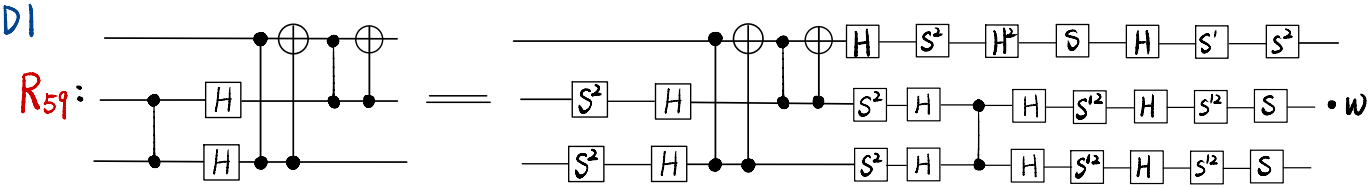
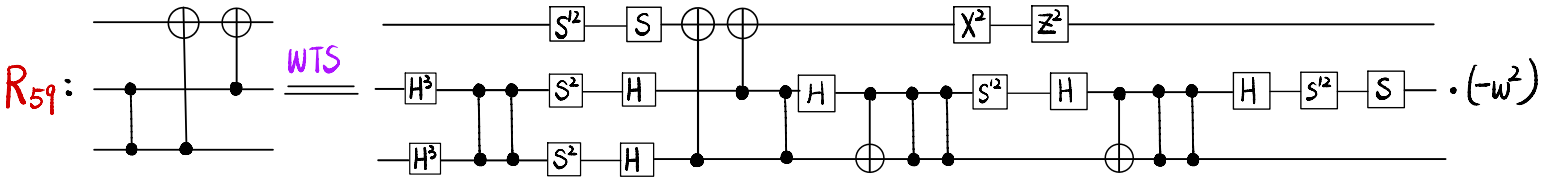
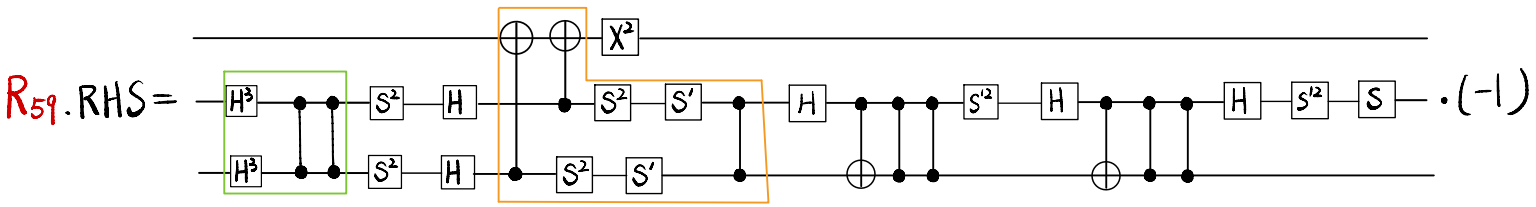
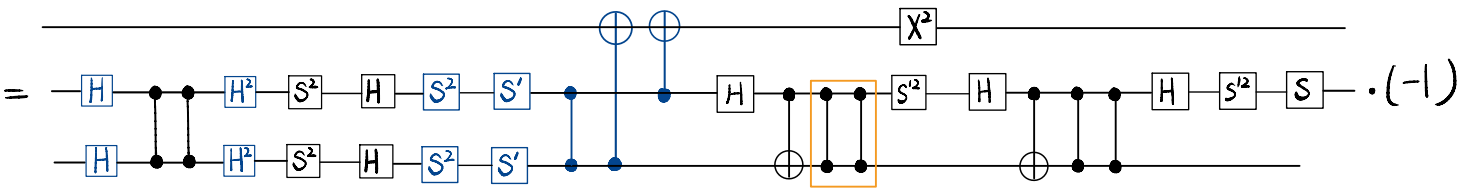
Lem D1

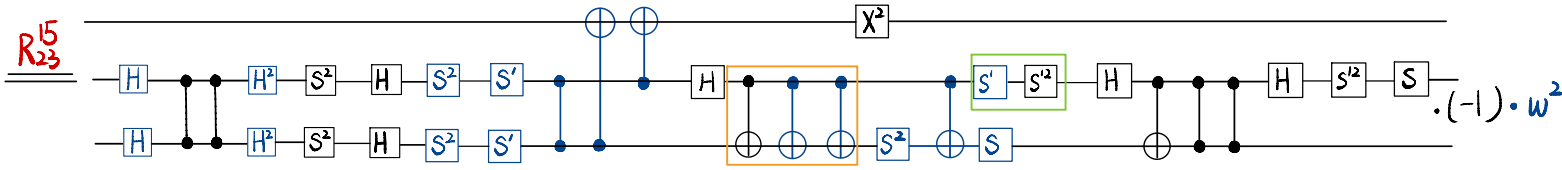


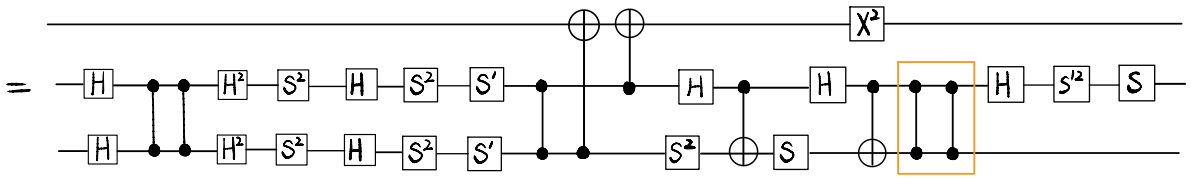
Proof cont.

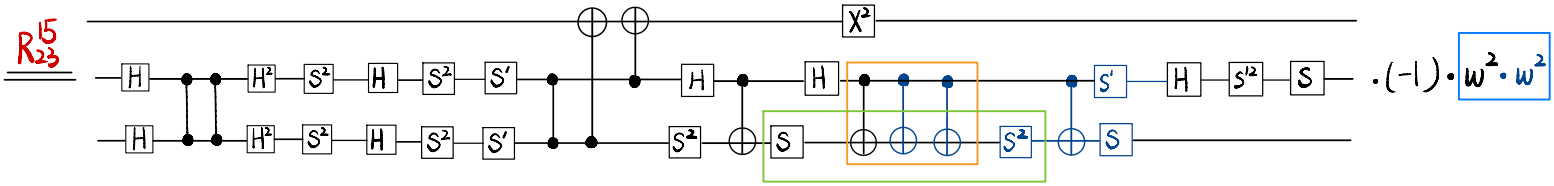


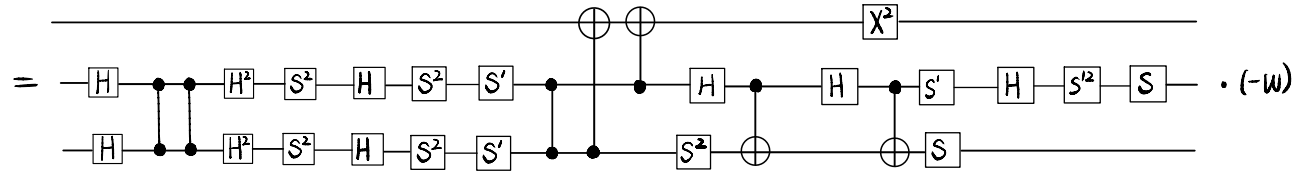


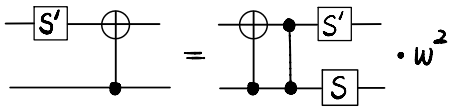
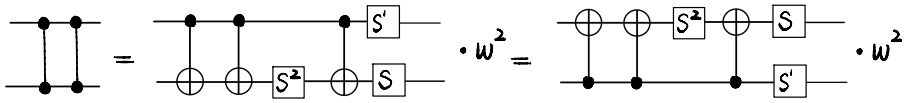




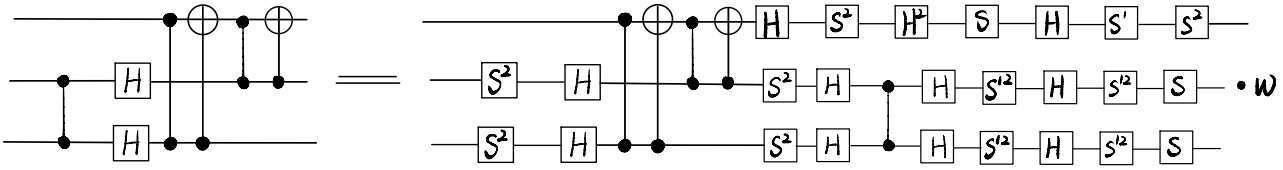




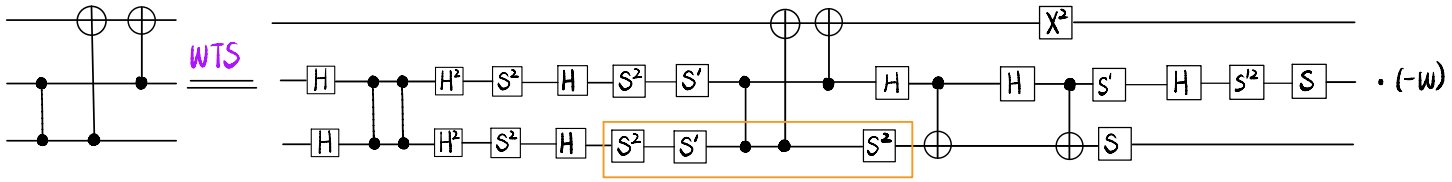


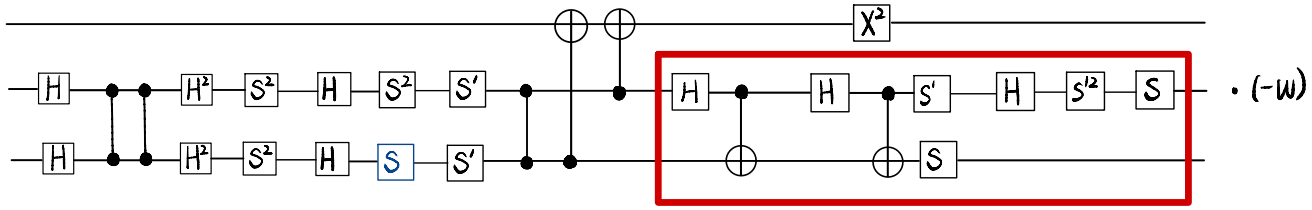
R_{23}^{12}:  $\cdot w^2$ R_{23}^{15}: 

Lem D1

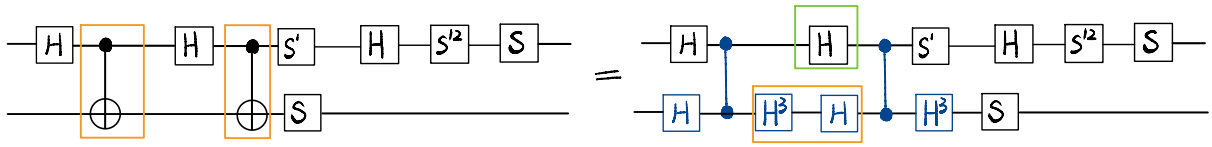
R_{59}: 

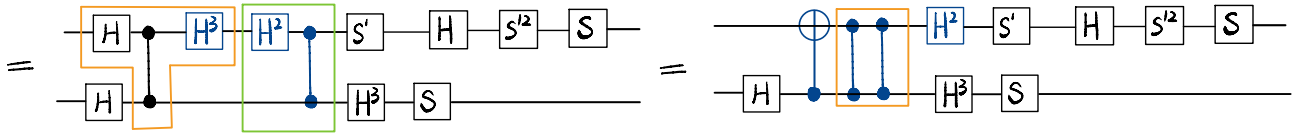
Proof cont.

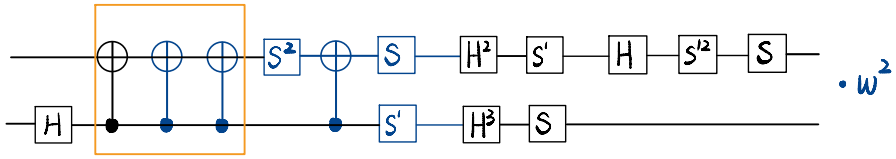
R_{59}: 

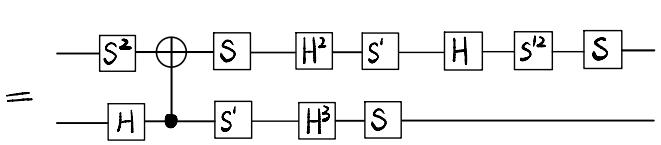
$R_{59}.RHS =$ 

P

$P =$ 

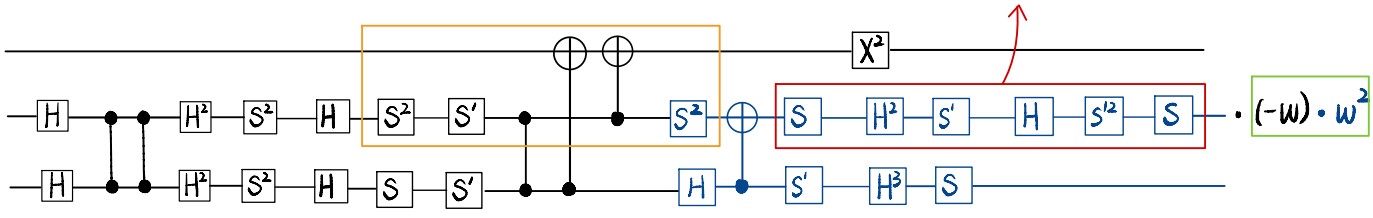


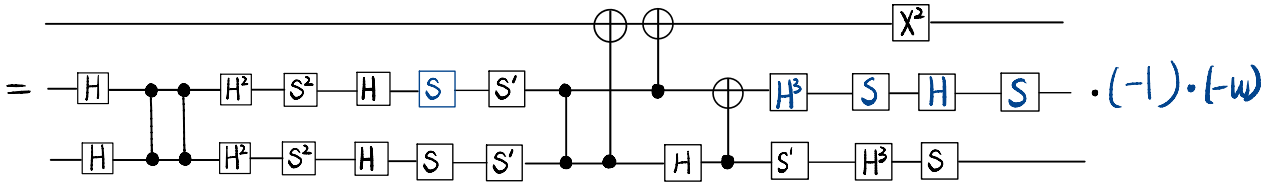
R_{23}^{15} 

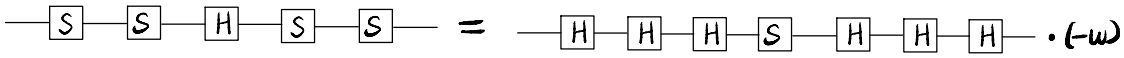


$SH^2S'HS'^2S \overset{Def1}{=} S\boxed{H^2H^2}S\ \boxed{H^2HH^2}S^2H^2S$

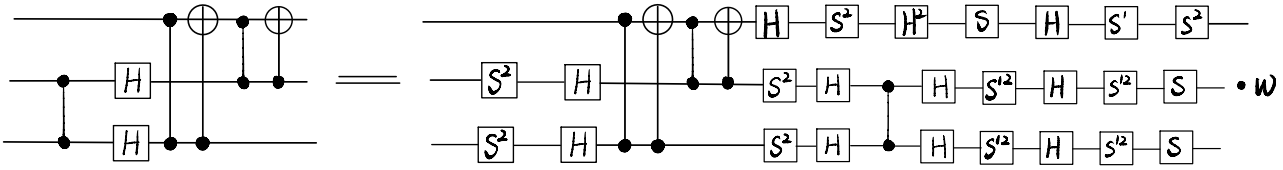
$= \boxed{S^2HS^2}H^2S = H^3S\boxed{H^3H^2}S \cdot(-w) = H^3SHS\cdot(-w)$

$R_{59}.RHS =$ 

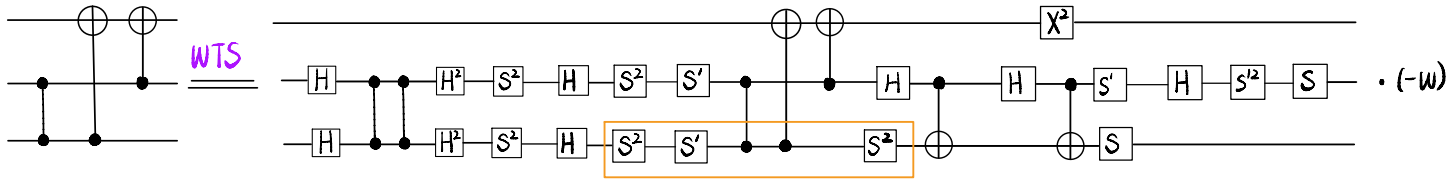


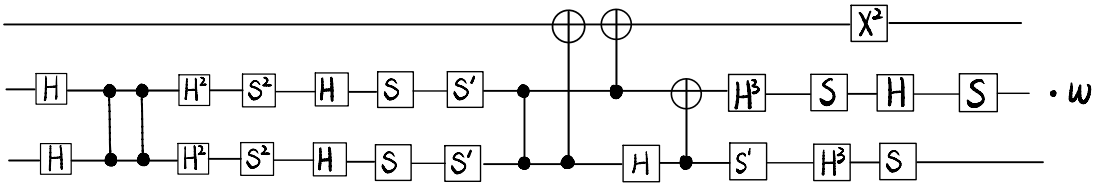
C_4^1: 

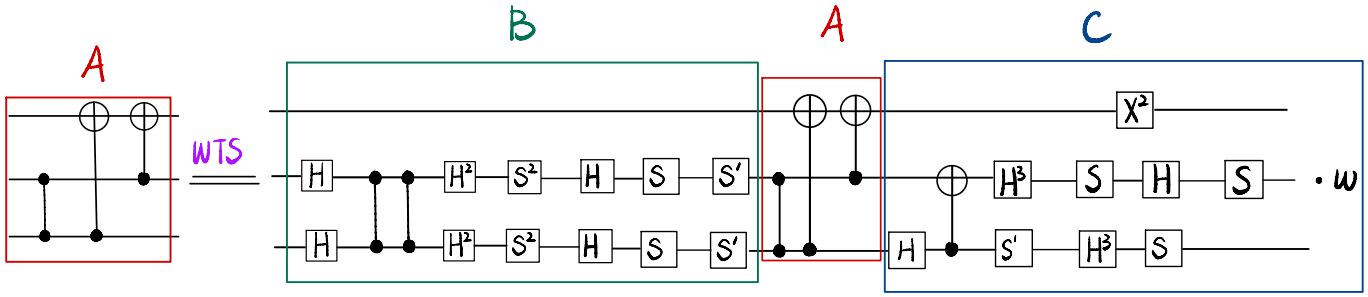
Lem D1

R_{59}: 

Proof cont.

R_{59}: 

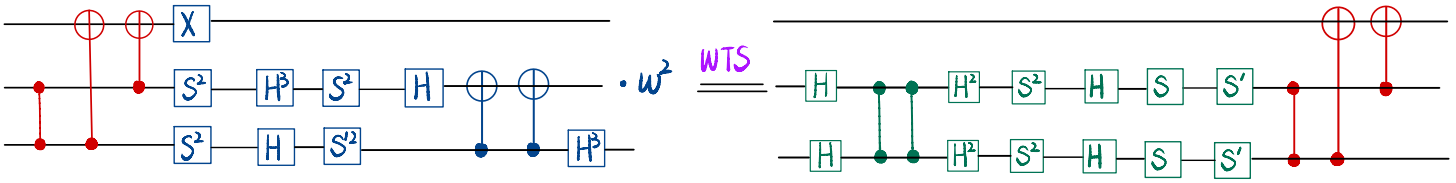
$R_{59}.RHS =$ 

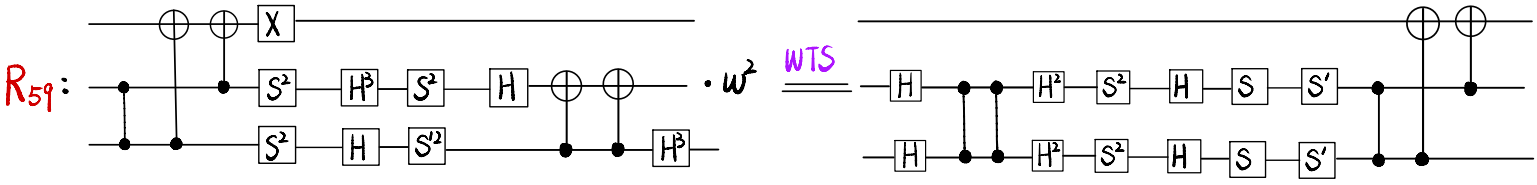


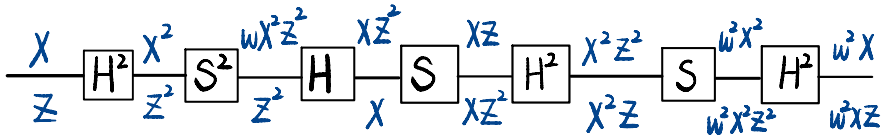
$A \overset{WTS}{=} B\,A\,C$

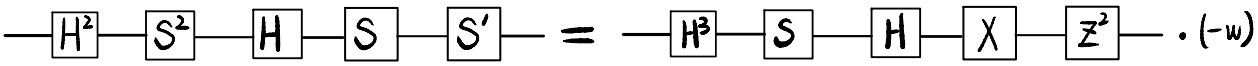
↓ composition in diagrammatic order

$A\,C^{-1} \overset{WTS}{=} B\,A$

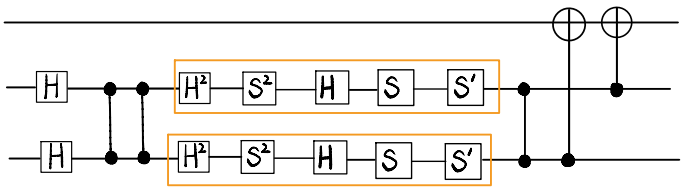
R_{59}: 







R59 . RHS :=



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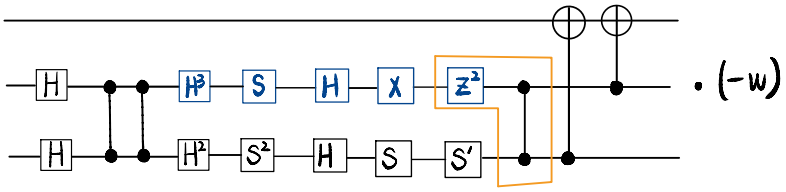
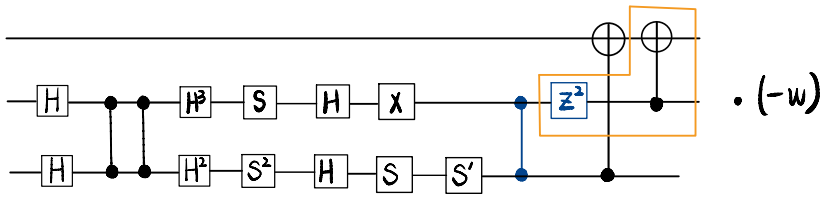


=



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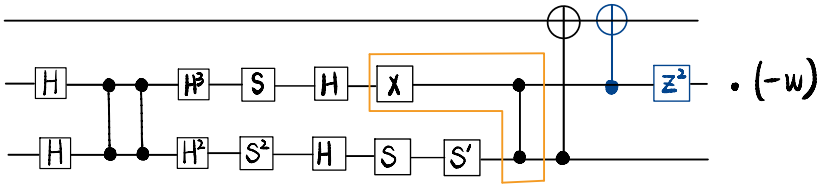

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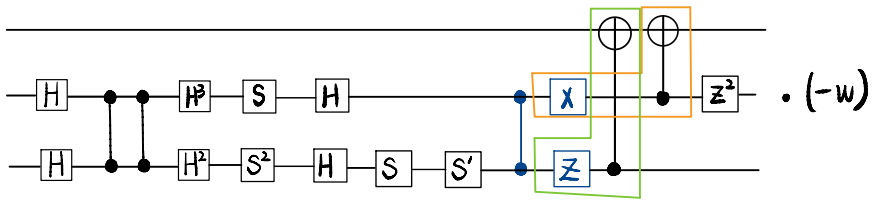

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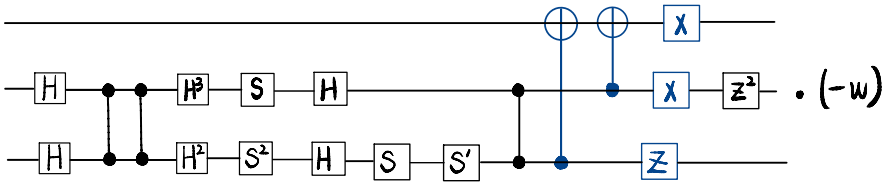
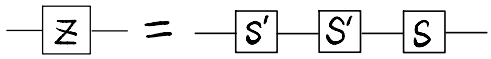
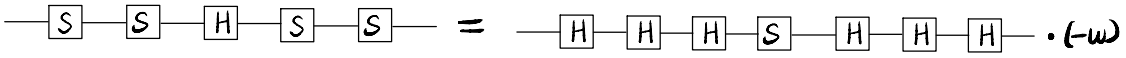
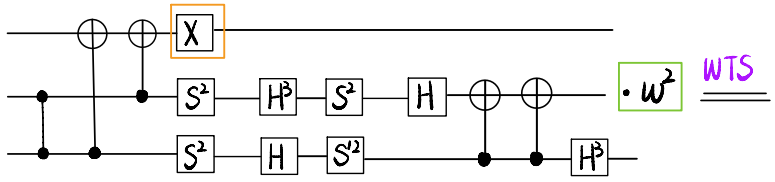
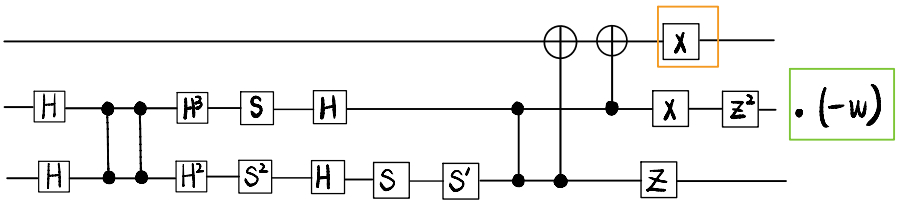


R10 : 

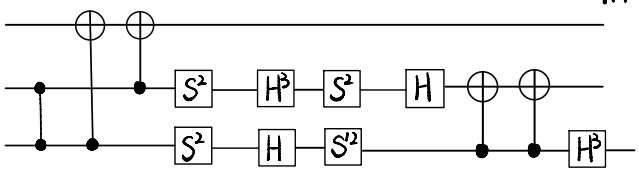
C_4^1 : 

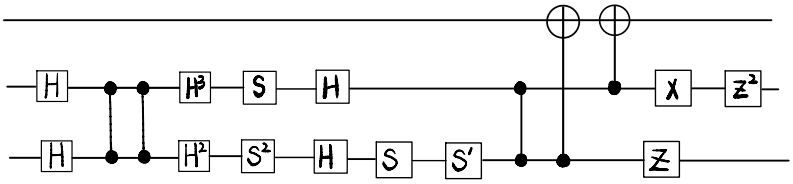
Hence R_{59} :  $\cdot w^2$ WTS



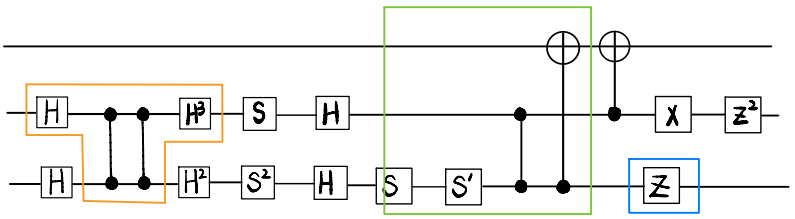
$\cdot (-w)$

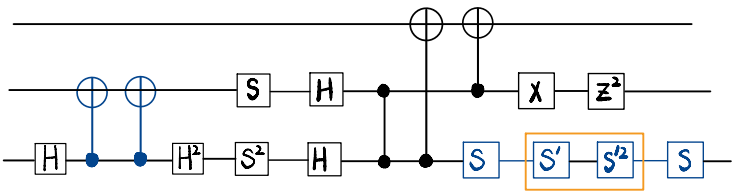
$\equiv$

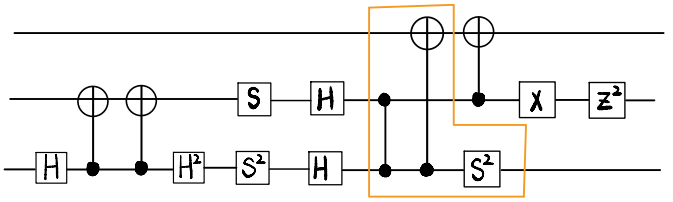
R_{59} :  WTS

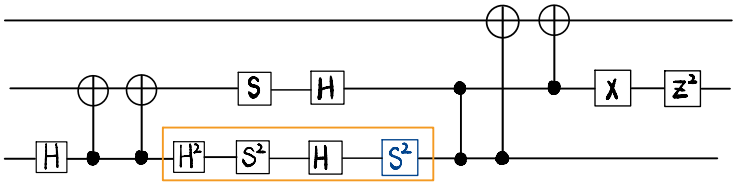


$\cdot (-w^2)$

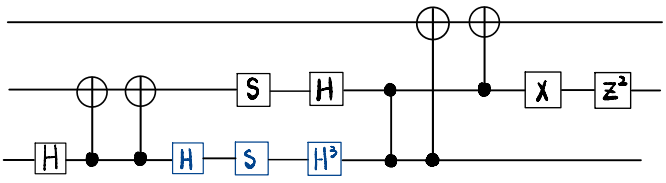
$R_{59}.RHS :=$  $\cdot (-w^2)$

$=$  $\cdot (-w^2)$

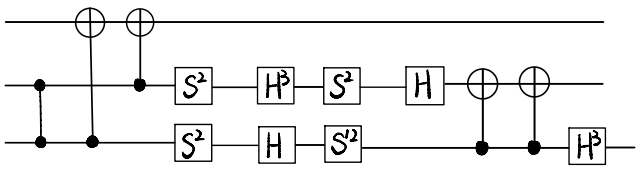
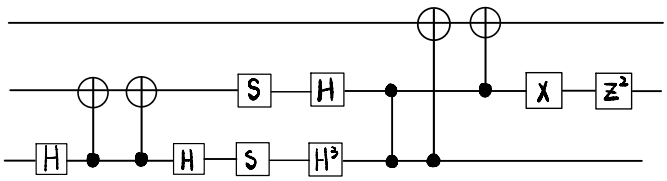
$=$  $\cdot (-w^2)$

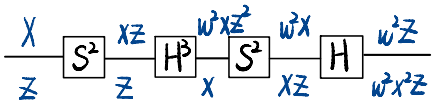
$=$  $\cdot (-w^2)$

$H^2 S^2 H S^2 \overset{C_4^1}{=} H^2 H^3 S H^3 \cdot (-w) \overset{C_2}{=} H S H^3 \cdot (-w)$

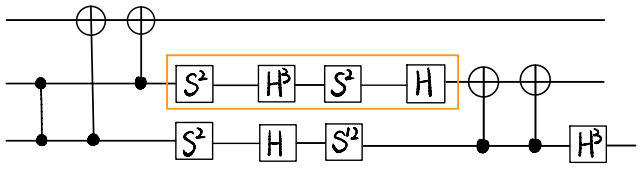
$=$ 

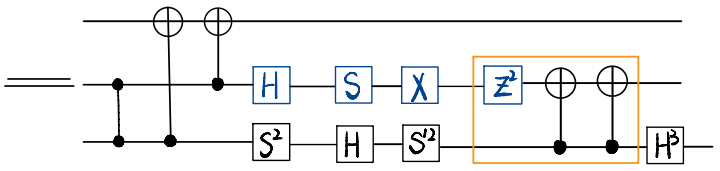
R11 : $Z^2 = S' S S$

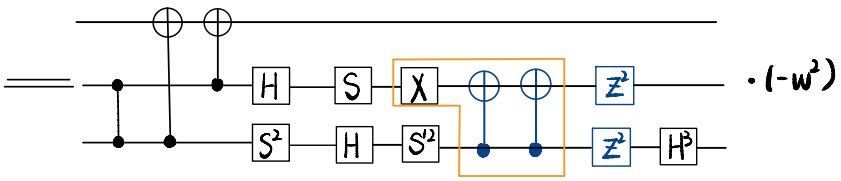
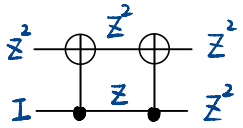
R_{59} :  WTS 

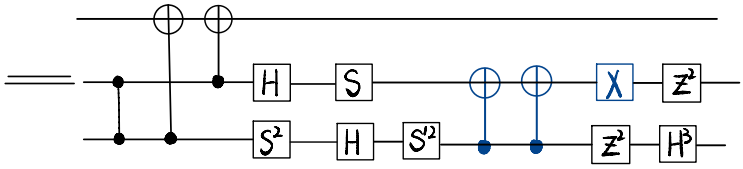


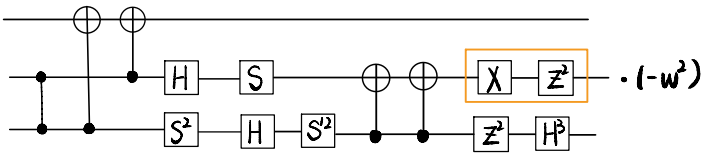
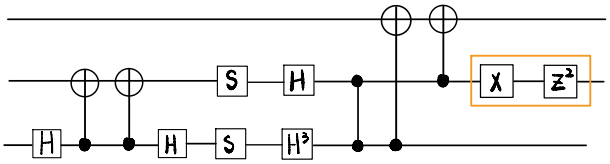
$S^2 H^3 S^2 H = H S X Z^2 \cdot (-w^2)$ (**)

R_{59}_LHS := 

=  $\cdot (-w^2)$

=  $\cdot (-w^2)$ 

=  $\cdot (-w^2)$

R_{59} :  $\cdot (-w^2)$ WTS 

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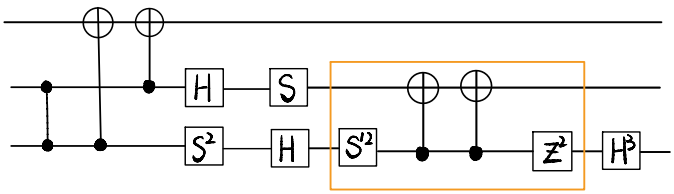
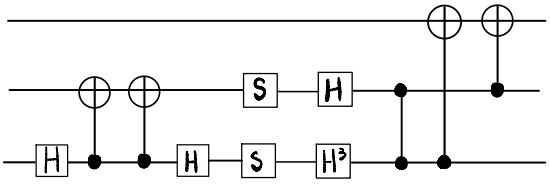
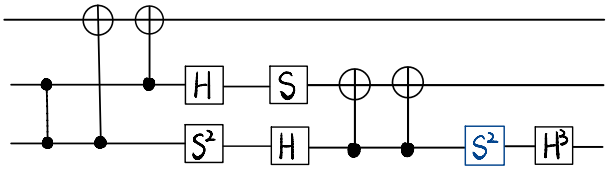
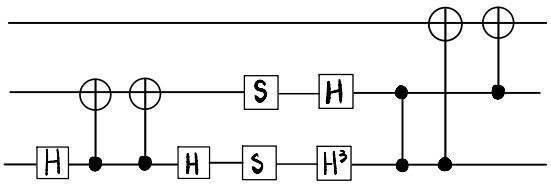
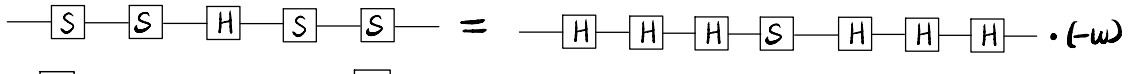
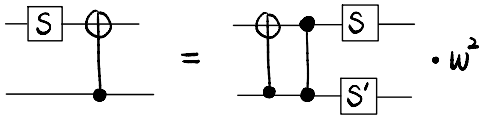
R_{59} :  $\cdot (-w^2)$ WTS 

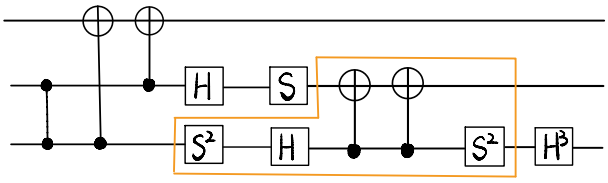
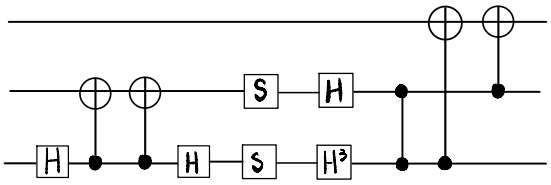
$S'^2 Z^2 \overset{R11}{=} S'^2 S' S^2 = S^2$

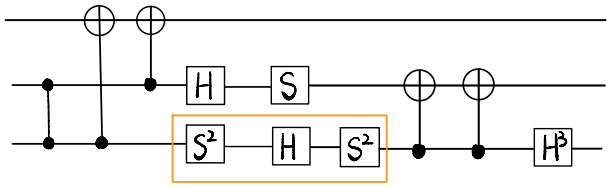
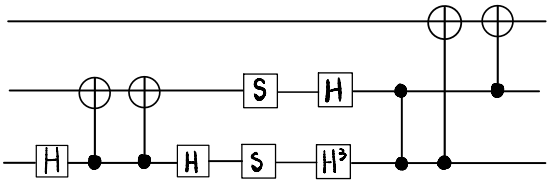
$\Vert\Vert$

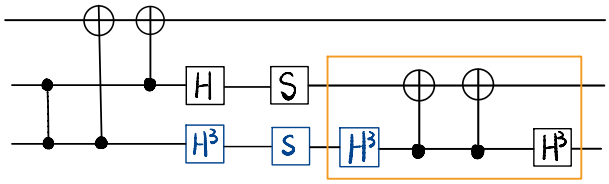
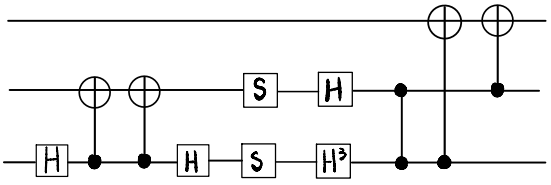
R_{59} :  $\cdot (-w^2)$ WTS 

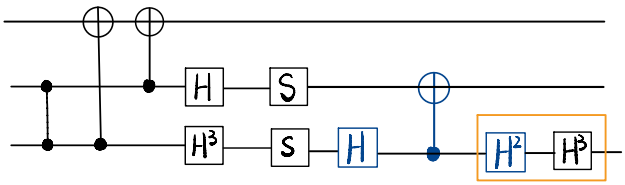
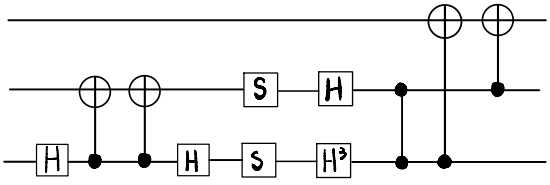
C_4^1: 

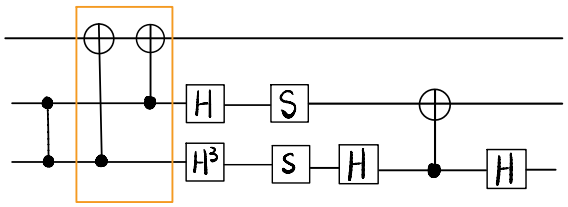
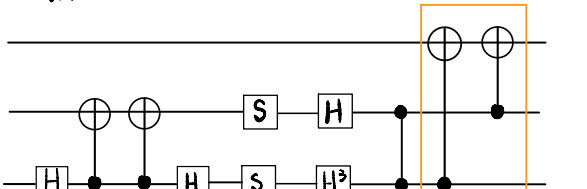
R_{23}^1: 

R_{59}:  WTS 

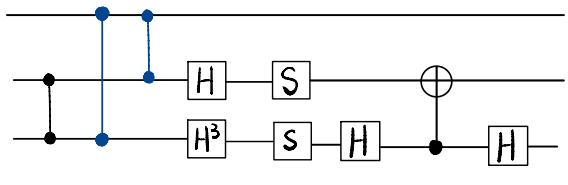
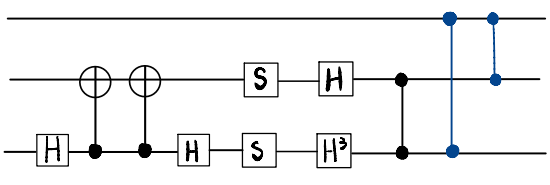
R_{59}:  WTS 

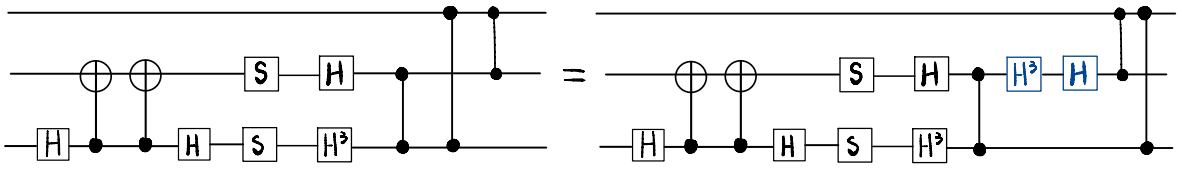
R_{59}:  WTS 

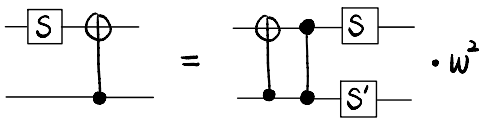
R_{59}:  WTS 

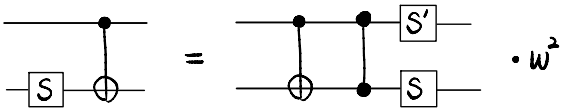
R_{59}:  WTS 

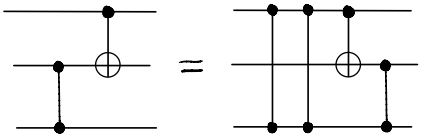
R_{59}: WTS

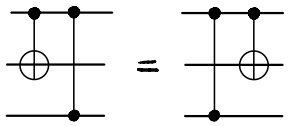
R_{59}:  WTS 

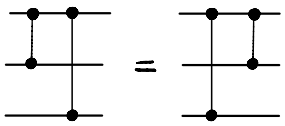
Then $R_{59}.RHS :=$ 

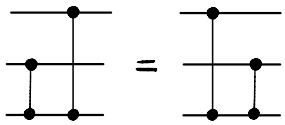
R_{23}^{1}: 

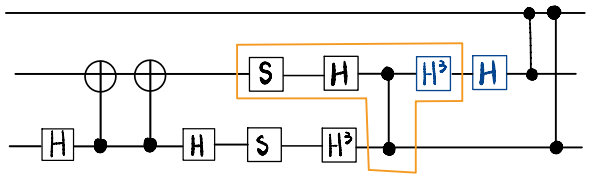
R_{23}^{4}: 

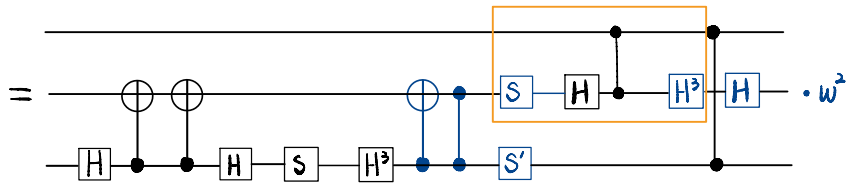
C_{16}^{1}: 

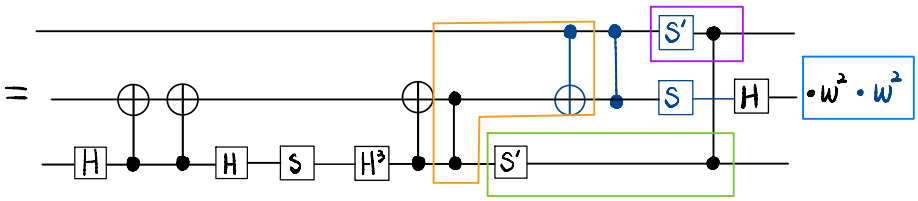
C_{13}^{5}: 

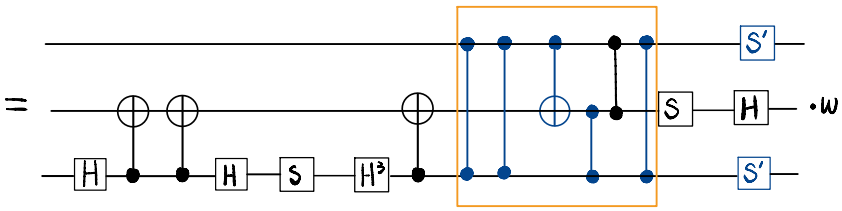
C_{13}^{1}: 

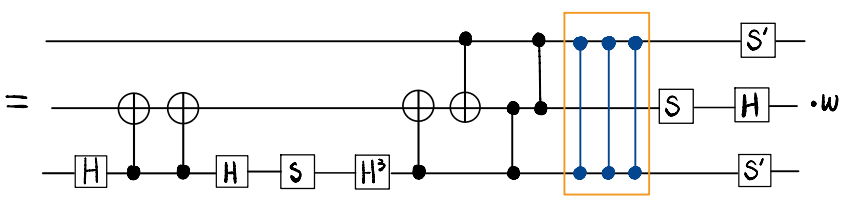
C_{13}^{2}: 

R59.RHS = 

= 

= 

= 

= 

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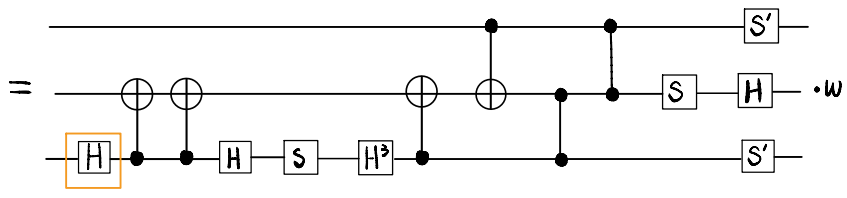
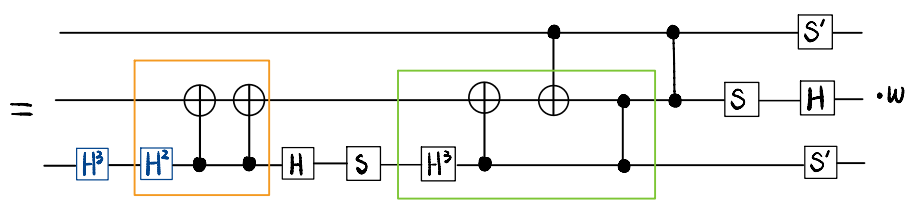
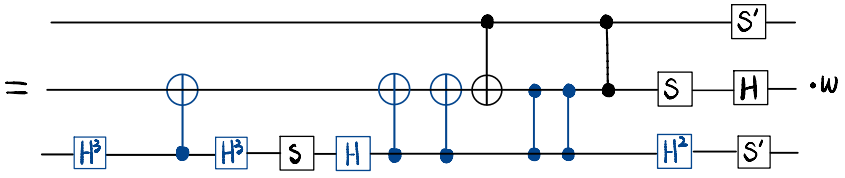
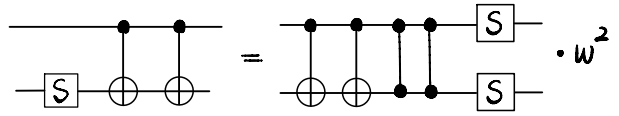
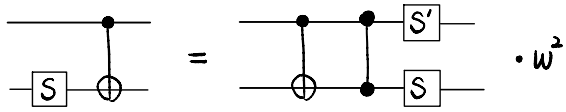
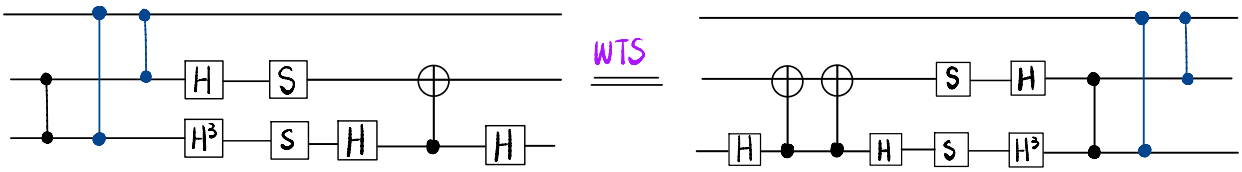
= 

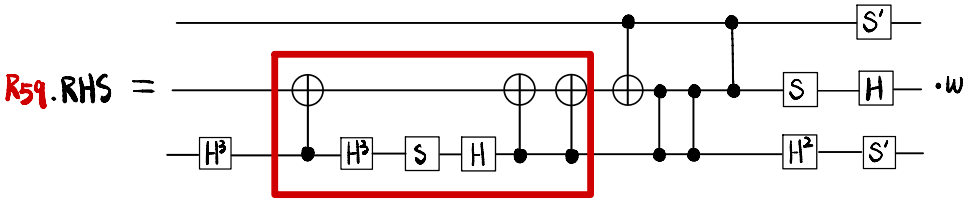
= 

= 

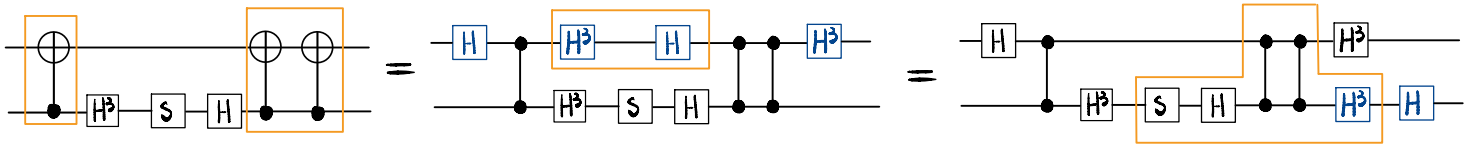
$R_{23}^{9'}$:  $\cdot w^2$

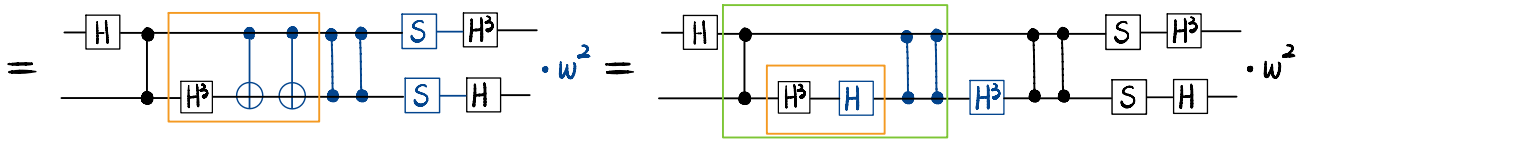
R_{23}^{4}:  $\cdot w^2$

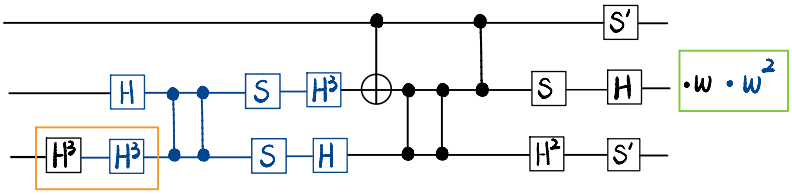
R_{59}: 



$R_{59}.RHS$ = $\cdot w$

Q = 



Then $R_{59}.RHS$ =  $\cdot w \cdot w^2$