

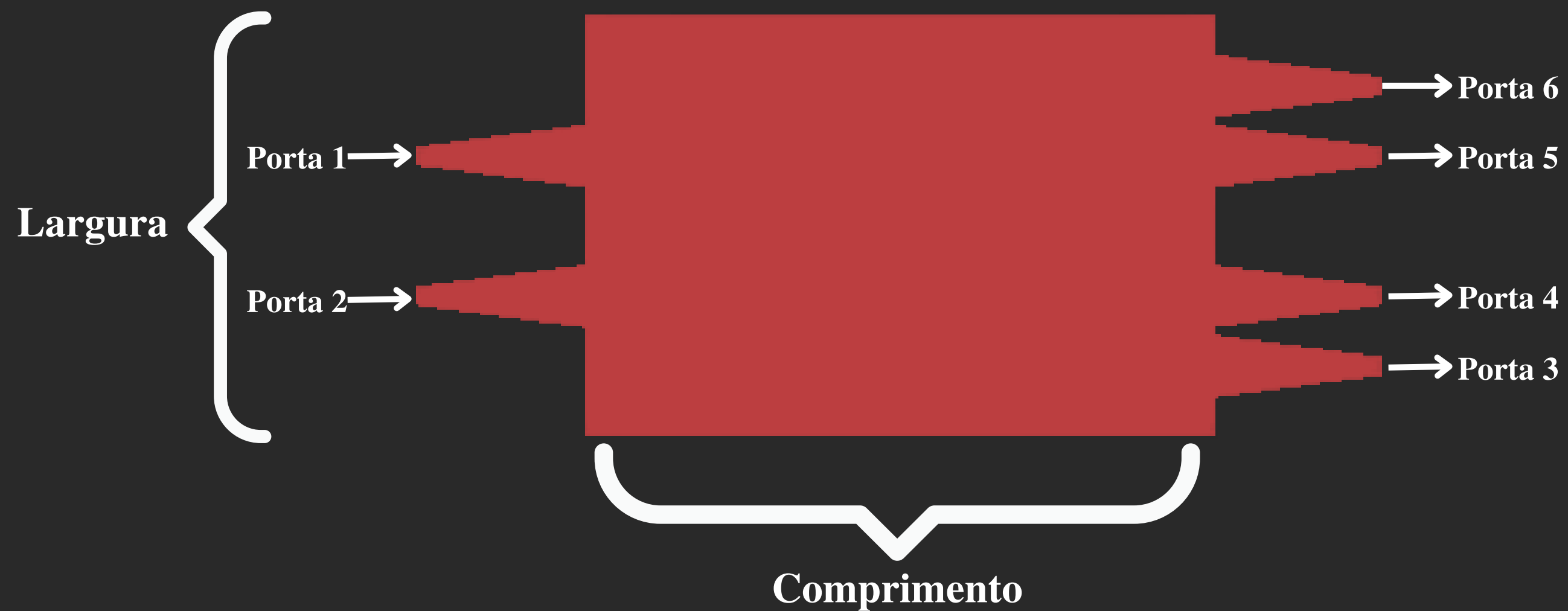
DESIGN MMI

2 X 4

SEMANA 1 E 2

Estrutura

Dimensões dos guias: 0.45 x 0.22 (um)



Solver

EME

cell geometry

x min (μm)

number of cell groups

energy conservation

number of modes for all cell groups

☒ allow custom eigensolver settings

cell group definition

	group spans (μm)	cells	subcell method	modes	custom	cell range	start (μm)	stop (μm)
1	6	15	CVCS	10	default	[1 ... 15]	-6	7.10543e-15
2	59.5	1	none	40	default	[16]	7.10543e-15	59.5
3	6	15	CVCS	10	default	[17 ... 31]	59.5	65.5

☒ display cells

Clear settings for cell group 2

Custom settings for cell group 2

y (μm)

y min (μm)

y span (μm)

y max (μm)

z (μm)

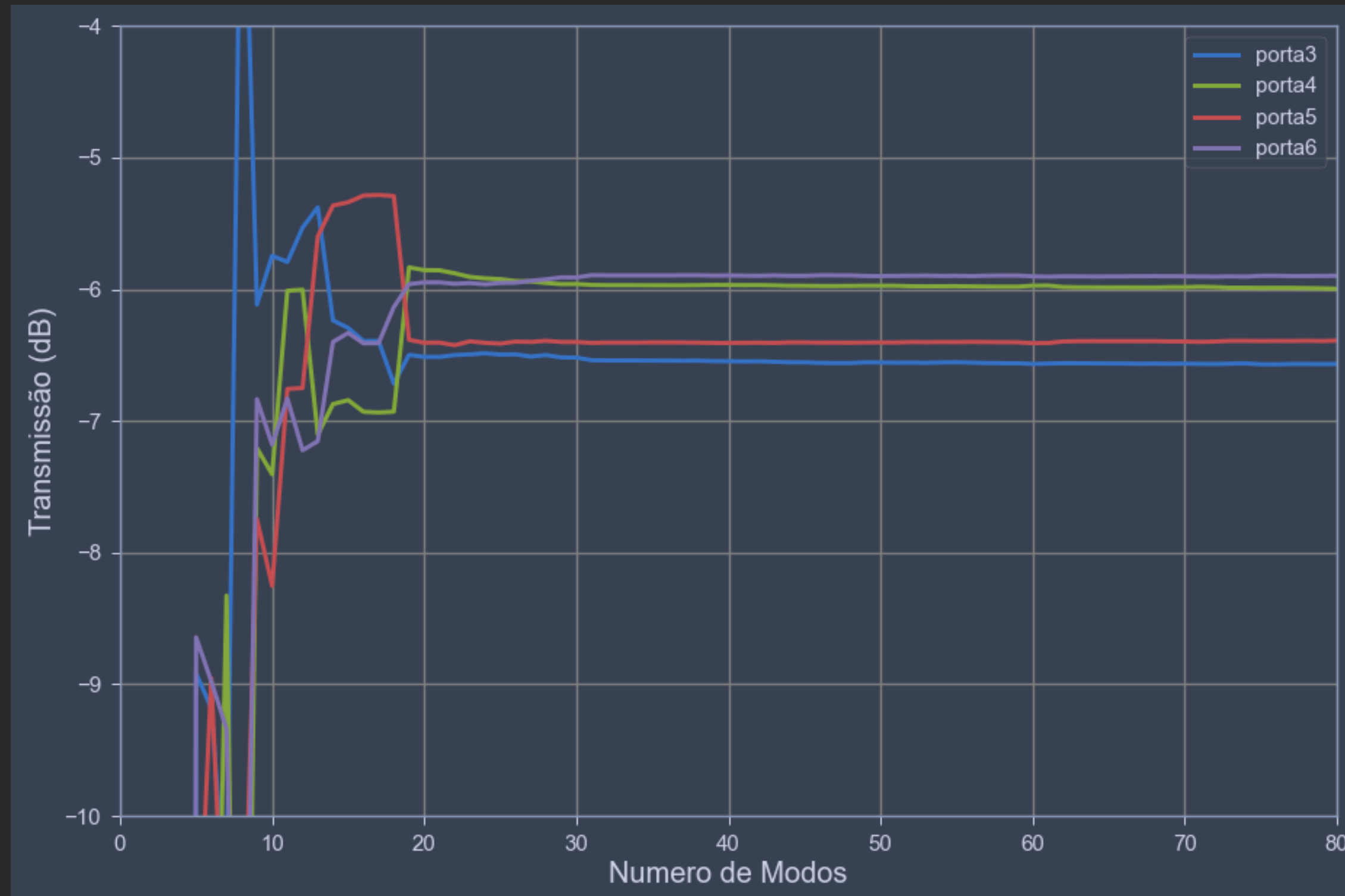
z min (μm)

z span (μm)

z max (μm)

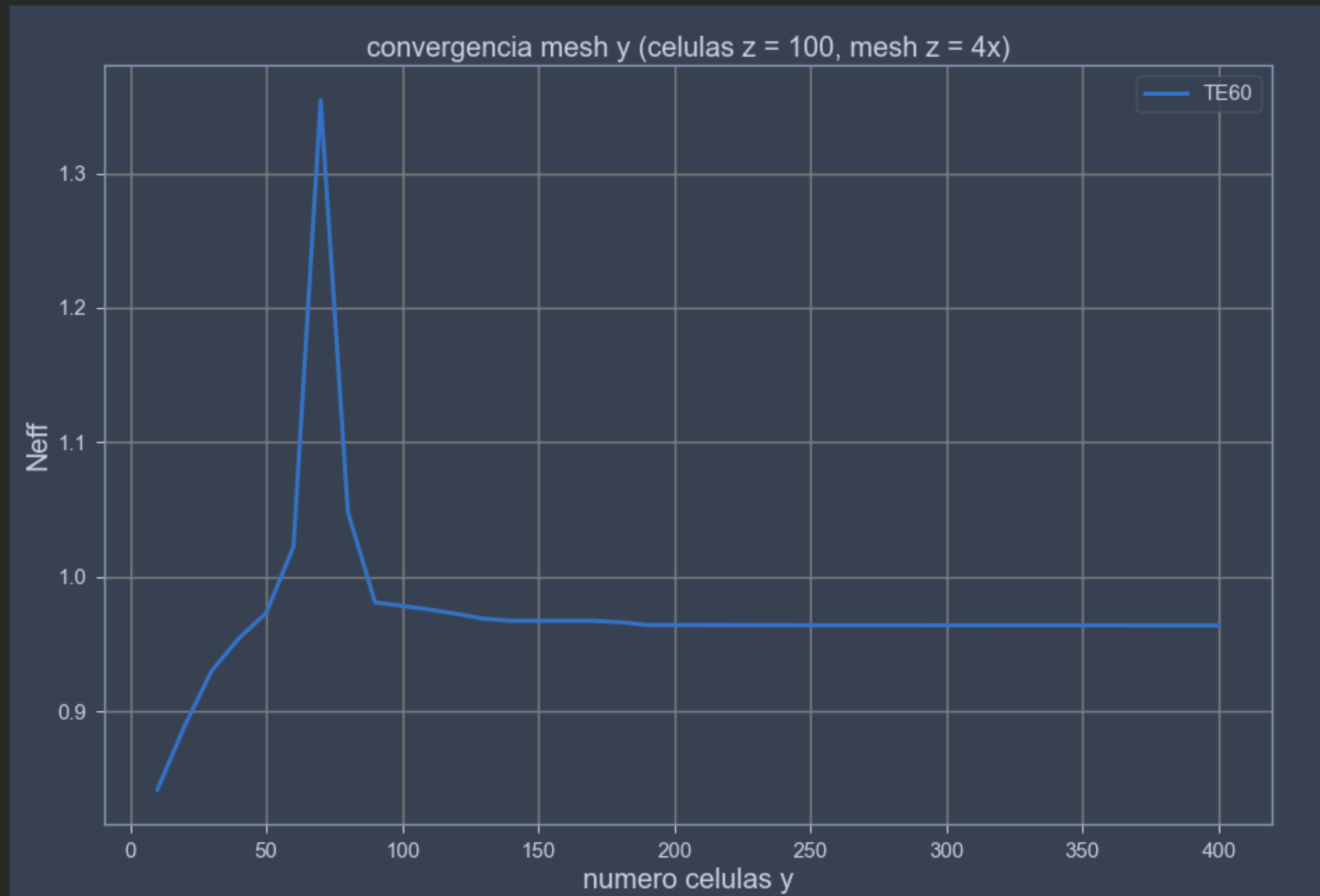
Convergência

Número de modos MMI



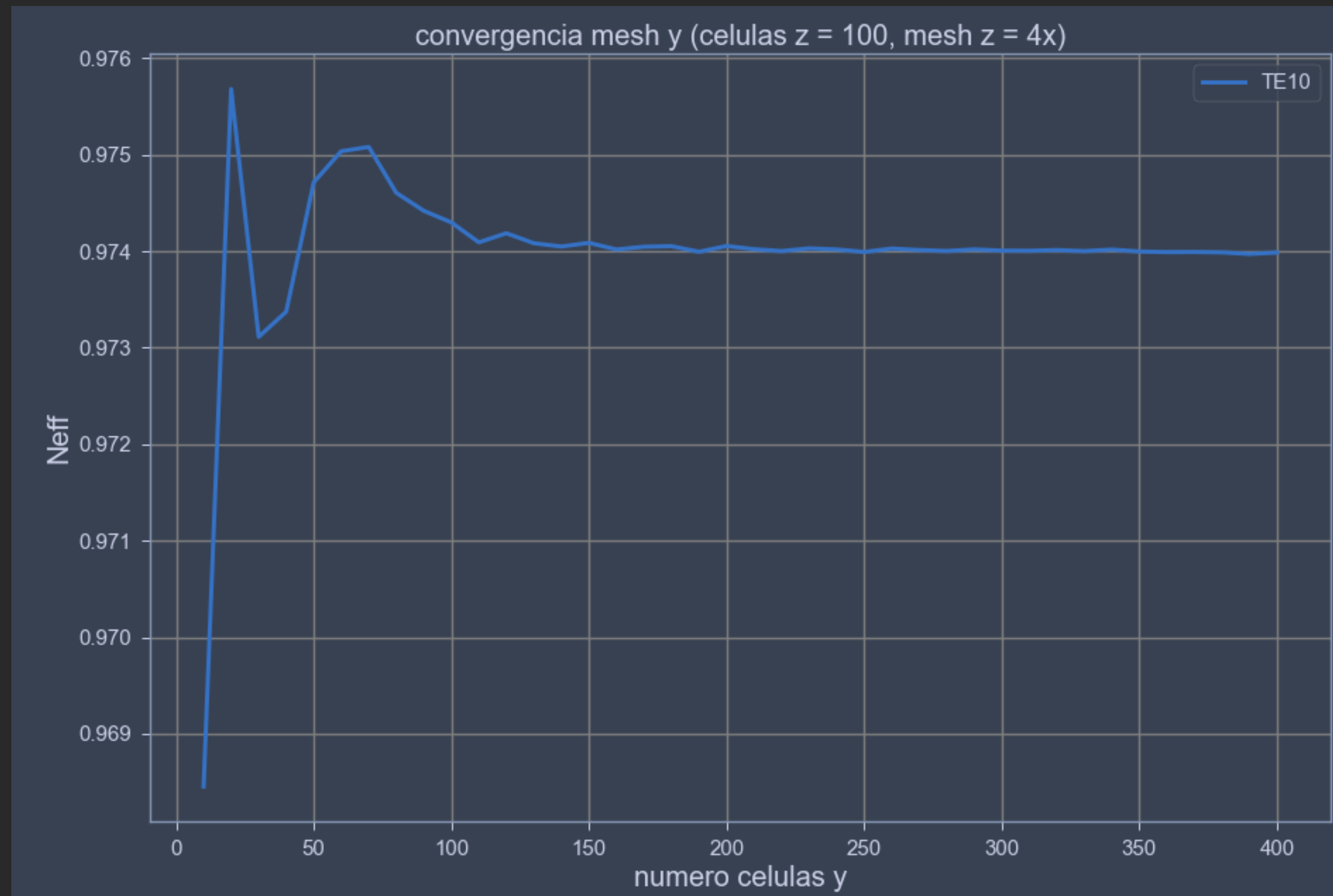
Convergência

Número de células MMI



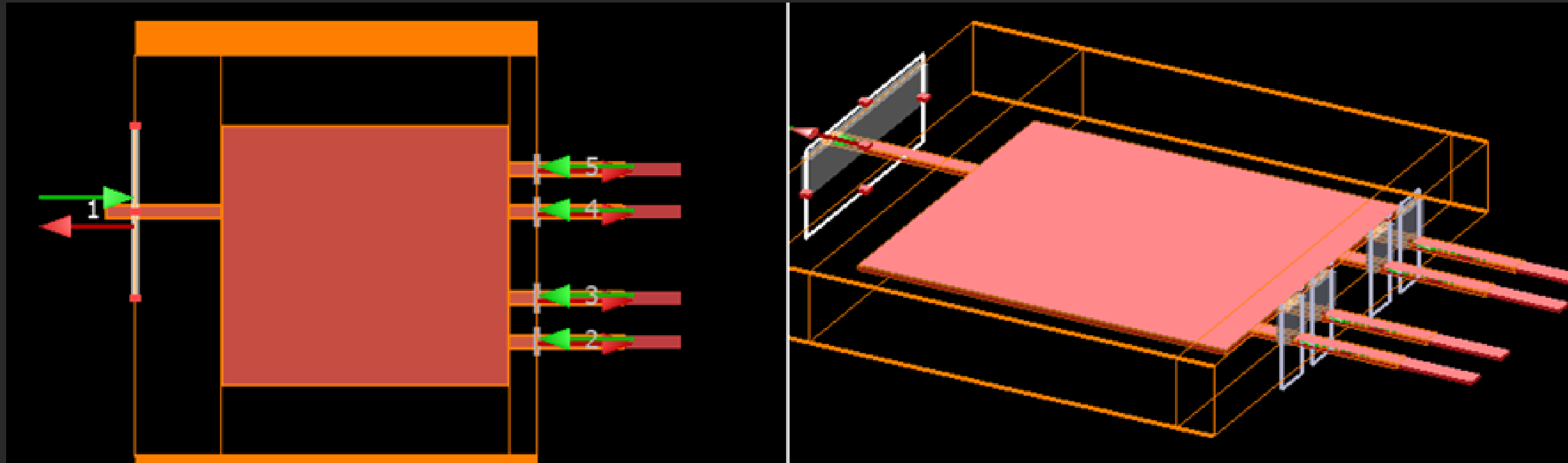
Convergência

Número de células Tappers



Primeiro Design

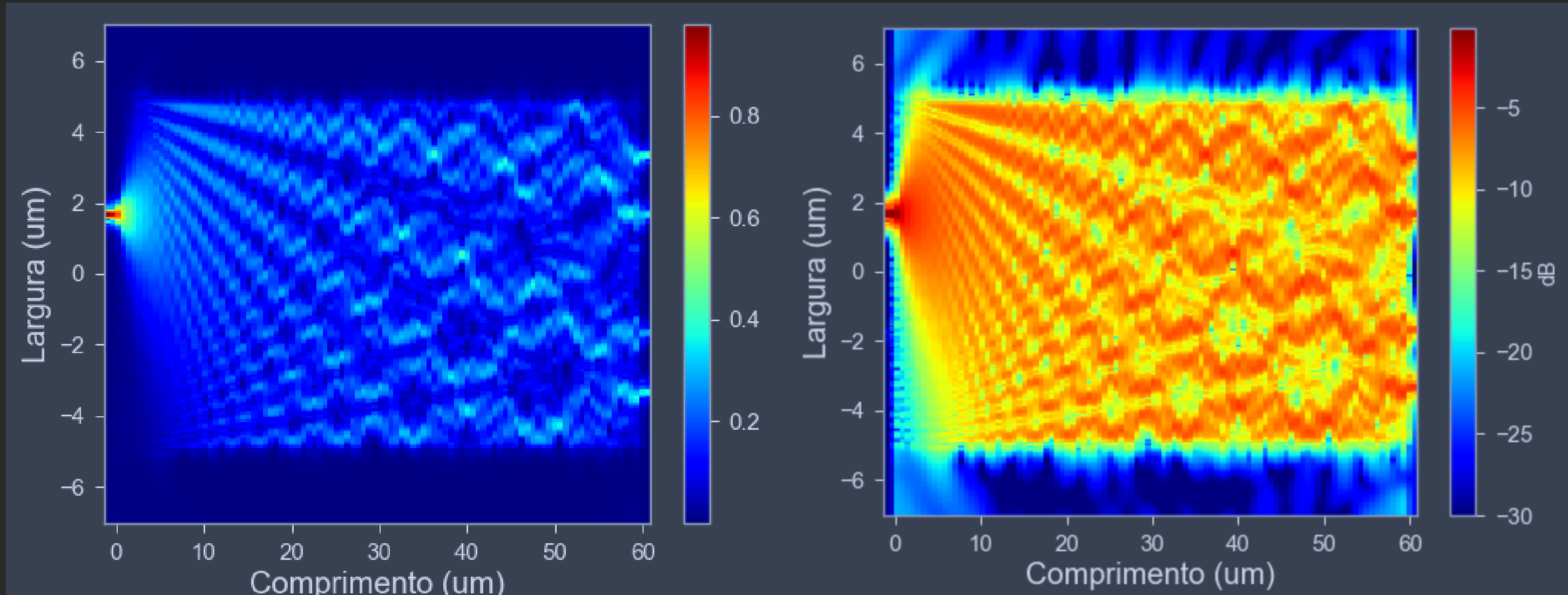
MMI sem o uso de tappers



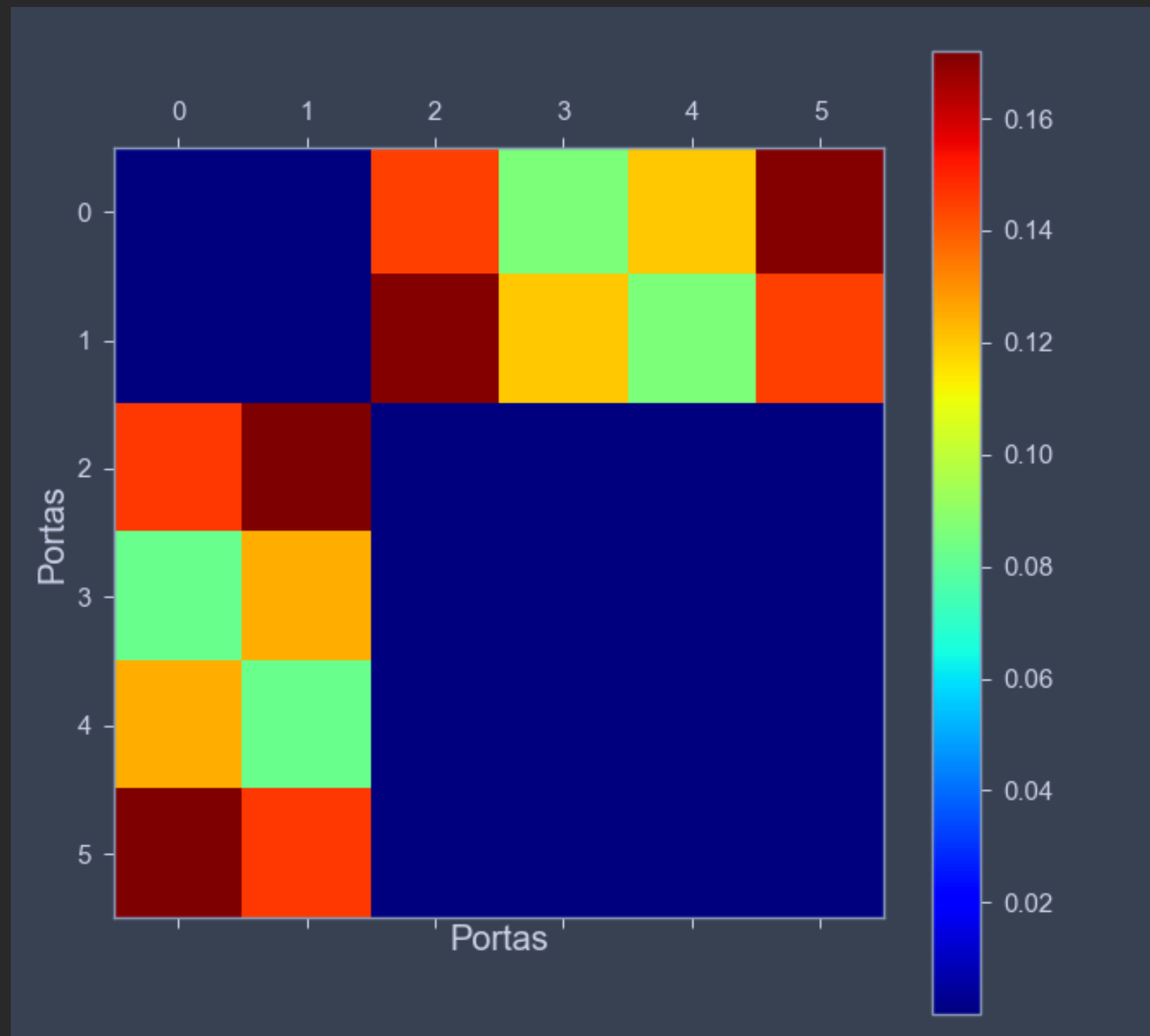
Largura do MMI: 8 μm

Comprimento do MMI: 37.3 μm

Resultados

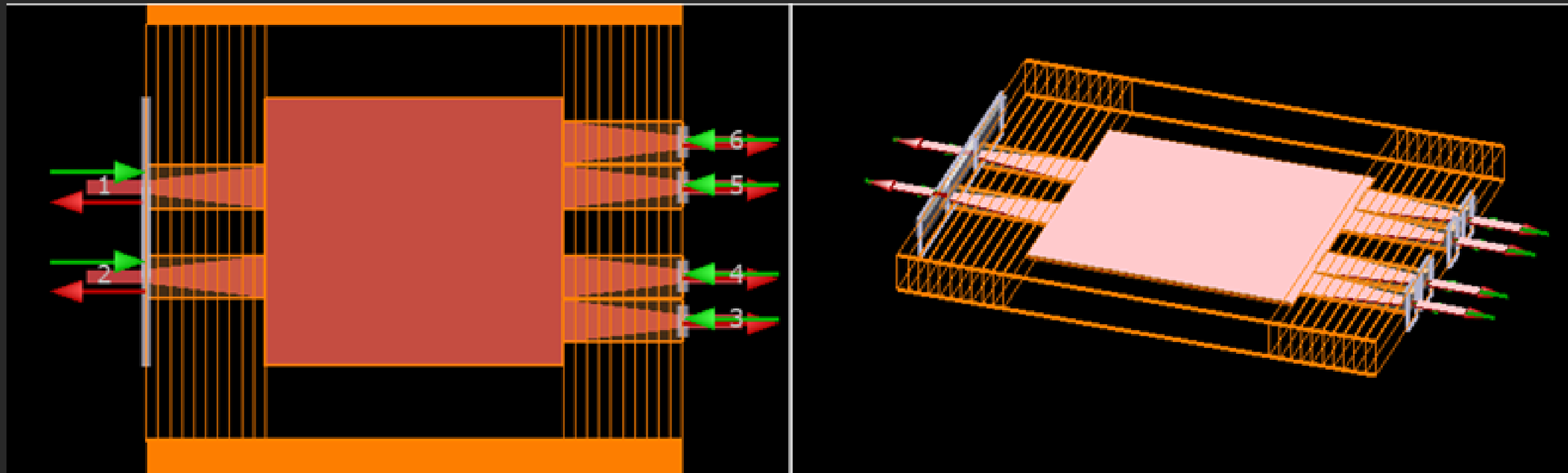


Resultados



Segundo Design

MMI com tappers

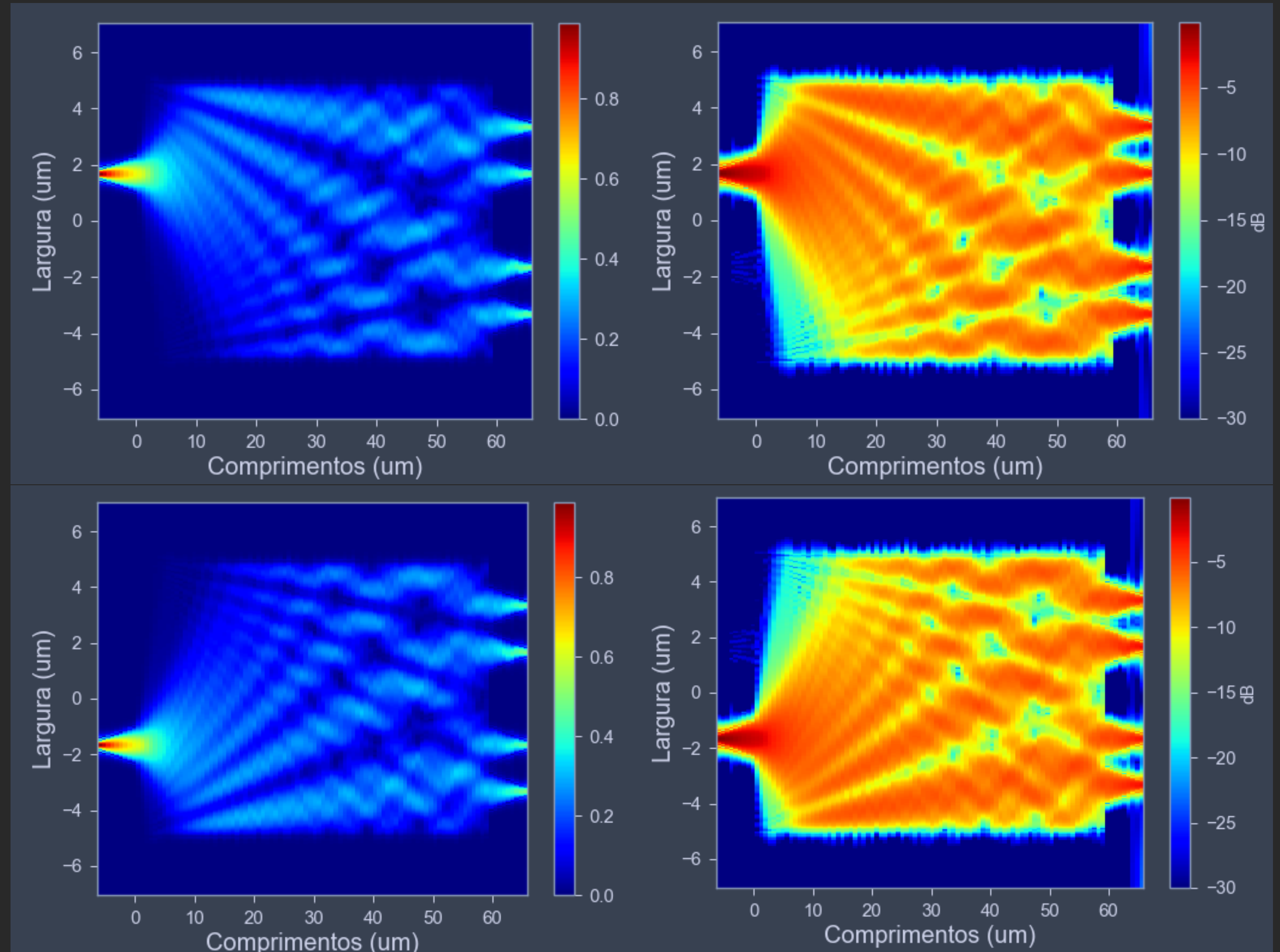


Largura: 8 μm

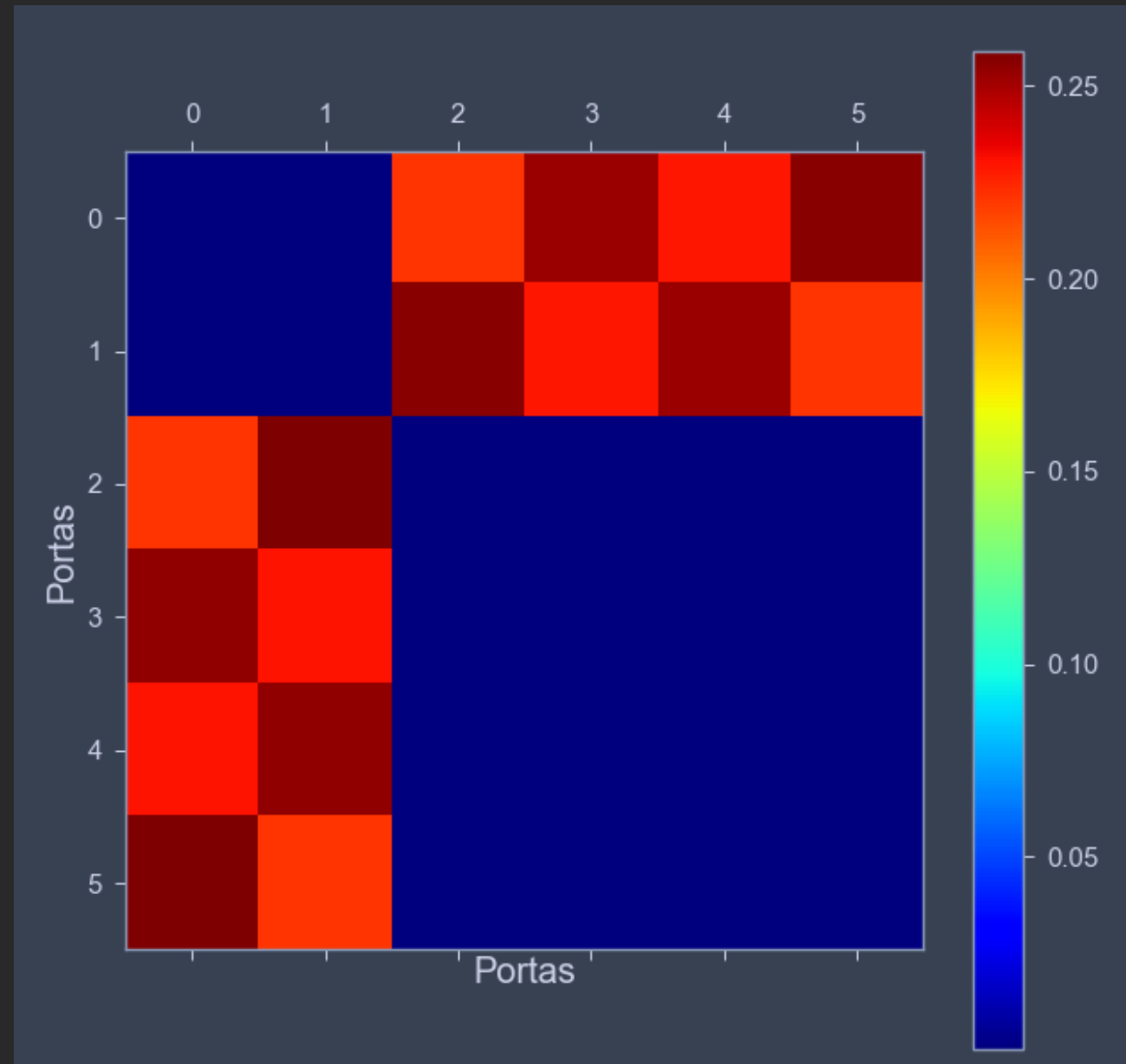
Comprimento do MMI: 37.3 μm

Espessurados Tappers: 1.3 μm

Resultados



Resultados



Transmissão	Porta 1	Porta 2
Porta 1	-46,63 dB	-52,36 dB
Porta 2	-52,36 dB	-46,63 dB
Porta 3	-6,72 dB	-6,01 dB
Porta 4	-5,82 dB	-6,88 dB
Porta 5	-6,88 dB	-5,82 dB
Porta 6	-6,01 dB	-6,716 dB
Perdas	-11,57 dB	-11,57 dB

Otimizações

Largura do MMI: 10 μm

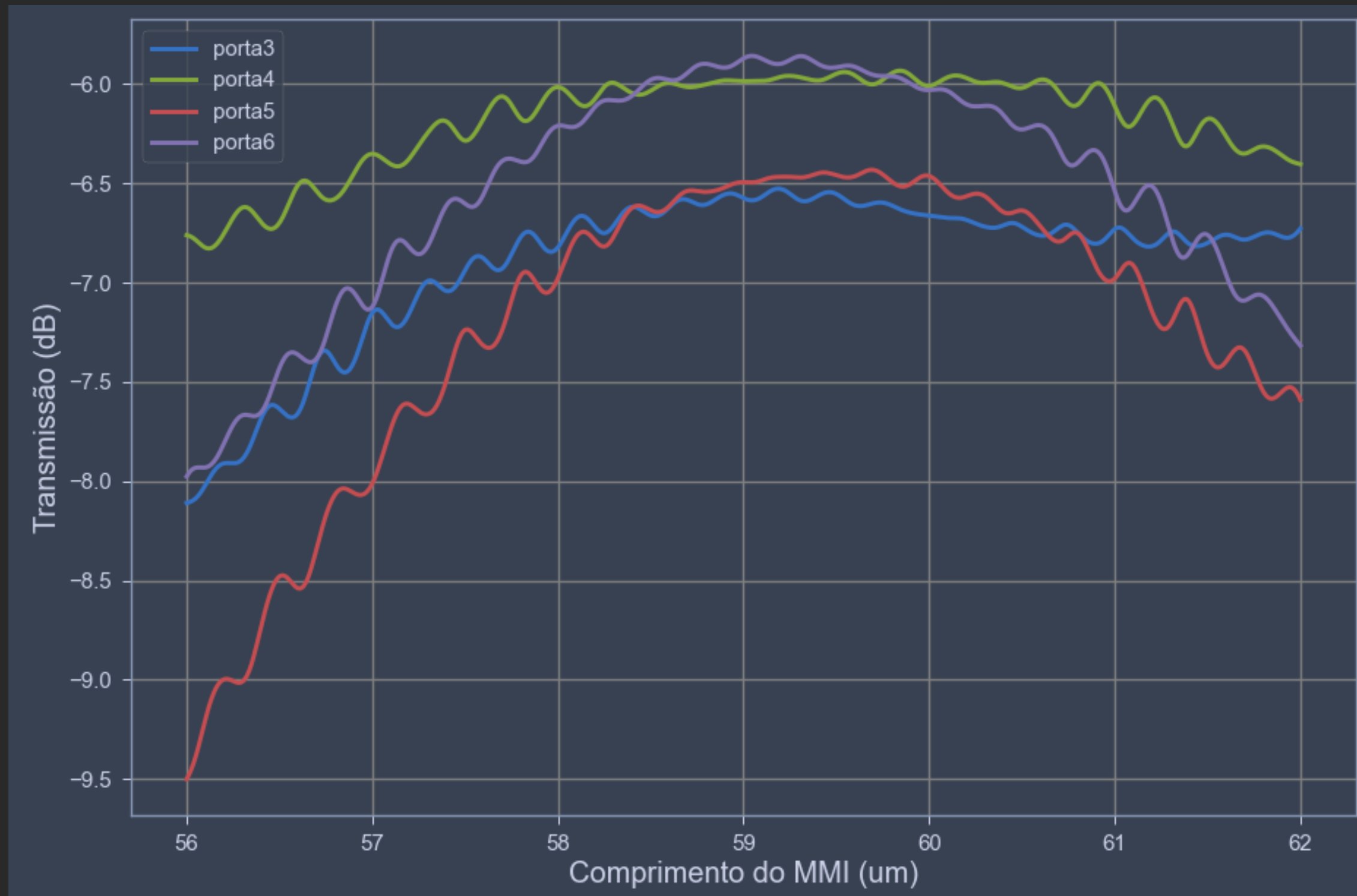
Espessura dos tappers: 1.5 μm

Comprimento teorico do MMI: 57.8 μm

Transmissão	Porta 1	Porta 2
Porta 1	-58.32 dB	-52,36 dB
Porta 2	-73.40 dB	-46,63 dB
Porta 3	-6.60 dB	-5.83 dB
Porta 4	-5.84 dB	-6.44 dB
Porta 5	-6.44 dB	-5.84 dB
Porta 6	-5.83 dB	-6.60 dB
Perdas	-14.92 dB	-14.92 dB

Otimizações

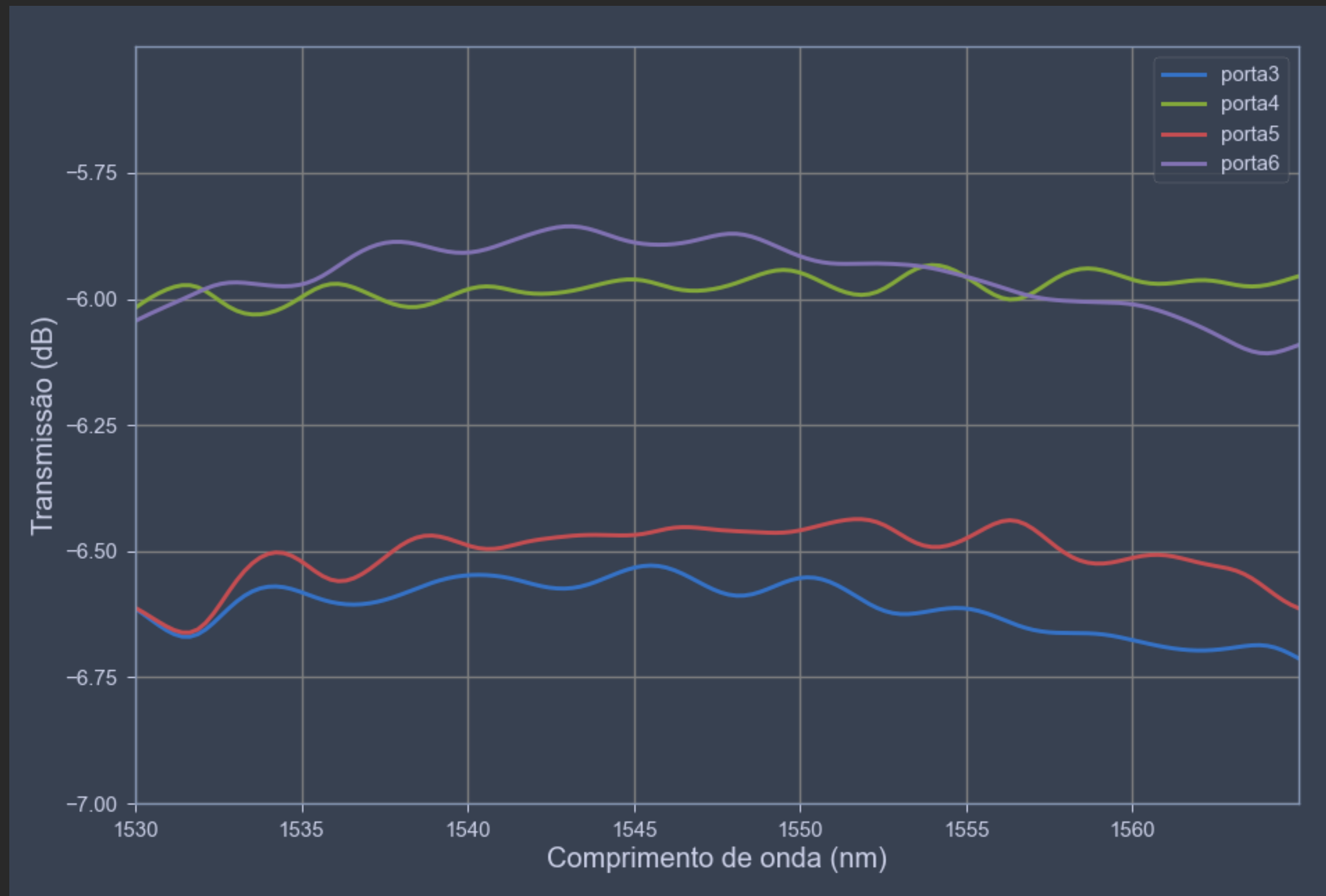
Análise experimental do comprimento



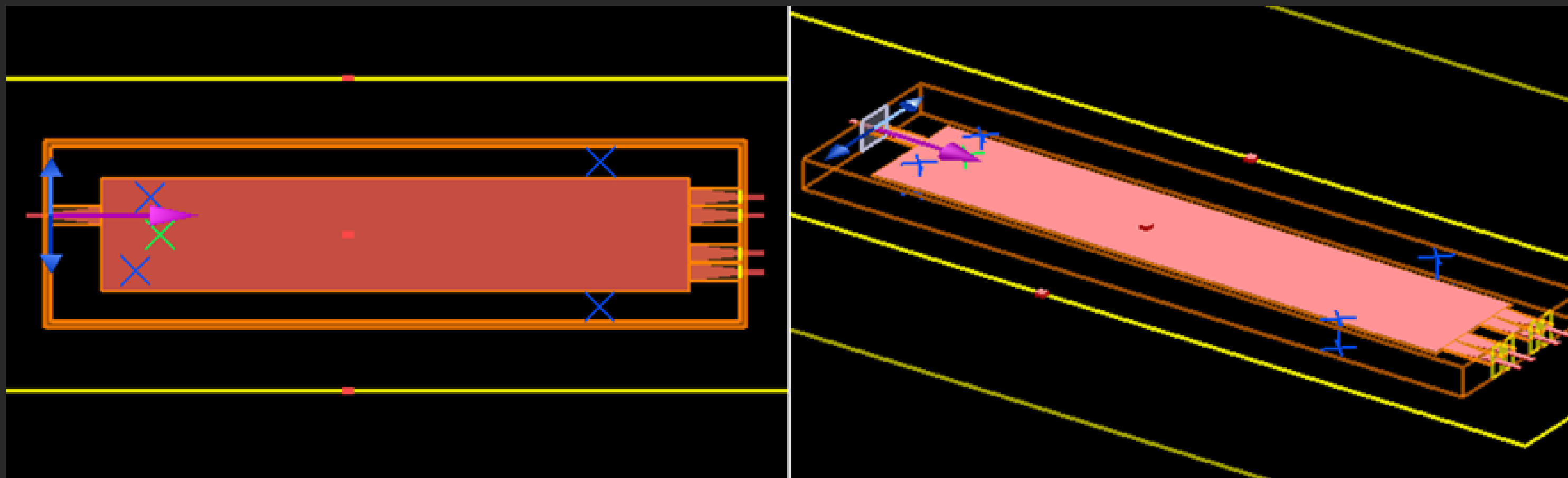
Resultados finais EME

Transmissão	Porta 1	Porta 2
Porta 1	-52.53 dB	-52,36 dB
Porta 2	-59.84dB	-46,63 dB
Porta 3	-6.55 dB	-5.86dB
Porta 4	-5.94 dB	-6.37 dB
Porta 5	-6.37 dB	-5.94dB
Porta 6	-5.86 dB	-6.55 dB
Perdas	-14.49 dB	-14.49 dB

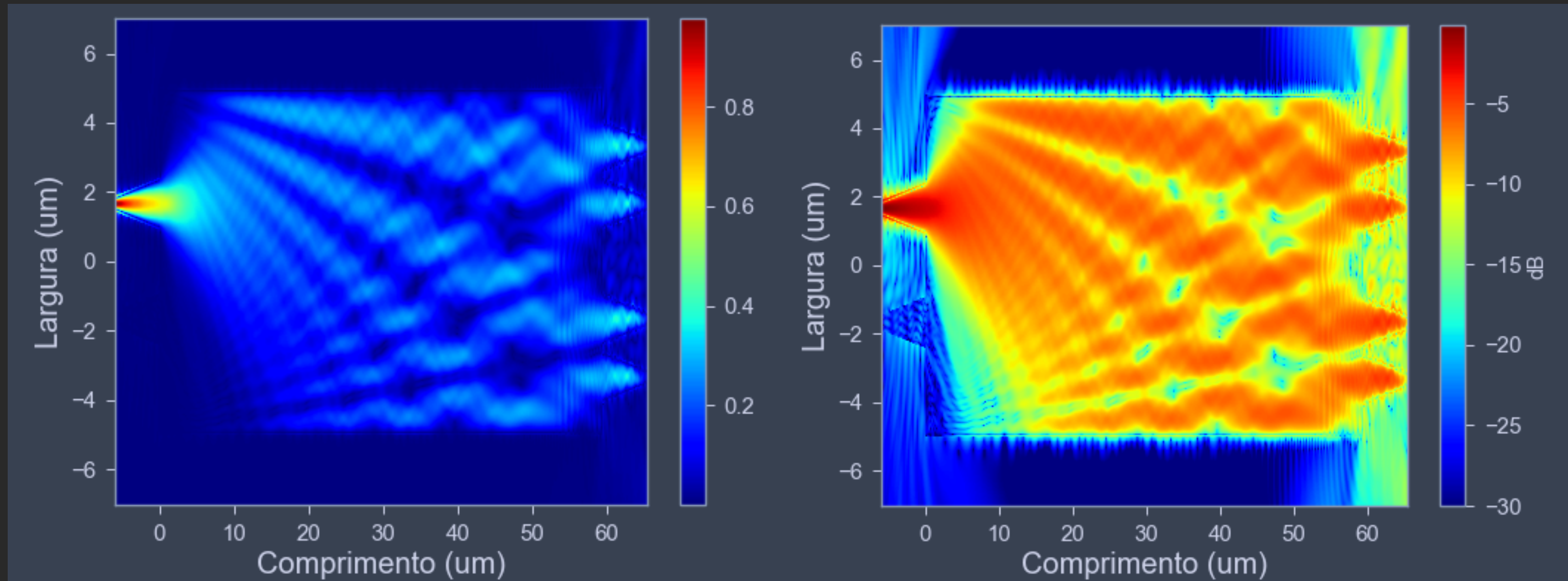
Resultados finais EME



Simulação VarFDTD



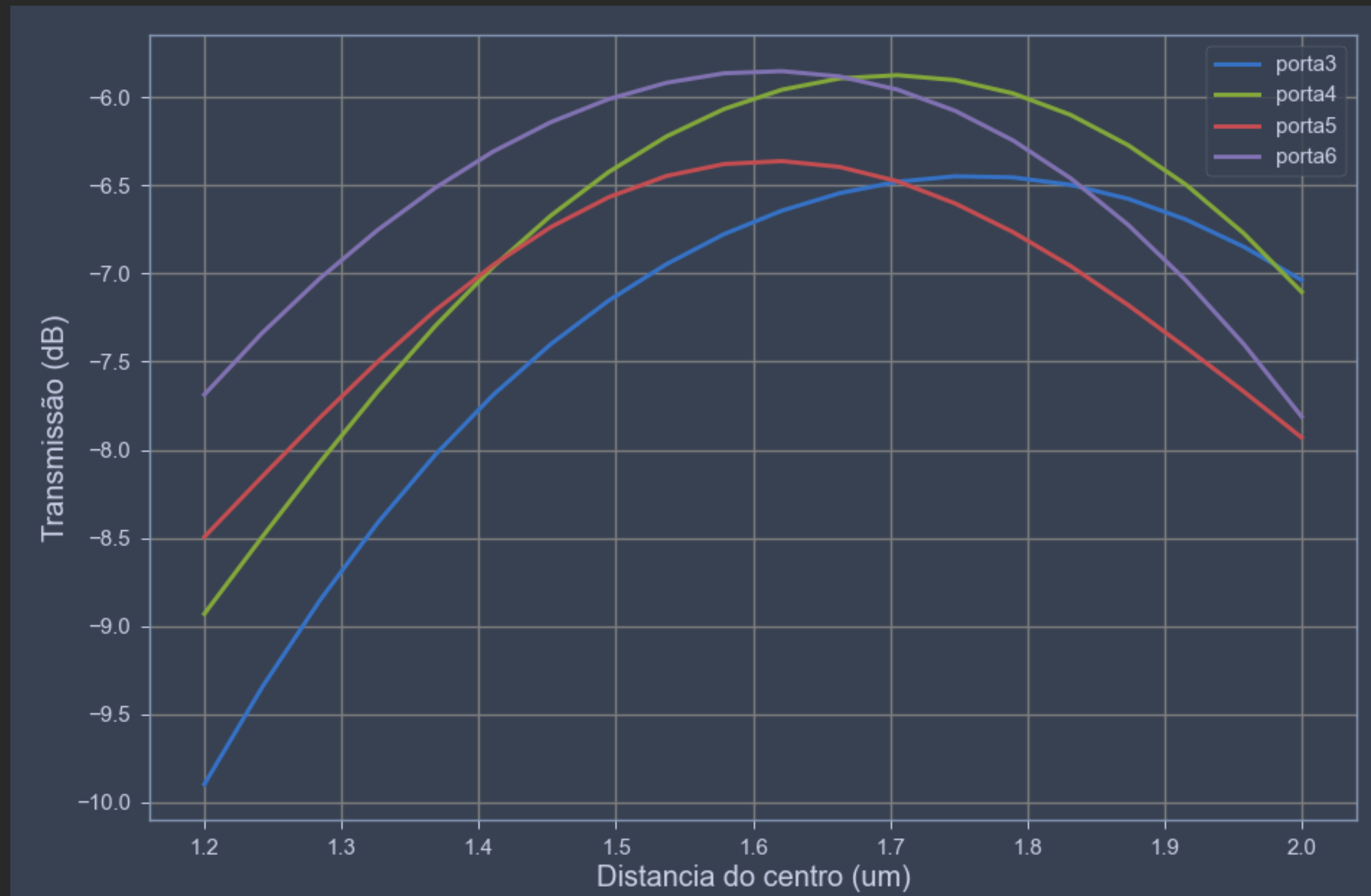
Resultados



SEMANA 3

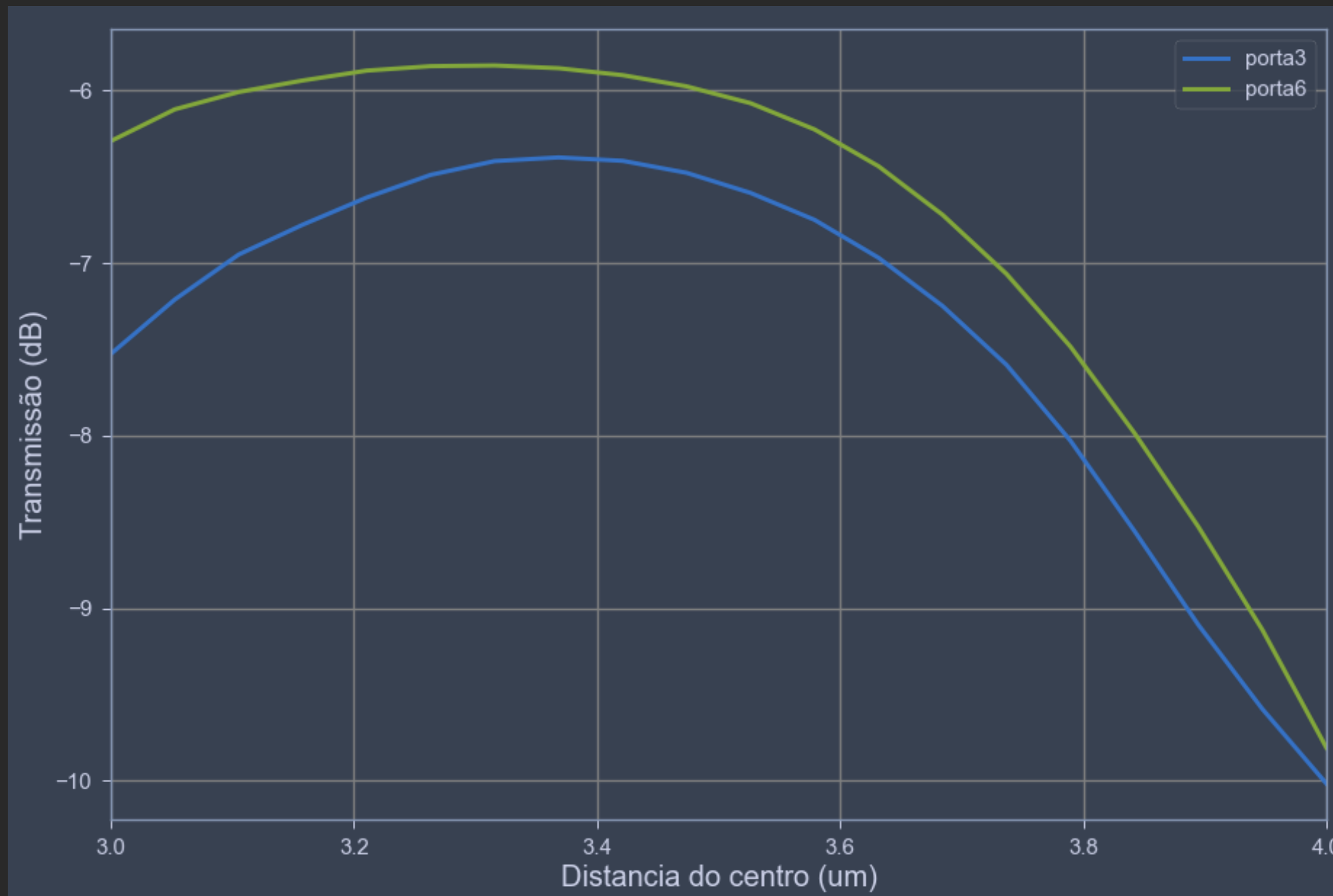
Otimizações das portas

Entrada



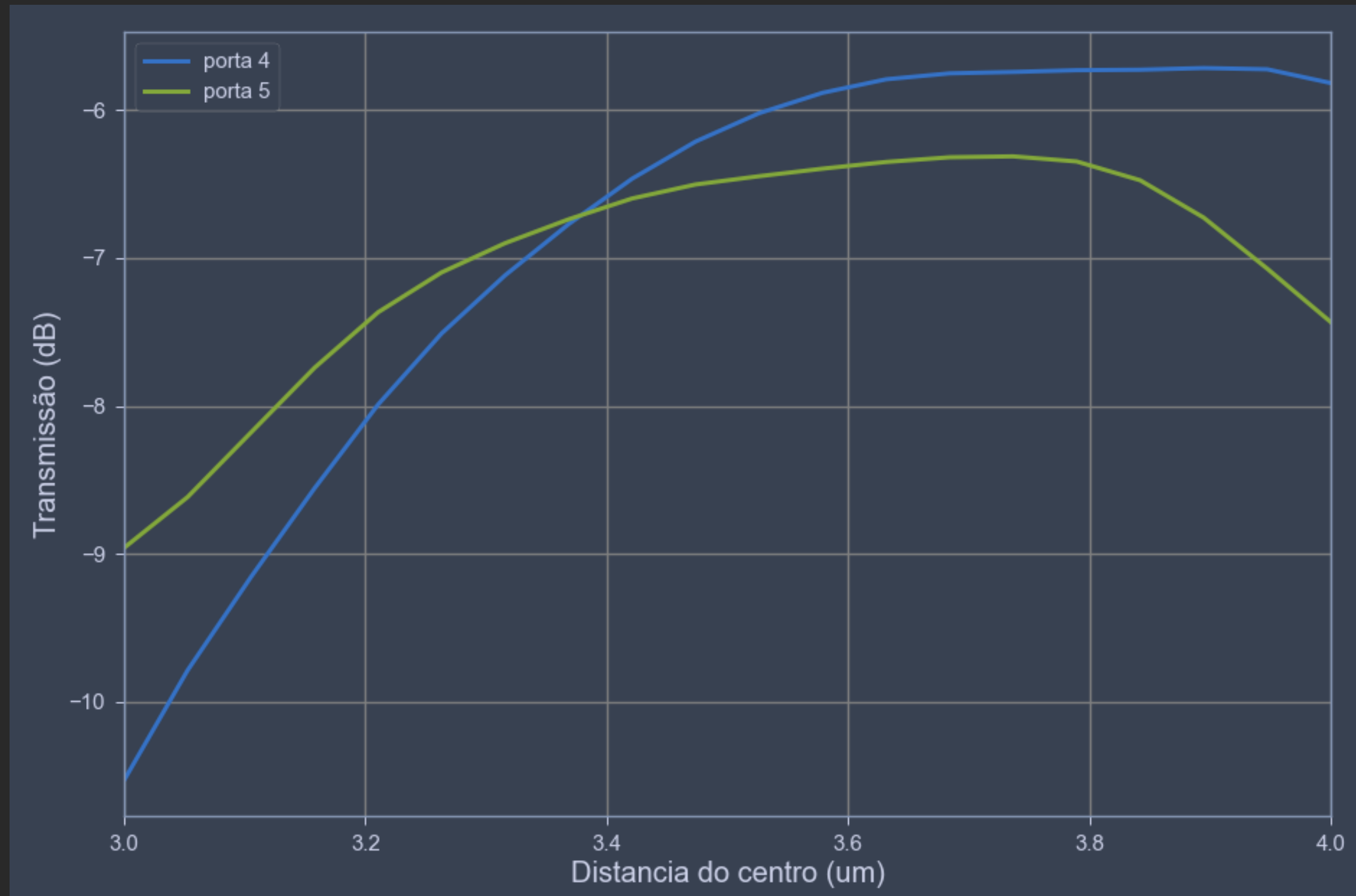
Otimizações das portas

Portas 3 e 6



Otimizações das portas

Portas 4 e 5



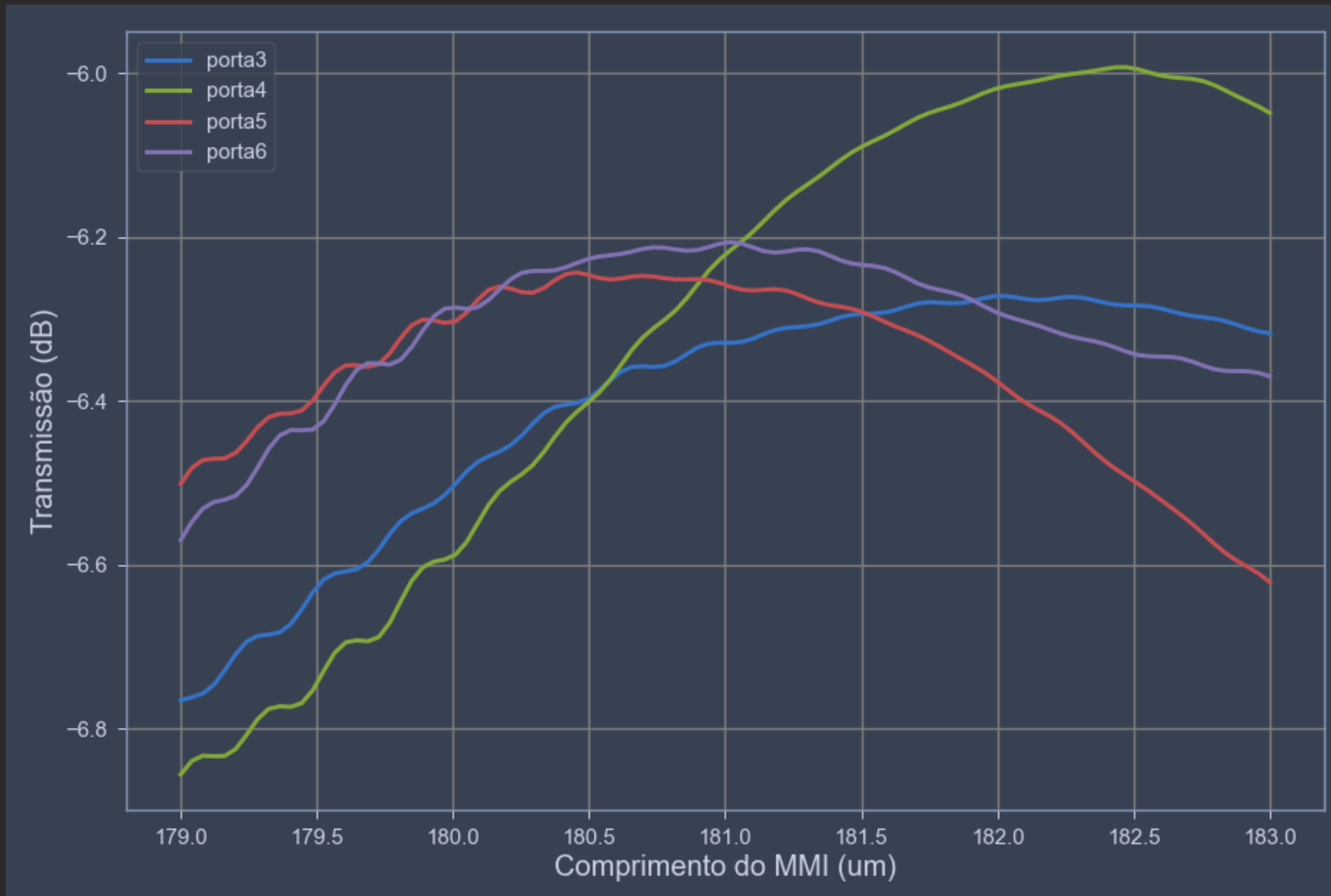
Solução

Novo design com interferência geral



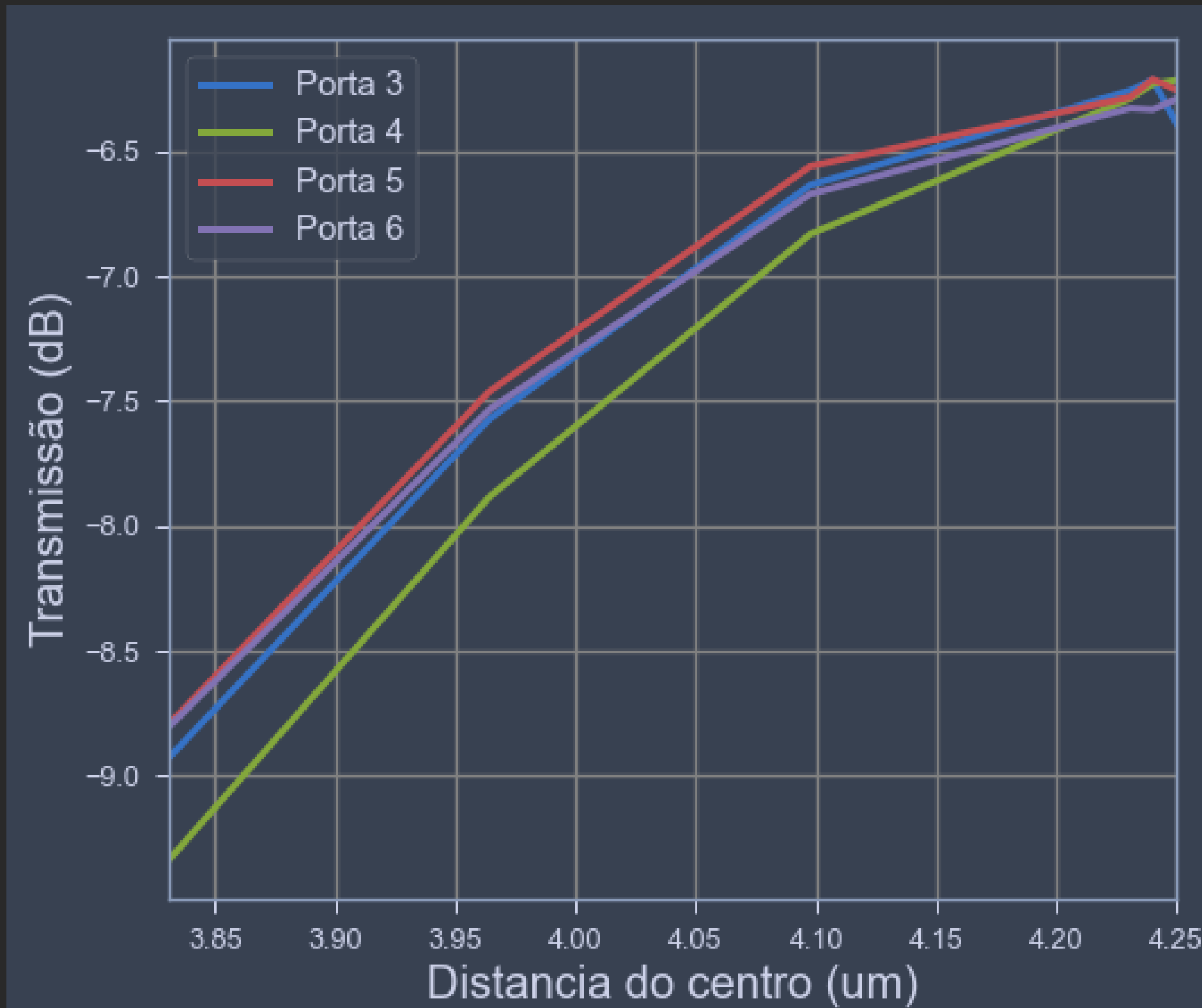
Otimizações

Comprimento do MMI



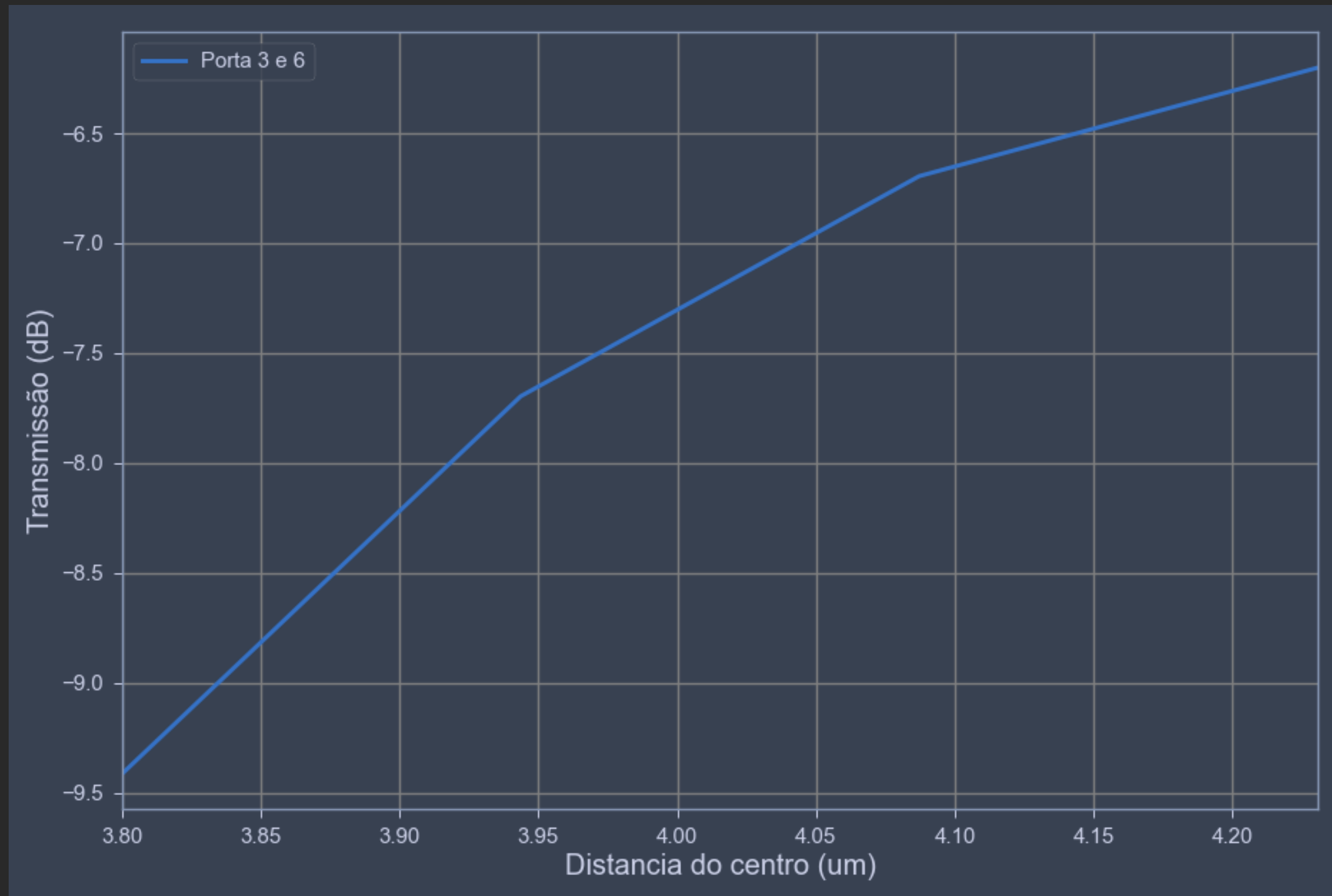
Otimizações

Posição da entrada



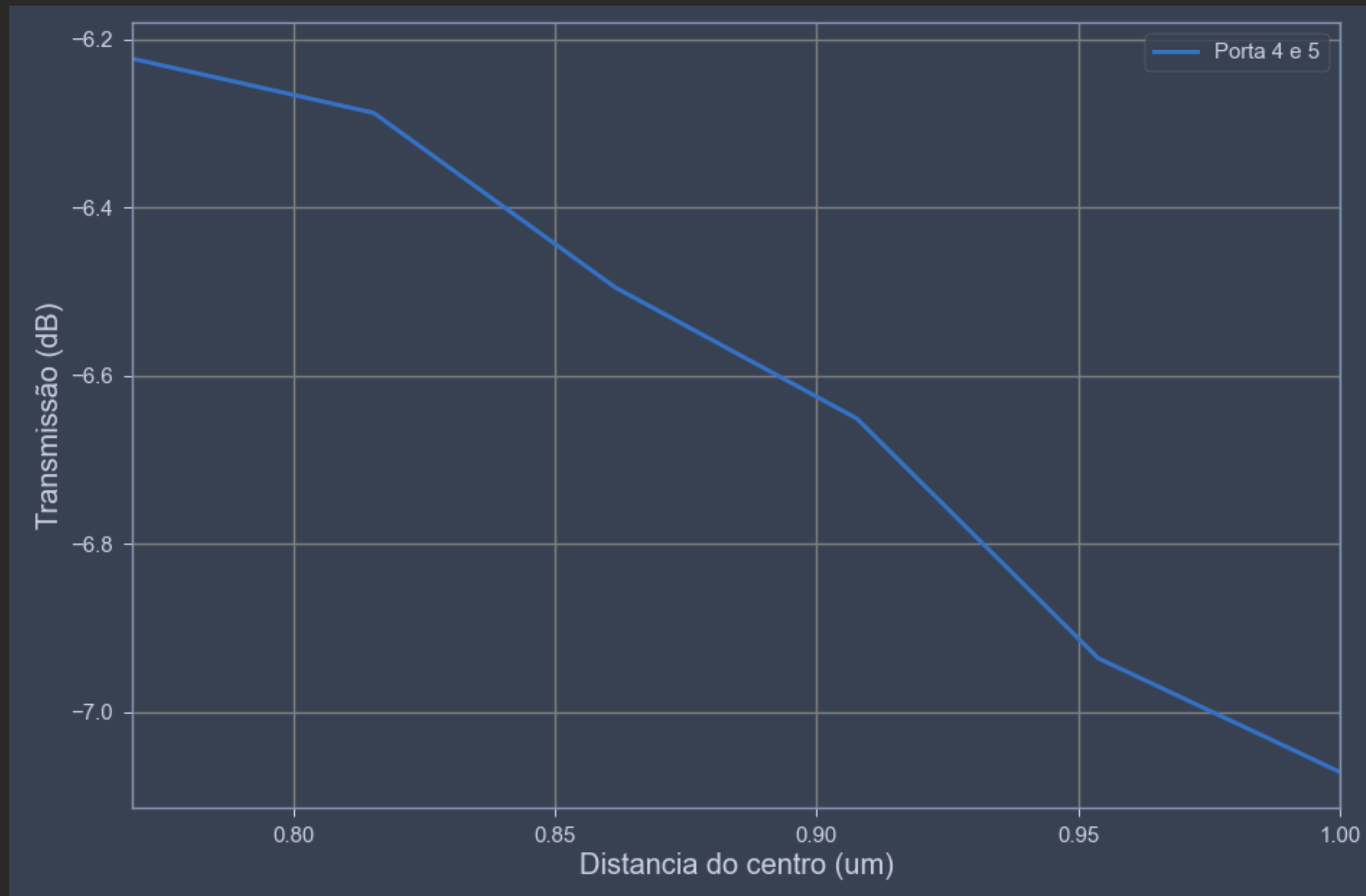
Otimizações

Posição das portas 3 e 6

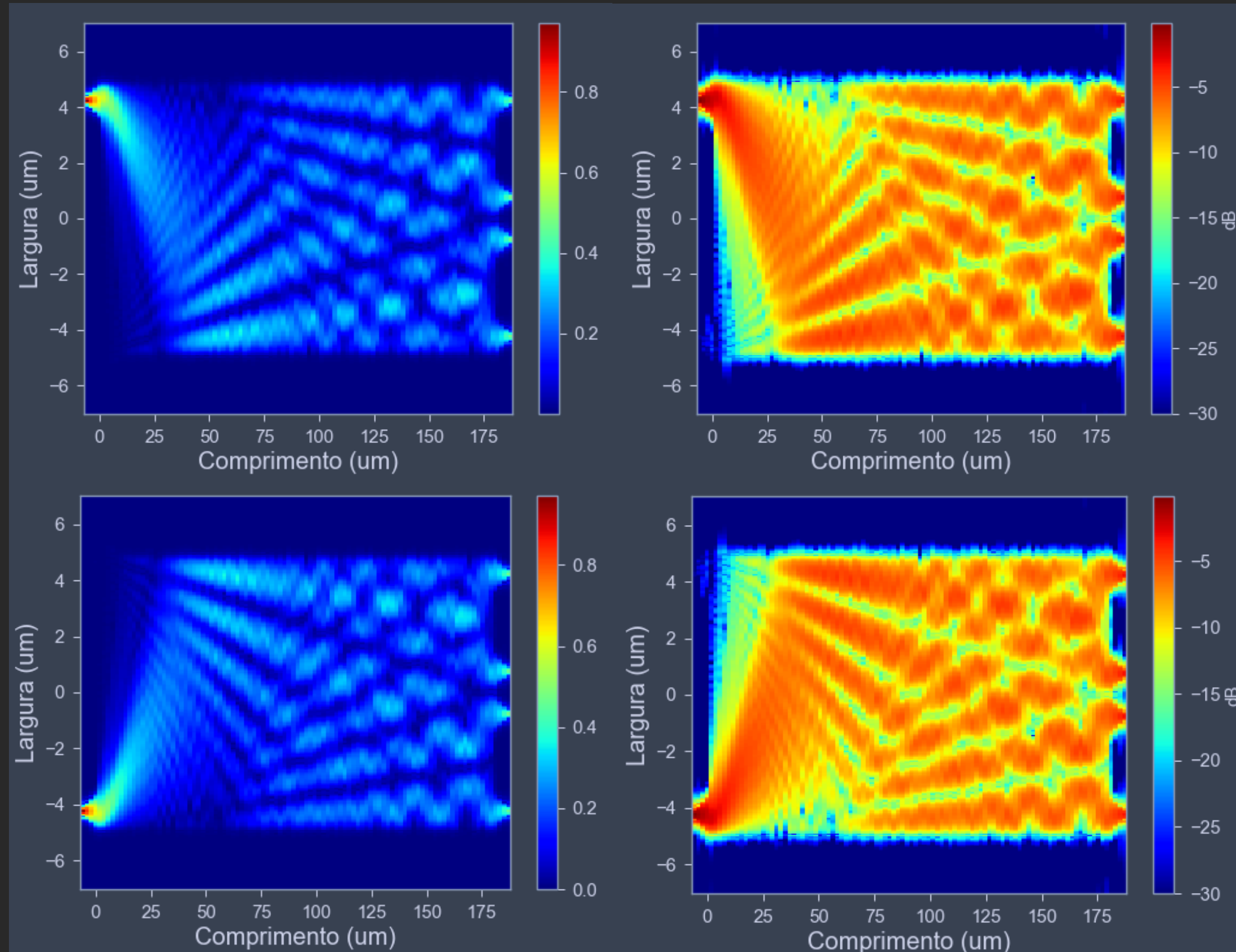


Otimizações

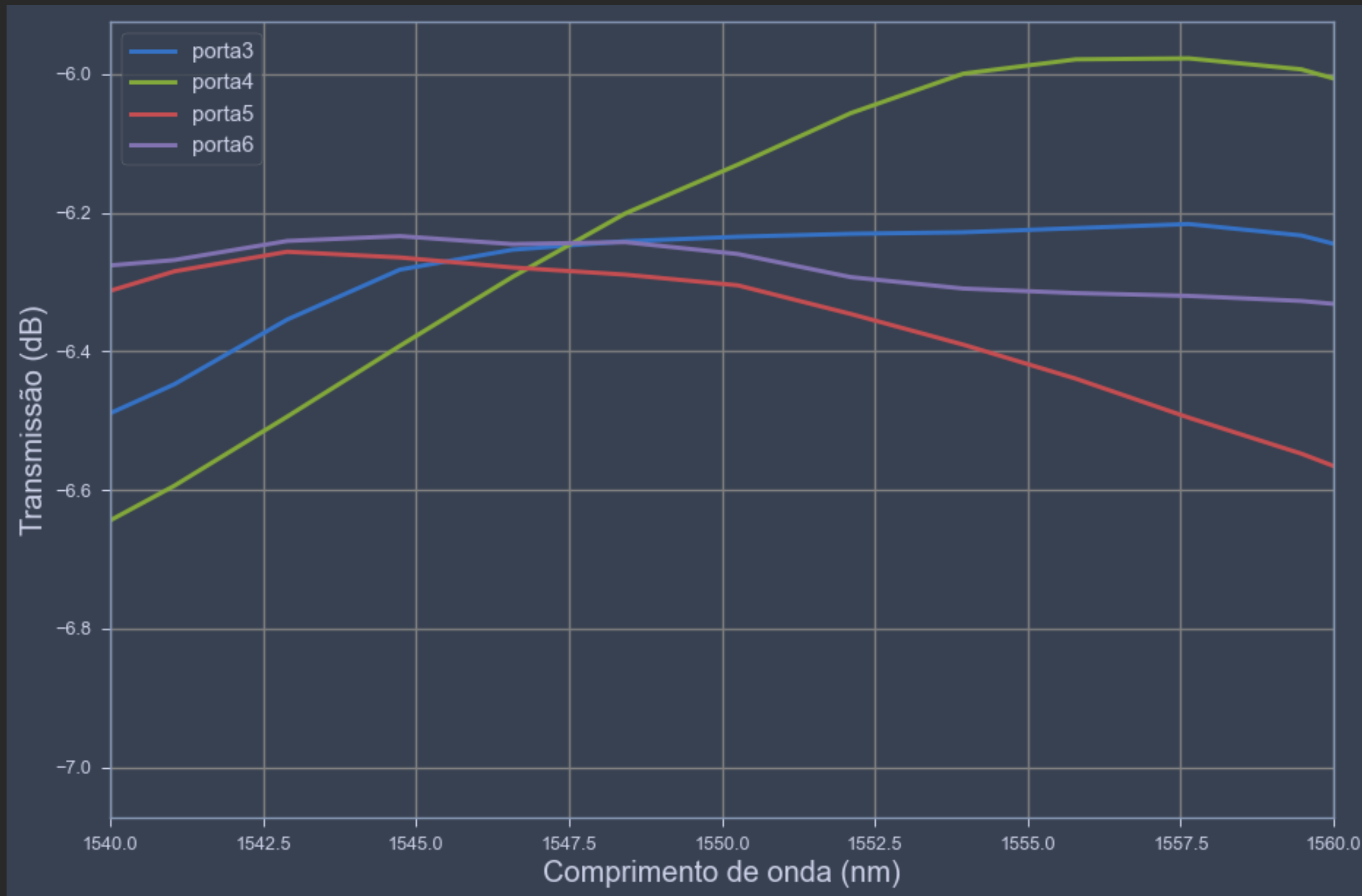
Posição das portas 4 e 5



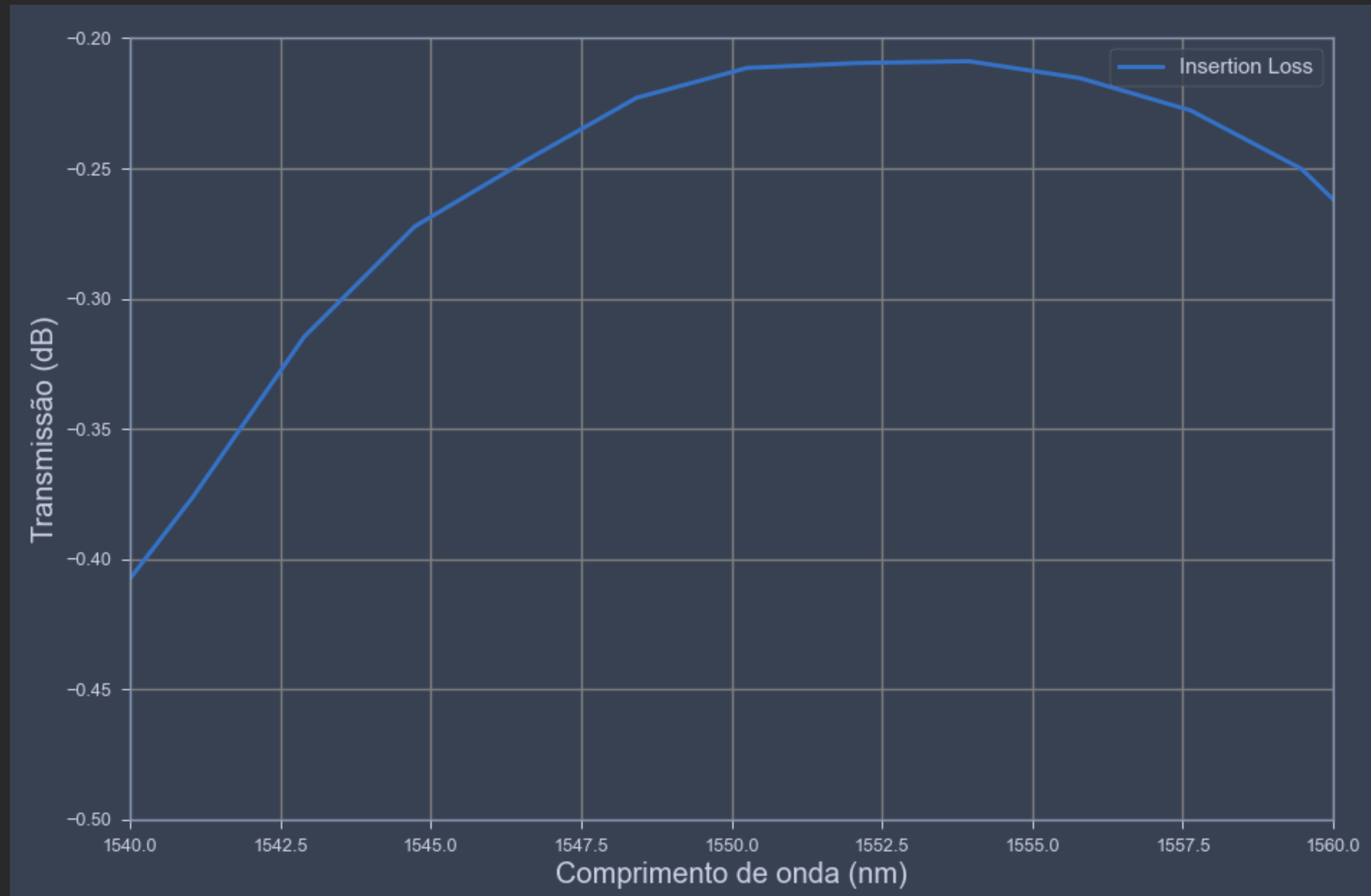
Resultados



Resultados



Resultados



Resultados EME

Comprimento de 1547 nm

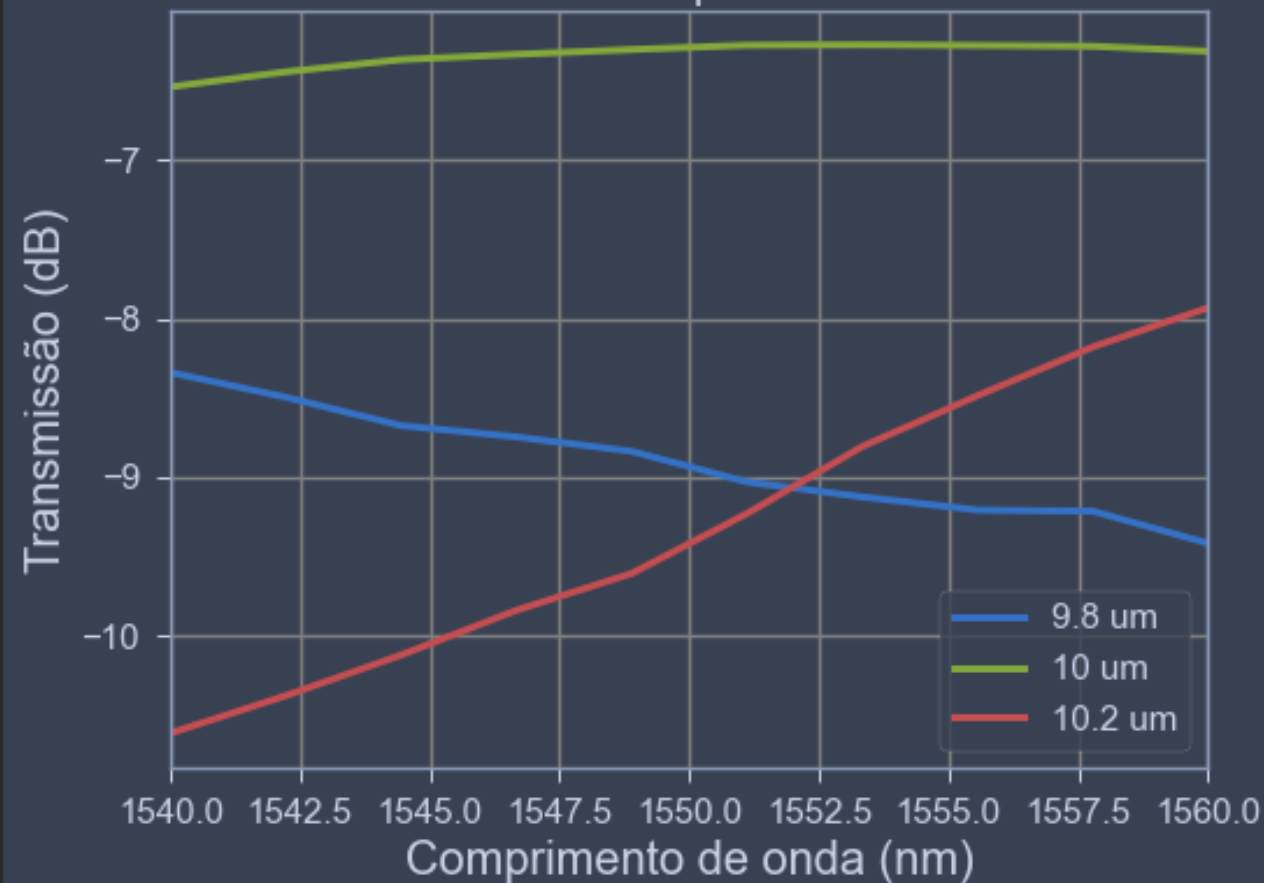
Transmissão	Porta 1	Porta 2
Porta 1	-49.14 dB	-46.84 dB
Porta 2	-46.84 dB	-49.11 dB
Porta 3	-6.32 dB	-6.21 dB
Porta 4	-6.21 dB	-6.25 dB
Porta 5	-6.25 dB	-6.21 dB
Porta 6	-6.20 dB	-6.31 dB

Insertion Loss	Porta 1	Porta 2
	-0.23 dB	-0.22 dB

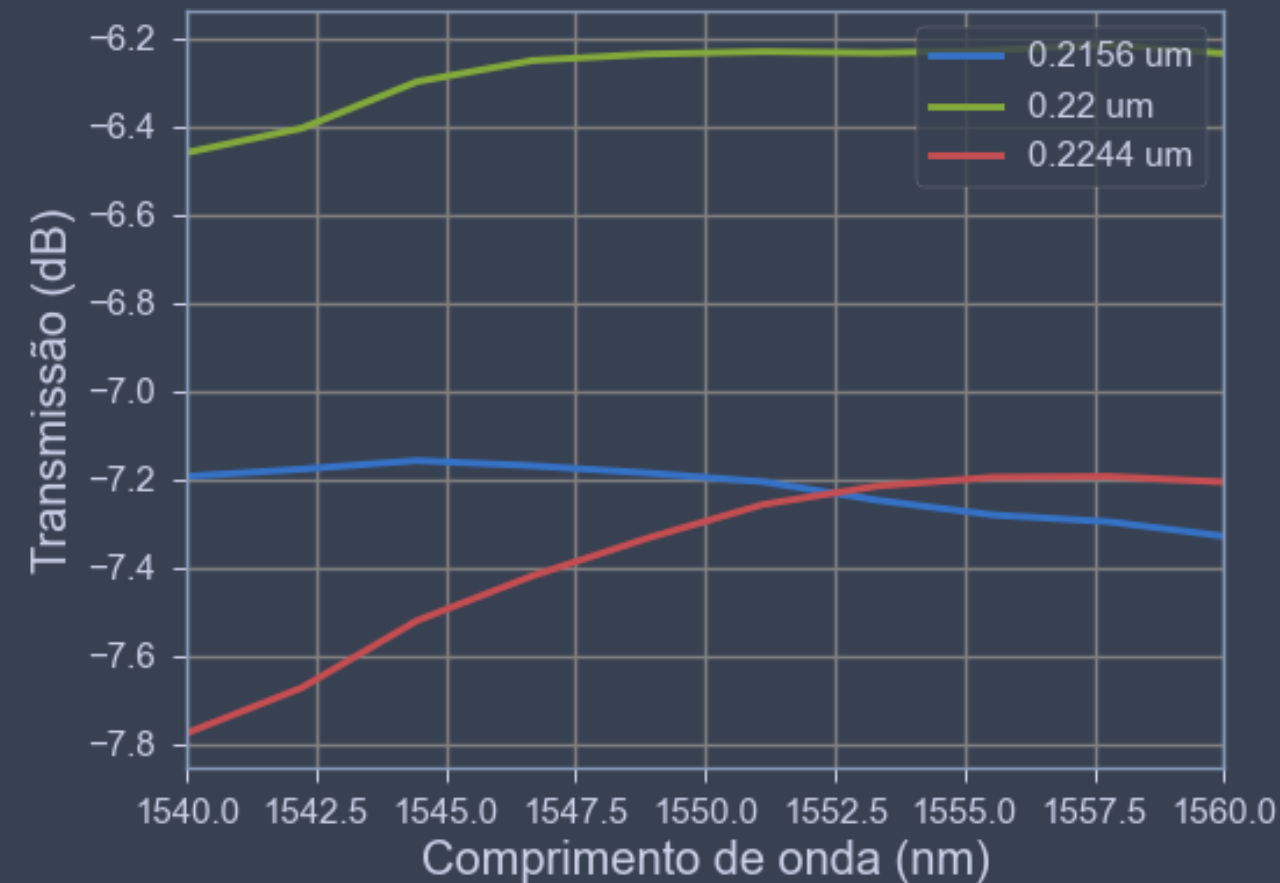
Analise de tolerancia

Porta 3

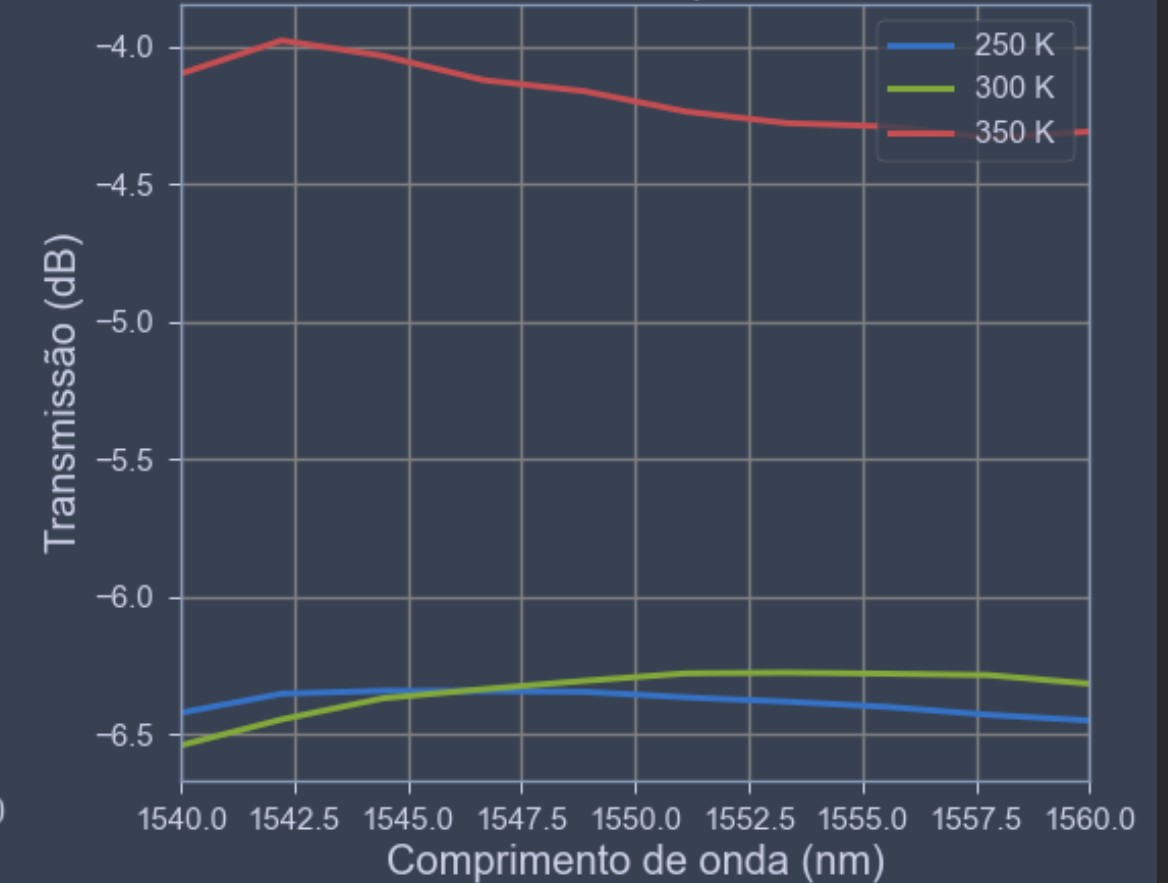
Tolerancia espessura MMI



Tolerancia altura MMI



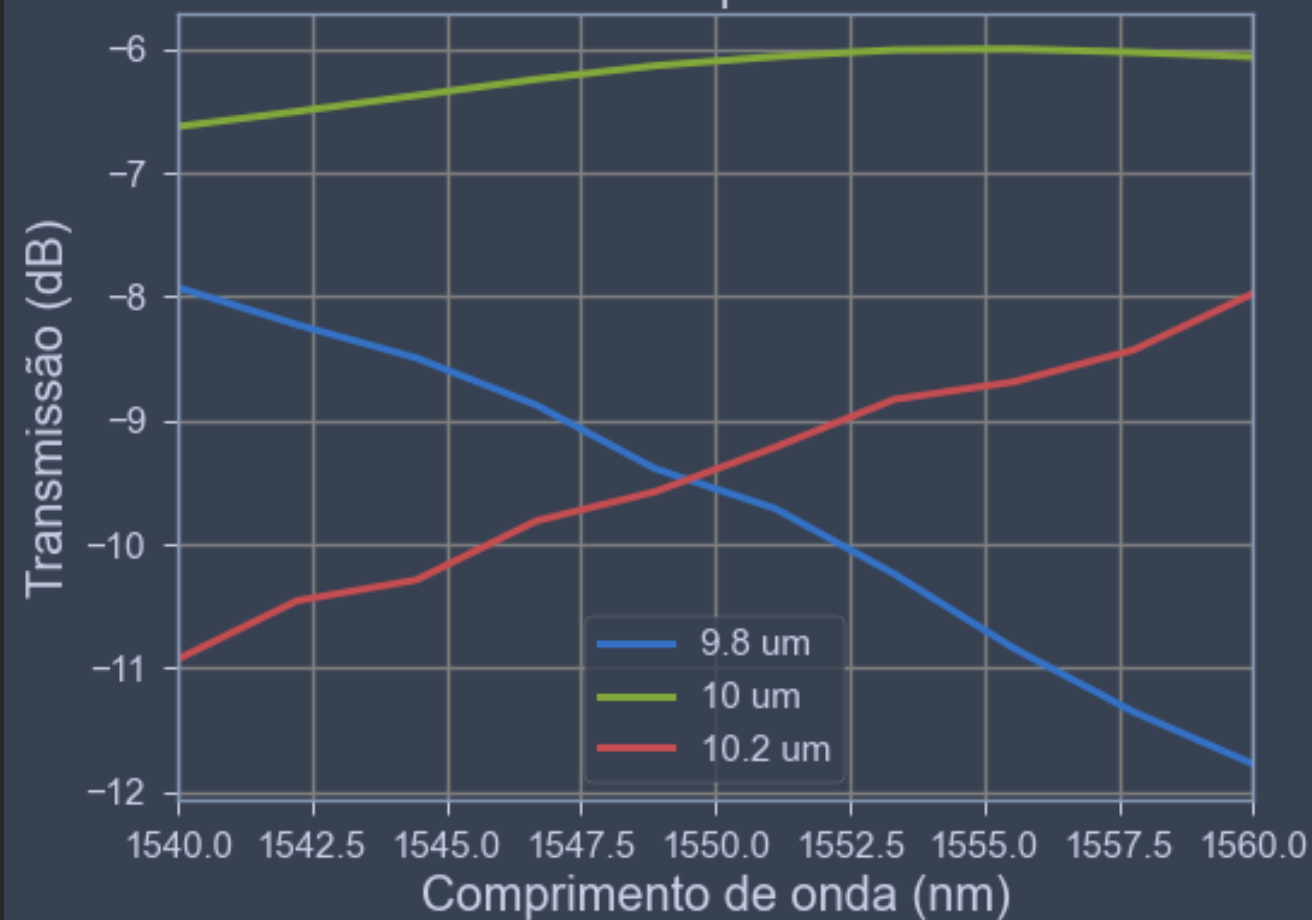
Tolerancia temperatura



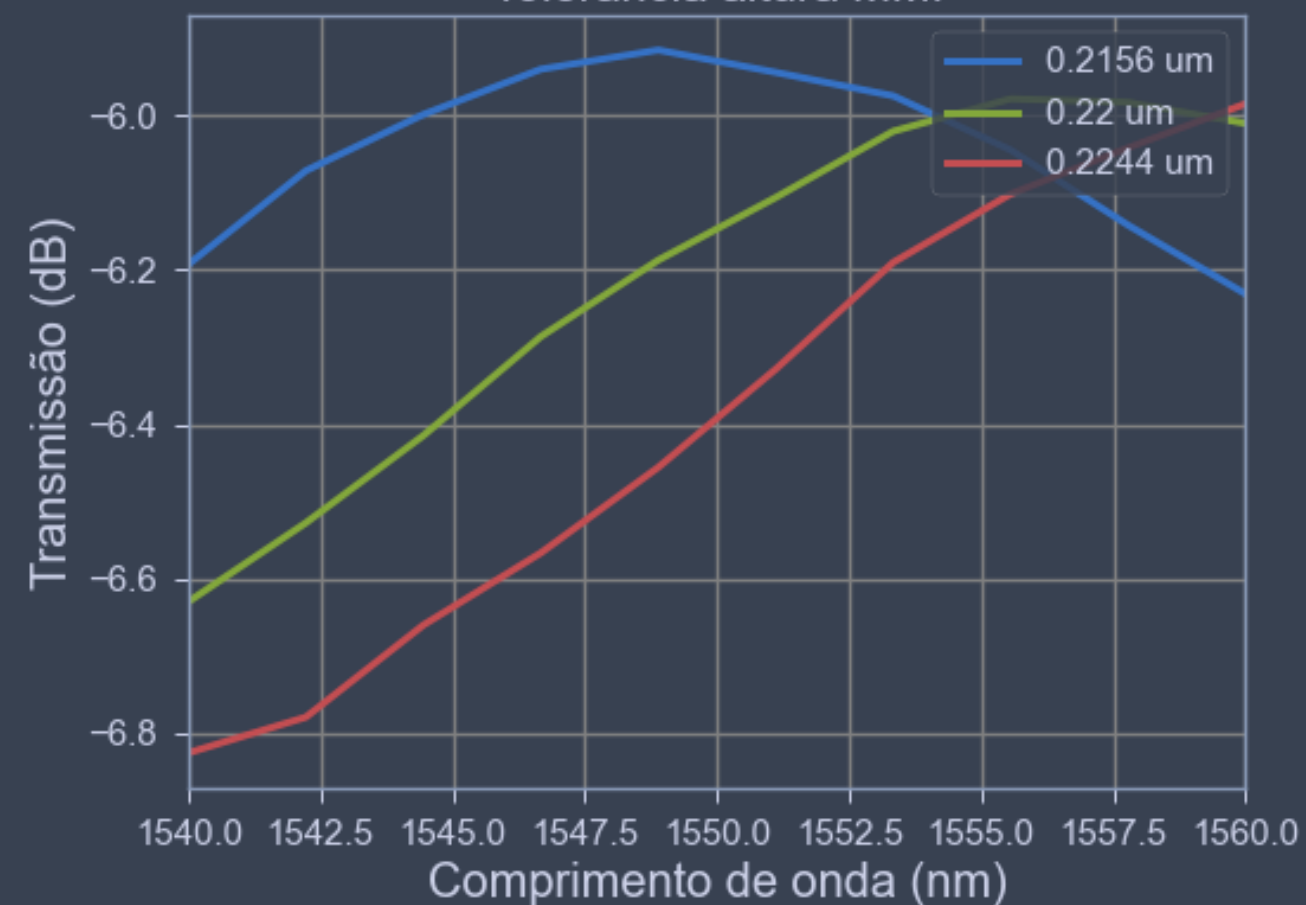
Analise de tolerancia

Porta 4

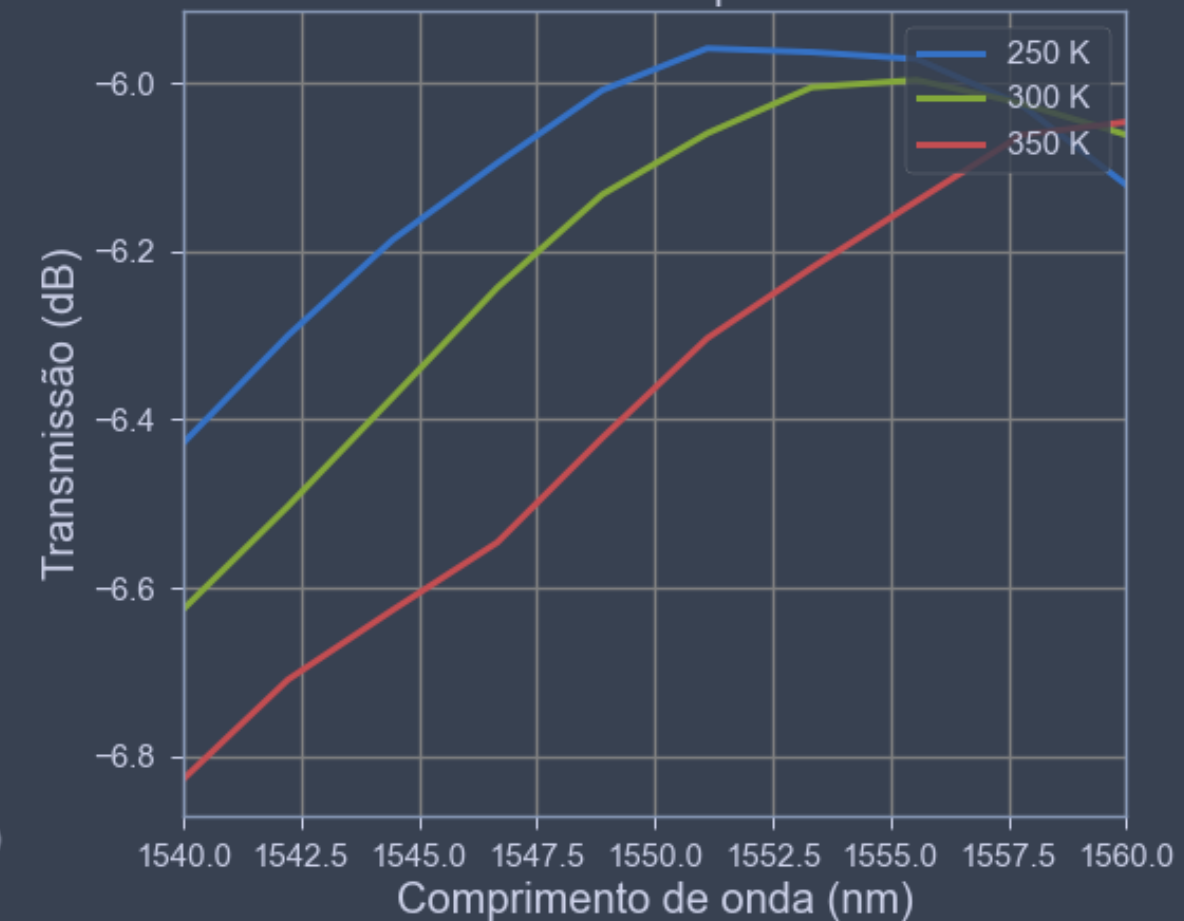
Tolerancia espessura MMI



Tolerancia altura MMI

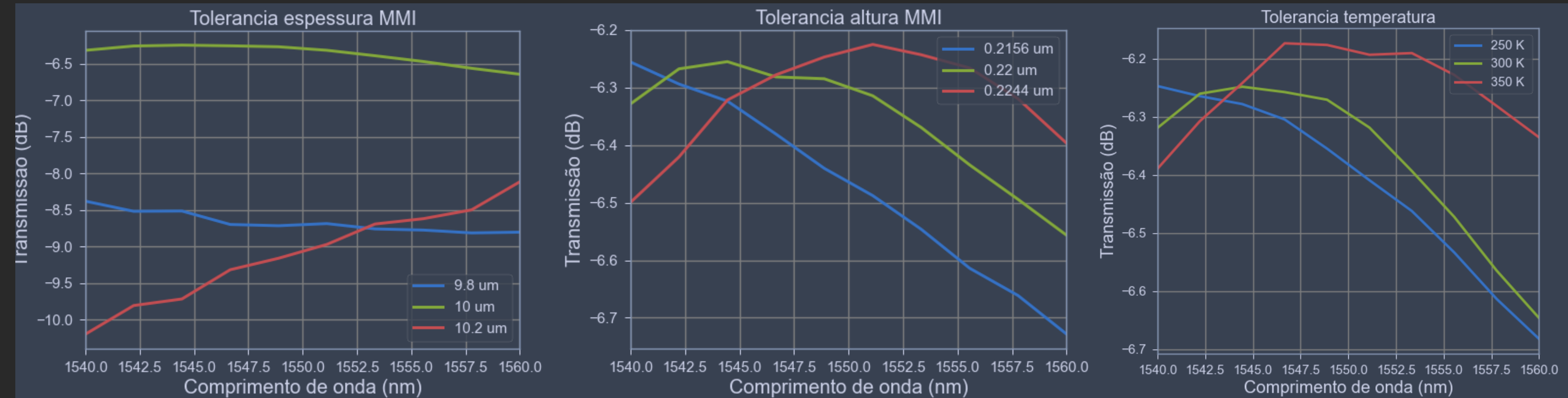


Tolerancia temperatura



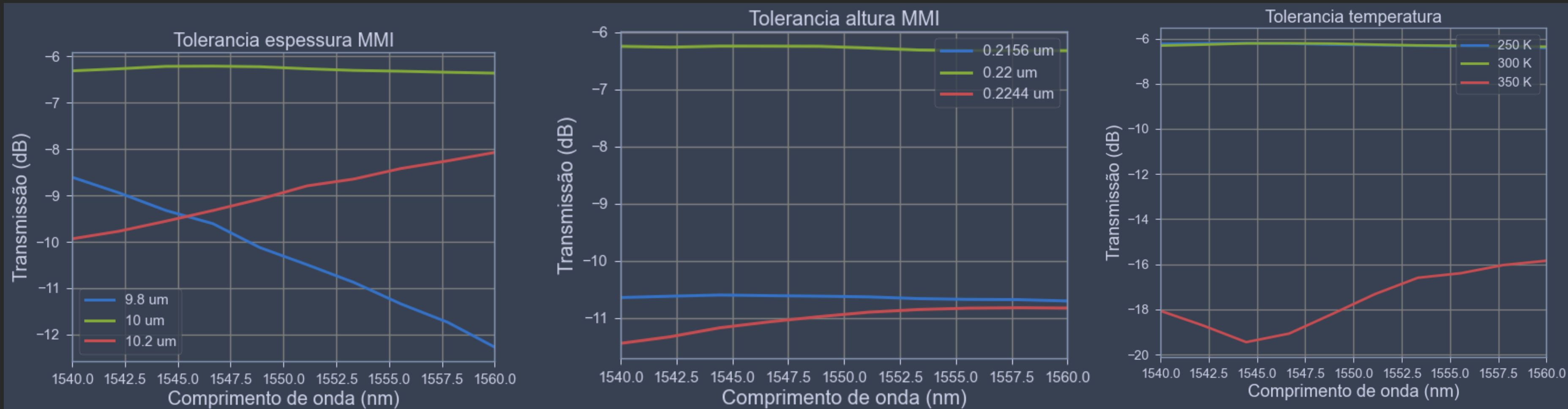
Analise de tolerancia

Porta 5



Analise de tolerancia

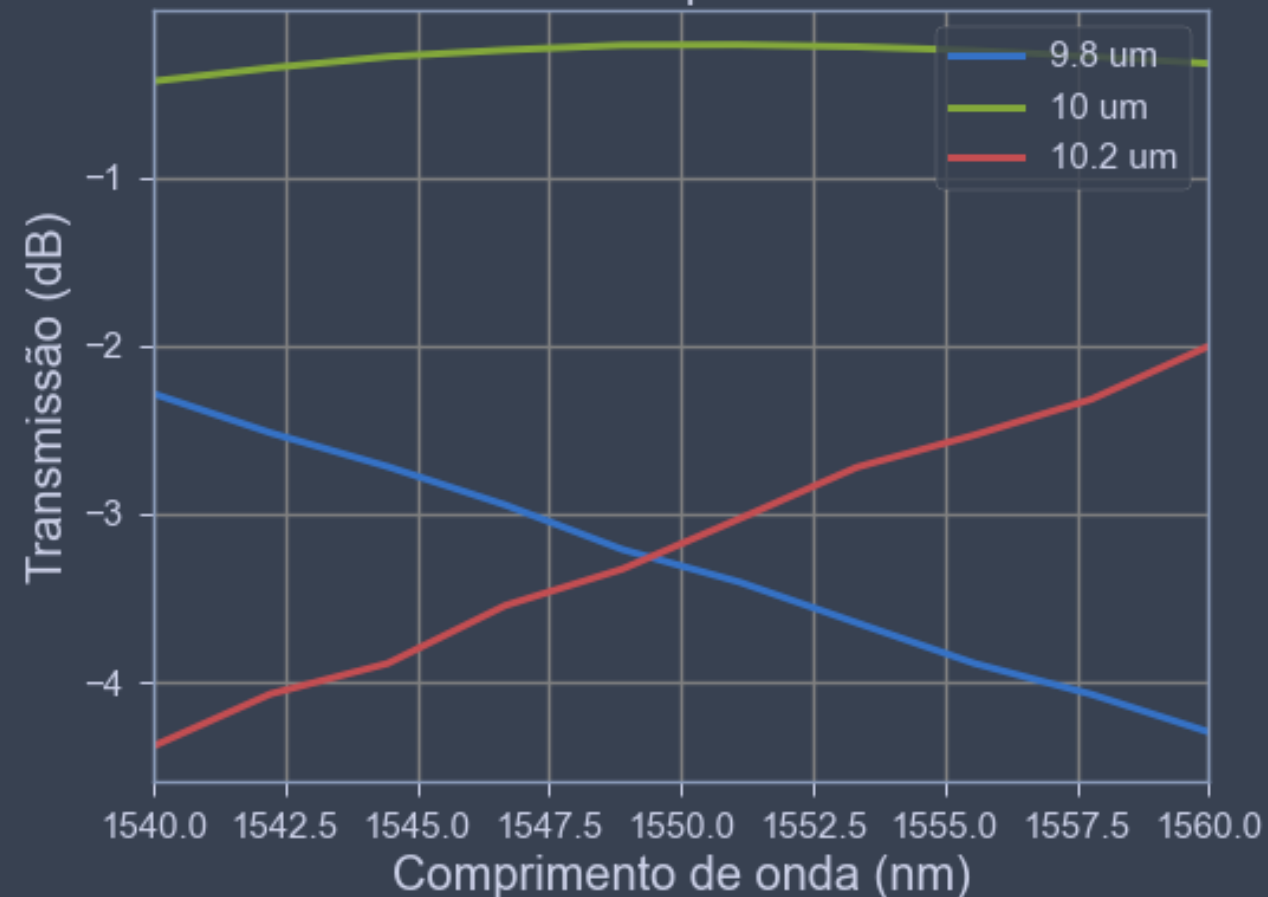
Porta 6



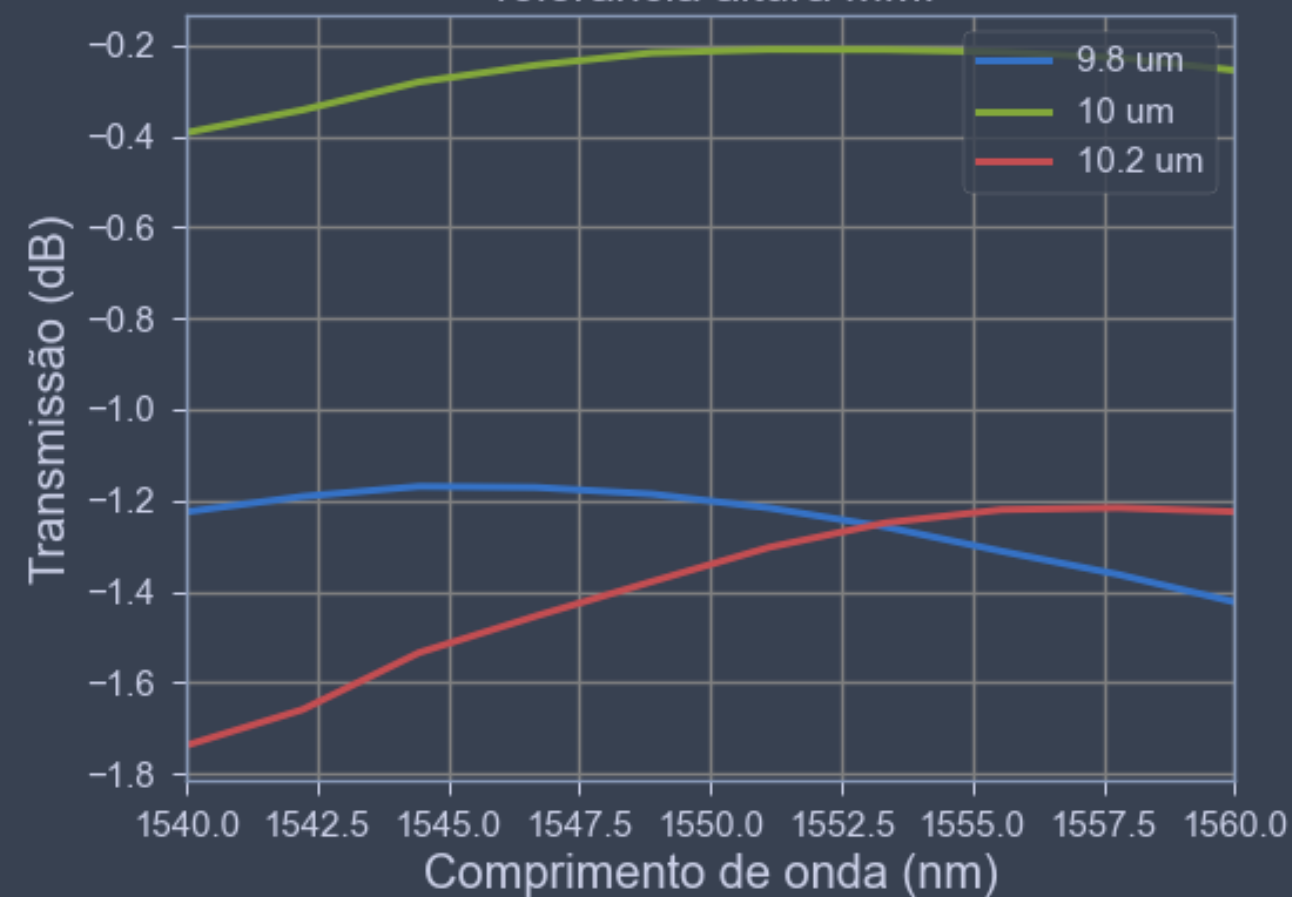
Analise de tolerancia

Insertion Loss

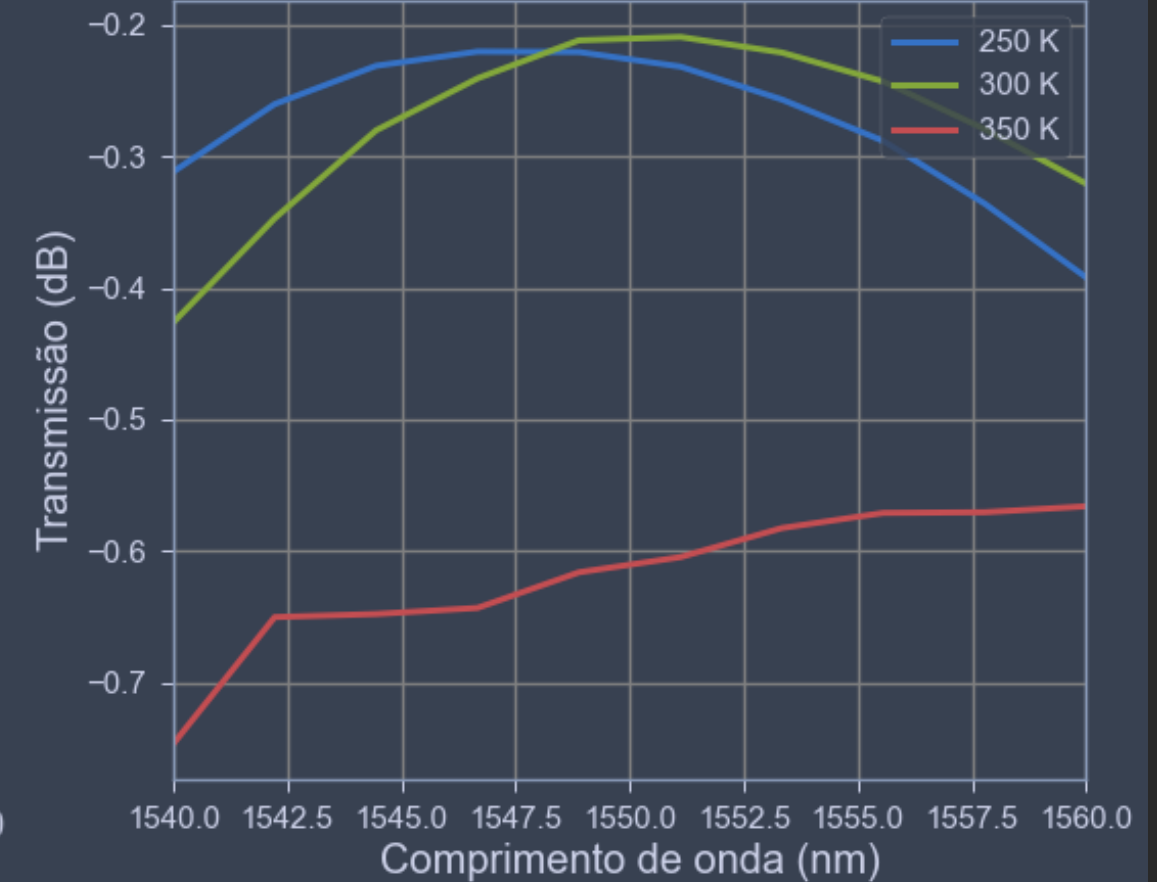
Tolerancia espessura MMI



Tolerancia altura MMI

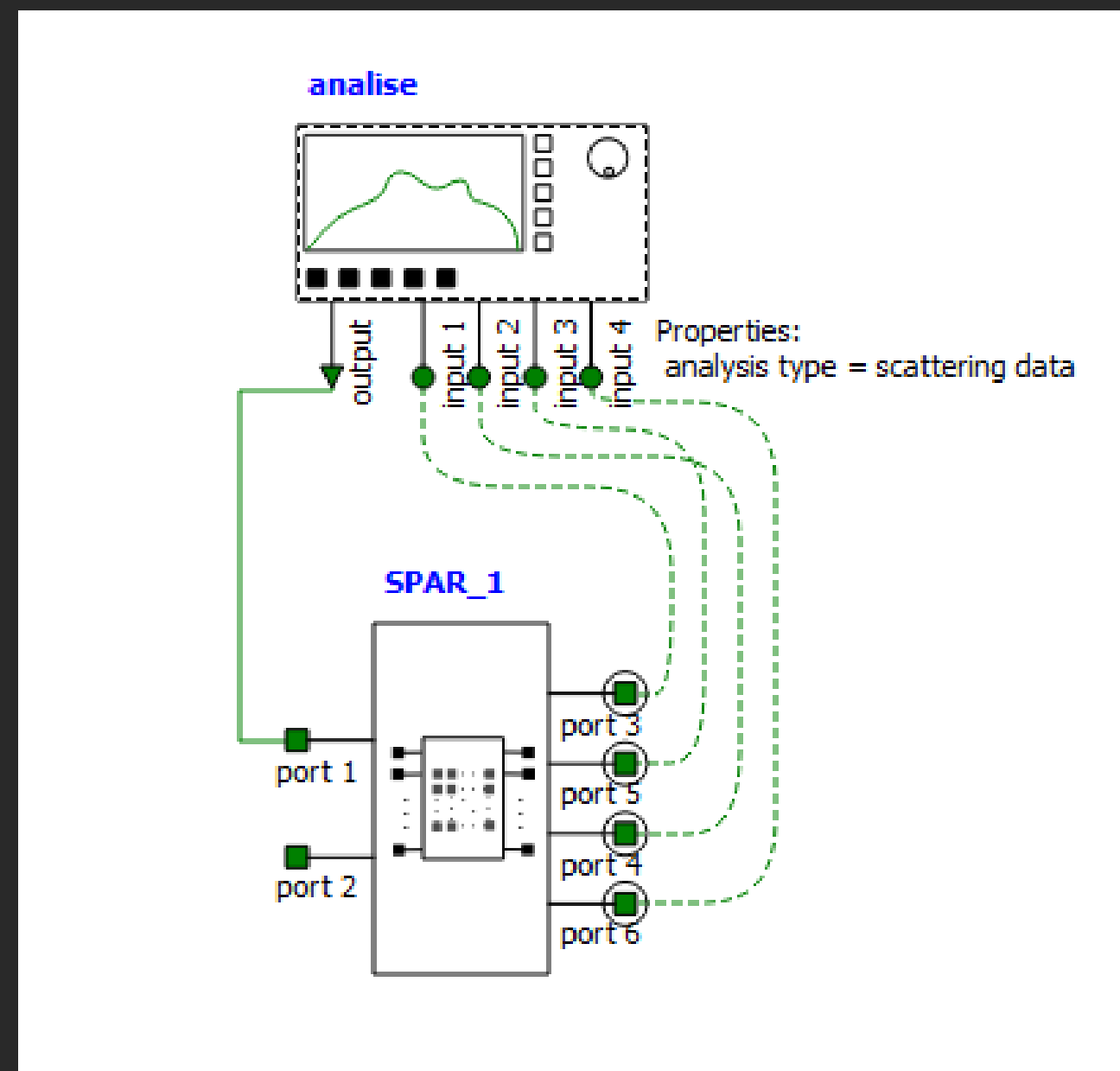


Tolerancia temperatura



Simulação interconnect

Banda C - 40 pontos de frequencia



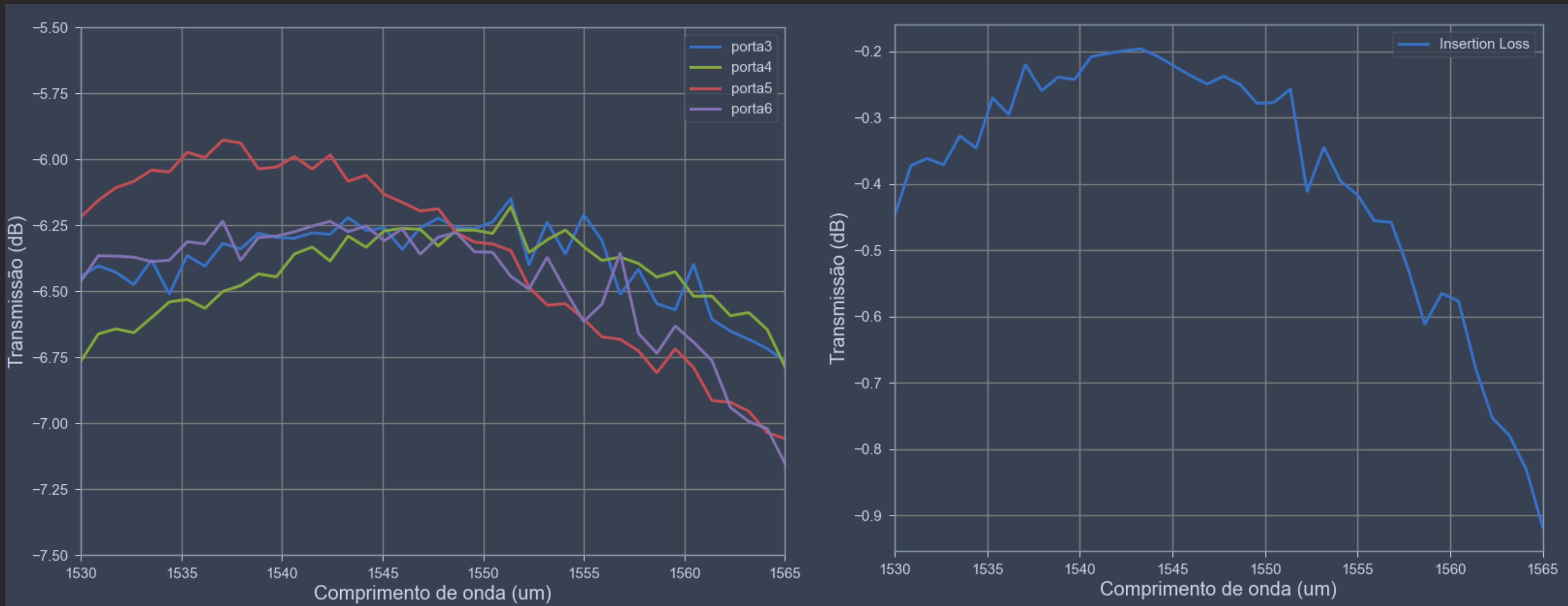
Simulação interconect

Resultados porta 1



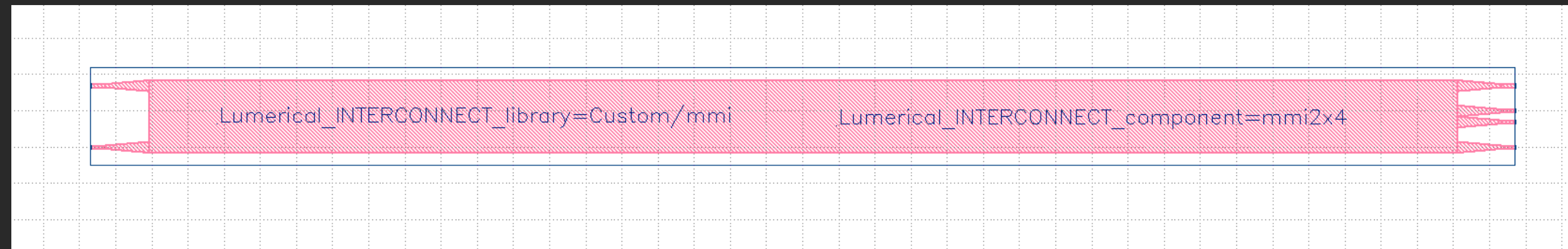
Simulação interconect

Resultados porta 2

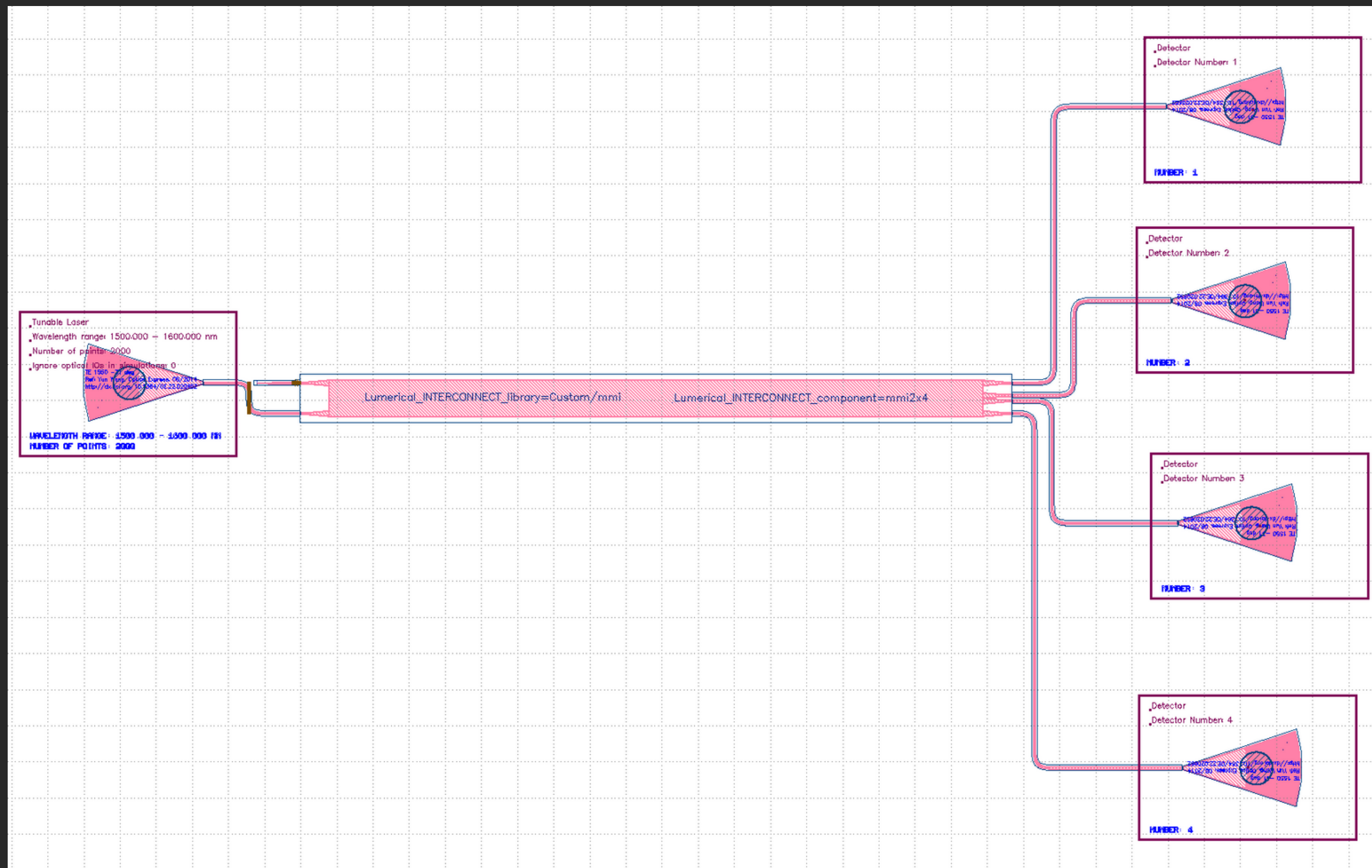


SEMANA 4 E 5

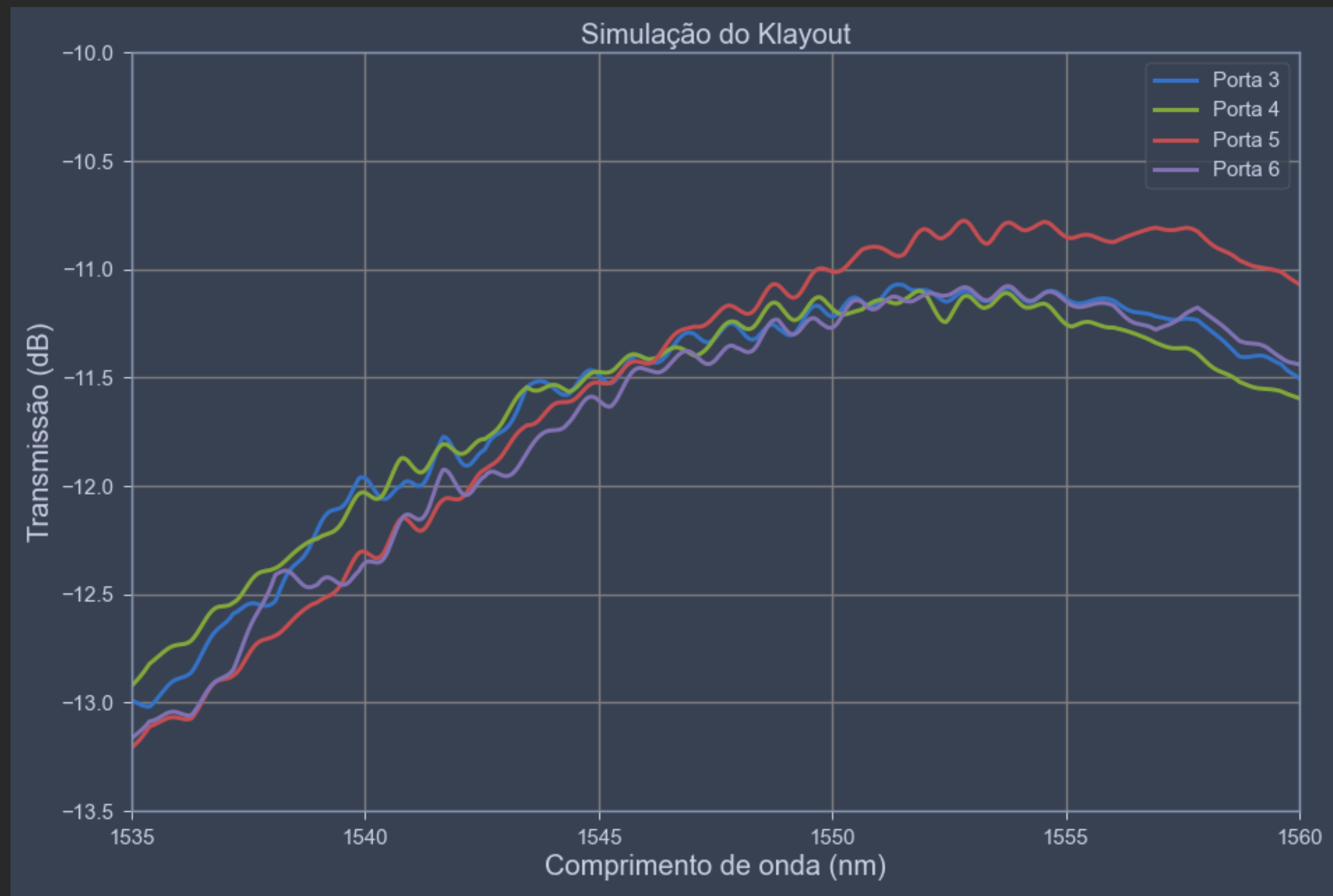
Exportação do dispositivo para o Klayout



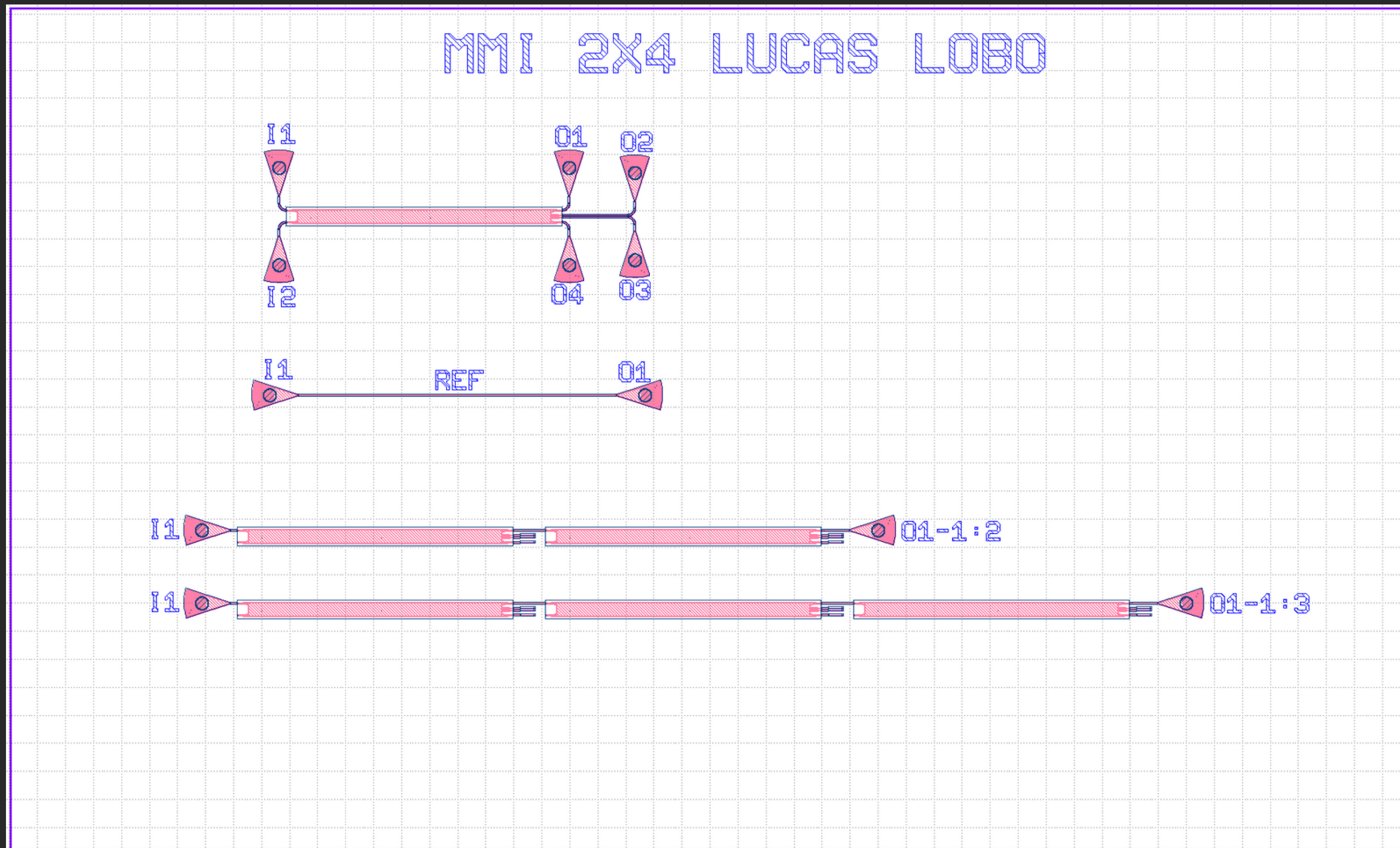
Circuito de teste



Resultado do circuito



Placa Final



Bibliografia

- Planar Monomode Optical Couplers Based on Multimode Interference Effects Lucas B. Soldano, Frank B. Veerman, Meint K.. Smit, Bastiaan H. Verbeek, Alain H. Dubost, and Erik C. M. Pennings
- Overlapping-image multimode interference couplers with a reduced number of self-images for uniform and nonuniform power splitting M. Bachmann, P. A. Besse, and H. Melchior