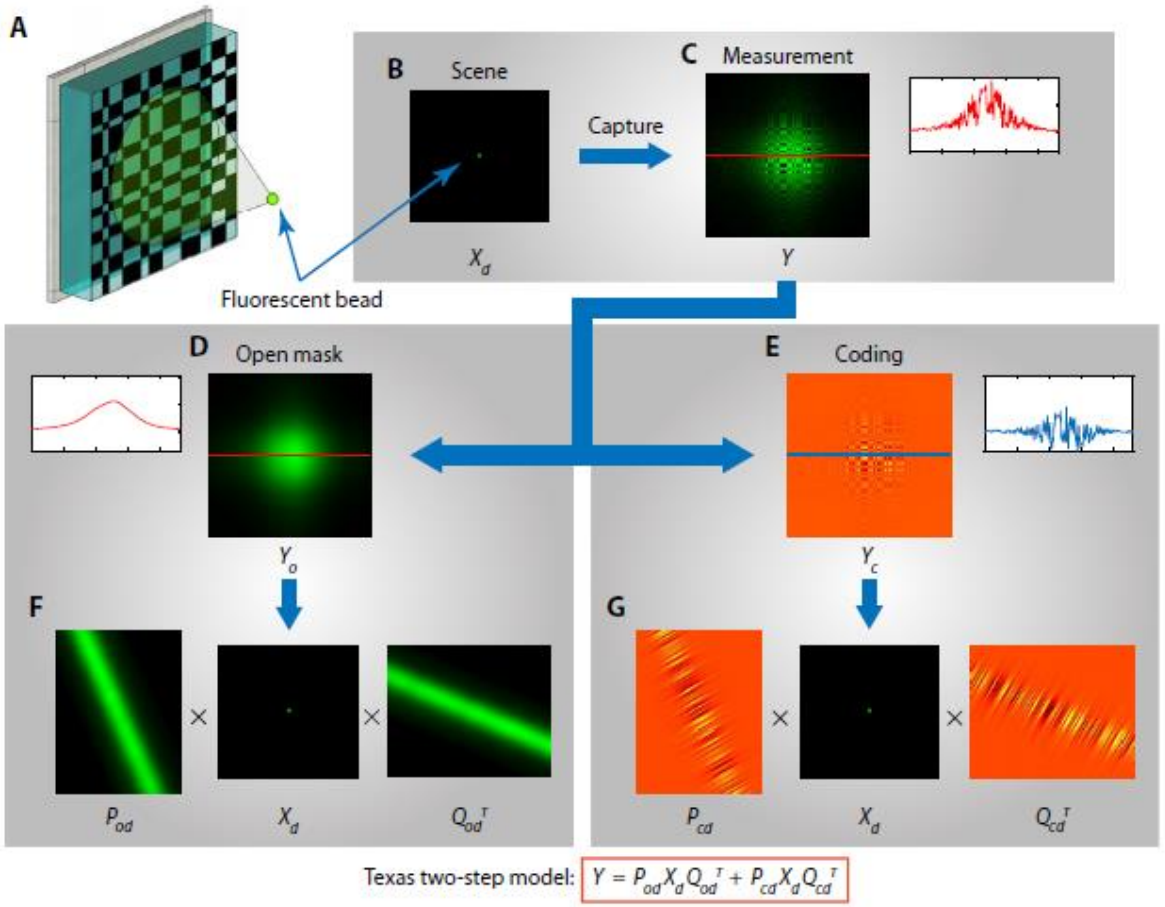
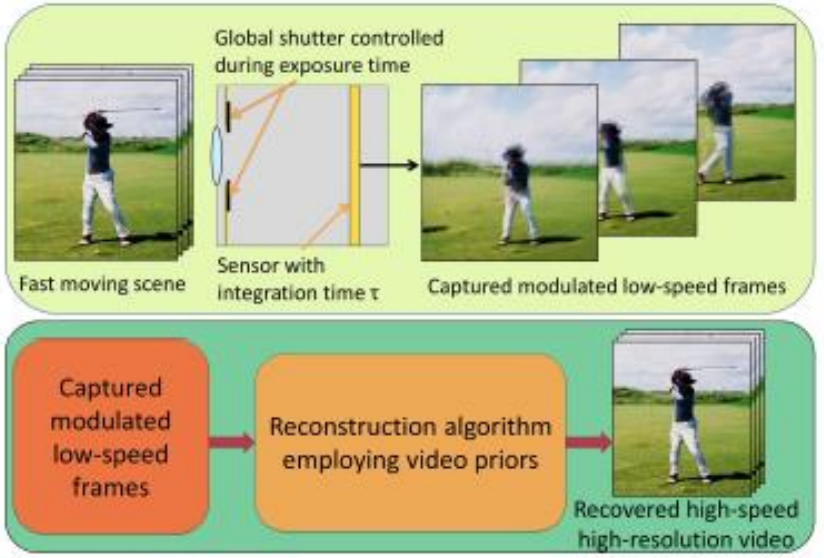
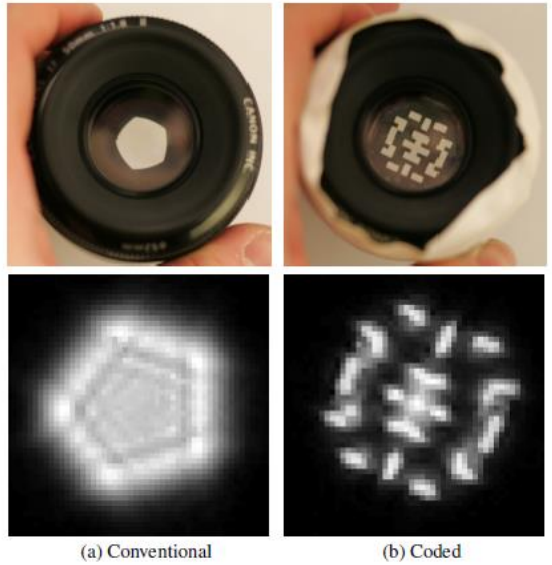
Main-idea: Coded-Aperture



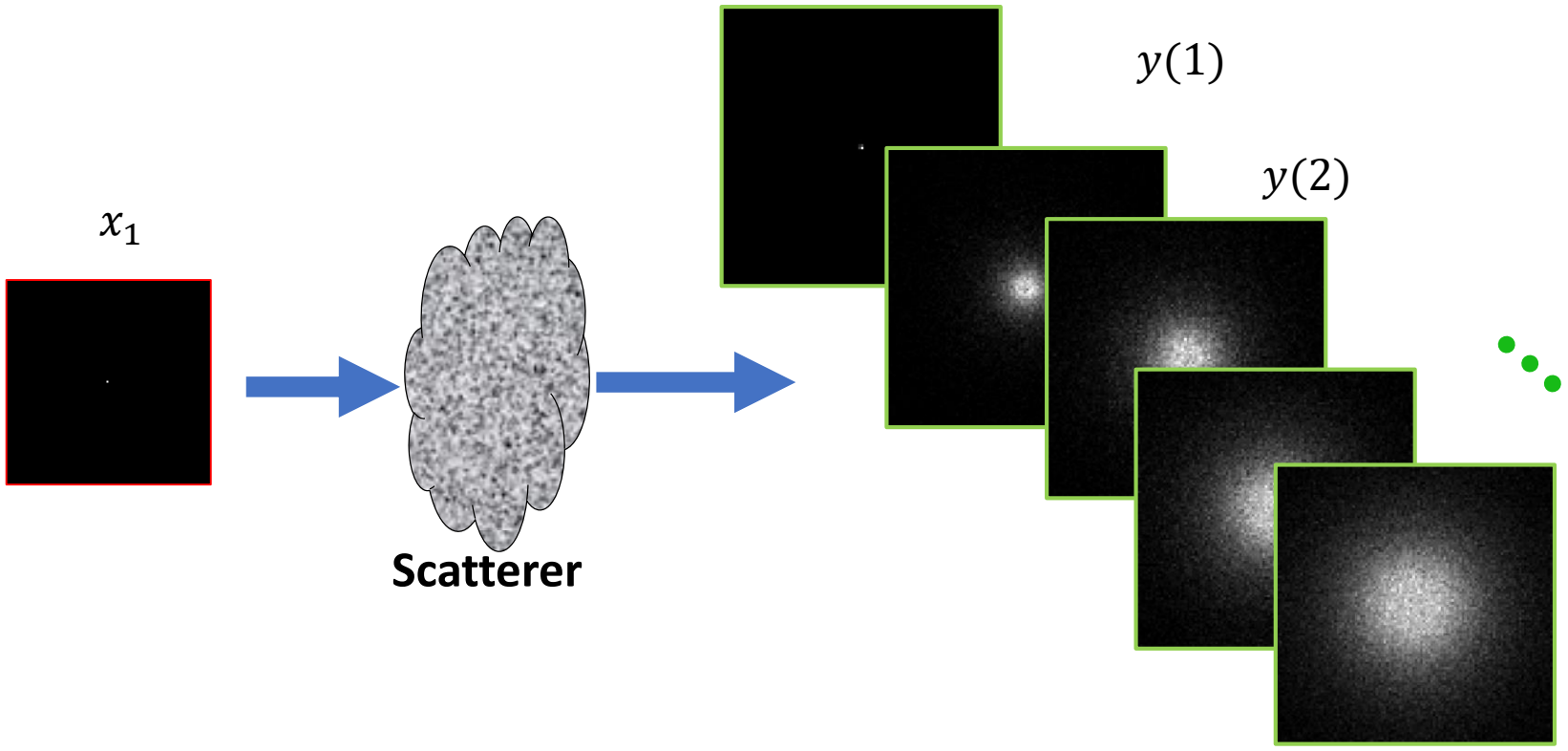
*Flat-Scope





*Flutter-Shutter/Coded-Aperture

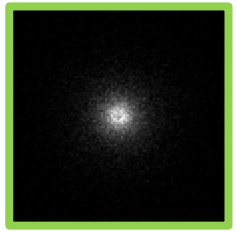
STPSF approach

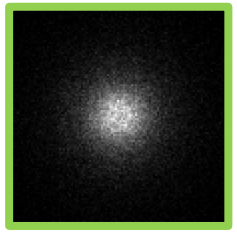


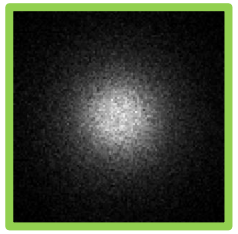
Can we use the scattered photons too?

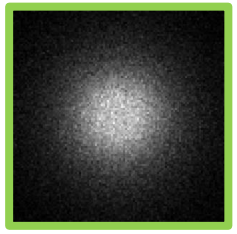
Problem with using scattered photons

$y(1)$

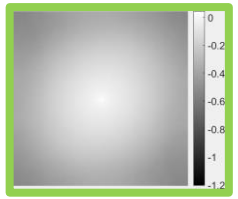
$y(6)$ 

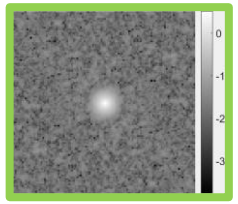
$y(11)$ 

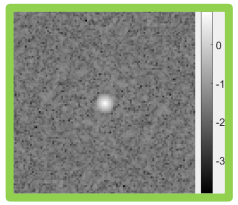
$y(16)$ 

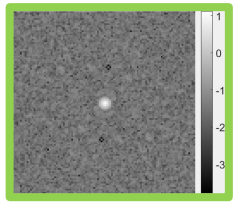
$y(21)$ 

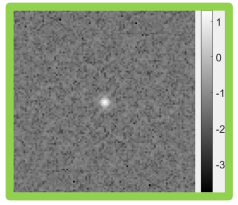
$FFT2$

$\hat{y}(1)$ 

$\hat{y}(6)$ 

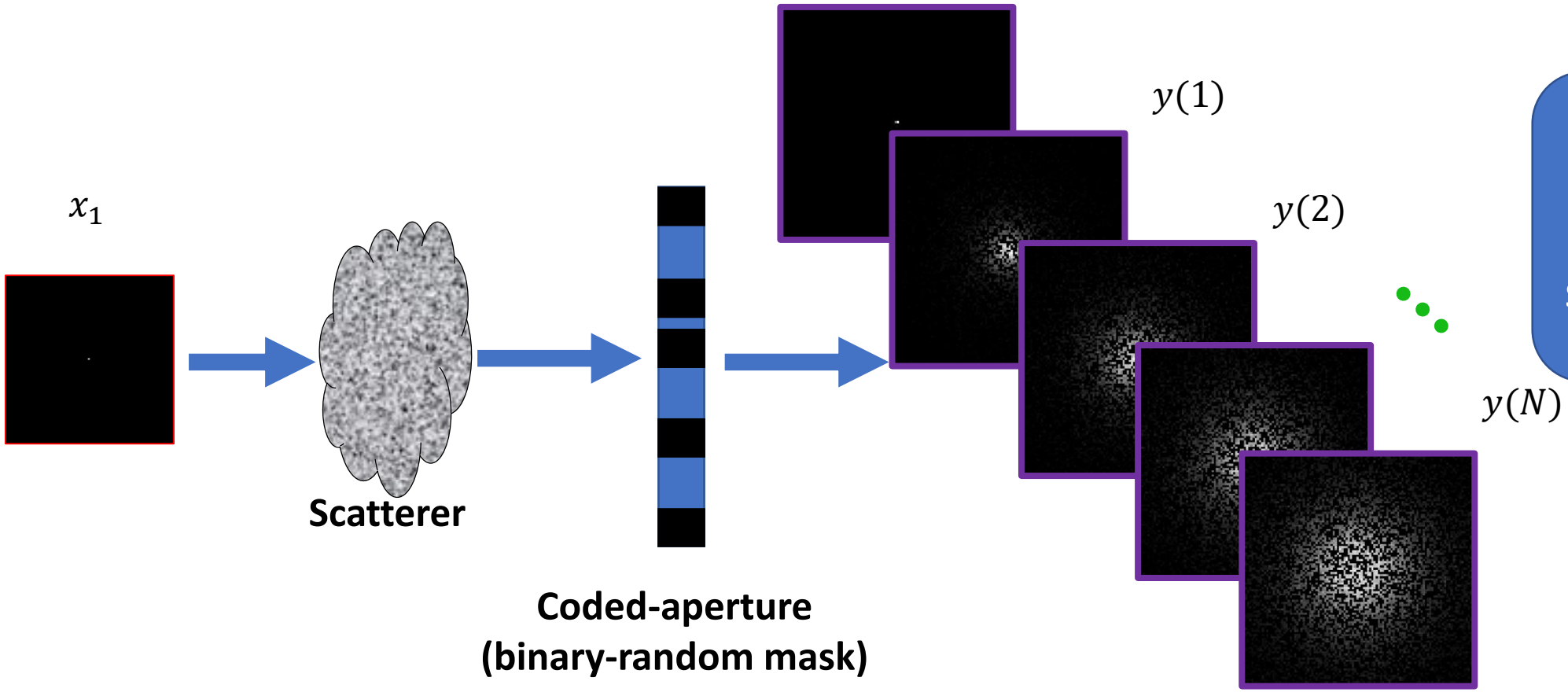
$\hat{y}(11)$ 

$\hat{y}(16)$ 

$\hat{y}(21)$ 

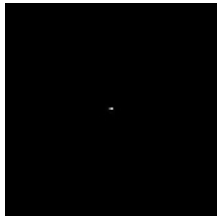
Very quickly high-frequency information lost.

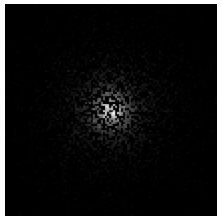
STPSF approach: Coded-aperture

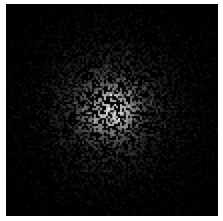


Can we now use the coded-scattered photons?

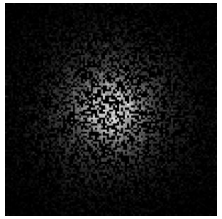
Can we use the coded scattered photons?

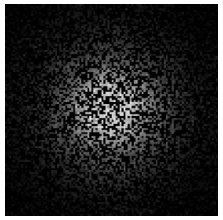
$y_c(1)$ 

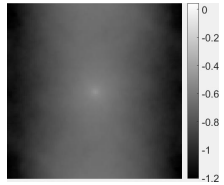
$y_c(6)$ 

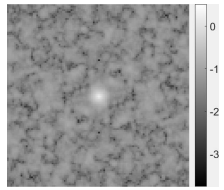
$y_c(11)$ 

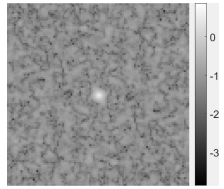
$FFT2$

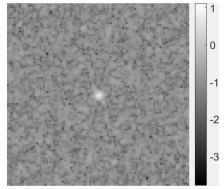
$y_c(16)$ 

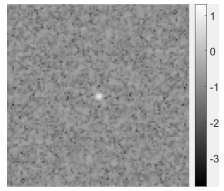
$y_c(21)$ 

$\widehat{y_c}(1)$ 

$\widehat{y_c}(2)$ 

$\widehat{y_c}(11)$ 

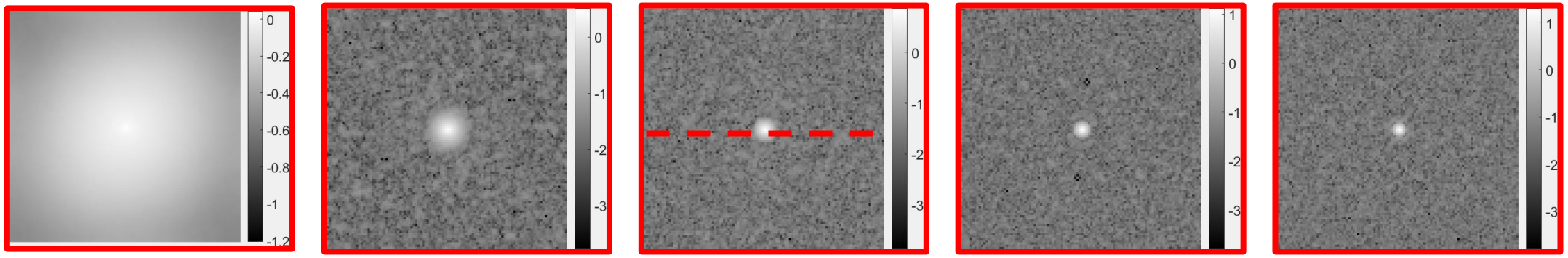
$\widehat{y_c}(16)$ 

$\widehat{y_c}(21)$ 

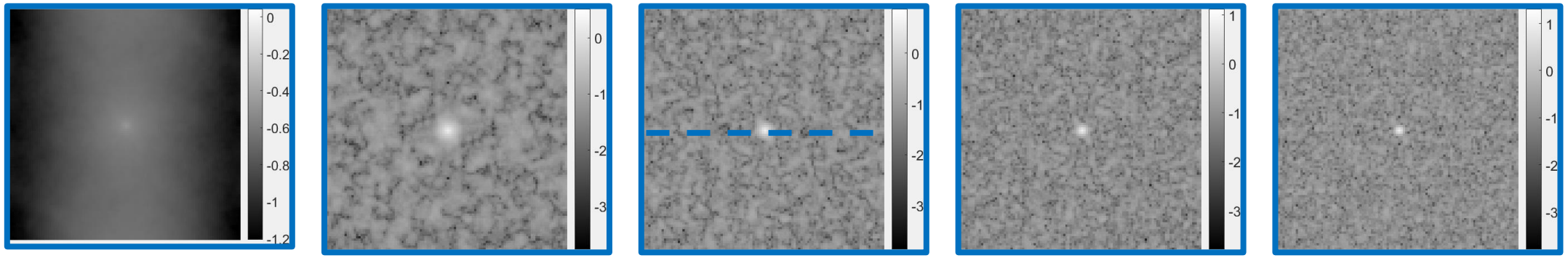
Is the high-frequency information preserved now?

Effect of coding in frequency-domain

Scattered-photons

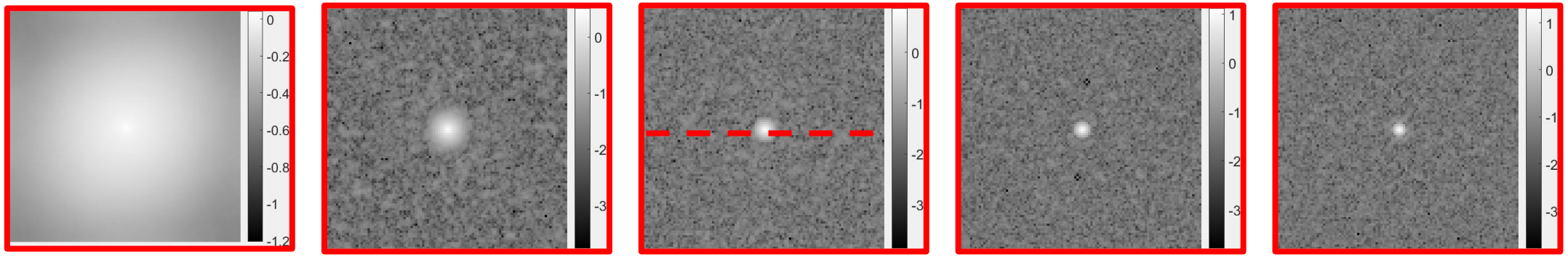


Coded scattered-photons

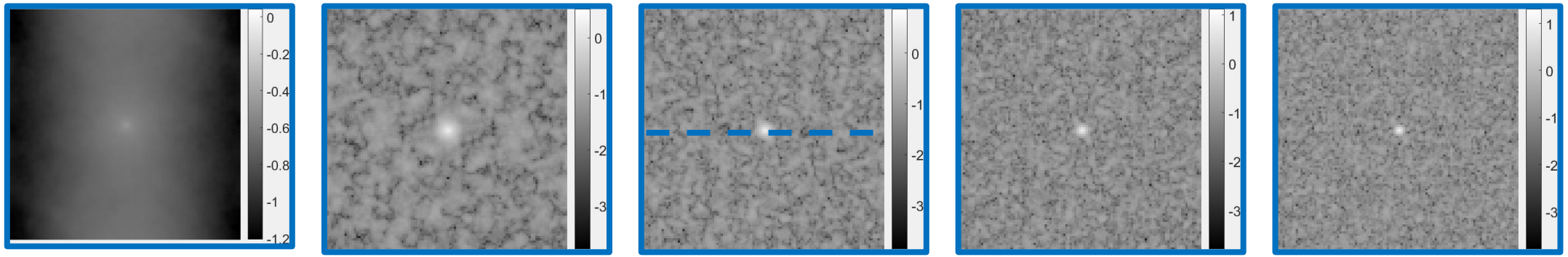


Effect of coding in frequency-domain

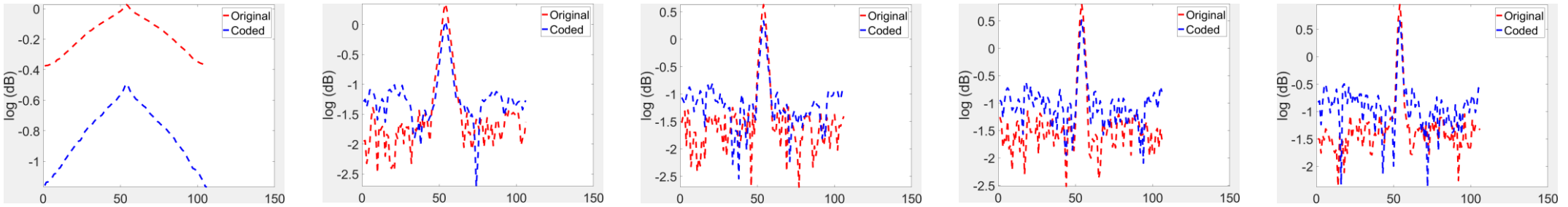
Scattered-photons



Coded scattered-photons



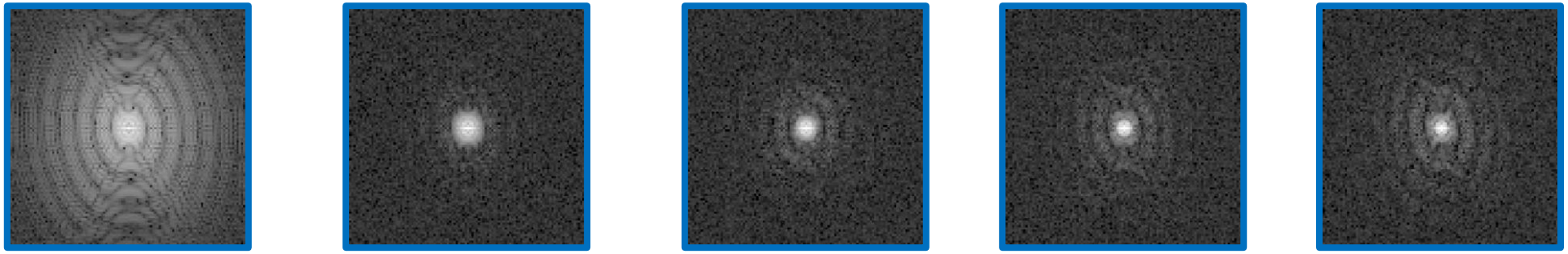
Central-frequency



Roughly 1 dB improvement in the high-frequency attenuation.

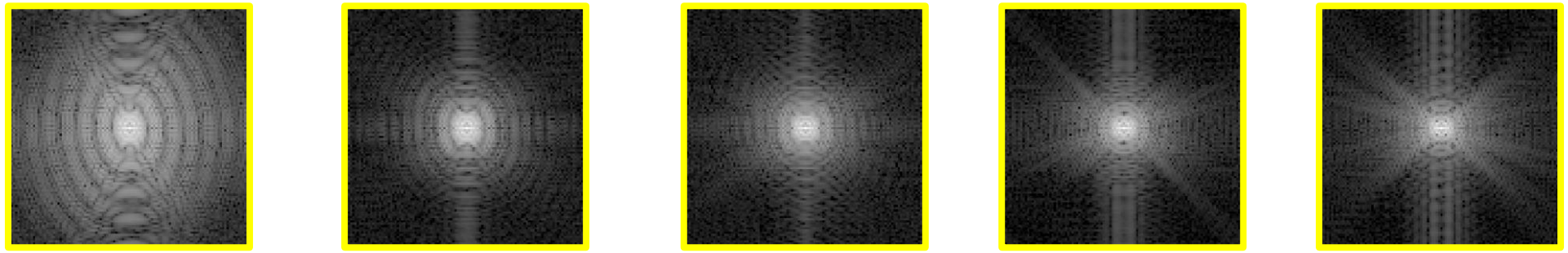
Fourier-domain: Scattered-photons

Captured FT

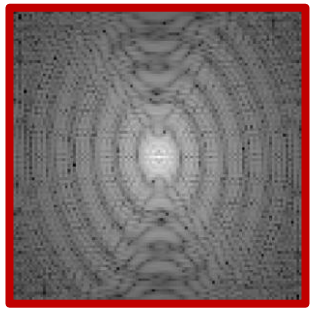


GT

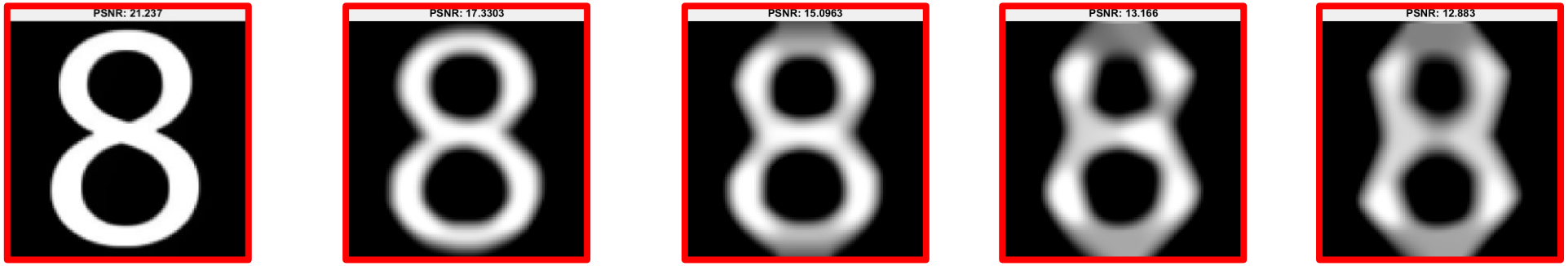
Deconvolved FT



GTFT



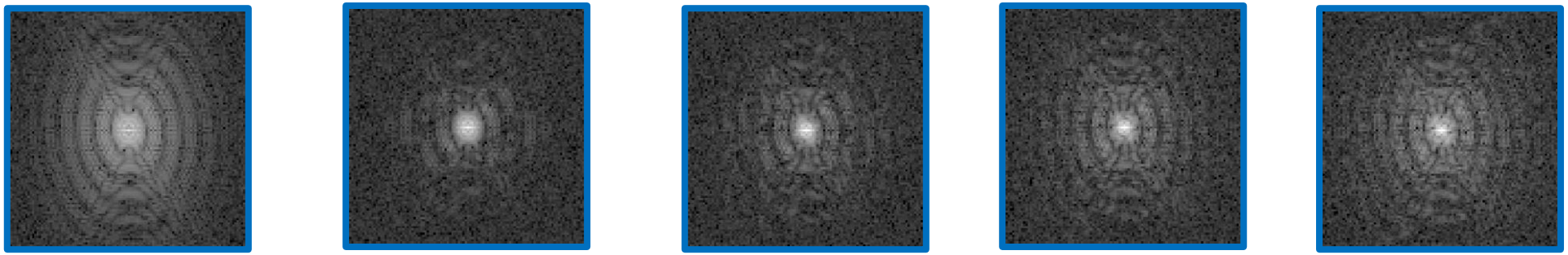
Deconvolved



Fourier-domain: Coded-scattered photons

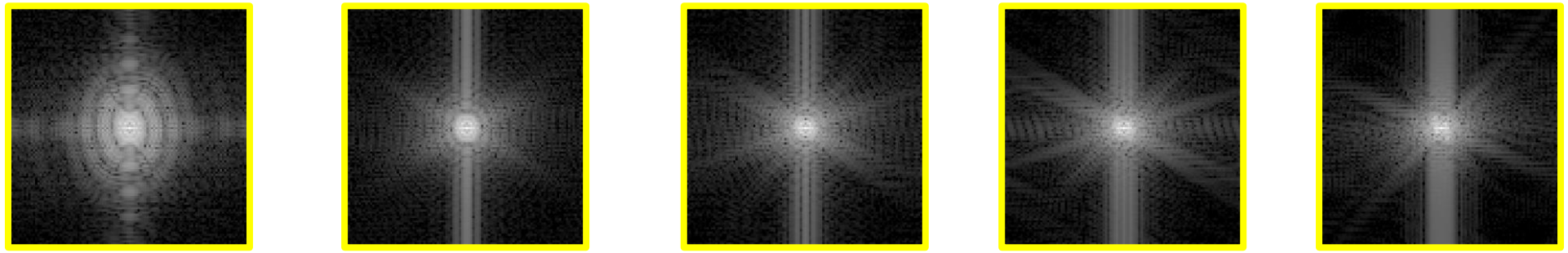
High-frequency information: Slight improvement

Captured FT

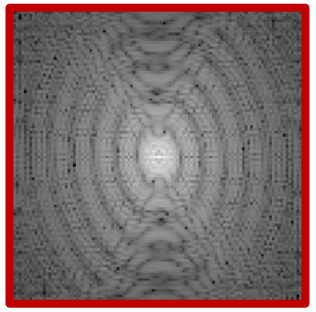


GT

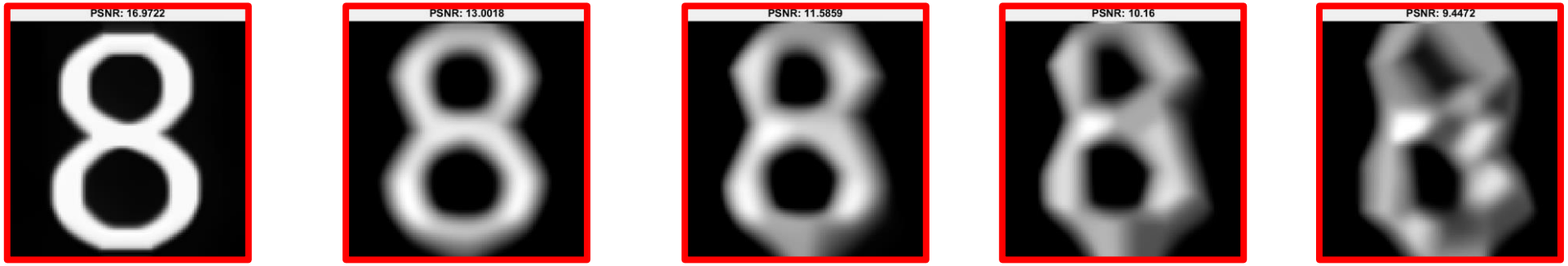
Deconvolved FT



GTFT

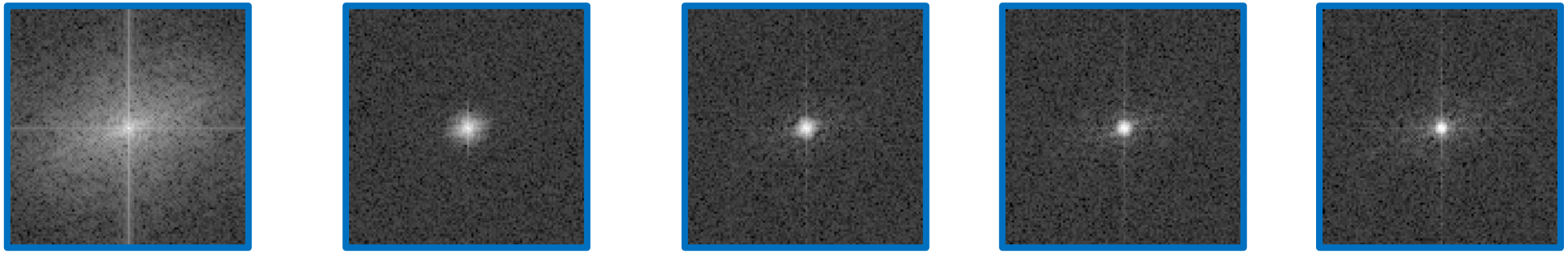


Deconvolved



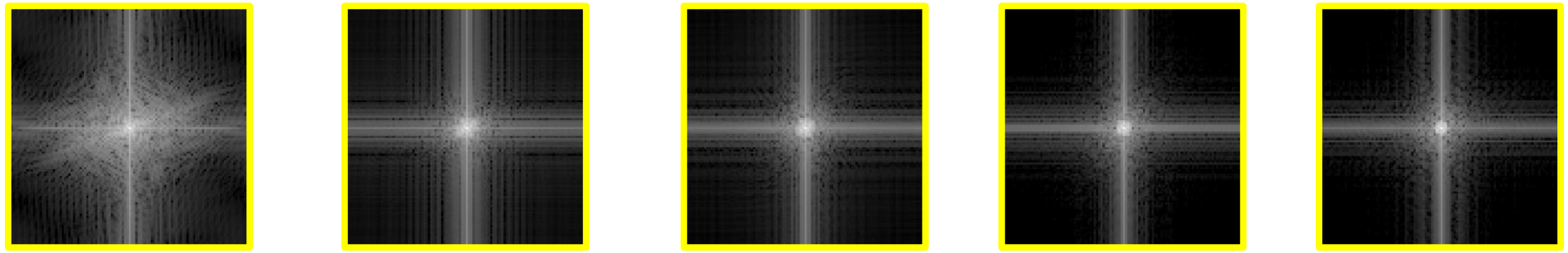
Fourier-domain: Scattered-photons

Captured FT

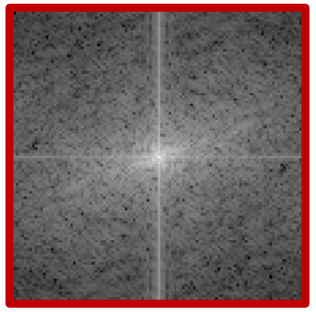


GT

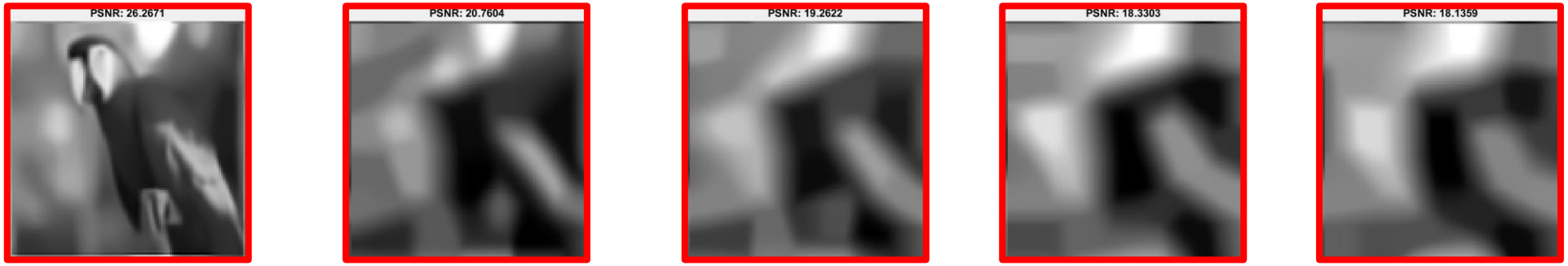
Deconvolved FT



GTFT



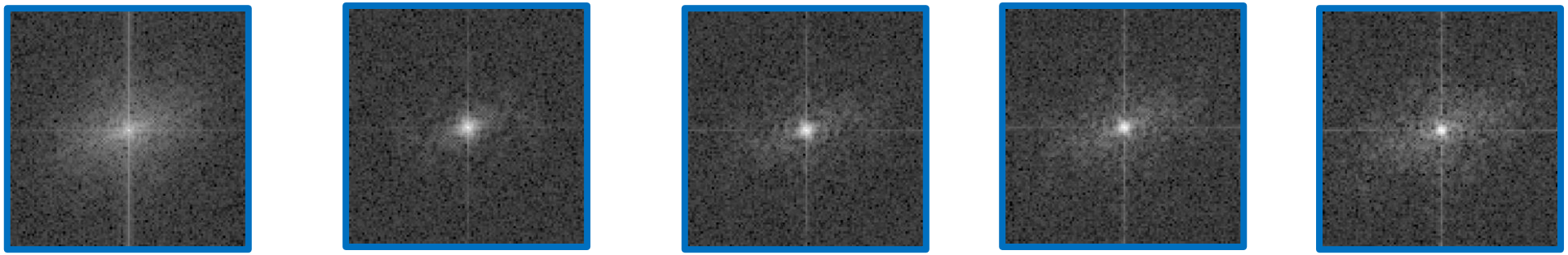
Deconvolved



Fourier-domain: Coded-scattered photons

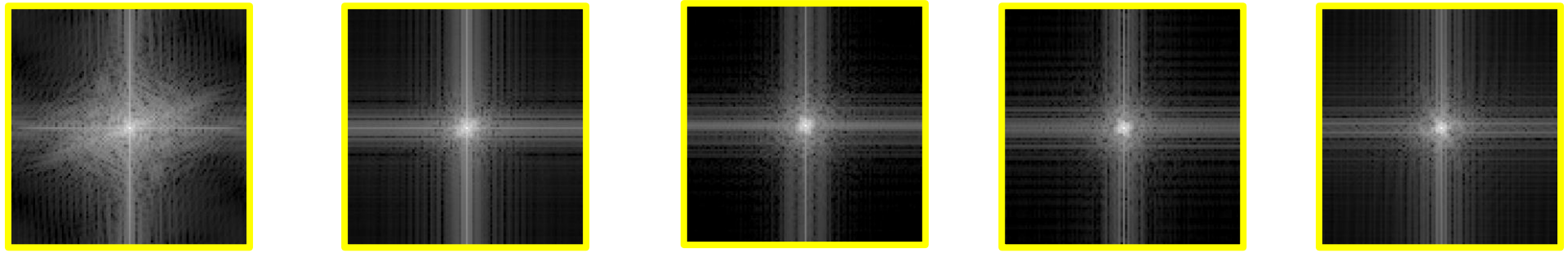
High-frequency information: Slight improvement

Captured FT

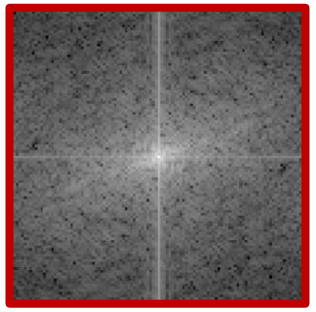


GT

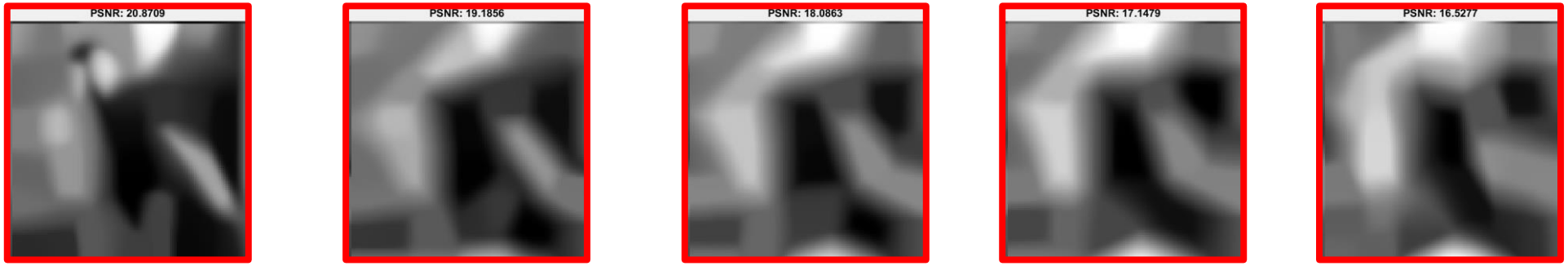
Deconvolved FT



GTFT

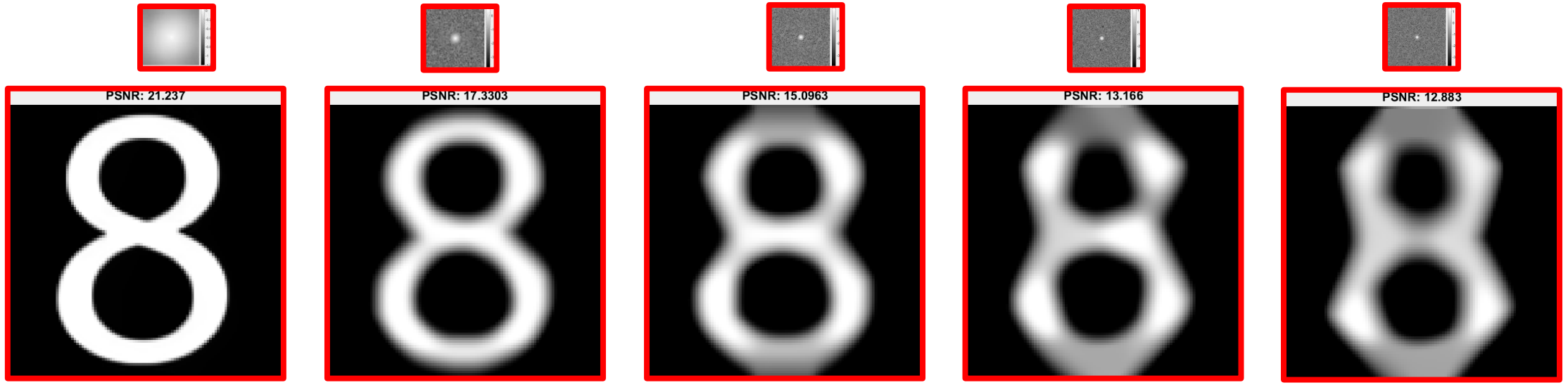


Deconvolved

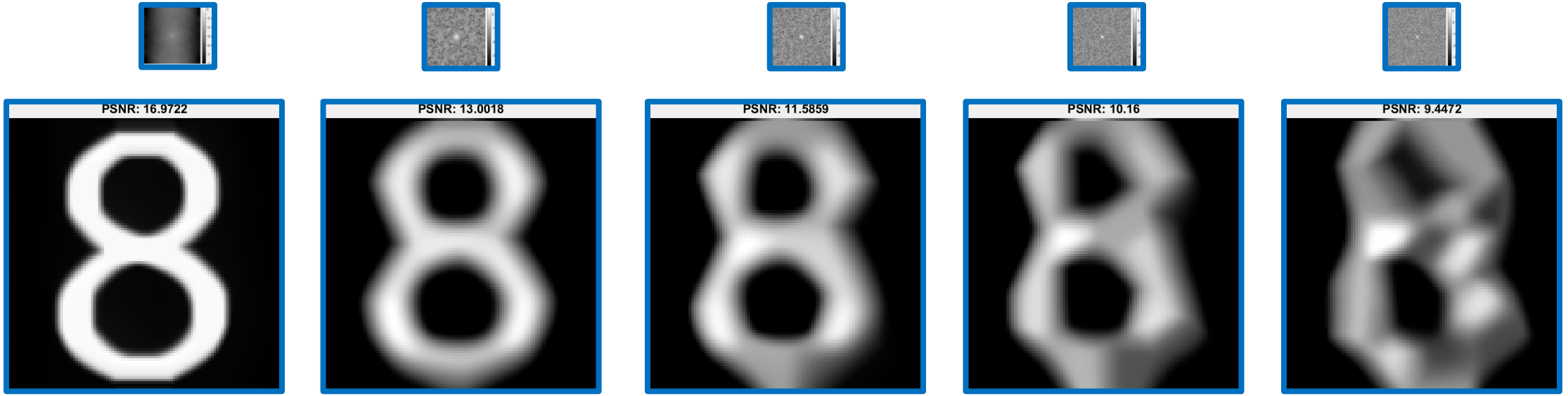


Comparison of deconvolution

Scattered-photons

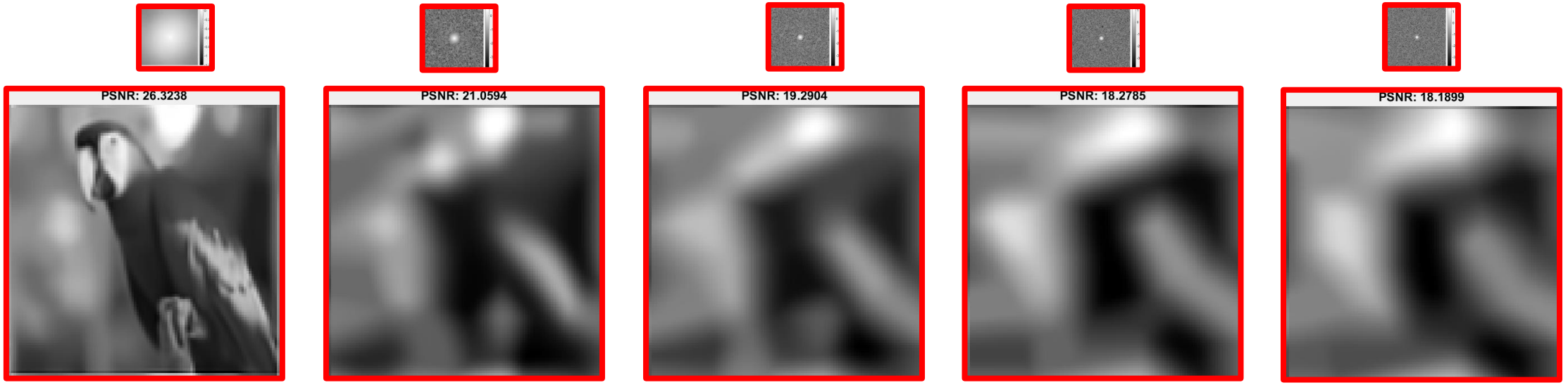
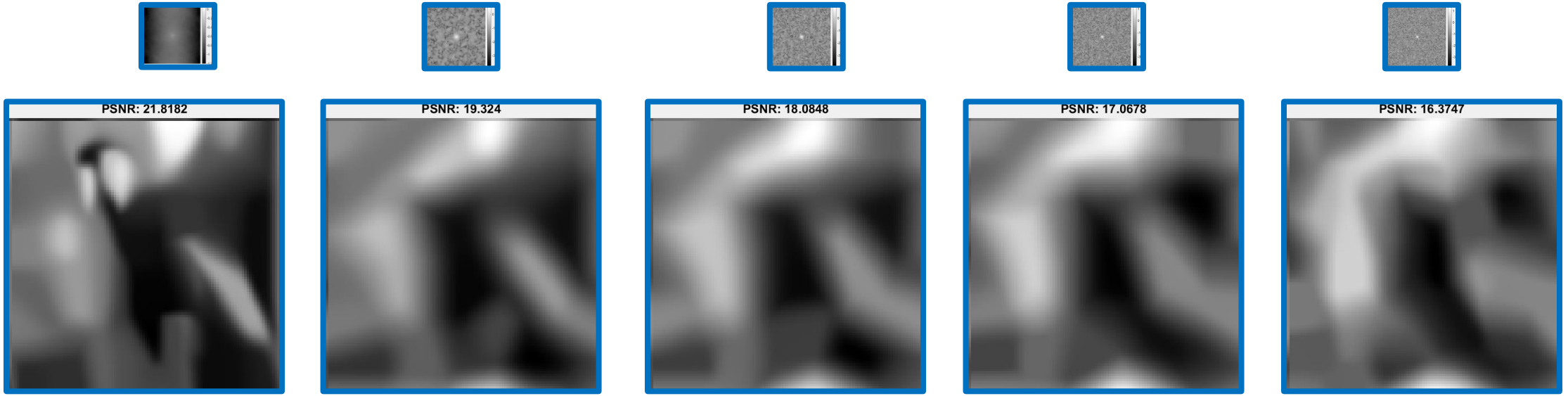


Coded scattered-photons



Comparison of deconvolution

Scattered-photons



Coded scattered-photons