

$$\begin{array}{ccccccc}
 (\mathbb{F}_{q^n})^m & \xrightarrow[\sim]{\tilde{\pi}_1^{-1}} & (\mathbb{F}_q^n)^m & \xrightarrow{M} & (\mathbb{F}_q^m)^n & \xrightarrow{\tilde{L}_2} & (\mathbb{F}_q^m)^n \xrightarrow[\sim]{\tilde{\pi}_2} (\mathbb{F}_{q^m})^n \\
 & & & & & & \nearrow \\
 & & & & & & L_2
 \end{array}$$