Algorithm 1: Low Precision NIHT

Input: The set of low precision measurement matrices $\{\hat{\mathbf{\Phi}}_1, \hat{\mathbf{\Phi}}_2, ...\hat{\mathbf{\Phi}}_{2n^*}\}$, measurements $\hat{\mathbf{y}}$, sparsity parameter s, number of iterations n^*, step size tuning parameters k, c

Initialize $\mathbf{x}^{[0]} = 0$, $\Gamma^{[1]} = \mathrm{supp}\big(\mathrm{H_s}(\hat{\mathbf{\Phi}}_1^\dagger \hat{\mathbf{y}})\big)$.

for $n = 1$ **to** n^* **do**

$\mathbf{g}^{[n]} = \hat{\mathbf{\Phi}}_{2n-1}^\dagger\big(\hat{\mathbf{y}} - \hat{\mathbf{\Phi}}_{2n}\mathbf{x}^{[n]}\big)$

$\hat{\mu}^{[n]} = (\mathbf{g}_{\Gamma^{[n]}}^\dagger \mathbf{g}_{\Gamma^{[n]}})/(\mathbf{g}_{\Gamma^{[n]}}^\dagger \mathbf{\Phi}_{\Gamma^{[n]}}^\dagger \mathbf{\Phi}_{\Gamma^{[n]}} \mathbf{g}_{\Gamma^{[i]}})$

$\mathbf{x}^{[n+1]} = H_s(\mathbf{x}^{[n]} + \hat{\mu}^{[n]}\mathbf{g}^{[n]})$

$\Gamma^{[n+1]} = \mathrm{supp}(\mathbf{x}^{[\mathrm{n+1}]})$

if $\Gamma^{[n+1]} = \Gamma^{[n]}$

$\mathbf{x}^{[n+1]} = \mathbf{x}^{[\mathbf{n}]}$

else if $\Gamma^{[n+1]} \neq \Gamma^{[n]}$

$b^{[n]} =$

$(\|\mathbf{x}^{n+1} - \mathbf{x}^n\|_2^2)/(\|\hat{\mathbf{\Phi}}_{2n-1}(\mathbf{x}^{n+1} - \mathbf{x}^n)\|_2^2)$

if $\hat{\mu}^{[n]} \leq (1-c)b^{[n]}$

$\mathbf{x}^{[n+1]} = \mathbf{x}^{[\mathbf{n}]}$

else $\hat{\mu}^{[n]} > (1-c)b^{[n]}$

repeat $\hat{\mu}^{[n]} \leftarrow \hat{\mu}^{[n]}/(k(1-c))$

$\mathbf{x}^{[n+1]} = H_s(\mathbf{x}^{[n]} + \hat{\mu}^{[n]}\mathbf{g}^{[n]})$

until $\hat{\mu}^{[n]} \leq (1-c)b^{[n]}$

$\Gamma^{[n+1]} = \mathrm{supp}(\mathbf{x}^{[\mathrm{n+1}]})$

end for