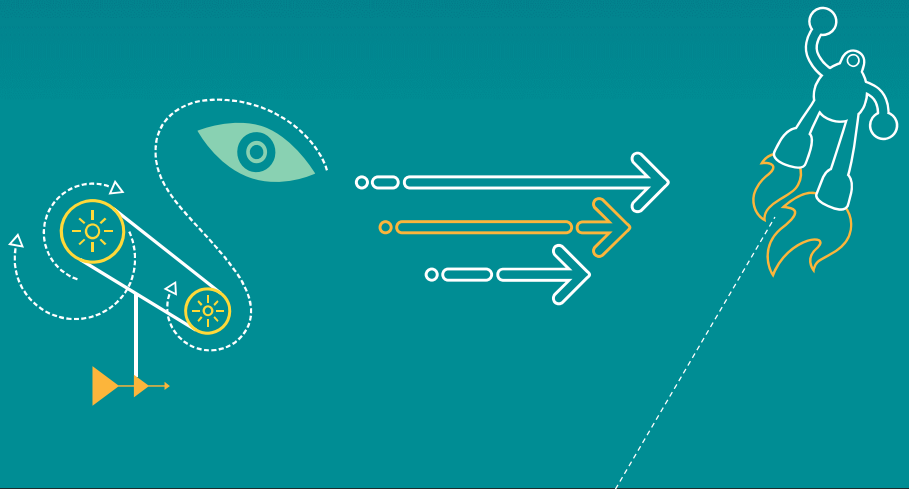
高通RF技术期刊2015-11-30

Qualcomm Technologies, Inc.



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Revision History

Revision	Date	Description
A	Nov 2015	Initial release

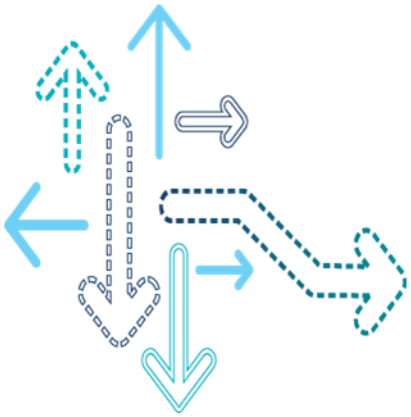
Note: There is no Rev. I, O, Q, S, X, or Z per Mil. standards.

Contents

- RF HW
- RF SW
- Power debug from RF perspective

1. TS14.18.5 EDGE Blocking and spurious response fail
2. Application note for TxM like SKY77916 and RF5216A
3. CDMA 4.3.1 Time Reference test failure

RF HW



TS14.18.5 EDGE Blocking and spurious response fail

- **Platform**: MSM8909+WTR4905
- **适用平台**: MSM8909+WTR4905

- **Description**: EDGE blocking failed @ USF when input 200kHz interference signal. There are two designs with the same RF part but the different RF card, it was found that one design can pass the test but one design failed. Compared with the two RF cards, if delete “RFC_WTR4905_CHILE_SRLTE_V2_TIMING_PAPM_MULTISLOT_CTL” part, this issue is gone. Since there is no QFE2101 for GSM APT, this code should be deleted.

- **问题描述**：

当选择USF配置的时候，EDGE blocking and spurious response失败。客户发现相同的射频设计，两个不同的RF card配置，导致的结果是不一样的。仔细比较RF card发现，RFC_WTR4905_CHILE_SRLTE_V2_TIMING_PAPM_MULTISLOT_CTL这部分代码是引起问题的关键，删除掉之后测试pass。究其原因，客户没有选择QFE2101给GSM供电，却在软件中进行了时序的配置，导致发射部分丢包而仪表测试到的BLER变大。

TS14.18.5 EDGE Blocking and spurious response fail

- **Solution**: Delete related driver code in RF card to make SW configuration match HW design to fix this issue.

- **解决办法**：软件配置应该与硬件设计保持一致，该band实际使用时不需要配置的器件比如TUNER，PAPM(QFE2101)之类，应该在该band的驱动代码中把相应的配置删除。

```
rfc_sig_info_type rf_card_wtr4905_chile_srlte_v2_tx0_gsm_g850_sig_cfg =
{
  RFC_ENCODED_REVISION,
  {
    { (int)RFC_WTR4905_CHILE_SRLTE_V2_TIMING_PA_CTL,    { RFC_CONFIG_ONLY  /*Warning: Not specified*/  , -10 }, {RFC_LOW, 0 }  },
    { (int)RFC_WTR4905_CHILE_SRLTE_V2_TIMING_PA_RANGE,    { RFC_CONFIG_ONLY  /*Warning: Not specified*/  , -3 }, {RFC_LOW, 0 }  },
    { (int)RFC_WTR4905_CHILE_SRLTE_V2_TIMING_ASM_CTL,    { RFC_CONFIG_ONLY  /*Warning: Not specified*/  , -10 }, {RFC_LOW, 0 }  },
    { (int)RFC_WTR4905_CHILE_SRLTE_V2_TIMING_TUNER_CTL,    { RFC_CONFIG_ONLY  /*Warning: Not specified*/  , -150 }, {RFC_LOW, 0 }  },
    { (int)RFC_WTR4905_CHILE_SRLTE_V2_TIMING_PAPM_CTL,    { RFC_CONFIG_ONLY  /*Warning: Not specified*/  , -100 }, {RFC_LOW, 0 }  },
    { (int)RFC_WTR4905_CHILE_SRLTE_V2_TIMING_PAPM_MULTISLOT_CTL,    { RFC_CONFIG_ONLY  /*Warning: Not specified*/  , -6 }, {RFC_LOW, 0 }  },
    { (int)RFC_WTR4905_CHILE_SRLTE_V2_GPDATA0_0,    { RFC_CONFIG_ONLY, 0 }, {RFC_CONFIG_ONLY, 0 }  },
    { (int)RFC_WTR4905_CHILE_SRLTE_V2_INTERNAL_GNSS_BLANK_CONCURRENCY,    { RFC_HIGH, -10 }, {RFC_LOW, 0 }  },
    { (int)RFC_WTR4905_CHILE_SRLTE_V2_TX_GTR_TH,    { RFC_CONFIG_ONLY, -10 }, {RFC_LOW, 66 }  },
    { (int)RFC_SIG_LIST_END,    { RFC_LOW, 0 }, {RFC_LOW, 0 } }
  },
};
```

Application note for TxM like SKY77916 and RF5216A

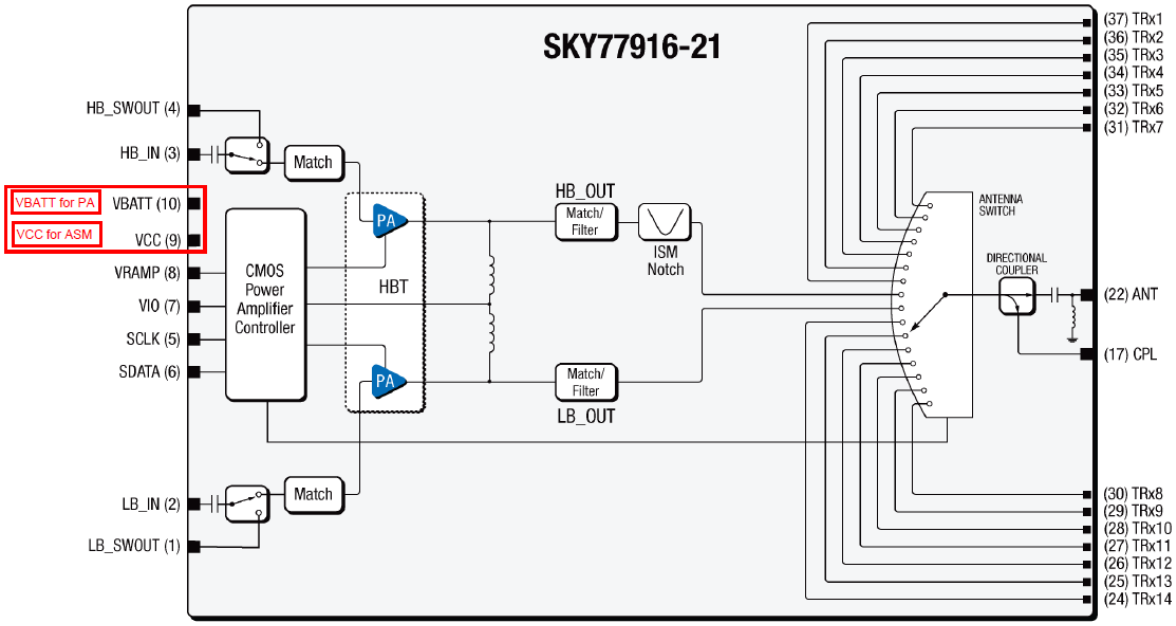
- **适用平台：**所有
- **问题描述：**当使用TxModule SKY77916/RF5216A作为射频前端时，需要特别注意供电方式的选择。

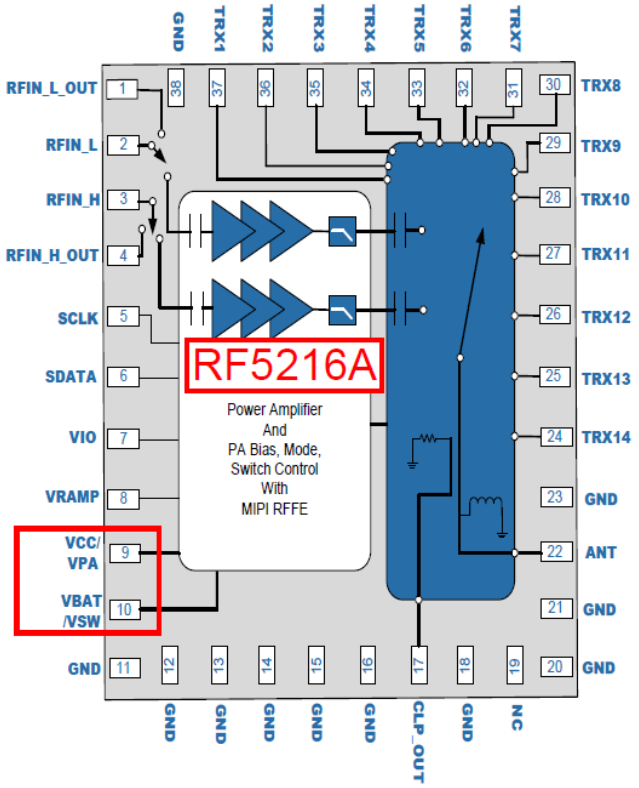
- TxM有三个供电管脚： VIO，VBATT， VCC。 其中VIO是MIPI部分的IO电源，需要连接到1.8V. 另外VBATT 和VCC是给PA和ASM的电源。

Pin Number	Pin Name	SKY77916	RF5216A
9	VCC	ASM power supply	PA power supply
10	VBATT	PA power supply	ASM power supply

- 如果需要支持GSM APT或者TDD/TDS APT，需要将PA部分供电电压接到QFE2101 VPA_APT 输出。**ASM电源一定不能连接到VPA_APT 上**，否则在APT模式下，ASM会因为电源电压偏低而工作异常，导致插损很大。
- 如果不需要支持GSM/TDD/TDS APT， 需要将TxM **VCC/VBATT 全部连接到VPH_PWR**。
- 由于SKY77916/RF5216A同一管脚给内部模块供电功能不一样，在支持APT的项目上没有办法做兼容（for SKY77916, VPA_APT 需要连到pin10 VBATT, for RF5216A, VPA_APT需要连到pin9 VCC）。

Application note for TxM like SKY77916 and RF5216A





Application note for TxM like SKY77916 and RF5216A

- **Platform:** All
- **Issue:** When use TxModue like SKY77916/RF5216A, need pay attention to the power supply connections

- TxM has three power supply pins: VIO,VBATT and VCC. VIO is the IO power supply for MIPI, should connected to 1.8V. VBATT and VCC are for PA and ASM power supply.

Pin Number	Pin Name	SKY77916	RF5216A
9	VCC	ASM power supply	PA power supply
10	VBATT	PA power supply	ASM power supply

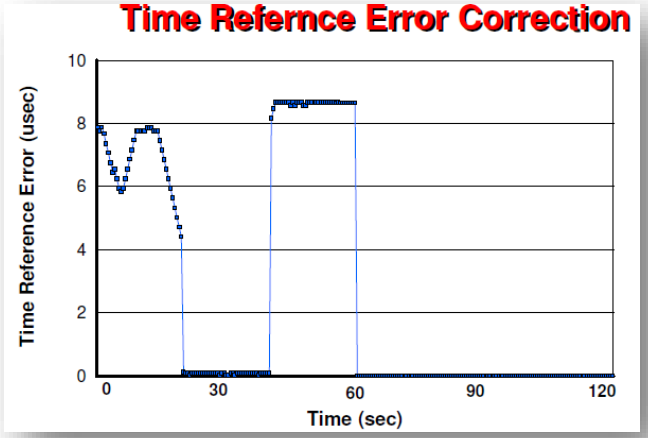
- If need support GSM/TDD/TDS APT mode, need connect TxM PA power supply to QFE2101 VPA_APT output. The power supply for ASM CANN'T be connected to VPA_APT, otherwise in APT mode, ASM will work abnormal due to low power supply, like high insertion loss.
- If don't support GSM/TDD/TDS APT, need connect TxM both VCC/VBATT to VPH_PWR.
- As SKY77916 and RF5216A use different function for same Pin, it can't be compatible when need support APT mode(for SKY77916, VPA_APT need connect to Pin10 VBATT; for RF5216A, VPA_APT need connected to Pin9 VCC).

CDMA 4.3.1 Time Reference test failure

- **Platform**: MSM8916+WTR4905
- **适用平台**: MSM8916+WTR4905

- **Description**: Customer project cannot get 4.3.1 Time Reference test data in 3rd party certification lab. In customer own lab with Agilent 8960, Time reference is fine.
- **问题描述**：客户项目在第三方实验室做CDMA测试时，测试项4.3.1测试结果为Undetermined. 实际实验室里使用单仪表测试发现没有问题。

Time Ref Corr Rate:	0.00 ns/msec
DTTime Passed:	Undetermined
Failure Reason:	
LTE Status:	N/A

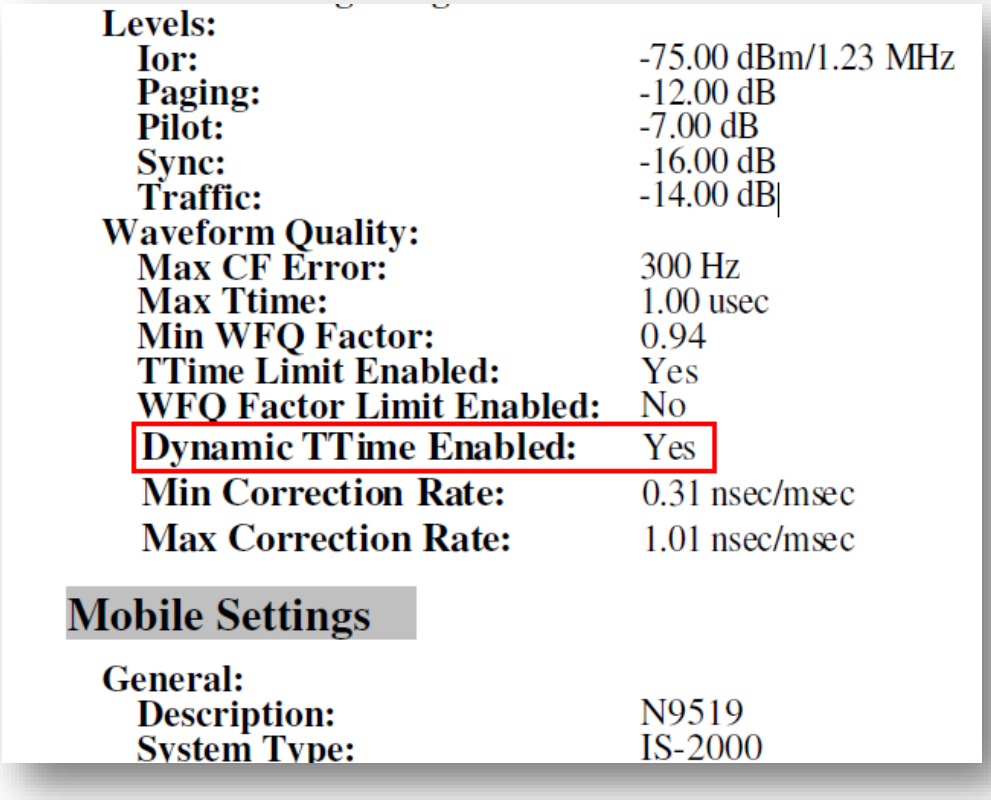


- **Analysis:** We found that in customer's test report, there is one parameter setting is wrong which may lead to such kind of issue. And with single Agilent 8960, it couldn't do 4.3.1 fully test.
- 问题分析：我们发现客户的测试报告中，有个参数设置存在问题，这个参数设置可能会影响测试结果。而客户使用单仪表Agilent8960，是不能完整测试4.3.1这个测试项的。

CDMA 4.3.1 Time Reference test failure

- **Solution**: Set “Dynamic TTime Enabled” to “No” from test system and redo the test, then test result is passing. In below snapshot of customer failure test report, we can see that this parameter is set to “Yes” which is wrong.

- **解决办法**：将测试系统参数”Dynamic TTime Enable”设置成“No”，然后重新测试，客户手机通过了该项测试。下面截图可以看到客户失败测试报告中，该参数被设置为了”Yes”. 这是错误的，应该设成“No”.



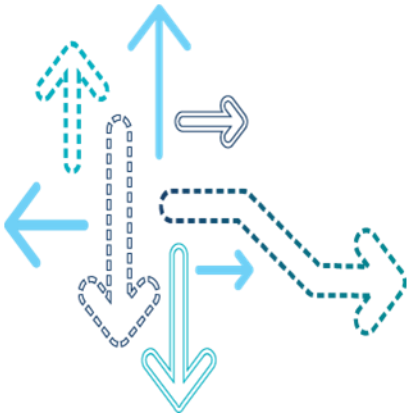
Levels:	
Ior:	-75.00 dBm/1.23 MHz
Paging:	-12.00 dB
Pilot:	-7.00 dB
Sync:	-16.00 dB
Traffic:	-14.00 dB
Waveform Quality:	
Max CF Error:	300 Hz
Max Ttime:	1.00 usec
Min WFQ Factor:	0.94
TTime Limit Enabled:	Yes
WFQ Factor Limit Enabled:	No
Dynamic TTime Enabled:	Yes
Min Correction Rate:	0.31 nsec/msec
Max Correction Rate:	1.01 nsec/msec

Mobile Settings

General:	
Description:	N9519
System Type:	IS-2000

1. RFSW Customer Engineering Debug Tool
2. RFCal DLL New Feature For ILPC Tuning
3. TDSCDMA manual HO fail on CMW500
4. LTE crash due to no buffer to use
5. M-Line calibration failure debug
6. WCDMA Calibration Upper bound Channel setting

RF SW



RFSW Customer Engineering Debug Tool

- **Platform:** ESC CalV4
- **适用平台：**ESC CalV4平台

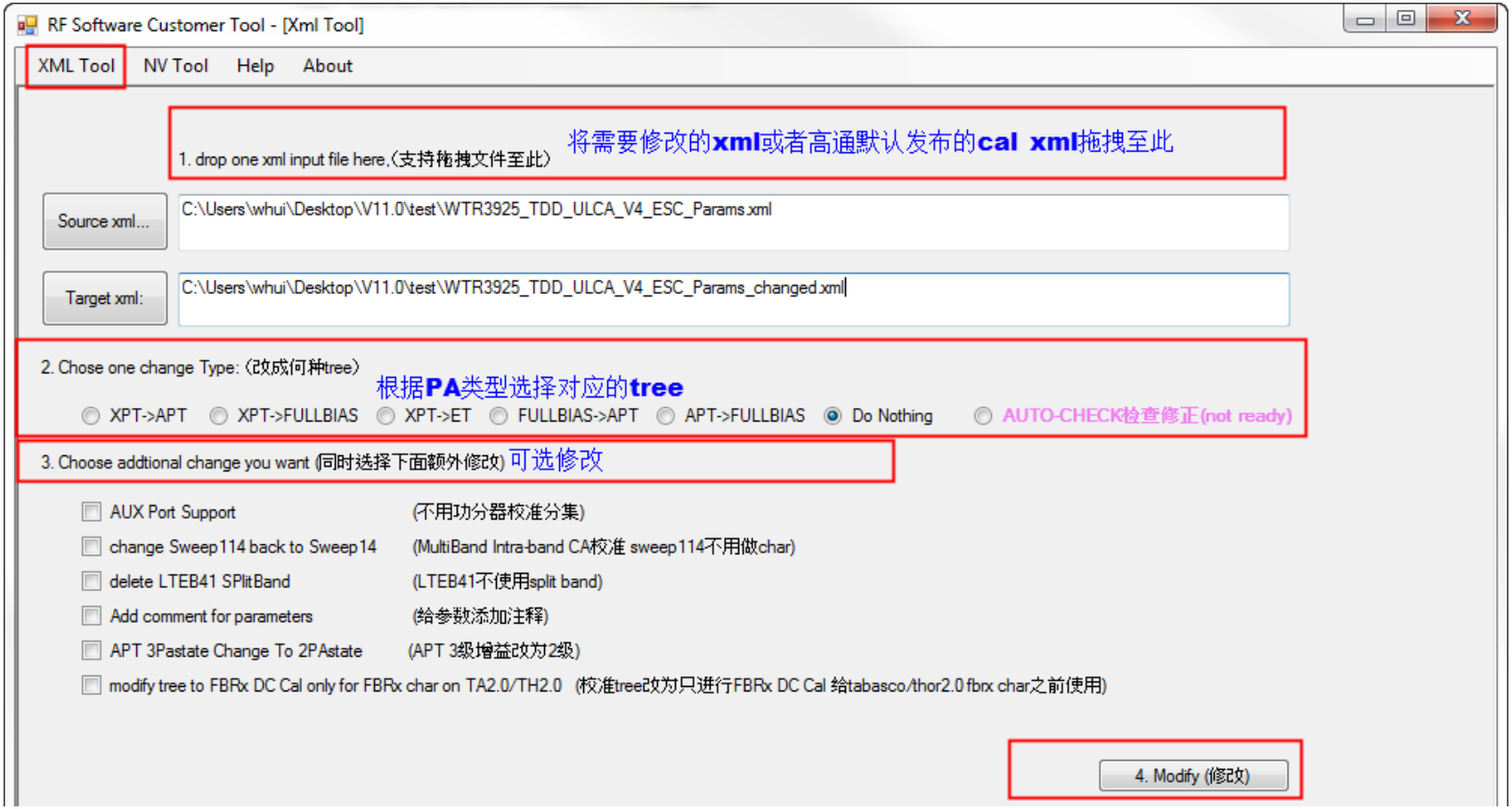
- **Description:** Customer often need to edit XML/QCN, it’s a little complex sometimes
- **问题描述：**客户在修改CalV4校准tree或者NV时候经常遇到一些困难

- **Solution:** RFSW Customer Engineering Team provide one debug tool to help you modify xml/qcn..
- **解决方案：** RFSW Customer Engineering Team提供一个debug工具，

- Where to get the tool: Right now customer can raise case for the engineer tool. And it will be update and released in createpoint in the future.
- 获取渠道：暂时通过提交case获取工具，后续会有升级，也会有计划在createpoint中更新

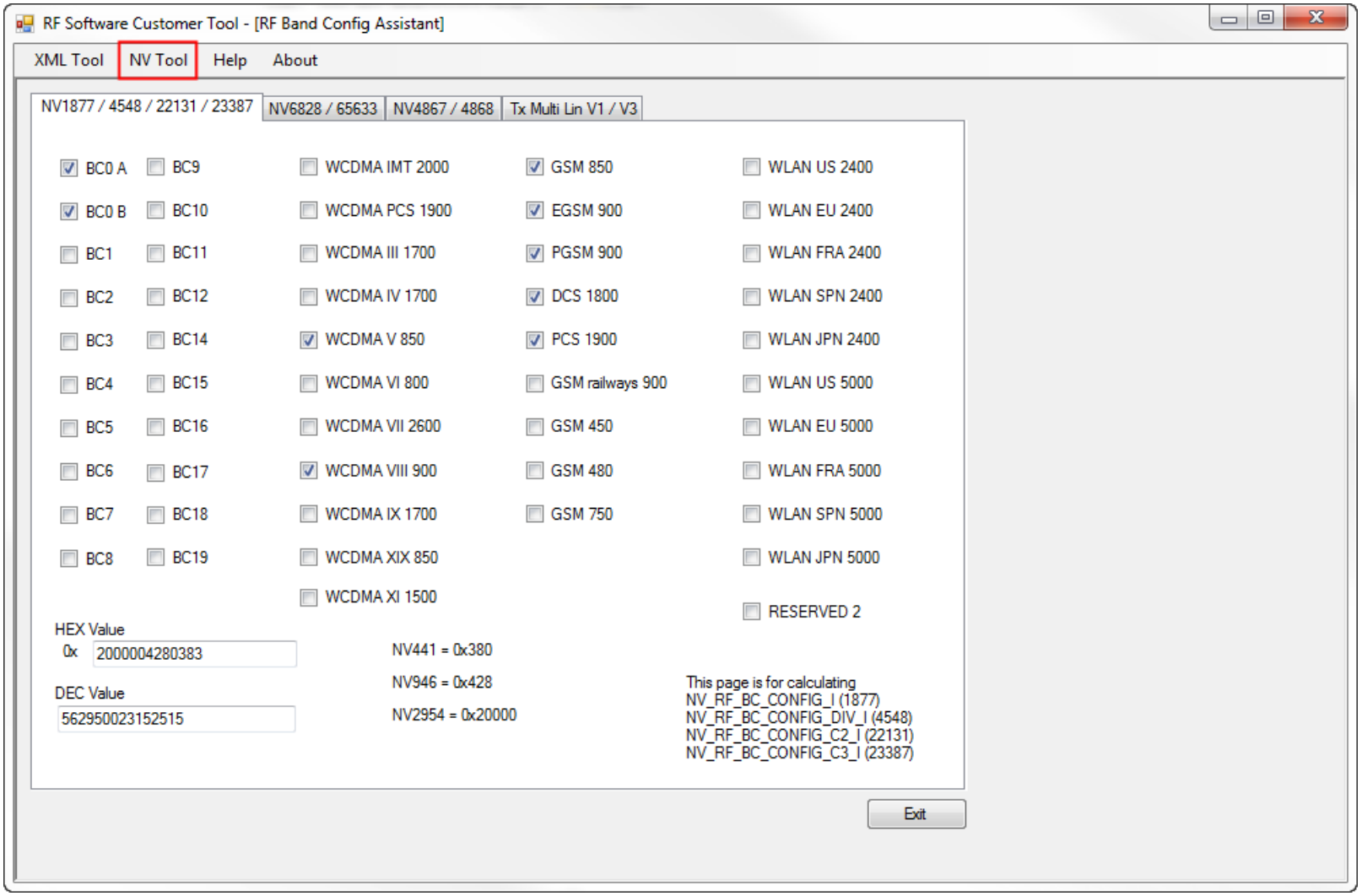
RFSW Customer Engineering Debug Tool (Cont.)

- Introduce
- 介绍



RFSW Customer Engineering Debug Tool (Cont.)

- Introduce
- 介绍



RFCal DLL New Feature For ILPC Tuning

- **Platform:** ESC CalV4
- **适用平台：**ESC CalV4平台

- **Description:** Customer often meet failure at WCDMA ILPC/TDS CLPC PA switch-point
- **问题描述：**客户在调试WCDMA内环/TDSCDMA闭环时经常遇到切换点失败的问题

- **Analysis:**
  - For some PA, there is still some glitch near PA switch-point even after calibration.
- **问题分析:**
  - 对于某些PA，即使校准完成后，PA切换点附近还是有一些WCDMA内环或者TDSCDMA闭环的失败概率

- **Solution:** Use RFCal 1854DLL or above version, using new rfcal paramters
- **解决方案：**使用1854版本的RFCal校准DLL或者更高的版本，加入新的校准参数

RFCal DLL New Feature For ILPC Tuning (Cont.)

- **Procedure**(流程)
- 1) should check which PA state/Channel failure, 先确认到底在哪级PA间、哪个信道失败
- 2) If reference channel failed, we need to tune tx-lin sweep firstly, 如果参考信道失败，首先考虑调整参考信道的tx-lin：
  - Add new parameters <Tx_Lin_Comp_Pwr> in tx-lin sweep
  - 在tx-lin sweep中添加<Tx_Lin_Comp_Pwr>参数
    - Add in sweep_type 0 => If you are using Fullbias only
    - Add in sweep_type 1 => If you are using APT
    - Add in sweep_type 7 => If you are using XPT PA
  - If failure at PA1<->PA0, you can edit compensation as below:
  - 如果失败在PA0(低增益)<-> PA1(高增益)，可以对低增益进行补偿，如：

```
<PA_State_List>1,0,0</PA_State_List>
<RGI_List>SSS(70,20,-1);SSS(70,41,-1);SSS(40,2,-2)</RGI_List>
<Tx_Lin_Comp_Pwr>0,10,10</Tx_Lin_Comp_Pwr>
```

  - If the failure point between PA2(HPM)<-> PA1(MPM中)，you need add value for PA1/PA0 both(If you compensate PA1 only)
  - 如果失败点是在高增益PA2和中增益PA1之间，可以对PA1、PA0一起进行补偿，如果只补偿了PA1，PA0<->PA1之间可能又会出现问题

```
<PA_State_List>2,1,0,0</PA_State_List>
<Tx_Lin_Comp_Pwr>0,-5,-5,-5<Tx_Lin_Comp_Pwr>
```

RFCal DLL New Feature For ILPC Tuning (Cont.)

- If finished reference channel, you failed at some edge channel PA switchpoint, you still need to add new parameter <FreqComp_Comp_Pwr_Per_State> in freqcomp sweep.
- 参考信道调整完毕后，如果其他校准的信道还有问题，需要在在XML里面，Freqcomp中添加参数 <FreqComp_Comp_Pwr_Per_State> 给需要的信道进行额外补偿
  - For example: if customer want to compensate edge channel 18038 and 18570 with different value, they can edit as below:
  - 例如：客户遇到pa state1,0的边缘信道18038/18570的切换点附近失败的问题，可以如下配置:

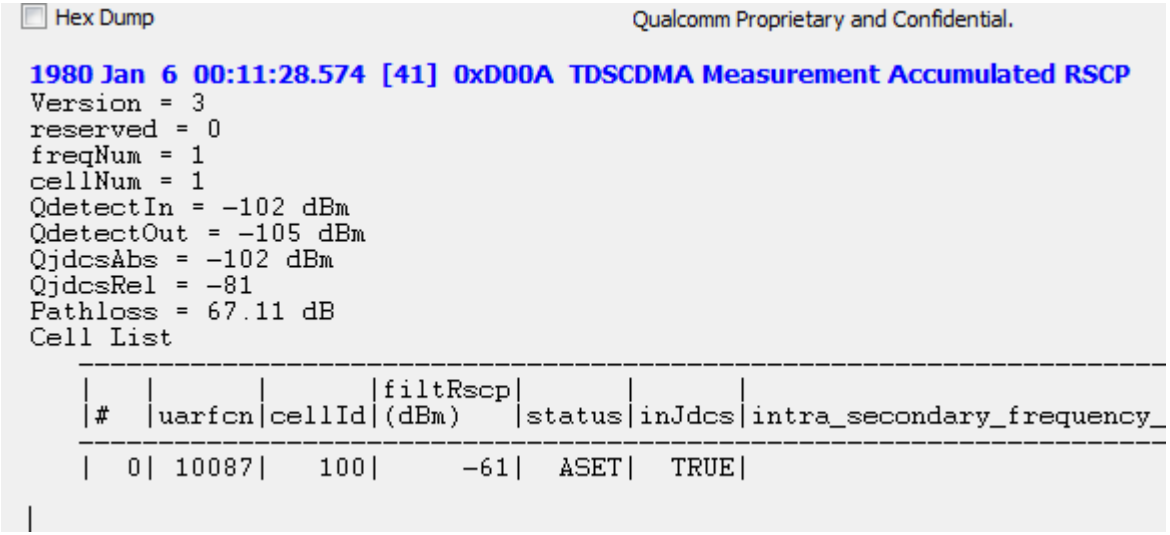
```
<Tx_Channel_List>18038,18300,18570</Tx_Channel_List>
<PA_State_List>2,2,1,0</PA_State_List>
<Purpose_List>5,4,4,4</Purpose_List>
<FreqComp_Comp_Pwr_Per_State>0,0,0;0,0,0;10,0,-10,-5,0,5</FreqComp_Comp_Pwr_Per_State>
```

TDSCDMA manual HO fail on CMW500

- **Platform:** MSM8x16/36/39/94/96/52
- **适用平台：**MSM8x16/36/39/94/96/52

- **Symptom:** TDSCDMA B34 HO B39 fail on CMW500
  现象: 使用CMW500, 从B34到B39频段，TDSCDMA手动切换失败

- **Analysis:**
- step1: From QXDM log, filter 0xD00A, find ARFCN always set 10087, can not see B39 ARFCN, but OEM test process do switch from B34 to B39



- **分析：**
- 第一步：从QXDM log的分析来看，服务小区的ARFCN一直是10087，没有看到B39的频点，但是从客户描述的测试步骤来看确实是做了B34到B39的切换

TDSCDMA manual HO fail on CMW500 (Cont.)

- Step2: From log, function output band always 0, rf_tdscdma_core_util.c 00303 rf_tdscdma_core_util_get_filtered_band: TDSCDMA rfc_band 7, band=0

- 第二步：函数rf_tdscdma_core_util_get_filtered_band的输出，从log中看，参数band的输出一直是0（B34）

- Step3: so doubt handover don't happen on CMW500
- 第三步：经过分析，虽然测试过程中做了切换的动作，但是没有触发CMW500进行切换

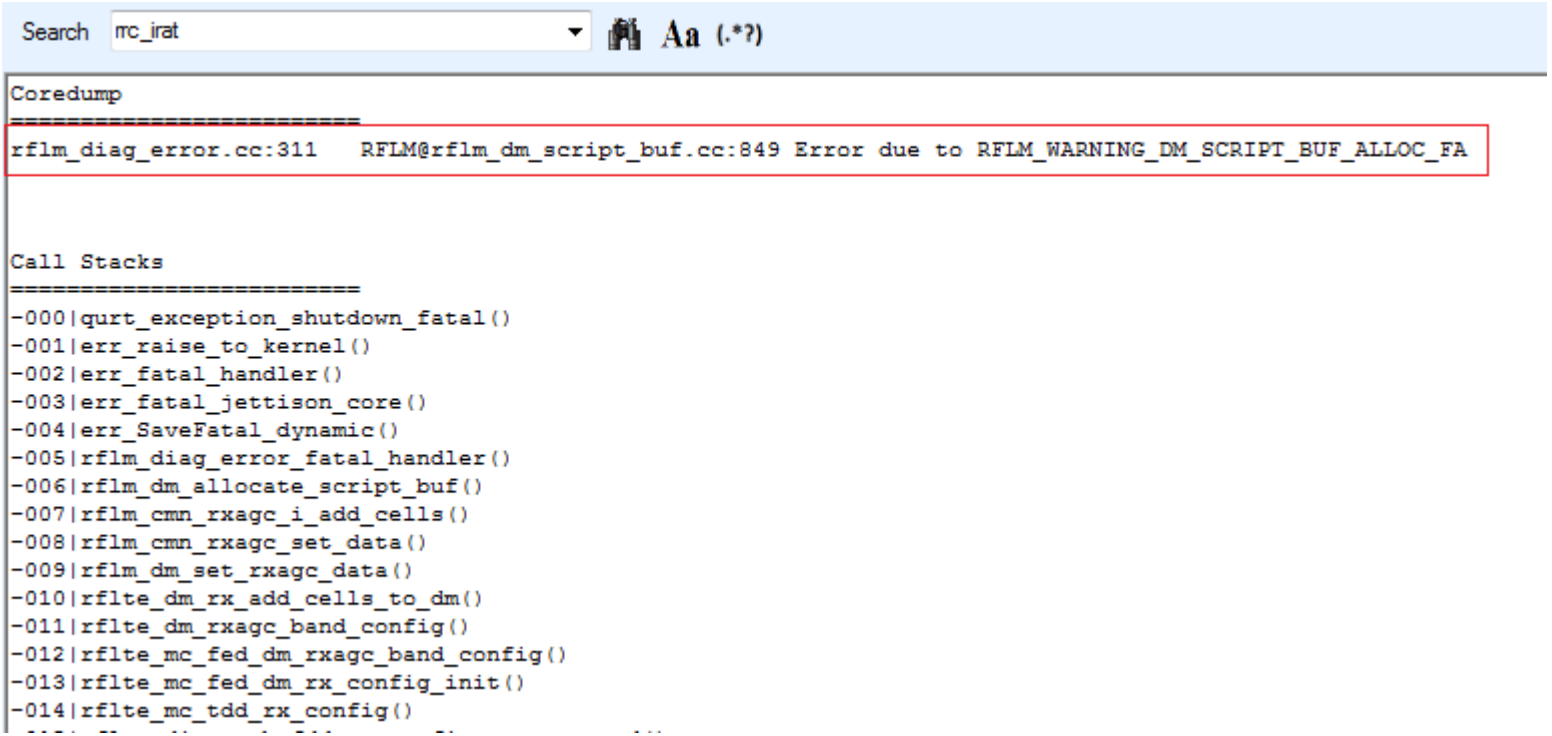
- Step4: after check NV, we found NV66024 bit 16 set 0, after set 1, this issue can be resolved

  NV66024->TDSCDMA->"TDS RRC Optional Feature Bitmasks
- 第四步：修改NV66024 bit 16，解决问题

LTE crash due to no buffer to use

- **Platform:**MSM8916/MSM8939
- **适用平台：**MSM8916/MSM8939

- **Symptom:** The phone crashes in LTE with low probability when it IRAT from TDSCDMA to LTE. Dump decode result is as below
- **问题描述：**手机在从TDS切换到LTE时，出现低概率死机事件，dump结果如下



LTE crash due to no buffer to use (Cont.)

- Dump F3 log shows 500bytes and 1KB buffers are full. You can also find it via checking buffer usage from dump with T32.
- F3 log显示500字节、1K字节 buffer已满。也可以通过T32加载dump查看buffer使用情况

```
rflm_cmn_ikage.c:778       rflm_cmn_ikage_get_data: API failed for command 10
rflm_dm_script_buf.cc:783       RFLM_WARNING_DM_SCRIPT_BUF_MIN_SZ_ALLOC_FAILED: Unable to allocate buffer for req sz 304: 500 bytes buffers full\n
rflm_dm_script_buf.cc:783       RFLM_WARNING_DM_SCRIPT_BUF_MIN_SZ_ALLOC_FAILED: Unable to allocate buffer for req sz 276: 500 bytes buffers full\n
rflm_dm_script_buf.cc:783       RFLM_WARNING_DM_SCRIPT_BUF_MIN_SZ_ALLOC_FAILED: Unable to allocate buffer for req sz 276: 500 bytes buffers full\n
rflm_dm_script_buf.cc:783       RFLM_WARNING_DM_SCRIPT_BUF_MIN_SZ_ALLOC_FAILED: Unable to allocate buffer for req sz 276: 500 bytes buffers full\n
rflm_dm_script_buf.cc:783       RFLM_WARNING_DM_SCRIPT_BUF_MIN_SZ_ALLOC_FAILED: Unable to allocate buffer for req sz 276: 500 bytes buffers full\n
rflm_dm_script_buf.cc:800       RFLM_WARNING_DM_SCRIPT_BUF_MIN_SZ_ALLOC_FAILED: Unable to allocate buffer for req sz 276: 1KB buffers full\n
rflm_dm_script_buf.cc:783       RFLM_WARNING_DM_SCRIPT_BUF_MIN_SZ_ALLOC_FAILED: Unable to allocate buffer for req sz 276: 500 bytes buffers full\n
rflm_dm_script_buf.cc:800       RFLM_WARNING_DM_SCRIPT_BUF_MIN_SZ_ALLOC_FAILED: Unable to allocate buffer for req sz 276: 1KB buffers full\n
rflm_dm_script_buf.cc:783       RFLM_WARNING_DM_SCRIPT_BUF_MIN_SZ_ALLOC_FAILED: Unable to allocate buffer for req sz 276: 500 bytes buffers full\n
rflm_dm_script_buf.cc:800       RFLM_WARNING_DM_SCRIPT_BUF_MIN_SZ_ALLOC_FAILED: Unable to allocate buffer for req sz 276: 1KB buffers full\n
rflm_dm_script_buf.cc:783       RFLM_WARNING_DM_SCRIPT_BUF_MIN_SZ_ALLOC_FAILED: Unable to allocate buffer for req sz 304: 500 bytes buffers full\n
rflm_dm_script_buf.cc:800       RFLM_WARNING_DM_SCRIPT_BUF_MIN_SZ_ALLOC_FAILED: Unable to allocate buffer for req sz 304: 1KB buffers full\n
rflm_dm_script_buf.cc:783       RFLM_WARNING_DM_SCRIPT_BUF_MIN_SZ_ALLOC_FAILED: Unable to allocate buffer for req sz 276: 500 bytes buffers full\n
rflm_dm_script_buf.cc:800       RFLM_WARNING_DM_SCRIPT_BUF_MIN_SZ_ALLOC_FAILED: Unable to allocate buffer for req sz 276: 1KB buffers full\n
```

```
rflm_dm = (
  handle_pool = (
    MyBufMgrTemplate<rflm_dm_handle_s, 16>::buf = ((meta = (external_user_data = 1,
    MyBufMgrTemplate<rflm_dm_handle_s, 16>::list = (mTotalItems = 16, mNumFreeItems
    MyBufMgrTemplate<rflm_dm_handle_s, 16>::mTotalBufs = 16,
    MyBufMgrTemplate<rflm_dm_handle_s, 16>::max_usage = 12,
    MyBufMgrTemplate<rflm_dm_handle_s, 16>::totalNewBuffs = 63182,
    MyBufMgrTemplate<rflm_dm_handle_s, 16>::totalDeleteBuffs = 63170),
  script_buf_2h = (MyBufMgrTemplate<rflm_dm_script_buf_s<50>, 30>::buf = ((buf_param
  script_buf_5h = (
    MyBufMgrTemplate<rflm_dm_script_buf_s<144>, 110>::buf = ((buf_params = (meta = (
    MyBufMgrTemplate<rflm_dm_script_buf_s<144>, 110>::list = (mTotalItems = 110, mNu
    MyBufMgrTemplate<rflm_dm_script_buf_s<144>, 110>::mTotalBufs = 110,
    MyBufMgrTemplate<rflm_dm_script_buf_s<144>, 110>::max_usage = 110,
    MyBufMgrTemplate<rflm_dm_script_buf_s<144>, 110>::totalNewBuffs = 398805,
    MyBufMgrTemplate<rflm_dm_script_buf_s<144>, 110>::totalDeleteBuffs = 0,
    script_buf_depth = 0),
  script_buf_1k = (
    MyBufMgrTemplate<rflm_dm_script_buf_s<306>, 40>::buf = ((buf_params = (meta = (b
    MyBufMgrTemplate<rflm_dm_script_buf_s<306>, 40>::list = (mTotalItems = 40, mNumF
    MyBufMgrTemplate<rflm_dm_script_buf_s<306>, 40>::mTotalBufs = 40,
    MyBufMgrTemplate<rflm_dm_script_buf_s<306>, 40>::max_usage = 40,
    MyBufMgrTemplate<rflm_dm_script_buf_s<306>, 40>::totalNewBuffs = 97646,
    MyBufMgrTemplate<rflm_dm_script_buf_s<306>, 40>::totalDeleteBuffs = 0,
    script_buf_depth = 0),
```

LTE crash due to no buffer to use (Cont.)

- From F3 log, it shows buffer exhaust begins at 500bytes buffers. Script_buf_5h is mostly occupied by UMTS and TDSCDMA.
- 从f3 log，可以知道500字节buffer首先耗尽。 Script_bug_5h 大部分被 UMTS 和 TDSCDMA 占用。

- **Solution**
- Apply CR899216/902494/895728 to fix.
- **解决方案**
- 申请CR899216/902494/895728 解决问题。

M-Line calibration failure debug

- **Platform:** CalV4 calibration, ET or APT+DPD design
- **适用平台：**CalV4校准, ET PA或者APT+DPD的PA.

- **Symptom:** in CalV4, customer often meet failure related with M-Line Table calculation in second sweep (sweep_type=6),
- **问题描述：**XPT校准过程中经常遇到跟M-line相关的校准失败。

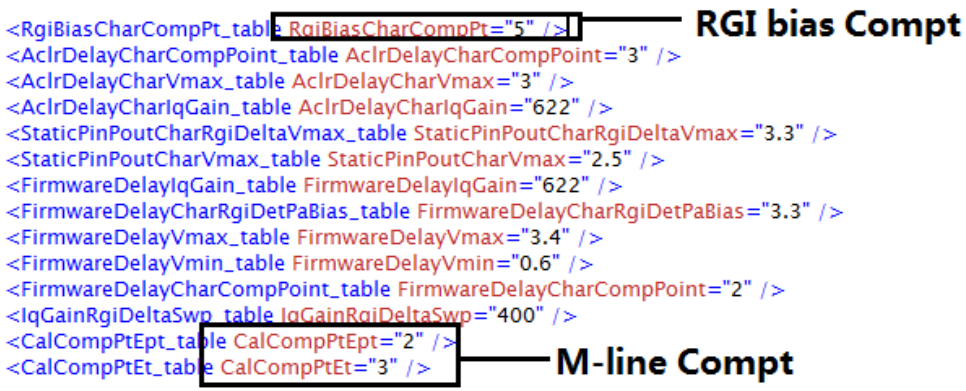
- **Issue 1:** N dB compression point not found for alignment sweep
- **问题 1：**第一个扫描中4对(RGI, bias) 扫描不能覆盖要求的n dB压缩点

Channel	XPT Mode	TxAGC	Vcc (mV)	Compression (dB)	Compression Min
358	1	64	1500	1.35212	3
358	1	65	2000	2.0206	3
358	1	66	2500	3.74484	3
358	1	67	3000	1.55804	3

```
<XPT_Swp1_RGI_List_ET>69,71,72,73</XPT_Swp1_RGI_List_ET>
<XPT_Swp1_RGI_List_EPT>64,65,66,67</XPT_Swp1_RGI_List_EPT>
<XPT_Swp1_Bias_List_ET>1500,2000,2500,3000</XPT_Swp1_Bias_List_ET>
<XPT_Swp1_Bias_List_EPT>1500,2000,2500,3000</XPT_Swp1_Bias_List_EPT>
```

M-Line calibration failure debug (Cont.)

- **Analysis:**
- The M-line n dB compression point limit is in “RFCAL_PA_PARAM.xml”.Here we need redo RGI bias char. But need ensure the RGI bias char CompPoint is bigger than M-line Compt 2dB.
- **问题分析：**
- M-line n dB压缩点门限要求保存在“RFCAL_PA_PARAM.xml”，出现这个情况RGI bias需要重做，但需要注意RGI Bias char的n dB 压缩点要大于M-line计算的压缩点，一般2dB，如下。最好多做几个手机，取最大的RGI值。



M-Line calibration failure debug (Cont.)

- **Issue 2:** Cannot find the power in the M-Line table
  - a. greater than requested power, i.e., expected power > max power in the M-Line table.
  - b. less than requested power, i.e., expected_power < min power in the M-Line table.
- **问题 2：**期望的校准功率点在M-line中找不到
  - a.校准期望功率大于M-line最大功率
  - b.校准期望功率小于M-line最小功率

Channel	XPT Mode	TxAGC	Vcc (mV)	Pout (dBm)
358	2	57	0	14.86
358	2	58	2	15.8
358	2	59	192	16.74
358	2	60	509	17.68
358	2	61	821	18.62
358	2	62	1216	19.56
358	2	63	1790	20.5
358	2	64	2285	21.44
358	2	65	2908	22.38
358	2	66	3754	23.32

<ET_Swp2_Meas_Pwr_List>14,18,20,24</ET_Swp2_Meas_Pwr_List>

M-Line calibration failure debug (Cont.)

MEASUREMENTS: Tx XPT Swp2 - M Line table

Channel	XPT Mode	TxAGC	Vcc (mV)	Pout (dBm)	Time (s)
358	2	64	3573	0	
358	2	65	3794	0	
358	2	66	4069	0	
358	2	67	4350	0	
358	2	68	4700	0	
358	2	69	5096	0	
358	2	70	5503	0	
358	2	71	6008	0	
358	2	72	6637	0	
358	2	73	7232	0	
358	2	74	7970	0	
358	2	75	8972	0	
358	2	76	9759	0	
358	2	77	10632	0	
358	2	78	11377	0	
358	2	79	12184	0	
358	2	80	12675	0	

SUREMENTS: Tx XPT Swp2 - ET M Line Select

Channel	XPT Mode	Exp Power	Selection Valid	Sel
358	2	18.5	0	
358	2	21.6	0	
358	2	23.6	0	
358	2	25	0	

MEASUREMENTS: Tx XPT Swp2 - M Line RGI Compression

Channel	XPT Mode	TxAGC	Vcc (mV)	Compression (dB)	Compr
358	2	69	1500	-8.1308	
358	2	71	2000	-8.1308	
358	2	73	2500	-8.1308	
358	2	74	3000	-8.1308	

- **Analysis:**
  - a.The error means the lowest/highest power in the M-Line table cannot cover the measurement power. Try to decrease/increase RGI in RGI delta sweep.
  - b.Or sweep1 for M-line calculation data is abnormal..
- **问题分析：**
  - a. 这类错误意味着M-line表无法覆盖校准的期望功率点，可以尝试调整RGI delta扫描区间。如果最大期望功率无法满足，可能受限硬件输出，需要降低最大的校准期望功率。
  - b. RGI Alignment sweep可能出现异常，导致M-line计算异常，可尝试增加 <XPT_Swp1_Cap_Segment_Length>4000</XPT_Swp1_Cap_Segment_Length>

M-Line calibration failure debug (Cont.)

- **Issue 3:** M Line Bias for expected power > Vmax and interpolated Bias is also > Vmax
- **问题 3：**期望功率在M-line上得到的电压值大于最大的XPT 工作电压

MEASUREMENTS: Tx XPT Swp2 - M Line table

Channel	XPT Mode	TxAGC	Vcc (mV)	Pout (dBm)	Time (s)
9750	2	66	1010	8.28	
9750	2	67	1146	10.21	
9750	2	68	1315	12.13	
9750	2	69	1507	13.9	
9750	2	70	1703	15.4	
9750	2	71	1924	16.82	
9750	2	72	2172	18.18	
9750	2	73	2540	19.87	
9750	2	74	2795	20.88	
9750	2	75	3111	21.99	
9750	2	76	3588	23.43	
9750	2	77	4135	24.83	
9750	2	78	4708	26.09	
9750	2	79	5295	27.21	
9750	2	80	6240	28.76	

MEASUREMENTS: Tx XPT Swp2 - Max M Line Power

Channel	XPT Mode	Vcc (mV)	XPT Swp2 Max MLine Power	Time (s)
9750	2	3800	23.9726	

MEASUREMENTS: Tx XPT Swp2 - ET M Line Selection Sweep Results

Channel	XPT Mode	Exp Power	Selection Valid	Selection Valid Min	TxAGC	Vcc (mV)	Pout (dBm)
9750	2	17.5	1	1	72	2172	18.18
9750	2	20	1	1	74	2795	20.88
9750	2	22	1	1	76	3588	23.43
9750	2	24	0	1	-	-	-

期望的24dBm对应的bias > 3800 (Vmax)

<MLineMaxPaSupplyEt_table MLineMaxPaSupplyEt="3.8" />

```
ET Debug (Error Mask = 16 ):
1) M Line Bias for expected power > Vmax and interpolated Bias is also > Vmax .
  -Max target Pout is set too high
  -Investigate Max achieveable power considering PA specs, front-end loss and temperature/frequency margin.
  -Consider Max power Vs. ACLR tradeoff using ENV Scaling.
```

M-Line calibration failure debug (Cont.)

- **Analysis:**
- The error means M-Line selected bias is higher than VdMax and Interpolated bias is higher than Vmax
- **问题分析：**
- 这类错误意味最大校准期望功率点电压在M-line计算的结果大于XPT最大工作电压。遇到这个情况，首先要检查线损情况。如果硬件是属性限制，可以适当降低校准最大期望功率，但最好能保证仍然大于23dBm以上。
- Target power选择的建议：

```
<ET_Swp3_Meas_Pwr_List>16,18,21,24</ET_Swp3_Meas_Pwr_List>
```

  - 4个点之间相隔3dBm为宜
  - 4个点的功率能覆盖该PA state的范围
  - 最大的功率是手机能达到的最大功率，需要覆盖高低信道的差异，所以尽量选的大一些（用该PA ET/EPT能工作的最大电压对应的功率回退0.5左右，保证既能提供大功率也能覆盖个体差异）

WCDMA Calibration Upper bound Channel setting

- **Platform**: All
- **适用平台**：所有平台

- **Symptom:** in WCDMA factory Calibration, there is one calibration parameter called “Upper Bound channel”, it is used to define the Channel coverage for the TX Linearizer NV Data together with it , for example, if you did TX linearizer (power vs RGI & Bias) with only one reference channel , you will set one upper bound channel for this TX linearizer calibration data , when online operation or NS , all channels lower than this upper bound channel will use the this set of TX linearizer calibration data to calculate the Frequency compensation
- Generally , based on 3GPP, we have to set the upper bound channel =highest channel in this Band ,take WCDAM B5 for example , the channel range for this band is 4132 to 4233, so the highest channel =4233, but if you set the upper bound channel in calibration parameters as 4233, some unexpected NS test issue will happen.

- **问题描述：** 在WCDMA的工厂校准中，有一个参数叫做“upper bound channel”, 它是用来定义和它关联的线性校准数据的信道范围，举例说明，如果WCDMA的线性校准只做一个信道，需要在这组线性校准数据中加入参数“upper bound channel”，在信令或者非信令综测时候，所有低于upper bound channel的信道都会用这组线性校准数据做频率补偿计算.

WCDMA Calibration Upper bound Channel setting

- 一般来说，根据3GPP，我们需要把这个upper bound channel设置成 这个band 内最高的那个信道，拿WCDMA B5为例，根据3GPP，这个带宽内的信道范围是从4132到4233，所以最大的信道是4233，所以如果你在校准参数中把upper bound channel设置成为4233， 那么在非信令中测试中会有一些未知问题发生.

- **Analysis:** In WCDMA L1 modem implementation, The top channels have been extended and the channel span is a multiple of 10. This is to accommodate with the L1 raw frequency scan which runs in 2MHz steps (10 channels) ,also take WCDMA band 5 as example , the channel range is 4132 ~4233, we can calculate the channel span=4233-4132=101, not multiple of 10 , so we have to add 9 to make it multiple of 10(101+9=110), so the final upper bound channel =4233+9=4242.

- **问题分析:** 对于WCDAM L1 modem的实现中，upper bound channel需要被扩展，能够让channel range是10的整数倍，这样就会符合L1 在以每步 2MHz （ 10 个信道，每个信道 200kHz ）原始频点扫描的实现，同样以WCDAM BAND 5为例，这个带宽的信道范围是4132到4233，我们可以计算出4233-4132=101 不是10的整数倍，因此我们要在基础上加9 =101+9=110,所以我们最后的upper bound channel要设置成4233+9=4242.

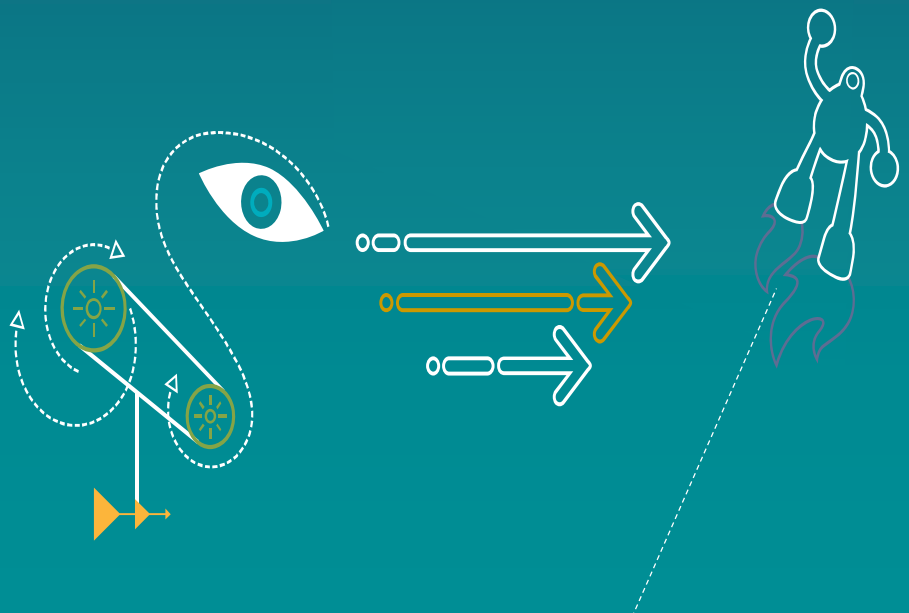
WCDMA Calibration Upper bound Channel setting

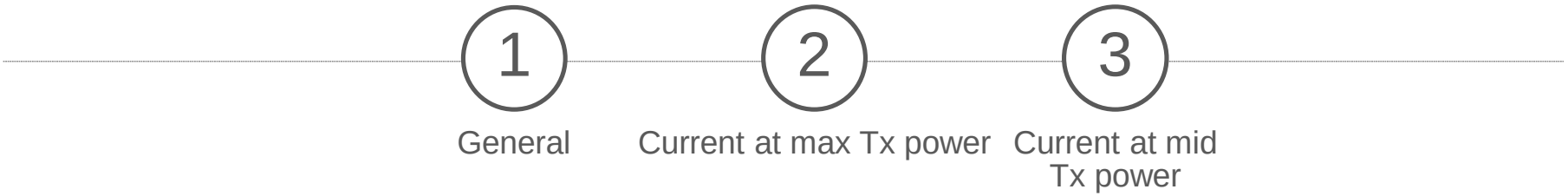
- **Solution:** Configure the upper bound channel according to the default setting in QDART RF Cal parameter released as below
- **解决办法：**按照我们QDART默认给出的校准参数去配置WCDMA的upper bound channel,如下：

WCDMA	B1	<Upper_Bound_Channel>9888</Upper_Bound_Channel>
	B2	<Upper_Bound_Channel>9542</Upper_Bound_Channel>
	B4	<Upper_Bound_Channel>1513</Upper_Bound_Channel>
	B5	<Upper_Bound_Channel>4242</Upper_Bound_Channel>
	B8	<Upper_Bound_Channel>2872</Upper_Bound_Channel>

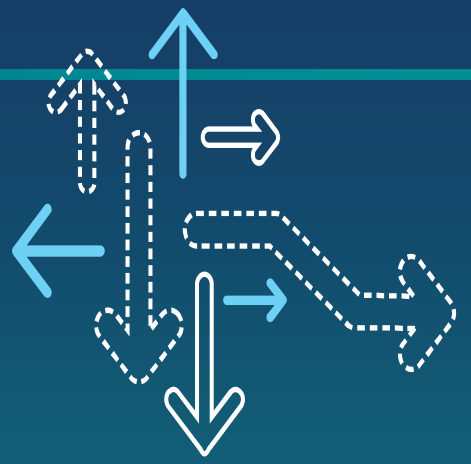
Power debug from RF perspective

QUALCOMM®



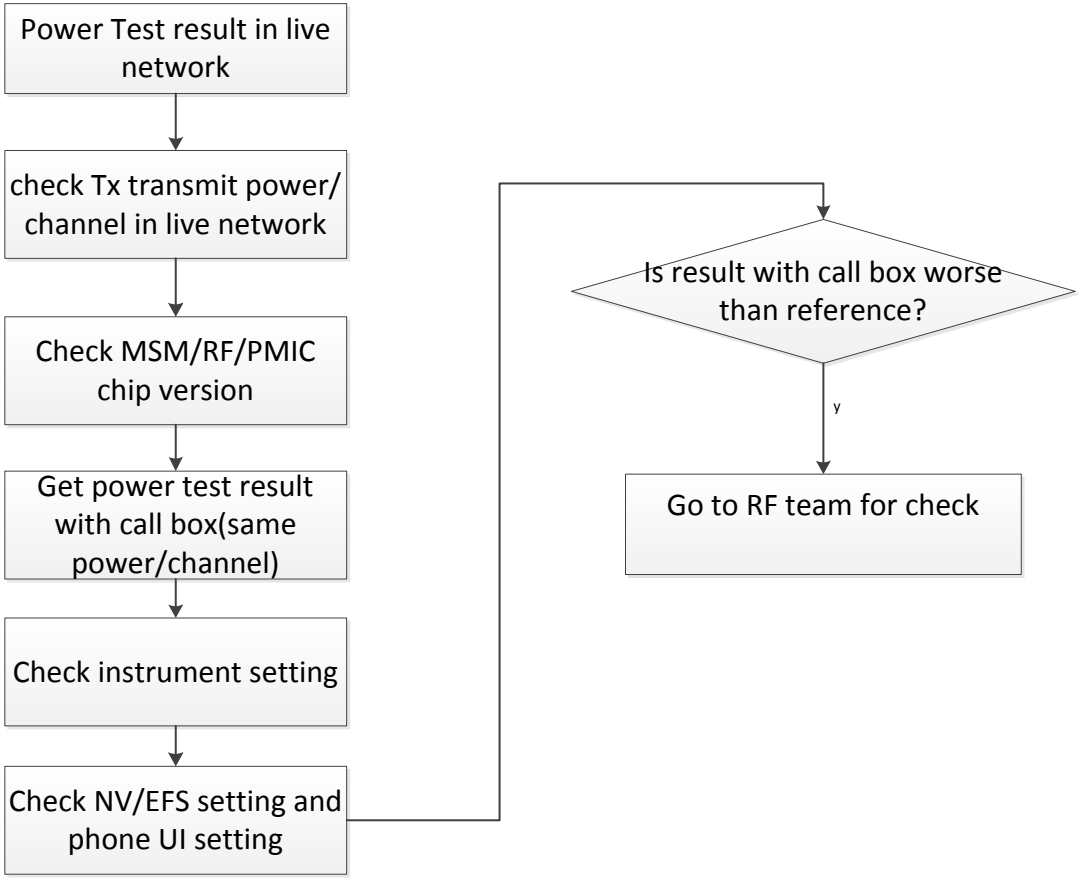


Agenda



1- General

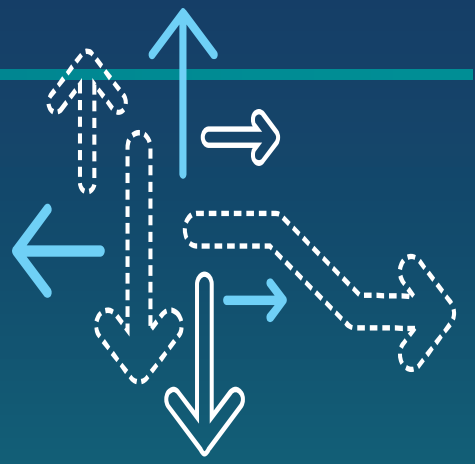
Talk current debug process



General info for power debug

- Key item for RF team to involve is: test result with call box

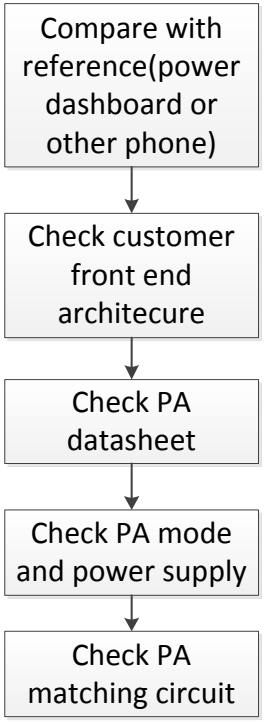
- In order to let RF team check RF power, normally we will need below info, RF team will request below from customers
  - Test result with call box(and make sure test setup is correct including instrument/NV/UI setting)
  - Our chip version(MSM/PMIC/RF)
  - Customer schematic
  - Customer PA datasheet
  - PA power supply scheme, Vbat or ET/APT



2 - Current consumption at max Tx power

Current consumption at Max Tx power

Current at max Tx power is more related with PA and Tx front end



Compare with reference(power dashboard or other phone)

- First, we need to compare with our power dashboard
  - But even customer current is bigger we need to check front end first, because different front end and component will cause current difference
  - Below is 8909 power dashboard for GSM voice call from Shanghai R&D team.
  - For MTP, there is no test data at max Tx power in dashboard, hence need to compare with other projects

		PA=2	PA=1	PA=0			
		GSM Voice Call					
		8909_LC_AMX_DVT1.0#4 PL1.1_27026build				8909_HQ_CMCC_1G_DVT 2_#06_PL1.1_27026build	
		PGSM900,chn=20		GSM850,chn=150		PGSM900,chn=20	
		Current/mA	TX level	Current/mA	TX level	Current/mA	TX level
Target TX/dBm Direction:5->32	5	90.69	19	97.55	19	97.59	19
	7	91.77	18	97.92	18	97.68	18
	9	92.9	17	99.73	17	97.96	17
	10	96.96	16	101.44	16	98.63	16
	12	97.72	15	104.38	15	99.65	15
	14	100.86	14	107.8	14	100.59	14
	16	106.15	13	113.28	13	103.56	13
	18	112.17	12	119.65	12	107.68	12
	20	120.51	11	127.54	11	113.35	11
	22	131.08	10	139.06	10	122.43	10
	24	143.16	9	155.18	9	166.84	9
	26	163.58	8	171.75	8	174.02	8
	28	200.03	7	193.12	7	186.16	7
	30	225.14	6	212.1	6	208.34	6
	32	253.4	5	245.06	5	232.21	5

Check customer front end

- Why
  - **If the insertion loss after PA is big, it will request PA output bigger Tx power in order to achieve same power at antenna connector, thus current will increase**
- What
  - **Check the front end architecture after PA**
- Whom
  - **HW RF engineer**

Check PA datasheet

- Why
  - **If Tx front end architecture is same, but PA is different, since the current consumption for each PA may be different, so current at phone level may be different. Check PA datasheet is first step if the issue is caused by PA itself**
- What
  - **Check PA datasheet**
- Whom
  - **HW RF engineer**

Electrical Specifications: Band B38

Test conditions unless otherwise noted: VCC=3.4, VBATT=3.4, Pmax = min, Temp = 25C, Zs=Zl=50Ω

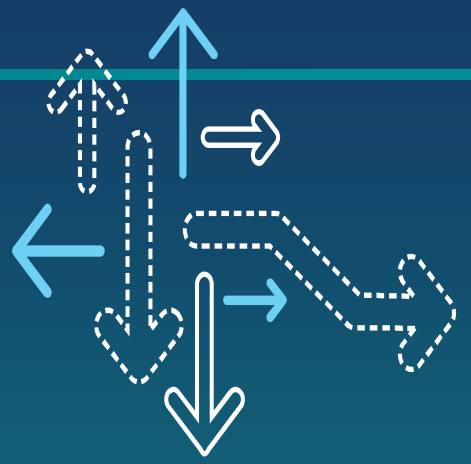
Parameter	Conditions	Min	Typ	Max	Unit	Notes
Pmax		27.5	28		dBm	
	20MHz QPSK Full RB	26.5			dBm	LTE MPR=1
	20MHz 16QAM Full RB	25.5			dBm	LTE MPR=2
HPM Gain			29		dB	
LPM Gain	Pout≤16dBm		18		dB	
EUTRA ACLR	All modulations		-38	-35	dBc	Pout≦P_{max}
UTRA ACLR1			-40	-38	dBc	Pout≦P_{max}
UTRA ACLR2			-42	-41	dBc	Pout≦P_{max}
EVM			3		%	Pout≦P_{max}
Current @ P_{max}			480		mA	Vcc=3.4V
Current @ 16dBm			140		mA	VCC1+VCC2
Current @ 0dBm			30		mA	VCC1+VCC2
Avg. current			80		mA	

Check PA mode and power supply

- Why
  - **PA current at different mode is different. Sometimes if PA is put into wrong PA mode or an unknown mode, PA current may be higher**
  - **Also needs to check PA's power supply(Vbat or ET/APT mode)**
- What
  - **Check PA mode setting, and power supply**
- Whom
  - **HW RF engineer/RF SW engineer**

Check PA matching circuit

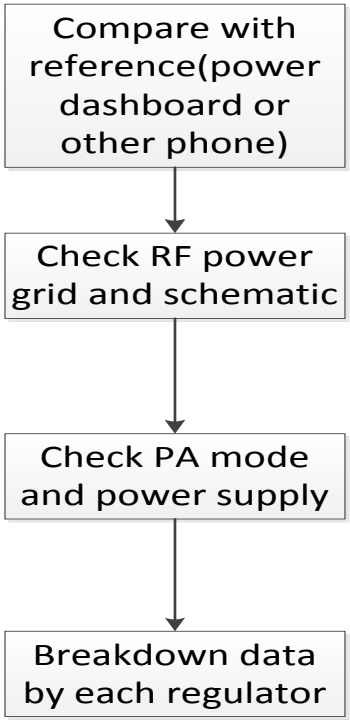
- Why
  - **PA performance(including RF performance and current consumption will be hugely impacted by PA matching circuit). It needs tradeoff. If the performance/current across different channels has big difference, or need to optimize the performance at specific channel, matching circuit needs to be fine tuned**
- What
  - **Check current at different channels, re-tuning matching circuit**
- Whom
  - **Qualcomm HW RF engineer or customer engineer can help check the data**
  - **PA vendor or customer engineer retune the matching circuit**



3 - Current consumption at mid Tx power(0dBm)

Current consumption at mid Tx power

- Current at mid Tx power(like 0dBm) is more related with transceiver/PA and modem(unused clocks/LDOs etc), here only discuss RF related.
- Below is the debug procedure from RF perspective.



Compare with reference(power dashboard or other phone)

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  - For MTP, there is no test data at max Tx power in dashboard, hence need to compare with other projects

		PA=2	PA=1	PA=0			
		GSM Voice Call					
		8909_LC_AMX_DVT1.0#4 PL1.1_27026build				8909_HQ_CMCC_1G_DVT 2_#06_PL1.1_27026build	
		PGSM900,chn=20		GSM850,chn=150		PGSM900,chn=20	
		Current/mA	TX level	Current/mA	TX level	Current/mA	TX level
Target TX/dBm Direction:5->32	5	90.69	19	97.55	19	97.59	19
	7	91.77	18	97.92	18	97.68	18
	9	92.9	17	99.73	17	97.96	17
	10	96.96	16	101.44	16	98.63	16
	12	97.72	15	104.38	15	99.65	15
	14	100.86	14	107.8	14	100.59	14
	16	106.15	13	113.28	13	103.56	13
	18	112.17	12	119.65	12	107.68	12
	20	120.51	11	127.54	11	113.35	11
	22	131.08	10	139.06	10	122.43	10
	24	143.16	9	155.18	9	166.84	9
	26	163.58	8	171.75	8	174.02	8
	28	200.03	7	193.12	7	186.16	7
	30	225.14	6	212.1	6	208.34	6
	32	253.4	5	245.06	5	232.21	5

Check RF power grid/schematic

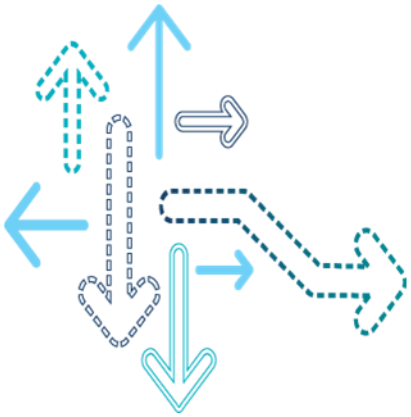
- Why
  - **RF power grid will impact current consumed by transceiver**
- What
  - **Check RF power grid**
- Whom
  - **HW RF engineer**

Check PA mode and power supply

- Why
  - **PA current at different mode is different. Sometimes if PA is put into wrong PA mode or an unknown mode, PA current may be higher**
  - **For 0dBm, some PA can work in very low power supply if APT is enabled.**
- What
  - **Check PA mode setting and PA power supply setting, HW and SW needs to be aligned**
  - **Check PA power supply voltage if it's in APT mode**
- Whom
  - **HW RF engineer/RF SW engineer**

Check breakdown data

- What
  - **Check breakdown data at each regulator**
- Whom
  - **Need BB or power engineer's help on it**



Questions?

https://support.cdmatech.com