

APPENDIX 1: Data of Radio tests

DATA OF CONDUCTED EMISSION TEST

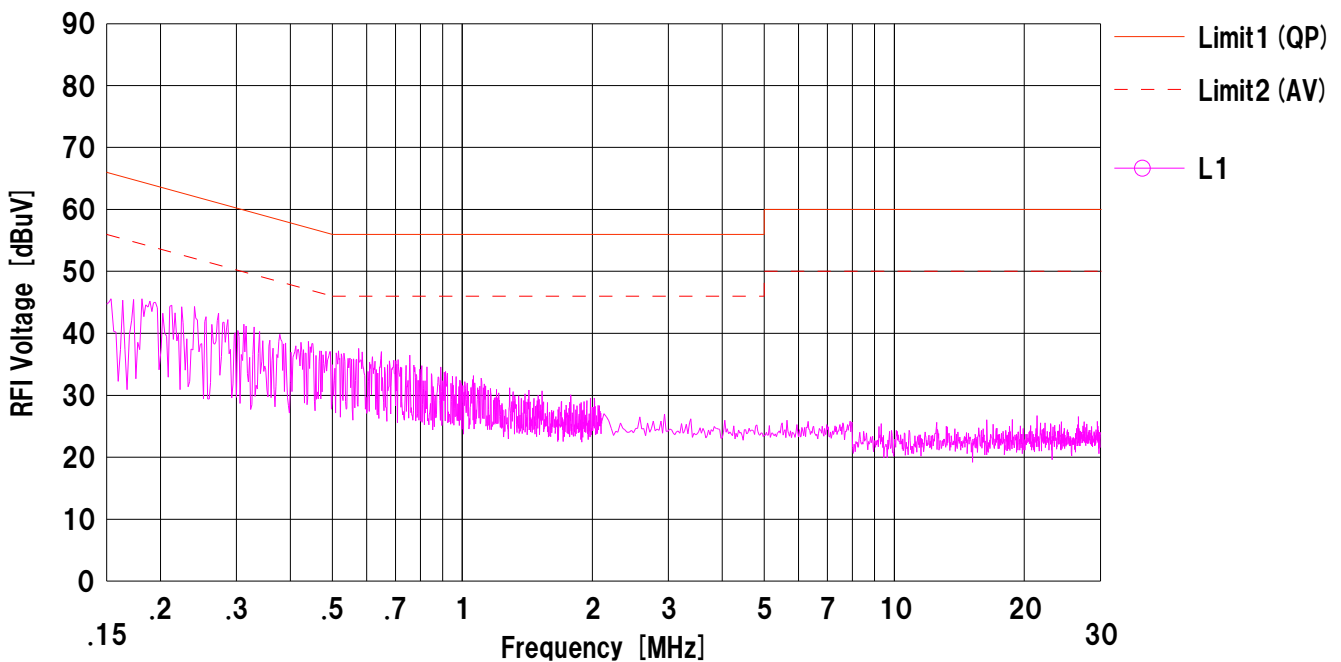
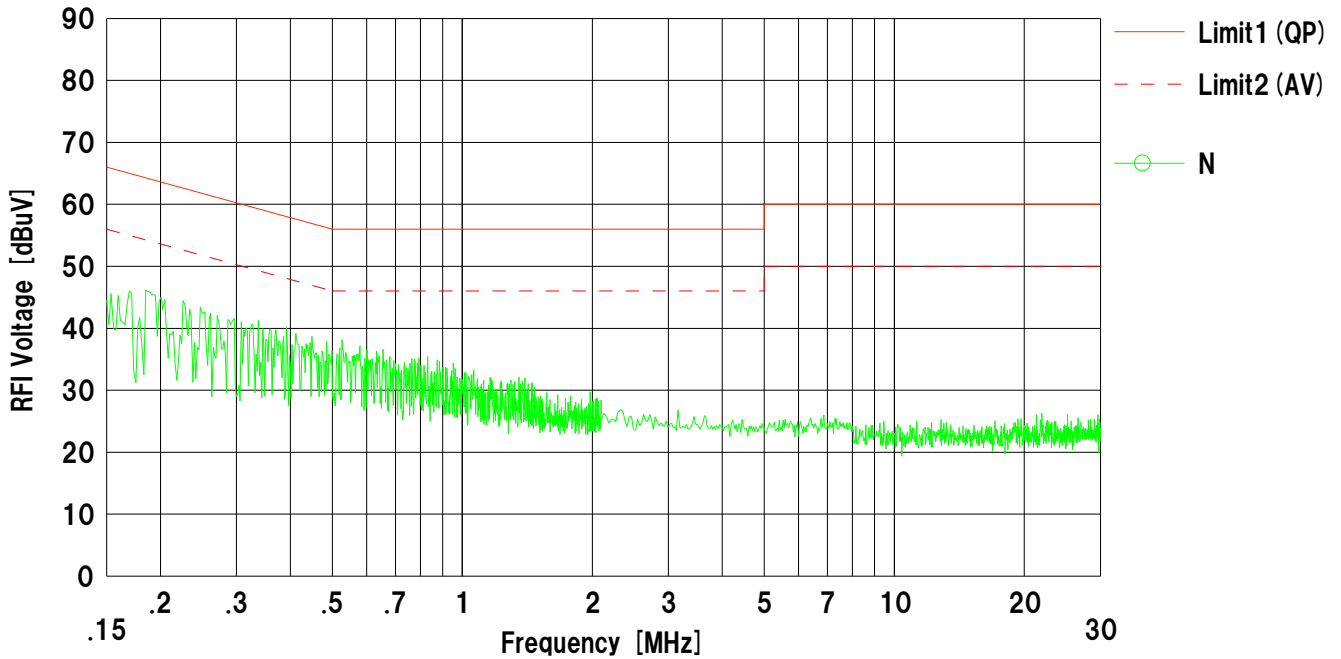
UL Japan, Inc. Shonan EMC Lab. No.1 Shielded Room
Date : 2012/04/23

Company	: Yokogawa Electric Corporation	Mode	: IEEE802.15.4 (Tx2405MHz)
Kind of EUT	: ISA100 Wireless Module	Report No.	: 32DE0368-SH-02-A
Model No.	: F9195KA	Power	: DC 5.0V
Serial No.	: 00:00:64:94:F1:6F	Temp./Humi.	: 22deg.C / 58%RH

Remarks : 2dBi antenna, DC Power Supply AC Input:AC120V/60Hz

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Akira Sato



Calculation:Result [dBuV] =Reading [dBuV] +C.Fac (LISN+Cable+ATT) [dB]
LISN:SLS-01

DATA OF CONDUCTED EMISSION TEST

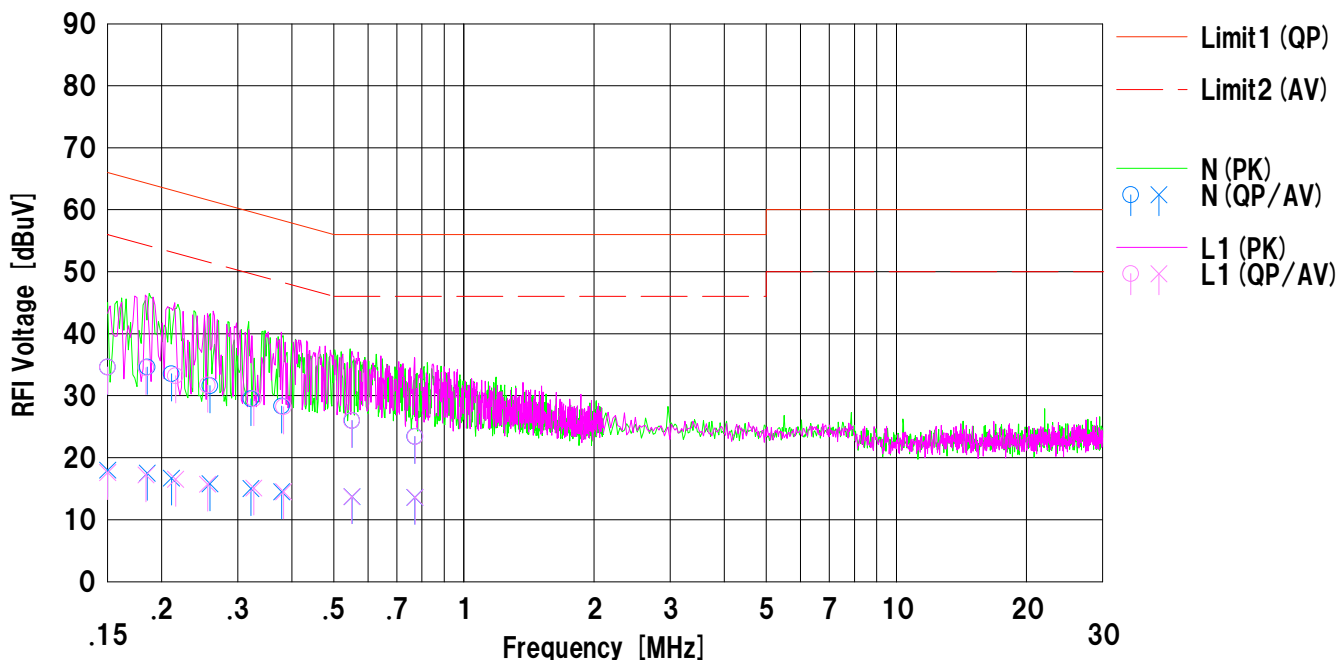
UL Japan, Inc. Shonan EMC Lab. No.1 Shielded Room
Date : 2012/04/23

Company : Yokogawa Electric Corporation	Mode : IEEE802.15.4 (Tx2440MHz)
Kind of EUT : ISA100 Wireless Module	Report No. : 32DE0368-SH-02-A
Model No. : F9195KA	Power : DC 5.0V
Serial No. : 00:00:64:94:F1:6F	Temp./Humi. : 22deg.C / 58%RH

Remarks : 2dBi antenna, DC Power Supply AC Input:AC120V/60Hz

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Akira Sato



No.	Freq. [MHz]	Reading		C.Fac [dB]	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]		<QP> [dBuV]	<AV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	0.15000	22.0	5.4	12.6	34.6	18.0	65.9	55.9	31.3	37.9	N	
2	0.18513	22.0	4.9	12.6	34.6	17.5	64.2	54.2	29.6	36.7	N	
3	0.21077	20.9	4.1	12.6	33.5	16.7	63.1	53.1	29.6	36.4	N	
4	0.25872	19.0	3.2	12.6	31.6	15.8	61.4	51.4	29.8	35.6	N	
5	0.32185	16.9	2.4	12.6	29.5	15.0	59.6	49.6	30.1	34.6	N	
6	0.37900	15.7	1.9	12.6	28.3	14.5	58.3	48.3	30.0	33.8	N	
7	0.55105	13.4	1.1	12.6	26.0	13.7	56.0	46.0	30.0	32.3	N	
8	0.77060	10.8	1.0	12.6	23.4	13.6	56.0	46.0	32.6	32.4	N	
9	0.15000	22.0	5.0	12.6	34.6	17.6	65.9	55.9	31.3	38.3	L1	
10	0.18397	21.9	4.6	12.6	34.5	17.2	64.3	54.3	29.8	37.1	L1	
11	0.21538	20.6	3.9	12.6	33.2	16.5	62.9	52.9	29.7	36.4	L1	
12	0.25545	19.1	3.1	12.6	31.7	15.7	61.5	51.5	29.8	35.8	L1	
13	0.32665	16.9	2.5	12.6	29.5	15.1	59.5	49.5	30.0	34.4	L1	
14	0.38265	15.6	1.9	12.6	28.2	14.5	58.2	48.2	30.0	33.7	L1	
15	0.55017	13.4	1.1	12.6	26.0	13.7	56.0	46.0	30.0	32.3	L1	
16	0.77131	10.8	1.0	12.6	23.4	13.6	56.0	46.0	32.6	32.4	L1	

Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN+Cable+ATT) [dB]
LISN:SLS-01

DATA OF CONDUCTED EMISSION TEST

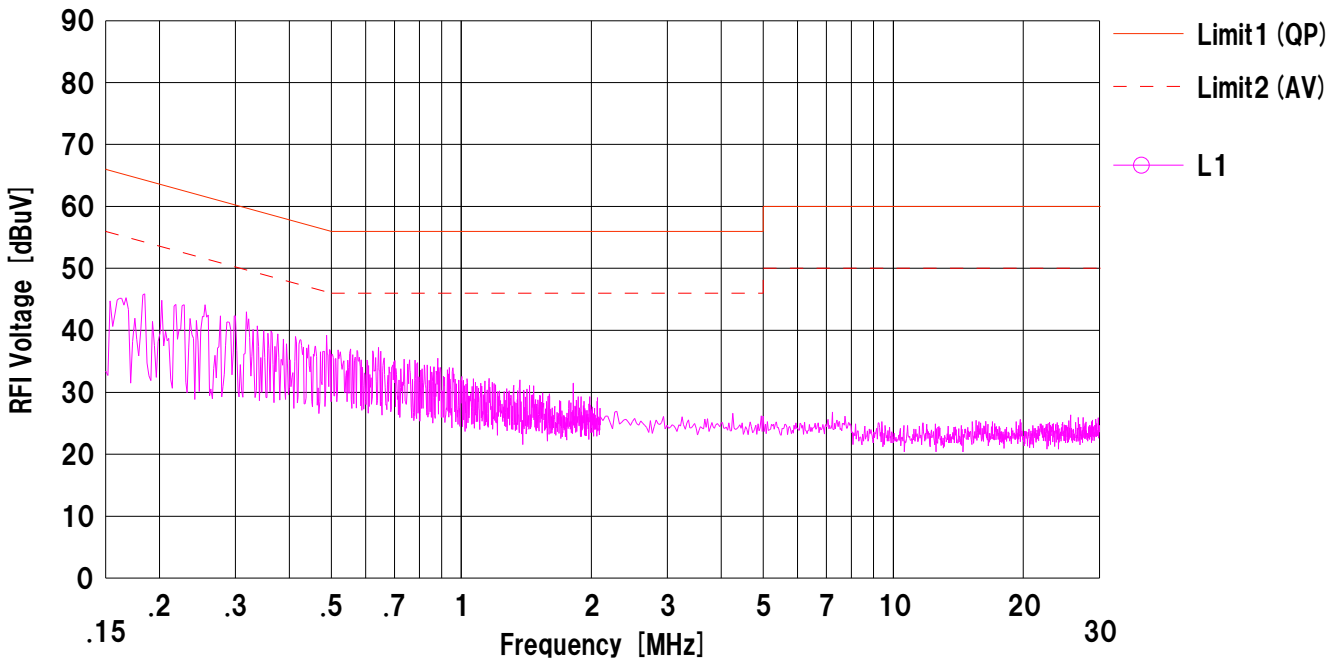
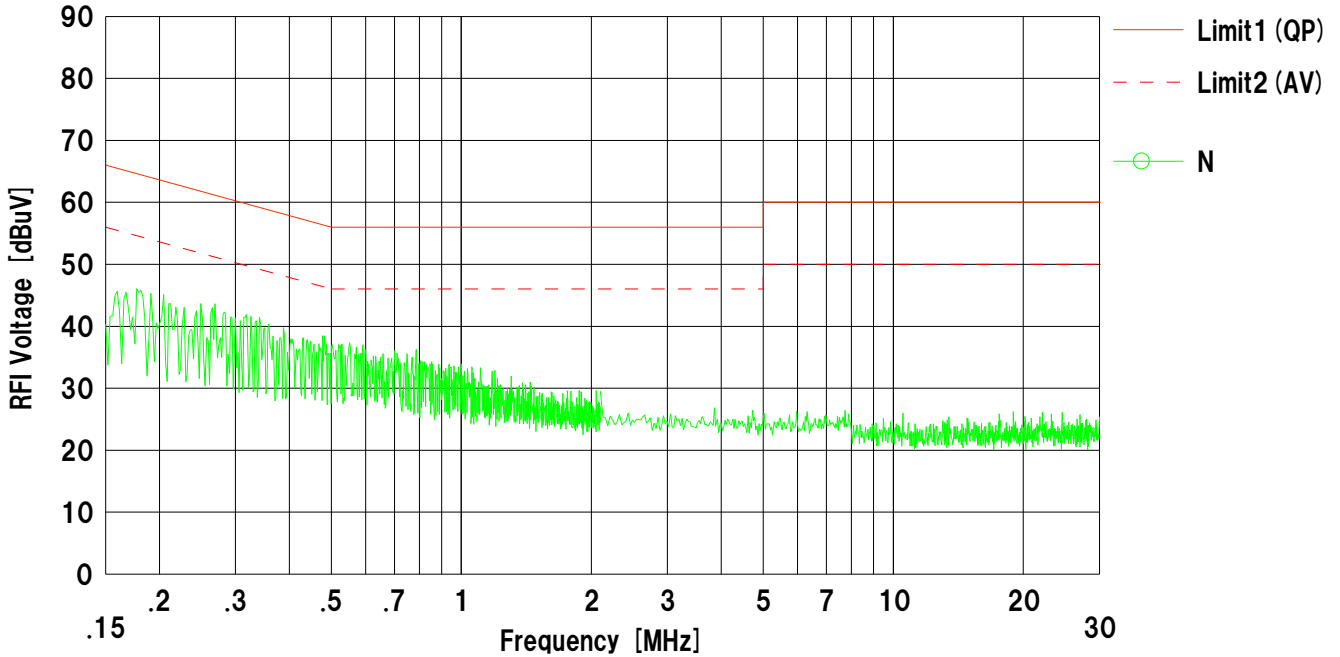
UL Japan, Inc. Shonan EMC Lab. No.1 Shielded Room
Date : 2012/04/23

Company : Yokogawa Electric Corporation	Mode : IEEE802.15.4 (Tx2475MHz)
Kind of EUT : ISA100 Wireless Module	Report No. : 32DE0368-SH-02-A
Model No. : F9195KA	Power : DC 5.0V
Serial No. : 00:00:64:94:F1:6F	Temp./Humi. : 22deg.C / 58%RH

Remarks : 2dBi antenna, DC Power Supply AC Input:AC120V/60Hz

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Akira Sato



Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN+Cable+ATT) [dB]
LISN: SLS-01

DATA OF CONDUCTED EMISSION TEST

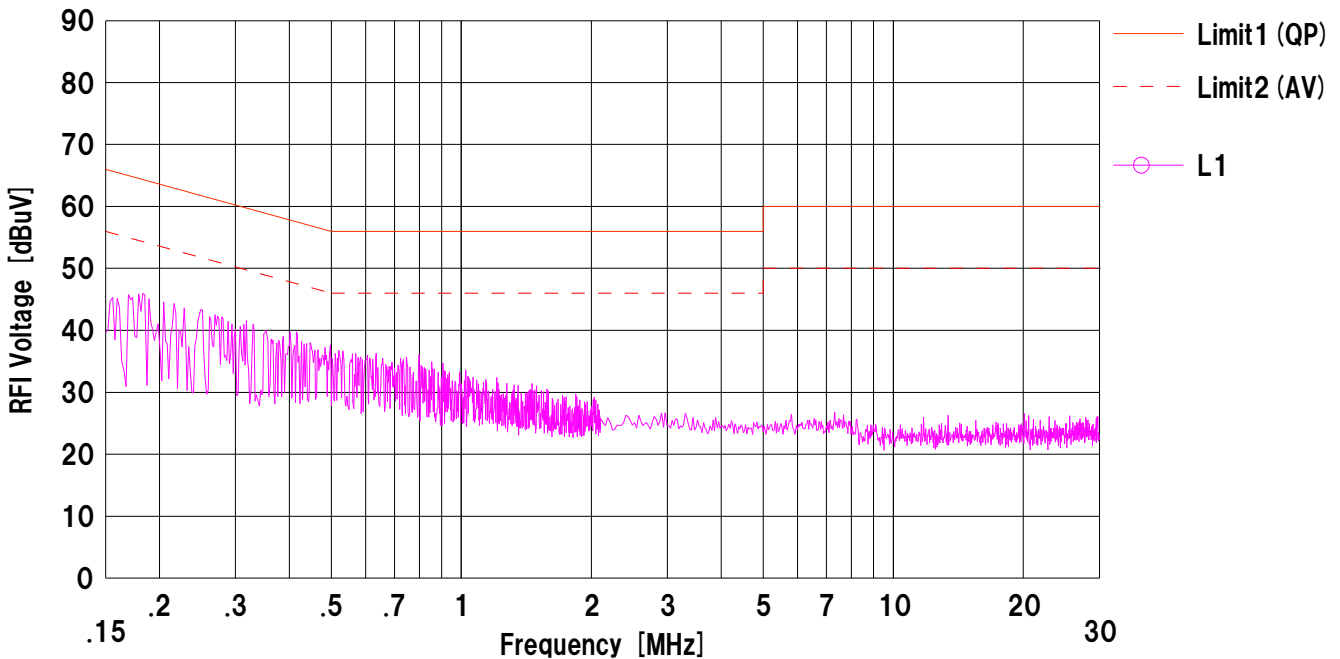
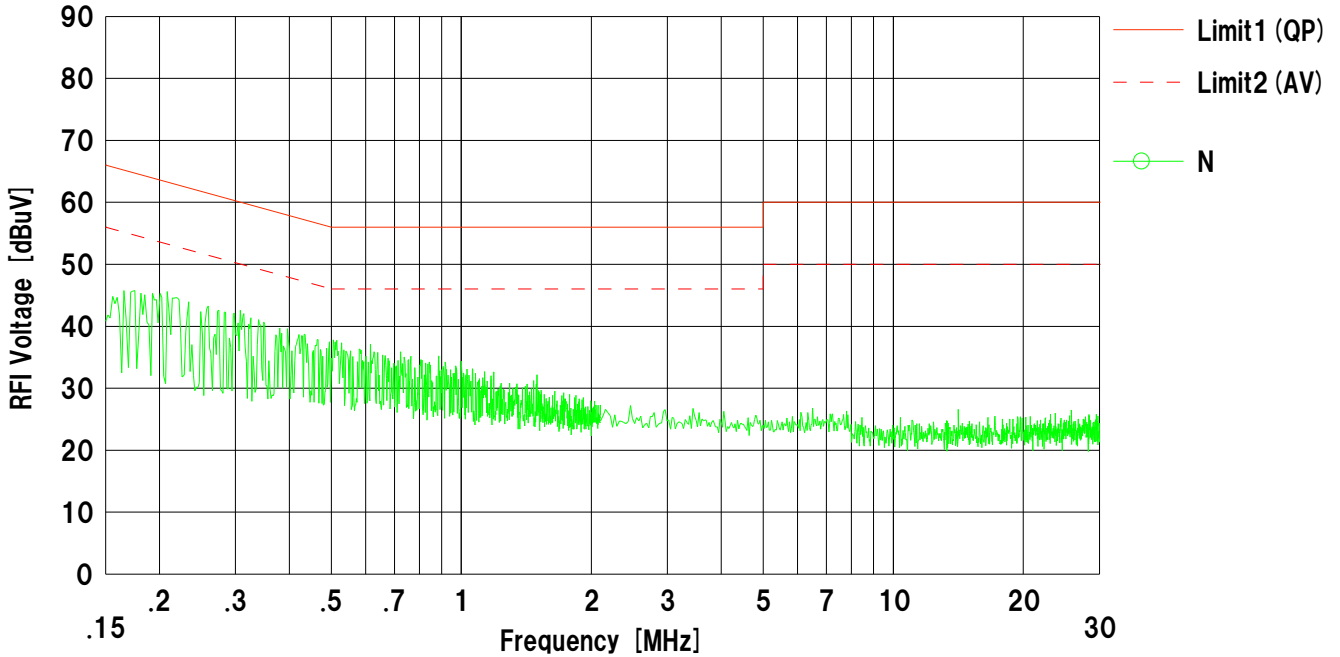
UL Japan, Inc. Shonan EMC Lab. No.1 Shielded Room
Date : 2012/04/24

Company : Yokogawa Electric Corporation	Mode : IEEE802.15.4 (Tx2405MHz)
Kind of EUT : ISA100 Wireless Module	Report No. : 32DE0368-SH-02-A
Model No. : F9195KA	Power : DC 5.0V
Serial No. : 00:00:64:94:F1:6F	Temp./Humi. : 22deg.C / 58%RH

Remarks : 6dBi antenna, DC Power Supply AC Input:AC120V/60Hz

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Akira Sato



Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN+Cable+ATT) [dB]
LISN: SLS-01

DATA OF CONDUCTED EMISSION TEST

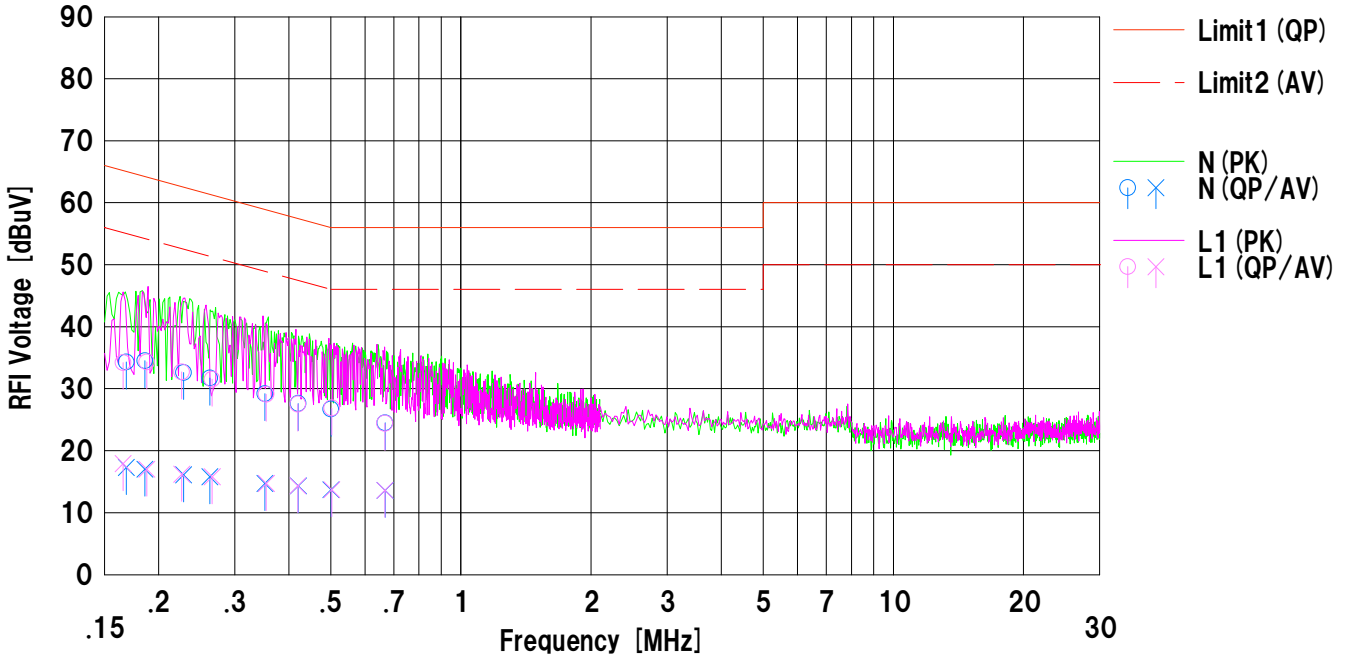
UL Japan, Inc. Shonan EMC Lab. No.1 Shielded Room
Date : 2012/04/24

Company : Yokogawa Electric Corporation	Mode : IEEE802.15.4 (Tx2440MHz)
Kind of EUT : ISA100 Wireless Module	Report No. : 32DE0368-SH-02-A
Model No. : F9195KA	Power : DC 5.0V
Serial No. : 00:00:64:94:F1:6F	Temp./Humi. : 22deg.C / 58%RH

Remarks : 6dBi antenna, DC Power Supply AC Input:AC120V/60Hz

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Akira Sato



No.	Freq. [MHz]	Reading		C.Fac [dB]	Results		Limit		Margin		Phase	Comment
		<QP>	<AV>		<QP>	<AV>	<QP>	<AV>	<QP>	<AV>		
		[dBuV]	[dBuV]		[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.16829	21.7	4.7	12.6	34.3	17.3	65.0	55.0	30.7	37.7	N	
2	0.18592	21.9	4.4	12.6	34.5	17.0	64.2	54.2	29.7	37.2	N	
3	0.22850	20.0	3.5	12.6	32.6	16.1	62.5	52.5	29.9	36.4	N	
4	0.26280	19.1	3.2	12.6	31.7	15.8	61.3	51.3	29.6	35.5	N	
5	0.35200	16.6	2.1	12.6	29.2	14.7	58.9	48.9	29.7	34.2	N	
6	0.42077	15.0	1.7	12.6	27.6	14.3	57.4	47.4	29.8	33.1	N	
7	0.50061	14.1	1.1	12.6	26.7	13.7	56.0	46.0	29.3	32.3	N	
8	0.66804	11.9	1.0	12.6	24.5	13.6	56.0	46.0	31.5	32.4	N	
9	0.16560	21.6	5.3	12.6	34.2	17.9	65.1	55.1	30.9	37.2	L1	
10	0.18778	21.7	4.4	12.6	34.3	17.0	64.1	54.1	29.8	37.1	L1	
11	0.22625	20.1	3.6	12.6	32.7	16.2	62.5	52.5	29.8	36.3	L1	
12	0.26599	18.9	3.2	12.6	31.5	15.8	61.2	51.2	29.7	35.4	L1	
13	0.35477	16.5	2.1	12.6	29.1	14.7	58.8	48.8	29.7	34.1	L1	
14	0.41999	14.9	1.7	12.6	27.5	14.3	57.4	47.4	29.9	33.1	L1	
15	0.50277	14.3	1.1	12.6	26.9	13.7	56.0	46.0	29.1	32.3	L1	
16	0.66714	11.8	1.0	12.6	24.4	13.6	56.0	46.0	31.6	32.4	L1	

Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN+Cable+ATT) [dB]
LISN:SLS-01

DATA OF CONDUCTED EMISSION TEST

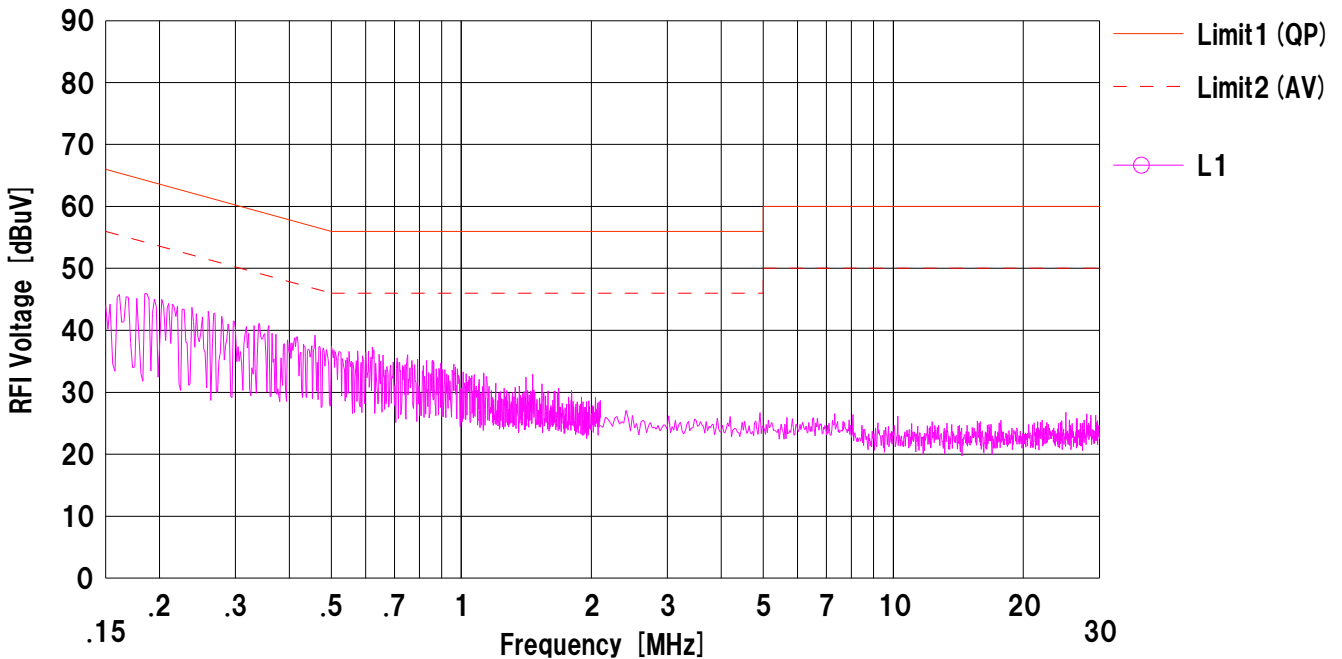
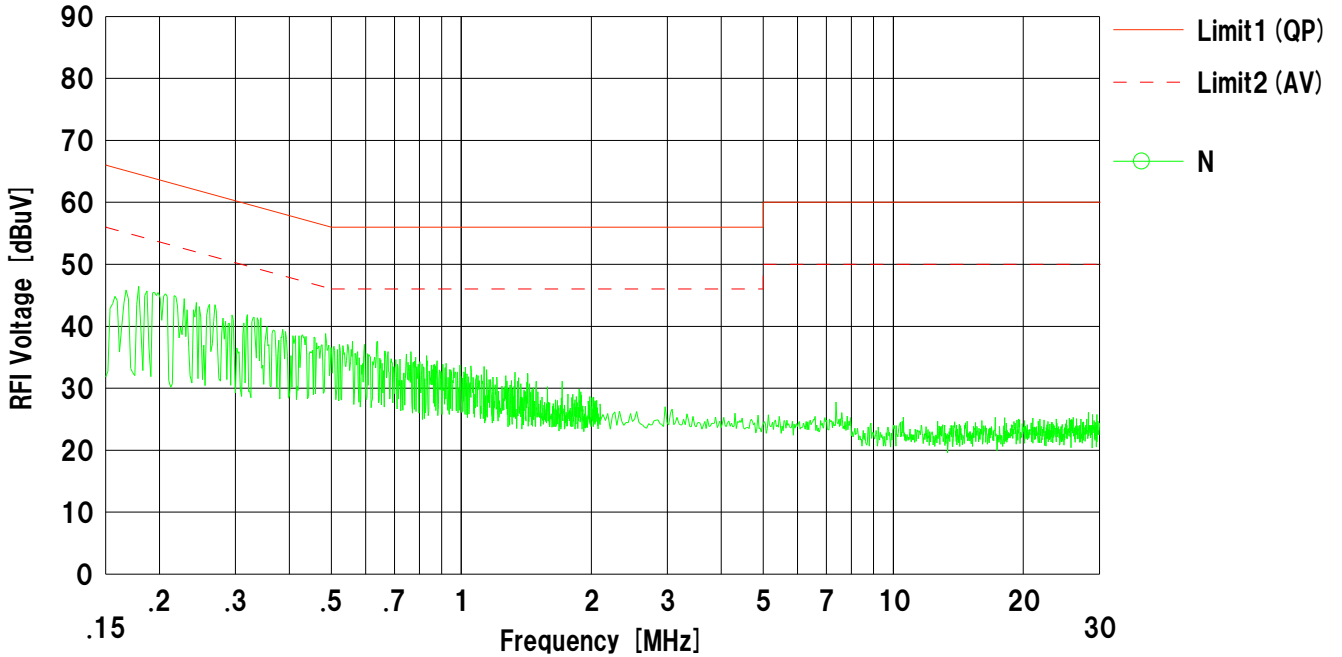
UL Japan, Inc. Shonan EMC Lab. No.1 Shielded Room
Date : 2012/04/24

Company : Yokogawa Electric Corporation	Mode : IEEE802.15.4 (Tx2475MHz)
Kind of EUT : ISA100 Wireless Module	Report No. : 32DE0368-SH-02-A
Model No. : F9195KA	Power : DC 5.0V
Serial No. : 00:00:64:94:F1:6F	Temp./Humi. : 22deg.C / 58%RH

Remarks : 6dBi antenna, DC Power Supply AC Input:AC120V/60Hz

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Akira Sato



Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN+Cable+ATT) [dB]
LISN:SLS-01

DATA OF CONDUCTED EMISSION TEST

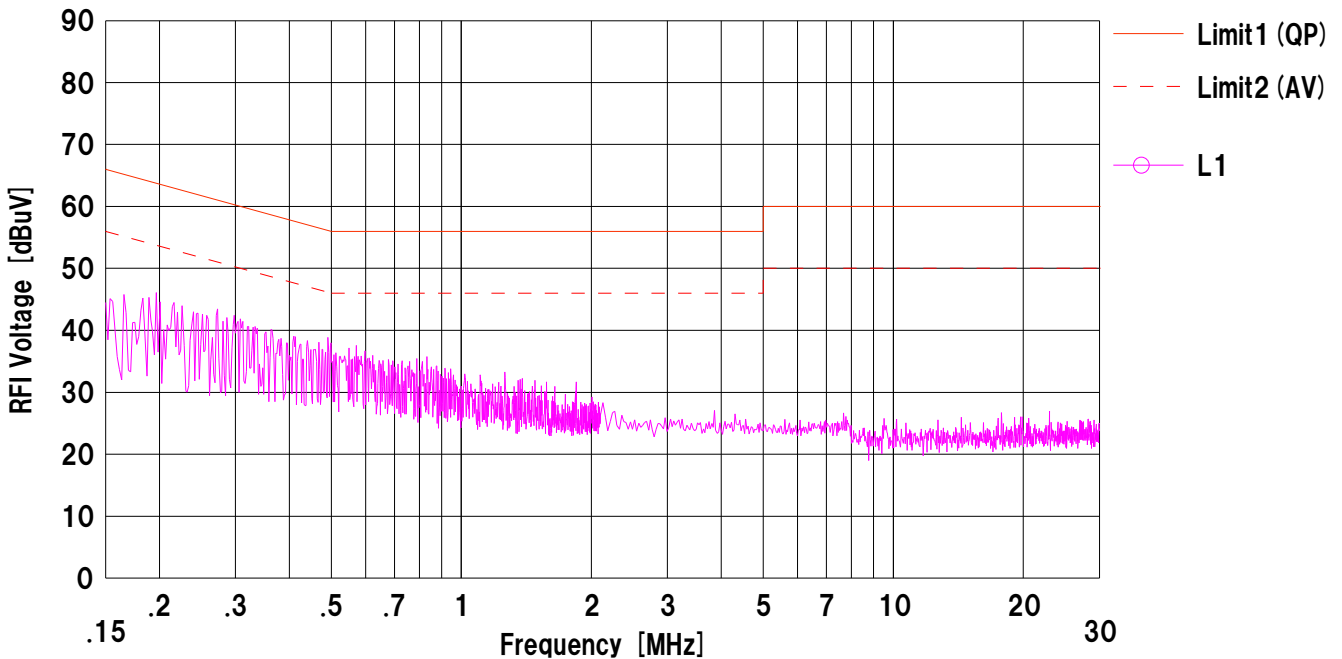
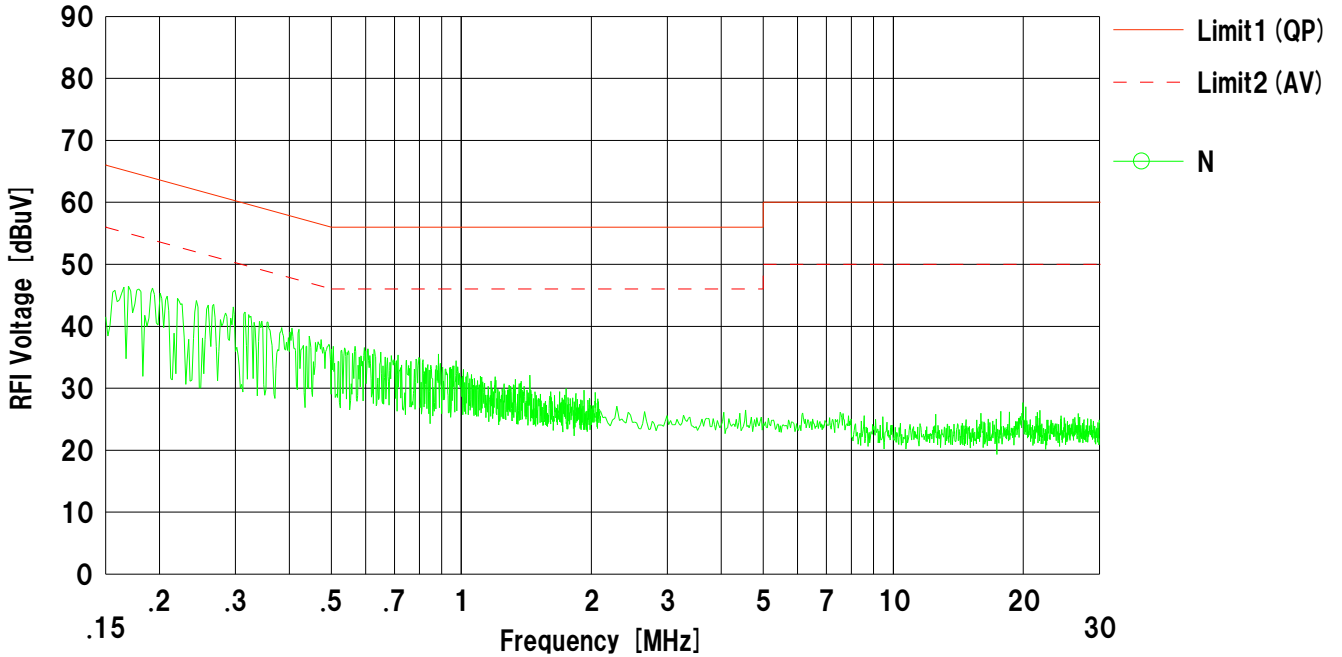
UL Japan, Inc. Shonan EMC Lab. No.1 Shielded Room
Date : 2012/04/24

Company : Yokogawa Electric Corporation	Mode : IEEE802.15.4 (Tx2405MHz)
Kind of EUT : ISA100 Wireless Module	Report No. : 32DE0368-SH-02-A
Model No. : F9195KA	Power : DC 5.0V
Serial No. : 00:00:64:94:F1:6F	Temp./Humi. : 22deg.C / 58%RH

Remarks : 9dBi antenna, DC Power Supply AC Input:AC120V/60Hz

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Akira Sato



Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN+Cable+ATT) [dB]
LISN: SLS-01

DATA OF CONDUCTED EMISSION TEST

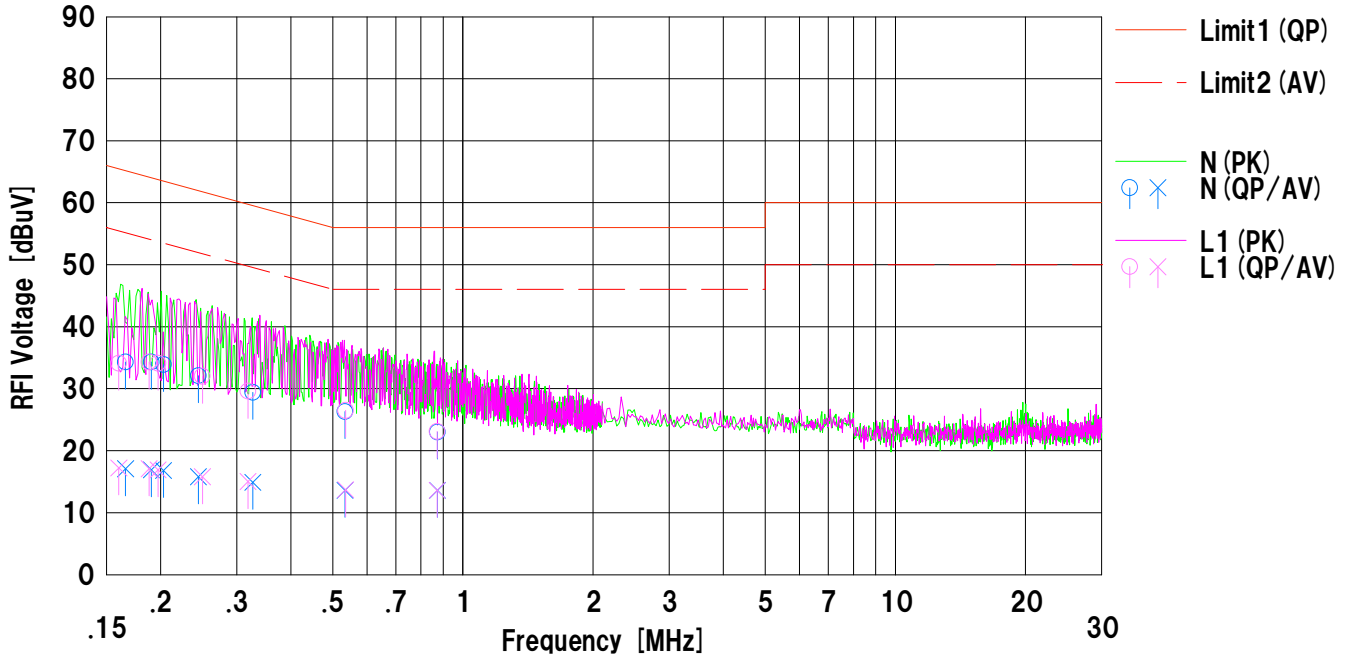
UL Japan, Inc. Shonan EMC Lab. No.1 Shielded Room
Date : 2012/04/24

Company : Yokogawa Electric Corporation	Mode : IEEE802.15.4 (Tx2440MHz)
Kind of EUT : ISA100 Wireless Module	Report No. : 32DE0368-SH-02-A
Model No. : F9195KA	Power : DC 5.0V
Serial No. : 00:00:64:94:F1:6F	Temp./Humi. : 22deg.C / 58%RH

Remarks : 9dBi antenna, DC Power Supply AC Input:AC120V/60Hz

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Akira Sato



No.	Freq. [MHz]	Reading		C.Fac [dB]	Results		Limit		Margin		Phase	Comment
		<QP>	<AV>		<QP>	<AV>	<QP>	<AV>	<QP>	<AV>		
		[dBuV]	[dBuV]		[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.16592	21.7	4.5	12.6	34.3	17.1	65.1	55.1	30.8	38.0	N	
2	0.19028	21.7	4.3	12.6	34.3	16.9	64.0	54.0	29.7	37.1	N	
3	0.20318	21.3	4.2	12.6	33.9	16.8	63.4	53.4	29.5	36.6	N	
4	0.24453	19.5	3.2	12.6	32.1	15.8	61.9	51.9	29.8	36.1	N	
5	0.32692	16.8	2.3	12.6	29.4	14.9	59.5	49.5	30.1	34.6	N	
6	0.53344	13.7	1.0	12.6	26.3	13.6	56.0	46.0	29.7	32.4	N	
7	0.87310	10.4	1.0	12.6	23.0	13.6	56.0	46.0	33.0	32.4	N	
8	0.16008	21.5	4.6	12.6	34.1	17.2	65.4	55.4	31.3	38.2	L1	
9	0.18796	21.7	4.5	12.6	34.3	17.1	64.1	54.1	29.8	37.0	L1	
10	0.19726	21.5	4.3	12.6	34.1	16.9	63.7	53.7	29.6	36.8	L1	
11	0.24982	19.4	3.2	12.6	32.0	15.8	61.7	51.7	29.7	35.9	L1	
12	0.31872	17.0	2.4	12.6	29.6	15.0	59.7	49.7	30.1	34.7	L1	
13	0.53566	13.9	1.1	12.6	26.5	13.7	56.0	46.0	29.5	32.3	L1	
14	0.87230	10.5	1.0	12.6	23.1	13.6	56.0	46.0	32.9	32.4	L1	

Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN+Cable+ATT) [dB]
LISN:SLS-01

DATA OF CONDUCTED EMISSION TEST

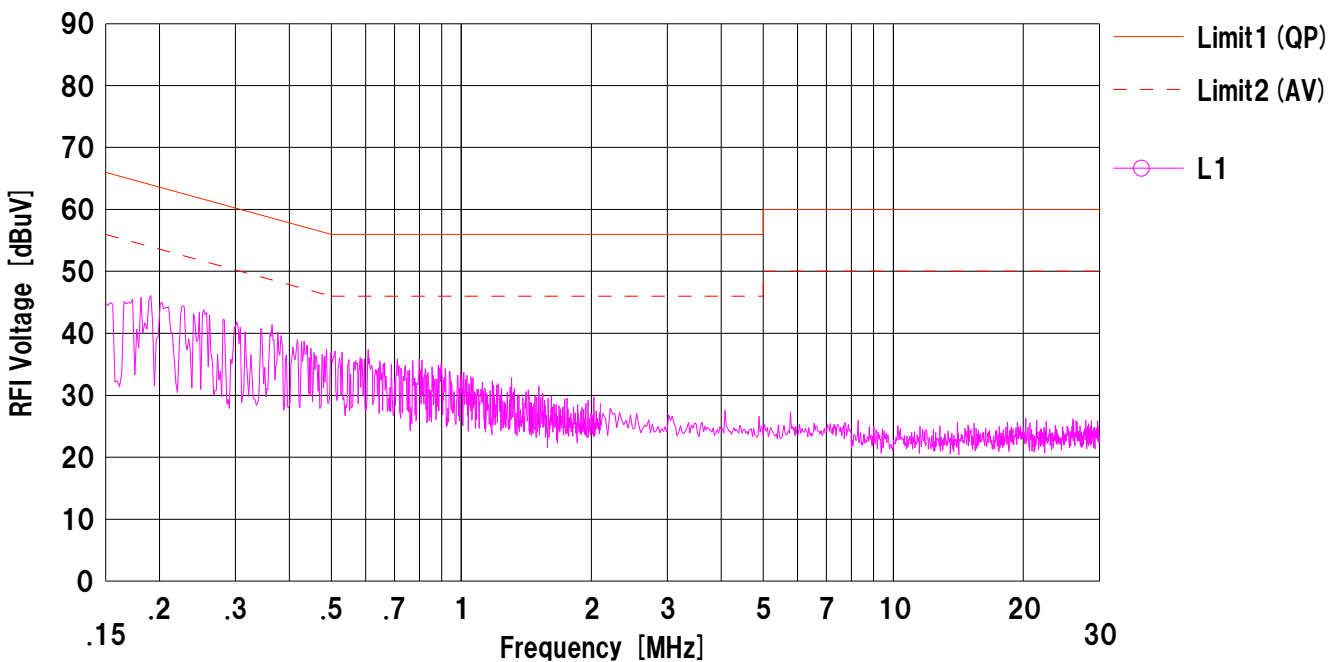
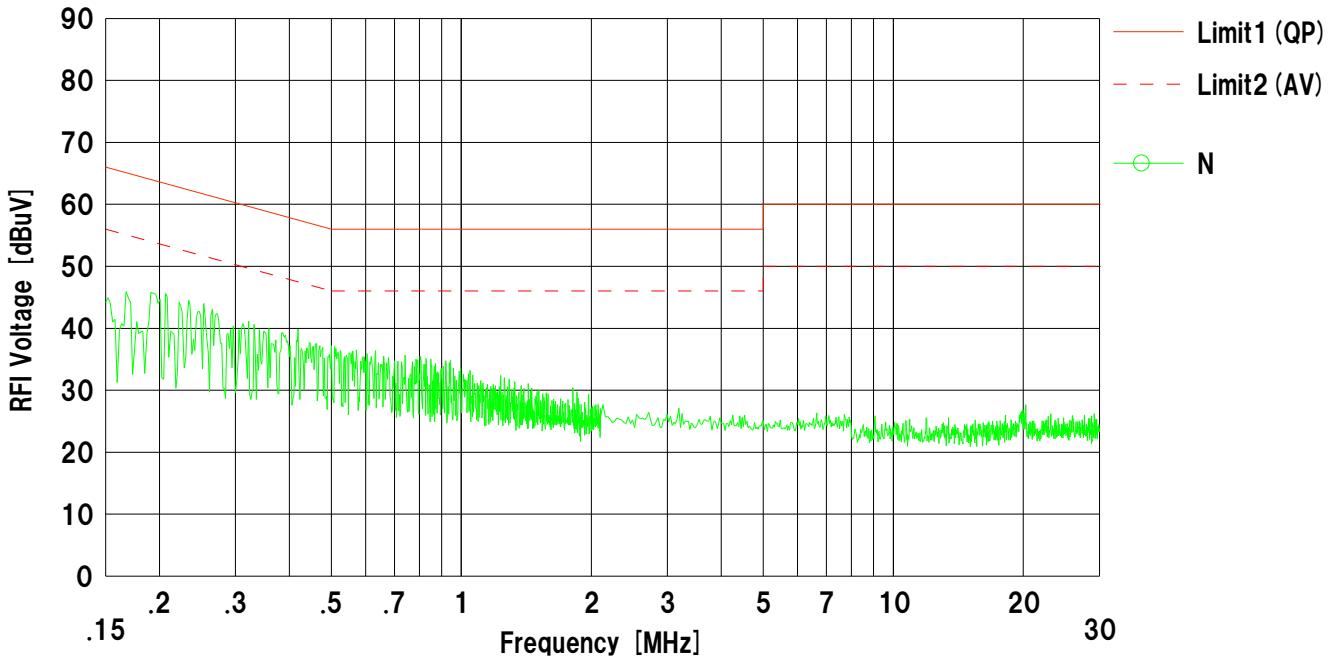
UL Japan, Inc. Shonan EMC Lab. No.1 Shielded Room
Date : 2012/04/24

Company : Yokogawa Electric Corporation	Mode : IEEE802.15.4 (Tx2475MHz)
Kind of EUT : ISA100 Wireless Module	Report No. : 32DE0368-SH-02-A
Model No. : F9195KA	Power : DC 5.0V
Serial No. : 00:00:64:94:F1:6F	Temp./Humi. : 22deg.C / 58%RH

Remarks : 9dBi antenna, DC Power Supply AC Input:AC120V/60Hz

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Akira Sato



Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN+Cable+ATT) [dB]
LISN: SLS-01

DATA OF CONDUCTED EMISSION TEST

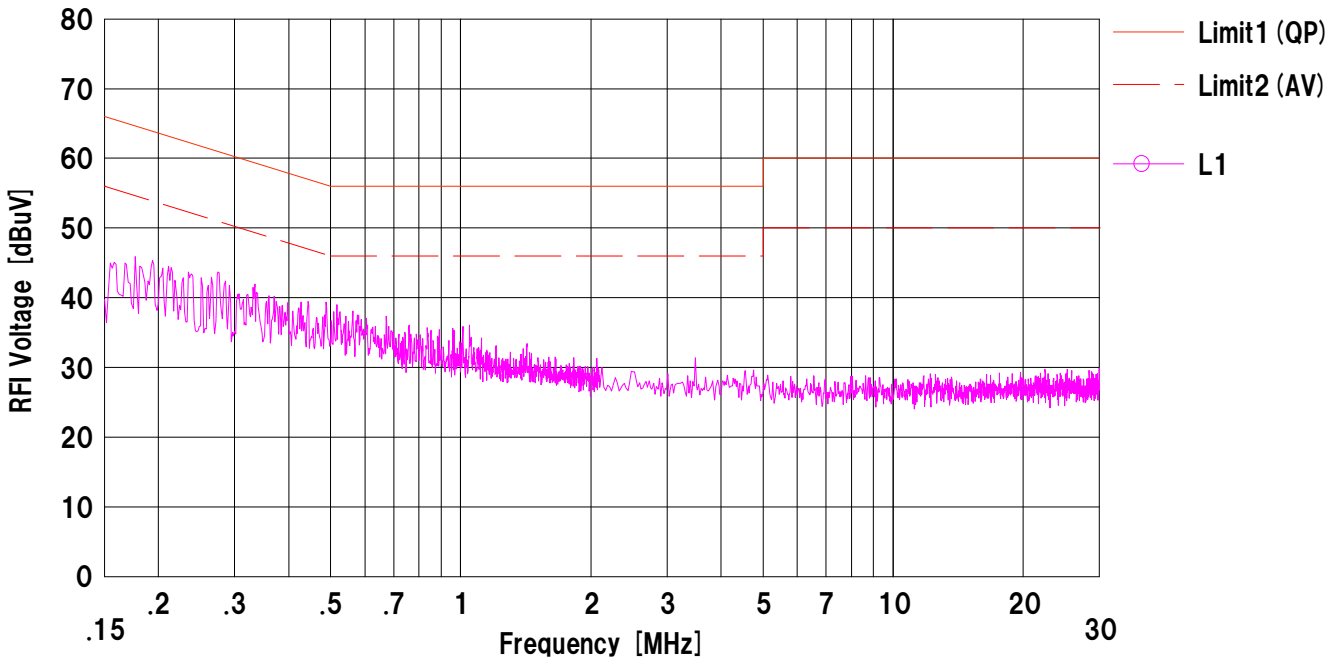
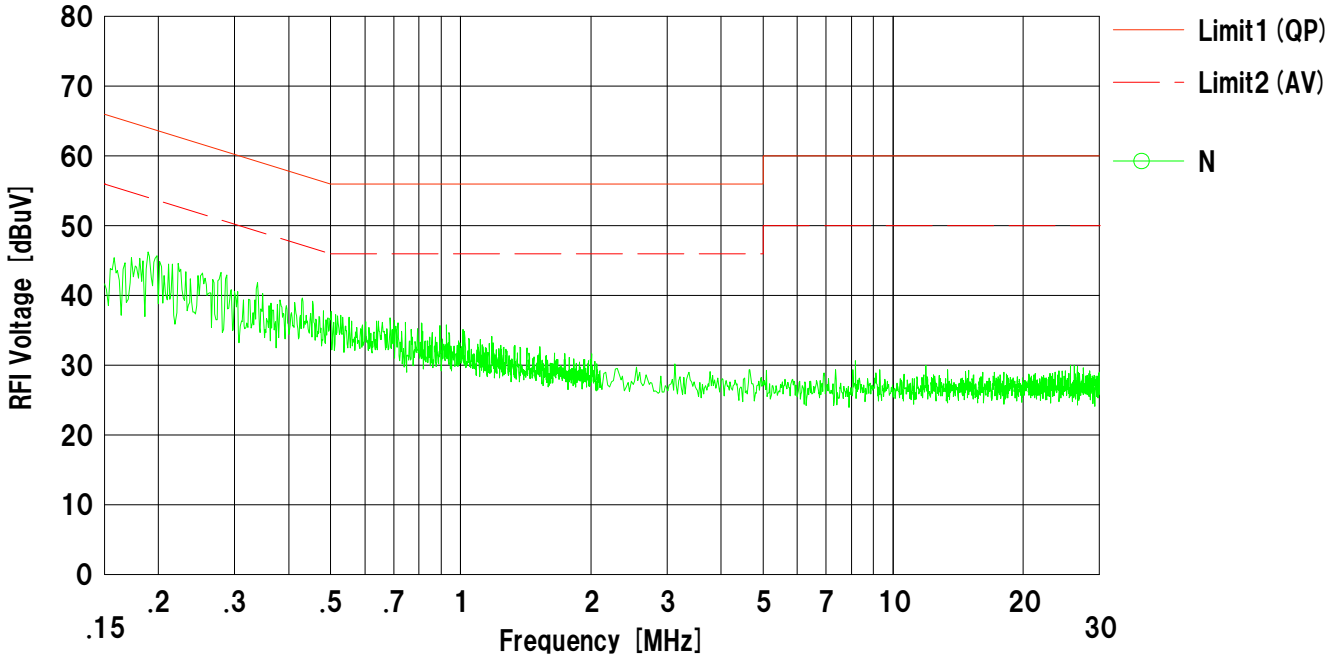
UL Japan, Inc. Shonan EMC Lab. No.1 Shielded Room
Date : 2012/05/29

Company : Yokogawa Electric Corporation	Mode : IEEE802.15.4 (Tx2405MHz)
Kind of EUT : ISA100 Wireless Module	Report No. : 32DE0368-SH-02-A
Model No. : F9195KA	Power : DC 5.0V
Serial No. : 00:00:64:94:F1:6F	Temp./Humi. : 26deg.C / 57%RH

Remarks : 15dBi antenna, DC Power Supply AC Input:AC120V/60Hz

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Shinichi Takano



Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN+Cable+ATT) [dB]
LISN:SLS-01

DATA OF CONDUCTED EMISSION TEST

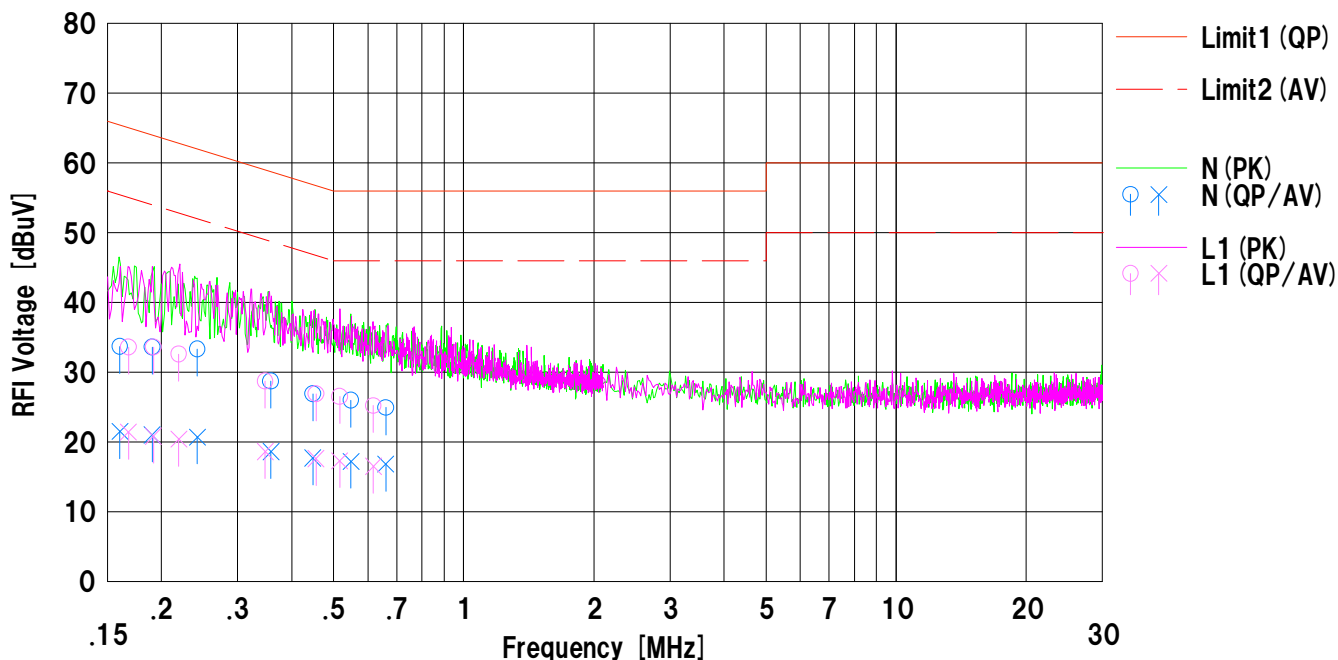
UL Japan, Inc. Shonan EMC Lab. No.1 Shielded Room
Date : 2012/05/29

Company : Yokogawa Electric Corporation	Mode : IEEE802.15.4 (Tx2440MHz)
Kind of EUT : ISA100 Wireless Module	Report No. : 32DE0368-SH-02-A
Model No. : F9195KA	Power : DC 5.0V
Serial No. : 00:00:64:94:F1:6F	Temp./Humi. : 26deg.C / 57%RH

Remarks : 15dBi antenna, DC Power Supply AC Input:AC120V / 60Hz

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Shinichi Takano



No.	Freq. [MHz]	Reading		C.Fac [dB]	Results		Limit		Margin		Phase	Comment
		<QP>	<AV>		<QP>	<AV>	<QP>	<AV>	<QP>	<AV>		
		[dBuV]	[dBuV]		[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.16026	21.1	8.9	12.6	33.7	21.5	65.4	55.4	31.7	33.9	N	
2	0.19026	21.0	8.4	12.6	33.6	21.0	64.0	54.0	30.4	33.0	N	
3	0.24208	20.7	8.1	12.6	33.3	20.7	62.0	52.0	28.7	31.3	N	
4	0.35821	16.1	6.0	12.6	28.7	18.6	58.7	48.7	30.0	30.1	N	
5	0.44776	14.3	5.1	12.6	26.9	17.7	56.9	46.9	30.0	29.2	N	
6	0.54822	13.4	4.6	12.6	26.0	17.2	56.0	46.0	30.0	28.8	N	
7	0.66077	12.3	4.2	12.6	24.9	16.8	56.0	46.0	31.1	29.2	N	
8	0.16784	21.0	8.8	12.6	33.6	21.4	65.0	55.0	31.4	33.6	L1	
9	0.19158	21.0	8.2	12.6	33.6	20.8	63.9	53.9	30.3	33.1	L1	
10	0.21950	20.0	7.8	12.6	32.6	20.4	62.8	52.8	30.2	32.4	L1	
11	0.34734	16.1	6.0	12.6	28.7	18.6	59.0	49.0	30.3	30.4	L1	
12	0.45584	14.3	5.0	12.6	26.9	17.6	56.7	46.7	29.8	29.1	L1	
13	0.51662	13.9	4.7	12.6	26.5	17.3	56.0	46.0	29.5	28.7	L1	
14	0.61790	12.6	3.9	12.6	25.2	16.5	56.0	46.0	30.8	29.5	L1	

Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN+Cable+ATT) [dB]
LISN:SLS-01

DATA OF CONDUCTED EMISSION TEST

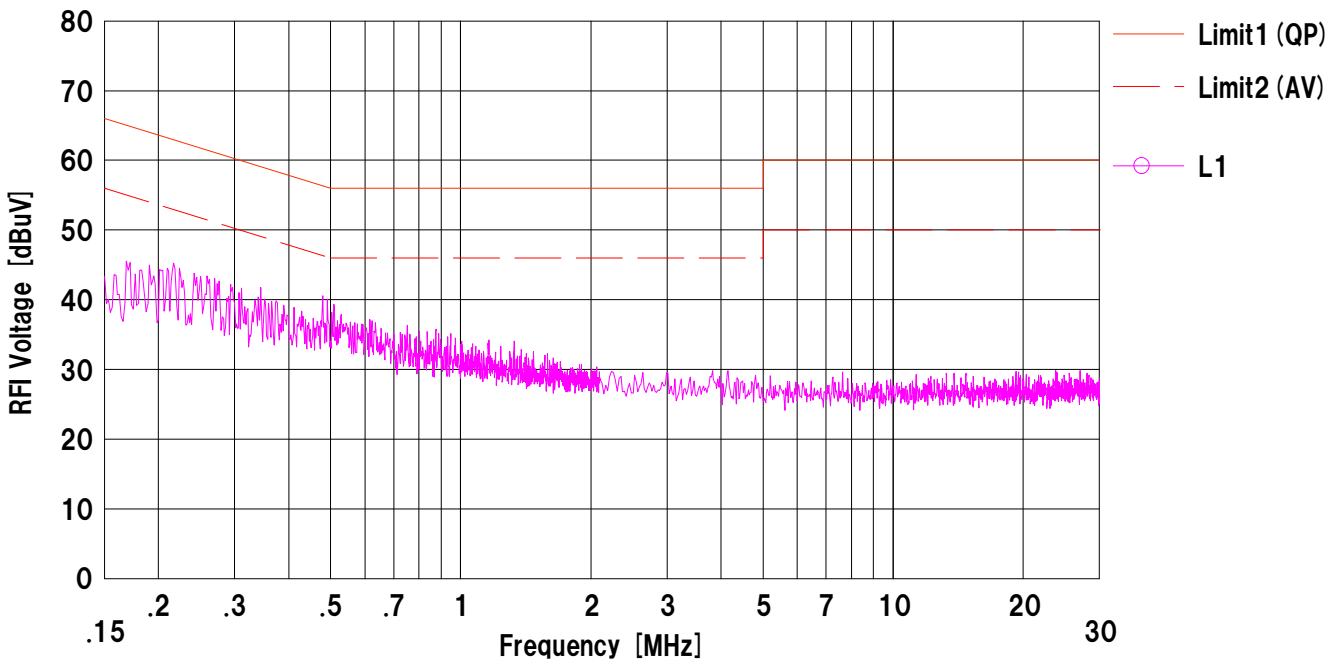
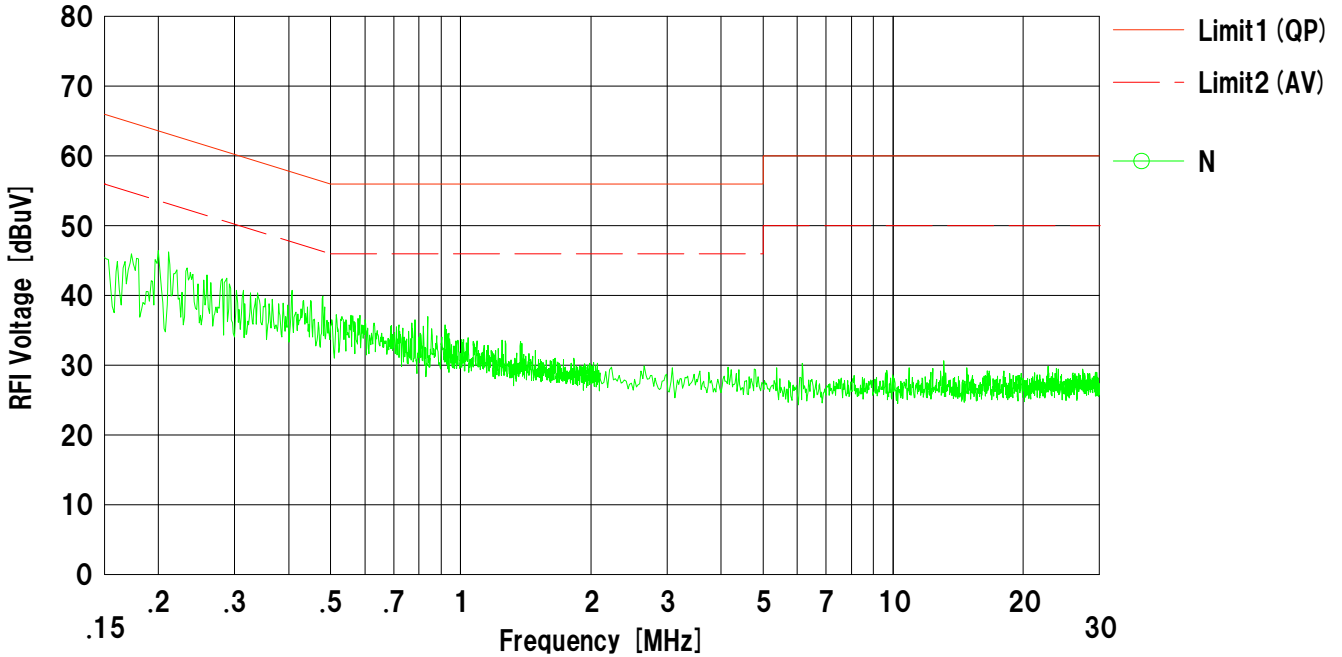
UL Japan, Inc. Shonan EMC Lab. No.1 Shielded Room
Date : 2012/05/29

Company : Yokogawa Electric Corporation	Mode : IEEE802.15.4 (Tx2475MHz)
Kind of EUT : ISA100 Wireless Module	Report No. : 32DE0368-SH-02-A
Model No. : F9195KA	Power : DC 5.0V
Serial No. : 00:00:64:94:F1:6F	Temp./Humi. : 26deg.C / 57%RH

Remarks : 15dBi antenna, DC Power Supply AC Input:AC120V/60Hz

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Shinichi Takano

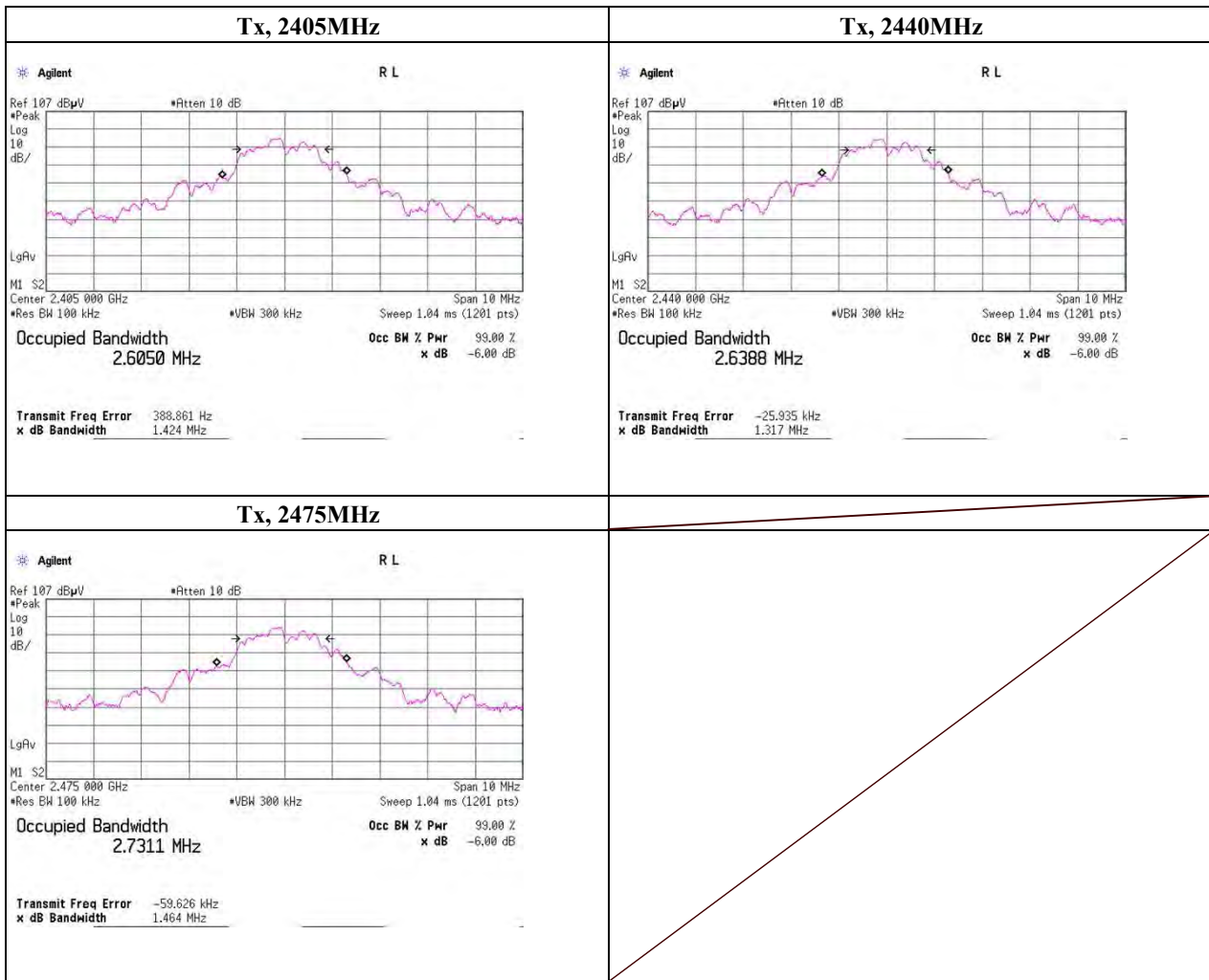


Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN+Cable+ATT) [dB]
LISN:SLS-01

-6dB Bandwidth

Test place	UL Japan, Inc. Shonan EMC Lab.	No.6 Shielded Room
Date	March 28, 2012	
Temperature / Humidity	21deg.C , 49%RH	
Engineer	Makoto Hosaka	
Mode	Tx, IEEE802.15.4, Antenna:2dBi,	

Freq. [MHz]	-6dB Bandwidth [MHz]	Limit [MHz]
2405.0000	1.424	> 0.500
2440.0000	1.317	> 0.500
2475.0000	1.464	> 0.500

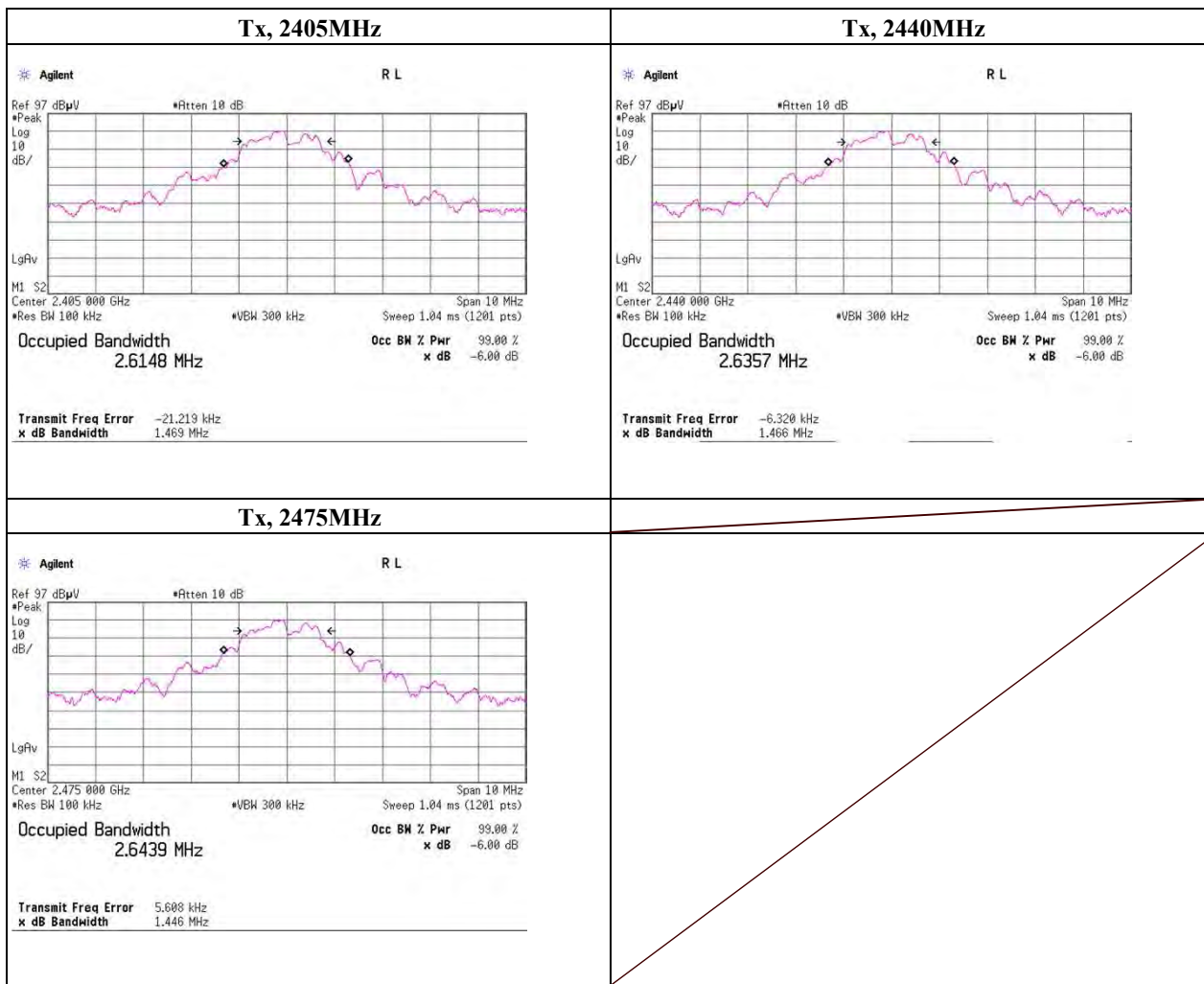


UL Japan, Inc.
Shonan EMC Lab.
 1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN
 Telephone : +81 463 50 6400
 Facsimile : +81 463 50 6401

-6dB Bandwidth

Test place	UL Japan, Inc. Shonan EMC Lab.	No.6 Shielded Room
Date	March 28, 2012	
Temperature / Humidity	21deg.C , 49%RH	
Engineer	Makoto Hosaka	
Mode	Tx, IEEE802.15.4, Antenna:6dBi,	

Freq. [MHz]	-6dB Bandwidth [MHz]	Limit [MHz]
2405.0000	1.469	> 0.500
2440.0000	1.466	> 0.500
2475.0000	1.446	> 0.500

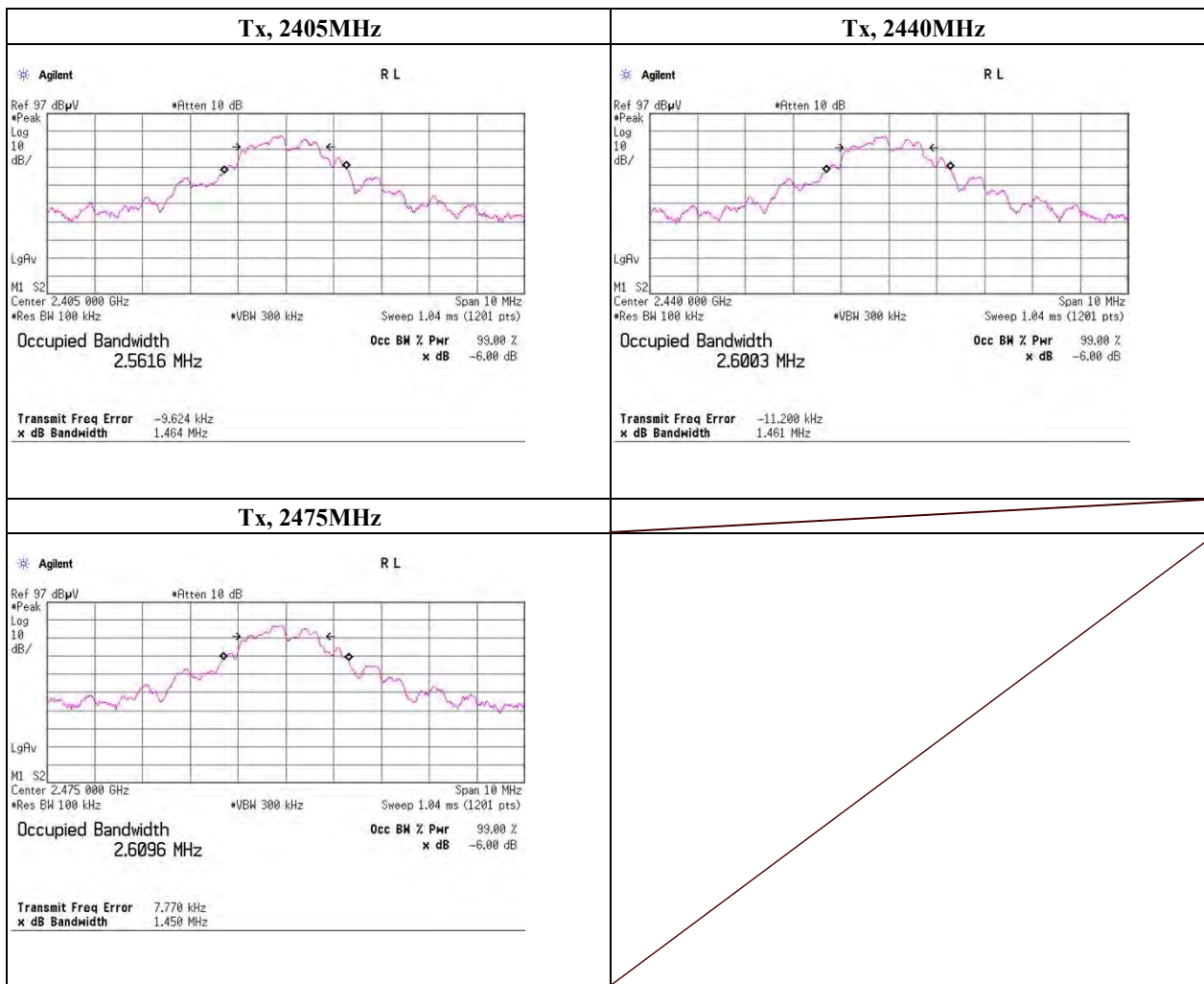


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-6dB Bandwidth

Test place	UL Japan, Inc. Shonan EMC Lab.	No.6 Shielded Room
Date	March 28, 2012	
Temperature / Humidity	21deg.C , 49%RH	
Engineer	Makoto Hosaka	
Mode	Tx, IEEE802.15.4, Antenna:9dBi,	

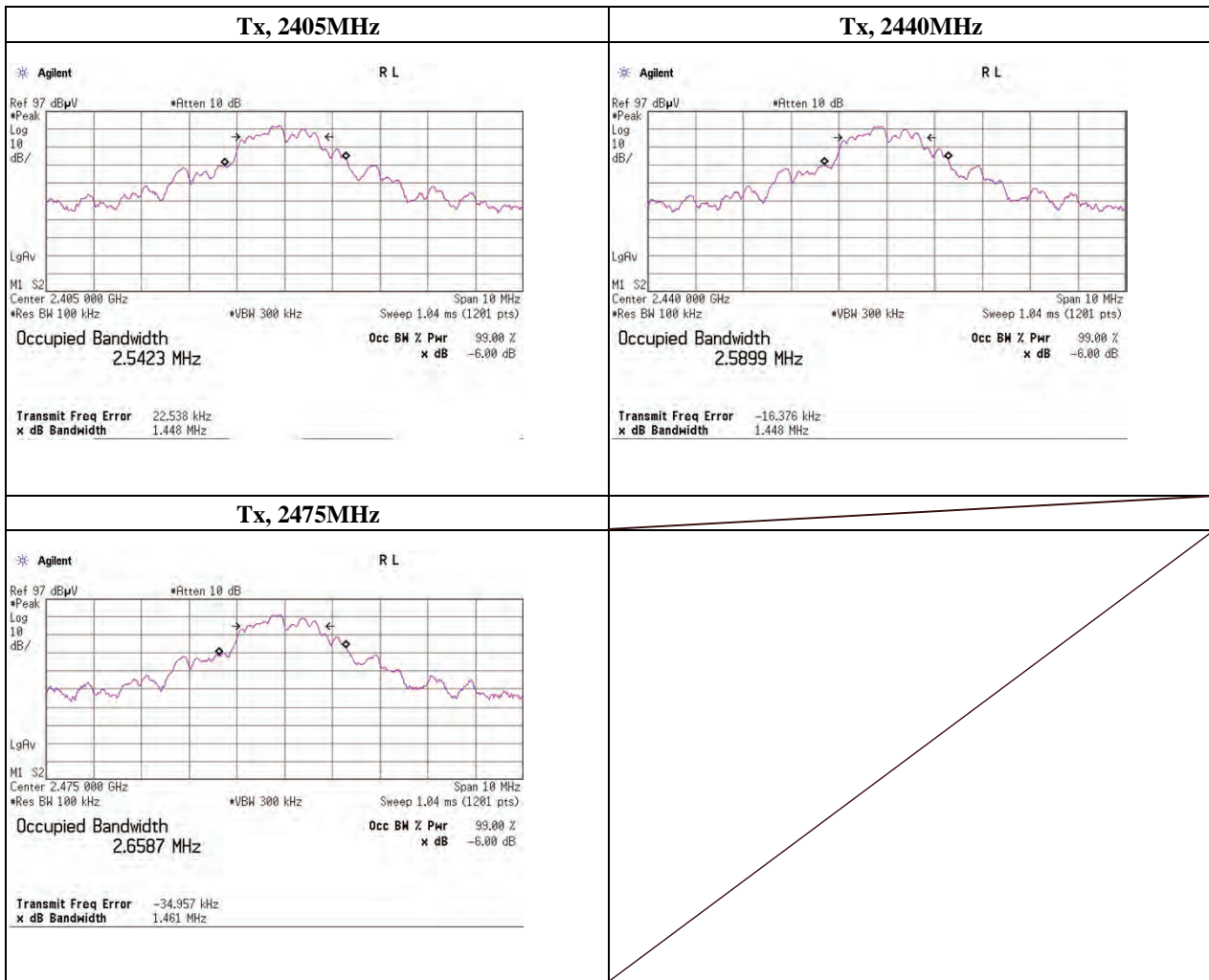
Freq. [MHz]	-6dB Bandwidth [MHz]	Limit [MHz]
2405.0000	1.464	> 0.500
2440.0000	1.461	> 0.500
2475.0000	1.450	> 0.500



-6dB Bandwidth

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	May 21, 2012	
Temperature / Humidity	23deg.C , 55%RH	
Engineer	Makoto Hosaka	
Mode	Tx, IEEE802.15.4, Antenna:15dBi,	

Freq. [MHz]	-6dB Bandwidth [MHz]	Limit [MHz]
2405.0000	1.448	> 0.500
2440.0000	1.448	> 0.500
2475.0000	1.461	> 0.500



Peak Output Power (Conducted)

Test place UL Japan, Inc. Shonan EMC Lab. No.6 Shielded Room
 Date March 27, 2012
 Temperature / Humidity 20deg.C , 45%RH
 Engineer Makoto Hosaka
 Mode Tx, IEEE802.15.4, Antenna:2dBi,

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

Ch	Freq. [MHz]	P/M (Peak) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
					[dBm]	[mW]	[dBm]	[mW]	
Low	2405.0	-10.61	2.75	20.01	12.15	16.41	30.00	1000	17.85
Mid	2440.0	-10.77	2.76	20.01	12.00	15.85	30.00	1000	18.00
High	2475.0	-11.00	2.77	20.01	11.78	15.07	30.00	1000	18.22

Sample Calculation:

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

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Peak Output Power (Conducted)

Test place UL Japan, Inc. Shonan EMC Lab. No.6 Shielded Room
 Date March 27, 2012
 Temperature / Humidity 20deg.C , 45%RH
 Engineer Makoto Hosaka
 Mode Tx, IEEE802.15.4, Antenna:6dBi,

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

Ch	Freq. [MHz]	P/M (Peak) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
					[dBm]	[mW]	[dBm]	[mW]	
Low	2405.0	-14.25	2.75	20.01	8.51	7.10	30.00	1000	21.49
Mid	2440.0	-14.45	2.76	20.01	8.32	6.79	30.00	1000	21.68
High	2475.0	-14.64	2.77	20.01	8.14	6.52	30.00	1000	21.86

Sample Calculation:

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

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Peak Output Power (Conducted)

Test place UL Japan, Inc. Shonan EMC Lab. No.6 Shielded Room
 Date March 27, 2012
 Temperature / Humidity 20deg.C , 45%RH
 Engineer Makoto Hosaka
 Mode Tx, IEEE802.15.4, Antenna:9dBi,

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

Ch	Freq. [MHz]	P/M (Peak) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit (*1)		Margin [dB]
					[dBm]	[mW]	[dBm]	[mW]	
Low	2405.0	-16.81	2.75	20.01	5.95	3.94	27.00	501	21.05
Mid	2440.0	-16.87	2.76	20.01	5.90	3.89	27.00	501	21.10
High	2475.0	-17.12	2.77	20.01	5.66	3.68	27.00	501	21.34

Sample Calculation:

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

*1) Limit: 30dBm-(9dBi-6dBi)=27dBm [15.247, b, (4)]

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Peak Output Power (Conducted)

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
 Date May 21, 2012
 Temperature / Humidity 23deg.C , 55%RH
 Engineer Makoto Hosaka
 Mode Tx, IEEE802.15.4, Antenna:15dBi,

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

Ch	Freq. [MHz]	P/M (Peak) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit (*1)		Margin [dB]
					[dBm]	[mW]	[dBm]	[mW]	
Low	2405.0	-14.43	2.75	9.68	-2.00	0.63	21.00	125	23.00
Mid	2440.0	-13.68	2.76	9.68	-1.24	0.75	21.00	125	22.24
High	2475.0	-13.97	2.77	9.68	-1.52	0.70	21.00	125	22.52

Sample Calculation:

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

*1) Limit: 30dBm-(15dBi-6dBi)=21dBm [15.247, b, (4)]

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Shonan EMC Lab.

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Radiated Emission

Test place UL Japan, Inc. Shonan EMC Lab. No.1and 2 Semi Anechoic Chamber
 Date 2012/3/20 2012/4/20 2012/4/21 2012/4/23
 Temperature / Humidity 22 deg.C , 39%RH 22 deg.C , 40%RH 21 deg.C , 38%RH 21 deg.C , 68%RH
 Engineer Hikaru Shirasawa Kenichi Adachi Kenichi Adachi Akira Sato
 Mode Tx, 2405 MHz
 Tx, IEEE802.15.4, Antenna:2dBi,

(* PK: Peak, AV: Average, QP: Quasi-Peak)

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.	797.406	QP	41.8	20.8	9.6	31.8	40.4	46.0	5.6	111	41	
Hori.	820.905	QP	43.3	21.1	9.7	31.7	42.4	46.0	3.6	123	40	
Hori.	844.783	QP	41.1	21.3	9.8	31.5	40.7	46.0	5.3	100	53	
Hori.	868.905	QP	44.5	21.6	9.9	31.4	44.6	46.0	1.4	100	57	
Hori.	893.377	QP	39.7	21.9	10.0	31.3	40.3	46.0	5.7	108	46	
Hori.	916.908	QP	43.9	22.1	10.1	31.1	45.0	46.0	1.0	100	59	
Hori.	940.812	QP	37.7	22.3	10.2	30.9	39.3	46.0	6.7	102	56	
Hori.	964.893	QP	41.2	22.6	10.3	30.7	43.4	53.9	10.5	100	69	
Hori.	2356.830	PK	56.5	27.1	13.6	38.2	59.0	73.9	14.9	100	125	
Hori.	2381.670	PK	60.0	27.2	13.7	38.2	62.7	73.9	11.2	100	125	
Hori.	2390.000	PK	58.0	27.2	13.7	38.2	60.7	73.9	13.2	100	125	
Hori.	4810.000	PK	49.6	31.2	6.2	37.0	50.0	73.9	23.9	120	190	
Hori.	7215.000	PK	45.2	36.5	7.2	39.0	49.9	73.9	24.0	100	0	
Hori.	9620.000	PK	41.9	38.4	9.0	37.2	52.1	73.9	21.8	100	0	
Hori.	12025.000	PK	43.0	39.3	9.6	37.9	54.0	73.9	19.9	100	0	
Vert.	224.428	QP	21.6	16.8	9.5	31.7	16.2	46.0	29.8	100	360	
Vert.	868.911	QP	42.1	21.6	9.9	31.4	42.2	46.0	3.8	121	45	
Vert.	916.748	QP	41.7	22.1	10.1	31.1	42.8	46.0	3.2	121	316	
Vert.	2356.830	PK	56.0	27.1	13.6	38.2	58.5	73.9	15.4	108	124	
Vert.	2381.670	PK	60.4	27.2	13.7	38.2	63.1	73.9	10.8	108	124	
Vert.	2390.000	PK	58.0	27.2	13.7	38.2	60.7	73.9	13.2	108	124	
Vert.	4810.000	PK	48.9	31.2	6.2	37.0	49.3	73.9	24.6	124	219	
Vert.	7215.000	PK	46.5	36.5	7.2	39.0	51.2	73.9	22.7	100	0	
Vert.	9620.000	PK	42.3	38.4	9.0	37.2	52.5	73.9	21.4	100	0	
Vert.	12025.000	PK	43.8	39.3	9.6	37.9	54.8	73.9	19.1	100	0	

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

*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

*No noise was detected above the 6th order harmonics.

Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

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.	2405.000	PK	100.0	27.3	13.7	38.2	102.8	-	-	Carrier
Hori.	2400.000	PK	57.6	27.3	13.7	38.2	60.4	82.8	22.4	
Vert.	2405.000	PK	101.9	27.3	13.7	38.2	104.7	-	-	Carrier
Vert.	2400.000	PK	58.1	27.3	13.7	38.2	60.9	84.7	23.8	

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

Duty factor relaxation

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2356.830	PK	56.5	27.1	13.6	38.2	-15.4	43.6	53.9	10.3	
Hori.	2381.670	PK	60.0	27.2	13.7	38.2	-15.4	47.3	53.9	6.6	
Hori.	2390.000	PK	58.0	27.2	13.7	38.2	-15.4	45.3	53.9	8.6	
Hori.	4810.000	PK	49.6	31.2	6.2	37.0	-15.4	34.6	53.9	19.3	
Hori.	7215.000	PK	45.2	36.5	7.2	39.0	-15.4	34.5	53.9	19.4	
Hori.	9620.000	PK	41.9	38.4	9.0	37.2	-15.4	36.7	53.9	17.2	
Hori.	12025.000	PK	43.0	39.3	9.6	37.9	-15.4	38.6	53.9	15.3	
Vert.	2356.830	PK	56.0	27.1	13.6	38.2	-15.4	43.1	53.9	10.8	
Vert.	2381.670	PK	60.4	27.2	13.7	38.2	-15.4	47.7	53.9	6.2	
Vert.	2390.000	PK	58.0	27.2	13.7	38.2	-15.4	45.3	53.9	8.6	
Vert.	4810.000	PK	48.9	31.2	6.2	37.0	-15.4	33.9	53.9	20.0	
Vert.	7215.000	PK	46.5	36.5	7.2	39.0	-15.4	35.8	53.9	18.1	
Vert.	9620.000	PK	42.3	38.4	9.0	37.2	-15.4	37.1	53.9	16.8	
Vert.	12025.000	PK	43.8	39.3	9.6	37.9	-15.4	39.4	53.9	14.5	

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

Radiated Emission

Test place UL Japan, Inc. Shonan EMC Lab. No.1and 2 Semi Anechoic Chamber
 Date 2012/3/20 2012/4/20 2012/4/21 2012/4/23
 Temperature / Humidity 22 deg.C , 39%RH 22 deg.C , 40%RH 21 deg.C , 38%RH 21 deg.C , 68%RH
 Engineer Hikaru Shirasawa Kenichi Adachi Kenichi Adachi Akira Sato
 Mode Tx, 2440 MHz
 Tx, IEEE802.15.4, Antenna:2dBi,

(* PK: Peak, AV: Average, QP: Quasi-Peak)

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.	808.375	QP	42.4	20.9	9.7	31.7	41.3	46.0	4.7	113	68	
Hori.	831.907	QP	43.0	21.2	9.8	31.6	42.4	46.0	3.6	110	62	
Hori.	855.903	QP	45.1	21.4	9.9	31.5	44.9	46.0	1.1	100	67	
Hori.	880.390	QP	42.0	21.7	10.0	31.4	42.3	46.0	3.7	100	58	
Hori.	903.909	QP	43.0	22.0	10.1	31.3	43.8	46.0	2.2	100	87	
Hori.	927.722	QP	39.3	22.2	10.1	31.1	40.5	46.0	5.5	100	53	
Hori.	951.744	QP	40.7	22.4	10.2	30.8	42.5	46.0	3.5	165	57	
Hori.	2391.794	PK	57.6	27.2	13.7	38.2	60.3	73.9	13.6	100	122	
Hori.	2487.759	PK	56.7	27.5	13.7	38.1	59.8	73.9	14.1	100	327	
Hori.	4880.000	PK	51.1	31.4	6.3	36.9	51.9	73.9	22.0	108	188	
Hori.	7320.000	PK	43.8	36.7	7.3	39.0	48.8	73.9	25.1	100	0	
Hori.	9760.000	PK	42.3	38.7	9.1	37.2	52.9	73.9	21.0	100	0	
Hori.	12200.000	PK	43.1	39.4	9.7	37.7	54.5	73.9	19.4	100	0	
Vert.	289.538	QP	21.6	18.6	10.3	31.7	18.8	46.0	27.2	100	359	
Vert.	855.909	QP	42.8	21.4	9.9	31.5	42.6	46.0	3.4	134	66	
Vert.	903.902	QP	41.0	22.0	10.1	31.3	41.8	46.0	4.2	117	18	
Vert.	952.379	QP	39.1	22.5	10.2	30.8	41.0	46.0	5.0	118	327	
Vert.	2391.794	PK	57.0	27.2	13.7	38.2	59.7	73.9	14.2	110	83	
Vert.	2487.759	PK	57.2	27.5	13.7	38.1	60.3	73.9	13.6	104	246	
Vert.	4880.000	PK	45.3	31.4	6.3	36.9	46.1	73.9	27.8	100	206	
Vert.	7320.000	PK	43.9	36.7	7.3	39.0	48.9	73.9	25.0	100	0	
Vert.	9760.000	PK	42.9	38.7	9.1	37.2	53.5	73.9	20.4	100	0	
Vert.	12200.000	PK	43.6	39.4	9.7	37.7	55.0	73.9	18.9	100	0	

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

*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

*No noise was detected above the 6th order harmonics.

Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

Duty factor relaxation

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2391.794	PK	57.6	27.2	13.7	38.2	-15.4	44.9	53.9	9.0	
Hori.	2487.759	PK	56.7	27.5	13.7	38.1	-15.4	44.4	53.9	9.5	
Hori.	4880.000	PK	51.1	31.4	6.3	36.9	-15.4	36.5	53.9	17.4	
Hori.	7320.000	PK	43.8	36.7	7.3	39.0	-15.4	33.4	53.9	20.5	
Hori.	9760.000	PK	42.3	38.7	9.1	37.2	-15.4	37.5	53.9	16.4	
Hori.	12200.000	PK	43.1	39.4	9.7	37.7	-15.4	39.1	53.9	14.8	
Vert.	2391.794	PK	57.0	27.2	13.7	38.2	-15.4	44.3	53.9	9.6	
Vert.	2487.759	PK	57.2	27.5	13.7	38.1	-15.4	44.9	53.9	9.0	
Vert.	4880.000	PK	45.3	31.4	6.3	36.9	-15.4	30.7	53.9	23.2	
Vert.	7320.000	PK	43.9	36.7	7.3	39.0	-15.4	33.5	53.9	20.4	
Vert.	9760.000	PK	42.9	38.7	9.1	37.2	-15.4	38.1	53.9	15.8	
Vert.	12200.000	PK	43.6	39.4	9.7	37.7	-15.4	39.6	53.9	14.3	

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

Radiated Emission

Test place UL Japan, Inc. Shonan EMC Lab. No.1and 2 Semi Anechoic Chamber
 Date 2012/3/20 2012/4/20 2012/4/21 2012/4/23
 Temperature / Humidity 22 deg.C , 39%RH 22 deg.C , 40%RH 21 deg.C , 38%RH 21 deg.C , 68%RH
 Engineer Hikaru Shirasawa Kenichi Adachi Kenichi Adachi Akira Sato
 Mode Tx, 2475 MHz
 Tx, IEEE802.15.4, Antenna:2dBi,

(* PK: Peak, AV: Average, QP: Quasi-Peak)

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.	795.373	QP	42.1	20.8	9.6	31.8	40.7	46.0	5.3	107	61	
Hori.	815.928	QP	43.8	21.0	9.7	31.7	42.8	46.0	3.2	114	59	
Hori.	832.295	QP	39.7	21.2	9.8	31.6	39.1	46.0	6.9	115	49	
Hori.	842.915	QP	44.8	21.3	9.8	31.5	44.4	46.0	1.6	100	54	
Hori.	867.388	QP	43.4	21.6	9.9	31.4	43.5	46.0	2.5	103	70	
Hori.	890.735	QP	44.5	21.8	10.0	31.3	45.0	46.0	1.0	100	72	
Hori.	914.783	QP	41.3	22.1	10.1	31.2	42.3	46.0	3.7	100	69	
Hori.	939.360	QP	41.9	22.3	10.2	31.0	43.4	46.0	2.6	100	77	
Hori.	2483.500	PK	53.2	27.5	13.7	38.1	56.3	73.9	17.6	100	323	
Hori.	2498.080	PK	58.8	27.6	13.7	38.1	62.0	73.9	11.9	100	323	
Hori.	2522.920	PK	56.0	27.6	13.8	38.1	59.3	73.9	14.6	100	328	
Hori.	4950.000	PK	43.8	31.5	6.3	36.9	44.7	73.9	29.2	100	0	
Hori.	7425.000	PK	44.5	36.9	7.4	39.0	49.8	73.9	24.1	100	0	
Hori.	9900.000	PK	43.7	39.0	9.2	37.2	54.7	73.9	19.2	100	0	
Hori.	12375.000	PK	44.4	39.5	9.8	37.5	56.2	73.9	17.7	100	0	
Vert.	295.843	QP	21.5	18.8	10.4	31.7	19.0	46.0	27.0	100	263	
Vert.	890.735	QP	41.3	21.8	10.0	31.3	41.8	46.0	4.2	124	46	
Vert.	938.897	QP	40.9	22.3	10.2	31.0	42.4	46.0	3.6	116	7	
Vert.	2483.500	PK	54.0	27.5	13.7	38.1	57.1	73.9	16.8	100	275	
Vert.	2498.080	PK	58.7	27.6	13.7	38.1	61.9	73.9	12.0	100	267	
Vert.	2522.920	PK	56.2	27.6	13.8	38.1	59.5	73.9	14.4	100	271	
Vert.	4950.000	PK	44.8	31.5	6.3	36.9	45.7	73.9	28.2	100	0	
Vert.	7425.000	PK	45.4	36.9	7.4	39.0	50.7	73.9	23.2	100	0	
Vert.	9900.000	PK	43.0	39.0	9.2	37.2	54.0	73.9	19.9	100	0	
Vert.	12375.000	PK	43.6	39.5	9.8	37.5	55.4	73.9	18.5	100	0	

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

*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

*No noise was detected above the 6th order harmonics.

Distance factor : 15GHz -40GHz : $20\log(3.0m/1.0m) = 9.5dB$

Duty factor relaxation

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	PK	53.2	27.5	13.7	38.1	-15.4	40.9	53.9	13.0	
Hori.	2498.080	PK	58.8	27.6	13.7	38.1	-15.4	46.6	53.9	7.3	
Hori.	2522.920	PK	56.0	27.6	13.8	38.1	-15.4	43.9	53.9	10.0	
Hori.	4950.000	PK	43.8	31.5	6.3	36.9	-15.4	29.3	53.9	24.6	
Hori.	7425.000	PK	44.5	36.9	7.4	39.0	-15.4	34.5	53.9	19.4	
Hori.	9900.000	PK	43.7	39.0	9.2	37.2	-15.4	39.3	53.9	14.6	
Hori.	12375.000	PK	44.4	39.5	9.8	37.5	-15.4	40.8	53.9	13.1	
Vert.	2483.500	PK	54.0	27.5	13.7	38.1	-15.4	41.7	53.9	12.2	
Vert.	2498.080	PK	58.7	27.6	13.7	38.1	-15.4	46.5	53.9	7.4	
Vert.	2522.920	PK	56.2	27.6	13.8	38.1	-15.4	44.1	53.9	9.8	
Vert.	4950.000	PK	44.8	31.5	6.3	36.9	-15.4	30.3	53.9	23.6	
Vert.	7425.000	PK	45.4	36.9	7.4	39.0	-15.4	35.3	53.9	18.6	
Vert.	9900.000	PK	43.0	39.0	9.2	37.2	-15.4	38.6	53.9	15.3	
Vert.	12375.000	PK	43.6	39.5	9.8	37.5	-15.4	40.0	53.9	13.9	

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

Radiated Emission

Test place UL Japan, Inc. Shonan EMC Lab. No.2 Semi Anechoic Chamber
 Date 2012/3/20 2012/4/21
 Temperature / Humidity 22 deg.C , 39%RH 21 deg.C , 38%RH
 Engineer Hikaru Shirasawa Kenichi Adachi
 Mode Tx, 2405 MHz
 Tx, IEEE802.15.4, Antenna:6dBi,

(* PK: Peak, AV: Average, QP: Quasi-Peak)

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.	556.906	QP	42.2	18.4	8.4	31.7	37.3	46.0	8.7	162	359	
Hori.	820.742	QP	38.4	21.1	9.6	31.3	37.8	46.0	8.2	100	320	
Hori.	844.823	QP	37.5	21.4	9.7	31.2	37.4	46.0	8.6	100	129	
Hori.	868.911	QP	38.3	21.7	9.8	31.1	38.7	46.0	7.3	100	132	
Hori.	916.898	QP	37.7	22.2	10.0	30.8	39.1	46.0	6.9	100	118	
Hori.	2356.750	PK	57.3	27.1	13.6	38.2	59.8	73.9	14.1	100	316	
Hori.	2381.670	PK	60.7	27.2	13.7	38.2	63.4	73.9	10.5	100	316	
Hori.	2390.000	PK	58.6	27.2	13.7	38.2	61.3	73.9	12.6	100	316	
Hori.	4810.000	PK	46.3	31.2	6.2	37.0	46.7	73.9	27.2	100	0	
Hori.	7215.000	PK	44.8	36.5	7.2	39.0	49.5	73.9	24.4	100	0	
Hori.	9620.000	PK	42.7	38.4	9.0	37.2	52.9	73.9	21.0	100	0	
Hori.	12025.000	PK	41.8	39.3	9.6	37.9	52.8	73.9	21.1	100	0	
Vert.	198.506	QP	23.8	16.4	9.3	31.8	17.7	43.5	25.8	100	310	
Vert.	748.746	QP	35.0	20.5	9.3	31.6	33.2	46.0	12.8	100	38	
Vert.	2356.750	PK	57.3	27.1	13.6	38.2	59.8	73.9	14.1	115	310	
Vert.	2381.670	PK	60.6	27.2	13.7	38.2	63.3	73.9	10.6	107	320	
Vert.	2390.000	PK	58.1	27.2	13.7	38.2	60.8	73.9	13.1	107	327	
Vert.	4810.000	PK	45.3	31.2	6.2	37.0	45.7	73.9	28.2	100	0	
Vert.	7215.000	PK	45.8	36.5	7.2	39.0	50.5	73.9	23.4	100	0	
Vert.	9620.000	PK	41.2	38.4	9.0	37.2	51.4	73.9	22.5	100	0	
Vert.	12025.000	PK	42.2	39.3	9.6	37.9	53.2	73.9	20.7	100	0	

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

*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

*No noise was detected above the 6th order harmonics.

Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

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.	2405.000	PK	99.6	27.3	13.7	38.2	102.4	-	-	Carrier
Hori.	2400.000	PK	58.2	27.3	13.7	38.2	61.0	82.4	21.4	
Vert.	2405.000	PK	99.4	27.3	13.7	38.2	102.2	-	-	Carrier
Vert.	2400.000	PK	58.2	27.3	13.7	38.2	61.0	82.2	21.2	

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

Duty factor relaxation

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2356.750	PK	57.3	27.1	13.6	38.2	-15.4	44.4	53.9	9.5	
Hori.	2381.670	PK	60.7	27.2	13.7	38.2	-15.4	48.0	53.9	5.9	
Hori.	2390.000	PK	58.6	27.2	13.7	38.2	-15.4	45.9	53.9	8.0	
Hori.	4810.000	PK	46.3	31.2	6.2	37.0	-15.4	31.3	53.9	22.6	
Hori.	7215.000	PK	44.8	36.5	7.2	39.0	-15.4	34.1	53.9	19.8	
Hori.	9620.000	PK	42.7	38.4	9.0	37.2	-15.4	37.5	53.9	16.4	
Hori.	12025.000	PK	41.8	39.3	9.6	37.9	-15.4	37.4	53.9	16.5	
Vert.	2356.750	PK	57.3	27.1	13.6	38.2	-15.4	44.4	53.9	9.5	
Vert.	2381.670	PK	60.6	27.2	13.7	38.2	-15.4	47.9	53.9	6.0	
Vert.	2390.000	PK	58.1	27.2	13.7	38.2	-15.4	45.4	53.9	8.5	
Vert.	4810.000	PK	45.3	31.2	6.2	37.0	-15.4	30.3	53.9	23.6	
Vert.	7215.000	PK	45.8	36.5	7.2	39.0	-15.4	35.1	53.9	18.8	
Vert.	9620.000	PK	41.2	38.4	9.0	37.2	-15.4	36.0	53.9	17.9	
Vert.	12025.000	PK	42.2	39.3	9.6	37.9	-15.4	37.8	53.9	16.1	

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

Radiated Emission

Test place UL Japan, Inc. Shonan EMC Lab. No.2 Semi Anechoic Chamber
 Date 2012/3/20 2012/4/21
 Temperature / Humidity 22 deg.C , 39%RH 21 deg.C , 38%RH
 Engineer Hikaru Shirasawa Kkenichi Adachi
 Mode Tx, 2440 MHz
 Tx, IEEE802.15.4, Antenna:6dBi,

(* PK: Peak, AV: Average, QP: Quasi-Peak)

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.	559.085	QP	38.5	18.5	8.5	31.7	33.8	46.0	12.2	200	169	
Hori.	831.916	QP	40.4	21.2	9.7	31.3	40.0	46.0	6.0	100	121	
Hori.	855.906	QP	39.1	21.5	9.8	31.1	39.3	46.0	6.7	100	312	
Hori.	903.907	QP	38.6	22.1	10.0	30.9	39.8	46.0	6.2	100	128	
Hori.	952.660	QP	37.7	22.6	10.2	30.5	40.0	46.0	6.0	100	129	
Hori.	2391.957	PK	57.7	27.2	13.7	38.2	60.4	73.9	13.5	100	318	
Hori.	2487.952	PK	56.6	27.5	13.7	38.1	59.7	73.9	14.2	100	318	
Hori.	4880.000	PK	42.6	31.4	6.3	36.9	43.4	73.9	30.5	100	0	
Hori.	7320.000	PK	43.7	36.7	7.3	39.0	48.7	73.9	25.2	100	0	
Hori.	9760.000	PK	42.8	38.7	9.1	37.2	53.4	73.9	20.5	100	0	
Hori.	12200.000	PK	43.3	39.4	9.7	37.7	54.7	73.9	19.2	100	0	
Vert.	209.543	QP	24.1	16.6	9.5	31.8	18.4	43.5	25.1	100	127	
Vert.	735.902	QP	35.4	20.4	9.3	31.6	33.5	46.0	12.5	100	25	
Vert.	2391.957	PK	57.3	27.2	13.7	38.2	60.0	73.9	13.9	100	115	
Vert.	2487.952	PK	56.3	27.5	13.7	38.1	59.4	73.9	14.5	100	115	
Vert.	4880.000	PK	42.5	31.4	6.3	36.9	43.3	73.9	30.6	100	0	
Vert.	7320.000	PK	43.4	36.7	7.3	39.0	48.4	73.9	25.5	100	0	
Vert.	9760.000	PK	42.5	38.7	9.1	37.2	53.1	73.9	20.8	100	0	
Vert.	12200.000	PK	44.0	39.4	9.7	37.7	55.4	73.9	18.5	100	0	

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

*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

*No noise was detected above the 6th order harmonics.

Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

Duty factor relaxation

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2391.957	PK	57.7	27.2	13.7	38.2	-15.4	45.0	53.9	8.9	
Hori.	2487.952	PK	56.6	27.5	13.7	38.1	-15.4	44.3	53.9	9.6	
Hori.	4880.000	PK	42.6	31.4	6.3	36.9	-15.4	28.0	53.9	25.9	
Hori.	7320.000	PK	43.7	36.7	7.3	39.0	-15.4	33.3	53.9	20.6	
Hori.	9760.000	PK	42.8	38.7	9.1	37.2	-15.4	38.0	53.9	15.9	
Hori.	12200.000	PK	43.3	39.4	9.7	37.7	-15.4	39.3	53.9	14.6	
Vert.	2391.957	PK	57.3	27.2	13.7	38.2	-15.4	44.6	53.9	9.3	
Vert.	2487.952	PK	56.3	27.5	13.7	38.1	-15.4	44.0	53.9	9.9	
Vert.	4880.000	PK	42.5	31.4	6.3	36.9	-15.4	27.9	53.9	26.0	
Vert.	7320.000	PK	43.4	36.7	7.3	39.0	-15.4	33.0	53.9	20.9	
Vert.	9760.000	PK	42.5	38.7	9.1	37.2	-15.4	37.7	53.9	16.2	
Vert.	12200.000	PK	44.0	39.4	9.7	37.7	-15.4	40.0	53.9	13.9	

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

Radiated Emission

Test place UL Japan, Inc. Shonan EMC Lab. No.2 Semi Anechoic Chamber
 Date 2012/3/20 2012/4/21
 Temperature / Humidity 22 deg.C , 39%RH 21 deg.C , 38%RH
 Engineer Hikaru Shirasawa Kenichi Adachi
 Mode Tx, 2475 MHz
 Tx, IEEE802.15.4, Antenna:6dBi,

(* PK: Peak, AV: Average, QP: Quasi-Peak)

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.	555.067	QP	39.0	18.4	8.4	31.7	34.1	46.0	11.9	160	350	
Hori.	815.928	QP	39.7	21.0	9.6	31.4	38.9	46.0	7.1	111	186	
Hori.	842.899	QP	39.4	21.4	9.7	31.2	39.3	46.0	6.7	110	183	
Hori.	890.908	QP	38.2	22.0	9.9	31.0	39.1	46.0	6.9	100	303	
Hori.	939.017	QP	37.9	22.4	10.1	30.7	39.7	46.0	6.3	100	131	
Hori.	2483.500	PK	53.5	27.5	13.7	38.1	56.6	73.9	17.3	100	318	
Hori.	2498.250	PK	57.8	27.6	13.7	38.1	61.0	73.9	12.9	100	318	
Hori.	2522.830	PK	55.9	27.6	13.8	38.1	59.2	73.9	14.7	100	318	
Hori.	4950.000	PK	43.4	31.5	6.3	36.9	44.3	73.9	29.6	100	0	
Hori.	7425.000	PK	45.6	36.9	7.4	39.0	50.9	73.9	23.0	100	0	
Hori.	9900.000	PK	42.9	39.0	9.2	37.2	53.9	73.9	20.0	100	0	
Hori.	12375.000	PK	42.8	39.5	9.8	37.5	54.6	73.9	19.3	100	0	
Vert.	202.791	QP	23.9	16.5	9.4	31.8	18.0	43.5	25.5	100	35	
Vert.	746.883	QP	35.9	20.5	9.3	31.6	34.1	46.0	11.9	100	11	
Vert.	2483.500	PK	53.4	27.5	13.7	38.1	56.5	73.9	17.4	109	117	
Vert.	2498.250	PK	57.9	27.6	13.7	38.1	61.1	73.9	12.8	112	333	
Vert.	2522.830	PK	56.1	27.6	13.8	38.1	59.4	73.9	14.5	107	332	
Vert.	4950.000	PK	42.8	31.5	6.3	36.9	43.7	73.9	30.2	100	0	
Vert.	7425.000	PK	45.3	36.9	7.4	39.0	50.6	73.9	23.3	100	0	
Vert.	9900.000	PK	42.6	39.0	9.2	37.2	53.6	73.9	20.3	100	0	
Vert.	12375.000	PK	42.4	39.5	9.8	37.5	54.2	73.9	19.7	100	0	

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

*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

*No noise was detected above the 6th order harmonics.

Distance factor : 15GHz -40GHz : $20\log(3.0m/1.0m)= 9.5dB$

Duty factor relaxation

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	PK	53.5	27.5	13.7	38.1	-15.4	41.2	53.9	12.7	
Hori.	2498.250	PK	57.8	27.6	13.7	38.1	-15.4	45.6	53.9	8.3	
Hori.	2522.830	PK	55.9	27.6	13.8	38.1	-15.4	43.8	53.9	10.1	
Hori.	4950.000	PK	43.4	31.5	6.3	36.9	-15.4	28.9	53.9	25.0	
Hori.	7425.000	PK	45.6	36.9	7.4	39.0	-15.4	35.5	53.9	18.4	
Hori.	9900.000	PK	42.9	39.0	9.2	37.2	-15.4	38.5	53.9	15.4	
Hori.	12375.000	PK	42.8	39.5	9.8	37.5	-15.4	39.2	53.9	14.7	
Vert.	2483.500	PK	53.4	27.5	13.7	38.1	-15.4	41.1	53.9	12.8	
Vert.	2498.250	PK	57.9	27.6	13.7	38.1	-15.4	45.7	53.9	8.2	
Vert.	2522.830	PK	56.1	27.6	13.8	38.1	-15.4	44.0	53.9	9.9	
Vert.	4950.000	PK	42.8	31.5	6.3	36.9	-15.4	28.3	53.9	25.6	
Vert.	7425.000	PK	45.3	36.9	7.4	39.0	-15.4	35.2	53.9	18.7	
Vert.	9900.000	PK	42.6	39.0	9.2	37.2	-15.4	38.2	53.9	15.7	
Vert.	12375.000	PK	42.4	39.5	9.8	37.5	-15.4	38.8	53.9	15.1	

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

Radiated Emission

Test place UL Japan, Inc. Shonan EMC Lab. No.1and 2 Semi Anechoic Chamber
 Date 2012/4/19 2012/4/20 2012/4/23
 Temperature / Humidity 22 deg.C , 40%RH 21 deg.C , 38%RH 21 deg.C , 61%RH
 Engineer Kenichi Adachi Kenichi Adachi Akira Sato
 Mode Tx, 2405 MHz
 Tx, IEEE802.15.4, Antenna:9dBi,

(* PK: Peak, AV: Average, QP: Quasi-Peak)

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.	604.722	QP	35.7	18.9	8.8	31.9	31.5	46.0	14.5	142	12	
Hori.	749.356	QP	34.9	20.5	9.4	31.9	32.9	46.0	13.1	107	348	
Hori.	772.723	QP	37.4	20.7	9.5	31.8	35.8	46.0	10.2	100	291	
Hori.	820.721	QP	34.3	21.1	9.7	31.7	33.4	46.0	12.6	122	7	
Hori.	868.886	QP	33.7	21.6	9.9	31.4	33.8	46.0	12.2	100	104	
Hori.	916.716	QP	35.4	22.1	10.1	31.1	36.5	46.0	9.5	100	353	
Hori.	2356.830	PK	56.3	27.1	13.8	38.2	59.0	73.9	14.9	100	317	
Hori.	2381.670	PK	59.7	27.2	13.8	38.2	62.5	73.9	11.4	100	126	
Hori.	2390.000	PK	58.1	27.2	13.9	38.2	61.0	73.9	12.9	100	320	
Hori.	4810.000	PK	43.1	31.2	6.2	37.0	43.5	73.9	30.4	100	0	
Hori.	7215.000	PK	44.9	36.5	7.2	39.0	49.6	73.9	24.3	100	0	
Hori.	9620.000	PK	41.7	38.4	9.0	37.2	51.9	73.9	22.0	100	0	
Hori.	12025.000	PK	42.8	39.3	9.6	37.9	53.8	73.9	20.1	100	0	
Vert.	156.122	QP	21.8	14.9	8.7	31.8	13.6	43.5	29.9	100	0	
Vert.	772.720	QP	31.0	20.7	9.5	31.8	29.4	46.0	16.6	100	112	
Vert.	2356.830	PK	56.2	27.1	13.8	38.2	58.9	73.9	15.0	110	359	
Vert.	2381.670	PK	59.6	27.2	13.8	38.2	62.4	73.9	11.5	105	29	
Vert.	2390.000	PK	57.6	27.2	13.9	38.2	60.5	73.9	13.4	104	355	
Vert.	4810.000	PK	43.3	31.2	6.2	37.0	43.7	73.9	30.2	100	0	
Vert.	7215.000	PK	46.1	36.5	7.2	39.0	50.8	73.9	23.1	100	0	
Vert.	9620.000	PK	41.6	38.4	9.0	37.2	51.8	73.9	22.1	100	0	
Vert.	12025.000	PK	42.0	39.3	9.6	37.9	53.0	73.9	20.9	100	0	

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

*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

*No noise was detected above the 6th order harmonics.

Distance factor : 15GHz -40GHz : $20\log(3.0m/1.0m) = 9.5dB$

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.	2405.000	PK	97.1	27.3	13.9	38.2	100.1	-	-	Carrier
Hori.	2400.000	PK	58.2	27.3	13.9	38.2	61.2	80.1	18.9	
Vert.	2405.000	PK	97.0	27.3	13.9	38.2	100.0	-	-	Carrier
Vert.	2400.000	PK	58.2	27.3	13.9	38.2	61.2	80.0	18.8	

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

Duty factor relaxation

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2356.830	PK	56.3	27.1	13.8	38.2	-15.4	43.7	53.9	10.2	
Hori.	2381.670	PK	59.7	27.2	13.8	38.2	-15.4	47.1	53.9	6.8	
Hori.	2390.000	PK	58.1	27.2	13.9	38.2	-15.4	45.6	53.9	8.3	
Hori.	4810.000	PK	43.1	31.2	6.2	37.0	-15.4	28.1	53.9	25.8	
Hori.	7215.000	PK	44.9	36.5	7.2	39.0	-15.4	34.2	53.9	19.7	
Hori.	9620.000	PK	41.7	38.4	9.0	37.2	-15.4	36.6	53.9	17.3	
Hori.	12025.000	PK	42.8	39.3	9.6	37.9	-15.4	38.4	53.9	15.5	
Vert.	2356.830	PK	56.2	27.1	13.8	38.2	-15.4	43.5	53.9	10.4	
Vert.	2381.670	PK	59.6	27.2	13.8	38.2	-15.4	47.0	53.9	6.9	
Vert.	2390.000	PK	57.6	27.2	13.9	38.2	-15.4	45.1	53.9	8.8	
Vert.	4810.000	PK	43.3	31.2	6.2	37.0	-15.4	28.3	53.9	25.6	
Vert.	7215.000	PK	46.1	36.5	7.2	39.0	-15.4	35.4	53.9	18.5	
Vert.	9620.000	PK	41.6	38.4	9.0	37.2	-15.4	36.4	53.9	17.5	
Vert.	12025.000	PK	42.0	39.3	9.6	37.9	-15.4	37.7	53.9	16.2	

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

Radiated Emission

Test place UL Japan, Inc. Shonan EMC Lab. No.1and 2 Semi Anechoic Chamber
 Date 2012/4/19 2012/4/20 2012/4/23
 Temperature / Humidity 22 deg.C , 40%RH 21 deg.C , 38%RH 21 deg.C , 61%RH
 Engineer Kenichi Adachi Kenichi Adachi Akira Sato
 Mode Tx, 2440 MHz
 Tx, IEEE802.15.4, Antenna:9dBi,

(* PK: Peak, AV: Average, QP: Quasi-Peak)

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.	599.581	QP	33.6	18.8	8.8	31.9	29.3	46.0	16.7	158	255	
Hori.	759.930	QP	35.5	20.6	9.5	31.9	33.7	46.0	12.3	100	84	
Hori.	856.363	QP	37.1	21.4	9.9	31.5	36.9	46.0	9.1	100	38	
Hori.	904.388	QP	35.5	22.0	10.1	31.2	36.4	46.0	9.6	100	95	
Hori.	952.370	QP	36.8	22.5	10.2	30.8	38.7	46.0	7.3	156	270	
Hori.	2392.465	PK	57.4	27.2	13.9	38.2	60.3	73.9	13.6	100	318	
Hori.	2487.470	PK	55.7	27.5	13.9	38.1	59.0	73.9	14.9	100	124	
Hori.	4880.000	PK	42.5	31.4	6.3	36.9	43.3	73.9	30.6	100	0	
Hori.	7320.000	PK	43.7	36.7	7.3	39.0	48.7	73.9	25.2	100	0	
Hori.	9760.000	PK	42.4	38.7	9.1	37.2	53.0	73.9	20.9	100	0	
Hori.	12200.000	PK	43.0	39.4	9.7	37.7	54.4	73.9	19.5	100	0	
Vert.	157.080	QP	22.8	14.9	8.8	31.8	14.7	43.5	28.8	100	350	
Vert.	855.909	QP	32.2	21.4	9.9	31.5	32.0	46.0	14.0	100	350	
Vert.	951.918	QP	32.6	22.4	10.2	30.8	34.4	46.0	11.6	109	89	
Vert.	2392.465	PK	56.9	27.2	13.9	38.2	59.8	73.9	14.1	109	8	
Vert.	2487.470	PK	56.5	27.5	13.9	38.1	59.8	73.9	14.1	100	2	
Vert.	4880.000	PK	43.0	31.4	6.3	36.9	43.8	73.9	30.1	100	0	
Vert.	7320.000	PK	43.8	36.7	7.3	39.0	48.8	73.9	25.1	100	0	
Vert.	9760.000	PK	42.7	38.7	9.1	37.2	53.3	73.9	20.6	100	0	
Vert.	12200.000	PK	43.1	39.4	9.7	37.7	54.5	73.9	19.4	100	0	

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

*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

*No noise was detected above the 6th order harmonics.

Distance factor : 15GHz -40GHz : $20\log(3.0m/1.0m)= 9.5dB$

Duty factor relaxation

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2392.465	PK	57.4	27.2	13.9	38.2	-15.4	44.9	53.9	9.0	
Hori.	2487.470	PK	55.7	27.5	13.9	38.1	-15.4	43.6	53.9	10.3	
Hori.	4880.000	PK	42.5	31.4	6.3	36.9	-15.4	27.9	53.9	26.0	
Hori.	7320.000	PK	43.7	36.7	7.3	39.0	-15.4	33.3	53.9	20.6	
Hori.	9760.000	PK	42.4	38.7	9.1	37.2	-15.4	37.6	53.9	16.3	
Hori.	12200.000	PK	43.0	39.4	9.7	37.7	-15.4	39.0	53.9	14.9	
Vert.	2392.465	PK	56.9	27.2	13.9	38.2	-15.4	44.4	53.9	9.5	
Vert.	2487.470	PK	56.5	27.5	13.9	38.1	-15.4	44.4	53.9	9.5	
Vert.	4880.000	PK	43.0	31.4	6.3	36.9	-15.4	28.4	53.9	25.5	
Vert.	7320.000	PK	43.8	36.7	7.3	39.0	-15.4	33.4	53.9	20.5	
Vert.	9760.000	PK	42.7	38.7	9.1	37.2	-15.4	37.9	53.9	16.0	
Vert.	12200.000	PK	43.1	39.4	9.7	37.7	-15.4	39.1	53.9	14.8	

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

Radiated Emission

Test place UL Japan, Inc. Shonan EMC Lab. No.1 and 2 Semi Anechoic Chamber
 Date 2012/4/19 2012/4/20 2012/4/23
 Temperature / Humidity 22 deg.C , 40%RH 21 deg.C , 38%RH 21 deg.C , 61%RH
 Engineer Kenichi Adachi Kenichi Adachi Akira Sato
 Mode Tx, 2475 MHz
 Tx, IEEE802.15.4, Antenna:9dBi,

(* PK: Peak, AV: Average, QP: Quasi-Peak)

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.	771.392	QP	37.9	20.7	9.5	31.8	36.3	46.0	9.7	100	281	
Hori.	842.906	QP	37.8	21.3	9.8	31.5	37.4	46.0	8.6	100	42	
Hori.	867.415	QP	34.2	21.6	9.9	31.4	34.3	46.0	11.7	100	104	
Hori.	891.380	QP	35.1	21.8	10.0	31.3	35.6	46.0	10.4	102	96	
Hori.	938.897	QP	37.0	22.3	10.2	31.0	38.5	46.0	7.5	100	354	
Hori.	2483.500	PK	54.7	27.5	13.9	38.1	58.0	73.9	15.9	103	320	
Hori.	2498.170	PK	56.4	27.6	13.9	38.1	59.8	73.9	14.1	102	127	
Hori.	2522.920	PK	54.8	27.6	13.9	38.1	58.2	73.9	15.7	100	320	
Hori.	4950.000	PK	43.4	31.5	6.3	36.9	44.3	73.9	29.6	100	0	
Hori.	7425.000	PK	44.6	36.9	7.4	39.0	49.9	73.9	24.0	100	0	
Hori.	9900.000	PK	42.6	39.0	9.2	37.2	53.6	73.9	20.3	100	0	
Hori.	12375.000	PK	43.3	39.5	9.8	37.5	55.1	73.9	18.8	100	0	
Vert.	296.479	QP	21.4	18.8	10.4	31.7	18.9	46.0	27.1	100	359	
Vert.	842.912	QP	32.9	21.3	9.8	31.5	32.5	46.0	13.5	238	339	
Vert.	2483.500	PK	55.0	27.5	13.9	38.1	58.3	73.9	15.6	100	358	
Vert.	2498.170	PK	56.9	27.6	13.9	38.1	60.3	73.9	13.6	100	57	
Vert.	2522.920	PK	55.1	27.6	13.9	38.1	58.5	73.9	15.4	100	0	
Vert.	4950.000	PK	44.7	31.5	6.3	36.9	45.6	73.9	28.3	100	0	
Vert.	7425.000	PK	45.1	36.9	7.4	39.0	50.4	73.9	23.5	100	0	
Vert.	9900.000	PK	42.9	39.0	9.2	37.2	53.9	73.9	20.0	100	0	
Vert.	12375.000	PK	43.1	39.5	9.8	37.5	54.9	73.9	19.0	100	0	

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

*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

*No noise was detected above the 6th order harmonics.

Distance factor : 15GHz -40GHz : $20\log(3.0m/1.0m)= 9.5dB$

Duty factor relaxation

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	PK	54.7	27.5	13.9	38.1	-15.4	42.6	53.9	11.3	
Hori.	2498.170	PK	56.4	27.6	13.9	38.1	-15.4	44.4	53.9	9.5	
Hori.	2522.920	PK	54.8	27.6	13.9	38.1	-15.4	42.8	53.9	11.1	
Hori.	4950.000	PK	43.4	31.5	6.3	36.9	-15.4	28.9	53.9	25.0	
Hori.	7425.000	PK	44.6	36.9	7.4	39.0	-15.4	34.5	53.9	19.4	
Hori.	9900.000	PK	42.6	39.0	9.2	37.2	-15.4	38.2	53.9	15.7	
Hori.	12375.000	PK	43.3	39.5	9.8	37.5	-15.4	39.7	53.9	14.2	
Vert.	2483.500	PK	55.0	27.5	13.9	38.1	-15.4	42.9	53.9	11.0	
Vert.	2498.170	PK	56.9	27.6	13.9	38.1	-15.4	44.9	53.9	9.0	
Vert.	2522.920	PK	55.1	27.6	13.9	38.1	-15.4	43.1	53.9	10.8	
Vert.	4950.000	PK	44.7	31.5	6.3	36.9	-15.4	30.2	53.9	23.7	
Vert.	7425.000	PK	45.1	36.9	7.4	39.0	-15.4	35.0	53.9	18.9	
Vert.	9900.000	PK	42.9	39.0	9.2	37.2	-15.4	38.5	53.9	15.4	
Vert.	12375.000	PK	43.1	39.5	9.8	37.5	-15.4	39.5	53.9	14.4	

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

Radiated Emission

Test place UL Japan, Inc. Shonan EMC Lab. No.1 Semi Anechoic Chamber
 Date 2012/5/25 2012/5/28
 Temperature / Humidity 22 deg.C , 58%RH 26 deg.C , 49%RH
 Engineer Makoto Hosaka Shinichi Takano
 Mode Tx, 2405 MHz
 Tx, IEEE802.15.4, Antenna:15dBi,

(* PK: Peak, AV: Average, QP: Quasi-Peak)

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.	916.900	QP	21.6	22.1	10.1	31.1	22.7	46.0	23.3	100	0	
Hori.	2356.830	PK	47.2	28.0	13.9	40.7	48.4	73.9	25.5	100	0	
Hori.	2381.670	PK	47.7	28.1	13.9	40.7	49.0	73.9	24.9	100	0	
Hori.	2390.000	PK	45.3	28.2	13.9	40.7	46.7	73.9	27.2	100	0	
Hori.	4810.000	PK	46.7	31.2	6.6	41.6	42.9	73.9	31.0	100	0	
Hori.	7215.000	PK	44.5	36.1	7.4	41.2	46.8	73.9	27.1	100	0	
Hori.	9620.000	PK	45.5	38.6	8.6	40.4	52.3	73.9	21.6	100	0	
Hori.	12025.000	PK	45.7	39.5	9.5	39.4	55.3	73.9	18.6	100	0	
Vert.	295.696	QP	21.8	18.8	10.4	31.7	19.3	46.0	26.7	100	0	
Vert.	2356.830	PK	51.5	28.0	13.9	40.7	52.7	73.9	21.2	100	85	
Vert.	2381.670	PK	52.3	28.1	13.9	40.7	53.6	73.9	20.3	100	85	
Vert.	2390.000	PK	50.5	28.2	13.9	40.7	51.9	73.9	22.0	100	88	
Vert.	4810.000	PK	44.7	31.2	6.6	41.6	40.9	73.9	33.0	100	0	
Vert.	7215.000	PK	45.5	36.1	7.4	41.2	47.8	73.9	26.1	100	0	
Vert.	9620.000	PK	46.7	38.6	8.6	40.4	53.5	73.9	20.4	100	0	
Vert.	12025.000	PK	45.2	39.5	9.5	39.4	54.8	73.9	19.1	100	0	

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

*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

*No noise was detected above the 6th order harmonics.

Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

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.	2405.000	PK	69.0	28.3	13.9	40.7	70.5	-	-	Carrier
Hori.	2400.000	PK	39.3	28.2	13.9	40.7	40.7	50.5	9.8	
Vert.	2405.000	PK	87.8	28.3	13.9	40.7	89.3	-	-	Carrier
Vert.	2400.000	PK	49.8	28.2	13.9	40.7	51.2	69.3	18.1	

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

Duty factor relaxation

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2356.830	PK	47.2	28.0	13.9	40.7	-15.4	33.0	53.9	20.9	
Hori.	2381.670	PK	47.7	28.1	13.9	40.7	-15.4	33.6	53.9	20.3	
Hori.	2390.000	PK	45.3	28.2	13.9	40.7	-15.4	31.3	53.9	22.6	
Hori.	4810.000	PK	46.7	31.2	6.6	41.6	-15.4	27.5	53.9	26.4	
Hori.	7215.000	PK	44.5	36.1	7.4	41.2	-15.4	31.4	53.9	22.5	
Hori.	9620.000	PK	45.5	38.6	8.6	40.4	-15.4	36.9	53.9	17.0	
Hori.	12025.000	PK	45.7	39.5	9.5	39.4	-15.4	39.9	53.9	14.0	
Vert.	2356.830	PK	51.5	28.0	13.9	40.7	-15.4	37.3	53.9	16.6	
Vert.	2381.670	PK	52.3	28.1	13.9	40.7	-15.4	38.2	53.9	15.7	
Vert.	2390.000	PK	50.5	28.2	13.9	40.7	-15.4	36.5	53.9	17.4	
Vert.	4810.000	PK	44.7	31.2	6.6	41.6	-15.4	25.5	53.9	28.4	
Vert.	7215.000	PK	45.5	36.1	7.4	41.2	-15.4	32.4	53.9	21.5	
Vert.	9620.000	PK	46.7	38.6	8.6	40.4	-15.4	38.1	53.9	15.8	
Vert.	12025.000	PK	45.2	39.5	9.5	39.4	-15.4	39.4	53.9	14.5	

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

Radiated Emission

Test place UL Japan, Inc. Shonan EMC Lab. No.1 Semi Anechoic Chamber
 Date 2012/5/25 2012/5/28
 Temperature / Humidity 22 deg.C , 58%RH 26 deg.C , 49%RH
 Engineer Makoto Hosaka Shinichi Takano
 Mode Tx, 2440 MHz
 Tx, IEEE802.15.4, Antenna:15dBi,

(* PK: Peak, AV: Average, QP: Quasi-Peak)

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.	855.900	QP	22.2	21.4	9.9	31.5	22.0	46.0	24.0	100	0	
Hori.	2391.794	PK	47.0	28.2	13.9	40.7	48.4	73.9	25.5	100	0	
Hori.	2487.918	PK	47.8	28.7	14.0	40.7	49.8	73.9	24.1	100	0	
Hori.	4880.000	PK	45.0	31.4	6.6	41.5	41.5	73.9	32.4	100	0	
Hori.	7320.000	PK	46.8	36.2	7.6	41.2	49.4	73.9	24.5	100	0	
Hori.	9760.000	PK	46.0	38.7	8.7	40.4	53.0	73.9	20.9	100	0	
Hori.	12200.000	PK	47.2	39.6	9.5	39.2	57.1	73.9	16.8	100	0	
Vert.	298.657	QP	21.7	18.9	10.4	31.7	19.3	46.0	26.7	100	0	
Vert.	2391.914	PK	51.5	28.2	13.9	40.7	52.9	73.9	21.0	100	95	
Vert.	2487.918	PK	52.0	28.7	14.0	40.7	54.0	73.9	19.9	100	94	
Vert.	4880.000	PK	44.4	31.4	6.6	41.5	40.9	73.9	33.0	100	0	
Vert.	7320.000	PK	47.0	36.2	7.6	41.2	49.6	73.9	24.3	100	0	
Vert.	9760.000	PK	46.0	38.7	8.7	40.4	53.0	73.9	20.9	100	0	
Vert.	12200.000	PK	45.7	39.6	9.5	39.2	55.6	73.9	18.3	100	0	

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

*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

*No noise was detected above the 6th order harmonics.

Distance factor : 15GHz -40GHz : $20\log(3.0\text{m}/1.0\text{m})= 9.5\text{dB}$

Duty factor relaxation

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2391.794	PK	47.0	28.2	13.9	40.7	-15.4	33.0	53.9	20.9	
Hori.	2487.918	PK	47.8	28.7	14.0	40.7	-15.4	34.4	53.9	19.5	
Hori.	4880.000	PK	45.0	31.4	6.6	41.5	-15.4	26.1	53.9	27.8	
Hori.	7320.000	PK	46.8	36.2	7.6	41.2	-15.4	34.0	53.9	19.9	
Hori.	9760.000	PK	46.0	38.7	8.7	40.4	-15.4	37.6	53.9	16.3	
Hori.	12200.000	PK	47.2	39.6	9.5	39.2	-15.4	41.7	53.9	12.2	
Vert.	2391.914	PK	51.5	28.2	13.9	40.7	-15.4	37.5	53.9	16.4	
Vert.	2487.918	PK	52.0	28.7	14.0	40.7	-15.4	38.6	53.9	15.3	
Vert.	4880.000	PK	44.4	31.4	6.6	41.5	-15.4	25.5	53.9	28.4	
Vert.	7320.000	PK	47.0	36.2	7.6	41.2	-15.4	34.2	53.9	19.7	
Vert.	9760.000	PK	46.0	38.7	8.7	40.4	-15.4	37.6	53.9	16.3	
Vert.	12200.000	PK	45.7	39.6	9.5	39.2	-15.4	40.2	53.9	13.7	

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

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Radiated Emission

Test place UL Japan, Inc. Shonan EMC Lab. No.1 Semi Anechoic Chamber
 Date 2012/5/25 2012/5/28
 Temperature / Humidity 22 deg.C , 58%RH 26 deg.C , 49%RH
 Engineer Makoto Hosaka Shinichi Takano
 Mode Tx, 2475 MHz
 Tx, IEEE802.15.4, Antenna:15dBi,

(* PK: Peak, AV: Average, QP: Quasi-Peak)

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.	890.735	QP	21.9	21.8	10.0	31.3	22.4	46.0	23.6	100	0	
Hori.	2483.500	PK	44.6	28.7	14.0	40.7	46.6	73.9	27.3	100	0	
Hori.	2499.524	PK	47.8	28.7	14.0	40.7	49.8	73.9	24.1	100	0	
Hori.	2522.564	PK	47.7	28.7	14.0	40.7	49.7	73.9	24.2	100	0	
Hori.	4950.000	PK	46.9	31.6	6.8	41.4	43.9	73.9	30.0	100	0	
Hori.	7425.000	PK	46.3	36.3	7.7	41.3	49.0	73.9	24.9	100	94	
Hori.	9900.000	PK	47.1	38.9	8.9	40.3	54.6	73.9	19.3	100	0	
Hori.	12375.000	PK	45.4	39.7	9.7	39.1	55.7	73.9	18.2	100	0	
Vert.	299.732	QP	21.6	18.9	10.4	31.7	19.2	46.0	26.8	100	0	
Vert.	2483.500	PK	52.0	28.7	14.0	40.7	54.0	73.9	19.9	100	93	
Vert.	2499.524	PK	50.8	28.7	14.0	40.7	52.8	73.9	21.1	100	93	
Vert.	2522.564	PK	50.8	28.7	14.0	40.7	52.8	73.9	21.1	100	92	
Vert.	4950.000	PK	44.9	31.6	6.8	41.4	41.9	73.9	32.0	100	0	
Vert.	7425.000	PK	44.9	36.3	7.7	41.3	47.6	73.9	26.3	100	0	
Vert.	9900.000	PK	47.0	38.9	8.9	40.3	54.5	73.9	19.4	100	0	
Vert.	12375.000	PK	47.0	39.7	9.7	39.1	57.3	73.9	16.6	100	0	

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

*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

*No noise was detected above the 6th order harmonics.

Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

Duty factor relaxation

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	PK	44.6	28.7	14.0	40.7	-15.4	31.2	53.9	22.7	
Hori.	2499.524	PK	47.8	28.7	14.0	40.7	-15.4	34.4	53.9	19.5	
Hori.	2522.564	PK	47.7	28.7	14.0	40.7	-15.4	34.3	53.9	19.6	
Hori.	4950.000	PK	46.9	31.6	6.8	41.4	-15.4	28.5	53.9	25.4	
Hori.	7425.000	PK	46.3	36.3	7.7	41.3	-15.4	33.6	53.9	20.3	
Hori.	9900.000	PK	47.1	38.9	8.9	40.3	-15.4	39.2	53.9	14.7	
Hori.	12375.000	PK	45.4	39.7	9.7	39.1	-15.4	40.3	53.9	13.6	
Vert.	2483.500	PK	52.0	28.7	14.0	40.7	-15.4	38.6	53.9	15.3	
Vert.	2499.524	PK	50.8	28.7	14.0	40.7	-15.4	37.4	53.9	16.5	
Vert.	2522.564	PK	50.8	28.7	14.0	40.7	-15.4	37.4	53.9	16.5	
Vert.	4950.000	PK	44.9	31.6	6.8	41.4	-15.4	26.5	53.9	27.4	
Vert.	7425.000	PK	44.9	36.3	7.7	41.3	-15.4	32.2	53.9	21.7	
Vert.	9900.000	PK	47.0	38.9	8.9	40.3	-15.4	39.1	53.9	14.8	
Vert.	12375.000	PK	47.0	39.7	9.7	39.1	-15.4	41.9	53.9	12.0	

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

Duty factor Calculation

Tx, IEEE802.15.4

Duty cycle specification	
<p>Duty factor= $20\text{Log}(17.024 / 100) = -15.38\text{dB}$</p> <p>Maximum transmission "ON" time per timeslot in ISA100: $32 \mu\text{s}/\text{byte} \times 133 \text{ bytes} = 4.256 \text{ ms}$</p> <p>Total maximum "ON" time over 100 ms in our system : $4.256 \text{ ms} \times 4 = 17.024 \text{ ms}$ (Maximum timeslot counts over 100 ms in our system : 4)</p>	<p>Maximum transmission "On" time : 4.256 ms</p> <p>timeslot period : 10.0 ms</p> <p>Start of timeslot End of timeslot</p> <p>time slot time slot time slot time slot</p> <p>100.0 ms</p>

Burst rate confirmation

Tx, IEEE802.15.4

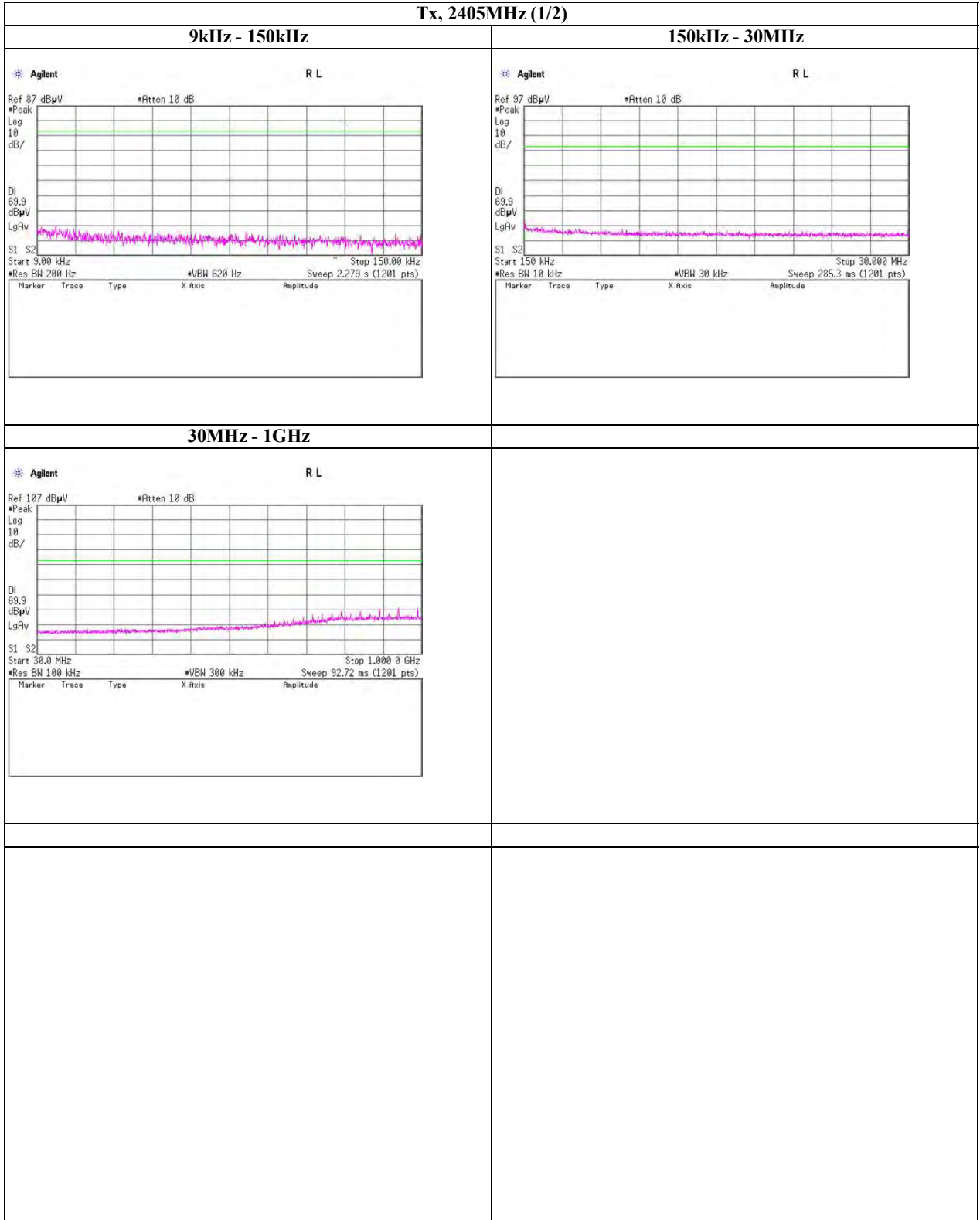
Burst rate confirmation											
<p>Agilent L</p> <p>Ref 0 dBm #Atten 14 dB Mkr1 50 ms -11.68 dBm</p> <p>#Peak Log 10 dB/ LgAv</p> <p>S1 S2 Center 2.405 000 GHz Span 0 Hz Res BW 1 MHz #VBW 3 MHz Sweep 100 ms (1201 pts)</p> <table border="1"> <thead> <tr> <th>Marker</th> <th>Trace</th> <th>Type</th> <th>X Axis</th> <th>Amplitude</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>(3)</td> <td>Time</td> <td>50 ms</td> <td>-11.68 dBm</td> </tr> </tbody> </table>	Marker	Trace	Type	X Axis	Amplitude	1	(3)	Time	50 ms	-11.68 dBm	
Marker	Trace	Type	X Axis	Amplitude							
1	(3)	Time	50 ms	-11.68 dBm							

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Spurious emission (Conducted)

Tx, IEEE802.15.4, Antenna:2dBi,

Tx, 2405MHz (1/2)



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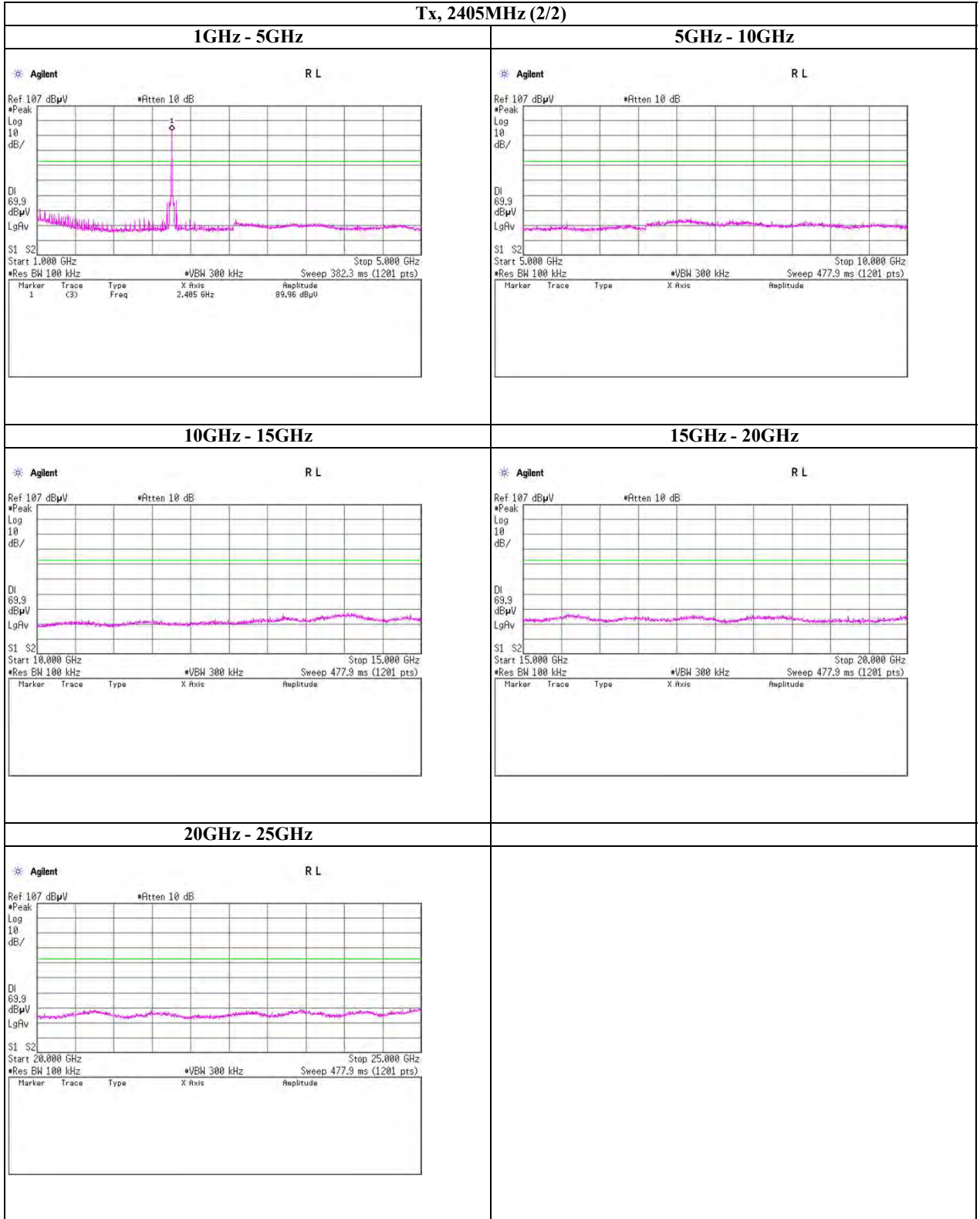
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Tx, 2405MHz (2/2)



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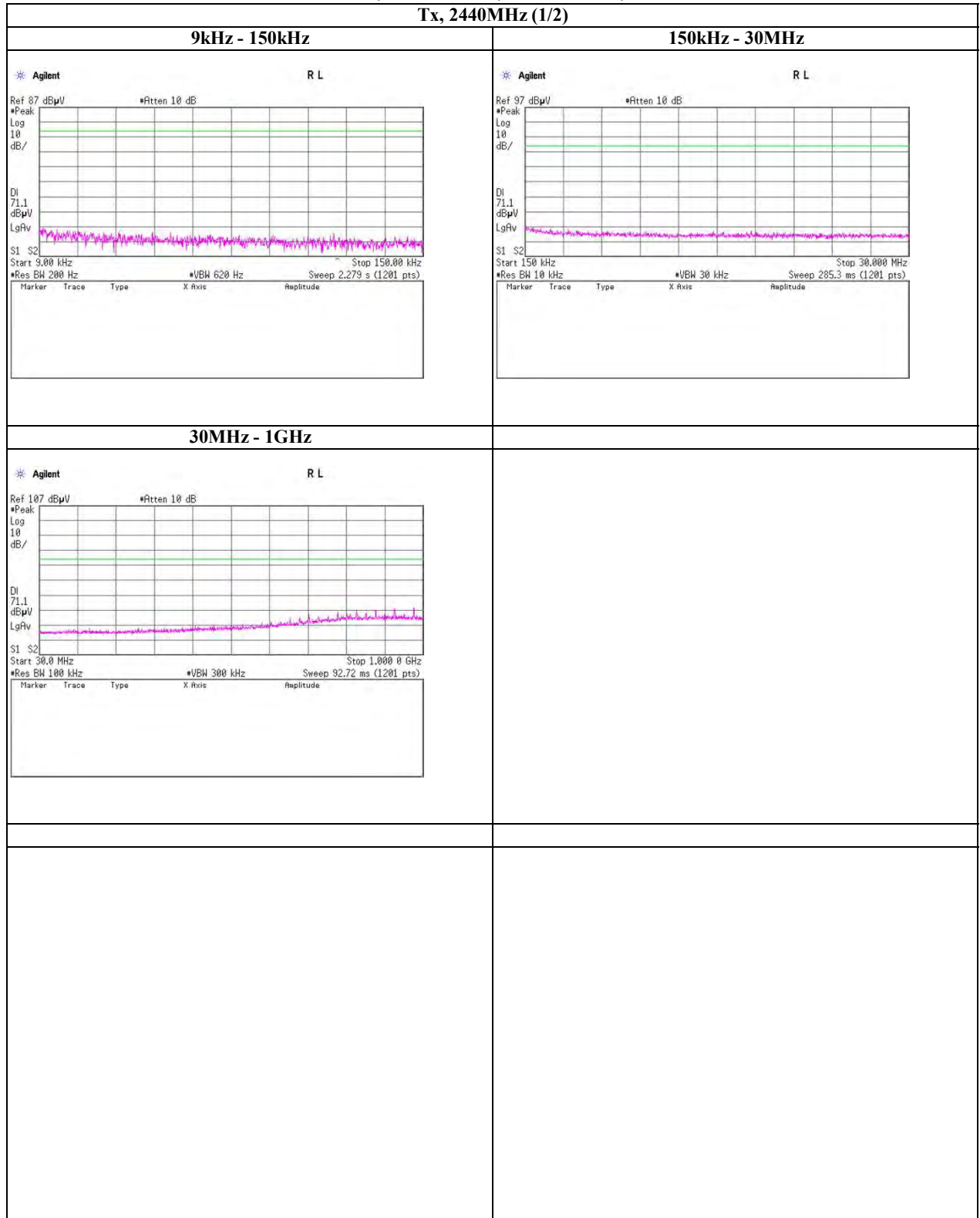
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Tx, 2440MHz (1/2)



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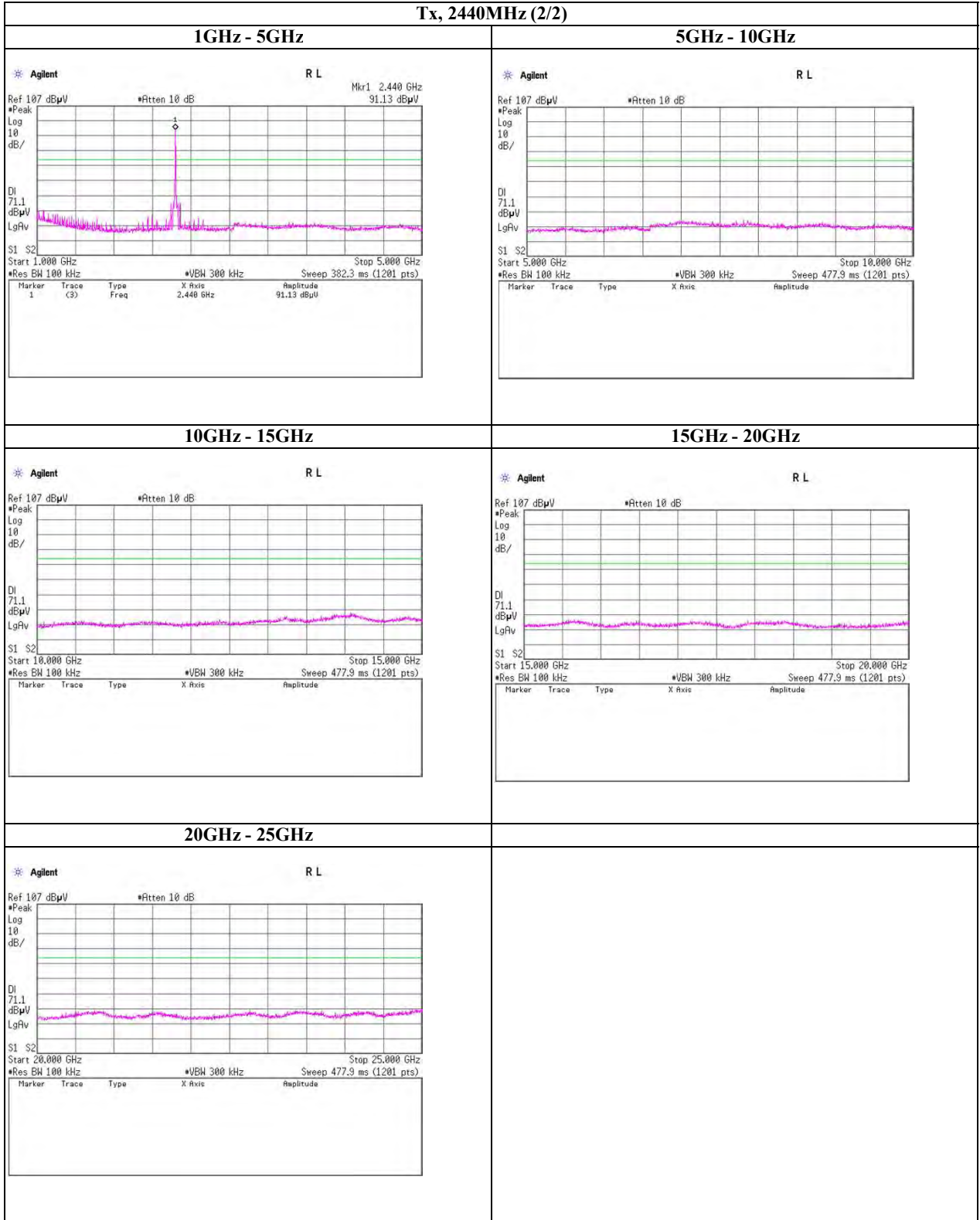
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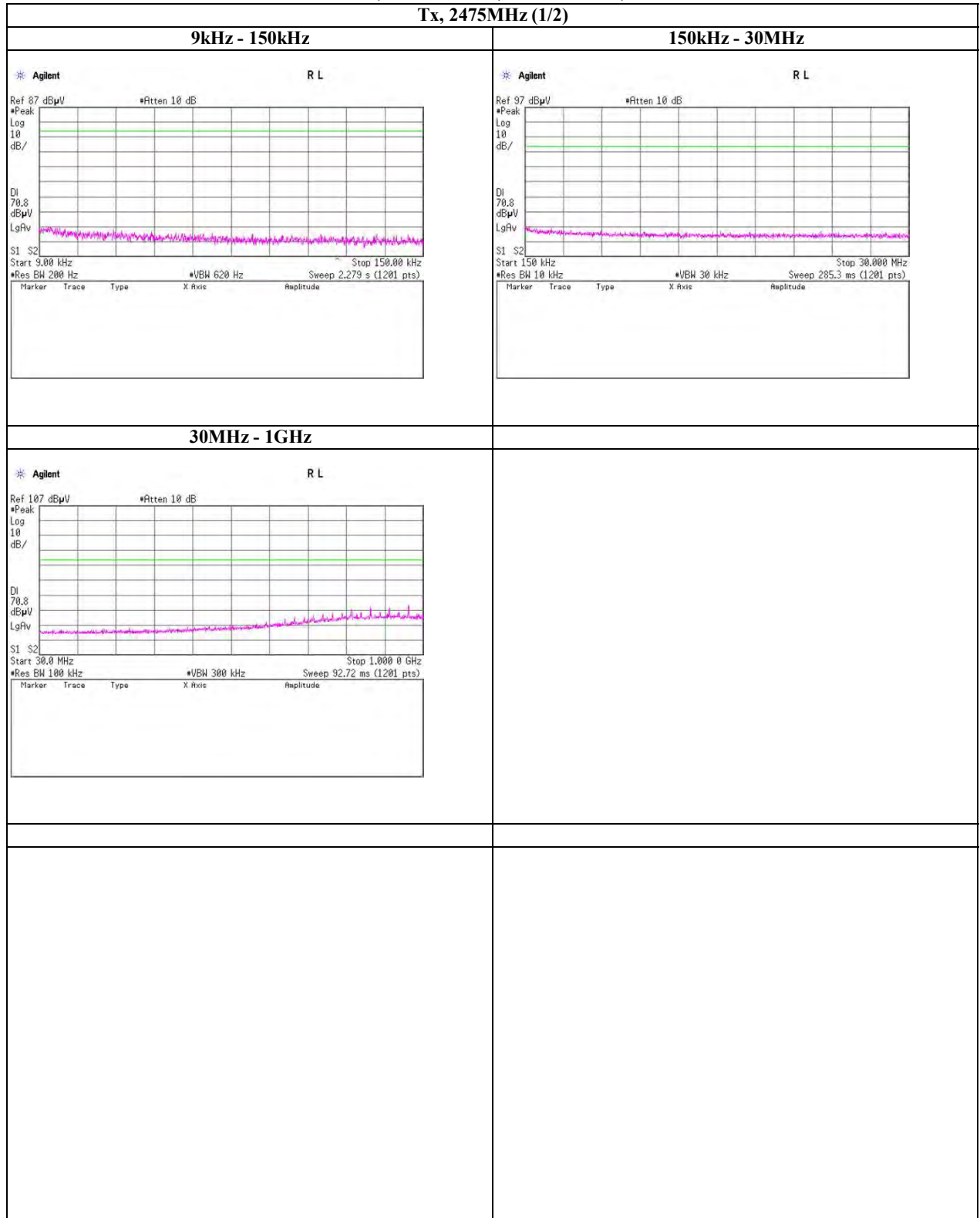
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Spurious emission (Conducted)

Tx, IEEE802.15.4, Antenna:2dBi,

Tx, 2475MHz (1/2)



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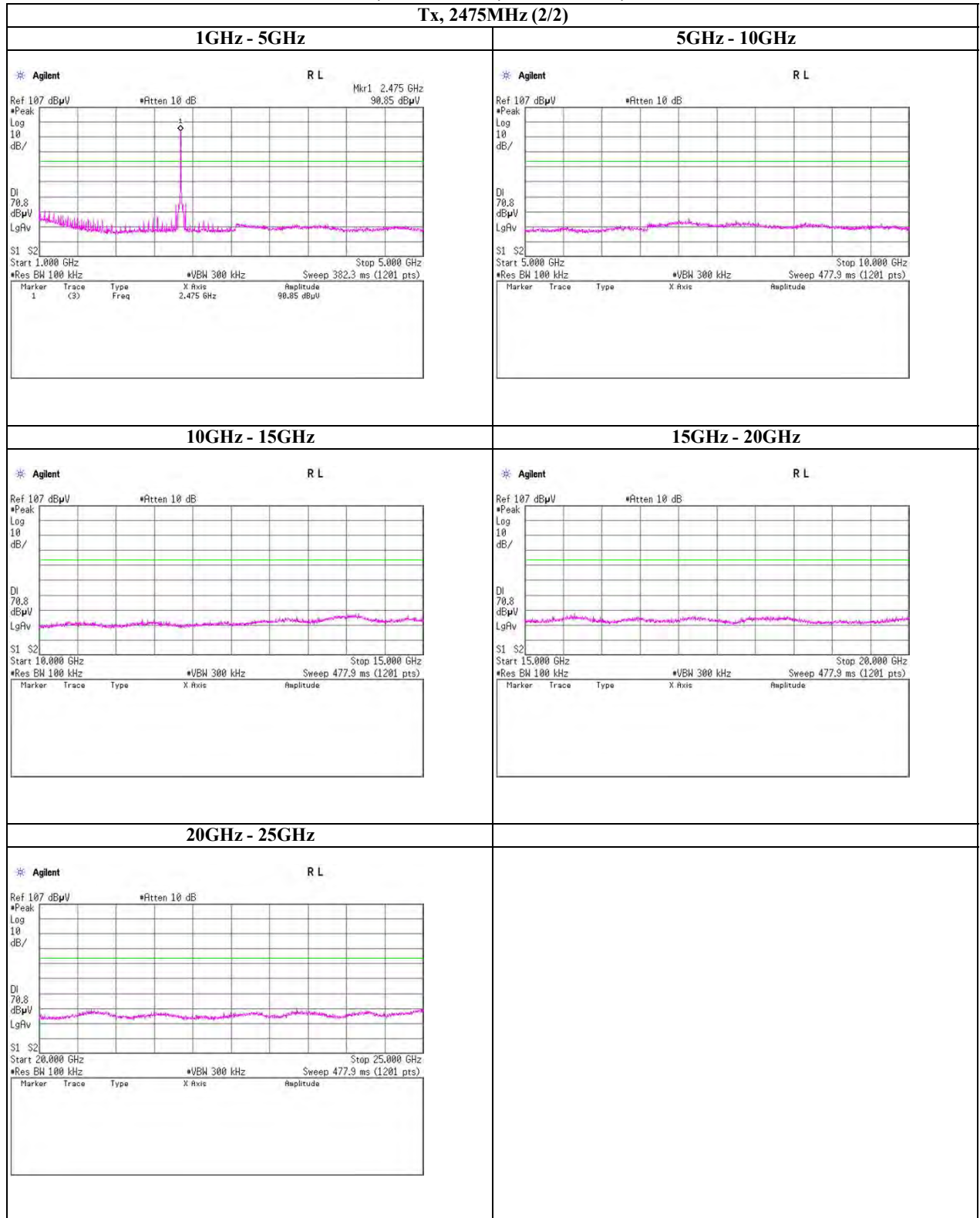
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Facsimile : +81 463 50 6401

Spurious emission (Conducted)

Tx, IEEE802.15.4, Antenna:2dBi,

Tx, 2475MHz (2/2)



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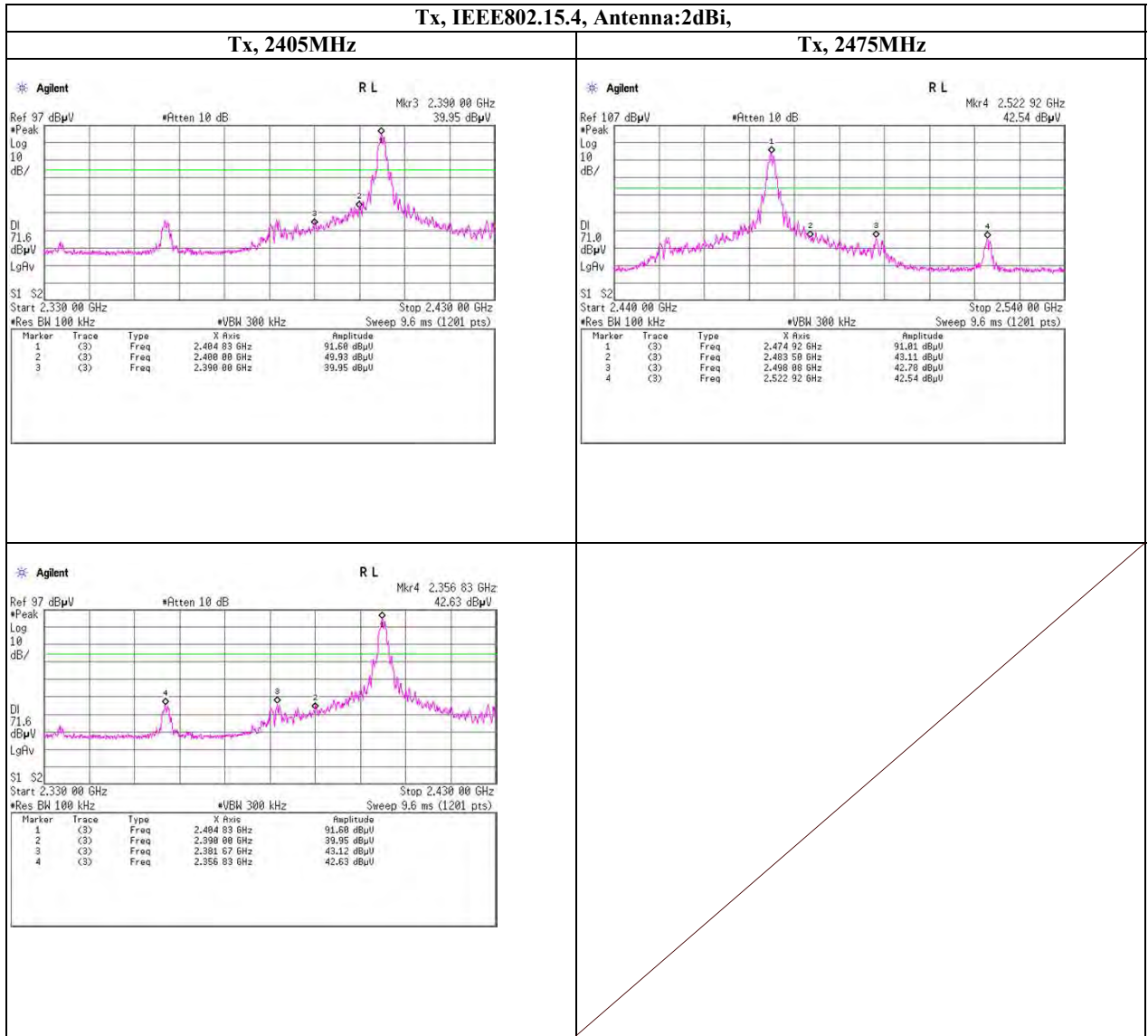
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Spurious emission (Conducted)

Band Edge compliance



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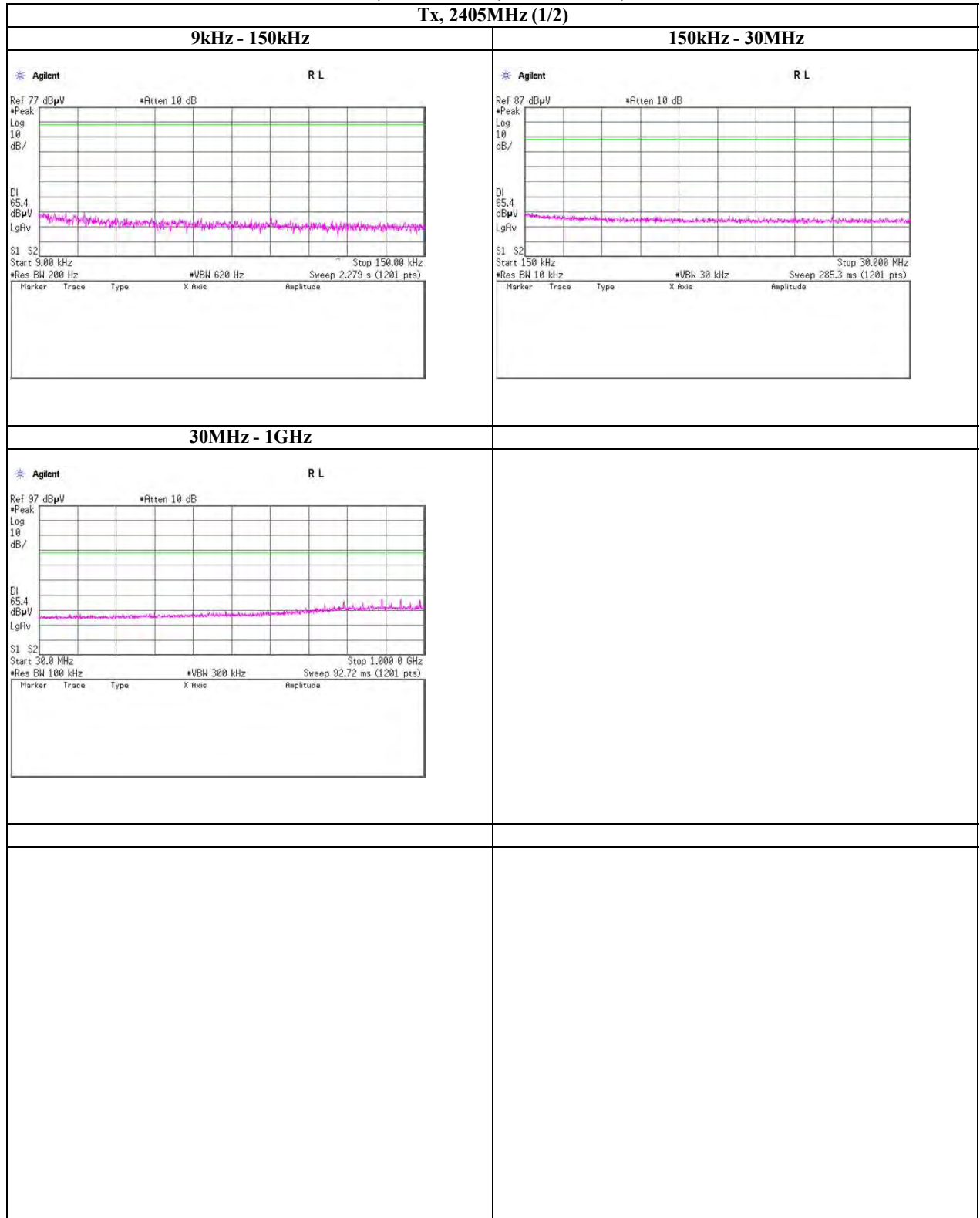
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Spurious emission (Conducted)

Tx, IEEE802.15.4, Antenna:6dBi,

Tx, 2405MHz (1/2)

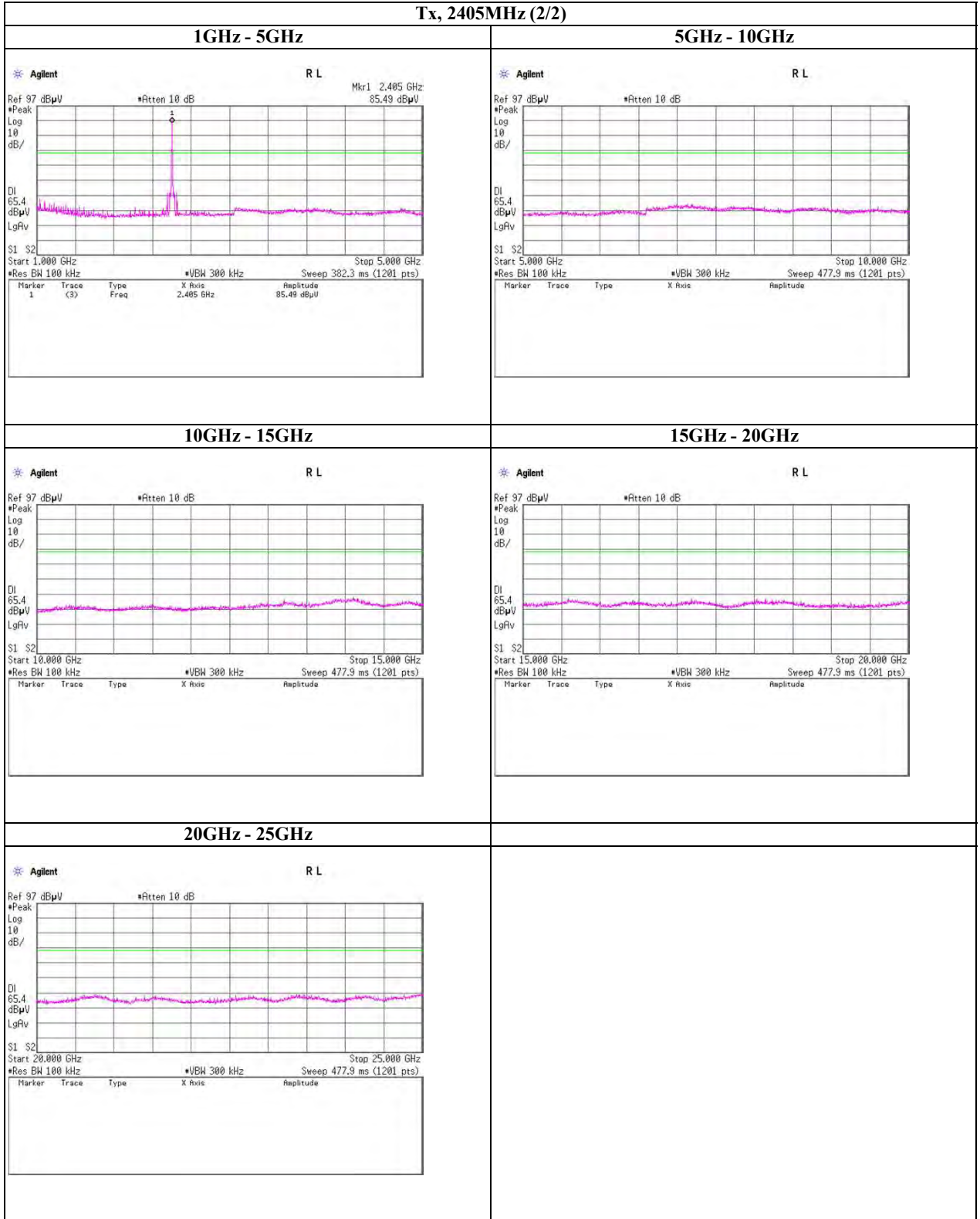


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Spurious emission (Conducted)

Tx, IEEE802.15.4, Antenna:6dBi,

Tx, 2405MHz (2/2)



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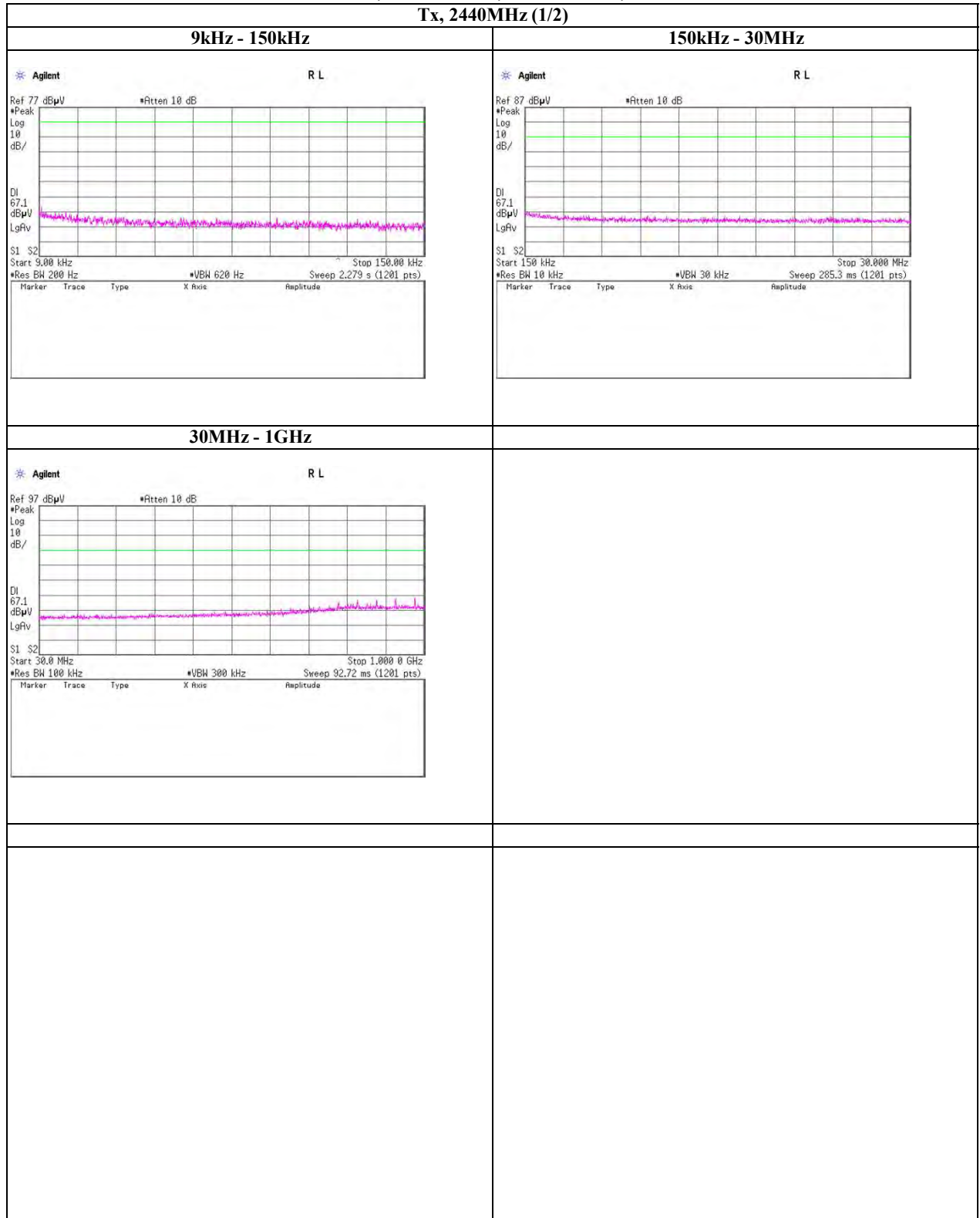
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Facsimile : +81 463 50 6401

Spurious emission (Conducted)

Tx, IEEE802.15.4, Antenna:6dBi,

Tx, 2440MHz (1/2)



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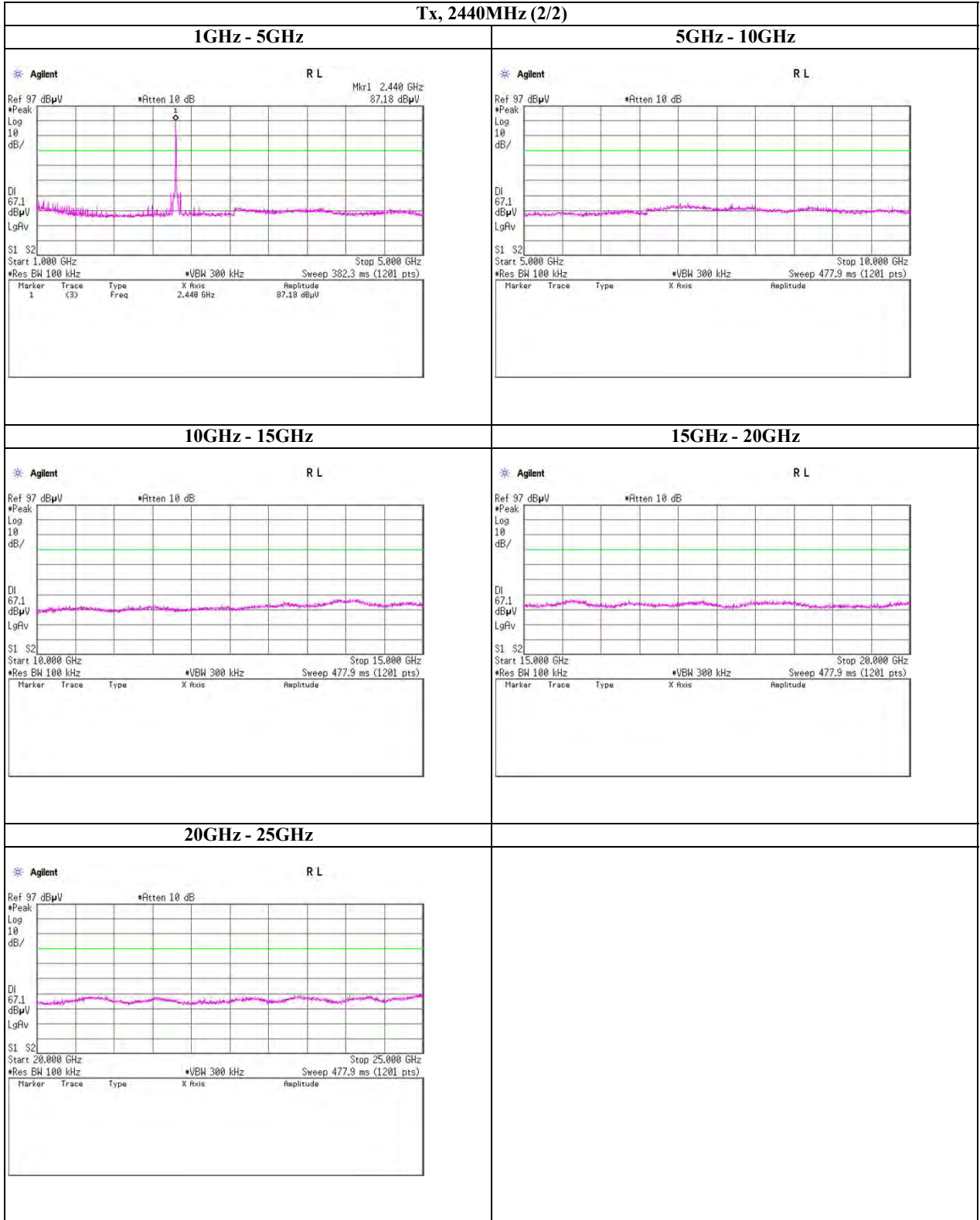
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Spurious emission (Conducted)

Tx, IEEE802.15.4, Antenna:6dBi,

Tx, 2440MHz (2/2)



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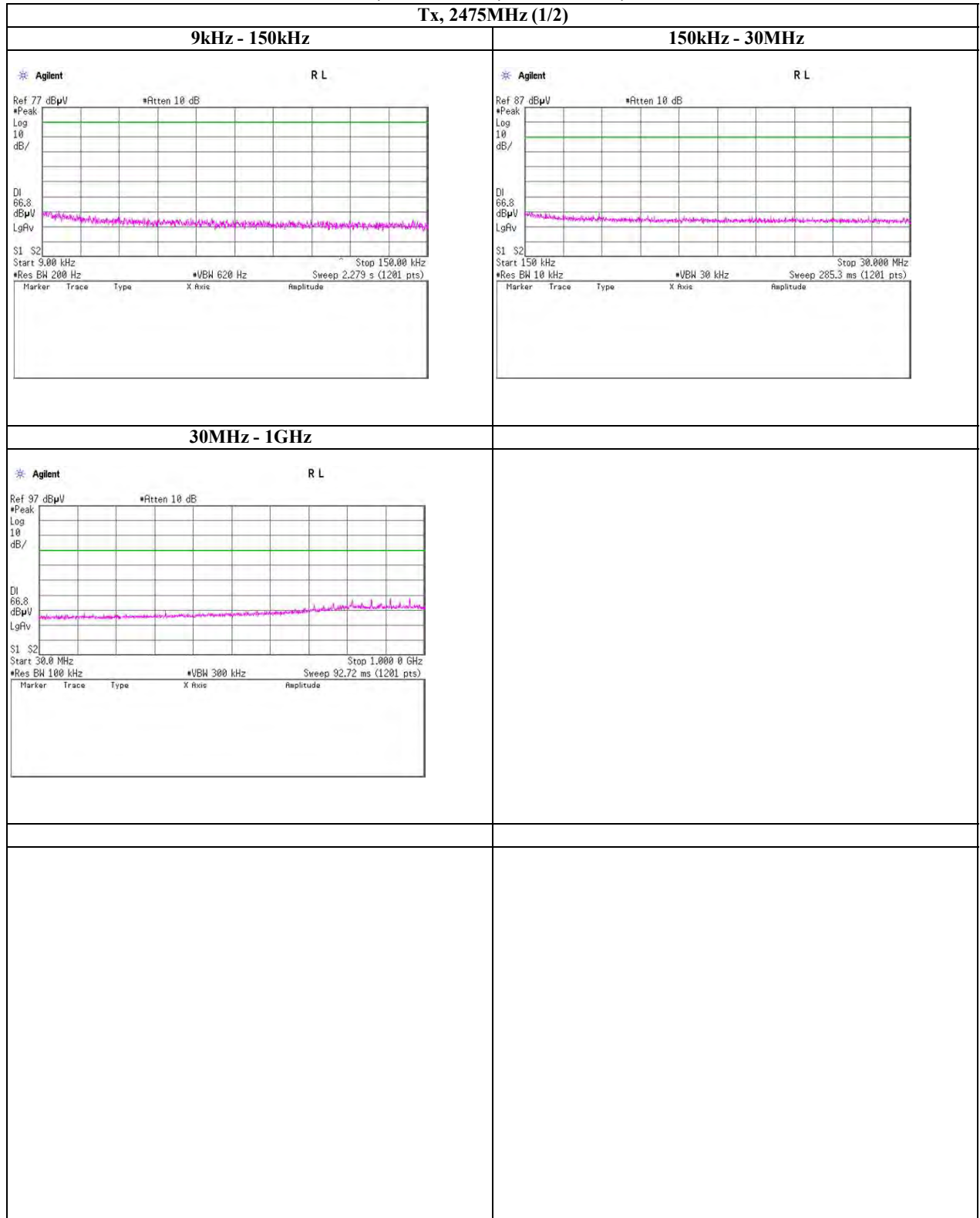
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Spurious emission (Conducted)

Tx, IEEE802.15.4, Antenna:6dBi,

Tx, 2475MHz (1/2)



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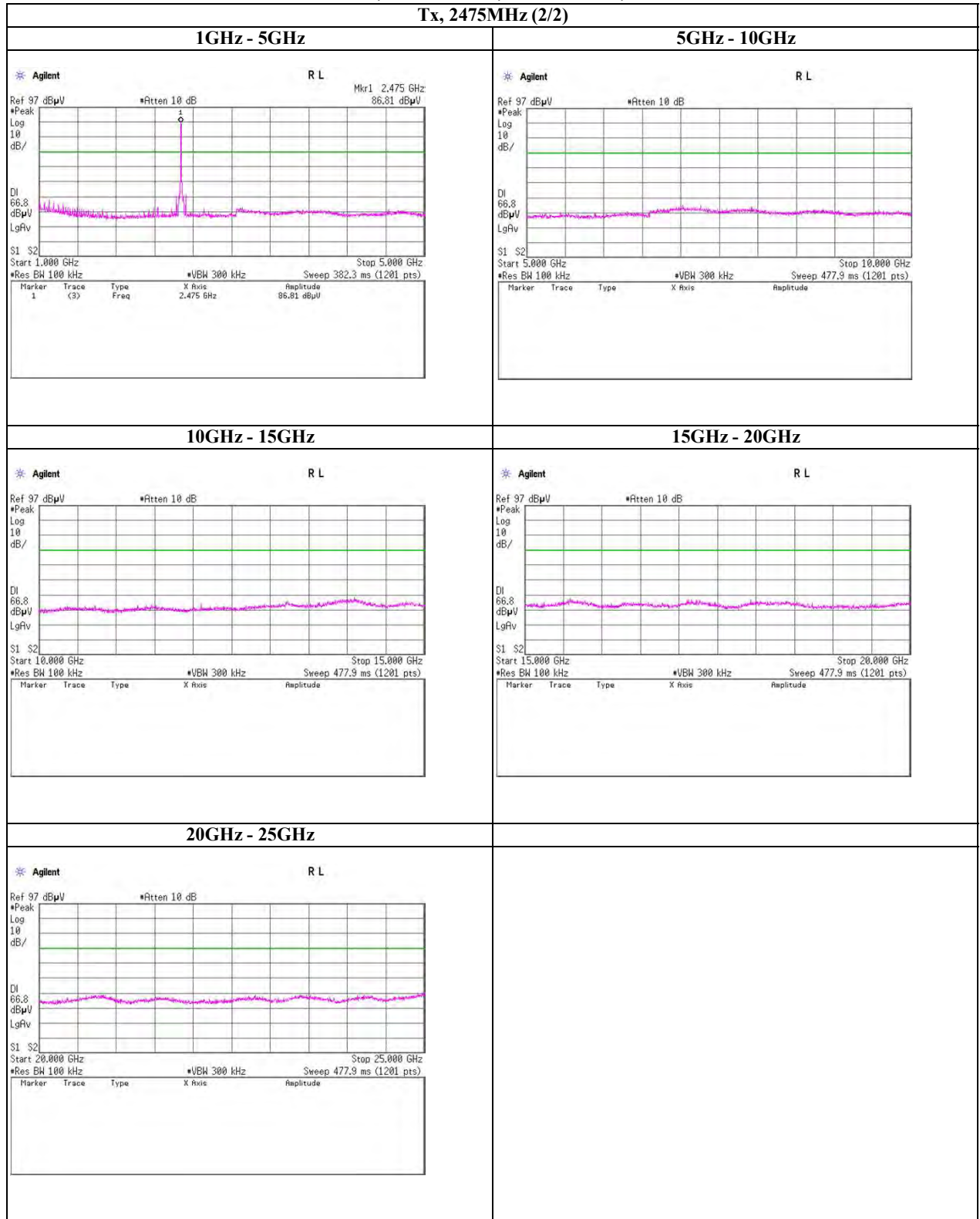
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Spurious emission (Conducted)

Tx, IEEE802.15.4, Antenna:6dBi,

Tx, 2475MHz (2/2)



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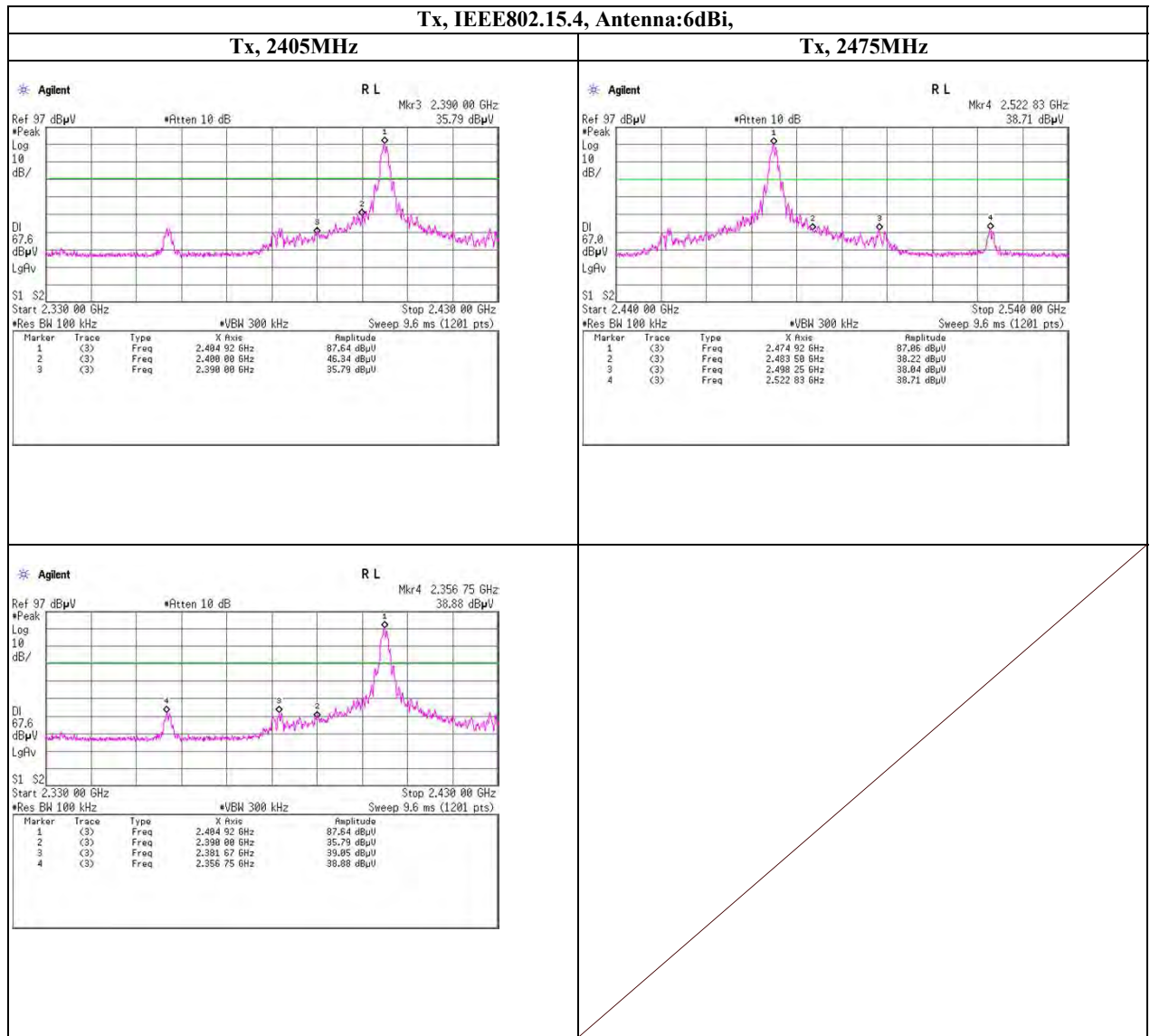
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Spurious emission (Conducted)

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