(8)

$$\Theta = \phi + \frac{\Omega t}{2} = -\frac{\pi}{4} + \frac{\Omega t}{2} + A\sin\left(\frac{\varepsilon t\sqrt{1-\gamma}}{2} + \delta\right)$$

$$I = J = (1-\gamma) + 2\sqrt{1-\gamma}\,A\cos\left(\frac{\varepsilon t\sqrt{1-\gamma}}{2} + \delta\right) \quad ?$$

$$q = \sqrt{2I}\sin\Theta$$

$$= \sqrt{2(1-\gamma) + 4\sqrt{1-\gamma}\,A\cos\left(\frac{\varepsilon t\sqrt{1-\gamma}}{2} + \delta\right)}\,\sin\left(-\frac{\pi}{4} + \frac{\Omega t}{2} + A\sin\left(\frac{\varepsilon t\sqrt{1-\gamma}}{2} + \delta\right)\right)$$

$$p = \sqrt{2I}\cos\Theta$$

$$= \sqrt{2(1-\gamma) + 4\sqrt{1-\gamma}\,A\cos\left(\frac{\varepsilon t\sqrt{1-\gamma}}{2} + \delta\right)}\,\cos\left(-\frac{\pi}{4} + \frac{\Omega t}{2} + A\sin\left(\frac{\varepsilon t\sqrt{1-\gamma}}{2} + \delta\right)\right)$$

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Simply: $\phi = -\frac{\pi}{4}$

So $\Theta = \phi + \frac{1}{2}\Omega t$

$$= \left(-\frac{\pi}{4} + \frac{1}{2}\Omega t\right)$$

$$I = J = 1 - \nu$$

So $q = \sqrt{2I}\sin\theta$

$$= \sqrt{2(1-\nu)}\,\sin\left(\frac{1}{2}\Omega t - \frac{1}{4}\pi\right)$$

$$p = \sqrt{2(1-\nu)}\,\cos\left(\frac{1}{2}\Omega t - \frac{1}{4}\pi\right)$$

where $\frac{\Omega}{2} = \omega\left(1 - \frac{1}{4}\varepsilon\nu\right)$