



## Facsimile

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Pages: 10 + Cover

Date: November 25, 1996

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**RE: Pending FCC File No. 5015-EX-PL-95 and STA**

Hello Carl -

Per our previous conversations about the above pending application and more recent request for STA, attached are revised write-ups of our materials testing operations in Tulsa. Per your request, we have included both the maximum antenna gain and a description of shielding for each test set up. In addition, we have included diagrams of each test set up.

Carl, I would be grateful if you could look over these revisions and give me your opinion on how to proceed before I officially submit revisions. Per our last conversation about this application, I plan to break up the tests into several separate applications instead of one. Please let me know how the new information on shielding and antenna gain affects chances of licensing each of the tests.

Please note that similar operations took place under the STA and expired licenses KA2XKC and KM2XPB. As we will state in each application, we are not aware of any interference complaints resulting from these operations.

Thank you,

Brett Wilson

## REFLECTION TEST - TUNNEL

**Purpose:** This measurement system is used in production to quantify material properties by measuring reflectivity of RF.

**Equipment:** This system incorporates a Hewlett Packard 8763C signal source attached through a waveguide network to a standard gain horn transmit/receive antenna. The aperture of the antenna extends through a hole into an absorber lined cavity where the sample is positioned for testing. This test system is housed in a metal building.

**Frequency:** Operation using certain frequencies from 9.0 to 18.0 GHz is requested for this experiment. The specific frequencies used in testing are classified.

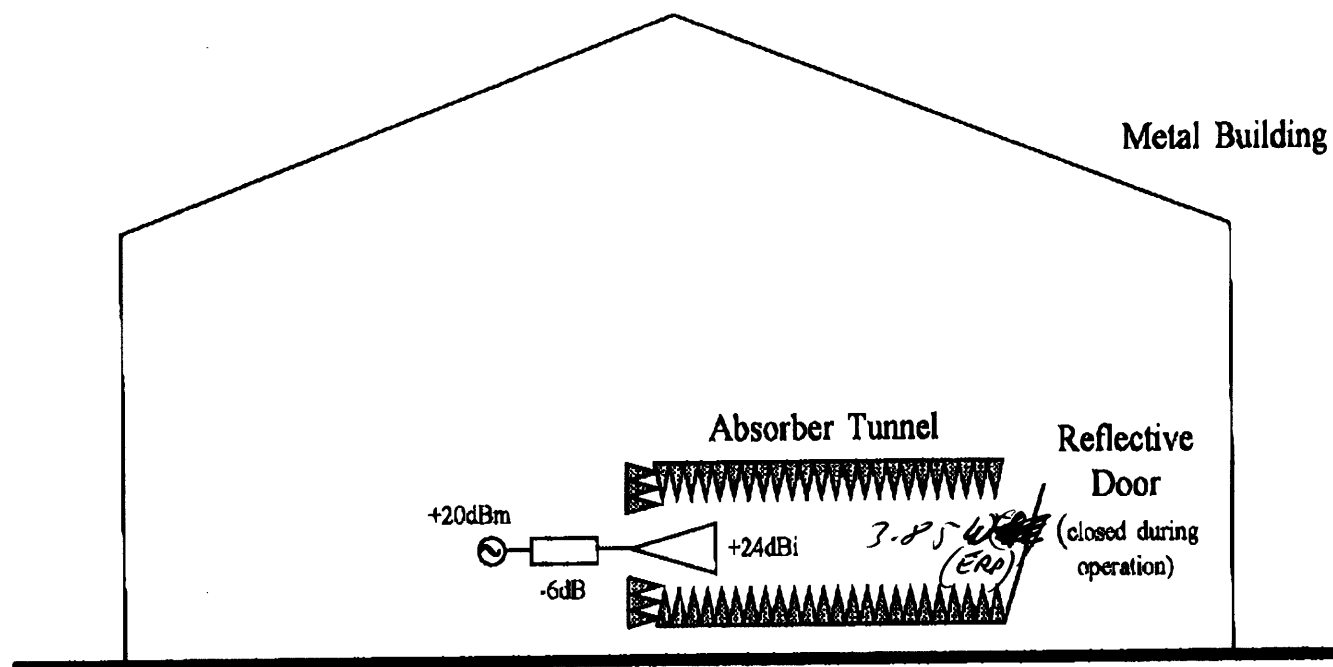
**Power:** Operations with a +20 dBm source is requested for this experiment. The waveguide network prior to the antenna reduces the transmitted power by 6 dB or more. The horn antenna has a maximum gain of +24 dBi at 18 GHz.

**Emissions:** Emissions will be unmodulated, continuous wave with a bandwidth of + or - 400 Hz.

**Shielding:** The horn antenna transmits through a five foot long absorber lined tunnel into a reflective termination, except during sample loading when operating procedure calls for disabling the transmitter. Radiation from this test system must escape a metal shell building with few windows or doors, all more than 25 feet from the test system. See the *Reflection Test - Tunnel* illustration for pictorial view.

20  
-6  
14  
+24  
38 dBm (2)  
63 W (2)  
3185 W (1)

# Reflection Test - Tunnel



9-18G143

## PARALLEL PLATE

**Purpose:** This device is a reflectivity measurement system which is used to measure material properties as well as absorption performance and two dimensional radar cross section.

**Equipment:** This test system utilizes a Hewlett Packard 8510C network analyzer configuration with RF coupled into a parallel plate transmission line test fixture. Test samples are positioned between the plates for measurement evaluation. Approximately 70 percent of the plates external edges are terminated using resistive materials, thereby attenuating emissions. Normal lab operation of the HP8510C utilizes the single sweep mode where the frequency range of interest is stepped, the data is collected and the source is put on hold. In the hold mode, no power is emitted. A typical acquisition or sweep time is approximately 40 seconds or less during which the frequency is continuously stepped.

**Frequency:** Operation from 0.5 to 6.0 GHz, typically in 6.25 MHz steps, is requested for this experiment.

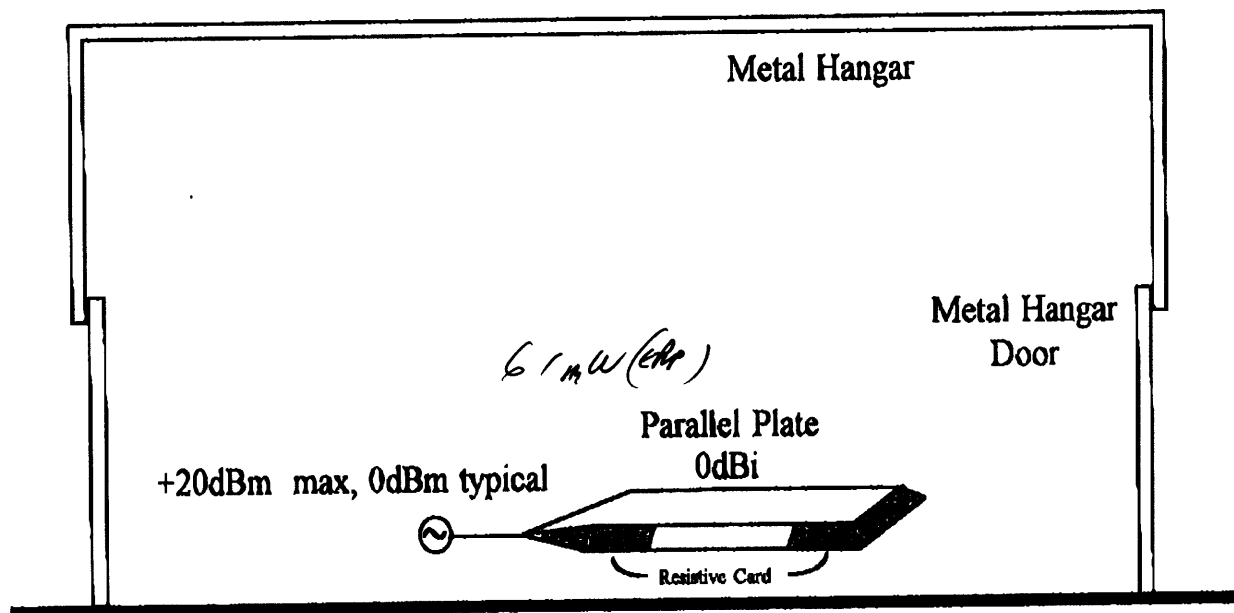
**Power:** Operation with a +20 dBm source is requested for this experiment. Typical operation utilizes the source power setting at 0 dBm. The parallel plate test system produces less than 0 dBi gain.

100 mW (ERP)  
61 mW (ERP)

**Emissions:** No information will be transmitted.

**Shielding:** The radiation from the edges is unfocused and diffuse, with a gain of less than 0 dBi. The system is located inside 8' high sheetrock walls and a metal hangar building. The metal hangar doors are rarely open. See the *Parallel Plate* figure for pictorial view.

## Parallel Plate



0.5 - 6 GHz

## COMPACT RANGE

**Purpose:** This test facility is used to measure radar cross section as well as antenna patterns.

**Equipment:** This test system utilizes an instrumentation radar attached to a single transmit/receive antenna which illuminates a collimating reflector. This equipment generates a high quality RF test environment inside an absorber lined metal chamber.

**Frequency:** Operation from 0.4 to 18.0 GHz, typically in 10 MHz steps between .4 and 2 GHz and in 20 MHz steps between 2 and 18 GHz, is requested for this experiment. In order to maintain a steady state, the system transmits at on single frequency between 1.2 and 1.6 GHz or 10.0 and 13.0 GHz during sample loading (when the chamber doors are briefly open).

**Power:** Operation with a +27 dBm source is requested for this experiment. Average power into the antenna on any given frequency is approximately +20 dBm because of the duty cycle of the pulsed emissions. The transmit/receive antenna has a maximum gain of +12 dBi at 18.0 GHz.

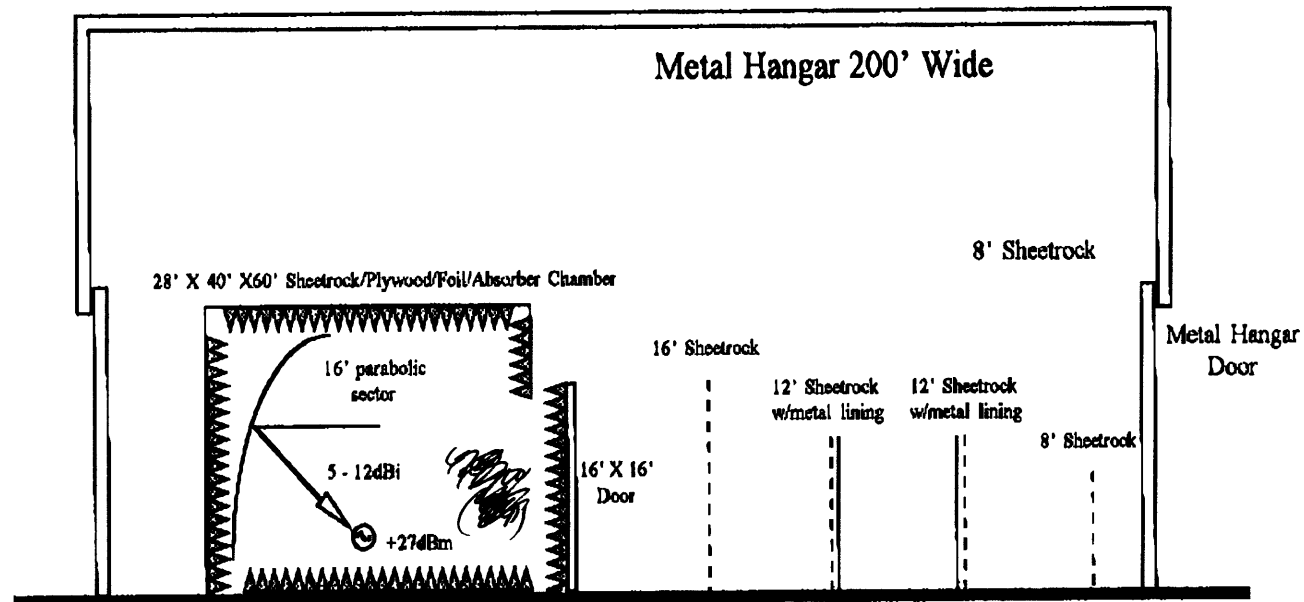
**Emissions:** Emissions will be pulsed. No information will be transmitted.

**Shielding:** The antenna (with 5 to 12 dBi gain) illuminates a parabolic sector reflector. The collimated rays are normally shielded from the exterior by a metallic absorber covered door, a sheetrock wall, 2 additional 12' metal lined sheetrock walls, an 8' sheetrock wall and a metal hangar shell. See *Compact Range* figure for pictorial view.

$$\begin{aligned}
 & 20 + 12 = 32 \text{ dBi} \\
 & 316 \text{ mW (ERP)} \\
 & 193 \text{ mW (ERP)}
 \end{aligned}$$

$$\begin{aligned}
 & 100 \text{ mW} \\
 & (20 + 12) = 32 \text{ dBi} \\
 & 316 \text{ mW (ERP)} \\
 & 193 \text{ mW (ERP)}
 \end{aligned}$$

# Compact Range



193mW - 970mW (EM)

0.4 - 18GHz

**REFLECTION/TRANSMISSION TABLE (B004 and B064)**

**Purpose:** This test set is used to extract complex RF material properties derived from reflectivity and transmissivity characteristics.

**Equipment:** This test system utilizes a Hewlett Packard 8510C network analyzer system coupled to two antennas, one which transmits RF and one which receives RF. This system is housed inside a metal building. Normal lab operation of the HP8510C utilizes the single sweep mode where the frequency range of interest is stepped, the data is collected and the source is put on hold. In the hold mode, no power is emitted. A typical acquisition or sweep time is approximately 40 seconds or less during which the frequency is continuously being stepped.

**Frequency:** Operation from 2.0 to 18.0 GHz, typically in 20 MHz steps, is requested for this experiment.

**Power:** Operation with a +20 dBm source is requested for the experiment. Typical operation utilizes the source power setting at 0 dBm for the reflection table in B004 and +10 dBm for the transmission table in B064. The maximum gain for both transmit antennas is +18 dBi at 18.0 GHz.

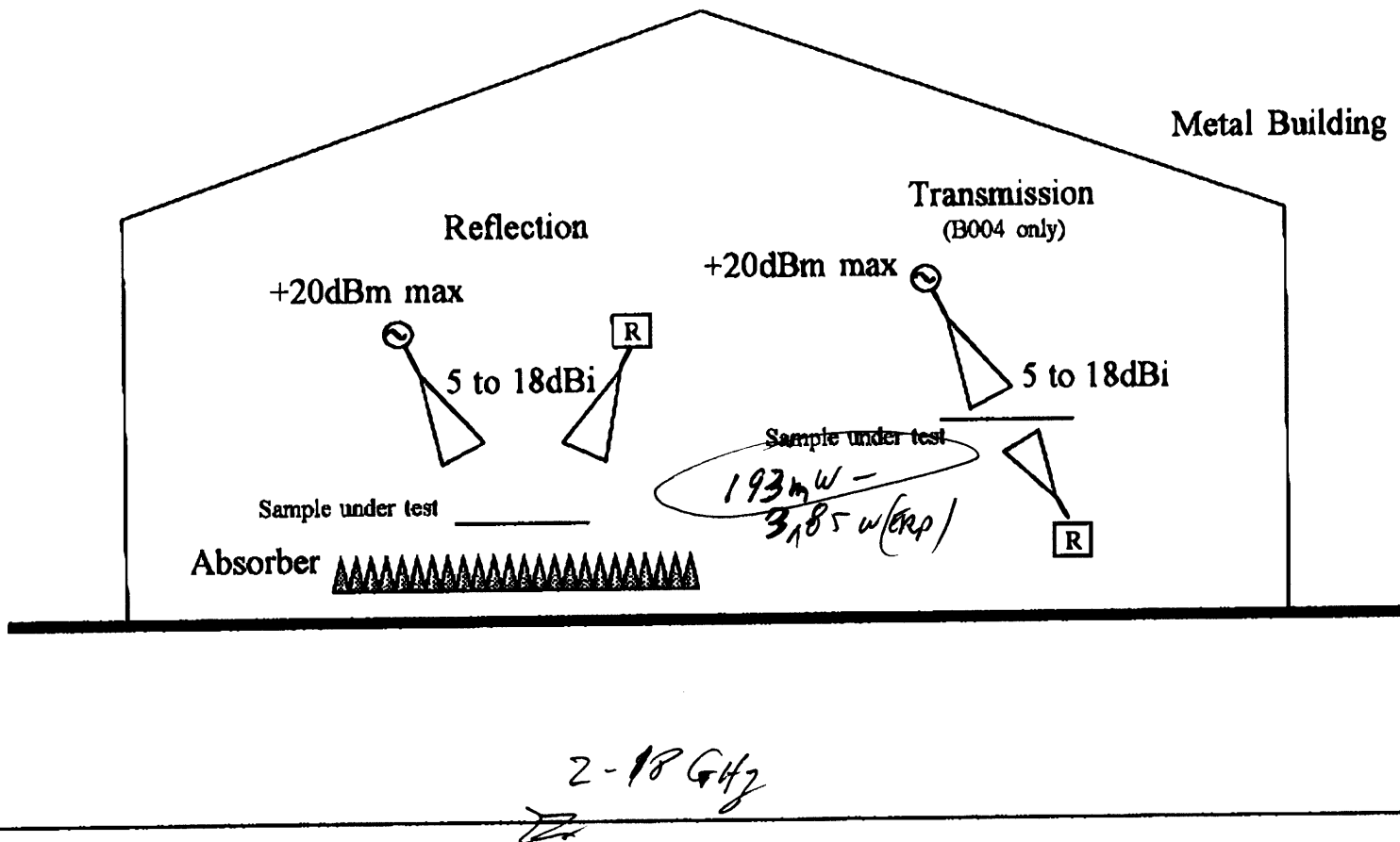
**Emissions:** No information will be transmitted.

**Shielding:** This system operates inside a metal building (B064) and a metal hanger (B004). For the reflection system, the transmitting antenna (+5 to +18 dBi) is pointed into a 12 inch square sample in an absorber covered area providing reduced upper hemispherical emissions. See Reflection/Transmission Table figure for pictorial view. For the transmission table (B004), the transmit antenna is pointed down into a 12 inch diameter sample and some energy is transmitted through the sample and measured while the remaining energy is reflected up into the building.

*Handwritten notes:*  
25 dBm (0 dBm) 30 dBm  
316 mW (10 dBm) 3.16 mW (0 dBm)  
193 mW (0 dBm) 3.16 mW (0 dBm)  
C. 18.0 GHz



# Reflection/Transmission Table



**TRANSMISSIVITY TEST SET (B064-Cp room, lines 1 and 2)**

**Purpose:** This test set is utilized to indicate RF insertion loss for absorber development and production processes.

**Equipment:** These test sets utilize M/A Com GaAs products (MA86626) Gunn diode sources coupled to a transmit antennas. Antennas are in close proximity for measuring the transmission characteristics of the material.

**Frequency:** Operation at 9.4 GHz is requested for this experiment.

**Power:** Operation with a +15 dBm source is requested for the experiment. The transmit antennas have a maximum gain of +12 dBi.

**Emissions:** Emissions will be unmodulated.

**Shielding:** These systems operate inside a metal building with few doors and windows. The transmitting antenna is pointed down into a receiving antenna, reducing the upper hemisphere emissions. See Transmissivity Test Set figure for a pictorial view.

27 dBm i  
500mW i  
305mW (one)

# Transmissivity Test Set

