$$\|\lambda^2 e_j E_B^2 \sum_{i=0}^{\infty} (-\lambda E_B)^i x_B^*\| = \lambda^2 \|e_j E_B^2\| \sum_{i=0}^{\infty} \|(\lambda E_B)^i\| \|x_B^*\|$$

$$= \lambda^2 \|e_j E_B^2\| \sum_{i=0}^{\infty} \|(\lambda E_B)\|^i \|x_B^*\|$$