General Physics Notes (07062026):

Waves in plasmas exist. The oscillating density n and potential ϕ in a drift wave are related by:

$$\frac{n_1}{n_0} = \frac{e\phi}{\tau} \cdot \frac{\omega^\dagger + ia}{\omega + ia} \tag{1}$$

Let's find the expression for the phase δ of ϕ_1 relative to n_1. Assume n_1 is $n_1 \in \mathbb{R}$.

Now if $\omega > \omega^\dagger$ does ϕ_1 lead or lag n_1. These are waves built with a sort of second quantization mindset with particle and not fields as the carriers. Wave equations solve the 2^{nd} order DE with space and time. We'll develop and use a new Hilbert-Huygens wavefront approach (space filling curve) in fractional dimensions. Something like this builds an isomorphic field to particle turbulence model and generates the chaotic motion from a progenitor field approach. (Let's get in the mindset of the $\zeta(s,t), \sum_{j,i=0}^{\infty} \frac{n_i}{n_j}$ and more advanced field and wave concepts.) We'll try to model the particle waves using a connected diagram and not an electrostatic potential diagram in space.

$$\tan\delta = \frac{\mathbb{I}(E_e)}{\mathbb{R}(E_e)} \tag{2}$$

$$\nabla\phi = E \tag{3}$$

We have the phase of the field and the classical Poisson equation. We'll not get into the nature of the electric field or the photons or the space filling curve or dimensions. I know this sounds like a lot to unpack, but the Poisson equation is really relating charge points or carriers to field.

$$\phi = \frac{\tau}{e} \cdot \frac{(\omega^\dagger + ia)(\omega - ia)}{\omega^2 + a^2} \tag{4}$$

ω is the plasma frequency and this is generally approached in the Huygens spherical wave and 2^{nd} order DE with space and time wave equation.

We'll transition to the new Hilbert fractional space filling curve approach as best as we can. Using $\omega = r^D$ where $r = \frac{r}{r_0}$ some Planck-Wheeler unit-less length correlation and D is a time frequency (assume some non-fractional time for now i.e. no time turbulence).

$$\phi = \frac{\tau}{e} \sum_{j=0}^{\infty} \frac{(r_j^D)^\dagger (r_j^D) + ia(r_j^D) - ia(r_j^D)^\dagger + (a^2)}{(r_j^{2D} + a^2)} \tag{5}$$

This gives us a rough idea of what fractional dimensional isomorphic approaches to turbulence are going to look like. When the plasma frequency is not a simple function, we are going to have to use fractional dimensional approaches.
I like to use multiple dimensions and skewness to describe the Poisson equations

relation between field and potential, where the one dimensional relation $\frac{\partial}{\partial x}$ is replaced with something else.

$$\sum_{n=0}^{\infty} \frac{\partial^n}{\partial x^n} \otimes \frac{\partial}{\partial x} \tag{6}$$

A fractal approach to the wave of Hilbert, where smaller waves are built upon larger waves etc. means that the tensor constructs an expansion in space from rivulets or arroyos built from the larger stream. It is like some sort of n-dimensional space filling curve.

A big step is to modify the calculus with the ζ function to involve the inflationary and evolutionary aspects of the complexity of the universe's connected diagram of quantum bodies. We'll give a little mention of this in a diagram at the end. The sum over n extends from the previous equation

$$\phi = \frac{E_0}{k} \otimes \frac{e^{(i{r_n}^D + i\delta)}}{k_n} \zeta(s', t') \tag{7}$$

When we understand the totality of this relation, we see the phase as developing in a picture of turbulent universal complexity and a space filling curve generated by the primes of the zeta. A lot of the field is dependent on the structure of the fractal wave and the phase, which we'll experimentally find with the phased array radar or detector.

From the real and imaginary parts of this, we'll generate the arctangent function which is the phase lag. It is left as an exercise to return to the eikonal of the wave equation and find the relevant phase terms (+) being right traveling and (-) being left traveling. What is nice about this is the nature of the punctuated equilibrium philosophy that extends to more dimensions and systems than just the natural evolutionary one.