

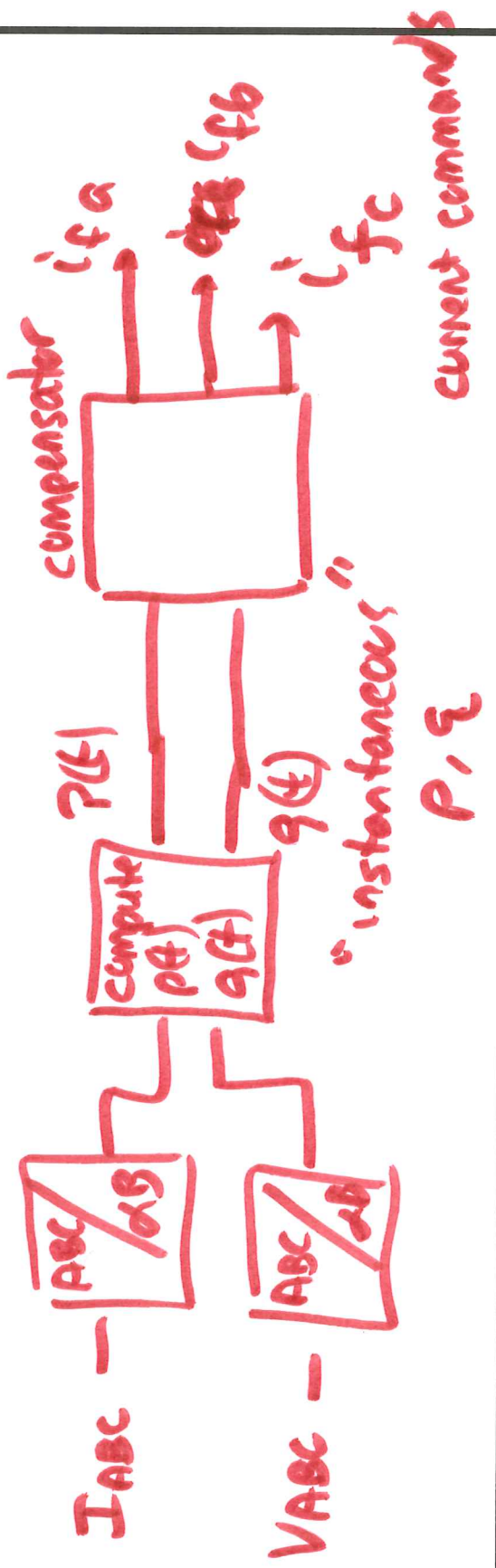
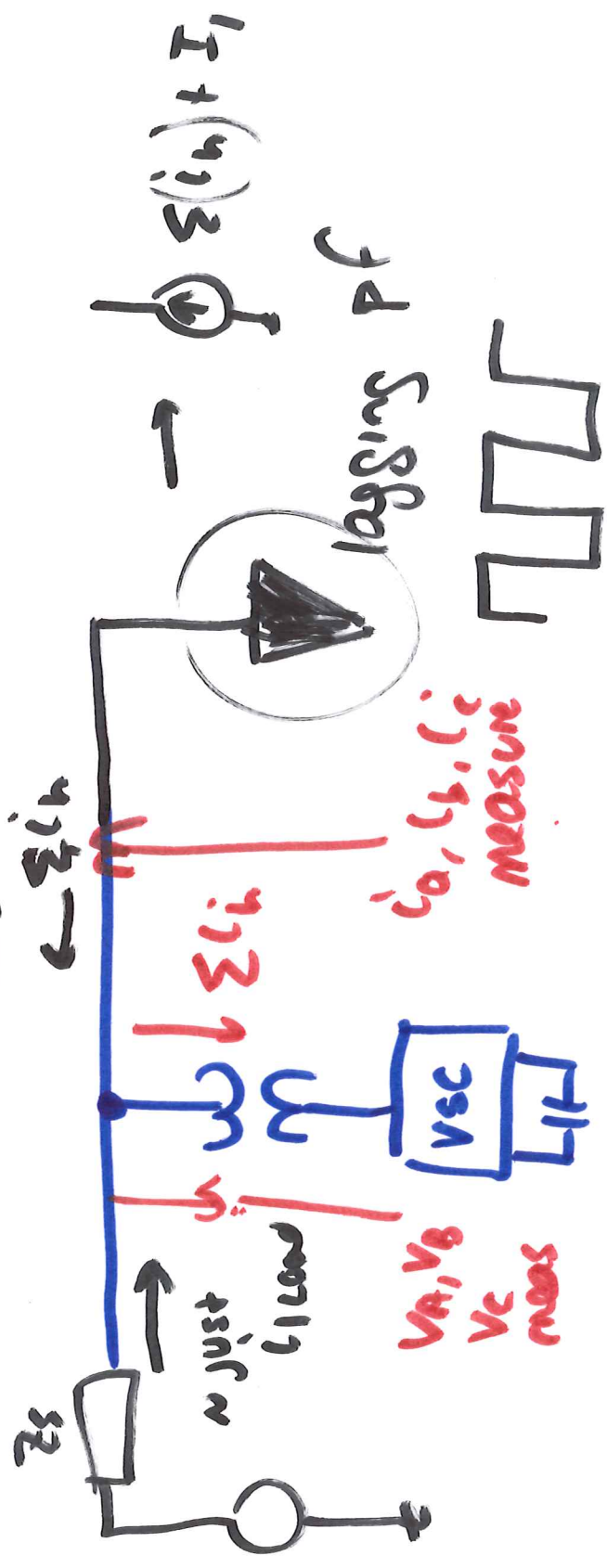
ECE 404-TD / 504-TD

ST: T&D APPLICATIONS OF  
VOLTAGE SOURCE CONVERTERS

SESSION no. 42

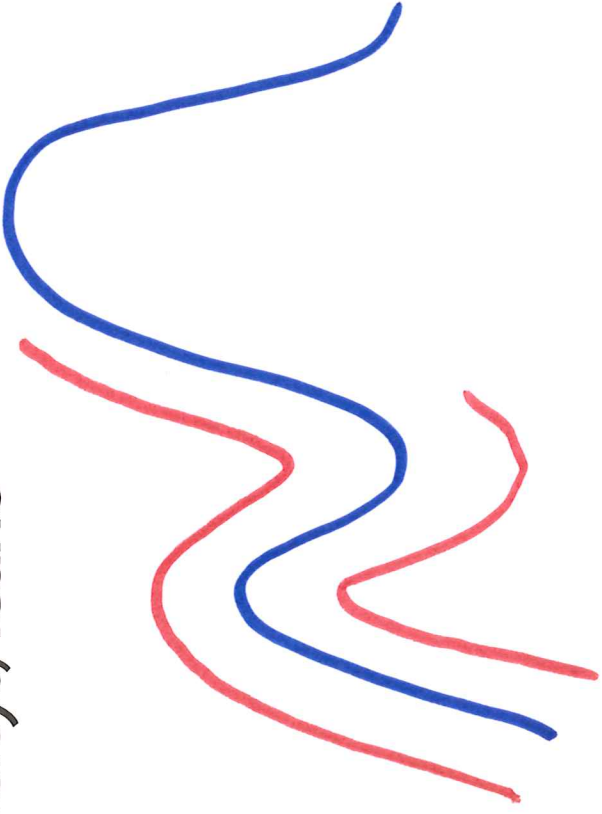
L42 1/14

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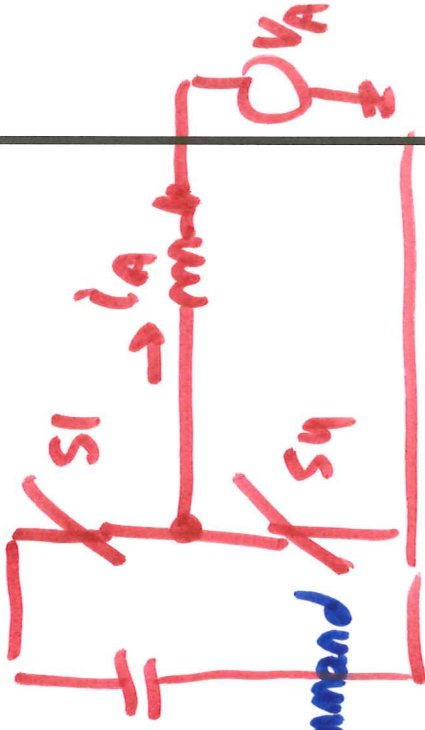
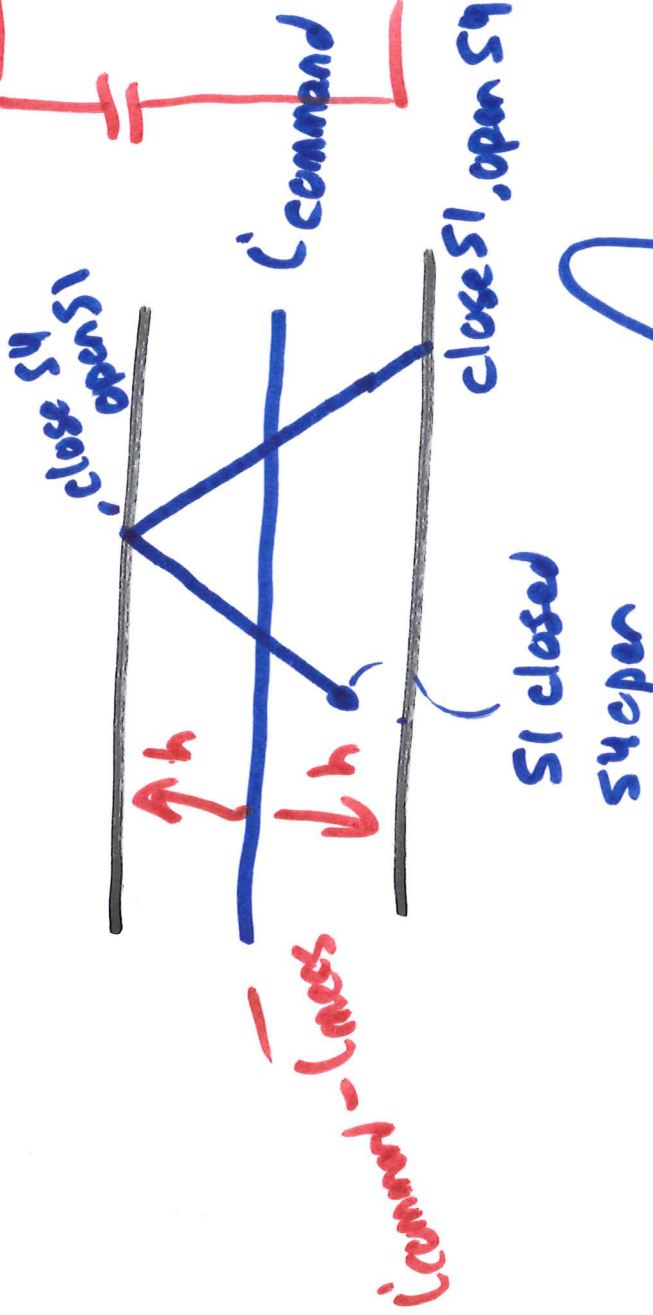


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2/17

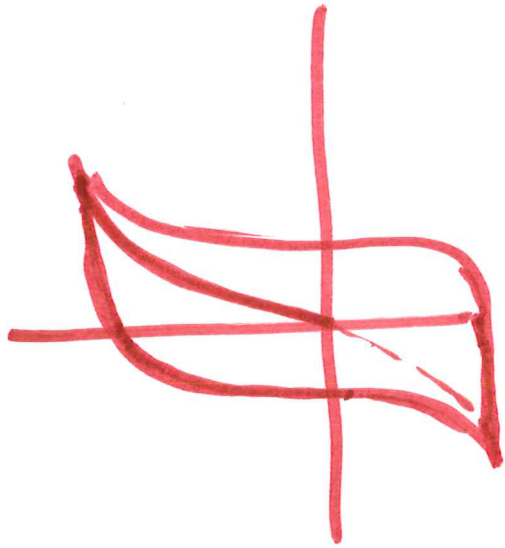


# hysteresis regulated PWM



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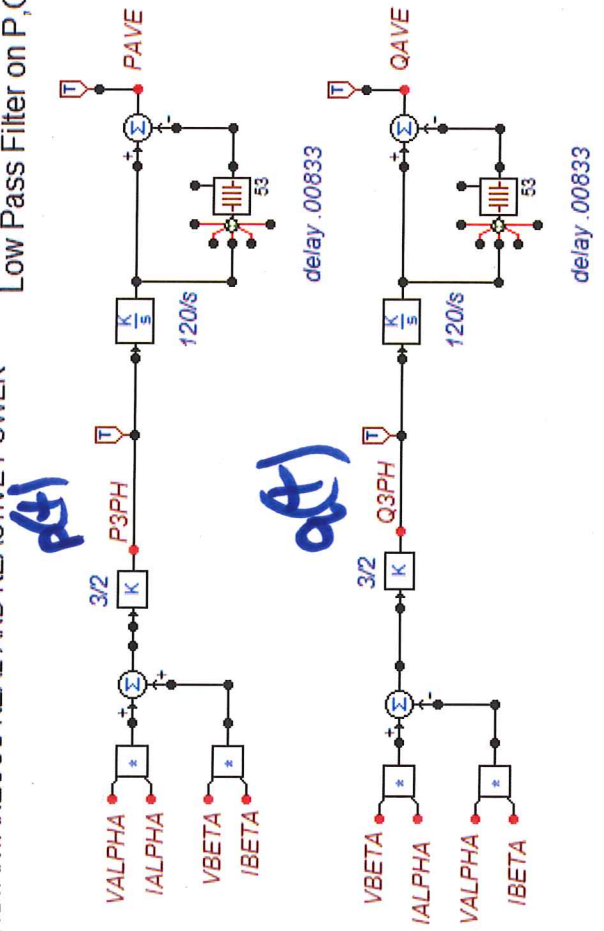
L42 4/14



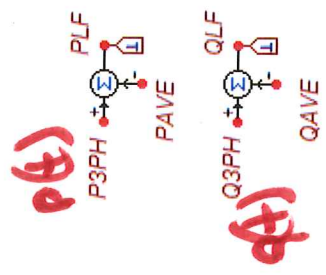
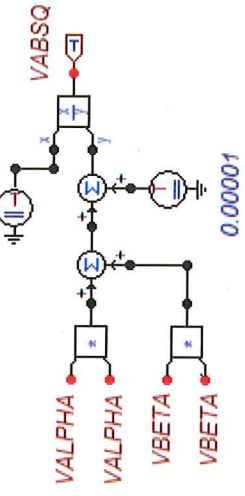
L42 5/14 L41 17/15

INSTANTANEOUS REAL AND REACTIVE POWER

Low Pass Filter on P, Q

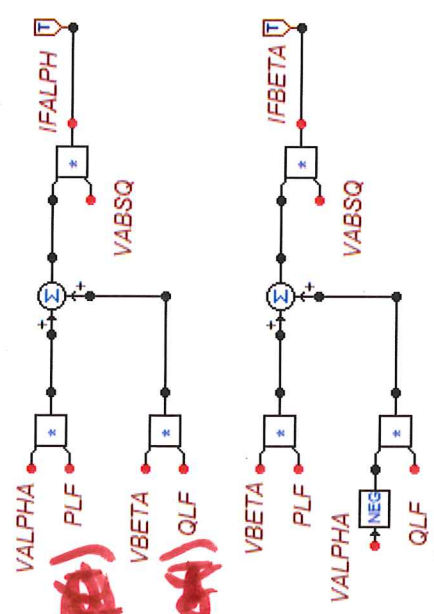


$$\frac{2}{3} \sqrt{V_d^2 + V_E^2} + 0.0001$$



Luz 6/14 Lul 18/15

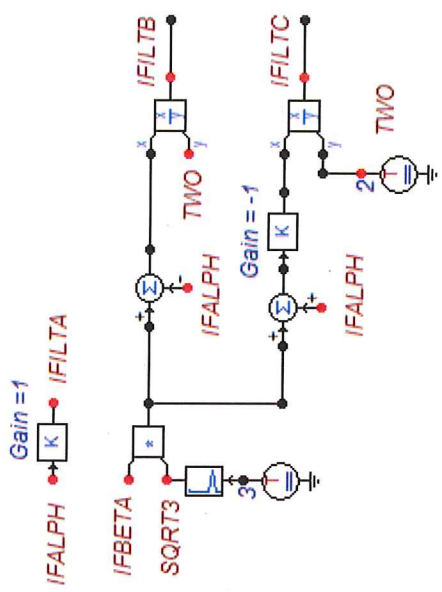
Compensator Currents in Alpha-Beta Frame



$P(s) = \frac{1}{s}$   
 $Q(s) = \frac{1}{s}$

$$\begin{bmatrix} v_\alpha & v_\beta \\ v_\beta & -v_\alpha \end{bmatrix} \begin{pmatrix} P(s) \\ Q(s) \end{pmatrix}$$

Transform Filter Currents to ABC Frame

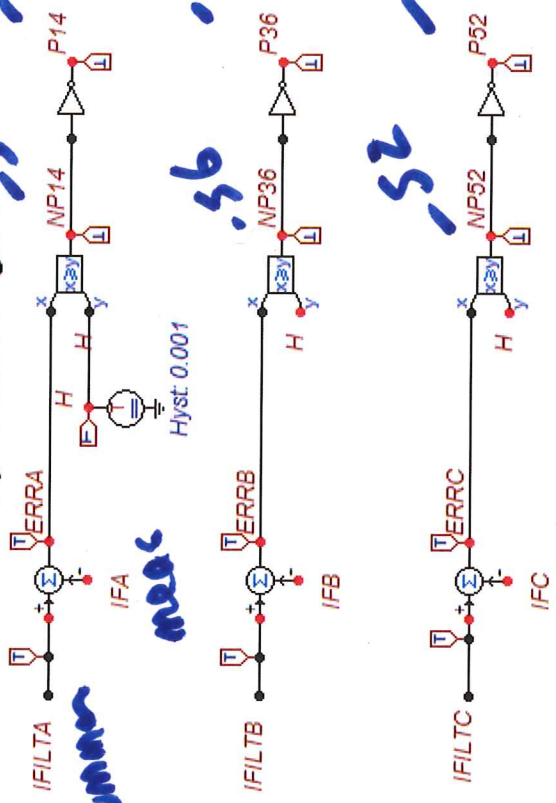




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Luz 7/14

### Hysteresis Regulator *SM*



*Common*  
*meas*

*56*, *53*

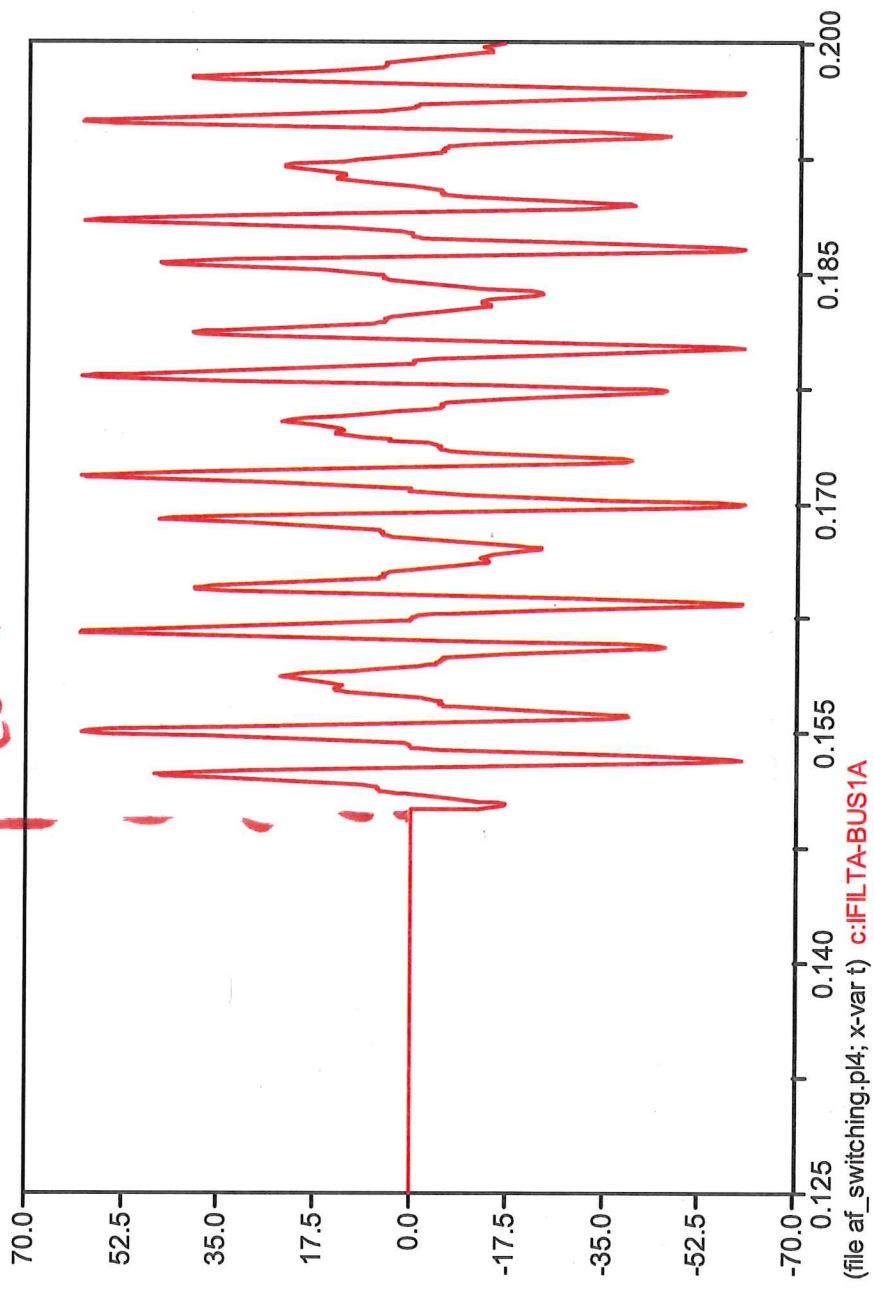
*52*, *55*



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turn on  
compensator

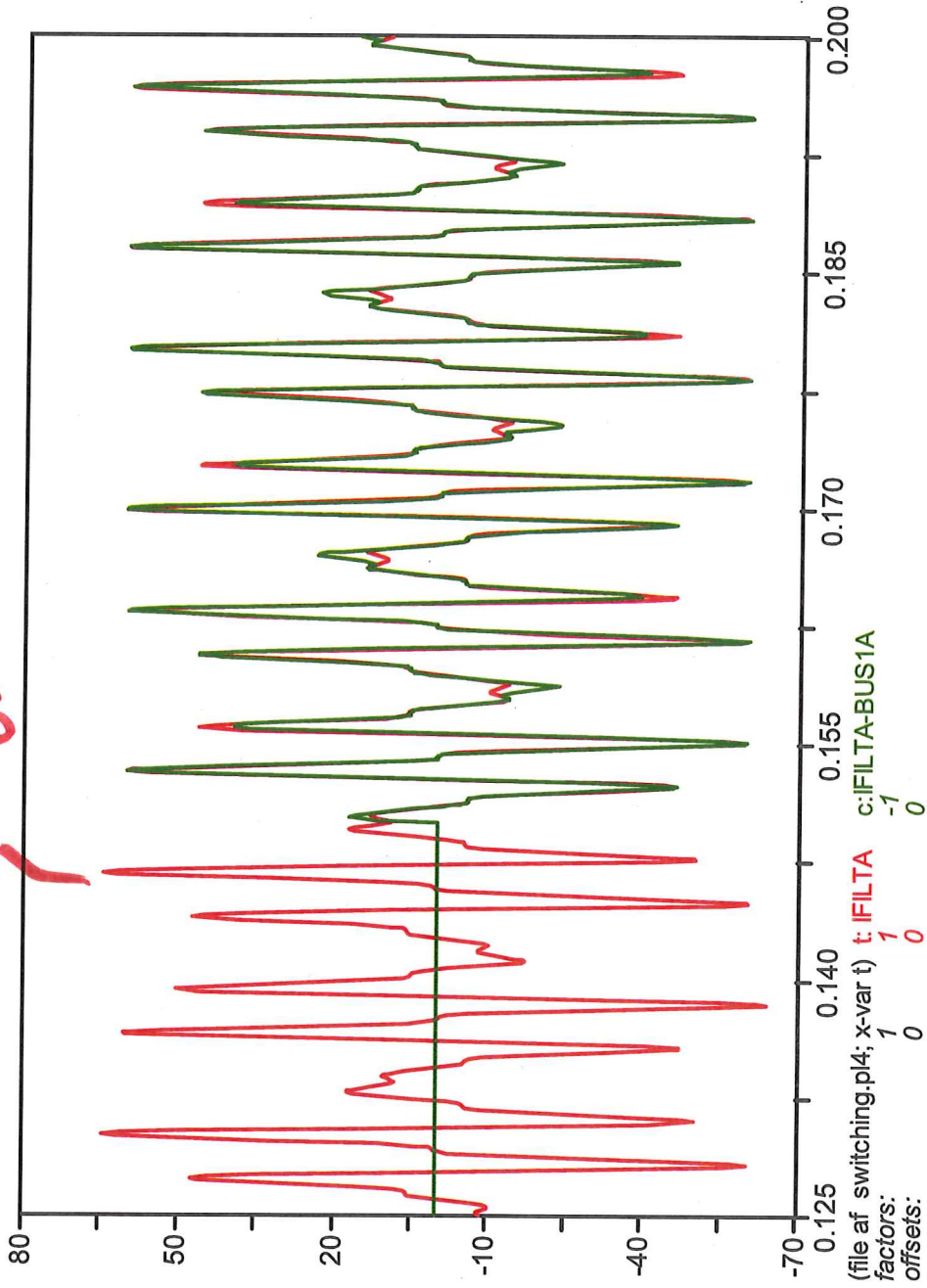
Compensator current



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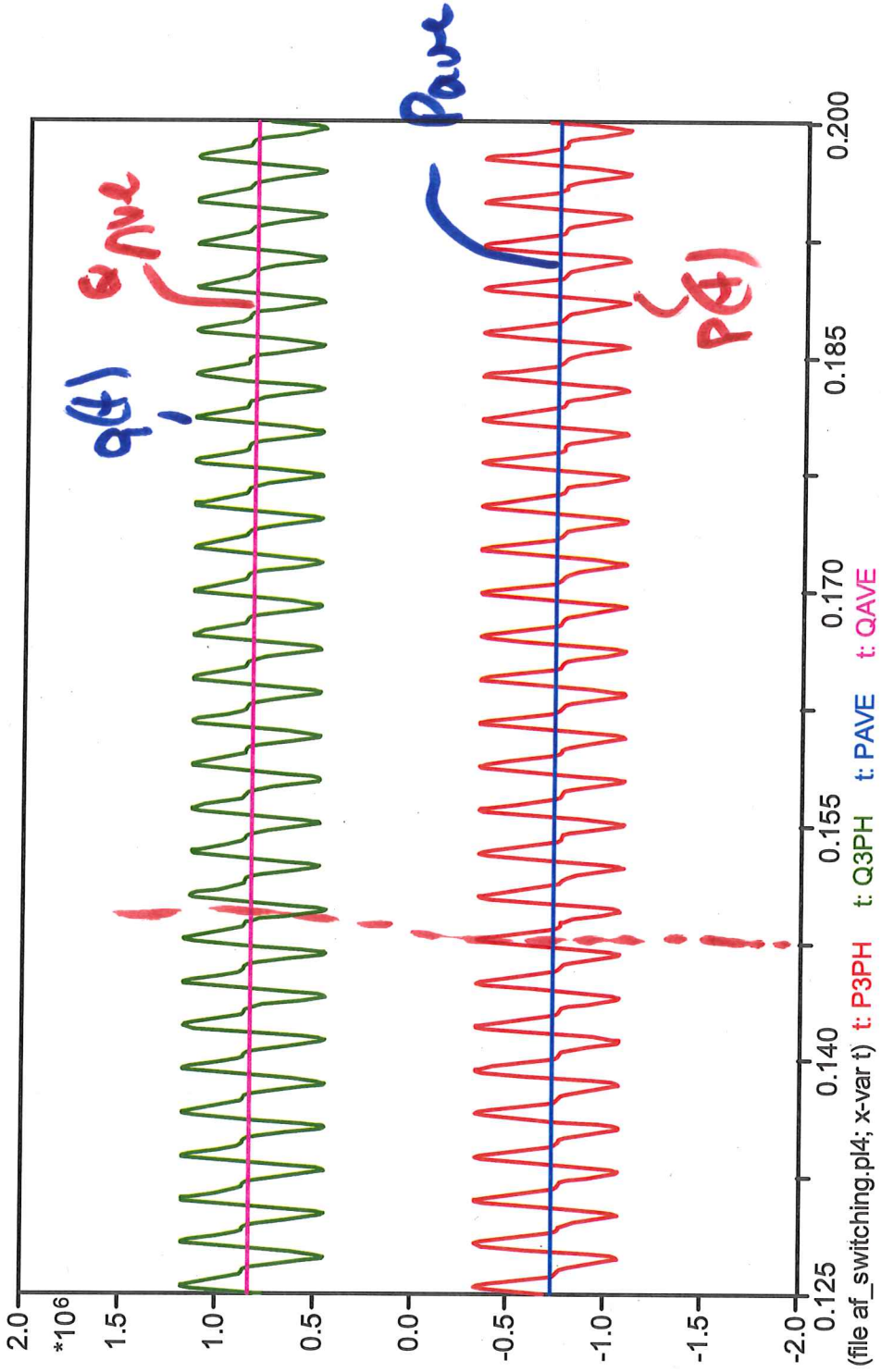
Commanded current and filter current

*commanded current*



Lyz 10/14

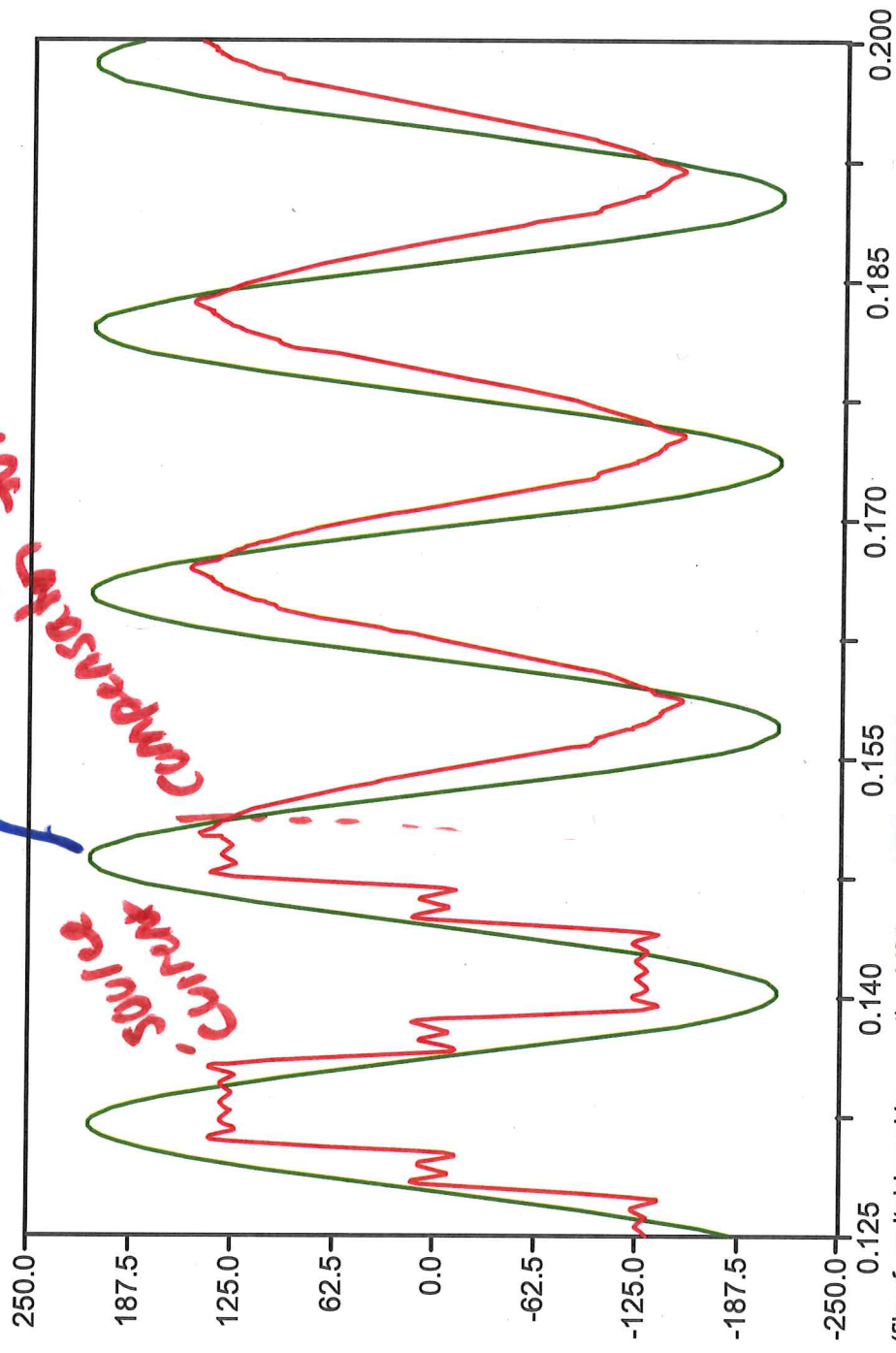
P and Q at the load



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Filtered Current and phase A voltage

*Voltage/100*



(file af switching.pl4; x-var t) v:VSA c:VSA -VSLA  
factors: 1 0.01 1 0  
offsets: 0 0 0 0

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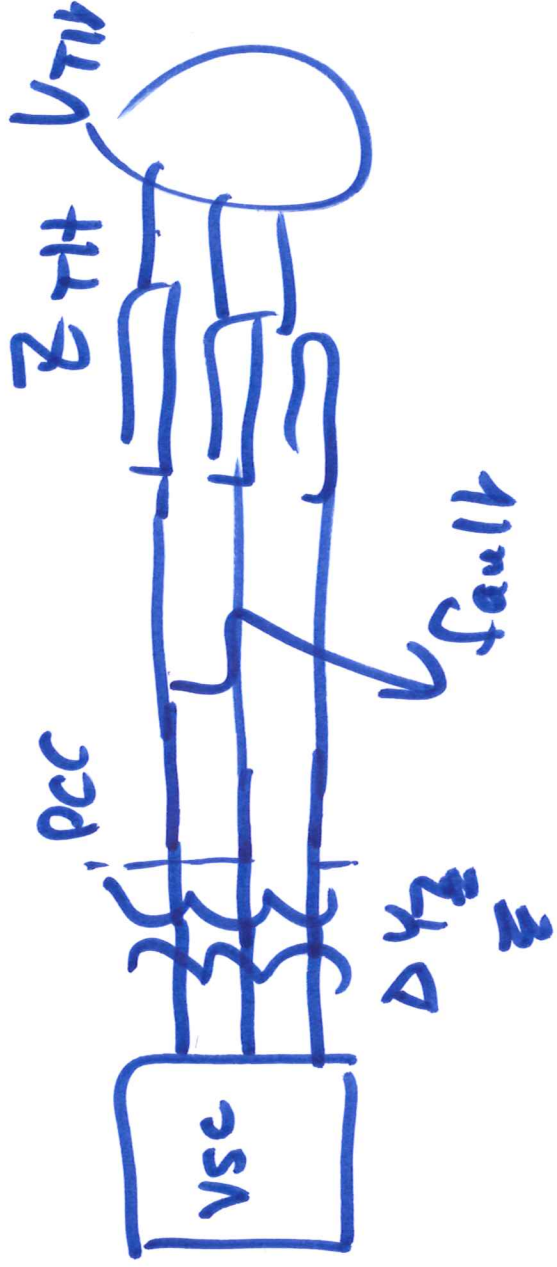
- Switching frequency is  
variable



# Current regulated PWM

- also sometimes used in response to external faults

(in general, not active filter)



very little  
overload  
capability

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- Often  $I_{\text{fault}}$  limited
- 110% - 150% of rated load current
- typically balanced 3 $\phi$  currents
- control power factor  $\rightarrow$  somewhat leading