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DILATION THEOREMS FOR POSITIVE OPERATOR-VALUED MEASURES

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Abstract: Let $Q(\Delta)$ be a positive operator-valued measure defined on a measurable space (X, Σ). This means that $Q(\Delta) : L_1(M, \mathcal{M}, \mu) \to L_1(M, \mathcal{M}, \mu)$ with $Q(\Delta)f \geq 0$ for $f \geq 0$. Then $Q(\cdot)$ has a "dilation" of the form $\tilde{Q}(\Delta) = 4E^{\mathcal{A}}\mathbf{1}_{e(\Delta)}E^{\mathcal{B}}\mathbf{1}_{\Omega_0}$ in $(\Omega, \mathcal{F}, P)$. Namely, for some "identification" map $i : \Omega \to M$, the equality $(Q(\Delta)f) \circ i = \tilde{Q}(\Delta)(f \circ i)$ holds. The indicator operators $\mathbf{1}_{e(\Delta)}$ are taken for a set $e(\Delta)$ with some σ-lattice homomorphism $e : \Sigma \to \mathcal{F}$. Other dilation formulas of that type are collected.

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