



ACCELERATING
INNOVATION

Job#1587

**Cooper Lighting Acoustic Ceiling
Sensor Board Samples with 1001013
Antenna Evaluation**
Matching Change from 2.6pF to 2.7pF

Rev. A.3 2023-12-07

San Diego Design Center



Revision History

Antenna P/N	1001013	
Revision	Date	Description of changes
Rev A.1	2023-09-21	Cooper Lighting Acoustic Ceiling Sensor Board Samples with 1001013 Ant Evaluation
Rev A.3	2023-12-07	Evaluation of 1001013 BT Ant Antenna performance with matching change from 2.6pF to 2.7pF for the Single PCB and Double stacked PCB per Cooper Lighting request

Summary

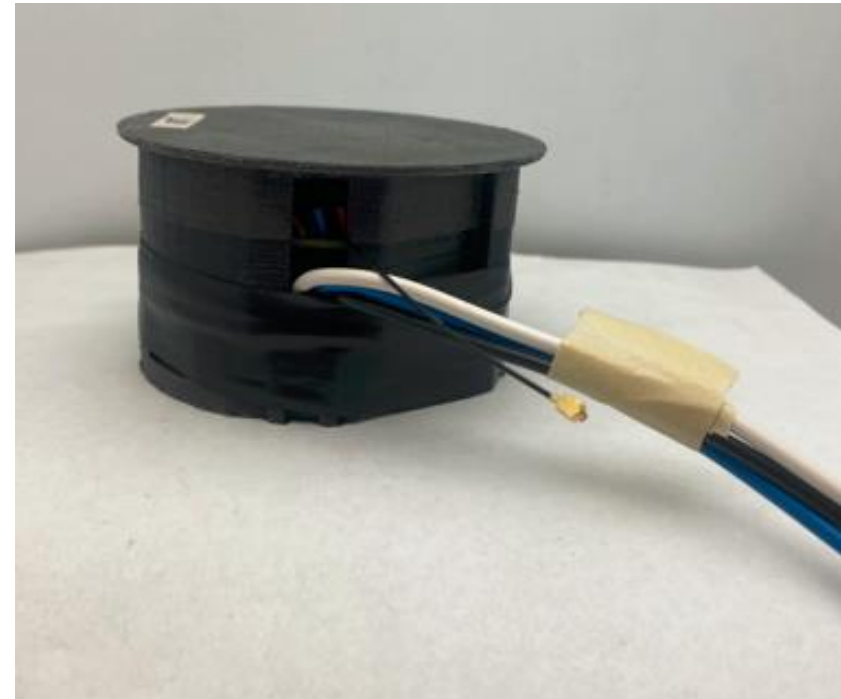
- The purpose of this report is to Evaluate 1001013 BT Antenna performance with matching change from 2.6pF to 2.7pF for the Single PCB and Double stacked PCB per Cooper Lighting's request tested inside plastic housing and long wires in Free Space.
- Data Taken
 - Return Loss
 - Efficiency
 - Peak Gain
 - Radiation Pattern

Picture New Acoustic Ceiling Sensor Samples

Sample New Single Board
inside Plastic Housing



Sample New Double Stacked Board
inside Plastic Housing



Picture New Sample Boards

Sample New Single Board

Long Wires

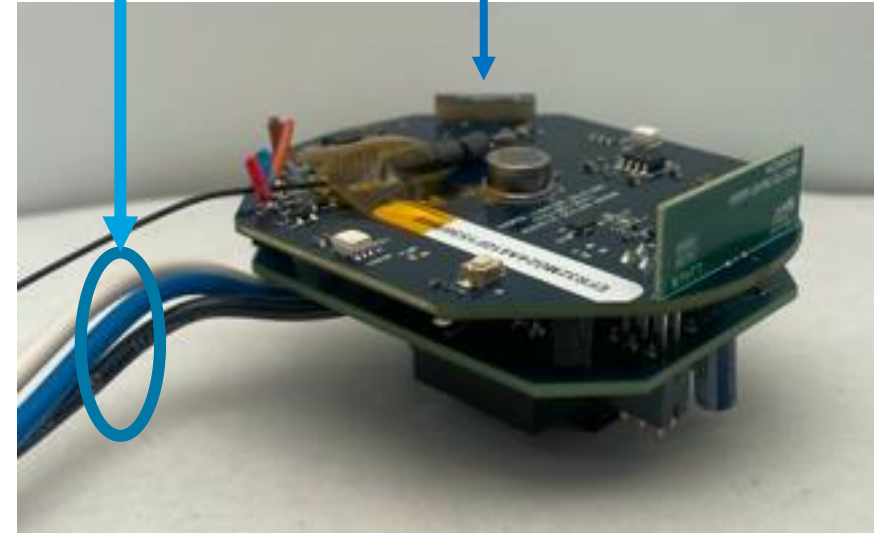
1001013 Ant



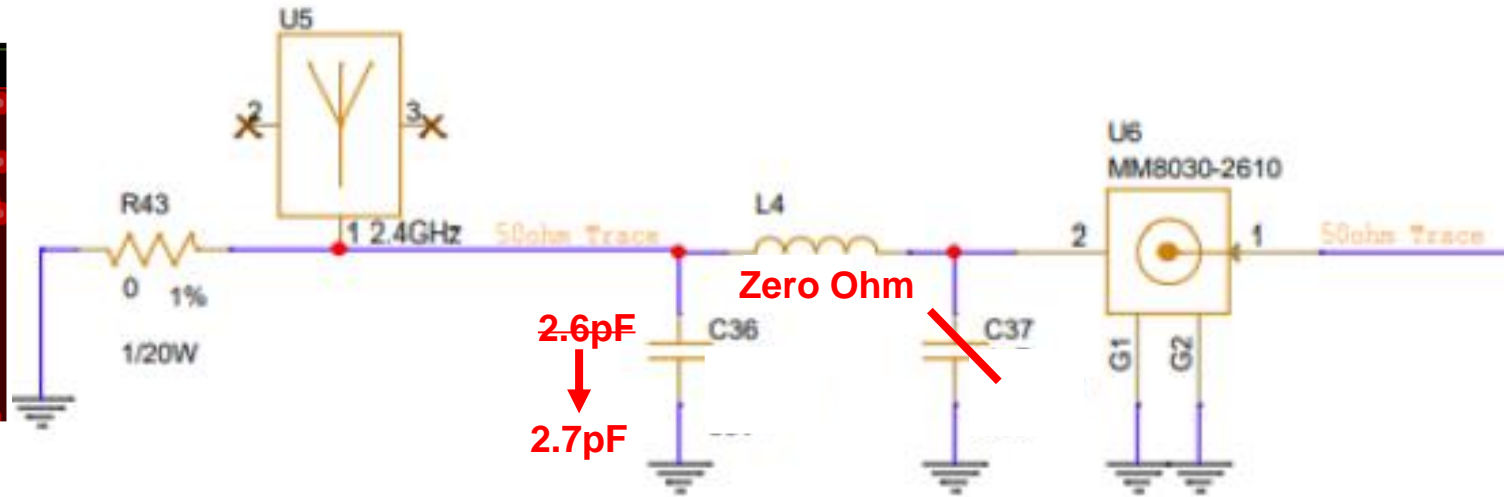
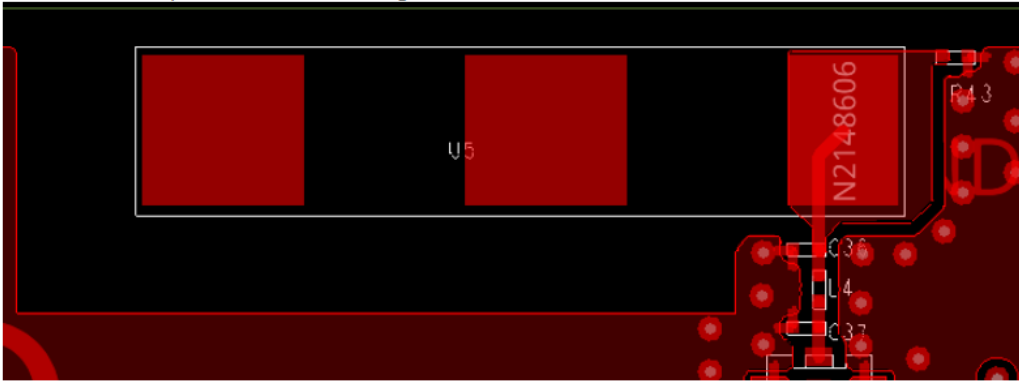
Sample New Double Stacked Board

Long Wires

1001013 Ant



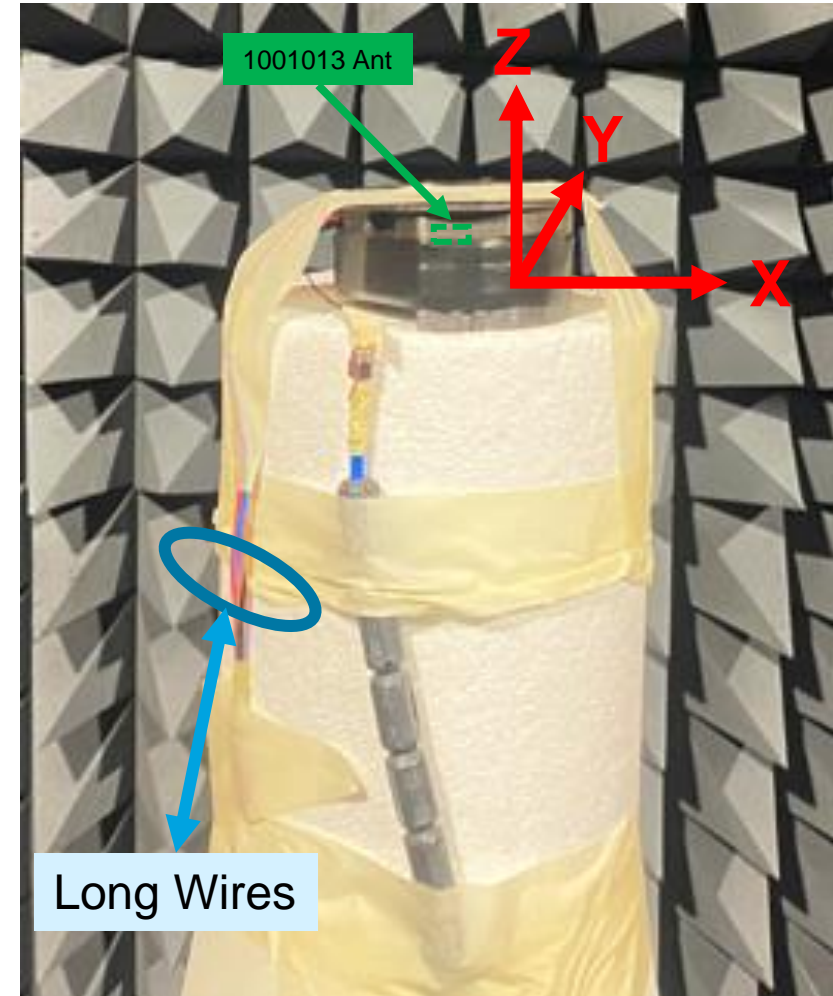
Recommended Matching Components



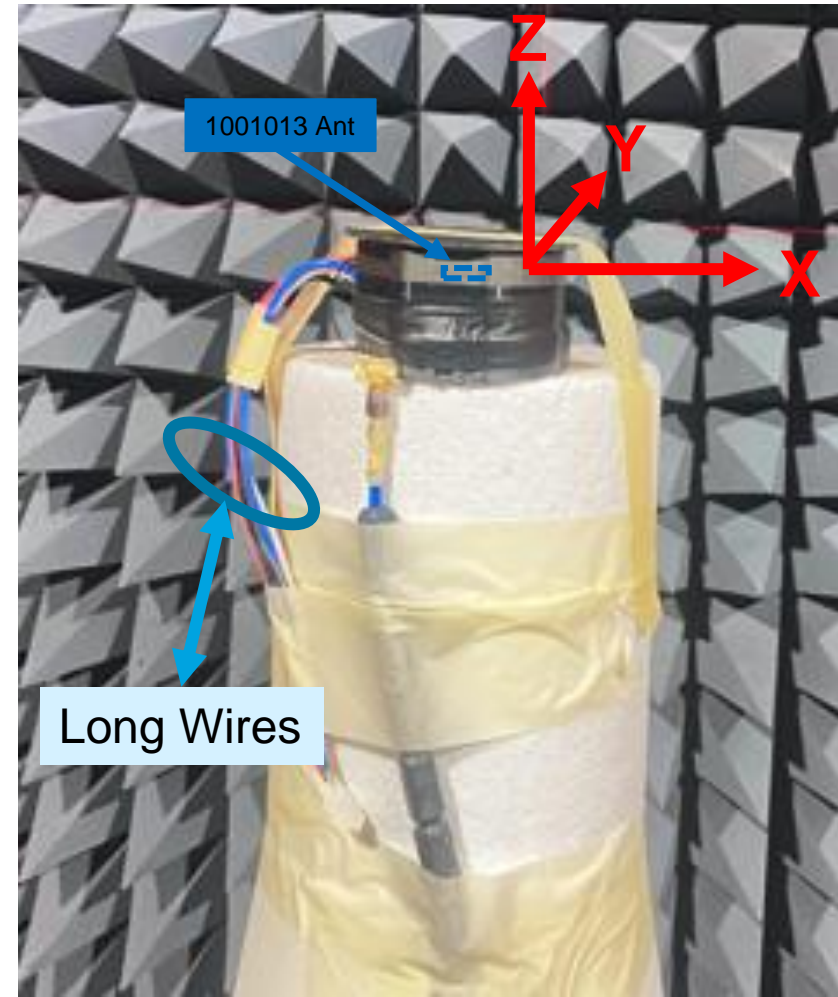
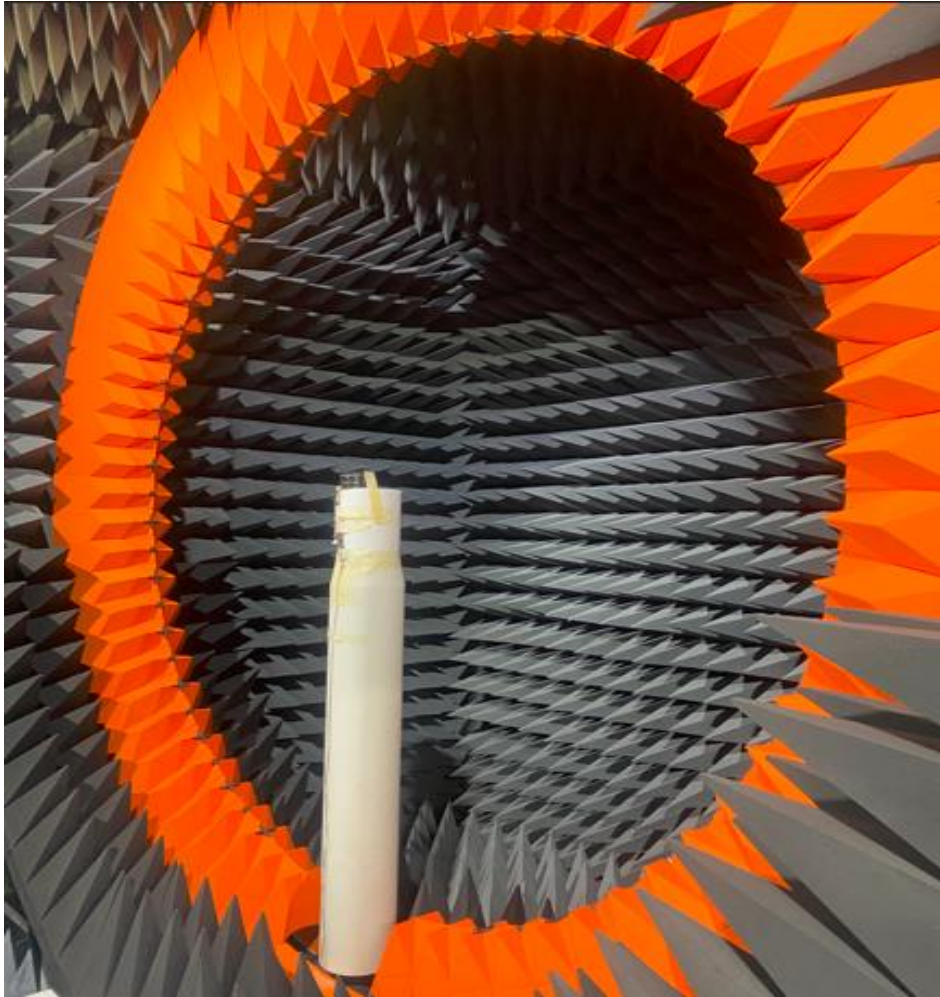
	C36	L4	C37
baseline matching	DNP	Baseline value	Baseline value
Tuned matching	2.6pF	Zero Ohm	DNP
New matching	2.7pF	Zero Ohm	DNP

Component Value	Manufacturer	Manufacturer Part Number	Tolerance
2.7 pF	KYOCERA AVX	02013A2R7BAT2A	±0.1pF
Zero ohm	Panasonic Electric Co	ERJ-1GE0R00C	Jumper

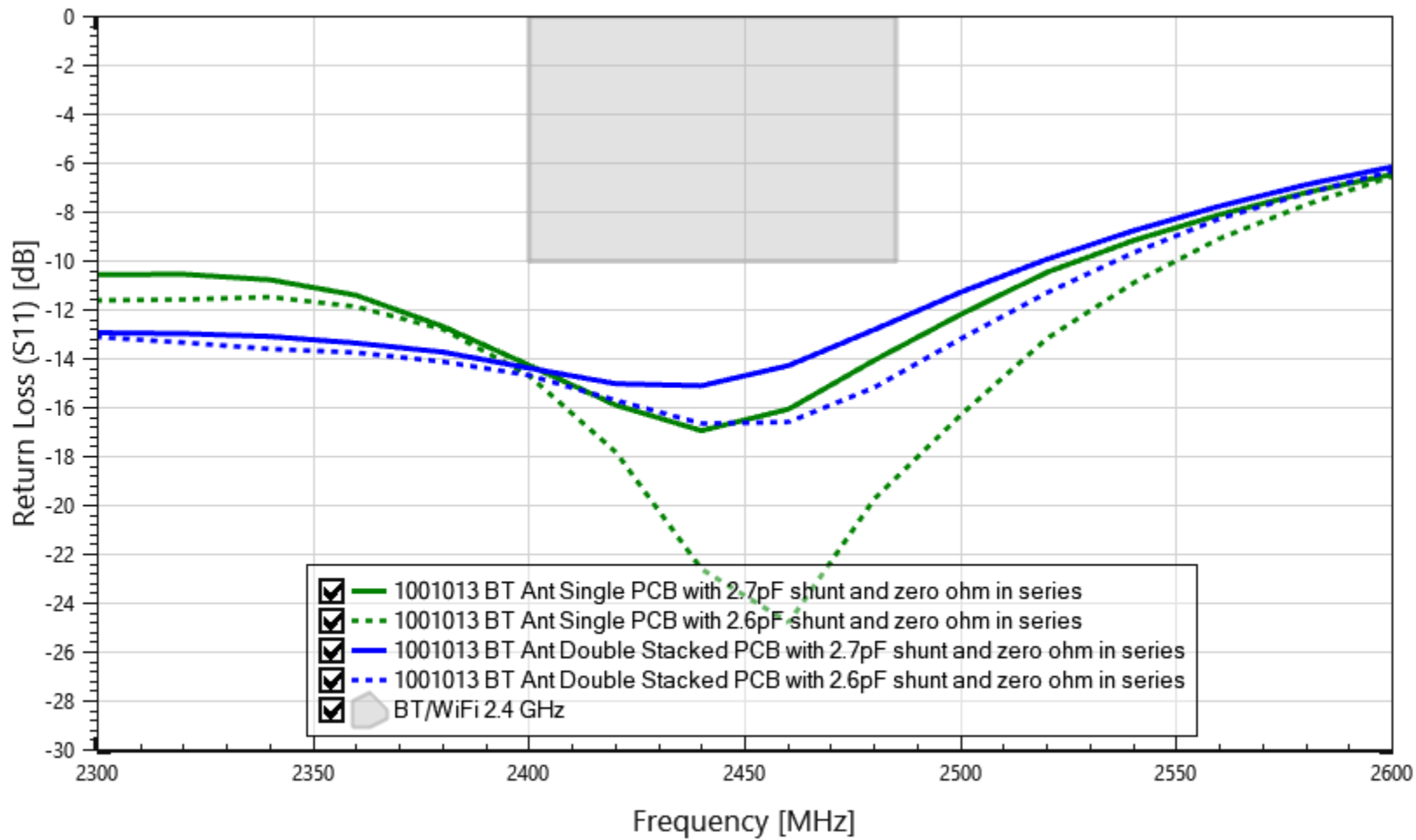
Test Setup – Single Board and Long Wires



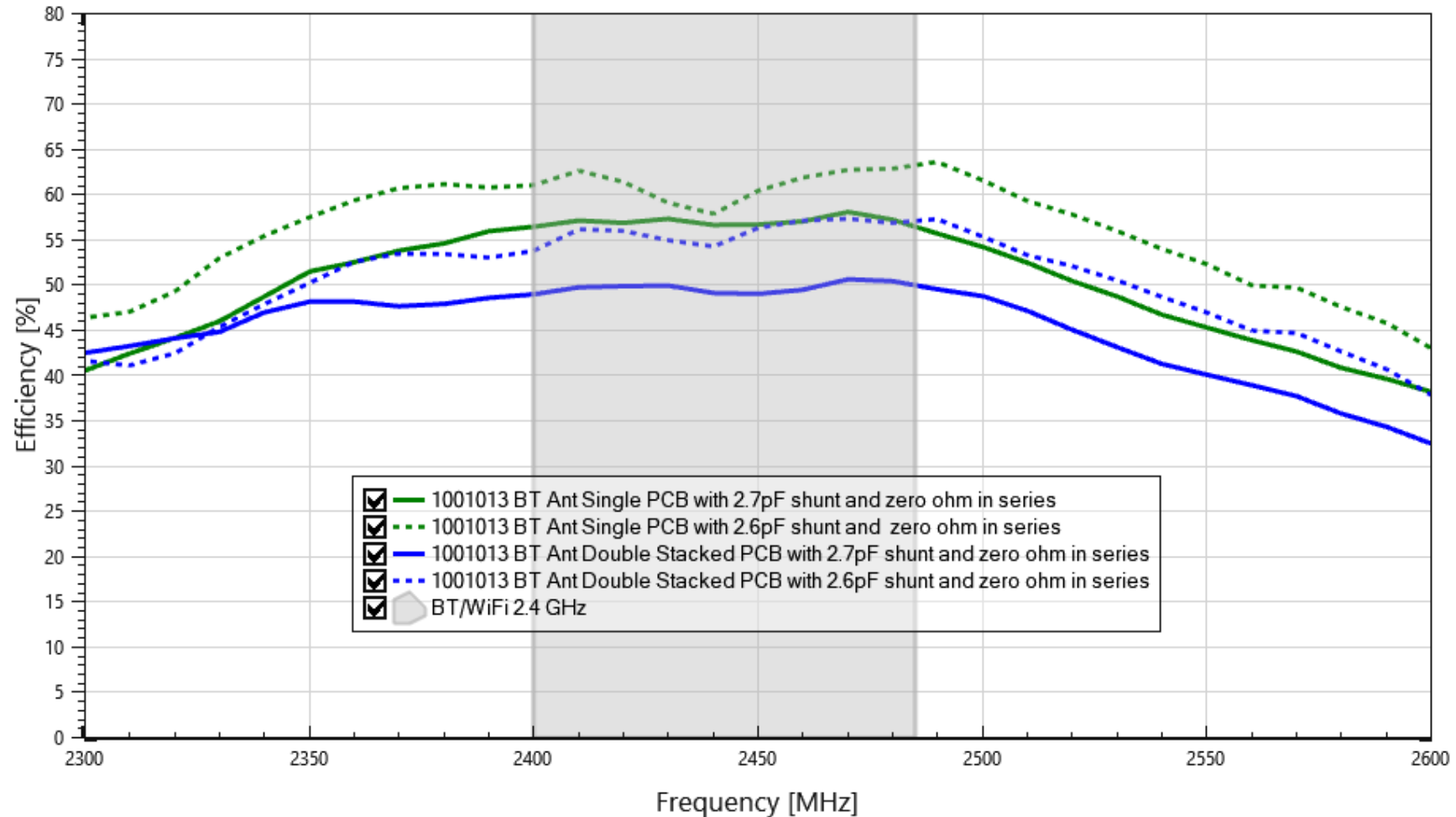
Test Setup – Double Stacked Boards and Long Wires



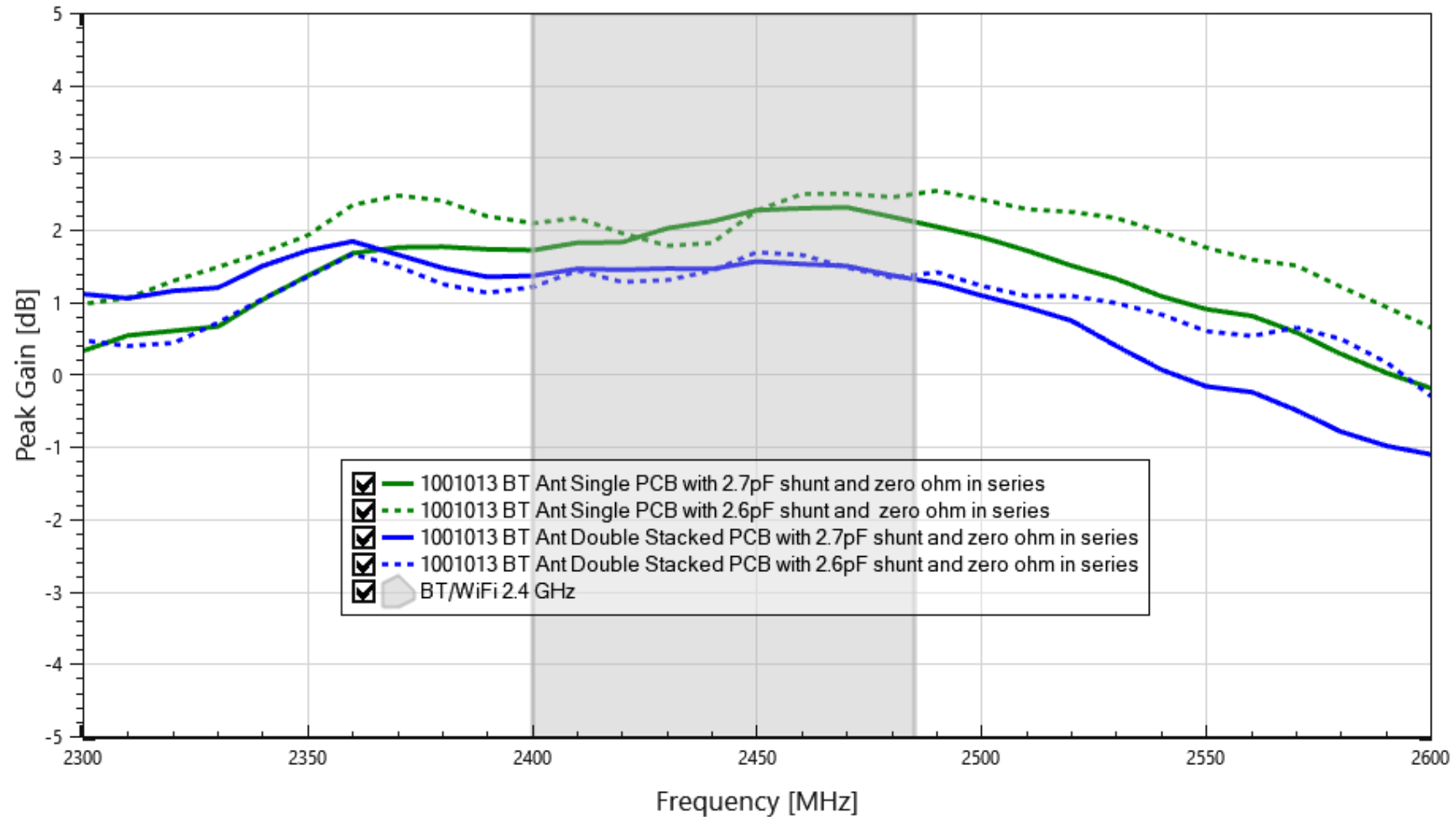
Return Loss WiFi 2.4G



Efficiency WiFi 2.4G

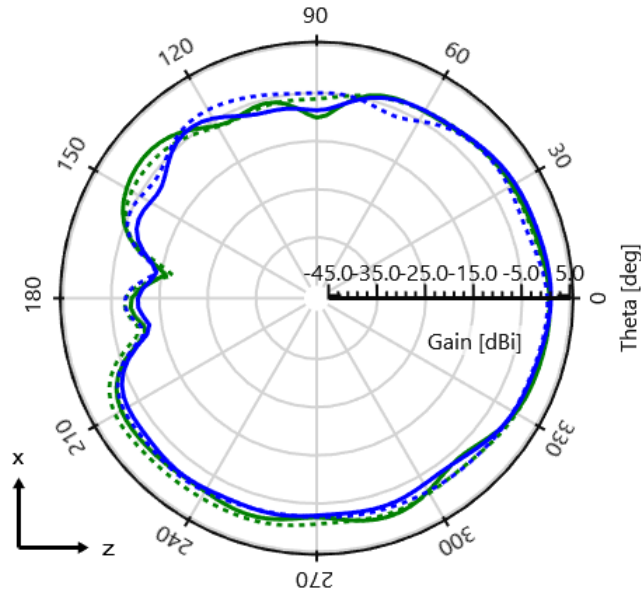


Peak Gain WiFi 2.4G

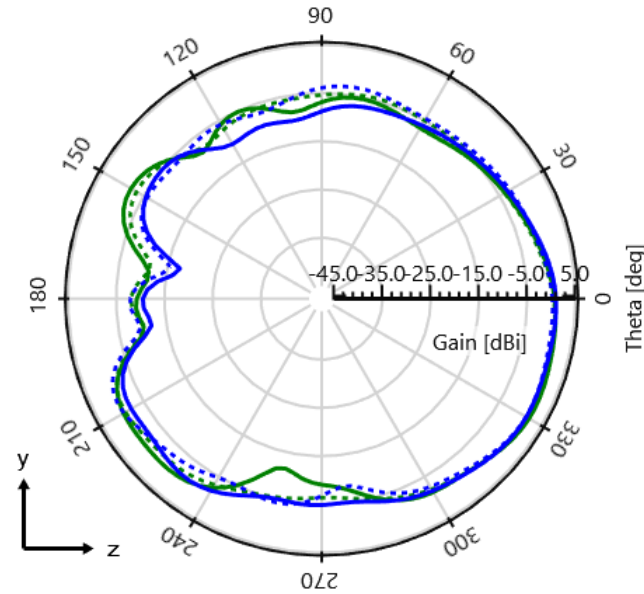


Radiation Pattern: Freespace (2440MHz)

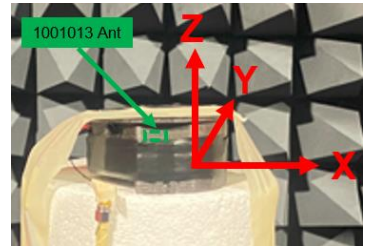
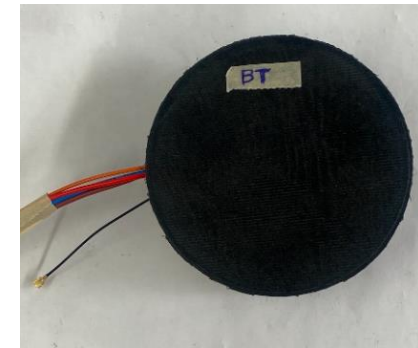
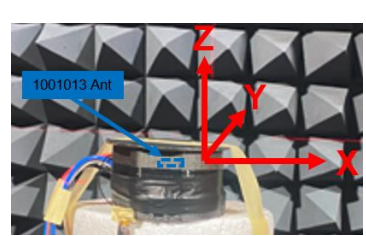
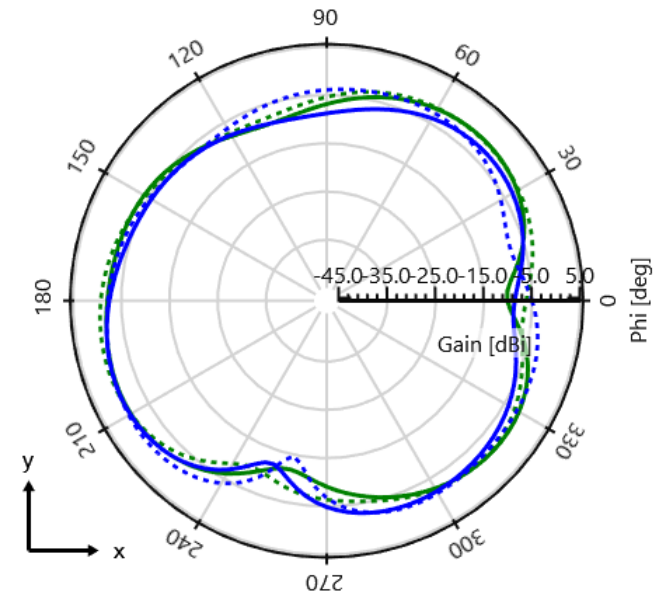
Gain (Total) - $\varphi = 0$ deg - 2440 MHz [Plane XZ]



Gain (Total) - $\varphi = 90$ deg - 2440 MHz [Plane YZ]



Gain (Total) - $\theta = 90$ deg - 2440 MHz [Plane XY]



- 1001013 BT Ant Single PCB with 2.7pF shunt and zero ohm in series
- 1001013 BT Ant Single PCB with 2.6pF shunt and zero ohm in series
- 1001013 BT Ant Double Stacked PCB with 2.7pF shunt and zero ohm in series
- 1001013 BT Ant Double Stacked PCB with 2.6pF shunt and zero ohm in series

Conclusion

New Matching components on Copper Lighting Acoustic Ceiling Sensor Sample Boards for 1001013 Antenna inside plastic housing with long wires tested in Freespace case RF performance are summarized below:

TEST DESCRIPTIONS	Ave Efficiency WiFi 2.4 GHz	Max Pk Gain WiFi 2.4 GHz
1001013 BT Ant Single PCB with 2.7pF shunt and Zero ohm in series	57 %	2.32 dB
1001013 BT Ant Single PCB with 2.6pF shunt and Zero ohm in series	61 %	2.55 dB
1001013 BT Ant Double Stacked PCB with 2.7pF shunt and Zero ohm in series	50 %	1.57 dB
1001013 BT Ant Double Stacked PCB with 2.6pF shunt and Zero ohm in series	56 %	1.69 dB

Overall preference is still good, only ~4% to 6 % efficiency drop.

The 2.7pF capacitor is acceptable for the change.

Please refer to the slide 6 for the matching component information.

THANK YOU.



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