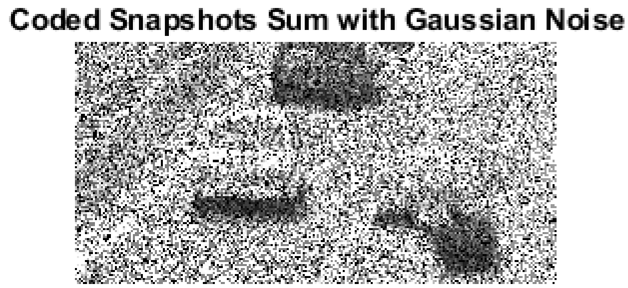
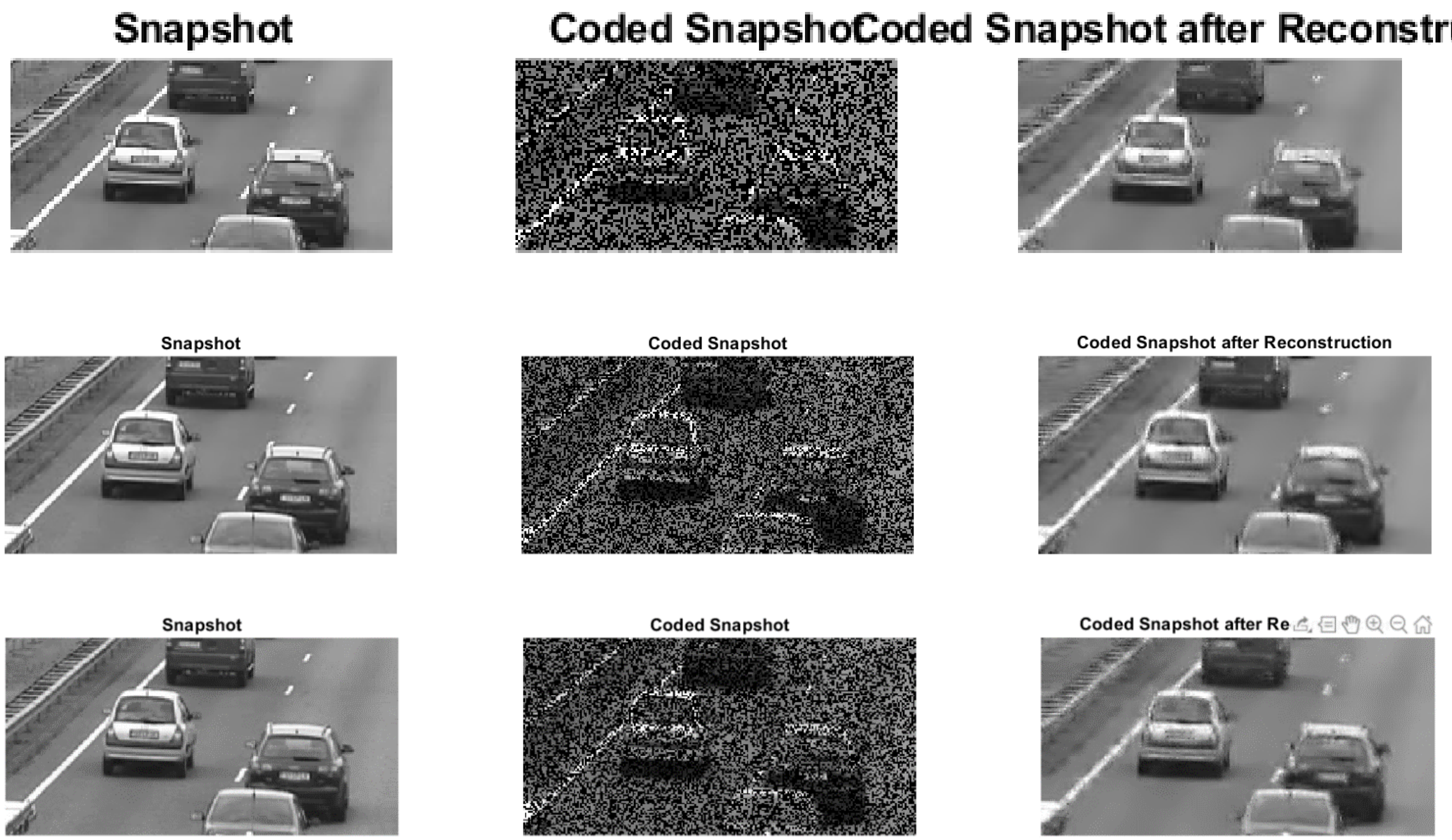
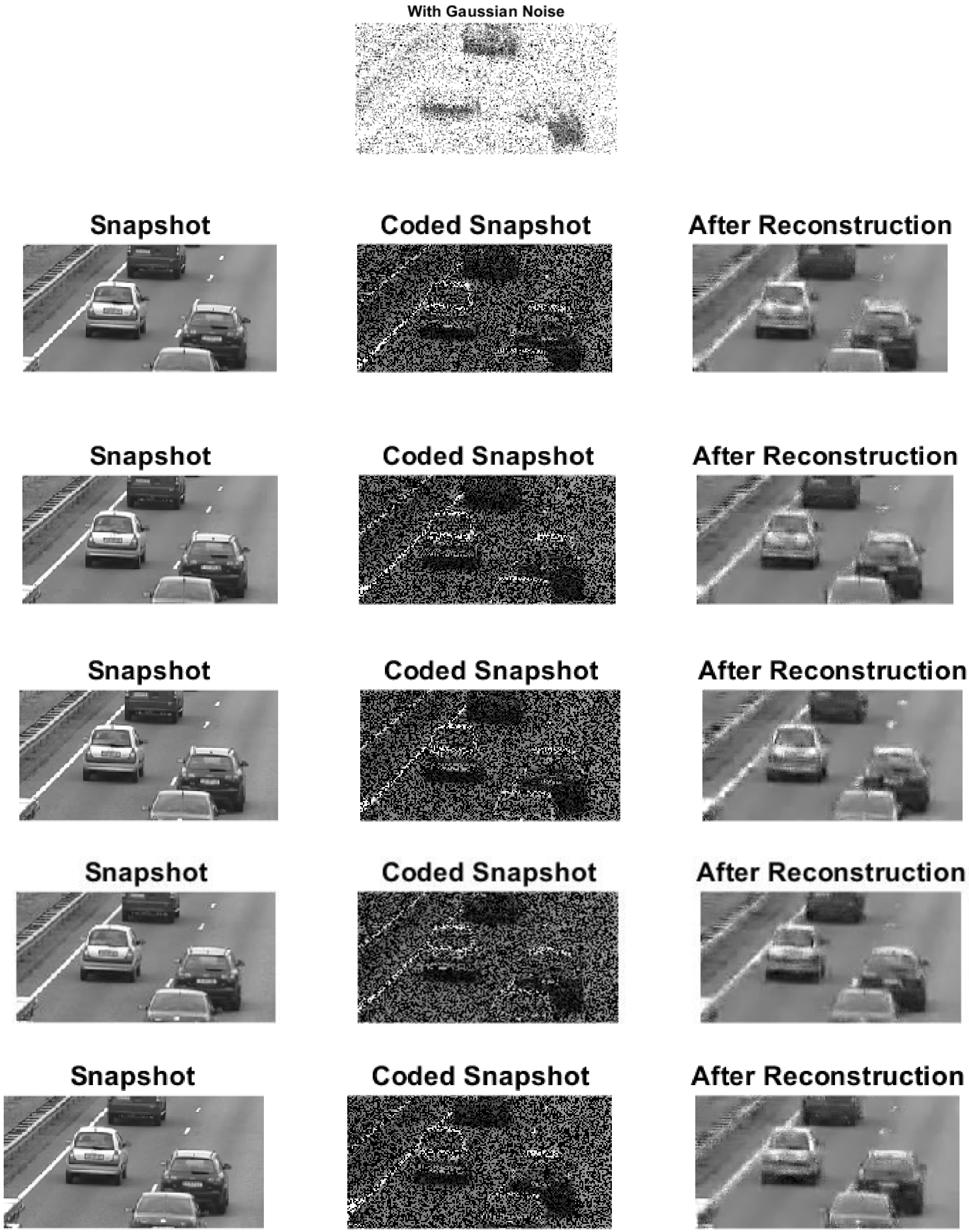
Q2

T = 3

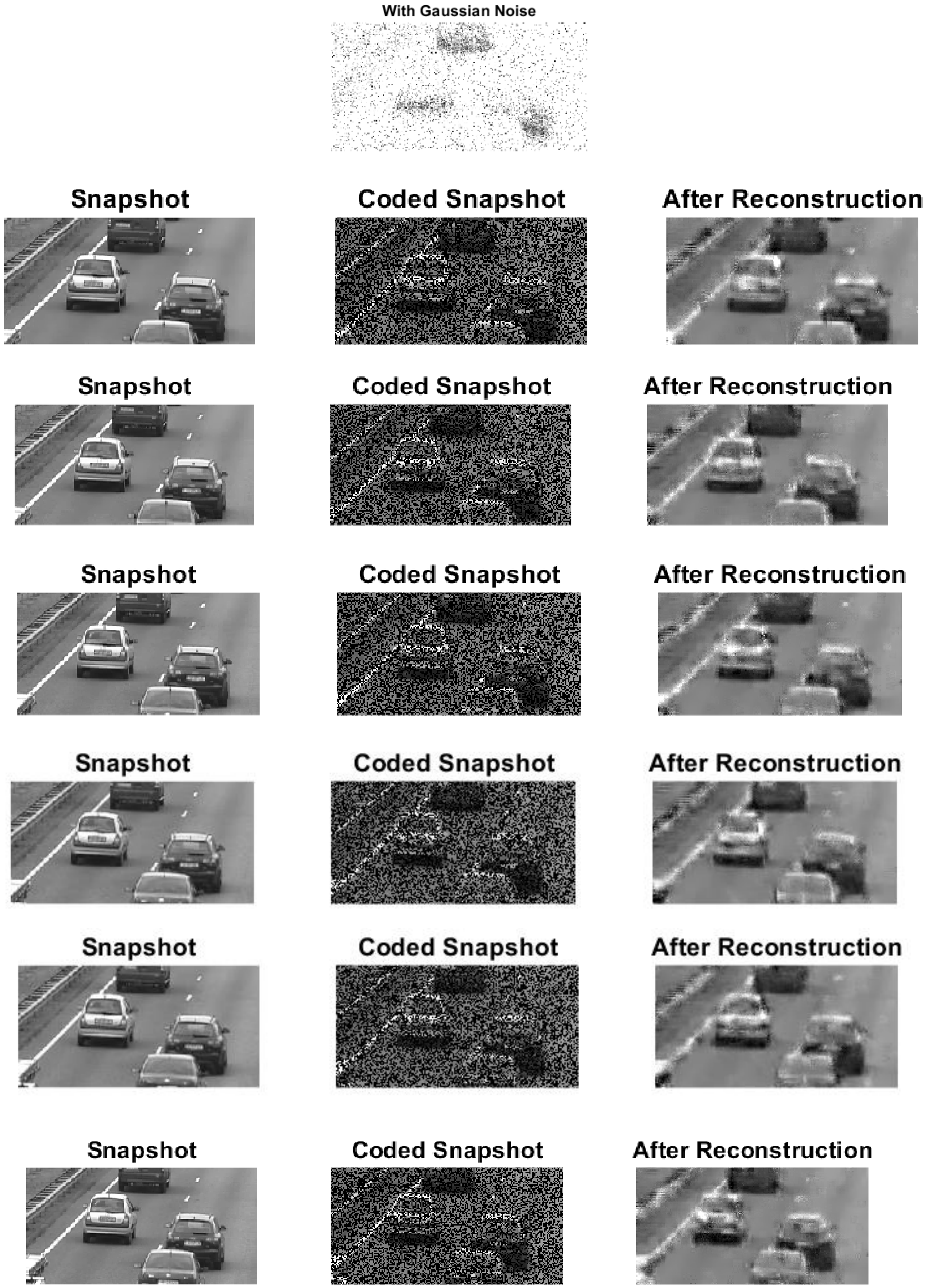

Coded Snapshots Sum with Gaussian Noise


Snapshot
Coded SnapshoCoded Snapshot after Reconstr
Snapshot
Coded Snapshot
Coded Snapshot after Reconstruction
Snapshot
Coded Snapshot
Coded Snapshot after Re

T = 5


With Gaussian Noise
Snapshot
Coded Snapshot
After Reconstruction
Snapshot
Coded Snapshot
After Reconstruction
Snapshot
Coded Snapshot
After Reconstruction
Snapshot
Coded Snapshot
After Reconstruction
Snapshot
Coded Snapshot
After Reconstruction

T = 7

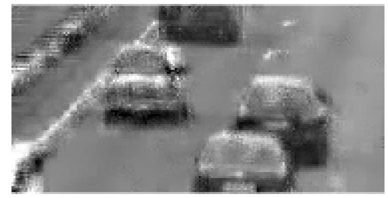


With Gaussian Noise
Snapshot
Coded Snapshot
After Reconstruction
Snapshot
Coded Snapshot
After Reconstruction
Snapshot
Coded Snapshot
After Reconstruction
Snapshot
Coded Snapshot
After Reconstruction
Snapshot
Coded Snapshot
After Reconstruction
Snapshot
Coded Snapshot
After Reconstruction

Snapshot

Coded Snapshot

After Reconstruction



Explanation for **Ax = b:**

$$E \quad = \sum_1^T F \cdot C_{\mathrm{t}}$$

E is the obtained image. We divide it into patches of 8*8. Let E^{ij} (and similiarly for other matrices) be the patch with left corner at (i,j) coordinate.

Then $E^{ij} = \sum_1^T F^{ij} \cdot C^{ij}{}_{\mathrm{t}}$.

So, $b = E^{ij}$. Also $F^{ij} = (\psi_{8x8} \otimes \psi_{8x8}) * \theta$, with θ being sparse.
$x\ (to\ be\ recovered)\ is, therefore, equal\ to\ [\theta_1\ \theta_2\ \theta_3]\ (for\ T = 3).$

Converting all products to matrix products :

$$A = \left([diag(C_1^{ij})\ \ diag(C_2^{ij})\ \ diag(C_3^{ij})]\right) * (I_{3x3} \otimes \psi_{8x8} \otimes \psi_{8x8})$$

Where Kronecker products are taken for forming 2-D DCT matrix diag(M) means putting all elements of the matrix along the diagonal row-first wise.

Explanation for error Term:

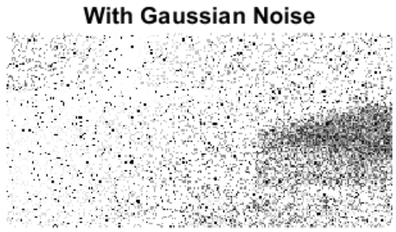
Consider $\mathbf{y} = \mathbf{\Phi}*\mathbf{f} + \boldsymbol{\eta} = \mathbf{\Phi}*\mathbf{\Psi}*\boldsymbol{\theta} + \boldsymbol{\eta}$. If for each i = 1 to m, $\boldsymbol{\eta}_\mathbf{i} \sim N(0,\sigma^2)$, with known σ then the squared magnitude of the vector $\boldsymbol{\eta}$ is a chi-square random variable. Hence with very high probability, the magnitude of $\boldsymbol{\eta}$ will lie within 3 standard deviations from the mean, i.e. set $\varepsilon \geq 3*\sigma*\sqrt{m}$.

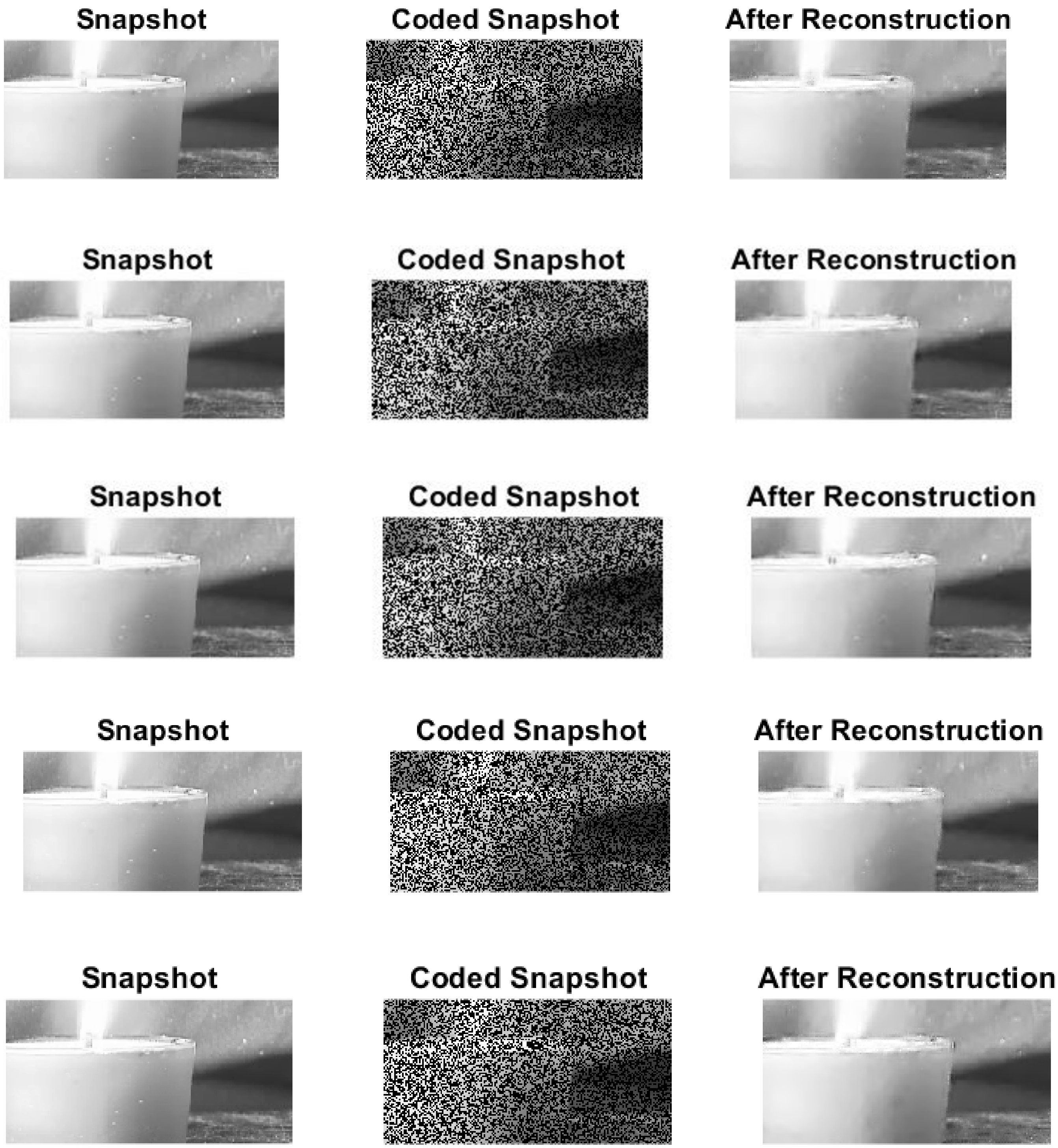
Therefore, set ε = 3*2*8 = 48.

RMSE $||Reconstructed - Original||_2 / ||Original||_2$

T =3 - 0.1043
T =5 - 0.1371
T =7 - 0.1759

FLAMES


With Gaussian Noise


Snapshot
Coded Snapshot
After Reconstruction
Snapshot
Coded Snapshot
After Reconstruction
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Snapshot
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After Reconstruction