EXHIBIT 13

CONDUCTED SPURIOUS EMISSIONS MEASUREMENTS

Measurements of DTSA conducted spurious emissions were performed in accordance with the requirements and conditions of §§ 24.238 and 2.1051; requirements, procedures and results are described in this exhibit.

Requirements

To obtain a certification grant of equipment authorization, § 2.1051 requires measurements of spurious emissions appearing at the equipment output terminals when properly loaded with a suitable artificial antenna (i.e., a matched 50 Ω load). The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified. Furthermore, § 2.1057 requires that measurements be made from the lowest radio frequency generated in the equipment up to at least the 10^{th} harmonic of the carrier frequency.

Broadband PCS equipment operating under the authority of Part 24, Subpart E, must comply with the emissions limits given in § 24.238. Specifically, § 24.238(a) requires that "on any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB." Note that, for any transmitter power P (measured in watts), evaluation of this expression results in an absolute emissions limit of -43 dBW or -13 dBm.

Sections 24.238(b), (c), and (d) give additional measurement requirements. A minimum resolution bandwidth of 1 MHz must be used, except within the 1 MHz bands immediately adjacent to the licensee's frequency block where a resolution bandwidth of at least one percent of the emission bandwidth is allowed. Emission bandwidth is defined as "the width of the signal between two points, one below the carrier frequency and one above the carrier frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power." When performing these measurements, "the nominal carrier frequency shall be adjusted as close to the licensee's frequency block edges, both upper and lower, as the design permits." To satisfy this last requirement, measurements were made at the PCS-1900 channels closest to the lower and upper edges of each of the six broadband PCS frequency blocks in which the DTSA can transmit (measurements at a total of twelve PCS-1900 channels).

Emission Bandwidth Measurement Procedure

Within the first one MHz from the license block's lower and upper edges, § 24.238(b) allows a resolution bandwidth of one percent of the emission bandwidth to be employed. Emission bandwidth was thus determined prior to the measurement of conducted emissions using a procedure similar to that utilized for measurement of occupied bandwidth. However, in this case, the emission bandwidth is defined as that outside of which all emissions are attenuated at least 26 dB below the transmitted power. That is, the power outside the emission bandwidth, centered about the emission, is 0.25% of the total transmitted power, or 0.125% (29 dB below total power) on either side of the center frequency; equivalently, 99.75% of the power in the transmitted signal is contained within the emissions bandwidth. The DTSA emission bandwidth was measured using the built-in "Occupied Bandwidth" function of the HP8563E Spectrum Analyzer (with a 99.75% value, versus 99% for occupied bandwidth) at all twelve PCS-1900 channels where conducted spurious emissions were to be measured. Specific procedures followed during measurements of emission bandwidth follow:

1. Configure the DTSA:
    - Input Voltage — 8.0 VDC
    - Mode — Speech call selected using the Racal 6103
    - RF Output Power — Maximum level (step 0, 30 dBm nominal) selected using the Racal 6103
    - Frequencies — Lowest and highest PCS-1900 channels in each PCS license block (12 total, matching those channels at which conducted emissions were to be measured)
2. Configure the HP8563E Spectrum Analyzer:
    - Center Frequency — Center of selected channel
    - Span — 1 MHz
    - RBW — 3 kHz
    - Sweep Time — 5 sec
    - Display — Max Hold
3. Use the internal capabilities of the HP8563E to measure 99.75% emission bandwidth of the transmitted pulse visible on the analyzer's display.
4. Perform measurement at all twelve channels.

Emissions Bandwidth Measurement Results

Emission bandwidth was measured at the low and high PCS-1900 terminal transmit channels in each of the six licensed PCS blocks. Results are summarized in Table E13.1. The maximum measured emission bandwidth is slightly less than 300 kHz. Within the first one MHz from the license block's lower and upper edges, § 24.238(b) allows a resolution bandwidth of one percent of the emission bandwidth to be employed. Therefore, for conducted spurious emissions in this range, a minimum RBW of 3 kHz is permitted.

Table E13.1. Summary of emission bandwidth measurements.

License Band	Frequency (MHz)	Emissions Bandwidth (kHz)
A	1850.2	293.3
	1864.8	291.7
D	1865.2	288.3
	1869.8	285.0
B	1870.2	286.7
	1884.8	291.7
E	1885.2	288.3
	1889.8	291.7
F	1890.2	291.7
	1894.8	290.0
C	1895.2	291.7
	1909.8	285.3

A typical HP8563E Spectrum Analyzer screen display obtained during a measurement of DTSA emission bandwidth is shown in Figure E13.1.

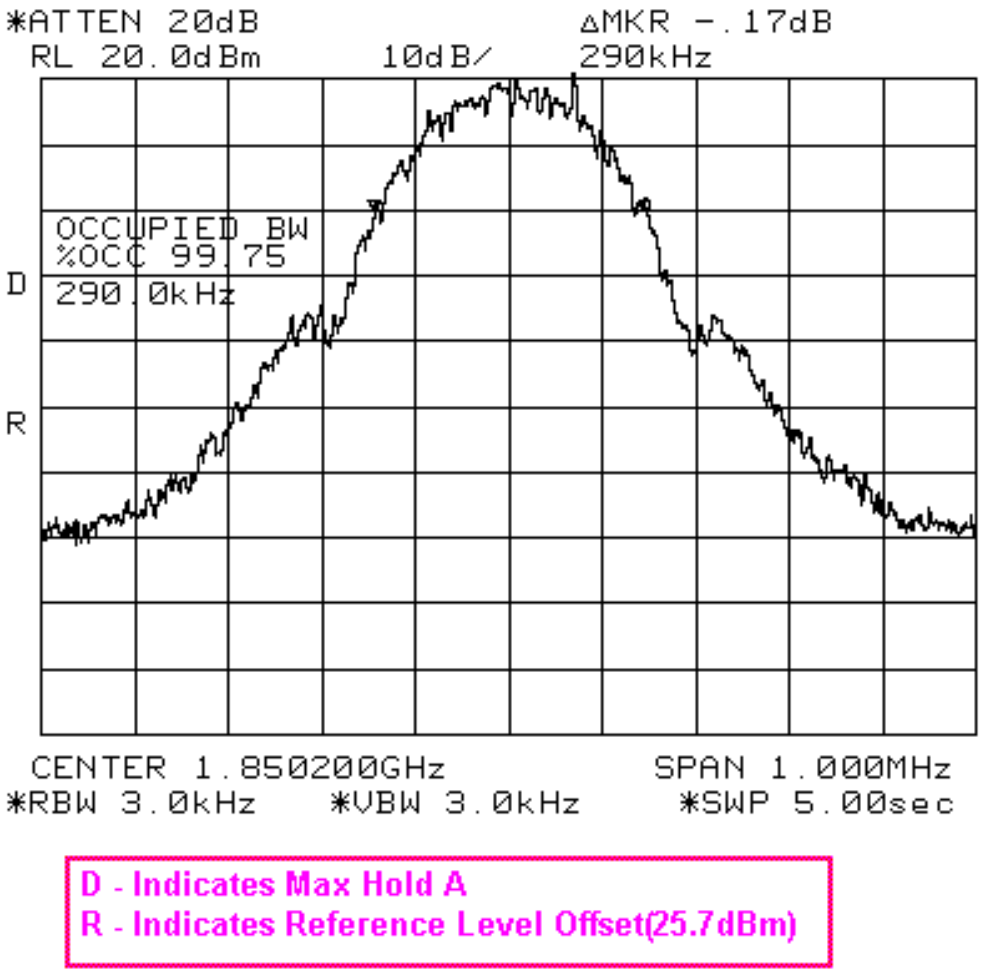

Figure E13.1 Sample spectral plot during emissions bandwidth measurement.

Conducted Emissions Measurement Procedure

Within the first one MHz from the license block's lower and upper edges, § 24.238(b) allows a resolution bandwidth of one percent of the emission bandwidth to be employed. Based on the preceding measurement of emission bandwidth, a RBW of 3 kHz in this range is permitted.

Beyond the first one MHz from the license edges, a minimum 1 MHz RBW is required. Unfortunately, within the first few MHz from the license edge where a 1 MHz RBW is required, the shape factor or skirts of the 1 MHz RBW filter on the HP8563E (and all other traditional analyzers) can corrupt the measurement, resulting in an apparent failure when, in fact, none exists. This difficulty has been well documented by others (see, for example, Motorola in FCC ID: IHET6VD1, and Omnipoint in FCC ID: OBTS1001 and CPRU1001).

Commonly employed methods for measuring conducted spurious emissions in this band are based on the use of a virtual "brick wall" filter. In the first few MHz beyond 1 MHz from the license edge, conducted spurious emissions are measured using a resolution bandwidth much less than the required 1 MHz filter. However, these measurements are then integrated ("added up") over a 1 MHz span starting at 1 MHz from the license edge. This integration can be performed internally to the analyzer, when using a Vector Signal Analyzer such as the HP89441 (and its band power marker functionality), or externally on a PC, when using the HP8563E. In either case, the result is a measurement made with an effective RBW filter of 1 MHz, but with a much sharper shape factor than possible when using a normal 1 MHz RBW filter. Measurements made in this manner must be performed to approximately 5 MHz from the license edge, at which point the default 1 MHz RBW filter in the HP8563E will not intercept any significant spectral energy in the intended transmission and a measurement using a normal 1 MHz RBW filter can be performed.

Within each PCS license block (A through F), the DTSA transmitter was tuned to the PCS-1900 channel closest to the lower and upper block edges. Measurements of conducted spurious emissions were then performed both below and above the license edge across the three frequency ranges and using the resolution bandwidths as shown in Table E13.1 to ensure compliance with the requirements given in § 24.238(a).

Table E13.1. Conducted spurious emissions measurement bands and RBW.

Frequency Range (from block edge)	RBW
0 to 1 MHz	3 kHz
1 to 5 MHz	10 kHz integrated up to 1 MHz
Beyond 5 MHz	1 MHz

For all conducted spurious emissions measurements, the DTSA was configured as follows:

1. Configure the DTSA:
    - Input Voltage 8.0 VDC
    - Mode Speech call selected using the Racal 6103
    - RF Output Power Maximum level (step 0, 30 dBm nominal) selected using the Racal 6103
    - Frequencies Lowest and highest PCS-1900 channels in each PCS license block (12 total, matching those channels at which emission bandwidth was measured)

Measurements Within First MHz Outside License Edge

Within the first one MHz from the license block's lower and upper edges, § 24.238(b) allows a resolution bandwidth of one percent of the emission bandwidth to be employed. Based on the results of the DTSA emission bandwidth measurement previously described, a minimum RBW of 3 kHz is allowed. Measurement procedure in this range was as follows:

1. Configure the HP8953E Spectrum Analyzer:
    - Center Frequency 0.5 MHz from license edge
    - Span 1 MHz
    - RBW 3 kHz
    - Sweep Time 6 sec
    - Display Max Hold
2. Trigger a single sweep on the HP8563E. The long sweep time ensures that, at each of the 601 display points comprising the sweep, the analyzer will dwell long enough to sample the transmission twice (6 sec / 601 points = approximately 10 ms per point and PCS-1900 transmissions occur every 4.6 ms)
3. Transfer data to PC; correct for diagnostic system path loss and plot data.
4. Measure emissions in this manner at both lower and upper edges of license block.
5. Perform measurement with DTSA tuned to lowest and highest PCS-1900 channels in each of the six broadband PCS blocks (a total of 12 measurements).

Measurements from 1 to 5 MHz Outside License Edge

Conducted emissions measurements covering the 1 to 5 MHz frequency span outside the lower and upper edge of each license block were made using the "brick wall" filter technique previously described, in which measurements made using an RBW less than the required 1 MHz are integrated into a 1 MHz equivalent RBW. A detailed description of the measurement procedure follows:

1. Configure the HP8563E Spectrum Analyzer:
    - Center Frequency 3.5 MHz from license edge
    - Span 6 MHz
    - RBW 10 kHz
    - Sweep Time 6 sec
    - Display Max Hold
2. Trigger a single sweep on the HP8563E. The long sweep time ensures that, at each of the 601 display points comprising the sweep, the analyzer will dwell long enough to sample the transmission twice (6 sec / 601 points = approximately 10 ms per point and PCS-1900 transmissions occur every 4.6 ms)
3. Transfer data to PC by reading HP8563E marker moved across entire span in 10 kHz steps.
4. Correct data for diagnostic system path loss.
5. Integrate results over a 1 MHz wide window (add up 100 consecutive 10 kHz results); report result at center of window (i.e., first 100 points give a result at 0.5 MHz from sweep start).
6. Move the 1 MHz integration window across entire span, creating a 5 MHz sweep with an effective measurement RBW of 1 MHz.
4. Measure emissions in this manner at both lower and upper edges of license block.
7. Perform measurement with DTSA tuned to lowest and highest PCS-1900 channels in each of the six broadband PCS blocks (a total of 12 measurements).

Greater than 5 MHz Outside License Edge

At frequencies greater than 5 MHz from the license edge, the 1 MHz RBW filter of the HP8563E spectrum analyzer will not intercept any significant amount of energy in the transmitted pulse. Therefore, a traditional measurement of conducted spurious emissions was possible, per the following procedures:

1. Configure the HP8953E Spectrum Analyzer:
    - Center Frequency 3.5 MHz from license edge
    - Spans 300 MHz: below 1810 MHz and above 2000 MHz;
      35 – 95 MHz (block dependent): 1810 MHz to 5 MHz below license edge
      130 – 85 MHz (block dependent): 5 MHz beyond license edge to 2000 MHz
    - RBW 1 MHz
    - Sweep Time 6 sec
    - Display Max Hold
2. Trigger a single sweep on the HP8563E. The long sweep time ensures that, at each of the 601 display points comprising the sweep, the analyzer will dwell long enough to sample the transmission twice (6 sec / 601 points = approximately 10 ms per point and PCS-1900 transmissions occur every 4.6 ms)
3. Transfer data to PC; correct for path loss and plot data.

4. Repeat 2 – 3 to cover entire 10 MHz to 20 GHz range. A total of 74 separate sweeps are required to cover this range.
5. Measure emissions in this manner at both lower and upper edges of license block.
6. Perform measurement with DTSA tuned to lowest and highest PCS-1900 channels in each of the six broadband PCS blocks (a total of 12 measurements).

Measurement Results

Conducted emissions results from both sides of all six PCS license blocks were very similar; therefore, only results with the transmitter tuned to the lowest PCS-1800 channel (channel 512, 1850.2 MHz) in the A license block measurements will be presented. However, the requirements of § 24.238(a) are met by the DTSA transmission at all PCS-1900 channels in all PCS license blocks (A, B, C, D, E, and F).

Figure E13.2 presents typical results (bitmap captured from HP8563E display) from the first MHz outside the license edge, for the lower edge of the A band (DTSA transmitting at channel 512, 1850.2 MHz); measurement RBW was 3 kHz as allowed by § 24.238(b). Conducted spurious emissions are in compliance with the –13 dBm limit with a margin of greater than 3 dB. Beyond approximately 0.1 MHz from the license edge (1849.9 MHz in this case), the level of conducted spurious emissions falls below the –33 dBm reporting requirement.

Results from the 1 to 5 MHz range outside the license edge, again at the lower edge of the A band and same transmit channel, are shown in Figure E13.3. Recall that the measurement in this region was performed using a 10 kHz RBW, with results integrated up into a 1 MHz-wide window moved across the span (the "brick wall" technique). This integration accounts for the smoother character of the result. Because of the wider effective RBW of 1 MHz, the results are larger that measured in the first MHz outside the license edge. As a rough check on the integration technique, note that, at 1849.0 MHz, the delta between the 0 – 1 MHz results (with 3 kHz RBW) and 1 – 5 MHz results (with 1 MHz effective RBW) is approximately 26 dB. For a constant power level, this change in RBW should result in a delta of 25 dB (10 * log of RBW ratio), thus validating the integration technique.

Finally, beyond 5 MHz from the license edge, all results (for all measurements) were well below the –33 dBm reporting requirement. A typical result from below the A band, again at the lower edge of the A band and the same transmit channel (channel 512, 1850.2 MHz) is shown in Figure E13.4.

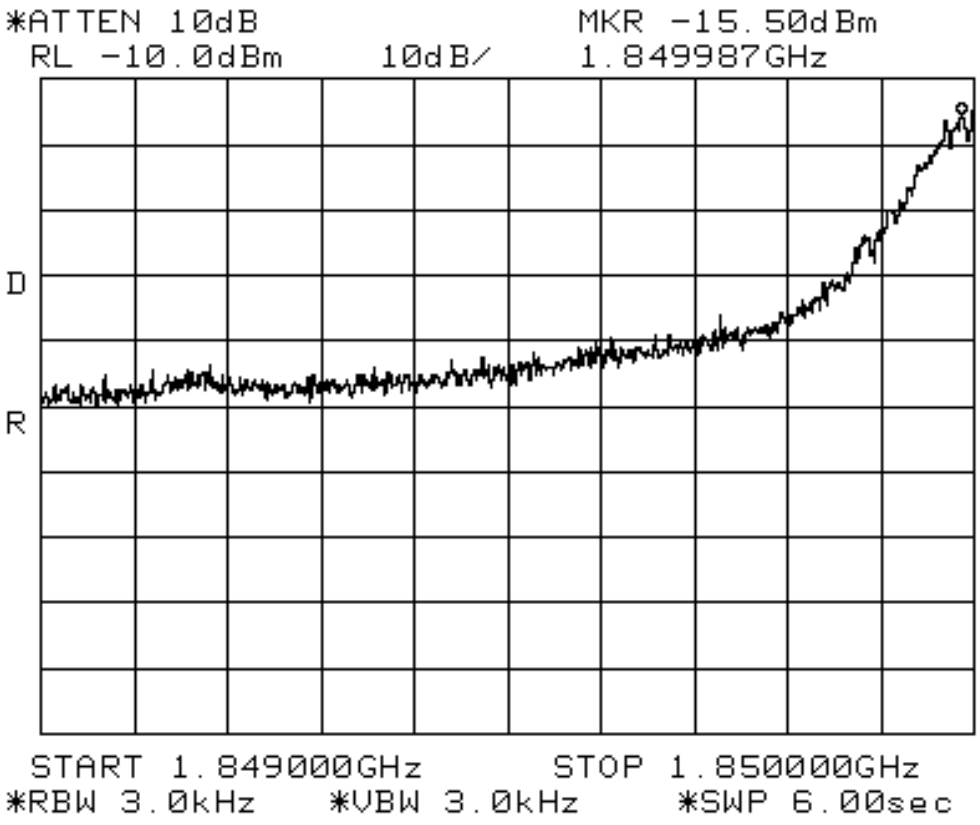

Figure E13.2. Typical conducted spurious emissions result within first 1 MHz of license edge.

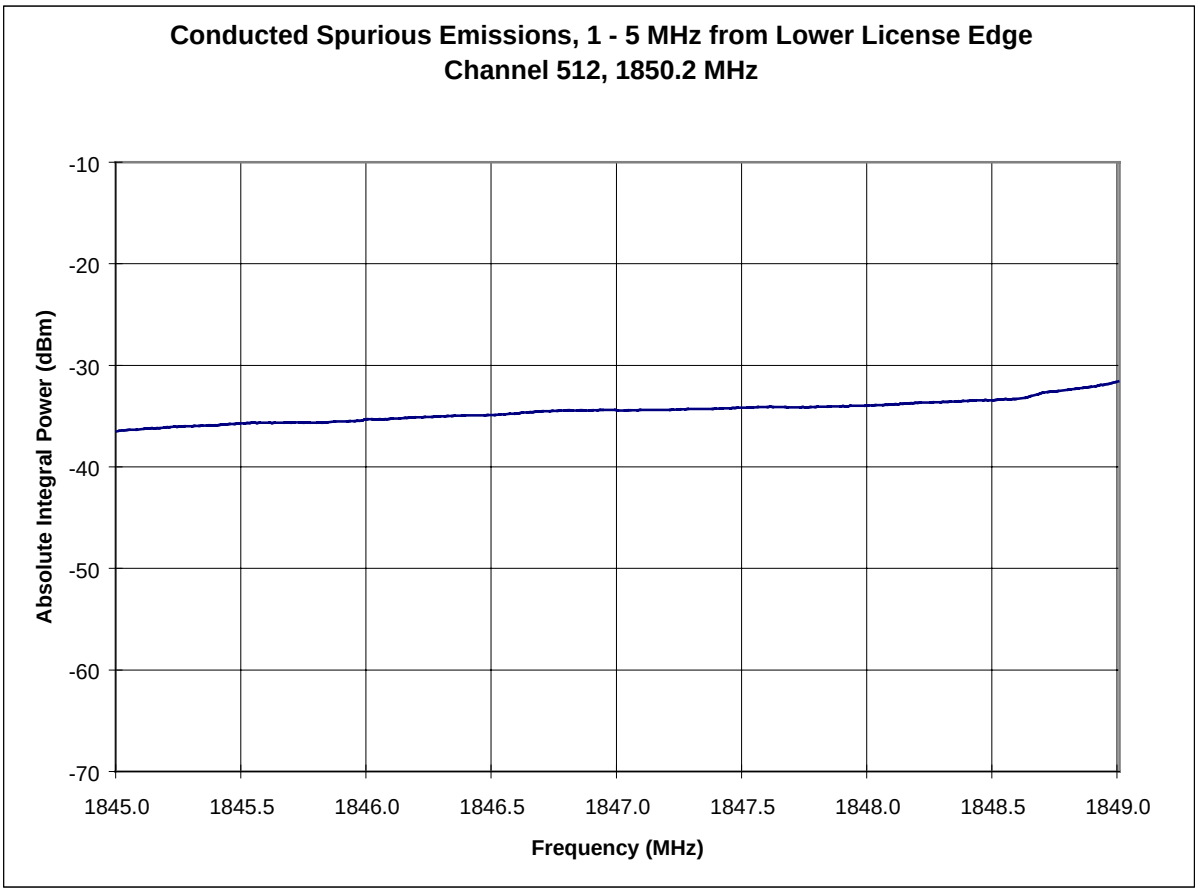

Figure E13.3. Typical conducted spurious emissions result from 1 to 5 MHz of license edge.

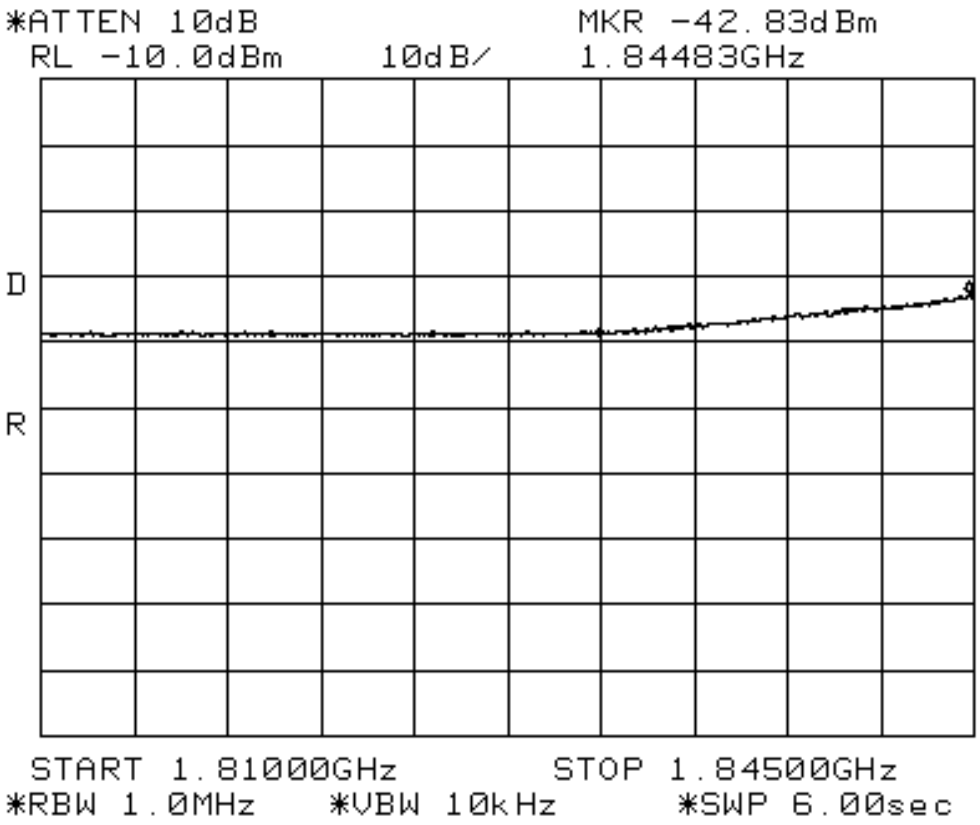

Figure E13.4. Typical conducted spurious emissions result beyond 5 MHz from license edge.