Restricted to brief peruse for research, reviews, or scholarly analysis, © with required quotation reference: ISBN-13: 978-8797246931

3.6. The Cyclic *Quantum* Oscillator Idea

We are now looking at an frequency-energy active ***entity*** Ψ as a single unified ***entity*** in physics.
We assume that Ψ can be split into a ***spectrum*** of cyclic oscillators Ψ_ω given by circle rotations as a ***primary quality***.
We remember that every circle oscillator ***entity*** Ψ_ω is given by an angular frequency energy ***quantum number*** ω. We remember that ***quantity*** $\omega \in \mathbb{R}$ is defined as a continuous ***spectrum***, as a prerequisite for Fourier transformations (1.81) section 1.7.7 and later below II. 4.1.4.2.
The stat-mode for a circle oscillator which we now call ψ_ω are mutually orthogonal when $\omega \neq \omega'$ as shown by (1.88). We remember that $\omega \in \mathbb{R}$ can be both positive and negative, as we defined it in section 3.1.7 of the cyclical rotation, which naturally applies to a harmonic circle oscillator

rotation	$u_\omega = e^{-i\omega t}$	$u_\omega^* = e^{+i\omega t}$	↻ ↺
$\omega > 0$	retrograde – clockwise	progressive - contra-clock	b d
$\omega < 0$	progressive – contra-clock	retrograde - clockwise	p q

Table 3.1 In the physics of a transversal plane of a circle rotation there is only one double degradation. The progressive is represented by $(+i, \omega{>}0)$ or $(-i, \omega{<}0)$ and the retrograde is represented by $(-i, \omega{>}0)$ or by $(+i, \omega{<}0)$.

The fundamental ideological foundation of the frequency image is the cyclic oscillation in a circle rotation where the *angular-frequency-energy* and *angular momentum* apply the quantum mechanical eigenvalue equations

(3.283) $$\hbar\omega\left(a_+^\dagger a_+ + a_-^\dagger a_- + 1\right)\psi(\varphi) \doteq E_\omega\psi(\varphi) \quad \text{and} \quad \hbar\left(a_+^\dagger a_+ - a_-^\dagger a_-\right)_3\psi(\varphi) \doteq \vec{L}_3\psi(\varphi).$$

I have above advocated, that these operators act on the virtual state modes $\psi(\varphi)$. States that not only oscillate in a transversal plane but also propagates into the future space, which is orthogonal to the oscillation plane. I.e., they produce a space of the past. (see e.g., -13)

The idea of the angular momentum operator $\hat{L}_3 = \hbar\left(a_+^\dagger a_+ - a_-^\dagger a_-\right)_3$ tests the virtual state-mode $\psi(\varphi)$ for rotation in a transversal plane $\odot$ to a ***direction*** $\mathbf{e}_3$, where $\odot \perp \mathbf{e}_3$ in space.
We have seen that the transversal circular rotation assumes eigenvalues $|\vec{L}_3| = \hbar 1$ with two states of angular momentum $\vec{L}_3 = \pm\hbar\vec{\mathbf{1}} \parallel \mathbf{e}_3$,[149] with the sign + for progressive $\vec{L}_3^+ = +\vec{\mathbf{1}}$, and − for retrograde $\vec{L}_3^- = -\vec{\mathbf{1}}$ rotation helicity, if $\hbar = 1$.
The idea of the Hamilton operator $\hat{H} = \hbar\omega\left(a_+^\dagger a_+ + a_-^\dagger a_- + 1\right)$ tests the virtual state mode $\psi(\varphi)$ condition of the angular frequency energy ω by first annihilating both the positive and the negative helicity, and then creating them identic again based on the idea of angular frequency energy ***quantity*** ω per se (itself).
Such an ***entity*** Ψ_ω, that satisfies (3.283) not only represents the concept of angular frequency energy of oscillation but also defines the concept of a ***direction*** $\hat{\vec{\omega}}$ caused by the angular momentum $\hat{\vec{\omega}} = \vec{L}_3^+ = -\vec{L}_3^- = \hbar\vec{\mathbf{1}}$. The main contention is that this is the ***direction*** from the past into the future, *FORWARD* through a transversal plane $\odot \perp \hat{\vec{\omega}} \parallel \mathbf{e}_3$.
This creates a quantum mechanical phase angle of development $\varphi = \omega t + \theta$, parameterised by t.
The fundamental physical ***entity*** for one quantity called a ***subton*** and the ***spectrum*** $\vec{\omega}$ is written

(3.284) $$\Psi_{\vec{\omega}}(\varphi) \sim \quad \psi_{\pm\vec{\omega}\perp\odot}(t) = \quad 2\tfrac{1}{\sqrt[4]{\pi}}\rho e^{-\frac{1}{2}\rho^2}\odot\left(e^{\pm i\omega t}\right)_{\odot\perp\vec{\omega}}, \quad \text{for } \forall\vec{\omega}, \quad \omega = |\vec{\omega}| \in \mathbb{R}_+.$$

These angular frequencies ω $[\hat{\omega}]$ should be counted as a ***quantity*** for us, it must be related to a given external angular frequency reference $\hat{\omega} \equiv 1$ $[\hat{\omega}]$. (Ding für Uns). The ***quality*** is the ***direction***.

[149] The idea $|\vec{\mathbf{1}}| = 1$ is the auto-norm of the quantum circle oscillator and not directly linked to our external norm $|\mathbf{e}_3| = 1$. It is the idea that the ***direction*** is the same $\mathbf{e}_3 \parallel \vec{\mathbf{1}}$ (for autonomous ***subton***, as for the condition a ***direction*** for us).

For quotation reference use: ISBN-13: 978-8797246931

Research on the a priori of Physics
Geometric Critique of Pure Mathematical Reasoning
Jens Erfurt Andresen
Edition 2, © 2020-22

3.6.1.2. The Direction

The ***direction*** in space, as a ***primary quality*** of an object for the development, is here indicated as a unit vector $\mathbf{e}_3 = \vec{\hat{\omega}}$, given by $|\mathbf{e}_3| = |\vec{\hat{\omega}}| \equiv \hat{\omega} \equiv 1$, due to the reference for the frequency norm $\hat{\omega} \equiv 1$ $[\hat{\omega}]$, and the fact $|\hat{\omega}^{-1}| = |\hat{\omega}|$ under condition $c=1$. Then we can write the rotation vector for an angular frequency ω as $\vec{\omega} = \omega\vec{\hat{\omega}} = \omega\hat{\omega}\mathbf{e}_3 = \omega\mathbf{e}_3[\hat{\omega}]$. Does the vector $\vec{\omega}$ have a ***direction*** with a negative orientation $\omega < 0$, it simply represents the retrograde helicity.
The sign $\pm i$ in (3.284) for helicity ± 1 may be omitted when we let the negative frequencies represent retrograde helicity. But on the other hand, it is practically advantageous to use $\pm i$ for the helicity when the double degeneration at the same frequency $|\omega|$ are combined in a superposition. Therefore $e^{-i\omega t}$ and $e^{+i\omega t}$, are the normal way of writing the two helicities. This implies full coverage for ***entities*** $\Psi_{\omega\pm}$ by using only positive frequencies $\omega > 0$.
We just complement the angular momentum ***quantum*** numbers for the helicity ± 1.
The ***primary quality***, the ***direction*** is externally given by the unit vector $\mathbf{e}_3 = \vec{\hat{\omega}}$, then $\vec{\omega} = \omega\mathbf{e}_3[\hat{\omega}]$.

The ***direction*** *FORWARD* from the past into the future is given internally for the ***subton*** as the auto-norm ***direction*** $\hat{\vec{\omega}}$. This internal ***direction*** is, of course, by its nature[150] parallel to the external ***direction*** $\mathbf{e}_3 \parallel \vec{\mathbf{1}} = \hat{\vec{\omega}}$. Auto normalization means that the frequency refers to itself, therefore we automatically have $\hat{\vec{\omega}} = \vec{\mathbf{1}}$. This autonomous vector represents not only the ***direction***, but also the angular momentum ***quantum*** with two orientations
$\vec{L}_3^+ = -\vec{L}_3^- = \hat{\vec{\omega}} = \vec{\mathbf{1}}$, $(\hbar=1)$, and the propulsive momentum $\mathbf{k}_3 = \frac{\hbar}{c}\omega\mathbf{e}_3$ $[\hat{\omega}]$,
and the flowing energy $\hbar\omega\mathbf{e}_3[\hat{\omega}]$, of this relativistic[151] ***quantum one subton***, as in (3.284).
The state mode ${}^{\mathrm{AB}}\Psi_{\vec{\omega}}(\phi)$ of Figure 3.13 is just the transport of angular frequency energy $\omega_\mathrm{A} = \omega_\mathrm{B}$ along with the advancement of the development parameter $t_\mathrm{A} = t_\mathrm{B}$, the quantum phase angle is propagated and preserved $\phi_\mathrm{A} = \phi_\mathrm{B} = \omega_\mathrm{A}t_\mathrm{A} = \omega_\mathrm{B}t_\mathrm{B}$. The picture is that a ***subton*** as a carrier ω_c *FORWARD* propagating a chronometer time $\{t_c\}$, and creates a past t_3, that with the speed of light becomes the extension (3.265)

$$|x_3| = \quad c\left|{}^{\mathrm{AB}}\phi_c\right|/|\omega_c| = \quad c\left|t_{c,\mathrm{B}} + t_3\right| - c\left|t_{c,\mathrm{A}}\right| = \quad c|t_3| \qquad [c\hat{\omega}^{-1}]$$

The past times with the speed of light are precise, which corresponds to spatial migration. The extension of this has a ***direction*** expressed as $\vec{x_3} = x_3\mathbf{e}_3[c\hat{\omega}^{-1}]$.
We have here to be aware of the ambiguity of our vector $\mathbf{e}_3$ for the ***direction*** in space, as a ***primary quality of first grade***:

- for the extension x_3 dimension we have a unit vector $\mathbf{e}_3[c\hat{\omega}^{-1}]$, and
- for angular frequency energy ω propagating state-mode dimension as a unit vector $\vec{\hat{\omega}} = \mathbf{e}_3[\hat{\omega}]$.

The ***direction*** is one and the same in natural space in physics, and the ambiguity problem disappears in math when $\hat{\omega} = \hat{\omega}^{-1} = 1 = c$, and $\hbar=1$ for energy/frequency =1, but it is in the ethical intuition important to distinguish an a priori foundation of physics.

[150] This is something we determine in our autonomous intuition of the whole concept for the ***subton*** idea. (An synthetic judgment).
[151] We recall here for ***subtons*** there is no portable energy, which is expressed by the Lagrange function $L_\omega = T_\omega - V_\omega = 0$. We call it light like as propagating energy, that only consists of state-mode energy for ***subtons*** which ontological have the speed of light.

For quotation reference use: ISBN-13: 978-8797246931

© Copyrighted material from hardback: ISBN-13: 978-8797246948, Kindle and PDF-file: ISBN-13: 978-8797246931, paperback: ISBN-13: 978-8797246917

© Copyrighted material from hardback: ISBN-13: 978-8797246931, paperback: ISBN-13: 978-8797246948, Kindle and PDF-file: ISBN-13: 978-8797246917