

Lemma. In *SRLC1* (Section 5.3 and Algorithm 7), the chosen m fulfills $m = O(\kappa \log^2(\kappa) \log(\epsilon_F^{-1}))$.

The expression used to choose m (Algorithm 7, GenParams, line 2) can be bounded as follows:

Since $0 < \epsilon_F < 1$ and $1 < \kappa$, we have:

$$\begin{aligned}
& 1 - \prod_{i=1}^{\kappa} \left(1 - \left(1 - \frac{3}{\kappa} \right)^{m-i+1} \right) \\
& \leq 1 - \prod_{i=1}^{\kappa} \left(1 - \left(1 - \frac{3}{\kappa} \right)^{m-\kappa+1} \right) \\
& \leq 1 - \left(1 - \kappa \left(1 - \frac{3}{\kappa} \right)^{m-\kappa+1} \right) \\
& = 1 - \left(1 - \left(1 - \frac{3}{\kappa} \right)^{m-\kappa+1} \right)^{\kappa} \\
& \leq \kappa \left(1 - \frac{3}{\kappa} \right)^{m-\kappa}
\end{aligned}$$

Therefore, $\kappa \left(1 - \frac{3}{\kappa} \right)^{m-\kappa} \leq \epsilon$ suffices for the expression in GenParams to be fulfilled.

We also have:

$$\begin{aligned}
& \kappa \left(1 - \frac{3}{\kappa} \right)^{m-\kappa} \leq \epsilon_F \\
& \Leftrightarrow \log \left(\kappa \left(1 - \frac{3}{\kappa} \right)^{m-\kappa} \right) \leq \log(\epsilon_F) \\
& \Leftrightarrow \log(\kappa) + (m - \kappa) \log \left(1 - \frac{3}{\kappa} \right) \leq \log(\epsilon_F) \\
& \Leftrightarrow (m - \kappa) \log \left(1 - \frac{3}{\kappa} \right) \leq \log(\epsilon_F / \kappa) \\
& \Leftrightarrow m - \kappa \geq \frac{\log(\epsilon_F / \kappa)}{\log \left(1 - \frac{3}{\kappa} \right)} \\
& \Leftrightarrow m \geq \frac{\log(\epsilon_F / \kappa)}{\log \left(1 - \frac{3}{\kappa} \right)} + \kappa \\
& \Leftrightarrow m \geq \frac{\log(\epsilon_F^{-1} \kappa)}{-\log \left(1 - \frac{3}{\kappa} \right)} + \kappa
\end{aligned}$$

Since $\frac{\log(\epsilon_F^{-1} \kappa)}{-\log \left(1 - \frac{3}{\kappa} \right)} = O(\kappa \log^2(\kappa) \log(\epsilon_F^{-1}))$ and we choose the smallest m possible for algorithm 7, we get $m = O(\kappa \log^2(\kappa) \log(\epsilon_F^{-1}))$.