1 Temperature And Super Conductivity

In this chapter there is a discussion of the Thermodynamic Laws and Classical Laws such as Charles Law and Boyles Law. From a Wave within Wave viewpoint, there is also a discussion about how Temperature maps to the wave amplitude. There is also a new derived Molecular Kinetic Energy formula. Later I explain more advanced features of Wave Amplitude manipulation where one can slow Light to a stop also Quantum Tunneling. From a Super Conductivity viewpoint, I explain Local and Non Local wave pools and why certain substances repel magnetic fields depending upon their temperature. The chapter also provides a general description of what Super Conductivity is. There are also explanations of Super Fluids and Quantum Tunneling.

1.1 Defining Temperature

In order to fully understand this work on temperature and the related effects, it helps to have read the Quantum Theory and the Advanced Quantum Theory pieces of the Pi-Space Theory as it builds upon these sections. I will assume the reader is familiar with the Wave Within Wave (WaWiW) design pattern. Also, I will assume the reader is familiar with the Pi-Space Hamiltonian notation used to develop the Navier-Stokes formulas.

Temperature and Pressure are related. Using the WaWiW notation, these are seen as vibrations on the Nx(0) layer altering (lowering/raising) the wave amplitude.

Recall that these Nx(0) considered to be the "local" waves. That is to say, these are the waves which are easier to measure in our reality (e.g. temperature and pressure for example).

For example, we have two waves out of phase contributing to Electricity and the Gravity field on the Nx(0) layer (see the Advanced Quantum Theory). The respective orthogonal waves are the Magnetic waves and the Turbulence waves. For the purposes of this section on temperature we'll focus on three distinct Nx(0) wave disturbances.

Ng(0) = Gravity Mass wave which carries temperature
Ne(0) = Electric Charge wave which carries temperature

Additionally temperature is carried through the "ether" by means of the Standard Model Bozons which were reverse engineered into the WaWiW notation. This temperature vibration is also at the Nb(0) layer where b is any arbitrary Bozon.

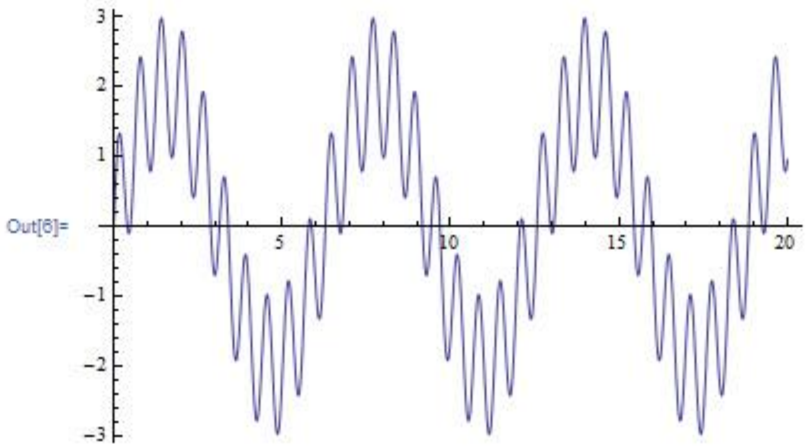
Temperature is seen as a "vibration" which is a sign of temperature. How can we model this Pi-Space temperature "vibration" using the WaWiW notation?

Let's take any arbitrary Nx(0) wave containing one or more child-waves. For simplicity, the diagrams I'll show just assume one parent and one child wave but in reality the nested waves go deeper. However, these are sufficient to show the principle of temperature in action.

For now we don't care if it's an electric wave, a Bozon carrying temperature, a Fermion or whatever. We just want to show Lower Temperature and Higher Temperature and Zero Temperature. Later, I'll dive into the detail of the Classical Laws, Bose-Einstein Condensate, Super Fluidity and Super Conductivity etc; based on these simple Pi-Space temperature diagrams. All of the current behavior we can see and measure extend from these simple concepts with some additional detail.

1. Higher Temperature (Higher Amplitude Wave size 2.0 Nx(0) Amplitude,)

In[6]:= `Plot[2 Sin[x] + Sin[10 x], {x, 0, 20}]`



2. Lower Temperature (Lower Amplitude Wave size 0.5 Nx(0) Amplitude)

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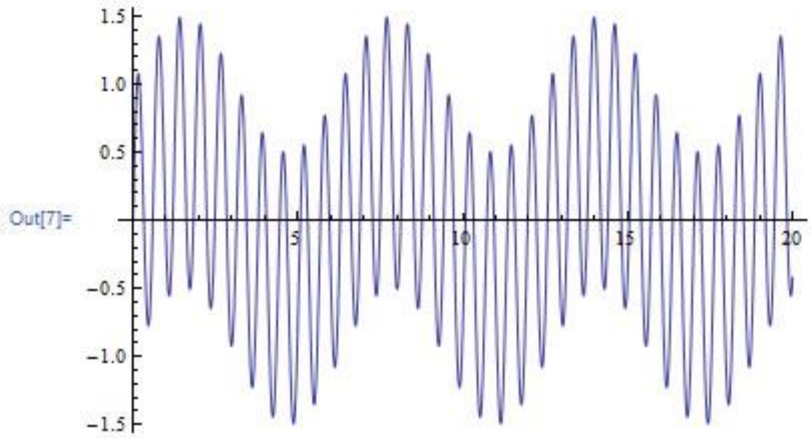
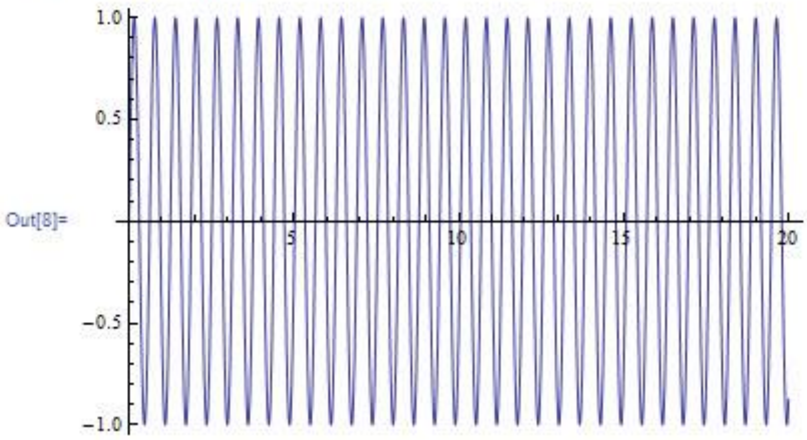


3. Close to Absolute Zero (Zero Amplitude Wave size 0.0 Nx(0) Amplitude)

In[8]:= `Plot[0 Sin[x] + Sin[10 x], {x, 0, 20}]`



Note how the last temperature example looks quite different. As a consequence I'll show how extreme temperature change alters the very behavior of substances in our reality.

Absolute Zero requires all Waves Within Waves to have zero amplitude. For the most part in this document we deal with just having the Local Waves with zero amplitude to demonstrate matter in another state.

1.2 Average Molecular Kinetic Energy In Pi-Space

Let's map the average molecular kinetic energy to Pi-Space and solve a sample problem. Let's do it classically and using Pi-Space

Transverse Kinetic Energy

$$< KE_{tr} >= \frac{3}{2}kT = \frac{1}{2}mv^2$$

Solving for velocity

$$v = \sqrt{\frac{2 < KEtr >}{m}}$$

Solving for Velocity in Pi-Space, we have the form

$$v = Cos\left(ArcSin\left(1 - \frac{\frac{3}{2}\frac{kT}{m}}{c^2} \right) \right) * c$$

Let's solve a problem

Find Transverse KE and Average Velocity

T = 27 Degrees Celsius = 300 Kelvin
Mass Helium = 6.65*10^-27 Kg

Solve for Classic

KEtr = (3/2)∗(1.38∗10^−23)∗(300)= 6.21×10^{-21}

Solving for Velocity

Sqrt[(2.0*(6.2*10^-21))/(6.65*10^-27)]

V = 1365.53 = 1.37*10^3 m/J

Solve for Pi-Space

V =
(Cos[ArcSin[
 1 - (((6.21*10^-21)/(6.65*10^-27))/(299792458^2))]])*(299792458)
Gives us

V = 1366.63 = 1.37*10^3 m/J

1.3 Temperature and Pressure In Pi-Space

In Pi-Space, heat in a fluid is on the local plane where the particles are. In order to map to Pi-Space we need to determine what the effect of Temperature on the wave function is.

The ideal gas law shows us the relationship.

$$pV = nRT$$

Volume stays the same so we see that increased pressure causes increased temperature. A larger pressure maps to a larger potential which in this case means larger wave amplitude. Additionally, a larger Temperature also means larger wave amplitude.

Note: When these large amplitudes act on one or more particles, they make them smaller and give them increased Kinetic Energy. I have already solved the velocity formulas for these cases.

We consider the use of Boltzmann's Constant k

$$pV = nkT$$

Let's consider the local plane once more. We add the pressure Potential.

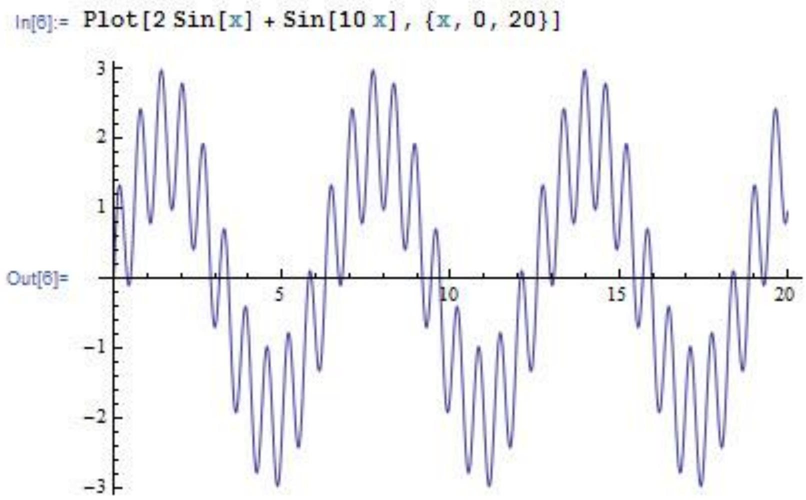
$$\left(\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t) - \Psi(r,t)\right) + \frac{\left(\frac{p}{\rho}\right)}{c^2}\Psi(r,t) \right)_{Local}$$

Next we add the temperature.

$$\left(\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)-\Psi(r,t)\right)+\frac{\left(\frac{p}{\rho}\right)}{c^2}\Psi(r,t)+k\frac{(\nabla T)}{c^2}\Psi(r,t)\right)_{Local}$$

The wave function is expressed directly here. In the wave-within-wave design pattern, we can draw this as follows

1. Higher Temperature/Pressure Potential (Higher Amplitude Wave size 2.0 Nx(0) Amplitude)



Temperature and Pressure are at the Nx(0) layer.

If we drop the Kinetic Component (we have already solved this for the Average Transverse Kinetic Energy and Pitot Pressure) and focus on the potential for a closed system we are left with the two values equal to one another. The reason for this is that they share the same underlying wave function within the closed system with a fixed volume.

$$\frac{\left(\frac{p}{\rho}\right)}{c^2}\Psi(r,t)=k\frac{(\nabla T)}{c^2}\Psi(r,t)$$

$$\frac{\left(\frac{p}{\rho}\right)}{c^2}=k\frac{(\nabla T)}{c^2}$$

This is the same as

$$pV=nkT$$

1.4 Charles Law Temperature And Volume In Pi-Space

Temperature and Volume are related in Charles Law. The pressure stays constant. We end up with the following expression.

$$V \alpha T$$

Also this can be expressed as

$$\frac{V1}{T1} = \frac{V2}{T2}$$

So, far we have not expressed Volume in the Pi-Space formula. How does this law relate to Pi-Space?

$$\left(\left(Cos\left(ArcSin\left(\frac{v}{c} \right) \right) \Psi(r,t) - \Psi(r,t) \right) + \frac{\left(\frac{p}{\rho} \right)}{c^2} \Psi(r,t) + k \frac{(\nabla T)}{c^2} \Psi(r,t) \right)^{Local}$$

We know pressure is constant so we can drop the Pressure

$$\left(\left(Cos\left(ArcSin\left(\frac{v}{c} \right) \right) \Psi(r,t) - \Psi(r,t) \right) + k \frac{(\nabla T)}{c^2} \Psi(r,t) \right)^{Local}$$

Next we need to show the relationship between temperature and volume.

In Pi-Space, temperature alters the area of a Pi-Shell/atom. Also, in earlier sections, I also showed that a Gravitational potential or Pressure alters the area of a Pi-Shell. In my Gravity work, I showed that Gauss' Law for Gravity showed that Gravity alters the Volume of a Sphere. This is foundational.

$$\Phi_D = \oiint_S D.dA$$

Therefore any area change to an atom causes a Volume change. What Gauss' Divergence theorem states is that an area change to a Sphere also alters its volume. If you are unsure of this, please read the Quantum Theory doc or Gauss' Theorem. Therefore temperature change alters the volume of a Pi-Shell or Mole of atoms.

$$\left(\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)-\Psi(r,t)\right)+k\frac{(\nabla T)}{c^2}\Psi(r,t)\right)^{Local}\alpha volume$$

This is how we describe Charles' Law in Pi-Space.

1.5 Boyles Law Pressure And Volume In Pi-Space

Pressure and Volume are related in Boyles Law. The two values are inversely proportional to one another when temperature is constant in a closed system.

$$p1v1 = p2v2$$

From this we can see that pressure and volume are inversely proportional to one another. How can we represent this in Pi-Space? This is reasonably easy. Let's take a look at the Pi-Space equation.

$$\left(\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)-\Psi(r,t)\right)+\frac{\left(\frac{p}{\rho}\right)}{c^2}\Psi(r,t)+k\frac{(\nabla T)}{c^2}\Psi(r,t)\right)^{Local}$$

We know temperature is constant so we can drop the temperature.

$$\left(\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)-\Psi(r,t)\right)+\frac{\left(\frac{p}{\rho}\right)}{c^2}\Psi(r,t)\right)^{Local}$$

We know density is mass divided by volume.

$$\left(\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)-\Psi(r,t)\right)+\frac{\left(\frac{p}{\left(\frac{m}{v}\right)}\right)}{c^2}\Psi(r,t)\right)^{Local}$$

Which give us

$$\left(\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)-\Psi(r,t)\right)+\frac{\left(\frac{pV}{m}\right)}{c^2}\Psi(r,t)\right)^{Local}$$

Therefore we can see pV is a constant. This is how we see Boyle's Law in Pi-Space. Please note that the expression on the left is the Kinetic Component related to any particular pressure. I've already solved this in the Quantum Theory doc relating to Pitot.

1.6 First Law of Thermodynamics In Pi-Space

This is a conservation of energy for Thermodynamic systems. It is usually formulated by stating that the change in the internal energy of a closed system is equal to the amount of heat supplied to the system, minus the work done by the system on its surroundings. The law of conservation of energy can be stated: The energy of an isolated system is constant.

$$dU = dQ - dW$$

In Chemistry, we have

$$dU = dQ + dW$$

Let's map this to the Pi-Space formula. U is the total energy of the system. Q is the heat of the system and W is the work done.

In Pi-Space, we use a Hamiltonian to express the total energy of a system which is zero

$$\left(\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)-\Psi(r,t)\right)+\frac{\left(\frac{p}{\rho}\right)}{c^2}\Psi(r,t)+k\frac{(\nabla T)}{c^2}\Psi(r,t)\right)^{Local}=0$$

The expression on the left is the Kinetic Component. The expressions on the right are the Thermodynamic components. These are temperature and PV (pressure volume).

So we can lose the parts we don't need and show that they represent a constant energy value U in a closed system.

$$\frac{\left(\frac{p}{\rho}\right)}{c^2}\Psi(r,t)+k\frac{(\nabla T)}{c^2}\Psi(r,t)=U$$

In the case of a closed system where there is being work done by it, we can express a gain in one part to the heat as a loss on the other. Therefore, we can say

$$k\frac{(\nabla T)}{c^2}\Psi(r,t)-\frac{\left(\frac{p}{\rho}\right)}{c^2}\Psi(r,t)=U$$

This is analogous to

$$dU=dQ-dW$$

Also, if an outside temperature gain due to heating is added, then the total energy of the overall system increases.

$$k\frac{(\nabla T)}{c^2}\Psi(r,t)+\frac{\left(\frac{p}{\rho}\right)}{c^2}\Psi(r,t)=U$$

This is analogous to

$$dU=dQ+dW$$

In case one is wondering where Pressure and Volume is, I already showed

$$\frac{\left(\frac{pV}{m}\right)}{c^2}\Psi(r,t)=\frac{\left(\frac{p}{\rho}\right)}{c^2}\Psi(r,t)$$

This gives us

$$k\frac{(\nabla T)}{c^2}\Psi(r,t)+\frac{\left(\frac{pV}{m}\right)}{c^2}\Psi(r,t)=U$$

This matches

$$dU=dQ+pdV$$

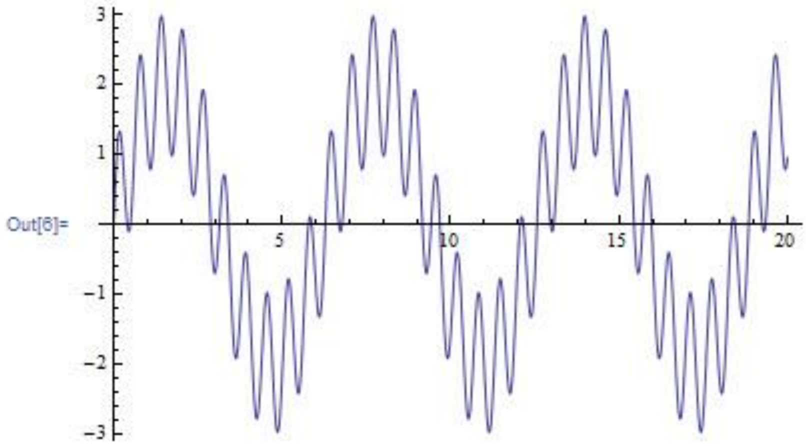
Note: The wave function can be dropped if, for example, the object is symmetric. Please take a look at how the shape of the container affects the wave function for Venturi and so on in the Quantum Theory doc.

1.7 Second Law of Thermodynamics in Pi-Space

Heat moves from hot to cold. This indicates the preferred vector component of the waves which carry the heat. Therefore, larger amplitude waves move to smaller amplitude waves.

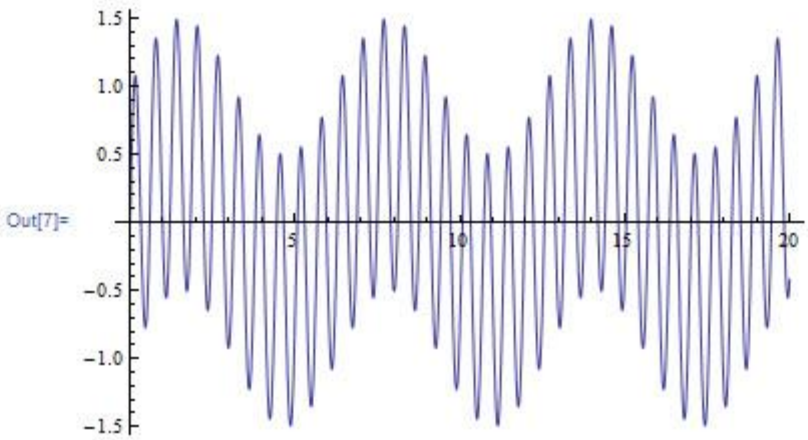
1. Higher Temperature (Higher Amplitude Wave size 2.0 Nx(0) Amplitude,)

In[6]:= `Plot[2 Sin[x] + Sin[10 x], {x, 0, 20}]`



2. Lower Temperature (Lower Amplitude Wave size 0.5 Nx(0) Amplitude)

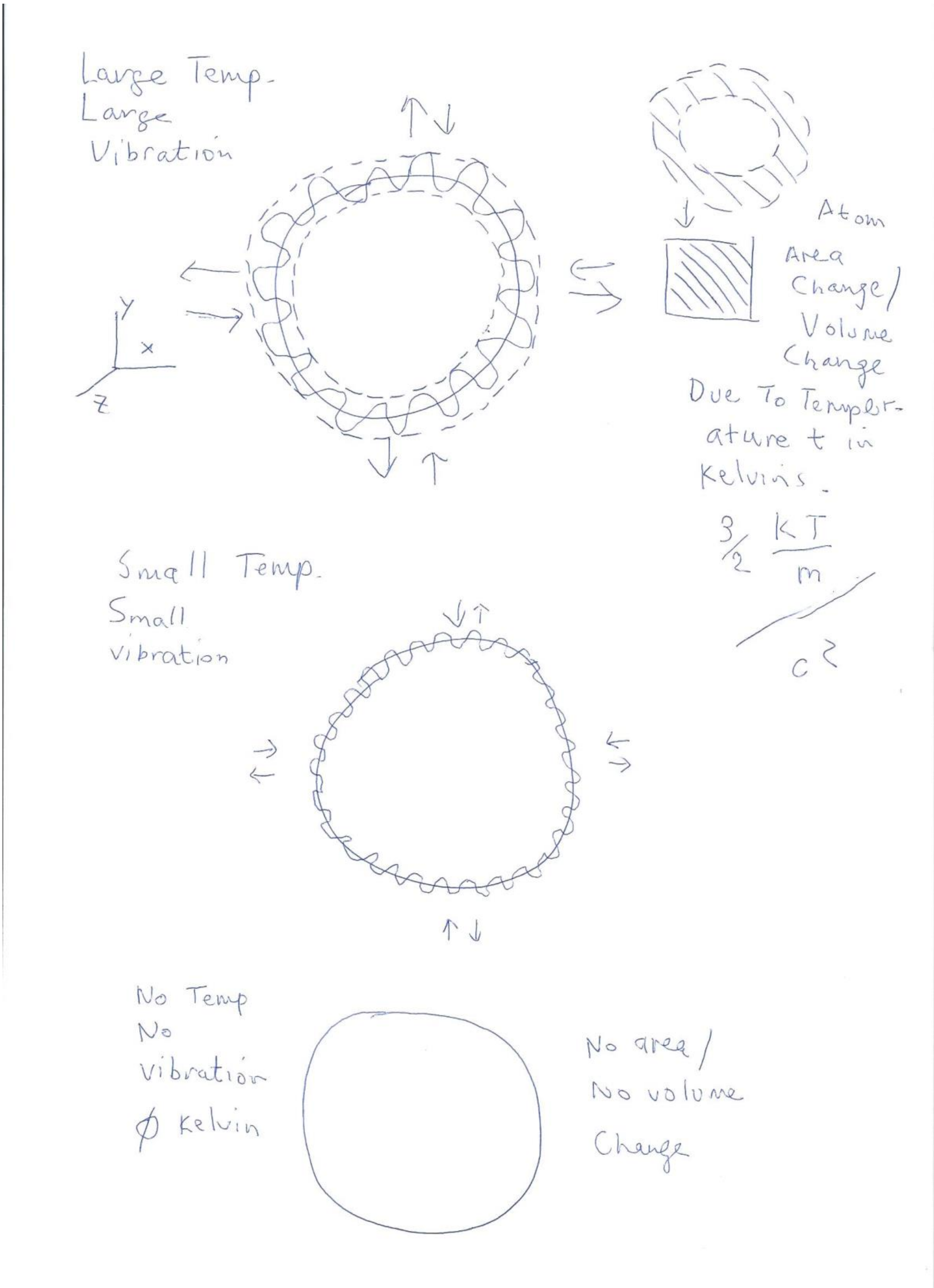
In[7]:= `Plot[0.5 Sin[x] + Sin[10 x], {x, 0, 20}]`



In practice this is similar to the Principle of Least Action except we are dealing with wave length as opposed to wave amplitude. Waves move towards a place where the smallest waves are. When an object falls under Gravity, it moves towards the center of Gravity. This is where the waves are the shortest. High pressure moves to low pressure. This is where the atoms have the least vibrations. Either the shorter wave length or the shorter wave amplitude is the preferred vector component. Therefore we can say that minimizing Nx(0) is the preferred vector component.

1.8 Drawing of Hot/Cold Particle in Pi-Space

Here is a rough hand drawn picture of a hot and cold particle.



Note: In the above diagram I refer to 0 Kelvin for No Vibrations. This is actually "close to" absolute zero because of the Nx(1++) waves still remain and there are still some remaining which are smaller than the Planck Length.

One can see from the picture that increased temperature means larger wave amplitudes on the particle in question. This in turn increases the vibrational nature of the particle. It also translates into an area change on the particle which can be mapped to an area/volume change. Remember in Pi-Space that area change translates to Classical Energy so we can then use this in the Translational Kinetic Energy formula I derived earlier.

1.9 Radiation and Lasers in Pi-Space

Now that we have established the idea of temperature in Pi-Space being amplitude related, we can apply this principle to Electromagnetic Radiation. We focus on the Electric wave which is Ne(0). In the Advanced Quantum Section, we defined the Electric part of the wave as follows.

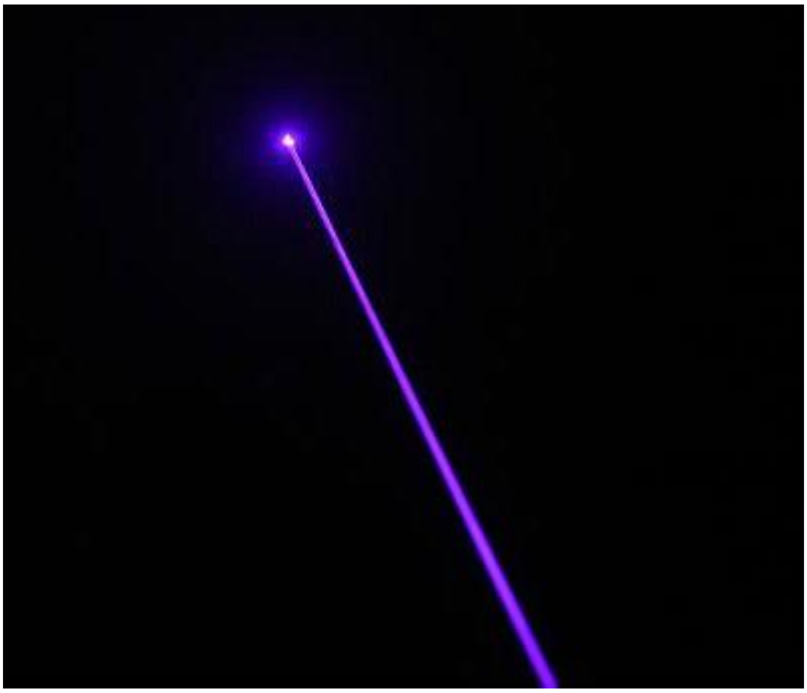
The Photon is a gauge Bozon. This is pretty straightforward to model. We define just the Ne(x) Electric wave for now. The Nm(x) Magnetic wave is the same just orthogonal. It's Ne(0).

In this case, the amplitude is 1. This is analogous to a temperature. The larger the amplitude, the larger the temperature it carries. Photons can be placed on top of one another so that their amplitude increases and therefore their temperature increases. This is how lasers work. Photons are placed on top of one another and the amplitude keeps getting larger; for example if you placed two one top of one another you would have amplitude 2. Photons are therefore seen as radiation. Visually they form a "beam of light". The wavelength determined the color. The amplitude determines the brightness and strength of the beam.

Now, in order to understand the meaning of the Wattage of a laser, here is how it works in Pi-Space. Let's imagine one has a laser which has power of 1Watts, what does this mean?

Translated into a Pi-Space understanding, this means that the amplitude of the radiation beam while interacting with a mass of one kilogram over one second causes the mass to lose area of 1/c^2. This is analogous to one Newton per second.

The altered amplitude change causes an area change and the object appears to burn/melt if sufficiently strong.



1.10 Bose Einstein Condensate

Bose and Einstein worked on a statistical model for low temperatures and realized that Bozons condensate at ultra low temperatures. In this piece I will not reverse engineer the math but I will explain purely in Pi-Space at a conceptual level what is happening. Cold atom physics is probably the most interesting area of the Pi-Space Theory in terms of what one can do with matter in this state.

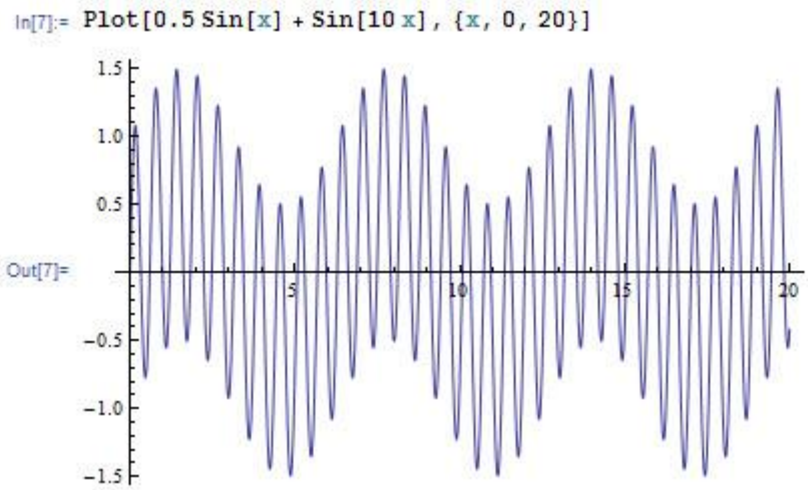
Recall that temperature equates to an amplitude at the Nx(0) layer. This is the Local wave. By this I mean these are the waves that are most readily measurable in our reality. For example, we have the Ne(0) wave which is the electric wave and it can carry heat.

Let's draw this once more for an atom with the Ng(x) waves.

Recall that Ng(0) is the gravity wave which causes the atom to have diameter d. Inside that is the Ng(1) which is the Mass wave. Therefore Mass generates a Gravity field. I've explained this in the Advanced Quantum Theory doc.

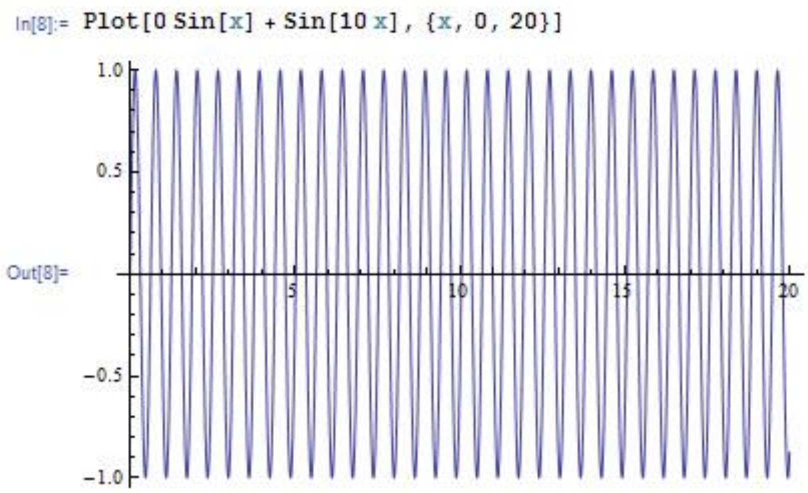
Let's lower the temperature of the atom.

1. Lower Temperature (Lower Amplitude Wave size 0.5 Ng(0) Amplitude, Mass Ng(1) is 10, amplitude 1)



What happens if we lower the temperature of the Ng(0) to absolute zero?

2. Absolute Zero (Zero Amplitude Wave size 0.0 Ng(0) Amplitude, just mass 10 Ng(1))

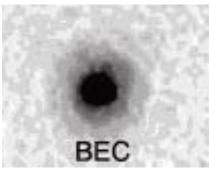


We now only have the Ng(1) mass waves which is what remains in the condensate. We no longer have a particle but clumps of Non-Local Ng(1) waves.

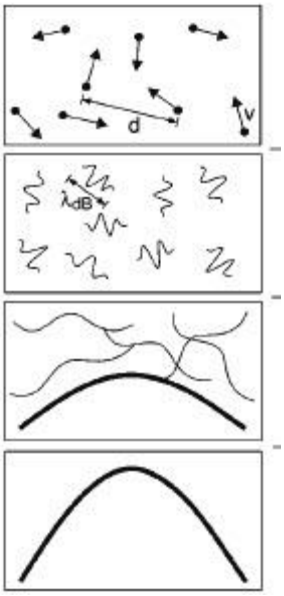
The atom still exists and has mass and a diameter d. It still exists in our reality but has entered a new state. The atoms clump together and form a condensate**. In Pi-Space the way we describe this is that we have created a Non-Local Wave Pool.** Namely, we are dealing with matter which has no Ng(0) waves. When we look at it, it should appear dark as Ne(0) carries photons. Also because it has no Ng(0) waves is has only the properties of Ng(1) which is the mass waves and deeper. I will explain the more interesting properties later like why light stops in Bose Einstein condensate and so on later. Importantly from a Quantum Mechanical view point, **no information is lost inside a condensate**. It is merely stored in the lower Ng(1) and deeper waves or simply held in place until transport is available (e.g. reheating). The condensates are the way to understand what happens in a Black Hole for example. The difference of course is that the wavelength is not shortened in a condensate.

All we are essentially doing with a Condensate is removing or dampening down the wave amplitude and effecting wave loss at a particular layer. This is all I want to explain here for now. More math will come later. All a Bose Einstein condensate does is lower the Nx(0) amplitudes. This may not seem like such a big deal but in Pi-Space it opens up a whole new way to do things Non-Locally which may seem to defy our intuition of what our reality is. However, all one is really doing is transferring either matter or information on Non-Local waves; namely Nx(1++) waves.

What it looks like (Non-Local wave pool)



The Local waves Ng(0) form around the condensate and we get a large wave length around the condensate. It grows as the temperature drops. To a certain extent it has dropped out of our reality but in Pi-Space the preferred term is a Non-Local wave pool. (diagrams respectfully borrowed from Ketterle doc).



1.11 Bose Einstein Math

Bose Einstein condensate uses a statistical distribution model. Here I'll show how the current math ties in with Pi-Space.

The statistical model uses the Exponent

$$f(E) = \frac{1}{Ae^{\frac{E}{kT}} - 1}$$

Also we know from Euler that

$$e^{ix} = \cos x + i \sin x$$

Recall from the advanced quantum section that Ne(x) and Ng(x) were modeled as out of phase with one another. This is another wave of saying cosine x and sine x. Therefore, the exponent in this form represents Ne(x) and Ng(x).

Now, I also stated that temperature is based on the wave amplitude which maps to the value "A" in Bose Einstein distribution. It can be carried by either the Electric Wave Ne(x) or Ng(x).

Therefore we can rewrite the Bose Einstein distribution so it is compatible with Pi-Space

$$f(E) = \frac{1}{A\left(\cos \frac{E}{kT} + i \sin \frac{E}{kT}\right) - 1}$$

This formula represents both the Ne(x) and Ng(x) which are out of Phase with one another. Also it only represents the local Ne(0) and Ng(0) waves. Amplitude A is 0 when absolute temperature is 0.

Recall from the previous diagrams that Ng(0) is modeled as a Sin wave, therefore

$$Nx(0) = Ai \sin \frac{E}{kT}$$

We can drop the imaginary axis i as this maps to the unit circle which is the path of the wave around the particle.

$$Nx(0) = A \sin \frac{E}{kT}$$

The Pi-Space interpretation of this is that Amplitude A size maps to the temperature. A zero temperature maps to a zero amplitude size.

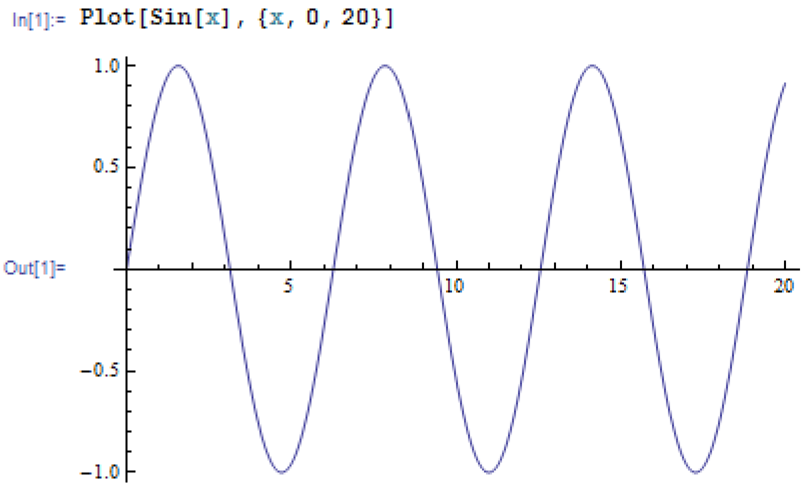
This formula only covers the Nx(0) layer and Pi-Space models the deeper inner waves.

1.12 Slowing Light In a Condensate In Pi-Space

I will discuss the high level theoretical way that light can be frozen in a Condensate in Pi-Space.

Please read the Advanced Quantum doc if you are unsure of Ne(x) and Ng(x).

Light is a gauge bozon and so exists purely on Ne(0)



It is a massless wave and a so-called Local wave on Layer 0

In order for light to move through a medium there needs to be transport waves on the respective Ne(0) layer in the medium the waves are moving through.

This can be provided for example by an atom at room temperature which contains Ne(0) waves. It can therefore absorb and then re-emit Ne(0) waves.

It can also pass through a "transparent" material which contains Ne(0) waves.

Let's describe the well known EIT experiment (Electromagnetically induced transparency) where light is "frozen".

The material (could be sodium atoms or silicon) is cooled to near absolute zero Kelvin.

Therefore the atoms provide no transport support for light Ne(0).

A coupling beam is shone on the cold atoms which allows them to vibrate which maps to a particular probability amplitude A. In Pi-Space this maps to Ne(0) waves on the cold atoms to have a specific amplitude. In Quantum Mechanics this is the n|> notation but is essentially a probability amplitude.

Next, the probe pulse is sent through the cold atoms. This is a guage bozon with a particular amplitude on the Ne(0) layer.

The amplitudes of the coupling beam and probe are coherent to they pass through the Ne(0) coupling waves on the cold atoms and the atoms become "transparent".

However, next the coupling beam is turned off. The cold atom no longer has sufficient amplitude support for light. Therefore the probe pules Ne(0) light waves have no transport waves on the Ne(0) layers of the atom so the probe light waits until Ne(0) transport is available in the medium. Therefore we have "frozen" light.

Also, the less Ne(0) waves there are on the cold atoms, the "slower" the Ne(0) light waves move. *Imagine a high speed highway where ultra cold holes in the road occasionally open up and the cars (light waves) have to wait until they fill back in.*

Ne(0) light waves need to move through Ne(0) transport waves provided by the medium. It there are no transport waves you have caught them. Typically we do this by freezing atoms.

Note: If one understand this principle there is no reason why one cannot go a level deeper and alter/dampen the amplitude of waves which carry "mass waves". I will describe more on the theoretical implications of this later and theoretical cool stuff here. Clearly in this case, light does not carry mass so it is a moot point for now at least.

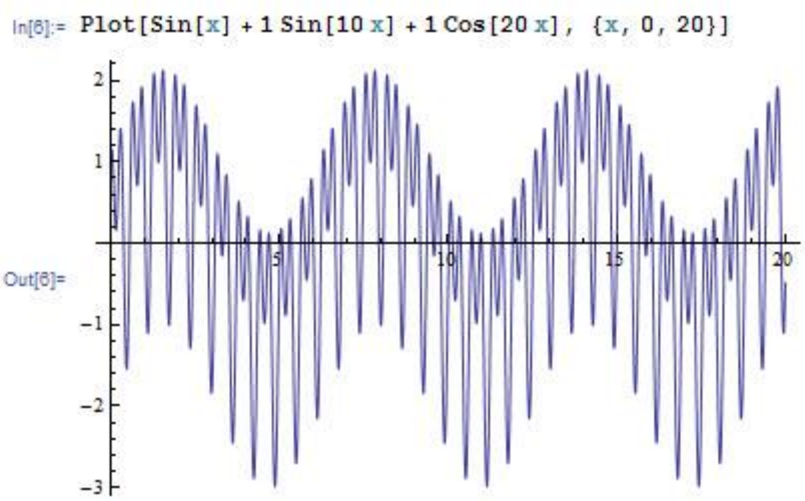
1.1 Modeling Electron Heat In Pi-Space

When electrons flow through power lines the voltage is stepped up in transformers to lessen power loss. Therefore it is the electron current I flowing through a wire which causes increased lost power, through heat for example. So how can we model an electron heating a wire for example in the Pi-Space Theory?

Recall how we modeled an electron in the Advanced Quantum Theory doc.

An Electron -1 charge

Ne(0) = Sine = Electric Sine wave
Ne(1) = Sine = Charge
Ne(2) = Cosine = -1 Charge Type



Ne(0) is the local electric wave and it is this wave which creates the heat. It does this by interacting with the atoms in the wire and increasing wave amplitudes.

From Band Theory, valence electrons can be excited to a conductive state and the atom in general can begin to vibrate with increased amplitude. When wave amplitudes increase sufficiently they can jump states.

This is defined formally by the Fermi Energy formula.

$$F_e(\varepsilon) = \frac{1}{e^{\frac{(\varepsilon-\mu)}{(kT)}} - 1}$$

Applying the Pi-Space Theory, the Ne(0) waves of the electron excite the band layers of the atom so that the atoms vibrates, increasing wave amplitudes in the atom. In some cases, the atom can glow and give off electromagnetic radiation which translates into an appliance providing heat. However, the key point to note is that it's the Ne(0) layers (electric wave part) of the electron which produces this effect by interacting with the atom.

The lesser charge Ne(1) and the charge type Ne(2) waves do not relate to the heating effect. It's important to understand this when we move to understanding the properties of Super Conductivity relating to super cooling. In this case, we need to ask the question: what happens to an electron and an electric current when one dampens/removes the Ne(0) waves so that they virtually disappear and all that is left is Ne(1) charge and Ne(2) charge type.

1.2 Modeling Electrical Resistance In Pi-Space

It's important to know what Resistivity is in terms of electrons flowing through a material before moving onto Super Conductivity. Resistance is measured in Ohm Meters.

$$\rho = R\frac{A}{\ell}$$

Where

R is the electrical resistance of a uniform specimen of the material (measured in ohms, Ω)

ℓ is the length of the piece of material (measured in meters, m)

A is the cross-sectional area of the specimen (measured in square meters, m^2).

We return to the definition of an electron in Pi-Space

Ne(0) = Sine = Electric Sine wave
Ne(1) = Sine = Charge
Ne(2) = Cosine = -1 Charge Type

Note that it is the Ne(0) local waves which experience "resistance" within a substance. The Ne(1) and Ne(2) waves do not experience the resistance. This is because they are much smaller. The sample diagrams are not to scale. I will discuss scale/size of waves in another section. For now, just understand that the Ne(0) waves are the ones which meet resistance within a substance and impede the progress of the electron flow / conductivity.

1.3 Modeling Voltage In Pi-Space

It's important to know how to model Voltage in Pi-Space. For example, later this understanding will help us understand what it means when we say Voltage is 0. Once more we return to the definition of an electron

Ne(0) = Sine = Electric Sine wave
Ne(1) = Sine = Charge
Ne(2) = Cosine = -1 Charge Type

So far from electrical heat and electrical resistance, we are dealing with the properties of the Ne(0) wave. In the case of voltage, it is also a property of the Ne(0) wave.

Classically we define the relationships to be

$$V = IR$$

Amps I is the number of electrons flowing through the conductor. Voltage is based on the hydraulic pressure analogy where one electron pushes against another. The more electrons that are pushing the greater the Voltage Potential difference is the way this is seen.

Modeling this in Pi-Space, Voltage is seen as Ne(0) waves pushing against one another which repel one another.

The electrons repel because the sign type wave Ne(2) function will increase amplitude if they combine and the goal of these waves is, if possible, to move towards waves of a different sign type and minimize the wave amplitude at Ne(2); therefore opposites attract. They will not occupy the same state was how Pauli described it but it's really more of a Symmetry Law in Pi-Space which I think is more intuitive. Negative flows to positive to minimize Ne(2) amplitudes. This is how this is seen in Pi-Space.

Final thought: Now that we have modeled Resistance, Current, Temperature and Voltage we see that all are modeled as properties on the Ne(0) layer in Pi-Space. We are now ready to describe Super Conductivity and other very interesting properties of electricity; namely the Ne(1++) properties where we say matter has moved to a new "state".

1.4 Modeling A Super Conducting Electron In Pi-Space

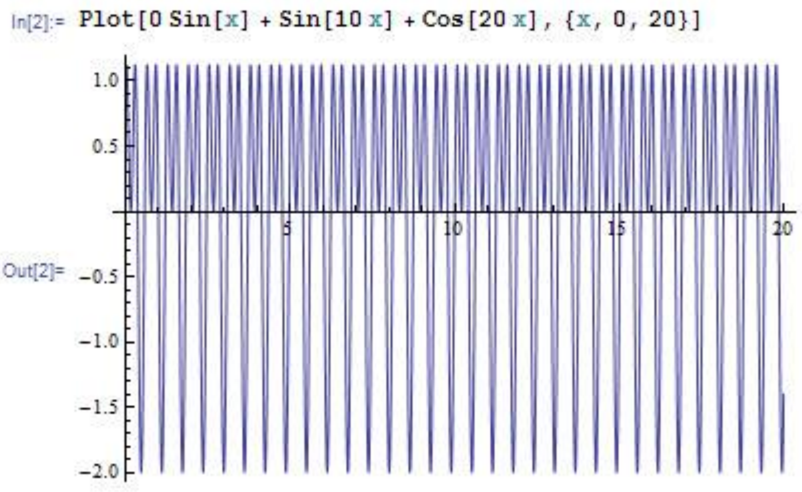
Let's model a Super Conducting electron in Pi-Space. In this case, we cancel the wave amplitude relating to the Electric Sine wave on Ne(0). This can be done by a variety of means but just for now, we assume there is some mechanism/device which achieves this effect.

~~Ne(0) = Sine = Electric Sine wave~~
Ne(1) = Sine = Charge
Ne(2) = Cosine = -1 Charge Type

So far from electrical heat and electrical resistance, we are dealing with the properties of the Ne(0) wave which is no longer present. Therefore now that we no Ne(0) wave, the electron has zero voltage, zero resistance, zero power loss as it flows. However, we still have charge on the Ne(1) layer and this forms the Super current running through the conductor. In terms of size the Charge waves on Ne(1) they are smaller than the Planck wavelength and deemed Non Local in that they are very difficult to measure experimentally at this size unlike the Ne(0) electric wave. Additionally, the orthogonal wave relating to an Electric Wave is the Magnetic wave and now that there is no Electric Wave, we cannot have a Magnetic Wave and in fact Magnetic Fields will be excluded from this Ne(1) layer where Ne(0) is missing. I will talk some more about this in the Meissner Effect piece.

In Pi-Space, we term Super Conducting electrons as forming a **"Charged Non Local Wave Pool"**. By this I mean, a Non Local wave pool containing Charge waves Ne(1++). The flowing Super Current can be seen as a **"Charged Non Local Wave Stream".**

Drawing it, it looks like this. We give zero amplitude to the first wave.



The benefits are clear, a power line / circuit with no power loss but the more important point is the scientific advantage of developing technology to adjust the wave amplitudes beyond just using temperature adjustments. Note: In Quantum Mechanics one tends to talk about Probability Amplitudes and can be seen as a precise Math approach to manipulate these amplitudes. These are analogous to the Pi-Space Wave Amplitudes. I may talk about this in a later section. For now I just want to focus on how to understand Super Conductivity at a Theoretical Level.

1.5 Modeling The Meissner Effect In Pi-Space

Let's model the Meissner Effect in Pi-Space. When an electron is forming a Super Current, it no longer has any Ne(0) waves.

In Classical Physics, this is stated as when E=0 then B=0.

So how do we model the Magnetic "B" field in Pi-Space?

For this, we have a complimentary magnetic wave which is orthogonal to the electric wave.

Therefore, we have a new Nm(*) wave within wave.
At present, we model the magnetic wave as follows

Nm(0) = magnetic wave

Therefore when Ne(0)=0 (*Amplitude*), Nm(0)=0 (*Amplitude*).

The complete Meissner effect assumes that Ne(0)=0 in the Super Conducting material. Later we can model the London Penetration which just means some of the outer edges of the Super Conducting material can carry an electric current, namely Ne(0) > 0.

However inside the complete Meissner effect we assume Ne(0) =0. Therefore, we cannot have any magnetic Nm(0) waves either as they are paired orthogonally (recall the Quantum Theory doc on this). By implication, the Super Conductor excludes a Magnetic Field.

Let's take the Classic example of placing a magnet on top of a Super Conductor at room temperature. Here we have

Note: T=Temperature, Tc=Critical Temperature

T > Tc

Ne(0) > 0
Nm(0) > 0

Now when we cool the Super Conductor to its critical temperature, we have

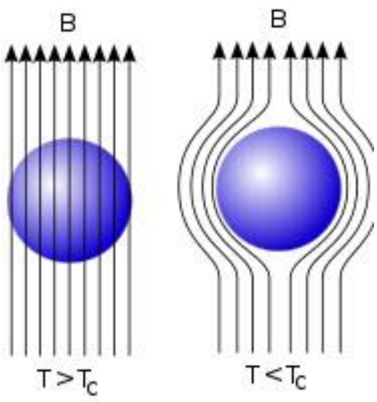
T < Tc

Ne(0) = 0
Nm(0) = 0

Therefore there is no transport layer for a Magnetic field and it is excluded. Recall the Bose Einstein case where we could "freeze" light and it turned out that this meant we could trap a wave traveling on a wave layer when it was not supported.

In this case, the field is excluded. Later I'll show how one can "trap" / "freeze" super currents inside a Super Conductor in the Type II example. There will be more on this later.

Let's see what this looks like. There are two temperatures. Think of the Magnetic lines as requiring Nm(0) waves and Ne(0) waves which are T>Tc to be inside the Super Conductor (at room temperature).



Note that if the magnet is on top of the Super Conductor when it is super cooled then the excluded Magnetic field, wraps around the Super Conductor.

1.6 Understanding Type I and Type II Super Conductors In Pi-Space At A High Level

Let's model the Type I and Type II Super Conductors in Pi-Space. Type I is the more straight forward case. In this case typically, we use liquid Helium to cool down a Super Conductor to its critical temperature.

In this case, all of the Super Conductor is typically below the critical temperature Tc and we have a super current.

Type I Super Conductor

T < Tc

Ne(0) = 0
Nm(0) = 0

This is what I call "brute force" cooling where the Helium cools the Super Conductor.

In the case of Type II Super Conductors, we do not use a brute force approach but we use an "Amplitude Subtraction" approach. What this means is that the arrangement of oscillating atoms in the material lessen the electron Ne(0) amplitudes such that they Super Conduct and form Super Currents Ne(0)=0. However, the effect of this is that not all parts of the Super Conductor create conditions where the electron forms a Super Current. Therefore there are "Local Wave Pools" within a "Non Local Super Conductor". In practical terms what this means is that there are cases where there are Super Conducting Locations and Non Super

Conducting Locations. I will provide more on the detail for this later. In this short term, just understand that a Type II Super Conductor contains both cases, namely.

Type II Super Conductor

T < Tc (e.g. Liquid Nitrogen)

Containing

“Non Local Super Currents”

Ne(0) = 0
Nm(0) = 0

And

“Local Wave Pools”

Ne(0) > 0
Nm(0) > 0

The Local Wave Pools support Electric and Magnetic Fields. An example of a Type II Super Conductor is $La_{1.85}Ba_{0.15}CuO_4$, BSCCO, and YBCO (Yttrium-Barium-Copper-Oxide), which is famous as the first material to achieve superconductivity above the boiling point of liquid nitrogen. Therefore, Type II are a mixture of Local and Non-Local effects which I will describe later. For now, please just understand these concepts.

1.7 How Quantum Tunneling Works In Pi-Space

Quantum Tunneling is reasonably straightforward to explain in Pi-Space. According to the Theory, our “solid” world is made up of Local Waves have Planck Length and Max Speed of Light C. These form atoms, planets and so on. Other waves form our Quantum Reality. So how can one wave “penetrate” or tunnel through another? The way this is described is that this happens at the Nx(1++) layer. In the case of an electron, the Ne(1++) wave carries the charge and the charge type and this wave is smaller than the Planck Length. Therefore, if this wave meets a Local wave it can “tunnel” through it. The distance is important because the transmitting Local wave must be in phase with one another on the other side in order to provide “transport” for the Ne(1++) waves carrying the charge. Therefore in certain situations when the two Local Transport waves on either side are in the right phase, the electron Ne(1++) piece can tunnel through a seemingly solid barrier.

e.g.

E>V

Ne(0) = Sine = Electric Sine wave (Local Wave/Local Solid)
Ne(1) = Sine = Charge (Tunneling wave)
Ne(2) = Cosine = -1 Charge Type (Tunneling wave)

E<V

Ne(1) = Sine = Charge (Tunneling wave)
Ne(2) = Cosine = -1 Charge Type (Tunneling wave)

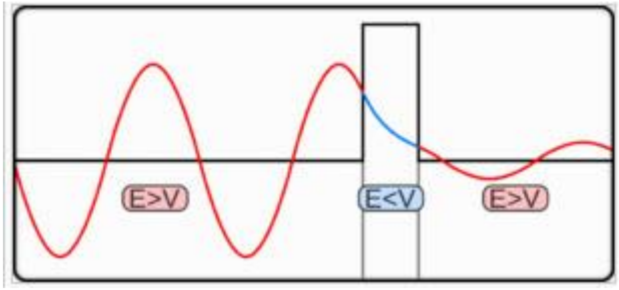


Diagram Sourced From Wikipedia

1.8 Josephson Effect

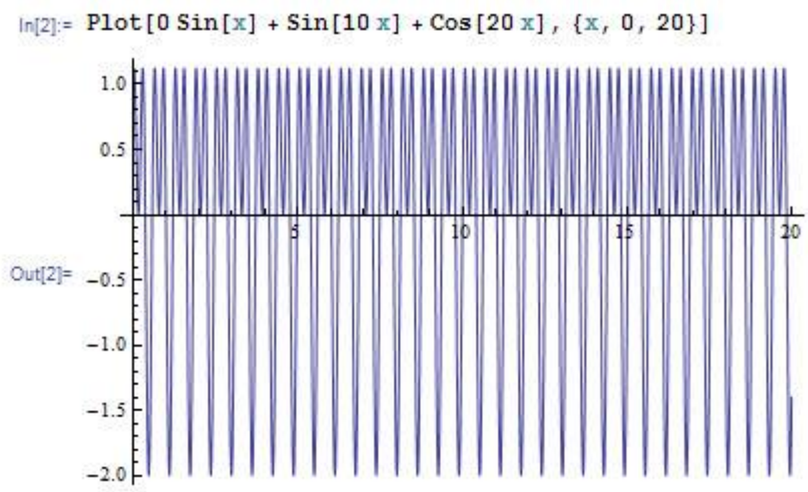
The Josephson effect is an S-I-S connection, namely it's a SuperConductor – Insulator – SuperConductor junction. The non-local charge is passed over the Insulator.

Super Conductor Flow

E<V

Ne(1) = Sine = Charge (Tunneling wave)
Ne(2) = Cosine = -1 Charge Type (Tunneling wave)

Drawing it, it looks like this. We give zero amplitude to the first wave.



The Mathematics are

$$I(t) = I_c \sin(\vartheta(t))$$

Here we see that the current which passes over is based on a Sine wave which maps to Ne(1++). This is an example of the Quantum Tunneling represented by Math.

1.9 SQUID Magnetometer In Pi-Space

A SQUID Magnetometer measures Magnetic fields. The way it does this is that it uses Josephson Junctions. If one passes E<V waves across an Insulator, these are very sensitive to Magnetic fields. This is because they are very small waves, on the order of the Planck Length. The Magnetic Field is Nm(0) and lower.

E<V

Ne(1) = Sine = Charge (Tunneling wave)
Ne(2) = Cosine = -1 Charge Type (Tunneling wave)

Magnetic Field is

Nm(0) = Sine = Magnetic Wave (Tunneling wave)

Therefore a Josephson junction is very sensitive to magnetic field because Nm(x) induces Ne(x) and conversely Ne(x) induces Nm(x).

Using this junction we can have sensitivity of the order of

Threshold for SQUID: 10^{-14} T

The Math flux quantized units are

$$\Phi_0 = \frac{2\pi\hbar}{2e} \cong 2.0678 x 10^{-15} tesla \cdot m^2$$

Here we see that these are the smallest Ne(0) local waves induced from a Ne(1++) carrier waves interacting with Nm(0) magnetic waves.

1.10 P vs NP Problems in Pi-Space

An interesting question which is raised in the Computability of any reality and by implication any physics theory is the question of P vs NP. The question that is raised is: Is P = NP? The answer in Pi-Space is that P != NP however, in order for Pi-Space to make such a claim, the logic is as follows.

Let's take two cases where Pi-Space must handle them.

In the first case, we take a P problem which can be solved in Polynomial time. In this case, we are dealing with the movement of an asteroid belt around the sun. This is computable but is a large problem and depends on the number of said particles and their distance from the sun.

In the second case, an NP problem, we are dealing with generating the entire Gravitational field for the entire known universe. To get to the point, it's not enough to calculate just the mass of the Earth. To do this correctly, one must calculate the mass for the entire universe to take into account every gravitational perturbation. Therefore, in a simple case, one can just focus on the Earth but to do it correctly, like reality must do, then it must be done for everything everywhere. This is therefore an NP problem where the calculation could simply take forever to figure out. So how does Pi-Space describe how this works?

In simple terms, P problems deal with the Local waves, namely Nx(0) waves. The world that we touch and feel and interact with it based on this category of waves. By implication we consider these solvable in Polynomial time. The simplest example of this is to compute the time taken for an object to move a distance under a specific acceleration. In the Newtonian world this is a Binomial problem, where we know the velocity and the acceleration.

$$t = \frac{v_{0y}}{g} \pm \sqrt{\frac{v_{0y}^2}{g^2} - \frac{2h}{g}}$$

Here we are dealing with Nx(0) calculations and this is a category P problem.

However, if we want to calculate the Gravitational field, we are dealing with an NP problem. For a planet, we know the mass but if we want to include everything we need to know all the masses and positions of everything at a split instant. Therefore, we are dealing with Nx(1++) waves which are Non Local. So how does reality have the "time" to calculate this? The answer is that the Nx(1++) waves are calculated before the Nx(0) waves therefore the Gravity field is always in place before the Nx(0) waves are complete. To a certain extent this model is a little like how distributed Computer processes work where certain results need to be computed before another step can occur. In Pi-Space, the deeper inner waves are analogous to "out of time" Local Waves. Recalling the work on Special Relativity, a smaller Pi-Shell which means a smaller Local Nx(0) wave, time shorten until time "stops" for the Local waves. However work is done on the Nx(1++) waves but Nx(0) is unaware of this like a "background process".

Therefore the answer to the question is

P != NP

The NP work is done in the Nx(1++) waves which are "out of time" relative to the Nx(0) waves.

This accounts for the "Spooky Action At A Distance" phenomena which Einstein noticed. These are external wave processes doing work independent of the Local Nx(0) waves. The idea being that EM properties are shared over large distances instantly without any seeming cause and effect. In Pi-Space these are seen as Nx(1++) properties associated with Non

Local “inner” waves which appear to operate instantly relative to the Local Waves which have maximum speed C. These are in fact NP processes as seen by Pi-Space as these generate fields and the like.

1.11 Quantum Computer in Pi-Space

In Pi-Space, we model local waves as Nx(0) and Non Local waves as Nx(1++). The Non Local waves operate out of time relative to the Local Nx(0) waves. Therefore, each wave set can be represented as a Hamiltonian. In order to process NP problems efficiently using this design pattern, one needs to assign Computability tasks to the Ne(1++) wave layer. Therefore this can be viewed as a Non Local Hamiltonian. These are the waves deeper than the Electric Wave and Gravity wave. I have already covered these in the Standard Model reverse engineering section.

1.12 Wave Within Wave For The Major Forces In Pi-Space

In Pi-Space, we model reality waves as having two waves which are out of phase. The Ne(x) carries the Electric Wave and the Ng(x) carries the Gravity wave. Inside each are deeper Non Local waves.

The combination of these waves alters the diameter or wavelength of a wave which in turn changes energy levels.

Each of these waves has a respective perpendicular wave. The Ne(x) has the Magnetic Nm(x) wave. Additionally, the Ng(x) has the Turbulence Nt(x) wave. Why do these waves exist at all? These are due to Conservation of Energy. A gain or loss of a Local Wave causes a resulting change on the perpendicular waves. Therefore the total change is zero relatively speaking.

Also, in Pi-Space there is a resemblance between Magnetic Waves and Turbulence Waves.

The Local waves are the Nx(0) waves. They have max speed C.

As the waves get smaller their energy content increases due to the shorter wavelength but are harder to measure in a Local context.

These properties of matter are mapped to Non-Local waves which operate out-of-time relative to Local waves and are responsible for Einstein’s Spooky Action At A Distance.

In Phase and Out of Phase waves combine to form Euler’s Exponent (e^i.Pi=-1) which is the high level building block of reality according to the Pi-Space Theory.

Ne(x) – The Electric Wave

Wave Ne(x)	*Name*	*Size (Decreasing)*
Ne(0)	Electric Wave	>= Planck Length

Ne(1)	Charge	< Planck Length
Ne(2)	Charge Type	
Ne(3)	3 Quarks	
Ne(4)	QCD Color	

Perpendicular Nm(x) – The Magnetic Wave

Wave Nm(x)	*Name*	*Size (Decreasing)*
Nm(0)	Magnetic Wave	>= Planck Length

Ng(x) – The Gravity Wave

Wave Ng(x)	*Name*	*Size (Decreasing)*
Ng(0)	Gravity Wave	>= Planck Length
Ng(1)	Mass	< Planck Length
Ng(2)	Neutrino	

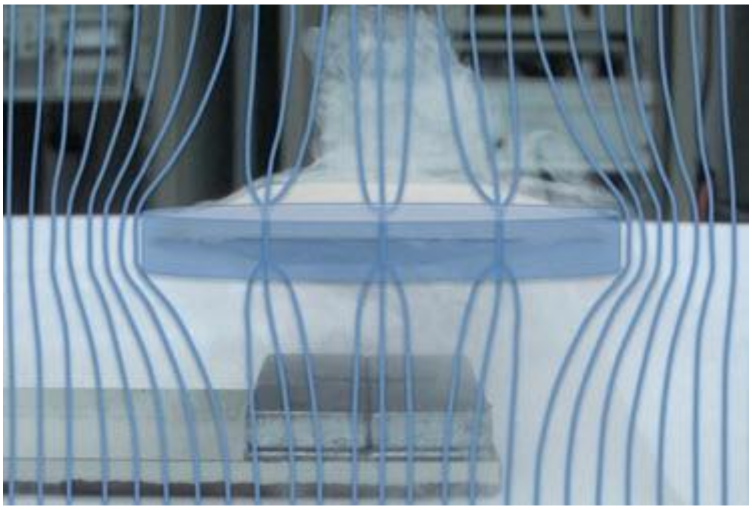
Perpendicular Nt(x) – The Turbulence Wave

Wave Nt(x)	*Name*	*Size (Decreasing)*
Nt(0)	Turbulence Wave	>= Planck Length

In Pi-Space, we model Local Waves as Nx(0) and Non Local waves as Nx(1++). Measuring Non Local waves using Local Waves is very difficult because of their size so this is how Pi-Space approximates String Theory (where measurement of waves this small is a known issue).

1.13 Magnetic Flux Lines for Super Conductor Type II

One of the cooler features of Super Conductor Type II materials is that they contain Magnetic Flux lines on their surface which allow them to float and become attached to rails (and the like) producing very nice real world demonstrations.



How can we describe this in Pi-Space? Recall that Type II Super Conductors unlike Type I Super Conductors use Amplitude Addition and Subtraction of the Local Waves to achieve Super Conductivity at higher temperatures. In other words, it is not “Brute Force”. The implication of this is that not all of the Object is Super Conducting. There are some parts of the surface of the Type II Super Conductors which have Ne(0) > 0 Local Waves. Therefore by implication they are capable of sustaining both an Electric and a Magnetic Wave. However this is only in certain parts of the Super Conducting material. In the diagram (courtesy of Scientific American) the Magnetic Field lines are only present in certain places on the material where we have local waves.

This is called a “Local Wave Pool” which supports E+M Local Waves.

Therefore in this case

Ne(0) > 0 and
Nm(0) > 0 <= magnetic flux lines

1.14 Cooper Pairs, BCS And Type I Conductors

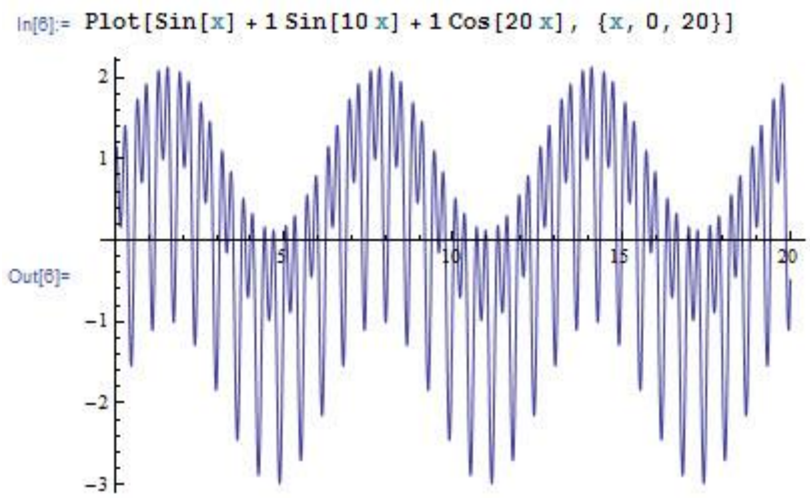
In the BCS explanation of Type I Super Conductors the lattice Phonons interact with Electron pairs moving through a metallic structure which causes them to Super Conduct. The Fermions/Electrons enter their ground state and behave like Bosons is the understood behavior.

Let’s try and explain this type of Behavior in Pi-Space.

The definition for an Electron is as follows.

An Electron -1 charge

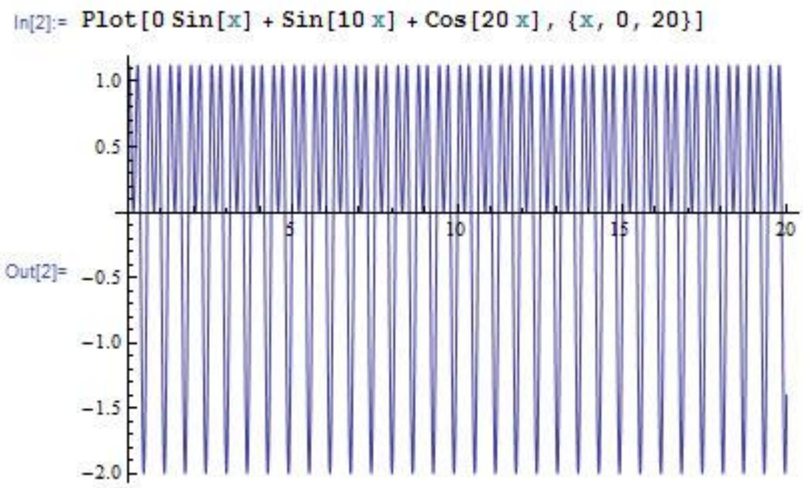
Ne(0) = Sine = Electric Sine wave
Ne(1) = Sine = Charge
Ne(2) = Cosine = -1 Charge Type



When an Electron enters its ground state in Pi-Space, this means that the Ne(0) Local Waves are tending towards 0.

Ne(1) = Sine = Charge (Tunneling wave)
Ne(2) = Cosine = -1 Charge Type (Tunneling wave)

Drawing it, it looks like this. We give zero amplitude to the first wave.



In this state they no longer look like "Classic Electrons" and enter a Super Conducting state where they are mainly Non Local.

In this case, the Pauli Exclusion Principle does not apply because the Local Waves are no longer present and they can combine Non Locally.

In this case, pairs of Electrons can combine at the Ne(1++) layer and can be "Boson Like" – but they are **not** Bosons (according to the Pi-Space Theory).

The Phonons in the lattice cause the Amplitude suppression of the Ne(0) waves in the Electron pair.

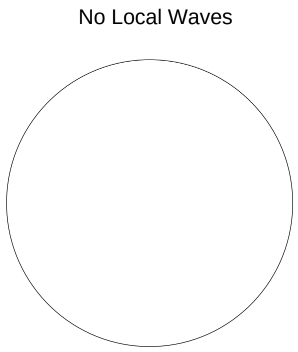
In Pi-Space, this is not a “special case” of the Pi-Space approach to Super Conductivity. The Phonons essentially suppress the Ne(0) Amplitude. In the other Type II case, Super Conductivity is also the product of Amplitude Suppression in which the different Lattice Atoms also interact with the Electrons to suppress the Ne(0) waves causing Super Conducting Electrons.

1.15 Lambda Point Super Fluid Temperature

When a fluid becomes a Super Fluid it does so at a temperature called the Lambda Point. For Helium II it is approximately 2.17 K at 1 atmosphere.

We can imagine a Helium II atom or Pi-Shell containing local waves. At this point it is not a Super Conducting Fluid. Its temperature is greater than the Lambda point.

In this simple example, we can imagine Nx(0) waves on the Helium II. Once it reaches the Lambda point, the Local Nx(0) wave amplitude is 0. We can draw this as follows.



However, although Nx(0) is 0, there are Nx(1++) waves still on the Super Fluid atom. These are Non Local but do contribute to the remaining temperature. Therefore, the Lamba Point is where the Nx(0) amplitude is 0. The remaining Nx(1++) contribute to the remaining temperature which in the case of Helium II is 2.17 K.

For example, if the atom contains Fermions we still have

Ne(1) = Sine = Charge (Tunneling wave)
Ne(2) = Cosine = -1 Charge Type (Tunneling wave)

1.16 Super Fluid Fermion and Boson

When a fluid becomes a Super Fluid we drop the local Nx(0) waves. In the case of a Fermion, we drop the Ne(0) and for a Boson we drop the Ng(0) wave.

Ne(x) – Super Fluid Fermion

Wave Ne(x)	*Name*	*Size (Decreasing)*
Ne(1)	Charge	< Planck Length
Ne(2)	Charge Type	
Ne(3)	3 Quarks	
Ne(4)	QCD Color	

Ng(x) – Super Fluid Boson

Wave Ng(x)	*Name*	*Size (Decreasing)*
Ng(1)	Mass	< Planck Length
Ng(2)	Neutrino	

Note that Charge and Mass are still carried even in a Super Fluid case.

Helium-4 is a boson particle
Helium-3, however, is a fermion particle

1.17 Gravity In A Super Fluid

This is one of the more interesting properties of a Super Fluid, namely how Classic Gravity affects a Super Fluid.

Recall that Gravity waves are at the Ng(0) layer.

Their wavelength is influenced by the combined mass waves which reside in the Ng(1) layer.

Using the Classical Newtonian approach, we have

$$Fg = \frac{GMm}{r^2}$$

Therefore the Ng(0) wavelength relates to Fg which translates to an area change on the Pi-Shell/atom. If you are unsure of this, please read the documents relating to Gravity and the Introduction to the Theory.

So what happens to a Super Fluid which has no Ng(0) waves which is how Classical Gravity operates on Classical fluid atoms?

Ng(x) – Super Fluid Boson

Wave Ng(x)	*Name*	*Size (Decreasing)*
Ng(1)	Mass	< Planck Length
Ng(2)	Neutrino	

The answer in Pi-Space is that Classical Gravity has little or no effect on a Super Fluid and is weak, governed only by those particles which have some Ng(0) waves. The Ng(1) wavelengths are in turn affected by the waves at the Ng(2) layer which is where Neutrinos are modeled according to the Theory and they have little or no mass of their own.

The fluid particles still want to move to a place where their wavelength is the shortest but do so in a weaker fashion than we are used to in a Classic context.

Therefore we can say that in a Super Fluid, the effect of Gravity on it is weak or negligible. By implication, forces at the Ng(1) layer will be stronger relative to the force of Gravity and the fluid will demonstrate what Pi-Space calls "Force Inversion". What this means is that normally weak forces at the Ng(0) layer become relatively stronger than Gravity in a Super Fluid. We can take a look at some well-known examples.

1.18 Helium Creep / Rollin Film

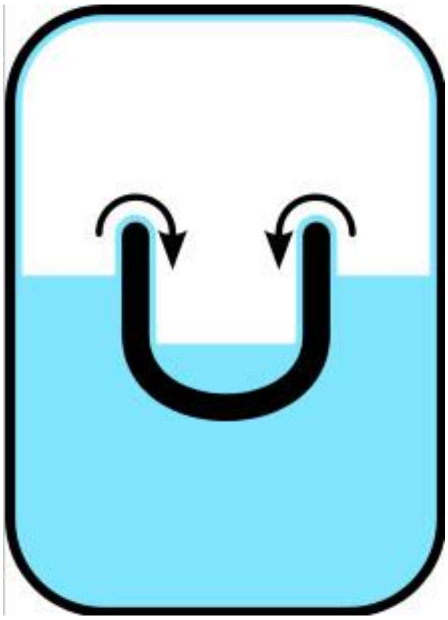
Super Fluid Helium will attempt to creep out of a container it is contained by to either obtain Super Fluid Equilibrium or to move to a location where the Wavelength is the shortest. In a typical Gravity field this is underneath the object. For Ng(1++) waves this is also underneath the container.

Now in this case, the effect of Gravity is almost nonexistent so we have Non Local wave behavior where the Ng(1++) waves find the path to the Shortest Wavelength location. As Gravity does not affect the fluid strongly, it moves around the container. What we witness is Nx(1++) wave behavior.

The Rollin Film which forms the Capillary action is also stronger than Gravity because the Super Fluid operates for the most part outside Classical Gravity which is at the Ng(0) wave layer.

Therefore what we see are normally weak forces operating more strongly and in effect ignoring Gravity at the removed/cooled Ng(0) wave layer as these forces operate at the Ng(1++) wave layer.

The Fluid equilibrium balances the Ng(1++) waves also so the locations of shortest wavelength are filled.



A Super Fluid in Pi-Space is termed a “Non Local Fluid” as it operates independently of Classical Gravity however it does seek out the Smallest Wavelength for its Ng(1++) waves. What one is looking at is a Ng(1++) fluid**. It’s inside our reality but operating at a different wave layer.**

Ng(x) – Super Fluid Boson

Wave Ng(x)	*Name*	*Size (Decreasing)*
Ng(1)	Mass Fluid	< Planck Length
Ng(2)	Neutrino	

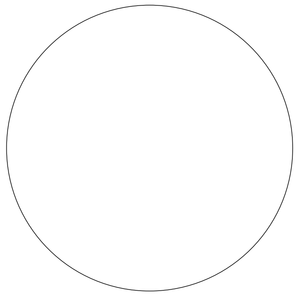
1.19 Helium Fountain

The Helium Fountain has two liquids. The Super Fluid and the Classical Fluid co-exist.

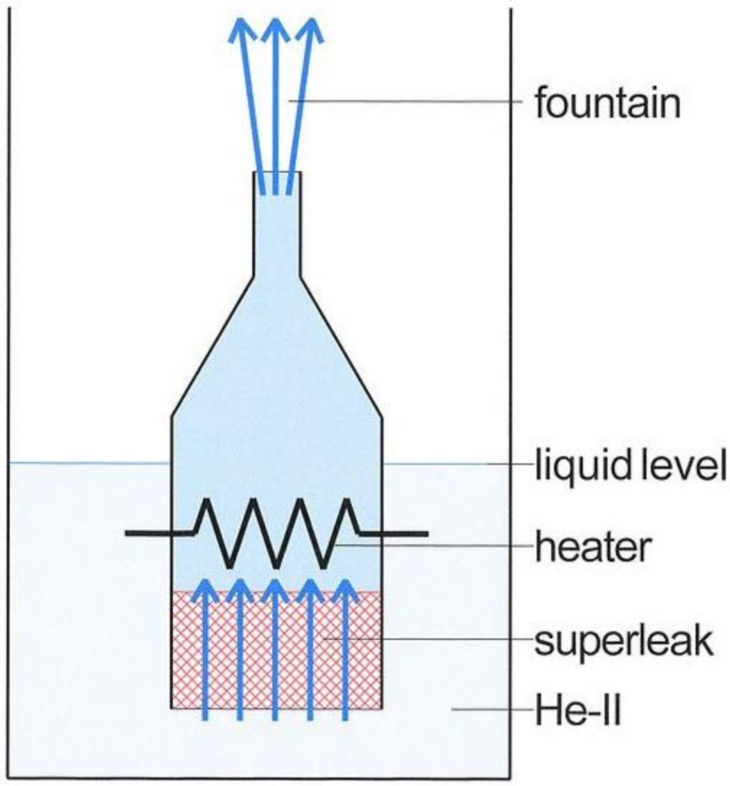
The Classical Fluid has local waves

The Super Fluid particles do not have local waves.

No Local Waves

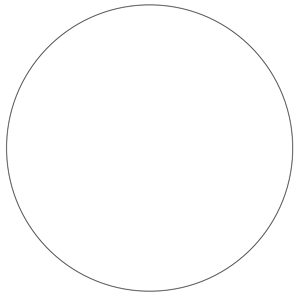


The Super Fluid is part of the Super Leak. Once it reaches the heater, it becomes a Classical Fluid and moves from Hot to Cold which causes it to form the fountain. It moves away from the heater.



1.20 Thermal Conductivity / Second Sound

When the fluid is a Super Fluid, the Phonon activity is removed and it has zero viscosity. The particles do not carry any Thermal waves.



Therefore when the fluid drops below the lambda point, it has high thermal conductivity. The heat waves travel through the Super Fluid like a Sound wave and it is called the Second Sound. This is because the Super Fluid does not carry any local waves. As the temperature drops further the heat waves travel even faster increasing to approximately 20 m/s around 1.8 K for Helium II.

1.21 Quantized Vortex Lines

An interesting question is how does a Super Fluid behave when it is spun in a container?

There are two distinct cases.

The first case is that the Super Fluid is beneath a critical velocity and the Super Fluid does not move at all relative to the container. **In Pi-Space this is because the liquid has formed no Classical Fluid atoms with local waves, namely Nx(0) waves.** Therefore, the Local Waves Nx(0) will not interact with the Non Local waves of the Super Fluid Nx(1).

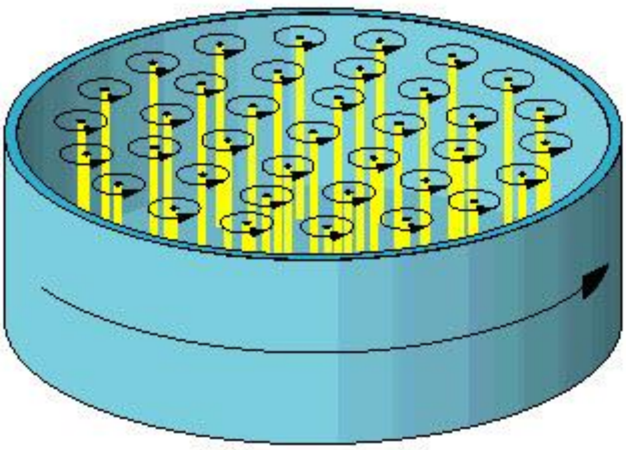
In the second case, the Fluid spins beyond the critical velocity and some of the Super Fluid atoms obtain Local Waves due to the movement of the container.

This is quite an interesting case. Inside the Fluid there are now Local waves which cause certain atoms to have local waves and they move with the container. They form atom "cores" (yellow lines in diagram).

Around them form, Vortex Fields which is already covered in the Pi-Space Theory. See the section on Navier-Stokes. They form perpendicular to the Local Fluids Atoms.

Additionally and more interestingly, the turbulence Nt(x) fields influence the Super Fluid atoms; therefore one can conclude that this is the way to move a Super Fluid, namely by the use Turbulence fields.

As a consequence of this, one can conclude that the Nt(x) field which is the product of Classical movement, contains Non Local waves which can in turn influence the position of Super Fluid atoms. This is a very interesting conclusion!



The yellow cores contain the Local waves. The arrowed circles around the yellow cores are the Turbulence Nt(x) waves.

Inside those Nt(x) waves are Non Local waves which cause the Super Fluid to rotate.

Perpendicular Nt(x) – The Turbulence Wave

Wave Nt(x)	*Name*	*Size (Decreasing)*
Nt(0)	Turbulence Wave	>= Planck Length
Nt(1)	**Super Fluid Wave**	**<Planck Length**

From a Math viewpoint

Curl **v** = 0, where **v**(**r**) is the velocity field.

The velocity around each vortex line is determined by h/m, where h is the Planck's constant, and m the mass of one atom.

What this means in Pi-Space it that we have a Local wave of Planck length. This is the smallest Local wave. This Local Ng(0) wave "carries" the Ng(1) mass waves which are Non Local and the product of these two waves produce Turbulence Nt(0) and Nt(1) waves.

It is Nt(1) which causes the Super Fluid to rotate as they are Ng(1++) waves.

Also this requires a "Critical Velocity" for the Ng(0) wave to form in the first place. Otherwise the Super Fluid will not rotate.

Measurements show there are approximately 1000 vortex lines in a container of radius 1 cm that is rotating 1 round per minute.