

$$\begin{array}{c}
\frac{\frac{\frac{\vdash \textcolor{red}{p}^\perp \Downarrow [\cdot][\cdot]p; \cdot}{\vdash [\cdot][\cdot]p^\perp; p} \text{I}^*}{\vdash \textcolor{red}{p} \oplus \textcolor{red}{q} \Downarrow [\cdot][\cdot]p^\perp; \cdot} \oplus}{\vdash [\cdot][3 : p \oplus q]; \cdot //^1 \vdash [\cdot][\cdot]p^\perp; \cdot} \text{K} \\
\frac{\vdash [\cdot][3 : p \oplus q]; \cdot //^1 \vdash [\cdot][\cdot]p^\perp; \cdot}{\vdash [\cdot][3 : p \oplus q]; \cdot //^1 \vdash [\cdot][\cdot]; p^\perp} * \\
\frac{\vdash \textcolor{red}{!}^1 p^\perp \Downarrow [\cdot][3 : p \oplus q]; \cdot}{\vdash [\cdot][3 : p \oplus q]; \cdot //^2 \vdash [\cdot][\cdot] \textcolor{red}{!}^1 p^\perp; \cdot} ! \\
\frac{\vdash [\cdot][3 : p \oplus q]; \cdot //^2 \vdash [\cdot][\cdot]; \textcolor{red}{!}^1 p^\perp}{\vdash \textcolor{red}{!}^2 \textcolor{red}{!}^1 p^\perp \Downarrow [\cdot][3 : p \oplus q]; \cdot} 4 \\
\frac{\vdash \textcolor{red}{!}^2 \textcolor{red}{!}^1 p^\perp \Downarrow [\cdot][3 : p \oplus q]; \cdot}{\vdash [\cdot][\cdot]; ?^3 p \oplus q, \textcolor{red}{!}^2 \textcolor{red}{!}^1 p^\perp} *
\end{array}$$