fail

6 - RGI out of range

1 - Tx XPT Swp2 - M Line RGI Compression fail

Description： This issue is found in lab . Cannot get compression point， the fail rate is about 20%

描述 ：这个问题在实验室发现。获取压缩点失败，不良率大约20%

MEASUREMENTS: Tx XPT Swp2 - M Line RGI Compression

Channel	XPT Mode	TxAGC	Vcc (mV)	Compression (dB)	Compression Min	Time (s)
24374	1	66	1500	4.2934	2.5	
24374	1	67	2200	4.43697	2.5	
24374	1	69	3000	-8.1308	2.5	
24374	1	71	3500	3.8764	2.5	

Root cause ： Swp1 IQ capture segment length is too short

原因：第一个sweep的IQ capture时间太短

1 - Tx XPT Swp2 - M Line RGI Compression fail

Solution : Increase the sweep1 Cap segment length

解决方案：增大第一个sweep的IQ capture时间：

<XPT_Swp1_Cap_Segment_Length>**4000**</XPT_Swp1_Cap_Segment_Length>

to :

<XPT_Swp1_Cap_Segment_Length>**8000**</XPT_Swp1_Cap_Segment_Length>

```
<XPT_Swp1_IQ_Gain>420</XPT_Swp1_IQ_Gain>
<XPT_Swp1_Env_Scale>820</XPT_Swp1_Env_Scale>
<XPT_Swp1_Num_IQ_Samples>9216</XPT_Swp1_Num_IQ_Samples>
<XPT_Swp1_Cap_Segment_Length>4000</XPT_Swp1_Cap_Segment_Length>
<XPT_Swp1_RGI_Delta_RGI_List>60,61,62,63,64,65,66,67,68,69,70,71,72,73</XPT_Swp1_RGI_Delta_RGI_List>
<XPT_Swp1_RGI_Delta_Bias>3500</XPT_Swp1_RGI_Delta_Bias>
<XPT_Swp1_Minimum_RGI_Delta_Power_dBm100>-100</XPT_Swp1_Minimum_RGI_Delta_Power_dBm100>
```

2 - Tx XPT Swp3 – XPT Swp3 power fail

Description : This issue is found in lab .Cannot get XPT swp3 power, the fail rate is about 20%

描述 ：这个问题在实验室发现。XPT Sweep3 功率测试失败，不良率大约20%

MEASUREMENTS: Tx XPT Swp3 - Linearizer

Channel	XPT Mode	PA State	TxAGC	Vcc	Exp Power	XPT Swp3 Power	XPT Swp3 Power Min	XPT Swp3 Power Max	Delta Expected Power	Delta Measure Power
24374	1	3	64	1666	17	17.3	9	25	0	0
24374	1	3	67	2364	20	-21.9	12	28	3	-39.2
24374	1	3	68	2714	22	22.9	14	30	2	44.8
24374	1	3	69	3070	24	24	16	32	2	1.1

Root cause ： Swp2 IQ capture segment length is too short

原因：第二个sweep的IQ capture时间太短

2 - Tx XPT Swp3 – XPT Swp3 power fail

Solution : Increase the sweep2 Cap segment length:

解决方案：增大第二个sweep的IQ capture时间：

<XPT_Swp2_Cap_Segment_Length>**4000**</XPT_Swp2_Cap_Segment_Length>
to :
<XPT_Swp2_Cap_Segment_Length>**8000**</XPT_Swp2_Cap_Segment_Length>

```
<XPT_Swp2_Channel_List>24374</XPT_Swp2_Channel_List>
<XPT_Swp2_EPT_PA_State>3</XPT_Swp2_EPT_PA_State>
<EPT_Swp2_Meas_Pwr_List>17,20,22,24</EPT_Swp2_Meas_Pwr_List>
<XPT_Swp2_Num_IQ_Samples>9216</XPT_Swp2_Num_IQ_Samples>
<XPT_Swp2_Cap_Segment_Length>4000</XPT_Swp2_Cap_Segment_Length>
<XPT_Swp2_MLine_Calc_Segment_Length>30000</XPT_Swp2_MLine_Calc_Segment_Length>
<XPT_Swp2_IQ_Processing_Segment_Length>30000</XPT_Swp2_IQ_Processing_Segment_Length>
```

3 - Tx XPT Swp3 – Delta measure power fail

Description : EPT swp3 delta measure power fail

描述：EPT sweep3 delta功率测试失败

MEASUREMENTS: Tx XPT Swp3 - Linearizer

Channel	XPT Mode	PA State	TxAGC	Vcc	Exp Power	XPT Swp3 Power	XPT Swp3 Power Min	XPT Swp3 Power Max	Delta Expected Power	Delta Measure Power
9848	1	3	69	2155	17	18.1	12	22	0	0
9848	1	3	70	2617	19	20.4	14	24	2	2.3
9848	1	3	70	2617	20	20.3	15	25	1	-0.1
9848	1	3	72	3500	23	23.8	18	28	3	3.5

Root cause : The EPT power list setting wrong, the 4 power list gap is too narrow.

原因: EPT power list 设置不对导致，4个功率值的间隔太小

3 - Tx XPT Swp3 – Delta measure power fail

Solution： Keep the power at least 2db gap for EPT_Swp_Meas_Pwr_List.

解决方案： EPT power list里面的4个功率点间隔至少2db，增大功率点间隔

Modify the power list from

<EPT_Swp2/3_Meas_Pwr_List>17,19,20,23</EPT_Swp2/3_Meas_Pwr_List>

<EPT_Fcomp_Meas_Pwr_List>17,19,20,23</EPT_Fcomp_Meas_Pwr_List> To

<EPT_Swp2/3_Meas_Pwr_List>15,18,20,23</EPT_Swp2/3_Meas_Pwr_List>

<EPT_Fcomp_Meas_Pwr_List>15,18,20,23</EPT_Fcomp_Meas_Pwr_List>

Pass log – after modify the power list

MEASUREMENTS: Tx XPT Swp3 - Linearizer

Channel	XPT Mode	PA State	TxAGC	Vcc	Exp Power	XPT Swp3 Power	XPT Swp3 Power Min	XPT Swp3 Power Max	Delta Expected Power	Delta Measure Power
9848	1	3	68	1820	15	16.1	10	20	0	0
9848	1	3	69	2163	18	18.2	13	23	3	2.1
9848	1	3	70	2678	20	20.6	15	25	2	2.4
9848	1	3	72	3500	23	23.8	18	28	3	3.2

4 - DPD Valid FLag for Requested Power 1700 is FALSE -page1

Description: DPD Construction fail, compare good board with failure board, get different calibration log. Normally the Swp2 M Line table Tx AGC is same as delta RGI sweep list.

描述：DPD创建失败，对比好的板子和fail的板子log，正常的板子Sweep2的M Line table中的Tx AGC 和Delta RGI sweep中的一致：

Fail log:

MEASUREMENTS: Tx XPT Swp2 - M Line table

Channel	XPT Mode	TxAGC	Vcc (mV)	Pout (dBm)	Time (s)
24374	1	51	1061	5.66	
24374	1	52	1180	8.48	
24374	1	53	1383	11.84	
24374	1	54	1515	13.49	
24374	1	55	1823	16.43	
24374	1	56	2045	18.06	
24374	1	57	2156	18.78	
24374	1	58	2449	20.42	
24374	1	59	3172	23.5	
24374	1	60	3862	25.68	
24374	1	61	4312	26.85	
24374	1	62	5148	28.68	
24374	1	63	5323	29.02	
24374	1	64	7039	31.79	
24374	1	65	7039	31.79	
24374	1	66	7039	31.79	
24374	1	67	6960	31.68	
24374	1	68	6960	31.68	
24374	1	69	6960	31.68	
24374	1	70	6883	31.57	
24374	1	71	6883	31.57	

Pass log

MEASUREMENTS: Tx XPT Swp2 - M Line table

Channel	XPT Mode	TxAGC	Vcc (mV)	Pout (dBm)	Time (s)
24374	1	60	1243	12.71	
24374	1	61	1319	13.67	
24374	1	62	1443	15.05	
24374	1	63	1552	16.1	
24374	1	64	1687	17.25	
24374	1	65	1826	18.29	
24374	1	66	2066	19.84	
24374	1	67	2352	21.38	
24374	1	68	2692	22.91	
24374	1	69	3066	24.34	
24374	1	70	3540	25.87	
24374	1	71	4064	27.28	
24374	1	72	4538	28.4	
24374	1	73	5290	29.91	

4 - DPD Valid FLag for Requested Power 1700 is FALSE -page2

Root cause: The swp2 Mline calc segment length and IQ capture segment length are too short .

原因： swp2 Mline 计算时间IQ capture的时间太短导致

Solution :check the swp2 segment length setting: Normal segment length is about 30000。

解决方案：检查swp2的时间设置，正常值设置在30000：

<XPT_Swp2_MLine_Calc_Segment_Length>60000</XPT_Swp2_MLine_Calc_Segment_Length>

<XPT_Swp2_IQ_Processing_Segment_Length>20000</XPT_Swp2_IQ_Processing_Segment_Length>

```
<Waveform>
<XPT_Swp2_Channel_List>24374</XPT_Swp2_Channel_List>
<XPT_Swp2_EPT_PA_State>3</XPT_Swp2_EPT_PA_State>
<EPT_Swp2_Meas_Pwr_List>17,20,22,24</EPT_Swp2_Meas_Pwr_List>
<XPT_Swp2_Num_IQ_Samples>9216</XPT_Swp2_Num_IQ_Samples>
<XPT_Swp2_Cap_Segment_Length>8000</XPT_Swp2_Cap_Segment_Length>
<XPT_Swp2_MLine_Calc_Segment_Length>60000</XPT_Swp2_MLine_Calc_Segment_Length>
<XPT_Swp2_IQ_Processing_Segment_Length>20000</XPT_Swp2_IQ_Processing_Segment_Length>
<XPT_Swp2_MLine_Bias_Option>0</XPT_Swp2_MLine_Bias_Option>
<XPT_Swp2_Enable_Mline_Debug_Info>TRUE</XPT_Swp2_Enable_Mline_Debug_Info>
<Post_Sweep_Computation>1</Post_Sweep_Computation>
<Compute_For_Sweep>2</Compute_For_Sweep>
```

5 - Max power cal fail

Description : EPT/ET max power calibration fail

描述：EPT/ET 最大功率校准失败

Fail log: M Line Bias for expected power > Vmax and interpolated Bias is also > Vmax

MEASUREMENTS: Tx XPT Swp2 - Max M Line Power

Channel	XPT Mode	Vcc (mV)	XPT Swp2 Max MLine Power	Time (s)
21102	1	3300	24.0412	

Root cause/原因:

1. The max target power setting is too higher than measurement power:

1. 最大期望功率设置过高，大于实际测试功率：

<EPT_Swp2/3_Meas_Pwr_List>18,20,22,**25**</EPT_Swp2_Meas_Pwr_List>

<EPT_Fcomp_Meas_Pwr_List>18,20,22,**25**</EPT_Fcomp_Meas_Pwr_List>

2. Poor matching : If the measure power is too lower (for example 21dbm) , it maybe the front end loss is too higher or PA output load shift too much.

2. 匹配比较差：如果实测功率过低（比如21dbm），这个种情况可能是前端插损过大或者PA输出load有问题。

5 - Max power cal fail

Solution /解决方法:

1. If the target power setting is too higher and test power is normal, need decrease the target power to cover most boards in input file.

1. 如果期望功率设置过高同时实测功率正常，这种情况需要在input file 中降低一下期望功率来覆盖大部分板子.

2. If it caused by abnormal IL or load shift, need check PA output S parameter from hardware side.

2. 如果是插损或者PA 输出load导致，需要从检查PA输出S参数。

6 - RGI out of range

Description: RGI setting is too higher in RGI sweep list

描述：RGI sweep list中 RGI 设置过高

The Max RGI is 75 on most platform, so the calibration RGI must be lower than 75 (need check with different WTR) .

Higher RGI will cause PA damaged issue and shorten the PA lifetime .

大部分平台最大RGI是75，所以校准的RGI必须小于75（不同的WTR不一样，需要根据平台来设置）

过高的RGI会导致PA损坏或缩短PA工作寿命。

Wrong RGI setting/错误的RGI设置 :

6 - RGI out of range

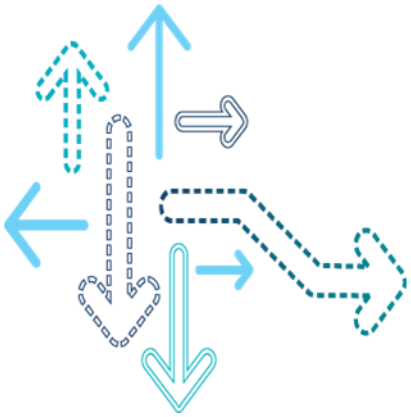
```
<PA_State_List>2,1,0,0</PA_State_List>
<RGI_List>SSS(80,35,-2);SSS(80,35,-2);SSS(63,44,-2);SSS(43,10,-2)</RGI_List>
<Bias_List>3300,3300,1500,1500</Bias_List>
<PA_Quiescent_Current>127,127,127,127</PA_Quiescent_Current>
<IQ_Gain>622,622,622,622</IQ_Gain>
<Env_Scale>1258,1258,1258,1258</Env_Scale>
<HDET_Avgs>1,0,0,0</HDET_Avgs>
<LPM_HDET_Avgs>0,0,0,0</LPM_HDET_Avgs>
<Segment_Length>4000;4000;4000;4000</Segment_Length>
<Config_Segment_Length>60000</Config_Segment_Length>
<Tuning_Segment_Length>20000</Tuning_Segment_Length>
<Enable_Tx_Lin_Limits>TRUE</Enable_Tx_Lin_Limits>
<Min_Start_Pwr>17,7,-5,-30</Min_Start_Pwr>
<Max_Expected_Pwr>33,20,10,-10</Max_Expected_Pwr>
<Lowest_End_Pwr>12,-3,-12,-50</Lowest_End_Pwr>
<Purpose_List>3,3,3,3</Purpose_List>
<Minimum_Delta_Power_dBm100>-100</Minimum_Delta_Power_dBm100>
<XPT_Swp1_Channel_List>23821</XPT_Swp1_Channel_List>
<XPT_Swp1_PA_State>3</XPT_Swp1_PA_State>
<XPT_Swp1_RGI_List>75,76,77,78</XPT_Swp1_RGI_List>
<XPT_Swp1_Bias_List>1500,2300,2800,3500</XPT_Swp1_Bias_List>
```

Solution : set the right RGI refers to different WTR（lower than max RGI）, run the RGI sweep char to choose the right RGI for XPT_Swp1_RGI_List

解决方案：根据平台在RGI list设置RGI（低于最大RGI），Swp1的RGI需要做RGI char 来设置。

1. HDR Open Loop Output Power failure issue
2. LTE B1 Tx Restricted Region Back-off
3. MSM8996 FBRx Char Failure Root Cause Analysis
4. Calibration issue of crash in rfgsm_core_tx.c
5. TDSCDMA NS Tx Max Power Issue

RF SW



HDR Open Loop Output Power failure issue

- **Platform:** MSM8996/MDM9x40
- **适用平台：**MSM8996/MDM9x40

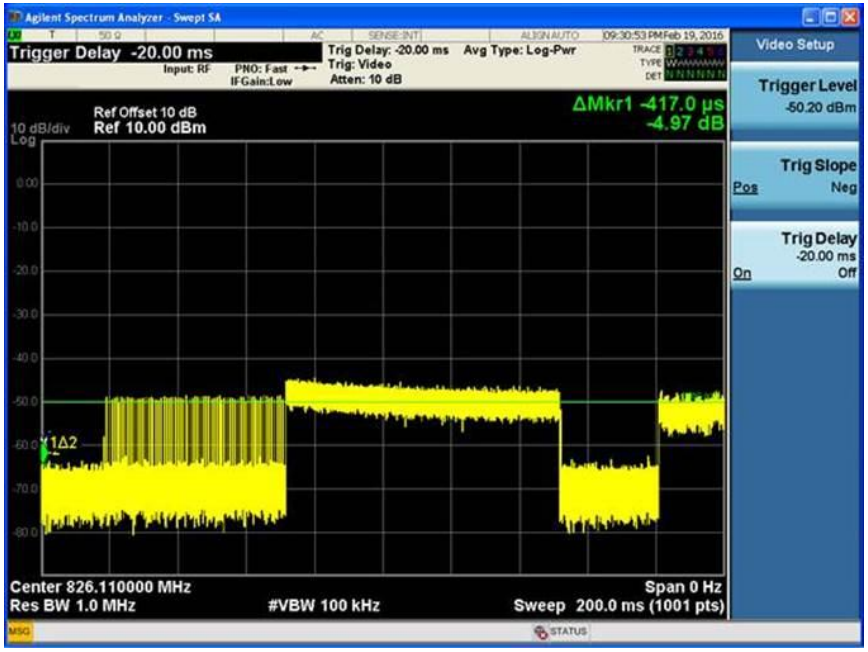
- **Symptom:** HDR test case 4.3.1 Open Loop Output Power fails Test1 (@-25dBm). The measured Tx power is below the lower limit.
- **问题描述：**HDR 测试项4.3.1 开环发射功率 Test1 (@-25dBm)失败。测试仪器测量到的攻略低于测试门限下限。

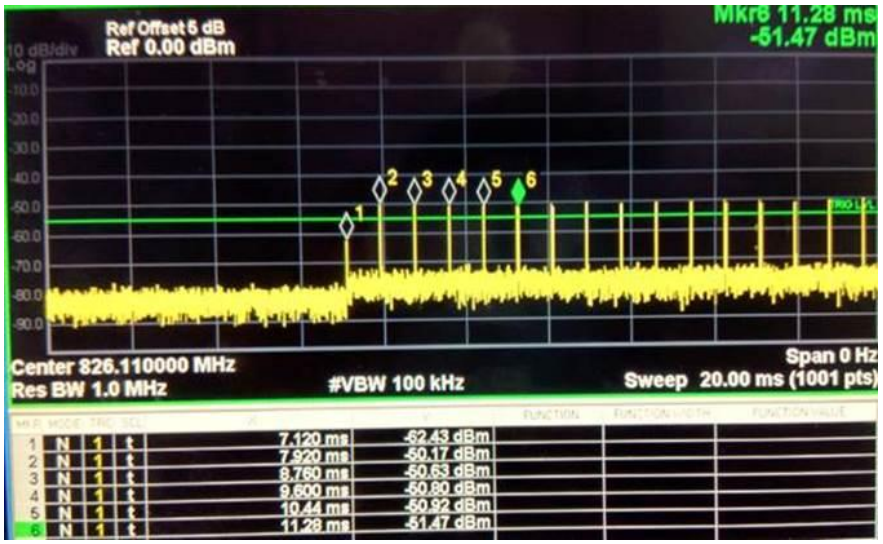
04_03_01

Ev_A_04_03_01 Range of Open Loop Output	Status: FAIL	Channel: 37		Duration: 0 sec	
Test Description	Meas. Value	Lower Limit	Upper Limit	Units	Pass/Fail
Open_Loop RT9.6k Acc Chan Test1	-63.34	-57.20	-38.20	dBm/BW	FAIL
Open_Loop RT9.6k Acc Chan Test2	-5.12	-17.20	1.80	dBm/BW	PASS
Open_Loop RT9.6k Acc Chan Test3	20.24	10.80	29.80	dBm/BW	PASS
Open_Loop RET128-bit Acc Chan Test1	-63.35	-57.20	-38.20	dBm/BW	FAIL
Open_Loop RET128-bit Acc Chan Test2	-5.10	-17.20	1.80	dBm/BW	PASS
Open_Loop RET128-bit Acc Chan Test3	20.53	10.80	29.80	dBm/BW	PASS

HDR Open Loop Output Power failure issue

- **Analysis:** Use spectrum analyzer to capture probe power, could find spurs before access probe. The first spur is about -62dBm which matches the TE report value. For Test1, the TE Ior is -25dBm, the TE trigger level is quite low and thus the false alarm caused by the spur leads to the failure.
- **问题分析：** 通过用频谱分析仪抓取时域上的发射功率信号，可以看到在access probe之前出现较多的毛刺。其中第一个毛刺的功率大约在-62dBm，符合测试仪器的测量值。Test1中，测试仪器的Ior设置为-25dBm，因而发射功率的trigger level相对较低，由于毛刺引起虚警从而导致测试失败。





HDR Open Loop Output Power failure issue

- **Analysis:** Meanwhile by comparison that different designs which adopt different PAs have different behavior. Those PAs which have larger gain (e.g. 20dB) at low gain state will fail the case, while those with less gain could pass. The reason is the larger gain PAs will amplify the spurs to a significant level which will trigger the TE as detection of access probe and report the measurement and then lead to failure.
- **问题分析：** 同时通过比较发现采用不同PA的设计方案表现不一。那些在低增益状态下能够提供较大增益（例如 20dB）的PA方案会导致测试失败，而增益较小的PA方案则可以通过测试。原因在于较大增益的PA能够将毛刺放大到足够大，触发测试仪器认为access probe已经开始，从而进行测量和报告，导致测试失败。

- **Solution:** Submit case to RFSW team with test report, spectrum analyzer plot and test log as well as PA spec to confirm the issue and apply CR#982324.
- **解决方案：** 提case到RFSW team，提供测试报告，频谱分析仪截图，测试log和PA器件手册已确认问题，再申请CR#982324。

LTE B1 Tx Restricted Region Back-off

- **Platform:** All
- **适用平台：**所有

- **Problem:** LTE Band 1 can't pass TELEC PHS emissions requirements.
- **问题描述：**LTE Band 1无法通过日本PHS emission测试指标。

- **Standard requirement:** JAPAN requirement conflicts with 3GPP SPEC, where max 1dBm back-off is required for normal NS_05 (RFNV_LTE_B1_AMPR_NS_05_I (NV20138)). While it can't meet JAPAN requirement, a larger back-off value need to be applied for PHS emission. For non-JAPAN market, there is no such need.
- **标准要求：**日本规范与3GPP规范有冲突，正常的3GPP NS_05 back-off NV (RFNV_LTE_B1_AMPR_NS_05_I (NV20138)) 无法满足日本规范需求，需要一个更大的back-off值来通过JAPAN PHS emission测试。对于非日本市场的UE，则没有这样的需求。

LTE B1 Tx Restricted Region Back-off

Table 6.6.3.3.3.1-1: Additional requirements (PHS)

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)				Measurement bandwidth
	5 MHz	10 MHz	15 MHz	20 MHz	
$1884.5 \le f \le 1915.7^{*1}$	-41	-41	-41	-41	300 KHz
Note 1: Applicable when the lower edge of the assigned E-UTRA UL channel bandwidth frequency is larger than or equal to the upper edge of PHS band (1915.7 MHz) + 4 MHz + the Channel BW assigned, where Channel BW is as defined in sub-clause 5.4.2. Additional restrictions apply for operations below this point.					

- **Solution:** RFNV_LTE_B1_NS_05_RESTRICTED_REGION_BACKOFF (NV26708) is created to enable customers to pass TELEC PHS emissions requirements. This feature allows the UE to take power back-off for UL configurations which are explicitly prohibited by 3GPP. So that UE could take a generous back-off in such cases. The default value is 130, which stands for 13dB. It could be a smaller value (<13dB) if test could still pass.
- **解决方案:** 为了使客户能够通过日本PHS emissions测试，RFNV_LTE_B1_NS_05_RESTRICTED_REGION_BACKOFF (NV26708) 能允许UE将功率回退应用于3GPP规范明确禁止的配置。默认情况下，该NV设置数值是130代表了回退13dB。只要测试能够通过，也可以选择一个稍小的值。

LTE B1 Tx Restricted Region Back-off

- Test verification: For lab test verification with this NV, please follow below RB allocation rule.
- 测试验证: 如果想在实验室里做验证，请根据下面的RB分配去做。

BW (MHz)	RB start / Tx freq (Hz)	RB number	Apply backoff
5	Tx freq < 1927200	Any	Yes
10	Tx freq < 1934700	Any	Yes
15	Tx freq == 1932500 && rb_start <= 7	Any	Yes
	Tx freq == 1932500 && 8 <= rb_start <= 66	rb number > MIN(30,67-rb_start)	
	Tx freq == 1932500 && 67 <= rb_start <= 74	Any	
	Tx freq < 1942200	Any	
20	Tx freq == 1930000 && rb_start <= 23	Any	Yes
	Tx freq == 1930000 && 24 <= rb_start <= 75	rb number > MIN(24,76-rb_start)	
	Tx freq == 1930000 && 76 <= rb_start <= 99	Any	
	Tx freq <1949700	Any	

MSM8996 FBRx Char Failure Root Cause Analysis

- **Platform:** MSM8996/MDM9x45 platform
- **适用平台:** MSM8996/MDM9x45 平台

- **Symptom:**
  FBRx char failure of all LTE bands and partial WCDMA bands

- **问题描述：**
  LTE所有band以及WCDMA部分band的FBRx char failure

MSM8996 FBRx Char Failure Root Cause Analysis

- Symptom details
- Issue 1: FB gain too low with LSE over range (FB gain值过低，且LSE 超标)

FBGain FreqComp	FBGain FreqComp Min	FBGain FreqComp Max	1SE FreqComp	1SE FreqComp Max
4769	1000	20000	174	1000
3372	1000	20000	231	1000
4195	1000	20000	1435	1000
5221	1000	20000	192	1000
3732	1000	20000	188	1000
4656	1000	20000	1128	1000
5832	1000	20000	78	1000
4184	1000	20000	224	1000
5174	1000	20000	966	1000
6573	1000	20000	61	1000
4721	1000	20000	119	1000

FBGain FreqComp	FBGain FreqComp Min	FBGain FreqComp Max	1SE FreqComp
2548	1000	20000	399
1100	1000	20000	0
256	1000	20000	16240
2585	1000	20000	391
1115	1000	20000	1015
256	1000	20000	16240
2585	1000	20000	198
1055	1000	20000	1130
256	1000	20000	0

- Issue 2: FB gain normal while LSE over range (FB gain值正常，但LSE 超标)

FBGain FreqComp	FBGain FreqComp Min	FBGain FreqComp Max	1SE FreqComp	1SE FreqComp Max
9568	1000	20000	46	1000
6635	1000	20000	64	1000
8231	1000	20000	105	1000
10742	1000	20000	100	1000
7530	1000	20000	125	1000
9367	1000	20000	163	1000
11095	1000	20000	23	1000
7831	1000	20000	70	1000
9879	1000	20000	58	1000
10463	1000	20000	52	1000
7237	1000	20000	55	1000
9151	1000	20000	85	1000
9869	1000	20000	59	1000
6761	1000	20000	62	1000
8469	1000	20000	158	1000
9239	1000	20000	67	1000
6323	1000	20000	19156	1000
7715	1000	20000	26905	1000
9117	1000	20000	101	1000
6305	1000	20000	21281	1000
7442	1000	20000	27131	1000

MSM8996 FBRx Char Failure Root Cause Analysis

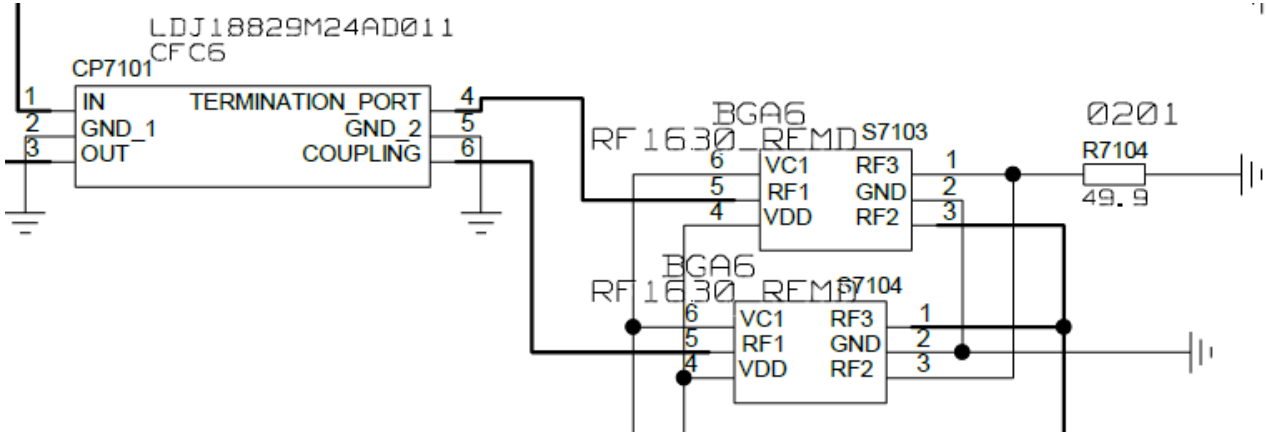
- **Root cause** (software side):
  1. Miss configuration of 3rd party coupler in RFC.
  2. FB path switch control logic error.
  3. DPD CONFIG NV configuration error (should be QC issue).

- **问题原因** (软件方面):
  1. RFC中没有对第三方coupler进行配置。
  2. FB path中增加了两个开关用于tuner，但是开关逻辑配置错误。
  3. DPD CONFIG NV 配置错误 (高通默认版本中的NV配置的就有问题)

MSM8996 FBRx Char Failure Root Cause Analysis

- **Root cause** (hardware side):

  1. Improper coupler selection, which will pull FB 50 ohm to 8 ohm.



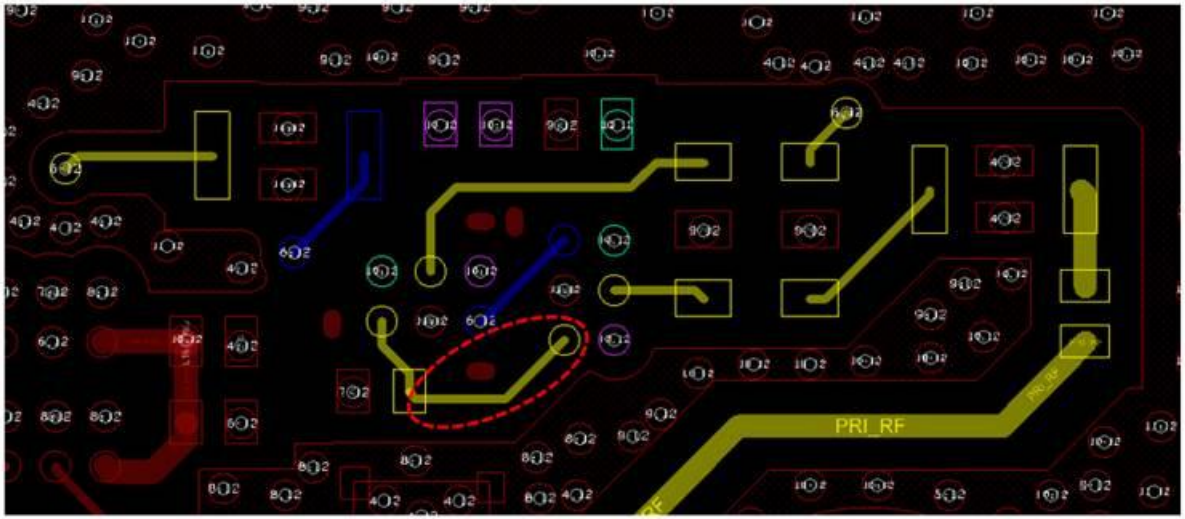
- **问题原因** (硬件方面)

  1. Coupler选型错误，导致coupler不在50 ohm。

MSM8996 FBRx Char Failure Root Cause Analysis

- **Root cause** (hardware side):

  2. RF open-circuit stub on the reverse path termination resistor when forward coupling path is selected (red oval). It could affect fwd coupling factor at higher frequencies.



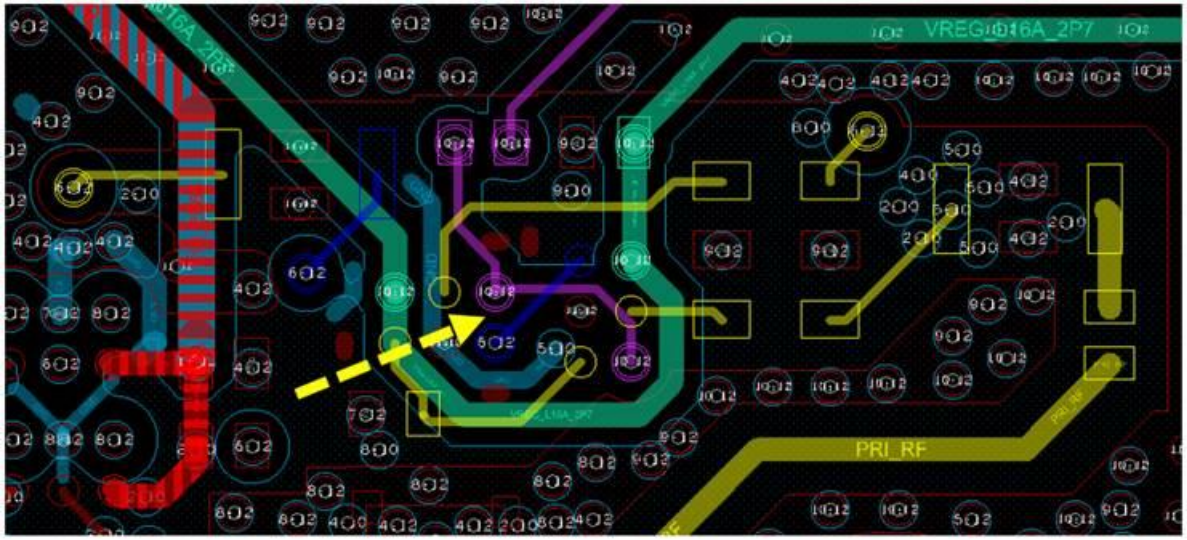
- **问题原因** (硬件方面)

  2. FB path正向工作的时候，红色标记的线路会辐射蓝色部分，影响正向高频信号耦合因子。

MSM8996 FBRx Char Failure Root Cause Analysis

- **Root cause** (hardware side):

  3. Potential via-to-via coupling between FBRx path and GRFC control line (yellow arrow). May couple digital noise into FBRX path (fwd and rvs directions).



- **问题原因** (硬件方面)

  3. GRFC控制信号的过孔可能会影响FBRx信号。

Calibration issue of crash in rfgsm_core_tx.c

- **Platform:** MSM8996
- **适用平台：**MSM8996

- **Symptom:** crash happens as below during UE calibration.
- **问题描述：**UE在做校准时出现如下死机现象。
- Coredump
- ==========
- rfgsm_core_tx.c:666 rfgsm_core_tx_sleep: TX Device 6 Pwr Down (ON->LPM) failed for band 1

- -000|qurt_exception_raise_nonfatal()
- -001|err_Fatal_internal3()
- -002|err_Fatal_internal2()
- -003|rfgsm_core_tx_sleep()
- -004|rfgsm_mc_tx_sleep()
- -005|rfgsm_dispatch_tx_sleep_req()
- -006|rfgsm_req_dispatch()
- -007|rfgsm_req_dispatcher()
- -008|rf_cmd_process()
- -009|rf_task_1()
- -010|TASK_ENTRY()
- -011|rex_os_thread_entry_func()
- -012|_pthread_stub()
- -013|qurt_trampoline()
- ----|end of frame

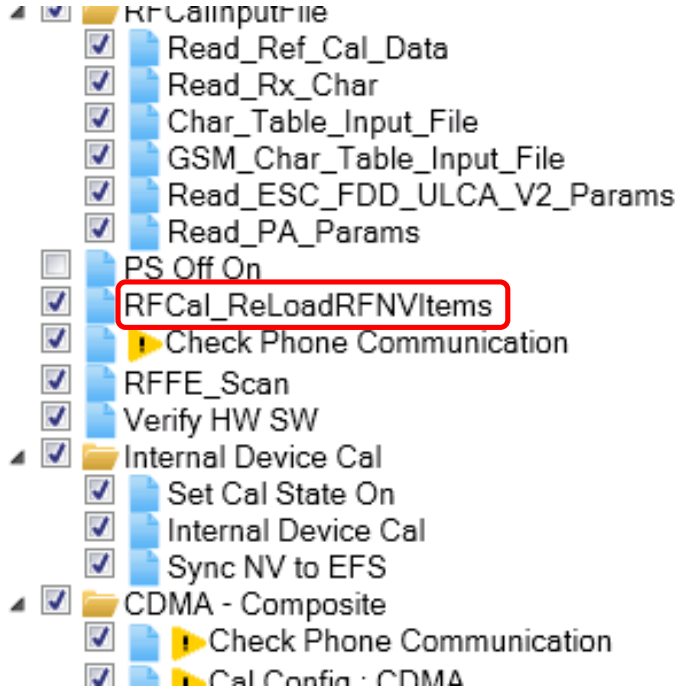
Calibration issue of crash in rfgsm_core_tx.c

- **Analysis:** From below F3 log, GSM (tech=2) is configuring WTR3925 into power OFF state (VoteOn=0), but WTR3925 has been already in power off state (pwr vote:st=0), this is unexpected.
- **问题分析：**从下面的F3消息可以看出，GSM正在配置WTR3925进入power OFF状态，但是此时WTR3925已经在power off状态了， 这是不合预期的状态迁移。

- //F3 message
- 17:28:58.125: wtr3925_common.cpp:8155 pwr SM got enabled: st = 1, last=0 ← wtr3925 enter LPM
- 17:28:58.126: wtr3925_common.cpp:8184 pwr SM got disabled: st = 0, last=1 ← wtr3925 enter pwr OFF
- 17:29:00.275: wtr3925_common.cpp:7262 pwr vote:st=0,VoteOn=0,tech=2,comp=4 ← GSM cfg wtr3925 into pwr off, but it's already in pwr OFF state, unexpected behavior.
- 17:29:00.275: wtr3925_common.cpp:7298 pwr vote: wrong st=0,last_st=1,vote_on=0,tech=2,comp=4
- 17:29:00.275: wtr3925_common.cpp:7322 wtr3925 pwr vote(after): st=0, last=1, return=0

Calibration issue of crash in rfgsm_core_tx.c

- **Solution:** Add RFCal_ReLoadRFNVItems node after PS Off On in Xtt tree
- **解决方案：**在校准tree中PS Off On节点之后添加 RFCal_ReLoadRFNVItems节点



TDSCDMA NS Tx Max Power Issue

- **Platform**: all platform
- **适用平台**：所有平台

- **Symptom**: TDSCDMA max power is not flat and lower than target power for H/M/L channel on some boards when non-signaling test with CMW500
- **问题描述**：有些板子在CMW500上做TDSCDMA非信令测试的时候，高中低信道的最大功率不平坦，并且最大功率偏低。

- **Analysis**: From failure log, we can see that the error b/w HDET and TxAGC are applied to MTPL, but not applied to TxAGC. Thus TxAGC does not increase as MTPL accordingly, which result in Tx max power is not accurate.
- **问题分析**：从异常的log来看， TXAGC和HDET之间的误差被补偿到MTPL上，但是MTPL的变化并没有体现在TxAGC上，导致最大发射功率不准确。

- 00:04:08.261 rf_tdscdma_core_txplim.c 00887 RFTXPLIM-ACQ:00002,TxAGC:940,HDET:930,FreqComp:-3,UTRAN:940,NV:940,Desired:937,Target:947,DEM:000
- 00:04:08.261 rf_tdscdma_core_txplim.c 00895 RFTXPLIM-ACQ:00002,Gain:04,LimitErr:05.50,Filtered:01.37,MTPL:942.87
- 00:04:08.271 rf_tdscdma_core_txplim.c 00887 RFTXPLIM-ACQ:00003,TxAGC:940,HDET:930,FreqComp:-3,UTRAN:940,NV:940,Desired:937,Target:947,DEM:000
- 00:04:08.271 rf_tdscdma_core_txplim.c 00895 RFTXPLIM-ACQ:00003,Gain:04,LimitErr:04.12,Filtered:01.03,MTPL:943.90
- 00:04:08.281 rf_tdscdma_core_txplim.c 00887 RFTXPLIM-ACQ:00004,TxAGC:940,HDET:930,FreqComp:-3,UTRAN:940,NV:940,Desired:937,Target:947,DEM:000
- 00:04:08.281 rf_tdscdma_core_txplim.c 00895 RFTXPLIM-ACQ:00004,Gain:04,LimitErr:03.09,Filtered:00.75,MTPL:944.65

TDSCDMA NS Tx Max Power Issue

- From pass log, TxAGC behavior is same as MTPL.
- 从正常的log可以看出， TXAGC的变化跟MTPL的行为保持一致。

00:12:40.340 rf_tdscdma_core_txplim.c 00887 RFTXPLIM-ACQ:00003,TxAGC:940,HDET:931,FreqComp:-3,UTRAN:1030,NV:940,Desired:937,Target:946,DEM:000
00:12:40.340 rf_tdscdma_core_txplim.c 00895 RFTXPLIM-ACQ:00003,Gain:04,LimitErr:04.62,Filtered:01.15,MTPL:942.53
00:12:40.350 rf_tdscdma_core_txplim.c 00887 RFTXPLIM-ACQ:00004,TxAGC:941,HDET:932,FreqComp:-3,UTRAN:1030,NV:940,Desired:937,Target:946,DEM:000
00:12:40.350 rf_tdscdma_core_txplim.c 00895 RFTXPLIM-ACQ:00004,Gain:04,LimitErr:03.46,Filtered:00.84,MTPL:943.37
00:12:40.360 rf_tdscdma_core_txplim.c 00887 RFTXPLIM-ACQ:00005,TxAGC:942,HDET:933,FreqComp:-3,UTRAN:1030,NV:940,Desired:937,Target:946,DEM:000
00:12:40.360 rf_tdscdma_core_txplim.c 00895 RFTXPLIM-ACQ:00005,Gain:04,LimitErr:02.62,Filtered:00.65,MTPL:944.03

- From FW log, TxAGC override flag is enabled in the failure log, which result in max power is always limited to 24dbm
- 从FW log 看， 在异常的log中，TXAGC override功能被使能，导致最大功率限制在24以内

1980 Jan 6 00:13:07.179 [58] 0xD11B TDSCDMA FW UPLINK Report
Version = 43
TimeStamp {
  subFrame = 4727
  slot = TS1
}
numChans = 1
servCellID = 100
minPwrLimited = FALSE
maxPwrLimited = TRUE
tpcPatternOverrideFlag = FALSE
txPwrOverrideFlag = FALSE pass
pathlossForSich = 0.00 dBm
frequency = 1919200000 Hz
txOutputPower = 24.38 dBm

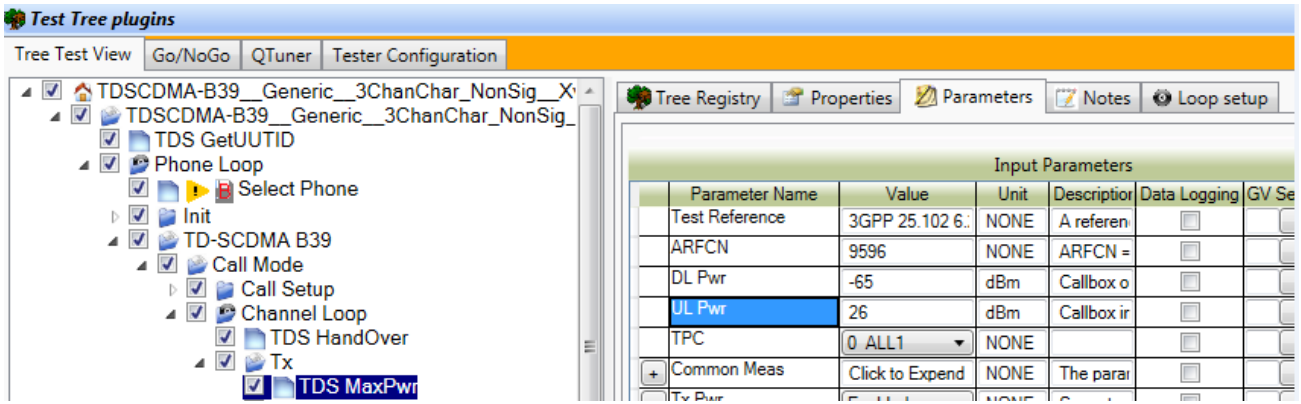
1980 Jan 6 00:04:19.526 [E5] 0xD11B TDSCDMA FW UPLINK Report
Version = 43
TimeStamp {
  subFrame = 3992
  slot = TS2
}
numChans = 1
servCellID = 0
minPwrLimited = FALSE
maxPwrLimited = FALSE
tpcPatternOverrideFlag = FALSE
txPwrOverrideFlag = TRUE failure
txPwrOverrideValue = 384
pathlossForSich = 0.00 dBm
frequency = 1919200000 Hz
txOutputPower = 24.00 dBm

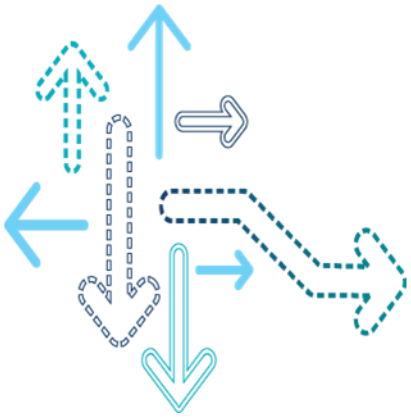
TDSCDMA NS Tx Max Power Issue

- From QSPR log, TxAGC override is indeed enabled when NS test on CMW500. While it's not enabled in other scenarios (no issue on 8820, or online test on CMW500)
- 从QSPR log看，在CMW500上做NS测试的时候， TxAGC override 被使能了。这个问题在其他时候不会遇到。（8820上或是CMW500信令测试都不会有此问题）

```
31:26:804   QMSL_L...   QLIB_IsPhoneConnected
31:26:855   QMSL_L...   QLIB_IsPhoneConnected
31:26:906   QMSL_L...   QLIB_FTM_TDSCDMA_BER_SET_UL_POWER(bOverride=1, UL_Pwr_dBm10=0)
```

- **Solution**: Set UL max power to a higher value than target power (like 26 dBm) in NS XTT to avoid this issue
- **解决方案**：在NS测试的时候可以把最大功率设的大一点(例如26 dBm)





Questions?

https://support.cdmatech.com