We consider a partially observed stochastic control problem with operator valued measures as controls. This is given by the following stochastic differential equation on the Hilbert space $X$ coupled with an algebraic equation representing noisy measurement process taking values from another Hilbert space $Y$ as follows:

\[
\begin{align*}
\frac{dx}{dt} &= Ax(t) + B(y(t-)) + \sigma(t)dW(t), \quad t \in I \equiv [0,T], \quad x(0) = x_0 \\
y(t) &= C(t)x(t) + \xi(t), \quad t \in I.
\end{align*}
\]

The process $x$ is the state, $y$ is the observation and $W$ is a Brownian motion taking values from a Hilbert space $H$ and $\xi$ is an arbitrary second order $Y$ valued random processes. The operator $A$ is the generator of a $C_0$-semigroup of bounded linear operators on $X$, $B \in M_{cabv}(\Sigma, \mathcal{L}(Y, X))$ and $\sigma \in B_\infty(I, \mathcal{L}(H, X))$. The problem is to find a control policy $B \in \Gamma \subset M_{cabv}(\Sigma, \mathcal{L}(Y, X))$ that minimizes the functional

\[
J(B) = \int_I Tr(P(t)) \lambda(dt) + \int_I |\bar{x}(t) - x_d(t)|_X^2 \nu(dt) + \Phi(B),
\]

where $P(t)$ dependent on $B$, is the covariance operator taking values from the space of nuclear operators $\mathcal{L}_1(X)$ and $\lambda$ and $\nu$ are nonnegative measures. (Received July 09, 2009)