

APPENDIX 1: Data of Radio tests

20dB Bandwidth and Carrier Frequency Separation

Test place

UL Japan, Inc. Shonan EMC Lab.

No.5 Shielded Room

Date

September 8, 2012

Temperature / Humidity

26 deg.C , 52 %RH

Engineer

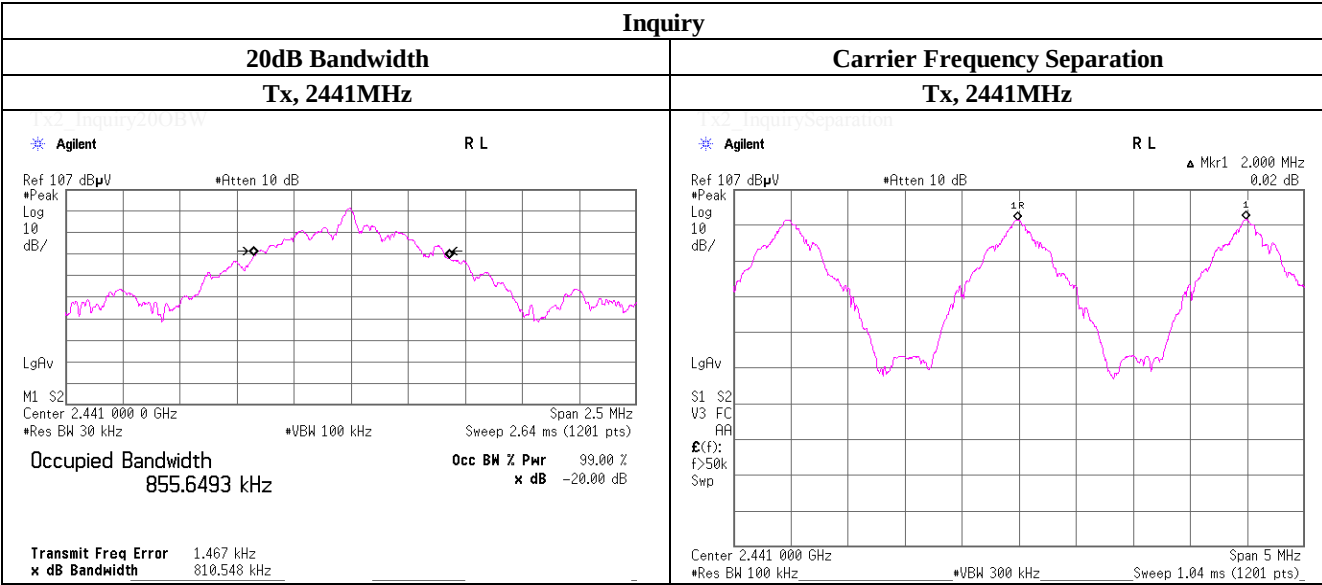
Shinichi Takano

Mode

Tx, Bluetooth, BDR, PRBS9

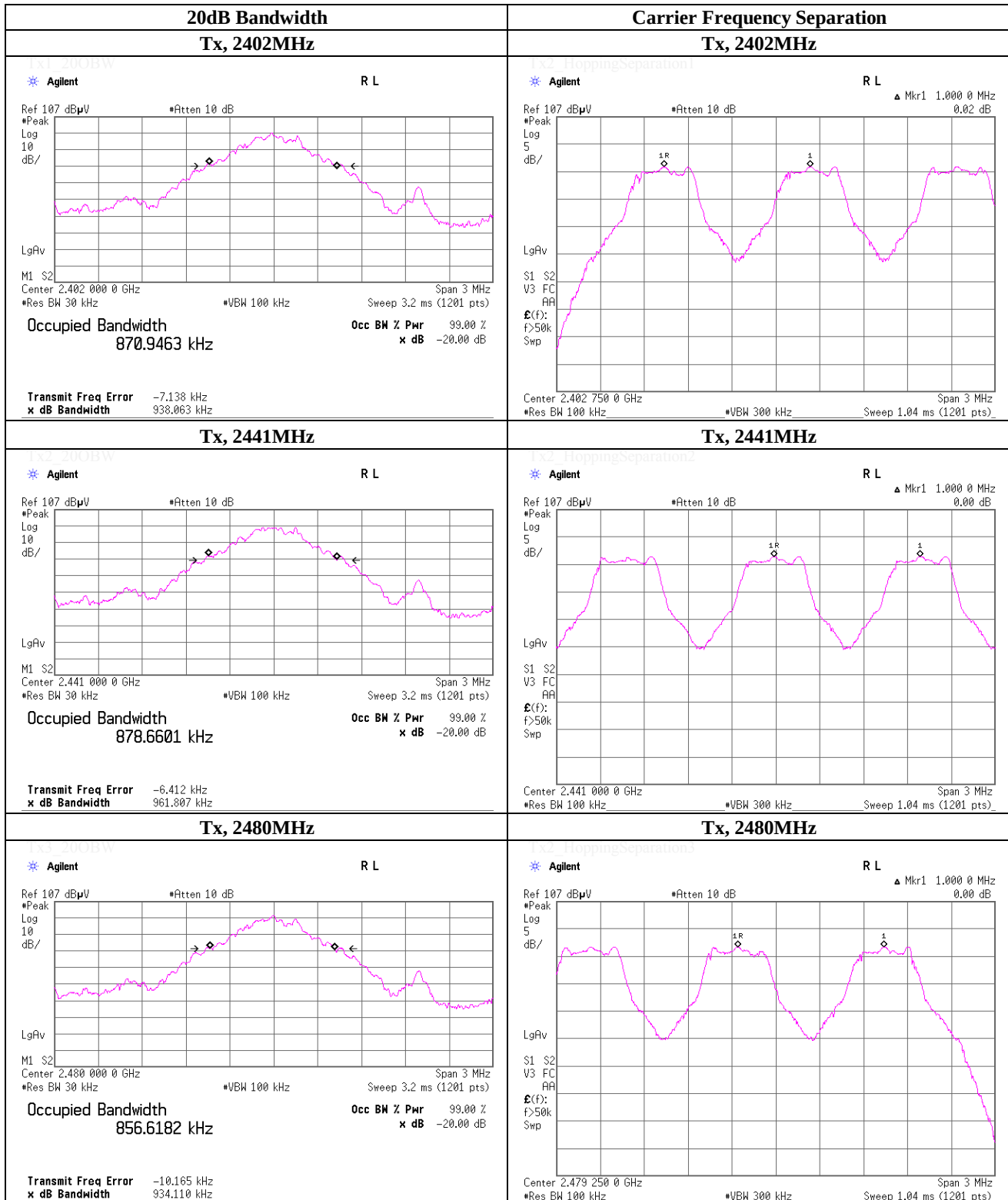
Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency Separation [MHz]
DH5	2402.0	0.938	1.000	>= 0.625
DH5	2441.0	0.962	1.000	>= 0.641
DH5	2480.0	0.934	1.000	>= 0.623
Inquiry	2441.0	0.811	2.000	>= 0.540

Limit: Two-thirds of 20dB Bandwidth or 25kHz (whichever is greater).
No limit applies to 20dB Bandwidth.



20dB Bandwidth and Carrier Frequency Separation

Tx, Bluetooth, BDR, PRBS9



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20dB Bandwidth and Carrier Frequency Separation

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
Date September 8, 2012
Temperature / Humidity 26 deg.C , 52 %RH
Engineer Shinichi Takano
Mode Tx, Bluetooth, EDR, PRBS9

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency Separation [MHz]
3-DH5	2402.0	1.297	1.000	>= 0.865
3-DH5	2441.0	1.290	1.000	>= 0.860
3-DH5	2480.0	1.297	1.000	>= 0.865

Limit: Two-thirds of 20dB Bandwidth or 25kHz (whichever is greater).
No limit applies to 20dB Bandwidth.

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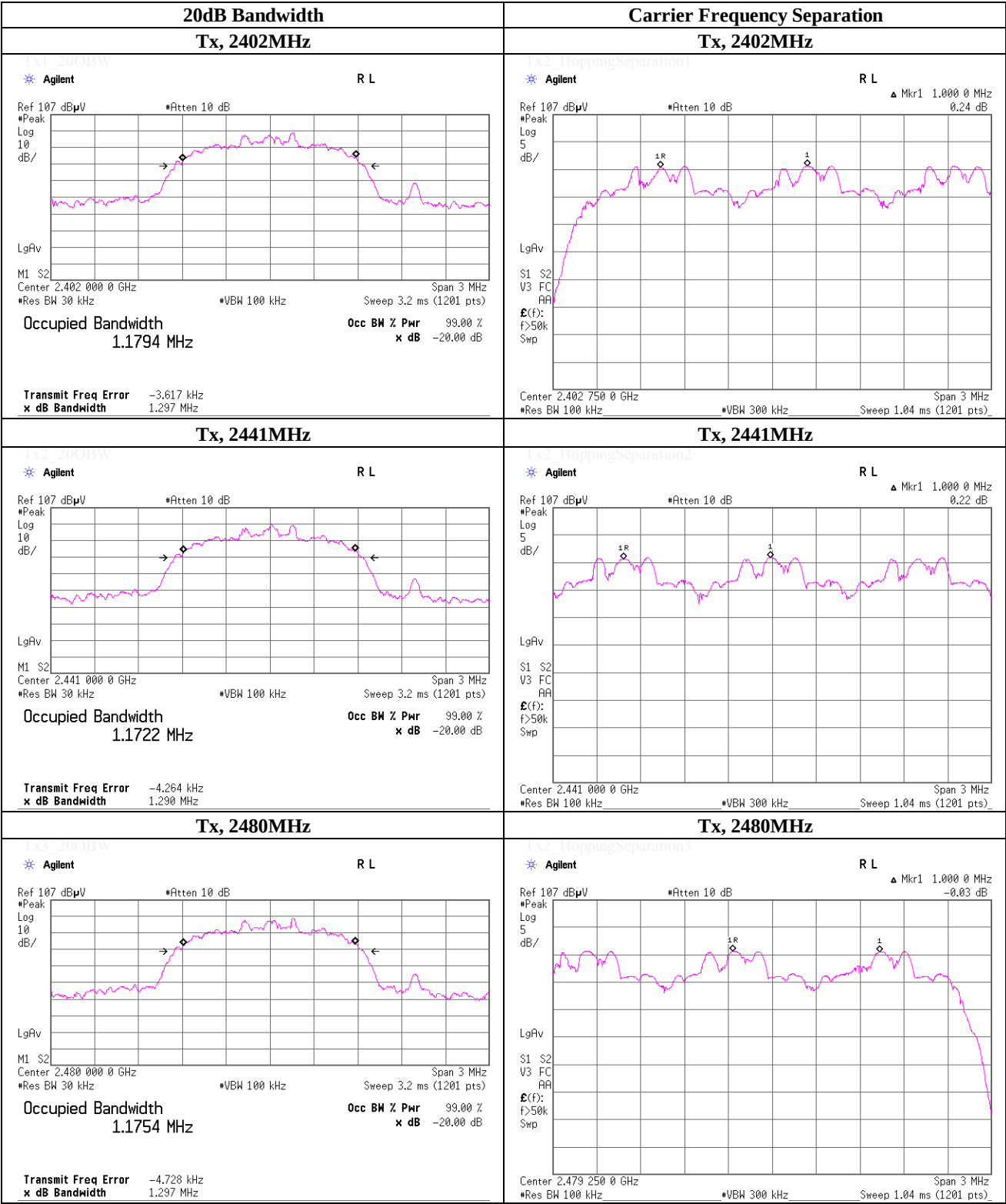
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20dB Bandwidth and Carrier Frequency Separation

Tx, Bluetooth, EDR, PRBS9



Number of Hopping Frequency

Test place

Date

Temperature / Humidity

Engineer

Mode

UL Japan, Inc. Shonan EMC Lab.

September 8, 2012

26 deg.C , 52 %RH

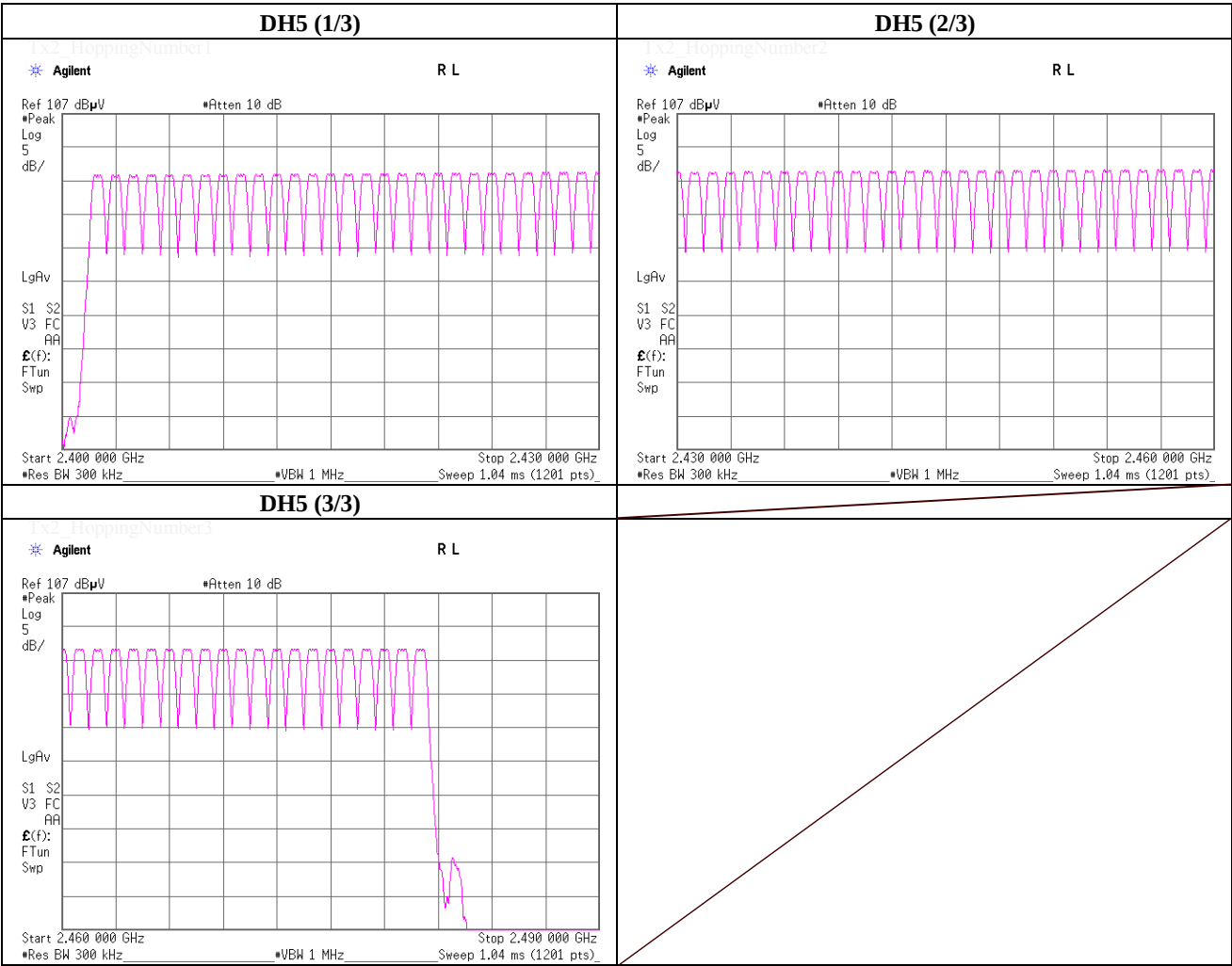
Shinichi Takano

Tx, Bluetooth, BDR, PRBS9

No.5 Shielded Room

Mode	Number of Channel [times]	Limit [times]
DH5	79	>= 15

* Test was not performed at AFH mode whose number of hopping channel is 20 channels because this Bluetooth radio is in compliance of Bluetooth Specification.

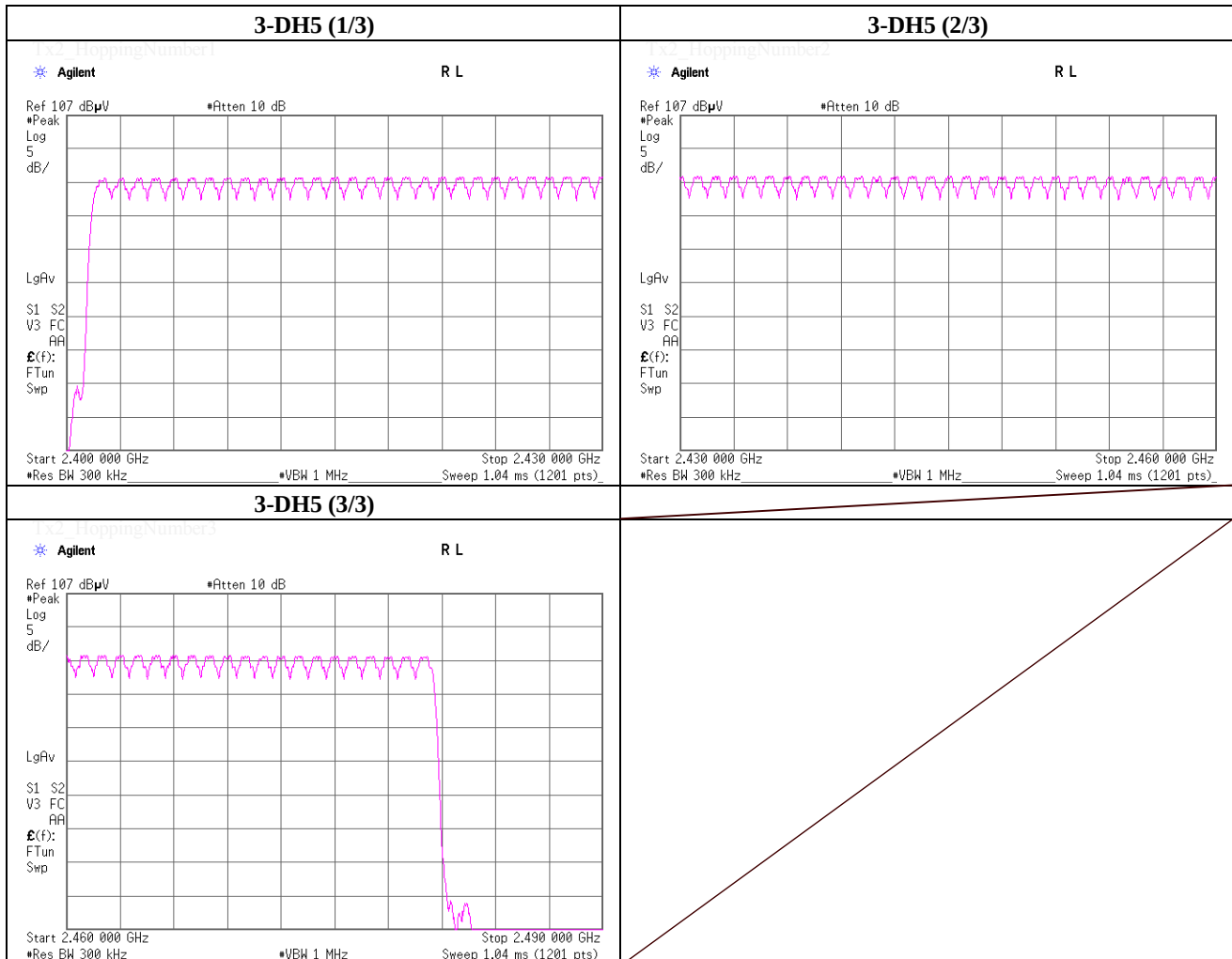


Number of Hopping Frequency

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	September 8, 2012	
Temperature / Humidity	26 deg.C , 52 %RH	
Engineer	Shinichi Takano	
Mode	Tx, Bluetooth, EDR, PRBS9	

Mode	Number of Channel [times]	Limit [times]
3-DH5	79	>= 15

* Test was not performed at AFH mode whose number of hopping channel is 20 channels because this Bluetooth radio is in compliance of Bluetooth Specification.



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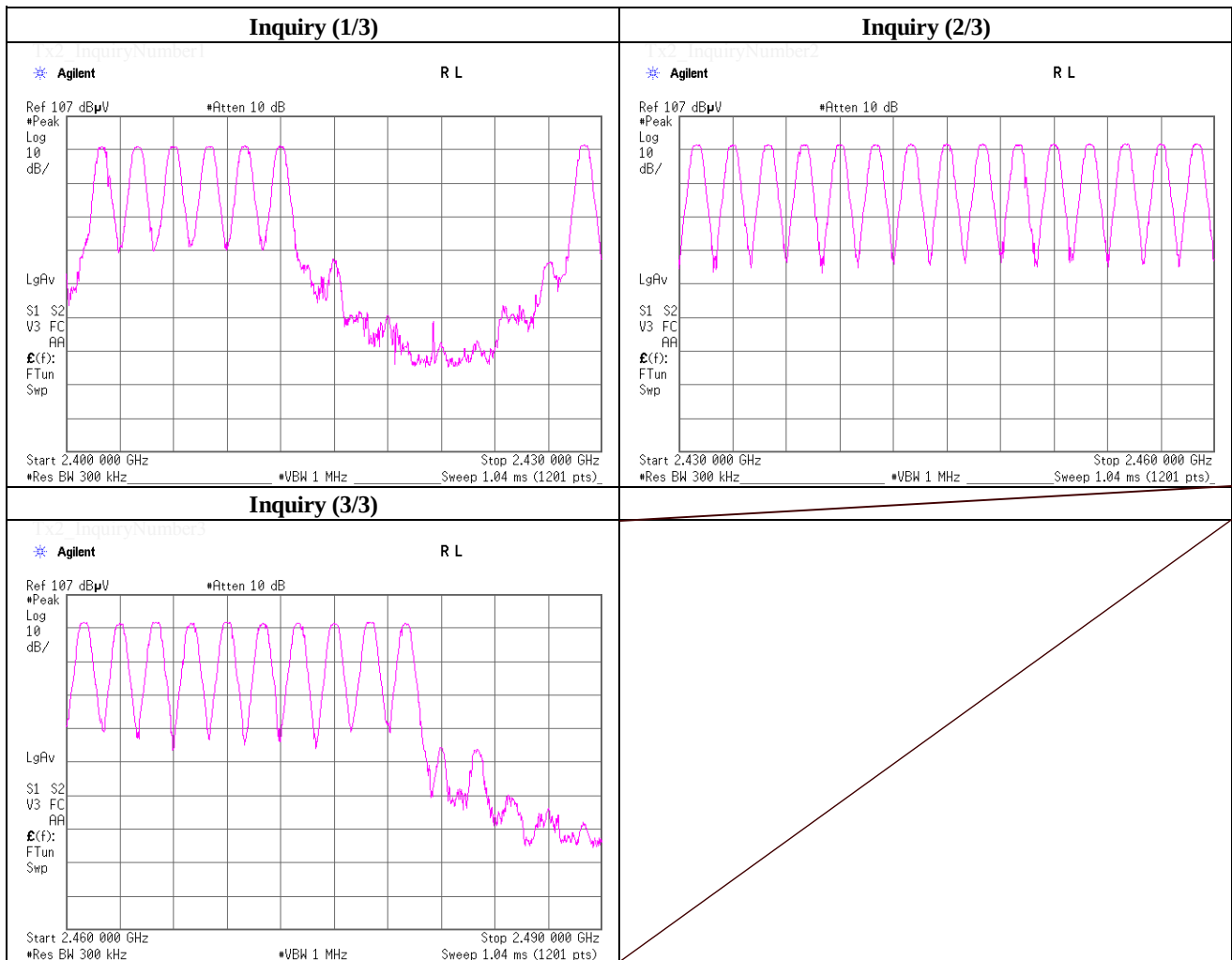
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Number of Hopping Frequency

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	September 8, 2012	
Temperature / Humidity	26 deg.C , 52 %RH	
Engineer	Shinichi Takano	
Mode	Tx, Bluetooth, Inquiry	

Mode	Number of Channel [times]	Limit [times]
Inquiry	32	≥ 15



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Dwell Time

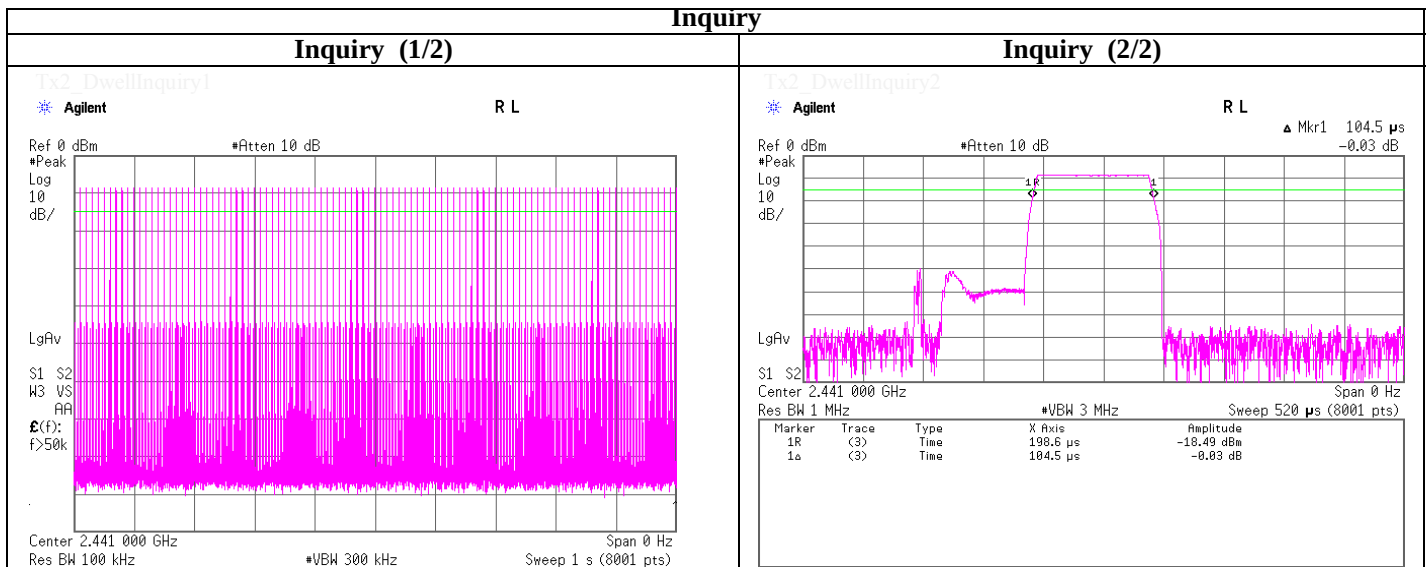
Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
Date September 8, 2012
Temperature / Humidity 26 deg.C , 52 %RH
Engineer Shinichi Takano
Mode Tx, Bluetooth, BDR, PRBS9

Mode	Number of transmission in a 31.6 (79 Hopping x 0.4) / 12.8 (32 Hopping x 0.4) second period		Length of transmission time [msec]	Result [msec]	Limit [msec]
DH1	51.0	/ 5.0 sec. x 31.6 sec. = 323 times	0.403	130	400
DH3	26.0	/ 5.0 sec. x 31.6 sec. = 165 times	1.659	274	400
DH5	17.0	/ 5.0 sec. x 31.6 sec. = 108 times	2.908	314	400
Inquiry	100.0	/ 1.0 sec. x 12.8 sec. = 1280 times	0.105	134	400

Sample Calculation

Result = Number of transmission x Length of transmission time

- * This device complies with the Bluetooth protocol for FHSS operation, employing a pseudo random channel selection and hopping rate to ensure that the occupancy time in $N \times 0.4s$, where N is the number of channels being used in the hopping sequence ($20 \leq N \leq 79$), is always less than 0.4s regardless of packet size (DH1, DH3 or DH5). This is confirmed in the test report for $N=79$.



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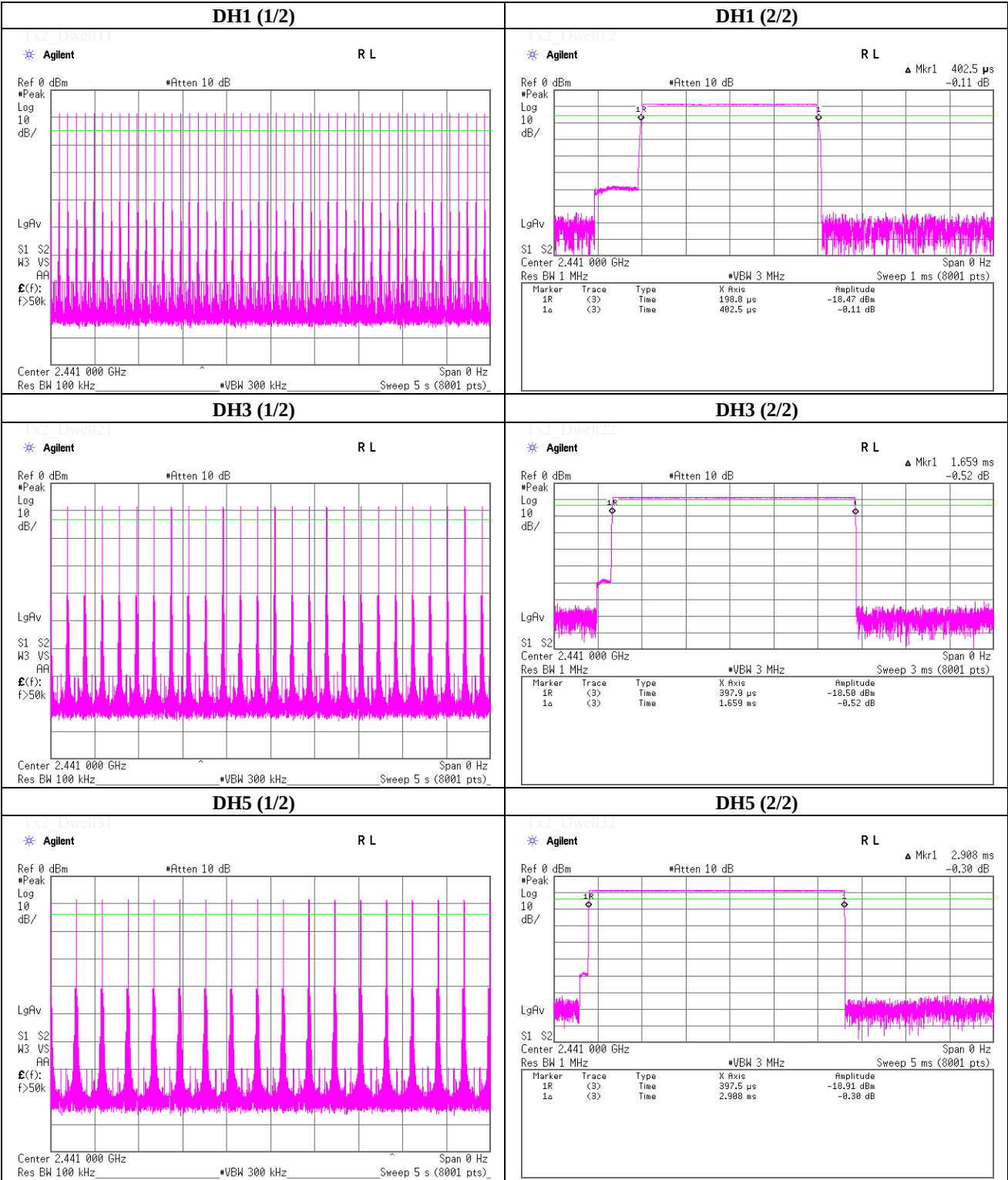
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Dwell time

Tx, Bluetooth, BDR, PRBS9



Dwell Time

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
Date September 8, 2012
Temperature / Humidity 26 deg.C , 52 %RH
Engineer Shinichi Takano
Mode Tx, Bluetooth, EDR, PRBS9

Mode	Number of transmission in a 31.6 (79 Hopping x 0.4) second	Length of transmission time [msec]	Result [msec]	Limit [msec]
3-DH1	51.0 / 5.0 sec. x 31.6 sec. = 323 times	0.417	135	400
3-DH3	26.0 / 5.0 sec. x 31.6 sec. = 165 times	1.668	275	400
3-DH5	17.0 / 5.0 sec. x 31.6 sec. = 108 times	2.919	315	400

Sample Calculation

Result = Number of transmission x Length of transmission time

* This device complies with the Bluetooth protocol for FHSS operation, employing a pseudo random channel selection and hopping rate to ensure that the occupancy time in $N \times 0.4s$, where N is the number of channels being used in the hopping sequence ($20 \leq N \leq 79$), is always less than 0.4s regardless of packet size (3-DH1, 3-DH3 or 3-DH5). This is confirmed in the test report for $N=79$.

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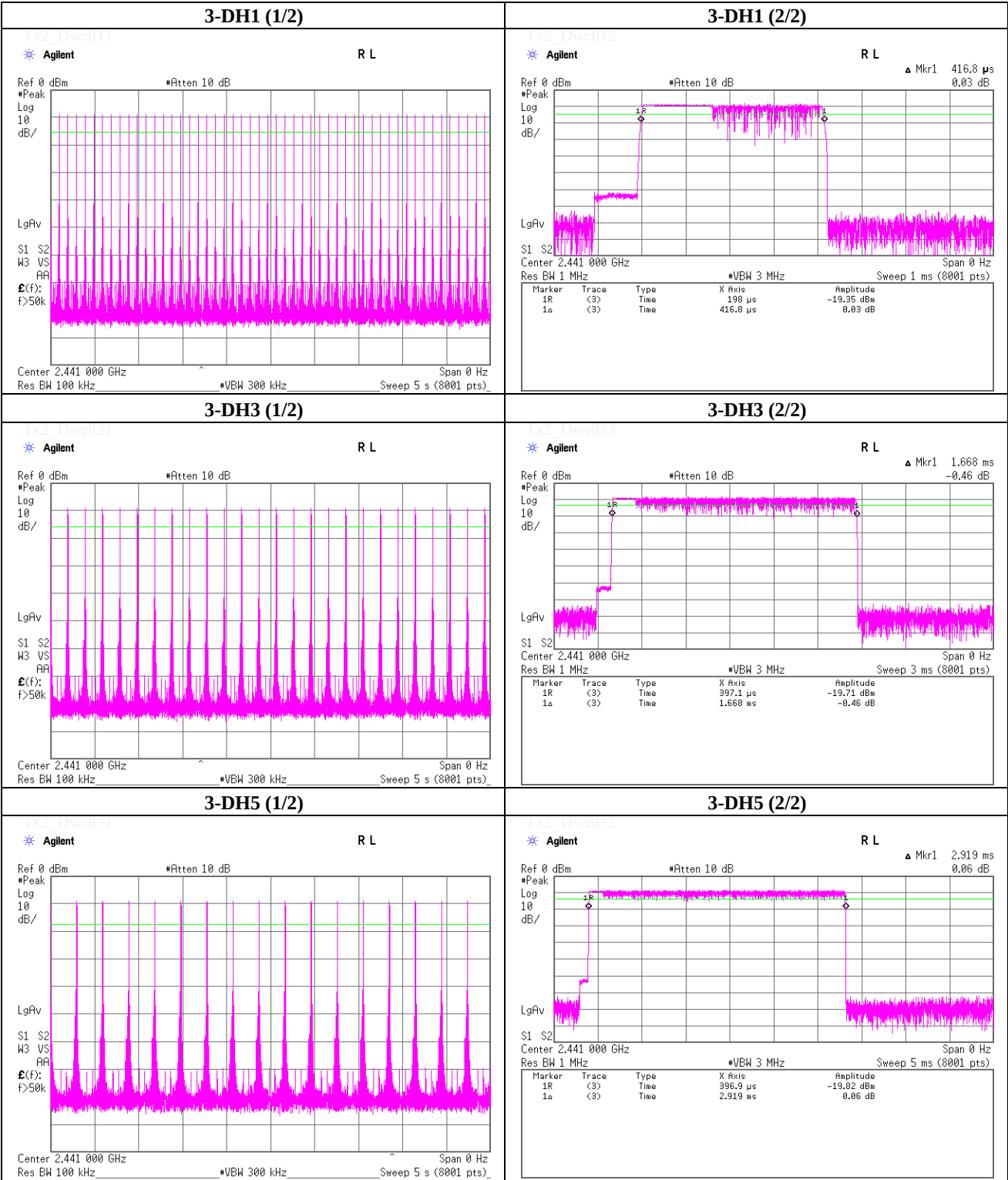
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Dwell time

Tx, Bluetooth, EDR, PRBS9



Peak Output Power (Conducted)

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
Date September 8, 2012
Temperature / Humidity 26 deg.C , 52 %RH
Engineer Shinichi Takano
Mode Tx, Bluetooth

(* P/M: Power Meter with power sensor)

	Freq.	P/M (Peak) Reading	Cable Loss	Atten. Loss	Result		Limit		Margin
	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]
DH5	2402.0	-8.86	0.64	9.97	1.75	1.50	20.97	125	19.22
DH5	2441.0	-8.35	0.65	9.97	2.27	1.69	20.97	125	18.70
DH5	2480.0	-8.14	0.65	9.97	2.48	1.77	20.97	125	18.49
2-DH5	2402.0	-8.28	0.64	9.97	2.33	1.71	20.97	125	18.64
2-DH5	2441.0	-7.96	0.65	9.97	2.66	1.85	20.97	125	18.31
2-DH5	2480.0	-8.26	0.65	9.97	2.36	1.72	20.97	125	18.61
3-DH5	2402.0	-8.17	0.64	9.97	2.44	1.75	20.97	125	18.53
3-DH5	2441.0	-7.87	0.65	9.97	2.75	1.88	20.97	125	18.22
3-DH5	2480.0	-8.11	0.65	9.97	2.51	1.78	20.97	125	18.46

Sample Calculation:

Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss

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Radiated Emission

Test place UL Japan, Inc. Shonan EMC Lab. No.1 Semi Anechoic Chamber
Date September 12, 2012 September 13, 2012
Temperature / Humidity 27deg.C / 57%RH 27deg.C / 59%RH
Engineer Kenichi Adachi Kenichi Adachi
Mode Bluetooth, DH5, Tx 2402MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	33.854	QP	37.3	17.1	7.0	31.8	29.6	40.0	10.4	166	214	
Hori.	113.534	QP	43.7	12.1	8.1	31.8	32.1	43.5	11.4	179	136	
Hori.	202.151	QP	46.6	16.4	9.2	31.7	40.5	43.5	3.0	173	117	
Hori.	335.066	QP	48.5	14.8	7.2	31.7	38.8	46.0	7.2	100	224	
Hori.	1601.995	PK	50.7	25.5	3.2	40.8	38.6	73.9	35.3	100	320	
Hori.	2390.000	PK	45.3	27.6	3.9	40.7	36.1	73.9	37.8	106	91	noise floor level
Hori.	4804.000	PK	58.4	31.2	6.4	41.6	54.4	73.9	19.5	148	21	
Hori.	7206.000	PK	47.6	36.0	7.7	41.2	50.1	73.9	23.8	100	0	noise floor level
Hori.	24020.000	PK	38.4	40.9	-1.4	46.9	31.0	73.9	42.9	100	0	noise floor level
Hori.	1601.995	AV	45.5	25.5	3.2	40.8	33.4	53.9	20.5	100	320	
Hori.	2390.000	AV	33.4	27.6	3.9	40.7	24.2	53.9	29.7	106	91	noise floor level
Hori.	4804.000	AV	52.3	31.2	6.4	41.6	48.3	53.9	5.6	148	21	
Hori.	7206.000	AV	34.6	36.0	7.7	41.2	37.1	53.9	16.8	100	0	noise floor level
Hori.	24020.000	AV	26.1	40.9	-1.4	46.9	18.7	53.9	35.2	100	0	noise floor level
Vert.	33.854	QP	40.4	17.1	7.0	31.8	32.7	40.0	7.3	100	151	
Vert.	196.618	QP	37.3	16.2	9.1	31.8	30.8	43.5	12.7	178	72	
Vert.	202.151	QP	38.8	16.4	9.2	31.7	32.7	43.5	10.8	180	63	
Vert.	575.998	QP	36.7	18.6	8.7	31.9	32.1	46.0	13.9	172	57	
Vert.	1601.995	PK	51.1	25.5	3.2	40.8	39.0	73.9	34.9	117	249	
Vert.	2390.000	PK	45.4	27.6	3.9	40.7	36.2	73.9	37.7	122	329	noise floor level
Vert.	4804.000	PK	55.5	31.2	6.4	41.6	51.5	73.9	22.4	100	177	
Vert.	7206.000	PK	47.7	36.0	7.7	41.2	50.2	73.9	23.7	100	0	noise floor level
Vert.	24020.000	PK	38.5	40.9	-1.4	46.9	31.1	73.9	42.8	100	0	noise floor level
Vert.	1601.995	AV	45.6	25.5	3.2	40.8	33.5	53.9	20.4	117	249	
Vert.	2390.000	AV	33.4	27.6	3.9	40.7	24.2	53.9	29.7	122	329	noise floor level
Vert.	4804.000	AV	48.7	31.2	6.4	41.6	44.7	53.9	9.2	100	177	
Vert.	7206.000	AV	34.7	36.0	7.7	41.2	37.2	53.9	16.7	100	0	noise floor level
Vert.	24020.000	AV	26.0	40.9	-1.4	46.9	18.6	53.9	35.3	100	0	noise floor level

Result = Reading + Ant Factor + Loss(Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)

*Distance factor [dB](15GHz - 40GHz)= 20 x log (3.0[m] / 1.0[m]) = 9.5 [dB]

20dBc Data Sheet (RBW 100kHz, VBW 300kHz)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	94.3	27.6	3.9	40.7	85.1	-	-	carrier
Hori.	2399.477	PK	51.7	27.6	3.9	40.7	42.5	65.1	22.6	
Hori.	2400.000	PK	52.0	27.6	3.9	40.7	42.8	65.1	22.3	
Vert.	2402.000	PK	93.3	27.6	3.9	40.7	84.1	-	-	carrier
Vert.	2399.477	PK	50.8	27.6	3.9	40.7	41.6	64.1	22.5	
Vert.	2400.000	PK	51.1	27.6	3.9	40.7	41.9	64.1	22.2	

Result = Reading + Ant Factor + Loss(Cable+Attenuator+Filter) - Gain(Amplifier)

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Radiated Emission

Test place UL Japan, Inc. Shonan EMC Lab. No.1 Semi Anechoic Chamber
Date September 12, 2012 September 13, 2012
Temperature / Humidity 27deg.C / 57%RH 27deg.C / 59%RH
Engineer Kenichi Adachi Kenichi Adachi
Mode Bluetooth, DH5, Tx 2441MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	33.852	QP	37.1	17.1	7.0	31.8	29.4	40.0	10.6	169	221	
Hori.	113.533	QP	43.4	12.1	8.1	31.8	31.8	43.5	11.7	174	144	
Hori.	202.150	QP	46.4	16.4	9.2	31.7	40.3	43.5	3.2	172	111	
Hori.	335.064	QP	48.4	14.8	7.2	31.7	38.7	46.0	7.3	100	226	
Hori.	351.702	QP	48.5	15.1	7.4	31.7	39.3	46.0	6.7	100	355	
Hori.	1626.662	PK	51.3	25.6	3.2	40.8	39.3	73.9	34.6	100	318	
Hori.	4882.000	PK	55.6	31.3	6.4	41.5	51.8	73.9	22.1	151	23	
Hori.	7323.000	PK	47.6	36.2	8.1	41.2	50.7	73.9	23.2	100	0	noise floor level
Hori.	24410.000	PK	39.1	40.7	-1.5	47.1	31.2	73.9	42.7	100	0	noise floor level
Hori.	1626.662	AV	45.7	25.6	3.2	40.8	33.7	53.9	20.2	100	318	
Hori.	4882.000	AV	47.9	31.3	6.4	41.5	44.1	53.9	9.8	151	23	
Hori.	7323.000	AV	34.6	36.2	8.1	41.2	37.7	53.9	16.2	100	0	noise floor level
Hori.	24410.000	AV	26.8	40.7	-1.5	47.1	18.9	53.9	35.0	100	0	noise floor level
Vert.	33.852	QP	40.1	17.1	7.0	31.8	32.4	40.0	7.6	100	145	
Vert.	202.150	QP	38.5	16.4	9.2	31.7	32.4	43.5	11.1	178	66	
Vert.	575.999	QP	36.1	18.6	8.7	31.9	31.5	46.0	14.5	169	62	
Vert.	1626.662	PK	51.5	25.6	3.2	40.8	39.5	73.9	34.4	100	288	
Vert.	4882.000	PK	53.0	31.3	6.4	41.5	49.2	73.9	24.7	100	173	
Vert.	7323.000	PK	47.5	36.2	8.1	41.2	50.6	73.9	23.3	100	0	noise floor level
Vert.	24410.000	PK	39.2	40.7	-1.5	47.1	31.3	73.9	42.6	100	0	noise floor level
Vert.	1626.662	AV	45.9	25.6	3.2	40.8	33.9	53.9	20.0	100	288	
Vert.	4882.000	AV	45.0	31.3	6.4	41.5	41.2	53.9	12.7	100	173	
Vert.	7323.000	AV	34.5	36.2	8.1	41.2	37.6	53.9	16.3	100	0	noise floor level
Vert.	24410.000	AV	26.8	40.7	-1.5	47.1	18.9	53.9	35.0	100	0	noise floor level

Result = Reading + Ant Factor + Loss(Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)

*Distance factor [dB](15GHz - 40GHz)= 20 x log (3.0[m] / 1.0[m]) = 9.5 [dB]

Radiated Emission

Test place UL Japan, Inc. Shonan EMC Lab. No.1 Semi Anechoic Chamber
Date September 12, 2012 September 13, 2012
Temperature / Humidity 27deg.C / 57%RH 27deg.C / 59%RH
Engineer Kenichi Adachi Kenichi Adachi
Mode Bluetooth, DH5, Tx 2480MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	33.849	QP	36.9	17.1	7.0	31.8	29.2	40.0	10.8	172	212	
Hori.	113.535	QP	43.5	12.1	8.1	31.8	31.9	43.5	11.6	181	142	
Hori.	119.084	QP	42.4	12.9	8.2	31.8	31.7	43.5	11.8	179	147	
Hori.	202.153	QP	46.5	16.4	9.2	31.7	40.4	43.5	3.1	168	121	
Hori.	351.701	QP	48.0	15.1	7.4	31.7	38.8	46.0	7.2	100	348	
Hori.	1652.660	PK	53.0	25.7	3.2	40.8	41.1	73.9	32.8	100	206	
Hori.	2483.500	PK	49.5	27.6	4.0	40.7	40.4	73.9	33.5	139	96	
Hori.	4960.000	PK	54.6	31.5	6.5	41.4	51.2	73.9	22.7	146	26	
Hori.	7440.000	PK	47.8	36.3	8.2	41.3	51.0	73.9	22.9	100	0	noise floor level
Hori.	24800.000	PK	38.8	40.5	-1.5	47.1	30.7	73.9	43.2	100	0	noise floor level
Hori.	1652.660	AV	47.0	25.7	3.2	40.8	35.1	53.9	18.8	100	206	
Hori.	2483.500	AV	37.8	27.6	4.0	40.7	28.7	53.9	25.2	139	96	
Hori.	4960.000	AV	46.9	31.5	6.5	41.4	43.5	53.9	10.4	146	26	
Hori.	7440.000	AV	34.7	36.3	8.2	41.3	37.9	53.9	16.0	100	0	noise floor level
Hori.	24800.000	AV	26.2	40.5	-1.5	47.1	18.1	53.9	35.8	100	0	noise floor level
Vert.	33.849	QP	40.2	17.1	7.0	31.8	32.5	40.0	7.5	100	167	
Vert.	202.153	QP	38.5	16.4	9.2	31.7	32.4	43.5	11.1	100	56	
Vert.	575.997	QP	36.4	18.6	8.7	31.9	31.8	46.0	14.2	173	59	
Vert.	1652.660	PK	53.2	25.7	3.2	40.8	41.3	73.9	32.6	100	86	
Vert.	2483.500	PK	49.4	27.6	4.0	40.7	40.3	73.9	33.6	108	251	
Vert.	4960.000	PK	52.2	31.5	6.5	41.4	48.8	73.9	25.1	100	175	
Vert.	7440.000	PK	47.7	36.3	8.2	41.3	50.9	73.9	23.0	100	0	noise floor level
Vert.	24800.000	PK	38.7	40.5	-1.5	47.1	30.6	73.9	43.3	100	0	noise floor level
Vert.	1652.660	AV	47.4	25.7	3.2	40.8	35.5	53.9	18.4	100	86	
Vert.	2483.500	AV	37.7	27.6	4.0	40.7	28.6	53.9	25.3	108	251	
Vert.	4960.000	AV	44.6	31.5	6.5	41.4	41.2	53.9	12.7	100	175	
Vert.	7440.000	AV	34.6	36.3	8.2	41.3	37.8	53.9	16.1	100	0	noise floor level
Vert.	24800.000	AV	26.1	40.5	-1.5	47.1	18.0	53.9	35.9	100	0	noise floor level

Result = Reading + Ant Factor + Loss(Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)

*Distance factor [dB](15GHz - 40GHz)= 20 x log (3.0[m] / 1.0[m]) = 9.5 [dB]

Radiated Emission

Test place UL Japan, Inc. Shonan EMC Lab. No.1 Semi Anechoic Chamber
Date September 12, 2012 September 13, 2012
Temperature / Humidity 27deg.C / 57%RH 27deg.C / 59%RH
Engineer Kenichi Adachi Kenichi Adachi
Mode Bluetooth, 3-DH5, Tx 2402MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	33.848	QP	37.1	17.1	7.0	31.8	29.4	40.0	10.6	178	217	
Hori.	113.544	QP	43.5	12.1	8.1	31.8	31.9	43.5	11.6	173	132	
Hori.	119.081	QP	42.0	12.9	8.2	31.8	31.3	43.5	12.2	171	137	
Hori.	202.157	QP	46.3	16.4	9.2	31.7	40.2	43.5	3.3	174	108	
Hori.	213.231	QP	45.5	16.6	9.3	31.7	39.7	43.5	3.8	172	112	
Hori.	335.068	QP	48.2	14.8	7.2	31.7	38.5	46.0	7.5	100	229	
Hori.	1601.998	PK	50.7	25.5	3.2	40.8	38.6	73.9	35.3	110	244	
Hori.	2390.000	PK	45.4	27.6	3.9	40.7	36.2	73.9	37.7	122	88	noise floor level
Hori.	4804.000	PK	51.7	31.2	5.8	41.6	47.1	73.9	26.8	149	14	
Hori.	7206.000	PK	47.7	36.0	6.9	41.2	49.4	73.9	24.5	100	0	noise floor level
Hori.	24020.000	PK	38.3	40.9	-1.4	46.9	30.9	73.9	43.0	100	0	noise floor level
Hori.	1601.998	AV	44.9	25.5	3.2	40.8	32.8	53.9	21.1	110	244	
Hori.	2390.000	AV	33.4	27.6	3.9	40.7	24.2	53.9	29.7	122	88	noise floor level
Hori.	4804.000	AV	40.3	31.2	5.8	41.6	35.7	53.9	18.2	149	14	
Hori.	7206.000	AV	34.7	36.0	6.9	41.2	36.4	53.9	17.5	100	0	noise floor level
Hori.	24020.000	AV	26.1	40.9	-1.4	46.9	18.7	53.9	35.2	100	0	noise floor level
Vert.	33.848	QP	39.9	17.1	7.0	31.8	32.2	40.0	7.8	100	153	
Vert.	202.157	QP	38.2	16.4	9.2	31.7	32.1	43.5	11.4	173	73	
Vert.	575.998	QP	36.5	18.6	8.7	31.9	31.9	46.0	14.1	170	54	
Vert.	1601.998	PK	50.9	25.5	3.2	40.8	38.8	73.9	35.1	108	278	
Vert.	2390.000	PK	45.3	27.6	3.9	40.7	36.1	73.9	37.8	100	309	noise floor level
Vert.	4804.000	PK	50.9	31.2	5.8	41.6	46.3	73.9	27.6	100	179	
Vert.	7206.000	PK	47.6	36.0	6.9	41.2	49.3	73.9	24.6	100	0	noise floor level
Vert.	24020.000	PK	38.4	40.9	-1.4	46.9	31.0	73.9	42.9	100	0	noise floor level
Vert.	1601.998	AV	45.1	25.5	3.2	40.8	33.0	53.9	20.9	108	278	
Vert.	2390.000	AV	33.3	27.6	3.9	40.7	24.1	53.9	29.8	100	309	noise floor level
Vert.	4804.000	AV	38.5	31.2	5.8	41.6	33.9	53.9	20.0	100	179	
Vert.	7206.000	AV	34.6	36.0	6.9	41.2	36.3	53.9	17.6	100	0	noise floor level
Vert.	24020.000	AV	26.2	40.9	-1.4	46.9	18.8	53.9	35.1	100	0	noise floor level

Result = Reading + Ant Factor + Loss(Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)

*Distance factor [dB](15GHz - 40GHz)= 20 x log (3.0[m] / 1.0[m]) = 9.5 [dB]

20dBc Data Sheet (RBW 100kHz, VBW 300kHz)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	95.2	27.6	3.9	40.7	86.0	-	-	carrier
Hori.	2399.625	PK	47.1	27.6	3.9	40.7	37.9	66.0	28.1	
Hori.	2400.000	PK	45.5	27.6	3.9	40.7	36.3	66.0	29.7	
Vert.	2402.000	PK	93.6	27.6	3.9	40.7	84.4	-	-	carrier
Vert.	2399.625	PK	45.7	27.6	3.9	40.7	36.5	64.4	27.9	
Vert.	2400.000	PK	45.5	27.6	3.9	40.7	36.3	64.4	28.1	

Result = Reading + Ant Factor + Loss(Cable+Attenuator+Filter) - Gain(Amplifier)

Radiated Emission

Test place UL Japan, Inc. Shonan EMC Lab. No.1 Semi Anechoic Chamber
Date September 12, 2012 September 13, 2012
Temperature / Humidity 27deg.C / 57%RH 27deg.C / 59%RH
Engineer Kenichi Adachi Kenichi Adachi
Mode Bluetooth, 3-DH5, Tx 2441MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	33.829	QP	37.5	17.1	7.0	31.8	29.8	40.0	10.2	163	220	
Hori.	113.537	QP	43.3	12.1	8.1	31.8	31.7	43.5	11.8	184	148	
Hori.	119.087	QP	42.1	12.9	8.2	31.8	31.4	43.5	12.1	182	142	
Hori.	202.158	QP	46.3	16.4	9.2	31.7	40.2	43.5	3.3	172	132	
Hori.	207.696	QP	45.8	16.5	9.2	31.7	39.8	43.5	3.7	171	138	
Hori.	213.233	QP	45.9	16.6	9.3	31.7	40.1	43.5	3.4	170	134	
Hori.	335.064	QP	48.1	14.8	7.2	31.7	38.4	46.0	7.6	100	225	
Hori.	1626.668	PK	50.7	25.6	3.2	40.8	38.7	73.9	35.2	108	247	
Hori.	4882.000	PK	50.6	31.3	5.8	41.5	46.2	73.9	27.7	148	17	
Hori.	7323.000	PK	47.5	36.2	7.2	41.2	49.7	73.9	24.2	100	0	noise floor level
Hori.	24410.000	PK	39.2	40.7	-1.5	47.1	31.3	73.9	42.6	100	0	noise floor level
Hori.	1626.668	AV	45.3	25.6	3.2	40.8	33.3	53.9	20.6	108	247	
Hori.	4882.000	AV	38.7	31.3	5.8	41.5	34.3	53.9	19.6	148	17	
Hori.	7323.000	AV	34.6	36.2	7.2	41.2	36.8	53.9	17.1	100	0	noise floor level
Hori.	24410.000	AV	26.8	40.7	-1.5	47.1	18.9	53.9	35.0	100	0	noise floor level
Vert.	33.829	QP	40.2	17.1	7.0	31.8	32.5	40.0	7.5	100	143	
Vert.	202.158	QP	38.4	16.4	9.2	31.7	32.3	43.5	11.2	172	74	
Vert.	575.999	QP	36.5	18.6	8.7	31.9	31.9	46.0	14.1	168	68	
Vert.	1626.668	PK	51.0	25.6	3.2	40.8	39.0	73.9	34.9	107	267	
Vert.	4882.000	PK	48.9	31.3	5.8	41.5	44.5	73.9	29.4	100	174	
Vert.	7323.000	PK	47.6	36.2	7.2	41.2	49.8	73.9	24.1	100	0	noise floor level
Vert.	24410.000	PK	39.1	40.7	-1.5	47.1	31.2	73.9	42.7	100	0	noise floor level
Vert.	1626.668	AV	45.5	25.6	3.2	40.8	33.5	53.9	20.4	107	267	
Vert.	4882.000	AV	37.1	31.3	5.8	41.5	32.7	53.9	21.2	100	174	
Vert.	7323.000	AV	34.6	36.2	7.2	41.2	36.8	53.9	17.1	100	0	noise floor level
Vert.	24410.000	AV	26.7	40.7	-1.5	47.1	18.8	53.9	35.1	100	0	noise floor level

Result = Reading + Ant Factor + Loss(Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)

*Distance factor [dB](15GHz - 40GHz)= 20 x log (3.0[m] / 1.0[m]) = 9.5 [dB]

Radiated Emission

Test place UL Japan, Inc. Shonan EMC Lab. No.1 Semi Anechoic Chamber
Date September 12, 2012 September 13, 2012
Temperature / Humidity 27deg.C / 57%RH 27deg.C / 59%RH
Engineer Kenichi Adachi Kenichi Adachi
Mode Bluetooth, 3-DH5, Tx 2480MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	33.844	QP	37.2	17.1	7.0	31.8	29.5	40.0	10.5	174	221	
Hori.	113.542	QP	43.6	12.1	8.1	31.8	32.0	43.5	11.5	182	153	
Hori.	202.156	QP	46.5	16.4	9.2	31.7	40.4	43.5	3.1	174	143	
Hori.	213.232	QP	45.9	16.6	9.3	31.7	40.1	43.5	3.4	175	147	
Hori.	335.065	QP	48.3	14.8	7.2	31.7	38.6	46.0	7.4	100	219	
Hori.	346.156	QP	47.8	15.0	7.3	31.7	38.4	46.0	7.6	100	221	
Hori.	1652.662	PK	52.0	25.7	3.2	40.8	40.1	73.9	33.8	106	239	
Hori.	2483.500	PK	48.5	27.6	4.0	40.7	39.4	73.9	34.5	134	87	
Hori.	4960.000	PK	48.3	31.5	5.9	41.4	44.3	73.9	29.6	149	15	
Hori.	7440.000	PK	47.7	36.3	7.3	41.3	50.0	73.9	23.9	100	0	noise floor level
Hori.	24800.000	PK	38.7	40.5	-1.5	47.1	30.6	73.9	43.3	100	0	noise floor level
Hori.	1652.662	AV	46.8	25.7	3.2	40.8	34.9	53.9	19.0	106	239	
Hori.	2483.500	AV	36.4	27.6	4.0	40.7	27.3	53.9	26.6	134	87	
Hori.	4960.000	AV	35.9	31.5	5.9	41.4	31.9	53.9	22.0	149	15	
Hori.	7440.000	AV	34.6	36.3	7.3	41.3	36.9	53.9	17.0	100	0	noise floor level
Hori.	24800.000	AV	26.1	40.5	-1.5	47.1	18.0	53.9	35.9	100	0	noise floor level
Vert.	33.844	QP	39.8	17.1	7.0	31.8	32.1	40.0	7.9	100	156	
Vert.	202.156	QP	38.6	16.4	9.2	31.7	32.5	43.5	11.0	173	78	
Vert.	575.998	QP	36.3	18.6	8.7	31.9	31.7	46.0	14.3	167	67	
Vert.	1652.662	PK	52.8	25.7	3.2	40.8	40.9	73.9	33.0	106	277	
Vert.	2483.500	PK	48.1	27.6	4.0	40.7	39.0	73.9	34.9	100	306	
Vert.	4960.000	PK	48.0	31.5	5.9	41.4	44.0	73.9	29.9	100	173	
Vert.	7440.000	PK	47.8	36.3	7.3	41.3	50.1	73.9	23.8	100	0	noise floor level
Vert.	24800.000	PK	38.8	40.5	-1.5	47.1	30.7	73.9	43.2	100	0	noise floor level
Vert.	1652.662	AV	47.1	25.7	3.2	40.8	35.2	53.9	18.7	106	277	
Vert.	2483.500	AV	36.1	27.6	4.0	40.7	27.0	53.9	26.9	100	306	
Vert.	4960.000	AV	35.7	31.5	5.9	41.4	31.7	53.9	22.2	100	173	
Vert.	7440.000	AV	34.7	36.3	7.3	41.3	37.0	53.9	16.9	100	0	noise floor level
Vert.	24800.000	AV	26.1	40.5	-1.5	47.1	18.0	53.9	35.9	100	0	noise floor level

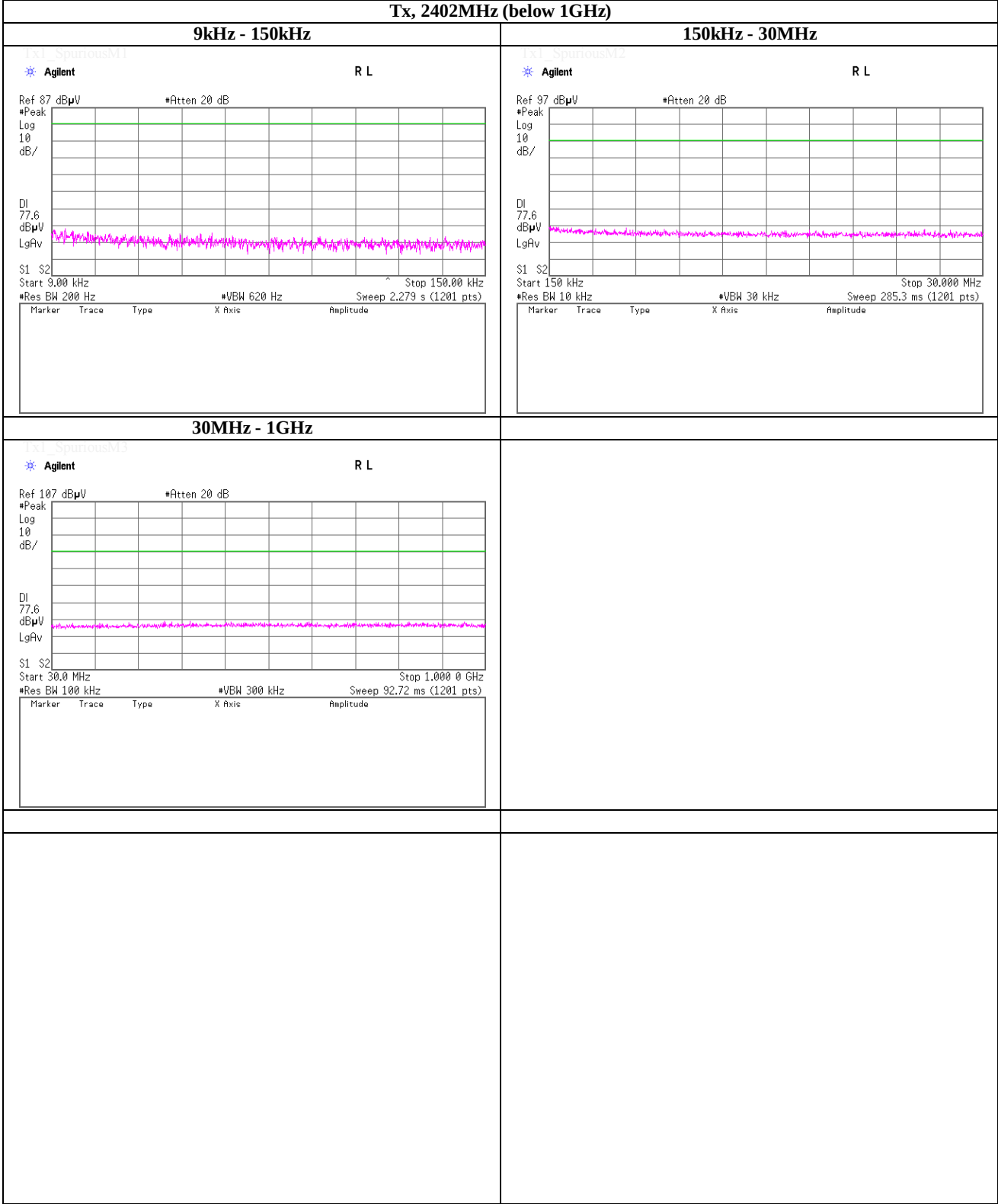
Result = Reading + Ant Factor + Loss(Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)

*Distance factor [dB](15GHz - 40GHz)= 20 x log (3.0[m] / 1.0[m]) = 9.5 [dB]

Spurious emission (Conducted)

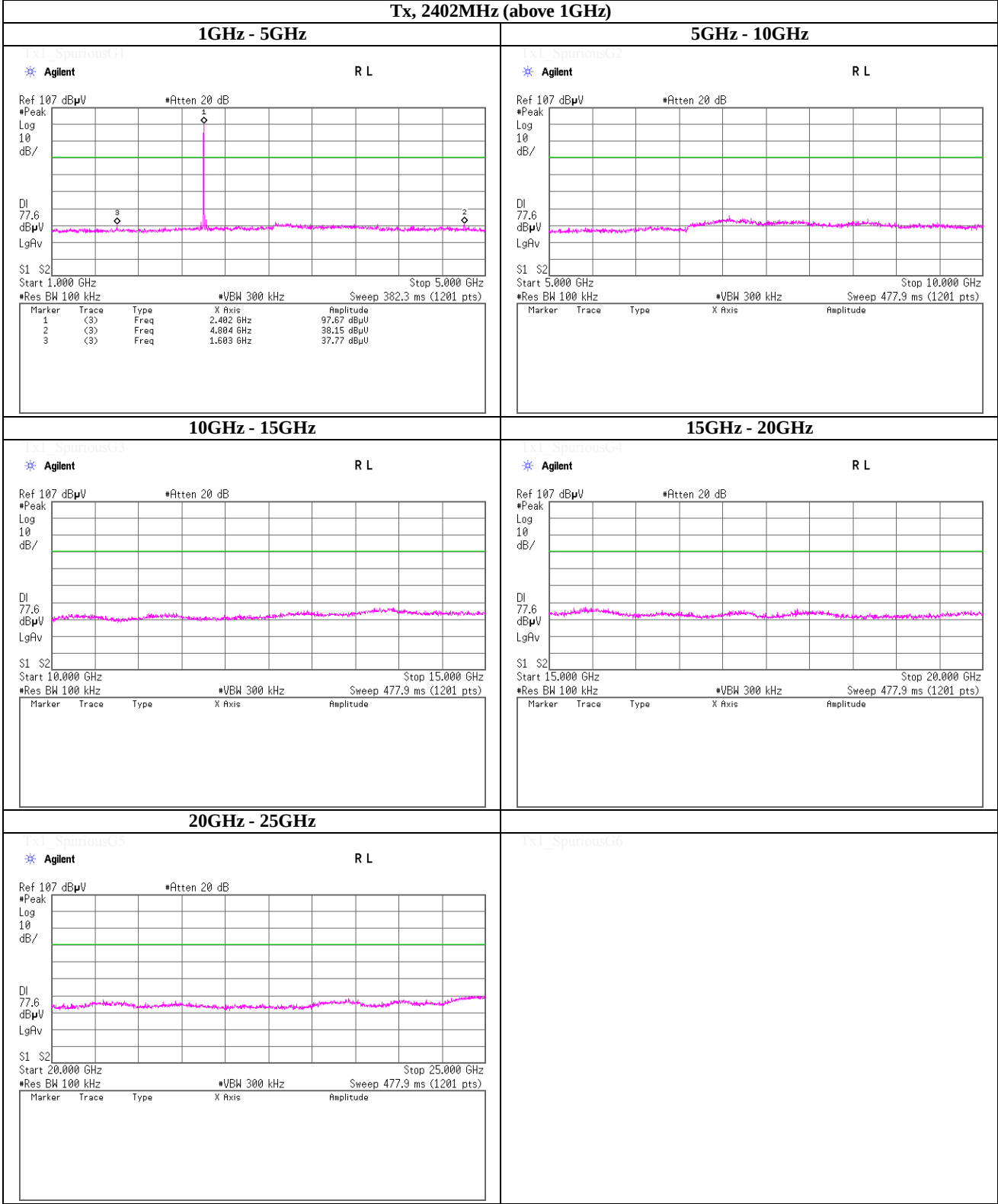
Tx, Bluetooth, BDR, PRBS9

Tx, 2402MHz (below 1GHz)



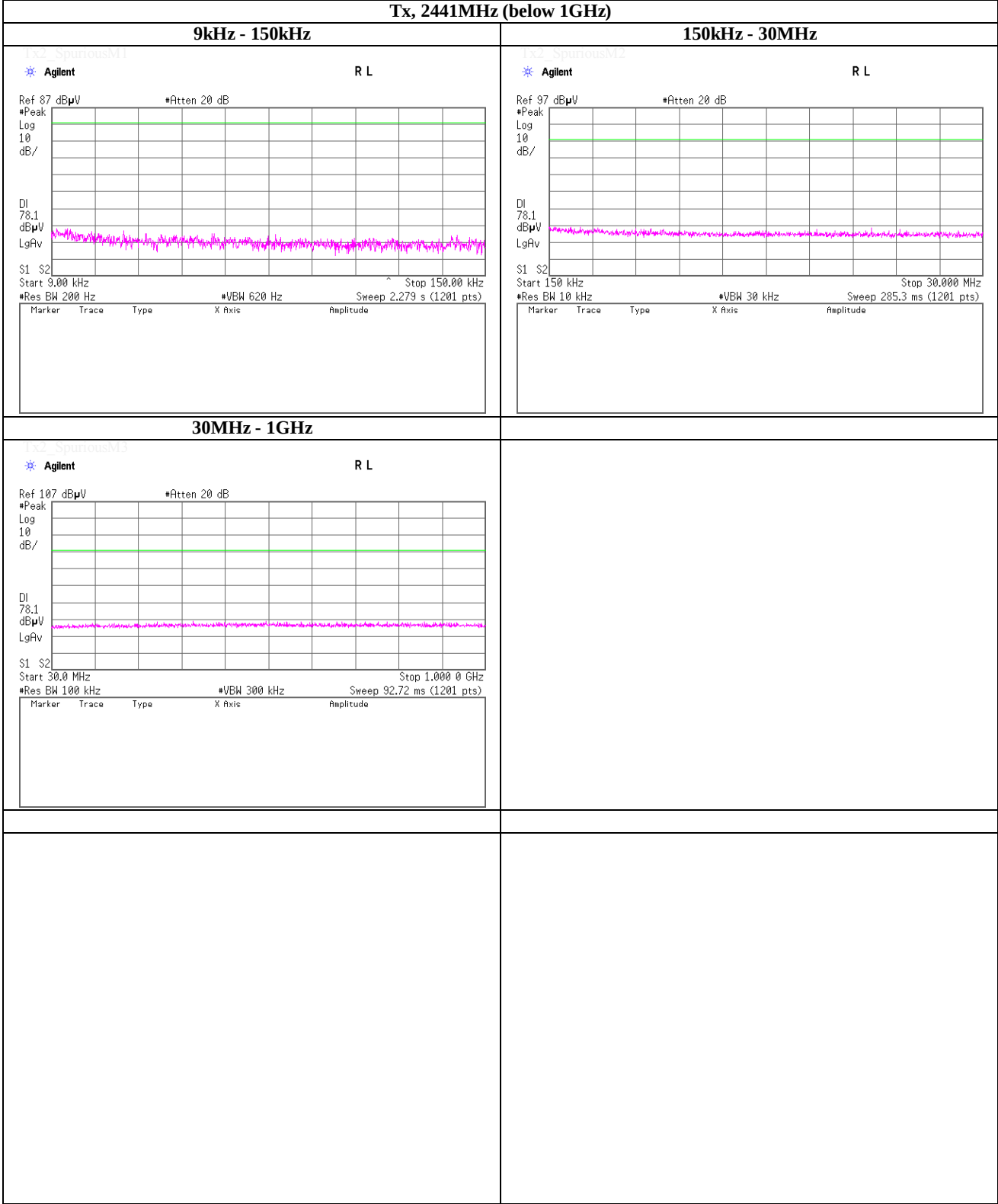
Spurious emission (Conducted)

Tx, Bluetooth, BDR, PRBS9
Tx, 2402MHz (above 1GHz)



Spurious emission (Conducted)

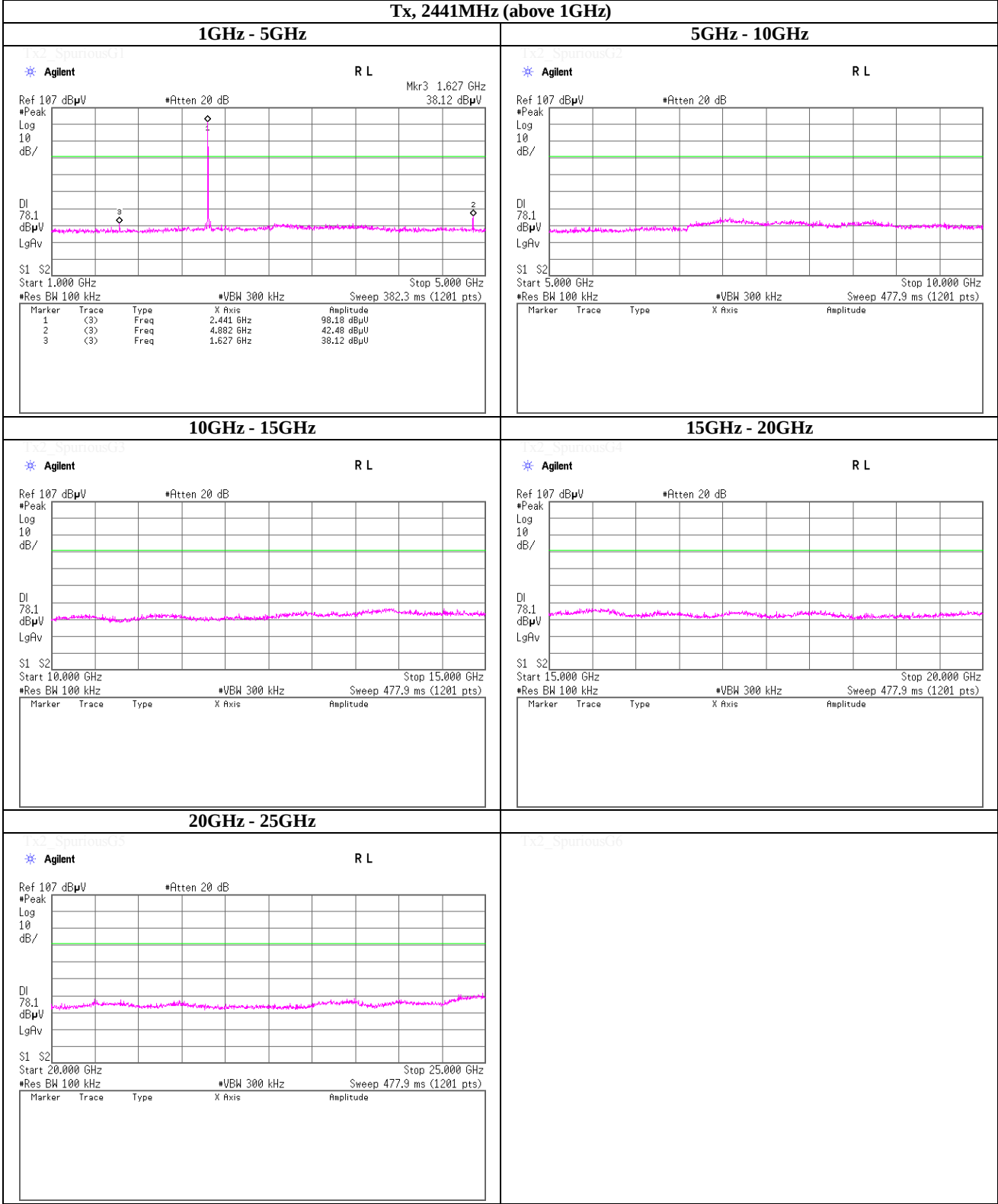
Tx, Bluetooth, BDR, PRBS9
Tx, 2441MHz (below 1GHz)



Spurious emission (Conducted)

Tx, Bluetooth, BDR, PRBS9

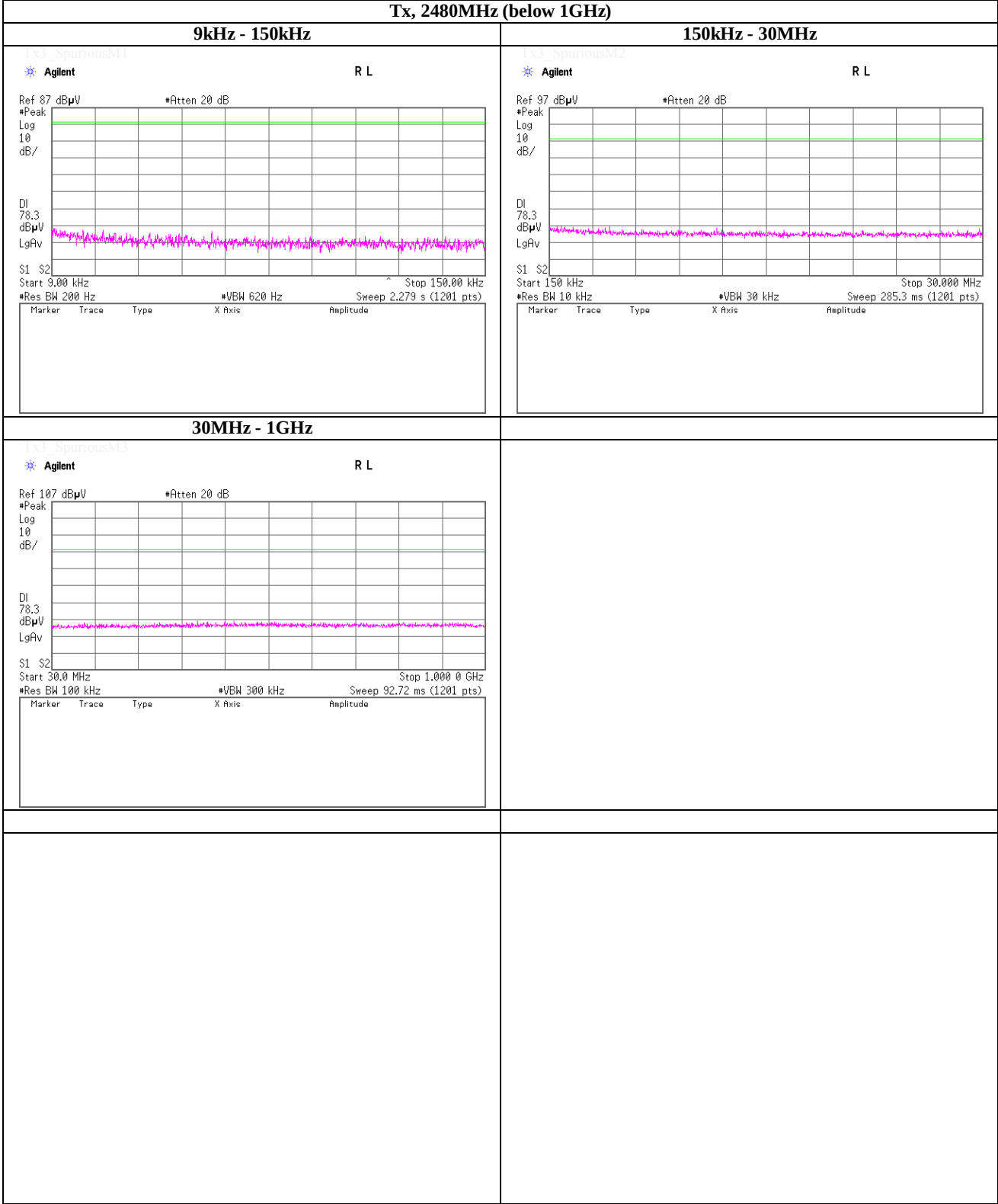
Tx, 2441MHz (above 1GHz)



Spurious emission (Conducted)

Tx, Bluetooth, BDR, PRBS9

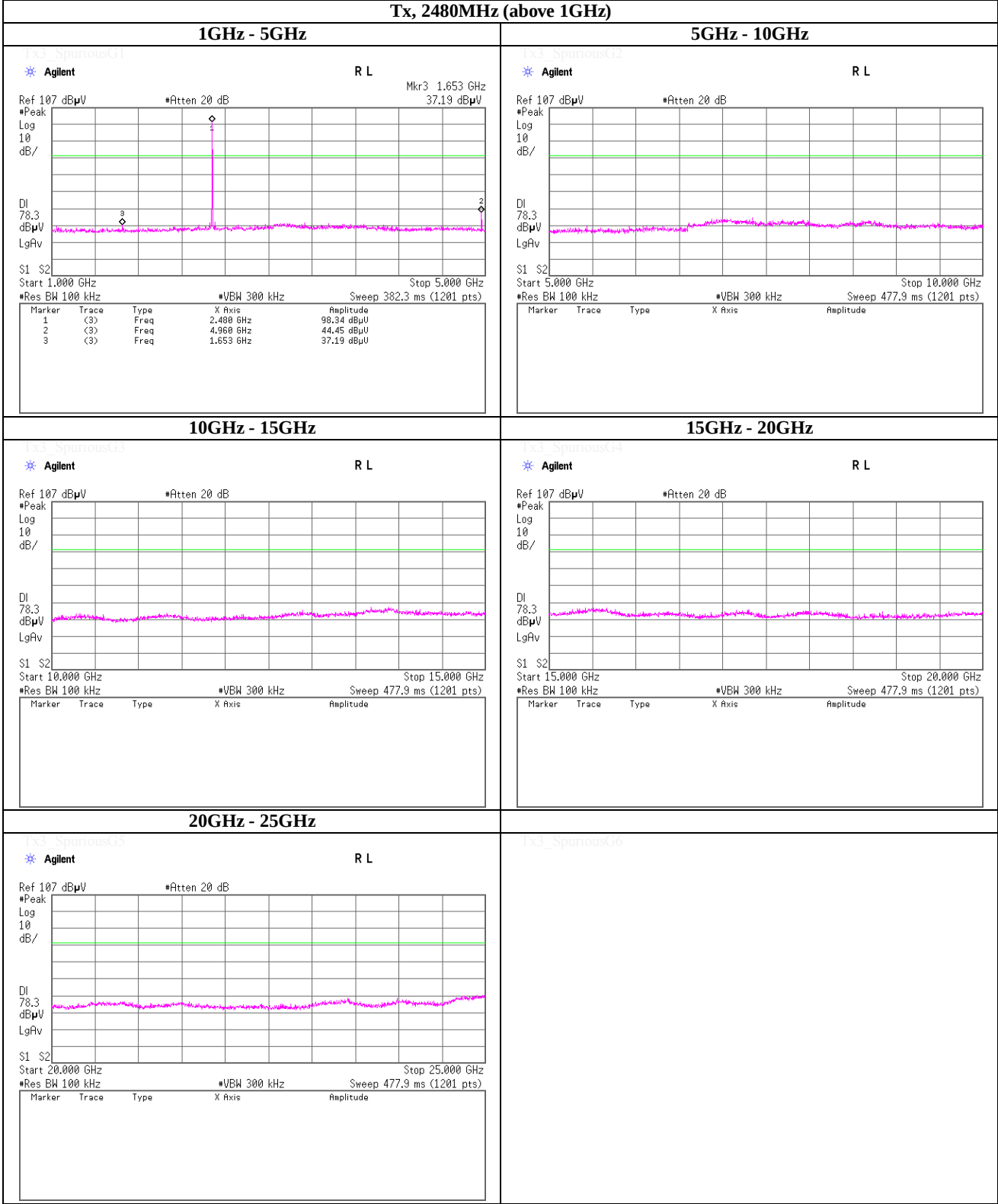
Tx, 2480MHz (below 1GHz)



Spurious emission (Conducted)

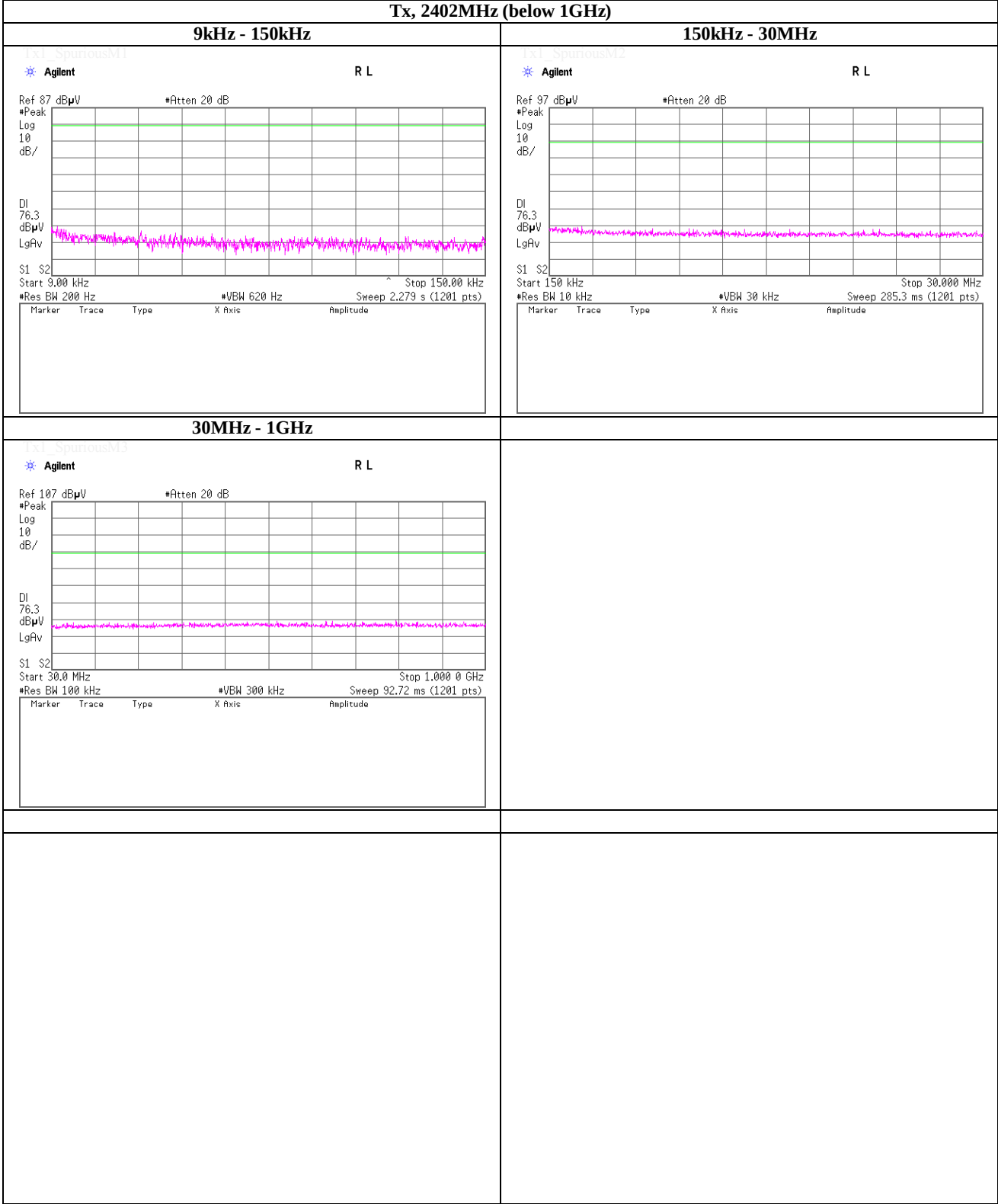
Tx, Bluetooth, BDR, PRBS9

Tx, 2480MHz (above 1GHz)



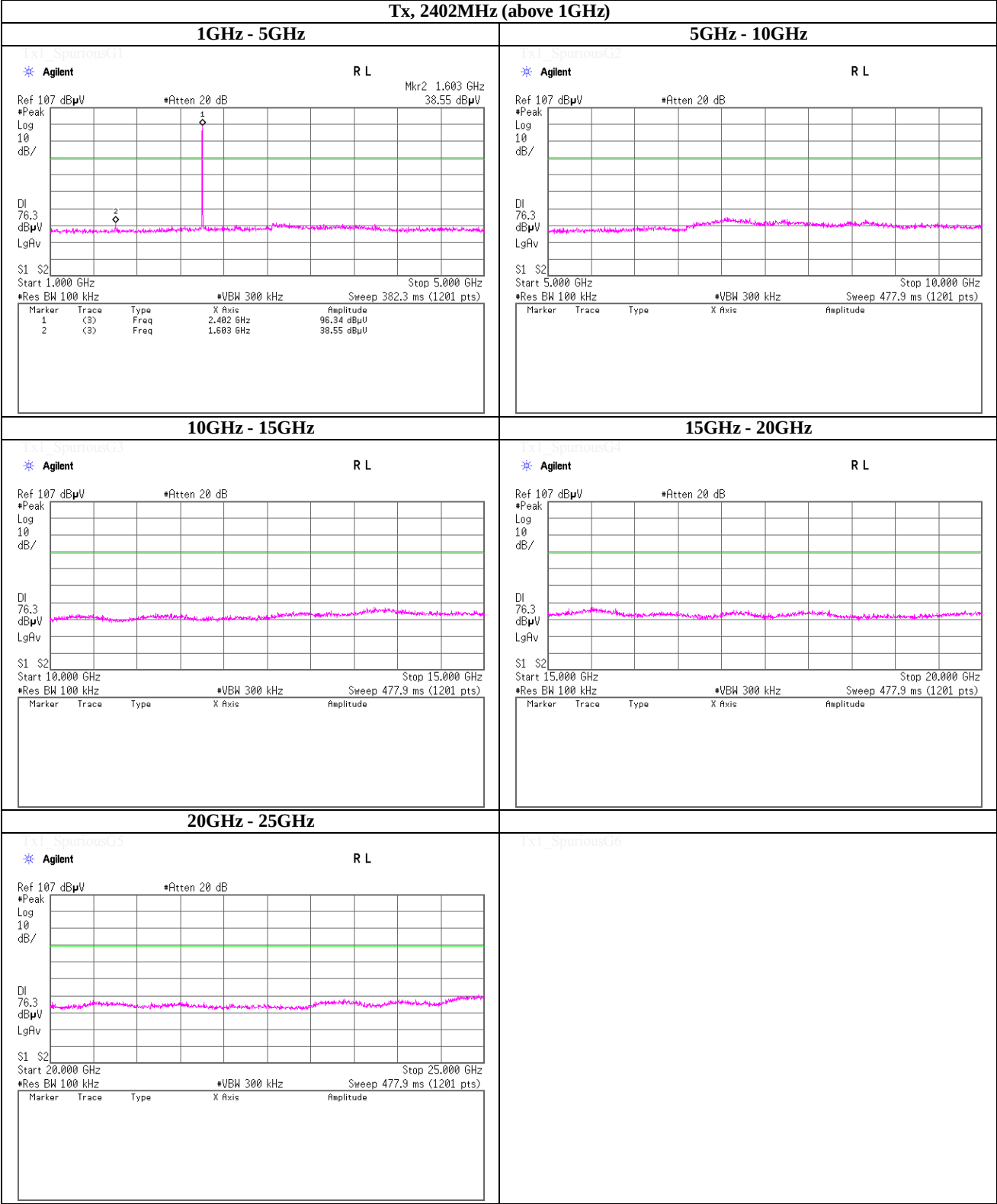
Spurious emission (Conducted)

Tx, Bluetooth, EDR, PRBS9
Tx, 2402MHz (below 1GHz)



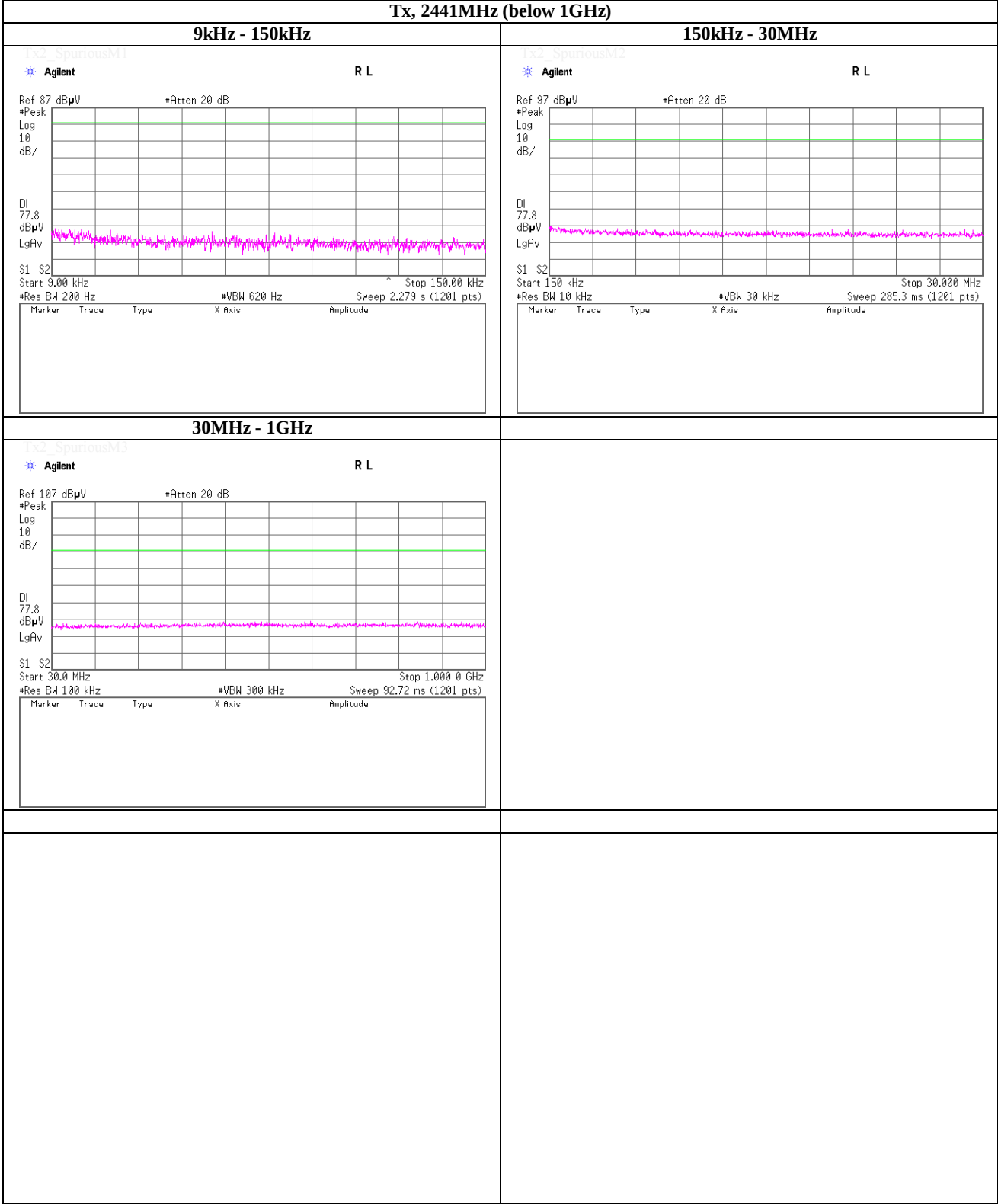
Spurious emission (Conducted)

Tx, Bluetooth, EDR, PRBS9
Tx, 2402MHz (above 1GHz)



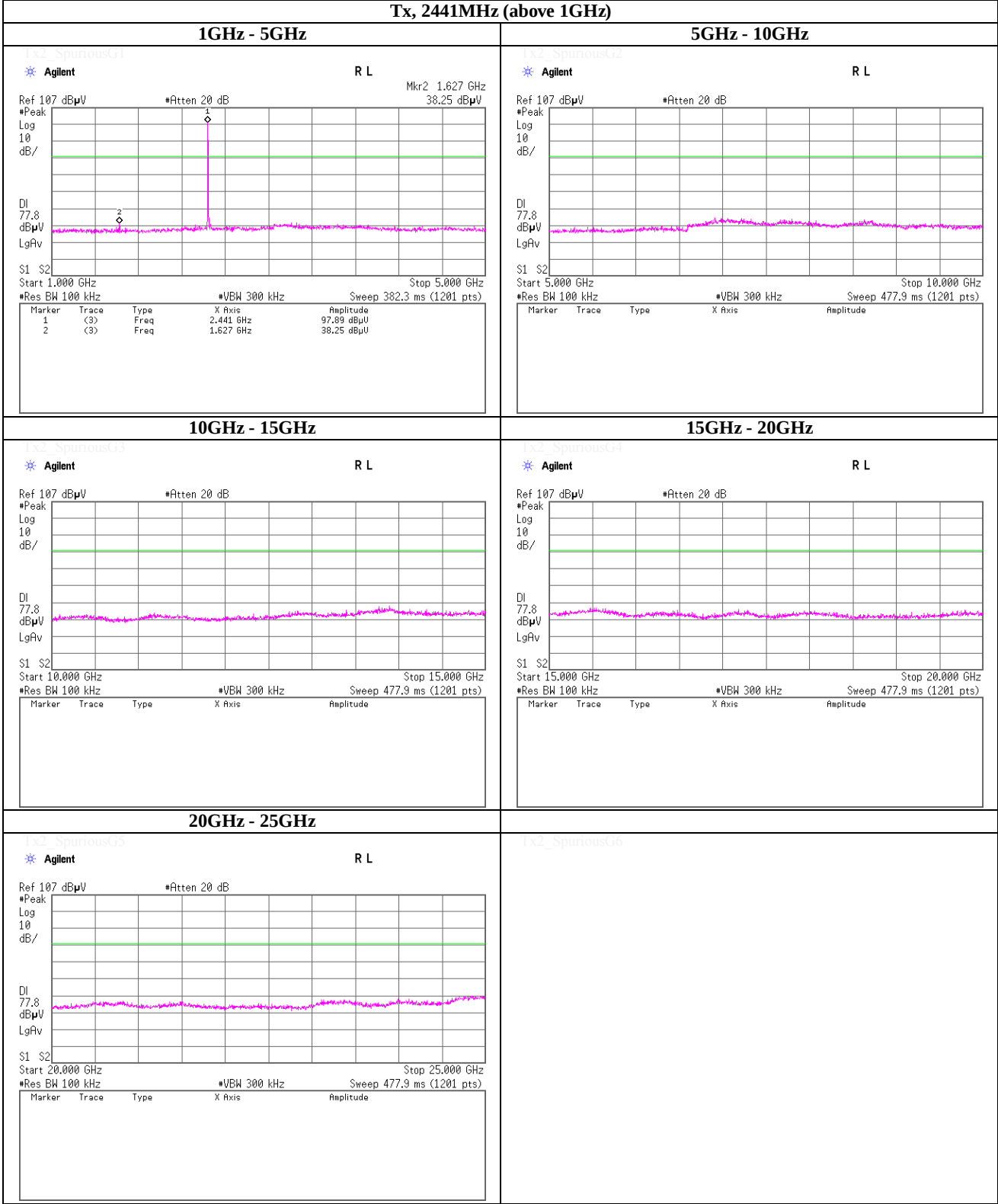
Spurious emission (Conducted)

Tx, Bluetooth, EDR, PRBS9
Tx, 2441MHz (below 1GHz)



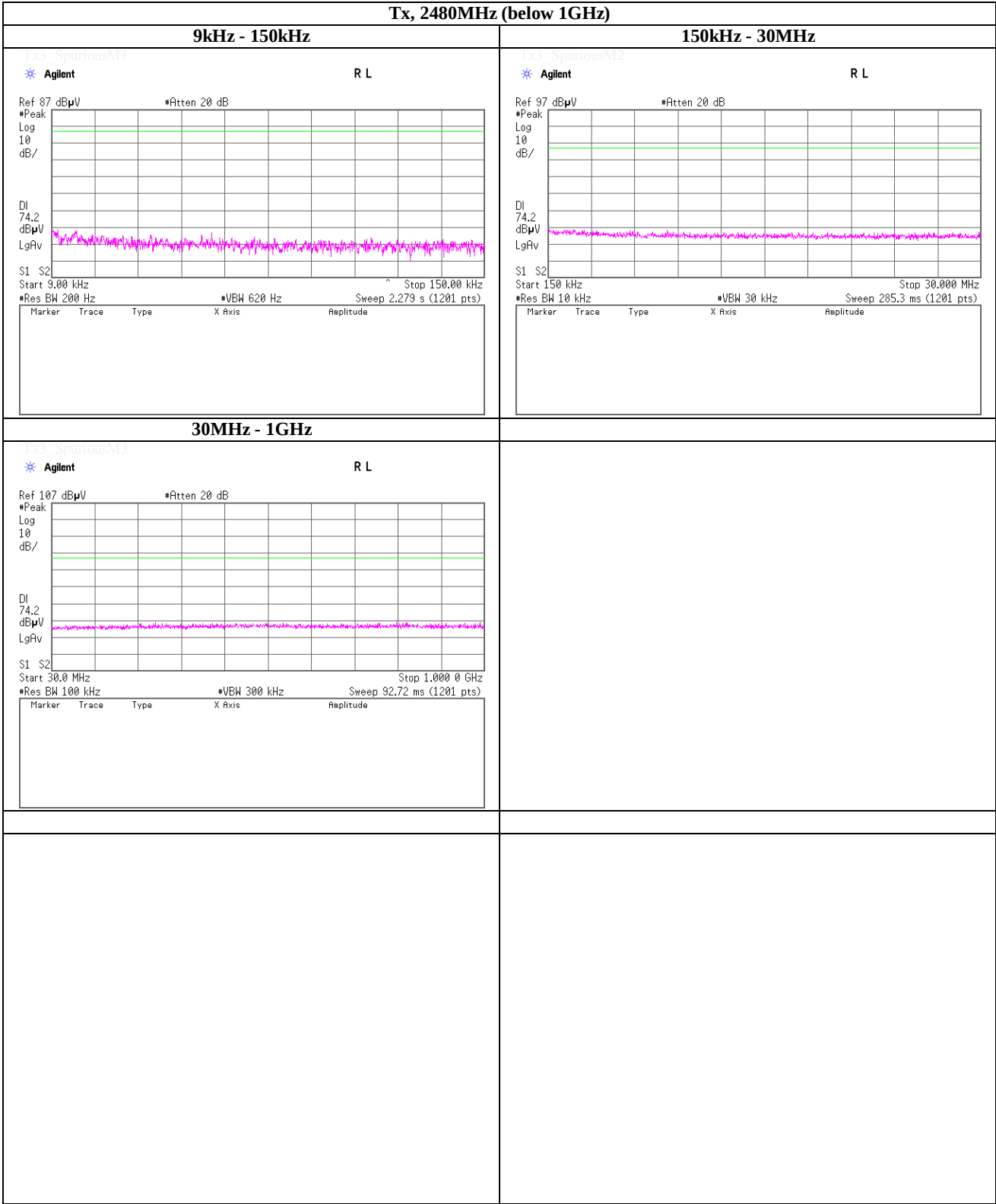
Spurious emission (Conducted)

Tx, Bluetooth, EDR, PRBS9
Tx, 2441MHz (above 1GHz)



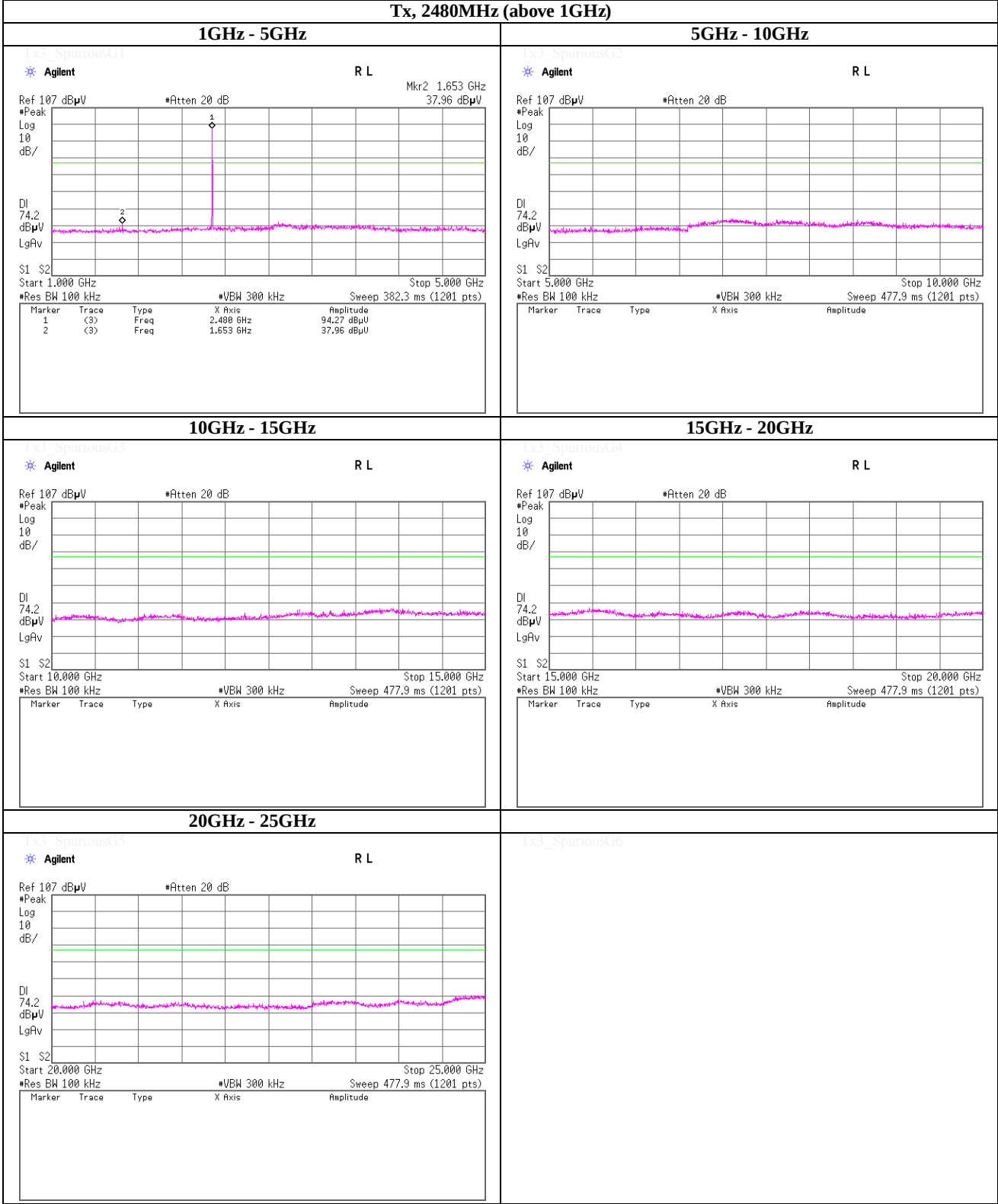
Spurious emission (Conducted)

Tx, Bluetooth, EDR, PRBS9
Tx, 2480MHz (below 1GHz)



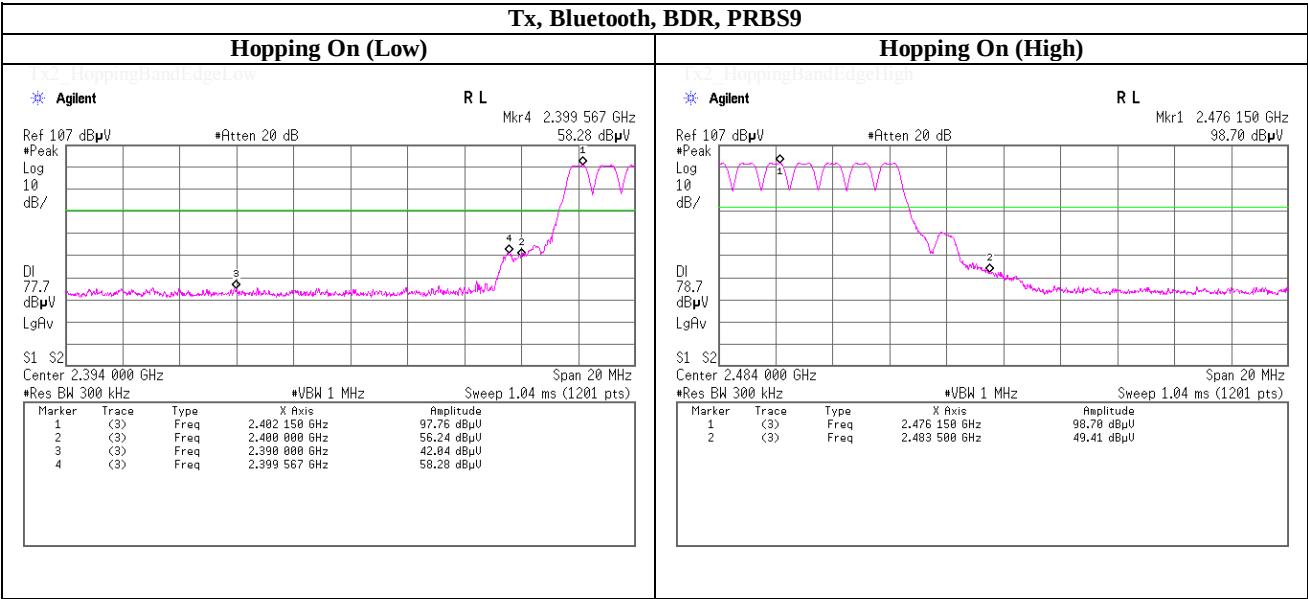
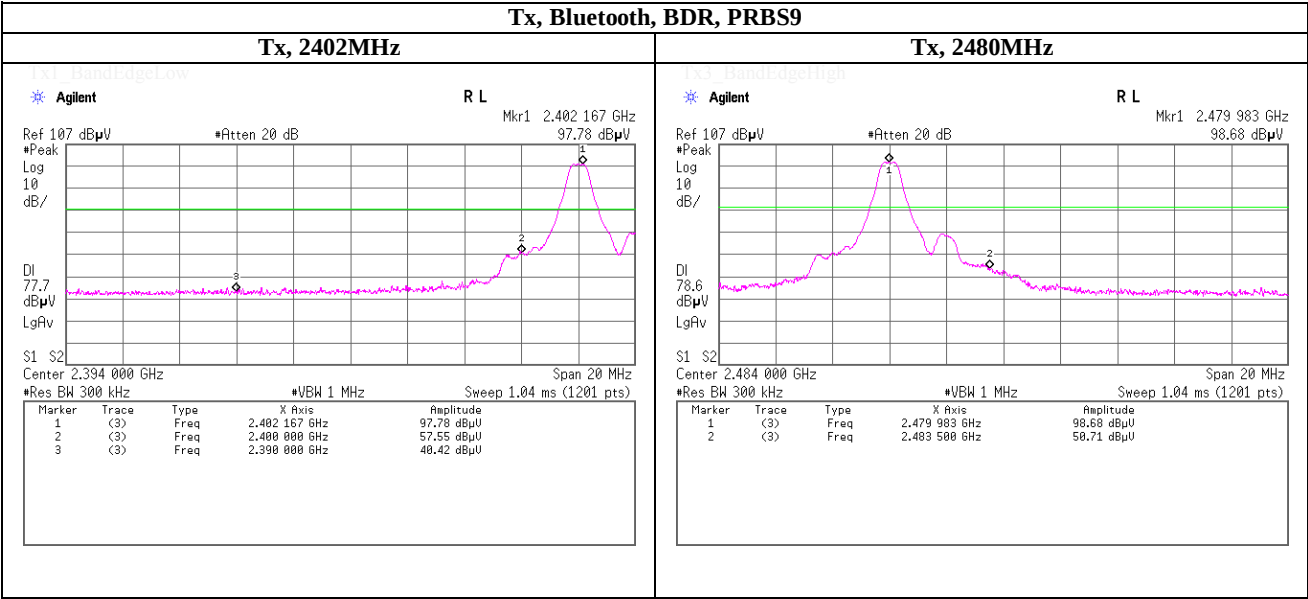
Spurious emission (Conducted)

Tx, Bluetooth, EDR, PRBS9
Tx, 2480MHz (above 1GHz)



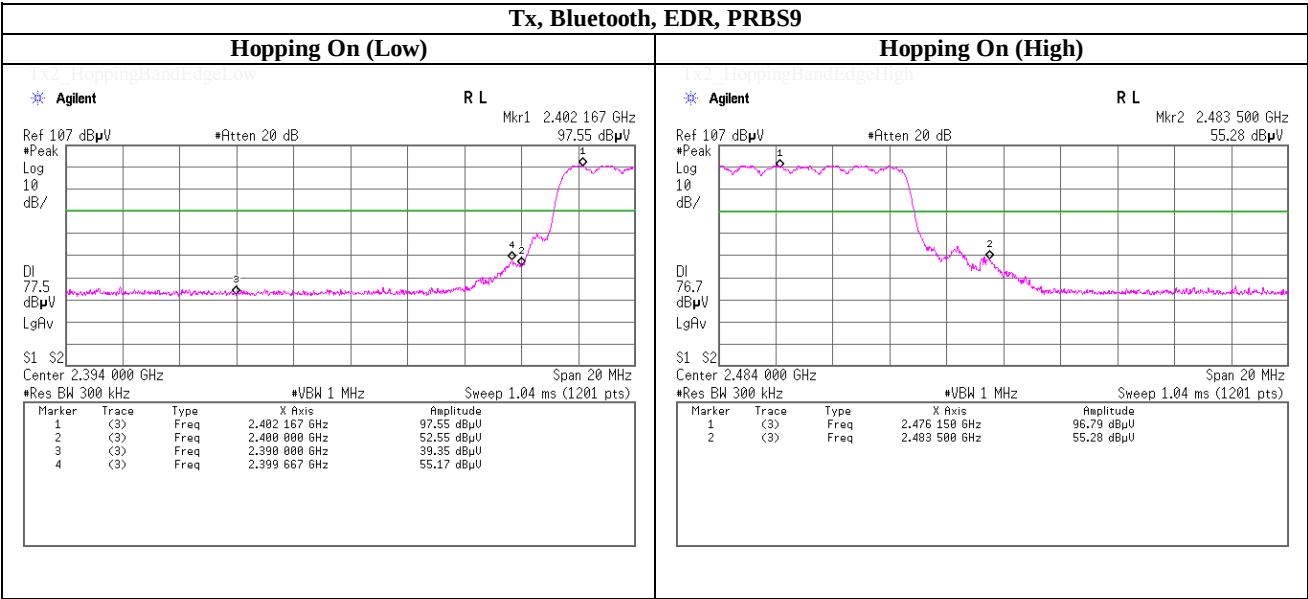
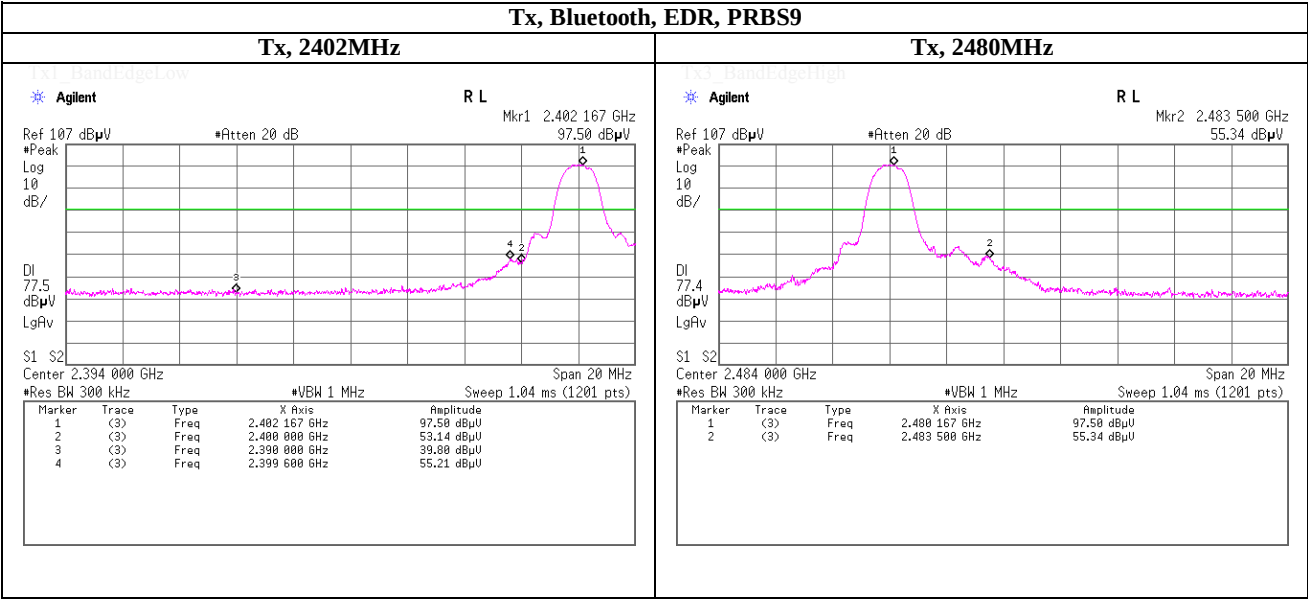
Spurious emission (Conducted)

Band Edge compliance

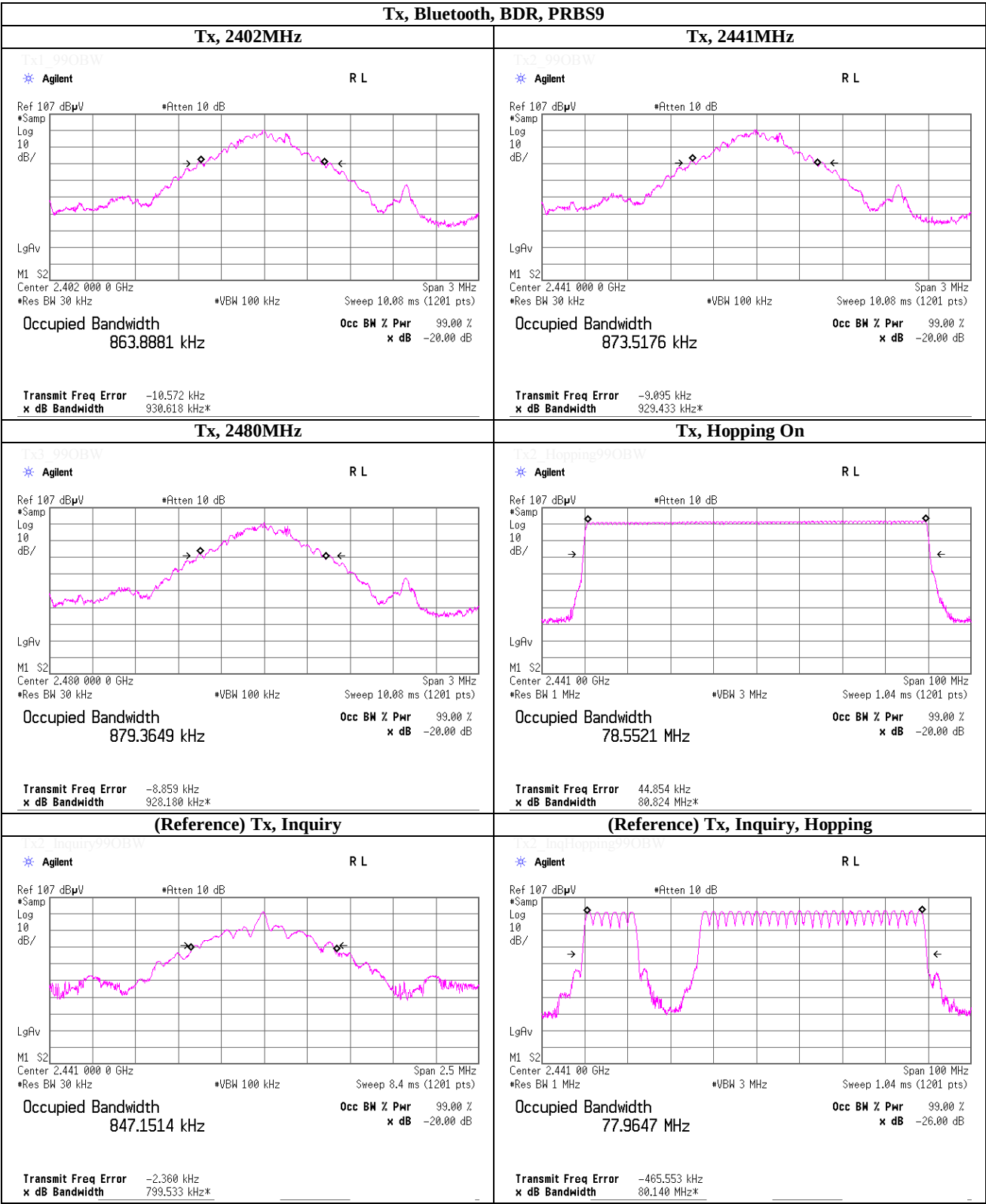


Spurious emission (Conducted)

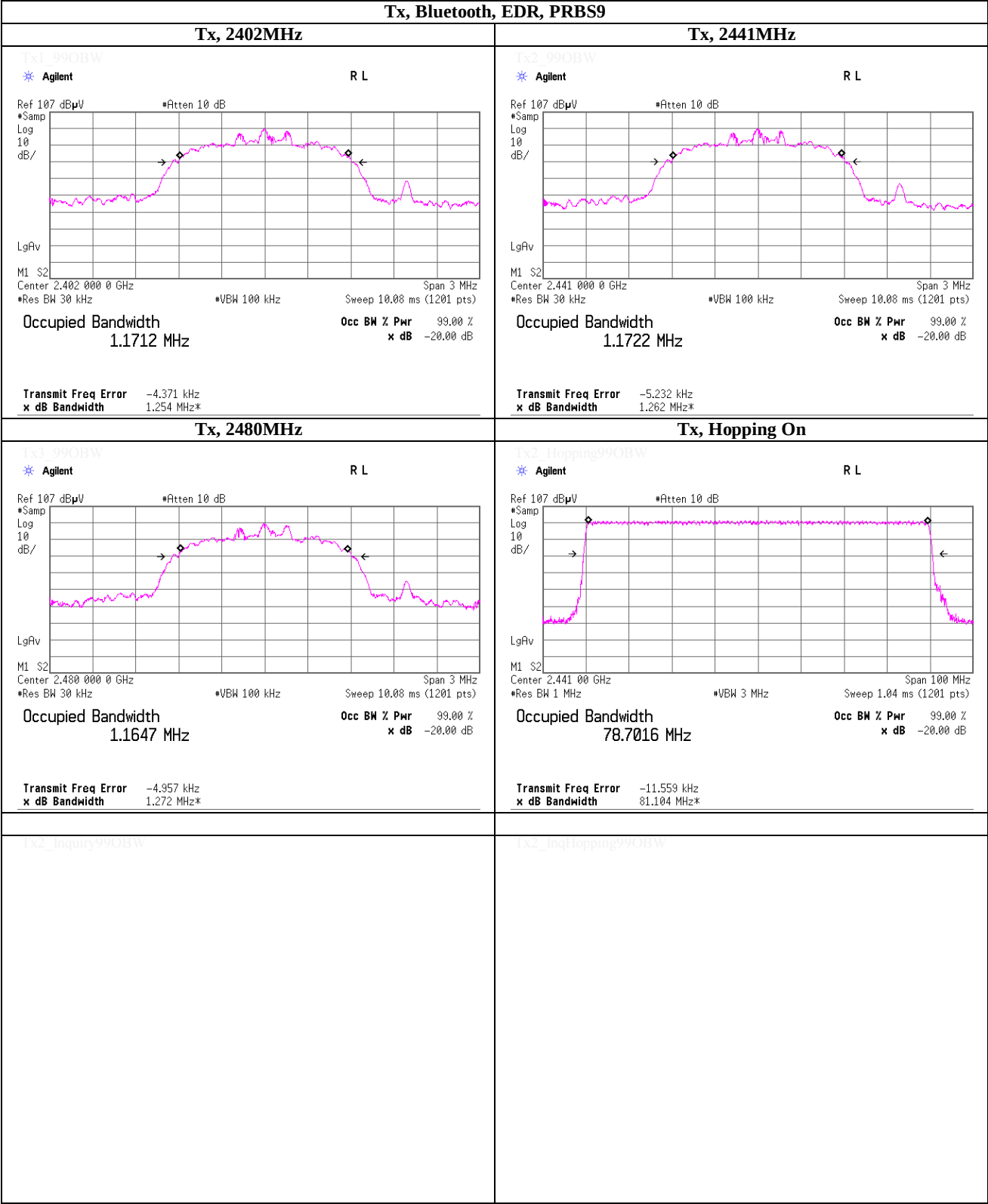
Band Edge compliance



99% Occupied Bandwidth



99% Occupied Bandwidth



Test Report No : 33AE0103-SH-01-A

APPENDIX 2

Test Instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY46180525	AT	2012/02/16 * 12
SAT10-10	Attenuator	Weinschel Corp.	54A-10	37584	AT	2012/04/06 * 12
SCC-G11	Coaxial Cable	Suhner	SUCOFLEX 102	31595/2	AT	2012/03/12 * 12
SPM-06	Power Meter	Anritsu	ML2495A	0850009	AT	2012/04/19 * 12
SPSS-03	Power sensor	Anritsu	MA2411B	0917063	AT	2012/04/19 * 12
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	AT	2012/03/26 * 12
SAEC-01(NSA)	Semi-Anechoic Chamber	TDK	SAEC-01(NSA)	1	RE	2012/09/11 * 12
SAF-04	Pre Amplifier	TOYO Corporation	TPA0118-36	1440489	RE	2012/03/12 * 12
SCC-G01	Coaxial Cable	Suhner	SUCOFLEX 104A	46497/4A	RE	2012/04/10 * 12
SCC-G21	Coaxial Cable	Suhner	SUCOFLEX 104	296169/4	RE	2012/05/22 * 12
SHA-01	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-725	RE	2012/08/20 * 12
SOS-01	Humidity Indicator	A&D	AD-5681	4062555	RE	2012/02/06 * 12
STR-03	Test Receiver	Rohde & Schwarz	ES140	100054/040	RE	2012/06/14 * 12
SJM-08	Measure	PROMART	SEN1935	-	RE	-
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE,RF,LF)	-	RE	-
SHA-04	Horn Antenna	ETS LINDGREN	3160-09	LM3640	RE	2012/03/30 * 12
SAF-08	Pre Amplifier	TOYO Corporation	HAP18-26W	00000019	RE	2012/03/12 * 12
SCC-G17	Coaxial Cable	Suhner	SUCOFLEX 104A	46291/4A	RE	2012/03/12 * 12
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	2011/12/27 * 12
SAF-01	Pre Amplifier	SONOMA	310N	290211	RE	2012/02/10 * 12
SAT6-05	Attenuator	JFW	50HF-006N	-	RE	2012/02/10 * 12
SAT3-04	Attenuator	JFW	50HF-003N	-	RE	2012/02/10 * 12
SBA-01	Biconical Antenna	Schwarzbeck	BBA9106	91032664	RE	2011/10/15 * 12
SCC-A1/A3/A5/A7/A8/A13/SRSE-01	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-269(RF Selector)	RE	2012/04/10 * 12
SCC-A2/A4/A6/A7/A8/A13/SRSE-01	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-269(RF Selector)	RE	2012/04/10 * 12
SLA-01	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP 9108-A 0888	RE	2011/11/23 * 12
STR-01	Test Receiver	Rohde & Schwarz	ESU40	100093	RE	2011/10/22 * 12

The expiration date of the calibration is the end of the expired month .
 As for some calibrations performed after the tested dates , those test equipment have been controlled by means of an unbroken chains of calibrations .

All equipment is calibrated with valid calibrations . Each measurement data is traceable to the national or international standards .

Test Item :

RE: Radiated emission ,

AT: Antenna terminal conducted test