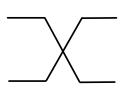
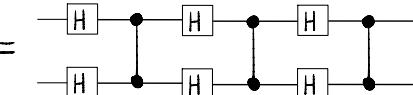
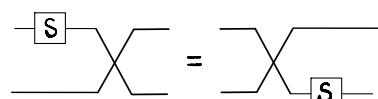
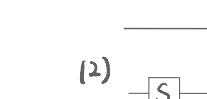


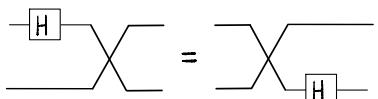
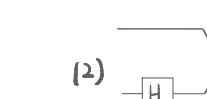
## Two - Qutrit Derived Relations : T<sub>3</sub>

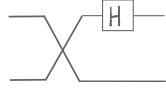
Def 3:  := 

R<sub>16</sub>:  = 

R<sub>18</sub>: (1)  = 

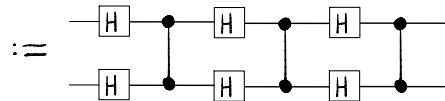
(2)  = 

R<sub>19</sub>: (1)  = 

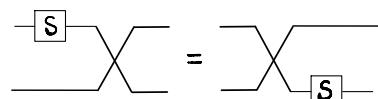
(2)  = 

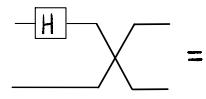
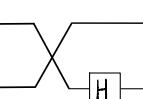
---

## Two - Qutrit Derived Relations : T<sub>2</sub>

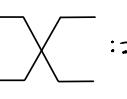
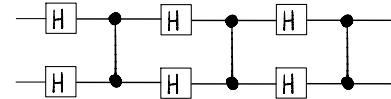
Def 3:  := 

R<sub>16</sub>:  = 

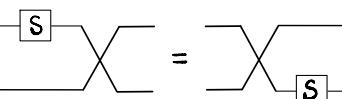
R<sub>18</sub>:  = 

R<sub>19</sub>:  = 

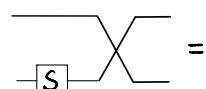
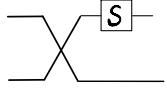
---

Def 3:  := 

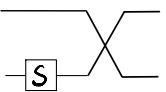
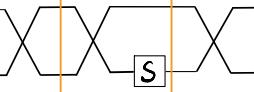
R<sub>16</sub>:  = 

Lem A By Def 3 & R<sub>16</sub>, R<sub>18</sub>: (1)  = 

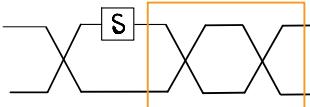
implies R<sub>18</sub>: (2)

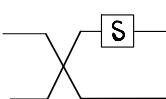
 = 

Proof: R<sub>18</sub>: (2). LHS :=

  $\stackrel{R_{16}}{=}$  

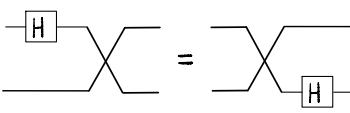
$\stackrel{R_{18}: (1)}{=}$



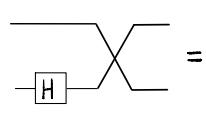
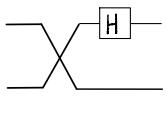
$\stackrel{R_{16}}{=}$   =: R<sub>18</sub>: (2). RHS

□

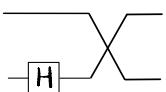
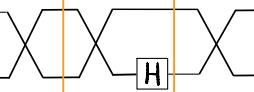
Lem B By Def 3 & R<sub>16</sub>, R<sub>19</sub>: (1)

 = 

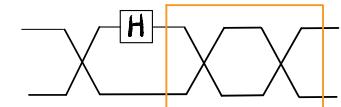
implies R<sub>19</sub>: (2)

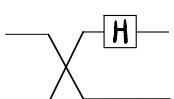
 = 

Proof: R<sub>19</sub>: (2). LHS :=

  $\stackrel{R_{16}}{=}$  

$\stackrel{R_{19}: (1)}{=}$



$\stackrel{R_{16}}{=}$   =: R<sub>19</sub>: (2). RHS

□

$$\text{Def 3: } \text{X} := \begin{array}{c} \text{H} \\ \text{H} \end{array} \quad \text{Def 1: } \text{S}' := \begin{array}{c} \text{H} \\ \text{H} \end{array} \quad \text{R}_{16}: \text{X} \otimes \text{X} = \text{X}$$

$$\text{Def 1: } \text{S}' := \begin{array}{c} \text{H} \\ \text{H} \end{array} \quad \text{R}_5: \text{X} = \begin{array}{c} \text{H} \\ \text{H} \end{array} \quad \text{S} \quad \begin{array}{c} \text{H} \\ \text{H} \end{array}$$

$$\text{R}_5: \text{X} = \begin{array}{c} \text{H} \\ \text{H} \end{array} \quad \text{S} \quad \begin{array}{c} \text{H} \\ \text{H} \end{array} \quad \text{S} \quad \begin{array}{c} \text{H} \\ \text{H} \end{array} \quad \text{S} \quad \begin{array}{c} \text{H} \\ \text{H} \end{array}$$

$$\text{R}_{10}: \text{Z} = \begin{array}{c} \text{H} \\ \text{H} \end{array} \quad \text{S} \quad \begin{array}{c} \text{S} \\ \text{S} \end{array} \quad \begin{array}{c} \text{H} \\ \text{H} \end{array} \quad \text{S} = \text{S}' \quad \text{S}' \quad \text{S}$$

$$\text{Prop 1} \quad \text{Let } \mathcal{C} := \langle H, S, w \rangle. \quad \forall u \in \mathcal{C}, \quad \begin{array}{c} u \\ \text{X} \end{array} = \text{X} \quad (1) \quad \text{and} \quad \begin{array}{c} u \\ \text{X} \end{array} = \text{X} \quad (2)$$

**Proof:**  $\forall u \in \mathcal{C}, \exists t \in \mathbb{Z}_6$  and  $m \in \mathbb{N}$  st.  $u = (-w)^t H^{a_0} S^{b_0} H^{a_1} S^{b_1} \dots H^{a_m} S^{b_m}$ , composition in diagrammatic order,  $a_i, b_i \in \mathbb{Z}_2, 0 \leq i \leq m$ . We proceed by induction on  $m$ .

**Base Case:** ①  $m=0, a_0=b_0=0$ .  $u = (-w)^t$  is a scalar. (1) & (2) hold trivially.

②  $m=0, a_0=1$  and  $b_0=0$ .  $u = (-w)^t H$ . By Lem A, (1) & (2) hold.

③  $m=0, a_0=0$  and  $b_0=1$ .  $u = (-w)^t S$ . By Lem B, (1) & (2) hold.

**Induction Hypothesis:** (1) & (2) hold for  $m \geq 0$ . That is, when  $u = (-w)^t H^{a_0} S^{b_0} H^{a_1} S^{b_1} \dots H^{a_m} S^{b_m}$

$$\begin{array}{c} u \\ \text{X} \end{array} = \text{X} \quad (3) \quad \text{and} \quad \begin{array}{c} u \\ \text{X} \end{array} = \text{X} \quad (4)$$

**Induction Step:** When  $u' = u H^{a_{m+1}} S^{b_{m+1}}$ , WTS  $\begin{array}{c} u' \\ \text{X} \end{array} = \text{X} \quad (5) \& \quad \begin{array}{c} u' \\ \text{X} \end{array} = \text{X} \quad (6)$

$$a_{m+1}, b_{m+1} \in \mathbb{Z}_2$$

$$(5). \text{LHS} := \begin{array}{c} u \\ \boxed{H^{a_{m+1}} \quad S^{b_{m+1}}} \end{array} \quad \begin{array}{c} \text{Lem A} \\ \text{Lem B} \end{array} \quad \begin{array}{c} u \\ \text{X} \end{array} \quad \begin{array}{c} \text{IH} \\ = \end{array} \quad \begin{array}{c} u \\ \boxed{H^{a_{m+1}} \quad S^{b_{m+1}}} \end{array} \quad \begin{array}{c} \text{def} \\ = \end{array}$$

$$\begin{array}{c} \text{X} \\ u \end{array} =: (5). \text{RHS} \quad (6). \text{LHS} := \begin{array}{c} u \\ \boxed{H^{a_{m+1}} \quad S^{b_{m+1}}} \end{array} \quad \begin{array}{c} \text{Reasoning analogously} \\ \text{as before} \end{array} \quad \begin{array}{c} u' \\ \text{X} \end{array} =: (6). \text{RHS}$$

This completes the proof. □

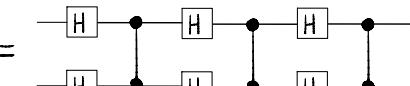
$$\text{Cor 1} \quad \text{R}_{20}: (1) \quad \begin{array}{c} X \\ \text{X} \end{array} = \begin{array}{c} X \\ \text{X} \end{array} \quad (2) \quad \begin{array}{c} X \\ \text{X} \end{array} = \begin{array}{c} X \\ \text{X} \end{array}$$

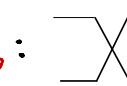
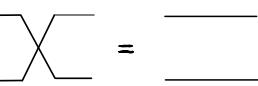
$$\text{R}_{21}: (1) \quad \begin{array}{c} Z \\ \text{Z} \end{array} = \begin{array}{c} Z \\ \text{Z} \end{array} \quad (2) \quad \begin{array}{c} Z \\ \text{Z} \end{array} = \begin{array}{c} Z \\ \text{Z} \end{array}$$

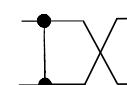
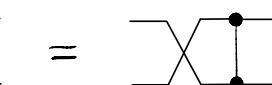
$$\text{R}_{22}: (1) \quad \begin{array}{c} S \\ \text{S} \end{array} = \begin{array}{c} S \\ \text{S} \end{array} \quad (2) \quad \begin{array}{c} S \\ \text{S} \end{array} = \begin{array}{c} S \\ \text{S} \end{array}$$

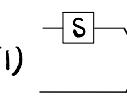
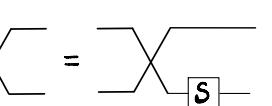
**Proof:** By Def 1, R<sub>5</sub>, R<sub>10</sub> & Prop 1. □

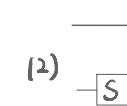
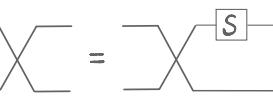
## Two - Qutrit Derived Relations : $T_3$

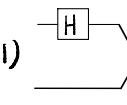
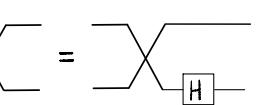
**Def 3:**  := 

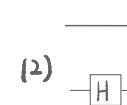
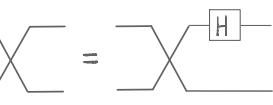
**R<sub>16</sub>:**  = 

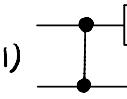
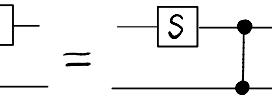
**R<sub>17</sub>:**  = 

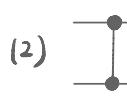
**R<sub>18</sub>: (1)**  = 

**(2)**  = 

**R<sub>19</sub>: (1)**  = 

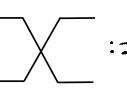
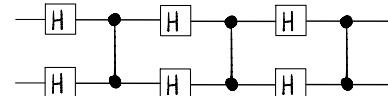
**(2)**  = 

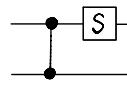
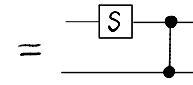
**C<sub>7</sub>: (1)**  = 

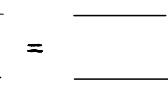
**(2)**  = 

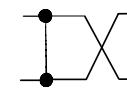
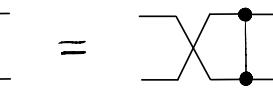
---

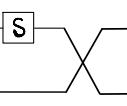
## Two - Qutrit Derived Relations : $T_2$

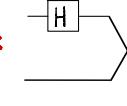
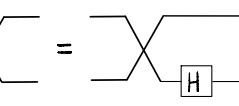
**Def 3:**  := 

**C<sub>7</sub>:**  = 

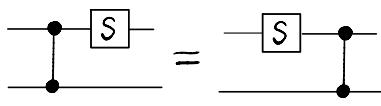
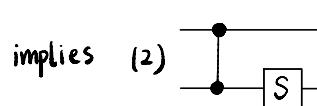
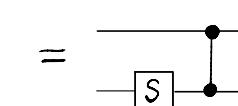
**R<sub>16</sub>:**  = 

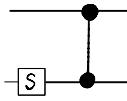
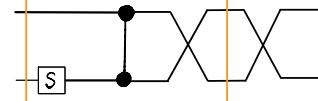
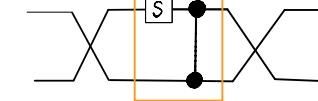
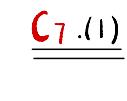
**R<sub>17</sub>:**  = 

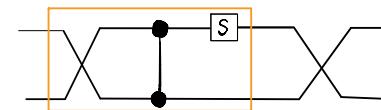
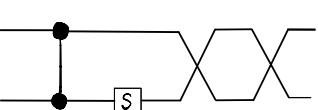
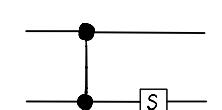
**R<sub>18</sub>:**  = 

**R<sub>19</sub>:**  = 

**Lem C** By Def 3, R<sub>16</sub>, R<sub>17</sub> & R<sub>18</sub>,

**C<sub>7</sub>: (1)**  =  implies **(2)**  = 

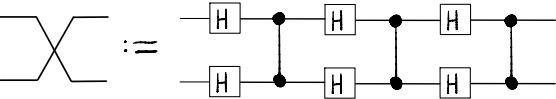
**Proof:** **C<sub>7</sub>.(2). RHS** :=   $\stackrel{R_{16}}{=}$    $\stackrel{R_{17}}{=}$    $\stackrel{R_{18}}{=}$    $\stackrel{C_7.(1)}{=}$

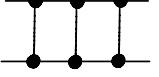
  $\stackrel{R_{17}}{=}$    $\stackrel{R_{16}}{=}$   =: **C<sub>7</sub>.(2). LHS**

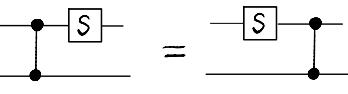
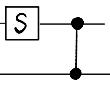
□

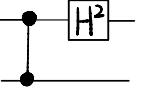
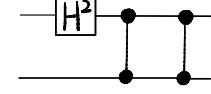
3

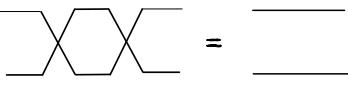
## Two - Qutrit $T_2$

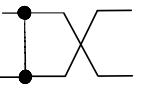
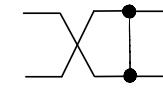
**Def 3:**  := 

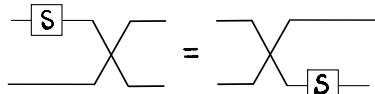
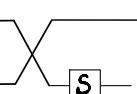
**C<sub>6</sub>:**  = 

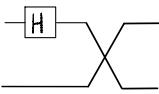
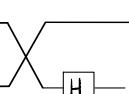
**C<sub>7</sub>:**  = 

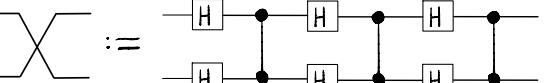
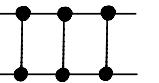
**C<sub>8</sub>:**  = 

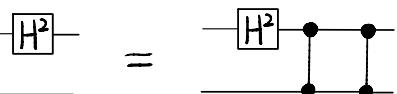
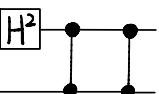
**R<sub>16</sub>:**  = 

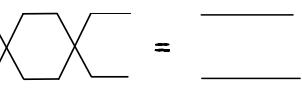
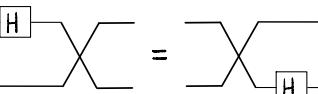
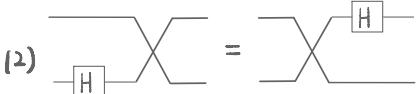
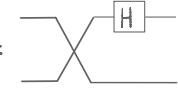
**R<sub>17</sub>:**  = 

**R<sub>18</sub>:**  = 

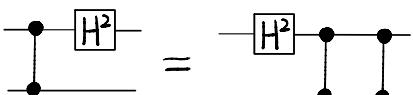
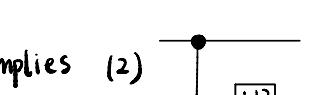
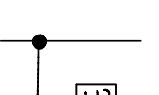
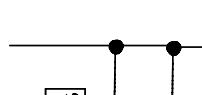
**R<sub>19</sub>:**  = 

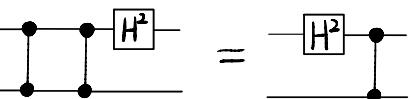
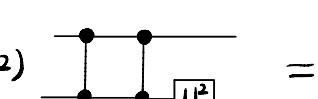
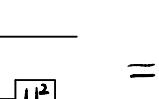
**Def 3:**  :=  **C<sub>6</sub>:**  =  **C<sub>2</sub>:**  $H^4 = I$

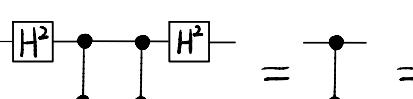
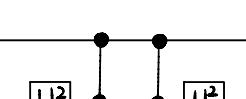
**C<sub>8</sub>:**  =  **R<sub>17</sub>:**  = 

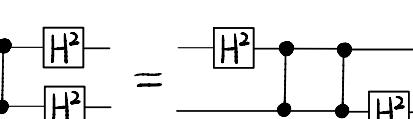
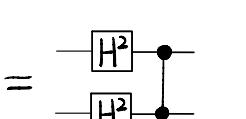
**R<sub>16</sub>:**  =  **R<sub>19</sub>: (1)**  =  **(2)**  = 

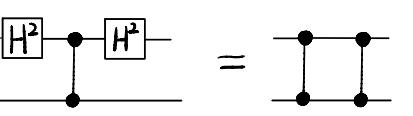
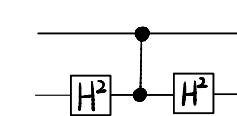
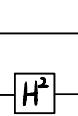
**Lem D** By Def3, R<sub>16</sub>, R<sub>17</sub>, R<sub>19</sub>, C<sub>6</sub>, C<sub>2</sub> & C<sub>8</sub>,

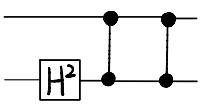
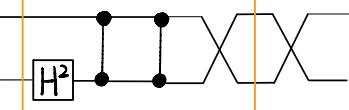
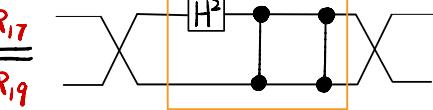
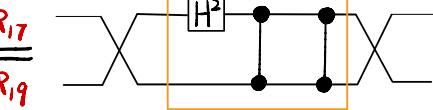
**C<sub>8</sub>: (1)**  =  implies **(2)**  = 

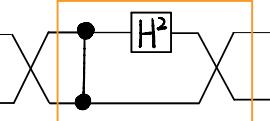
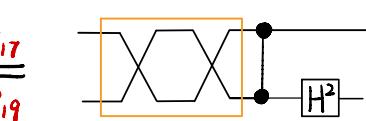
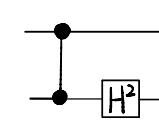
**C<sub>8</sub><sup>1</sup>: (1)**  =  **(2)**  = 

**C<sub>8</sub><sup>2</sup>:**  =  = 

**C<sub>8</sub><sup>3</sup>:**  =  = 

**C<sub>8</sub><sup>4</sup>:**  =  = 

**Proof:** **C<sub>8</sub>.(2). RHS** :=  **R<sub>16</sub>**  **R<sub>17</sub>**  **R<sub>19</sub>** 

**C<sub>8</sub>.(1)**  **R<sub>17</sub>**  **R<sub>16</sub>**  =: **C<sub>8</sub>.(2).LHS**

$$\text{Def 3: } \text{Diagram} := \text{Diagram} \quad C_6: \text{Diagram} = \text{Diagram} \quad C_2: H^4 = I$$

$$C_8: \text{Diagram} = \text{Diagram} \quad R_{17}: \text{Diagram} = \text{Diagram}$$

$$R_{16}: \text{Diagram} = \text{Diagram} \quad R_{19}: (1) \text{Diagram} = \text{Diagram} \quad (2) \text{Diagram} = \text{Diagram}$$


---

$$C_8 : (1) \text{Diagram} = \text{Diagram} \quad \text{implies} \quad (2) \text{Diagram} = \text{Diagram}$$

$$C_8^1 : (1) \text{Diagram} = \text{Diagram} \quad (2) \text{Diagram} = \text{Diagram}$$

$$C_8^2: \text{Diagram} = \text{Diagram} = \text{Diagram}$$

$$C_8^3: \text{Diagram} = \text{Diagram} = \text{Diagram}$$

$$C_8^4: \text{Diagram} = \text{Diagram} = \text{Diagram}$$


---

Proof cont:

$$C_8^1.(1). \text{LHS} := \text{Diagram} \stackrel{C_8}{=} \text{Diagram} \stackrel{C_8}{=} \text{Diagram} \stackrel{C_6}{=} \text{Diagram} \stackrel{C_6}{=} \text{Diagram} =: C_8^1.(1). \text{RHS}.$$

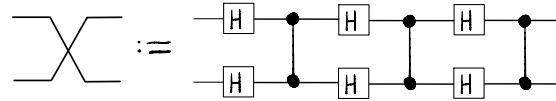
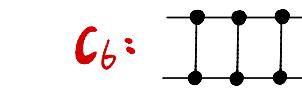
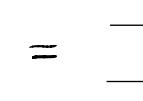
$$C_8^1.(2). \text{LHS} := \text{Diagram} \stackrel{R_{16}}{=} \text{Diagram} \stackrel{R_{17}}{=} \text{Diagram} \stackrel{C_8^1.(1)}{=}$$

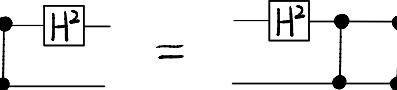
$$\text{Diagram} \stackrel{R_{19}}{=} \text{Diagram} \stackrel{R_{16}}{=} \text{Diagram} =: C_8^1.(2). \text{RHS}.$$

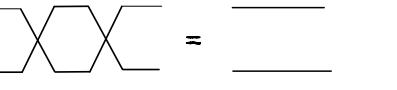
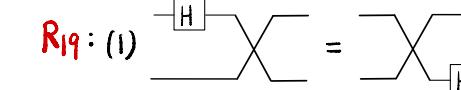
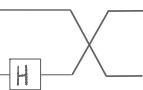
$$C_8^2. \text{LHS} := \text{Diagram} \stackrel{C_8^1}{=} \text{Diagram} \stackrel{C_2}{=} \text{Diagram} =: C_8^2. \text{MID}$$

$$C_8^2. \text{RHS} := \text{Diagram} \stackrel{R_{16}}{=} \text{Diagram} \stackrel{R_{19}}{=} \text{Diagram}$$

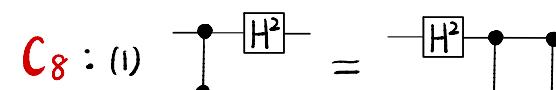
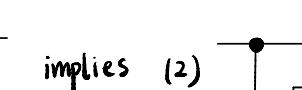
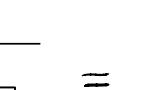
$$\stackrel{C_8^2}{=} \text{Diagram} \stackrel{R_{17}}{=} \text{Diagram} \stackrel{R_{16}}{=} \text{Diagram} =: C_8^2. \text{MID}$$

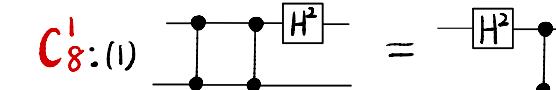
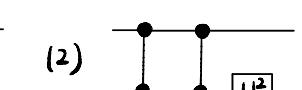
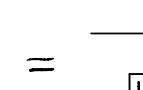
Def 3:  :=   $C_6$ :  =   $C_2$ :  $H^4 = I$

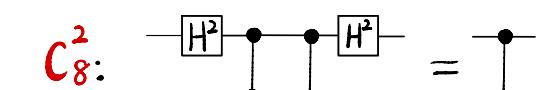
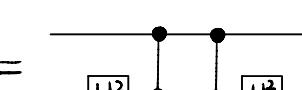
$C_8$ :  =   $R_{17}$ :  = 

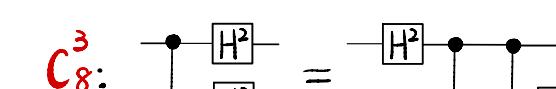
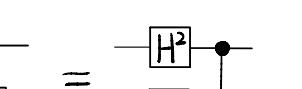
$R_{16}$ :  =   $R_{19}$ : (1)  =  (2) 

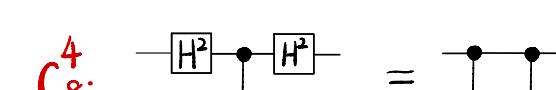
---

$C_8$ : (1)  =  implies (2)  = 

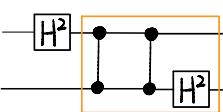
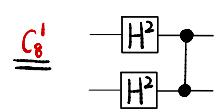
$C_8^1$ : (1)  =  (2)  = 

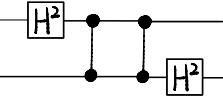
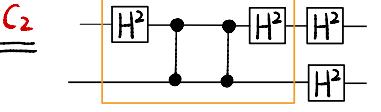
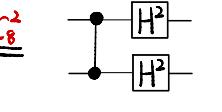
$C_8^2$ :  = 

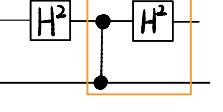
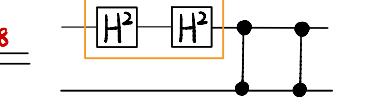
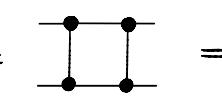
$C_8^3$ :  = 

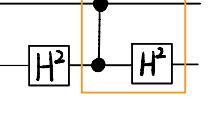
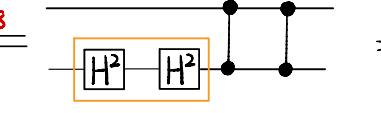
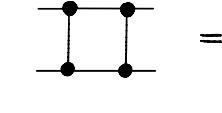
$C_8^4$ :  = 

Proof cont:

$C_8^3 \cdot \text{MID} :=$    $\stackrel{C_8}{=}$    $=: C_8^3 \cdot \text{RHS}$ .

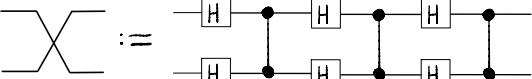
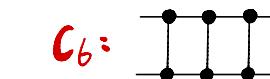
$C_8^3 \cdot \text{MID} :=$    $\stackrel{C_2}{=}$    $\stackrel{C_2}{=}$    $=: C_8^3 \cdot \text{LHS}$ .

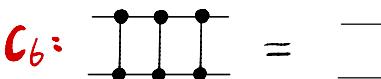
$C_8^4 \cdot \text{LHS} :=$    $\stackrel{C_8}{=}$    $\stackrel{C_2}{=}$    $=: C_8^4 \cdot \text{MID}$

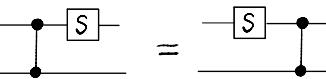
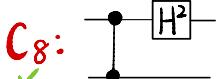
$C_8^4 \cdot \text{RHS} :=$    $\stackrel{C_8}{=}$    $\stackrel{C_2}{=}$    $=: C_8^4 \cdot \text{MID}$

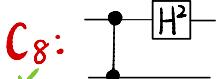
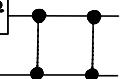
## Two - Qutrit Derived Relations : T<sub>2</sub>

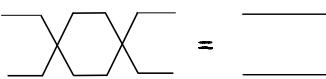
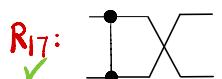
**Def 1 :**  $S' := H \otimes H \otimes S \otimes H \otimes H$        $S'^2 := H \otimes H \otimes S^2 \otimes H \otimes H$

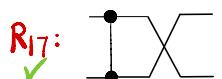
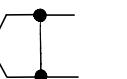
**Def 3 :**  = 

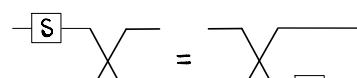
**C<sub>6</sub>:**  = 

**C<sub>7</sub>:**  = 

**C<sub>8</sub>:**  = 

**R<sub>16</sub>:**  = 

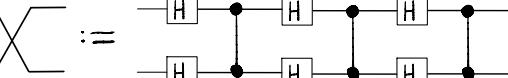
**R<sub>17</sub>:**  = 

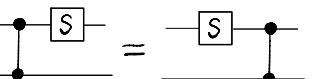
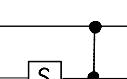
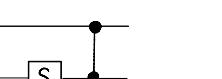
**R<sub>18</sub>:**  = 

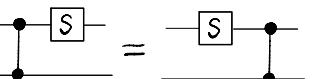
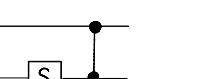
**R<sub>19</sub>:**  = 

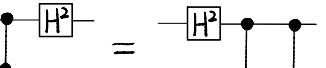
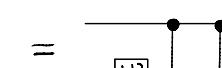
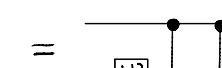
---

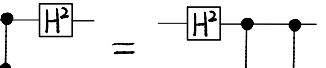
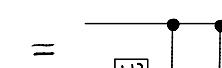
**Def 1 :**  $S' := H \otimes H \otimes S \otimes H \otimes H$        $S'^2 := H \otimes H \otimes S^2 \otimes H \otimes H$

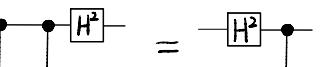
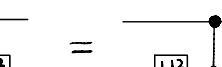
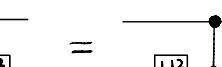
**Def 3 :**  = 

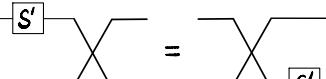
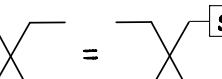
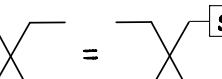
**C<sub>7</sub>: (1)**  =  (2)  = 

**R<sub>16</sub>:**  = 

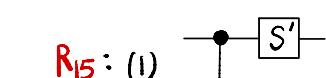
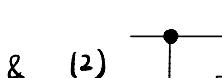
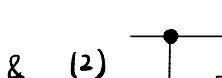
**C<sub>8</sub> : (1)**  =  (2)  = 

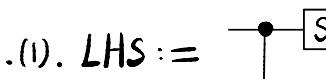
**R<sub>17</sub>:**  = 

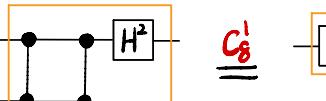
**C<sub>8</sub><sup>1</sup> : (1)**  =  (2)  = 

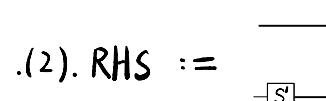
**R<sub>22</sub> : (1)**  =  (2)  = 

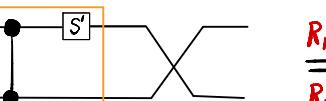
**Lem E** By Def 1, Def 3, C<sub>7</sub>, C<sub>8</sub>, R<sub>16</sub>, R<sub>17</sub> & R<sub>22</sub>,

**R<sub>15</sub> : (1)**  =  & (2)  = 

**Proof:** R<sub>15</sub>.(1). LHS :=   $\stackrel{\text{Def 1}}{=} \boxed{H^2 \otimes S \otimes H^2} \otimes S \otimes H^2 \stackrel{\text{C}_8}{=} \boxed{H^2 \otimes S \otimes H^2} \otimes S \otimes H^2 \stackrel{\text{C}_7}{=}$

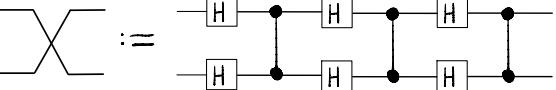
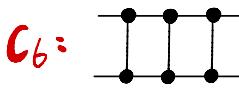
  $\stackrel{\text{C}_8^1}{=} \boxed{H^2 \otimes S \otimes H^2} \otimes S \otimes H^2 \stackrel{\text{Def 1}}{=} \boxed{S'} \otimes S \otimes H^2 =: R_{15}.(1).RHS$

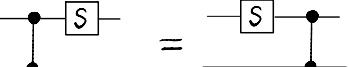
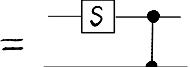
**R<sub>15</sub> .(2). RHS** :=   $\stackrel{R_{16}}{=} \boxed{S'} \otimes \boxed{H^2 \otimes S \otimes H^2} \otimes S \otimes H^2 \stackrel{R_{17}}{=} \boxed{S'} \otimes \boxed{H^2 \otimes S \otimes H^2} \otimes S \otimes H^2 \stackrel{R_{22}}{=} \boxed{S'} \otimes S \otimes H^2 \stackrel{\text{R15.(1)}}{=}$

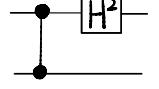
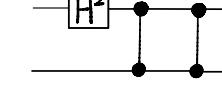
  $\stackrel{R_{22}}{=} \boxed{S'} \otimes \boxed{H^2 \otimes S \otimes H^2} \otimes S \otimes H^2 \stackrel{R_{16}}{=} \boxed{S'} \otimes S \otimes H^2 =: R_{15}.(2).LHS$  

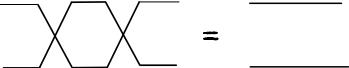
## Two - Qutrit Derived Relations : T<sub>2</sub>

**Def 1 :**  $S' := H \otimes H \otimes S \otimes H \otimes H$        $S'^2 := H \otimes H \otimes S^2 \otimes H \otimes H$

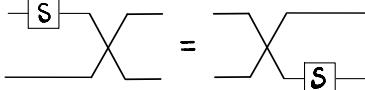
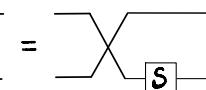
**Def 3 :**        $C_6:$   = 

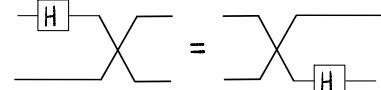
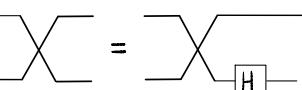
$C_7:$   = 

$C_8:$   = 

$R_{16}:$   = 

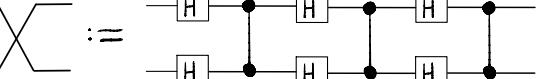
$R_{17}:$   = 

$R_{18}:$   = 

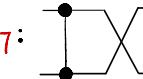
$R_{19}:$   = 

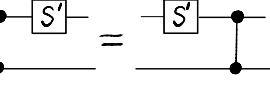
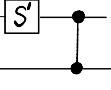
---

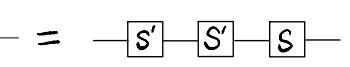
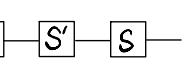
**Def 1 :**  $S' := H \otimes H \otimes S \otimes H \otimes H$        $S'^2 := H \otimes H \otimes S^2 \otimes H \otimes H$

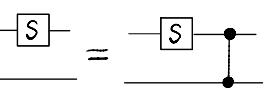
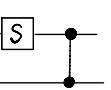
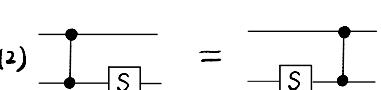
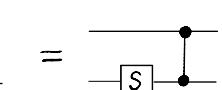
**Def 3 :**  = 

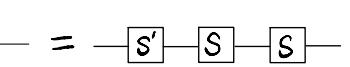
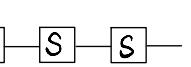
$R_{16}:$   = 

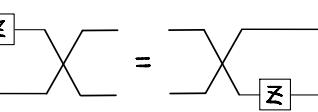
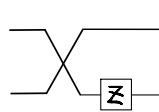
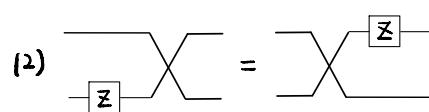
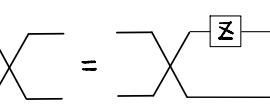
$R_{17}:$   = 

$R_{15}:$  (1)  = 

$R_{10}:$   = 

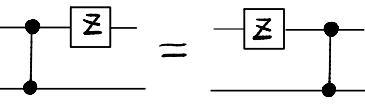
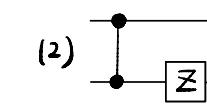
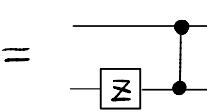
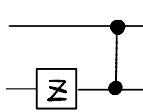
$C_7:$  (1)  =  (2)  = 

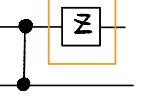
$R_{11}:$   = 

$R_{21}:$  (1)  =  (2)  = 

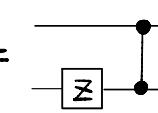
---

Lem F By Def 1, Def 3, C<sub>7</sub>, R<sub>10</sub>, R<sub>11</sub>, R<sub>15</sub>, R<sub>16</sub>, R<sub>17</sub> & R<sub>21</sub>,

$R_B:$  (1)  =  & (2)  = 

**Proof:**  $R_B.$  (1). LHS :=   $\stackrel{R_{10}}{=} \boxed{\begin{array}{c} \bullet \\ \text{---} \\ \bullet \end{array} \otimes \begin{array}{c} \bullet \\ \text{---} \\ \bullet \end{array} \otimes \begin{array}{c} \bullet \\ \text{---} \\ \bullet \end{array} \otimes \begin{array}{c} \bullet \\ \text{---} \\ \bullet \end{array}}$   $\stackrel{C_7}{=} \boxed{\begin{array}{c} \bullet \\ \text{---} \\ \bullet \end{array} \otimes \begin{array}{c} \bullet \\ \text{---} \\ \bullet \end{array} \otimes \begin{array}{c} \bullet \\ \text{---} \\ \bullet \end{array}}$   $\stackrel{R_{15}}{=} \boxed{\begin{array}{c} \bullet \\ \text{---} \\ \bullet \end{array} \otimes \begin{array}{c} \bullet \\ \text{---} \\ \bullet \end{array} \otimes \begin{array}{c} \bullet \\ \text{---} \\ \bullet \end{array}}$

$\stackrel{R_{10}}{=} \boxed{\begin{array}{c} \bullet \\ \text{---} \\ \bullet \end{array}} =: R_B.(1).RHS$

$R_B.$  (2). RHS :=   $\stackrel{R_{16}}{=} \boxed{\begin{array}{c} \bullet \\ \text{---} \\ \bullet \end{array} \otimes \begin{array}{c} \bullet \\ \text{---} \\ \bullet \end{array} \otimes \begin{array}{c} \bullet \\ \text{---} \\ \bullet \end{array} \otimes \begin{array}{c} \bullet \\ \text{---} \\ \bullet \end{array}}$   $\stackrel{R_{17}}{=} \boxed{\begin{array}{c} \bullet \\ \text{---} \\ \bullet \end{array} \otimes \begin{array}{c} \bullet \\ \text{---} \\ \bullet \end{array} \otimes \begin{array}{c} \bullet \\ \text{---} \\ \bullet \end{array}}$   $\stackrel{R_{21}}{=} \boxed{\begin{array}{c} \bullet \\ \text{---} \\ \bullet \end{array} \otimes \begin{array}{c} \bullet \\ \text{---} \\ \bullet \end{array} \otimes \begin{array}{c} \bullet \\ \text{---} \\ \bullet \end{array}}$

$\stackrel{R_{13}.(1)}{=} \boxed{\begin{array}{c} \bullet \\ \text{---} \\ \bullet \end{array} \otimes \begin{array}{c} \bullet \\ \text{---} \\ \bullet \end{array} \otimes \begin{array}{c} \bullet \\ \text{---} \\ \bullet \end{array}}$   $\stackrel{R_{17}}{=} \boxed{\begin{array}{c} \bullet \\ \text{---} \\ \bullet \end{array} \otimes \begin{array}{c} \bullet \\ \text{---} \\ \bullet \end{array} \otimes \begin{array}{c} \bullet \\ \text{---} \\ \bullet \end{array}}$   $\stackrel{R_{16}}{=} \boxed{\begin{array}{c} \bullet \\ \text{---} \\ \bullet \end{array}} =: R_B.(2).LHS$