Algorithm 2 CHEBYCHEV-PROPAGATOR Evaluate $\vec{w} = f(\pm\hat{A}\,dt)\vec{v}$, with $f(\pm\hat{A}\,dt) = \mathrm{e}^{\pm\mathrm{i}\hat{A}\,dt}$.

Input: input vector $\vec{v} \in \mathbb{C}^N$; operator $\hat{A} \in \mathbb{C}^{N\times N}$; time step dt;
Output: Approximation of propagated vector $\vec{w} = e^{-i\hat{A}\,dt}\vec{v} \in \mathbb{C}^N$

procedure CHEBY($\vec{v}$, $\hat{A}$, dt)
  Δ = spectral radius of $\hat{A}$
  $E_{\min}$ = minimum eigenvalue of $\hat{A}$
  $[a_0 \dots a_n] =$ EXPCHEBYCOEFFS(Δ, $E_{\min}$, dt)
  $d = \frac{1}{2}\Delta$; $\beta = d + E_{\min}$
  $\vec{v}_0 = \vec{v}$
  $\vec{w}^{(0)} = a_0\vec{v}_0$
  $\vec{v}_1 = \pm\frac{\mathrm{i}}{d}\left(\hat{A}\vec{v}_0 - \beta\vec{v}_0\right)$
  $\vec{w}^{(1)} = \vec{w}^{(0)} + a_1\vec{v}_1$
  for $i = 2 : n$ **do**
    $\vec{v}_i = \pm\frac{2\mathrm{i}}{d}\left(\hat{A}\vec{v}_{i-1} - \beta\vec{v}_{i-1}\right) + \vec{v}_{i-2}$
    $\vec{w}^{(i)} = \vec{w}^{(i-1)} + a_i\vec{v}_i$
  end for
  return $e^{\pm\mathrm{i}\,\beta\,dt}\vec{w}^{(n)}$
end procedure