Notes on the 12 qubit PPS

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Notes about the problems in the 12 qubit PPS preparation, including Matlab codes and Experiments.

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Calculating the state to state GRAPE on Ordi2. In pulsefinder folder. paramsfile is 'twqubit_subS2S.m', and the output file is 'twqubit_7zto12z'.

The GRAPE is to evolve ZZZZZZZIIIII to ZZZZZZZZZZZ. As the couplings between nearest-neighbored C and H are about 150Hz. I set the GRAPE

```
1  % Number of timesteps
2  params.plength = 400;
3
4  % Length of each time step
5  params.timestep = 10e-6;
6
7  params.subsystem{1} = [1 2 3 9 10 11];
8  params.subsystem{2} = [4 5 6 7 8 12];
9  params.subsys_weight = [6 6];
10
11 % Input and goal states for state to state
12 params.rhoin = mkstate('+1ZZZZZZZIIIII',1);
13 params.rhogoal = mkstate('+1ZZZZZZZZZZZ',1);
14
15 % Allow Zfreedom or not
16 params.Zfreedomflag = 1;
```

The fidelity keeps 0 all the time. Guess the reason is 'Zfreedom'. Set 'params.Zfreedomflag = 0;'. However, still 0.

Annie said maybe due to the length. Her SWAP gate requires 8ms, so I changed 'params.plength = 800;'. But for with or without Zfreedom, fidelity is still 0.

Check if some of my GRAPE settings are wrong. try to repeat Annie's SWAP gate calculation.

```
1  % Number of timesteps
2  params.plength = 800;
3
4  % Length of each time step
5  params.timestep = 10e-6;
6
7  params.subsystem{1} = [1 2 3 9 10 11];
8  params.subsystem{2} = [4 5 6 7 8 12];
9  params.subsys_weight = [6 6];
10
11 % Input and goal states for state to state
12 params.rhoin = mkstate('+1IIIIIIIZIIII+1IIIIIIIIZIII+1IIIIIIIIIZII+1IIIIIIIIIIZI
       +1IIIIIIIIIIIZ',1);
13 params.rhogoal = mkstate('+1IIIIIIIZIIII+1IIIIIIIIZIII+1IIIIIIIIIZII+1
       IIIIIIIIIIZI+1IIIIIZIIIIZ',1);
14
15 % Allow Zfreedom or not
16 params.Zfreedomflag = 0;
```

The outputfile is 'twqubit_SWAPC7H5'. And the fidelity is already over 98%.

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