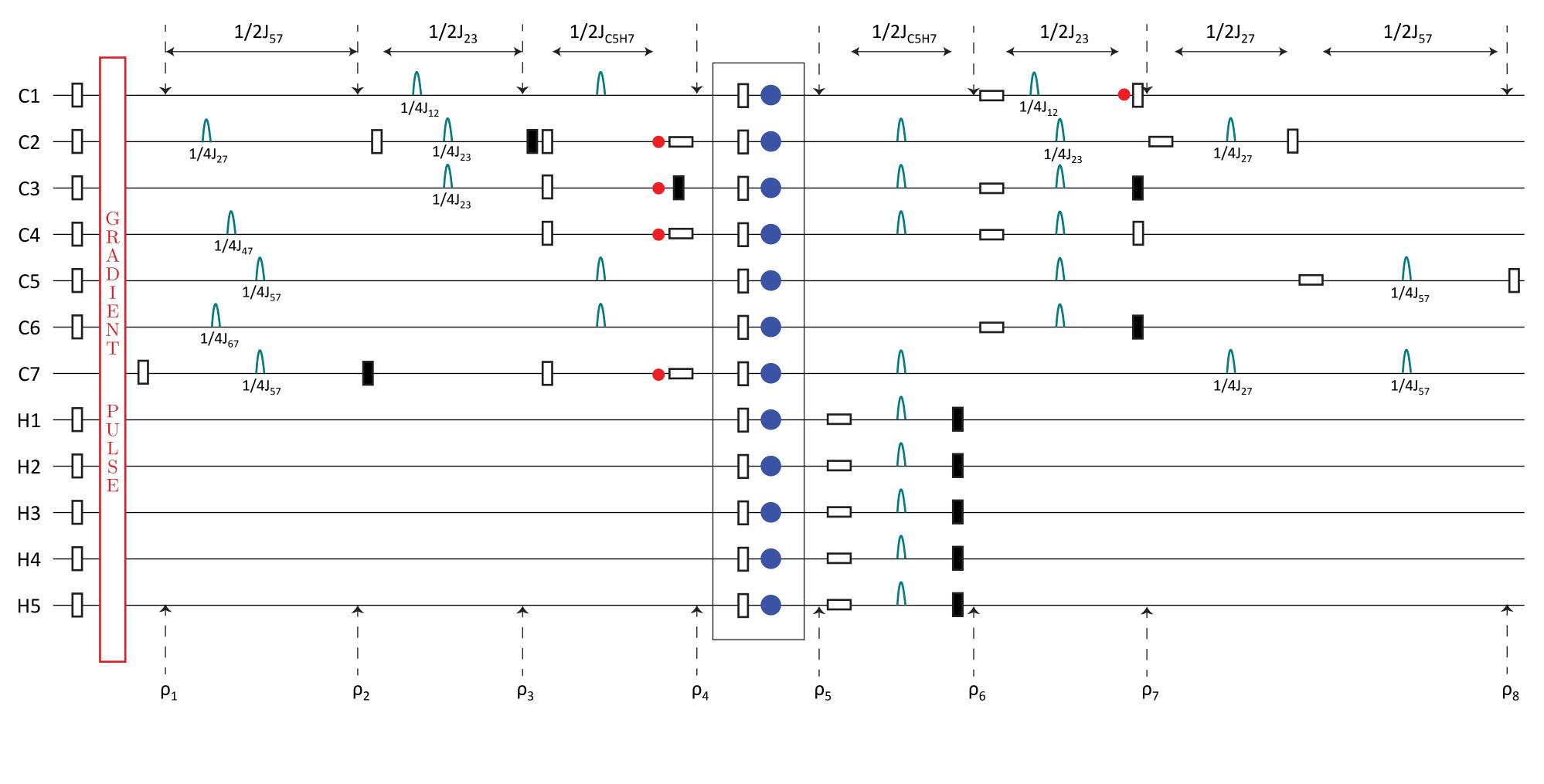
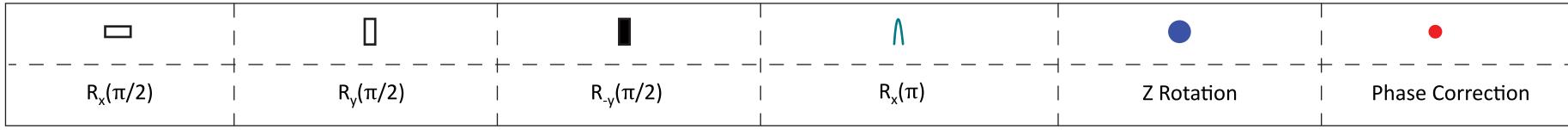
|           | <b>C1</b> | <b>C2</b>                    | <b>C3</b>                             | <b>C4</b> | <b>C5</b> | C6    | <b>C7</b> | H1             | H2             | Н3             | Н4             | H5             |
|-----------|-----------|------------------------------|---------------------------------------|-----------|-----------|-------|-----------|----------------|----------------|----------------|----------------|----------------|
| <b>C1</b> | 30020     | C-13 labeled 12-qubit system |                                       |           |           |       |           |                |                |                |                |                |
| <b>C2</b> | 57.58     | 8779                         | Dichloro-cyclobutanone H <sub>1</sub> |           |           |       |           |                |                |                |                |                |
| <b>C3</b> | -2.00     | 32.70                        | 6245                                  |           |           |       | CI        | C <sub>5</sub> | $-C_4$         | S              |                | H <sub>3</sub> |
| <b>C4</b> | 0         | 0.30                         | 0                                     | 10333     |           |       |           |                |                |                | $C_3$          | $H_2$          |
| <b>C5</b> | -1.25     | 2.62                         | 1.11                                  | 33.16     | 15745     |       |           |                | 7              | C <sub>2</sub> |                |                |
| C6        | 5.54      | -1.66                        | 0                                     | -3.53     | 33.16     | 34381 |           |                | H <sub>5</sub> |                | H <sub>4</sub> |                |
| <b>C7</b> | 1.25      | 37.48                        | 0.94                                  | 29.02     | -21.75    | 34.57 | 11928     |                | 0              | 0              | Н              |                |
| H1        | 0         | 0                            | 2.36                                  | 166.6     | 4.06      | 5.39  | 8.61      | 3310           |                |                |                |                |
| H2        | 4.41      | 1.86                         | 146.6                                 | 2.37      | 0         | 0     | 0         | 0              | 2468           |                |                |                |
| Н3        | 1.81      | 3.71                         | 146.6                                 | 2.37      | 0         | 0     | 0         | 0.18           | -12.41         | 2158           |                |                |
| H4        | -13.19    | 133.6                        | -6.97                                 | 6.23      | 0         | 5.39  | 3.78      | -0.68          | 1.28           | 6.00           | 2692           |                |
| Н5        | 7.87      | -8.35                        | 3.35                                  | 8.13      | 2.36      | 8.52  | 148.5     | 8.46           | -1.06          | -0.36          | 1.30           | 3649           |
| T1        | 8.015     | 3.611                        | 1.834                                 | 3.722     | 12.95     | 8.157 | 3.636     | 3.831          | 2.128          | 2.278          | 2.654          | 3.472          |
| <b>T2</b> | 1.611     | 0.877                        | 1.122                                 | 0.792     | 1.143     | 1.912 | 0.531     | 0.337          | N/A            | N/A            | 0.318          | 0.276          |





| Simulated Fidelity |   |
|--------------------|---|
| 1                  | $\rho_1 = Z_7$  |
| 1                  | $\rho_2 = Z_2 Z_4 Z_5 Z_6 Z_7$  |
| <b>1</b>           | $\rho_3 = Z_1 Z_2 Z_3 Z_4 Z_5 Z_6 Z_7$  |
| 0.95               | $\rho_4 = Z_1 Z_2 Z_3 Z_4 Z_5 Z_6 Z_7 Z_8 Z_9 Z_{10} Z_{11} Z_{12}$   |
| 0.9511             | $\rho_5 = \prod_{i=1}^{12} I_i^+ + \prod_{i=1}^{12} I_i^-$  |
| 0.8717             | $\rho_6 = (A_1 A_5 A_6 I_1^+ I_2^- I_3^- I_4^- I_5^+ I_6^+ I_7^- + A'_1 A'_5 A'_6 I_1^- I_2^+ I_3^+ I_4^+ I_5^- I_6^- I_7^+)  00000\rangle$ |
| 0.8570             | $\rho_7 = (A_1 A_5 A_6 A_7 I_2^+ I_5^- I_7^- + A'_1 A'_5 A'_6 A'_7 I_2^- I_5^+ I_7^+)  000000000\rangle$                                    |
| 0.8570             | $\rho_8 = (A_1 A_5 A_6 A_7 B_5 I_7^- + A'_1 A'_5 A'_6 A'_7 B'_5 I_7^+)  00000000000\rangle$   |
|                    |   |

$$I^{\pm} = I_x \pm iI_y$$

 $A_1 = \cos[2\pi(\omega_1 - O_1)/2J_{C7H5}] - i\sin[2\pi(\omega_1 - O_1)/2J_{C7H5}]$ 

 $A_5 = \cos[2\pi(\omega_5 - O_1)/2J_{C7H5}] - i\sin[2\pi(\omega_5 - O_1)/2J_{C7H5}]$ 

 $A_6 = \cos[2\pi(\omega_6 - O_1)/2J_{C7H5}] - i\sin[2\pi(\omega_6 - O_1)/2J_{C7H5}]$ 

 $A_{7} = \{\cos[2\pi(\omega_{7} - O_{1})/2J_{23}] + i\sin[2\pi(\omega_{7} - O_{1})/2J_{23}]\}^{*}$  $\prod_{k=8}^{12} \{\cos[\pi J_{7k}/2J_{23}] + i\sin[\pi J_{7k}/2J_{23}]\}$ 

 $B_{5} = \{\cos[2\pi(\omega_{5} - O_{1})/2J_{27}] + i\sin[2\pi(\omega_{5} - O_{1})/2J_{27}]\}^{*}$  $\prod_{k \neq 2,5,7} \{\cos[\pi J_{5k}/2J_{27}] + i\sin[\pi J_{5k}/2J_{27}]\}$ 

