Optimized Antenna Support Case Study

CEL's Tailored Antenna Solution for Compact PCB Challenges

A leading fleet management system provider aimed to develop a new miniature telematics product for their offering. This device required a new dual-mode Wi-Fi and BT radio. Although throughput wasn't critical, coverage, range and reliability was. Additionally, board space was very limited. The CMP9010 Module they were interested in was too large, therefore CEL took the challenge of developing a smaller, efficient antenna solution, to meet their space limitations without compromising on performance metrics like return loss, gain, and total radiated power (TRP).

ISSUES

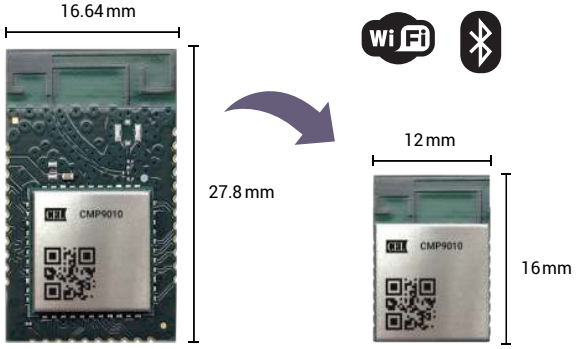
- Customer needed reliable connectivity…consistent connection with minimal disconnects
- Very limited board space on host PCB
- Minimize certification work & expense



SOLUTION

1. Proposal:

- CEL proposed the smaller CMP9010-9 (Stamp module) paired with a custom antenna to be integrated on the host PCB.

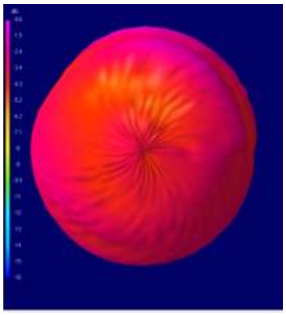


CMP9010-2
462.6mm2
Wi-Fi 4, BT5.2
SDIO/UART
Omni & Efficient Antenna
I-Temp

CMP9010-9
~192mm2
Wi-Fi 4, BT5.2
SDIO/UART
Integrated PMIC
I-Temp

2. Antenna Development Steps:

- CEL obtained detailed information about the host PCB including dimensions, material, antenna location, and maximum antenna dimensions.
- Simulation testing on 1st pass design, followed by ordering PCBs with the new antenna design.
- CEL measured the following at 2.4GHz and 5GHz
  - Return loss, Peak gain, Average gain
  - Plotted total radiated power performance
- Completed and compared module antenna performance vs. enclosure results.
- The Customer implemented antenna on host board



Looking directly at +x

3. Certification and Field Testing:

- CEL obtained a Class II Permissive change, which eliminated the need for full certification, thereby saving time, + $$$, and reduced risk.
- Conducted field testing to assess rate vs. range performance within the final enclosure.

PEAK GAIN AND TRP MEASUREMENT

CEL's Optimized Antenna Design (12 x 4 mm)

Freq (MHz)	2405	2440	2480	5200	5400	5600	5800
Pk gain (dBi)	-1.8	-0.6	-0.2	1.1	2.4	3.7	4.6
Avg TRP (dBm)	-4.7	-3.6	-3.4	-3.4	-1.3	-0.7	-0.2

WBENEFITS

- ☑ **Smallest Radio + Antenna solution**
- ☑ **Optimized Radio – Omni-directional, Efficient, Consistent Across Band, Tuned**
- ☑ **Confirmed Acceptable Performance - Antenna and Product Tested - TRP**
- ☑ **Class II Permissive Change Support**

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