

FCC test part 47ch 2.1511c, 87.199 and 87.139h Spurious Emissions referenced to the Output Carrier Frequencies of 121.5 MHz and 243 MHz KTF406-ELT

Test Notes and Deviations: The DME beacon has a SMA 50 OHM output that feeds a remote antenna with internal impedance matching network at the end of a 3 ft cable. For convenience and repeatability of measurements the antenna A output connector is directly connected to the test equipment through a 26 dB attenuator network to protect the spectrum analyzer during the 5 watt 406 MHz bursts.

The beacon spectrum analyzer direct connection method to locate spurious signals is far more revealing than the radiated emission method requiring dipole antenna re-tuning over the 30 to 1000 MHz band. This is the case because the spectrum analyzer provides the equivalent ideal 50-ohm antenna load to the beacon over the whole 30 to 1000MHz band. The DME antenna provides a low VSWR load only at the required beacon output frequencies. At other frequencies the antenna would reflect most of the energy back to the beacon and not radiate it into free space. Because of this fact any actual field emission testing would reveal fewer spurious emissions than the direct connection method used below.

Sweep times are kept below 30 seconds rather than 100 seconds as required in some FCC tests to prevent display gaps caused during the 406 burst modulation that occurs every 50 seconds or so.

The scope is used to monitor swept audio tone and 406-burst modulation to determine when to acquire data after the burst.

1. Set equipment as shown in figure 1.
2. Activate beacon.
3. Set spectrum analyzer up as follows:

a) Start Frequency :	10 MHz
b) Stop Frequency :	900 MHz
c) IF bandwidth (resolution bandwidth) :	1 MHz
d) Video bandwidth:	1 MHz
e) Amplitude scale:	10db/div
f) Sweep speed:	50msec (5ms/ div.) continuous
4. Adjust the amplitude scale level till the modulation covers the screen near full scale like shown in figure 2.
5. Go to trace peak hold after the beacon's 406 burst for 30 seconds to "fill in" the trace and obtain the lowest peak carrier level. Then go to single sweep mode to freeze the display.
6. Turn on marker peak search and adjust marker to the peak of the 121.5 MHz carrier as shown in figure 2.
7. Record the 121.5 MHz carrier marker value in dBm. (this measured at -7.13dbm in figure 2)
8. Adjust marker to the peak of the 243 MHz carrier as shown in figure 3.
9. Record the 243 MHz carrier marker value in dBm. (this measured at -6.47dbm in figure 3)
10. Adjust marker to the peak of the 364.5 MHz harmonic spurious as shown in figure 4.
11. Record the 364.5 MHz harmonic spurious marker value in dBm. (this measured at -51.13dbm in figure 4)

12. Adjust marker to the peak of the 486 MHz harmonic spurious as shown in figure 5.
13. Record the 486 MHz harmonic spurious marker value in dBm. (this measured at -55.13dbm in figure 5)
14. Adjust marker to the only remaining visible peak between 486 MHz and 900 MHz. This remaining peak harmonic spurious is located at 851.5MHz as shown in figure 6.
15. Record the 851.5 MHz harmonic spurious marker value in dBm. (this measured at -55.13dbm in figure 6)
16. Verify the 121.5 MHz related harmonics spurious levels are below the 121.5 MHz carrier by at least 30 dB. To do this subtract the 364.5 MHz spur from the 121.5 MHz carrier as follows:

$$121.5 \text{ MHz carrier level in dBm} - 364.5 \text{ MHz spurious level dBm} = \text{dB}_{\text{spur364.5}}$$

$$-7.13 \text{ dBm} - (-51.13) \text{ dB} = 44 \text{ dB}_{\text{spur364.5MHz}}$$

This passes the spurious requirement of 30 dB below the 121.5 MHz carrier level as per the 2.1511, 87.199 and 87.139h at the beyond the 100 % bandwidth point from the carrier (+/-25 kHz).

17. Verify the next 121.5 MHz related harmonics spurious levels are below the 121.5 MHz carrier by at least 30 dB. To do this subtract the 851.5 MHz spur from the 121.5 MHz carrier as follows:

$$121.5 \text{ MHz carrier level in dBm} - 851.5 \text{ MHz spurious level dBm} = \text{dB}_{\text{spur851.5mhz}}$$

$$-7.13 \text{ dBm} - (-55.13) \text{ dB} = 48 \text{ dB}_{\text{spur851.5MHz}}$$

This passes the spurious requirement of 30 dB below the 121.5 MHz carrier level as per the 2.1511, 87.199 and 87.139h at the beyond the 100 % bandwidth point from the carrier (+/-25 kHz).

18. Verify the 243 MHz related harmonics spurious levels are below the 243 MHz carrier by at least 30 dB. To do this subtract the 486 MHz spur from the 243 MHz carrier as follows:

$$243\text{mhz carrier level in dBm} - 486 \text{ MHz spurious level dBm} = \text{dB}_{\text{spur486mhz}}$$

$$-6.47 \text{ dBm} - (-55.13) \text{ dB} = 48.66 \text{ dB}_{\text{spur486Mhz}}$$

This passes the spurious requirement of 30 dB below the 121.5 MHz carrier level as per the 2.1511, 87.199 and 87.139h at the beyond the 100 % bandwidth point from the carrier (+/-25 kHz).

Verify no **other non-harmonically related spurious signal** appears above the -55.13 dBm level between 10 MHz and 900 MHz.

Since **none can be found** that appears bigger than the harmonically related spurious found at the -55.13 dBm level, the beacon does not broadcast any unwanted non-harmonic signals at least 48 dB below the carrier.

This passes the spurious requirement of 30 dB below both the 121.5 and 243 MHz carrier level as per the 2.1511, 87.199 and 87.139h at the beyond the 100 % bandwidth point from the carrier (+/-25 kHz).

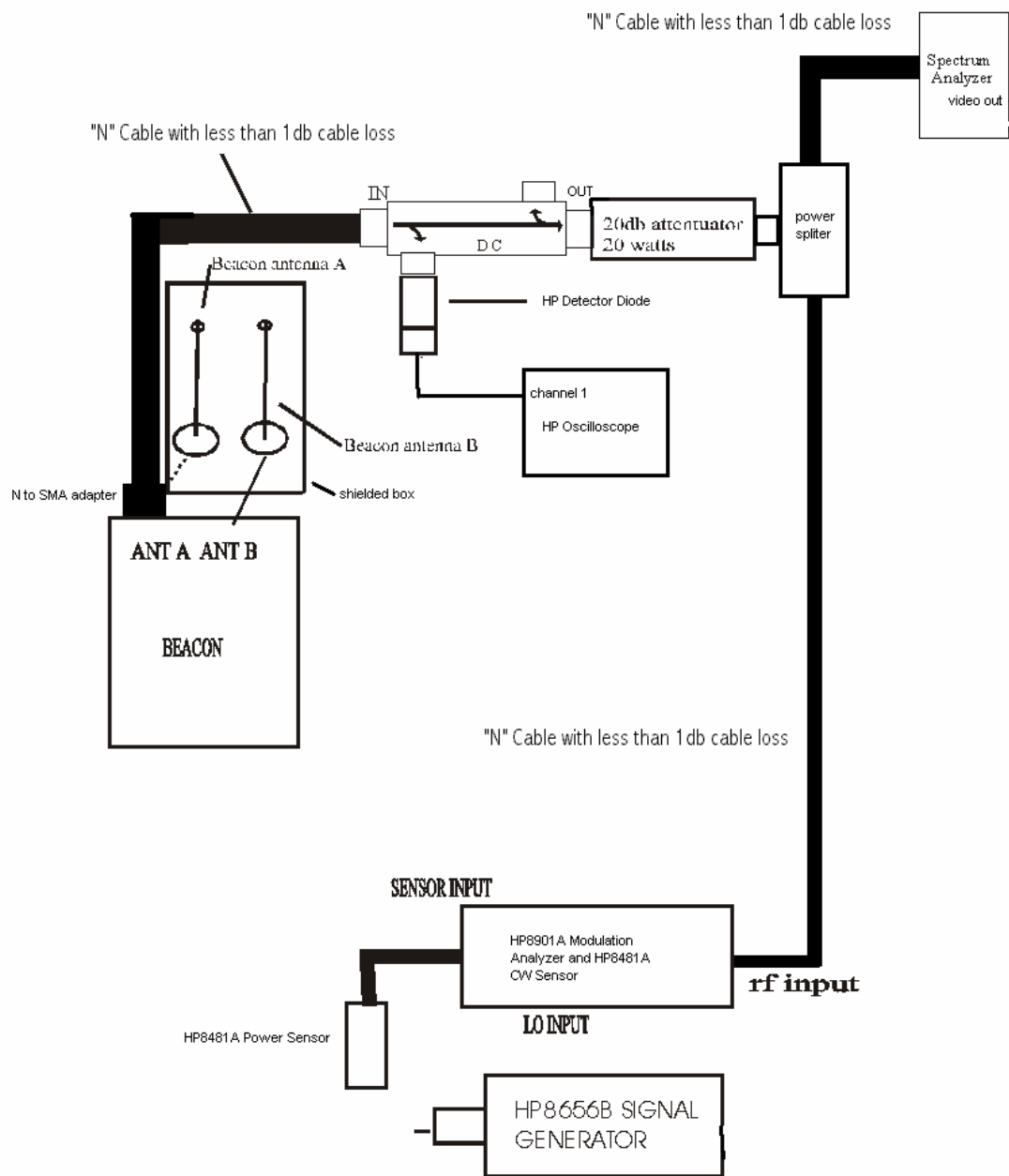


Figure 1

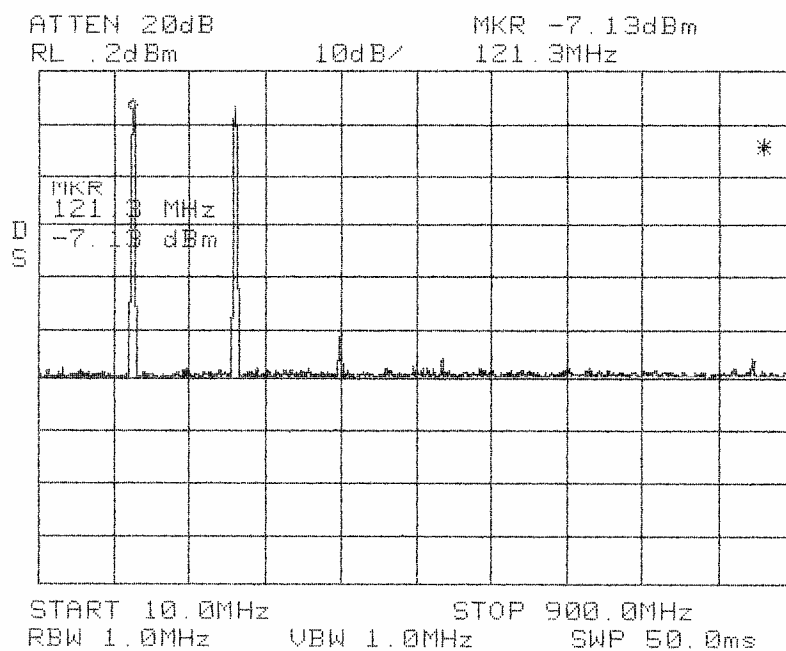


Figure 2

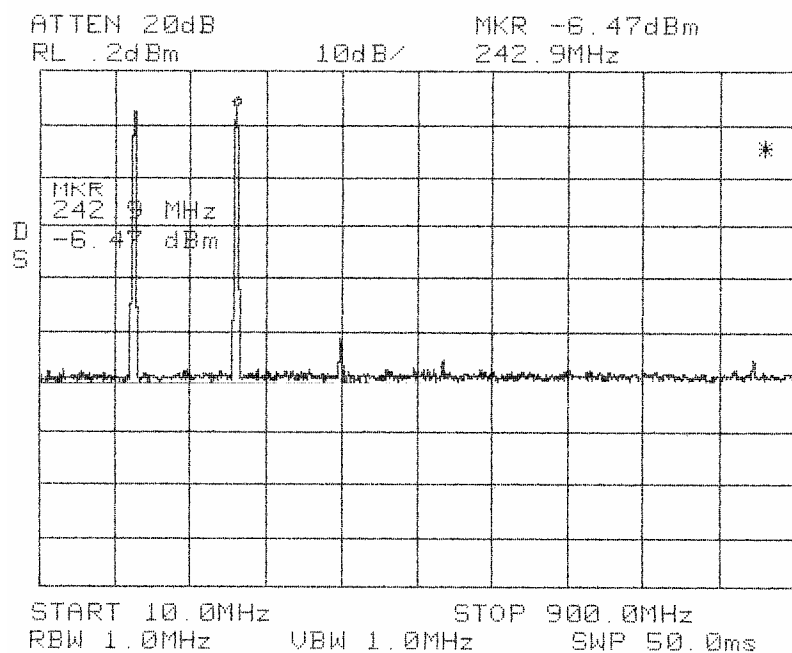


Figure 3

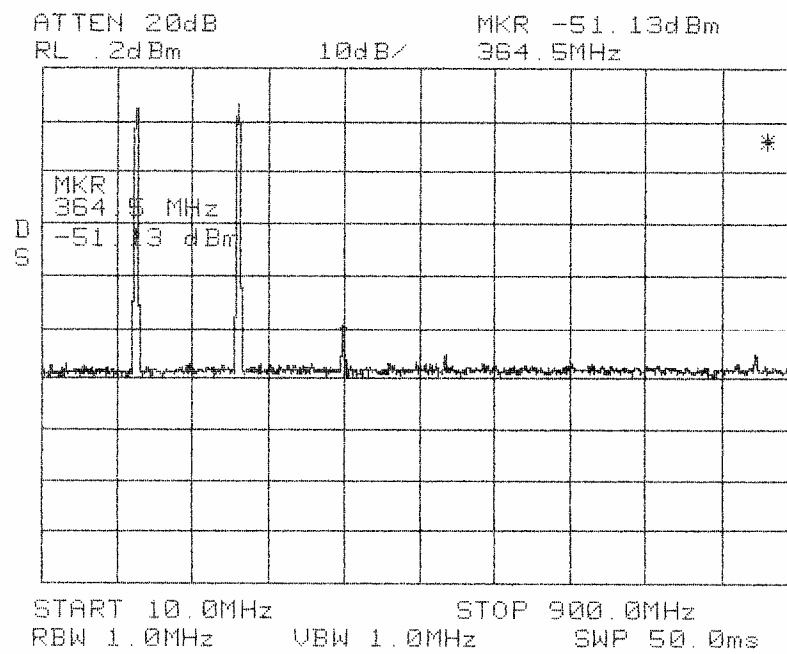


Figure 4

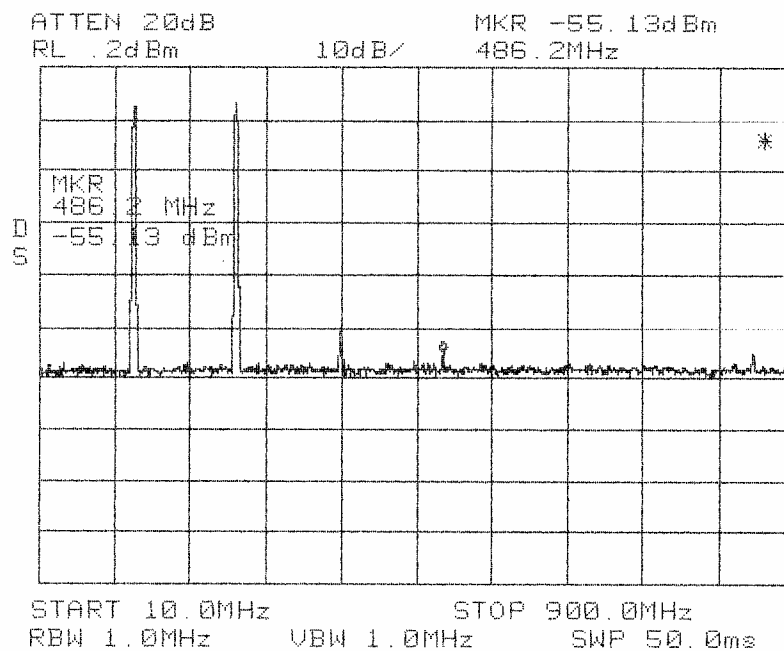


Figure 5

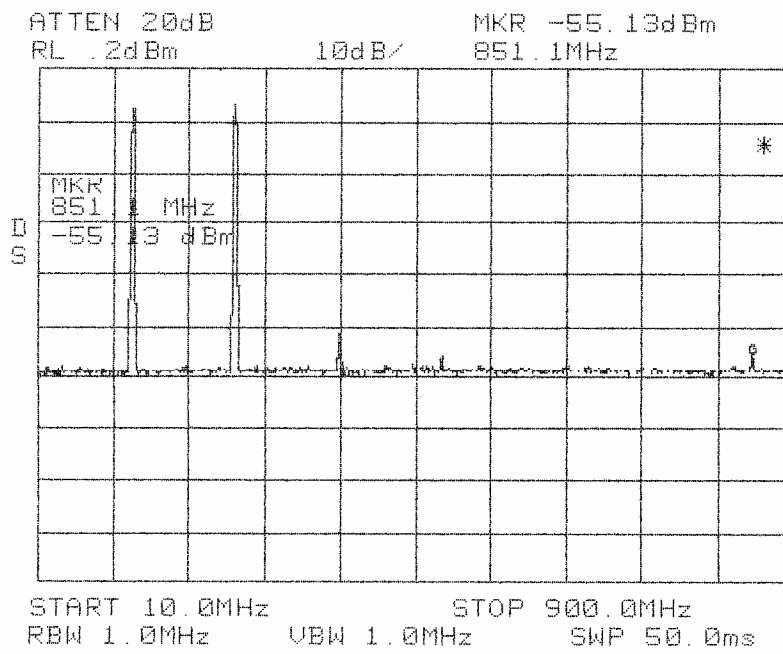


Figure 6