

Technical Report # TR240813-01

Yale Tumbler 310 Antenna Gain Measurements

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Customer: Yale	Revision: 1.0
Prepared for: Yale Engineering	Prepared By: John Loudenback

Revision Tracking

Rev.	Author	Revision Description	Date
1.0	JL	Initial Draft	13 August 2024

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Yale Tumbler 310 Antenna Gain Measurements

This document details the measured antenna gain performance for the Yale Tumbler 310 antenna. Measurements were taken in CAE's Piper anechoic chamber.

Measurements of Yale Tumbler 310 -

- Total Isotropic Gain: -1.83 dBi
- **Peak Gain: 3.86 dBi**
- Antenna Efficiency: 66%

Note: Antenna gain measurements are within an error range of +/- 1 dBi.

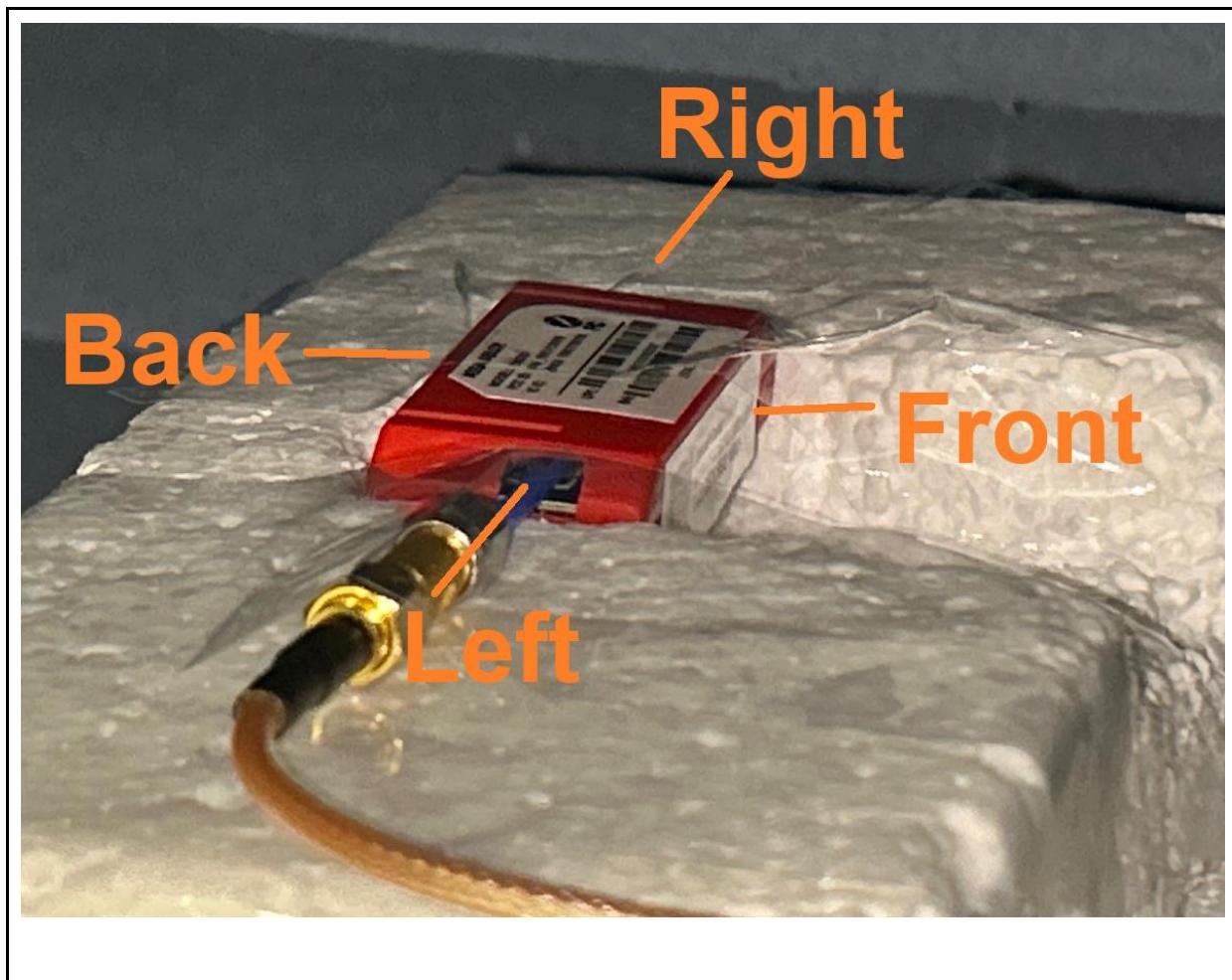
Radiation Plots

RF radiation patterns show the antenna gain (dBi) performance - at different antenna orientations in a spherical sweep. Four different orientations associated with the antenna are shown. These same orientations are shown for the RF spherical radiation patterns in the following pages. The radiation patterns include 3D plots for both horizontal and vertical polarizations of the receiving horn antenna.

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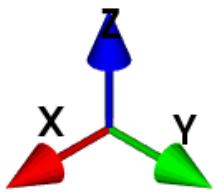
Antennas Test Orientation

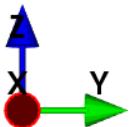
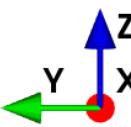
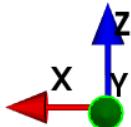
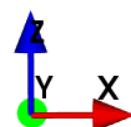
In the photo below, the orientation labels reflect the pictured Tumbler 310 antenna, as it would be positioned in a Yale Lock. Front or Back orientation labels are the front or back of the Yale Lock. Left or Right orientation labels are the left or right of the Yale Lock when looking at the front of the lock. These orientation labels correspond to the radiation patterns that follow.



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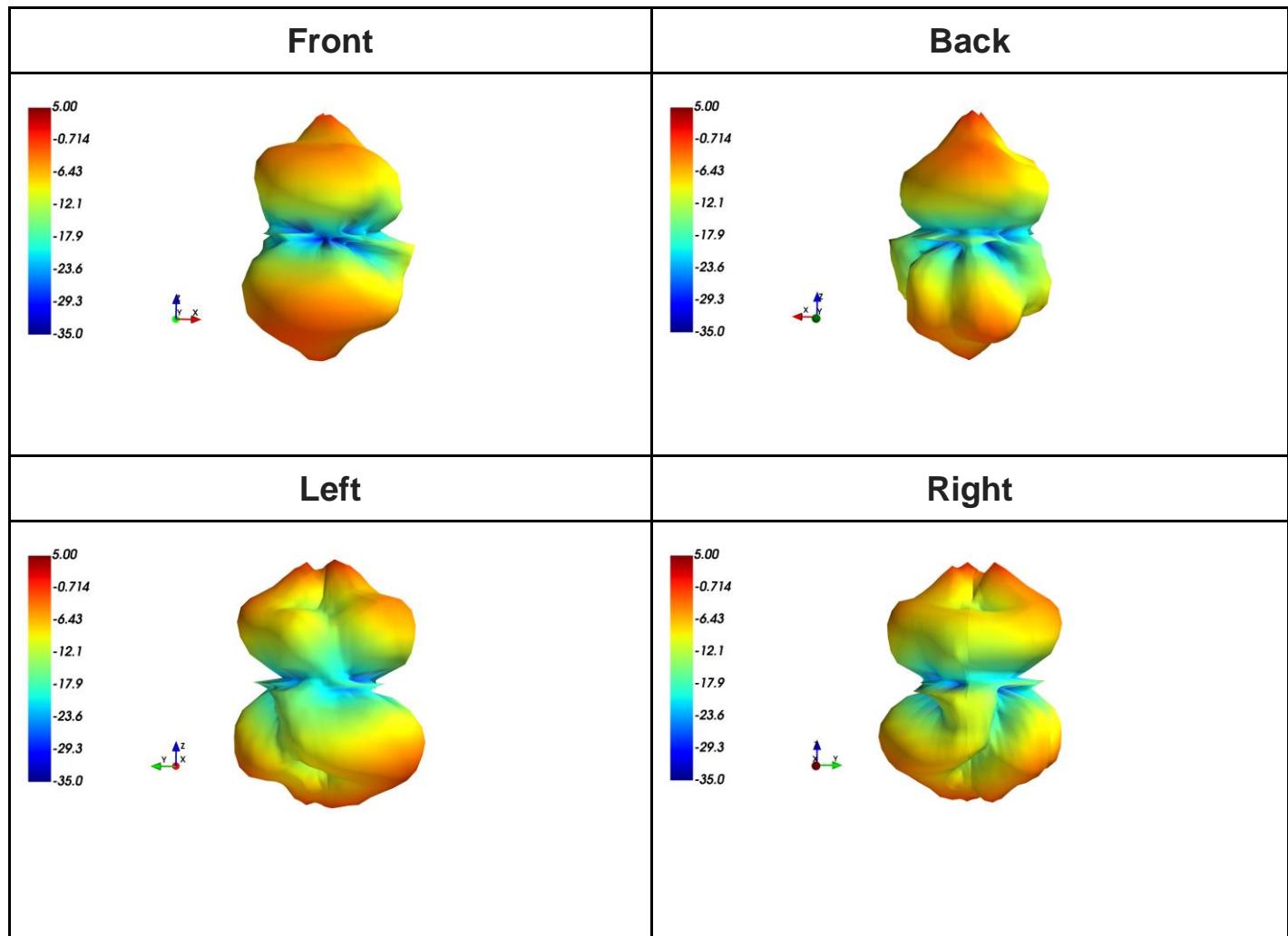
Each 3D antenna gain plot has the X, Y, Z axes showing orientation of the lock in 3D space. The radiation plots show the radiation from the X-Y axis perspectives and not the Z axis. A key showing which Axis corresponds to a specific DUT orientation is shown below. In the radiation plots a solid dot indicates that the positive axis is pointing out of the screen, otherwise it is the negative axis pointing out.



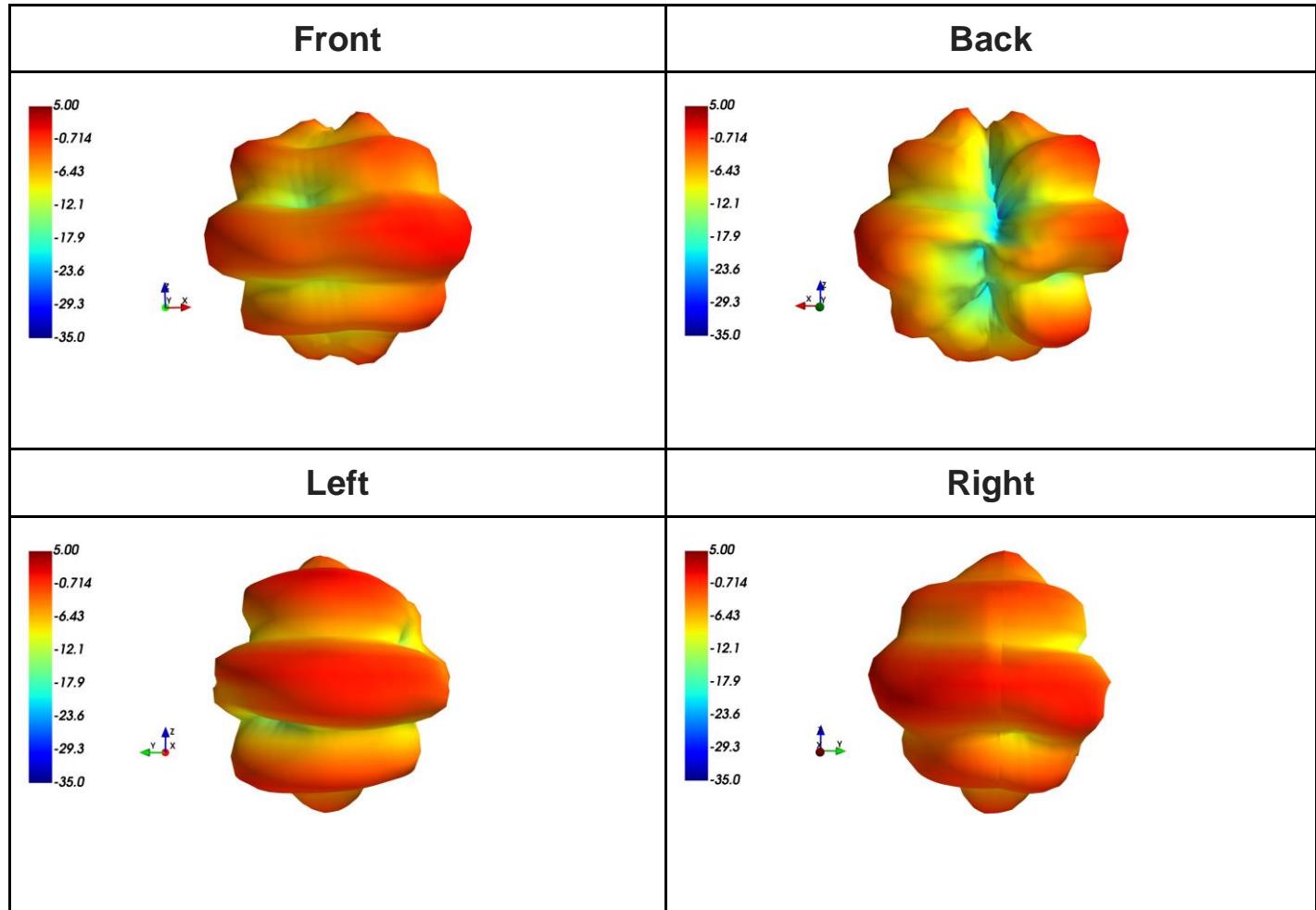
Axis:	DUT Orientation:
Positive X Axis	 Right
Negative X Axis	 Left
Positive Y Axis	 Back
Negative Y Axis	 Front

Yale Tumbler 310 Antenna Radiation Patterns

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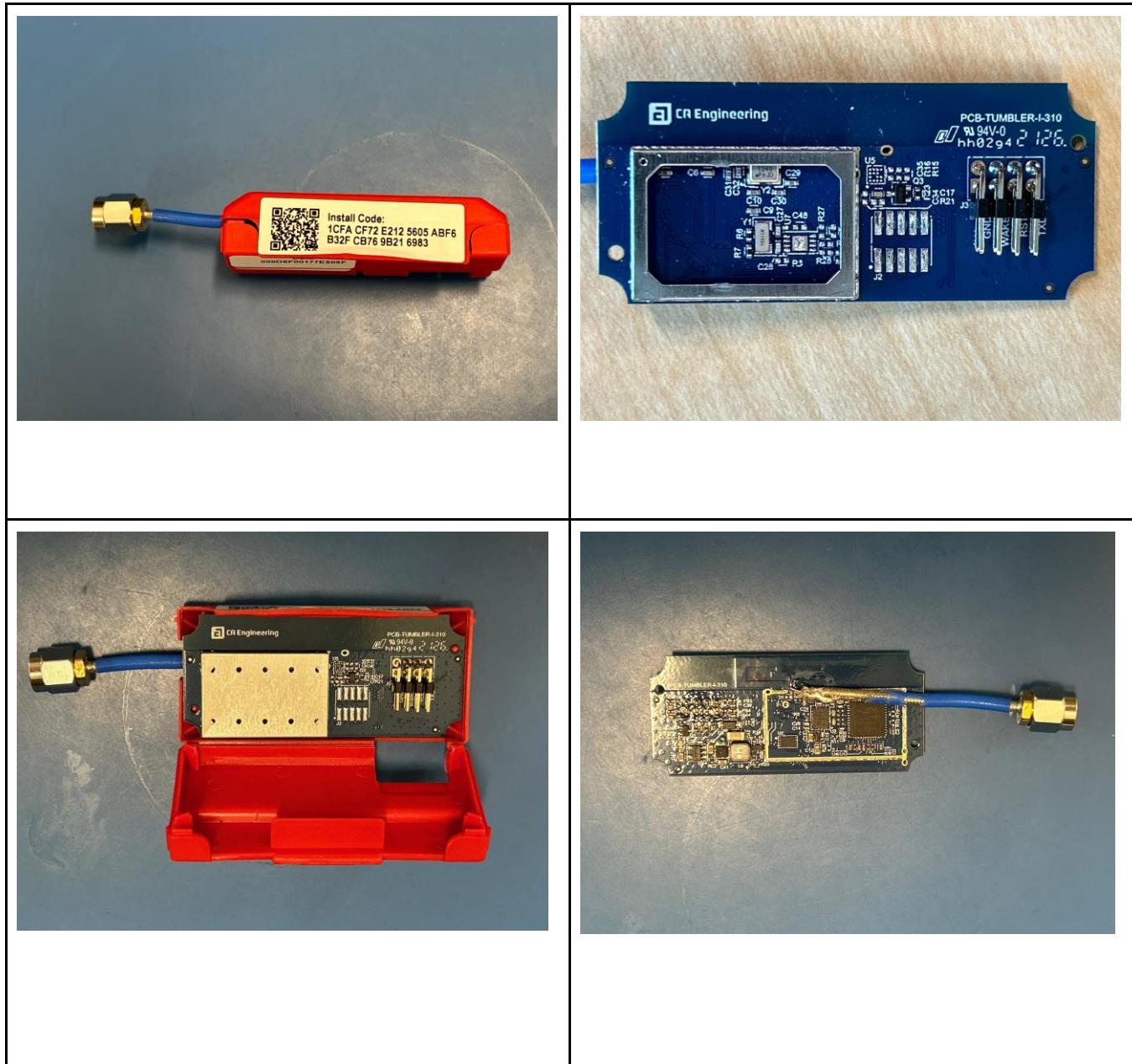
Vertical Polarization @ 2440 MHz**Horizontal Polarization @ 2440 MHz**

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Additional Product Photos



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Conclusion

The Yale Tumbler 310 antenna performed very well especially in the Horizontal orientation. While it is fairly polarized it should not be an issue in a home where there are lots of reflections. The antenna has excellent peak gain and very good antenna efficiency as well.

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