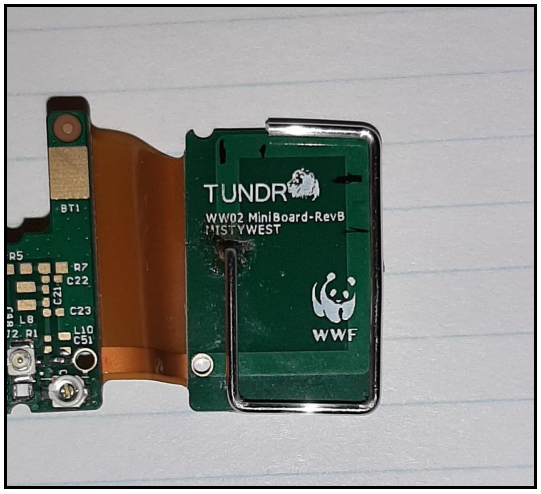
General:
The resonator in the latest encapsulated unit was originally tuned to 586 MHz in air to achieve a 425 MHz target frequency after encapsulation. However, the measured resonant frequency was 465 MHz. The most plausible explanation is a lower dielectric constant of the encapsulant compared to IDEO's original material. The deviation is significant and may indicate that there are fundamental differences in the encapsulation process, e.g. different materials.

An extension for the resonator was created, inserted into the encapsulant, and soldered to the existing resonator. The end of the resonator was within the encapsulant but should have terminated 15 mm from the right board edge, as shown. The resonance of this modified unit reduced to the target of 425 MHz.

A representative extension was created and attached to an existing 586 MHz prototype. The extension reduced the resonance to between 526 and 537 MHz.

Soldered Extension, 526.25 to 537.75 MHz

Solid Extension, 511.25 to 518.75 MHz

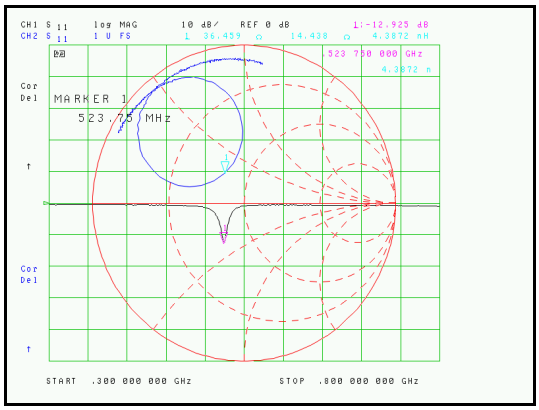


Solid Extension, 523.25 to 535 MHz, 12 mm

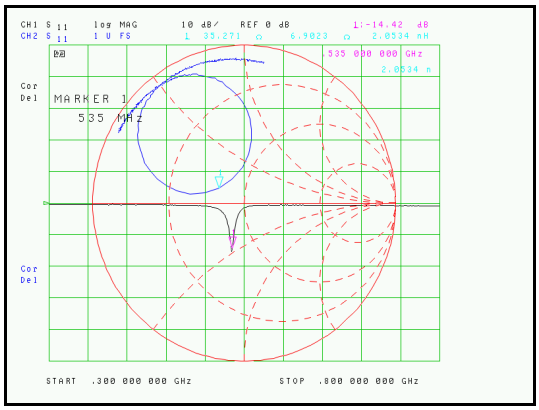
A Solid wire version of the resonator was created and installed onto the prototype but was found to resonate too low in frequency. The length was reduced such that the coil terminated 12mm from the right board edge which was found to duplicate the range of the soldered extension. Note: when installed in the mount the end of the resonator aligns with the mark.

Return loss and range performance,

The construction of the Hybrid Coil is described. The return loss performance at the maximum and minimum capacitance is shown with L9 is installed as 5.6nH for consistency with previous measurements. The matching component on the board is to be 6.8nH and will improved the return loss.



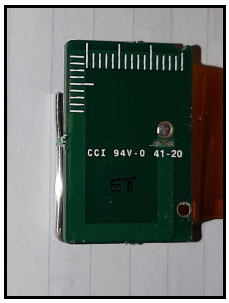
Max Capacitance, 523.75 MHz



Min Capacitance, 525 MHz

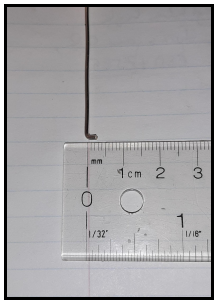
Modifications:

PCB Radiator Removal:
Sever the PCB radiator at the position shown. Two cuts through the radiator ~1.5mm apart with the copper between removed.

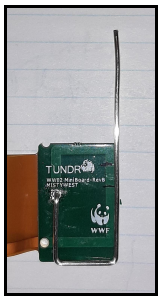


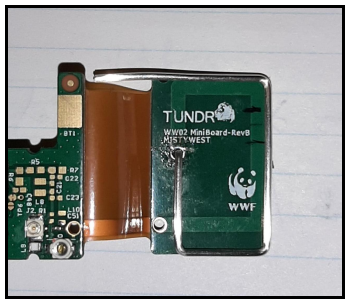
Hybrid Coil Construction:
Starting with a straightened, 9 cm, length of #16 AWG wire.

Initial Bend:
This forms the connection to the PCB. The tail needs to be long enough to allow soldering into the via on the PCB but not so long that it extends through the PCB once soldered. The coil is spaced 1.6mm above the PCB so a length of ~2.5mm is desired. As a spacer is used for positioning this length is critical only for mechanical attachment.



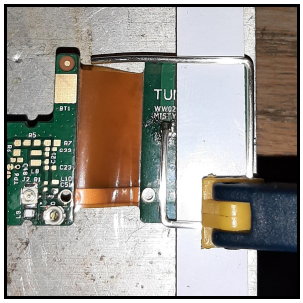
First, second and third bends:
The coil is bent using the edge of the PCB as a length gauge. Positioning the pliers at the edge results in the outside of the bent section falling within the confines of the PCB (or at least very close). This is to keep the resonator within the confines of the mount.



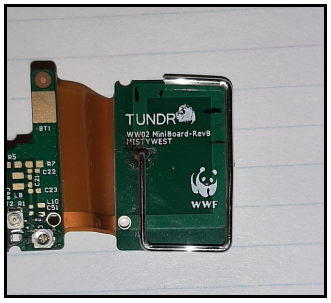


Vertical Position:
The coil is clamped to the resonator assembly using a scrap piece of PCB for consistent vertical spacing (1.6mm). The coil is manually aligned with the edges of the PCB and then soldered. The coil is then trimmed to length, 12 mm from the right PCB edge.

Note: Clamping the assembly onto a second piece of scrap material will prevent solder flow through the via. This is to avoid mechanical conflicts with the mount.


Clamped, aluminum plate.

Soldered, Trimmed 15mm



Soldered, Trimmed, 12mm

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