

$$\begin{aligned} \|\lambda^2 e_j E_B^2 \sum_{i=0}^{\infty} (-\lambda E_B)^i x_B^*\| &\leq \|\lambda^2 e_j E_B^2\| \cdot \sum_{i=0}^{\infty} \|(-\lambda E_B)^i\| \cdot \|x_B^*\| \\ &\leq \|\lambda^2 e_j E_B^2\| \cdot \frac{1}{1 - \|\lambda E_B\|} \cdot \|x_B^*\| \end{aligned}$$