Quix Implementation

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1 Introduction

In this paper, we present a method in order to convert our theoretic circuits into Quix circuits. More accurately, we start by explaining how to implement 12-mode generic interferometer in the Quix chip. Afterwards, we show some `Perceval` tools allowing for the conversion of a circuit into a generic interferometer.

Sadly, the rectangular decomposition is not implemented yet in `Perceval`. Therfore, we use triangular decomposition which work for shallow low-mode circuits. The code of the notebook `Generic interferometer.ipynb` shows some examples of this approach.

2 Implementation of the 12 mode rectangular generic interferometer

We propose (fig. 1) a map between the 12-mode generic interferometer in `Perceval` and the components of the Quix chip.

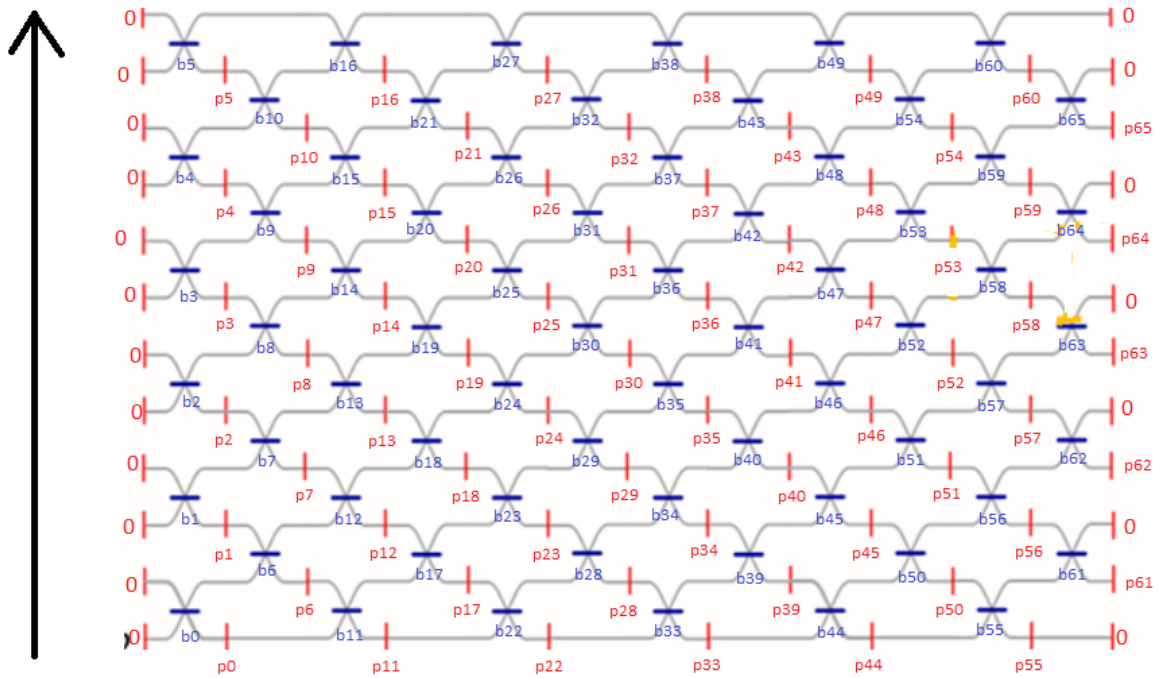

Figure 1: Implementation of a 12 mode generic interferometer in Quix

3 Circuit Conversion into a 12 mode generic interferometer

3.1 Limiting modes

In order to limit modes, one can work on the modes of interest and set the limiting beam splitters into full-reflection mode, see fig. 2. The potential added phase will not have an actual effect on our boson sampler. Indeed, the phase does not affect the photon count.

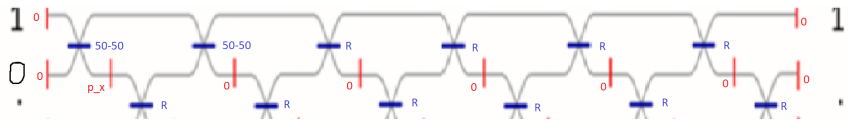

Figure 2: Example of a circuit limited by reflecting beam splitters

As shown in fig. 2, it may be easier to implement the last circuit mode in the upper Quix mode.

3.2 Limiting depth

If the considered circuit is too shallow for the Quix chip, we can set the phase shifters following our circuit to a zero phase. Likewise, the following beam splitters can be set to full-reflection. The justifiacation for this approach is the same as in 3.1.

3.3 Circuit conversion into a generic interferometer

Rectangular decomposition is not implemented yet in Perceval. Nevertheless, triangular decomposition can be useful for shallow low mode circuits.

In this case, we can use the command: `pcvl.Circuit.decomposition(U, bp, shape="triangle")`, where `bp` is shown in fig. 3 and U the unitary matrix of the considered circuit:

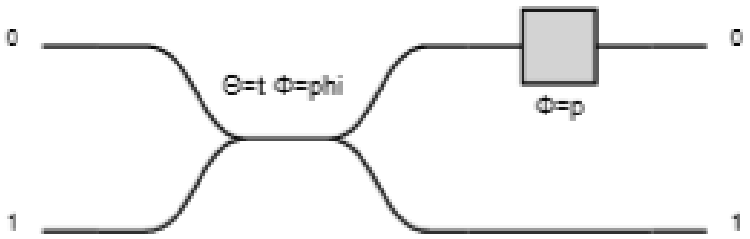

Figure 3: Circuit used as basis of the triangular decomposition