

**WCDMA Band 2**

WCDMA  Band 2 REL99	<b>UL Verification Services, Inc.</b> <b>High Frequency Substitution Measurement</b>																																																																																										
	Company: Samsung Project #: 4788869688 Date: 2019-04-16 Test Engineer: 45585 Configuration: EUT / X-Position Location: Chamber 2 Mode: Rel99 Band 2 Fundamentals  <u>Test Equipment:</u> Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables Substitution: Horn 3115[00167451], 8.5m SMA-type Cable																																																																																										
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**LTE Band 2**

LTE Band 2 20MHz QPSK	<b>UL Verification Services, Inc.</b> <b>High Frequency Substitution Measurement</b>								
	Company: Samsung Project #: 4788869685 Date: 2019-01-28 Test Engineer: 47989 Configuration: EUT / X-Position Location: Chamber 1 Mode: LTE_QPSK Band 2 Fundamentals, 20MHz Bandwidth								
	<b>Test Equipment:</b> Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables Substitution: Horn 3115[00167211], 2.5m SMA-type Cable								
	f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
	Low Ch								
	1860.00	13.71	V	4.5	9.4	18.65	33.0	-14.4	
	1860.00	16.81	H	4.5	9.4	21.74	33.0	-11.3	
	Mid Ch								
	1880.00	14.61	V	4.5	9.3	19.39	33.0	-13.6	
	1880.00	18.19	H	4.5	9.3	22.96	33.0	-10.0	
High Ch									
1900.00	13.02	V	4.6	9.2	17.63	33.0	-15.4		
1900.00	17.88	H	4.6	9.2	22.50	33.0	-10.5		
LTE Band 2 20MHz 16QAM	<b>UL Verification Services, Inc.</b> <b>High Frequency Substitution Measurement</b>								
	Company: Samsung Project #: 4788869685 Date: 2019-01-28 Test Engineer: 47989 Configuration: EUT / X-Position Location: Chamber 1 Mode: LTE_16QAM Band 2 Fundamentals, 20MHz Bandwidth								
	<b>Test Equipment:</b> Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables Substitution: Horn 3115[00167211], 2.5m SMA-type Cable								
	f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
	Low Ch								
	1860.00	11.48	V	4.5	9.4	16.42	33.0	-16.6	
	1860.00	15.13	H	4.5	9.4	20.06	33.0	-12.9	
	Mid Ch								
	1880.00	7.22	V	4.5	9.3	12.00	33.0	-21.0	
	1880.00	17.81	H	4.5	9.3	22.58	33.0	-10.4	
High Ch									
1900.00	11.93	V	4.6	9.2	16.54	33.0	-16.5		
1900.00	17.06	H	4.6	9.2	21.68	33.0	-11.3		

LTE Band 2 15MHz QPSK	<b>UL Verification Services, Inc.</b> <b>High Frequency Substitution Measurement</b>								
	Company: Samsung Project #: 4788869685 Date: 2019-01-28 Test Engineer: 47989 Configuration: EUT / X-Position Location: Chamber 1 Mode: LTE_QPSK Band 2 Fundamentals, 15MHz Bandwidth								
	<b>Test Equipment</b> Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables Substitution: Horn 3115[00167211], 2.5m SMA-type Cable								
	f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
	Low Ch								
	1857.50	8.93	V	4.5	9.5	13.88	33.0	-19.1	
	1857.50	15.54	H	4.5	9.5	20.49	33.0	-12.5	
	Mid Ch								
	1880.00	14.44	V	4.5	9.3	19.22	33.0	-13.8	
	1880.00	18.54	H	4.5	9.3	23.31	33.0	-9.7	
High Ch									
1902.50	12.49	V	4.6	9.1	17.08	33.0	-15.9		
1902.50	18.02	H	4.6	9.1	22.60	33.0	-10.4		
LTE Band 2 15MHz 16QAM	<b>UL Verification Services, Inc.</b> <b>High Frequency Substitution Measurement</b>								
	Company: Samsung Project #: 4788869685 Date: 2019-01-28 Test Engineer: 47989 Configuration: EUT / X-Position Location: Chamber 1 Mode: LTE_16QAM Band 2 Fundamentals, 15MHz Bandwidth								
	<b>Test Equipment</b> Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables Substitution: Horn 3115[00167211], 2.5m SMA-type Cable								
	f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
	Low Ch								
	1857.50	9.61	V	4.5	9.5	14.56	33.0	-18.4	
	1857.50	15.05	H	4.5	9.5	20.00	33.0	-13.0	
	Mid Ch								
	1880.00	13.59	V	4.5	9.3	18.37	33.0	-14.6	
	1880.00	17.42	H	4.5	9.3	22.19	33.0	-10.8	
High Ch									
1902.50	11.54	V	4.6	9.1	16.13	33.0	-16.9		
1902.50	16.93	H	4.6	9.1	21.51	33.0	-11.5		

LTE Band 2 10MHz QPSK	<b>UL Verification Services, Inc.</b> <b>High Frequency Substitution Measurement</b>								
	Company: Samsung Project #: 4788869685 Date: 2019-01-28 Test Engineer: 47989 Configuration: EUT / X-Position Location: Chamber 1 Mode: LTE_QPSK Band 2 Fundamentals, 10MHz Bandwidth								
	<b>Test Equipment</b> Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables Substitution: Horn 3115[00167211], 2.5m SMA-type Cable								
	f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
	Low Ch								
	1855.00	9.20	V	4.5	9.5	14.17	33.0	-18.8	
	1855.00	15.61	H	4.5	9.5	20.58	33.0	-12.4	
	Mid Ch								
	1880.00	12.90	V	4.5	9.3	17.68	33.0	-15.3	
	1880.00	17.59	H	4.5	9.3	22.36	33.0	-10.6	
High Ch									
1905.00	13.27	V	4.6	9.1	17.82	33.0	-15.2		
1905.00	18.24	H	4.6	9.1	22.79	33.0	-10.2		
LTE Band 2 10MHz 16QAM	<b>UL Verification Services, Inc.</b> <b>High Frequency Substitution Measurement</b>								
	Company: Samsung Project #: 4788869685 Date: 2019-01-28 Test Engineer: 47989 Configuration: EUT / X-Position Location: Chamber 1 Mode: LTE_16QAM Band 2 Fundamentals, 10MHz Bandwidth								
	<b>Test Equipment</b> Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables Substitution: Horn 3115[00167211], 2.5m SMA-type Cable								
	f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
	Low Ch								
	1855.00	8.46	V	4.5	9.5	13.43	33.0	-19.6	
	1855.00	14.69	H	4.5	9.5	19.66	33.0	-13.3	
	Mid Ch								
	1880.00	12.10	V	4.5	9.3	16.88	33.0	-16.1	
	1880.00	16.59	H	4.5	9.3	21.36	33.0	-11.6	
High Ch									
1905.00	12.39	V	4.6	9.1	16.94	33.0	-16.1		
1905.00	17.16	H	4.6	9.1	21.71	33.0	-11.3		

LTE Band 2 5MHz QPSK	<b>UL Verification Services, Inc.</b> <b>High Frequency Substitution Measurement</b>																																																																																										
	Company: Samsung Project #: 4788869685 Date: 2019-01-29 Test Engineer: 47989 Configuration: EUT / X-Position Location: Chamber 1 Mode: LTE_QPSK Band 2 Fundamentals, 5MHz Bandwidth																																																																																										
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LTE Band 2 3MHz QPSK	<b>UL Verification Services, Inc.</b> <b>High Frequency Substitution Measurement</b>								
	Company: Samsung Project #: 4788869685 Date: 2019-01-29 Test Engineer: 47989 Configuration: EUT / X-Position Location: Chamber 1 Mode: LTE_QPSK Band 2 Fundamentals, 3MHz Bandwidth								
	<b>Test Equipment</b> Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables Substitution: Horn 3115[00167211], 2.5m SMA-type Cable								
	f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
	Low Ch								
	1851.50	10.09	V	4.5	9.5	15.10	33.0	-17.9	
	1851.50	16.35	H	4.5	9.5	21.35	33.0	-11.6	
	Mid Ch								
	1880.00	16.31	V	4.5	9.3	21.09	33.0	-11.9	
	1880.00	18.84	H	4.5	9.3	23.61	33.0	-9.4	
High Ch									
1908.50	14.37	V	4.6	9.1	18.88	33.0	-14.1		
1908.50	18.83	H	4.6	9.1	23.33	33.0	-9.7		
LTE Band 2 3MHz 16QAM	<b>UL Verification Services, Inc.</b> <b>High Frequency Substitution Measurement</b>								
	Company: Samsung Project #: 4788869685 Date: 2019-01-29 Test Engineer: 47989 Configuration: EUT / X-Position Location: Chamber 1 Mode: LTE_16QAM Band 2 Fundamentals, 3MHz Bandwidth								
	<b>Test Equipment</b> Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables Substitution: Horn 3115[00167211], 2.5m SMA-type Cable								
	f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
	Low Ch								
	1851.50	9.74	V	4.5	9.5	14.75	33.0	-18.3	
	1851.50	15.36	H	4.5	9.5	20.36	33.0	-12.6	
	Mid Ch								
	1880.00	15.26	V	4.5	9.3	20.04	33.0	-13.0	
	1880.00	17.81	H	4.5	9.3	22.58	33.0	-10.4	
High Ch									
1908.50	11.41	V	4.6	9.1	15.92	33.0	-17.1		
1908.50	16.20	H	4.6	9.1	20.70	33.0	-12.3		

LTE Band 2 1.4MHz QPSK	<b>UL Verification Services, Inc.</b> <b>High Frequency Substitution Measurement</b>								
	Company: Samsung Project #: 4788869685 Date: 2019-01-29 Test Engineer: 47989 Configuration: EUT / X-Position Location: Chamber 1 Mode: LTE_QPSK Band 2 Fundamentals, 1.4MHz Bandwidth								
	<b>Test Equipment</b> Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables Substitution: Horn 3115[00167211], 2.5m SMA-type Cable								
	f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
	Low Ch								
	1850.70	10.63	V	4.5	9.5	15.64	33.0	-17.4	
	1850.70	16.02	H	4.5	9.5	21.03	33.0	-12.0	
	Mid Ch								
	1880.00	16.09	V	4.5	9.3	20.87	33.0	-12.1	
	1880.00	18.78	H	4.5	9.3	23.55	33.0	-9.4	
High Ch									
1909.30	14.70	V	4.6	9.1	19.19	33.0	-13.8		
1909.30	18.02	H	4.6	9.1	22.51	33.0	-10.5		
LTE Band 2 1.4MHz 16QAM	<b>UL Verification Services, Inc.</b> <b>High Frequency Substitution Measurement</b>								
	Company: Samsung Project #: 4788869685 Date: 2019-01-29 Test Engineer: 47989 Configuration: EUT / X-Position Location: Chamber 1 Mode: LTE_16QAM Band 2 Fundamentals, 1.4MHz Bandwidth								
	<b>Test Equipment</b> Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables Substitution: Horn 3115[00167211], 2.5m SMA-type Cable								
	f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
	Low Ch								
	1850.70	9.91	V	4.5	9.5	14.92	33.0	-18.1	
	1850.70	14.99	H	4.5	9.5	20.00	33.0	-13.0	
	Mid Ch								
	1880.00	15.01	V	4.5	9.3	19.79	33.0	-13.2	
	1880.00	17.80	H	4.5	9.3	22.57	33.0	-10.4	
High Ch									
1909.30	13.88	V	4.6	9.1	18.37	33.0	-14.6		
1909.30	17.24	H	4.6	9.1	21.73	33.0	-11.3		

**LTE Band 5**

LTE Band 5 10MHz QPSK	<p style="text-align: center;"><b>UL Verification Services, Inc.</b>  <b>High Frequency Substitution Measurement</b></p> <p>Company: Samsung                  Project #: 4788869685                  Date: 2019-02-01                  Test Engineer: 47989                  Configuration: EUT / X-Position                  Location: Chamber 1                  Mode: LTE_QPSK Band 5 Fundamentals, 10MHz Bandwidth</p> <p><u>Test Equipment:</u>                  Receiving: VULB9163-750, and Chamber 1 SMA Cables                  Substitution: Dipole 3121_DB4, 2.5m SMA-type Cable</p> <table border="1"> <thead> <tr> <th>f MHz</th> <th>SG reading (dBm)</th> <th>Ant. Pol. (H/V)</th> <th>Cable Loss (dB)</th> <th>Antenna Gain (dBd)</th> <th>ERP (dBm)</th> <th>Limit (dBm)</th> <th>Delta (dB)</th> <th>Notes</th> </tr> </thead> <tbody> <tr> <td colspan="9">Low Ch</td> </tr> <tr> <td>829.00</td> <td>17.29</td> <td>V</td> <td>3.0</td> <td>-1.5</td> <td>12.81</td> <td>38.5</td> <td>-25.7</td> <td></td> </tr> <tr> <td>829.00</td> <td>24.00</td> <td>H</td> <td>3.0</td> <td>-1.5</td> <td>19.52</td> <td>38.5</td> <td>-19.0</td> <td></td> </tr> <tr> <td colspan="9">Mid Ch</td> </tr> <tr> <td>836.50</td> <td>14.78</td> <td>V</td> <td>3.0</td> <td>-1.4</td> <td>10.32</td> <td>38.5</td> <td>-28.2</td> <td></td> </tr> <tr> <td>836.50</td> <td>22.57</td> <td>H</td> <td>3.0</td> <td>-1.4</td> <td>18.11</td> <td>38.5</td> <td>-20.4</td> <td></td> </tr> <tr> <td colspan="9">High Ch</td> </tr> <tr> <td>844.00</td> <td>13.85</td> <td>V</td> <td>3.1</td> <td>-1.4</td> <td>9.40</td> <td>38.5</td> <td>-29.1</td> <td></td> </tr> <tr> <td>844.00</td> <td>22.62</td> <td>H</td> <td>3.1</td> <td>-1.4</td> <td>18.17</td> <td>38.5</td> <td>-20.3</td> <td></td> </tr> </tbody> </table>									f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes	Low Ch									829.00	17.29	V	3.0	-1.5	12.81	38.5	-25.7		829.00	24.00	H	3.0	-1.5	19.52	38.5	-19.0		Mid Ch									836.50	14.78	V	3.0	-1.4	10.32	38.5	-28.2		836.50	22.57	H	3.0	-1.4	18.11	38.5	-20.4		High Ch									844.00	13.85	V	3.1	-1.4	9.40	38.5	-29.1		844.00	22.62	H	3.1	-1.4	18.17	38.5	-20.3	
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LTE Band 5 10MHz 16QAM	<p style="text-align: center;"><b>UL Verification Services, Inc.</b>  <b>High Frequency Substitution Measurement</b></p> <p>Company: Samsung                  Project #: 4788869685                  Date: 2019-02-01                  Test Engineer: 47989                  Configuration: EUT / X-Position                  Location: Chamber 1                  Mode: LTE_16QAM Band 5 Fundamentals, 10MHz Bandwidth</p> <p><u>Test Equipment:</u>                  Receiving: VULB9163-750, and Chamber 1 SMA Cables                  Substitution: Dipole 3121_DB4, 2.5m SMA-type Cable</p> <table border="1"> <thead> <tr> <th>f MHz</th> <th>SG reading (dBm)</th> <th>Ant. Pol. (H/V)</th> <th>Cable Loss (dB)</th> <th>Antenna Gain (dBd)</th> <th>ERP (dBm)</th> <th>Limit (dBm)</th> <th>Delta (dB)</th> <th>Notes</th> </tr> </thead> <tbody> <tr> <td colspan="9">Low Ch</td> </tr> <tr> <td>829.00</td> <td>15.86</td> <td>V</td> <td>3.0</td> <td>-1.5</td> <td>11.38</td> <td>38.5</td> <td>-27.1</td> <td></td> </tr> <tr> <td>829.00</td> <td>22.59</td> <td>H</td> <td>3.0</td> <td>-1.5</td> <td>18.11</td> <td>38.5</td> <td>-20.4</td> <td></td> </tr> <tr> <td colspan="9">Mid Ch</td> </tr> <tr> <td>836.50</td> <td>13.45</td> <td>V</td> <td>3.0</td> <td>-1.4</td> <td>8.99</td> <td>38.5</td> <td>-29.5</td> <td></td> </tr> <tr> <td>836.50</td> <td>21.61</td> <td>H</td> <td>3.0</td> <td>-1.4</td> <td>17.15</td> <td>38.5</td> <td>-21.4</td> <td></td> </tr> <tr> <td colspan="9">High Ch</td> </tr> <tr> <td>844.00</td> <td>12.27</td> <td>V</td> <td>3.1</td> <td>-1.4</td> <td>7.82</td> <td>38.5</td> <td>-30.7</td> <td></td> </tr> <tr> <td>844.00</td> <td>22.56</td> <td>H</td> <td>3.1</td> <td>-1.4</td> <td>18.11</td> <td>38.5</td> <td>-20.4</td> <td></td> </tr> </tbody> </table>									f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes	Low Ch									829.00	15.86	V	3.0	-1.5	11.38	38.5	-27.1		829.00	22.59	H	3.0	-1.5	18.11	38.5	-20.4		Mid Ch									836.50	13.45	V	3.0	-1.4	8.99	38.5	-29.5		836.50	21.61	H	3.0	-1.4	17.15	38.5	-21.4		High Ch									844.00	12.27	V	3.1	-1.4	7.82	38.5	-30.7		844.00	22.56	H	3.1	-1.4	18.11	38.5	-20.4	
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LTE Band 5 5MHz QPSK	<b>UL Verification Services, Inc.</b> <b>High Frequency Substitution Measurement</b>								
	Company: Samsung Project #: 4788869685 Date: 2019-02-01 Test Engineer: 47989 Configuration: EUT / X-Position Location: Chamber 1 Mode: LTE_QPSK Band 5 Fundamentals, 5MHz Bandwidth								
	<b>Test Equipment:</b> Receiving: VULB9163-750, and Chamber 1 SMA Cables Substitution: Dipole 3121_DB4, 2.5m SMA-type Cable								
	f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
	Low Ch								
	826.50	14.59	V	3.0	-1.5	10.11	38.5	-28.4	
	826.50	23.79	H	3.0	-1.5	19.31	38.5	-19.2	
	Mid Ch								
	836.50	14.71	V	3.0	-1.4	10.25	38.5	-28.3	
	836.50	24.07	H	3.0	-1.4	19.61	38.5	-18.9	
High Ch									
846.50	13.53	V	3.1	-1.4	9.08	38.5	-29.4		
846.50	19.85	H	3.1	-1.4	15.40	38.5	-23.1		
LTE Band 5 5MHz 16QAM	<b>UL Verification Services, Inc.</b> <b>High Frequency Substitution Measurement</b>								
	Company: Samsung Project #: 4788869685 Date: 2019-02-01 Test Engineer: 47989 Configuration: EUT / X-Position Location: Chamber 1 Mode: LTE_16QAM Band 5 Fundamentals, 5MHz Bandwidth								
	<b>Test Equipment:</b> Receiving: VULB9163-750, and Chamber 1 SMA Cables Substitution: Dipole 3121_DB4, 2.5m SMA-type Cable								
	f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
	Low Ch								
	826.50	13.42	V	3.0	-1.5	8.94	38.5	-29.6	
	826.50	22.49	H	3.0	-1.5	18.01	38.5	-20.5	
	Mid Ch								
	836.50	13.45	V	3.0	-1.4	8.99	38.5	-29.5	
	836.50	22.81	H	3.0	-1.4	18.35	38.5	-20.2	
High Ch									
846.50	12.16	V	3.1	-1.4	7.71	38.5	-30.8		
846.50	19.12	H	3.1	-1.4	14.67	38.5	-23.8		

LTE Band 5 3MHz QPSK	<b>UL Verification Services, Inc.</b> <b>High Frequency Substitution Measurement</b>								
	Company: Samsung Project #: 4788869685 Date: 2019-02-01 Test Engineer: 47989 Configuration: EUT / X-Position Location: Chamber 1 Mode: LTE_QPSK Band 5 Fundamentals, 3MHz Bandwidth								
	<b>Test Equipment</b> Receiving: VULB9163-750, and Chamber 1 SMA Cables Substitution: Dipole 3121_DB4, 2.5m SMA-type Cable								
	f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
	Low Ch								
	825.50	14.38	V	3.0	-1.5	9.90	38.5	-28.6	
	825.50	23.19	H	3.0	-1.5	18.71	38.5	-19.8	
	Mid Ch								
	836.50	13.83	V	3.0	-1.4	9.37	38.5	-29.1	
	836.50	23.00	H	3.0	-1.4	18.54	38.5	-20.0	
High Ch									
847.50	12.31	V	3.1	-1.4	7.87	38.5	-30.6		
847.50	22.23	H	3.1	-1.4	17.78	38.5	-20.7		
LTE Band 5 3MHz 16QAM	<b>UL Verification Services, Inc.</b> <b>High Frequency Substitution Measurement</b>								
	Company: Samsung Project #: 4788869685 Date: 2019-02-01 Test Engineer: 47989 Configuration: EUT / X-Position Location: Chamber 1 Mode: LTE_16QAM Band 5 Fundamentals, 3MHz Bandwidth								
	<b>Test Equipment</b> Receiving: VULB9163-750, and Chamber 1 SMA Cables Substitution: Dipole 3121_DB4, 2.5m SMA-type Cable								
	f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
	Low Ch								
	825.50	12.89	V	3.0	-1.5	8.41	38.5	-30.1	
	825.50	21.67	H	3.0	-1.5	17.19	38.5	-21.3	
	Mid Ch								
	836.50	12.41	V	3.0	-1.4	7.95	38.5	-30.6	
	836.50	21.58	H	3.0	-1.4	17.12	38.5	-21.4	
High Ch									
847.50	11.27	V	3.1	-1.4	6.83	38.5	-31.7		
847.50	21.10	H	3.1	-1.4	16.65	38.5	-21.8		

LTE Band 5 1.4MHz QPSK	<b>UL Verification Services, Inc.</b> <b>High Frequency Substitution Measurement</b>									
	Company: Samsung Project #: 4788869685 Date: 2019-02-01 Test Engineer: 47989 Configuration: EUT / X-Position Location: Chamber 1 Mode: LTE_QPSK Band 5 Fundamentals, 1.4MHz Bandwidth									
	<b>Test Equipment:</b> Receiving: VULB9163-750, and Chamber 1 SMA Cables Substitution: Dipole 3121_DB4, 2.5m SMA-type Cable									
	f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes	
	Low Ch									
	824.70	14.28	V	3.0	-1.5	9.79	38.5	-28.7		
	824.70	23.33	H	3.0	-1.5	18.84	38.5	-19.7		
	Mid Ch									
	836.50	14.47	V	3.0	-1.4	10.01	38.5	-28.5		
	836.50	23.34	H	3.0	-1.4	18.88	38.5	-19.6		
High Ch										
848.30	12.25	V	3.1	-1.4	7.81	38.5	-30.7			
848.30	22.30	H	3.1	-1.4	17.86	38.5	-20.6			
LTE Band 5 1.4MHz 16QAM	<b>UL Verification Services, Inc.</b> <b>High Frequency Substitution Measurement</b>									
	Company: Samsung Project #: 4788869685 Date: 2019-02-01 Test Engineer: 47989 Configuration: EUT / X-Position Location: Chamber 1 Mode: LTE_16QAM Band 5 Fundamentals, 1.4MHz Bandwidth									
	<b>Test Equipment:</b> Receiving: VULB9163-750, and Chamber 1 SMA Cables Substitution: Dipole 3121_DB4, 2.5m SMA-type Cable									
	f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes	
	Low Ch									
	824.70	13.00	V	3.0	-1.5	8.51	38.5	-30.0		
	824.70	22.14	H	3.0	-1.5	17.65	38.5	-20.8		
	Mid Ch									
	836.50	13.01	V	3.0	-1.4	8.55	38.5	-30.0		
	836.50	21.83	H	3.0	-1.4	17.37	38.5	-21.1		
High Ch										
848.30	10.83	V	3.1	-1.4	6.39	38.5	-32.1			
848.30	21.28	H	3.1	-1.4	16.84	38.5	-21.7			

**LTE Band 17**

LTE Band 17 10MHz QPSK	<b>UL Verification Services, Inc.</b> <b>High Frequency Substitution Measurement</b>								
	Company: Samsung Project #: 4788869688 Date: 2019-04-10 Test Engineer: 45585 Configuration: EUT / X-Position Location: Chamber 1 Mode: LTE_QPSK Band 17 Fundamentals, 10MHz Bandwidth  <u>Test Equipment:</u> Receiving: VULB9163-750, and Chamber 1 SMA Cables Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable								
	<b>f</b>	<b>SG reading</b>	<b>Ant. Pol.</b>	<b>Cable Loss</b>	<b>Antenna Gain</b>	<b>ERP</b>	<b>Limit</b>	<b>Delta</b>	<b>Notes</b>
	<b>MHz</b>	<b>(dBm)</b>	<b>(H/V)</b>	<b>(dB)</b>	<b>(dBd)</b>	<b>(dBm)</b>	<b>(dBm)</b>	<b>(dB)</b>	
	Low Ch								
	709.00	14.10	V	2.8	-1.6	9.71	34.8	-25.1	
	709.00	21.62	H	2.8	-1.6	17.23	34.8	-17.5	
	Mid Ch								
	710.00	14.12	V	2.8	-1.6	9.73	34.8	-25.0	
	710.00	21.53	H	2.8	-1.6	17.14	34.8	-17.6	
	High Ch								
	711.00	13.98	V	2.8	-1.6	9.58	34.8	-25.2	
	711.00	21.52	H	2.8	-1.6	17.13	34.8	-17.6	
LTE Band 17 10MHz 16QAM	<b>UL Verification Services, Inc.</b> <b>High Frequency Substitution Measurement</b>								
	Company: Samsung Project #: 4788869688 Date: 2019-04-10 Test Engineer: 45585 Configuration: EUT / X-Position Location: Chamber 1 Mode: LTE_16QAM Band 17 Fundamentals, 10MHz Bandwidth  <u>Test Equipment:</u> Receiving: VULB9163-750, and Chamber 1 SMA Cables Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable								
	<b>f</b>	<b>SG reading</b>	<b>Ant. Pol.</b>	<b>Cable Loss</b>	<b>Antenna Gain</b>	<b>ERP</b>	<b>Limit</b>	<b>Delta</b>	<b>Notes</b>
	<b>MHz</b>	<b>(dBm)</b>	<b>(H/V)</b>	<b>(dB)</b>	<b>(dBd)</b>	<b>(dBm)</b>	<b>(dBm)</b>	<b>(dB)</b>	
	Low Ch								
	709.00	13.04	V	2.8	-1.6	8.65	34.8	-26.1	
	709.00	20.29	H	2.8	-1.6	15.90	34.8	-18.9	
	Mid Ch								
	710.00	12.89	V	2.8	-1.6	8.50	34.8	-26.3	
	710.00	20.39	H	2.8	-1.6	16.00	34.8	-18.8	
	High Ch								
	711.00	12.89	V	2.8	-1.6	8.49	34.8	-26.3	
	711.00	20.02	H	2.8	-1.6	15.63	34.8	-19.1	

LTE Band 17 5MHz QPSK	<b>UL Verification Services, Inc.</b> <b>High Frequency Substitution Measurement</b>								
	Company: Samsung Project #: 4788869688 Date: 2019-04-10 Test Engineer: 45585 Configuration: EUT / X-Position Location: Chamber 1 Mode: LTE_QPSK Band 17 Fundamentals, 5MHz Bandwidth								
	<b>Test Equipment:</b> Receiving: VULB9163-750, and Chamber 1 SMA Cables Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable								
	f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
	Low Ch								
	706.50	13.88	V	2.8	-1.6	9.50	34.8	-25.3	
	706.50	21.15	H	2.8	-1.6	16.77	34.8	-18.0	
	Mid Ch								
	710.00	14.16	V	2.8	-1.6	9.77	34.8	-25.0	
	710.00	21.65	H	2.8	-1.6	17.26	34.8	-17.5	
High Ch									
713.50	13.31	V	2.8	-1.6	8.91	34.8	-25.9		
713.50	21.08	H	2.8	-1.6	16.68	34.8	-18.1		
LTE Band 17 5MHz 16QAM	<b>UL Verification Services, Inc.</b> <b>High Frequency Substitution Measurement</b>								
	Company: Samsung Project #: 4788869688 Date: 2019-04-10 Test Engineer: 45585 Configuration: EUT / X-Position Location: Chamber 1 Mode: LTE_16QAM Band 17 Fundamentals, 5MHz Bandwidth								
	<b>Test Equipment:</b> Receiving: VULB9163-750, and Chamber 1 SMA Cables Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable								
	f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
	Low Ch								
	706.50	12.51	V	2.8	-1.6	8.13	34.8	-26.6	
	706.50	20.02	H	2.8	-1.6	15.64	34.8	-19.1	
	Mid Ch								
	710.00	13.05	V	2.8	-1.6	8.66	34.8	-26.1	
	710.00	20.27	H	2.8	-1.6	15.88	34.8	-18.9	
High Ch									
713.50	11.83	V	2.8	-1.6	7.43	34.8	-27.3		
713.50	19.63	H	2.8	-1.6	15.23	34.8	-19.5		

**LTE Band 41**

LTE Band 41 20MHz QPSK	<b>UL Verification Services, Inc.</b> <b>High Frequency Substitution Measurement</b>								
	Company: Samsung Project #: 4788869685 Date: 2019-02-12 Test Engineer: 45585 Configuration: EUT / X-Position Location: Chamber 2 Mode: LTE_QPSK Band 41 Fundamentals, 20MHz Bandwidth								
	<b>Test Equipment:</b> Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables Substitution: Horn 3115[00167451], 2.5m SMA-type Cable								
	f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
	Low Ch								
	2506.00	15.02	V	5.2	10.1	19.85	33.0	-13.2	
	2506.00	17.25	H	5.2	10.1	22.08	33.0	-10.9	
	Mid Ch								
	2593.00	16.52	V	5.3	10.0	21.16	33.0	-11.8	
	2593.00	17.28	H	5.3	10.0	21.92	33.0	-11.1	
	High Ch								
	2680.00	15.43	V	5.4	10.0	20.02	33.0	-13.0	
2680.00	15.23	H	5.4	10.0	19.82	33.0	-13.2		
LTE Band 41 20MHz 16QAM	<b>UL Verification Services, Inc.</b> <b>High Frequency Substitution Measurement</b>								
	Company: Samsung Project #: 4788869685 Date: 2019-02-12 Test Engineer: 45585 Configuration: EUT / X-Position Location: Chamber 2 Mode: LTE_16QAM Band 41 Fundamentals, 20MHz Bandwidth								
	<b>Test Equipment:</b> Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables Substitution: Horn 3115[00167451], 2.5m SMA-type Cable								
	f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
	Low Ch								
	2506.00	14.12	V	5.2	10.1	18.95	33.0	-14.1	
	2506.00	16.35	H	5.2	10.1	21.18	33.0	-11.8	
	Mid Ch								
	2593.00	15.99	V	5.3	10.0	20.63	33.0	-12.4	
	2593.00	16.78	H	5.3	10.0	21.42	33.0	-11.6	
	High Ch								
	2680.00	13.90	V	5.4	10.0	18.49	33.0	-14.5	
2680.00	14.78	H	5.4	10.0	19.37	33.0	-13.6		

LTE Band 41 15MHz QPSK	<b>UL Verification Services, Inc.</b> <b>High Frequency Substitution Measurement</b>								
	Company: Samsung Project #: 4788869685 Date: 2019-02-12 Test Engineer: 45585 Configuration: EUT / X-Position Location: Chamber 2 Mode: LTE_QPSK Band 41 Fundamentals, 15MHz Bandwidth								
	<b>Test Equipment:</b> Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables Substitution: Horn 3115[00167451], 2.5m SMA-type Cable								
	f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
	Low Ch								
	2503.50	16.99	V	5.2	10.1	21.82	33.0	-11.2	
	2503.50	16.52	H	5.2	10.1	21.35	33.0	-11.6	
	Mid Ch								
	2593.00	15.19	V	5.3	10.0	19.83	33.0	-13.2	
	2593.00	17.54	H	5.3	10.0	22.18	33.0	-10.8	
High Ch									
2682.50	15.97	V	5.4	10.0	20.57	33.0	-12.4		
2682.50	15.37	H	5.4	10.0	19.97	33.0	-13.0		
LTE Band 41 15MHz 16QAM	<b>UL Verification Services, Inc.</b> <b>High Frequency Substitution Measurement</b>								
	Company: Samsung Project #: 4788869685 Date: 2019-02-12 Test Engineer: 45585 Configuration: EUT / X-Position Location: Chamber 2 Mode: LTE_16QAM Band 41 Fundamentals, 15MHz Bandwidth								
	<b>Test Equipment:</b> Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables Substitution: Horn 3115[00167451], 2.5m SMA-type Cable								
	f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
	Low Ch								
	2503.50	16.20	V	5.2	10.1	21.03	33.0	-12.0	
	2503.50	15.74	H	5.2	10.1	20.57	33.0	-12.4	
	Mid Ch								
	2593.00	14.96	V	5.3	10.0	19.60	33.0	-13.4	
	2593.00	17.66	H	5.3	10.0	22.30	33.0	-10.7	
High Ch									
2682.50	15.79	V	5.4	10.0	20.39	33.0	-12.6		
2682.50	15.16	H	5.4	10.0	19.76	33.0	-13.2		

LTE Band 41 10MHz QPSK	<b>UL Verification Services, Inc.</b> <b>High Frequency Substitution Measurement</b>								
	<b>Company:</b> Samsung <b>Project #:</b> 4788869685 <b>Date:</b> 2019-02-12 <b>Test Engineer:</b> 45585 <b>Configuration:</b> EUT / X-Position <b>Location:</b> Chamber 2 <b>Mode:</b> LTE_QPSK Band 41 Fundamentals, 10MHz Bandwidth								
	<b>Test Equipment:</b> Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables Substitution: Horn 3115[00167451], 2.5m SMA-type Cable								
	f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
	Low Ch								
	2501.00	17.55	V	5.2	10.1	22.39	33.0	-10.6	
	2501.00	17.17	H	5.2	10.1	22.01	33.0	-11.0	
	Mid Ch								
	2593.00	15.52	V	5.3	10.0	20.16	33.0	-12.8	
	2593.00	17.23	H	5.3	10.0	21.87	33.0	-11.1	
	High Ch								
	2685.00	15.71	V	5.4	10.0	20.30	33.0	-12.7	
2685.00	15.06	H	5.4	10.0	19.65	33.0	-13.4		
LTE Band 41 10MHz 16QAM	<b>UL Verification Services, Inc.</b> <b>High Frequency Substitution Measurement</b>								
	<b>Company:</b> Samsung <b>Project #:</b> 4788869685 <b>Date:</b> 2019-02-12 <b>Test Engineer:</b> 45585 <b>Configuration:</b> EUT / X-Position <b>Location:</b> Chamber 2 <b>Mode:</b> LTE_16QAM Band 41 Fundamentals, 10MHz Bandwidth								
	<b>Test Equipment:</b> Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables Substitution: Horn 3115[00167451], 2.5m SMA-type Cable								
	f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
	Low Ch								
	2501.00	16.58	V	5.2	10.1	21.42	33.0	-11.6	
	2501.00	16.16	H	5.2	10.1	21.00	33.0	-12.0	
	Mid Ch								
	2593.00	14.72	V	5.3	10.0	19.36	33.0	-13.6	
	2593.00	17.04	H	5.3	10.0	21.68	33.0	-11.3	
	High Ch								
	2685.00	15.98	V	5.4	10.0	20.57	33.0	-12.4	
2685.00	15.28	H	5.4	10.0	19.87	33.0	-13.1		



LTE Band 41 5MHz QPSK	<b>UL Verification Services, Inc.</b> <b>High Frequency Substitution Measurement</b>								
	Company: Samsung Project #: 4788869685 Date: 2019-02-12 Test Engineer: 45585 Configuration: EUT / X-Position Location: Chamber 2 Mode: LTE_QPSK Band 41 Fundamentals, 5MHz Bandwidth								
	<b>Test Equipment:</b> Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables Substitution: Horn 3115[00167451], 2.5m SMA-type Cable								
	f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
	Low Ch								
	2498.50	16.30	V	5.2	10.1	21.14	33.0	-11.9	
	2498.50	17.15	H	5.2	10.1	21.99	33.0	-11.0	
	Mid Ch								
	2593.00	15.82	V	5.3	10.0	20.46	33.0	-12.5	
	2593.00	17.36	H	5.3	10.0	22.00	33.0	-11.0	
High Ch									
2687.50	15.65	V	5.4	10.0	20.25	33.0	-12.8		
2687.50	15.91	H	5.4	10.0	20.51	33.0	-12.5		
LTE Band 41 5MHz 16QAM	<b>UL Verification Services, Inc.</b> <b>High Frequency Substitution Measurement</b>								
	Company: Samsung Project #: 4788869685 Date: 2019-02-12 Test Engineer: 45585 Configuration: EUT / X-Position Location: Chamber 2 Mode: LTE_16QAM Band 41 Fundamentals, 5MHz Bandwidth								
	<b>Test Equipment:</b> Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables Substitution: Horn 3115[00167451], 2.5m SMA-type Cable								
	f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
	Low Ch								
	2498.50	15.04	V	5.2	10.1	19.88	33.0	-13.1	
	2498.50	15.83	H	5.2	10.1	20.67	33.0	-12.3	
	Mid Ch								
	2593.00	15.06	V	5.3	10.0	19.70	33.0	-13.3	
	2593.00	16.61	H	5.3	10.0	21.25	33.0	-11.8	
High Ch									
2687.50	14.76	V	5.4	10.0	19.36	33.0	-13.6		
2687.50	15.00	H	5.4	10.0	19.60	33.0	-13.4		

## 10.2. FIELD STRENGTH OF SPURIOUS RADIATION

### RULE PART(S)

FCC: §2.1053, §22.917, §24.238 and §27. 53

### LIMIT

Part 22.917(a) & Part 24.238(a) & Part 27.53(h) The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log (P)$  dB.

Part 27.53:

(g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least  $43 + 10 \log (P)$  dB.

(m) (4) For mobile digital stations, the attenuation factor shall be not less than  $40 + 10 \log (P)$  dB on all frequencies between the channel edge and 5 megahertz from the channel edge,  $43 + 10 \log (P)$  dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and  $55 + 10 \log (P)$  dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less than  $43 + 10 \log (P)$  dB on all frequencies between 2490.5 MHz and 2496 MHz and  $55 + 10 \log (P)$  dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

### TEST PROCEDURE

ANSI / TIA / EIA 603 E Clause 2.2.12; ESU40 setting reference to 971168 D01 v03r01

For peak power measurement with a ESU40:

- a) Set the RBW = 100 KHz for emission below 1GHz and 1MHz for emissions above 1GHz
- b) Set VBW  $\geq 3 \times$  RBW;
- c) Set span  $\geq 1.5$  times the OBW;
- d) Sweep time = auto couple;
- e) Detector = rms;
- f) Ensure that the number of measurement points  $\geq$  span/RBW;
- g) Trace mode = average(WCDMA, LTE), Maxhold(GSM, LTE Band41);;

### RESULTS

See the following pages.

NOTE : Please refer to section 5.4 for bandwidth and RB setting about LTE bands.

### 10.2.1. SPURIOUS RADIATION PLOTS

#### GSM1900

UL Verification Services, Inc. Above 1GHz High Frequency Substitution Measurement									
Company:		Samsung							
Project #:		4788869688							
Date:		2109-04-17							
Test Engineer:		45585							
Configuration:		EUT / AC Adapter / Earphone, X-Position							
Location:		Chamber 1							
Mode:		GPRS 1900 MHz Harmonics							
f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
<b>Low Ch, 1850.2MHz</b>									
3700.40	1.1	V	3.0	43.8	1.0	-41.7	-13.0	-28.7	
5550.60	-3.8	V	3.0	43.7	1.0	-46.5	-13.0	-33.5	
7400.80	-4.6	V	3.0	42.5	1.0	-46.1	-13.0	-33.1	
3700.40	-1.3	H	3.0	43.8	1.0	-44.1	-13.0	-31.1	
5550.60	-6.1	H	3.0	43.7	1.0	-48.8	-13.0	-35.8	
7400.80	-4.7	H	3.0	42.5	1.0	-46.2	-13.0	-33.2	
<b>Mid Ch, 1880MHz</b>									
3760.00	2.2	V	3.0	43.8	1.0	-40.6	-13.0	-27.6	
5640.00	0.0	V	3.0	43.7	1.0	-42.7	-13.0	-29.7	
7520.00	-4.7	V	3.0	42.5	1.0	-46.1	-13.0	-33.1	
3760.00	-1.8	H	3.0	43.8	1.0	-44.6	-13.0	-31.6	
5640.00	-5.5	H	3.0	43.7	1.0	-48.2	-13.0	-35.2	
7520.00	-4.7	H	3.0	42.5	1.0	-46.2	-13.0	-33.2	
<b>High Ch, 1909.8MHz</b>									
3819.60	-0.3	V	3.0	43.8	1.0	-43.1	-13.0	-30.1	
5729.40	-1.3	V	3.0	43.7	1.0	-44.0	-13.0	-31.0	
7639.20	-4.7	V	3.0	42.4	1.0	-46.1	-13.0	-33.1	
3819.60	-3.0	H	3.0	43.8	1.0	-45.8	-13.0	-32.8	
5729.40	-4.6	H	3.0	43.7	1.0	-47.3	-13.0	-34.3	
7639.20	-4.6	H	3.0	42.4	1.0	-46.0	-13.0	-33.0	

UL Verification Services, Inc. Above 1GHz High Frequency Substitution Measurement									
Company:		Samsung							
Project #:		4788869688							
Date:		2109-04-17							
Test Engineer:		45585							
Configuration:		EUT / AC Adapter / Earphone							
Location:		Chamber 1							
Mode:		EGPRS 1900 MHz Harmonics							
f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
<b>Low Ch, 1850.2MHz</b>									
3700.40	0.2	V	3.0	43.8	1.0	-42.5	-13.0	-29.5	
5550.60	-6.1	V	3.0	43.7	1.0	-48.8	-13.0	-35.8	
7400.80	-4.8	V	3.0	42.5	1.0	-46.4	-13.0	-33.4	
3700.40	-1.8	H	3.0	43.8	1.0	-44.6	-13.0	-31.6	
5550.60	-7.6	H	3.0	43.7	1.0	-50.3	-13.0	-37.3	
7400.80	-5.0	H	3.0	42.5	1.0	-46.5	-13.0	-33.5	
<b>Mid Ch, 1880MHz</b>									
3760.00	-0.1	V	3.0	43.8	1.0	-42.9	-13.0	-29.9	
5640.00	-6.3	V	3.0	43.7	1.0	-49.0	-13.0	-36.0	
7520.00	-4.8	V	3.0	42.5	1.0	-46.3	-13.0	-33.3	
3760.00	-3.6	H	3.0	43.8	1.0	-46.4	-13.0	-33.4	
5640.00	-6.5	H	3.0	43.7	1.0	-49.2	-13.0	-36.2	
7520.00	-5.0	H	3.0	42.5	1.0	-46.4	-13.0	-33.4	
<b>High Ch, 1909.8MHz</b>									
3819.60	-0.8	V	3.0	43.8	1.0	-43.6	-13.0	-30.6	
5729.40	-6.2	V	3.0	43.7	1.0	-48.9	-13.0	-35.9	
7639.20	-4.7	V	3.0	42.4	1.0	-46.1	-13.0	-33.1	
3819.60	-4.1	H	3.0	43.8	1.0	-46.9	-13.0	-33.9	
5729.40	-6.2	H	3.0	43.7	1.0	-48.9	-13.0	-35.9	
7639.20	-4.7	H	3.0	42.4	1.0	-46.1	-13.0	-33.1	

**WCDMA Band 5**

		UL Verification Services, Inc. Above 1GHz High Frequency Substitution Measurement									
		Company: Samsung Project #: 4788869685 Date: 2019-02-13 Test Engineer: 45585 Configuration: EUT / AC Adapter / Earphone Location: Chamber 2 Mode: Rel99 Band 5 Harmonics									
f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes		
Low Ch, 826.4MHz											
1652.80	-13.8	V	3.0	38.2	1.0	-51.0	-13.0	-38.0			
2479.20	-12.8	V	3.0	38.8	1.0	-50.6	-13.0	-37.6			
3305.60	-10.2	V	3.0	39.4	1.0	-48.6	-13.0	-35.6			
1652.80	-11.8	H	3.0	38.2	1.0	-49.0	-13.0	-36.0			
2479.20	-13.4	H	3.0	38.8	1.0	-51.2	-13.0	-38.2			
3305.60	-10.5	H	3.0	39.4	1.0	-48.9	-13.0	-35.9			
Mid Ch, 836.6MHz											
1673.20	-13.9	V	3.0	38.2	1.0	-51.2	-13.0	-38.2			
2509.80	-12.8	V	3.0	38.8	1.0	-50.6	-13.0	-37.6			
3346.40	-10.3	V	3.0	39.5	1.0	-48.7	-13.0	-35.7			
1673.20	-11.9	H	3.0	38.2	1.0	-49.1	-13.0	-36.1			
2509.80	-13.3	H	3.0	38.8	1.0	-51.2	-13.0	-38.2			
3346.40	-10.5	H	3.0	39.5	1.0	-48.9	-13.0	-35.9			
High Ch, 846.6MHz											
1693.20	-14.7	V	3.0	38.2	1.0	-52.0	-13.0	-39.0			
2539.80	-12.6	V	3.0	38.9	1.0	-50.5	-13.0	-37.5			
3386.40	-10.0	V	3.0	39.5	1.0	-48.5	-13.0	-35.5			
1693.20	-12.7	H	3.0	38.2	1.0	-50.0	-13.0	-37.0			
2539.80	-13.2	H	3.0	38.9	1.0	-51.0	-13.0	-38.0			
3386.40	-10.3	H	3.0	39.5	1.0	-48.8	-13.0	-35.8			
		UL Verification Services, Inc. Above 1GHz High Frequency Substitution Measurement									
		Company: Samsung Project #: 4788869685 Date: 2019-02-13 Test Engineer: 45585 Configuration: EUT / AC Adapter / Earphone, X-Position Location: Chamber 2 Mode: HSDPA Band 5 Harmonics									
f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes		
Low Ch, 826.4MHz											
1652.80	-15.0	V	3.0	38.2	1.0	-52.2	-13.0	-39.2			
2479.20	-12.9	V	3.0	38.8	1.0	-50.7	-13.0	-37.7			
3305.60	-10.3	V	3.0	39.4	1.0	-48.7	-13.0	-35.7			
1652.80	-13.4	H	3.0	38.2	1.0	-50.6	-13.0	-37.6			
2479.20	-13.3	H	3.0	38.8	1.0	-51.1	-13.0	-38.1			
3305.60	-10.5	H	3.0	39.4	1.0	-48.9	-13.0	-35.9			
Mid Ch, 836.6MHz											
1673.20	-13.2	V	3.0	38.2	1.0	-50.5	-13.0	-37.5			
2509.80	-12.5	V	3.0	38.8	1.0	-50.4	-13.0	-37.4			
3346.40	-9.9	V	3.0	39.5	1.0	-48.4	-13.0	-35.4			
1673.20	-12.2	H	3.0	38.2	1.0	-49.5	-13.0	-36.5			
2509.80	-13.3	H	3.0	38.8	1.0	-51.1	-13.0	-38.1			
3346.40	-10.1	H	3.0	39.5	1.0	-48.6	-13.0	-35.6			
High Ch, 846.6MHz											
1693.20	-15.2	V	3.0	38.2	1.0	-52.4	-13.0	-39.4			
2539.80	-12.7	V	3.0	38.9	1.0	-50.5	-13.0	-37.5			
3386.40	-10.0	V	3.0	39.5	1.0	-48.5	-13.0	-35.5			
1693.20	-14.5	H	3.0	38.2	1.0	-51.7	-13.0	-38.7			
2539.80	-12.9	H	3.0	38.9	1.0	-50.8	-13.0	-37.8			
3386.40	-10.2	H	3.0	39.5	1.0	-48.7	-13.0	-35.7			

**WCDMA Band 2**

		UL Verification Services, Inc. Above 1GHz High Frequency Substitution Measurement								
		Company:	Samsung							
		Project #:	4788869688							
		Date:	2019-04-16							
		Test Engineer:	45585							
		Configuration:	EUT / AC Adapter / Earphone, X-Position							
		Location:	Chamber 2							
		Mode:	Rel99 Band 2 Harmonics							
f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes	
Low Ch, 1852.4MHz										
3704.80	-11.2	V	3.0	39.7	1.0	-49.9	-13.0	-36.9		
5557.20	-8.3	V	3.0	39.9	1.0	-47.2	-13.0	-34.2		
7409.60	-6.2	V	3.0	39.4	1.0	-44.6	-13.0	-31.6		
3704.80	-11.4	H	3.0	39.7	1.0	-50.1	-13.0	-37.1		
5557.20	-8.6	H	3.0	39.9	1.0	-47.5	-13.0	-34.5		
7409.60	-7.0	H	3.0	39.4	1.0	-45.4	-13.0	-32.4		
Mid Ch, 1880MHz										
3760.00	-10.8	V	3.0	39.7	1.0	-49.5	-13.0	-36.5		
5640.00	-7.9	V	3.0	40.0	1.0	-46.8	-13.0	-33.8		
7520.00	-6.3	V	3.0	39.4	1.0	-44.7	-13.0	-31.7		
3760.00	-11.2	H	3.0	39.7	1.0	-49.8	-13.0	-36.8		
5640.00	-8.2	H	3.0	40.0	1.0	-47.1	-13.0	-34.1		
7520.00	-7.0	H	3.0	39.4	1.0	-45.4	-13.0	-32.4		
High Ch, 1907.6MHz										
3815.20	-11.0	V	3.0	39.7	1.0	-49.8	-13.0	-36.8		
5722.80	-8.1	V	3.0	40.0	1.0	-47.1	-13.0	-34.1		
7630.40	-6.2	V	3.0	39.3	1.0	-44.5	-13.0	-31.5		
3815.20	-11.2	H	3.0	39.7	1.0	-50.0	-13.0	-37.0		
5722.80	-8.3	H	3.0	40.0	1.0	-47.3	-13.0	-34.3		
7630.40	-7.0	H	3.0	39.3	1.0	-45.3	-13.0	-32.3		
		UL Verification Services, Inc. Above 1GHz High Frequency Substitution Measurement								
		Company:	Samsung							
		Project #:	4788869688							
		Date:	2019-04-16							
		Test Engineer:	45585							
		Configuration:	EUT / AC Adapter / Earphone, X-Position							
		Location:	Chamber 2							
		Mode:	HSDPA Band 2 Harmonics							
f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes	
Low Ch, 1852.4MHz										
3704.80	-11.2	V	3.0	39.7	1.0	-49.8	-13.0	-36.8		
5557.20	-8.3	V	3.0	39.9	1.0	-47.2	-13.0	-34.2		
7409.60	-6.1	V	3.0	39.4	1.0	-44.5	-13.0	-31.5		
3704.80	-11.5	H	3.0	39.7	1.0	-50.2	-13.0	-37.2		
5557.20	-8.6	H	3.0	39.9	1.0	-47.5	-13.0	-34.5		
7409.60	-7.0	H	3.0	39.4	1.0	-45.4	-13.0	-32.4		
Mid Ch, 1880MHz										
3760.00	-10.8	V	3.0	39.7	1.0	-49.5	-13.0	-36.5		
5640.00	-7.9	V	3.0	40.0	1.0	-46.8	-13.0	-33.8		
7520.00	-6.2	V	3.0	39.4	1.0	-44.6	-13.0	-31.6		
3760.00	-11.1	H	3.0	39.7	1.0	-49.7	-13.0	-36.7		
5640.00	-8.2	H	3.0	40.0	1.0	-47.1	-13.0	-34.1		
7520.00	-7.0	H	3.0	39.4	1.0	-45.4	-13.0	-32.4		
High Ch, 1907.6MHz										
3815.20	-10.9	V	3.0	39.7	1.0	-49.6	-13.0	-36.6		
5722.80	-8.1	V	3.0	40.0	1.0	-47.1	-13.0	-34.1		
7630.40	-6.3	V	3.0	39.3	1.0	-44.6	-13.0	-31.6		
3815.20	-11.2	H	3.0	39.7	1.0	-49.9	-13.0	-36.9		
5722.80	-8.4	H	3.0	40.0	1.0	-47.4	-13.0	-34.4		
7630.40	-6.9	H	3.0	39.3	1.0	-45.3	-13.0	-32.3		

**LTE Band 2**

UL Verification Services, Inc. Above 1GHz High Frequency Substitution Measurement									
Company:		Samsung							
Project #:		4788869685							
Date:		2019-02-01							
Test Engineer:		47989							
Configuration:		EUT / AC Adapter / Earphone, X-Position							
Location:		Chamber 1							
Mode:		LTE_QPSK Band 2 Harmonics, 20MHz Bandwidth							
f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
LTE									
Band 2									
20MHz									
QPSK									
Low Ch, 1860MHz									
3720.00	-11.6	V	3.0	43.8	1.0	-54.4	-13.0	-41.4	
5580.00	-8.6	V	3.0	43.7	1.0	-51.3	-13.0	-38.3	
7440.00	-6.0	V	3.0	42.5	1.0	-47.5	-13.0	-34.5	
3720.00	-11.6	H	3.0	43.8	1.0	-54.3	-13.0	-41.3	
5580.00	-8.7	H	3.0	43.7	1.0	-51.4	-13.0	-38.4	
7440.00	-6.0	H	3.0	42.5	1.0	-47.5	-13.0	-34.5	
Mid Ch, 1880MHz									
3760.00	-11.4	V	3.0	43.8	1.0	-54.2	-13.0	-41.2	
5640.00	-8.5	V	3.0	43.7	1.0	-51.2	-13.0	-38.2	
7520.00	-6.0	V	3.0	42.5	1.0	-47.5	-13.0	-34.5	
3760.00	-11.3	H	3.0	43.8	1.0	-54.1	-13.0	-41.1	
5640.00	-8.6	H	3.0	43.7	1.0	-51.3	-13.0	-38.3	
7520.00	-5.9	H	3.0	42.5	1.0	-47.4	-13.0	-34.4	
High Ch, 1900MHz									
3800.00	-11.3	V	3.0	43.8	1.0	-54.1	-13.0	-41.1	
5700.00	-8.2	V	3.0	43.7	1.0	-50.9	-13.0	-37.9	
7600.00	-6.0	V	3.0	42.4	1.0	-47.4	-13.0	-34.4	
3800.00	-11.3	H	3.0	43.8	1.0	-54.1	-13.0	-41.1	
5700.00	-8.4	H	3.0	43.7	1.0	-51.1	-13.0	-38.1	
7600.00	-5.9	H	3.0	42.4	1.0	-47.3	-13.0	-34.3	

**LTE Band 5**

UL Verification Services, Inc. Above 1GHz High Frequency Substitution Measurement									
Company:		Samsung							
Project #:		4788869685							
Date:		2019-02-01							
Test Engineer:		47989							
Configuration:		EUT / AC Adapter / Earphone, Z-Position							
Location:		Chamber 1							
Mode:		LTE_QPSK Band 5 Harmonics, 5MHz Bandwidth							
f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 826.5MHz									
1653.00	-6.0	V	3.0	43.6	1.0	-48.6	-13.0	-35.6	
2479.50	-12.4	V	3.0	43.4	1.0	-54.8	-13.0	-41.8	
3306.00	-10.6	V	3.0	43.6	1.0	-53.3	-13.0	-40.3	
5MHz									
1653.00	-5.0	H	3.0	43.6	1.0	-47.6	-13.0	-34.6	
2479.50	-13.1	H	3.0	43.4	1.0	-55.5	-13.0	-42.5	
3306.00	-10.8	H	3.0	43.6	1.0	-53.5	-13.0	-40.5	
Mid Ch, 836.5MHz									
1673.00	-7.9	V	3.0	43.6	1.0	-50.5	-13.0	-37.5	
2509.50	-12.5	V	3.0	43.4	1.0	-54.9	-13.0	-41.9	
3346.00	-10.7	V	3.0	43.6	1.0	-53.3	-13.0	-40.3	
1673.00	-6.8	H	3.0	43.6	1.0	-49.4	-13.0	-36.4	
2509.50	-13.1	H	3.0	43.4	1.0	-55.5	-13.0	-42.5	
3346.00	-10.7	H	3.0	43.6	1.0	-53.4	-13.0	-40.4	
High Ch, 846.5MHz									
1693.00	-7.4	V	3.0	43.6	1.0	-49.9	-13.0	-36.9	
2539.50	-12.4	V	3.0	43.4	1.0	-54.8	-13.0	-41.8	
3386.00	-10.1	V	3.0	43.7	1.0	-52.7	-13.0	-39.7	
1693.00	-7.2	H	3.0	43.6	1.0	-49.7	-13.0	-36.7	
2539.50	-12.8	H	3.0	43.4	1.0	-55.3	-13.0	-42.3	
3386.00	-10.1	H	3.0	43.7	1.0	-52.8	-13.0	-39.8	

LTE  
 Band 5  
 5MHz  
 QPSK

**LTE Band 17**

UL Verification Services, Inc. Above 1GHz High Frequency Substitution Measurement											
LTE Band 17 10MHz QPSK		Company: Samsung Project #: 4788869688 Date: 2019-04-10 Test Engineer: 45585 Configuration: EUT / AC Adapter / Earphone, X-Position Location: Chamber 1 Mode: LTE_QPSK Band 17 Hamonics, 10MHz Bandwidth									
		f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
		Low Ch, 709MHz									
		1418.00	-16.2	V	3.0	43.8	1.0	-59.0	-13.0	-46.0	
		2127.00	-13.7	V	3.0	43.3	1.0	-56.1	-13.0	-43.1	
		2836.00	-11.7	V	3.0	43.5	1.0	-54.2	-13.0	-41.2	
		3545.00	-7.6	V	3.0	43.7	1.0	-50.4	-13.0	-37.4	
		1418.00	-15.2	H	3.0	43.8	1.0	-58.0	-13.0	-45.0	
		2127.00	-14.7	H	3.0	43.3	1.0	-57.0	-13.0	-44.0	
		2836.00	-12.0	H	3.0	43.5	1.0	-54.5	-13.0	-41.5	
3545.00	-6.1	H	3.0	43.7	1.0	-48.9	-13.0	-35.9			
Mid Ch, 710MHz											
1420.00	-16.2	V	3.0	43.8	1.0	-58.9	-13.0	-45.9			
2130.00	-13.8	V	3.0	43.3	1.0	-56.1	-13.0	-43.1			
2840.00	-11.5	V	3.0	43.5	1.0	-54.0	-13.0	-41.0			
3550.00	-6.5	V	3.0	43.7	1.0	-49.2	-13.0	-36.2			
1420.00	-15.1	H	3.0	43.8	1.0	-57.9	-13.0	-44.9			
2130.00	-14.5	H	3.0	43.3	1.0	-56.9	-13.0	-43.9			
2840.00	-12.0	H	3.0	43.5	1.0	-54.5	-13.0	-41.5			
3550.00	-5.8	H	3.0	43.7	1.0	-48.6	-13.0	-35.6			
High Ch, 711MHz											
1422.00	-16.1	V	3.0	43.8	1.0	-58.9	-13.0	-45.9			
2133.00	-13.6	V	3.0	43.3	1.0	-56.0	-13.0	-43.0			
2844.00	-11.5	V	3.0	43.5	1.0	-54.0	-13.0	-41.0			
3555.00	-7.9	V	3.0	43.7	1.0	-50.6	-13.0	-37.6			
1422.00	-15.5	H	3.0	43.8	1.0	-58.3	-13.0	-45.3			
2133.00	-14.5	H	3.0	43.3	1.0	-56.9	-13.0	-43.9			
2844.00	-11.8	H	3.0	43.5	1.0	-54.3	-13.0	-41.3			
3555.00	-6.9	H	3.0	43.7	1.0	-49.6	-13.0	-36.6			



**LTE Band 41**

UL Verification Services, Inc. Above 1GHz High Frequency Substitution Measurement									
Company:		Samsung							
Project #:		4788869685							
Date:		2019-02-12							
Test Engineer:		45585							
Configuration:		EUT / AC Adapter / Earphone / X-Position							
Location:		Chamber 2							
Mode:		LTE_QPSK Band 41 Harmonics, 10MHz Bandwidth							
f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
<b>Low Ch, 2501MHz</b>									
5002.00	-14.8	V	3.0	39.8	1.0	-53.5	-25.0	-28.5	
7503.00	-5.9	V	3.0	39.4	1.0	-44.3	-25.0	-19.3	
10004.00	-11.8	V	3.0	38.6	1.0	-49.3	-25.0	-24.3	
12505.00	-3.3	V	3.0	39.0	1.0	-41.3	-25.0	-16.3	
15006.00	-5.9	V	3.0	41.3	1.0	-46.2	-25.0	-21.2	
5002.00	-15.8	H	3.0	39.8	1.0	-54.6	-25.0	-29.6	
7503.00	-6.4	H	3.0	39.4	1.0	-44.8	-25.0	-19.8	
10004.00	-11.7	H	3.0	38.6	1.0	-49.3	-25.0	-24.3	
12505.00	-7.7	H	3.0	39.0	1.0	-45.6	-25.0	-20.6	
15006.00	-6.4	H	3.0	41.3	1.0	-46.7	-25.0	-21.7	
<b>Mid Ch, 2593MHz</b>									
5186.00	-12.7	V	3.0	39.8	1.0	-51.6	-25.0	-26.6	
7779.00	-2.9	V	3.0	39.3	1.0	-41.2	-25.0	-16.2	
10372.00	-5.3	V	3.0	38.6	1.0	-42.8	-25.0	-17.8	
12965.00	4.6	V	3.0	39.4	1.0	-33.8	-25.0	-8.8	
15558.00	-1.8	V	3.0	41.1	1.0	-41.9	-25.0	-16.9	
5186.00	-13.0	H	3.0	39.8	1.0	-51.8	-25.0	-26.8	
7779.00	-2.3	H	3.0	39.3	1.0	-40.5	-25.0	-15.5	
10372.00	-5.8	H	3.0	38.6	1.0	-43.4	-25.0	-18.4	
12965.00	-4.7	H	3.0	39.4	1.0	-43.1	-25.0	-18.1	
15558.00	-6.2	H	3.0	41.1	1.0	-46.3	-25.0	-21.3	
<b>High Ch, 2685MHz</b>									
5370.00	-8.8	V	3.0	39.9	1.0	-47.7	-25.0	-22.7	
8055.00	-3.9	V	3.0	39.2	1.0	-42.0	-25.0	-17.0	
10740.00	-4.1	V	3.0	38.5	1.0	-41.7	-25.0	-16.7	
13425.00	-4.4	V	3.0	39.8	1.0	-43.2	-25.0	-18.2	
16110.00	-5.2	V	3.0	40.9	1.0	-45.1	-25.0	-20.1	
5370.00	-11.6	H	3.0	39.9	1.0	-50.5	-25.0	-25.5	
8055.00	-6.6	H	3.0	39.2	1.0	-44.7	-25.0	-19.7	
10740.00	-9.8	H	3.0	38.5	1.0	-47.3	-25.0	-22.3	
13425.00	-8.0	H	3.0	39.8	1.0	-46.8	-25.0	-21.8	
16110.00	-5.4	H	3.0	40.9	1.0	-45.3	-25.0	-20.3	

LTE  
 Band 41  
 10MHz  
 QPSK