



Address all correspondences regarding this report to:

Timothy Milam
Custom Integrated Antennas
1322 Butcher Hollow, PO Box 116
Van Lear, KY 41265
Tel: (512) 638-2643
E-mail: an10a@cia-aa.com

Document #: CIA 2020-0017.002

Custom Integrated Antennas (CIA)

“Zygo Coach’s Unit Bluetooth Antenna Report”

02/17/2020)

(Reference “Zygo Coach’s Unit VHF Antenna Report CIA 09-
20-2022” for That Antenna Data Analysis.)

Originally Submitted to Zygo on:

February 17, 2020



Table of Contents

1	DUT Description.....	4
1.1	Zygo Coach's Unit	4
1.1.1	External View	4
1.1.2	Internal View	4
1.2	PIFA Antenna Component.....	4
2	Test Equipment Used	5
3	Key Antenna Specifications	5
4	Measured Data	6
4.1	VSWR.....	6
4.2	Principal Radiated Patterns	6
4.2.1	Vertically Polarized DUT (V-Pol).....	6
4.2.2	Horizontally Polarized DUT (H-Pol).....	7
4.3	Tabular Data Summary.....	7
5	Conclusion	7



Zygo Coach's Unit Bluetooth Antenna Analysis

Document #: CIA 2020-0017.002

Revision History

Date of Revision	Revision Comments	Pages Affected
11/07/2019	Entire Document	All
09/20/2022	Updated title with current information, added the "Key Antenna Specifications" table on page 7, added note on page 8 regarding the DUT name, added the "Peak Gain" details paragraph at the end of the "Conclusions" section on page 9. Also, the "Table of Contents" changed as a result of the additions.	1, 2, 7, 8, and 9

Zygo Coach's Unit Bluetooth Antenna Report (CIA 02/17/2020)

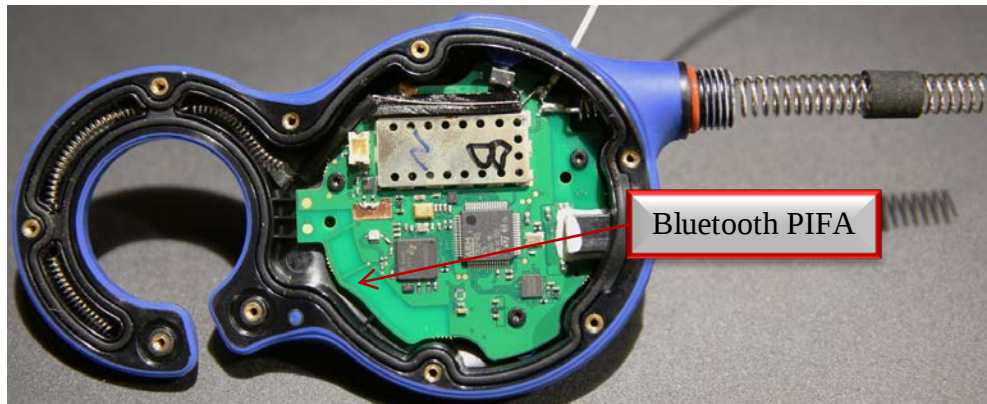
1 DUT Description

1.1 Zygo Coach's Unit

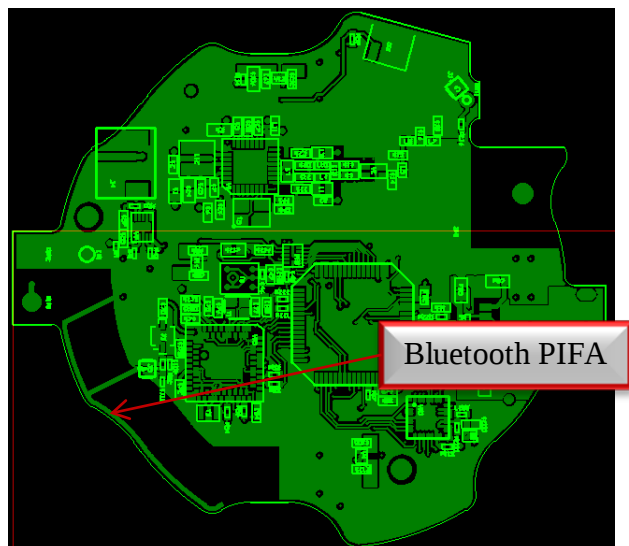
1.1.1 External View



1.1.2 Internal View



1.2 PIFA Antenna Component



2 Test Equipment Used

- Test Range = 13 ft. x 9 ft. x 9 ft. Rectangular Anechoic Chamber with Cummings Microwave C-RAM SFC-18 in. pyrimidal absorber total coverage, except for 72 inches of SFC-18 Walkway and full corner treatment with 3 in. C-RAM Cornerblock. The DUT / Test antenna seperation was 46 inches.
- Test (Site Source) Antenna = RFSpin Model QRH11, 700 MHz – 11 GHz Quadridge Horn, S/N: 200721Q11
- Vector Network Analyzer “VNA” = Pico Technology Model “PicoVNA 106 300 kHz – 6 GHz Quad RX, S/N: A0063/08671.
- TX Coaxial Cable = 20 ft. Times Microwave LMR-240 Low Loss cable with Pasternack PE44637 Crimp/Solder SMA-Male connectors on both ends.
- RX Coaxial Cable = 37 ft. Times Microwave LMR-400 Low Loss cable with Pasternack PE44668 Crimp/Solder Type N-Male connectors on both ends.
- TX Adapter = Pasternack PE91339, N-Male to SMA-Female Adapter to VNA
- RX Adapter = Pasternack PE9082 N-Female to SMA-Male Adapter to DUT
- Channel Master 360 degree programmable turntable with Styrofoam pedestal DUT mounting platform

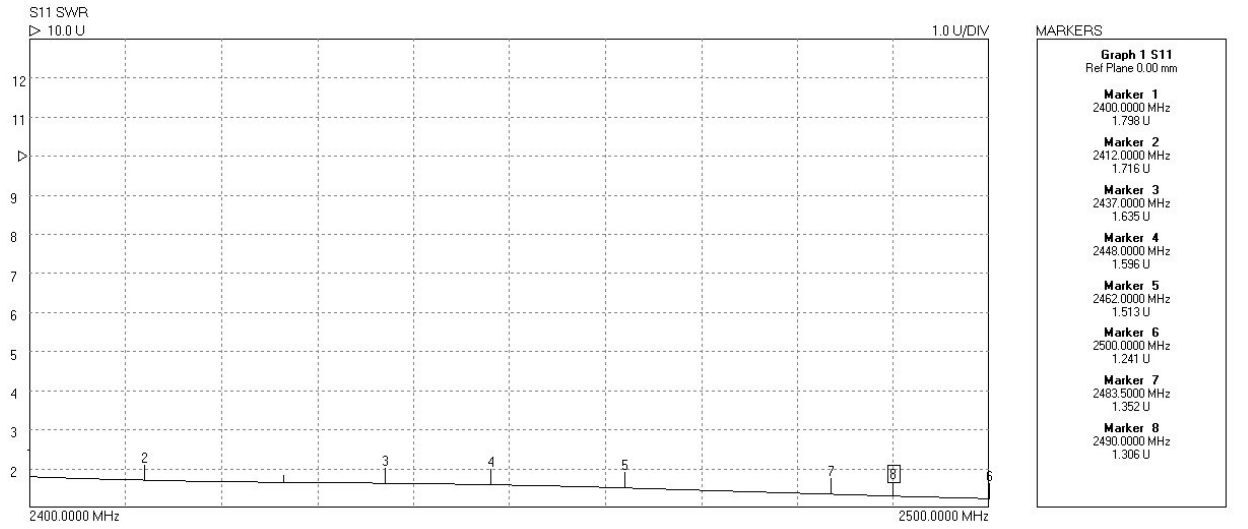
3 Key Antenna Specifications

Antenna Parameter	Values / Comments
Antenna Type	Custom PCB Trace PIFA
Frequency Band (MHz)	2400 - 2500
Nominal Impedance	50 Ω
Peak Gain (dBi) Highest gain measured of all data points	-0.52 (Found at 2448 MHz and angle 247.5 degrees in the V-Pol Azimuth plane plot below)
Efficiency (%) Average efficiency of all data points measured	24.6
Pattern Characteristics	
Overall Pattern Shape	Omni-Directional
HPBW (Half Power Beam Width) Typical	(N/A)
Front-to-back Ratio (Typical)	(N/A)
2:1 VSWR Band Width (MHz)	100+
Connection Requirement	None (PCB Trace)
Power Handling (Watts)	5
Physical Dimensions	
Length (mm)	26
Width or diameter (mm)	6
Depth or thickness (mm)	1 oz.
Material	Copper PCB trace

4 Measured Data

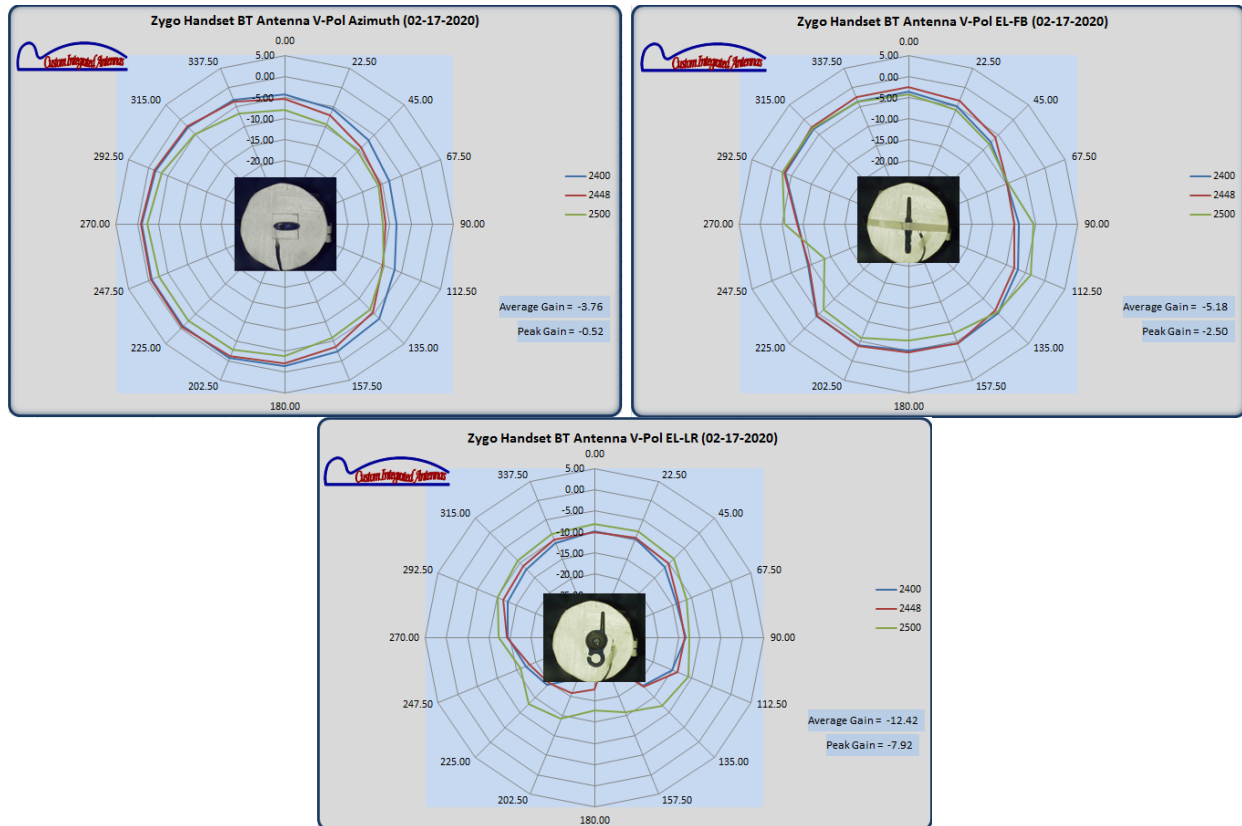
NOTE: The DUT referred to in the measured data below as "Handset" is referred to as "Coach's Unit" elsewhere in this report and other filing documents.

4.1 VSWR

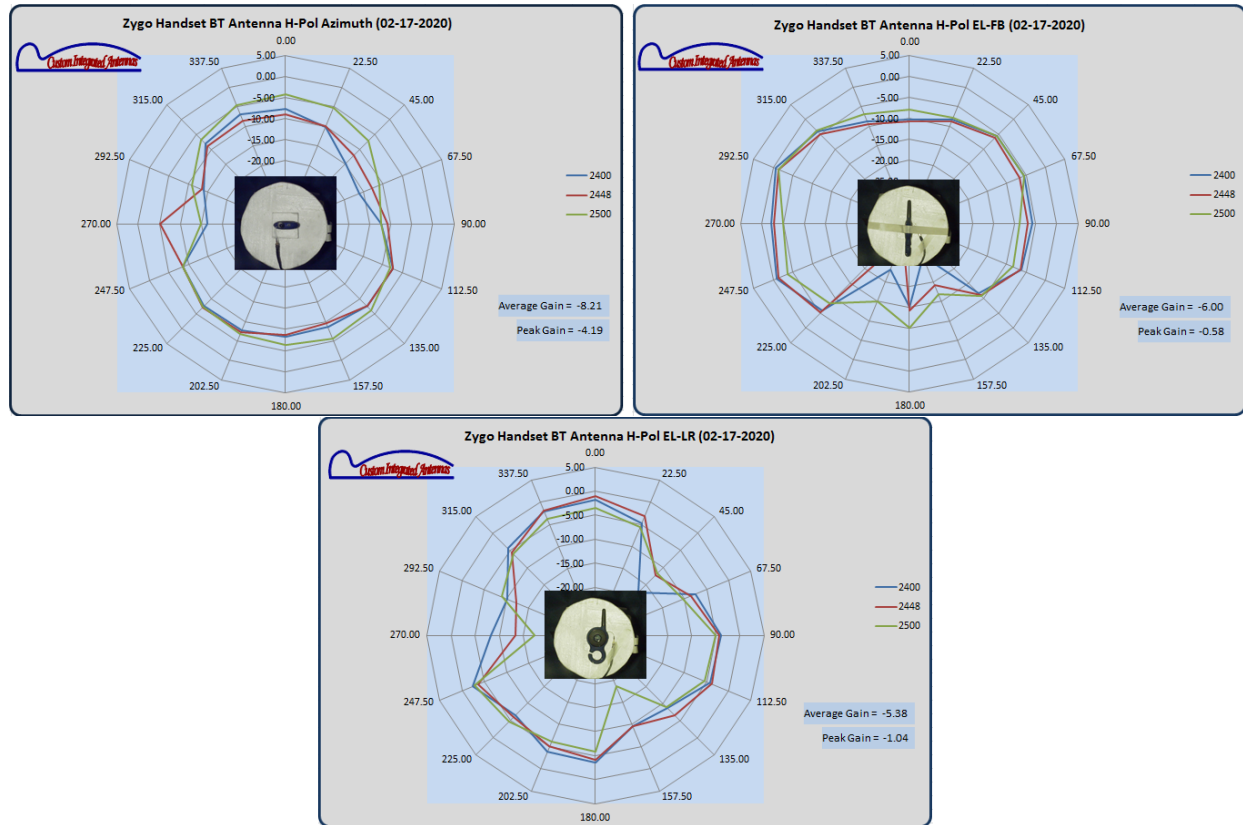


4.2 Principal Radiated Patterns

4.2.1 Vertically Polarized DUT (V-Pol)



4.2.2 Horizontally Polarized DUT (H-Pol)



4.3 Tabular Data Summary

Average Gain Comparison: All data points averaged for each frequency and all angles (dBi)				Average Gain 2.4 GHz ISM Band (dBi)	Maximum Gain (dBi)
Frequency (MHz)	2400	2448	2500	Radiation Plane Average	Maximum (dBi)
Zygo Handset BT Antenna V-Pol Azimuth (02-17-2020)	-2.93	-3.41	-5.28	-3.76	-0.52
Zygo Handset BT Antenna V-Pol EL-FB (02-17-2020)	-5.28	-4.87	-5.42	-5.18	-2.50
Zygo Handset BT Antenna V-Pol EL-LR (02-17-2020)	-13.72	-13.15	-10.93	-12.42	-7.92
Zygo Handset BT Antenna H-Pol Azimuth (02-17-2020)	-9.18	-8.66	-7.09	-8.21	-4.19
Zygo Handset BT Antenna H-Pol EL-FB (02-17-2020)	-5.51	-6.08	-6.47	-6.00	-0.58
Zygo Handset BT Antenna H-Pol EL-LR (02-17-2020)	-4.97	-5.03	-6.24	-5.38	-1.04

Red Highlighted Cell is the DUT's Peak Gain (dBi) of all data points measured.

5 Conclusion

The performance of the Bluetooth antenna was much better than the VHF antenna, due to its more conventional size and construction.

The peak gain of the Bluetooth antenna is -0.52 dBi. The peak gain value was measured at 2448 MHz at the 247.5 degree data point of the polar plot provided above, i.e., "Zygo Handset BT Antenna V-Pol Azimuth (02/17/2020).