



## Test Plan

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Introduction	VZ_TC_3GPPB13SUPRRM_1347144	3
2.1 RSRP INTRA-FREQUENCY ACCURACY IN RRC_CONNECTED MODE	VZ_TC_3GPPB13SUPRRM_431	17
2.1.2.4 RSRP Intra-Frequency Accuracy in RRC_CONNECTED Mode - Test 4	VZ_TC_3GPPB13SUPRRM_3533424	24
2.2 RSRP INTRA-FREQUENCY ACCURACY IN RRC_IDLE MODE	VZ_TC_3GPPB13SUPRRM_432	25
2.3 RSRQ INTRA-FREQUENCY ACCURACY IN RRC_CONNECTED MODE	VZ_TC_3GPPB13SUPRRM_433	35
2.4 RSRQ INTRA-FREQUENCY ACCURACY IN RRC_IDLE MODE	VZ_TC_3GPPB13SUPRRM_434	42
2.5 eICIC GCF RRM Conformance Test Cases	VZ_TC_LTE 3GPP Band 13 Supplementary RRM Conformance_8812	52
2.7 eICIC UE Resets measSubframePcell at RRC Connection Re-establish	VZ_TC_LTE Band 13 Supplementary RRM Conformance_8814	54
2.12 Intra-Frequency RSRP and RSRQ Accuracy Test while CRS-AssistanceInfoList-r11 is Present	VZ_TC_LTE 3GPP Band 13 Supplementary RRM Test Plan_9501	61

## Introduction

VZ\_TC\_3GPPB13SUPRRM\_1347144

Rev.	Author	Description of Changes	Date
1.0	Verizon Wireless	Initial release.	June 2012
2.0	Verizon Wireless	Added connection diagrams. Updated test parameters and procedures.	October 2012
3.0	Verizon Wireless	Added section 1.5.6.	February 2013
4.0	Verizon Wireless	Updates to sections: 1.5.2.1, 2.2.2, 2.2.3.2, 2.2.3.4, 2.3.3.2, 2.4.2, 2.4.3.2, 2.4.3.3, 2.4.3.4	June 2013
5.0	Verizon Wireless	Updates to sections: 1.5.7, 2.1, 2.2, 2.3, 2.4	October 2013
6.0	Verizon Wireless	Updates/Clarifications in the test equipment configuration for RSRP/RSRQ accuracy tests.	June 2014
7.0	Verizon Wireless	Added test cases for feICIC (2.5 - 2.11)	Feb 2015

8.0	Verizon Wireless	Added test cases for CRS IC (2.12)  Updated temperature test requirements for RSRP/RSRQ accuracy tests	June 2015
9.0	Verizon Wireless	Added test cases for Blind Data Interference cancellation	October 2016
10.0	Verizon Wireless	Editorial change in step 7 of TC 2.8. Missing a "minus" sign.  Modified 2.10 to update RSRQ value for pass/fail criteria	June 2017
11.0	Verizon Wireless	Reduced R11 feICIC test scope to support R10 eICIC.	Oct 2017
12.0	Verizon Wireless	Modified 2.7 to update RSRQ value for pass/fail criteria.  Updated TC 2.1,2.2,2.3,2.4	Feb 2018

## Introduction

Verizon Wireless requires all devices designed to operate on the Verizon Wireless LTE 3GPP Band

13 network to meet Verizon Wireless-specific RRM performance requirements as detailed in the Verizon Wireless LTE 3GPP Band 13 Network Access Device Requirements. This document describes the procedure for verifying that these requirements have been met. Verizon Wireless-specific RRM performance requirements and testing are in addition to standard 3GPP LTE RRM minimum performance requirements and conformance testing defined in 3GPP TS 36.133: Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements for support of radio resource management and 3GPP TS 36.521-3: Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) conformance specification; Radio transmission and reception; Part 3: Radio Resource Management conformance testing, respectively.

This publication is part of Verizon Wireless compliance with the FCC's rules for 700 MHz C Block (47 C.F.R. § 27.16), as explained in the FCC's Second Report and Order in WT Docket No. 06-150, "Service Rules for the 698-746, 747-762 and 777-792 MHz Bands" released on August 10, 2007.

In this document, the terms LTE (Long Term Evolution) and E-UTRA (Evolved Universal Terrestrial Radio Access) are considered equivalent.

## Test Objectives

The objective of this document is to define the Verizon Wireless-specific RRM performance test procedures for devices designed to operate on the Verizon Wireless LTE 3GPP Band 13 network.

This document will be used by employees of device manufacturers, test labs, and Verizon Wireless to guide the execution of Verizon Wireless-specific LTE RRM performance testing. This document will also be used to define the Verizon Wireless-specific RRM performance test procedures for test automation development.

Wherever possible, this test plan uses 3GPP standard RRM conformance test procedures for LTE as defined in 3GPP TS 36.521-3: Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) conformance specification; Radio transmission and reception; Part 3: Radio Resource Management conformance testing.

## Definitions

The following terms are used in this document:

Acronym/Term	Definition
3GPP	3 <sup>rd</sup> Generation Partnership Project, manages GSM, EDGE, UMTS, HSPA, and LTE standards
BW	Bandwidth
DL	Downlink
E-UTRA	Evolved Universal Terrestrial Radio Access
FFS	For Future Study
LTE	Long Term Evolution
MHz	Mega-Hertz (1 x 10 <sup>6</sup> cycles per second)
N/A	Not Applicable
RB	Resource Block
RBstart	RB number where a RB allocation begins within the channel
RRM	Radio Resource Management
RSRP	Reference Signal Received Power
RSRQ	Reference Signal Received Quality
UE	User Equipment
UL	Uplink
VZW	Verizon Wireless

### 3GPP Release 9 Specifications

Refer to the 3GPP Release 9 Specifications section of the Verizon Wireless LTE 3GPP Band 13 Network Access Requirements for details on the correct version for all 3GPP specification documents referenced in this test plan.

### Entrance Criteria

All devices shall successfully pass this test plan per the Verizon Wireless LTE 3GPP Band 13 Lab Conformance Test Plan and in accordance with the Verizon Wireless LTE 3GPP Band 13 Device Conformance Test Process. Prior to testing, Verizon Wireless strongly recommends that all devices pass 3GPP standard RRM conformance per 3GPP TS 36.521-3: Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) conformance specification; Radio transmission and reception; Part 3: Radio Resource Management conformance testing.

Test Equipment Configuration for RSRP and RSRQ Accuracy Test Cases:

This section applies to the RSRP and RSRQ accuracy test cases in this document only.

For details on test equipment currently approved by Verizon Wireless, refer to the Verizon Wireless LTE 3GPP Band 13 Test Equipment List.

## Reference Measurement Channels

Reference measurement channels used in this test plan shall be per 3GPP TS 36.521-3: Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) conformance specification; Radio transmission and reception; Part 3: Radio Resource Management conformance testing.

## Temperature and Voltage Test Requirements

### Ambient Temperature

The test cases in this test plan shall be performed at the following ambient temperatures:

- 0-100C
- 0+250C
- 0+550C

### UE Power Supply/Battery Voltage

The power supply/battery voltage for the device under test shall be per the normal operating conditions as defined by the device manufacturer, 3GPP TS 36.101: Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception, and 3GPP TS 36.508: Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Packet Core (EPC); Common test environments for User Equipment (UE) conformance testing unless indicated otherwise.

### IMS Test Mode Operation

Unless indicated otherwise in the test case procedure, IMS Test Mode shall be enabled in the device for the test cases in this test plan. IMS Test Mode operation is per the Verizon Wireless LTE 3GPP Band 13 Network Access Requirements.

### Test Channels

All tests in this test plan shall be performed using the following channels only:

- Downlink channel number: 5230
- Uplink channel number: 23230

## Connection Diagrams

2 Cells, Intra-Frequency, AWGN Only

3 Cells, Intra-Frequency, AWGN Only

2 Cells, Intra-Frequency, AWGN with Fading

3 Cells, Intra-Frequency, AWGN with Fading

## Simultaneous Test Execution

To reduce test time, the test platform shall execute the following test cases simultaneously:

- 2.1 and 2.3
- 2.2 and 2.4

## Common eNB Configuration Information

The test platform shall configure all eNB's as follows:

- Downlink 2x2 transmit diversity shall be used.
- RA/RB shall be -3 dB.

The default parameters for simulated cells shall be

:

o Cell 1 in the tests in this test plan shall be per "Cell 1" in Table 4.4.2-1A of 3GPP TS 36.508: Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Packet Core (EPC); Common test environments for User Equipment (UE) conformance testing.

o Cell 2 in the tests in this test plan shall be per "Cell 4" in Table 4.4.2-1A of 3GPP TS 36.508: Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Packet Core (EPC); Common test environments for User Equipment (UE) conformance testing.

o Cell 3 in the tests in this test plan shall be per "Cell 12" in Table 4.4.2-1A of 3GPP TS 36.508: Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Packet Core (EPC); Common test environments for User Equipment (UE) conformance testing.

o All cells shall be in the same tracking area.

- All cells shall be time synchronized.
- For test cases that require connected-mode DRX, the following parameters shall be used for connected-mode DRX:



- o  $\text{drxInactivityTimer} = \text{PSF}_{200}$
- o  $\text{drxRetransmissionTimer} = \text{PSF}_2$
- o  $\text{longDrxCycle} = \text{SF}_{320}$
- o  $\text{onDurationTimer} = \text{PSF}_{10}$

## Test Tolerances

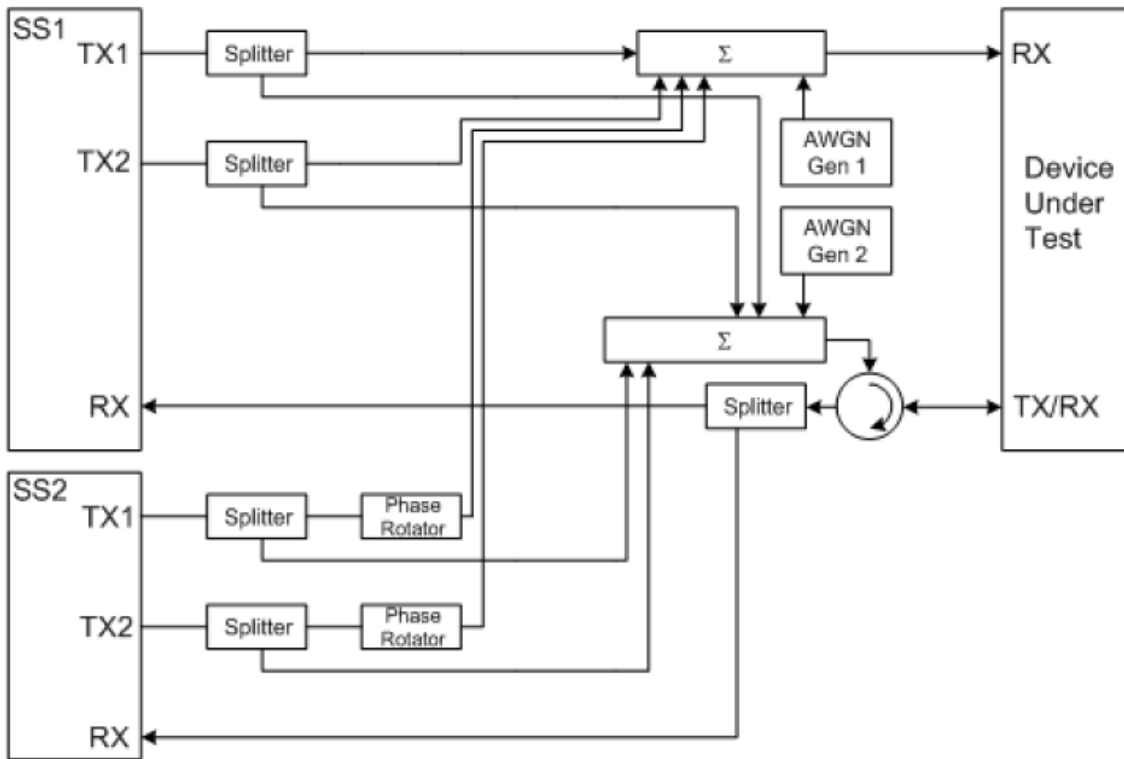
Test tolerances for the test cases in this test plan are included in the expected result criteria for the individual test procedures. No deviations from the test tolerances in this test plan shall be permitted.

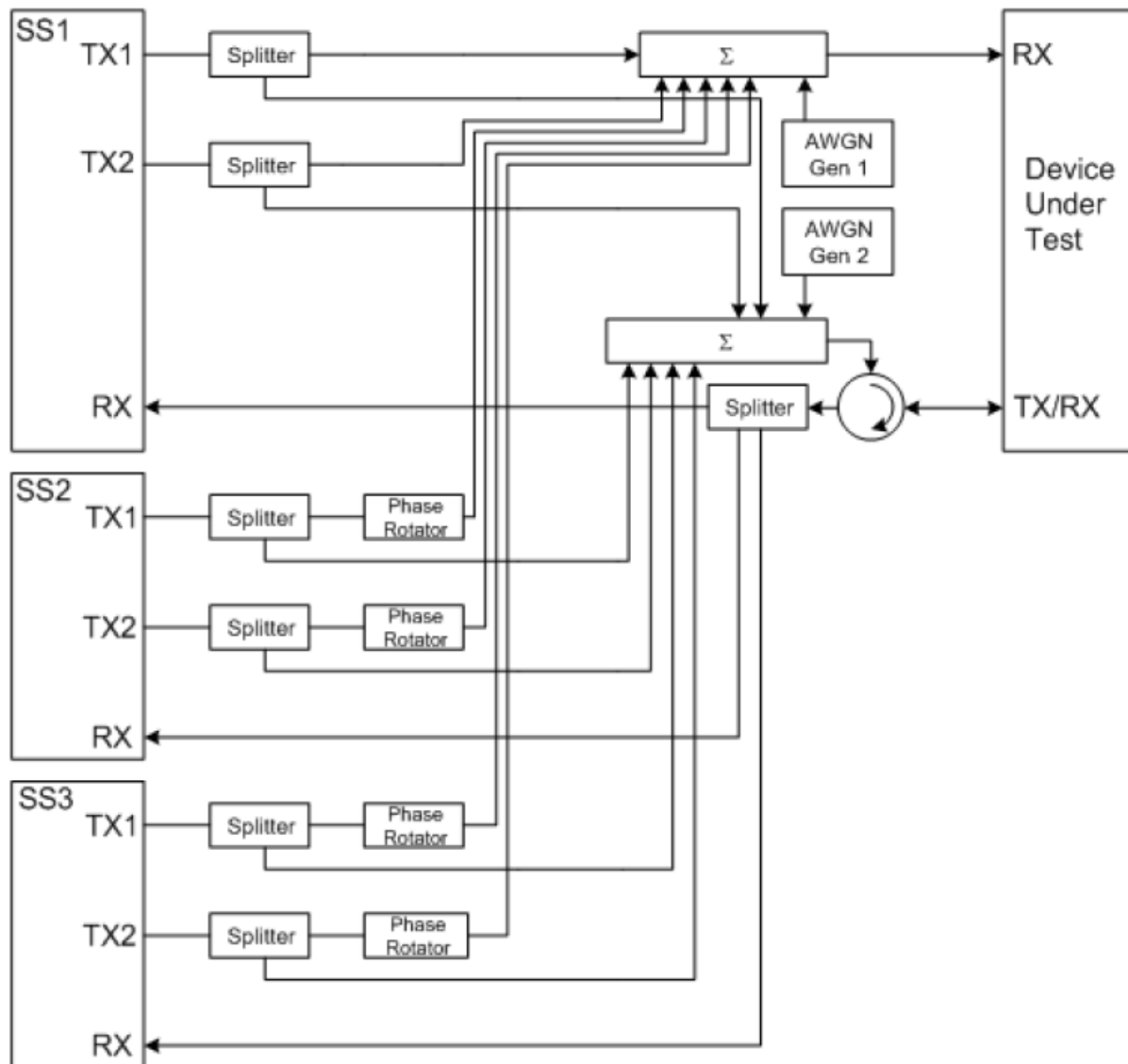
### Applying the Pass/Fail Criteria for RRC\_IDLE Mode Tests

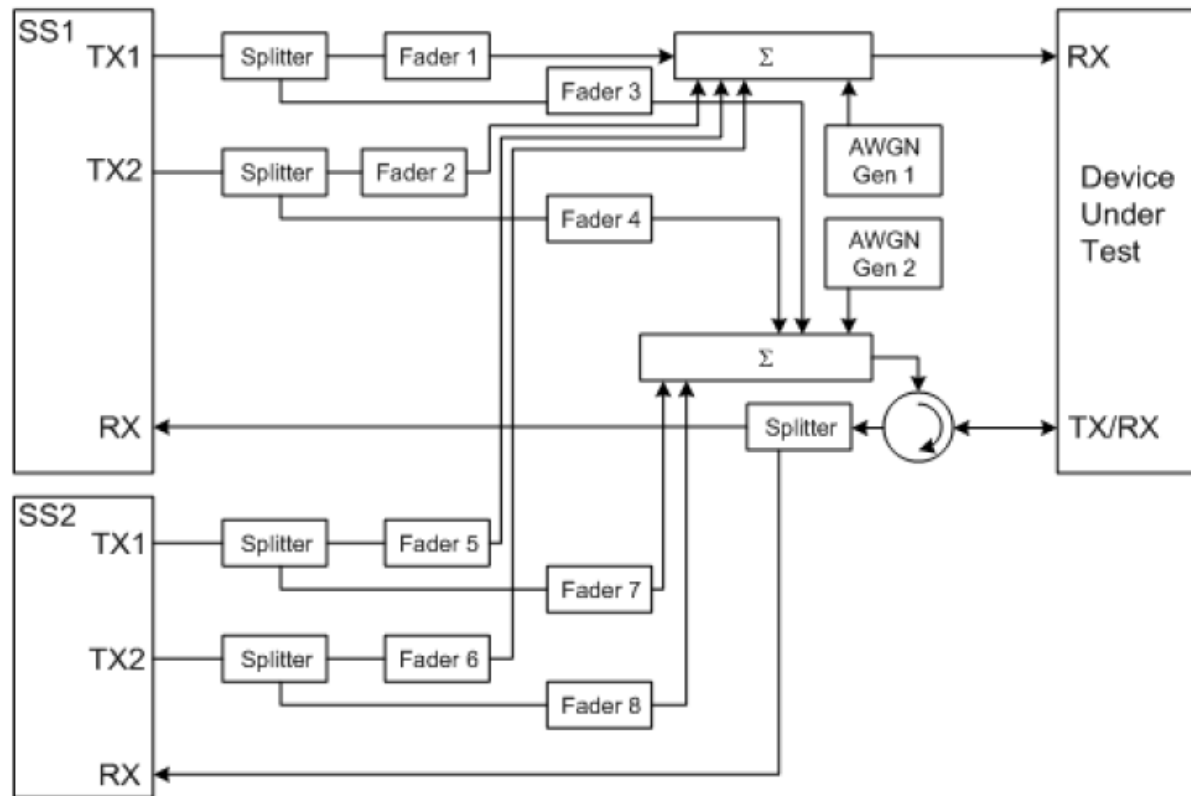
For RRC\_IDLE mode tests with fading, the test platform shall apply the pass/fail criteria as follows:

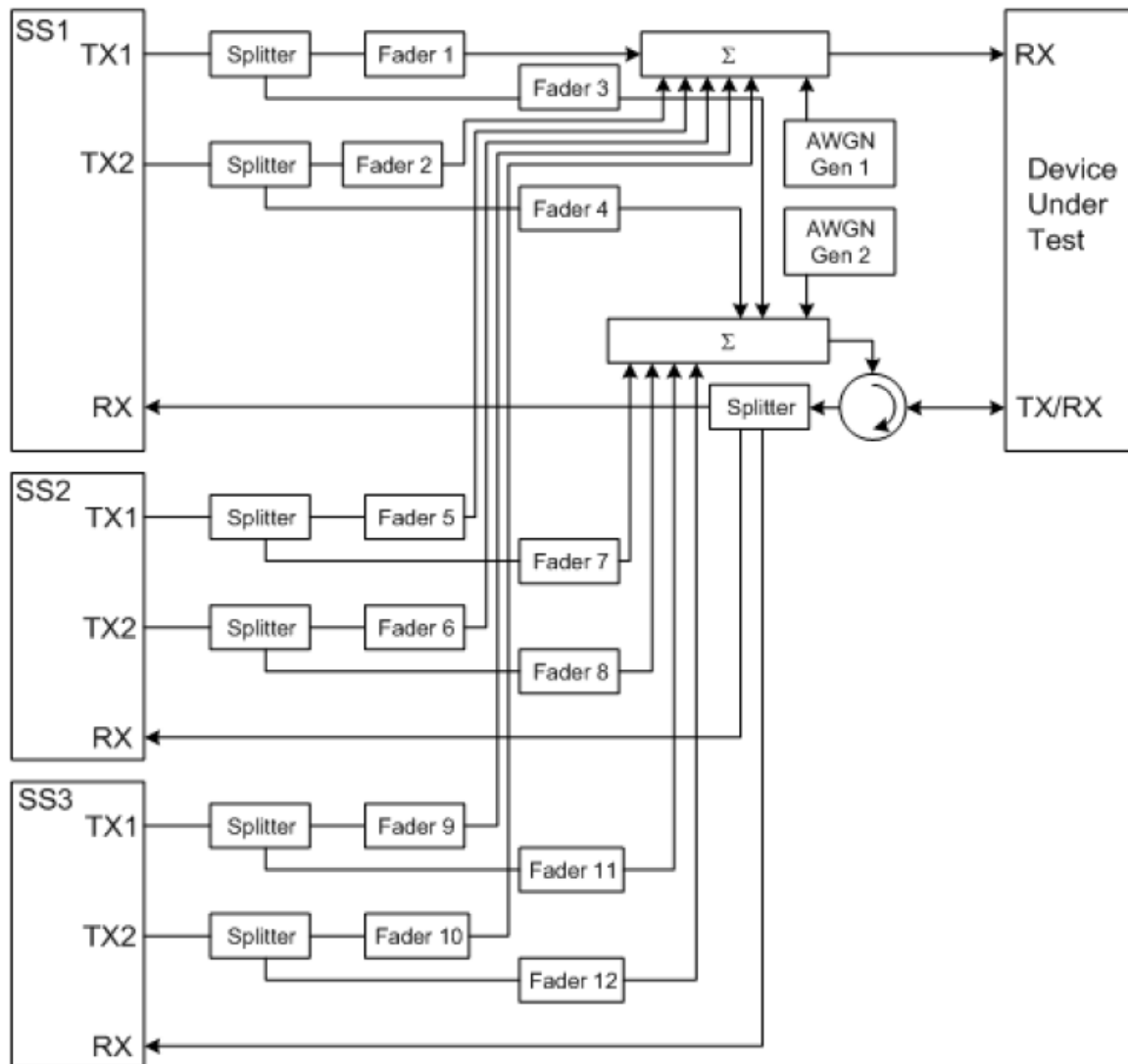
- 1) Record 100 measurements of cells 1, 2, and 3 using the AT commands to request measurements from the device.
- 2) Average all 100 measurements for cell 1 to determine the mean for cell 1.
- 3) Average all 100 measurements for cell 2 to determine the mean for cell 2.
- 4) Average all 100 measurements for cell 3 to determine the mean for cell 3.
- 5) Use the mean values for cells 1, 2, and 3 to determine pass/fail using the pass/fail criteria.

For RRC\_IDLE mode tests without fading (i.e. AWGN only), there is no need to average since there is no fading. As a result, each individual measurement needs to meet the pass/fail criteria for the test to pass.

















## 2.1 RSRP INTRA-FREQUENCY ACCURACY IN RRC\_CONNECTED MODE

VZ\_TC\_3GPPB13SUPRRM\_431

### Definition

This test verifies that the UE meets Verizon Wireless requirements for RSRP intra-frequency absolute accuracy and relative accuracy when the UE is operating in RRC\_CONNECTED mode.

### Traceability

- Verizon Wireless LTE 3GPP Band 13 Network Access Device Requirements
- 3GPP TS 36.521-3: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) conformance specification; Radio transmission and reception; Part 3: Radio Resource Management conformance testing*

### Applicability

This test case applies to all UEs designed to operate on the Verizon Wireless LTE 3GPP Band 13 network.

Design Steps
Step Name
Step 1
Pre-Conditions
Procedures
<p><b>Test Procedure</b></p> <ol style="list-style-type: none"> <li>1. Set the initial conditions as per section 9.1.1.1.4.1 of 3GPP TS 36.521-3: <i>Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) conformance specification; Radio transmission and reception; Part 3: Radio Resource Management conformance testing</i> for a 10 MHz channel in Band 13 with the following exceptions: <ol style="list-style-type: none"> <li>1. Connections are per section 1.5.5 of this document.</li> </ol> </li> <li>2. Follow steps 1 through 8 in section 9.1.1.1.4.2 of 3GPP TS 36.521-3: <i>Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) conformance specification; Radio transmission and reception; Part 3: Radio Resource Management conformance testing</i> using the message contents defined in section 9.1.1.1.4.3 of 3GPP TS 36.521-3: <i>Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) conformance specification; Radio transmission and reception; Part 3: Radio Resource Management conformance testing</i> with the exceptions noted below: <ol style="list-style-type: none"> <li>1. L3 filtering shall be enabled for RSRP measurements with the coefficient set to k=8.</li> <li>2. Set the parameters for Test 1 per Table 2.1.2-1 and Table 2.1.2-2 below.</li> <li>3. The UE shall be set up to report RSRP results for Cells 1, 2, and 3 for a given test.</li> <li>4. UE measurements shall be taken for each cell in a given test until the appropriate confidence level defined in Annex G.2 of 3GPP TS 36.521-3 is achieved.</li> </ol> </li> </ol>

5. For each test, the RSRP values reported for all cells shall be recorded.
6. For each set of measurements reported by the device, the test platform shall calculate:
  1. RSRP for Cell 2 RSRP for Cell 1
  2. RSRP for Cell 3 RSRP for Cell 1 (if Cell 3 is used for the test)
7. The test platform shall report the following statistics for informational purposes:
  1. Mean RSRP value reported for each cell.
  2. Maximum RSRP value reported for each cell.
  3. Minimum RSRP value reported for each cell.
  4. Standard deviation for the RSRP values reported for each cell.
  5. RSRP values versus time reported for each cell.
3. Repeat steps 1.) and 2.) for Test 2 per Table 2.1.2-1 and Table 2.1.2-3 for propagation conditions AWGN, EPA5, and EVA70.
4. Repeat steps 1.) and 2.) for Test 3 per Table 2.1.2-1 and Table 2.1.2-4 for propagation conditions AWGN, EPA5, and EVA70.
5. Repeat steps 1.) and 2.) for Test 4 per Table 2.1.2-1 and Table 2.1.2-5 for propagation conditions AWGN, EPA5, and EVA70 with the following exception: connected-mode DRX shall be enabled.

**Table 2.1.2-1. RSRP intra-frequency accuracy test parameters common to all tests.**

Parameter	Unit	Cell		
		#1	#2	#3
E-UTRA RF Channel Number		5230		
BWchannel	MHz	10		
Measurement bandwidth	nPRB	Not specified up to 50 RB allowed		
PDSCH Reference measurement channel defined in A.1.1 of 3GPP TS 36.521-3		R.1 FDD	-	-
PDSCH allocation	nPRB	1336	-	-
PDCCH/PCFICH/PHICH Reference measurement channel defined in A.2.1 of 3GPP TS 36.521-3		R.7 FDD		

OCNG Patterns defined in D.1.1 (OP.1 FDD) and D.1.2 (OP.2 FDD) of 3GPP TS 36.521-3		OP.1 FDD	OP.2 FDD	OP.2 FDD
PBCH_RA	dB	-3	-3	-3
PBCH_RB				
PSS_RA				
SSS_RA				
PCFICH_RB				
PHICH_RA				
PHICH_RB				
PDCCH_RA				
PDCCH_RB				
PDSCH_RA				
PDSCH_RB				
OCNG_RANote 1				
OCNG_RBNote 1				
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.				

**Table 2.1.2-2. RSRP intra-frequency accuracy test parameters for Test 1.**

Parameter	Unit	Cell		
		#1	#2	#3
<i>N<sub>oc</sub></i> <i>Note 2</i>	dBm/15 kHz	-124.0		
<i>E<sub>s</sub></i> / <i>I<sub>ot</sub></i>	dB	-1.98	-4.89	-4.89
RSRPNote 3	dBm/15 kHz	-119.0	-121.0	-121.0
<i>I<sub>o</sub></i> Note 3	dBm/9 MHz	-87.10		

Es /Noc		5.0	3.0	3.0
Propagation condition		AWGN		
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.				
Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.				
Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna por.				
Table 2.1.2-3. RSRP intra-frequency accuracy test parameters for Test 2.				
Parameter	Unit	Cell		
		#1	#2	#3
Noc Note2	dBm/15 kHz	-120.0		
Es/Iot	dB	4.86	-5.04	N/A
RSRPNote3	dBm/15 kHz	-100.0	-105.0	N/A
IoNote3	dBm/9 MHz	-70.99		
Es /Noc		20.0	15.0	N/A
Propagation condition		AWGN, EPA5, EVA70		
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.				
Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.				
Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.				

Table 2.1.2-4. RSRP intra-frequency accuracy test parameters for Test 3.

Parameter	Unit	Cell		
		#1	#2	#3
$N_{oc}$ Note2	dBm/15 kHz	-100.0		
$E_s/I_{ot}$	dB	4.86	-5.04	N/A
RSRPNote3	dBm/15 kHz	-80.0	-85.0	N/A
$I_o$ Note3	dBm/9 MHz	-50.99		
$E_s/N_{oc}$		20.0	15.0	N/A
Propagation condition		AWGN, EPA5, EVA70		
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.				
Note 3: RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.				
Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.				

PranTable 2.1.2-5. RSRP intra-frequency accuracy test parameters for Test 4.

Parameter	Unit	Cell		
		#1	#2	#3
$N_{oc}$ Note 2	dBm/15 kHz	-124.0		
$E_s/I_{ot}$	dB	4.21	-5.26	N/A
RSRP Note 3	dBm/15 kHz	-112.0	-117.0	N/A
$I_o$ Note 3	dBm/9 MHz	-82.82		

Es/Noc		12.0	7	N/A
Propagation condition		AWGN, EPA <sub>5</sub> , EVA <sub>70</sub>		
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <i>Noc</i> to be fulfilled.				
Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.				
Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.				
Expected Results				
Absolute RSRP				
The RSRP values reported by the UE shall meet the limits in the table below:				
	Test 1	Test 2	Test 3	Test 4
00 to +400C				
Cell 1 - Lowest reported value	RSRP <sub>17</sub>	RSRP <sub>36</sub>	RSRP <sub>56</sub>	RSRP <sub>24</sub>
Cell 1 - Highest reported value	RSRP <sub>26</sub>	RSRP <sub>45</sub>	RSRP <sub>65</sub>	RSRP <sub>33</sub>
Cell 2 - Lowest reported value	RSRP <sub>15</sub>	RSRP <sub>31</sub>	RSRP <sub>51</sub>	RSRP <sub>19</sub>
Cell 2 Highest reported value	RSRP <sub>24</sub>	RSRP <sub>40</sub>	RSRP <sub>60</sub>	RSRP <sub>28</sub>
Cell 3 - Lowest reported value	RSRP <sub>15</sub>	N/A	N/A	N/A
Cell 3 - Highest reported value	RSRP <sub>24</sub>	N/A	N/A	N/A
-300 to < 00C, >400C to +600C				
Cell 1 - Lowest reported value	RSRP <sub>15</sub>	RSRP <sub>34</sub>	RSRP <sub>54</sub>	RSRP <sub>22</sub>
Cell 1 - Highest reported value	RSRP <sub>28</sub>	RSRP <sub>47</sub>	RSRP <sub>67</sub>	RSRP <sub>35</sub>
Cell 2 - Lowest reported value	RSRP <sub>13</sub>	RSRP <sub>29</sub>	RSRP <sub>49</sub>	RSRP <sub>17</sub>

Cell 2 Highest reported value	RSRP <sub>26</sub>	RSRP <sub>42</sub>	RSRP <sub>62</sub>	RSRP <sub>30</sub>
Cell 3 - Lowest reported value	RSRP <sub>13</sub>	N/A	N/A	N/A
Cell 3 - Highest reported value	RSRP <sub>26</sub>	N/A	N/A	N/A
<b>Relative RSRP</b> For a given measurement report (i.e. MeasurementReport message), the RSRP values reported for Cell 2 and Cell 3 with respect to the RSRP value reported for Cell 1 shall meet the requirements in the table below where RSRP <sub>x</sub> is the value reported for Cell 1 in a given measurement report:				
	<b>Test 1</b>	<b>Test 2</b>	<b>Test 3</b>	<b>Test 4</b>
<b>00 to +400C</b>				
Cell 2 - Lowest reported value	RSRP <sub>x-5</sub>	RSRP <sub>x-8</sub>	RSRP <sub>x-8</sub>	RSRP <sub>x-8</sub>
Cell 2 Highest reported value	RSRP <sub>x+1</sub>	RSRP <sub>x-2</sub>	RSRP <sub>x-2</sub>	RSRP <sub>x-2</sub>
Cell 3 - Lowest reported value	RSRP <sub>x-5</sub>	N/A	N/A	N/A
Cell 3 - Highest reported value	RSRP <sub>x+1</sub>	N/A	N/A	N/A
<b>-300 to &lt; 00C, &gt;400C to +600C</b>				
Cell 2 - Lowest reported value	RSRP <sub>x-6</sub>	RSRP <sub>x-9</sub>	RSRP <sub>x-9</sub>	RSRP <sub>x-9</sub>
Cell 2 Highest reported value	RSRP <sub>x+2</sub>	RSRP <sub>x-1</sub>	RSRP <sub>x-1</sub>	RSRP <sub>x-1</sub>
Cell 3 - Lowest reported value	RSRP <sub>x-6</sub>	N/A	N/A	N/A
Cell 3 - Highest reported value	RSRP <sub>x+2</sub>	N/A	N/A	N/A

#### 2.1.2.4 RSRP Intra-Frequency Accuracy in RRC\_CONNECTED Mode - Test 4

VZ\_TC\_3GPPB13SUPRRM\_3533424



## 2.2 RSRP INTRA-FREQUENCY ACCURACY IN RRC\_IDLE MODE

VZ\_TC\_3GPPB13SUPRRM\_432

### Definition

This test verifies that the UE meets Verizon Wireless requirements for RSRP intra-frequency absolute accuracy and relative accuracy when the UE is operating in RRC\_IDLE mode.

### Traceability

- Verizon Wireless LTE 3GPP Band 13 Network Access Device Requirements
- 3GPP TS 36.521-3: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) conformance specification; Radio transmission and reception; Part 3: Radio Resource Management conformance testing*

### Applicability

This test case applies to all UEs designed to operate on the Verizon Wireless LTE 3GPP Band 13 network.

Design Steps
Step Name
Step 1
Pre-Conditions
Procedures
<p><b>Test Procedure</b></p> <ol style="list-style-type: none"> <li>1. Set the RF level of Cell 1 to -85 dBm/15 kHz with no AWGN or fading. The RF output for all cells shall be set to OFF. Connections are per section 1.5.5 of this document.</li> <li>2. The network emulator shall set the values in SIB1, SIB3, and SIB4 defined in Table 2.2.2-6 for Test 1.</li> <li>3. The RF output power for Cell 1 shall be set to ON.</li> <li>4. Power on the UE.</li> <li>5. Verify that the UE successfully attaches to the network.</li> <li>6. The network emulator shall set the idle mode DRX cycle to 1.28s.</li> <li>7. The network emulator shall release the RRC connection.</li> <li>8. Set the parameters for Cell 1, Cell 2, and Cell 3 for Test 1 per Table 2.2.2-1 and Table 2.2.2-2.</li> <li>9. The RF output power for Cell 2 and Cell 3 shall be set to ON.</li> <li>10. The test platform shall request a measurement report for all cells (i.e. Cell 1, Cell 2, and Cell</li> </ol>

3) every 5.12s using the custom VZW AT command +VZWRSP until both of the criteria below are satisfied:

1. UE measurements shall be taken for each cell in a given test until the appropriate confidence level defined in Annex G.2 of 3GPP TS 36.521-3 is achieved.
11. For each test, the RSRP values reported for all cells shall be recorded and:
  1. For each set of measurements reported by the device, the test platform shall calculate:
    1. RSRP for Cell 2 RSRP for Cell 1
    2. RSRP for Cell 3 RSRP for Cell 1 (if Cell 3 is used for the test)
  2. The test platform shall report the following statistics for informational purposes:
    1. Mean RSRP value reported for each cell.
    2. Maximum RSRP value reported for each cell.
    3. Minimum RSRP value reported for each cell.
    4. Standard deviation for the RSRP values reported for each cell.
    5. RSRP values versus time reported for each cell.
12. Repeat steps 1.) through 11.) for Test 2 per Table 2.2.2-3 and Table 2.2.2-6 for propagation conditions AWGN, EPA5, and EVA70.
13. Repeat steps 1.) through 11.) for Test 3 per Table 2.2.2-4 and Table 2.2.2-6 for propagation conditions AWGN, EPA5, and EVA70.
14. Repeat steps 1.) through 11.) for Test 4 per Table 2.2.2-5 and Table 2.2.2-6 for propagation conditions AWGN, EPA5, and EVA70.

**Table 2.2.21. RSRP intra-frequency accuracy test parameters common to all tests.**

Parameter	Unit	Cell		
		#1	#2	#3
E-UTRA RF Channel Number		5230		
BWchannel	MHz	10		
OCNG Patterns defined in D.1.1 (OP.1 FDD) and D.1.2 (OP.2 FDD) of 3GPP TS 36.521-3		OP.2 FDD	OP.2 FDD	OP.2 FDD
PBCH_RA	dB	-3	-3	-3
PBCH_RB				
PSS_RA				
SSS_RA				
PCFICH_RB				
PHICH_RA				
PHICH_RB				
PDCCH_RA				

PDCCH_RB				
PDSCH_RA				
PDSCH_RB				
OCNG_RANote 1				
OCNG_RBNote 1				
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.				

**Table 2.2.22. RSRP intra-frequency accuracy test parameters for Test 1.**

Parameter	Unit	Cell		
		#1	#2	#3
$N_{oc}$ Note 2	dBm/15 kHz	-124.0		
$E_s/I_{ot}$	dB	-1.98	-4.89	-4.89
RSRP Note 3	dBm/15 kHz	-119.0	-121.0	-121.0
$I_o$ Note 3	dBm/9 MHz	-87.10		
$E_s/N_{oc}$		5.0	3.0	3.0
Propagation condition		AWGN		
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.				
Note 3: RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.				
Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.				

**Table 2.2.23. RSRP intra-frequency accuracy test parameters for Test 2.**

Parameter	Unit	Cell		
		#1	#2	#3
$N_{oc}$ Note 2	dBm/15 kHz	-120.0		
$E_s/I_{ot}$	dB	4.86	-5.04	N/A
RSRPNote 3	dBm/15 kHz	-100.0	-105.0	N/A
$I_o$ Note 3	dBm/9 MHz	-70.99		
$E_s/N_{oc}$		20	15	N/A

Propagation condition		AWGN, EPA <sub>5</sub> , EVA <sub>70</sub>
<p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p>		

**Table 2.2.24. RSRP intra-frequency accuracy test parameters for Test 3.**

Parameter	Unit	Cell		
		#1	#2	#3
$N_{oc}$ Note2	dBm/15 kHz	-100.0		
$E_s/I_{ot}$	dB	4.86	-5.04	N/A
RSRP Note3	dBm/15 kHz	-80.0	-85.0	N/A
$I_o$ Note3	dBm/9 MHz	-50.99		
$E_s/N_{oc}$		20.0	15.0	N/A
Propagation condition		AWGN, EPA5, EVA70		
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.				
Note 3: RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.				
Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.				

**Table 2.2.25. RSRP intra-frequency accuracy test parameters for Test 4.**

Parameter	Unit	Cell		
		#1	#2	#3
$N_{oc}$ Note2	dBm/15 kHz	-124.0		
$E_s/I_{ot}$	dB	4.21	-5.26	N/A
RSRP Note3	dBm/15 kHz	-112.0	-117.0	N/A
$I_o$ Note3	dBm/9 MHz	-82.82		
$E_s/N_{oc}$		12.0	7	N/A

Propagation condition		AWGN, EPA5, EVA70
<p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p>		

**Table 2.2.26. Critical SIB reselection parameters for RSRP intra-frequency accuracy tests.**

Parameter	Test 1	Test 2	Test 3	Test 4
<b>SIB1:</b>				
q-RxLevMin	-62 (-124 dBm)	-55 (-110 dBm)	-45 (-90 dBm)	-61 (-122 dBm)
q-RxLevMinOffset	6 (12 dB)	8 (16 dB)	8 (16 dB)	8 (16 dB)
<b>SIB3:</b>				
q-Hyst	dB24 (24 dB)	dB24 (24 dB)	dB24 (24 dB)	dB24 (24 dB)
q-RxLevMin	-62 (-124 dBm)	-55 (-110 dBm)	-45 (-90 dBm)	-61 (-122 dBm)
s-IntraSearch	6 (12 dB)	9 (18 dB)	9 (18 dB)	9 (18 dB)
s-IntraSearchP	6 (12 dB)	9 (18 dB)	9 (18 dB)	9 (18 dB)
<b>SIB4:</b>				
q-OffsetCell	dB0 (0 dB)	dB0 (0 dB)	dB0 (0 dB)	dB0 (0 dB)

### Expected Results

#### Expected Result

#### Absolute RSRP, AWGN Only

The RSRP values reported by the UE shall meet the limits in the table below:

	Test 1	Test 2	Test 3	Test 4
00 to +400C				

Cell 1 - Lowest reported value	RSRP_17	RSRP_36	RSRP_56	RSRP_24
Cell 1 - Highest reported value	RSRP_26	RSRP_45	RSRP_65	RSRP_33
Cell 2 - Lowest reported value	RSRP_15	RSRP_31	RSRP_51	RSRP_19
Cell 2 Highest reported value	RSRP_24	RSRP_40	RSRP_60	RSRP_28
Cell 3 - Lowest reported value	RSRP_15	N/A	N/A	N/A
Cell 3 - Highest reported value	RSRP_24	N/A	N/A	N/A
<b>-300 to &lt; 00C, &gt;400C to +600C</b>				
Cell 1 - Lowest reported value	RSRP_15	RSRP_34	RSRP_54	RSRP_22
Cell 1 - Highest reported value	RSRP_28	RSRP_47	RSRP_67	RSRP_35
Cell 2 - Lowest reported value	RSRP_13	RSRP_29	RSRP_49	RSRP_17
Cell 2 Highest reported value	RSRP_26	RSRP_42	RSRP_62	RSRP_30
Cell 3 - Lowest reported value	RSRP_13	N/A	N/A	N/A
Cell 3 - Highest reported value	RSRP_26	N/A	N/A	N/A
<b>Absolute RSRP, AWGN with Fading</b> The mean RSRP values reported by the UE shall meet the limits in the table below:				
	<b>Test 1</b>	<b>Test 2</b>	<b>Test 3</b>	<b>Test 4</b>
<b>00 to +400C</b>				
Cell 1 - Lowest reported value	N/A	RSRP_36	RSRP_56	RSRP_24
Cell 1 - Highest reported value	N/A	RSRP_45	RSRP_65	RSRP_33
Cell 2 - Lowest reported value	N/A	RSRP_31	RSRP_51	RSRP_19
Cell 2 Highest reported value	N/A	RSRP_40	RSRP_60	RSRP_28
Cell 3 - Lowest reported value	N/A	N/A	N/A	N/A

Cell 3 - Highest reported value	N/A	N/A	N/A	N/A
<b>-300 to &lt; 00C, &gt;400C to +600C</b>				
Cell 1 - Lowest reported value	N/A	RSRP <sub>34</sub>	RSRP <sub>54</sub>	RSRP <sub>22</sub>
Cell 1 - Highest reported value	N/A	RSRP <sub>47</sub>	RSRP <sub>67</sub>	RSRP <sub>35</sub>
Cell 2 - Lowest reported value	N/A	RSRP <sub>29</sub>	RSRP <sub>49</sub>	RSRP <sub>17</sub>
Cell 2 Highest reported value	N/A	RSRP <sub>42</sub>	RSRP <sub>62</sub>	RSRP <sub>30</sub>
Cell 3 - Lowest reported value	N/A	N/A	N/A	N/A
Cell 3 - Highest reported value	N/A	N/A	N/A	N/A
The standard deviation of the RSRP values reported by the UE shall meet the limits in the table below:				
	<b>Test 1</b>	<b>Test 2</b>	<b>Test 3</b>	<b>Test 4</b>
<b>00 to +400C</b>				
Cell 1 - Lowest reported value	FFS	FFS	FFS	FFS
Cell 1 - Highest reported value	FFS	FFS	FFS	FFS
Cell 2 - Lowest reported value	FFS	FFS	FFS	FFS
Cell 2 Highest reported value	FFS	FFS	FFS	FFS
Cell 3 - Lowest reported value	FFS	N/A	N/A	N/A
Cell 3 - Highest reported value	FFS	N/A	N/A	N/A
<b>-300 to &lt; 00C, &gt;400C to +600C</b>				
Cell 1 - Lowest reported value	FFS	FFS	FFS	FFS
Cell 1 - Highest reported value	FFS	FFS	FFS	FFS
Cell 2 - Lowest reported value	FFS	FFS	FFS	FFS
Cell 2 Highest reported value	FFS	FFS	FFS	FFS

Cell 3 - Lowest reported value	FFS	N/A	N/A	N/A
Cell 3 - Highest reported value	FFS	N/A	N/A	N/A
<b>Relative RSRP, AWGN Only</b> For a given measurement report, the RSRP values reported for Cell 2 and Cell 3 with respect to the RSRP value reported for Cell 1 shall meet the requirements in the table below where RSRP <sub>x</sub> is the value reported for Cell 1 in a given measurement report:				
	<b>Test 1</b>	<b>Test 2</b>	<b>Test 3</b>	<b>Test 4</b>
<b>00 to +400C</b>				
Cell 2 - Lowest reported value	RSRP <sub>x-5</sub>	RSRP <sub>x-8</sub>	RSRP <sub>x-8</sub>	RSRP <sub>x-8</sub>
Cell 2 Highest reported value	RSRP <sub>x+1</sub>	RSRP <sub>x-2</sub>	RSRP <sub>x-2</sub>	RSRP <sub>x-2</sub>
Cell 3 - Lowest reported value	RSRP <sub>x-5</sub>	N/A	N/A	N/A
Cell 3 - Highest reported value	RSRP <sub>x+1</sub>	N/A	N/A	N/A
<b>-300 to &lt; 00C, &gt;400C to +600C</b>				
Cell 2 - Lowest reported value	RSRP <sub>x-6</sub>	RSRP <sub>x-9</sub>	RSRP <sub>x-9</sub>	RSRP <sub>x-9</sub>
Cell 2 Highest reported value	RSRP <sub>x+2</sub>	RSRP <sub>x-1</sub>	RSRP <sub>x-1</sub>	RSRP <sub>x-1</sub>
Cell 3 - Lowest reported value	RSRP <sub>x-6</sub>	N/A	N/A	N/A
Cell 3 - Highest reported value	RSRP <sub>x+2</sub>	N/A	N/A	N/A
<b>Relative RSRP, AWGN with Fading</b> The mean of the RSRP values reported for Cell 2 and Cell 3 with respect to the mean of the RSRP values reported for Cell 1 shall meet the requirements in the table below where RSRP <sub>x</sub> is the mean of the values reported for Cell 1:				
	<b>Test 1</b>	<b>Test 2</b>	<b>Test 3</b>	<b>Test 4</b>
<b>00 to +400C</b>				



Cell 2 - Lowest reported value	N/A	RSRP_x-8	RSRP_x-8	RSRP_x-8
Cell 2 Highest reported value	N/A	RSRP_x-2	RSRP_x-2	RSRP_x-2
Cell 3 - Lowest reported value	N/A	N/A	N/A	N/A
Cell 3 - Highest reported value	N/A	N/A	N/A	N/A
<b>-300 to &lt; 00C, &gt;400C to +600C</b>				
Cell 2 - Lowest reported value	N/A	RSRP_x-9	RSRP_x-9	RSRP_x-9
Cell 2 Highest reported value	N/A	RSRP_x-1	RSRP_x-1	RSRP_x-1
Cell 3 - Lowest reported value	N/A	N/A	N/A	N/A
Cell 3 - Highest reported value	N/A	N/A	N/A	N/A
<p>The standard deviation of the RSRP values reported for Cell 2 and Cell 3 with respect to the standard deviation of the RSRP values reported for Cell 1 shall meet the requirements in the table below where RSRP_x is the standard deviation of the values reported for Cell 1:</p>				
	<b>Test 1</b>	<b>Test 2</b>	<b>Test 3</b>	<b>Test 4</b>
<b>00 to +400C</b>				
Cell 2 - Lowest reported value	FFS	FFS	FFS	FFS
Cell 2 Highest reported value	FFS	FFS	FFS	FFS
Cell 3 - Lowest reported value	FFS	N/A	N/A	N/A
Cell 3 - Highest reported value	FFS	N/A	N/A	N/A
<b>-300 to &lt; 00C, &gt;400C to +600C</b>				
Cell 2 - Lowest reported value	FFS	FFS	FFS	FFS
Cell 2 Highest reported value	FFS	FFS	FFS	FFS
Cell 3 - Lowest reported value	FFS	N/A	N/A	N/A
Cell 3 - Highest reported value	FFS	N/A	N/A	N/A



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## 2.3 RSRQ INTRA-FREQUENCY ACCURACY IN RRC\_CONNECTED MODE

VZ\_TC\_3GPPB13SUPRRM\_433

### Definition

This test verifies that the UE meets Verizon Wireless requirements for RSRQ intra-frequency absolute accuracy and relative accuracy when the UE is operating in RRC\_CONNECTED mode.

### Traceability

- Verizon Wireless LTE 3GPP Band 13 Network Access Device Requirements
- 3GPP TS 36.521-3: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) conformance specification; Radio transmission and reception; Part 3: Radio Resource Management conformance testing*

### Applicability

This test case applies to all UEs designed to operate on the Verizon Wireless LTE 3GPP Band 13 network.

Design Steps
Step Name
Step 1
Pre-Conditions
Procedures
<b>Test Procedure</b> <ol style="list-style-type: none"> <li>1. Set the initial conditions as per section 9.2.1.1.4.1 of 3GPP TS 36.521-3: <i>Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) conformance specification; Radio transmission and reception; Part 3: Radio Resource Management conformance testing</i> for a 10 MHz channel in Band 13. <ol style="list-style-type: none"> <li>1. Connections are per section 1.5.5 of this document.</li> </ol> </li> <li>2. Follow steps 1 through 8 in section 9.2.1.1.4.2 of 3GPP TS 36.521-3: <i>Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) conformance specification; Radio transmission and reception; Part 3: Radio Resource Management conformance testing</i> using the message contents defined in section 9.2.1.1.4.3 of 3GPP TS 36.521-3: <i>Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) conformance specification; Radio transmission and reception; Part 3: Radio Resource Management conformance testing</i> with the exceptions noted below: <ol style="list-style-type: none"> <li>1. L3 filtering shall be enabled for RSRQ measurements with the coefficient set to k=8.</li> <li>2. Set the parameters for Test 1 per Table 2.3.2-1 and Table 2.3.2-2 below.</li> <li>3. The UE shall be set up to report RSRQ results for Cells 1, 2, and 3 for a given test.</li> <li>4. UE measurements shall be taken for each cell in a given test until the appropriate</li> </ol> </li> </ol>

- confidence level defined in Annex G.2 of 3GPP TS 36.521-3 is achieved.
5. For each test, the RSRQ values reported for all cells shall be recorded.
  6. For each set of measurements reported by the device, the test platform shall calculate:
    1. RSRQ for Cell 2 RSRQ for Cell 1
    2. RSRQ for Cell 3 RSRQ for Cell 1 (if Cell 3 is used for the test)
  7. The test platform shall report the following statistics for informational purposes:
    1. Mean RSRQ value reported for each cell.
    2. Maximum RSRQ value reported for each cell.
    3. Minimum RSRQ value reported for each cell.
    4. Standard deviation for the RSRQ values reported for each cell.
    5. RSRQ values versus time reported for each cell.
  3. Repeat steps 1.) and 2.) for Test 2 per Table 2.3.2-1 and Table 2.3.2-3 for propagation conditions AWGN, EPA5, and EVA70.
  4. Repeat steps 1.) and 2.) for Test 3 per Table 2.3.2-1 and Table 2.3.2-4 3 for propagation conditions AWGN, EPA5, and EVA70.
  5. Repeat steps 1.) and 2.) for Test 4 per Table 2.3.2-1 and Table 2.3.2-5 3 for propagation conditions AWGN, EPA5, and EVA70 with the following exception: connected-mode DRX shall be enabled.

**Table 2.3.2-1. RSRQ intra-frequency accuracy test parameters common to all tests.**

Parameter	Unit	Cell		
		#1	#2	#3
E-UTRA RF Channel Number		5230		
BWchannel	MHz	10		
Measurement bandwidth	n PRB	Not specified up to 50 RB allowed		
PDSCH Reference measurement channel defined in A.1.1 of 3GPP TS 36.521-3		R.1 FDD	-	-
PDSCH allocation	n PRB	1336	-	-
PDCCH/PCFICH/PHICH Reference measurement channel defined in A.2.1 of 3GPP TS 36.521-3		R.7 FDD		
OCNG Patterns defined in D.1.1 (OP.1 FDD) and D.1.2 (OP.2 FDD) of 3GPP TS 36.521-3		OP.1 FDD	OP.2 FDD	OP.2 FDD

PBCH_RA	dB	-3	-3	-3
PBCH_RB				
PSS_RA				
SSS_RA				
PCFICH_RB				
PHICH_RA				
PHICH_RB				
PDCCH_RA				
PDCCH_RB				
PDSCH_RA				
PDSCH_RB				
OCNG_RANote 1				
OCNG_RBNote 1				
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.				

Table 2.3.2-2. RSRQ intra-frequency accuracy test parameters for Test 1.

Parameter	Unit	Cell		
		#1	#2	#3
$N_{oc}$ Note 2	dBm/15 kHz	-124.0		
$E_s/I_{ot}$	dB	-1.98	-4.89	-4.89
RSRP Note 3	dBm/15 kHz	-119.0	-121.0	-121.0
RSRQ Note 3	dB	-14.90	-16.90	-16.90
$I_o$ Note 3	dBm/9 MHz	-87.10		
$E_s/N_{oc}$		5.0	3.0	3.0

Propagation condition		AWGN
<p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: RSRP, RSRQ, and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: RSRP and RSRQ minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p>		

**Table 2.3.2-3. RSRQ intra-frequency accuracy test parameters for Test 2.**

Parameter	Unit	Cell		
		#1	#2	#3
$N_{oc}$ Note2	dBm/15 kHz	-120.0		
$E_s/I_{ot}$	dB	4.86	-5.04	N/A
RSRP Note3	dBm/15 kHz	-100.0	-105.0	N/A
RSRQ Note3	dB	-12.02	-17.02	N/A
$I_o$ Note3	dBm/9 MHz	-70.99		
$E_s/N_{oc}$		20.0	15.0	N/A
Propagation condition		AWGN, EPA5, EVA70		

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3: RSRP, RSRQ, and  $I_o$  levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: RSRP and RSRQ minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

**Table 2.3.2-4. RSRQ intra-frequency accuracy test parameters for Test 3.**

Parameter	Unit	Cell		
		#1	#2	#3

<i>Noc</i> Note2	dBm/15 kHz	-100.0		
Es/Iot	dB	4.86	-5.04	N/A
RSRPNote3	dBm/15 kHz	-80.0	-85.0	N/A
RSRQNote3	dB	-12.02	-17.02	N/A
IoNote3	dBm/9 MHz	-50.99		
Es/Noc		20.0	15.0	N/A
Propagation condition		AWGN, EPA5, EVA70		
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <i>Noc</i> to be fulfilled.				
Note 3: RSRP, RSRQ, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.				
Note 4: RSRP and RSRQ minimum requirements are specified assuming independent interference and noise at each receiver antenna port.				
Table 2.3.2-5. RSRQ intra-frequency accuracy test parameters for Test 4.				
Parameter	Unit	Cell		
		#1	#2	#3
<i>Noc</i> Note2	dBm/15 kHz	-124.0		
Es/Iot	dB	4.21	-5.26	N/A
RSRPNote3	dBm/15 kHz	-112.0	-117.0	N/A
RSRQNote3	dB	-12.19	-17.19	N/A
IoNote3	dBm/9 MHz	-82.82		
Es/Noc		12.0	7.0	N/A
Propagation condition		AWGN, EPA5, EVA70		
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <i>Noc</i>				

to be fulfilled.

Note 3: RSRP, RSRQ, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: RSRP and RSRQ minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

## Expected Results

### Expected Result

#### Absolute RSRQ

The RSRQ values reported by the UE shall meet the limits in the table below:

	Test 1	Test 2	Test 3	Test 4
<b>00 to +400C</b>				
Cell 1 - Lowest reported value	RSRQ <sub>-3</sub>	RSRQ <sub>-9</sub>	RSRQ <sub>-9</sub>	RSRQ <sub>-9</sub>
Cell 1 - Highest reported value	RSRQ <sub>-16</sub>	RSRQ <sub>-22</sub>	RSRQ <sub>-22</sub>	RSRQ <sub>-22</sub>
Cell 2 - Lowest reported value	RSRQ <sub>-0</sub>	RSRQ <sub>-0</sub>	RSRQ <sub>-0</sub>	RSRQ <sub>-0</sub>
Cell 2 Highest reported value	RSRQ <sub>-12</sub>	RSRQ <sub>-12</sub>	RSRQ <sub>-12</sub>	RSRQ <sub>-12</sub>
Cell 3 - Lowest reported value	RSRQ <sub>-0</sub>	N/A	N/A	N/A
Cell 3 - Highest reported value	RSRQ <sub>-12</sub>	N/A	N/A	N/A
<b>-300 to &lt; 00C, &gt;400C to +600C</b>				
Cell 1 - Lowest reported value	RSRQ <sub>-0</sub>	RSRQ <sub>-6</sub>	RSRQ <sub>-6</sub>	RSRQ <sub>-6</sub>
Cell 1 - Highest reported value	RSRQ <sub>-19</sub>	RSRQ <sub>-25</sub>	RSRQ <sub>-25</sub>	RSRQ <sub>-25</sub>
Cell 2 - Lowest reported value	RSRQ <sub>-0</sub>	RSRQ <sub>-0</sub>	RSRQ <sub>-0</sub>	RSRQ <sub>-0</sub>
Cell 2 Highest reported value	RSRQ <sub>-15</sub>	RSRQ <sub>-15</sub>	RSRQ <sub>-15</sub>	RSRQ <sub>-15</sub>
Cell 3 - Lowest reported value	RSRQ <sub>-0</sub>	N/A	N/A	N/A
Cell 3 - Highest reported value	RSRQ <sub>-15</sub>	N/A	N/A	N/A



### Relative RSRQ

For a given measurement report (i.e. MeasurementReport message), the RSRQ values reported for Cell 2 and Cell 3 with respect to the RSRQ value reported for Cell 1 shall meet the requirements in the table below where RSRQ<sub>x</sub> is the value reported for Cell 1 in a given measurement report:

	Test 1	Test 2	Test 3	Test 4
<b>00 to +400C</b>				
Cell 2 - Lowest reported value	RSRQ <sub>x-12</sub>	RSRQ <sub>x-18</sub>	RSRQ <sub>x-18</sub>	RSRQ <sub>x-18</sub>
Cell 2 Highest reported value	RSRQ <sub>x+4</sub>	RSRQ <sub>x-2</sub>	RSRQ <sub>x-2</sub>	RSRQ <sub>x-2</sub>
Cell 3 - Lowest reported value	RSRQ <sub>x-12</sub>	N/A	N/A	N/A
Cell 3 - Highest reported value	RSRQ <sub>x+4</sub>	N/A	N/A	N/A
<b>-300 to &lt; 00C, &gt;400C to +600C</b>				
Cell 2 - Lowest reported value	RSRQ <sub>x-14</sub>	RSRQ <sub>x-20</sub>	RSRQ <sub>x-20</sub>	RSRQ <sub>x-20</sub>
Cell 2 Highest reported value	RSRQ <sub>x+6</sub>	RSRQ <sub>x+0</sub>	RSRQ <sub>x+0</sub>	RSRQ <sub>x+0</sub>
Cell 3 - Lowest reported value	RSRQ <sub>x-14</sub>	N/A	N/A	N/A
Cell 3 - Highest reported value	RSRQ <sub>x+6</sub>	N/A	N/A	N/A

## 2.4 RSRQ INTRA-FREQUENCY ACCURACY IN RRC\_IDLE MODE

VZ\_TC\_3GPPB13SUPRRM\_434

### Definition

This test verifies that the UE meets Verizon Wireless requirements for RSRQ intra-frequency absolute accuracy and relative accuracy when the UE is operating in RRC\_IDLE mode.

### Traceability

- Verizon Wireless LTE 3GPP Band 13 Network Access Device Requirements
- 3GPP TS 36.521-3: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) conformance specification; Radio transmission and reception; Part 3: Radio Resource Management conformance testing*

### Applicability

This test case applies to all UEs designed to operate on the Verizon Wireless LTE 3GPP Band 13 network.

Design Steps
Step Name
Step 1
Pre-Conditions
Procedures
<p><b>Test Procedure</b></p> <ol style="list-style-type: none"> <li>1. Set the RF level of Cell 1 to -85 dBm/15 kHz with no AWGN or fading. The RF output for all cells shall be set to OFF. Connections are per section 1.5.5 of this document.</li> <li>2. The network emulator shall set the values in SIB1, SIB3, and SIB4 defined in Table 2.4.2-6 for Test 1.</li> <li>3. The RF output power for Cell 1 shall be set to ON.</li> <li>4. Power on the UE.</li> <li>5. Verify that the UE successfully attaches to the network.</li> <li>6. The network emulator shall set the idle mode DRX cycle to 1.28s.</li> <li>7. The network emulator shall release the RRC connection.</li> <li>8. Set the parameters for Cell 1, Cell 2, and Cell 3 for Test 1 per Table 2.4.2-1 and Table 2.4.2-2.</li> <li>9. The RF output power for Cell 2 and Cell 3 shall be set to ON.</li> <li>10. The test platform shall request a RSRQ measurement report for all cells (i.e. Cell 1, Cell 2, and Cell 3) every 5.12s using the custom VZW AT command +VZWRSRQ until both of the criteria below are satisfied: <ol style="list-style-type: none"> <li>1. UE measurements shall be taken for each cell in a given test until the appropriate confidence level defined in Annex G.2 of 3GPP TS 36.521-3 is achieved.</li> </ol> </li> </ol>

11. For each test, the RSRQ values reported for all cells shall be recorded and:
  1. For each set of measurements reported by the device, the test platform shall calculate:
    1. RSRQ for Cell 2 RSRQ for Cell 1
    2. RSRQ for Cell 3 RSRQ for Cell 1 (if Cell 3 is used for the test)
  2. The test platform shall report the following statistics for informational purposes:
    1. Mean RSRQ value reported for each cell.
    2. Maximum RSRQ value reported for each cell.
    3. Minimum RSRQ value reported for each cell.
    4. Standard deviation for the RSRQ values reported for each cell.
    5. RSRQ values versus time reported for each cell.
12. Repeat steps 1.) through 11.) for Test 2 per Table 2.4.2-3 and Table 2.4.2-6 for propagation conditions AWGN, EPA5, and EVA70.
13. Repeat steps 1.) through 11.) for Test 3 per Table 2.4.2-4 and Table 2.4.2-6 for propagation conditions AWGN, EPA5, and EVA70.
14. Repeat steps 1.) through 11.) for Test 4 per Table 2.4.2-5 and Table 2.4.2-6 for propagation conditions AWGN, EPA5, and EVA70.

**Table 2.4.21. RSRQ intra-frequency accuracy test parameters common to all tests.**

Parameter	Unit	Cell		
		#1	#2	#3
E-UTRA RF Channel Number		5230		
BWchannel	MHz	10		
OCNG Patterns defined in D.1.1 (OP.1 FDD) and D.1.2 (OP.2 FDD) of 3GPP TS 36.521-3		OP.2 FDD	OP.2 FDD	OP.2 FDD
PBCH_RA	dB	-3	-3	-3
PBCH_RB				
PSS_RA				
SSS_RA				
PCFICH_RB				
PHICH_RA				
PHICH_RB				
PDCCH_RA				
PDCCH_RB				

PDSCH_RA				
PDSCH_RB				
OCNG_RANote 1				
OCNG_RBNote 1				
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.				

**Table 2.4.22. RSRQ intra-frequency accuracy test parameters for Test 1.**

Parameter	Unit	Cell		
		#1	#2	#3
$N_{oc}$ Note 2	dBm/15 kHz	-124.0		
$E_s/I_{ot}$	dB	-1.98	-4.89	-4.89
RSRP Note 3	dBm/15 kHz	-119.0	-121.0	-121.0
RSRQ Note 3	dB	-14.90	-16.90	-16.90
$I_o$ Note 3	dBm/9 MHz	-87.10		
$E_s/N_{oc}$		5.0	3.0	3.0
Propagation condition		AWGN		

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3: RSRP, RSRQ, and  $I_o$  levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: RSRP and RSRQ minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

**Table 2.4.23. RSRQ intra-frequency accuracy test parameters for Test 2.**

Parameter	Unit	Cell		
		#1	#2	#3
$N_{oc}$ Note 2	dBm/15 kHz	-120.0		

Es/Iot	dB	4.86	-5.04	N/A
RSRPN <sub>Note 3</sub>	dBm/15 kHz	-100.0	-105.0	N/A
RSRQN <sub>Note 3</sub>	dB	-12.02	-17.02	N/A
Io <sub>Note 3</sub>	dBm/9 MHz	-70.99		
Es/Noc		20.0	15.0	N/A
Propagation condition		AWGN, EPA <sub>5</sub> , EVA <sub>70</sub>		
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <i>Noc</i> to be fulfilled.				
Note 3: RSRP, RSRQ, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.				
Note 4: RSRP and RSRQ minimum requirements are specified assuming independent interference and noise at each receiver antenna port.				
Table 2.4.24. RSRQ intra-frequency accuracy test parameters for Test 3.				
Parameter	Unit	Cell		
		#1	#2	#3
<i>Noc</i> <sub>Note 2</sub>	dBm/15 kHz	-100.0		
Es/Iot	dB	4.86	-5.04	N/A
RSRPN <sub>Note 3</sub>	dBm/15 kHz	-80.0	-85.0	N/A
RSRQN <sub>Note 3</sub>	dB	-12.02	-17.02	N/A
Io <sub>Note 3</sub>	dBm/9 MHz	-50.99		
Es/Noc		20.0	15.0	N/A
Propagation condition		AWGN, EPA <sub>5</sub> , EVA <sub>70</sub>		
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <i>Noc</i> to be fulfilled.				
Note 3: RSRP, RSRQ, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.				

Note 4: RSRP and RSRQ minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

**Table 2.4.25. RSRQ intra-frequency accuracy test parameters for Test 4.**

Parameter	Unit	Cell		
		#1	#2	#3
$N_{oc}$ Note 2	dBm/15 kHz	-124.0		
$E_s/I_{ot}$	dB	4.21	-5.26	N/A
RSRP Note 3	dBm/15 kHz	-112.0	-117.0	N/A
RSRQ Note 3	dB	-12.19	-17.19	N/A
$I_o$ Note 3	dBm/9 MHz	-82.82		
$E_s/N_{oc}$		12.0	7.0	N/A
Propagation condition		AWGN, EPA <sub>5</sub> , EVA <sub>70</sub>		

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3: RSRP, RSRQ, and  $I_o$  levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: RSRP and RSRQ minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

**Table 2.4.26. Critical SIB reselection parameters for RSRQ intra-frequency accuracy tests.**

Parameter	Test 1	Test 2	Test 3	Test 4
<b>SIB<sub>1</sub>:</b>				
q-RxLevMin	-62 (-124 dBm)	-55 (-110 dBm)	-45 (-90 dBm)	-61 (-122 dBm)
q-RxLevMinOffset	6 (12 dB)	8 (16 dB)	8 (16 dB)	8 (16 dB)
q-QualMin	-19 (-19 dB)	-16 (-16 dB)	-16 (-16 dB)	-16 (-16 dB)
q-QualMinOffset	Omitted	Omitted	Omitted	Omitted
<b>SIB<sub>3</sub>:</b>				

q-Hyst	dB <sub>24</sub> (24 dB) -62 (-124 dBm)	dB <sub>24</sub> (24 dB) -55 (-110 dBm)	dB <sub>24</sub> (24 dB) -45 (-90 dBm)	dB <sub>24</sub> (24 dB) -61 (-122 dBm)
q-RxLevMin	6 (12 dB)	9 (18 dB)	9 (18 dB)	9 (18 dB)
s-IntraSearch	6 (12 dB)	9 (18 dB)	9 (18 dB)	9 (18 dB)
s-IntraSearchP	8 (8 dB)	8 (8 dB)	8 (8 dB)	8 (8 dB)
s-IntraSearchQ	-19 (-19 dB)	-21 (-21 dB)	-16 (-16 dB)	-16 (-16 dB)
q-QualMin				
<b>SIB4:</b>				
q-OffsetCell	dB <sub>0</sub> (0 dB)	dB <sub>0</sub> (0 dB)	dB <sub>0</sub> (0 dB)	dB <sub>0</sub> (0 dB)
Expected Results				
<p><b>Expected Result</b></p> <p><b>Absolute RSRQ, AWGN Only</b></p> <p>The RSRQ values reported by the UE shall meet the limits in the table below:</p>				
	<b>Test 1</b>	<b>Test 2</b>	<b>Test 3</b>	<b>Test 4</b>
<b>00 to +400C</b>				
Cell 1 - Lowest reported value	RSRQ <sub>-3</sub>	RSRQ <sub>-9</sub>	RSRQ <sub>-9</sub>	RSRQ <sub>-9</sub>
Cell 1 - Highest reported value	RSRQ <sub>-16</sub>	RSRQ <sub>-22</sub>	RSRQ <sub>-22</sub>	RSRQ <sub>-22</sub>
Cell 2 - Lowest reported value	RSRQ <sub>-0</sub>	RSRQ <sub>-0</sub>	RSRQ <sub>-0</sub>	RSRQ <sub>-0</sub>
Cell 2 Highest reported value	RSRQ <sub>-12</sub>	RSRQ <sub>-12</sub>	RSRQ <sub>-12</sub>	RSRQ <sub>-12</sub>
Cell 3 - Lowest reported value	RSRQ <sub>-0</sub>	N/A	N/A	N/A
Cell 3 - Highest reported value	RSRQ <sub>-12</sub>	N/A	N/A	N/A
<b>-300 to &lt; 00C, &gt;400C to +600C</b>				
Cell 1 - Lowest reported value	RSRQ <sub>-0</sub>	RSRQ <sub>-6</sub>	RSRQ <sub>-6</sub>	RSRQ <sub>-6</sub>
Cell 1 - Highest reported value	RSRQ <sub>-19</sub>	RSRQ <sub>-25</sub>	RSRQ <sub>-25</sub>	RSRQ <sub>-25</sub>

Cell 2 - Lowest reported value	RSRQ <sub>0</sub>	RSRQ <sub>0</sub>	RSRQ <sub>0</sub>	RSRQ <sub>0</sub>
Cell 2 Highest reported value	RSRQ <sub>15</sub>	RSRQ <sub>15</sub>	RSRQ <sub>15</sub>	RSRQ <sub>15</sub>
Cell 3 - Lowest reported value	RSRQ <sub>0</sub>	N/A	N/A	N/A
Cell 3 - Highest reported value	RSRQ <sub>15</sub>	N/A	N/A	N/A

### Absolute RSRQ, AWGN with Fading

The mean RSRQ values reported by the UE shall meet the limits in the table below:

	Test 1	Test 2	Test 3	Test 4
<b>00 to +400C</b>				
Cell 1 - Lowest reported value	N/A	RSRQ <sub>9</sub>	RSRQ <sub>9</sub>	RSRQ <sub>9</sub>
Cell 1 - Highest reported value	N/A	RSRQ <sub>22</sub>	RSRQ <sub>22</sub>	RSRQ <sub>22</sub>
Cell 2 - Lowest reported value	N/A	RSRQ <sub>0</sub>	RSRQ <sub>0</sub>	RSRQ <sub>0</sub>
Cell 2 Highest reported value	N/A	RSRQ <sub>12</sub>	RSRQ <sub>12</sub>	RSRQ <sub>12</sub>
Cell 3 - Lowest reported value	N/A	N/A	N/A	N/A
Cell 3 - Highest reported value	N/A	N/A	N/A	N/A
<b>-300 to &lt; 00C, &gt;400C to +600C</b>				
Cell 1 - Lowest reported value	N/A	RSRQ <sub>6</sub>	RSRQ <sub>6</sub>	RSRQ <sub>6</sub>
Cell 1 - Highest reported value	N/A	RSRQ <sub>25</sub>	RSRQ <sub>25</sub>	RSRQ <sub>25</sub>
Cell 2 - Lowest reported value	N/A	RSRQ <sub>0</sub>	RSRQ <sub>0</sub>	RSRQ <sub>0</sub>
Cell 2 Highest reported value	N/A	RSRQ <sub>15</sub>	RSRQ <sub>15</sub>	RSRQ <sub>15</sub>
Cell 3 - Lowest reported value	N/A	N/A	N/A	N/A
Cell 3 - Highest reported value	N/A	N/A	N/A	N/A

The standard deviation of the RSRQ values reported by the UE shall meet the limits in the table



below:				
	Test 1	Test 2	Test 3	Test 4
00 to +400C				
Cell 1 - Lowest reported value	FFS	FFS	FFS	FFS
Cell 1 - Highest reported value	FFS	FFS	FFS	FFS
Cell 2 - Lowest reported value	FFS	FFS	FFS	FFS
Cell 2 Highest reported value	FFS	FFS	FFS	FFS
Cell 3 - Lowest reported value	FFS	N/A	N/A	N/A
Cell 3 - Highest reported value	FFS	N/A	N/A	N/A
-300 to < 00C, >400C to +600C				
Cell 1 - Lowest reported value	FFS	FFS	FFS	FFS
Cell 1 - Highest reported value	FFS	FFS	FFS	FFS
Cell 2 - Lowest reported value	FFS	FFS	FFS	FFS
Cell 2 Highest reported value	FFS	FFS	FFS	FFS
Cell 3 - Lowest reported value	FFS	N/A	N/A	N/A
Cell 3 - Highest reported value	FFS	N/A	N/A	N/A
<p><b>Relative RSRQ, AWGN Only</b></p> <p>For a given measurement report, the RSRQ values reported for Cell 2 and Cell 3 with respect to the RSRQ value reported for Cell 1 shall meet the requirements in the table below where RSRQ<sub>x</sub> is the value reported for Cell 1 in a given measurement report:</p>				
	Test 1	Test 2	Test 3	Test 4
00 to +400C				
Cell 2 - Lowest reported value	RSRQ <sub>x-12</sub>	RSRQ <sub>x-18</sub>	RSRQ <sub>x-18</sub>	RSRQ <sub>x-18</sub>

Cell 2 Highest reported value	RSRQ <sub>x+4</sub>	RSRQ <sub>x-2</sub>	RSRQ <sub>x-2</sub>	RSRQ <sub>x-2</sub>
Cell 3 - Lowest reported value	RSRQ <sub>x-12</sub>	N/A	N/A	N/A
Cell 3 - Highest reported value	RSRQ <sub>x+4</sub>	N/A	N/A	N/A
<b>-300 to &lt; 00C, &gt;400C to +600C</b>				
Cell 2 - Lowest reported value	RSRQ <sub>x-14</sub>	RSRQ <sub>x-20</sub>	RSRQ <sub>x-20</sub>	RSRQ <sub>x-20</sub>
Cell 2 Highest reported value	RSRQ <sub>x+6</sub>	RSRQ <sub>x+0</sub>	RSRQ <sub>x+0</sub>	RSRQ <sub>x+0</sub>
Cell 3 - Lowest reported value	RSRQ <sub>x-14</sub>	N/A	N/A	N/A
Cell 3 - Highest reported value	RSRQ <sub>x+6</sub>	N/A	N/A	N/A
<b>Relative RSRQ, AWGN with Fading</b> The mean of the RSRQ values reported for Cell 2 and Cell 3 with respect to the mean of the RSRQ values reported for Cell 1 shall meet the requirements in the table below where RSRQ <sub>x</sub> is the mean of the values reported for Cell 1:				
	<b>Test 1</b>	<b>Test 2</b>	<b>Test 3</b>	<b>Test 4</b>
<b>00 to +400C</b>				
Cell 2 - Lowest reported value	N/A	RSRQ <sub>x-18</sub>	RSRQ <sub>x-18</sub>	RSRQ <sub>x-18</sub>
Cell 2 Highest reported value	N/A	RSRQ <sub>x-2</sub>	RSRQ <sub>x-2</sub>	RSRQ <sub>x-2</sub>
Cell 3 - Lowest reported value	N/A	N/A	N/A	N/A
Cell 3 - Highest reported value	N/A	N/A	N/A	N/A
<b>-300 to &lt; 00C, &gt;400C to +600C</b>				
Cell 2 - Lowest reported value	N/A	RSRQ <sub>x-20</sub>	RSRQ <sub>x-20</sub>	RSRQ <sub>x-20</sub>
Cell 2 Highest reported value	N/A	RSRQ <sub>x+0</sub>	RSRQ <sub>x+0</sub>	RSRQ <sub>x+0</sub>
Cell 3 - Lowest reported value	N/A	N/A	N/A	N/A
Cell 3 - Highest reported value	N/A	N/A	N/A	N/A

The standard deviation of the RSRQ values reported for Cell 2 and Cell 3 with respect to the standard deviation of the RSRQ values reported for Cell 1 shall meet the requirements in the table below where RSRQ<sub>x</sub> is the standard deviation of the values reported for Cell 1:

	Test 1	Test 2	Test 3	Test 4
<b>00 to +400C</b>				
Cell 2 - Lowest reported value	FFS	FFS	FFS	FFS
Cell 2 Highest reported value	FFS	FFS	FFS	FFS
Cell 3 - Lowest reported value	FFS	N/A	N/A	N/A
Cell 3 - Highest reported value	FFS	N/A	N/A	N/A
<b>-300 to &lt; 00C, &gt;400C to +600C</b>				
Cell 2 - Lowest reported value	FFS	FFS	FFS	FFS
Cell 2 Highest reported value	FFS	FFS	FFS	FFS
Cell 3 - Lowest reported value	FFS	N/A	N/A	N/A
Cell 3 - Highest reported value	FFS	N/A	N/A	N/A

## 2.5 eICIC GCF RRM Conformance Test Cases

VZ\_TC\_LTE\_3GPP Band 13 Supplementary RRM Conformance\_8812

### Definition

In order to comply with Verizon Wireless eICIC requirements, devices shall pass all applicable RRM and RLM test cases listed in

- 3GPP TS 36.521-3: *Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); User Equipment (UE) conformance specification; Part 1: Protocol conformance specification*, Release 12.
- 3GPP TS 37.571-1: *Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); User Equipment (UE) conformance specification for UE positioning; Part 1: conformance test specification*, Release 12.

### Traceability:

- "Verizon Wireless LTE 3GPP Band 13 Network Access Device Requirements,"
- 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification*, Release 11
- 3GPP TS 36.214: *Evolved Universal Terrestrial Radio Access (E-UTRA); Physical Layer; Measurements*, Release 11
- 3GPP TS 36.523-1: *Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); User Equipment (UE) conformance specification; Part 1: Protocol conformance specification*, Release 12.
- 3GPP TS 37.571-1: *Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); User Equipment (UE) conformance specification for UE positioning; Part 1: conformance test specification*, Release 12.

### Applicability:

This test applies to all devices that are designed to support the Verizon Wireless LTE 3GPP Band 13 network.

Design Steps
Step Name
Step 1
Pre-Conditions
Procedures
All test steps in the following list of 3GPP test specification shall be followed:
<ul style="list-style-type: none"> <li>• 36.521-3</li> </ul>

<ul style="list-style-type: none"> <li>Measurement accuracy <ul style="list-style-type: none"> <li>9.1.8 for RSRP (Non-MBSFN ABS), H2.7</li> <li>9.1.10 for RSRP (MBSFN ABS)</li> <li>9.2.7.1 for RSRQ (Non-MBSFN ABS), 36.214 (all OFDM symbols)</li> <li>9.2.9.1 for RSRQ (MBSFN ABS), 36.214 (all OFDM symbols)</li> </ul> </li> <li>Cell identification <ul style="list-style-type: none"> <li>8.1.7 (eICIC)</li> </ul> </li> <li>RLM <ul style="list-style-type: none"> <li>7.3.9, 7.3.11, 7.3.13, 7.3.15, 7.3.20 (in sync, out of sync)</li> </ul> </li> </ul>
<ul style="list-style-type: none"> <li>37.571-1 Rx-Tx difference <ul style="list-style-type: none"> <li>8.1.5</li> </ul> </li> </ul>
Expected Results
As stated in 36.521-3 and 37.571-1 test cases above.

## 2.7 eICIC UE Resets measSubframePcell at RRC Connection Re-establish

Supplementary RRM Conformance\_8814

VZ\_TC\_LTE Band 13

### Definition:

This procedure is to test the compliance of UE reset of measSubframePcell after RRC Connection Re-establish support to the VzW requirements. Note this test verifies UE measurement of serving/pico cell as well as macro cell neighbor. Note: A2 is not a good way for regular HO trigger, it is used here to trigger re-establish only.

### Traceability:

1. "Verizon Wireless LTE 3GPP Band 13 Network Access Requirements"
2. 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification*, Release 11, section 5.3.7.2

### Applicability:

This test applies to all devices that are designed to operate in the Verizon Wireless LTE 3GPP Band 13 network.

Design Steps
Step Name
Step 1
Pre-Conditions
<p><b>System Simulator:</b></p> <ul style="list-style-type: none"> <li>- cell 1 (belongs to TAI-1, home PLMN) transmit power is set according to Tx condition below. Cell 1 is a pico cell.</li> <li>- cell 2 (belongs to TAI-2, home PLMN) transmit power is set to according to Tx condition below, Cell 2 is an aggressor cell and contains ABS pattern.</li> <li>- cell 3 (belongs to TAI-3, home PLMN) transmit power is set to according to Tx condition below, Cell 3 is another pico cell.</li> </ul> <p>- Use OCNG to generate the resource restriction pattern for the Pcell measurement on serving sector. This is used to introduce noise in dirty" subframe as per signaled Pcell pattern measSubframePatternPCell IE included in RadioResourceConfigDedicated in RRC Connection Reconfiguration message. For example:</p> <ul style="list-style-type: none"> <li>• When ABS pattern is enforced, OCNG shall be configured such that it generates the noise level = -85 dBm per</li> </ul>

Resource element in serving RS symbol position. In clean subframes, only the subcarriers occupied by the reference Signal shall transmit at -85dBm (2 per antenna). In dirty subframes, all subcarriers within a PRB shall transmit at -85dBm power.

- When ABS pattern is not enforced, OCNG shall be configured such that it generates the noise level = -85dBm in all subcarrier of a PRB.

The power levels of the simulator shall be set based on the settings of this test case to replace what is defined in section 6.2.2 of TS 36.508.

Use RSRQ for A2 threshold instead of RSRP defined in Table 4.6.6-5 of TS 36.508 (in ReportConfigEUTRA-A2):

- triggerQuantity = rsrq
- a2-threshold = value defined in this document

## Procedures

The network simulator is configured for signal conformance testing as described in Section *Test Equipment Configuration* with the exception cited in section 5.2A.5 in 36.508 for feICIC and powered on. The device (UE) under test is then connected to the network simulator. After the UE is powered on, acquired and synchronized to the network and already has an internet PDN connection established, UE is in RRC connected mode according to T<sub>0</sub> condition in table below. The following procedures should be followed.

UE is on a Pico cell, provides measurement for another Pico cell

Step	Procedure	Message Sequence	Verdict
		U - S Message	
1	<p>The TE simulator transmits an <i>RRCCONNECTIONRECONFIGURATION</i> message with serving cell measurement restriction pattern (<i>measSubframePatternPCell</i>) on Cell 1 to setup intra frequency measurement. The pattern is what Cell2 uses as in table below for T<sub>1</sub>.</p> <p>The TE simulator applies OCNG signal</p>	β <i>RRCCONNECTIONRECONFIGURATION</i>	N/A

	<p>according to PCell measurement restriction pattern (on behalf of Cell 2).</p> <p>The TE simulator sets up A2 threshold in Cell 1 for RSRQ to -3db in the associated <i>measObjectEUTRA</i> IE.</p> <p>The TE simulator changes Cell 1, Cell 2 and Cell 3 parameters according to the row "T 1" in table below.</p>			
2	<p>The UE transmits an <i>RRCConnectionReconfigurationComplete</i> message on Cell 1 to confirm the setup of intra frequency measurement.</p>	à	<i>RRCConnectionReconfigurationComplete</i>	N/A
3	<p>Check: Does the UE transmit a <i>MeasurementReport</i> message on Cell 1 to report event A2 with the measured <b>RSRQ</b> values for Cell 1, 2 and 3? (RSRP is not used since RSRP is not impacted by ABS pattern)</p>	à	<i>MeasurementReport</i>	N/A
4	<p>Check: Does the UE transmit serving RSRQ measurements in serving cell measurement restriction pattern?</p>	-	-	<p>Pass if the message is sent and serving cell (PCell, Cell 1) RSRQ = -11.5dB (+/- 2dB)</p> <p>Accuracy in 36.133 9.1.5.2 allows +/- 2.5dB</p>
5	<p>The TE simulator transmits an</p>	<	<i>RRCConnectionReconfiguration</i>	N/A



	<i>RRCCONNECTIONReconfiguration</i> message on Cell 1 to order the UE to perform intra frequency handover to Cell 2.	--		
6	The TE simulator changes Cell 1, Cell 2 and Cell 3 parameters according to the row "T2" in table below.	- -		-
7	The UE releases the configured <i>measSubframePatternPcell</i> , and transmits an <i>RRCCONNECTIONReestablishmentRequest</i> message on Cell 3.	-- >	<i>RRCCONNECTIONReestablishmentRequest</i>	N/A
8	The TE simulator transmits an <i>RRCCONNECTIONReestablishment</i> message to resume SRB1 operation and re-activate security on Cell 3.	< --	<i>RRCCONNECTIONReestablishment</i>	N/A
9	The UE transmits an <i>RRCCONNECTIONReestablishmentComplete</i> message on Cell 3.	-- >	<i>RRCCONNECTIONReestablishmentComplete</i>	N/A
10	<p>The TE simulator transmits an <i>RRCCONNECTIONReconfiguration</i> message to re-establish radio bearer on Cell 3.</p> <p>The TE simulator changes Cell 1, cell 2 and Cell 3 parameters according to the row "T3" in table below.</p> <p>The TE simulator transmits an <i>RRCCONNECTIONReconfiguration</i> message with serving cell measurement restriction pattern (<i>measSubframePatternPCell</i>) on Cell 3 to setup intra frequency measurement.</p> <p>The TE simulator applies OCNG signal according to PCell measurement restriction pattern (on behalf of Cell 1).</p> <p>The TE simulator sets up A2 threshold for</p>	< --	<i>RRCCONNECTIONReconfiguration</i>	N/A

	RSRQ to -3db in the associated <i>measObjectEUTRA</i> IE.			
11	The UE transmits an <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> message on Cell 3.	-- >	<i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i>	N/A
12	Check: Does the UE transmit a <i>MEASUREMENTREPORT</i> message on Cell 3 to report event A2 with the measured RSRQ values for Cell 2 and the serving cell (Cell 3)?	à	<i>MEASUREMENTREPORT</i>	N/A
13	Check: Does the UE transmit RSRP and RSRQ measurements for serving cell that represents new measurement restriction pattern?	-	-	Pass if the message is sent and RSRQ = - 12.83 dB (+/- 2dB)  In this case, if UE switches ABS pattern properly after re- establishm ent, it should measure the correct RSRQ at the right ABS subframes.
14	Configure the TE simulator to release the RRC connection	β	<i>RRCCONNECTIONRELEASE</i>	N/A

	Parameter	Unit	Cell 1	Cell 2	Cell 3	Remark
T <sub>0</sub>	Cell-specific RS EPRE	dBm/15kHz	-91	"Off"	"Off"	This is to make sure UE is connected to Cell 1 (serving cell) via system selection (no IC, no offset applied)
T <sub>1</sub>	Cell-specific RS EPRE	dBm/15kHz	-91	-85 w/ ABS (for Cell 1) 100000001000000010000000100000 0010000000	"Off"	This is to make sure that UE can measure Cell 1 quality in ABS subframe vs non-ABS subframe
T <sub>2</sub>	Cell-specific RS EPRE	dBm/15kHz	"off"	"Off"	-87	This is to make sure that UE fails the handover, re-establish on a different cell (cell 3) via regular idle mode system re-selection.  The criteria for re-establish is "suitable cell", so Cell 1 is turned off to guarantee UE re-establish on Cell 3.
T <sub>3</sub>	Cell-specific RS EPRE	dBm/15kHz	"off"	-80 w/ ABS (for cell 3) 001100000011000000110000001100 0000110000	-91	This is to make sure that UE resets its measSubframePatternPCell after re-establishment

#### Expected Results

UE shall meet the verdicts in the Table above.



## 2.12 Intra-Frequency RSRP and RSRQ Accuracy Test while CRS-AssistanceInfoList-r11 is Present

VZ\_TC\_LTE\_3GPP Band 13 Supplementary RRM Test Plan\_9501

### Definition

This procedure is to verify that cell throughput does NOT suffer from CRS IC.

### Traceability:

- Verizon Wireless LTE 3GPP Band 13 Network Access Requirements
- 3GPP TS 36.521-3: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) conformance specification; Radio transmission and reception; Part 3: Radio Resource Management conformance testing*

### Applicability:

This test applies to all devices that are designed to operate in the Verizon Wireless LTE 3GPP Band 13 network.

Design Steps				
Step Name				
Step 1				
Pre-Conditions				
The test configuration shall be identical to test configuration in section 2.1 and 2.3 of Verizon Wireless LTE 3GPP Band 13 Supplementary RRM Test Plan.				
Procedures				
The network simulator is configured for signal conformance testing as described in Section <i>Test Equipment Configuration</i> and powered on. The device (UE) under test is then connected to the network simulator. After the UE is powered on, acquired and synchronized to the network, the following procedures should be either initiated by the UE or performed in response to messages received by the UE.				
Step	Procedure	Message Sequence		Verdict
		U-S	Message	
1	UE performs the Initial Attach procedure to the LTE network.	-	-	N/A
2	Configure the network simulator to send the Capability Inquiry message to the UE	<=	Capability Inquiry	N/A
2a	UE respond to the enquiry by sending the UE Capability Information message to eNB	=>	UE Capability Information	N/A
2b	The featureGroupIndRel10-r10 field in the UE-EUTRA-Capability-v1020 IE indicate the feature group 115 supported by the UE			N/A
3	The crs-InterfHandl-r11 field in phyLayerParameters-v1130 IE supported by the UE and set to "supported".			N/A
4	The TE simulator sends RRCConnectionReconfiguration message with RadioResourceConfigDedicated with CRS-AssistanceInfoList-r11 for the 2 neighbors (fake neighbors, these cells are not radiating) that contains:	<=	RRCConnectionReconfiguration	N/A

	<ul style="list-style-type: none"><li>• 2 antenna ports per PCIs and</li><li>• The respective physical cell id of the neighboring cells</li><li>• No MBSFN configuration</li></ul>			
5	Run Test 2.1 in this document			Pass if the absolute and relative RSRP measurement meets the criteria defined in the reference test case
6	Run Test 2.3 in this document			Pass if the absolute and relative RSRP measurement meets the criteria defined in the reference test case
7	Power off the UE			
Expected Results				
UE shall meet the verdicts in the Table above.				

## Requirement Coverage For Test Plan

### 2.1 RSRP INTRA-FREQUENCY ACCURACY IN RRC\_CONNECTED MODE

VZ\_TC\_3GPPB13SUPRRM\_431

Requirement Name	Requirement Plan Id	Created By	Created Date
DNS SERVER PER PDN	LTEB13NAC	Admin User	11-07-0013 14:27:19
RSRP ABSOLUTE ACCURACY	LTEB13NAC	Admin User	11-07-0013 14:28:17
RSRP RELATIVE ACCURACY	LTEB13NAC	Admin User	11-07-0013 14:28:19
Uplink Traffic Shaping	LTEB13NAC	Admin User	12-06-0013 18:17:13

### 2.2 RSRP INTRA-FREQUENCY ACCURACY IN RRC\_IDLE MODE

VZ\_TC\_3GPPB13SUPRRM\_432

Requirement Name	Requirement Plan Id	Created By	Created Date
DNS SERVER PER PDN	LTEB13NAC	Admin User	11-07-0013 14:27:19
RSRP ABSOLUTE ACCURACY	LTEB13NAC	Admin User	11-07-0013 14:28:17

RSRP RELATIVE ACCURACY	LTEB13NAC	Admin User	11-07-0013 14:28:19
Uplink Traffic Shaping	LTEB13NAC	Admin User	12-06-0013 18:17:13

2.3 RSRQ INTRA-FREQUENCY ACCURACY IN RRC\_CONNECTED MODE  
VZ\_TC\_3GPPB13SUPRRM\_433

Requirement Name	Requirement Plan Id	Created By	Created Date
DNS SERVER PER PDN	LTEB13NAC	Admin User	11-07-0013 14:27:19
RSRQ ABSOLUTE ACCURACY	LTEB13NAC	Admin User	11-07-0013 14:28:20
RSRQ RELATIVE ACCURACY	LTEB13NAC	Admin User	11-07-0013 14:28:22
Uplink Traffic Shaping	LTEB13NAC	Admin User	12-06-0013 18:17:13



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#### 2.4 RSRQ INTRA-FREQUENCY ACCURACY IN RRC\_IDLE MODE

VZ\_TC\_3GPPB13SUPRRM\_434

Requirement Name	Requirement Plan Id	Created By	Created Date
DNS SERVER PER PDN	LTEB13NAC	Admin User	11-07-0013 14:27:19
RSRQ ABSOLUTE ACCURACY	LTEB13NAC	Admin User	11-07-0013 14:28:20
RSRQ RELATIVE ACCURACY	LTEB13NAC	Admin User	11-07-0013 14:28:22
Uplink Traffic Shaping	LTEB13NAC	Admin User	12-06-0013 18:17:13

#### 2.5 eICIC GCF RRM Conformance Test Cases VZ\_TC\_LTE 3GPP Band13 Supplementary RRM Conformance\_8812

Requirement Name	Requirement Plan Id	Created By	Created Date
Req-1	LTEB13NAC	Admin User	09-12-0014 15:16:38
Req-2	LTEB13NAC	Admin User	09-12-0014 15:12:21
Req-2	LTEB13NAC	Admin User	09-12-0014 15:18:08
Req-3	LTEB13NAC	Admin User	09-12-0014 14:51:03

Req-3	LTEB13NAC	Admin User	09-12-0014 15:19:08
Req-4	LTEB13NAC	Admin User	09-12-0014 14:52:50
Req-4	LTEB13NAC	Admin User	09-12-0014 15:20:13
Req-5	LTEB13NAC	Admin User	09-12-0014 14:55:30

2.7 eICIC UE Resets measSubframePcell at RRC Connection Re-establish VZ\_TC\_LTE Band 13  
Supplementary RRM Conformance\_8814

Requirement Name	Requirement Plan Id	Created By	Created Date
Req-3	LTEB13NAC	Admin User	09-12-0014 14:51:03
Req-4	LTEB13NAC	Admin User	09-12-0014 14:52:50
Req-5	LTEB13NAC	Admin User	09-12-0014 14:55:30

2.12 Intra-Frequency RSRP and RSRQ Accuracy Test while CRS-AssistanceInfoList-r11 is Present  
VZ\_TC\_LTE 3GPP Band13 Supplementary RRM Test Plan\_9501

Requirement Name	Requirement Plan Id	Created By	Created Date
CRS IC WITHOUT ABS	LTEB13NAC	Admin User	12-19-0014 15:35:02



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