

FILON TRAPAZOID TRANSFORM

$TSTART:=time(1)$

POINTS PER DECADE SNIPPET

TIME DOMAIN FUNCTION

FREQUENCY DOMAIN FUNCTION

DEVELOP FILON TRANSFORM

$$F(t)=\frac{1}{2\pi}\int_{-\infty}^{\infty}F(\omega)e^{-i\omega t}d\omega$$

$Nf=1.200\cdot10^3$

FREQUENCY SPACING = h

INITIAL GUESS = $h:=\omega_{Nf}-\omega_1=6.220\cdot10^{10}$

NOW REDUCE h BY FACTORS OF 2 UNTIL A GOOD TRANSFORM IS ACHIEVED. THIS MAY REQUIRE A LARGE FACTOR OF 2 TO ACHIEVE A GOOD TRANSFORM .IF YOU CONTINUE TO REDUCE h BEYOND THE OPTIMUM VALUE, THE TRANSFORM WILL BEGIN TO DEGRADE.

$m:=14$

$h:=\frac{h}{2^m}=3.797\cdot10^6$

$min(t)=1.297\cdot10^{-11}$

$max(t)=9.900\cdot10^{-5}$

$k:=\lceil1..length(t)\rceil$

$$C(t):=\begin{cases}eval\left(\frac{1}{t^2\cdot h^2}\cdot\left(1-e^{-i\cdot t\cdot h}-i\cdot t\cdot h\right)\right)& \text{if } n=-Nf \\ eval\left(\frac{1}{t^2\cdot h^2}\cdot\left(1-e^{-i\cdot t\cdot h}+i\cdot t\cdot h\right)\right)& \text{if } n=Nf \\ eval\left(\frac{1}{t^2\cdot h^2}\cdot\left(2-e^{-i\cdot t\cdot h}-e^{+i\cdot t\cdot h}\right)\right)& \text{otherwise}\end{cases}$$

THIS FORM OF C[T] IS OBTAINED BY THE cases FUNCTION. THE RESULT IS THE SAME IF I USE A STRING OF if..else PROGRAMMING FUNCTIONS.

$Nt=2.100\cdot10^2\qquad Nf=1.200\cdot10^3$

$$FilonPlus_k:=eval\left(\frac{h}{2\cdot\pi}\cdot\sum_{n=-Nf}^{Nf}C(t_k)\cdot\left(e^{-i\cdot t_k\cdot n\cdot h}\cdot f(n\cdot h)\right)\right)$$
$$FilonMinus_k:=eval\left(\frac{h}{2\cdot\pi}\cdot\sum_{n=-Nf}^{Nf}C(-t_k)\cdot\left(e^{i\cdot t_k\cdot n\cdot h}\cdot f(n\cdot h)\right)\right)$$

$$EvenF_k:=\frac{FilonPlus_k+FilonMinus_k}{2}$$

$$OddF_k:=\frac{FilonPlus_k-FilonMinus_k}{2}$$

$TOTALFILON_k:=EvenF_k+OddF_k$

$$EvenF=\begin{bmatrix}8.653\cdot10^2+1.833\cdot10^3\cdot i\\8.835\cdot10^2+1.833\cdot10^3\cdot i\\9.055\cdot10^2+1.832\cdot10^3\cdot i\\9.312\cdot10^2+1.831\cdot10^3\cdot i\\9.606\cdot10^2+1.830\cdot10^3\cdot i\\9.938\cdot10^2+1.829\cdot10^3\cdot i\\\vdots\end{bmatrix}$$

$$OddF=\begin{bmatrix}-2.948\cdot10^4-2.917\cdot10^5\cdot i\\-2.334\cdot10^4-2.372\cdot10^5\cdot i\\-1.902\cdot10^4-1.997\cdot10^5\cdot i\\-1.577\cdot10^4-1.724\cdot10^5\cdot i\\-1.322\cdot10^4-1.516\cdot10^5\cdot i\\-1.113\cdot10^4-1.352\cdot10^5\cdot i\\\vdots\end{bmatrix}$$

$$TOTALFILON=\begin{bmatrix}-2.862\cdot10^4-2.899\cdot10^5\cdot i\\-2.246\cdot10^4-2.354\cdot10^5\cdot i\\-1.811\cdot10^4-1.979\cdot10^5\cdot i\\-1.484\cdot10^4-1.706\cdot10^5\cdot i\\-1.225\cdot10^4-1.498\cdot10^5\cdot i\\-1.013\cdot10^4-1.334\cdot10^5\cdot i\\-8.342\cdot10^3-1.201\cdot10^5\cdot i\\\vdots\end{bmatrix}$$

$Feven_k:=|EvenF_k|$

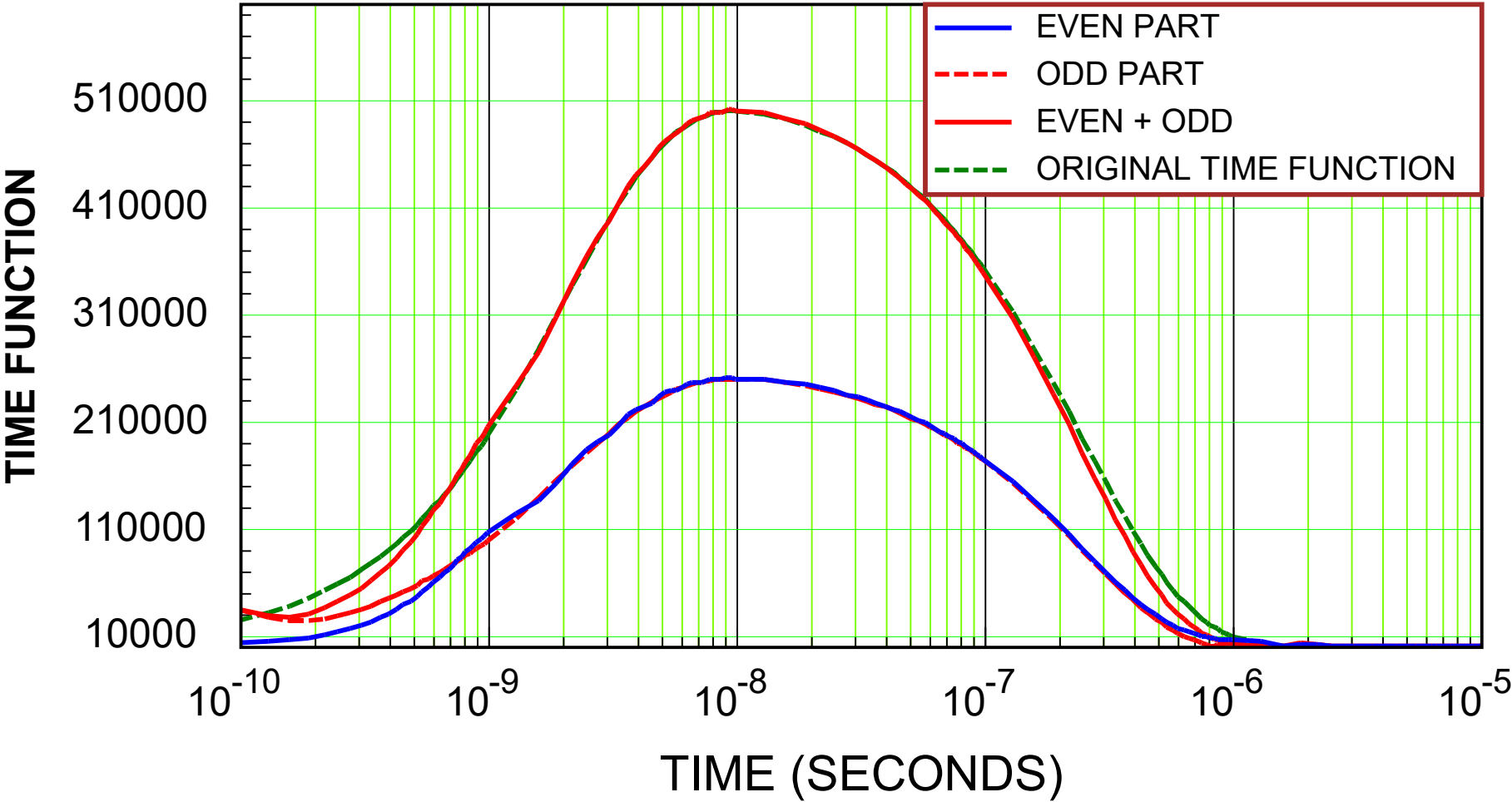
$Fodd_k:=|OddF_k|$

$Filon_k:=|TOTALFILON_k|$

$EvenPlot:=eval(augment(t,Feven))$ $OddPlot:=eval(augment(t,Fodd))$ $Fplot:=eval(augment(t,Filon))$

$Eplot:=eval(augment(t,EE))$

FILON TRAPEZOID FOURIER TRANSFORM



EvenPlot

OddPlot

Fplot

Eplot

Frequency Points Per Decade: $NPD = 1.000 \cdot 10^2$

Frequency Spacing: $h = 3.797 \cdot 10^6$

$\text{time}(1) - TSTART = 256.76$ s

Not for commercial use

2/2