Field Strength of Spurious Radiation Measurement

1.1 Rules and Specification Limits

2.1053(a): ANSI/ TIA/ EIA-603-1992, Paragraph 2.2.12

Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, Power leads, or intermediate circuit elements under normal conditions of installation and operation.

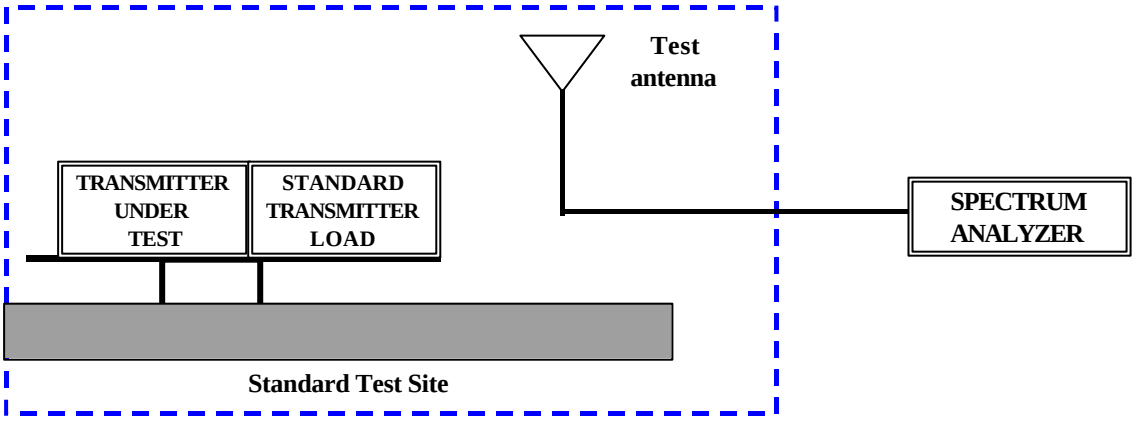
74.861(e)(6)(iii):

Spurious and harmonics must be at least 43 + 10 log (Output Power) below the Carrier peak

2.1057:

In all measurements set forth, the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10^{th} harmonic of the carrier frequency.

1.2 Measurement Condition & Setup



1.Connect the equipment as illustrated.

2.Adjust the spectrum analyzer for the following setting:

a) Resolution Bandwidth ≦ 3kHz

b) Video Bandwidth ≧ 10kHz

c) Sweep Speed ≦ 2000Hz /second

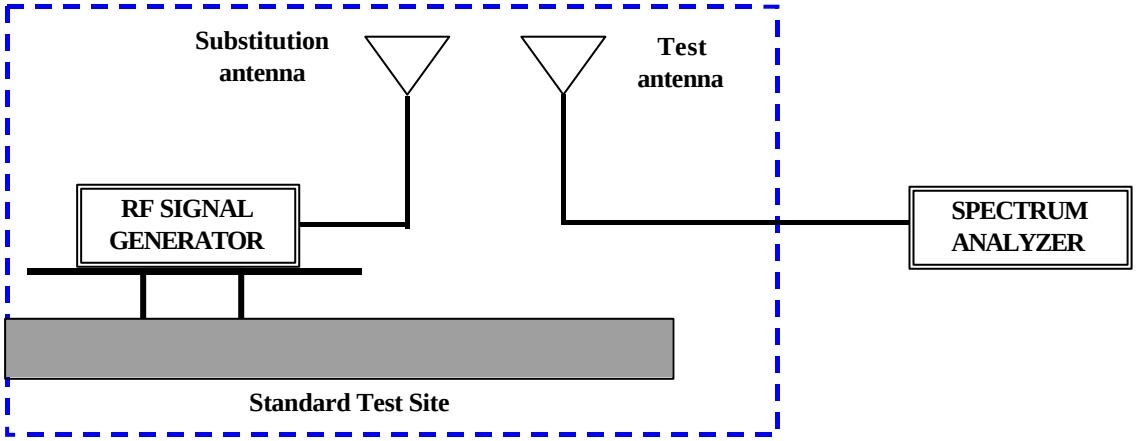
d) Detector mode = Positive Peak

3.Place the transmitter to be tested on the turntable in the standard test site. The transmitter is transmitting into a non-radiating load, which is placed on the turntable. The RF cable to this load should be of minimum length.

4.For each spurious measurement the test antenna should be adjusted to the correct length for the frequency involved. The length may be determined form a calibration ruler supplied with the equipment. Measurements shall be made form the lowest radio frequency generated in the equipment to the tenth harmonic of the carrier, except for the region close to the carrier equal to ±the test bandwidth (see section 1.3.4.4)

5.For each spurious frequency, raise and lower the test antenna from 1m to 4m to obtain a maximum reading on the spectrum analyzer with the test antenna at horizontal polarity. Then the turntable should be rotated 360° to determine the maximum reading. Repeat this procedure to obtain the highest possible reading. Record this maximum reading.

6.Repeat step (5) for each spurious frequency with the test antenna polarized vertically.



7.Reconnect the equipment as illustrated.

8.Keep the spectrum analyzer adjusted as in step (2)

9. *Remove the transmitter and replace it with a substitution antenna (the antenna should be half-wavelength for each frequency involved). The center of the substitution antenna should be approximately at the same location as the center of the transmitter. At the lower frequencies, where the substitution antenna is very long, this will be impossible to achieve when the antenna is polarized vertically. In such case the lower end of the antenna should be 0.3m above the ground.*

10. *Feed the substitution antenna at the transmitter end with a signal generator connected to the antenna by means of a non-radiating cable. With the antennas at both ends horizontally polarized and with the signal generator tuned to a particular spurious frequency, raise and lower the test antenna to obtain a maximum reading at the spectrum analyzer. Adjust the level of the signal generator output until the previously recorded maximum reading for this set of conditions is obtained. This should be done carefully repeating the adjustment of the test antenna and generator output.*

11. *Repeat step (10) with both antennas vertically polarized for each spurious frequency.*

12. *Calculate power in dBm into a reference ideal half-wave dipole antenna by reducing the readings obtained in steps (10) and (11) by the power loss in the cable between the generator and the antenna and further corrected for the gain of the substitution antenna used relative to and ideal half-wave dipole antenna.*

13. The levels record in step (12) are the absolute levels of radiated spurious emissions in dBm. The radiated spurious emissions in dB can be calculated by the following:

Radiated spurious emissions (dB) =

$$10 \log \left[\frac{\text{TX power in watts}}{0.001} \right]_{10} - \text{the levels in step (12)}$$

1.3 Measurement Result:

(Test Frequency: 794.900MHz , Horizontal , 30 MHz ~ 1 GHz)

Test Conditions:

Testing room : Temperature : 26 °C Humidity : 73 % RH

Testing site : Temperature : 31 °C Humidity : 75 % RH

Frequency	*Reading Amplitude*	*Ant. Height*	*Table*	*Correction Factors*	*Corrected Power*	*Attenuated below the mean power*	*minimum Attenuation limit*
MHz	**dBm**	**m**	**degree**	**dB**	**dBm**	**dBc**	**dBc**
198.727	-44.00	1.00	136	-4.65	-48.65	50.10	14.44
397.452	-41.14	1.00	57	-6.09	-47.23	48.68	14.44
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Note:

1. Corrected Amplitude = Reading Amplitude – Correction Factors
2. The maximum field measured is 1.45 dBm
   Attenuated below the mean power = Power – Corrected Power
   {For example: 1.45 – (- 48.65) = 50.1 dBc}
1. Attenuation required = 43 + 10 log (1.396 mW) =14.44
2. **Measurement result passed by more than 20dB margin.**

Measurement Result:
(Test Frequency: 794.900MHz , Horizontal , 1GHz ~ 18GHz)

Radiated Emission				*Correction Factors*	*Corrected Amplitude* dBm	*Attenuated below the mean power (*dBc*)*	*minimum Attenuation Limit* (dBc)
Frequency (GHz)	*Amplitude* (dBm)	*Ant. H.* (cm)	*Table* (°)	(dB)			
1.589	-38.84	1.00	32	-4.67	-34.17	35.62	14.44
2.380	-31.80	1.00	224	1.32	-33.12	34.57	14.44
2.770	-31.16	1.00	34	2.69	-33.85	35.30	14.44
2.980	-16.33	1.00	48	3.42	-19.75	21.20	14.44
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Radiated Emission Test Result:
(Test Frequency: 794.900MHz , Vertical , 30MHz ~ 1GHz)

Frequency	*Reading Amplitude*	*Ant. Height*	*Table*	*Correction Factors*	*Corrected Power*	*Attenuated below the mean power*	*minimum Attenuation limit*
MHz	dBm	m	degree	dB	dBm	dBc	dBc
198.727	-49.06	3.96	8	-3.12	-45.94	44.79	14.44
397.451	-52.00	1.00	45	-7.52	-44.48	45.93	14.44
***							

Note:

1. Corrected Amplitude = Reading Amplitude – Correction Factors
2. The maximum field measured is 1.45 dBm
   Attenuated below the mean power = Power – Corrected Power
   {For example: 1.45 – (- 48.65) = 50.1 dBc}
3. Attenuation required = 43 + 10 log (1.396 mW) =14.44
4. **Measurement result passed by more than 20dB margin.**

Radiated Emission Test Result:
(Test Frequency: 794.900MHz , Vertical , 1GHz ~ 18GHz)

Radiated Emission				*Correction Factors*	*Corrected Amplitude* dBm	*Attenuated below the mean power (*dBc*)*	*minimum Attenuation Limit* (dBc)
Frequency (GHz)	*Amplitude* (dBm)	*Ant. H.* (cm)	*Table* (°)	(dB)			
1.589	-36.96	1.00	134	-5.64	-31.32	32.77	14.44
2.380	-38.38	1.00	327	-1.05	-37.33	38.78	14.44
2.770	-48.41	1.00	50	-0.94	-47.47	48.92	14.44
2.980	-36.41	1.00	94	-0.87	-35.54	36.99	14.44
***							

Measurement Result:
(Test Frequency: 800.200MHz , Horizontal , 30MHz ~ 1GHz)

Frequency	*Reading Amplitude*	*Ant. Height*	*Table*	*Correction Factors*	*Corrected Power*	*Attenuated below the mean power*	*minimum Attenuation limit*
MHz	dBm	m	degree	dB	dBm	dBc	dBc
200.049	-49.77	1.00	150	-3.11	-46.66	47.48	13.79
400.100	-57.16	2.47	7	-7.54	-49.62	50.44	13.79
600.148	-48.32	1.00	84	-4.53	-43.79	44.61	13.79
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Note:

1. Corrected Amplitude = Reading Amplitude – Correction Factors
2. The maximum field measured is 0.82 dBm
   Attenuated below the mean power = Power – Corrected Power
   {For example: 0.82 – (- 46.66) = 50.1 dBc}
3. Attenuation required = 43 + 10 log (1.20 mW) =13.79
4. **Measurement result passed by more than 20dB margin.**

Measurement Result:
(Test Frequency: 800.200MHz , Horizontal , 1GHz ~ 18GHz)

Radiated Emission				*Correction Factors*	*Corrected Amplitude* dBm	*Attenuated below the mean power (*dBc*)*	*minimum Attenuation Limit* (dBc)
Frequency (GHz)	*Amplitude* (dBm)	*Ant. H.* (cm)	*Table* (°)	(dB)			
1.400	-34.13	1.00	9	-4.63	-29.50	30.32	13.79
1.600	-35.12	1.00	141	-5.91	-29.21	30.03	13.79
2.390	-32.49	1.00	95	-1.05	-31.44	32.26	13.79
2.790	-38.46	1.00	417	-0.93	-37.53	38.35	13.79
3.000	-29.81	1.00	206	-0.87	-28.94	28.12	13.79
3.190	-35.98	1.00	4	-1.49	-34.49	35.31	13.79
5.990	-74.26	1.00	189	-36.39	-37.87	38.69	13.79
6.800	-74.82	1.00	206	-38.08	-36.74	37.56	13.79
7.410	-79.39	1.00	40	-40.87	-38.52	39.34	13.79
7.610	-78.67	1.00	146	-41.35	-37.32	38.14	13.79
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Radiated Emission Test Result:
(Test Frequency: 800.200MHz , Vertical , 30MHz ~ 1GHz)

Frequency	*Reading Amplitude*	*Ant. Height*	*Table*	*Correction Factors*	*Corrected Power*	*Attenuated below the mean power*	*minimum Attenuation limit*
MHz	dBm	m	degree	dB	dBm	dBc	dBc
200.052	-54.20	2.44	56	-5.14	-49.06	49.88	13.79
600.152	-51.37	1.00	13	-5.33	-46.04	46.86	13.79
***							

Note:

1. Corrected Amplitude = Reading Amplitude – Correction Factors
2. The maximum field measured is 0.82 dBm
   Attenuated below the mean power = Power – Corrected Power
   {For example: 0.82 – (- 46.66) = 50.1 dBc}
3. Attenuation required = 43 + 10 log (1.20 mW) =13.79
4. **Measurement result passed by more than 20dB margin.**

Radiated Emission Test Result:
(Test Frequency: 800.200MHz , Vertical , 1GHz ~ 18GHz)

Radiated Emission				*Correction Factors*	*Corrected Amplitude* dBm	*Attenuated below the mean power (*dBc*)*	*minimum Attenuation Limit* (dBc)
Frequency (GHz)	*Amplitude* (dBm)	*Ant. H.* (cm)	*Table* (°)	(dB)			
1.400	-33.3	2.44	10	-3.79	-29.51	30.33	13.79
1.600	-40.35	1.00	58	-4.85	-35.50	36.32	13.79
2.390	-31.23	1.00	151	-1.36	-29.87	30.69	13.79
2.790	-24.6	1.00	206	-2.76	-21.84	22.62	13.79
3.000	-21.91	1.00	27	-3.49	-18.42	19.24	13.79
3.190	-32.83	1.00	116	-1.67	-31.16	32.42	13.79
5.990	-84.09	1.00	237	-35.72	-48.37	49.19	13.79
6.800	-81.3	1.00	308	-38.32	-42.98	43.80	13.79
7.000	-83.04	1.00	346	-37.67	-45.37	46.19	13.79
7.200	-84.8	1.00	15	-38.71	-46.09	46.91	13.79
7.410	-85.32	1.00	97	-39.80	-45.52	46.34	13.79
7.610	-81.22	1.00	2	-40.20	-41.02	41.84	13.79

Measurement Result:
(Test Frequency: 804.900MHz , Horizontal , 30MHz ~ 1GHz)

Frequency	*Reading Amplitude*	*Ant. Height*	*Table*	*Correction Factors*	*Corrected Power*	*Attenuated below the mean power*	*minimum Attenuation limit*
MHz	dBm	m	degree	dB	dBm	dBc	dBc
201.227	-47.97	1.00	150	-3.07	-44.90	48.22	16.30
402.452	-47.68	1.00	28	-7.42	-40.26	43.58	16.30
***							

Note:

1. Corrected Amplitude = Reading Amplitude – Correction Factors
2. The maximum field measured is 3.32 dBm
   Attenuated below the mean power = Power – Corrected Power
   {For example: 3.32 – (- 44.90) = 48.22 dBc}
3. Attenuation required = 43 + 10 log (2.14 mW) =16.30
4. **Measurement result passed by more than 20dB margin.**

Measurement Result:
(Test Frequency: 804.900MHz , Horizontal , 1GHz ~ 18GHz)

Radiated Emission				*Correction Factors*	*Corrected Amplitude* dBm	*Attenuated below the mean power (*dBc*)*	*minimum Attenuation Limit* (dBc)
Frequency (GHz)	*Amplitude* (dBm)	*Ant. H.* (cm)	*Table* (°)	(dB)			
1.207	-42.12	1.00	64	-4.51	-37.61	40.93	16.30
1.609	-36.93	1.00	150	-5.78	-31.15	34.47	16.30
2.010	-46.94	1.00	29	-1.67	-45.27	48.59	16.30
2.410	-42.24	1.00	146	-1.04	-41.20	44.52	16.30
2.810	-39.19	1.00	228	-0.92	-38.27	41.59	16.30
3.010	-41.17	1.00	339	-0.90	-40.27	43.59	16.30
3.220	-40.39	1.00	8	-1.59	-38.80	41.12	16.30
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Radiated Emission Test Result:
(Test Frequency: 804.900MHz , Vertical , 30MHz ~ 1GHz)

Frequency	*Reading Amplitude*	*Ant. Height*	*Table*	*Correction Factors*	*Corrected Power*	*Attenuated below the mean power*	*minimum Attenuation limit*
MHz	dBm	m	degree	dB	dBm	dBc	dBc
201.226	-52.68	2.47	4	-5.05	-47.63	50.95	16.30
402.452	-48.39	1.00	9	-6.11	-42.28	45.60	16.30
***							

Note:

1. Corrected Amplitude = Reading Amplitude – Correction Factors
2. The maximum field measured is 3.32 dBm
   Attenuated below the mean power = Power – Corrected Power
   {For example: 3.32 – (- 44.90) = 48.22 dBc}
3. Attenuation required = 43 + 10 log (2.14 mW) =16.30

Radiated Emission Test Result:
(Test Frequency: 804.900MHz , Vertical , 1GHz ~ 18GHz)

Radiated Emission				*Correction Factors*	*Corrected Amplitude* dBm	*Attenuated below the mean power (*dBc*)*	*minimum Attenuation Limit* (dBc)
Frequency (GHz)	*Amplitude* (dBm)	*Ant. H.* (cm)	*Table* (°)	(dB)			
1.207	-46.09	1.00	35	-3.15	-42.94	46.26	16.30
1.609	-39.08	1.00	35	-4.71	-34.37	37.69	16.30
2.010	-46.39	1.00	39	-0.98	-45.41	48.73	16.30
2.410	-34.30	1.00	167	1.43	-35.73	39.05	16.30
2.810	-24.68	1.00	229	2.83	-27.51	30.83	16.30
3.010	-25.58	1.00	64	3.40	-28.98	32.30	16.30
3.220	-32.61	1.00	181	1.39	-34.00	37.32	16.30
3.420	-34.49	1.00	38	-0.53	-33.96	37.28	16.30
3.620	-71.65	1.00	239	-33.09	-33.09	36.41	16.30
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