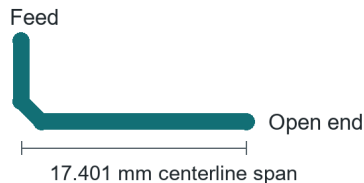


Mopeka Pro200B Antenna Report

Bent PCB monopole | Reference design and simulation

Permanent attachment. The antenna is etched directly into the PCB copper and permanently attached to the device. It is not a separately replaceable component, and the product has no detachable RF antenna connector. This construction uses the permanently attached antenna provision of 47 CFR 15.203.

Nordic nRF52 DK reference



Unshorted printed bent monopole.

Native layout: 12 December 2017; schematic/layout PDF pp. 2, 8-9. nRF52832 development kit.

Trace width: 1.270 mm.

Main route centerline: 22.736 mm.

Board: approximately 101.60 x 63.50 mm.

Four-layer CAD stack; approximately 1.6 mm.

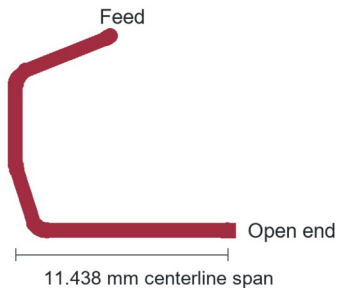
Nordic's hardware files provide the antenna geometry reference. Its published DK Q&A describes gain around 0 dBi. Mopeka results are calculated from the separate PRO200B model.

PCA10040 v1.2.4 / PCB 400150

Rotated and mirrored for comparison

Design comparison. PRO200B and PCA10040 use an unshorted bent printed monopole. Their trace widths, routes, ground planes and PCB stacks differ. PCA10040 includes an RF test connector and a 1.2 pF antenna shunt; PRO200B uses its own feed arrangement.

Mopeka PRO200B antenna



M2006211C / M2006212C

Trace width: 0.800 mm.

Copper envelope: approx. 12.27 x 11.30 mm.

Main centerline: 24.144 mm.

Open-end pad: 0.800 mm square.

No grounded shorting arm.

Board: 36.00 x 40.50 mm.

Four layers; FR-4/prepreg, approximately 0.8 mm CAD stack.



Ground-envelope inset; inner voids omitted. Blue: antenna projection.

Bottom copper / rev C / flat open end

Construction and feed. Integral copper for BLE channel centers 2402-2480 MHz. The nRF52810-QCAA ANT pin 19 feeds C15 0.8 pF shunt and L3 3.9 nH series; C36 is not fitted. The radiator lies over a copper-recessed region on all layers. The assembly has two top-side CR2032 cells and holders.

Dimensions follow native layout and released rev C copper. The 24.144 mm route includes bends and joining segments; narrower feed routing and the terminal-pad extension are excluded. The open-end pad is square.

Simulation result. Highest sampled total gain is 2.156 dBi at 2480 MHz for the PCB, battery, enclosure, foam and potting model. Results cover 2402, 2440 and 2480 MHz on a 3-degree spherical angular grid. The model configuration and numerical results follow.

Assembled antenna model

PRO200B Rev C | M2006211C | 2480 MHz

Peak gain

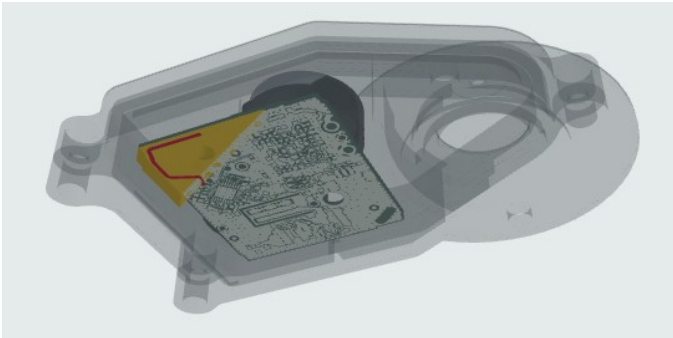
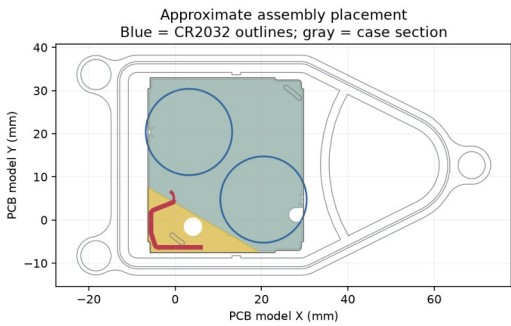
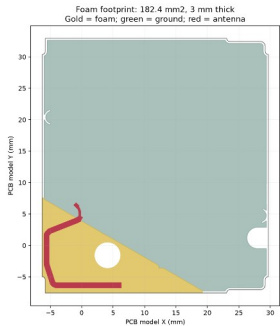
2.156 dBi

Radiation efficiency

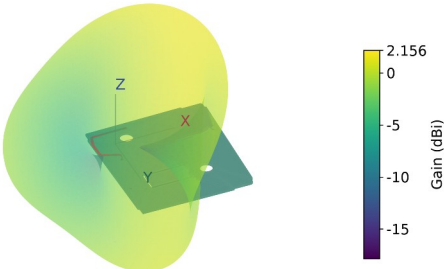
79.8%

S11 at 50 ohms

-3.869 dB



3D assembly. Enclosure translucent; potting hidden for visibility.



3D gain at 2480 MHz. Assembled-model result; PCB shown for orientation. Pattern radius is arbitrary, not distance.

Results

Case	MHz	Gain dBi	Realized dBi	Efficiency	S11 dB
Assembled	2402	2.112	0.292	80.4%	-4.656
Assembled	2440	2.125	0.070	80.0%	-4.237
Assembled	2480	2.156	-0.138	79.8%	-3.869
Bare PCB	2402	1.946	1.650	94.0%	-11.815
Bare PCB	2440	1.977	1.746	94.4%	-12.850
Bare PCB	2480	2.009	1.798	94.8%	-13.252

Model Properties

The assembled model includes the PCB, batteries, holders, ABS enclosure, foam and potting. The following values are material inputs at 2440 MHz.

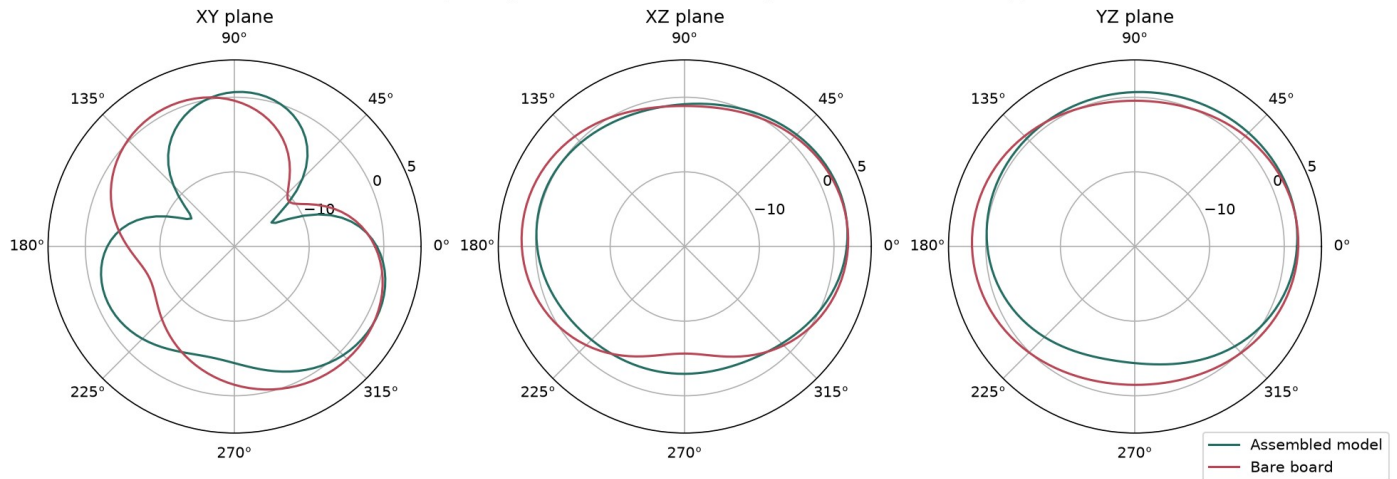
Material	Relative permittivity	Loss tangent
ABS enclosure	2.7	0.01
Holder plastic	3.0	0.02
Foam	1.1	0.003
Potting	3.5	0.03
Air pockets	1.0	0

Foam: 3 mm beneath the ground-free antenna corner; footprint 182.4 mm². Gain uses accepted feed power; realized gain includes mismatch to 50 ohms. Single material case and mesh. Microwave material characterization, hardware correlation and production-tolerance sweeps are outside this model.

Radiation Pattern Results

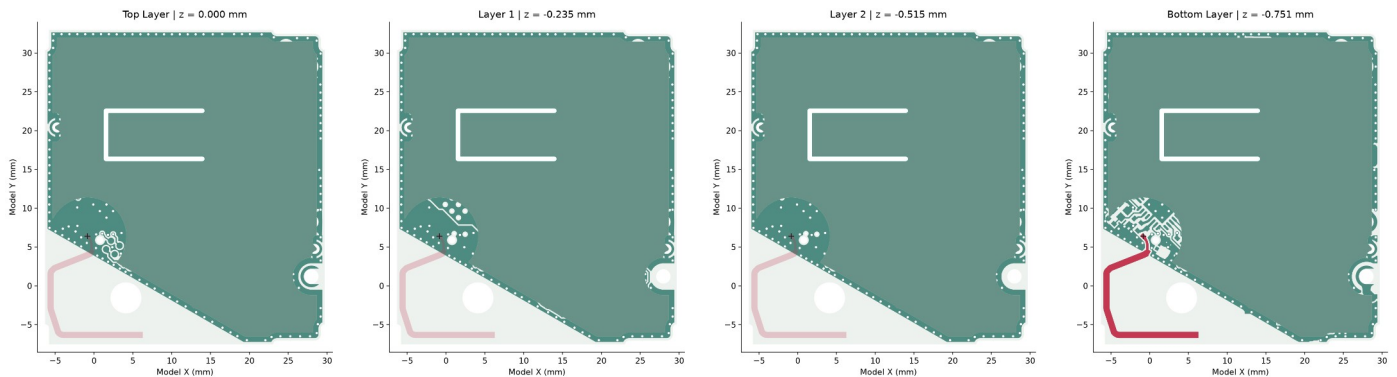
Principal Plane Gain Patterns at 2440 MHz

2440 MHz | Total gain (dBi), common scale | Values below -20 dBi clipped



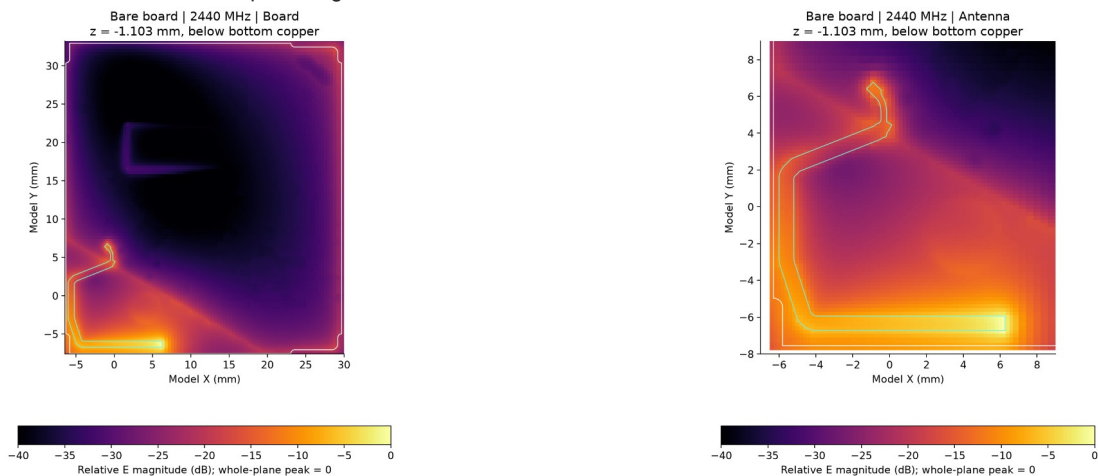
Four Copper Layers

M2006211C, top-view coordinates on every layer. The feed region, perimeter ground-via ring and sideways U-shaped slot remain visible. Red marks the bottom antenna, projected onto the other layers. Muted green conceals interior circuit detail.



Computed Near Field Bare Board at 2440 MHz

Saved bare-board result. Computed electric-field magnitude below the antenna-side copper; cyan outlines the antenna. Both views use the same whole-plane maximum as 0 dB. These maps belong to the bare-board model.



Source: assembled simulation index.html and loaded_summary.json; copper and field provenance in inspection_views.json. Assembly run: loaded_e35_t003_m200_v2. Near-field run: pro200b_c_m200_v2. openEMS 0.37.0rc2, Cartesian FDTD.