

**Test: Peak Power Spectral Density**

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**Ref.:** FCC Part 15.247 (d)

**Criteria:** The power spectral density averaged over any one-second interval shall not be greater than 8.0 dBm in any 3 kHz bandwidth within the pass bands. For a direct sequence system, it is defined as the peak power spectral density conducted from the intentional radiator to the antenna measured during any time interval of continuous transmission.

**Set-up:** See Figure 4

**Condition:** Radiated Test

**Equipment:** See Appendix A

**Methodology:** Because the antenna is integrated within the DUI the Power Spectral Density of radiated signal was measured and then converted into Power Spectral Density conducted from the transmitter by applying the antenna gain provided by manufacturer. The measurement was performed by using the *Direct Method* in which the measurement is carried within a calibrated set-up and the readings from the spectrum analyzer are corrected by a factor comprised of *Cable Loss and Antenna Factor*. The test was repeated with two different sets of settings on the spectrum analyzer - narrow and wide span. Results obtained from both measurements are presented in the report (Graphs 1 to 6 and tables 1 and 2). Testing was performed with the spectrum analyzer settings as shown below (the peak signal was located and the span was reduced and the sweep time increased in a manner to maintain calibration and to keep the peak emission in the display after which the reading was taken).

1) Spectrum-Analyzer settings – narrow span:

Res. Bandwidth:	3 kHz
Video Bandwidth:	30 kHz
Span:	15 kHz
Ref. Level:	-20 dBm
Sweep:	5 seconds

2) Spectrum-Analyzer settings – wide span:

Res. Bandwidth:	3 kHz
Video Bandwidth:	30 kHz
Span:	3 MHz
Ref. Level:	-10 dBm

Sweep:

1000 seconds

The DUI was positioned on the turn-table and received signal was **maximized** by rotating the turntable and adjusting the height of the receiving antenna.

Power Spectral Density of the received signal (from the receiving antenna) was measured on the spectrum analyzer and recorded. The actual Conducted Peak Power Spectral Density on the DUI was obtained from the recorded reading in a following manner:

Sample Calculation:

Reading recorded on spectrum analyzer:

$$PPSD_{Spec.Analyzer} = -76.3 \text{ dBm/Hz}$$

So for 3kHz BW,

$$P_{3kHz} = -76.31 \text{ dBm} + 34.8 \text{ dB} = -41.51 \text{ dBm}$$

Converted to Voltage Reading:

$$V = P_{3kHz} + 107 \text{ dBmV/dBm} = 65.49 \text{ dBmV}$$

E-field at receive antenna (3 m from DUI):

$$\begin{aligned} E_{ANT} &= V + \text{Cable Loss} + \text{Antenna Factor} \\ &= 65.49 + 5.7 \text{ dB} + 32.2 \text{ dB/m} \\ &= 103.39 \text{ dBmV/m} \\ &= 0.148 \text{ V/m} \end{aligned}$$

Conducted Power Spectral Density at DUI:

Since  $P = (E_{ANT} * d)^2 / (30 * G)$

And  $G = 4 \text{ dBi} = 2.51$

So

$$\begin{aligned} P &= (0.148 * 3)^2 / (30 * 2.51) \\ &= 0.00261 \text{ W} \\ &= 4.2 \text{ dBm} \end{aligned}$$

**Test Results:** See Test Data, See Graphs 1 - 6

## Recalculated

**Table 1a: Base Unit – Conducted Power Spectral Density Test Data - Calculation**

Channel #	Frequency (MHz)	Reading on Spectr.An. (dBm/Hz)	PPSD for 3kHz BW (dBm)	Voltage on Spectr. An. (dB $\mu$ V)	E-field @ 3m (dB $\mu$ V/m)	E-field @ 3m (V/m)	Conducted Power @ DUI (dBm)
1	5742.980	-76.31	-41.51	65.49	103.39	0.148	4.2
18	5788.880	-79.35	-44.55	62.45	100.35	0.104	1.1
35	5794.280	-82.33	-47.53	59.47	97.37	0.074	-1.9

**Table 1b: Base Unit – Conducted Power Spectral Density Test Data – Results and Limits**

Channel #	Frequency (MHz)	Conducted Power @ 3kHz Bandwidth (dBm)	Limit (dBm)	Margin (dB)	Pass/Fail
1	5742.980	4.2	8.0	3.8	Pass
18	5788.880	1.1	8.0	6.9	Pass
35	5794.280	-1.9	8.0	9.9	Pass

**Test performed by:** \_\_\_\_\_ **Date:** June , 2002 \_\_\_\_\_

**Test Results:** See Test Data, See Graphs 1 - 6

## Recalculated

**Table 2a: Handset** – Conducted Power Spectral Density Test Data - Calculation

Channel #	Frequency (MHz)	Reading on Spectr.An. (dBm/Hz)	PPSD for 3kHz BW (dBm)	Voltage on Spectr. An. (dBμV)	E-field @ 3m (dBμV/m)	E-field @ 3m (V/m)	Conducted Power @ DUI (dBm)
1	5742.980	-75.55	-40.75	66.25	104.15	0.161	4.9
18	5788.880	-78.55	-43.75	63.25	101.15	0.114	1.9
35	5794.280	-79.91	-45.11	61.89	99.79	0.098	0.6

**Table 2b: Handset** – Conducted Power Spectral Density Test Data – Results and Limits

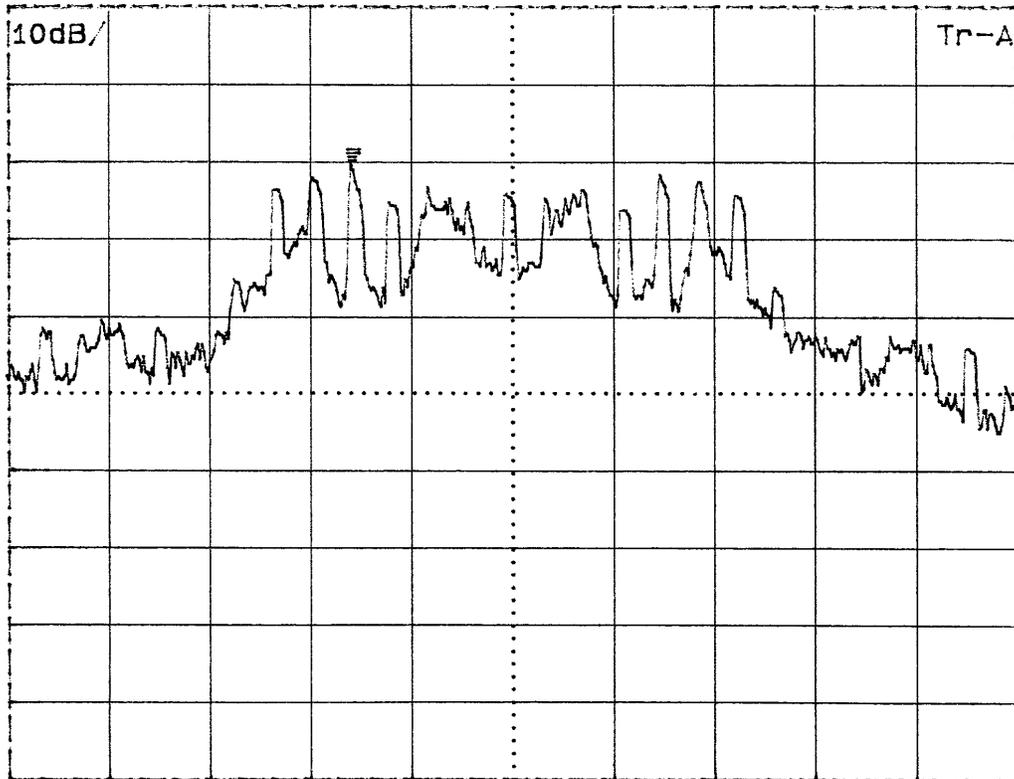
Channel #	Frequency (MHz)	Conducted Power @ 3kHz Bandwidth (dBm)	Limit (dBm)	Margin (dB)	Pass/Fail
1	5742.980	4.9	8.0	3.1	Pass
18	5788.880	1.9	8.0	6.1	Pass
35	5794.280	0.6	8.0	7.4	Pass

**Test performed by:** \_\_\_\_\_ **Date:** June , 2002 \_\_\_\_\_



**Graph 1a**

ChPwr: -11.43 dBm      UNIDEN-Base      Ch01  
-76.20 dBm/Hz      RB 3kHz#      AT 10dB      Band auto  
RLV: -10.00dBm      VB 30kHz#      ST 1000s#



CF: 5.742990GHz

Span: 3.00MHz

**Peak Power Spectral Density**

**UNIDEN – Base Unit**

Channel: 01

Transmitting Frequency: 5742.980 MHz

Resolution Bandwidth: 3.0 kHz

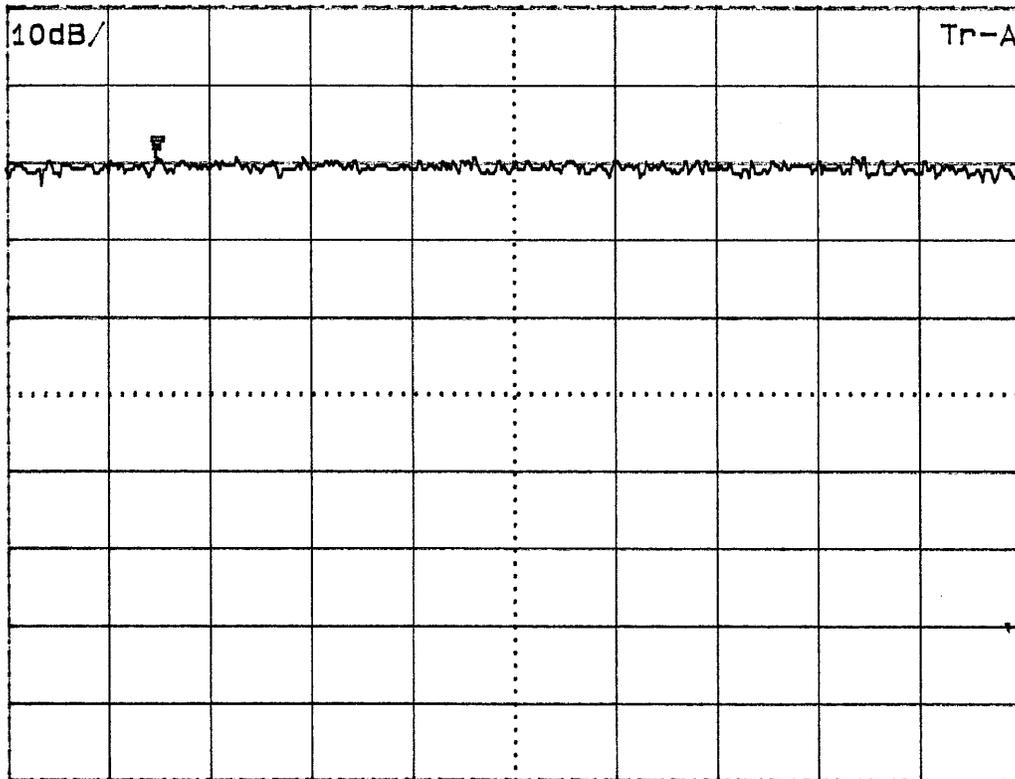
Video Bandwidth: 30.0 kHz

Span: 3.0 MHz

Sweep Time: 1000 seconds

### Graph 1b

ChPwr: -39.32 dBm      UNIDEN-Base      Ch01  
-76.31 dBm/Hz      RB 3kHz#      AT 10dB      Band auto  
RLV: -20.00dBm      VB 30kHz#      ST 5.0s#



CF: 5.742538857GHz

Span: 15.00kHz

### Peak Power Spectral Density

#### UNIDEN - Base Unit

Channel: 01

Transmitting Frequency: 5742.980 MHz

Resolution Bandwidth: 3.0 kHz

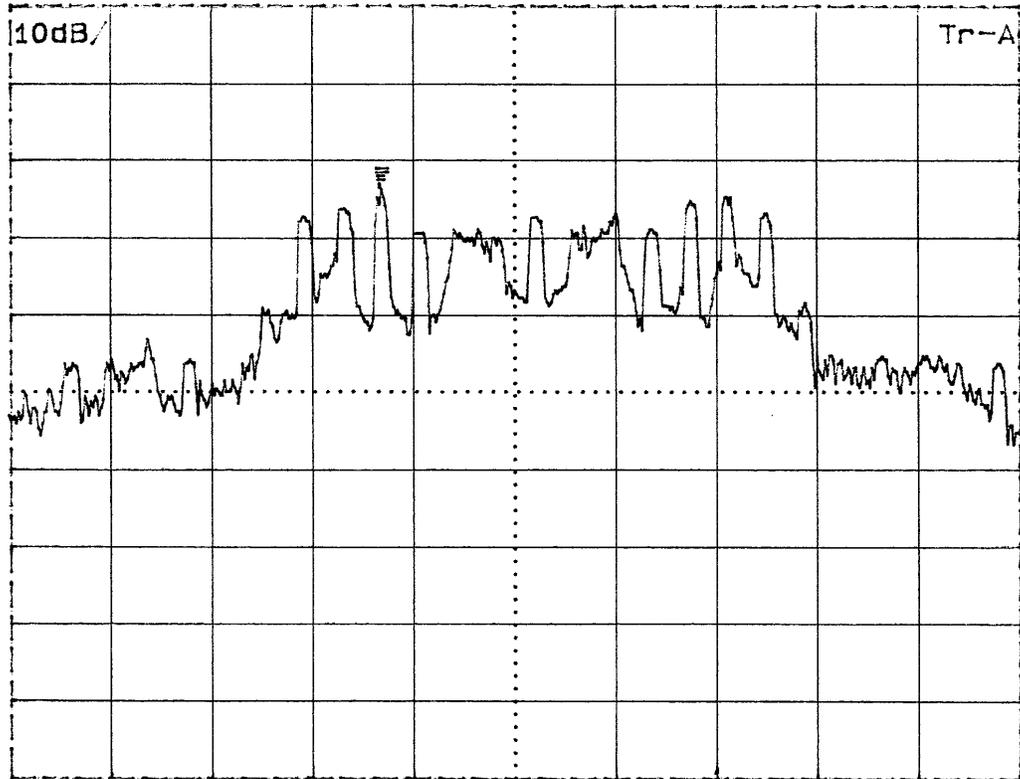
Video Bandwidth: 30.0 kHz

Span: 15.0 kHz

Sweep Time: 5 seconds

**Graph 2a**

ChPwr: -14.48 dBm      UNIDEN-Base      Ch18  
         -79.25 dBm/Hz      RB 3kHz#      AT 10dB      Band auto  
RLV: -10.00dBm      VB 30kHz#      ST 1000s#



CF: 5.791512GHz

Span: 3.00MHz

**Peak Power Spectral Density**

**UNIDEN – Base Unit**

Channel: 18

Transmitting Frequency: 5788.880 MHz

Resolution Bandwidth: 3.0 kHz

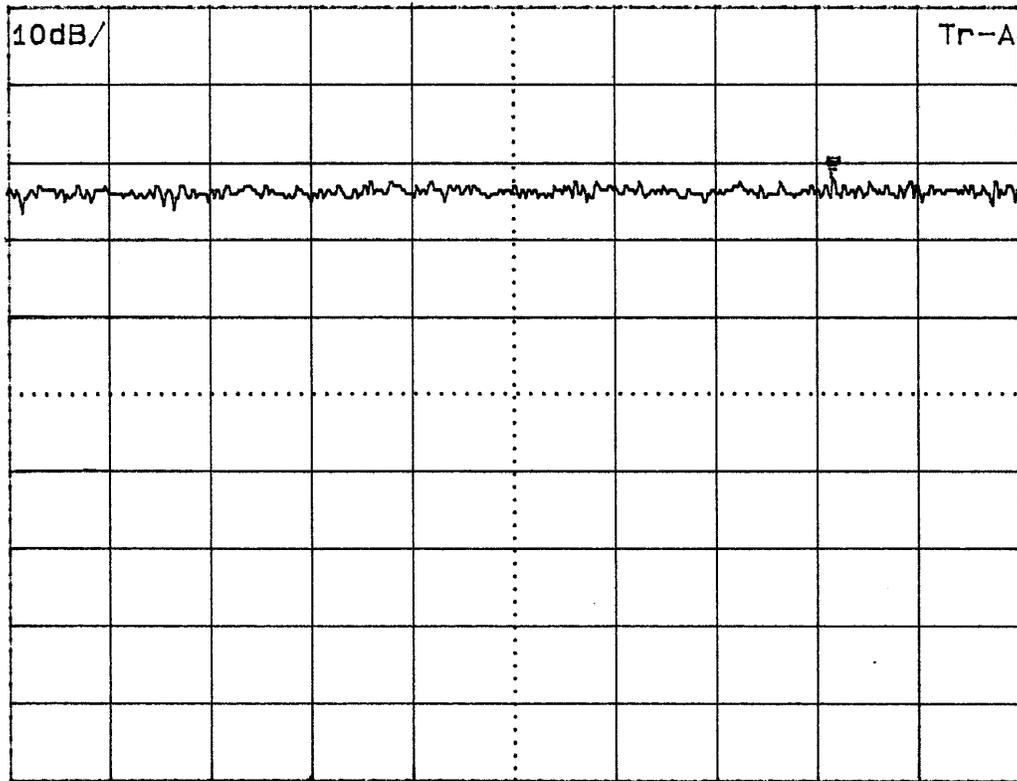
Video Bandwidth: 30.0 kHz

Span: 3.0 MHz

Sweep Time: 1000 seconds

### Graph 2b

ChPwr: -42.36 dBm      UNIDEN-Base      Ch18  
-79.35 dBm/Hz      RB 3kHz#      AT 10dB      Band auto  
RLV: -20.00dBm      VB 30kHz#      ST 5.0s#



CF: 5.789462737GHz

Span: 15.00kHz

### Peak Power Spectral Density

#### UNIDEN - Base Unit

Channel: 18

Transmitting Frequency: 5788.880 MHz

Resolution Bandwidth: 3.0 kHz

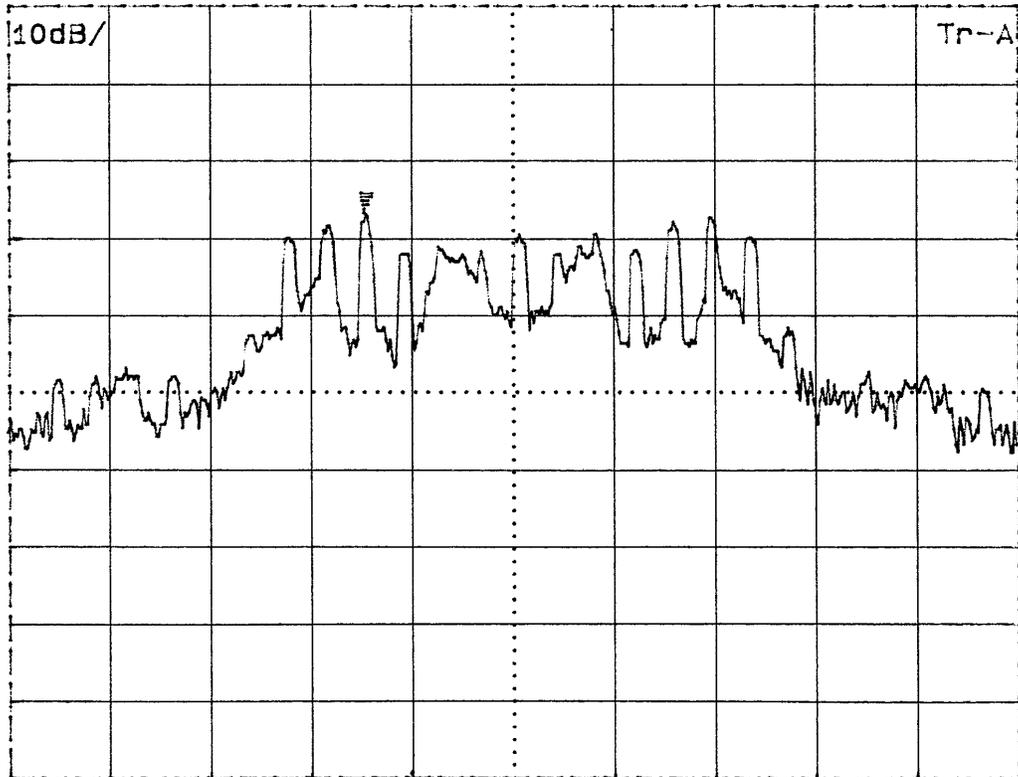
Video Bandwidth: 30.0 kHz

Span: 15.0 kHz

Sweep Time: 5 seconds

Graph 3a

ChPwr: -17.29 dBm      UNIDEN-Base      Ch35  
-82.06 dBm/Hz      RB 3kHz#      AT 10dB      Band auto  
RLV: -10.00dBm      VB 30kHz#      ST 1000s#



CF: 5.834750GHz

Span: 3.00MHz

### Peak Power Spectral Density

#### UNIDEN - Base Unit

Channel: 35

Transmitting Frequency: 5834.780 MHz

Resolution Bandwidth: 3.0 kHz

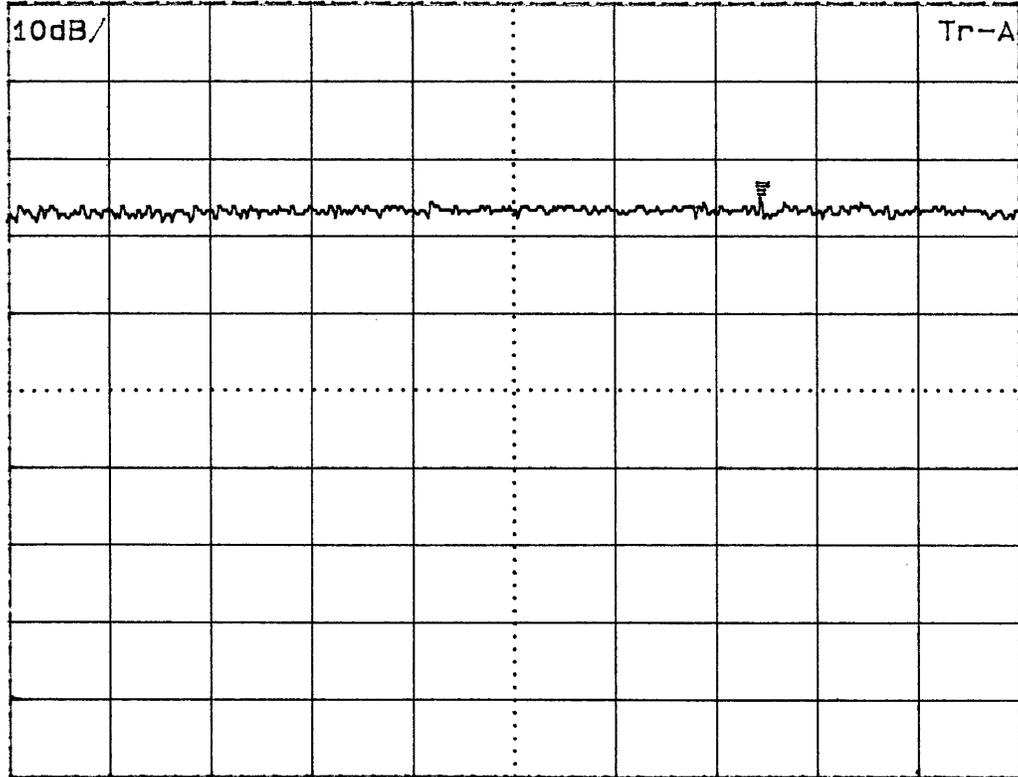
Video Bandwidth: 30.0 kHz

Span: 3.0 MHz

Sweep Time: 1000 seconds

**Graph 3b**

ChPwr: -45.34 dBm      UNIDEN-Base      Ch35  
-82.33 dBm/Hz      RB 3kHz#      AT 10dB      Band auto  
RLV: -20.00dBm      VB 30kHz#      ST 5.0s#



CF: 5.835249218GHz

Span: 15.00kHz

**Peak Power Spectral Density**

**UNIDEN – Base Unit**

Channel: 35

Transmitting Frequency: 5834.780 MHz

Resolution Bandwidth: 3.0 kHz

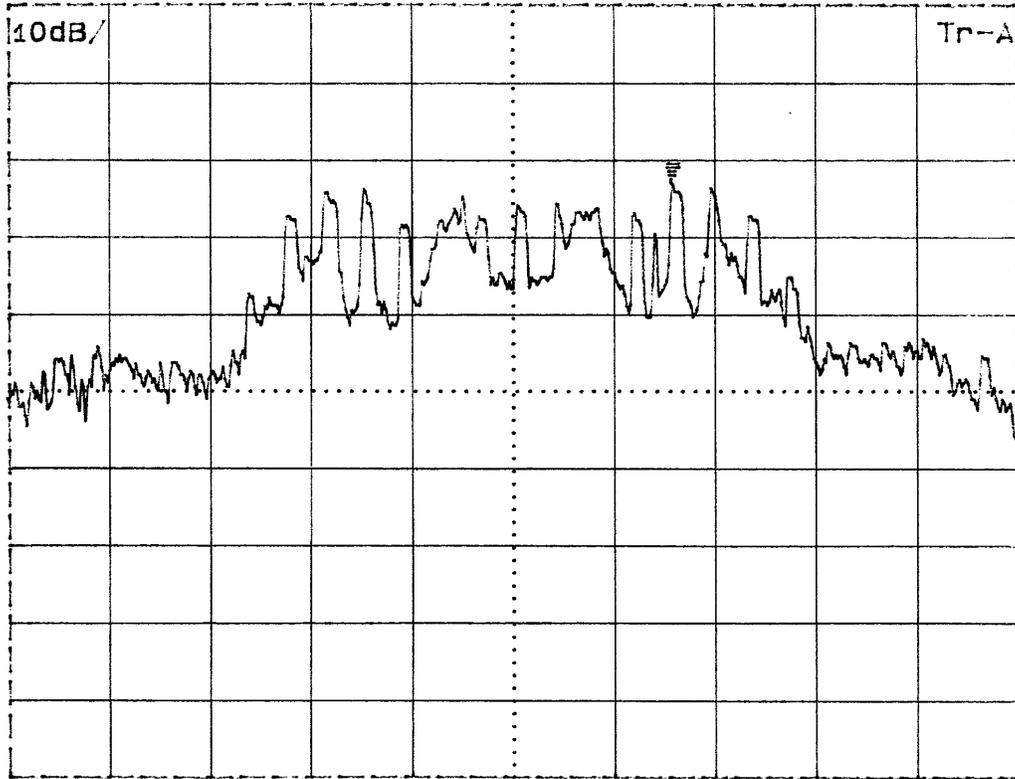
Video Bandwidth: 30.0 kHz

Span: 15.0 kHz

Sweep Time: 5 seconds

**Graph 4a**

ChPwr: -13.44 dBm      UNIDEN-Handset Ch01  
-78.21 dBm/Hz      RB 3kHz#    AT 10dB    Band auto  
RLV: -10.00dBm      VB 30kHz#    ST 1000s#



CF: 5.742980GHz

Span: 3.00MHz

### Peak Power Spectral Density

#### UNIDEN – Handset

Channel: 01

Transmitting Frequency: 5742.980 MHz

Resolution Bandwidth: 3.0 kHz

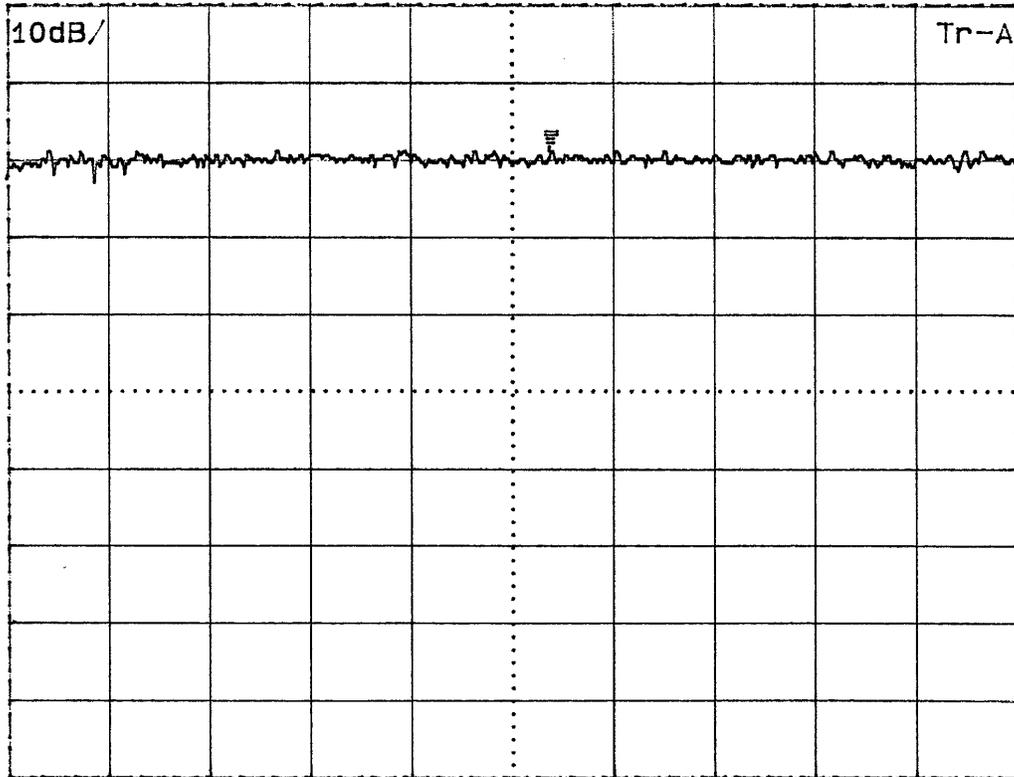
Video Bandwidth: 30.0 kHz

Span: 3.0 MHz

Sweep Time: 1000 seconds

**Graph 4b**

ChPwr: -38.56 dBm      UNIDEN-Handset Ch01  
-75.55 dBm/Hz      RB 3kHz#    AT 10dB    Band auto  
RLV: -20.00dBm      VB 30kHz#    ST 5.0s#



CF: 5.743447818GHz

Span: 15.00kHz

**Peak Power Spectral Density**

**UNIDEN – Handset**

Channel: 01

Transmitting Frequency: 5742.980 MHz

Resolution Bandwidth: 3.0 kHz

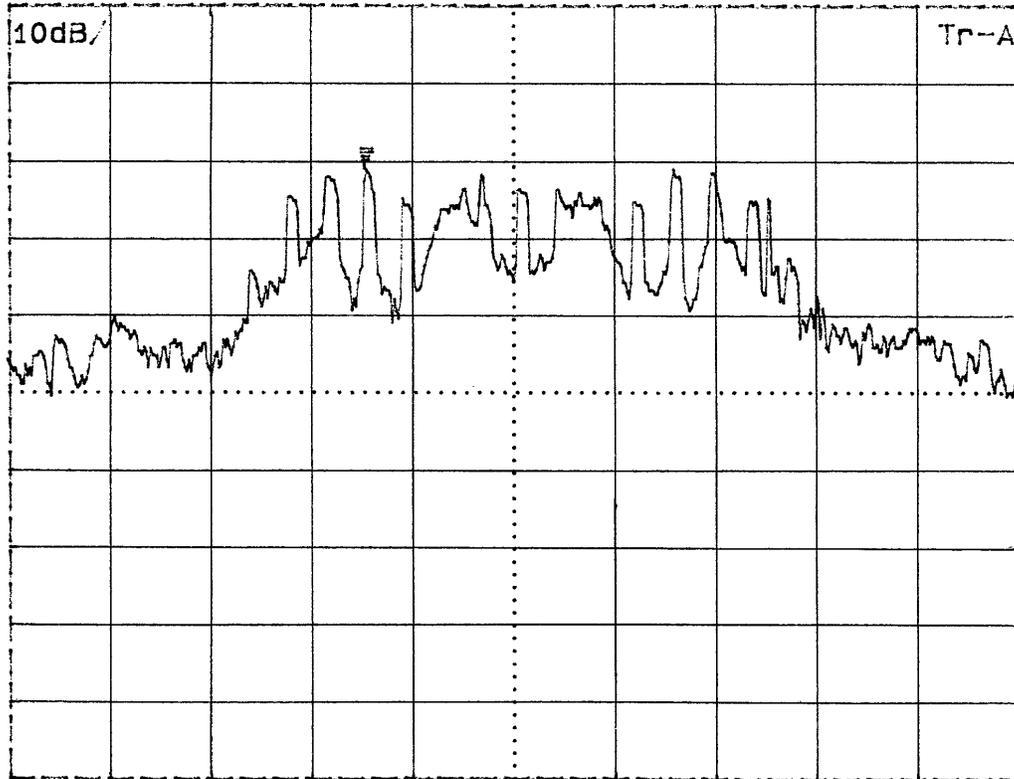
Video Bandwidth: 30.0 kHz

Span: 15.0 kHz

Sweep Time: 5 seconds

**Graph 5a**

ChPwr: -10.98 dBm      UNIDEN-Handset Ch18  
-75.75 dBm/Hz      RB 3kHz#    AT 10dB    Band auto  
RLV: -10.00dBm      VB 30kHz#    ST 1000s#



CF: 5.788880GHz

Span: 3.00MHz

### Peak Power Spectral Density

#### UNIDEN - Handset

Channel: 18

Transmitting Frequency: 5788.880 MHz

Resolution Bandwidth: 3.0 kHz

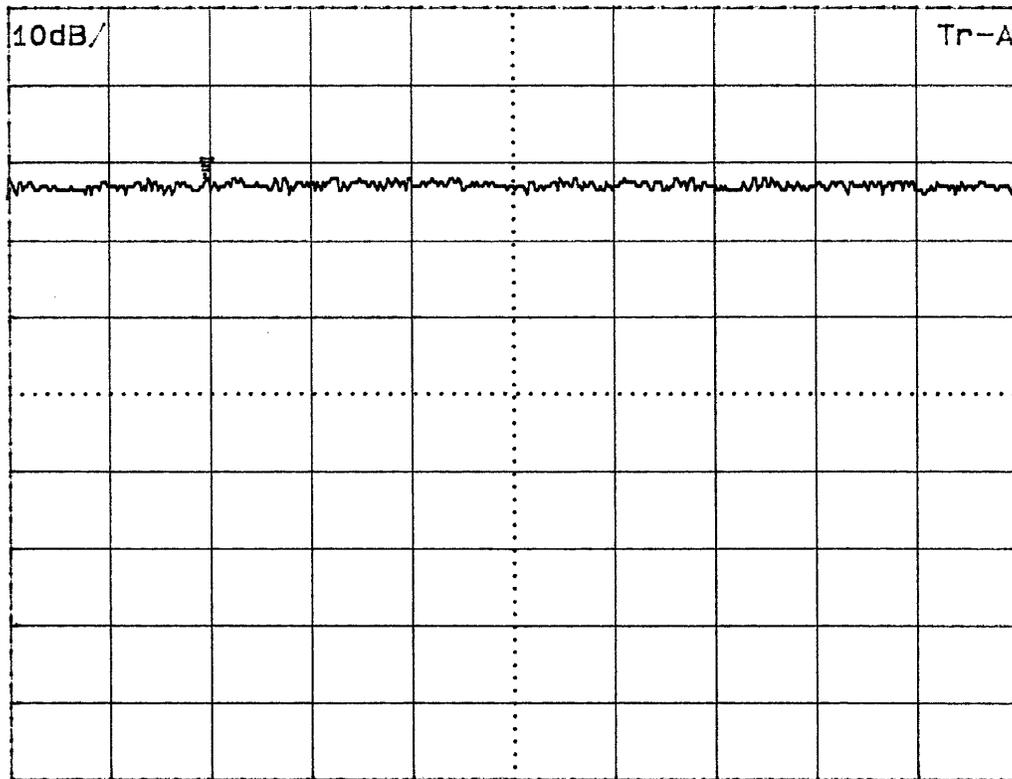
Video Bandwidth: 30.0 kHz

Span: 3.0 MHz

Sweep Time: 1000 seconds

**Graph 5b**

ChPwr: -41.56 dBm      UNIDEN-Handset Ch18  
-78.55 dBm/Hz      RB 3kHz#    AT 10dB    Band auto  
RLV: -20.00dBm      VB 30kHz#    ST 5.0s#



CF: 5.789350218GHz

Span: 15.00kHz

### Peak Power Spectral Density

#### UNIDEN – Handset

Channel: 18

Transmitting Frequency: 5788.880 MHz

Resolution Bandwidth: 3.0 kHz

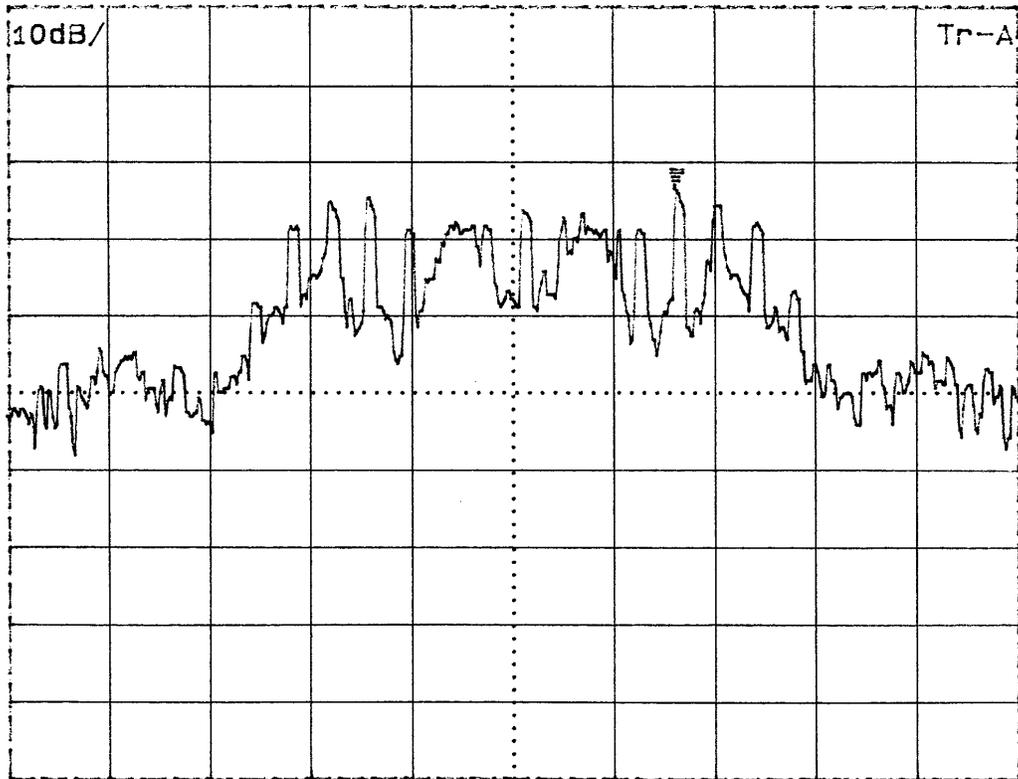
Video Bandwidth: 30.0 kHz

Span: 15.0 kHz

Sweep Time: 5 seconds

Graph 6a

ChPwr: -14.69 dBm      UNIDEN-Handset Ch35  
-79.46 dBm/Hz      RB 3kHz#    AT 10dB    Band auto  
RLV: -10.00dBm      VB 30kHz#    ST 1000s#



CF: 5.834766GHz

Span: 3.00MHz

### Peak Power Spectral Density

#### UNIDEN – Handset

Channel: 35

Transmitting Frequency: 5834.780 MHz

Resolution Bandwidth: 3.0 kHz

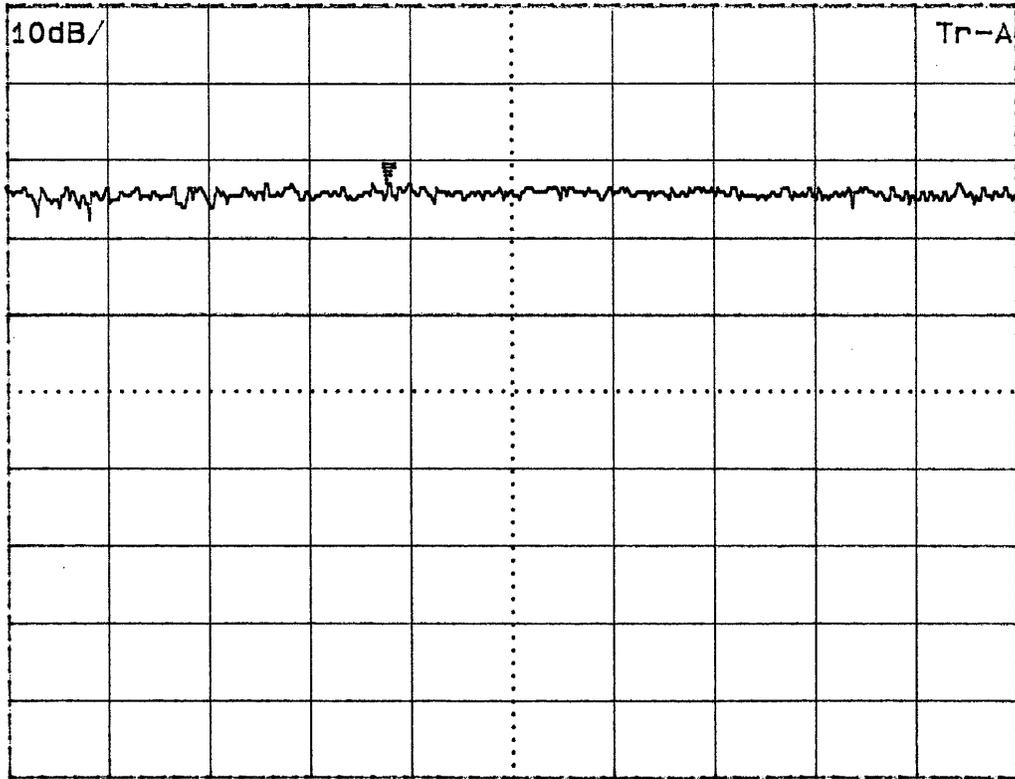
Video Bandwidth: 30.0 kHz

Span: 3.0 MHz

Sweep Time: 1000 seconds

**Graph 6b**

ChPwr: -42.92 dBm      UNIDEN-Handset Ch35  
-79.91 dBm/Hz      RB 3kHz#    AT 10dB    Band auto  
RLV: -20.00dBm      VB 30kHz#    ST 5.0s#



CF: 5.835246798GHz

Span: 15.00kHz

### Peak Power Spectral Density

#### UNIDEN – Handset

Channel: 35

Transmitting Frequency: 5834.780 MHz

Resolution Bandwidth: 3.0 kHz

Video Bandwidth: 30.0 kHz

Span: 15.0 kHz

Sweep Time: 5 seconds

***Conclusion:*** Pass.

***Block Diagram***

**Pictures of the testing set-up:**



**Uniden - Base unit  
Testing Peak Power Spectral Density - Radiated**



**Uniden - Handset  
Testing Peak Power Spectral Density - Radiated**