



Nox Medical

Harmonics investigation report

Doc.no: 3-3-TR-880 450-01

Revision History

Date	Rev.	Author	Description
2026-03-06	PA1	Alexander Bergslilja	Draft
2026-03-09	PA2	Alexander Bergslilja	Draft, updated with suggested modification
2026-03-11	A	Alexander Bergslilja	Released



Table of Contents

1	INTRODUCTION	4
2	RESULTS.....	5
2.1	BASELINE.....	5
2.2	MODIFIED FILTER WITH ADDED CAPACITOR	5



Prepared:
Alexander Berglilja
Approved:
Jonas Strandell

Release:
2026-03-11
Doc.no:
3-3-TR-880 450-01

Page:
3 of 6
Rev:
A

1 Introduction

This report presents findings in the investigation done with problem with 3rd harmonics in the Nox RIP sensor device.

Measurements were conducted on HW revision 880450-01 R4A.

To high levels were found during Spurious Radiated Emissions compliance testing in the ~7324MHz-7440MHz range. The levels were between 6.0 – 11.7dB above the limits.

This is in the frequency range of the 3rd harmonics for a 2.4GHz transceiver.

Conducted measurements were made to quantify the levels and attempts were made to minimize the 3rd harmonic of the DUT.

The current design (Figure 1) has a 2nd order low pass filter on the antenna port.

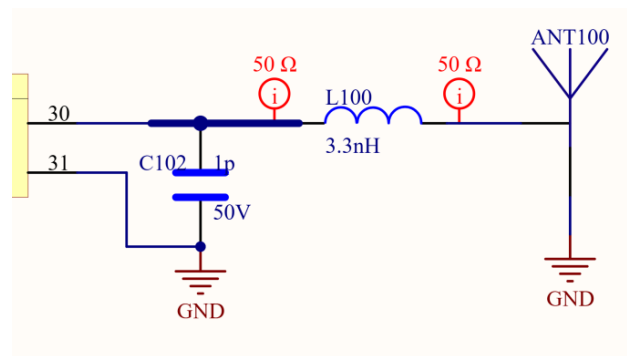


Figure 1. Current design 2nd order low pass filter.

Attempts were made to modify the filter to give more suppression of the harmonics. The conclusion is that it is not possible without also suppressing the fundamental frequency which gives a loss in TX output power.

An additional component in the filter was seen to suppress the harmonics enough without affecting the fundamental frequency.

2 Results

2.1 Baseline

Without modifications the 3rd harmonics were measured when transmitting at +4dBm output power and channel 22 (2446MHz).

- 3rd harmonic at 7338MHz: -34.56dBm

2.2 Modified filter with added capacitor

A 1.5pF capacitor, GJM1555C1H1R5BB01, was added to the filter design.

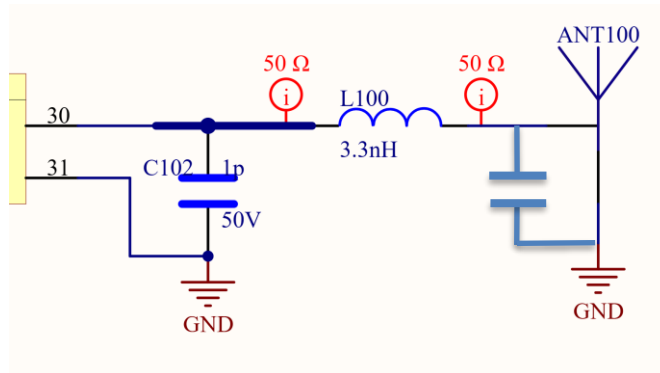


Figure 2. Modified filter with added capacitor in shunt position.

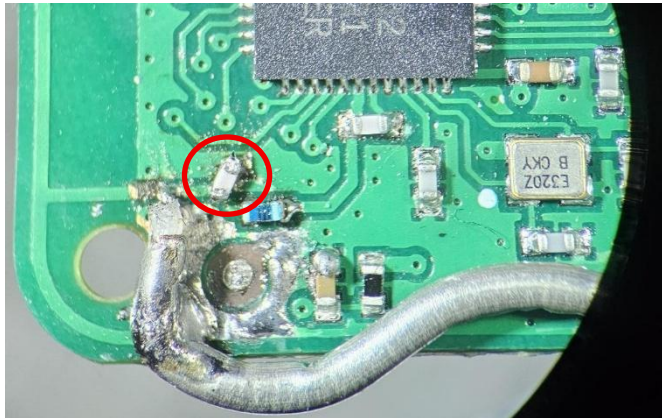


Figure 3. PCB with added shunt capacitor highlighted.

Table 1. Modified filter performance.



Channel	Fundamental frequency	3rd harmonic frequency	Harmonic level(dBm)	Suppression compared to baseline(dB)
0	2402	7206	-54.11	19.55
19	2440	7320	-55.24	20,68
39	2480	7440	-56.41	21.85

No effects were seen on the TX output power.

The 20dB improvement in suppression of 3rd harmonics should decrease the radiated spurious emissions levels accordingly.