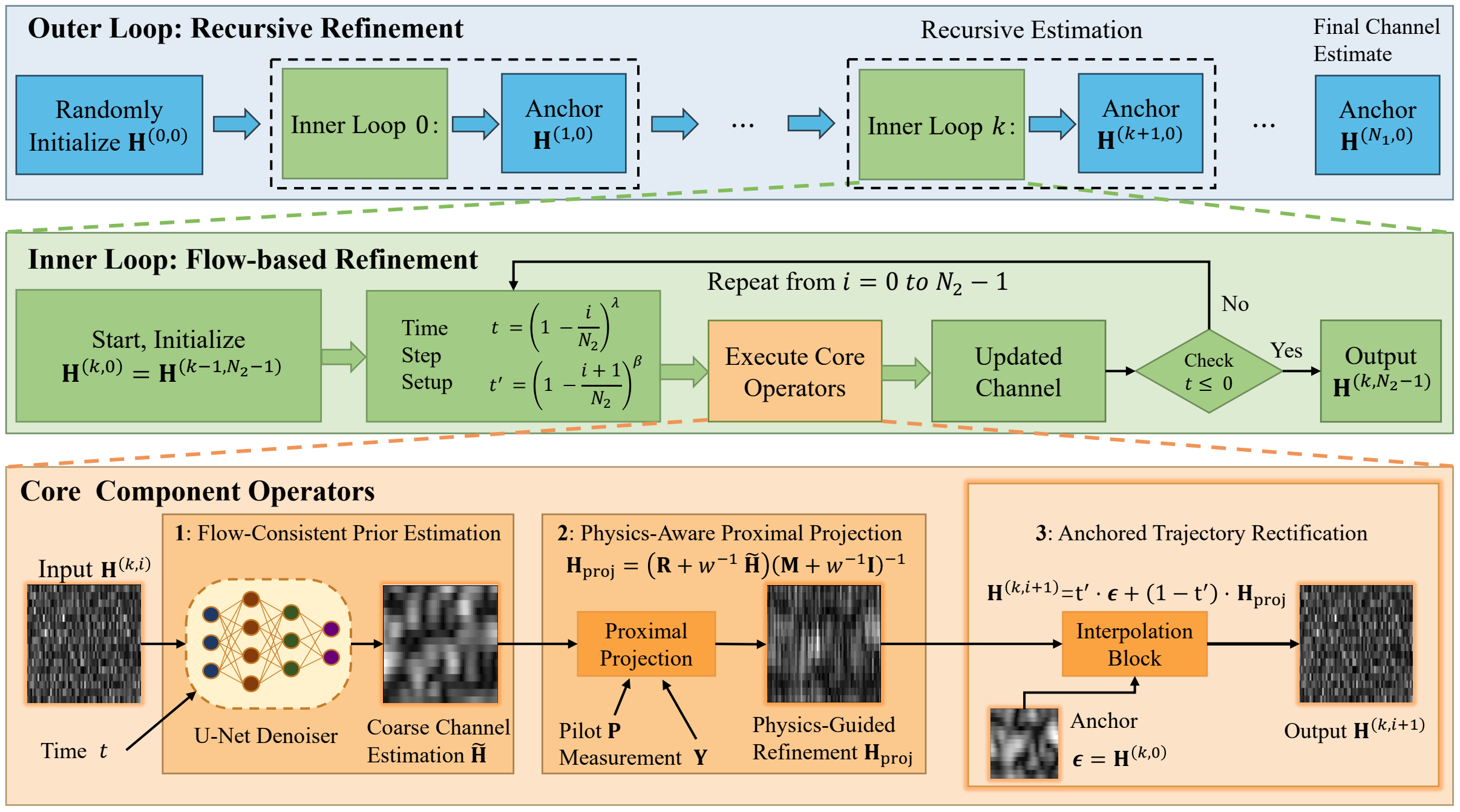
Outer Loop: Recursive Refinement
Recursive Estimation
Final Channel Estimate
Randomly Initialize $\mathbf{H}^{(0,0)}$
Inner Loop 0:
Anchor $\mathbf{H}^{(1,0)}$
Inner Loop k:
Anchor $\mathbf{H}^{(k+1,0)}$
Anchor $\mathbf{H}^{(N_1,0)}$
Inner Loop: Flow-based Refinement
Repeat from $i = 0$ to $N_2 - 1$
Start, Initialize $\mathbf{H}^{(k,0)} = \mathbf{H}^{(k-1,N_2-1)}$
Time Step Setup
$t = \left(1 - \frac{i}{N_2}\right)^{\lambda}$
$t' = \left(1 - \frac{i+1}{N_2}\right)^{\beta}$
Execute Core Operators
Updated Channel
Check $t \leq 0$
No
Yes
Output $\mathbf{H}^{(k,N_2-1)}$
Core Component Operators
1: Flow-Consistent Prior Estimation
Input $\mathbf{H}^{(k,i)}$
Time t
U-Net Denoiser
Coarse Channel Estimation $\widetilde{\mathbf{H}}$
2: Physics-Aware Proximal Projection
$\mathbf{H}_{\text{proj}} = (\mathbf{R} + w^{-1}\widetilde{\mathbf{H}})(\mathbf{M} + w^{-1}\mathbf{I})^{-1}$
Proximal Projection
Pilot $\mathbf{P}$
Measurement $\mathbf{Y}$
Physics-Guided Refinement $\mathbf{H}_{\text{proj}}$
3: Anchored Trajectory Rectification
$\mathbf{H}^{(k,i+1)} = t' \cdot \boldsymbol{\epsilon} + (1 - t') \cdot \mathbf{H}_{\text{proj}}$
Interpolation Block
Anchor
$\boldsymbol{\epsilon} = \mathbf{H}^{(k,0)}$
Output $\mathbf{H}^{(k,i+1)}$