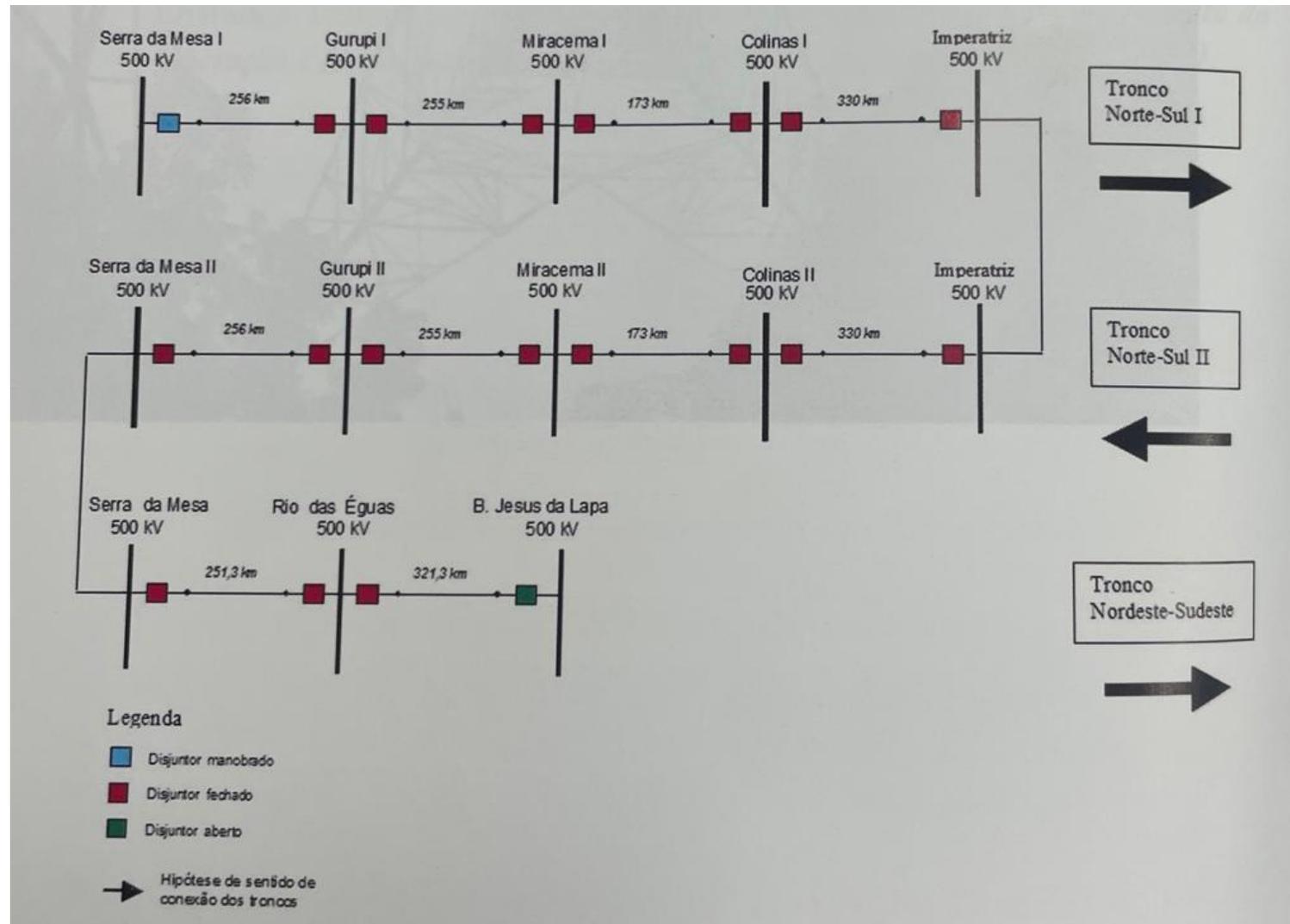




# FALTA AO LONGO DA LINHA DE MAIS DE MÉDIO COMPRIMENTO DE ONDA

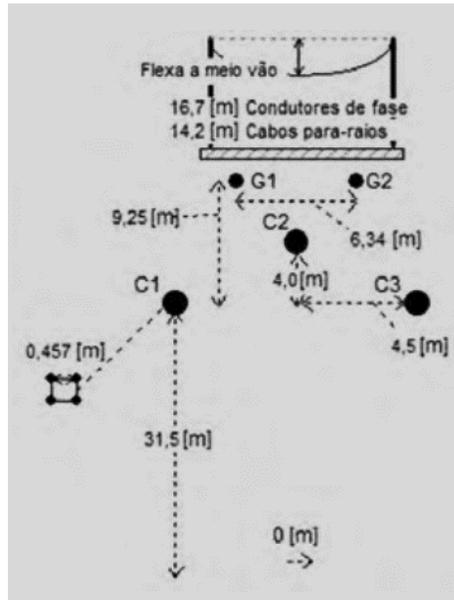
IT-306 GG Tópicos em Sistemas de Energia Elétrica III  
Nelson Carreño Acosta

Interligações Norte-Sul I, Norte-Sul II e parte da Interligação Nordeste-Sudeste, entre Serra da Mesa e Bom Jesus da Lapa, totalizando um comprimento de 2600 km.

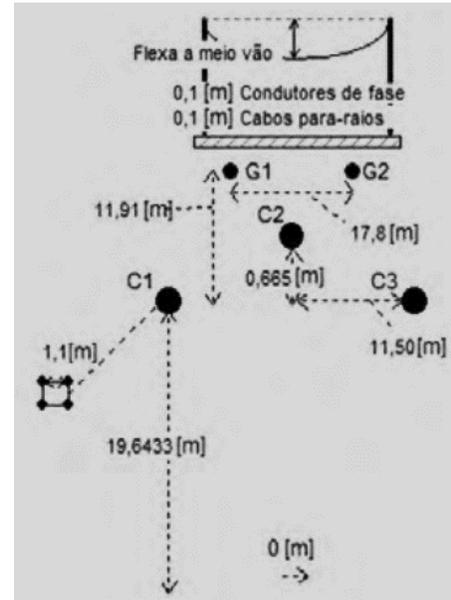


## Características das linhas que formam o Elo CA

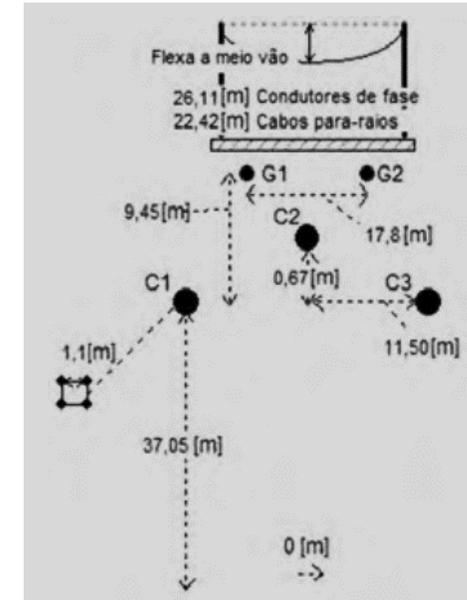
### Norte-Sul I



### Norte-Sul II



### Nordeste-Sudeste

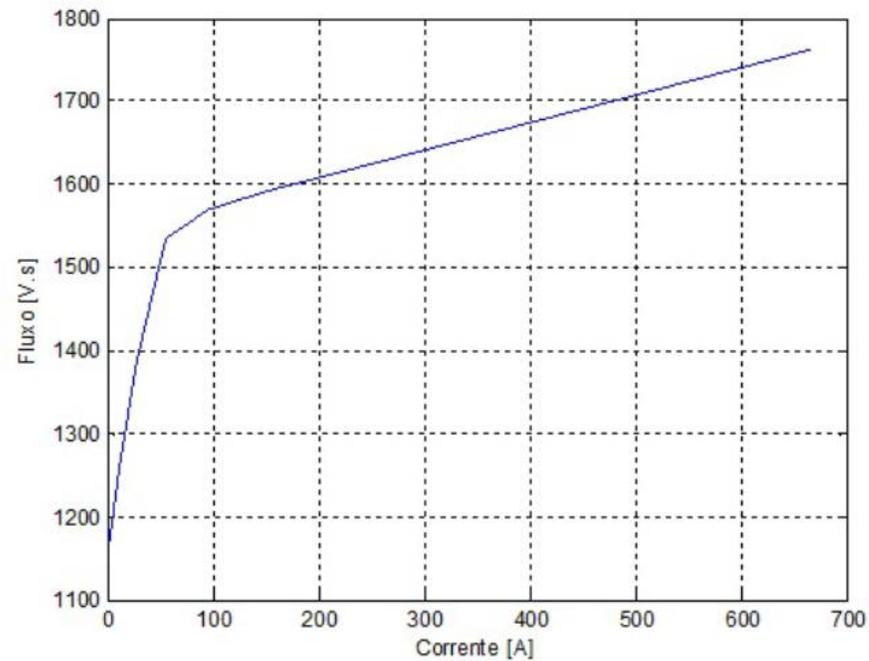


Condutor	Resistência Unitária [ $\Omega/\text{km}$ ]	Rext [m]	Rint [m]	$\mu_r$
RAIL	0,0614	0,014795	0,0037	1
PR-Aço galv EHS	3,51	0,00457	-	1

Condutor	Resistência Unitária [ $\Omega/\text{km}$ ]	Rext [m]	Rint [m]	$\mu_r$
RAIL	0,0614	0,014795	0,0037	1
PR-Aço galv EHS	3,51	0,00457	-	1

## Dados do Transformador

Transformador Elevador de Serra da Mesa I 525 kV (Y) / 15 kV (Δ) – 472,6 MVA	
Reatância de dispersão do primário (525 kV)	31,338 Ω
Reatância de dispersão do secundário (15 kV)	0,0846 Ω
Resistência do enrolamento primário (525 kV)	0,795 Ω
Resistência do enrolamento secundário (15 kV)	0,003 Ω

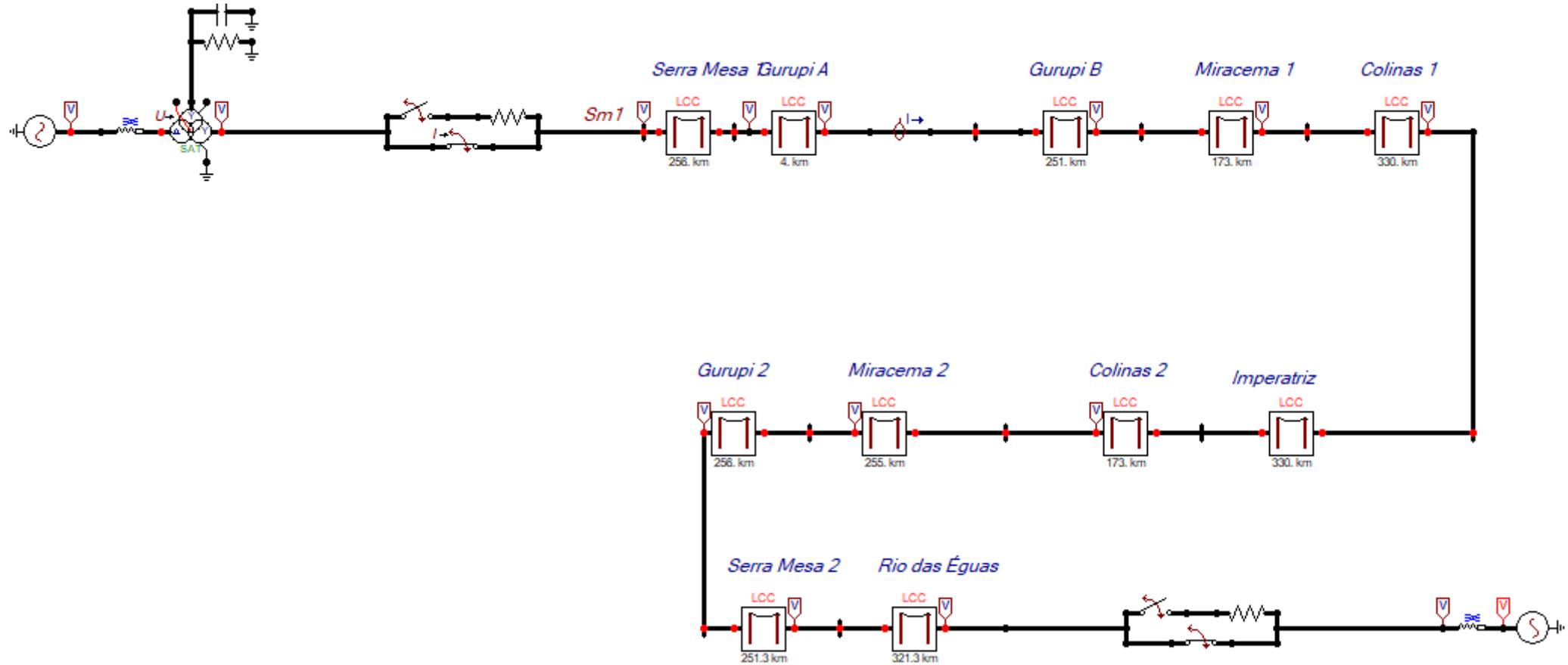


## Dados do Para-raios

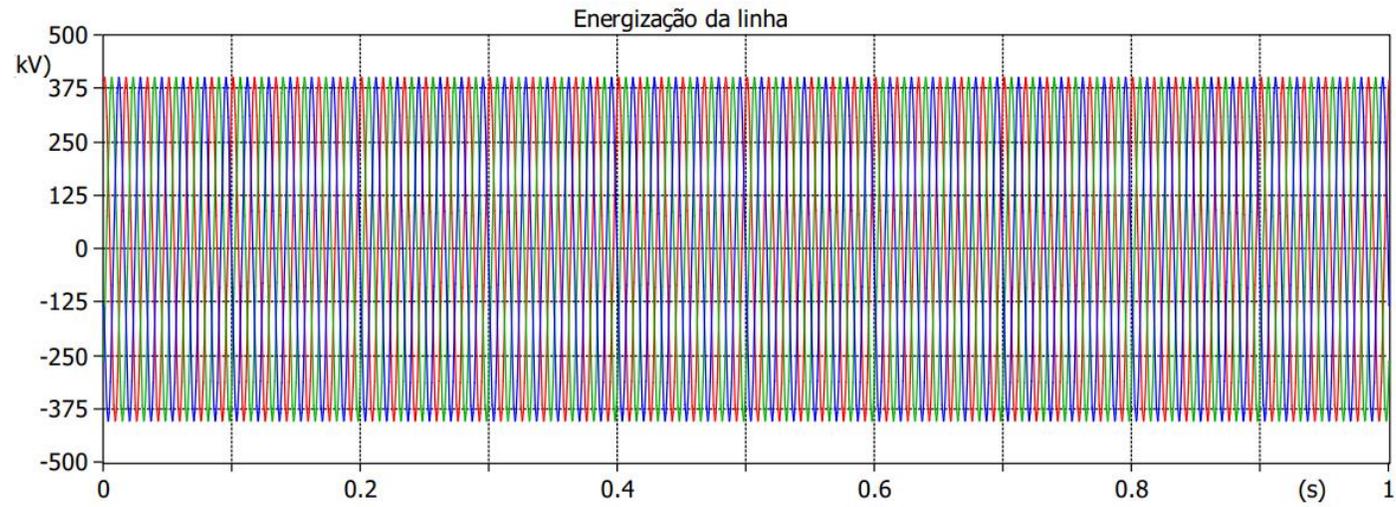
Tabela 1	
420 KV Class 5	
I[A]	V[pu]
0,001	1,16
250	1,19
500	1,22
1000	1,25
2000	1,30
3000	1,34

Surge Arrester

# Energização da linha

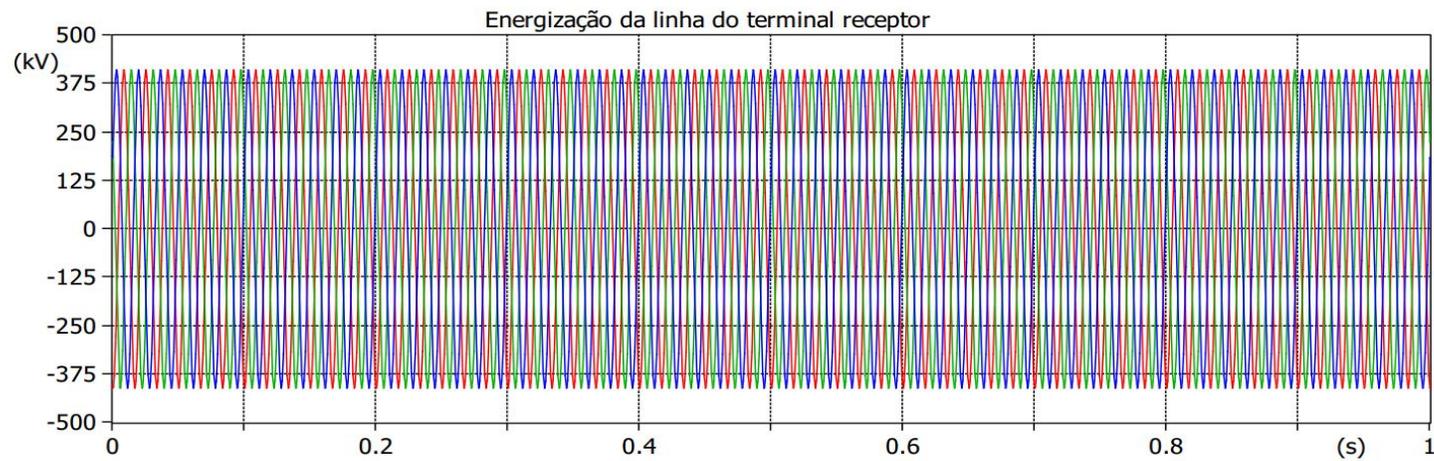


Tensão no  
Terminal  
Emissor  
Serra Mesa 1



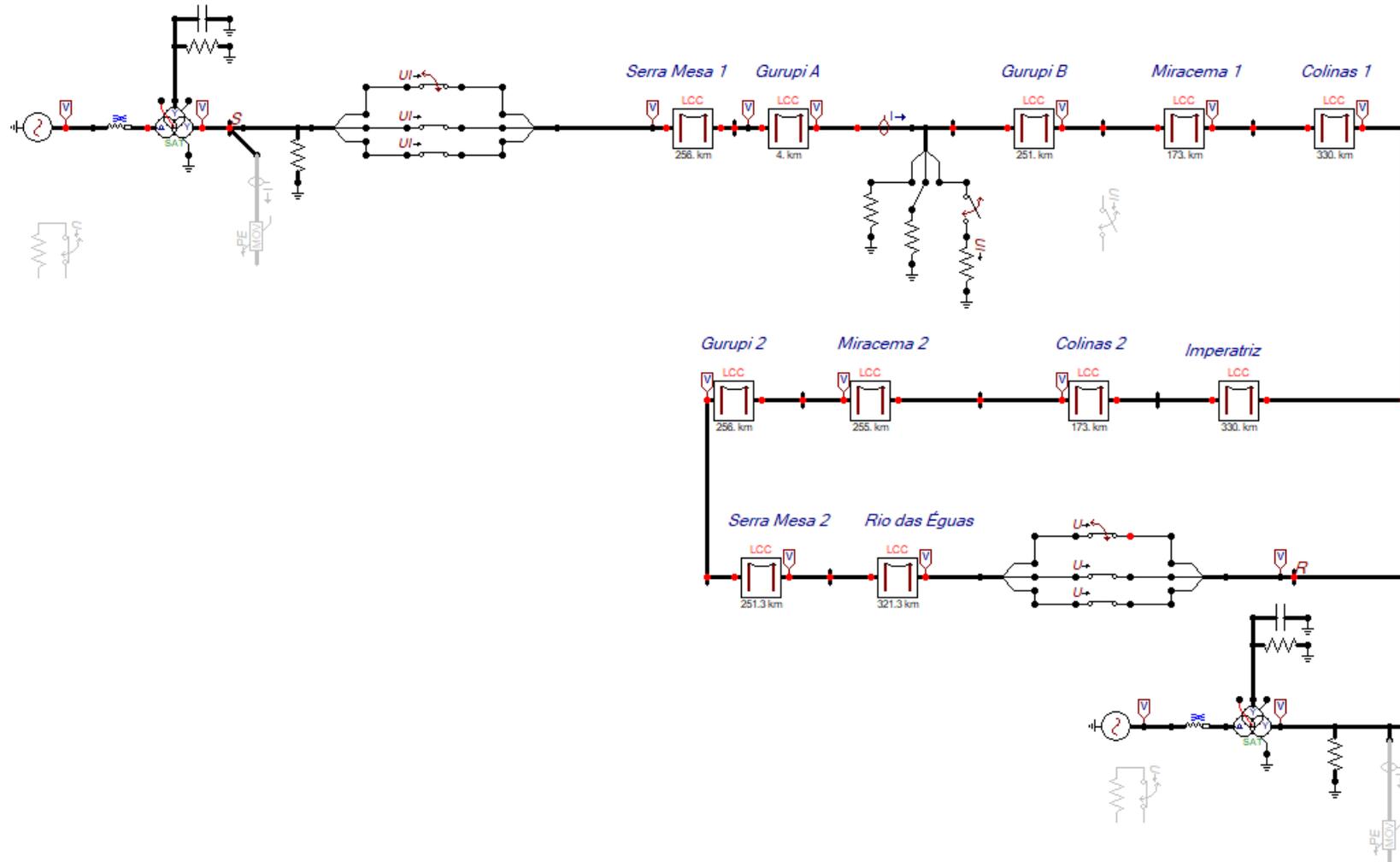
(file MediaOndafaltas20.pl4; x-var t) v:SM1A v:SM1B v:SM1C

Tensão no  
Terminal  
Emissor  
B. Jesus da  
Lapa

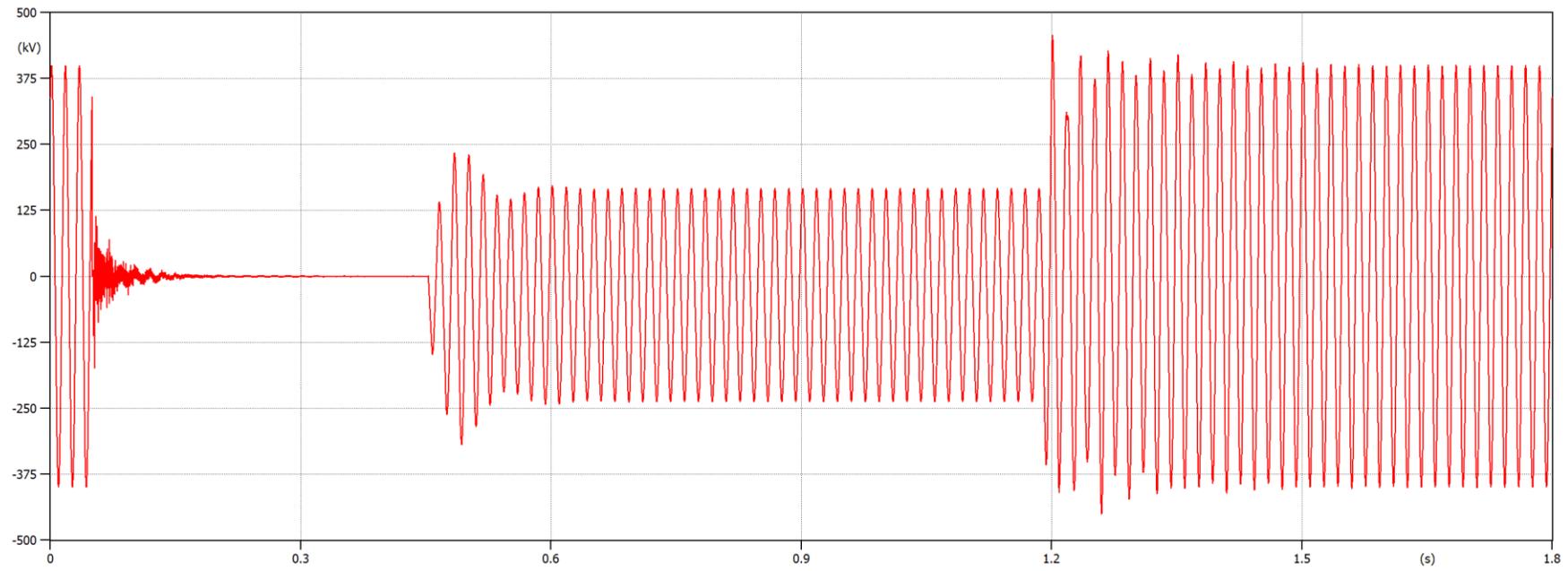


(file MediaOndafaltas20.pl4; x-var t) v:JESUSA v:JESUSB v:JESUSC

## Sobretensões na linha devido a uma falta

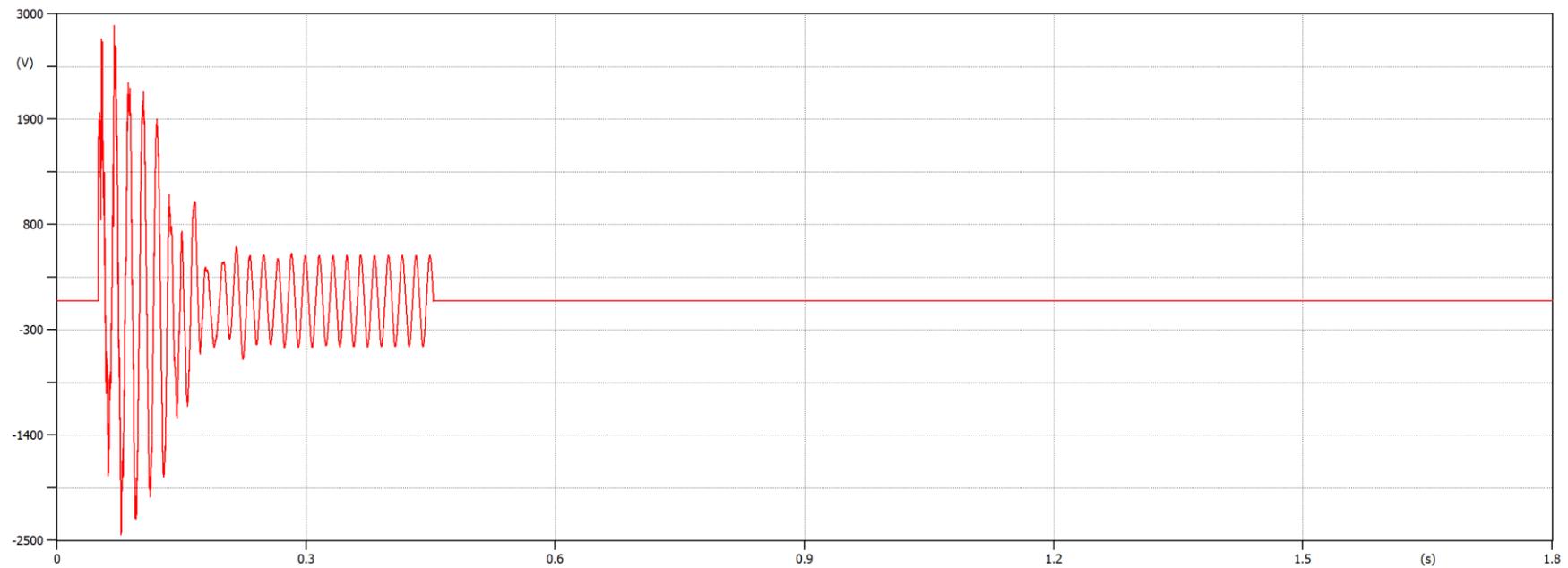


TRT



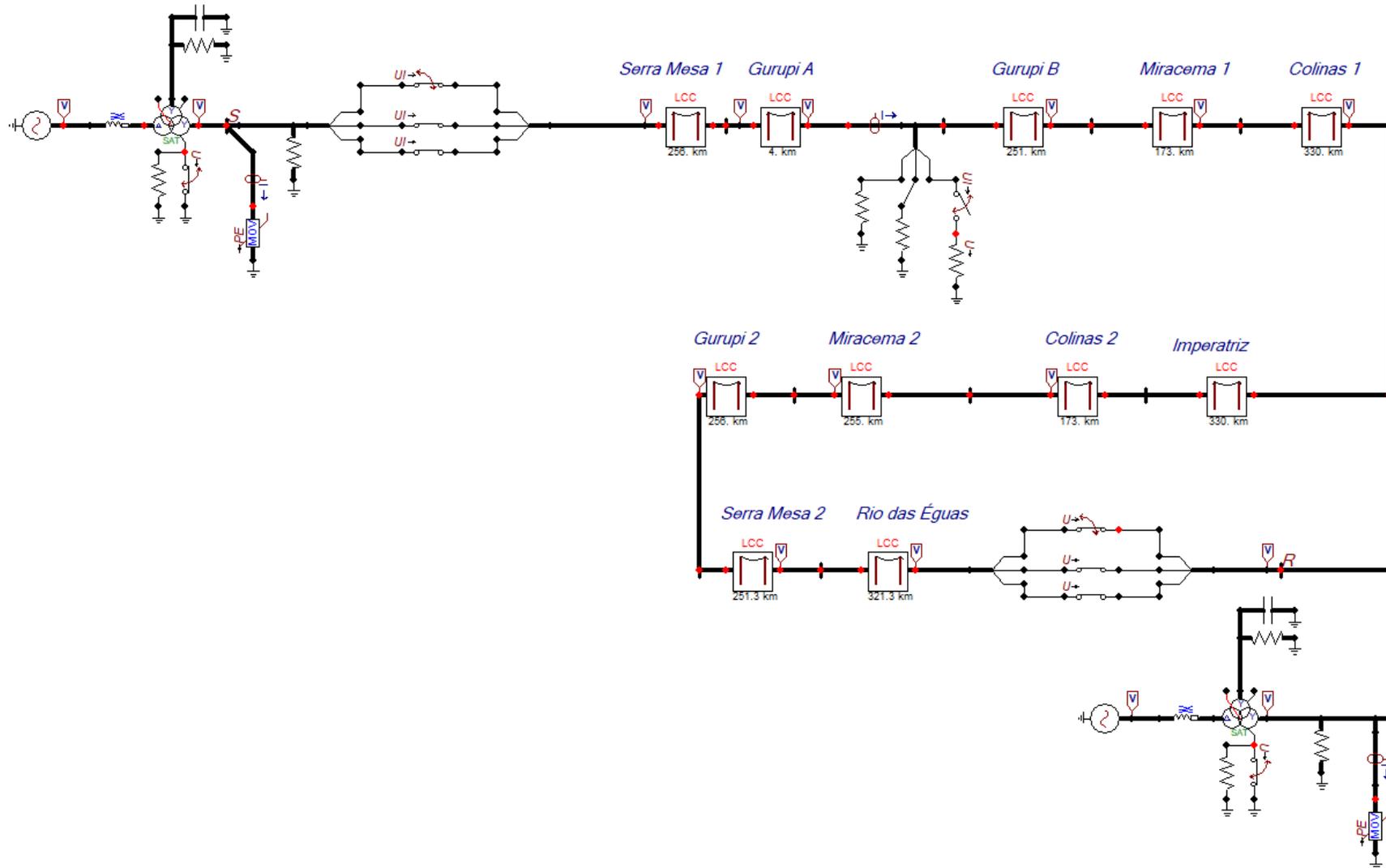
(file MediaOndafaltasMono-260km.pl4; x-var t) v:GURAA

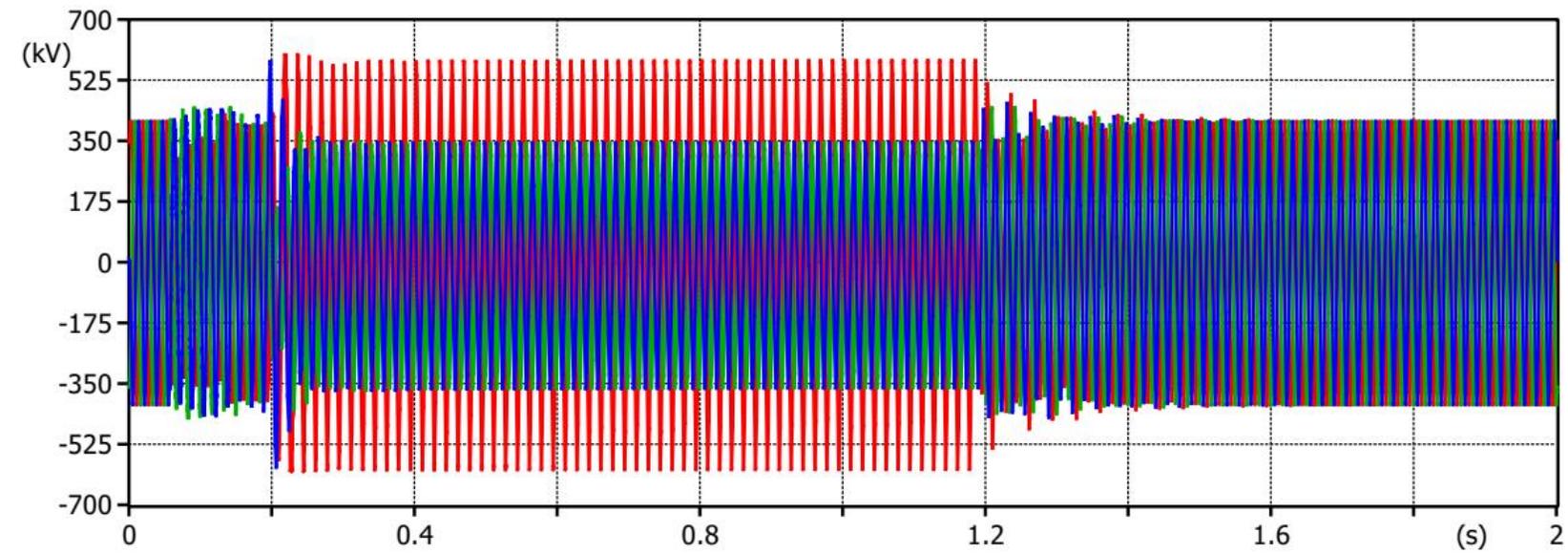
Arco Secundário



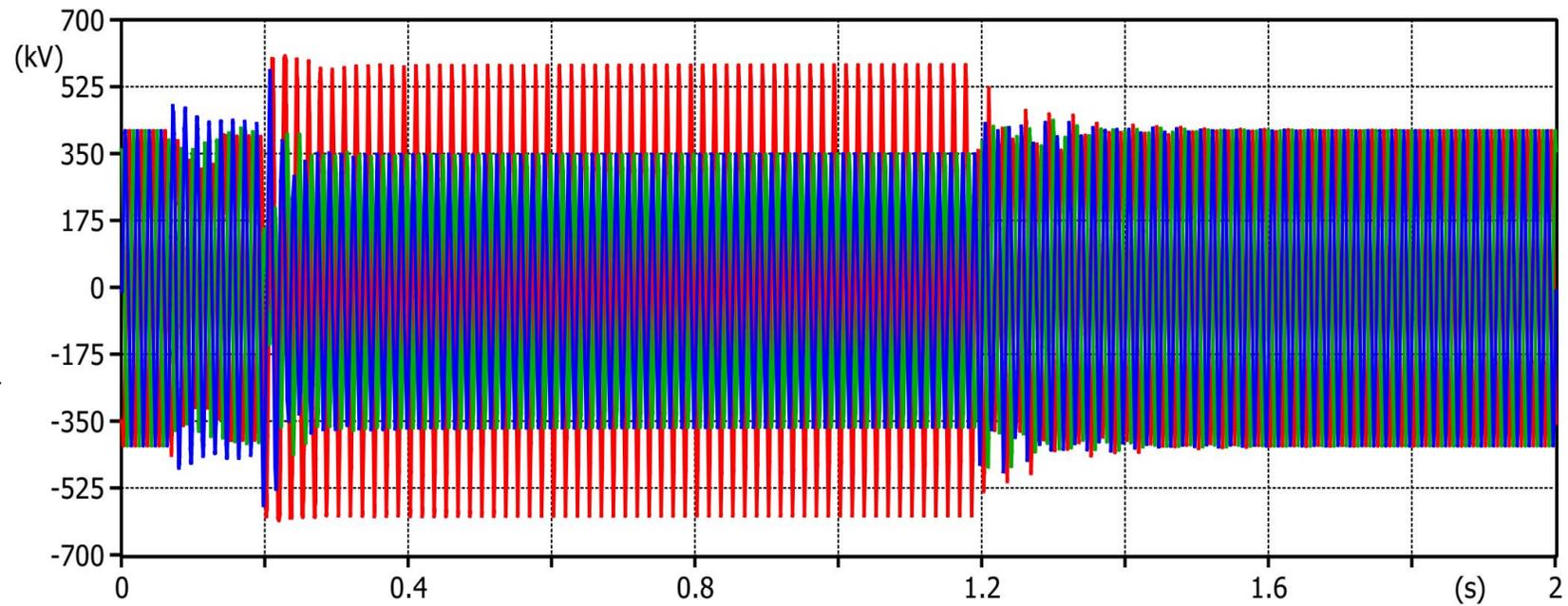
(file MediaOndafaltasMono-260km.pl4; x-var t) v:XX0007-

# Falta Monopolar a 260 km do Receptor com Religamento Monopolar



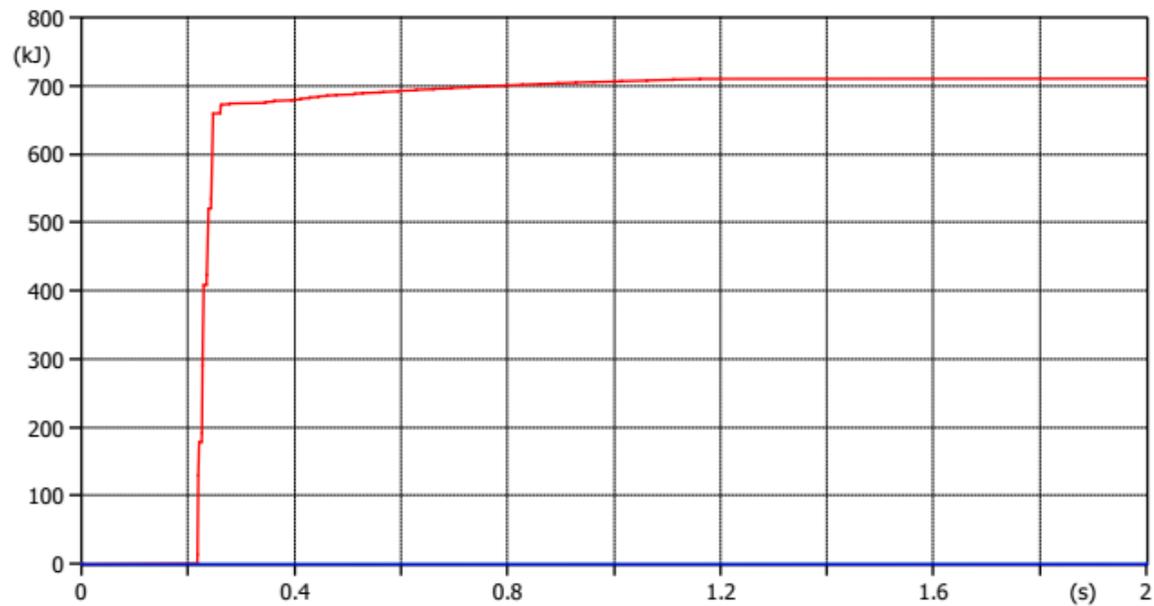


(file MediaOndafaltasMono-260km.pl4; x-var t) v:SA v:SB v:SC



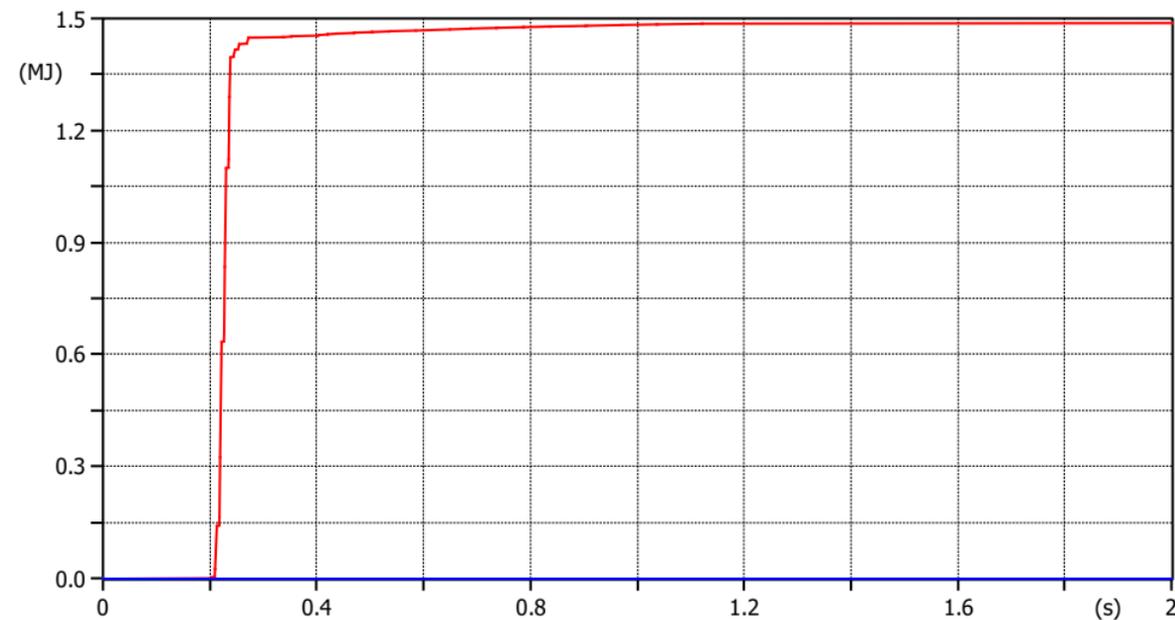
(file MediaOndafaltasMono-260km.pl4; x-var t) v:RA v:RB v:RC

### Energia dissipada Para-raios 1



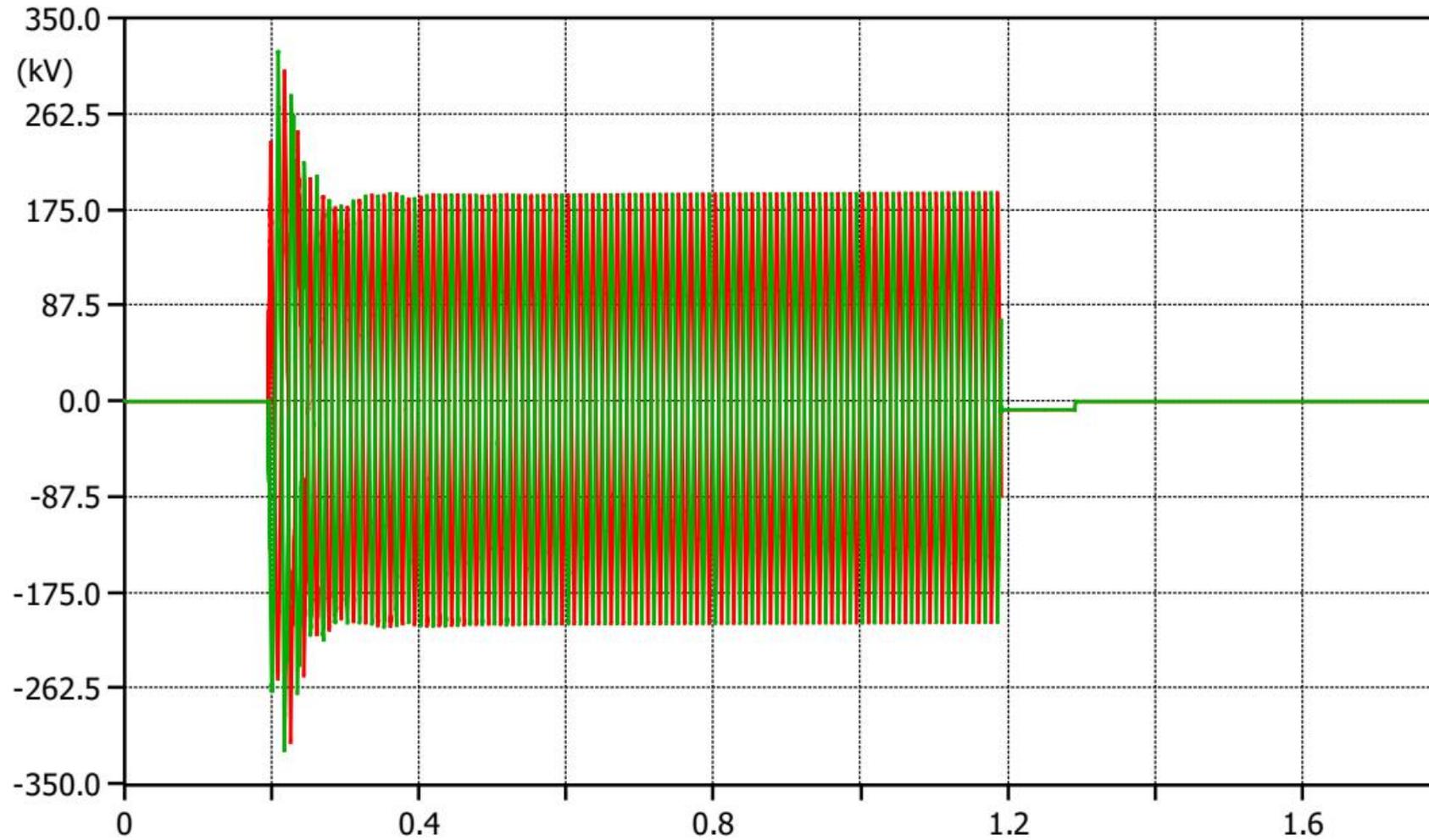
(file MediaOndafaltasMono-260km.pl4; x-var t) e:SP1A - e:SP1B - e:SP1C -

### Energia dissipada Para-raios 2



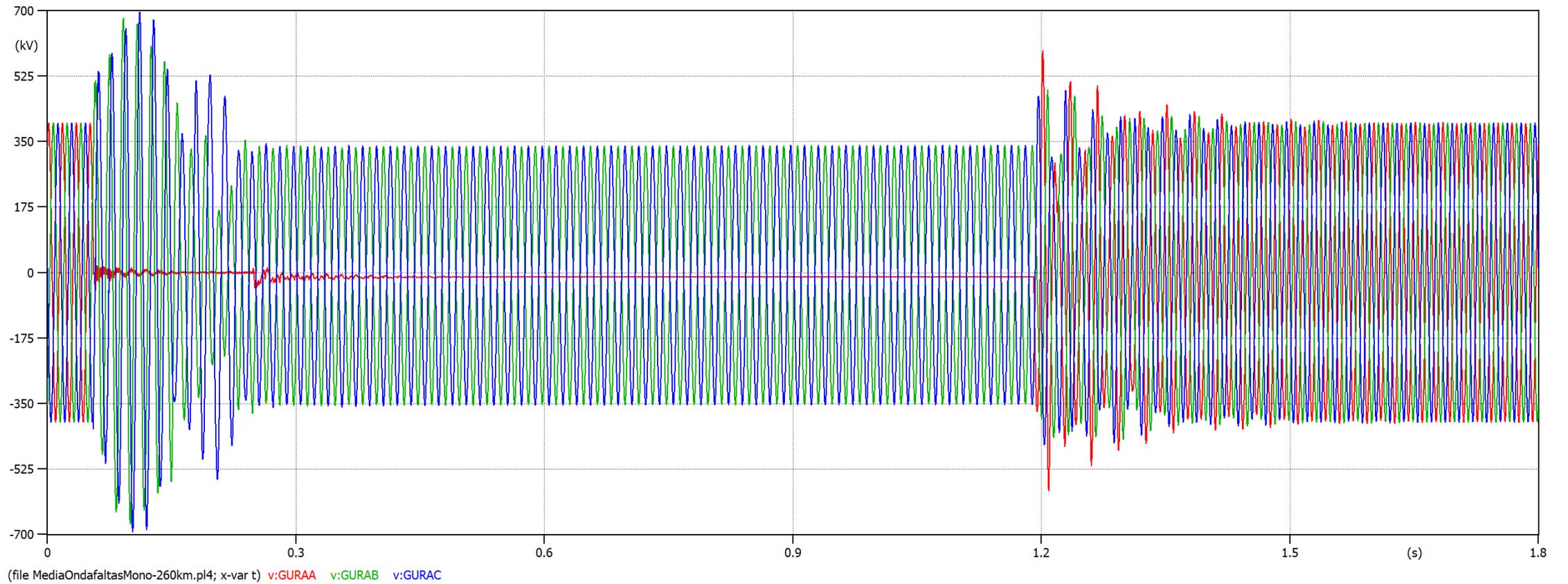
(file MediaOndafaltasMono-260km.pl4; x-var t) e:RP2A - e:RP2B - e:RP2C -

# Tensão no Neutral Breaker

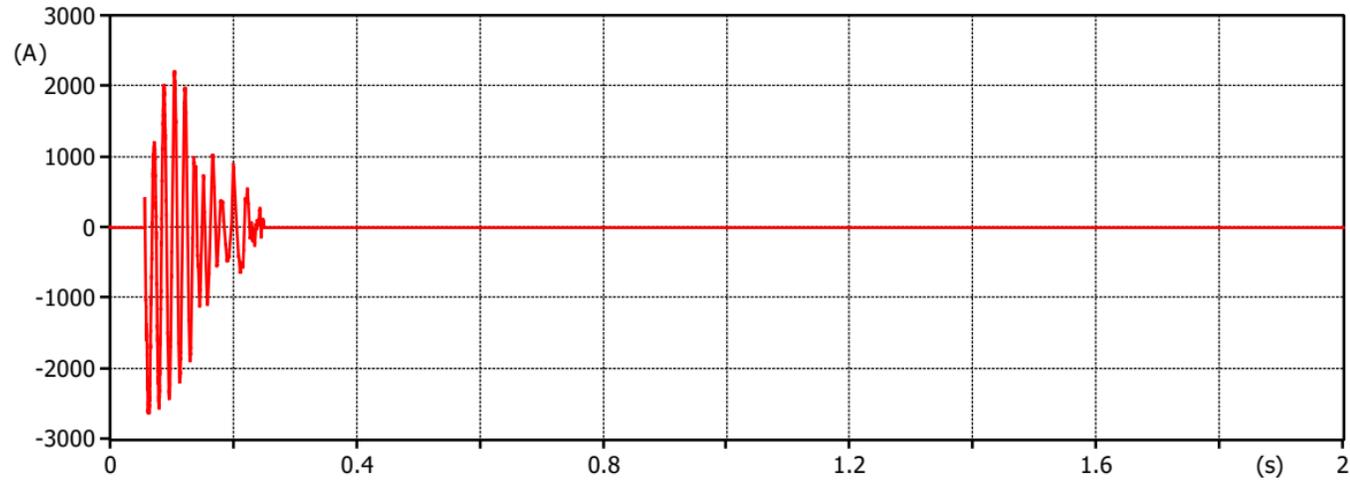


(file MediaOndafaltasMono-260km.pl4; x-var t) v:NBS - v:NBR -

# Tensão na ponto de falta a 260 km

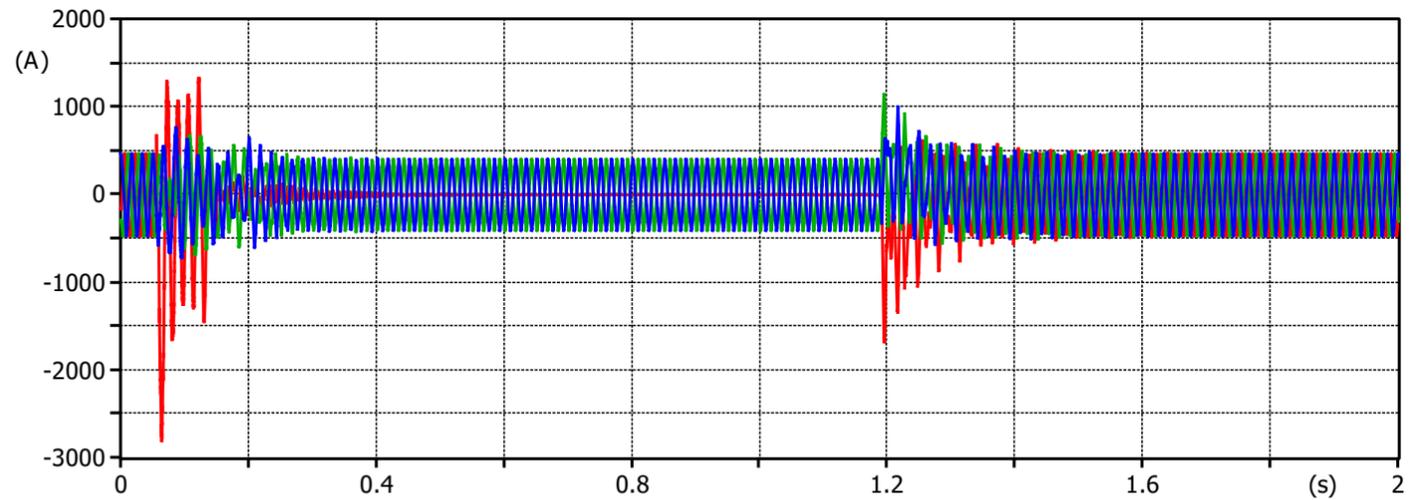


Corrente de falta mitigada a 50 Amperes



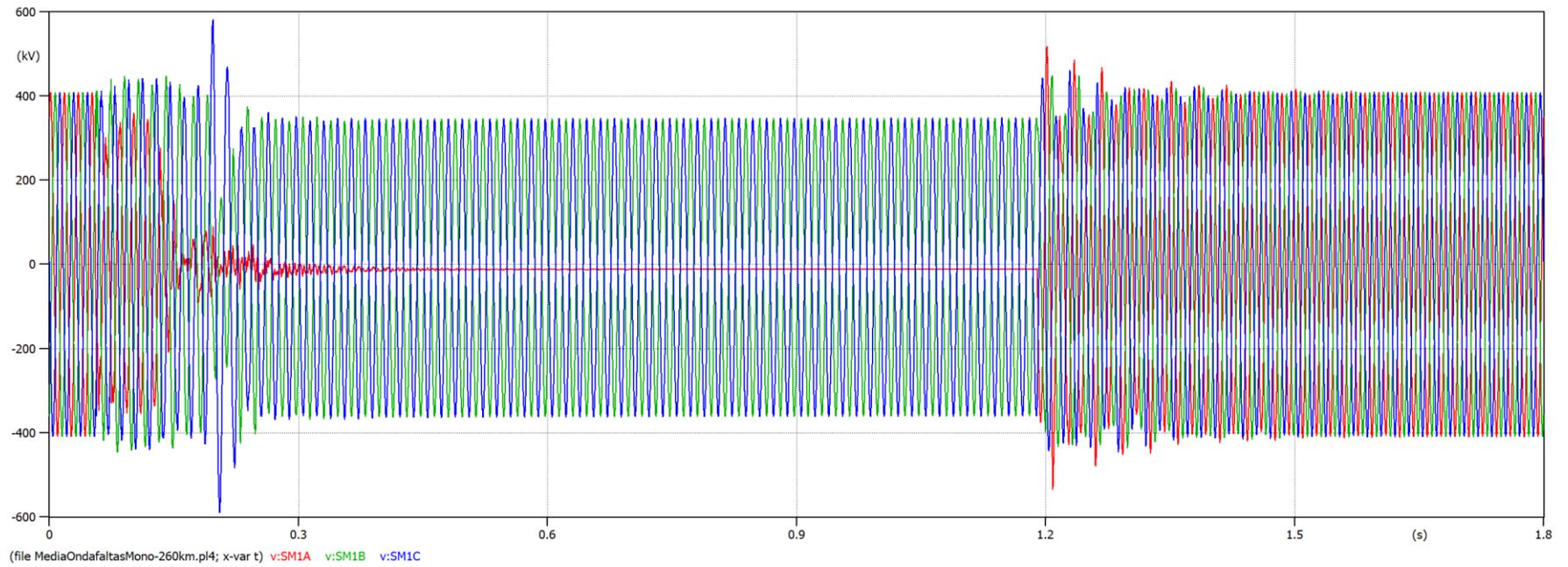
(file MediaOndafaltasMono-260km.pl4; x-var t) c:GURBA -CF

Corrente na linha durante lá falta

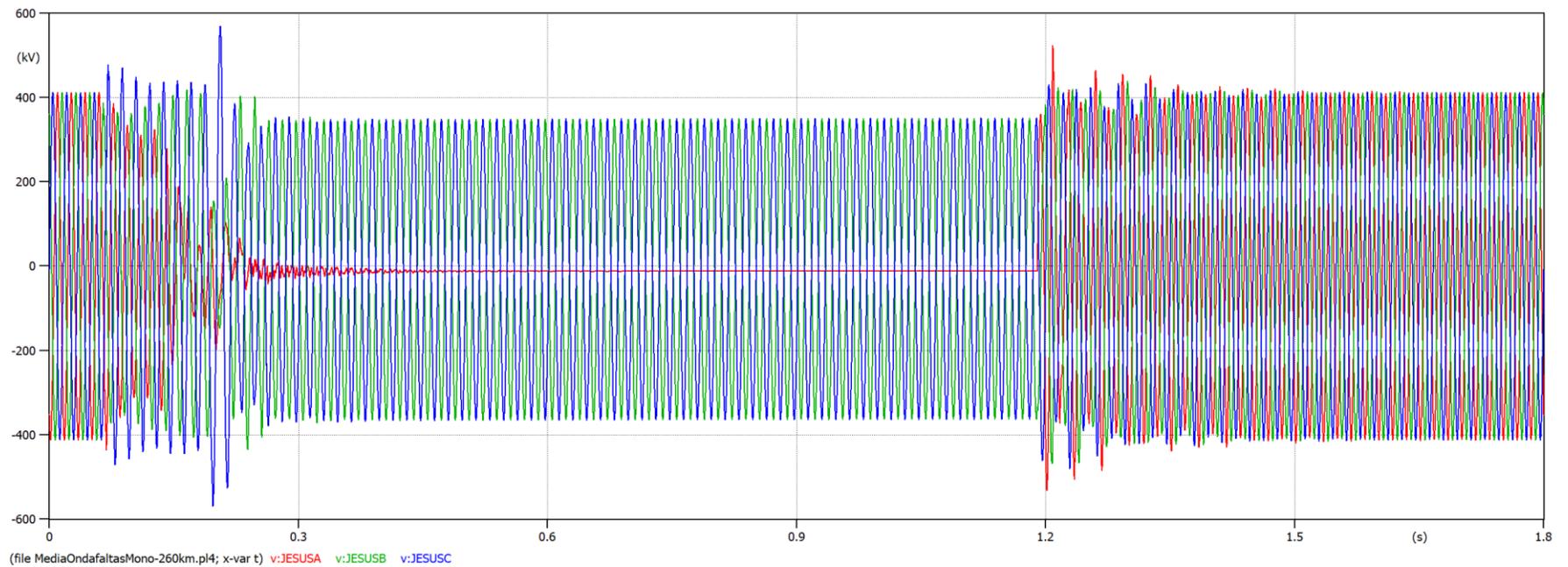


(file MediaOndafaltasMono-260km.pl4; x-var t) c:MC1A -GURBA c:MC1B -GURBB c:MC1C -GURBC

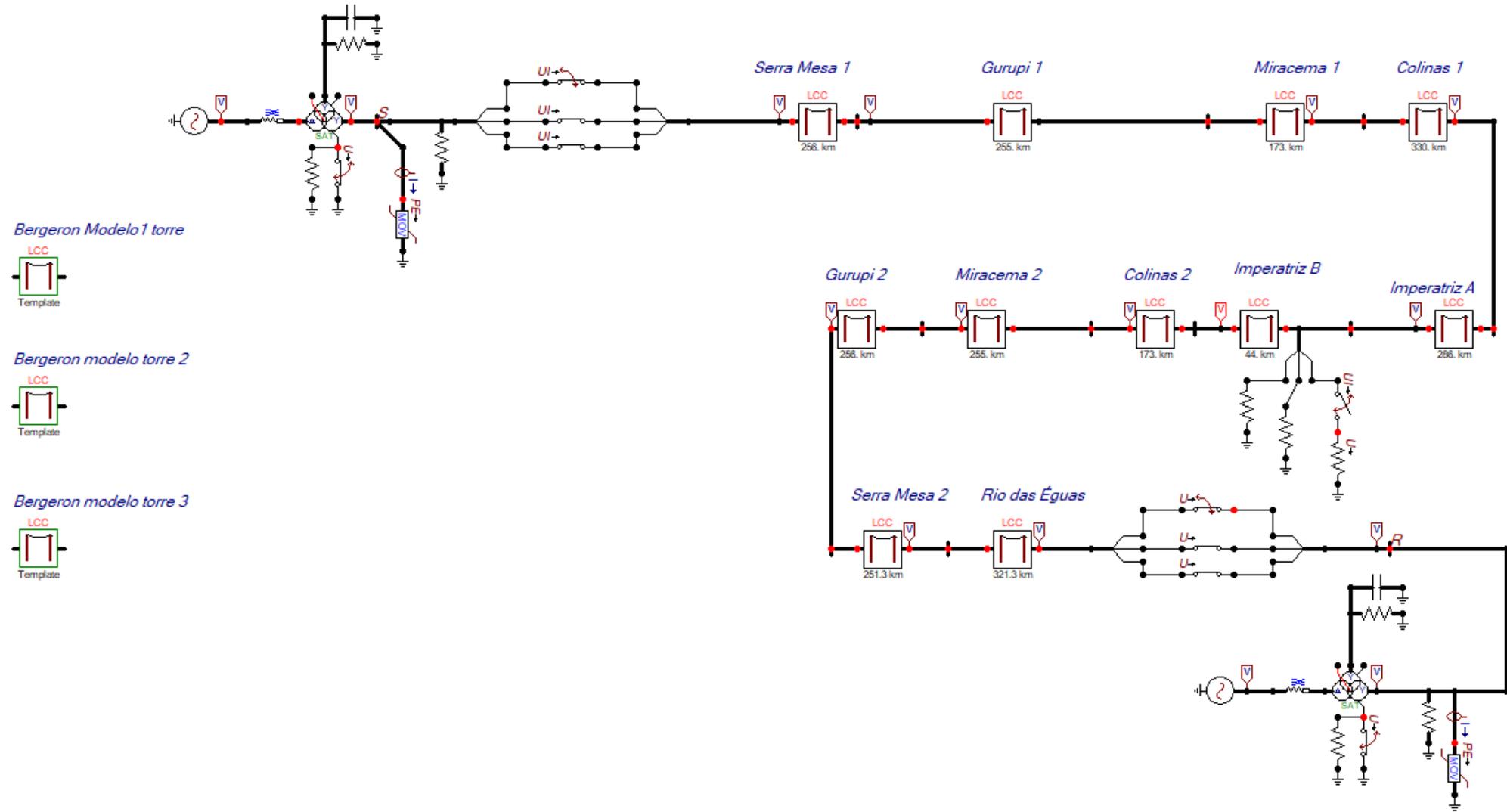
Tensão no Serra Mesa 1

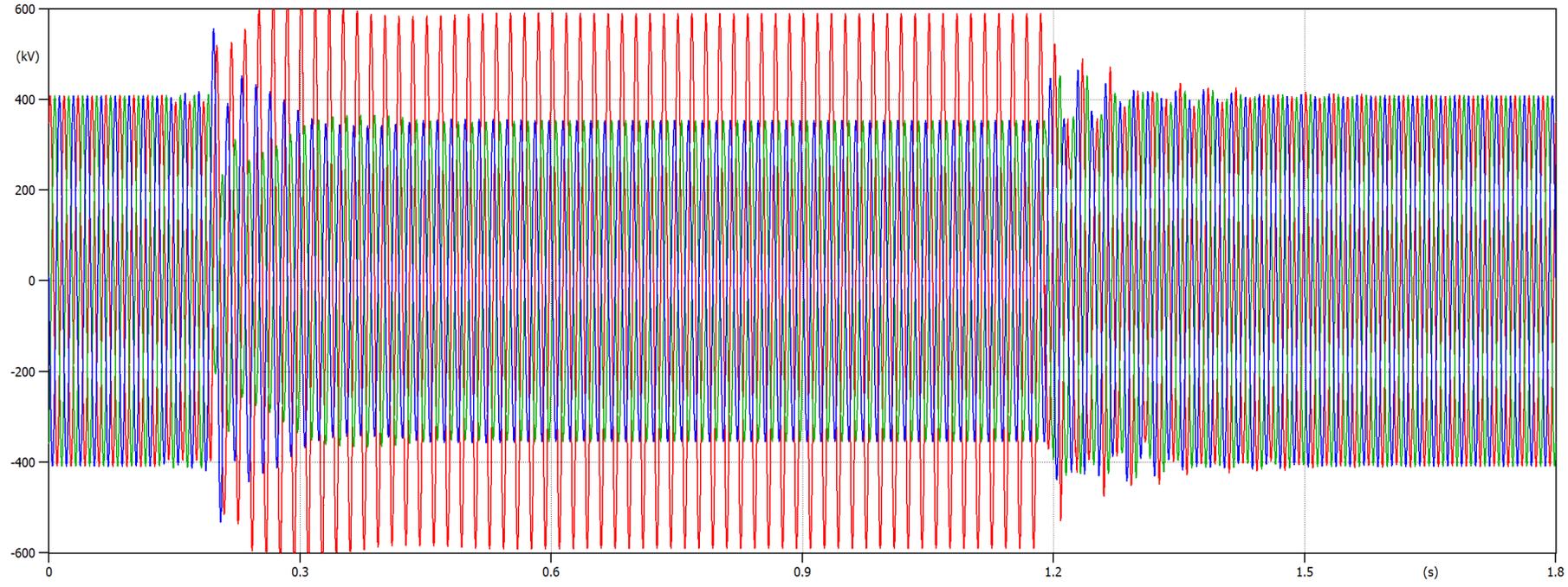


Tensão no B. Jesus da Lapa

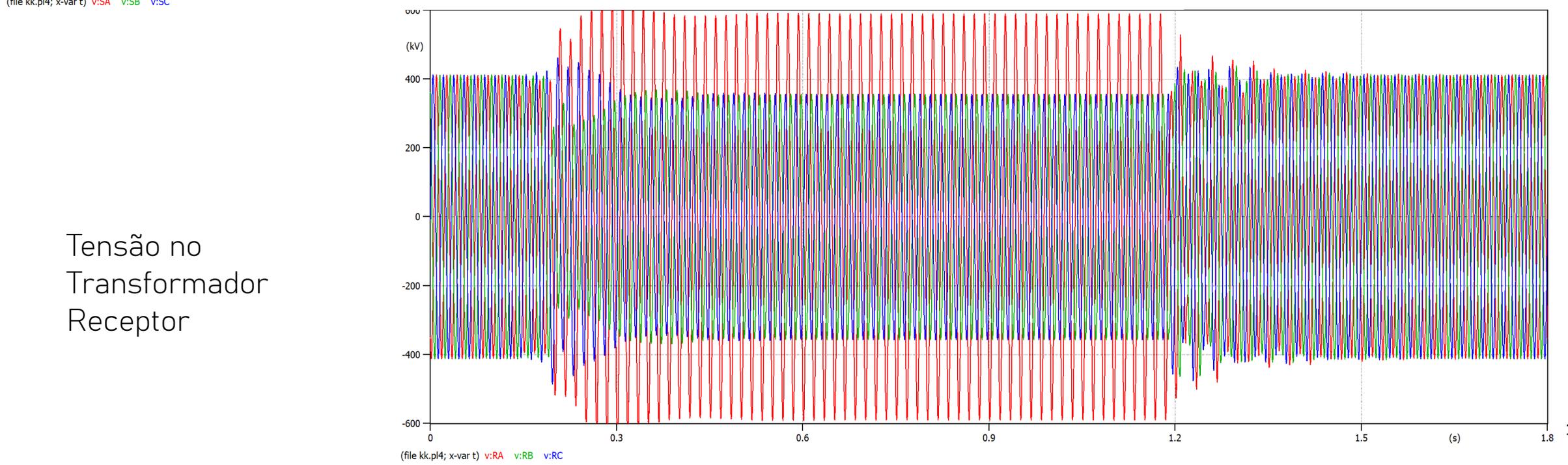


# Falta Monopolar a 1300 km do Receptor com Religamento Monopolar



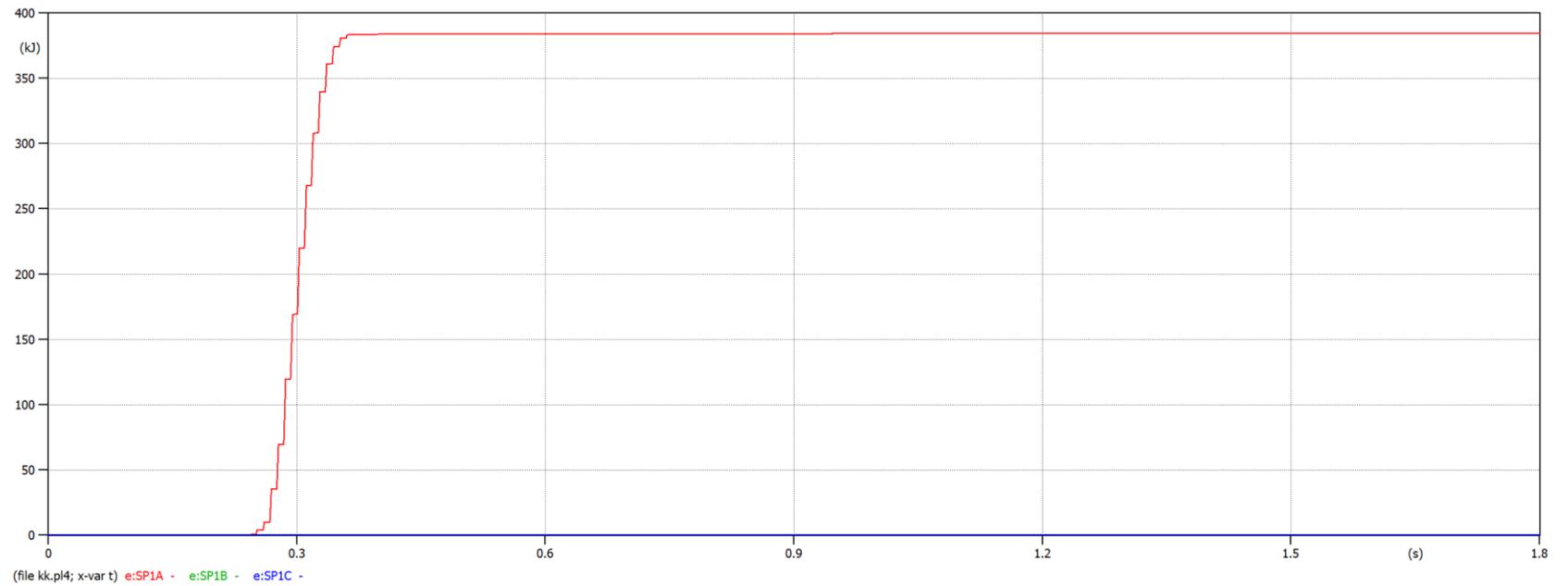


Tensão no Transformador Emissor

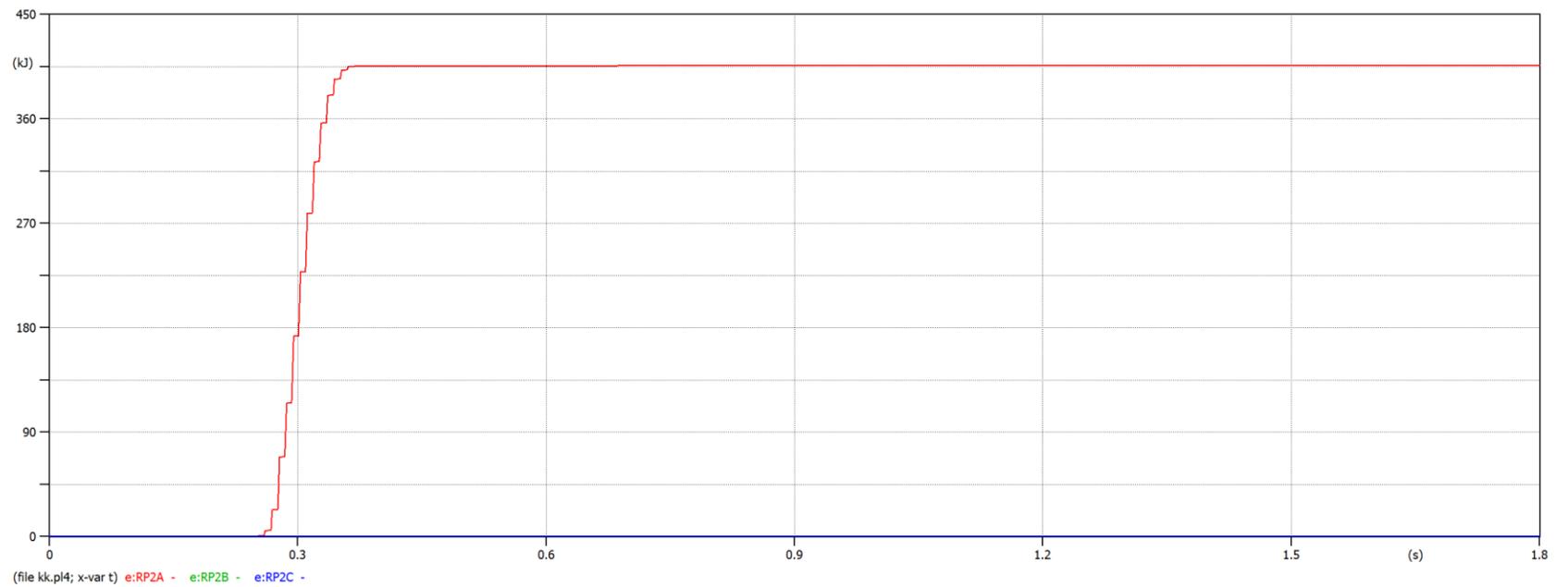


Tensão no Transformador Receptor

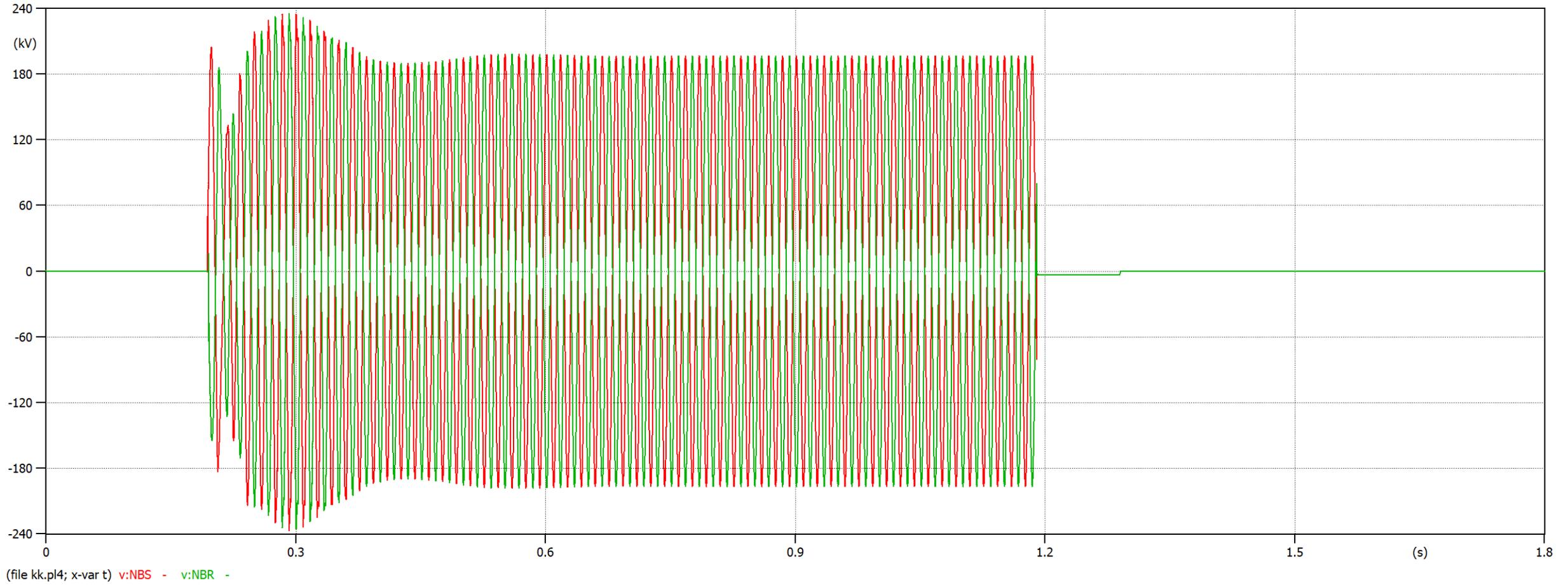
Energia dissipada  
Para-raios 1



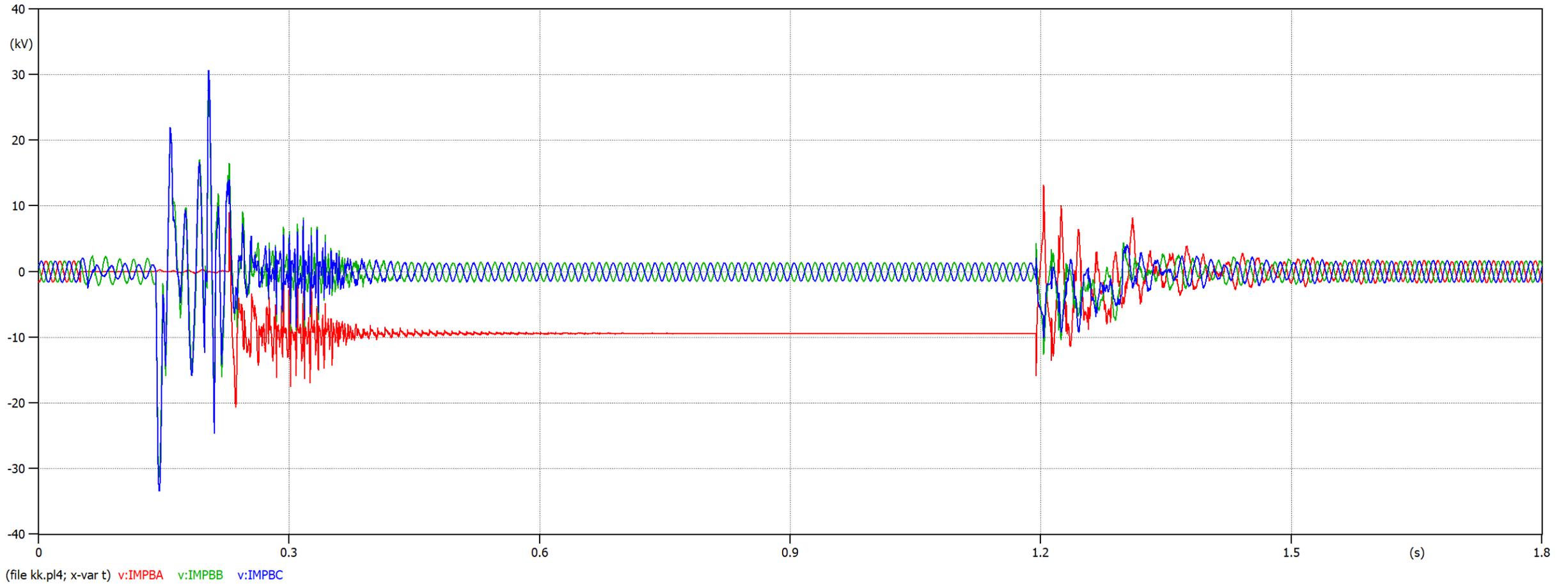
Energia dissipada  
Para-raios 2



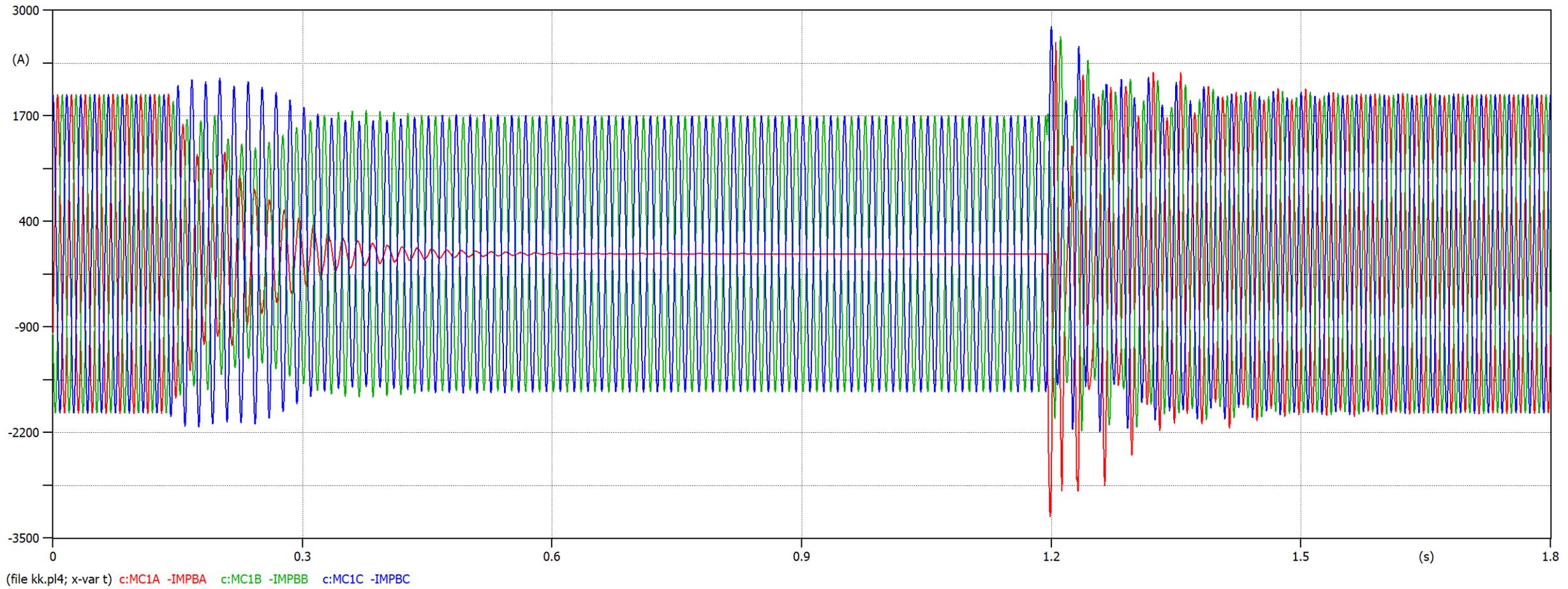
# Tensão no Neutral breaker

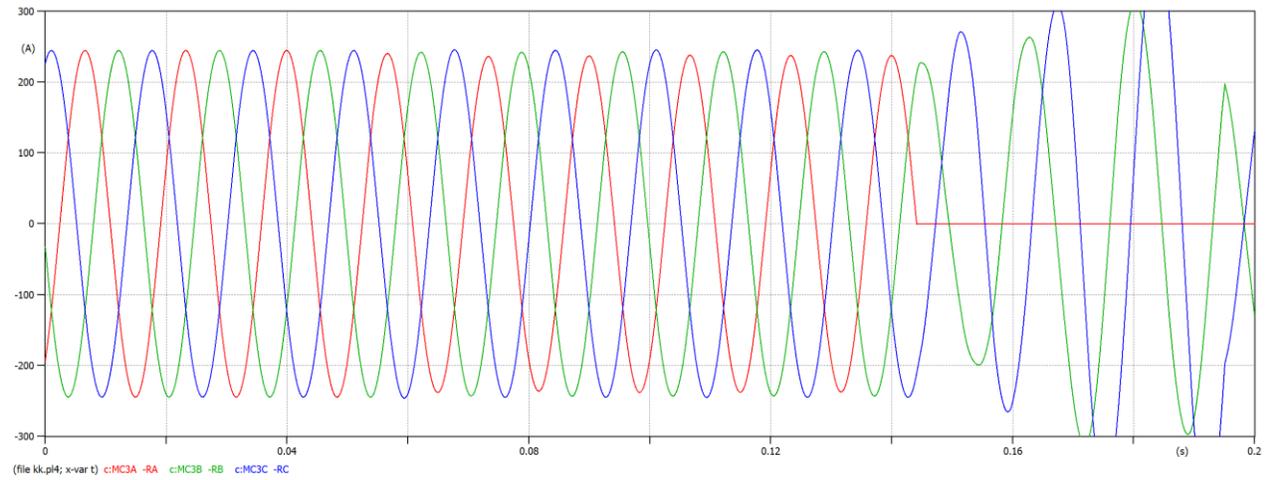
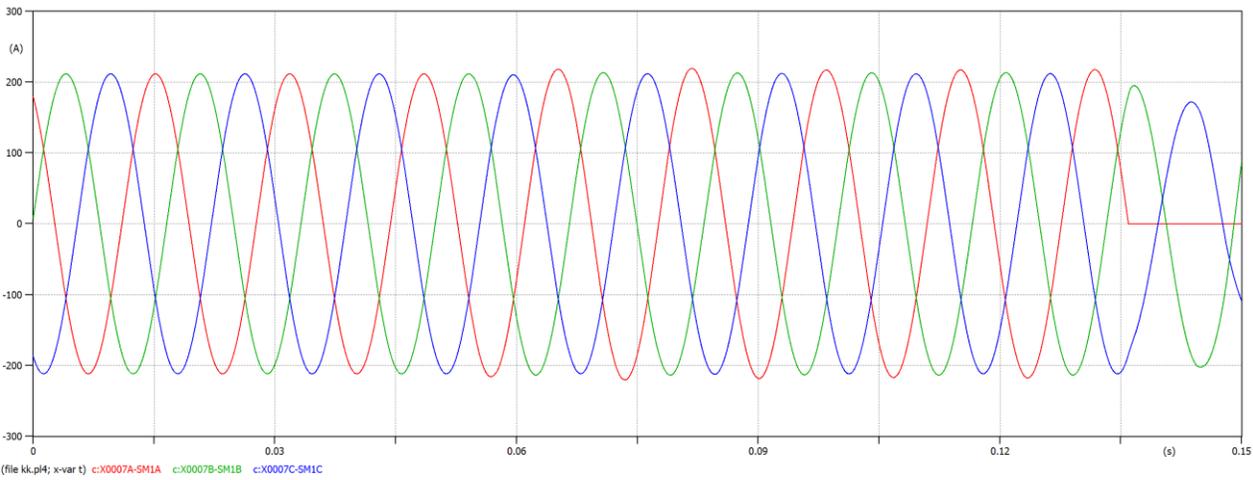
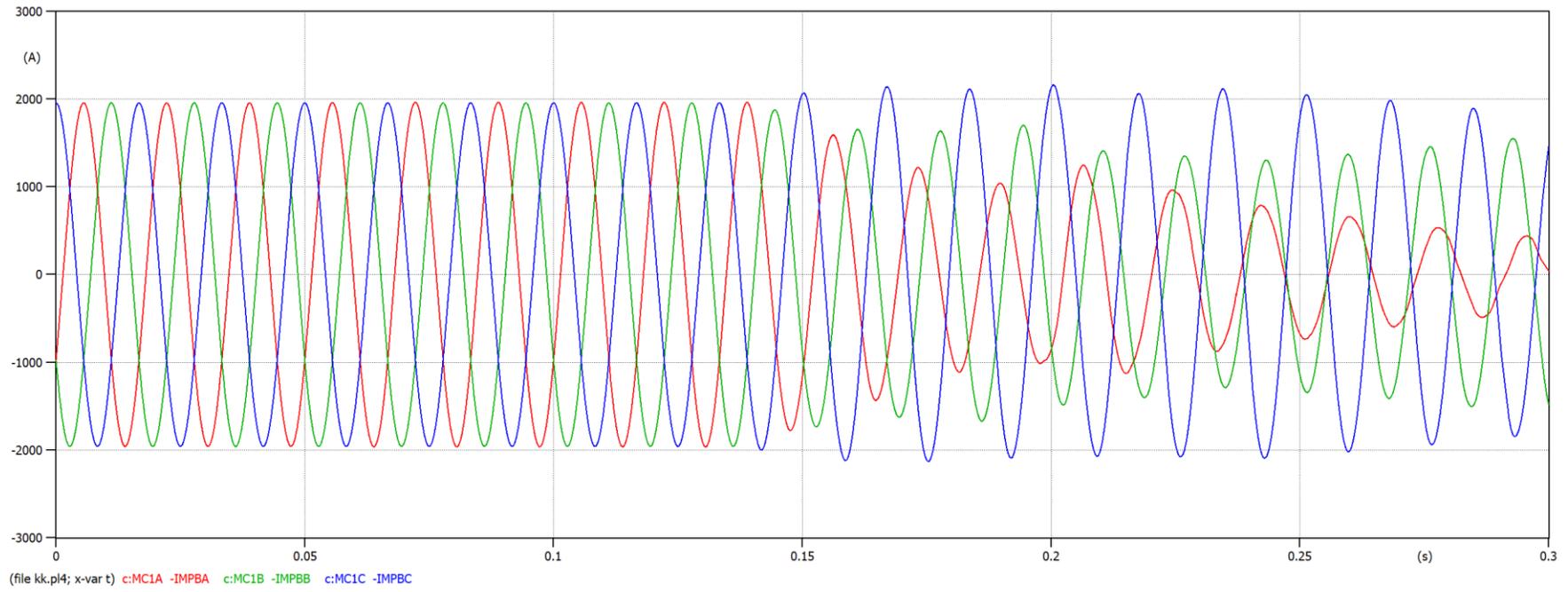


# Tensão vista pela linha

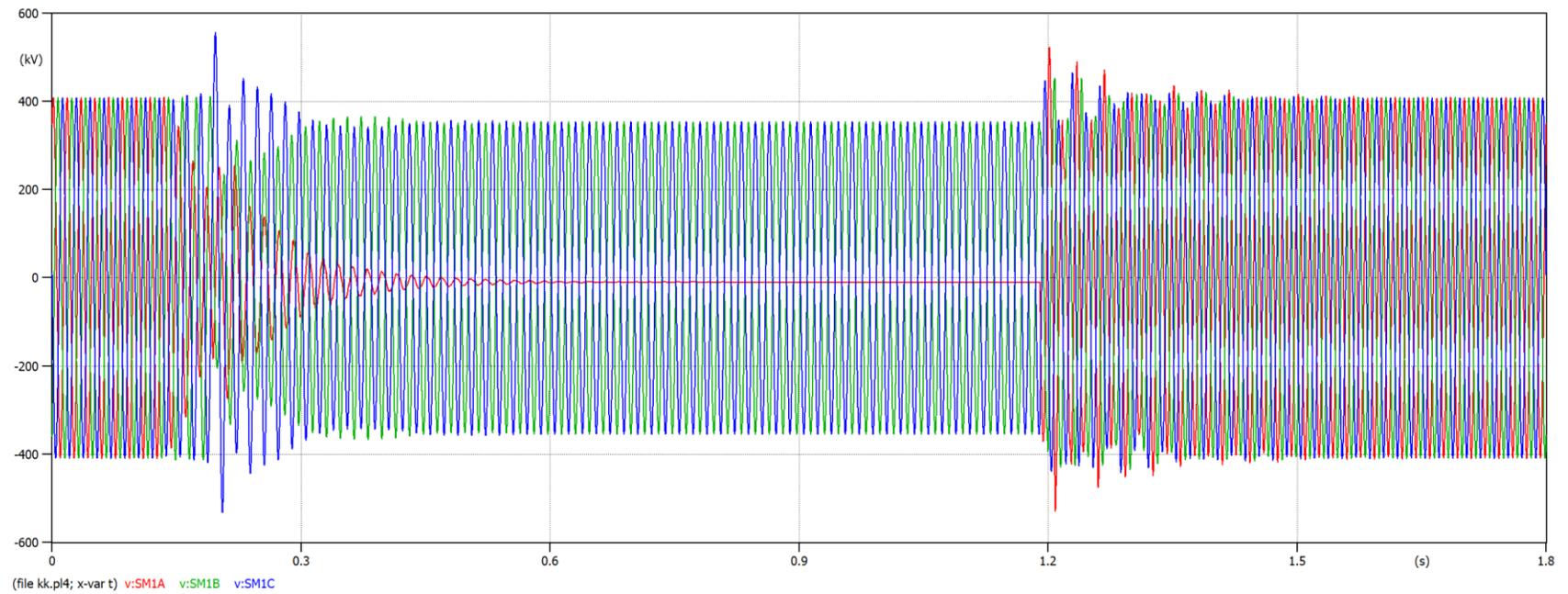


# Corrente vista pela linha

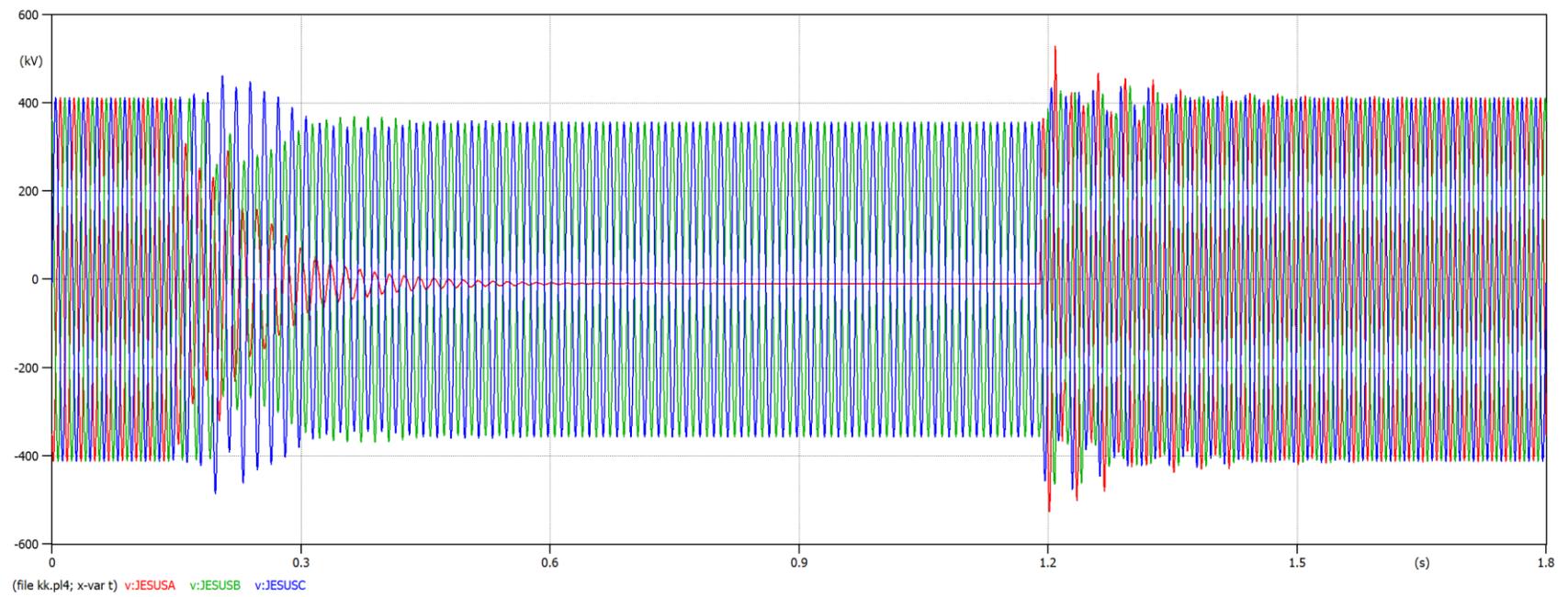




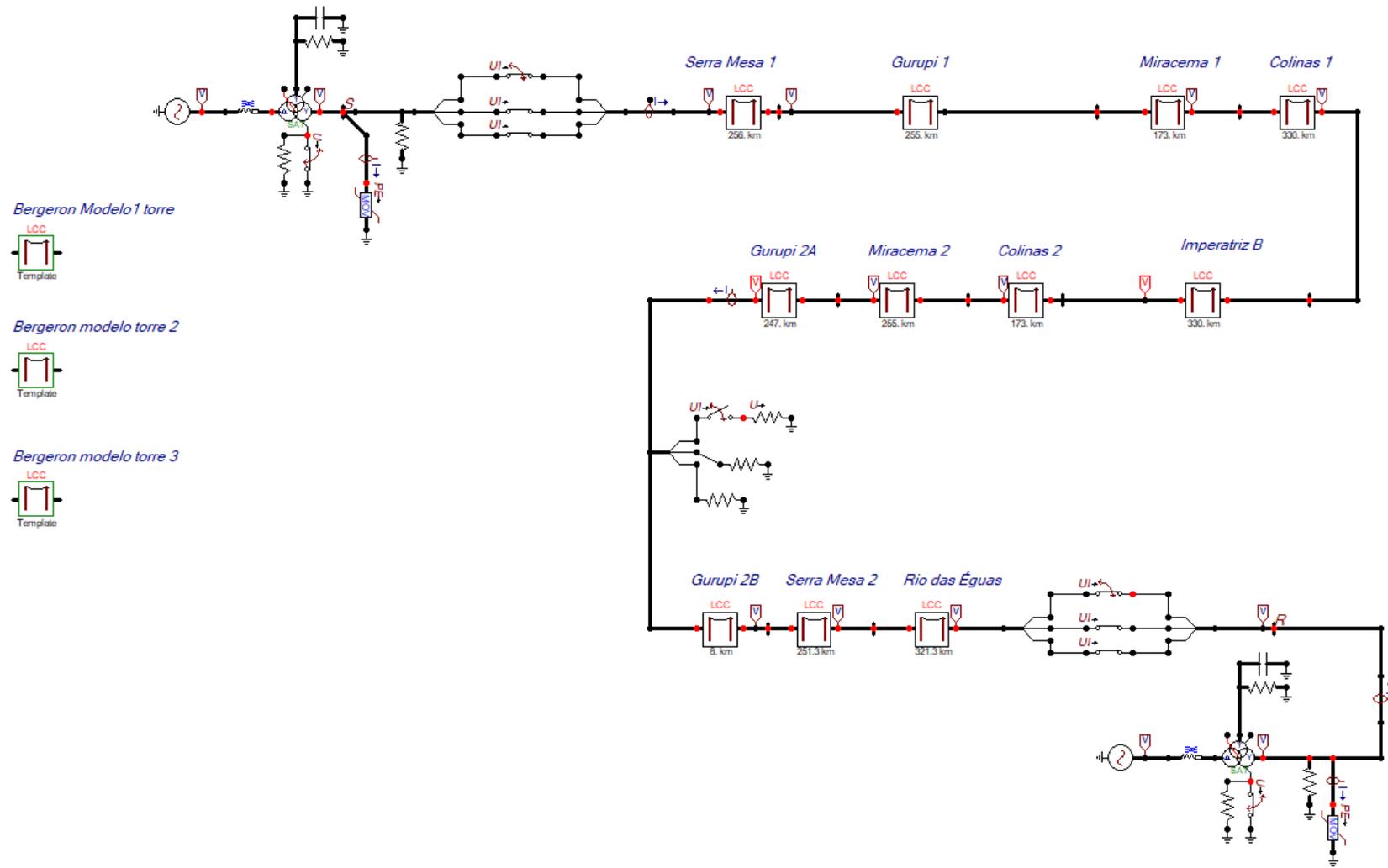
Tensão no  
Terminal  
Emissor  
Serra Mesa 1

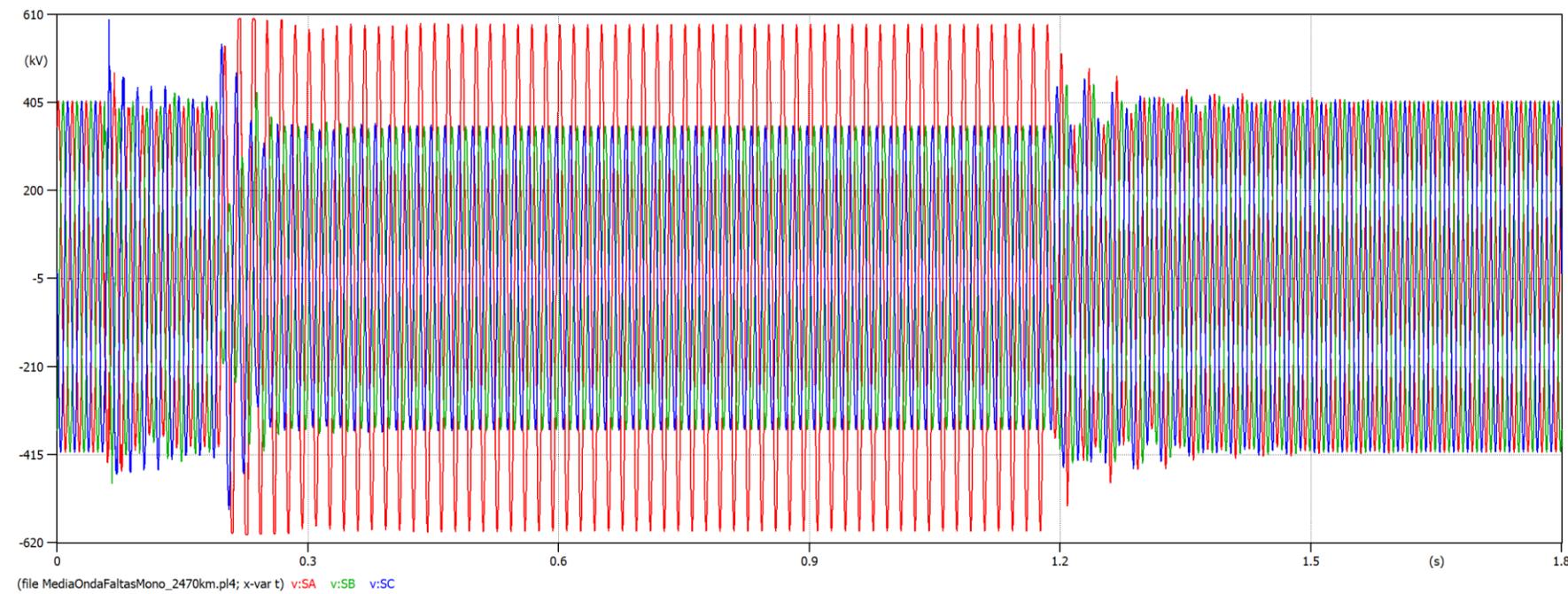


Tensão no  
Terminal  
Emissor  
B. Jesus da  
Lapa

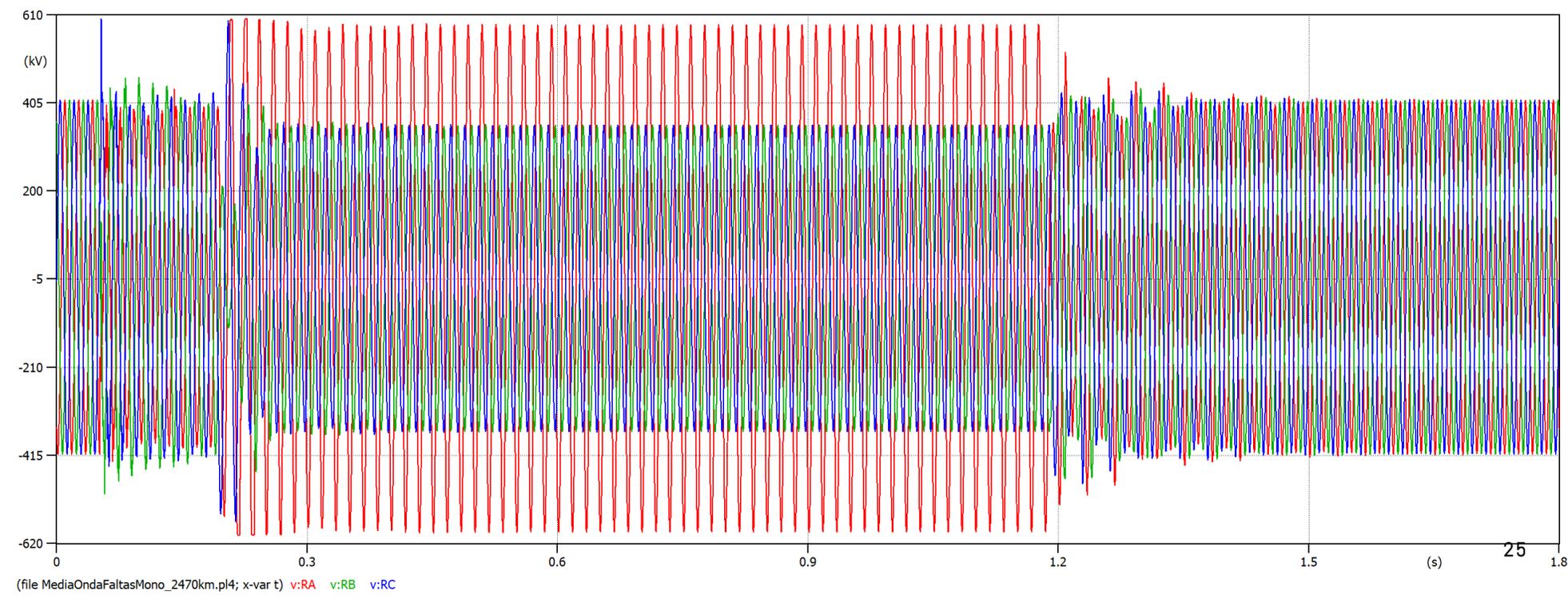


# Falta Monopolar a 2400 km do Receptor com Religamento Monopolar



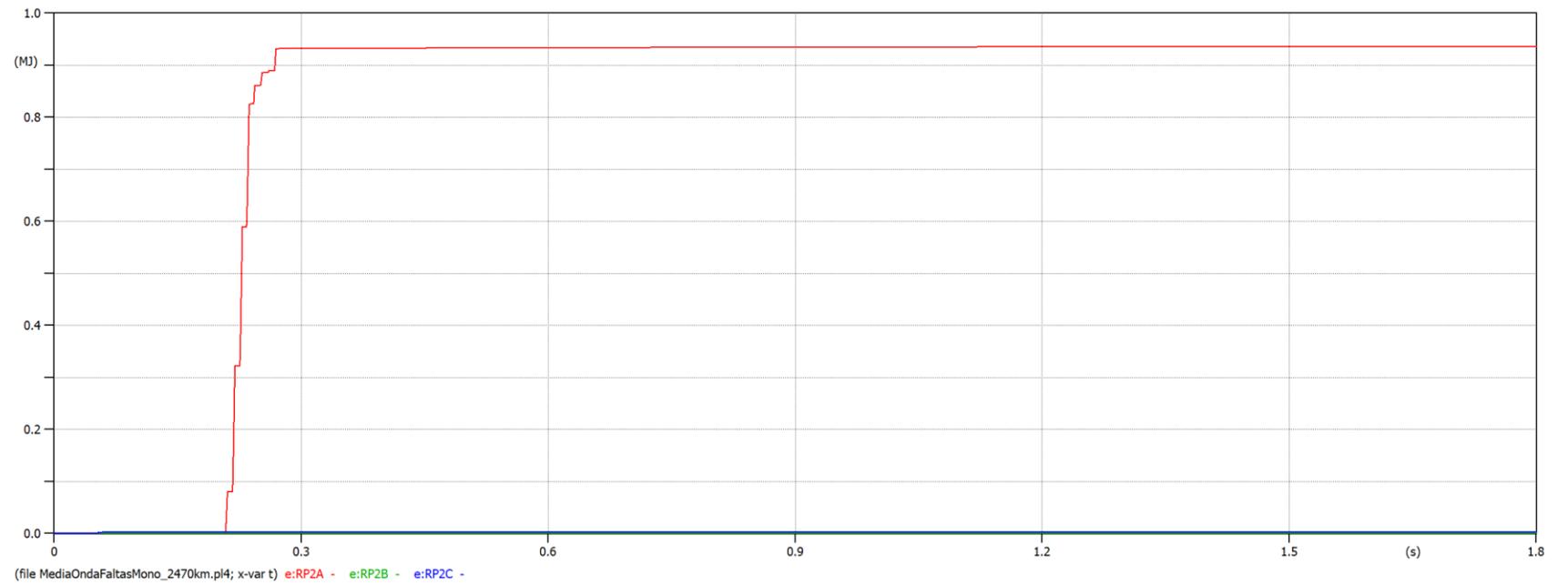


Tensão no Transformador Emissor

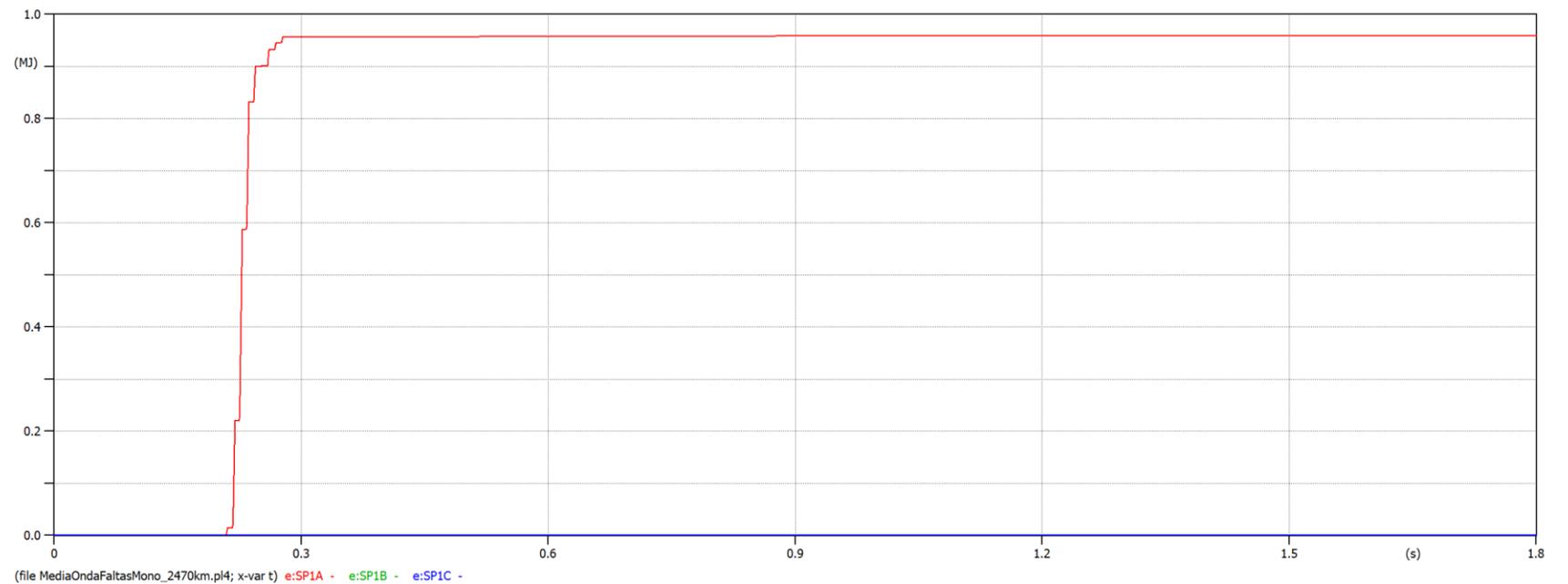


Tensão no Transformador Receptor

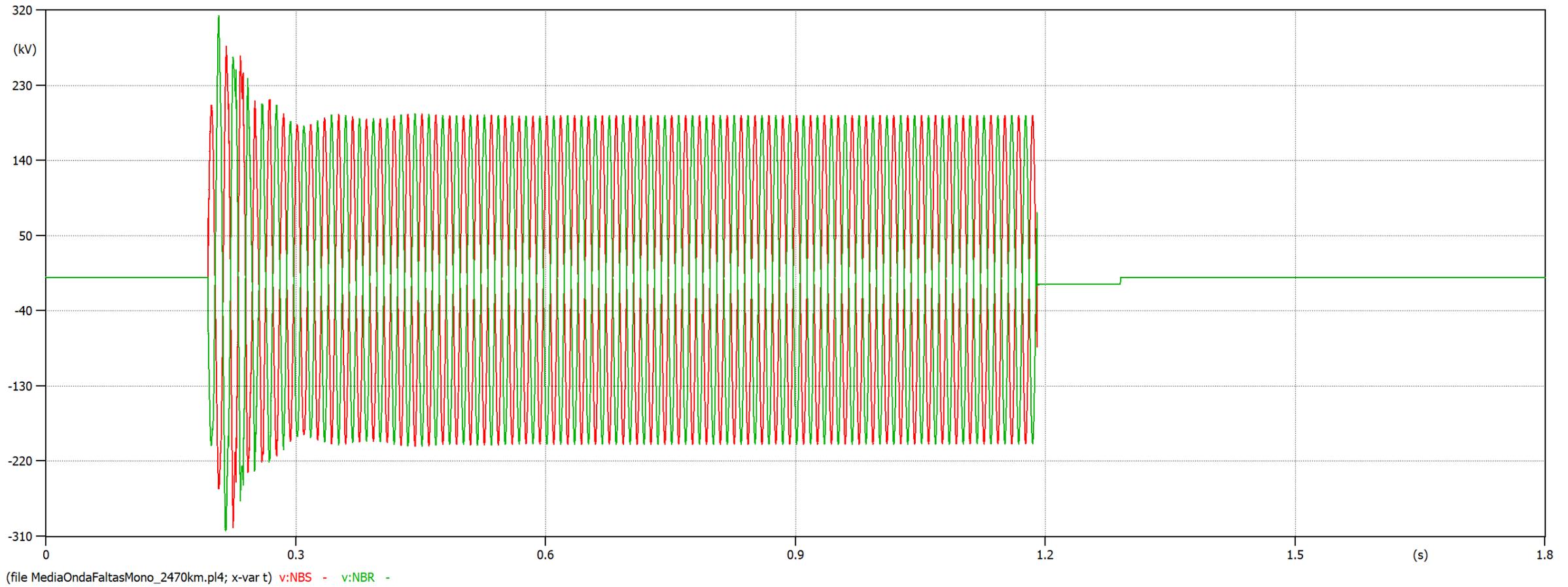
Energia dissipada  
Para-raios 1



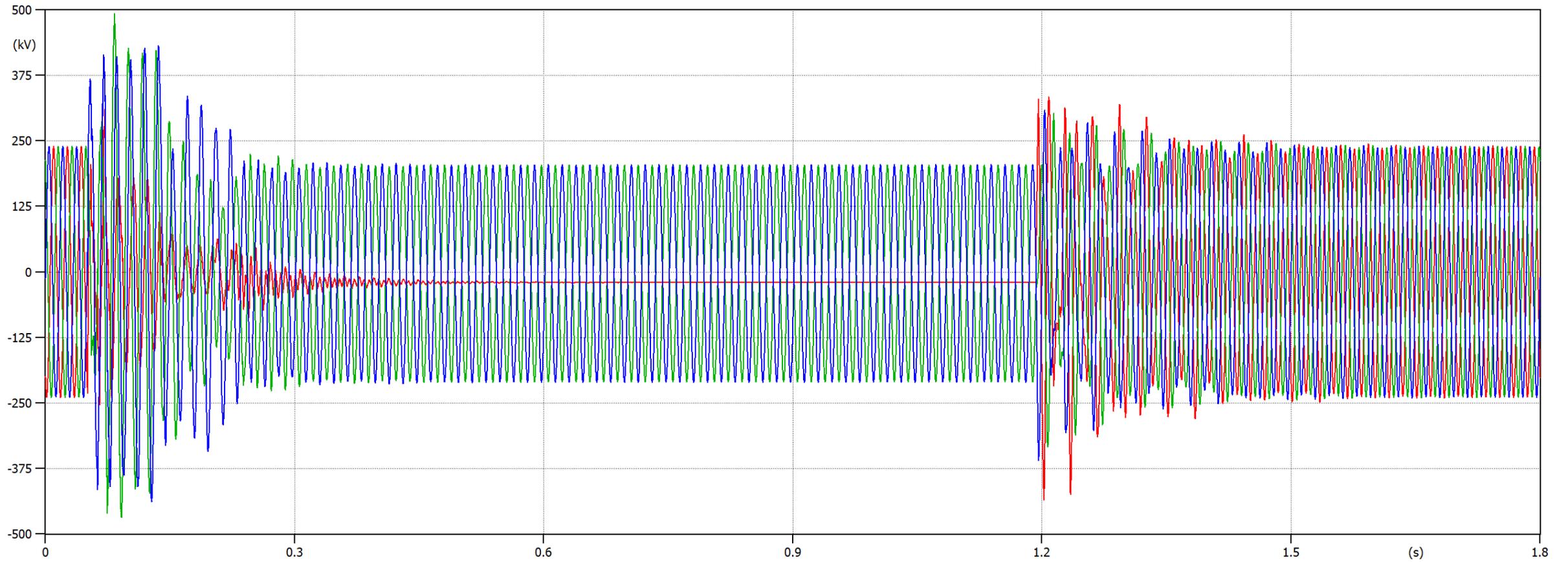
Energia dissipada  
Para-raios 2



# Tensão no Neutral Breaker

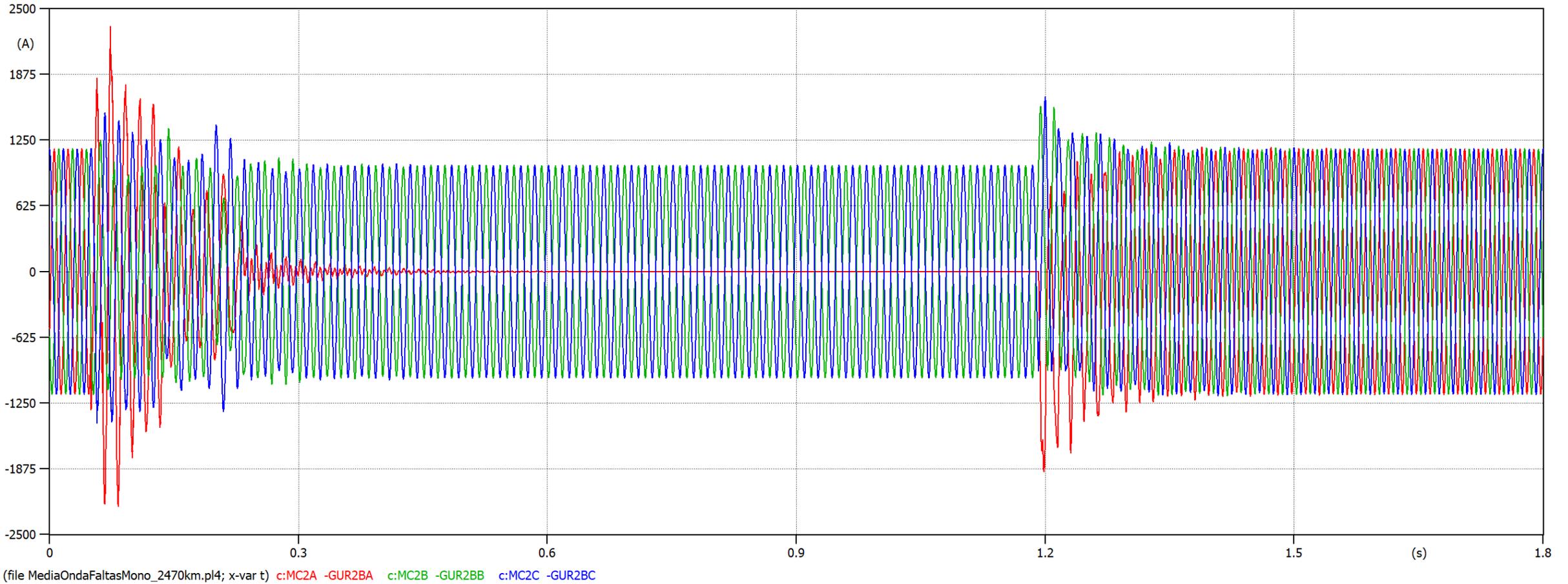


# Tensão na Falta

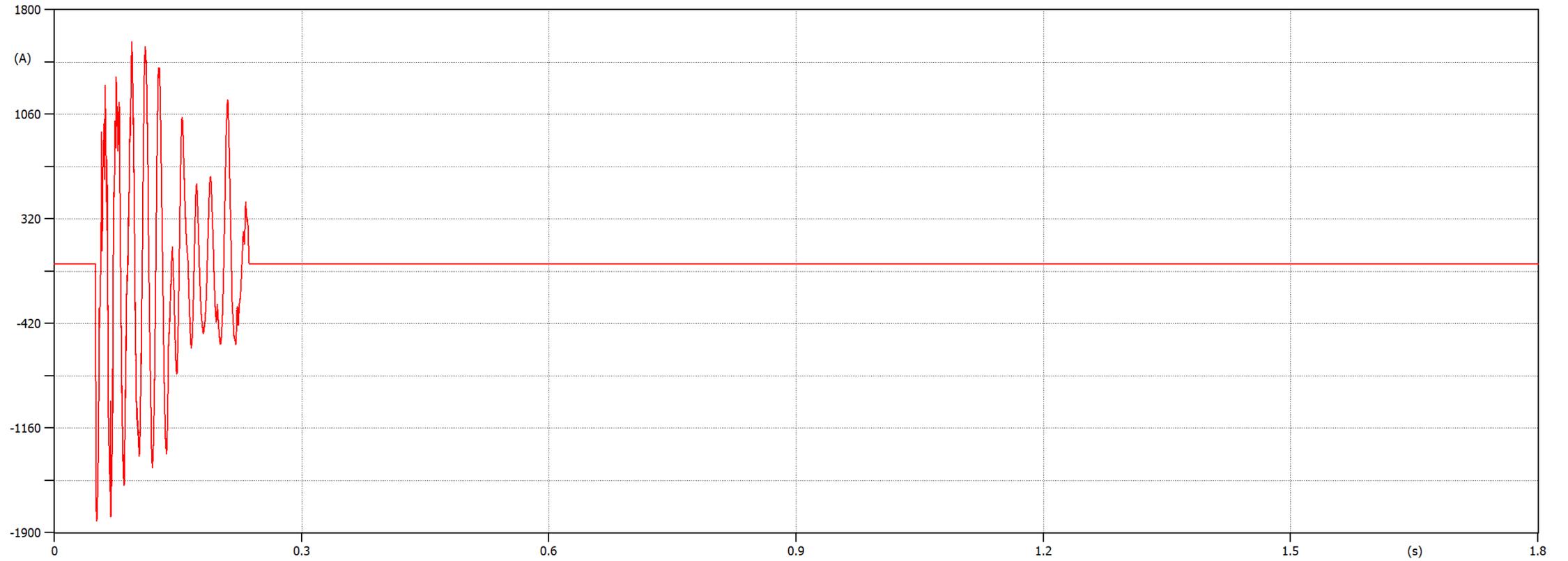


(file MediaOndaFaltasMono\_2470km.pl4; x-var t) v:GUR2AA v:GUR2AB v:GUR2AC

# Corrente vista pela linha

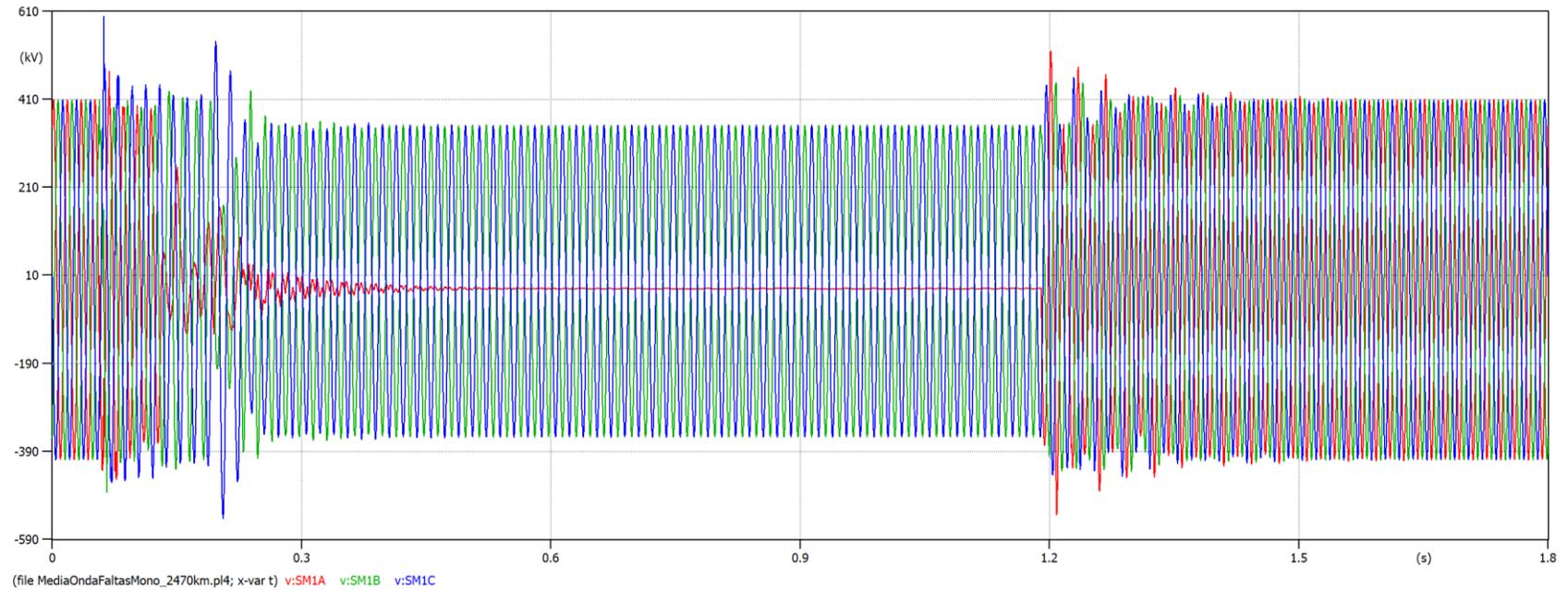


# Corrente na falta

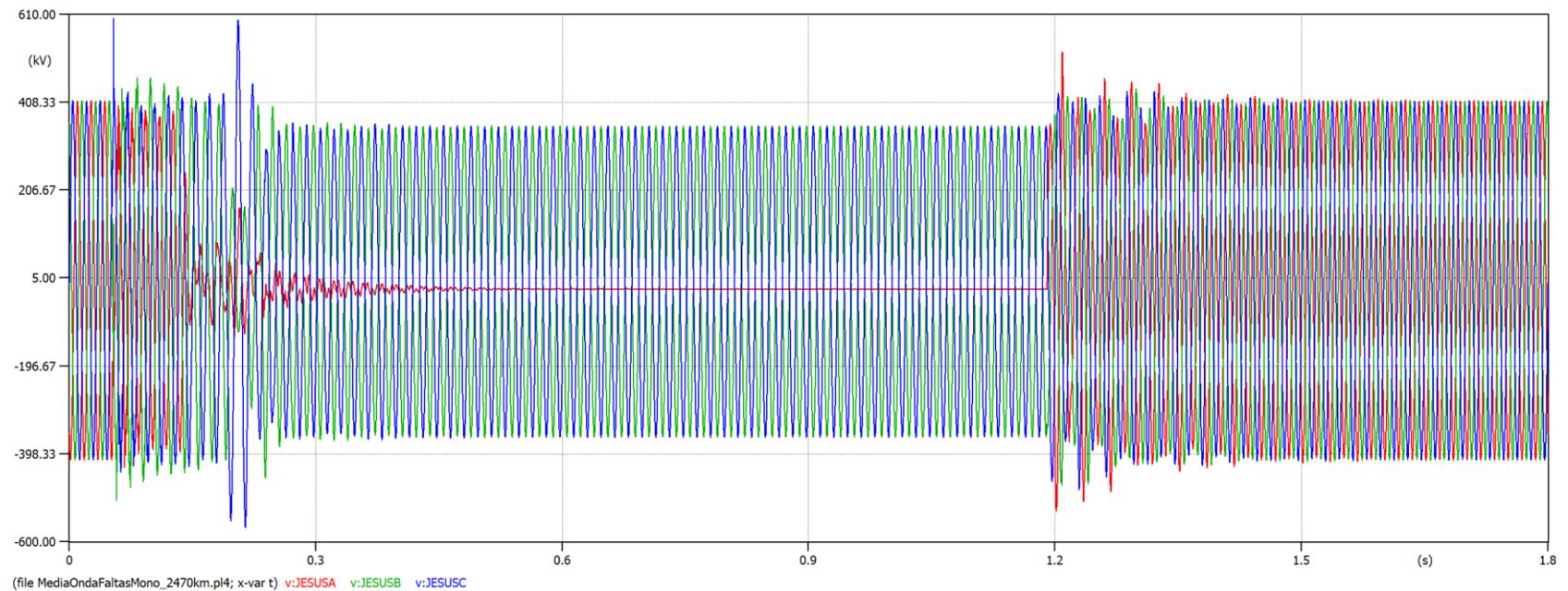


(file MediaOndaFaltasMono\_2470km.pl4; x-var t) c:GUR2BA-CF

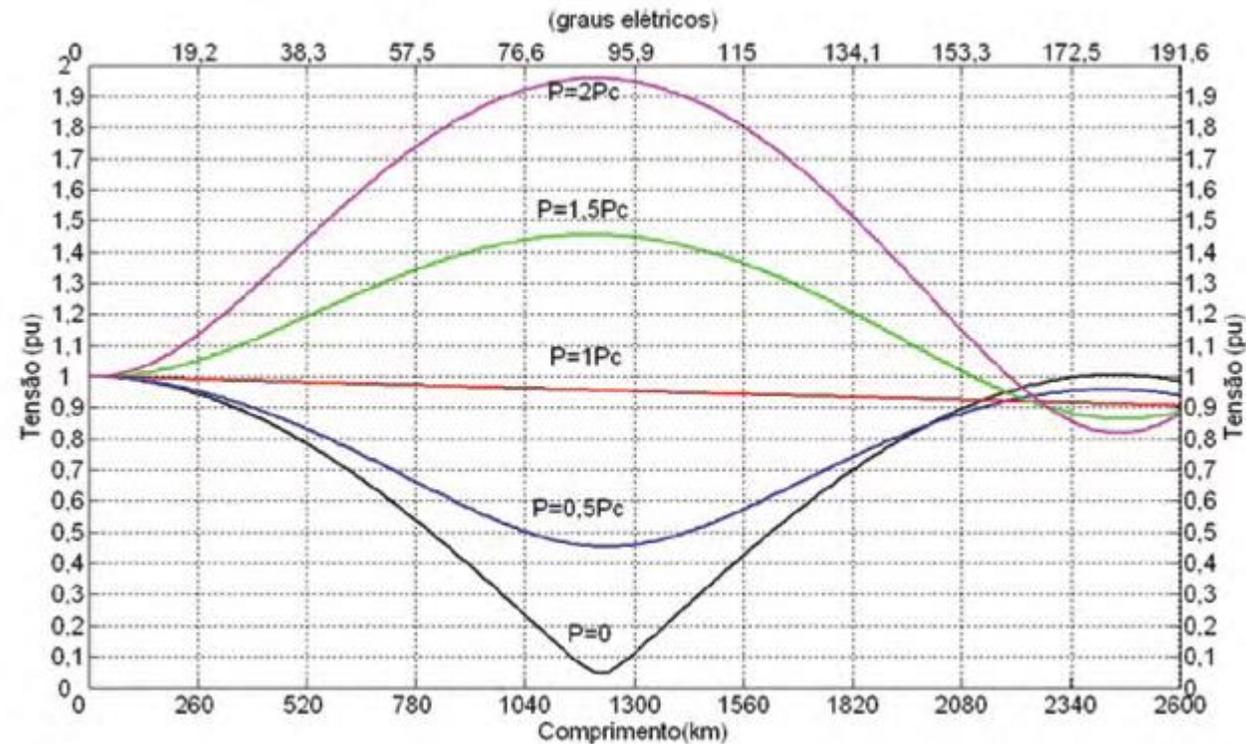
Tensão no  
Terminal  
Emissor  
Serra Mesa 1



Tensão no  
Terminal  
Emissor  
B. Jesus da  
Lapa



Perfil de tensão ao longo do Elo CA, 500 kV, em regime permanente com fator de potência unitário. ( $P_c$  — potência característica da linha;  $P$  — potência injetada no terminal emissor).



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A.F.N.C. Moro, J.A. Santiago, M.C. Tavares, Power differential protection for half-wavelength transmission lines—Software in the loop analysis, Electric Power Systems Research, Volume 223, 2023, 109626, ISSN 0378-7796, <https://doi.org/10.1016/j.epsr.2023.109626>.

Ozenir Dias, Maria Cristina Tavares, Fabiano Magrin,  
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