Explanation of Drude model discrepancy in literature

There are two expressions for the Drude model found in the literature. It is not immediately obvious how the parameters of the two expressions are related. The only difference between the two expressions of the Drude model is that ϵ_∞ is factored out and ω_p is defined differently. The following derivation of the relationship between the two expressions assumes that ϵ_∞ is a directly measured parameter, and is therefore the same in both methods. Note that the subscripts "F" and "LR" refer to the different forms of the expressions exemplified by references (for example) given by Franzen[7] and LeRu,[8] respectively.

Franzen expression	LeRu expression
$$\epsilon = \epsilon_\infty - \frac{\omega_{p,F}^2}{\omega^2 + i\omega\gamma}$$	$$\epsilon = \epsilon_\infty\left(1 - \frac{\omega_{p,LR}^2}{\omega^2 + i\omega\gamma}\right)$$
Solve each expression for ω_p:	
$\omega_{p,F}$ $$= \sqrt{\epsilon_\infty \omega^2 + \epsilon_\infty i\omega\gamma - \epsilon\omega^2 + \epsilon i\omega\gamma}$$	$\omega_{p,LR}$ $$= \epsilon_\infty^{-\frac{1}{2}} \sqrt{\epsilon_\infty \omega^2 + \epsilon_\infty i\omega\gamma - \epsilon\omega^2 + \epsilon i\omega\gamma}$$
Therefore, $$\omega_{p,F} = \epsilon_\infty^{\frac{1}{2}} \omega_{p,LR}$$	

In this work, we have used the more common expression defined by Franzen, and therefore all plasma frequencies are given as $\omega_{p,F}$, as defined above.