

$$\pi_n(\tilde{\mathbf{x}}_{1:n}) \propto p(y_n|\tilde{\mathbf{x}}_{1:n})p(\tilde{\mathbf{x}}_n|\tilde{\mathbf{x}}_{1:n-1})\pi_{n-1}(\tilde{\mathbf{x}}_{1:n-1})$$