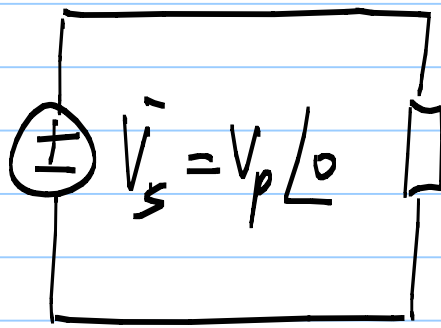
Lecture 35



Real power,
Reactive power
} instantaneous values

Complex power $= \bar{P} = \frac{\bar{V}\bar{I}^*}{2} = \frac{\bar{V}_s \cdot \bar{V}_s^* Y_L^*}{2}$

$= \frac{|V_s|^2 |Y_L| [\cos\phi - j\sin\phi]}{2}$

$\phi = \not\angle Y_L$

$$Y_L = |Y_L| \cdot \angle\phi$$

$$p(t) = v(t) \cdot i(t)$$

$$= V_p \cos\omega t \cdot \left[V_p \cdot |Y_L| \cdot \cos(\omega t + \phi) \right]$$

$\cos\omega t \cos\phi$

$-\sin\omega t \sin\phi$

$$= V_p^2 |Y_L| \cos^2\omega t \cdot \cos\phi$$

$$- V_p^2 |Y_L| \sin\omega t \cos\omega t \cdot \sin\phi$$

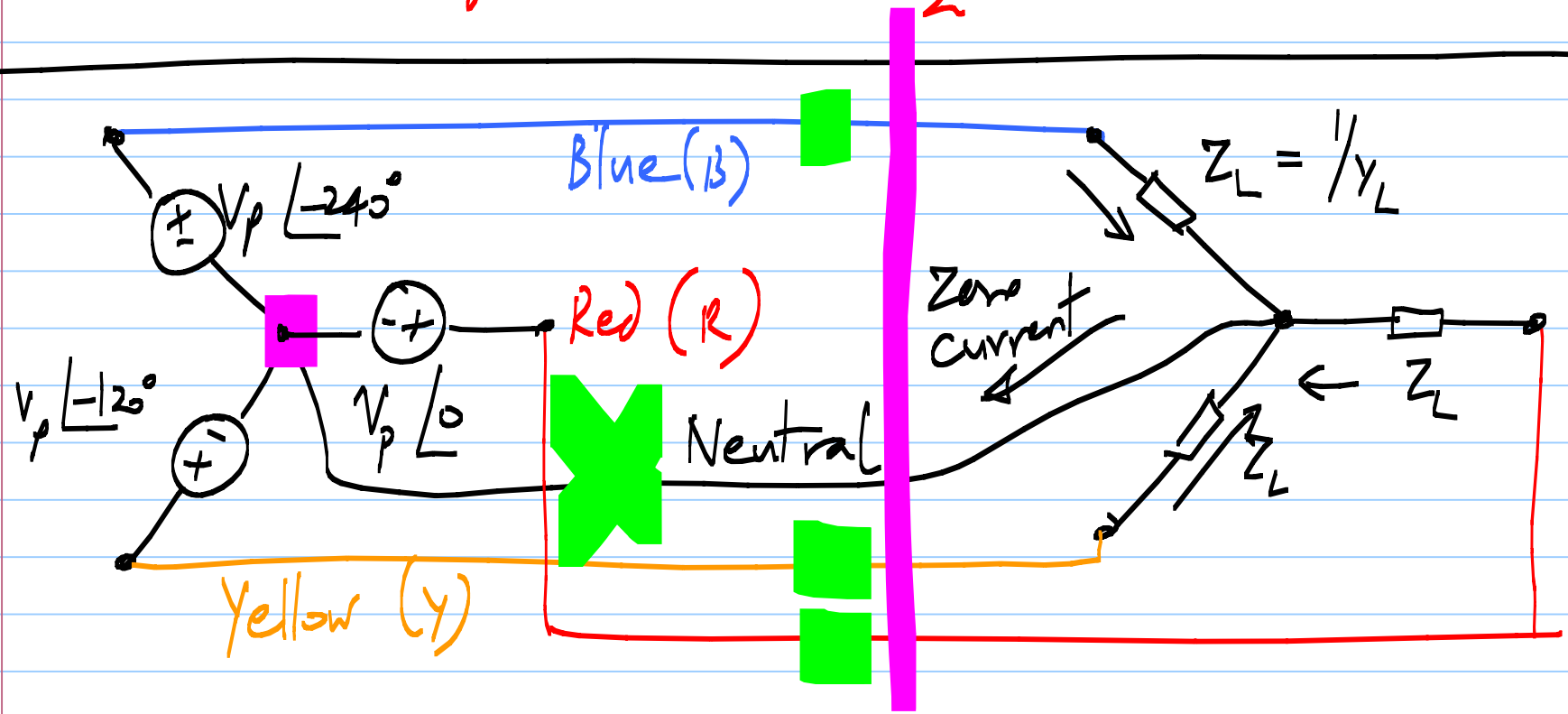
$$= \frac{V_p^2 |Y_L|}{2} \left[\cos\phi (1 + \cos 2\omega t) - \sin\phi \sin(2\omega t) \right]$$

average = 0

Real & reactive powers: oscillating at 2ω

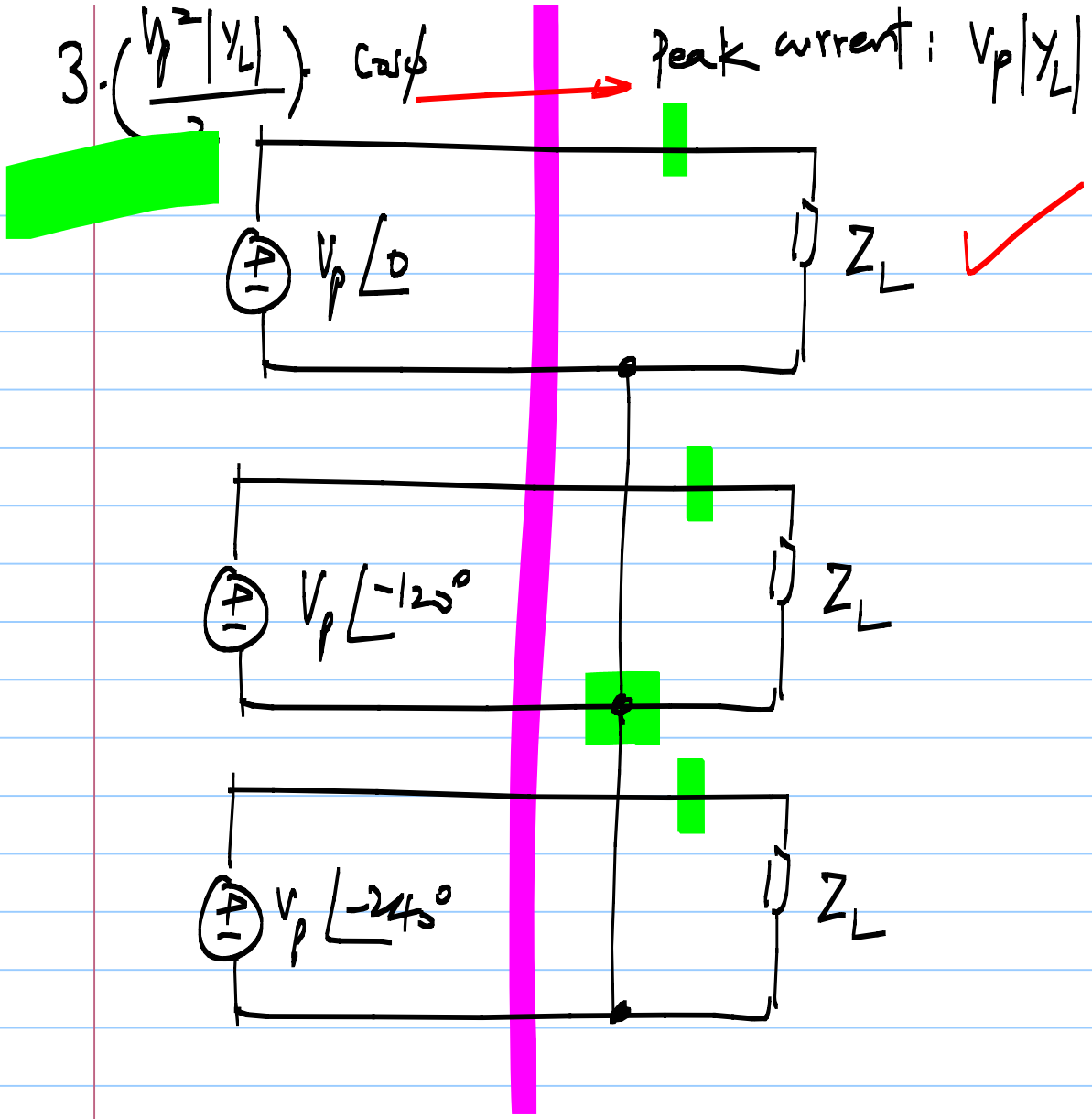
Single phase

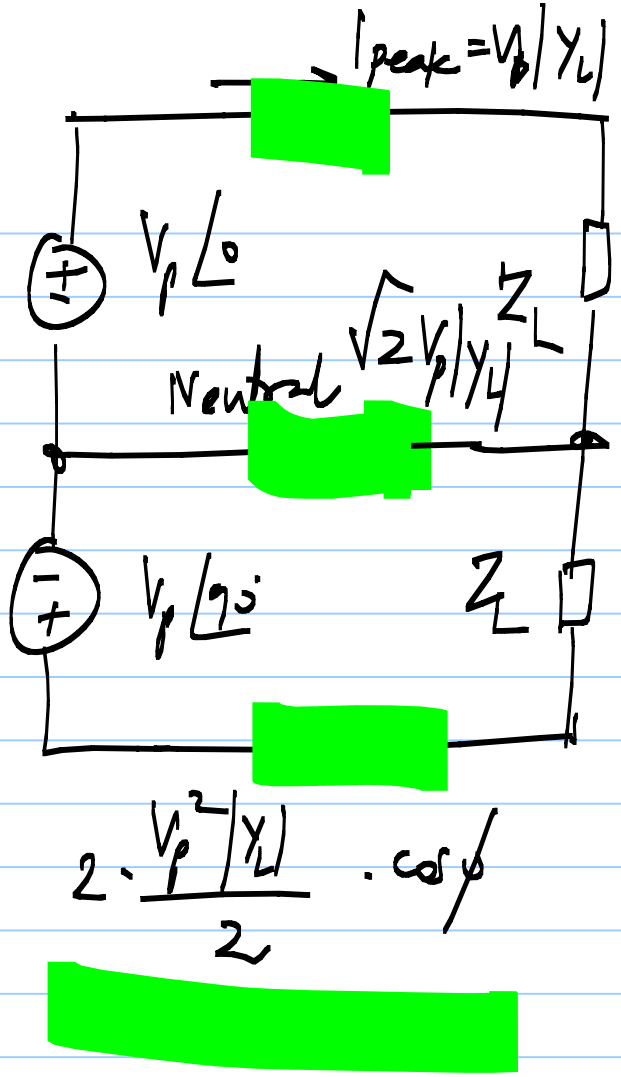
average value = $\frac{|V_p^2 Y_L|}{2} \cos\phi$



3. $\left(\frac{V_p^2 |Y_L|}{2}\right) \cdot \cos\phi$

Peak current : $V_p |Y_L|$





$2 \cdot \frac{V_p^2 |Y_L|}{2} \cdot \cos\phi$

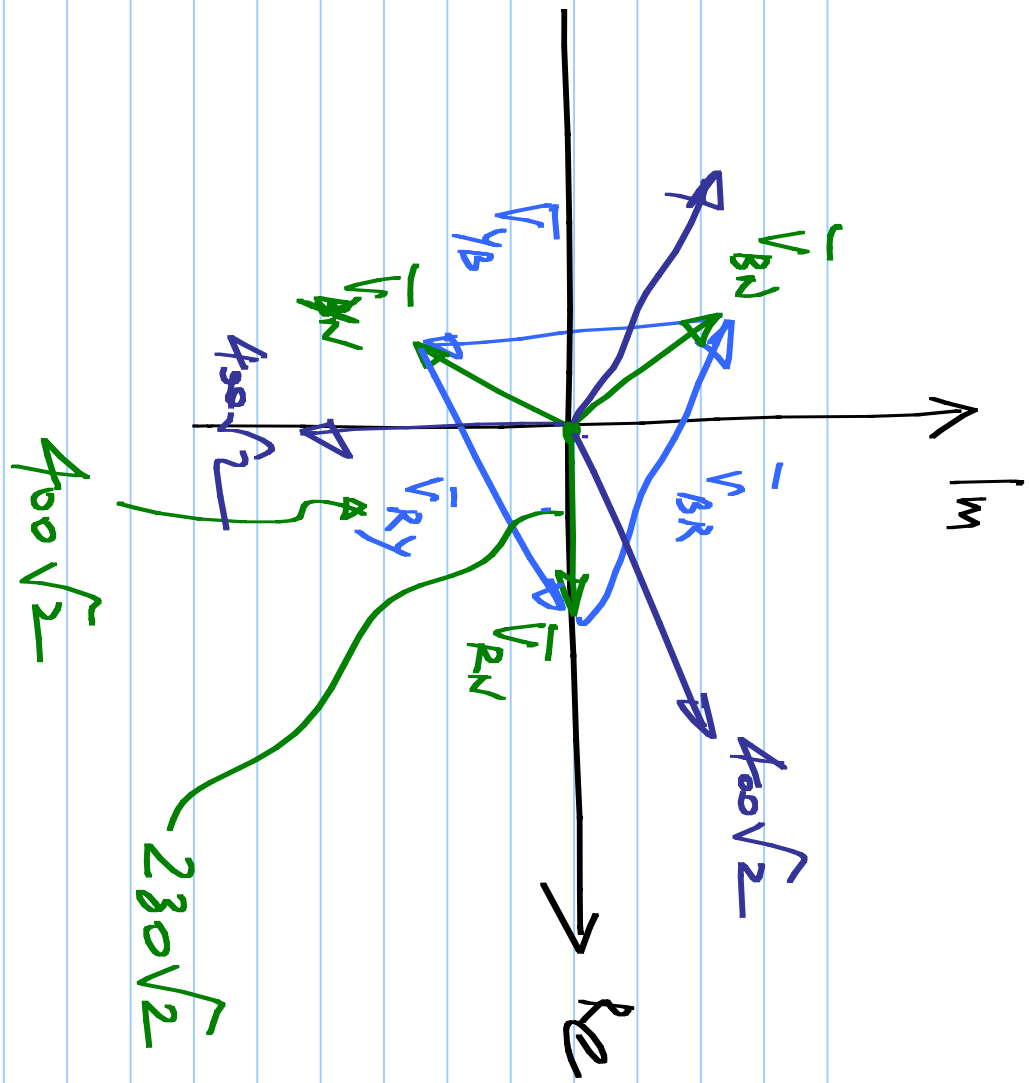
$$P_R(t) = \frac{V_p^2 |Y_L|}{2} \left[\cos\phi \left(1 + \cos 2\omega t\right) - \sin\phi \sin(2\omega t) \right]$$

$$P_Y(t) = \frac{V_p^2 |Y_L|}{2} \left[\cos\phi \left(1 + \cos(2\omega t - 240^\circ) - \sin\phi \sin(2\omega t - 240^\circ) \right] \right.$$

$$P_B(t) = \frac{V_p^2 |Y_L|}{2} \left[\cos\phi \left(1 + \cos(2\omega t - 480^\circ) - \sin\phi \sin(2\omega t - 480^\circ) \right] \right.$$

Balanced 3 phase load driven from a (balanced) 3 phase source:

* Constant (total) real power } instantaneous values
* Zero (total) reactive power }


V_{YB}
V_{BN}
V_{YN}
V_{RY}
V_{BR}
V_{RN}
$400\sqrt{2}$
$230\sqrt{2}$
$400\sqrt{2}$
$400\sqrt{2}$
Im
Re