



## Appendix D. Combined PD Verification for 2nd Generation of Qualcomm Smart Transmit

### 1. n261

#### Verification Criteria 1 (PD per beam):

In the case of UE employing 2nd generation of Qualcomm Smart Transmit, measured PD results should meet

$$\text{Measured PD} \leq (b_j \cdot \text{PD\_design\_target} + \text{total uncertainty of QTM})$$

where PD\_design\_target is as shown in Part 0 report; 'b<sub>j</sub>' is the backoff value for QTM 'j' printed in "Qualcomm MG script", as shown in below table:

<b>PD_design_target (W/m2):</b>		4.75	
<b>Total uncertainty (dB):</b>		2	
<b>Module</b>	<b>Printed backoff value b<sub>j</sub> (linear)</b>	<b>b<sub>j</sub>*PD_design_target + total uncertainty (W/m2)</b>	<b>Highest measured PD per QTM out of all the beams and bands(W/m2)</b>
QTM 0	0.9772	7.36	3.98
QTM 1	0.9772	7.36	3.9

#### Verification Criteria 2 (combined PD):

Additionally, based on the measured PD data, beams having the highest measured PD per QTM should be identified first, and then combined PD for these identified PD beams should be evaluated at each QTM's dominant surface and should meet below criteria:

combined PD at QTM<sub>j</sub> location = {c(p,j) \* meas.PD.beamp + c(q,j) \* meas.PD.beamq} ≤ (PD\_design\_target + total uncertainty) where, meas.PD.beami = measured 4cm<sup>2</sup> PD for beam i, i = p, q c(i,j) = contribution factor from beami to QTM<sub>j</sub>, i = p, q and j = 0, 1

Beam p = beam having the highest measured PD among all beams tested for QTM0

Beam q = beam having the highest measured PD among all beams tested for QTM1

The evaluation procedures are:

1. Identify beams per QTM having highest measured PD and their corresponding worst surface listed below:

Module	Identified Beam/beam-pair ID	Measured PD (W/m2)	Dominant surface
QTM 0	39	3.98	Left Side
QTM 1	36	3.9	Right Side

Enter the above beam ID and dominant surfaces in "Qualcomm MG script" to obtain the below contribution factors provided by manufacture:

Beam ID	Contribution Factor	
	Left Side	Right side
39	1	0.0024
36	0.0021	1

Combined PD at dominant surfaces of all QTMs and show that combined PD ≤ 7.5 W/m<sup>2</sup> (=PD\_design\_target + 2.0dB total uncertainty)

Combined PD	
<b>PD_design_target(W/m<sup>2</sup>)</b>	4.75
<b>Total uncertainty</b>	2dB
<b>Location</b>	<b>Combined PD (W/m<sup>2</sup>)</b>
QTM 0/ Left	=1*3.98+0.0024*3.9=3.99
QTM 1/ Right	=0.0021*3.98+1*3.9=3.91



**2. n260**

**Verification Criteria 1 (PD per beam):**

In the case of UE employing 2nd generation of Qualcomm Smart Transmit, measured PD results should meet

$$\text{Measured PD} \leq (b_j * \text{PD\_design\_target} + \text{total uncertainty of QTM})$$

where PD\_design\_target is as shown in Part 0 report; 'bj' is the backoff value for QTM 'j' printed in "Qualcomm MG script", as shown in below table:

<b>PD_design_target (W/m2):</b>		4.75	
<b>Total uncertainty (dB):</b>		2	
<b>Module</b>	<b>Printed backoff value bj (linear)</b>	<b>bj*PD_design_target + total uncertainty (W/m2)</b>	<b>Highest measured PD per QTM out of all the beams and bands(W/m2)</b>
QTM 0	0.977	7.31	3.45
QTM 1	0.977	7.31	4.03

**Verification Criteria 2 (combined PD):**

Additionally, based on the measured PD data, beams having the highest measured PD per QTM should be identified first, and then combined PD for these identified PD beams should be evaluated at each QTM's dominant surface and should meet below criteria:

$$\text{combined PD at QTMj location} = \{c(p,j) * \text{meas.PD.beam p} + c(q,j) * \text{meas.PD.beam q}\} \leq (\text{PD\_design\_target} + \text{total uncertainty})$$

where, meas.PD.beami = measured 4cm2 PD for beam i, i = p, q c(i,j) = contribution factor from beami to QTMj, i = p, q and j = 0, 1

Beam p = beam having the highest measured PD among all beams tested for QTM0

Beam q = beam having the highest measured PD among all beams tested for QTM1

The evaluation procedures are:

1. Identify beams per QTM having highest measured PD and their corresponding worst surface listed below:

Module	Identified Beam/beam-pair ID	Measured PD (W/m2)	Dominant surface
QTM 0	31	3.45	Left Side
QTM 1	36	4.03	Right Side

Enter the above beam ID and dominant surfaces in "Qualcomm MG script" to obtain the below contribution factors provided by manufacture:

Beam ID	Contribution Factor	
	Left Side	Right side
31	1	0.0025
36	0.0023	1

Combined PD at dominant surfaces of all QTMs and show that combined PD ≤ 7.5 W/m2 (=PD\_design\_target + 2.0dB total uncertainty)

Combined PD	
<b>PD_design_target(W/m^2)</b>	4.75
<b>Total uncertainty</b>	2dB
<b>Location</b>	<b>Combined PD (W/m^2)</b>
QTM 0/ Left	=1*3.45+0.0025*4.03=3.46
QTM 1/ Right	=0.0021*3.45+1*4.03=4.04