Acceleration approach
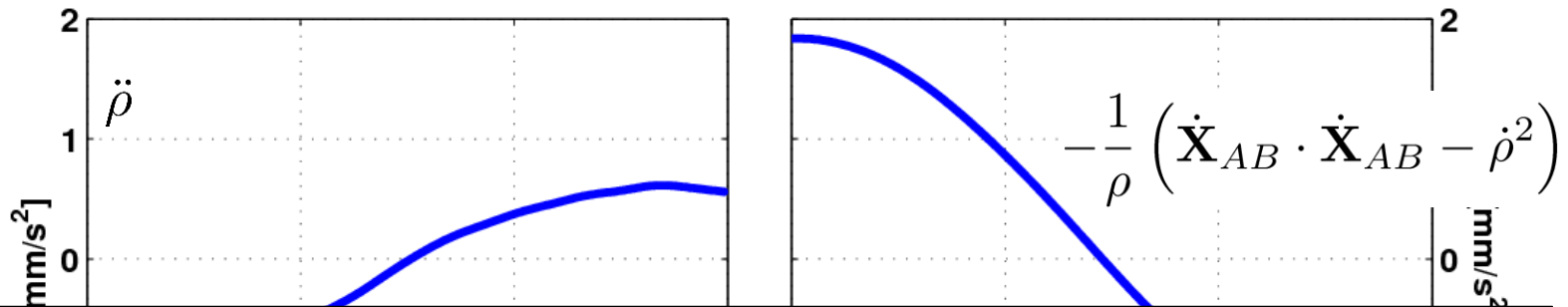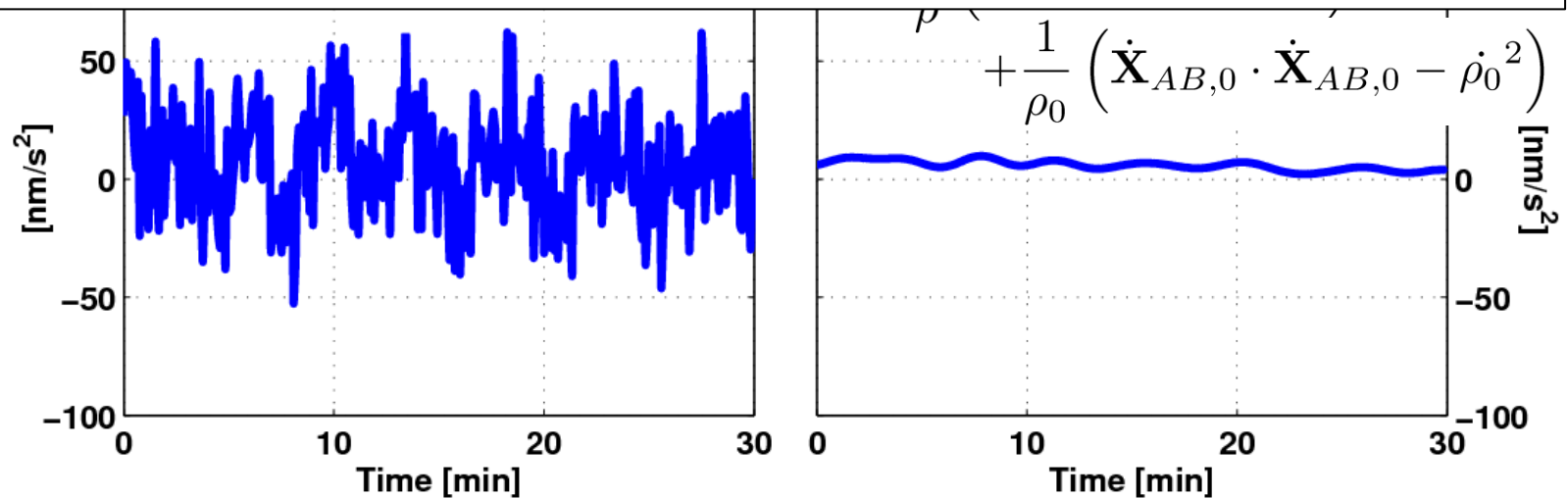
ULux progress on WP2

Approach:

$$\nabla V \cdot \boldsymbol{e}_{AB} = \ddot{\rho} - \frac{1}{\rho} \left(\|\dot{\boldsymbol{X}}_{AB}\|^2 - \dot{\rho}^2 \right)$$
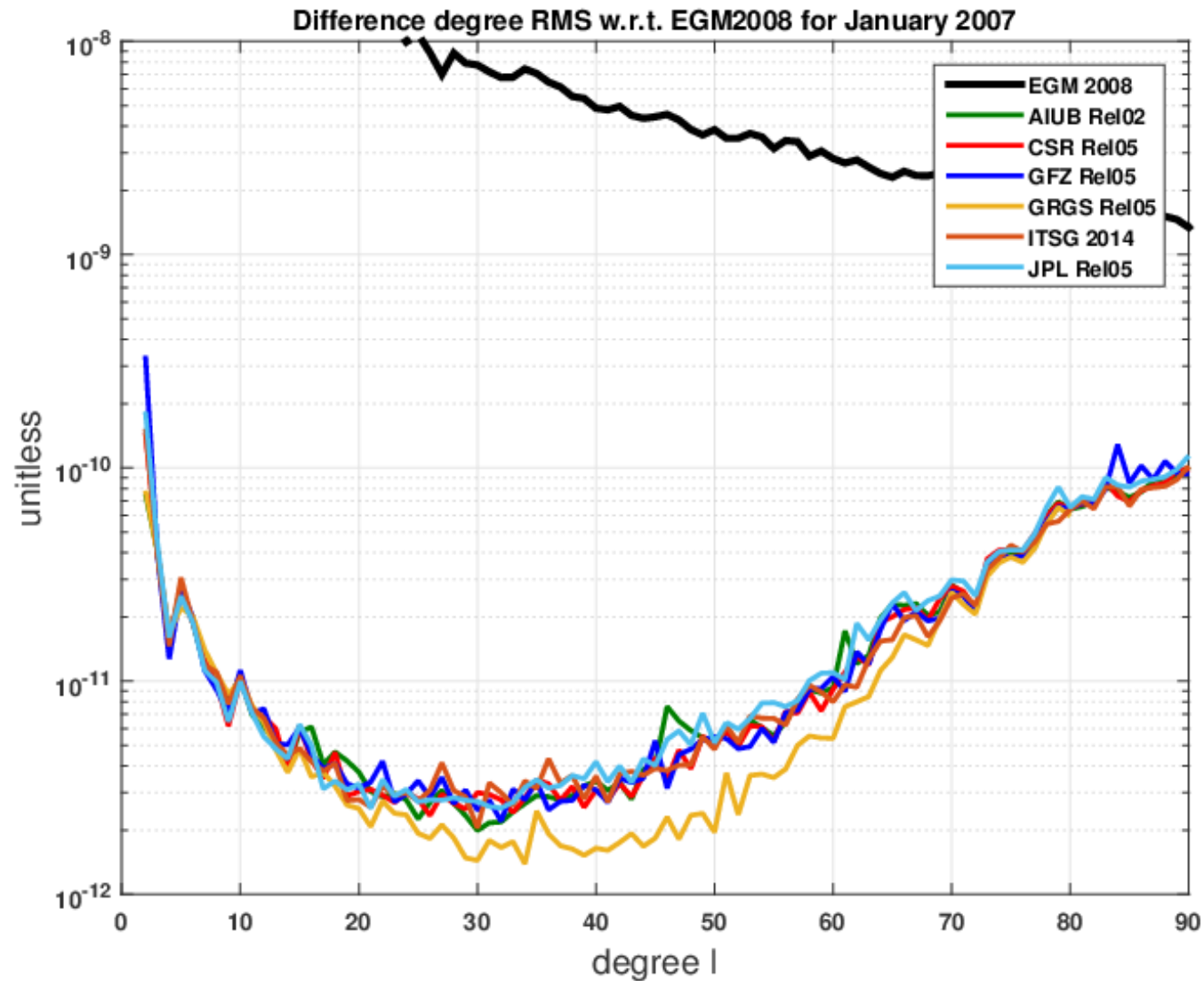

$\ddot{\rho}$

$$-\frac{1}{\rho} \left(\dot{\mathbf{X}}_{AB} \cdot \dot{\mathbf{X}}_{AB} - \dot{\rho}^2 \right)$$

Approximation:

$$\ddot{\rho} - \ddot{\rho}^0 = (\nabla V_B - \nabla V_A) \cdot \boldsymbol{e}_{AB} - \left(\nabla V_B^0 - \nabla V_A^0 \right) \cdot \boldsymbol{e}_{AB}^0$$

$$+\frac{1}{\rho_0} \left(\dot{\mathbf{X}}_{AB,0} \cdot \dot{\mathbf{X}}_{AB,0} - \dot{\rho}_0{}^2 \right)$$

Approximate implementation

Difference degree RMS w.r.t. EGM2008 for January 2007

Approximate implementation

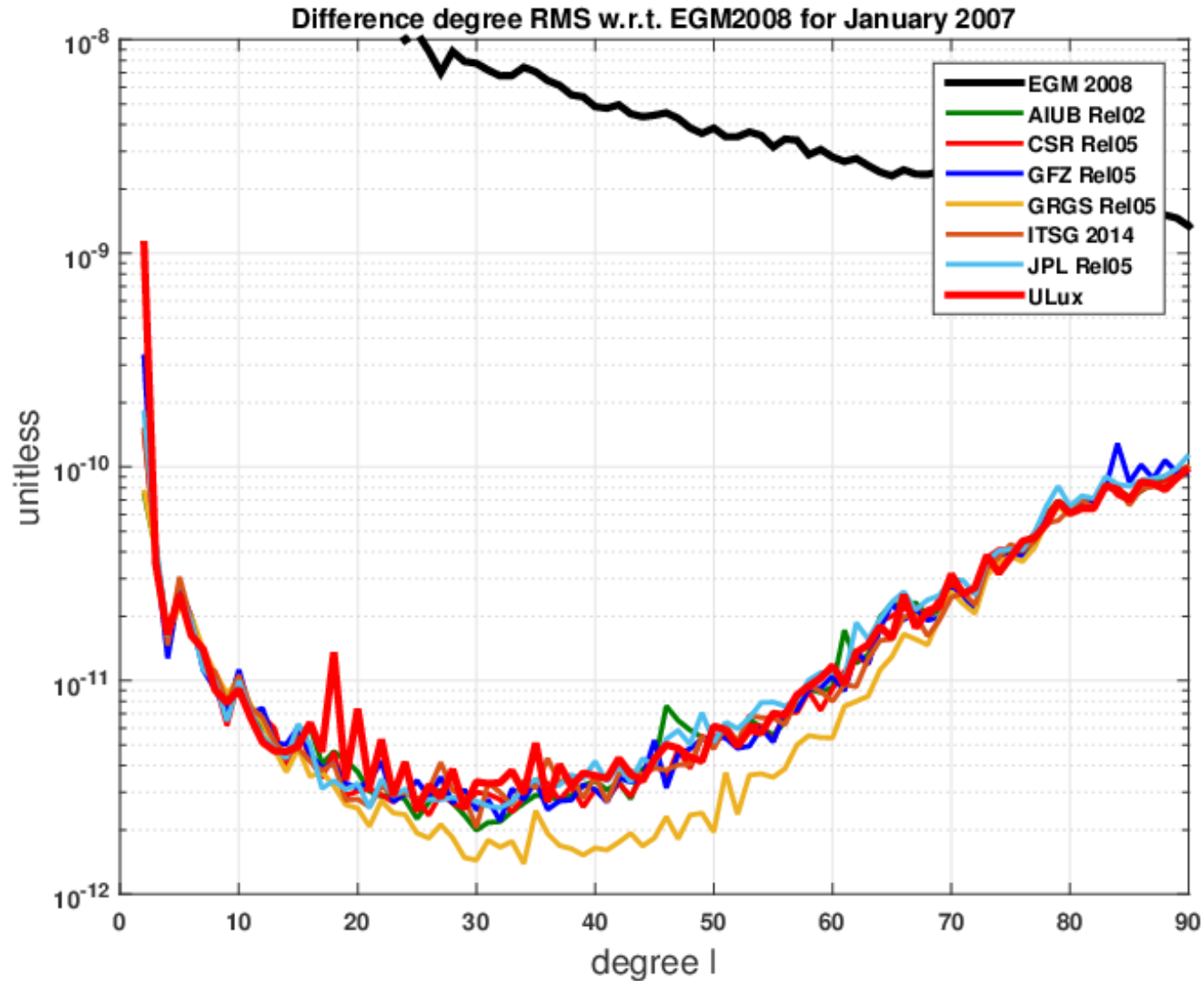Difference degree RMS w.r.t. EGM2008 for January 2007

Refinement

- So far:

$$\ddot{\rho} - \ddot{\rho}^0 = (\nabla V_B - \nabla V_A) \cdot \boldsymbol{e}_{AB} - (\nabla V_B^0 - \nabla V_A^0) \cdot \boldsymbol{e}_{AB}^0$$

- Full expression:

$$\ddot{\rho} - \ddot{\rho}^0 = (\nabla V_B - \nabla V_A) \cdot \boldsymbol{e}_{AB} - (\nabla V_B^0 - \nabla V_A^0) \cdot \boldsymbol{e}_{AB}^0$$
$$+ \frac{1}{\rho} \left(\dot{\boldsymbol{X}}_{AB} \cdot \dot{\boldsymbol{X}}_{AB} - \dot{\rho}^2 \right) - \frac{1}{\rho^0} \left(\dot{\boldsymbol{X}}_{AB}^0 \cdot \dot{\boldsymbol{X}}_{AB}^0 - \left(\dot{\rho}^0\right)^2 \right)$$
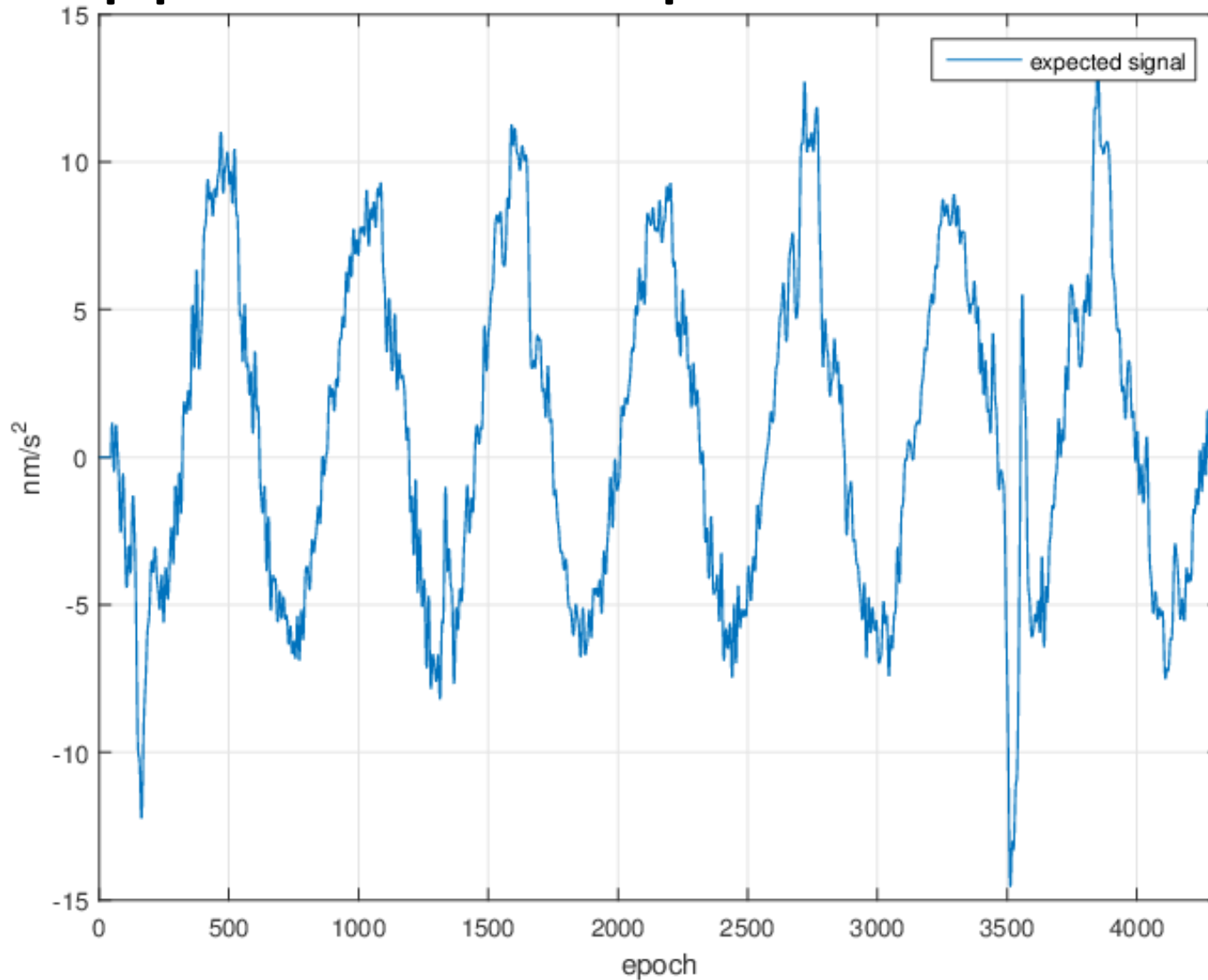
- Linearization and solution by variational equations

$$\nabla V_{AB} \cdot \boldsymbol{e}_{AB} - \nabla V_{AB}^0 \cdot \boldsymbol{e}_{AB}^0 \quad = \quad \sum_i \frac{\partial f_1}{\partial s_i} \Delta s_i + \sum_i \frac{\partial f_2}{\partial s_i} \Delta s_i + \hbar^2$$

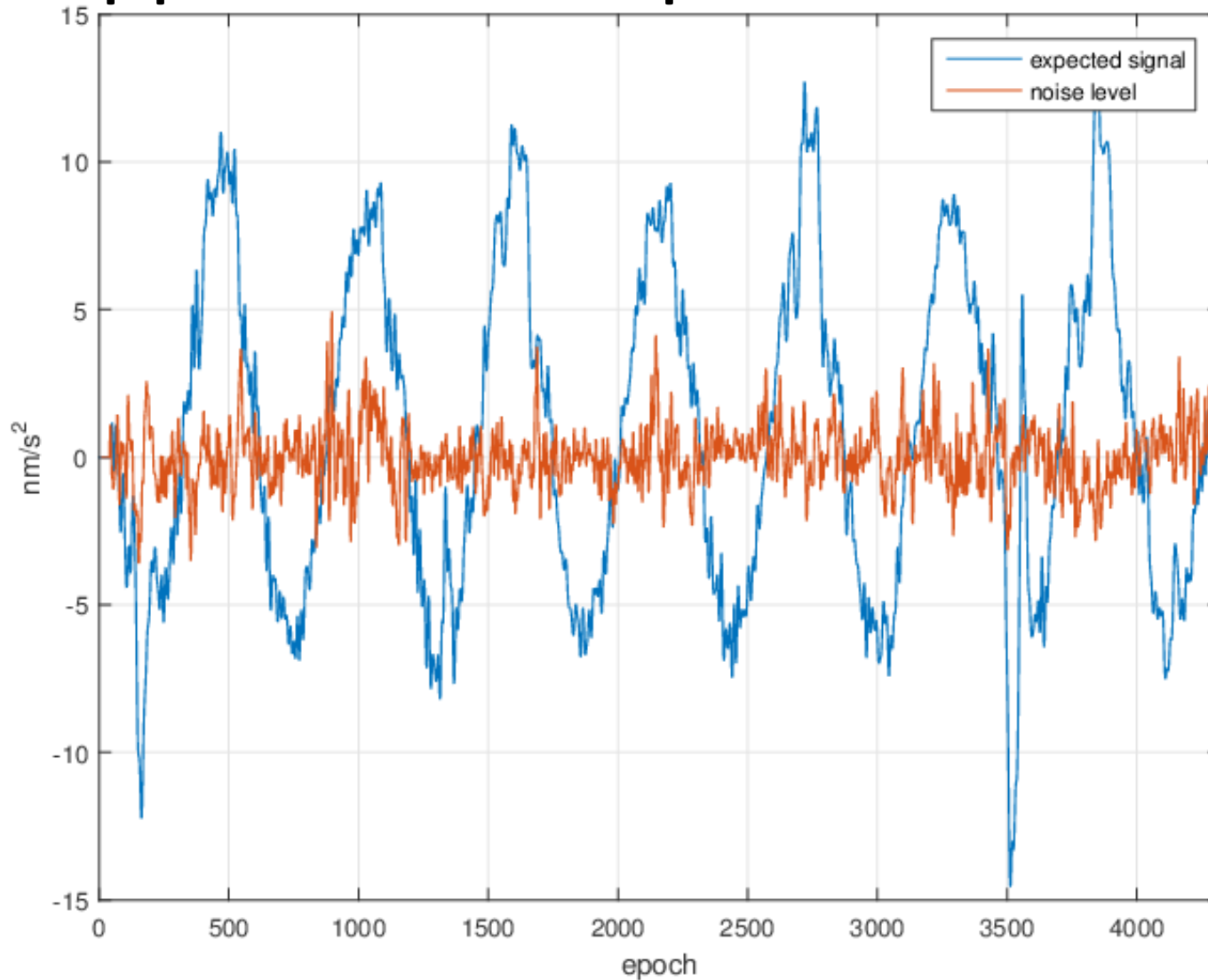$$\frac{1}{\rho} \|\dot{\boldsymbol{X}}_{AB}\|^2 - \frac{1}{\rho^0} \|\dot{\boldsymbol{X}}_{AB}^0\|^2 \quad = \quad \sum_i \frac{\partial g_1}{\partial s_i} \Delta s_i + \hbar^2$$

$$-\frac{\dot{\rho}^2}{\rho} + \frac{\left(\dot{\rho}^0\right)^2}{\rho^0} \quad = \quad \sum_i \frac{\partial g_2}{\partial s_i} \Delta s_i + \hbar^2$$
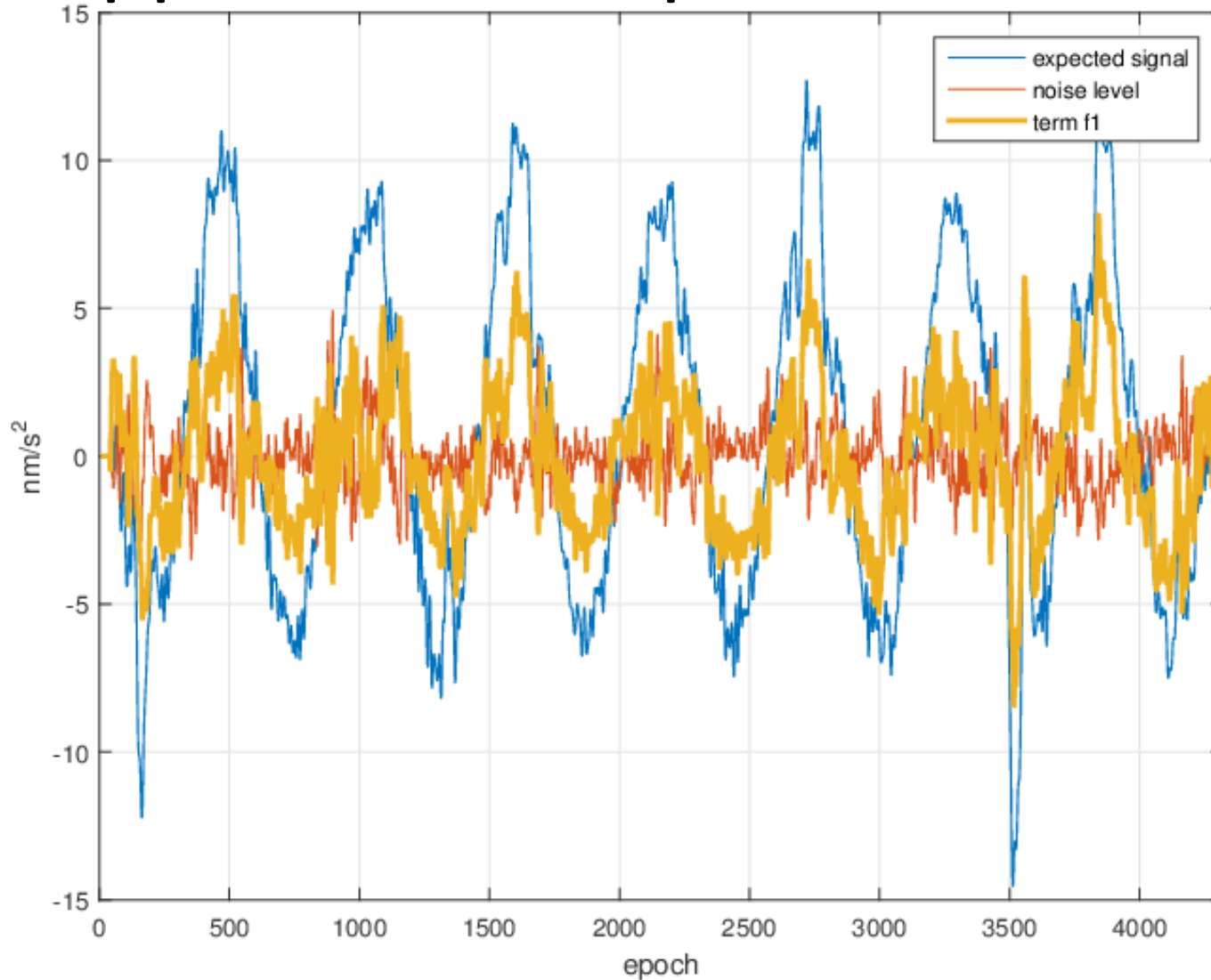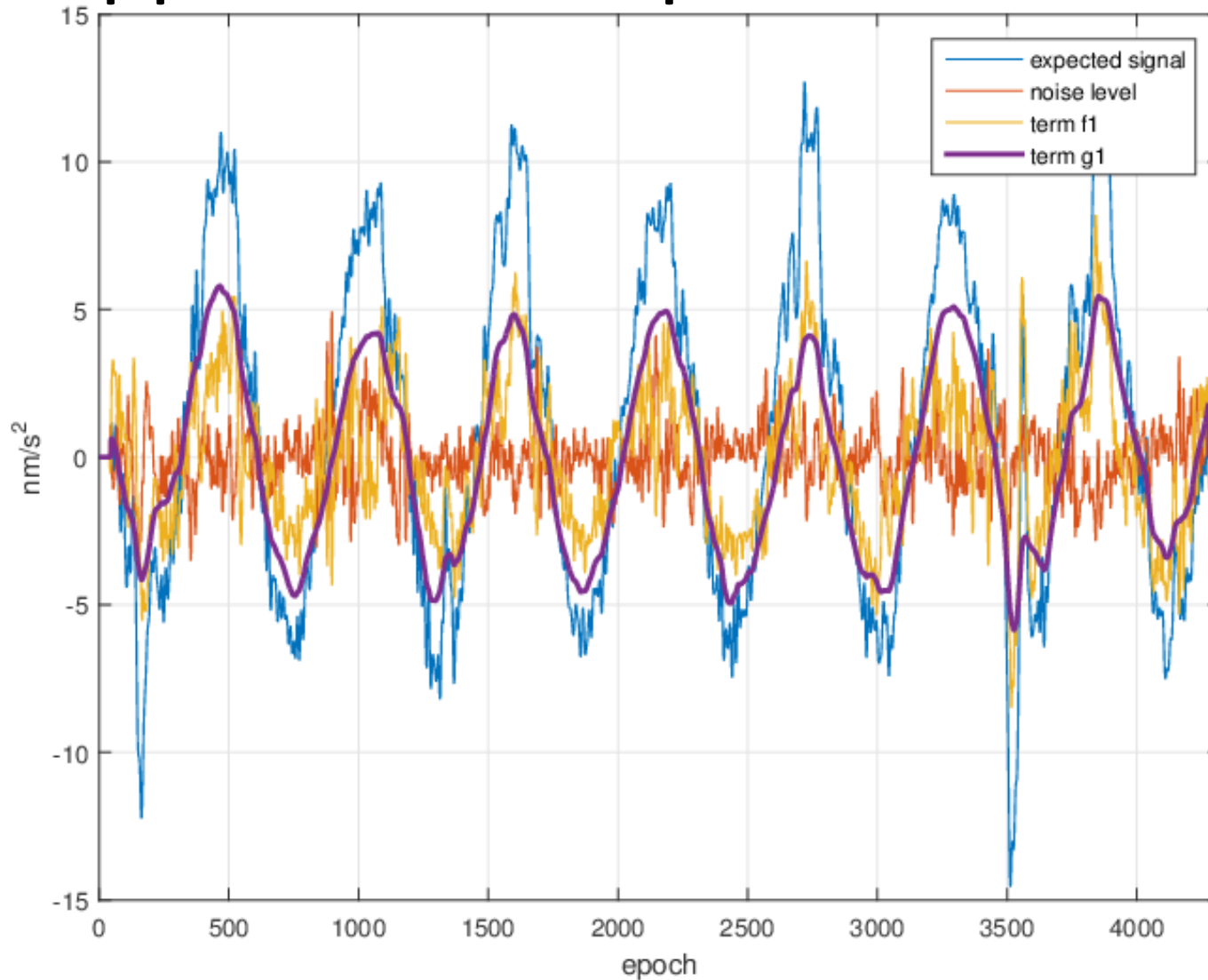
5

Approximate implementation

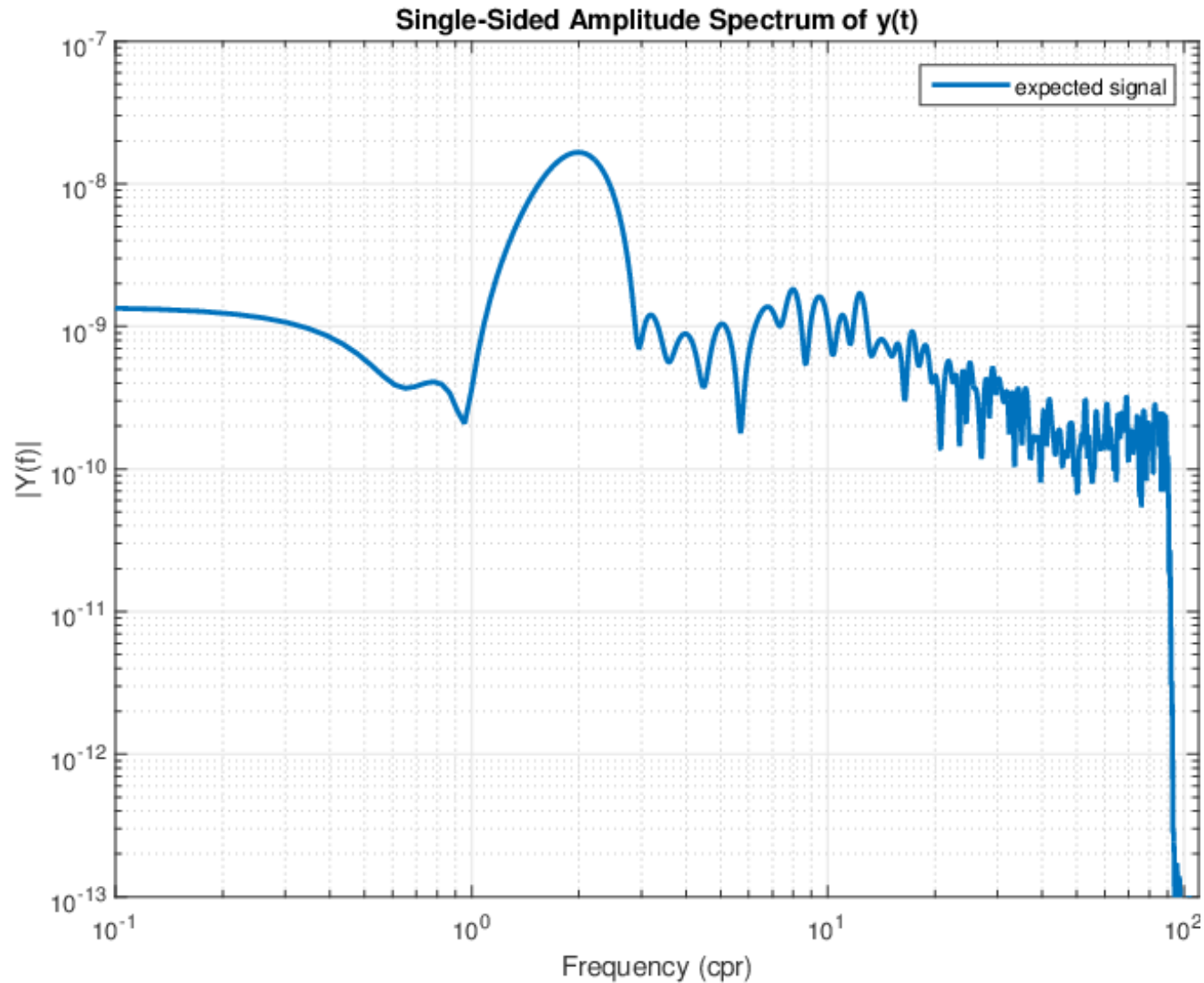# Approximate implementation

Approximate implementation

Approximate implementation

Back to the acceleration approach

Single-Sided Amplitude Spectrum of y(t)

Back to the acceleration approach

Single-Sided Amplitude Spectrum of y(t)

Back to the acceleration approach

Single-Sided Amplitude Spectrum of y(t)

Back to the acceleration approach

Single-Sided Amplitude Spectrum of y(t)
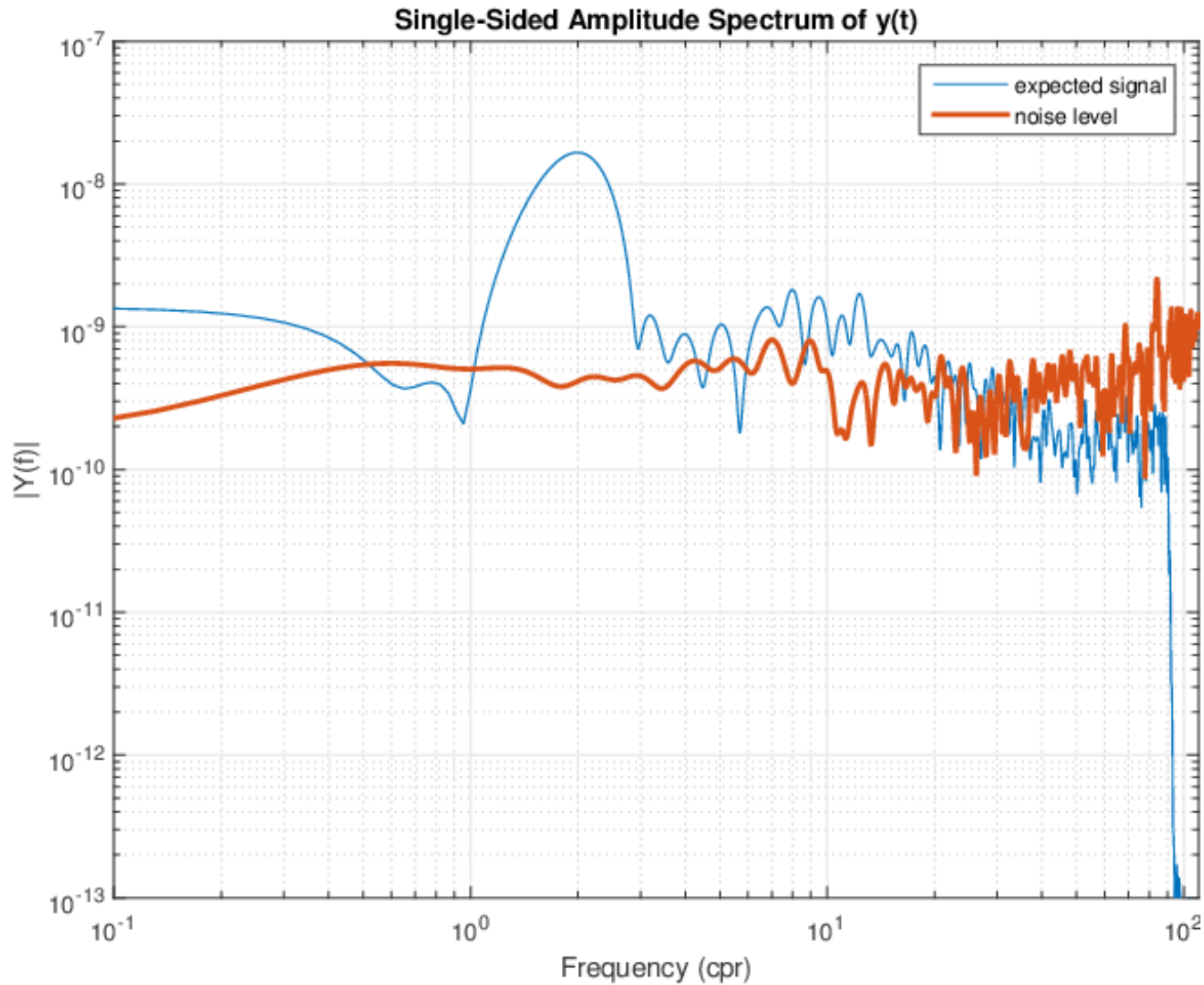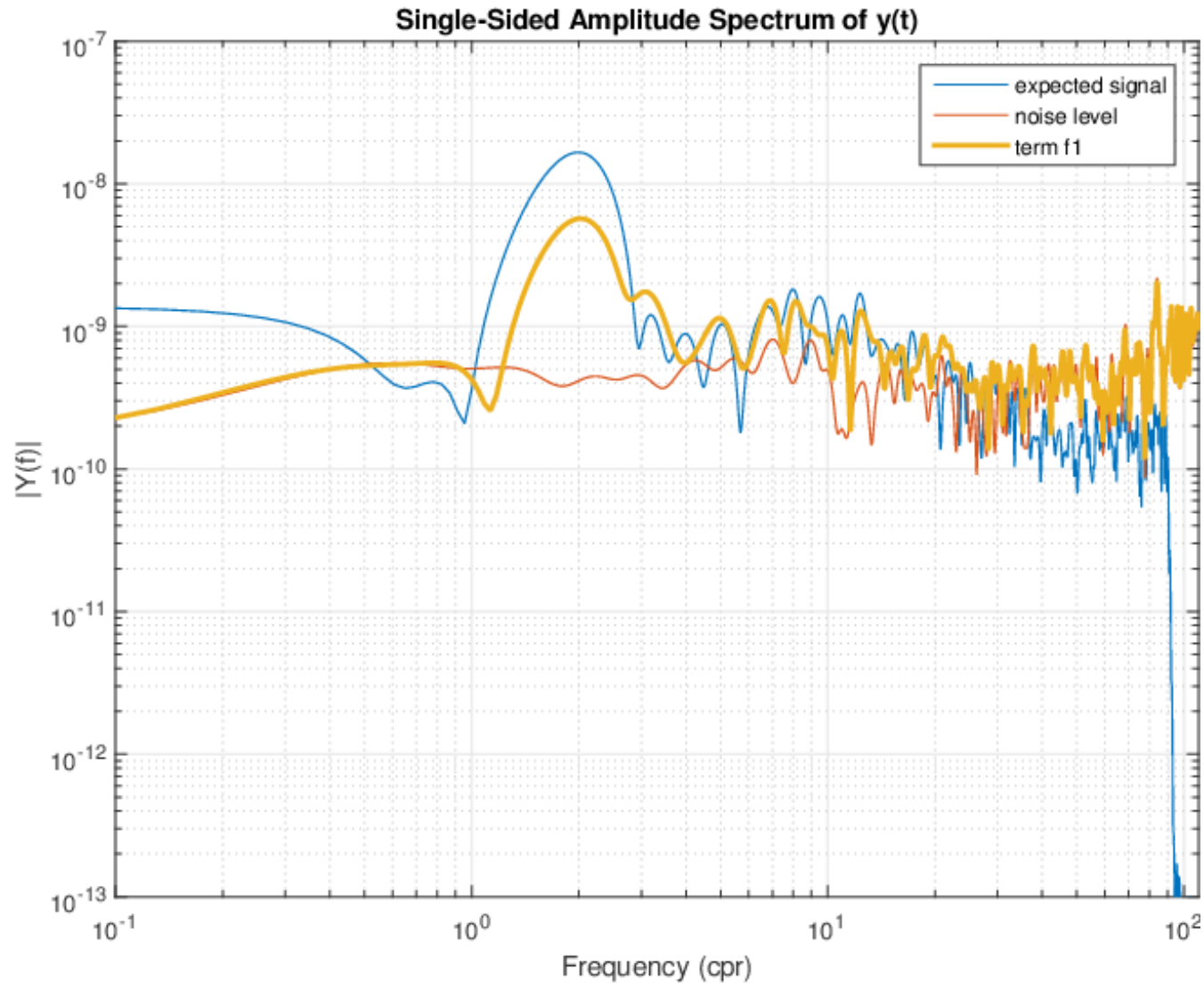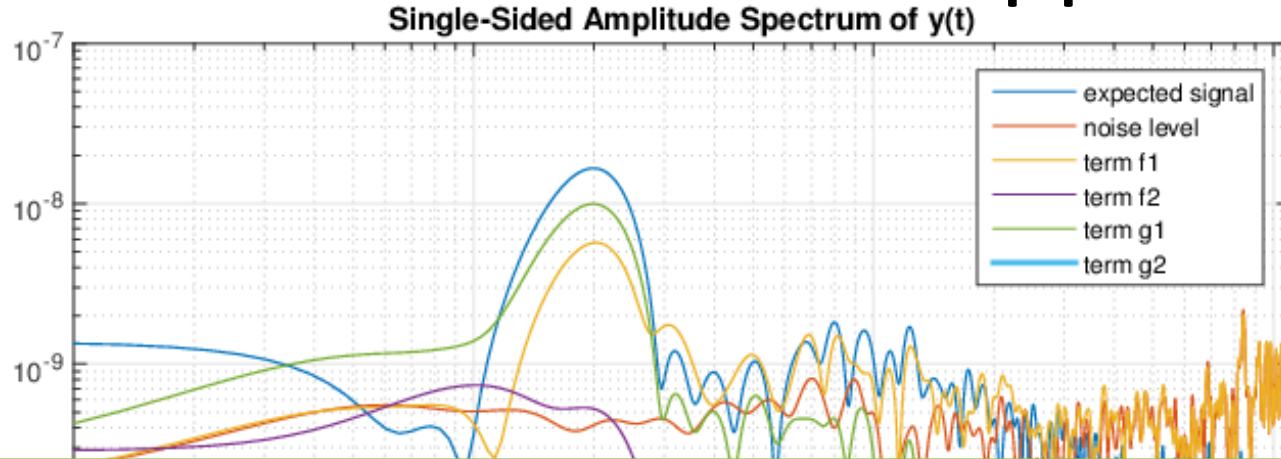
Full approach currently under implementation

EOSIEM