$$
\begin{array}{c|c} 1 & 0 \\ \hline 0 & p \end{array}\; d \begin{array}{c|c} \omega ⧗ 1_R & \varkappa\Gamma\psi ⧗ \overset{*}{\mathring{e}} \\ \hline \varphi\Gamma ⧗ e & \Omega ⧗ 1_L \end{array}\; \begin{array}{c|c} 1 & 0 \\ \hline 0 & p \end{array}
$$

$$
= \begin{array}{c|c} \underbrace{f + d\omega} ⧗ 1_R + \underbrace{\psi\varepsilon + \overset{*}{\mathring{\varepsilon}}\varphi} \underset{\varkappa}{⧗} \overset{*}{\mathring{e}} e & -\Gamma \underbrace{d\psi + \omega\overset{*}{\mathring{\varepsilon}} - \overset{*}{\mathring{\varepsilon}}\Omega} \underset{\varkappa}{⧗} \overset{*}{\mathring{e}} \\ \hline \underbrace{d\varphi + \Omega\varepsilon - \varepsilon\omega}\Gamma ⧗ e & \underbrace{F + d\Omega} ⧗ 1_L + \underbrace{\varphi\overset{*}{\mathring{\varepsilon}} + \varepsilon\psi} \underset{\varkappa}{⧗} e\overset{*}{\mathring{e}} \end{array}
$$

$$
\pi \underbrace{f^0 df^1} = \begin{array}{c|c} \omega_R ⧗ 1_R & \varkappa\Gamma\varphi_R ⧗ \overset{*}{\mathring{e}} \\ \hline \varphi_L \Gamma ⧗ e & \omega_L ⧗ 1_L \end{array}
$$

$$
\Longrightarrow \omega_i = f^0_i d f^1_i \;\; \varphi_i = f^0_i f^1_{ji}
$$

$$
\pi \underbrace{df^0 df^1} = \begin{array}{c|c} df^0_R ⧗ 1_R & \varkappa\Gamma f^0_{LR} ⧗ \overset{*}{\mathring{e}} \\ \hline f^0_{RL}\Gamma ⧗ e & df^0_L ⧗ 1_L \end{array}\; \begin{array}{c|c} df^1_R ⧗ 1_R & \varkappa\Gamma f^1_{LR} ⧗ \overset{*}{\mathring{e}} \\ \hline f^1_{RL}\Gamma ⧗ e & df^1_L ⧗ 1_L \end{array}
$$

$$
= \begin{array}{c|c} \underbrace{df^0_R \times df^1_R} ⧗ 1_R + f^0_{LR} f^1_{RL} \underset{\varkappa}{⧗} \overset{*}{\mathring{e}} e & \Gamma \underbrace{f^0_{LR} df^1_L - df^0_R f^1_{LR}} \underset{\varkappa}{⧗} \overset{*}{\mathring{e}} \\ \hline \underbrace{df^0_L f^1_{RL} - f^0_{RL} df^1_R}\Gamma ⧗ e & \underbrace{df^0_L \times df^1_L} ⧗ 1_L + f^0_{RL} f^1_{LR} \underset{\varkappa}{⧗} e\overset{*}{\mathring{e}} \end{array}
$$

$$
= \begin{array}{c|c} \underbrace{f_R + d\omega_R} ⧗ 1_R + \underbrace{\varphi_L + \varphi_R} \underset{\varkappa}{⧗} \overset{*}{\mathring{e}} e & -\Gamma \underbrace{\omega_{RL} + d\varphi_R} \underset{\varkappa}{⧗} \overset{*}{\mathring{e}} \\ \hline \underbrace{\omega_{LR} + d\varphi_L}\Gamma ⧗ e & \underbrace{f_L + d\omega_L} ⧗ 1_L + \underbrace{\varphi_L + \varphi_R} \underset{\varkappa}{⧗} e\overset{*}{\mathring{e}} \end{array}
$$

$$
d\omega_i = d f^0_i ⧖ d f^1_i = \underbrace{df^0_i \times df^1_i}^{\perp} \Longrightarrow d f^0_i \times d f^1_i = d\omega_i + f_i
$$

$$
\varphi_i + \varphi_j = f^0_i f^1_{ji} + f^0_j f^1_{ij} = \underbrace{f^0_i - f^0_j} f^1_{ji} = f^0_{ij} f^1_{ji}
$$

$$
\omega_{ij} + d\varphi_i = f^0_i d f^1_i - f^0_j d f^1_j + d f^0_i f^1_{ji} + f^0_i d f^1_{ji} = f^0_i d f^1_j - f^0_j d f^1_j + d f^0_i f^1_{ji} = f^0_{ij} d f^1_j + d f^0_i f^1_{ji}
$$

$$
D \underbrace{\begin{array}{c|c} 1 & 0 \\ \hline 0 & p \end{array}\; d + \omega_2} = \begin{array}{c|c} 1 & 0 \\ \hline 0 & p \end{array}\; \underbrace{d\omega_2 + \omega_2^2} \begin{array}{c|c} 1 & 0 \\ \hline 0 & p \end{array} + \begin{array}{c|c} 1 & 0 \\ \hline 0 & p \end{array}\; d \begin{array}{c|c} 1 & 0 \\ \hline 0 & p^2 \end{array}^{\perp}
$$

$$
= \begin{array}{c|c} d\omega ⧗ 1_R + \left(\underbrace{\psi + \overset{*}{\mathring{\varepsilon}}}\underbrace{\varphi + \varepsilon} - I\right) \underset{\varkappa}{⧗} \underbrace{\overset{*}{\mathring{e}} e - r/s} & -\Gamma \underbrace{\psi + \overset{*}{\mathring{\varepsilon}}} D \underset{\varkappa}{⧗} \overset{*}{\mathring{e}} \\ \hline D \underbrace{\varphi + \varepsilon}\Gamma ⧗ e & D\Omega ⧗ 1_L + \left(\underbrace{\varphi + \varepsilon}\underbrace{\psi + \overset{*}{\mathring{\varepsilon}}} - I\right) \underset{\varkappa}{⧗} \underbrace{e\overset{*}{\mathring{e}} - r/s} \end{array}
$$

$$
D\varphi = d\varphi + \Omega\varphi - \varphi\omega: \quad \varphi D = d\varphi + \omega\varphi - \varphi\Omega: \quad D\Omega = d\Omega + \Omega ⧖ \Omega
$$

$$
\overset{\perp}{\omega}{}_2^2 = \begin{array}{c|c} \omega ⧗ 1_R & \overset{\perp}{\varkappa}\Gamma\psi ⧗ \overset{*}{\mathring{e}} \\ \hline \varphi\Gamma ⧗ e & \Omega ⧗ 1_L \end{array}^{2} = \begin{array}{c|c} \varkappa\psi\varphi ⧗ \underbrace{\overset{*}{\mathring{e}} e - r/s} & \varkappa\Gamma \underbrace{\psi\Omega - \omega\psi} ⧗ \overset{*}{\mathring{e}} \\ \hline \underbrace{\Omega\varphi - \varphi\omega}\Gamma ⧗ e & \underbrace{\Omega ⧖ \Omega} ⧗ 1_L + \varphi\psi \underset{\varkappa}{⧗} \underbrace{e\overset{*}{\mathring{e}} - r/s} \end{array}
$$

$$\frac{1\,|\,0}{0\,|\,p}\;\overbrace{d\omega_2\frac{1\,|\,0}{0\,|\,p}}^{\perp}=\frac{d\omega\bowtie 1_R+\underbrace{\psi\varepsilon+\overset{*}{\varepsilon}\varphi}\bowtie_{\varkappa}\underbrace{\overset{*}{e}e-r/s}}{\underbrace{d\varphi+\Omega\varepsilon-\varepsilon\omega}\Gamma\bowtie e}\left|\frac{-\Gamma\underbrace{d\psi+\omega\overset{*}{\varepsilon}-\overset{*}{\varepsilon}\Omega}\bowtie_{\varkappa}\overset{*}{e}}{d\Omega\bowtie 1_L+\underbrace{\varphi\overset{*}{\varepsilon}+\varepsilon\psi}\bowtie_{\varkappa}\underbrace{e\overset{*}{e}-r/s}}\right.$$

$$D\underbrace{\frac{1\,|\,0}{0\,|\,p}\,d+\omega_2}=\frac{1\,|\,0}{0\,|\,p}\;\underbrace{d+\omega_2}^{2}\frac{1\,|\overset{\perp}{\,}0}{0\,|\,p}=\frac{1\,|\,0}{0\,|\,p}\;\overbrace{d\omega_2\frac{1\,|\,0}{0\,|\,p}}^{\perp}+\overset{\perp}{\omega}{}_2^2+\overbrace{\frac{1\,|\,0}{0\,|\,p}\;d\underbrace{\frac{1\,|\,0}{0\,|\,p}}}^{\perp}{}^{2}$$

$$=\frac{d\omega\bowtie 1_R+\underbrace{\psi\varphi+\psi\varepsilon+\overset{*}{\varepsilon}\varphi}\bowtie_{\varkappa}\underbrace{\overset{*}{e}e-r/s}}{\underbrace{\Omega\varphi-\varphi\omega+d\varphi+\Omega\varepsilon-\varepsilon\omega}\Gamma\bowtie e}\left|\frac{\Gamma\underbrace{\psi\Omega-\omega\psi-d\psi-\omega\overset{*}{\varepsilon}+\overset{*}{\varepsilon}\Omega}\bowtie_{\varkappa}\overset{*}{e}}{\underbrace{d\Omega+\Omega\bowtie\Omega}\bowtie 1_L+\underbrace{\varphi\psi+\varphi\overset{*}{\varepsilon}+\varepsilon\psi-\varepsilon\overset{*}{\varepsilon}}\bowtie_{\varkappa}\underbrace{e\overset{*}{e}-r/s}}\right.$$

$$\psi\varphi+\psi\varepsilon+\overset{*}{\varepsilon}\varphi+I=\psi\varphi+\psi\varepsilon+\overset{*}{\varepsilon}\varphi+\overset{*}{\varepsilon}\varepsilon=\underbrace{\psi+\overset{*}{\varepsilon}}\underbrace{\varphi+\varepsilon}$$

$$\varphi\psi+\varphi\overset{*}{\varepsilon}+\varepsilon\psi-\varepsilon\overset{*}{\varepsilon}+I=\varphi\psi+\varphi\overset{*}{\varepsilon}+\varepsilon\psi+\varepsilon\overset{*}{\varepsilon}=\underbrace{\varphi+\varepsilon}\underbrace{\psi+\overset{*}{\varepsilon}}$$

$$D\underbrace{\varphi+\varepsilon}=d\underbrace{\varphi+\varepsilon}+\Omega\underbrace{\varphi+\varepsilon}-\underbrace{\varphi+\varepsilon}\omega=d\varphi+\Omega\varphi+\Omega\varepsilon-\varphi\omega-\varepsilon\omega$$

$$\underbrace{\psi+\overset{*}{\varepsilon}}D=d\underbrace{\psi+\overset{*}{\varepsilon}}+\omega\underbrace{\psi+\overset{*}{\varepsilon}}-\underbrace{\psi+\overset{*}{\varepsilon}}\Omega=d\psi+\omega\psi+\omega\overset{*}{\varepsilon}-\psi\Omega-\overset{*}{\varepsilon}\Omega$$

$$\overline{D\left(\frac{1\,|\,0}{0\,|\,p}\,d+\omega_2\right)}^{2}=s\,\overline{d\omega}^{2}+\overline{d\Omega}^{2}-r\varkappa\,\overline{D\underbrace{\varphi+\varepsilon}}^{2}+\overline{\underbrace{\psi+\overset{*}{\varepsilon}}D}^{2}$$

$$+\underbrace{\overbrace{e\overset{*}{e}-\frac{r}{s}}^{2}y_L}\;\overline{\underbrace{\psi+\overset{*}{\varepsilon}}\underbrace{\varphi+\varepsilon}-I}^{2}+\overline{\underbrace{\varphi+\varepsilon}\underbrace{\psi+\overset{*}{\varepsilon}}-I}^{2}$$

$$\text{LHS}=s\,\overline{d\omega-\varkappa\overbrace{\underbrace{\psi+\overset{*}{\varepsilon}}\underbrace{\varphi+\varepsilon}-I}\frac{r}{s}}^{2}+\overline{D\Omega-\varkappa\overbrace{\underbrace{\varphi+\varepsilon}\underbrace{\psi+\overset{*}{\varepsilon}}-I}\frac{r}{s}}^{2}+t\,\overline{\underbrace{\psi+\overset{*}{\varepsilon}}\underbrace{\varphi+\varepsilon}-I}^{2}+\overline{\underbrace{\varphi+\varepsilon}\underbrace{\psi+\overset{*}{\varepsilon}}-I}^{2}$$

$$+r\varkappa\Bigg(2\Re\,\underbrace{d\omega-\varkappa\overbrace{\underbrace{\psi+\overset{*}{\varepsilon}}\underbrace{\varphi+\varepsilon}-I}\frac{r}{s}\bowtie\overbrace{\underbrace{\psi+\overset{*}{\varepsilon}}\underbrace{\varphi+\varepsilon}-I}-\overline{D\underbrace{\varphi+\varepsilon}}^{2}-\overline{\underbrace{\psi+\overset{*}{\varepsilon}}D}^{2}+2\Re\,D\Omega-\varkappa\overbrace{\underbrace{\varphi+\varepsilon}\underbrace{\psi+\overset{*}{\varepsilon}}-I}\frac{r}{s}\bowtie\ldots}$$

$$=s\,\overline{d\omega}^{2}+\overline{d\Omega}^{2}-r\varkappa\,\overline{D\underbrace{\varphi+\varepsilon}}^{2}+\overline{\underbrace{\psi+\overset{*}{\varepsilon}}D}^{2}+\overline{\underbrace{\psi+\overset{*}{\varepsilon}}\underbrace{\varphi+\varepsilon}-I}^{2}+\overline{\underbrace{\varphi+\varepsilon}\underbrace{\psi+\overset{*}{\varepsilon}}-I}^{2}\underbrace{s\frac{r^2}{s^2}+t-2r\frac{r}{s}}$$

$$\underbrace{\overbrace{e\overset{*}{e}-\frac{r}{s}}^{2}y_L}=\underbrace{\left(e\overset{*}{e}\right)^{2}y_L-2\frac{r}{s}e\overset{*}{e}+y_L+\frac{r^2}{s^2}y_{(L)}8}=t-2r\frac{r}{s}+s\frac{r^2}{s^2}$$

$$\overbrace{\underbrace{\frac{1\,|\,0}{0\,|\,p}\,d+\omega_2}^{2}\frac{1\,|\,0}{0\,|\,p}}^{\perp}$$

$$=\frac{d\omega\bowtie 1_R+\underbrace{\overline{\varphi+\varepsilon}^{2}-I}\bowtie_{\varkappa}\underbrace{\overset{*}{e}e-r_R/s_R}}{D\underbrace{\varphi+\varepsilon}\Gamma\bowtie e}\left|\frac{-\Gamma\overbrace{D\underbrace{\varphi+\varepsilon}}^{*}\bowtie_{\varkappa}\overset{*}{e}}{D\Omega\bowtie 1_L+\overbrace{\underbrace{\varphi+\varepsilon}\underbrace{\varphi\overset{*}{+}\varepsilon}-I}\bowtie_{\varkappa}\underbrace{e\overset{*}{e}-r_L/s_L}}\right.$$

$$D\varphi = d\varphi + \Omega\varphi - \varphi\omega: \quad D\Omega = d\Omega + \Omega\boxtimes\Omega$$

$$\text{LHS } = \begin{array}{c|c}1&0\\\hline 0&p\end{array}\, d\omega_2 \overset{\perp}{\begin{array}{c|c}1&0\\\hline 0&p\end{array}} + \overset{\perp}{\omega}{}_2^2 + \begin{array}{c|c}1&0\\\hline 0&p\end{array}\ \overbrace{d\begin{array}{c|c}1&0\\\hline 0&p\end{array}}^{\perp}{}^2$$

$$\overbrace{\begin{array}{c|c}1&0\\\hline 0&p\end{array}\ \overbrace{d\begin{array}{c|c}1&0\\\hline 0&p\end{array}}^2}^{\perp} = \begin{array}{c|c}1&0\\\hline 0&p\end{array}\ \overbrace{\begin{array}{c|c}0&0\\\hline 0&dp\end{array}}^{\perp}{}^2 = \begin{array}{c|c}0&\overset{\perp}{0}\\\hline 0&p\,\overbrace{dp}^2\end{array}$$

$$\begin{array}{c|c}1&0\\\hline 0&p\end{array}\, d\begin{array}{c|c}\omega\boxtimes 1_R&\varkappa\Gamma\overset{*}{\varphi}\boxtimes\overset{*}{e}\\\hline \varphi\Gamma\boxtimes e&\Omega\boxtimes 1_L\end{array}\ \overset{\perp}{\begin{array}{c|c}1&0\\\hline 0&p\end{array}}$$

$$= \begin{array}{c|c} d\omega\boxtimes 1_R + \underbrace{\overset{*}{\varphi}\varepsilon + \overset{*}{\varepsilon}\varphi}\underset{\varkappa}{\boxtimes}\underbrace{\overset{*}{e}e - r_R/s_R} & -\Gamma\,\underbrace{d\overset{*}{\varphi} + \omega\overset{*}{\varepsilon} - \overset{*}{\varepsilon}\Omega}\underset{\varkappa}{\boxtimes}\overset{*}{e} \\\hline \underbrace{d\varphi + \Omega\varepsilon - \varepsilon\omega}\Gamma\boxtimes e & d\Omega\boxtimes 1_L + \underbrace{\varphi\overset{*}{\varepsilon} + \varepsilon\overset{*}{\varphi}}\underset{\varkappa}{\boxtimes}\underbrace{e\overset{*}{e} - r_L/s_L}\end{array}$$

$$\overbrace{\begin{array}{c|c}\omega\boxtimes 1_R&\varkappa\Gamma\overset{*}{\varphi}\boxtimes\overset{*}{e}\\\hline \varphi\Gamma\boxtimes e&\Omega\boxtimes 1_L\end{array}}^{\perp}{}^2 = \begin{array}{c|c}\varkappa\overset{*}{\varphi}\varphi\boxtimes\underbrace{\overset{*}{e}e - r_R/s_R} & \varkappa\Gamma\,\underbrace{\overset{*}{\varphi}\Omega - \omega\overset{*}{\varphi}}\boxtimes\overset{*}{e}\\\hline \underbrace{\Omega\varphi - \varphi\omega}\Gamma\boxtimes e & \underbrace{\Omega\boxtimes\Omega}\boxtimes 1_L + \varphi\overset{*}{\varphi}\underset{\varkappa}{\boxtimes}\underbrace{e\overset{*}{e} - r_L/s_L}\end{array}$$

$$\overset{*}{\varphi}\varphi + \overset{*}{\varphi}\varepsilon + \overset{*}{\varepsilon}\varphi = \underbrace{\varphi \overset{*}{+} \varepsilon}\ \underbrace{\varphi + \varepsilon} - \overset{*}{\varepsilon}\varepsilon = \overset{2}{\ulcorner\varphi + \varepsilon\urcorner} - 1$$

$$\varphi\overset{*}{\varphi} + \varphi\overset{*}{\varepsilon} + \varepsilon\overset{*}{\varphi} - \varepsilon\overset{*}{\varepsilon} = \underbrace{\varphi + \varepsilon}\,\overbrace{\varphi \overset{*}{+} \varepsilon} - \varepsilon\overset{*}{\varepsilon} - \varepsilon\overset{*}{\varepsilon} = \underbrace{\varphi + \varepsilon}\,\overbrace{\varphi \overset{*}{+} \varepsilon} - I$$

$$D\underbrace{\varphi + \varepsilon} = d\underbrace{\varphi + \varepsilon} + \Omega\underbrace{\varphi + \varepsilon} - \underbrace{\varphi + \varepsilon}\omega = d\varphi + \Omega\varphi + \Omega\varepsilon - \varphi\omega - \varepsilon\omega$$

$$\overbrace{D\underbrace{\varphi \overset{*}{+} \varepsilon}} = d\overset{*}{\varphi} + \overset{*}{\varphi}\,\overset{*}{\Omega} + \overset{*}{\varepsilon}\,\overset{*}{\Omega} - \bar{\omega}\,\overset{*}{\varphi} - \bar{\omega}\,\overset{*}{\varepsilon} = d\overset{*}{\varphi} + \omega\overset{*}{\varphi} + \omega\overset{*}{\varepsilon} - \overset{*}{\varphi}\Omega - \overset{*}{\varepsilon}\Omega$$

$$\begin{array}{cc|cc} 0&0&&\overset{\perp}{0}\ \ 0\\ 0&0&&0\ \ 0\\\hline 0&0&0&0\\ 0&0&0&-\varkappa I\boxtimes e\overset{*}{e}\end{array} = \begin{array}{c|c}0&\overset{\perp}{0}\\\hline 0&-\varkappa\begin{array}{c|c}0&0\\\hline 0&I\end{array}\boxtimes e\overset{*}{e}\end{array} = \begin{array}{c|c}0&\overset{\perp}{0}\\\hline 0&-\varkappa\varepsilon\overset{*}{\varepsilon}\boxtimes e\overset{*}{e}\end{array} = \begin{array}{c|c}0&0\\\hline 0&-\varkappa\varepsilon\overset{*}{\varepsilon}\boxtimes\underbrace{e\overset{*}{e} - r_L/s_L}\end{array}$$

$$\begin{array}{c|c} \begin{array}{c} d\omega\boxtimes 1_R + \\ \varkappa\underbrace{\overset{2}{\ulcorner\varphi + \varepsilon\urcorner} - I}\boxtimes\underbrace{\overset{*}{e}e - r/s}\end{array} & -\varkappa\Gamma\overbrace{D\underbrace{\varphi \overset{*}{+} \varepsilon}}\boxtimes\overset{*}{e} \\\hline D\underbrace{\varphi + \varepsilon}\Gamma\boxtimes e & \begin{array}{c}\underbrace{D\Omega_0 + \frac{1}{2}d\omega}\boxtimes 1_L + \\ \varkappa\underbrace{\overbrace{\varphi + \varepsilon}\,\overbrace{\varphi \overset{*}{+} \varepsilon} - I}\boxtimes\underbrace{e\overset{*}{e} - r/s}\end{array}\end{array}$$

$$D\Omega = d\underbrace{\Omega_0 + \frac{1}{2}\omega} + \underbrace{\Omega_0 + \frac{1}{2}\omega}\boxtimes\underbrace{\Omega_0 + \frac{1}{2}\omega} = d\,\Omega_0 + \Omega_0\boxtimes\Omega_0 + \frac{1}{2}d\omega = D\,\Omega_0 + \frac{1}{2}d\omega$$

$$\overbrace{D\underbrace{\varphi \overset{*}{+} \varepsilon}} = \overbrace{d\varphi + \Omega\underbrace{\varphi \overset{*}{+} \varepsilon} - \underbrace{\varphi + \varepsilon}\omega} = d\overset{*}{\varphi} + \overbrace{\varphi \overset{*}{+} \varepsilon}\,\overset{*}{\Omega} - \bar{\omega}\,\underbrace{\varphi + \varepsilon} = d\overset{*}{\varphi} - \overbrace{\varphi \overset{*}{+} \varepsilon}\,\Omega + \omega\underbrace{\varphi + \varepsilon} = \overbrace{\varphi \overset{*}{+} \varepsilon}\,D$$

$$\left\| D\left(\begin{array}{c|c}1&0\\ \hline 0&p\end{array}\right)(d+\omega_2)\right\|^2 = \frac{3s}{2}\|d\omega\|^2 + s\|d\Omega_0\|^2 - 2r\varkappa\|D(\varphi+\varepsilon)\|^2$$

$$+2\left\langle \left(e\overset{*}{e} - \frac{r}{s}\right)^2 y_L\right\rangle \left(\|\varphi+\varepsilon\|^2 - 1\right)^2 + \text{cst}$$

$$\text{LHS} = s\|d\omega\|^2 + \left\|D\Omega_0 + \frac{1}{2}d\omega\right\|^2 - r\varkappa\|D(\varphi+\varepsilon)\|^2 + \left\|\left(D(\psi+\varepsilon)\right)^*\right\|^2$$

$$+\left\langle\left(e\overset{*}{e} - \frac{r}{s}\right)^2 y_L\right\rangle\left(\left\|(\varphi+\varepsilon)^*(\varphi+\varepsilon) - I\right\|^2 + \left\|(\varphi+\varepsilon)(\varphi+\varepsilon)^* - I\right\|^2\right)$$

$$\left\|D\Omega_0 + \frac{1}{2}d\omega\right\|^2 = \|D\Omega_0\|^2 + \frac{1}{4}\|d\omega\|^2 = \|D\Omega_0\|^2 + \frac{1}{2}\|d\omega\|^2$$

$$\|D(\varphi+\varepsilon)\| = \left\|\left(D(\psi+\varepsilon)\right)^*\right\|$$

$$\|\varphi\overset{*}{\varphi} - I\|^2 = \left\langle(\varphi\overset{*}{\varphi} - I)^2\right\rangle = \left\langle\varphi\overset{*}{\varphi}\varphi\overset{*}{\varphi} - 2\varphi\overset{*}{\varphi} + 1\right\rangle$$

$$= (\overset{*}{\varphi}\varphi)^2 - 2\overset{*}{\varphi}\varphi + 2 = (\overset{*}{\varphi}\varphi - 1)^2 + 1 = \|\overset{*}{\varphi}\varphi - I\|^2 + 1$$

$$\left(\begin{array}{c|c}1&0\\ \hline 0&p\end{array}(d+\omega_2)\right)^2 \left(\begin{array}{c|c}1&0\\ \hline 0&p\end{array}\right)^{\perp} \barwedge \left(\begin{array}{c|c}1&0\\ \hline 0&p\end{array}(d+\omega_2)\right)^2 \left(\begin{array}{c|c}1&0\\ \hline 0&p\end{array}\right)^{\perp}$$

$$= s_R d\omega \barwedge d\omega + s_L D\Omega \barwedge D\Omega + \frac{r_R + r_L}{4}\left(m_H^2\left(\|\varphi+\varepsilon\|^2 - 1\right)^2 - 4\varkappa\|D(\varphi+\varepsilon)\|^2\right)$$

$$\frac{r_R + r_L}{4}m_H^2 = \left\langle(\overset{*}{e}e)^2 y_R\right\rangle + \left\langle(e\overset{*}{e})^2 y_L\right\rangle - \frac{r_R^2}{s_R} - \frac{r_L^2}{s_L}$$

$$\text{LHS} = s_R\left(d\omega - \varkappa\left(\|\varphi+\varepsilon\|^2 - 1\right)\frac{r_R}{s_R}\right)\barwedge\left(d\omega - \varkappa\left(\|\varphi+\varepsilon\|^2 - 1\right)\frac{r_R}{s_R}\right)$$

$$+s_L\left(D\Omega - \varkappa\left((\varphi+\varepsilon)(\psi+\overset{*}{\varepsilon}) - I\right)\frac{r_L}{s_L}\right)\barwedge\left(D\Omega - \varkappa\left((\varphi+\varepsilon)(\psi+\overset{*}{\varepsilon}) - I\right)\frac{r_L}{s_L}\right)$$

$$r_R\varkappa 2\Re\left(\left(d\omega - \varkappa\left(\|\varphi+\varepsilon\|^2 - 1\right)\frac{r_R}{s_R}\right)\barwedge\left(\|\varphi+\varepsilon\|^2 - 1\right) - D(\varphi+\varepsilon)\barwedge D(\varphi+\varepsilon)\right)$$

$$r_L \varkappa 2\Re \underbrace{D\Omega - \varkappa \underbrace{\overbrace{\varphi+\varepsilon}\overbrace{\varphi+\varepsilon}^{*} - I}\frac{r_L}{s_L} \bar{\times} \underbrace{\overbrace{\varphi+\varepsilon}\overbrace{\varphi+\varepsilon}^{*} - I} - D\underbrace{\varphi \overset{*}{+} \varepsilon} \bar{\times} D\underbrace{\varphi \overset{*}{+} \varepsilon}}$$

$$\underbrace{\ulcorner\varphi+\varepsilon\urcorner^2 - 1} \bar{\times} \underbrace{\ulcorner\varphi+\varepsilon\urcorner^2 - 1}\ \underbrace{\overbrace{\overset{*}{e}e}^{2} y_R} + \underbrace{\overbrace{\varphi+\varepsilon}\overbrace{\varphi+\varepsilon}^{*} - I} \bar{\times} \underbrace{\overbrace{\varphi+\varepsilon}\overbrace{\varphi+\varepsilon}^{*} - I}\ \underbrace{\overbrace{e\overset{*}{e}}^{2} y_L}$$

$$= s_R d\omega \bar{\times} d\omega + s_L D\Omega \bar{\times} D\Omega - \varkappa \underbrace{r_R + r_L} D\underbrace{\varphi+\varepsilon} \bar{\times} D\underbrace{\varphi+\varepsilon} + \text{ cst}$$

$$+ \overbrace{\ulcorner\varphi+\varepsilon\urcorner^2 - 1}^{2}\ \underbrace{s_R\frac{r_R^2}{s_R^2} + s_L\frac{r_L^2}{s_L^2} - 2\frac{r_R^2}{s_R^2} - 2\frac{r_L^2}{s_L^2}} + \underbrace{\overbrace{\overset{*}{e}e}^{2} y_R + \overbrace{e\overset{*}{e}}^{2} y_L}$$

$$\underbrace{\overbrace{\overset{*}{e}e - \frac{r_R}{s_R}}^{2} y_R} + \underbrace{\overbrace{e\overset{*}{e} - \frac{r_L}{s_L}}^{2} y_L} = \underbrace{\overbrace{\overset{*}{e}e}^{2} y_R} + \frac{r_R^2}{s_R^2}\underbrace{y_R} - 2\frac{r_R}{s_R}\underbrace{\overset{*}{e}e y_R}$$

$$+ \underbrace{\overbrace{e\overset{*}{e}}^{2} y_L} + \frac{r_L^2}{s_L^2}\underbrace{y_L} - 2\frac{r_L}{s_L}\underbrace{\overbrace{e\overset{*}{e}}^{2} y_L}$$

$$= \underbrace{\overbrace{\overset{*}{e}e}^{2} y_R} + \underbrace{\overbrace{e\overset{*}{e}}^{2} y_L} + \frac{r_R^2}{s_R^2}s_R - 2\frac{r_R}{s_R}r_R + \frac{r_L^2}{s_L^2}s_L - 2\frac{r_L}{s_L}r_L = \frac{r_R + r_L}{4}m_H^2$$