FCC test part 47ch
2.1515c
Signal Enhancement Test for 121.5MHz
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 Carrier frequency is read by using the Spectrum analyzers peak marker frequency counter function at a very narrow resolution bandwidth and narrow span to obtain the necessary accuracy directly off the analyzer rather than the FCC generator substitution method.

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) Center Frequency : 121.5 MHz
   b) IF bandwidth (resolution bandwidth) : 10KHz
   c) Video bandwidth: 3MHz
   d) Scan width: 100kHZ total (1Khz /div)
   e) Amplitude scale: 10db/div
   f) Sweep speed: 1sec (100ms/ 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 center as shown in figure 2.
7. Record the marker value in dbm. (this measured at –7.92 dbm in figure 2)
8. Calculate the mean power reference level by adding the modulation duty cycle derating contribution as follows:
   Peak level + modulation factor from paragraph 2.1513 in db = mean reference level total power
   -7.92dbm + (10 $\log_{10}$ (0.38912))db = -12.019 dbm

9. Set spectrum analyzer up as follows:
   a) Center Frequency : 121.5 MHz (re-center for actual carrier frequency as required)
   b) IF bandwidth (resolution bandwidth) : 30Hz
   c) Video bandwidth: 3MHz
   d) Scan width: 200 Hz total (20 hz /div)
   e) Amplitude scale: 5db/div

f) Sweep speed: 30sec (3sec/div) continuous
g) Trace peak hold: On
h) Adjust the amplitude scale level and center frequency till the modulation covers the screen near full scale like shown in figure 3.

10. Go to trace peak hold and single sweep mode after the beacon's 406 burst for one 30 second sweep to "fill in" the trace as shown in figure 3.
11. Turn on marker peak search to locate the highest peak and carrier frequency as shown in figure 3.
12. Record the marker value in dbm. (this measured at –14.92 dbm in figure 3)
13. Calculate the ratio of carrier power to the mean total power as follows:

$$\text{LOG}_{10}^{-1}((\text{dBc-dBt})/10 = (\text{Carrier power in milliwatts/total power in milliwatts})$$
$$\text{LOG}_{10}^{-1}((-14.92-(-12.019))/10 = \mathbf{0.51 \text{ or } 51\%}$$

This passes the RTCA DO-183 (Paragraph 2.2.2.2b) power distribution requirement of at least 30% of the total power within +/-30 Hz.

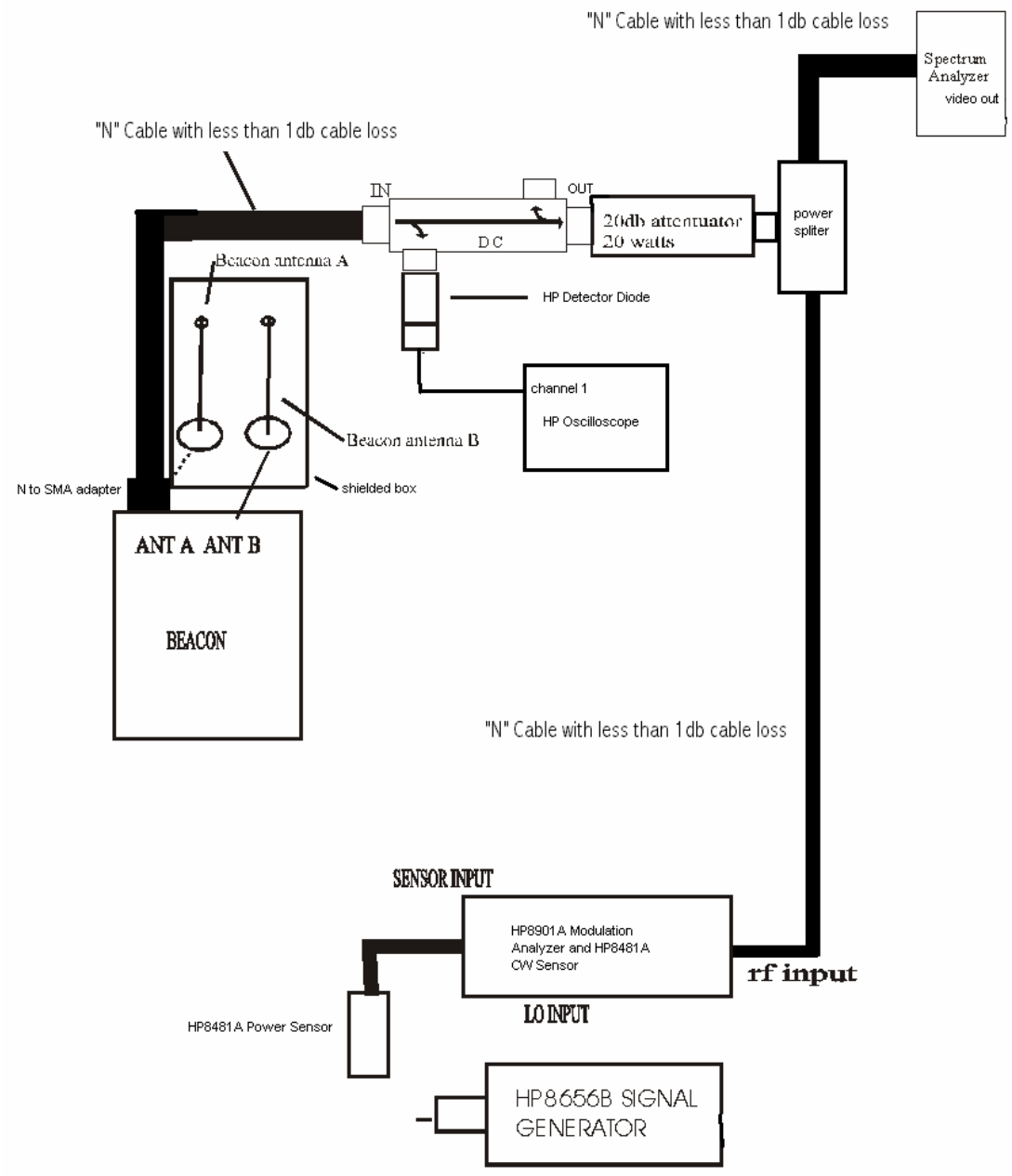
"N" Cable with less than 1db cable loss
Spectrum Analyzer video out
"N" Cable with less than 1db cable loss
IN
OUT
DC
20db attenuator 20 watts
power spliter
Beacon antenna A
HP Detector Diode
channel 1
HP Oscilloscope
Beacon antenna B
N to SMA adapter
shielded box
ANT A ANT B
BEACON
"N" Cable with less than 1db cable loss
SENSOR INPUT
HP8901A Modulation Analyzer and HP8481A CW Sensor
rf input
LO INPUT
HP8481A Power Sensor
HP8656B SIGNAL GENERATOR

Figure 1

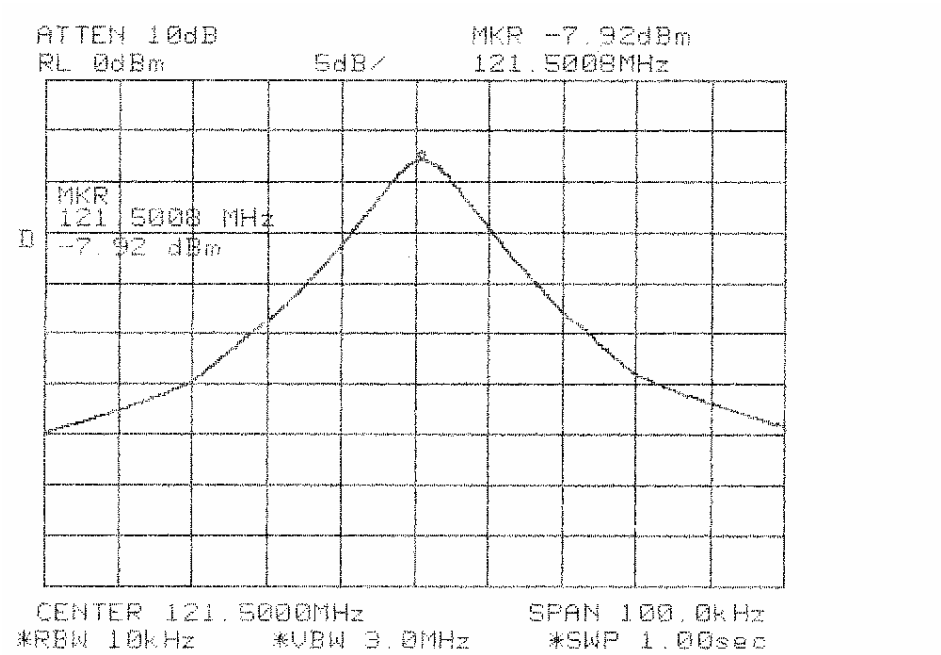

Figure 2

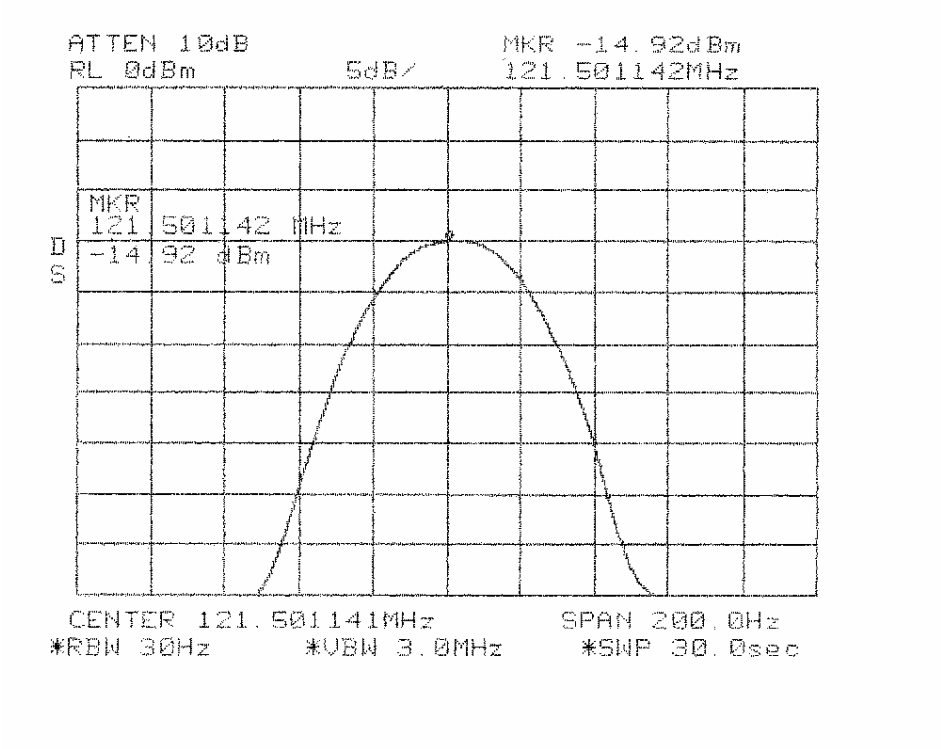

Figure 3