

# Silicon photonics design

## Silicon Photonics Design, Fabrication and Data Analysis

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Course: Silicon Photonics Design, Fabrication and Data Analysis

## Overview

This is a design document for a silicon photonics chip consisting of four sets of grating couplers. Each set consists of three grating couplers, with one representing the input where the laser is shone on, and the other two representing the two outputs with one taking a longer and more complicated path while the other taking a short path. The purpose of this report is to demonstrate the effects of the transfer function given various layouts, connection topologies, and a circuit layout.

The circuit design is created in KLayout 0.29.11 and simulated in Lumerical 2024 R2.3. The EBeam technology is used throughout this design.

## Layouts

My chip will consist of four layouts. For each interferometer, there is a “long” output and a “short” output, distinguished by the presence and absence of specific circuit elements, respectively.

1. Long path wraps around an area enclosing both Circuit 1 and Circuit 2. Both circuits meet at a 50-50 splitter.
2. Long path contains a Bragg gating, otherwise symmetrical with the input grating placed at the center.
3. Long path contains branching paths and a bridging 50-50 splitter between the two branches. This is reminiscent of one of the simplest irreducible electrical circuits.
4. Long path contains a complex circuit containing eight splitters. The waveguides form a cubic graph, with two opposite ‘vertices’ attached with an input and output. Imperfections.

# Gallery

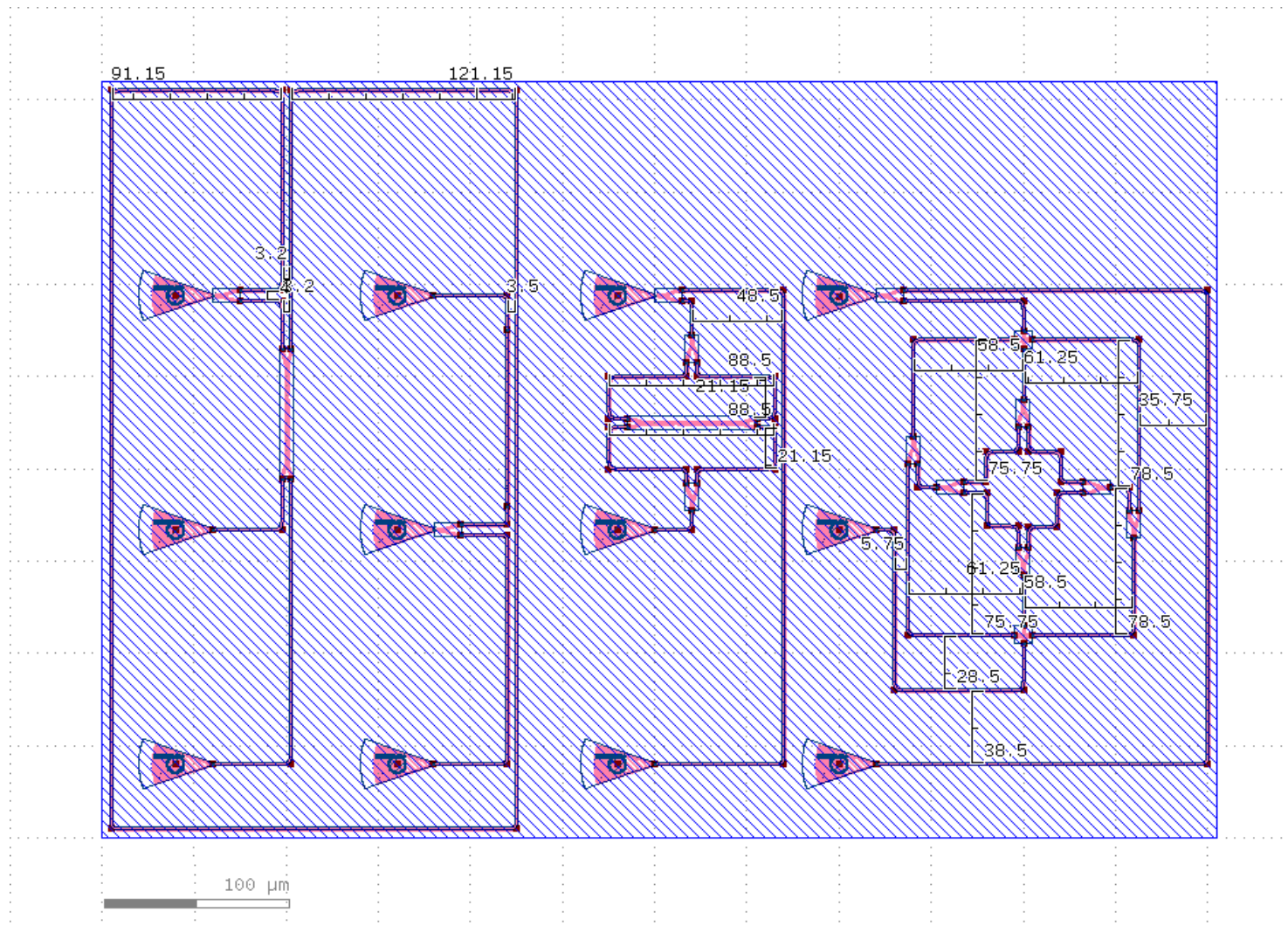


Figure 1: Circuit layout

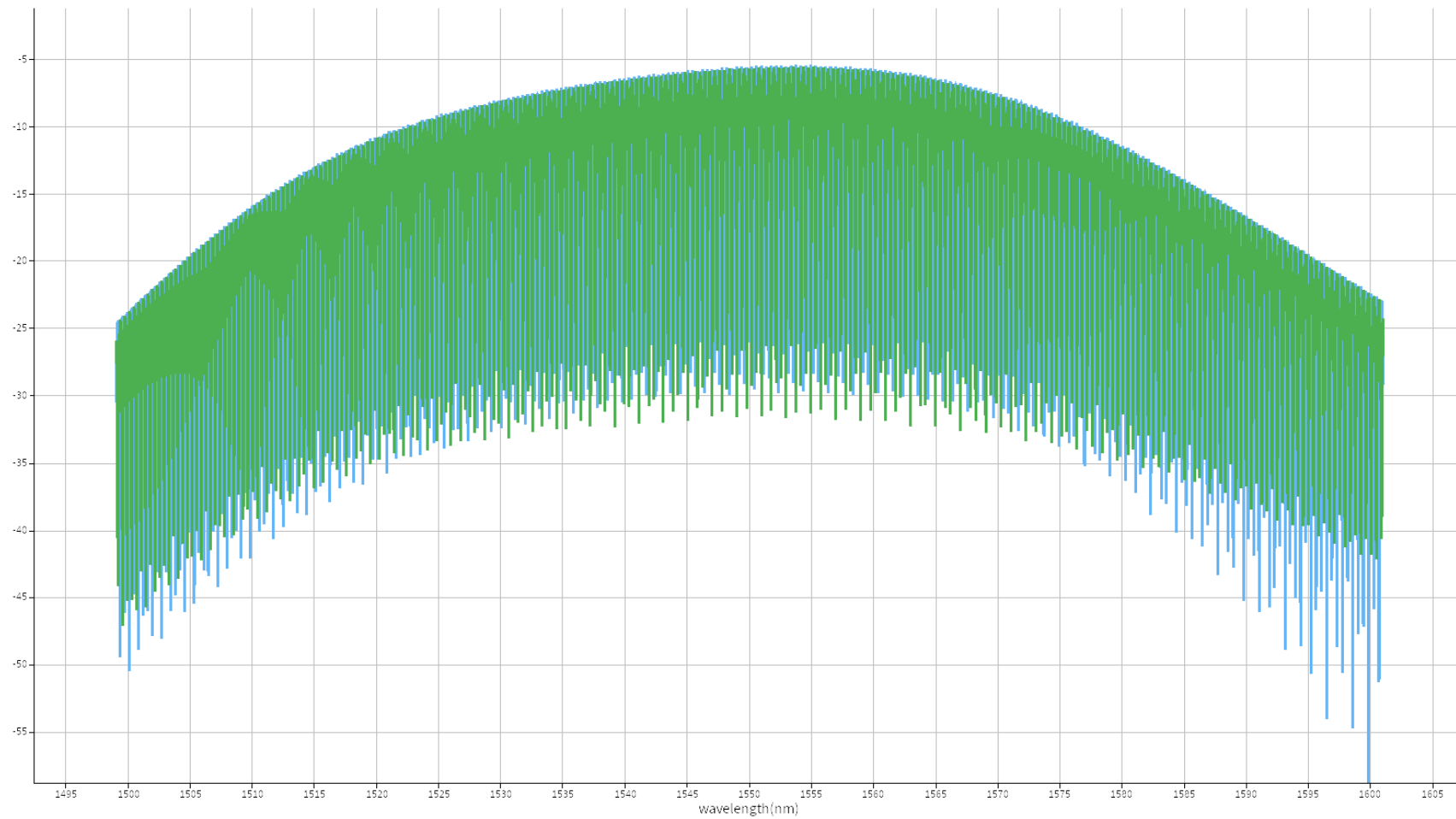


Figure 2: TE-dB gain for Circuit 1 (blue for long path)

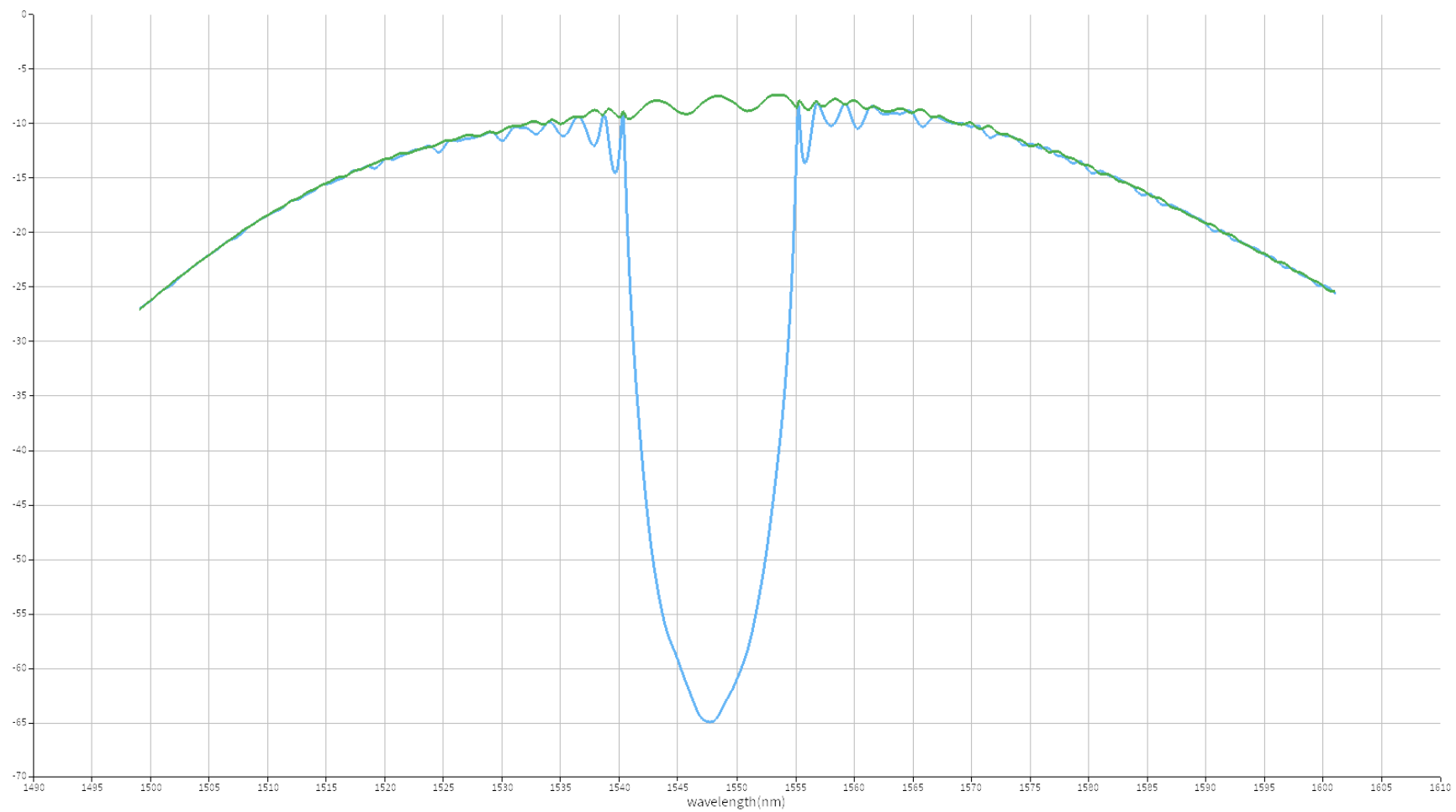


Figure 3: TE-dB gain for Circuit 2 (blue for long path)

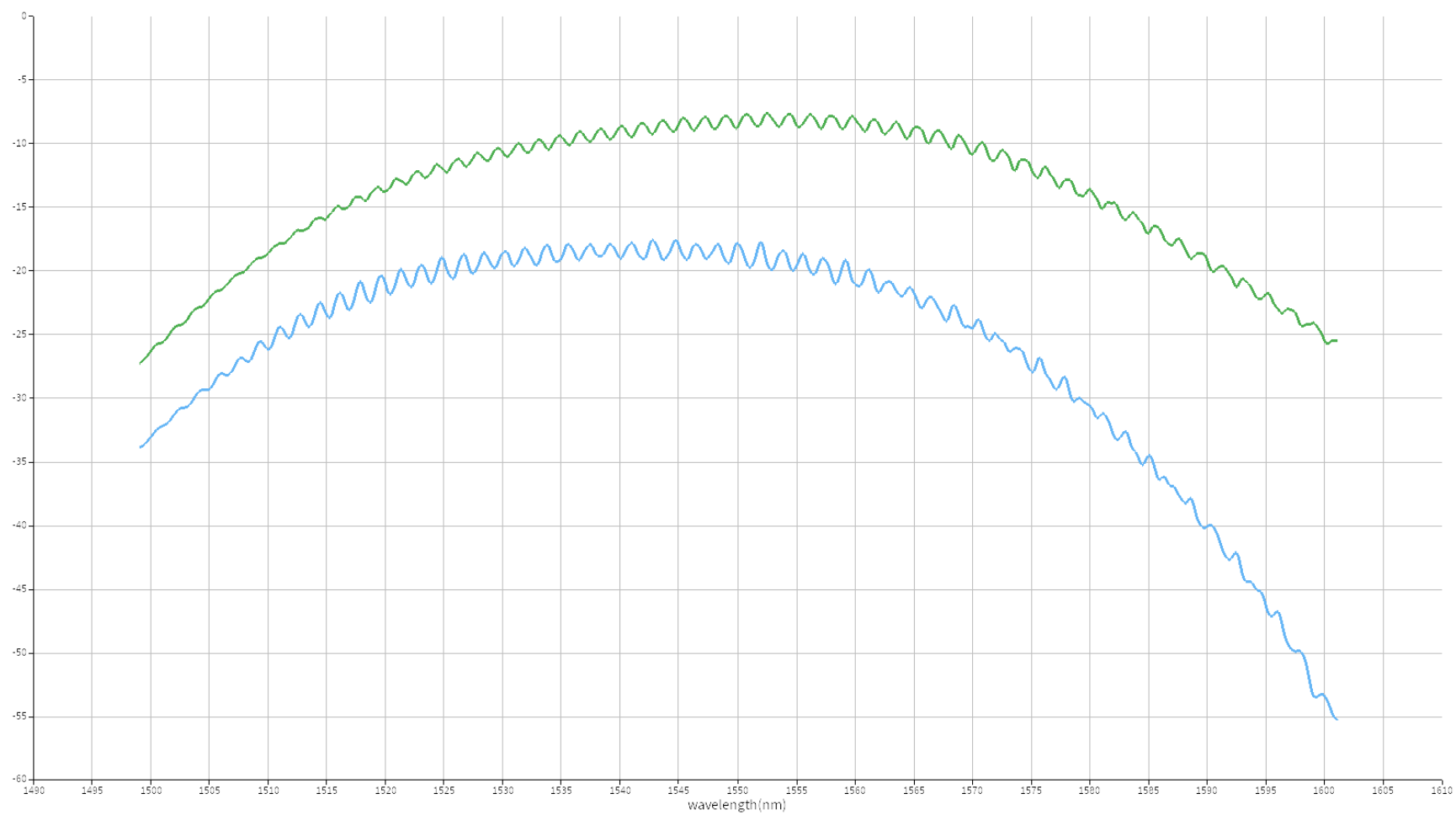


Figure 4: TE-dB gain for Circuit 3 (blue for long path)

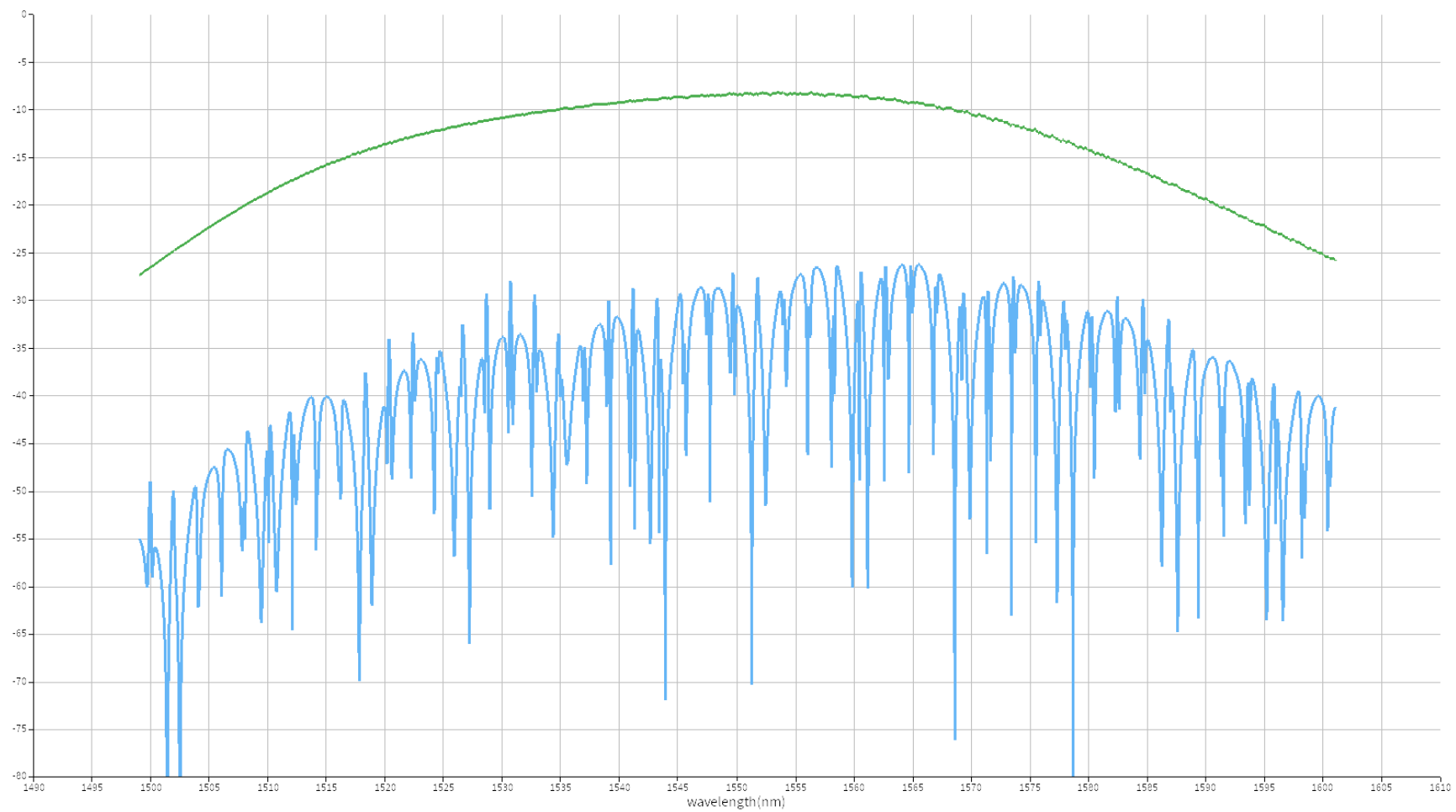


Figure 5: TE-dB gain for Circuit 4 (blue for long path)