

# simple component library

- 0: splitter\_50\_50
- 1: splitter\_90\_10
- 2: grating\_coupler\_elliptical
- 3: ring\_resonator\_single
- 4: spiral
- 5: green\_splitter\_50\_50

Prompt: extract suitable components for

- A. an unbalanced splitter
- B. a balanced splitter ← two items
- C. a balanced splitter at telecom wavelengths

YamlLib.yaml

0:

```
name: splitter_50_50
description: |
  this is a balanced splitter.
  the splitting ratio is 50/50.
  the input optical power from either of the
  input ports splits into the two output
  ports with a 50/50 ratio.
  it is based on an MMI interferometer.
  it is designed for telecom c-band.
number_of_input_ports: 2
number_of_output_ports: 2
x_y_size_μm: [15, 3]
yaml_code: |
  component: mmi2x2
  settings:
    width_taper: 1
    length_taper: 5
    length_mmi: 5
    width_mmi: 2.5
    gap_mmi: 0.50
```

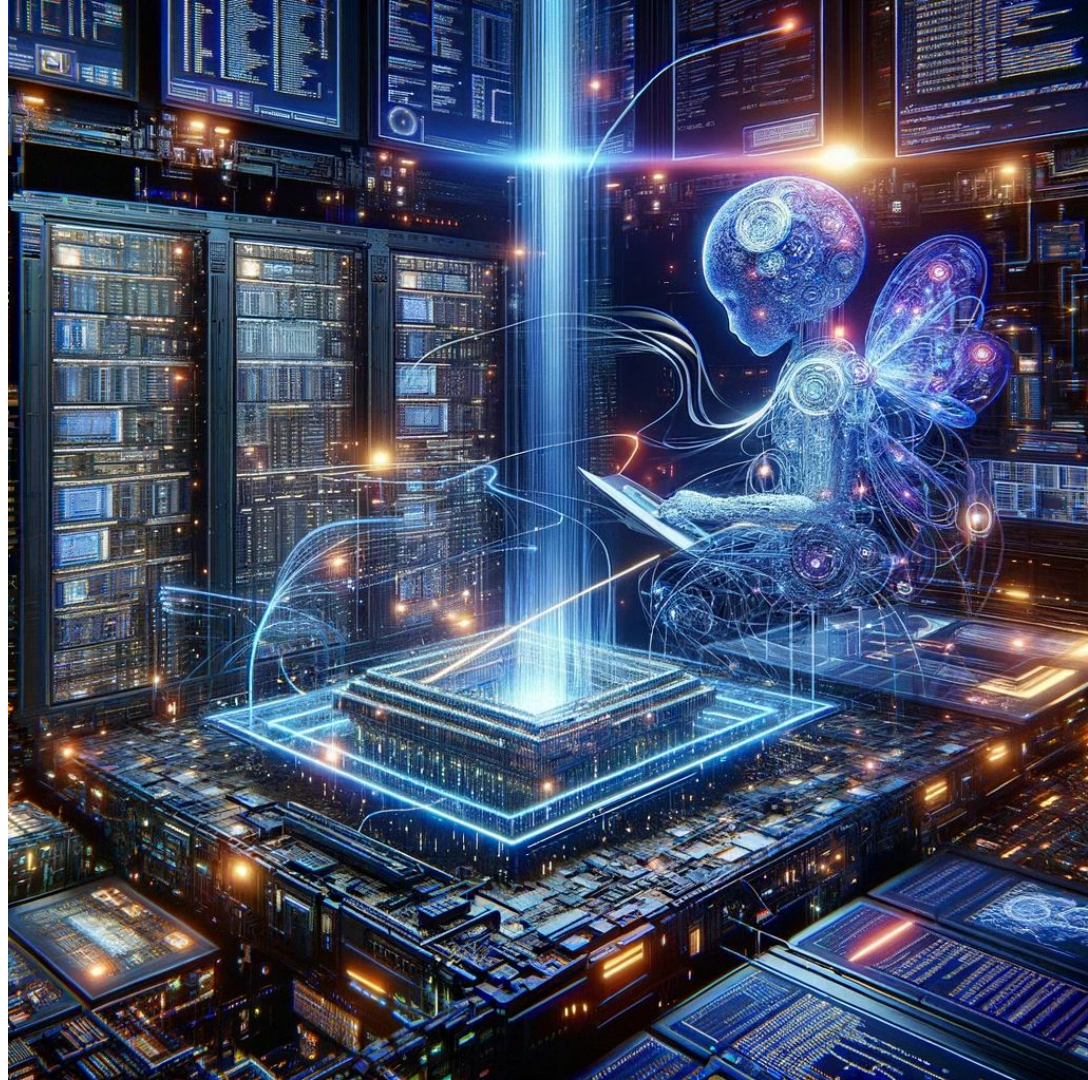
1:

```
name: splitter_90_10
description: |
  this is an unbalanced splitter.
  the splitting ratio is 90/10.
  the input optical power from either of the
  input ports splits into the two output
  ports with a 90/10 ratio.
  it is based on an MMI interferometer.
  it is designed for telecom c-band.
number_of_input_ports: 2
number_of_output_ports: 2
```

# How to extract?

## Couple of ideas

- Ask an LLM
- Semantic similarity



# Prompting LLMs

```
prompt = 'instructions: You are a photonic chip layout developer. The following yaml data, \
starts with [[ and ends with ]], lists all available 6 photonic items/components. \
When you are asked to design or find suitable components, you can only choose \
from the components included in this yaml list. In your answer, do not explain \
details of the process, only provide a list items you find suitable, corresponding \
to the prompt. \n[[' + yaml_content + ']]\n' + \
'Prompt: Extract suitable components for a balanced splitter for telecom wavelengths.'
```

“yaml\_content” is the simple component library, and only contains name and description fields. I’ve seen some LLMs get confused by other fields, fabricating fake relationships between different components.

As the db gets larger, say >1000 words, we need to break it into segments.

# chat/instruct LLMs

I tested each about 10 times. They passed if they answered consistently (100%).

	A	B	C	
openai/gpt-3.5-turbo	✓	x	x	open ai models tested on their <a href="#">playground</a>
openai/gpt-4-turbo-preview	✓	✓	✓	
openai/gpt-4	✓	✓	✓	
meta/llama-2-7b-chat	x	x	x	tested on replicate
meta/llama-2-13b-chat	x	x	x	tested on replicate
meta/llama-2-70b-chat	✓	✓	x	tested on replicate
mistralai/mixtral-8x7b-instruct-v0.1	✓	✓	x	tested on replicate
mistralai/mistral-7b-instruct-v0.2	x	✓	x	tested on replicate
google/gemma-2b	✓	x (0.9)	x	all google models tested on GCP vertex ai console, more info <a href="#">about google models</a>
google/gemini-1.0-pro-001	✓	x (0.9)	x	
google/text-bison@001	✓	x (0.9)	✓	
google/text-bison@002	✓	x (0.9)	x	

## Examples (B): Extract suitable components for a balanced splitter

**gpt4: and gemini:**

```
splitter_50_50  
green_splitter_50_50
```

**gemma**

with splitting ratio of 50/50 and designed for telecom c-band.

Answer:

```
- splitter_50_50  
- green_splitter_50_50**Note:** The  
prompt asks for a balanced splitter  
with a splitting ratio of 50/50 and  
designed for telecom c-band. There  
are two components that meet this  
criteria: `splitter_50_50` and  
`green_splitter_50_50`.I hope this  
explanation is clear. Let me know  
if you have any further  
questions.**Also:** I have included  
the
```

**llama-2-7b-chat**

Based on the YAML data provided, here are three components that could be suitable for a balanced splitter:

1. `[[0]]` - Splitter\_50\_50: This component has a splitting ratio of 50/50, which means that the input optical power is divided equally between the two output ports. This makes it a good candidate for a balanced splitter.
2. `[[3]]` - Ring Resonator Single: This component is designed to take light from a bus waveguide at the resonant frequencies. As long as the coupling between the bus waveguide and the ring

**llama-2-70b-chat**

Based on the given YAML data, the following components are suitable for a balanced splitter:

1. `splitter_50_50`
2. `green_splitter_50_50`



# Semantic similarity {prompt : components}

python:[sentence\\_transformers](#), based on [Sentence-BERT paper](#)

Pre-trained small (43 MB) model: '[paraphrase-albert-small-v2](#)'

Takes about a second an item to run on macbook air

(A) unbalanced splitter

item	score
splitter_90_10	0.5458
splitter_50_50	0.5385
green_splitter_50_50	0.5082
grating_coupler_elliptical	0.2548
spiral	0.1913

(B) balanced splitter

item	score
splitter_50_50	0.5196
green_splitter_50_50	0.5123
splitter_90_10	0.442
grating_coupler_elliptical	0.3115
spiral	0.1898

(C) balanced splitter at telecom wavelengths

item	score
splitter_50_50	0.6707
green_splitter_50_50	0.6701
splitter_90_10	0.6018
grating_coupler_elliptical	0.4316
spiral	0.3747