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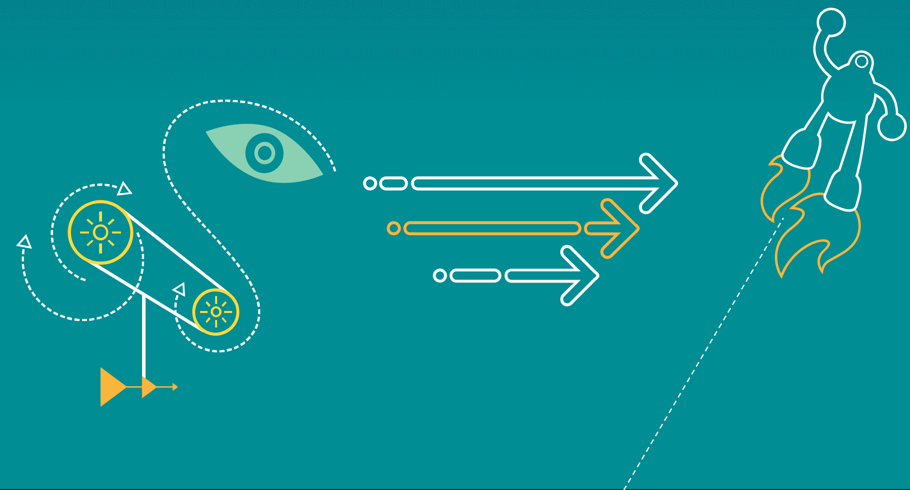
Qualcomm Technologies, Inc.



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Revision History

Revision	Date	Description
A	Oct 2015	Initial release

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

Contents

- RF HW
- RF SW

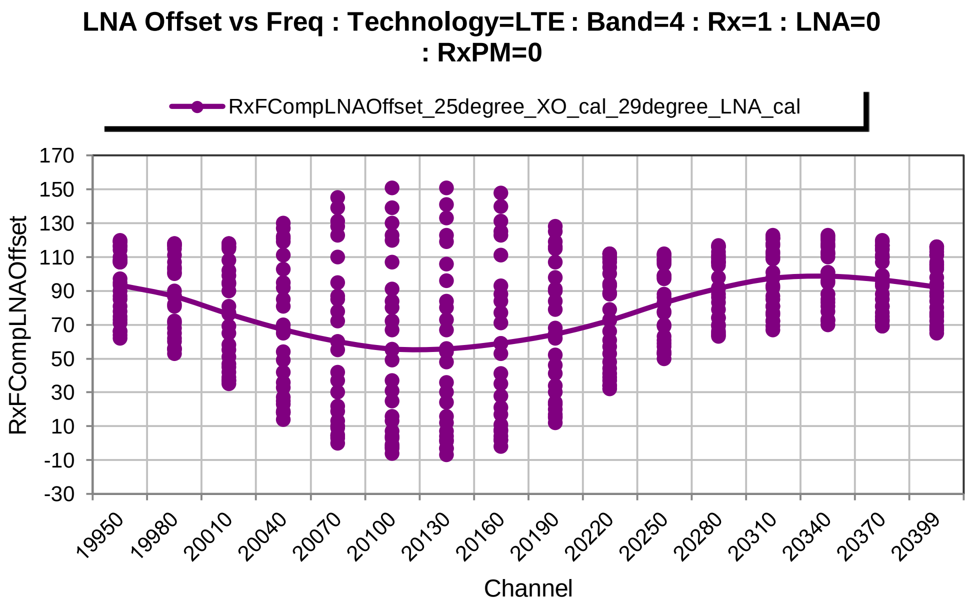
1. Notch filter NV impact LTE Rx Calibration
2. FDD+TDD LTE DLCA RF front-end design tips
3. ET/APT PA power supply with QFE3100/1100
4. Power drop during QPA characterization

RF HW

Notch filter NV impact LTE Rx Calibration

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

- **Symptom**: some boards LTE LNA OFFSET calibration fail in factory. It is random happen on one board and the calibration value has big variation. The picture shows the LTE B4 multi-times calibration data.
- **问题描述**：在工厂校准中，有的单板LTE LNA OFFSET校准结果超出限制。在同一个单板上，问题随机出现，校准值偏离较大。下图是LTE B4多次校准的数据的分布图。



Notch filter NV impact LTE Rx Calibration

- **Analysis**: In calibration mode, RFNV_LTE_Cx_SPURS_TABLE_I NV is active. The frequency customer set in notch filter NV equal to the frequency of DL calibration waveform in some condition. When they are equal, the DL signal is filtered out and calibration result is impacted. The formula as below,
  - Fcal+500KHz = Fnotch + Ferror
    - Fcal is the LO frequency of reference calibration channel，500KHz is offset of calibration DL signal (LTE Rx calibration use 500KHz offset CW tone waveform)，Fnotch is the frequency of notch filter, Ferror is the frequency error caused by XO (it is a function of temperature).
    - If don't consider extreme temperature condition, the XO error (ppm) formula is: f(t)=-0.25(t-T0)+C0, T0 is related to XO type, C0 is XO calibration result, t is XO temperature.

  So when the board's temperature meet the above formula, the issue will happen.

  For example, NV23759 (RFNV_LTE_C0_SPURS_TABLE_I) set 2131500000Hz，and LTE B4 reference channel is 20160 (LO=2131MHz)，when Ferror equal to zero, the issue happens. As: 2131MHz + 500KHz = 2131500000Hz + 0

Notch filter NV impact LTE Rx Calibration

- **问题分析**：在校准模式下， RFNV_LTE_Cx_SPURS_TABLE_I NV是生效的。客户在notch filter NV中添加的一些频率，刚好在某些情况下与校准的下行信号重叠，这样下行信号被滤除，影响校准结果。具体关系如下，
  - Fcal+500KHz = Fnotch + Ferror
    - 其中，Fcal 是校准参考信道中心频率，500KHz是校准信号频偏（LTE接收校准用的是500KHz频偏的CW波），Fnotch 是NV中设置的滤波频率，Ferror 是XO引入的频率误差（是温度的函数)。
    - 在不考虑极限温度的情况下，XO的频率误差(ppm)由公式决定：f(t)=-0.25(t-T0)+C0, T0 由晶体决定，C0由XO校准确定，t 是XO的温度。

  所以当单板温度变化满足以上关系式时，问题会发生。

  例子：如 NV23759 (RFNV_LTE_C0_SPURS_TABLE_I) 中如果设置2131500000Hz，而LTE B4校准参考信道为20160（中心频率2131MHz），那么当 Ferror 为0时，问题就会发生。如下，2131MHz + 500KHz = 2131500000Hz + 0

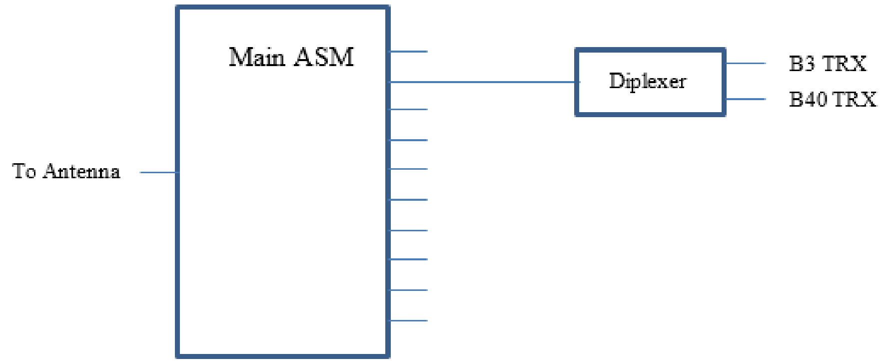
Notch filter NV impact LTE Rx Calibration

- **Solution**: apply CR911828 to disable notch filter in calibration mode
- **解决办法**：CR911828，在校准时关闭notch filter。

FDD+TDD LTE DLCA RF front-end design tips

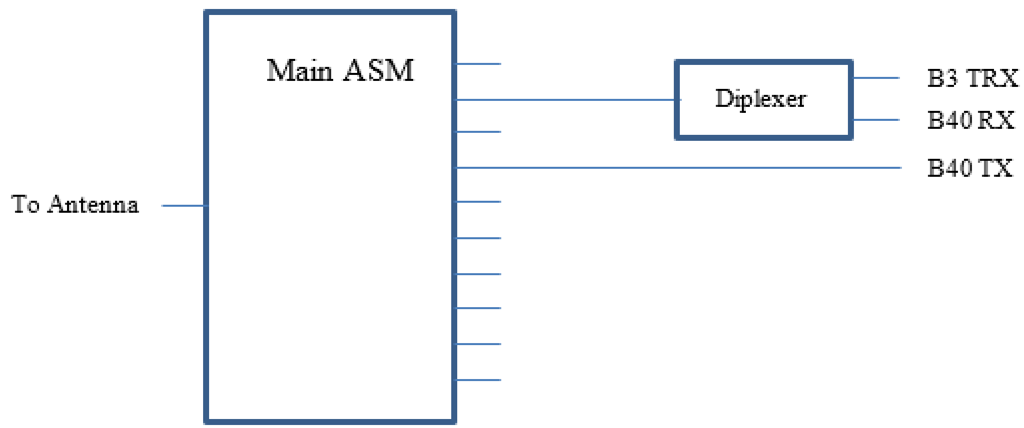
- **Platform**: All
- **适用平台**：All

- **Description**: In a FDD+TDD DLCA design, FDD band will be always Pcell, and TDD is Scell. E.g. B3+40 DLCA, the uplink will be always in B3. So far, we can see TDD band is always in HB in a FDD+TDD DLCA combos, such as B3+40, B5+40. QCT ref designs adapt dual antennas, one for LB+MB, the other for HB. But many customers still want to use antenna, take B3+40 for example, we need to use a diplexer to combine B3 and B40. The diplexer will introduce 0.6-1dB IL, this is a big challenge to TX and RX performance.
- **问题描述**： 对于FDD+TDD的LTE DLCA组合，FDD总是Pcell，TDD总是Scell。比如B3+40的DLCA，上行信号总是在B3. 目前来看，FDD+TDD的CA组合，TDD都是在HB，比如常见的B3+40，B5+40. 在高通的参考设计中，都是双天线的架构，LB+MB是一个天线，HB是单独一个天线。不过，不少客户还是想用单天线的设计，以B3+40的DLCA为例，那么就需要一个diplexer来合路。而这样的diplexer往往会有0.6~1dB的插损，给收发性能带来很大挑战。如下图：



FDD+TDD LTE DLCA RF front-end design tips

- **Solution**: In a B3+40 DLCA call, uplink is in B3, and B3 RX and B40 RX work simultaneously, B40 TX is OFF. Then we can move B40 TX to a dedicated port of main ASM, and B40 RX is still combined by a diplexer with B3 TRX. This is a effective way to reduce post-PA IL for B40 TX, and also improves the current consumption of B40.
- **解决方案**：如果还是想用单天线方案，由于做DLCA业务时，B3的TRX和B40的RX会同时工作，而B40的TX不工作，那么可以让B40的TX单独占用main ASM的一个口，而B40的RX还是通过diplexer来和B3的TRX合路。这样就可以有效降低B40 TX链路上post-PA的插损，降低B40 PA的压力，同时也改善了功耗。如下图：

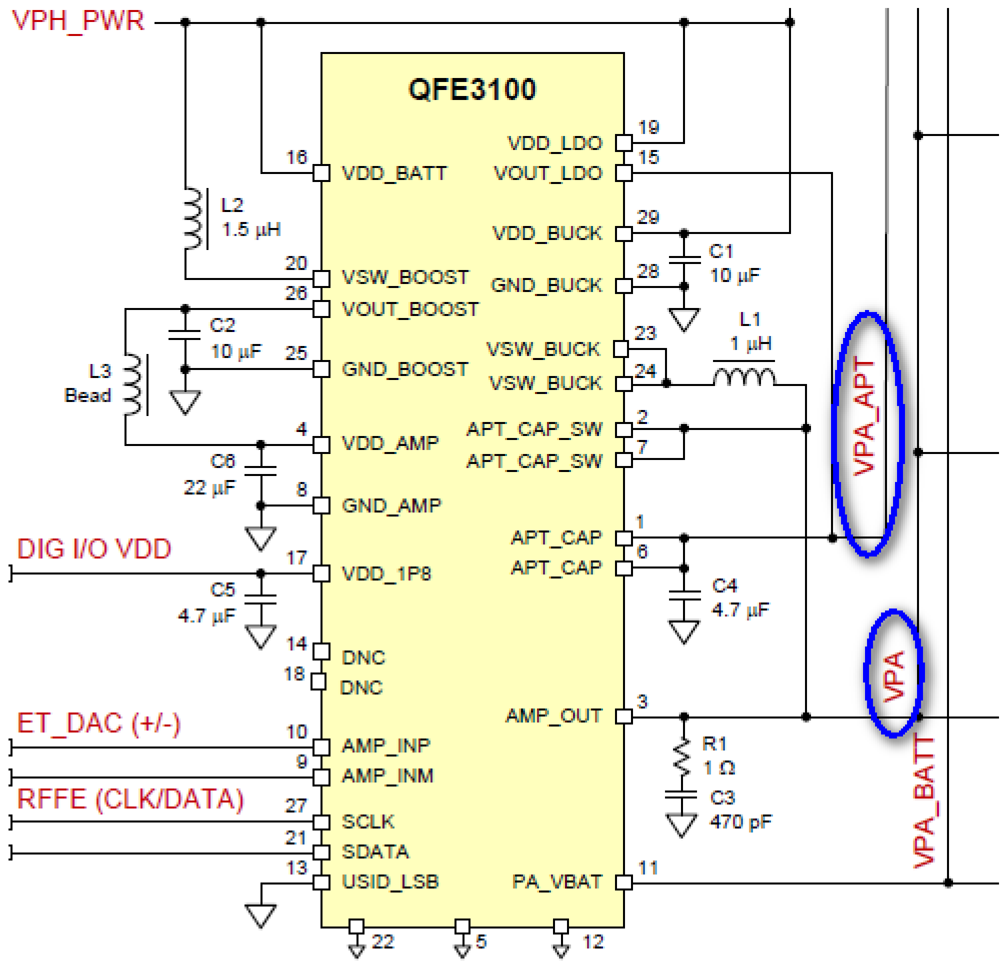


ET/APT PA power supply with QFE3100/1100

- **Platform**: All+QFE1100/3100
- **适用平台**：All+QFE1100/3100

- **Description**: As QFE3100/1100 design guideline describes, normally, there are 2 power supplies for PA, one is VPA, the other is VPA_APT, VPA powers ET PA, not only supports ET but also support APT. VPA_APT powers PA with APT only, only support APT. Schematic is shown in next slide, Since VPA supports both ET+APT, can APT only PA be powered with VPA?
- **问题描述**： 80-NP959-5/80-NA681-5 中介绍，QFE3100/1100给PA的VCC供电通常有两根电源，一根是VPA，另外一根是VPA_APT，其中VPA是给ET PA供电，支持ET+APT，VPA_APT给APT PA供电，仅支持APT。原理图如下页所示，既然VPA支持ET+APT，APT only的PA能否用VPA来供电？

ET/APT PA power supply with QFE3100/1100



ET/APT PA power supply with QFE3100/1100

- **Answer**: ET means power supply envelope tracks TX power, power voltage changes frequently and timely, so cannot shunt too big value capacitors on VPA, otherwise it’s very hard to meet voltage timely changing requirement. As a supporting ET IC, for QFE3100, the max load capacitance is 1200pF, for QFE1100, just only 600pF. Different PA has different internal capacitance, normally, for ET HC-PA, the internal capacitance is about 100~300pF, for satellite PA, it’s about 100pF, for B7 high band PA, about 50pF, much less than requirement of QFE3100/1100. Of course, equivalent capacitance on all ET PAs must be calculated together. On the other hand, for APT only PA, internal capacitance is much larger, normally, in nF range. Although VPA supports APT, still cannot power APT only PA with VPA.

- **问题答复**：ET是电压包络跟踪TX的功率，电源电压是实时变化的，所以在电源上不能并太大的电容，否则难以满足电压的快速变化要求。作为支持ET的两个IC，QFE3100可以支持的最大负载电容是1200pF，QFE1100仅支持600pF。VCC在PA内部都有等效电容，不同的PA有不同的等效值，一般来说支持ET的HC-PA，内部等效电容大约100~300pF，satellite PA大约100pF, B7 high band PA大约50pF，远小于QFE1100/3100支持的最大负载电容的要求。当然也必须考虑多个ET PA同时用VPA供电的情况，所有的 ET PA内部、外部等效电容之和要严格满足QFE1100/3100的要求。而支持APT only的PA，内部等效电容要大得多，一般几百pF~几nF不等，所以APT PA不能用VPA的电源供电，只能用VPA_APT来供电。

Power drop during QPA characterization

- **Platform**: MSM8916/39+WTR1605L
- **适用平台**：MSM8916/39+WTR1605L

- **Symptom**: on WTR1605L+QPA design, power droop happens when doing PinPout char, leading to char failure or wrong char data.
- **问题描述**：WTR1605L搭配QPA的设计中，做PinPout char的时候会出现功率随IQ Gain递减突然掉三个多dB的现象，导致特征化失败或者错误的特征化数据。

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Frequency and Temperature Compensation Sweep

PA State 0 and corresponding XPT action is: 1

Chan	State	PA	BW	Bias	RGI	Delay Gain	IQ Scale	Env ADC	Therm Pwr	Tx Neg1	Aclr Pos1	Aclr Neg	Eutra Pos	Eutra
18001	0	10	2430	80	1240	622	820	1094	17.61	-36.75	-37.36			
18001	0	10	2430	80	1240	617	820	1092	14.19	-33.65	-33.99			
18001	0	10	2430	80	1240	612	820	1090	14.13	-33.60	-33.95			
18001	0	10	2430	80	1240	607	820	1087	14.04	-33.76	-33.95			
18001	0	10	2430	80	1240	602	820	1087	13.99	-33.52	-33.77			
18001	0	10	2430	80	1240	597	820	1086	13.90	-33.46	-33.81			
18001	0	10	2430	80	1240	592	820	1085	13.84	-33.61	-33.68			

Power drop during QPA characterization

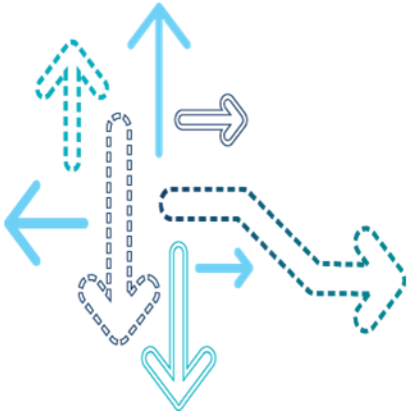
- **Analysis**: WTR1605L, including HW and SW, is an old platform, new version SubSysRFCal_NET.dll sends additional commands to instrument and DUT, leading wrong responds.
- **问题分析**: WTR1605L软硬件都是老平台，不能适用新的SubSysRFCal_NET.dll。

- **Solution**: using SubSysRFCal_NET.dll older than 1794 (including 1794). No impact on calibration.
- **解决办法**：做特征化的时候使用1794或者更老版本的SubSysRFCal_NET.dll。校准不受影响。

```
================================================================
Frequency and Temperature Compensation Sweep

PA State 0 and corresponding XPT action is: 1
Chan PA        Bias     RGI      Delay    IQ       Env      Therm    Tx       Aclr     Aclr     Eutra    Eutra
     State                                Gain     Scale    ADC      Pwr      Neg1     Pos1     Neg      Pos
18001          0        2420     82       1240     622      820      1220     19.92    -36.77   -35.40   -24.77   -26.91
18001          0        2420     82       1240     617      820      1220     19.86    -36.90   -35.52   -24.78   -26.65
18001          0        2420     82       1240     612      820      1220     19.82    -37.04   -35.84   -24.55   -27.15
18001          0        2420     82       1240     607      820      1220     19.77    -37.12   -35.79   -25.22   -27.61
18001          0        2420     82       1240     602      820      1220     19.72    -37.23   -35.91   -24.77   -27.38
18001          0        2420     82       1240     597      820      1220     19.68    -37.43   -36.00   -24.77   -27.14
18001          0        2420     82       1240     592      820      1220     19.64    -37.61   -36.10   -24.88   -27.21
```

1. How is the downlink signal impacting the WCDMA uplink signal EVM
2. GSM PA_RANGE_MAP and Switch-point
3. TDD-LTE NS Call Failure Randomly After Cal
4. RxTx Split in New Modem SW



RF SW

How is the downlink signal impacting the WCDMA uplink signal EVM

- **Platform**: ALL
- **适用平台**：所有平台

- **Symptoms**:
- Recently some customers reported the random & low-failure-rate WCDMA peak EVM failure at TX power 0dBm when testing under some auto run scripts, and it is not replicable when testing manually under the same Test Equipment.
- The symptoms include below:
- Replicable only under some auto run scripts in low failure rate.
- Manually testing, the peak/rms EVM is consistently passing with enough margin.
- **问题描述**：
- 最近有客户向我们报告在运行某些自动测试脚本时会小概率随即出现WCDMA 0dBm功率峰值EVM超标的失败故障，并且在同一个测试仪器上类似的问题是无法通过手动测试复现的。
- 故障特征归纳如下：
- 仅在运行自动测试脚本时小概率复现。
- 手动测试时，峰值/RMS值的EVM都一致以足够余量通过测试。

How is the downlink signal impacting the WCDMA uplink signal EVM

- **Analysis:**
- While analyzing the logs and double checking the settings at Test Equipment side, the culprit is narrowed down as below, also please see **Figure 1**:
- 1. When testing TX EVM, The DL power on test equipment is still set at RX Sensitivity testing level, in this case -104dBm by the auto run scripts and RXAGC blocked at -90dBm indicating the DL interference present.
- 2. The low DL power and the interference results in DL SIR degradation and TPC decoding failure as shown.
- 3. The TXAGC hence is fluctuating severely around 0dBm due to the TPC decoding failure.
- 4. When UL TXAGC fluctuation exceeding the hysteresis of PA state switching b/w HPM and LPM, typically 3dB, the PA state start toggling frequently b/w HPM and LPM during the EVM testing.
- As you have noticed, the severe TX power fluctuation along with PA state toggling could be the worst case for EVM testing, because the impact not only comes from the transmitter but also the PA used like PA gain settling time etc. in this case.
- More important such testing is far beyond the EVM testing requirements specified in 3GPP.
- To have a more clear picture of the WCDMA downlink SIR estimation and TPC decoding, **Figure 2** is taken from 3GPP TS25.214 Annex B.1 when a DPCH is configured in the downlink.

How is the downlink signal impacting the WCDMA uplink signal EVM

- **问题分析：**
- 按照现象描述的,该问题的调试重点在缩小手动测试和自动脚本测试的差异。经过log分析和检查仪器设置，问题定位如下，详见**图1**：
- 1。 当测试 上行发射EVM时，自动测试脚本对仪器侧的下行仍然设置在灵敏度测试功率等级,在这个用例是-104dBm。而RXAGC被阻塞在-90dBm, 说明在测试环境中有下行干扰信号。
- 2。如此低的下行功率并伴有干扰导致下行SIR恶化和TPC解码失败， 如图所示。
- 3。TPC解码失败导致上行TXAGC发生了剧烈的抖动。
- 4。当上行TXAGC抖动超出PA 高增益和低增益模式之间的切换迟滞（典型3dB)，PA在EVM的测试过程频繁的在高增益和低增益模式之间反复切换。
- 如大家所注意到的，剧烈的发射功率抖动并伴随着PA增益态频繁切换恐怕是EVM测试的最坏场景了，因为这种情况影响除了来自发射机本身同时还要把所用的PA考虑进来，例如PA增益的稳定时间等等。
- 更重要的是这样测试与3GPP EVM测试规范要求差别太大了。
- 为了大家对WCDMA下行SIR估算和TPC解码有一个更清晰的理解， **图 2** 摘自3GPP TS25.214 Annex B.1，对应于下行配置DPCH码道的场景。

Table 5.13.1: Parameters for EVM

Parameter	Level / Status	Unit
Output power	≥ –20	dBm
Operating conditions	Normal conditions	
Power control step size	1	dB

How is the downlink signal impacting the WCDMA uplink signal EVM

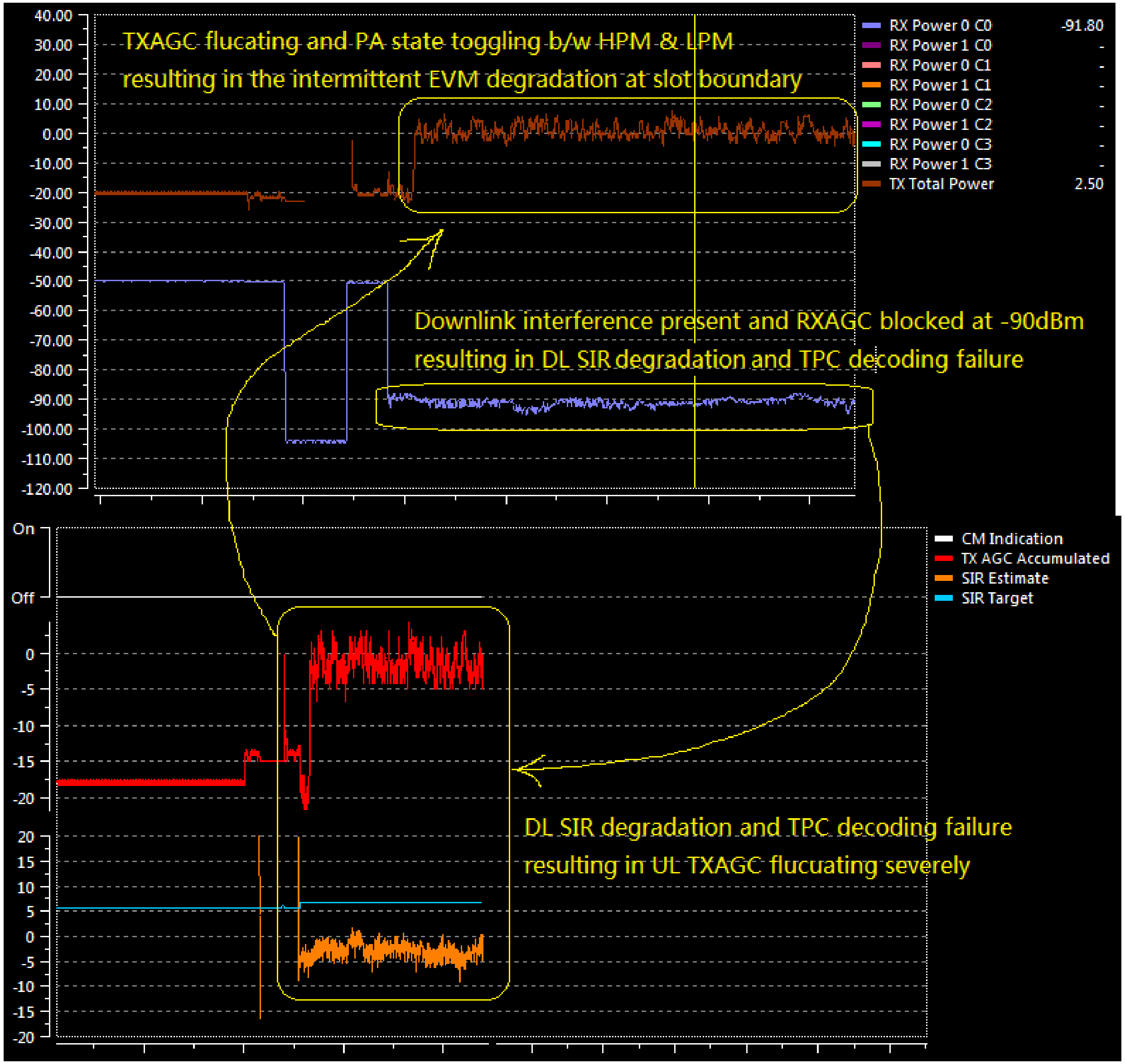


Figure 1

How is the downlink signal impacting the WCDMA uplink signal EVM

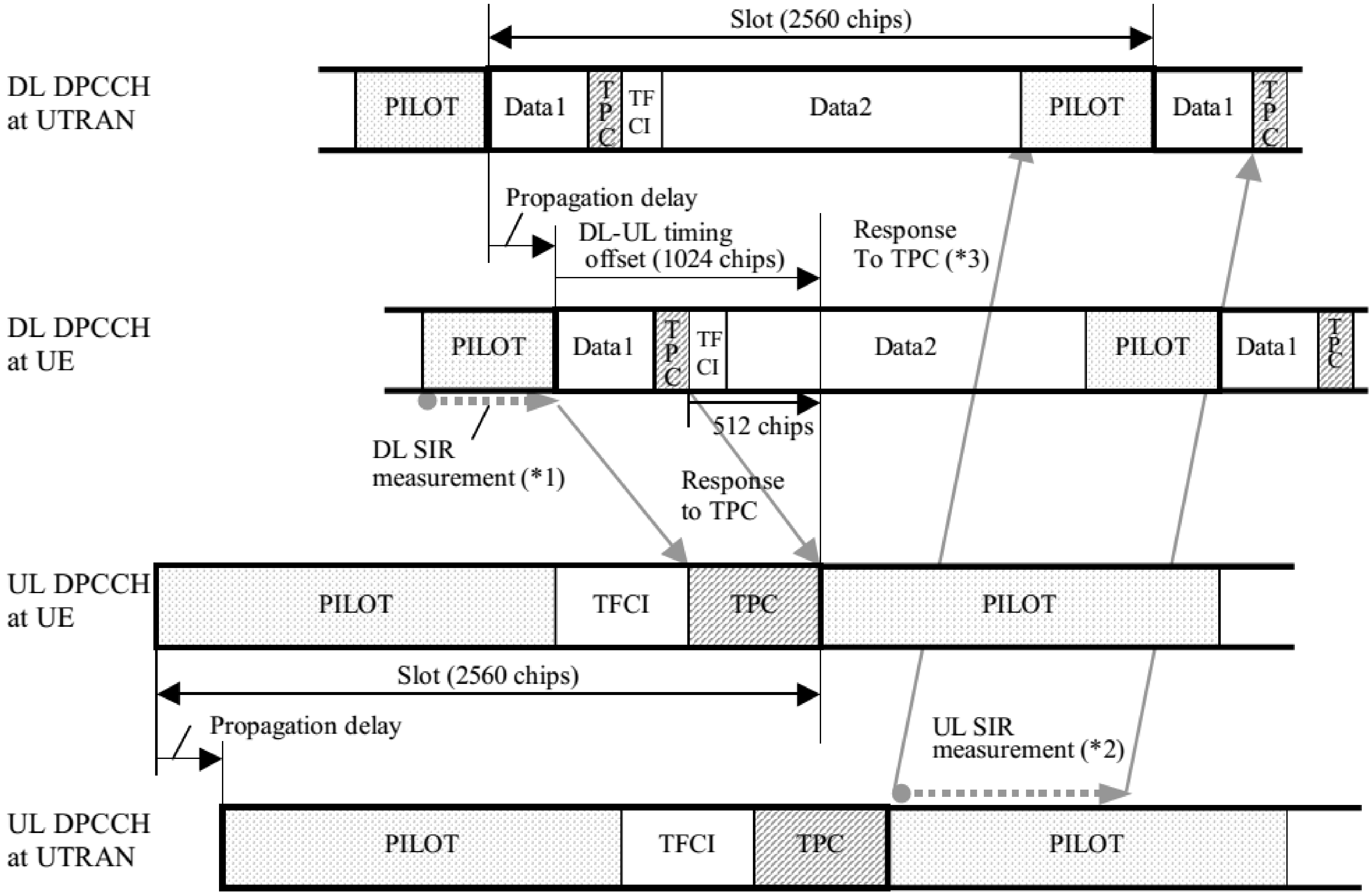


Figure 2 from TS25.214 Annex B.1

How is the downlink signal impacting the WCDMA uplink signal EVM

- **Solution**:
- The UL TXAGC fluctuation violates the 3GPP EVM requirements which is specified as 1dB power control step size. To follow 3GPP, the UL fluctuation must be avoided during the EVM testing by correcting the DL setup, hence the DL power must be set at the appropriate level also the testing is suggested done under shielding condition.

- **解决方案**：
- 上行TXAGC剧烈抖动与 3GPP EVM的1dB功率控制步长测试要求不符。按照3GPP这种抖动必须在EVM测试过程中规避， 可通过纠正下行设置规避。因此，上行EVM测试中下行必须设置合理功率大小，并且建议在屏蔽环境中测试。

GSM PA_RANGE_MAP and Switch-point

- **Platform**: DPM2.0/JO/BO/TA/TH
- **适用平台**：DPM2.0/JO/BO/TA/TH

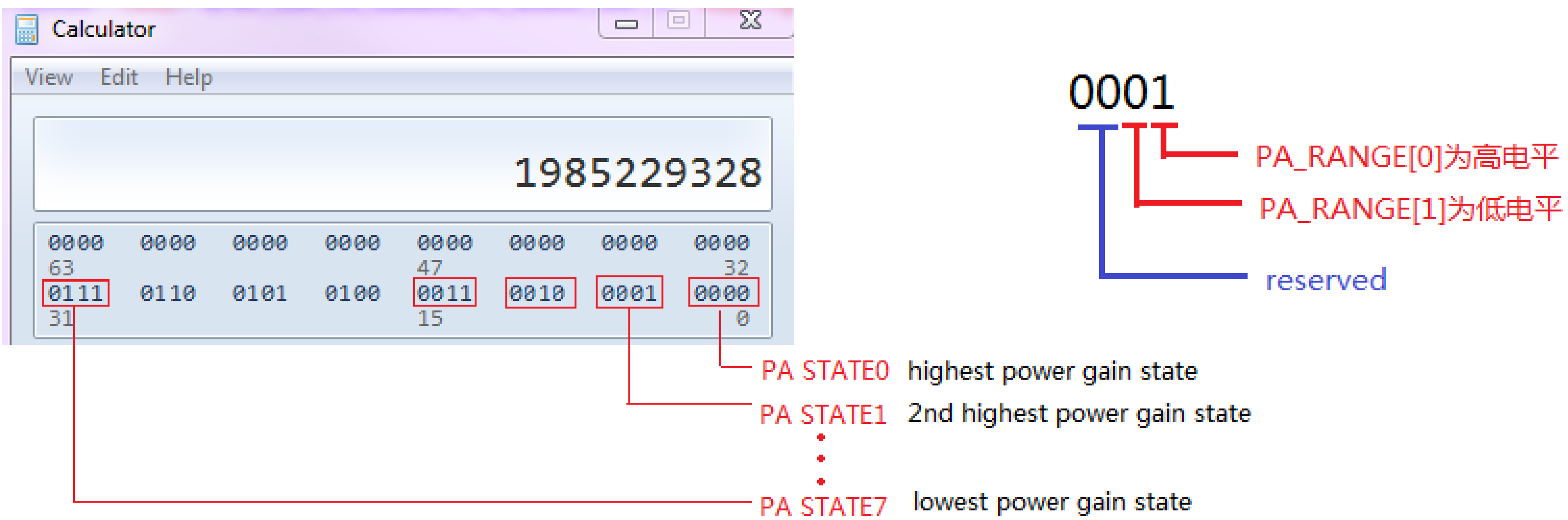
- **Symptom**: RFNV PA_RANGE_MAP is introduced in GSM since DPM2.0, named as RFNV_GSM_C0_GSMX_PA_RANGE_MAP_I.
- **问题描述**：在DPM2.0以后，GSM引入了用于设置PA RANGE MAP的NV，RFNV_GSM_C0_GSM850_PA_RANGE_MAP_I。

- **Analysis**: GSM PA RANGE MAP is hard-coded before DPM2.0. However, this new NV is just useful for GRFC PA but inactive for MIPI PA. PS, PA state0 is the highest power gain state while PA state7 is the lowest power gain state for both GRFC PA and MIPI PA.
- **问题分析**：在DPM2.0之前，GSM的PA_RANGE_MAP 一直是写在代码里的。新引入的RFNV_GSM_C0_GSMX_PA_RANGE_MAP_I用于GRFC PA，MIPI PA不受该NV影响。无论对于GRFC PA 还是MIPI PA，PA state0为最高增益，PA state7为最低增益，其他以此类推。

GSM PA_RANGE_MAP and Switch-point

- This NV is in the format of uint32, every 4 bits stand for one PA state, then it could stand for 8 PA states at most. Take the default value of static NV as an example.
- 该NV为uint32，每4bit代表一个PA STATE，共有8个state。以静态NV中的默认值1985229328为例

<NvItem id="25426" name="RFNV_GSM_C0_GSM850_PA_RANGE_MAP_I" mapping="direct" encoding="dec">1985229328</NvItem>



- In common SW, only least 2 bits of the four are used to control PA_RANGE[0] and PA_RANGE[1].
- 目前软件中，只使用了4bit中的最低2bit，分别用来控制PA_RANGE[0]和PA_RANGE[1]。

GSM PA_RANGE_MAP and Switch-point

- For MIPI PA, name the four values in array as PA range 0 to Pa range 3. And PA range0 is fixed as PA state0. Since then, the register values in PA ranges should be in the order of gain descending.
- 对于MIPI PA，将每个port num下的四个值叫做PA range0到PA range3。软件中PA range0被固定用作PA state1. 因此需要将4个PA range的寄存器值按增益从大到小排序。

```
#define RFDEVICE_PA_SKY_77916_21_PA_SET_RANGE_NUM_REGS 1
static uint8 rfdevice_pa_sky_77916_21_pa_set_range_regs[RFDEVICE_PA_SKY_77916_21_PA_SET_RANGE_NUM_REGS] =  {0x00, };
static int16 rfdevice_pa_sky_77916_21_pa_set_range_data[RFDEVICE_PA_SKY_77916_21_NUM_PORTS][4][RFDEVICE_PA_SKY_77916_
{
  { /* PORT NUM: 0 */
    { 0x14, },   /* PA Range: 0 */
    { 0x15, },   /* PA Range: 1 */
    { 0x16, },   /* PA Range: 2 */
    { 0x17, },   /* PA Range: 3 */
  },
```

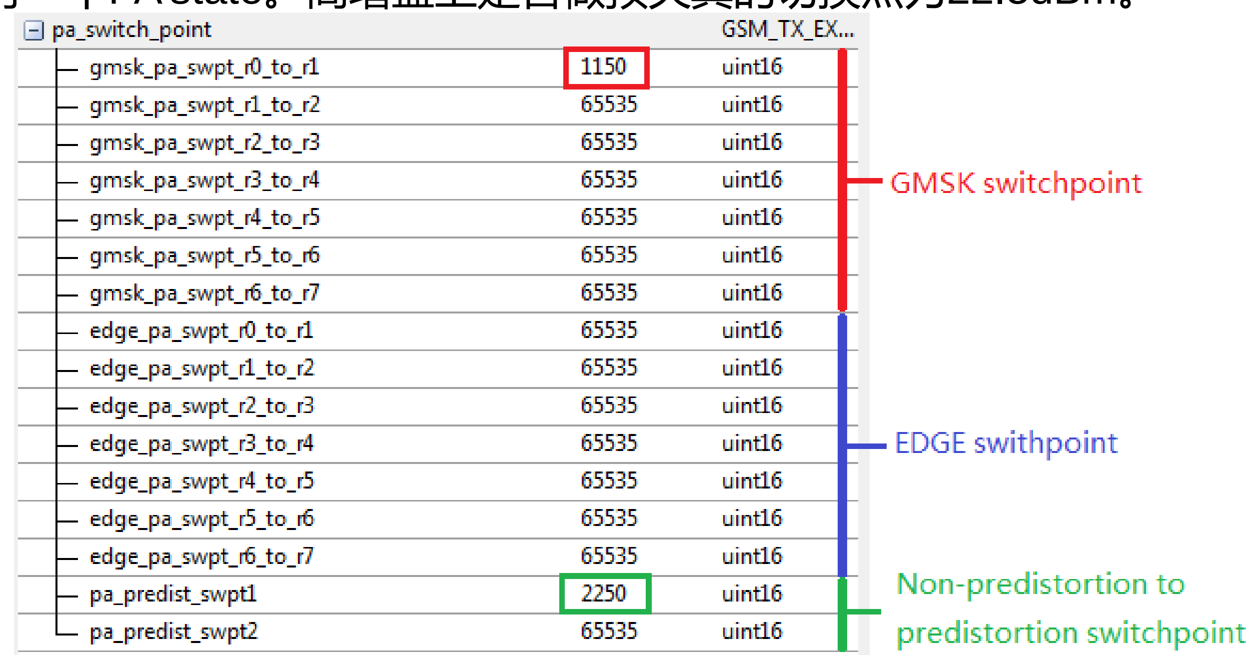
PA state0: highest gain

⋮

PA state3: lowest gain

GSM PA_RANGE_MAP and Switch-point

- Take RFNV_GSM_C0_GSM850_EXTENDED_PA_SWPT_I as an example. Set max value 65535 as the switch-point means that PA states after this switch-point are obsoleted. Then, GMSK have 2 PA state: PA state0 and PA state1, while EDGE only have only one PA state. The predistortion switch-point is 22.5dBm.
- Switch-point对GRFC和MIPI PA 同样有效。此处以RFNV_GSM_C0_GSM850_EXTENDED_PA_SWPT_I为例。将uint16的最大值65535作为切换点，意味着废弃后面的PA state。 因此， GMSK有两个PA state: PA state0 and PA state1, EDGE只有一个PA state。高增益上是否做预失真的切换点为22.5dBm。



pa_switch_point		GSM_TX_EX...
gmsk_pa_swpt_r0_to_r1	1150	uint16
gmsk_pa_swpt_r1_to_r2	65535	uint16
gmsk_pa_swpt_r2_to_r3	65535	uint16
gmsk_pa_swpt_r3_to_r4	65535	uint16
gmsk_pa_swpt_r4_to_r5	65535	uint16
gmsk_pa_swpt_r5_to_r6	65535	uint16
gmsk_pa_swpt_r6_to_r7	65535	uint16
edge_pa_swpt_r0_to_r1	65535	uint16
edge_pa_swpt_r1_to_r2	65535	uint16
edge_pa_swpt_r2_to_r3	65535	uint16
edge_pa_swpt_r3_to_r4	65535	uint16
edge_pa_swpt_r4_to_r5	65535	uint16
edge_pa_swpt_r5_to_r6	65535	uint16
edge_pa_swpt_r6_to_r7	65535	uint16
pa_predist_swpt1	2250	uint16
pa_predist_swpt2	65535	uint16

TDD-LTE NS Call Failure Randomly After Cal

- **Platform**: All
- **适用平台**：所有平台

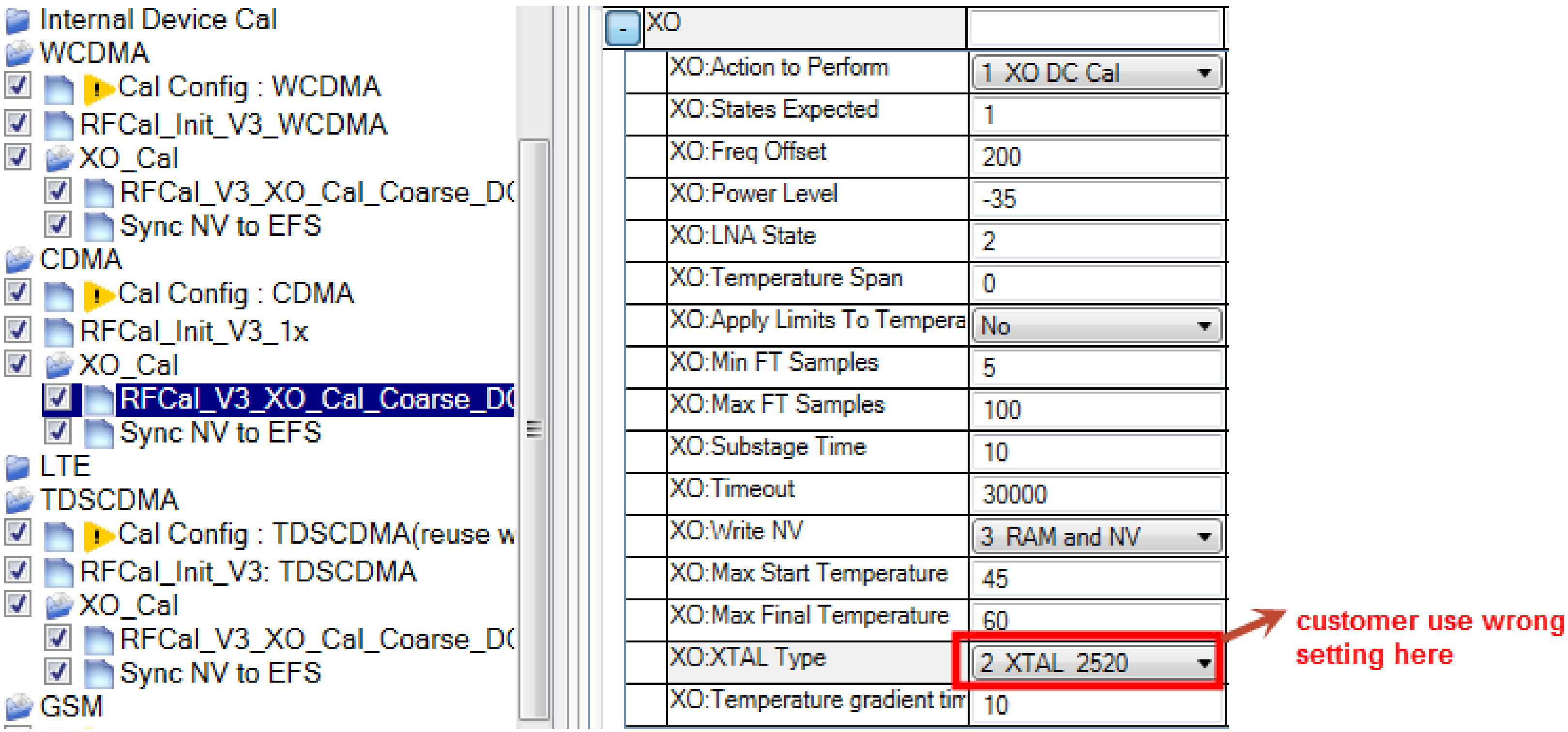
- **Description**: Customer factory line report 2% TDD-LTE B39/40/41 NS ACQ failure
- **问题描述**：客户在校准+非信令测试中，有概率在TDD-LTE B39/40/41非信令测试呼叫失败

- **Analysis**:
  - Check QXDM Log, PLL’s rot is about -6000, and initial frequency error is 15000hz, too big
  - But XO Cal already passed
  - TDD-LTE Band test at last, the DUT’s temperature is a bit too high: more than 50degree

- **问题分析**:
  - PLL’s Rot -6000以及15000hz的出视频偏较大，怀疑跟xo有关；但是客户已经通过了xo校准；
  - 检查手机在测试时候的温度：由于TDD在最后测试，温升较大。怀疑跟xo温度有关。

TDD-LTE NS Call Failure Randomly After Cal (Continue.)

- **Solution**: check customer cal tree that they use wrong xo_type setting
- **解决方案**：检查客户的校准tree，发现他们的XO类型选错了，需要调整为正确的尺寸设置



RxTx Split in New Modem SW

- **Platform**: MSM8952/8976/8996, MDM9x40 (TA2.0 and TH2.0 Modem or derived)
- **适用平台**：MSM8952/8976/8996，MDM9x40（基于TA2.0和TH2.0的Modem版本或者衍生版本)

- **Introduction**:
- What is RxTx Split?
- RFM logical device represents physical WTR VCO and related RF front end path.
- Rx and Tx functionality is split into different RF logical device. Device 0 does not mean Rx and Tx anymore.

- **内容介绍**：
- 什么是RxTx Split?
- 每一个RFM logical device代表了特定的WTR VCO及其对应的射频前端通路而组成的的物理链路。
- Rx和Tx的功能从原先的一个RF logical device中分离出来。Device 0不再代表既有Rx又有Tx。

RxTx Split in New Modem SW

- Why RxTx split is needed
- New CRAT features on TH/TA have requirement to separate Rx and Tx.
- Old Concept of logical devices makes RFC not scalable and difficult to maintain.
  - DR-DSDS has huge size of concurrency table
  - LTE CA combination requires alt path to handle WTR VCO allocaiton

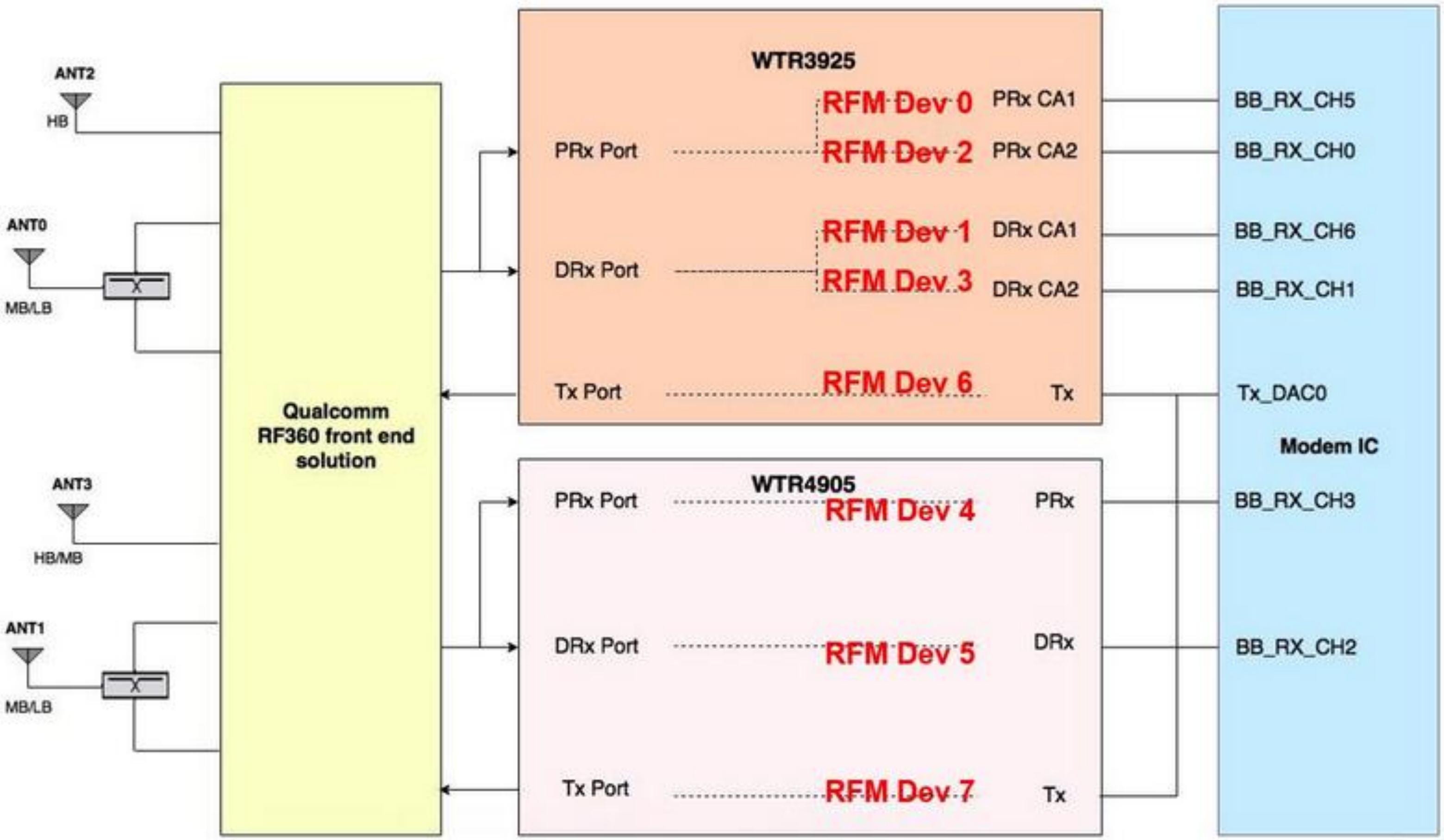
- 为何需要RxTx Split
- 为了支持更多的在TH/TA 所引入的多模和共存的特性，需要将Rx和Tx分离。
- 原先在RFC中定义logical devices的概念已经不适用于新的特性，会使RFC变得不稳定和难以维护。
  - DR-DSDS会引入极大量的concurrency查询表。
  - LTE CA的各种组合需要alt path来处理WTR VCO选择和变换。

- Please refer to 80-P1053-1 for RxTx Split Overview
- 请参考 80-P1053-1 RxTx Split 概述
- **Target Info:**
- THOR 2.0 ES2(6/30), Tabasco 2.0 ES1(7/17) and further MPSS is affected.
- 版本信息：
- 从THOR 2.0 ES2(6/30), Tabasco 2.0 ES1(7/17)开始及以后的MPSS版本

RxTx Split in New Modem SW

New RF logical Device concept

新的RF logical Device 概念



RxTx Split in New Modem SW

- **Major Changes**
- **主要变化**

- RFC
  - New RFM device to physical path mapping
  - Preferred Device / Associated Device
  - Refer to 80-P1053-4 for details
  - 新的RFM device到物理链路的映射
  - 新增Preferred Device和Associated Device概念
  - 详阅80-P1053-4

- NV
  - New NV is added for new RF dev
  - Refer to 80-P1053-3 for details
  - 为新的RF dev新增NV
  - 详阅80-P1053-3

FTM (QRCT)
- Preferred device is set when using old FTM
- New API introduced to set RF device
- Refer to 80-P1053-3, 80-P2164-1 for details
- 调用旧的FTM接口会映射到Preferred device
- 为设置RF device新增接口来适配新增的device
- 详阅80-P1053-3及80-P2164-1

RF Cal (QSPR)
- Cal params change
- Refer to 80-P1053-3 for details
- 校准参数发生变化
- 详阅80-P1053-3

Questions?

https://support.cdmatech.com