BROADCAST MICROWAVE SERVICES, INC.

6GHz / 4W Power Amplifier

User Manual

(BPA-5CC-9)

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BMS BROADCAST MICROWAVE SERVICES, INC.

WARNING!
RF RADIATION EXPOSURE HAZARD

This warning is provided by Broadcast Microwave Services (BMS) Inc. for safety purpose. The following information help to reduce the risk of RF exposure hazard.

FCC Limit of RF Exposure

According to Federal Communication Commission (FCC), the Maximum Permissible Exposure (MPE) for FR radiation has been set to 1.0 mW/cm^2 for the 6 GHz Power Amplifier with maximum 4 Watt output power (OET Bulletin 65).

The 6 GHz Power Amplifier (PA) may ba a part of a non-broadcast transmitter and without an antenna it will not create RF exposure (power density) exceeding the 1.0 mW/cm^2 FCC limit.

However a high-gain antenna such as a parabolic dish will greatly enhance the 6 GHz PA output power density beyond the MPE limit of 1.0 mW/cm^2.

In this situation a minimum distance from the antenna needs to be calculated in order to keep the MPE always below the safety limit. The calculation has been done for 6 GHz PA based on the formula mentioned in OET Bulletin 56.

The calculations have been done for different commonly used antenna in the BAS and Public Safety/ Law enforcement applications.

Figure 1 shows the plot of the minimum exposure distance for 5dBi, 16dBi, and 30dBi antennas. The 6 GHz PA transmits the maximum power of 4 Watt. The minimum exposure distances are found from the cross points of the exposure graphs (for various antennas) with the line of maximum permissible exposure (i.e. $1mW/cm^2$). Notice that the numbers in Figure 1 predict the worse case scenario, which is straight in front of the antenna (exposing to the antenna main-lobe). Obviously the side-lobe exposures are well below these numbers as the radiation intensity dramatically reduces on the side lobes. The antenna used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

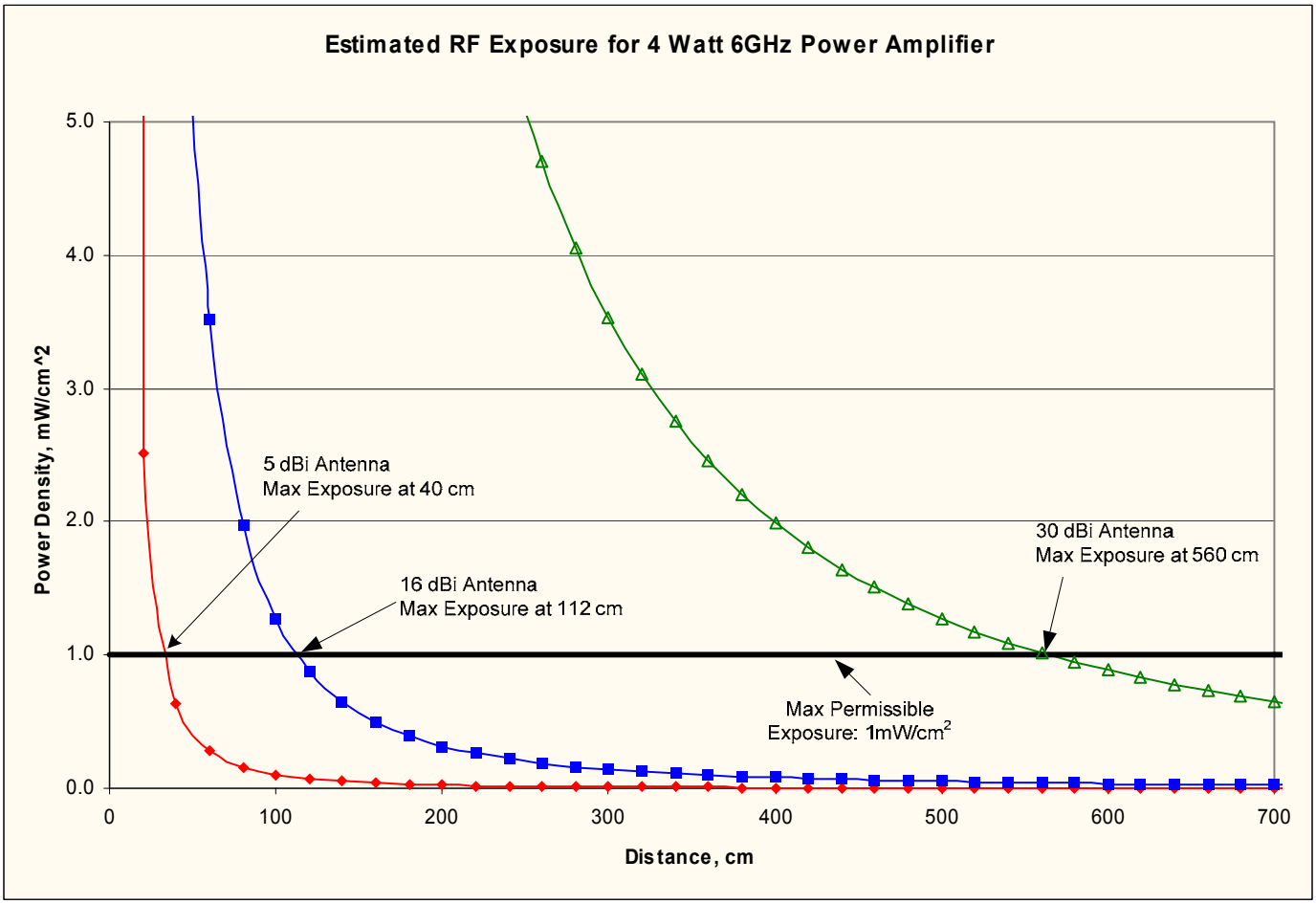

Figure 1

Summary

In order the keep the RF exposure within the FCC limit, it is necessary to maintain the safe distance from the antenna. The results shown in Figures 1 can be summarized in the following table:

Antenna Gain (dBi)	Minimum permissible distance from antenna (cm)
5	40
16	112
30	560

Notice the above table indicates worst-case situation (straight in front of the antenna).

LINEAR POWER AMPLIFIER *(BPA-5CC-9)*

BPA-5CC-9 is a linear power amplifier with 4 watt maximum RF power and operating at 6.425 – 6.525 GHz). This power amplifier is used for increasing the transmitting range by boosting the 6GHz transmitter power to maximum 4 Watts.

Application

Portable 6GHz COFDM transmitters such as 6GHz Carry-Coder II, are used behind the camera in Electronic News Gathering (ENG). These transmitters are only capable to provide a medium RF power (e.g. 250mW). This seriously limits the distance between the event site and the TV relay station. To extend the transmission range, an external amplifier is needed to boost the transmitter power in order to compensate the path loss and ensure the acceptable Received Signal Level (RSL) at the destination. The BPA-5CC-9 will increase the RF power to the maximum 4W, without adding spurious and distortions to the transmitter output. The output of the power amplifier is directly connected to the 6 GHz transmitting antenna.

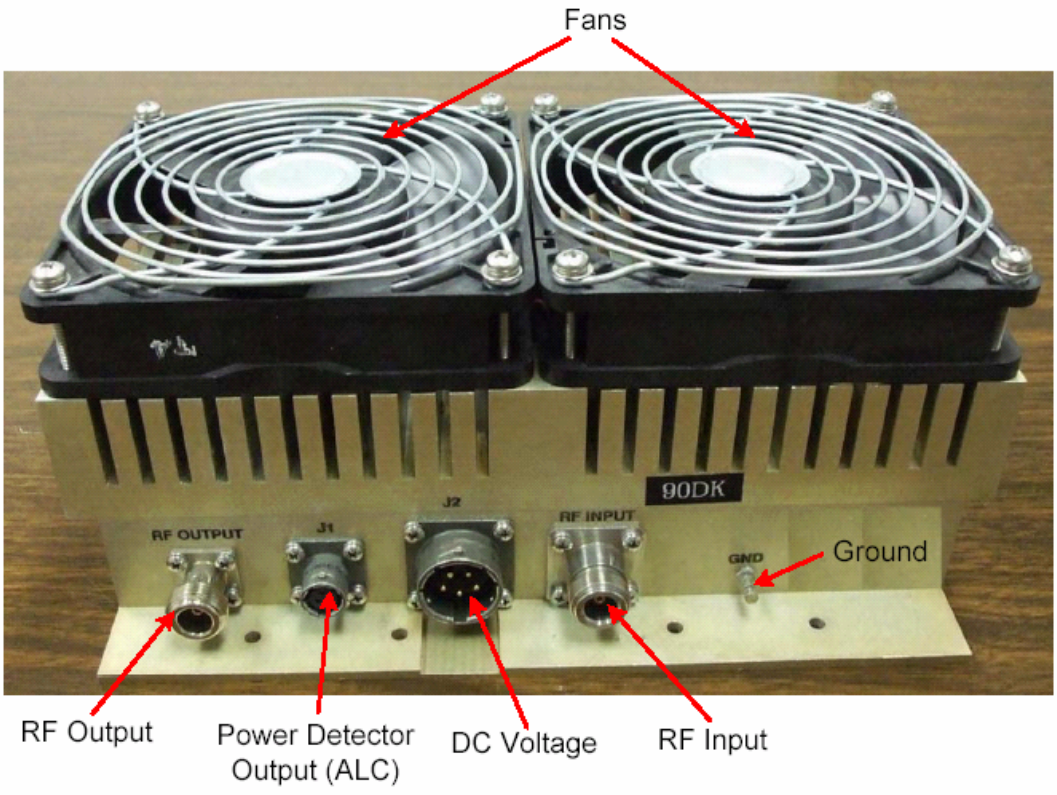

Figure 1 BPA-5CC-9 Linear Power Amplifier

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Specification:

Frequency	*6.425 – 6.525 GHz*
Output Power	*4 Watt max.*
Input Voltage	*28 VDC*
Input Current	*7.3 Amp*
Input RF Power	*16 mW (12 dBm) max.*
Gain @ 12 dBm input	*25 dB*
Gain Flatness	*± 0.5 dB Over 50 MHz*
Gain vs. Temperature	*± 1 dB Over Temperature*
Operating Temperature	*-20° to +50°C*
Storage Temperature	*40° to +90°C*
Dimensions	*9.5" x 5" x 3"*
Weight	*5 lbs*
RF Input Connector	*Type "N"*
RF Output Connector	*Type "N" Isolator Protected*

CONTACT INFORMATION

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Typical application of the 6GHz Power Amplifier is shown in Figure 2.

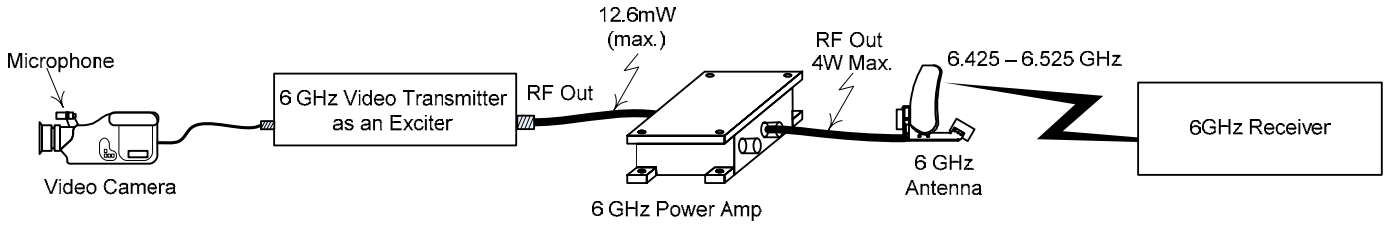

Figure 2 Typical application of the 6GHz Power Amplifier

The diagram of Figure 2 simply shows the connections, not indicating a practical installation. A more informative diagram is shown in Figure 3.

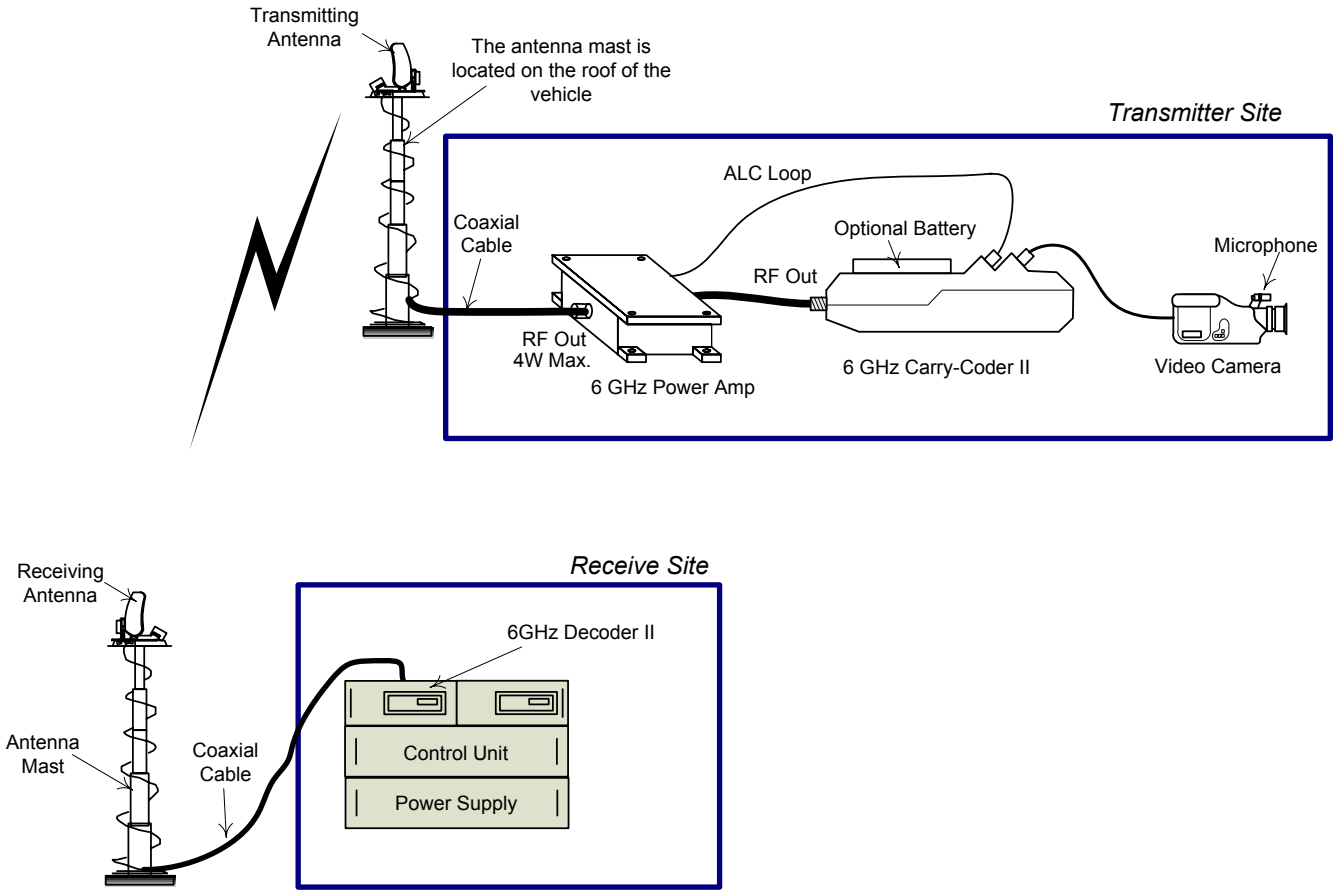

Figure 3 Typical system of 6GHz Carry-Coder II with power amplifier

The output of the 6GHz power amplifier is directed to the transmitting antenna located on a mast. The mast is positioned on the rooftop of a mobile vehicle.
The receiver antenna can also be located on a mast to result a better coverage over longer distance.