$$|\psi_{\Sigma\pm\odot\perp\omega\mathbf{e}_3}(t)\rangle = A\left(N_+ a^\dagger_{\odot+\omega} + N_- a^\dagger_{\odot-\omega}\right)_{\mathbf{e}_3}|0{,}0\rangle = A\left(N a^\dagger_{\odot+\omega} + N a^\dagger_{\odot-\omega} + M a^\dagger_{\odot\pm\omega}\right)_{\mathbf{e}_3}|0{,}0\rangle$$

$$= \frac{1}{2N+M}\odot 2\tilde{r}(\rho)\left(\sum_{n^+=1}^{N} e^{+i(\omega t+\theta_{n^+})} + \sum_{n^-=1}^{N} e^{-i(\omega t+\theta_{n^-})} + \sum_{n=N+1}^{N+M} e^{\pm i(\omega t+\theta_n)}\right)_{\mathbf{e}_3}$$

$$(3.281)\quad = \odot\tilde{r}(\rho)\left(\frac{1}{N!}\sum_{\substack{n^+=1\\ n^-=1}}^{N}\left(e^{+i(\omega t+\theta_{n^+}-\theta_{n^-})} + e^{-i(\omega t+\theta_{n^+}-\theta_{n^-})}\right) + \frac{2}{M}\sum_{n=N}^{N+M} e^{\pm i(\omega t+\theta_n)}\right)_{\mathbf{e}_3}$$

$$= \odot\tilde{r}(\rho)\left(\frac{1}{N!}\sum_{\substack{n^+=1\\ n^-=1}}^{N} 2\cos(\omega t+\theta_{n^+}-\theta_{n^-}) + \frac{2}{M}\sum_{n=N}^{N+M} e^{\pm i(\omega t+\theta_n)}\right)_{\mathbf{e}_3} \quad \text{for}\forall\rho\geq 0$$

If successful at the same time to phase modulating the first N pairs of ***double±subtons*** with individual phase differences $\omega t+\theta_{n^+}-\theta_{n^-}$, we run into the problem, that the ***double±subtons*** make pairs in $N!$ ways since their ***subtons*** $|\psi_{+\odot\perp\omega\mathbf{e}_3}(t)\rangle$ respectively $|\psi_{-\odot\perp\omega\mathbf{e}_3}(t)\rangle$ are individually indistinguishable. The remaining $M=|N_+-N_-|$ with the same helicity, do not possess relative phase angles, as they individually θ_n *only* relate to the symmetry $\odot = \{U_\theta : \theta \to e^{i\theta} \in U(1) \mid \forall\theta\in\mathbb{R}\} \leftrightarrow \{\theta_n \mid \theta_n \in [0,2\pi[\,\}$.
Overall, the pair phase angle coding loses its meaning and information disappears in the confusion of indistinguishability between creation A and annihilation B information.
Here we recall that the relativistic idea dictates that the development parameter has the same inner value at annihilation as at creation $t = t_B = t_A$. We conclude that local multiple *simultaneous* phase modulation of each ***double±subtons*** is impossibly to read. Thus, a local microscopic quantum mechanical angular phase angle encoding of an ensemble transversal plane wave of simultaneous ***subtons*** will not transfer any distinguishable information. By contrast, ordinary macroscopic frequency\phase modulation when it is related to the idea of a carrier reference $\vec{\omega}_c\,[\hat{\omega}]$, $\{t_c\}\,[\hat{\omega}^{-1}]$ is a well-tested option.[147]

[147] All data communication in optical fibre, coaxial cable, Wi-Fi, cellular, DVB, DAB and all other radio signal coding uses this principle. E.g., the newest I know about is by COFDM method in practice.

3.5.4. One *double±subton* as an Information q-bit Real

The idea of the ***double±subton*** as expressed in (3.238) and (3.244)

$$(3.282)\quad {}^{\overleftrightarrow{AB}}\psi^{\vec{2}}_{\omega}(\theta') \sim \left|\psi^{\vec{2}}_{\odot_{\theta'}\perp\omega\boldsymbol{e}_3}(t)\right\rangle = 2\tilde{r}(\rho)\cos(\omega t+\theta')_{\perp\boldsymbol{e}_3}, \text{for}\forall\rho\geq 0, \phi = \omega t+\theta'.$$

Here, the encoded angular phase shift θ' between the two ***subtons*** is interesting. It is a real ***quantity*** that can assume all values. $\theta' \in [0,2\pi[\,\subset\mathbb{R}$. (Identical modulo 2π in $\mathbb{R}$).
The ***quality*** of this is just the angular difference in the transversal plane for the two co-created ***subtons***.
This possibility ***quality*** of a quantum real phase information θ' designates the name a ***q-bit*** real.
This '***q-bit***' differs from the binary value of ***quantity*** for the binary ***quality*** just to be able to decide between the options an ***entity*** '1' or no ***entity*** '0'. My claim, for a physical 'bit' as a primitive form, is that, having a physical setup (at a given temperature T) is ***quality*** with the ability to create one ***subton*** (transmit) and to annihilate the ***subton*** (receive and measure). The binary ***quantity*** is then to determine the receipt of at least one ***subton***$_\omega$ '1' or non '0' to receive an expected ***subton*** in the ***quality*** at the setup form in physical reality that contains the bit.
In practice, static data bits are macroscopic states with some quantum charges, but dynamic measurements always involve ***subtons***, (usually, several elemental quantum charges or ***subtons*** per bit, if $\hbar\omega \ll kT$).

A similar primitive setup structure in physics is needed to applicate a determination of the real angular phase θ' ***q-bit*** information ***quantity*** of one ***double±subton*** ${}^{AB}\Psi^{\vec{2}}_{\omega}(\theta')$, in which we are forced to keep each pair separated. Hereto we must demand $\hbar\omega \gg kT$ for the setup, to avoid thermal creation\annihilation.
We may think that for optical photons, it is possible to maintain one ***double±subton***, in between two parallel mirrors A and B which are located in resonance. The creation at A and annihilation at B are matched by synchronous creation in B with annihilation in A and vice versa. The helicity $\pm$ change orientations in these reflections and the phase angle coding θ' conceivably preserved.
The designation $\overleftrightarrow{AB}$ in ${}^{\overleftrightarrow{AB}}\Psi^{\vec{2}}_{\omega}$ specify the conservation of a local ***double±subton*** in its reversing resonance with the mirrors as a ***quality*** containing the real ***q-bit***.
The idea is further, we can let two individual ***q-bits*** ${}^{\overleftrightarrow{AB}}\Psi^{\vec{2}}_{\omega}(\theta')$ and ${}^{\overleftrightarrow{CD}}\Psi^{\vec{2}}_{\omega}(\theta'')$ interact to $\left[{}^{\overleftrightarrow{AB}}\Psi^{\vec{2}}_{\omega}(\theta'), {}^{\overleftrightarrow{CD}}\Psi^{\vec{2}}_{\omega}(\theta'')\right] \to {}^{\overleftrightarrow{EF}}\Psi^{\vec{2}}_{\omega}(\theta'+\theta'')$ to a new local ***double±subton*** as a new ***q-bit*** real.
From the two ***quality*** containers $\overleftrightarrow{AB}\oplus\overleftrightarrow{CD}$ to a container $\overleftrightarrow{EF}$, a structure in physics that contains the real ***q-bit quantity*** $\theta'+\theta''\in\mathbb{R}$ as a real number.

The ***quality*** of such a process with a real ***q-bit*** is additive; a real ***q-bit*** as a sum of two real ***q-bit***.
I.e., the real numbers $\theta'''=\theta'+\theta''\in\mathbb{R}$ are ***quantities*** that are represented by the ***quality*** of the physical setup we call real ***q-bit*** addition.
In this way, such a setup may be called a ***quantum computer***.[148]

[148] A 2022 revision comment to this is that ***qubits*** concerning quaternion information shall be researched further in the future. Note the difference ***q-bit*** ↔ ***qubit*** between reals and quaternions associated to the Bloch sphere.