1 Info on noise on Pulser device

Pulser device is Chadoq. This table sums the main characteristics of noise parameters

Phase	Type		Parameter	Value measured
Preparation	Rearrangement		-	$\approx 50\%$ (Preprocessed)
	Optical pumping		η	0.5% (expected)
Dynamics	Temperature ($T = 30\mu$K)	Thermal motion	σ_r	85 nm
		Doppler shift	σ_δ	0.47 MHz
	Lasers related noises	Intensity fluctuation	σ_Ω	3%
		Waist	w_{eff}	148 μm
		Spatial variation	-	$< 1\%$
		Rising time	τ_r	50 ns
Measurement	False positive		ε	3%
	False negative		ε'	8%

From Lucas' email:

- For the optimisation, your pulses should not be shorter than approximatively twice the rising time. The fact that the pulses are not perfect square induces a small change in the overall phase applied. Also the total sequence should not last longer than 5 us because after that the decoherence effects become strong enough and should be taken into account.
- For the interaction term, we are working with a certain rydberg level at the moment which can be defined in Pulser by n = 60 (this should return an interaction coefficient of $2\pi \times 137000$ $MHz \mu m^6$). You can change that at the beginning of your code when importing from the Device class the instance Chadoq2 and then do Chadoq2 change rydberg level(60).
- For the new design of the sequence, it depends a bit on how you parameterize your QAOA. For instance for odd intervals of time, you apply $\frac{\Omega_{on}}{2\pi} = 2MHz$ and no detuning. For even intervals, you apply $\frac{\Omega_{on}}{2\pi} = 0MHz$ (no amplitude) but then you need to apply (in order to mimic the prototype implementation) $\delta = lightshift(\Omega_{on}) - lightshift(\Omega_{off})$ which should be around $2\pi \times -3MHz$. The function lightshift is given by

$$lightshift(\Omega) = \frac{\Omega_r^2 - \Omega^2_{\text{b from }\Omega}(\Omega)}{4\Delta_i} \tag{1}$$

$$\Omega_{\text{b from }\Omega}(\Omega) = \Omega \frac{2\Delta_i}{\Omega_r} \tag{2}$$

with $\Delta_i = 2\pi \times 700$ and $\Omega_r = 2\pi \times 30$.

So taking $\Omega_{on} = 2 \times 2\pi$ MHz and $\Omega_{off} = 0 \times 2\pi$ we get:

$$\delta = lightshift(\Omega_{on}) - lightshift(\Omega_{off}) \tag{3}$$

$$= \frac{\Omega_r^2 - (2 \times 2\pi \frac{2\Delta_i}{\Omega_r})^2}{4\Delta_i} - \frac{\Omega_r^2}{4\Delta_i} \tag{4}$$

$$= -\frac{(2\pi)^2 (4 \frac{2\pi \times 700}{2\pi \times 30})^2}{2\pi \times 4 \times 700} = -(2\pi)\frac{280}{90} = -3.1 \times 2\pi \tag{5}$$