Mueller SYSTEMS

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Mueller DCOM Series
Monopole Antenna Test Report
Rev A

Revision History

Version	Date	Author	Comments
A	13 Mar 24	Ran Z	Initial draft

Introduction

The monopole antenna (Mueller PN: 145-0037-001) is designed for MINODE-WATER6 products, which operate in the 902MHz to 928MHz frequency band. The antenna is soldered to the PCBA module of the MINODE-WATER6 product.
This document provides specifications and preliminary measurements of the monopole antenna.

Mechanical Specifications

The type of connection of the monopole antenna is soldered. The antenna is made of 70/30 brass.
The dimensions are shown in Figure 1.

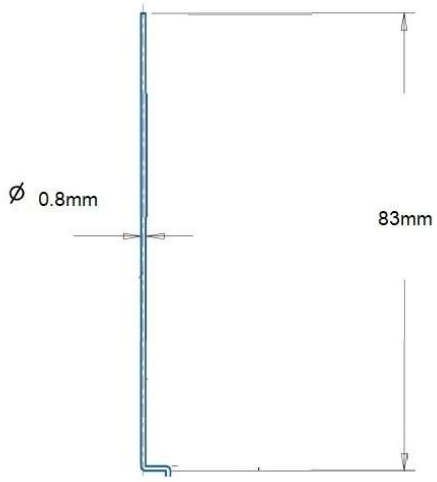

Figure 1 (a) Mechanical drawing

(b) PCBA (radio module) bottom view with antenna

Electrical Specifications

Center Frequency: 915MHz
Frequency Range: 902MHz-928MHz
Polarization: Vertical
Wavelength: ¼ wave
VSWR: <2.0
Gain: 4dBi (Preliminary)
Impedance: 50 ohms
Connection: Soldered
Operating Temperature Range: –20°C to +85°C

VSWR Graph

The VSWR measurements via Network Analyzer E5061B (Mueller ID: MY49201842) are < 2.0 in the range of 902MHz-928MHz, shown in Figure 2.

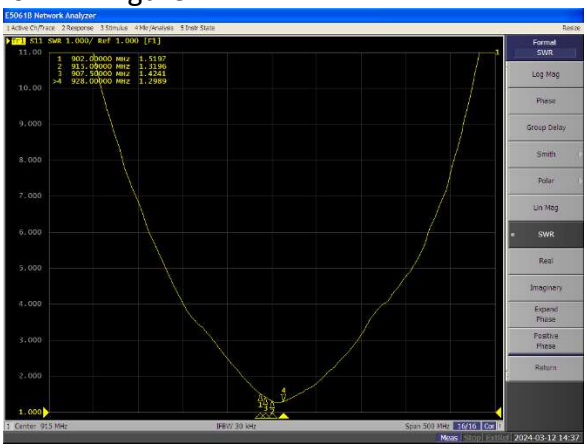

Figure 2 VSWR in the range of 902MHz-928MHz

The plot was measured with a 7.6 cm x 7.6 cm (3.00 inches x 3.00 inches) reference ground plane.

Gain Calculation

The gain G is calculated from the EIRP (Equivalent Isotropic Radiated Power) of the antenna, see Equation 1.

$$G\ (dBi) = EIRP\ (dBm) - Pt\ (dBm) + L\ (dB) \quad (1)$$

where Pt is the power transmitted from the radio module, L is the total losses (the cable losses, antenna mismatch etc.)

The EIRP is estimated from the radiated field strength measurement of the test unit in free space, see Equation 2.

$$EIRP\ (dBm) = E(dBuV/m) + 20\log(D) - 104.8 \quad (2)$$

where E is the radiated field strength, and D is the distance between the receiver antenna and the test unit, as shown in Figure 1(b).

The antenna gains at three frequencies are given in Table 1. The total loss at the connector of the antenna is assumed to be negligible, 0dB for this gain calculation.

Table 1 Calculated gain of the monopole antenna

Frequency (MHz)	Gain G (dBi)	**Maximum Pt (dBm)	Maximum EIRP (dBm)	*Maximum E (dBuV/m)
902.3	4.1	29.0	33.1	128.4
914.9	4.2	28.9	33.1	128.4
927.0	4.3	28.5	32.8	128.1

*The radiated field strength data were obtained in a third-party test lab (designation number US5301), with D = 3m. The measurement uncertainty (with a 95% confidence level) for the test using a Log Periodic Antenna (200 MHz to 1000 MHz) is ± 5.18 dB.

**The Pt data were measured with an SMA connector at the antenna port in Mueller HW lab.

The gain of the monopole antenna is typical 4dBi in the range of 902MHz-928MHz. The values in Table 1 are computed under ideal conditions, assuming free space, no connection loss, and no measurement uncertainty.

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