

$$\|x\|^2 \leq \sum_{j=1}^n |\langle \mu_j, x \rangle|^2 + \varepsilon^2; \quad \|x\|^2 - \varepsilon^2 \leq \sum_{j=1}^n |\langle \mu_j, x \rangle|^2 \leq \sum_{\mu \in U} |\langle \mu, x \rangle|^2$$

$$\varepsilon \rightarrow 0+ \Rightarrow \|x\|^2 \leq \sum_{\mu \in U} |\langle \mu, x \rangle|^2$$

(3) $\Rightarrow$ (1):

$$x \in U^\perp \xRightarrow{(3)} \|x\|^2 = \sum_{\mu \in U} \underbrace{|\langle \mu, x \rangle|^2}_{=0} = 0 \Rightarrow x=0, \text{ t.g. } U^\perp = \{0\}$$