$$\inf_{\substack{V,\rho,L,L_t,\\ L_{0,i},S_k,L_{\mathcal{E},k}}} \sum_{k=1}^{N} \text{vol}(\mathcal{E}(t_k)) \tag{1}$$

$$\sum_{k=1}^{N} vol(\{\bar{x} \mid \bar{x}^T S_k \bar{x} \leq 1\}) \tag{2}$$

$$\text{such that} \tag{3}$$

$$\dot{\rho}(t) - \dot{V}(t,\bar{x}) - L(t,\bar{x})\left[V(t,\bar{x}) - \rho(t)\right] - L_t(t,\bar{x})\left[t\,(T-t)\right] \quad \text{is SOS} \tag{4}$$

$$\rho(0) - V(0,\bar{x}) - \sum_{i}^{N} L_{0,i}(\bar{x}) g_{0,i}(\bar{x}) \text{is SOS} \tag{5}$$

$$1 - \bar{x}^T S_k \bar{x} - L_{\mathcal{E},k}(\bar{x})\left[\rho(t_k) - V(t_k,\bar{x})\right] \text{is SOS} \tag{6}$$

$$\forall k \in \{1,\ldots,N\}\, S_k \succeq 0 \tag{7}$$

$$\forall k \in \{1,\ldots,N\} L_t(t,\bar{x}),\, L_{0,i}(\bar{x}) \text{are SOS} \tag{8}$$

$$\forall i \in \{1,\ldots,N\}, \forall k \in \{1,\ldots,N\} \tag{9}$$

$$\tag{10}$$

$$\min_{\substack{V,\rho,L,L_t,\\ L_{0,i},S_k,L_{\mathcal{E},k}}} \quad \sum_{k=1}^{N} \text{vol}(\mathcal{E}(t_k)) = \sum_{k=1}^{N} \text{vol}(\{\bar{x} \mid \bar{x}^T S_k \bar{x} \leq 1\}$$

s.t.

$$\begin{aligned}
&\dot{\rho}(t) - \dot{V}(t,\bar{x}) - L(t,\bar{x})\left[V(t,\bar{x}) - \rho(t)\right] - L_t(t,\bar{x})\left[t\,(T-t)\right] && \text{is SOS},\\
&\rho(0) - V(0,\bar{x}) - \sum_{i}^{N} L_{0,i}(\bar{x}) g_{0,i}(\bar{x}) && \text{is SOS},\\
&1 - \bar{x}^T S_k \bar{x} - L_{\mathcal{E},k}(\bar{x})\left[\rho(t_k) - V(t_k,\bar{x})\right] && \text{is SOS},\\
&S_k \succeq 0 && \forall k \in \{1,\ldots,N\},\\
&L_t(t,\bar{x}),\, L_{0,i}(\bar{x}) && \text{are SOS},\\
& && \forall i \in \{1,\ldots,N_0\} \forall k \in \{1,\ldots,N\}
\end{aligned} \tag{11}$$