dme CORPORATION

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ORIGINAL

ALIVENESS TEST PROCEDURE
for the
SRB, Model 406

Where used: P3-03-0041-001

Y1-02-1054

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TEST DATA SHEETS
RF BEACON ASSEMBLY
P3-03-0041-001

REVISIONS

Revision	Date	Change Description	Approval
-	021016	ERN-SRB/406-07	J. KOTYK
A	030326	INC NOR (-)1	C. Middleton

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1.0 PURPOSE

The purpose of this procedure is to electrically check the "aliveness" , "activation" and "selftest" of the SRB-406 beacon in accordance with the specifications outlined in the DO-204, DO-183 and ED62

2.0 REQUIRED EQUIPMENT AND DOCUMENTS (or equivalent)

2.1 Equipment

Shielded box (with small notched hole on case or lid to allow the cable to exit) large enough to put a beacon antenna inside	TBD or make item
Oscilloscope	HP54510B
Spectrum Analyzer	HP8593A
Modulation Analyzer with CW probe	HP8901B analyzer ; Probe HP8481A
RF Signal Generator	HP8656B
Scanning Test Receiver, AM 121.5/243 MHz	IFR FM/AM 500
1 Directional Coupler	NARDA Model 3020A
20 db attentuator 20watts sma (f)-sma (f)	Inmet 2066-20F
Detector diode	HP8473B
Cables to connect to directional coupler main output and detector diode. (BNC)	RG58
Coax Adapters to interconnect diode detector ,attenuator, and RF reference	As required.
Cables with approximate <1db loss (N) to be used with directional coupler input and output	QMI KU1818-48

2.2 Documents

Assembly Drawing RF beacon	A3-07-1032
Schematic RF board	Y1-01-0039
Schematic digital board	Y1-01-0038

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3.0 SETUP INSTRUCTIONS AND SPECTRUM ANALYZER DB OFFSET DETERMINATION

Note: All pass fail criteria are provided in the data sheet and turn on all test equipment upon hooking it up and allow to warm up for at least 15 minutes.

3.1 ZERO/CAL the HP8901B power meter sensor function with the HP 8481A sensor at 50 MHZ frequency mode using the HP8901B front panel cal connector. Connect the equipment as shown in Figure 1.

3.2 Set the HP8901B frequency mode to 121.5 MHZ then change to the power meter mode. Connect the HP8481A power sensor to the HP8656B RF output connector.

3.3 Set the HP8656B to 121.5 **MHZ** and both AM and FM modulation set to OFF. Adjust the HP8656B amplitude (in 0.1 db increments) till the HP8901B reads 0.00 dbm +/- 0.05. **Record** the amplitude setting on the HP8656B to obtain that level.

3.4 Set the HP8656B to 243 **MHZ** and both AM and FM modulation set to OFF. Set the HP8901B frequency mode to 243 HZ then change to the power meter mode. Adjust the HP8656B amplitude (in 0.1 db increments) till the HP8901B reads 0.00 dbm +/- 0.05. **Record** the amplitude setting on the HP8656B to obtain that level.

3.5 Set the HP8656B to 406.028 **MHZ** and both AM and FM modulation set to OFF. Set the HP8901B frequency mode to 406.028HZ then change to the power meter mode. Adjust the HP8656B amplitude (in 0.1 db increments) till the HP8901B reads 0.00 dbm +/- 0.05. **Record** the amplitude setting on the HP8656B to obtain that level.

3.6 Remove the sensor from the HP8656B generator and put it aside. Place an N (m) to SMA (f) adapter on the HP8656B RF output.

3.7 Connect the coupler input cable to the HP8656B RF output.

3.8 Set the HP8656B to **121.5 MHZ** and both AM and FM modulation set to OFF. Set the HP8656B to the power level recorded in **paragraph 3.3** Set the Spectrum analyzer center frequency for **121.5 MHz**, and span frequency of 10MHZ, an amplitude of **+20dBm** and use **manual 2 sec sweep**. Use MARKER PEAK SEARCH and MARKER DELTA to normalize the spectrum analyzer. Use the **store location 1** on the spectrum analyzer to hold the setup and normalized reading.

3.9 Set the HP8656B to **243 MHZ** and both AM and FM modulation set to OFF. Set the HP8656B to the power level recorded in **paragraph 3.4** Set the Spectrum analyzer center frequency for **243 MHz**, and span frequency of 10MHZ, an amplitude of **+20dBm** and use **manual 2 sec sweep.** Use MARKER PEAK SEARCH and MARKER DELTA to normalize

the spectrum analyzer. Use the **store location 2** on the spectrum analyzer to hold the setup and normalized reading.

3.10 Set the HP8656B to **406.028 MHZ** and both AM and FM modulation set to OFF. Set the HP8656B to the power level recorded in **paragraph 3.5** Set the Spectrum analyzer center frequency for **406.028 MHz**, and span frequency of 100 kHz, an amplitude of **+20dBm** and use **auto sweep**. Use MARKER PEAK SEARCH and MARKER DELTA to normalize the spectrum analyzer. Use the **store location 3** on the spectrum analyzer to hold the setup and normalized reading.

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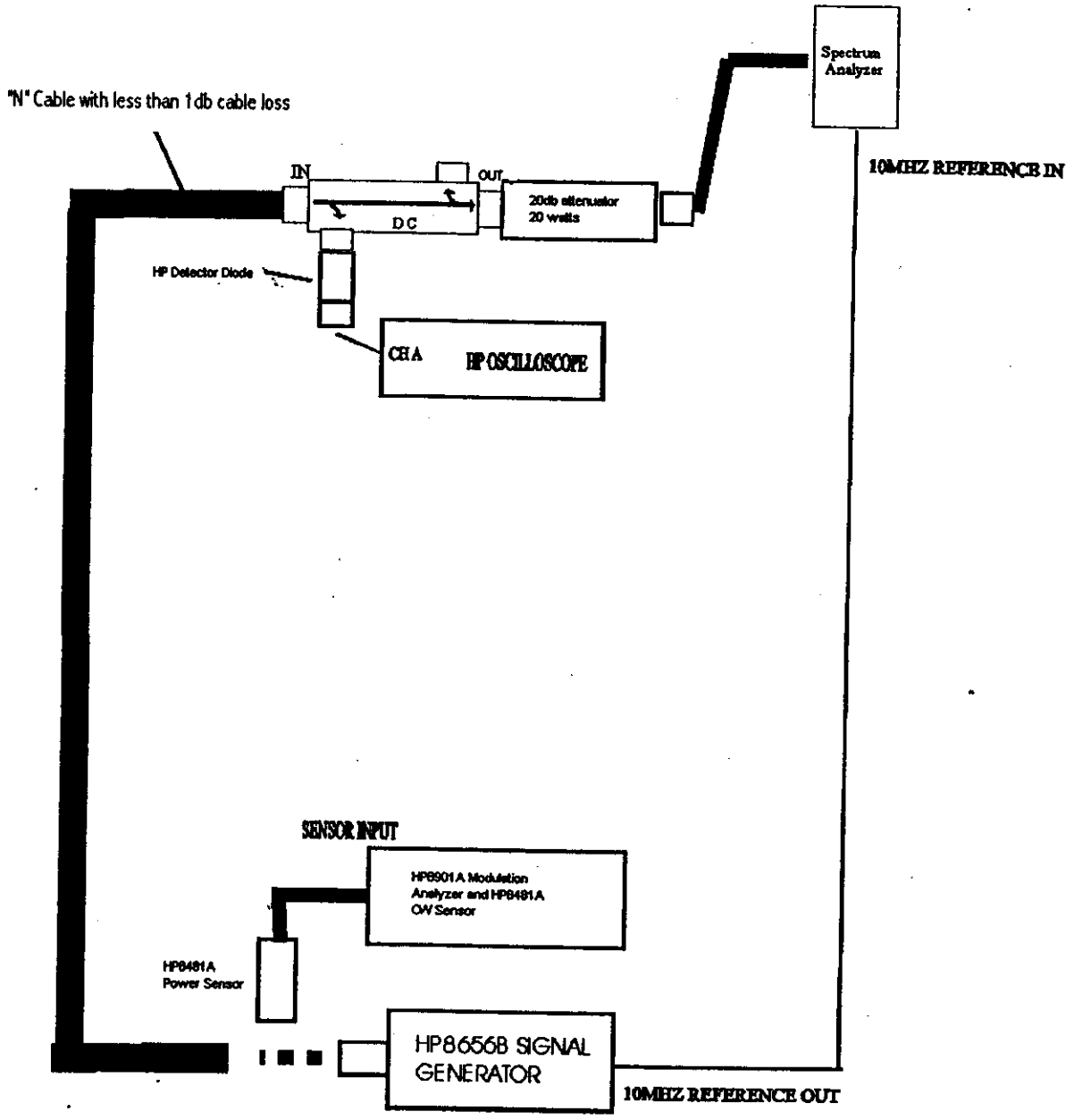

------ Indicates alternate connections

Figure 1 System Pre-Test Setup

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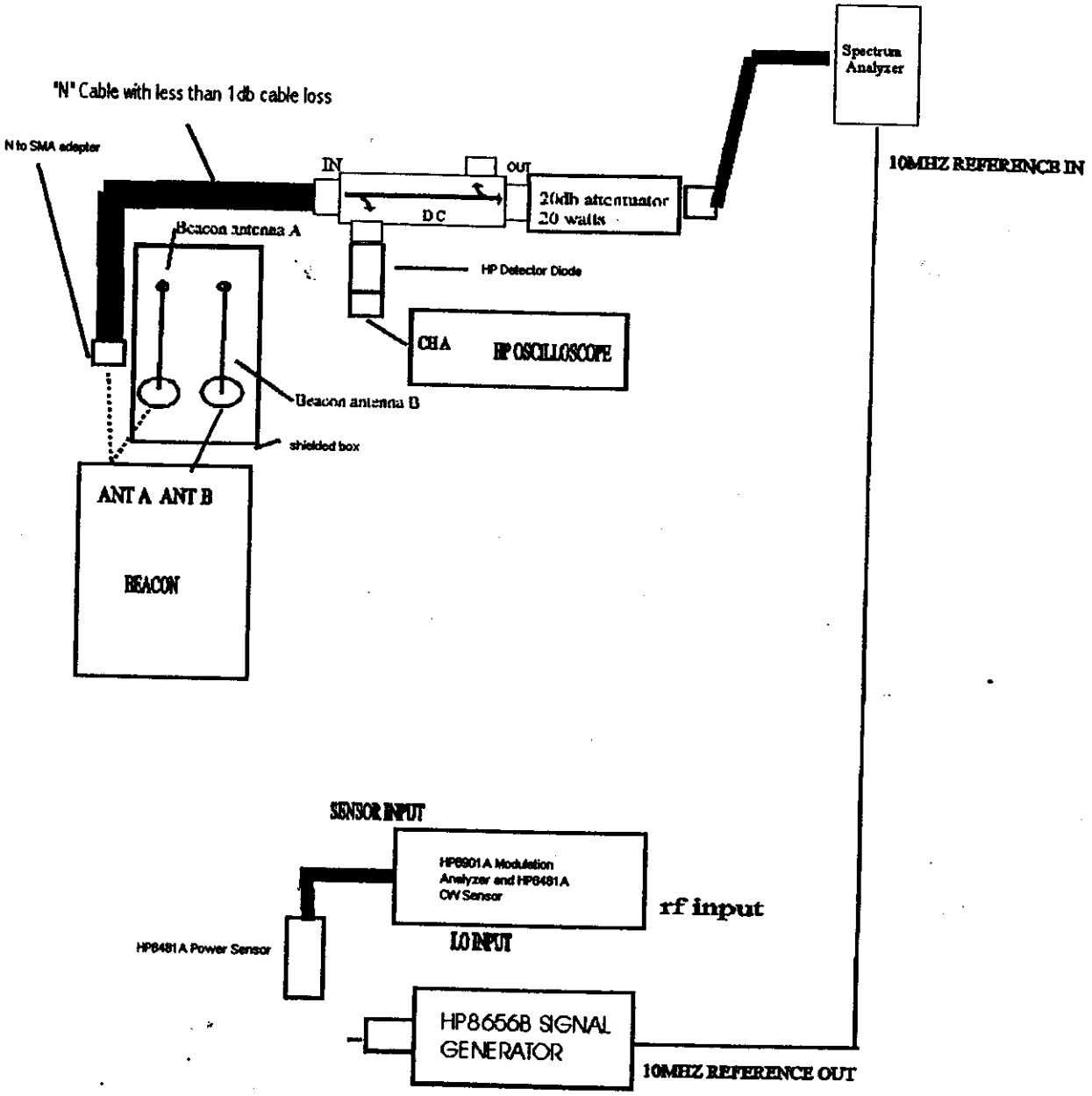

Figure 2 System Test Setup

------- Indicates alternate connections

ISO 9001 CERTIFIED
FM 39229

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4.0 RF Beacon Tests

4.1 BEACON Activation and SELF TESTS

4.1.1 Install the beacon magnet back into its recess unless already done and install antenna A and B if not already done. Take antenna A and B and place both in a shielded enclosure (with only the cable exiting the container) to prevent radiating the emergency signals when activation occurs. Turn on scanner tuned to 121.5 or 243 MHZ. Press the beacon test switch and verify the beacon LED "double blinks" every five seconds for about 60 seconds indicating the beacon self test passes and then goes off. Record results on the test data sheet.

4.1.2 Make sure the antenna sense points are not covered with dew or are wet. Remove the magnet and verify that the beacon stays off (no swept sound from scanner) and the beacon LED does not light up. Record results on the test data sheet.

4.1.3 Open the shielded enclosure and **touch the antenna sense points on the B antenna with moistened fingers and quicky (under 2 seconds) close the shielded enclosure.** Verify the beacon activates with a single LED blink every few seconds and the swept sound comes from the scanner. Record results on the data sheet.

4.1.4 Place magnet back in beacon magnet recess. Verify the beacon stops transmitting (LED off and no sound from scanner). Record results on the data sheet.

4.1.5 Remove the magnet. Open the shielded enclosure and **touch the antenna sense points on the A antenna with moistened fingers and quicky (under 2 seconds) close the shielded enclosure.** Verify the beacon activates with a single LED blink every few seconds and the swept sound comes from the scanner. Record results on the data sheet.

4.1.6 Place magnet back in beacon magnet recess. Verify the beacon stops transmitting (LED off and no sound from scanner). Record results on the data sheet.

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4.2 RF beacon 121.5/243 Mhz Operational Parameters

4.2.1 Connect the equipment as shown in Figure 2 with the directional coupler input cable connected to the beacon antenna A output. Turn the HP8656b RF output **ON/OFF to OFF.** Activate beacon by removing magnet from top of unit. **Allow unit to warm up 5 minutes unless already warmed up.** Use the **recall location 1** on the spectrum analyzer to obtain the setup and normalized reading for the 121.5Mhz signal. Note there is a swept tone on the scanner set to 121.5 Mhz. **Use MARKER PEAK SEARCH.** Measure and record on the test data sheet the output power and calculate the Effective Isotropic Radiated Power (EIRP)

4.2.2 Set the span frequency for 100KHZ . Set the TRACE HOLD on and let the display "fill in" the modulation peaks on the Spectrum analyzer display for at least 20 seconds. Use normal MARKER PEAK SEARCH (marker delta off) on the spectrum analyzer and read the marker peak frequency. Measure and record on the test data sheet the 121.5 Mhz marker frequency.

4.2.3 Use the **recall location 2** on the spectrum analyzer to obtain the setup and normalized reading for the 243 Mhz signal. Use MARKER PEAK SEARCH. Measure and record on the test data sheet the output power and calculate the Effective Isotropic Radiated Power (EIRP)

4.2.4 Set the span frequency for 100KHZ . Set the TRACE HOLD on and let the display "fill in" the modulation peaks on the Spectrum analyzer display for at least 20 seconds. Use normal MARKER PEAK SEARCH (marker delta off) on the spectrum analyzer and read the marker peak frequency. Measure and record on the test data sheet the 243 Mhz marker frequency.

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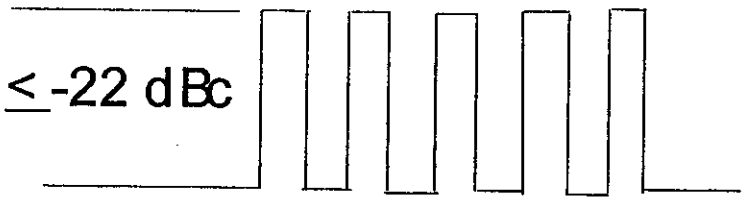

Figure 3. Modulation Depth

4.2.5 Set the TRACE HOLD off and SWEEP TIME to AUTO. Set RESOLUTION BANDWIDTH to 3 MHz. Set the span frequency for 3 MHz. Set the sweep for SINGLE SWEEP. Use MARKER PEAK SEARCH and MARKER DELTA to perform the modulation depth check. This is accomplished by moving the DELTA MARKER to a modulation "valley" to determine the modulation "depth" from its peak. The "valley" must be less than -22 dBc (i.e. this equates to >85% modulation). See Figure 3. (It is typically below –35dBc.) Record results on the test data sheet.

4.2.6 Connect the diode detector output directly to the scope input. Set the oscilloscope controls to view the negative going pulse whose pulse width and period are constantly varying (note: disregard the large 406 MHZ pulse every 50 seconds or so). Set the duty cycle mode on. Use the normal mode and level adjustment to capture a waveform duty cycle on the scope and verify that the positive pulse width duty cycle is between 45% and 67%(note: because a negative output diode detector is used the complemented duty cycle of the standard 33% to 55% is used for the test limits) Record results on the test data sheet.

4.2.7 Connect the diode detector output directly to the scope input. Set the oscilloscope controls to view the negative going pulse whose pulse width and period are constantly varying. (note: disregard the large 406 MHZ pulse every 50 seconds or so) Use the normal mode and level adjustment to capture a continuous waveform on the scope and set the statistic frequency mode on. Over a period of 45 seconds or less the statistic mode will show the maximum and minimum audio frequencies. Record results on the test data sheet.

4.2.8 Use a stop watch or digital watch with stop watch function. Listen to the scanner radio tuned to 121.5 or 243 MHZ and count the number of audio downward swept tones in a ten second period. The number must fall between 20 and 40. Record results on the test data sheet.

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4.3 RF beacon 406.028 Mhz Operational Parameters

4.3.1 Turn the HP8656b RF output **ON/OFF to OFF.** Use the **recall location 3** on the spectrum analyzer to obtain the setup and normalized reading for the 406.028 Mhz signal. Allow unit to warm up 5 minutes unless already warmed up. Set the TRACE HOLD on and let the display "fill in" the modulation peaks on the Spectrum analyzer display for at least 3 minutes. Use MARKER PEAK SEARCH. Measure and record on the test data sheet the output power and calculate the Effective Isotropic Radiated Power (EIRP)

4.3.2 Turn TRACE MODE off and set the frequency SPAN to 10 KHZ. Set the TRACE HOLD on and let the display "fill in" the modulation peaks on the Spectrum analyzer display for at least 3 minutes. Use normal MARKER PEAK SEARCH (marker delta off) on the spectrum analyzer and read the marker peak frequency . Record results on the test data sheet.

4.3.3 Place magnet back in beacon magnet recess and remove test connection to Antenna A output.

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Tested By: _____

DATE: _____

Beacon P3-03-0041-001 Serial Number: _____

Test Equipment	Model	Serial No. or Control No.	Cal. Due

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SPECTRUM ANALYZER OFFSET DETERMINATION AND PRETEST					
Para.	**Description**	**Min.**	**Results**	**Max.**	**Pass / Fail (circle one)**
3.3	HP8656 setting for 121.5MHZ	-0.5	_____dBm	+0.5	P F
3.4	HP8656 setting for 243 MHZ	-0.5	_____dBm	+0.5	P F
3.5	HP8656 setting for 406.028 MHZ	-0.5	_____dBm	+0.5	P F

BIST and turn on tests					
Para.	**Description**	**Min.**	**Results**	**Max.**	**Pass / Fail (circle one)**
4.1.1	Beacon passes self test and goes off	N/A	_____ chk	N/A	P F
4.1.2	Beacon stays off	N/A	_____ chk	N/A	P F
4.1.3	Beacon transmits when B antenna is touched.	N/A	_____ chk	N/A	P F
4.1.4	Beacon goes off when magnet is installed.	N/A	_____ chk	N/A	P F
4.1.5	Beacon transmits when A antenna is touched.	N/A	_____ chk	N/A	P F
4.1.6	Beacon goes off when magnet is installed.	N/A	_____ chk	N/A	P F

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RF beacon 121.5/243 Mhz Tests					
Para.	**Description**	**Min.**	**Results**	**Max.**	**Pass / Fail (circle one)**
4.2.1	Peak Power at 121.5 MHZ	17.0dBm	_____ dBm	N/A	P F
	Antenna gain including feeder and mismatch losses for 121.5 Mhz obtained from antenna field tests.	N/A	_____ dB	N/A	N/A
	Peak power + antenna gain= EIRP	20dbm EIRP	_____ dBm	N/A	P F
4.2.2	Frequency 121.5 MHz ± 6 kHz	121.494	_____ MHz	121.506	P F
4.2.3	Peak Power at 243 MHZ	17.0dBm	_____ dBm	N/A	P F
	Antenna gain including feeder and mismatch losses for 243 Mhz obtained from antenna field tests.	N/A	_____ dB	N/A	N/A
	Peak power + antenna gain= EIRP	20dbm EIRP	_____ dBm	N/A	P F
4.2.4	Frequency 243 MHz ± 12 kHz	242.988	_____ MHz	243.012	P F
4.2.5	121.5 Mhz Modulation depth	N/A	_____ dBc	-22dBc	P F
4.2.6	121. 5 /243 Mhz Duty cycle	45%	_____ %	67%	P F
4.2.7	Max audio frequency	N/A	_____ Hz	1600	P F
	Min audio frequency	300	_____ Hz	N/A	P F
	Max - Min	700	_____ Hz	N/A	P F
4.2.8	Sweeps in 10 seconds	20	_____ count	40	P F

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RF beacon 406.028 Mhz Tests					
Para.	**Description**	**Min.**	**Results**	**Max.**	**Pass / Fail (circle one)**
4.3.1	Peak Power at 406.028 MHZ	35.0dBm	_____dBm	N/A	P F
	Antenna gain including feeder and mismatch losses for 406.028 Mhz obtained from antenna field tests.	N/A	_____ dB	N/A	N/A
	Peak power + antenna gain= EIRP	32.0dbm EIRP	_____ dBm	N/A	P F
4.3.2	Frequency Accuracy 406.028 MHz ± 1 kHz	406.0270	_____mHz	406.0290	P F