A Cinematic Association Interaction Of Particles As A Model Of Double-Slit Interference And All Optical Phenomena

Viktor Schatz

Summary: Double-slit interference has made physics think for 215 years and there is no end in sight. Quantum mechanics always explains it by an interference of 2 waves. A new model of a volatile temporary Association Interaction has now been proposed, in which the particle wave interacts with the electromagnetic wave fields of the surface atoms and their shell electrons. It can be understood as interference between these two wave functions involved or as a deflection of the moving particle from its momentum direction by a quantized angular amount. The quantization of the angle results from the assumption that there are only standing EM waves, so that wave peaks only have certain locations that are periodically spaced. As a result, they are the points of separation for the volatile associated particles. This means that previous interpretations of 'pilot waves' and the like are no longer exclusive. The same Cinematic Association Interaction is generalized to all optical effects, such as transparency, dispersion, diffraction, reflection, opacity and colour formation, but also impacts of particles and absorption. Waves as particles must no longer be thought capable of deleting each others masses and energy, which was a paradox phenomenon of wave interference theories. Compton effect and impacts of particles are identified as a reflection due to same electromagnetic Association Interaction.

The double-slit interference, known from Young from 1803, is the supreme experiment in quantum mechanics. An interference pattern is interpreted as a wave property and also occurs when photons or rest mass particles and entire molecules are sent individually. That is why there are mystifying interpretations such as “wave interferes with itself” and “a pilot wave”. We have been talking about a “wave-particle dualism” for 100 years and have completely dispensed with a vivid clear model for it because it was impossible to imagine.

The basic hypothesis of the present association-interaction theory is that based on the quantum mechanical location wave functions for mass particles, the same should also apply to photons.

The classic electromagnetic transverse EM waves with their wave crests correspond to these probable quantum mechanical locations that can be spaced apart in wavelengths or proportional to them along the route of a photon. Because electromagnetic EM wave is not a longitudinal wave, but a transversal one, a continuous movement of the wave crests in space must consequently be excluded and we only have standing EM waves. We assume it is a phenomenon. When the particle source sends monochromatic particles, the wave crest locations are organized in phase with each other. A non-standing EM wave must be composed of several superimposed standing EM waves, becoming additionally longitudinal waves.

Elementary Association Interaction

According to a quantum mechanically qualitatively explained transparency interaction, the EM waves of the photons are in an interaction with the EM waves of the shell electrons, forming a new wave that is slower than the speed of light in a vacuum. In itself, this can also be applied to the Association Interaction.

But our hypothesis is different: the photons and mass particles too revolve around an mass particle, an atom or entire group of atoms, like the bridging element of a double slit. The Association Interaction is basically an attempted absorption that is broken off and ends in emission after a short time. The reason is that the quantum size is not suitable for absorption by a shell electron. An association period is specified individually between the atoms and the moving particles, photons or fermions. This slows down the light without losing momentum and also maintains the wavelength.

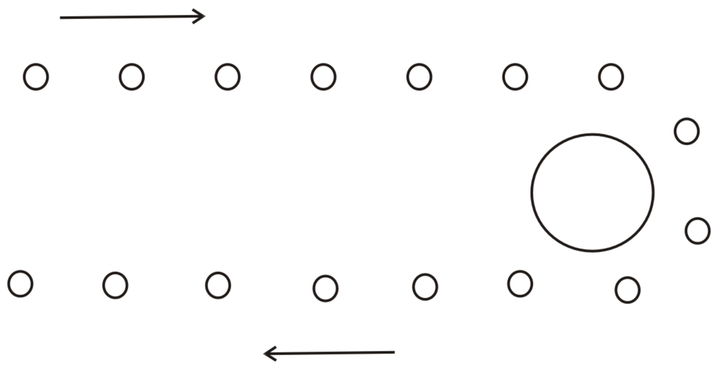

Fig. 1. Association interaction of photons on an atom when reflected from a perpendicular incidence of light.

In the case of reflection, it becomes clear vivid why the angle of incidence is the same as the angle of reflection. After a partial revolution, the EM wave arrives at the surface where there are no neighbouring atoms at a symmetrical circular angle position around the atom and the absence of the EM fields of the neighbouring atoms provokes the detachment of the photon from the Association Interaction. With a transparent material there are weak reflections because a small part of the photons go into reflection interaction instead of transparency interaction. The flatter the angle of incidence, the less reflection, which is also evident in this model. The associated particle can turn around a mass particle many times before losing association.

The electromagnetic forces presented in waves crests of photons and particles attract and repel if being close individually and the moment and point of association and disassociation is a function of wave lengths of both interacting particles which are in dissonance. That is the reason, why different frequencies of light can have different refraction indexes. The figure 1 stands also for an impact and can be acting under another angle. The only difference is, that lattice atoms are standing in a position having smaller movement area and a free particle is moving trough space. If they will be meet by another particle they behave similar by Association Interaction.

So any Association Interaction is always starting with electromagnetic attraction and ending by repelling.

Compton effect and particles impact

The Compton effect is identified as a reflection by same Association Interaction and therefore is acting also for a single mass particle, met in space alone, not just on atoms and with photons of a wide spectrum possible. So there is nothing like a classical hit between two small hard balls and now we know how it is working cinematically by an attracting and repulsive force which is electro magnetic.

Same is to think about impacts of two mass particles as they are wave like entities they can cinematically act as a reflection process by Association Interaction.

Transparency

In the case of transparent materials, the rotation of the atom on the surface is in an asymmetrical and in the depth symmetrical atomic environment. In a symmetrical environment, a 180 degree Association Interaction can take place. In the parting plane there are no neighbouring atoms of the same substance from outside and the Association Interaction has a different orbital association angle than 180m degrees. This is how light refraction occurs. As is well known, it takes place with different angles of refraction at different frequencies, which is also evident in the model.

On the surface of a gap edge, the moving particle only circulates a part of the way until the end of the association period. The vibrations of the phase of different particles create scattering.

In the end, 2 EM waves interfere again, but one of them is from surface atoms. And the particle goes through both gaps, but in rotation through both slits one after another.

Double slit interference

This is exactly what is pictured in the double slit experiment according to Figure 2. Due to a phase position along the path, the “standing wave peaks” have a certain phase position in relation to the edges and their surface atoms of the double gap or individual gap or edge. Therefore the transmission source must be fixed and monochrome.

The EM wave peaks meet the EM waves of the surface atoms of the gap edge and due to its narrow shape in the order of magnitude of the wavelength they are positioned very close to the lattice atoms in the surface. The EM locations are spaced apart in wavelengths or according to quantum mechanical location wave locations.

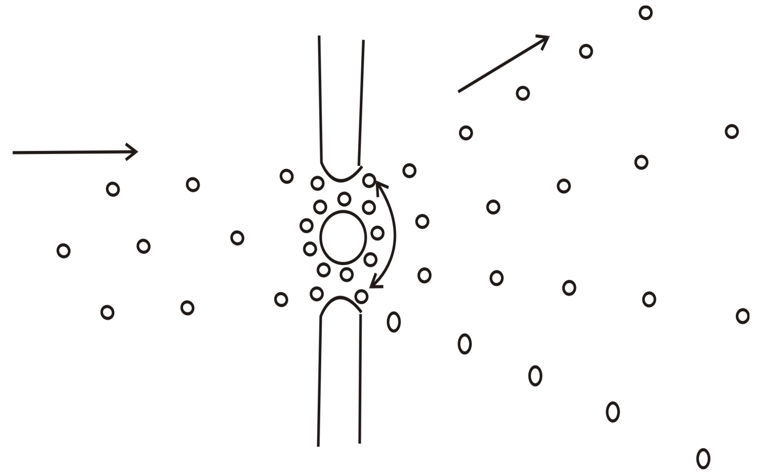

Figure 2. An Association Interaction at a double gap around a bridge element.

As a whole, a photon is electromagnetically neutral, but very close are individual positive and negative photon components, the EM wave crests, in strong electromagnetic force interaction with the virtual photons of the electromagnetic force of the electrons or protons.

The edge of the gap has a small rounding. The radius of this rounding can be played with and demonstrated that it influences the interference pattern.

The individual EM wave particle experiences an electromagnetic attraction from the atomic proximity with a gap width in the order of magnitude of the light particle wavelength used, by which the particle is deflected very slightly from the given pulse and guided along the edge surface.

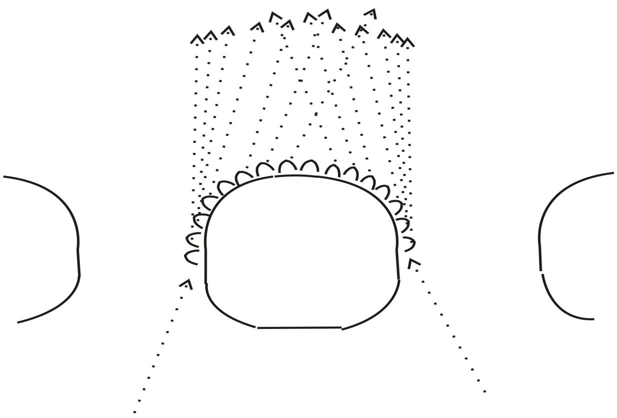

Figure 3. Enlarged edge and bridge element of a double-slit interference arrangement.

We have omitted the representation of the processes on the outer margins. The localization locations must also be somewhat

larger. Presumably the pattern particles interact with both edges of a gap that is of the order of magnitude of the wavelength is. The lanes do not necessarily have to cross, as shown - they can also only be spread apart.

The interference occurs more strongly at the double gap than at a single edge or a gap, because the particles can rotate around the bridge element. The width of the bridge element must also be in the order of the wavelength. In light, that is between 400 and 700 nanometres. For the interference with the electrons, a lattice structure of a solid was used, through which they penetrated, because such gaps are no longer feasible macroscopically.

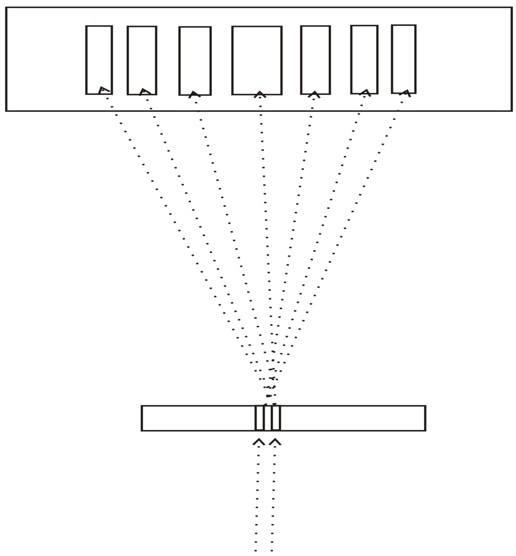

Fig. 4. Particle trajectories to the left and right of the double slit.

The photons even have to circulate around the bridge element several times, because the wavelength in the width of the bridge element cannot produce points that are so close together then wave length is. But phase shifts can take place in several revolutions and then these association-interaction points lie closer to one another than the wavelength would result. After closing of a gap will still have a pattern, but it will have much fewer more widely spaced stripes that are less pronounced. The bridge element is the means of generating interference.

Scatter of the probability locations

Each hit-interference-pattern-stripe shows a statistical hit distribution around a central position, which was projected from the transmitting atom to the atomic surface in the gap edge and further on the screen.

The EM wave longitudinally transmits the wave location phases from the transmission source. Accuracy of the phases of EM-waves are known as exact by using interferometers. The emitting atoms vibrate and emit photons from different positions in relation to the atomic lattice. They pass through central positions much more often, which is why a central cluster of hits is mapped in the double-slit interference pattern. In addition, several atoms send, which can have a dissonance with each other.

The Association Interaction and absorption

An absorption is a successful association and *vice versa* . Attempted and failed absorption is an association. It takes a time that depends on the properties of the atoms. It must also receive the momentum of the photon as far as possible, except for one change that occurs depending on the properties of the atoms. This makes absorption and association an unified process, an interaction with parameters. The atomic shell quanta decide that.

Diffraction phenomena

Wave diffraction is known from spheres, whereby the large radii are more helpful here to let the photons stick to them longer.

The particles must have a monochrome frequency, otherwise each frequency produces its own hit position and they overlap.

Matter waves according to de Broglie

The mass particles of electrons already showed patterns in air gaps, but the bridge element was charged with a positive charge. This confirms the HITASHI experiment [1], whereby the electrical or electromagnetic nature of the Association Interaction was shown even more vivid clearly.

Double slit interference was shown also with neutrons [2] and even a macroscopic pieces of a number of atoms. This is supported by the current model of Associated Interaction too. And we see a strong relation to the matter wave length. Mass particles and photons must have similar wave like attributes allowing Associated Interactions with each other.

Evidence by non-extinction of the waves

The particles are no longer mutually 'extinguished' or deleted, which was clearly paradoxical in terms of energy and mass conservation of particles. Here is a potential for proof, because the sum of the energy of all particles after interference is preserved, while in the wave-cancellation model it has to decrease. That is presumably measurable in the experiment we propose. An image sensor can be operated as an energy sensor for this purpose. And the bridge element should be removable in the double gap. It can certainly also absorb some of the photons, but it is very likely that photons arriving in this way will also be bent around the bridge element. Quantitatively it can be estimated of the interference images showing approximately 30-50 % 'deleted waves' of the whole area, so the energy measurement difference must be a recognisable one.

Equally paradoxical must appear, when asked, why didn't these waves collapse due to interaction with a gas or a transparent medium through which the photons hit air molecules? Nor do they collapse if they penetrate a sheet of transparent glass. And there are certainly very many interfering atoms in the path of the photons.

Experimental shapes of bridge element

If the shape of the front side of the bridge element in double slit would get a form of a triangle or a prism it could show, that the Associated Interaction is real, when the projection will be influenced. But the impulse of the photons can be kept even then and no effect would be to see.

No impulse problem on the transparent boundary surface

There is no longer an impulse problem at the transparent boundary surface. This arises when one assigns impulse and therefore mass to the photon, this is retained, but in the medium the speed of light decreases and with it the impulse, whereby energy would have to be released and thermally lost. After the exit, the reverse impulse process takes place, which requires an expenditure of energy and should therefore have a cooling effect. That was the problem of classical wave mechanics, which may have gone unnoticed.

Broad spectrum of transparency

In this way, the transparency is not limited to just absorbing and emitting, because it would only be the narrow frequency bands that would obtain transparency.

In *opaque* materials, different atomic orbital angles apply, so that the photons are released from an Association Interaction randomly distributed in many directions.

The colors of the fabrics are made up of reflected frequencies, while the others in the fabric are chaotically diverted to atoms and absorbed.

Meta-materials with a negative refractive index

These are almost an example of the fact that the EM force fields of the material atoms influence the photons electromagnetically and the association-interaction model also explains this clearly.

Light entrainment in transparent moving media

It was an important experiment at the beginning of relativism, when light was directed through water flowing across it. Photons are shifted transversely to an extent proportional to the refractive index. This also shows an interaction along the path of the photons, which depends on the speed of the medium and the thickness. So it is not just on the surface - the interaction happens in the depths of the medium on a multitude of atoms of the medium that are encountered. Each Association Interaction lasts for a while and the associated photon is carried away a little, transversely. Again no absorption and emission responsible because the spectrum is wide. A gas has a much lower atomic density and the speed of light is almost that of a vacuum due to rare interactions, but water and glass almost halve the speed of light because there are many more interactions.

Light scattering

A *light scattering* in the medium such as air or water is also evidence of interaction of photons and atoms and molecules in a broad optical frequency range, the slightly deflect a part of the photons due to the properties of the atoms and molecules.

A diamond

A diamond has a refractive index of 2.4 compared to 1.5 for glass. It is no coincidence that diamond has a higher density and therefore more atoms on which more Association Interactions with photons can take place.

Polarization

Both linear and circular polarization fit into the Association Interaction of the photons on the atoms in the broad spectrum of light for the same reasons.

Van der Waal's forces

These are postulated for chemical surface processes in chemistry in the 19th century and are of an electromagnetic nature. They are very likely another appearance of the Association Interaction.

There are applications for coating with powders or liquids. These forces are also Association Interactions, but they act on baryonic rest mass matter, i.e. not on photons. It is interesting that these forces showed a much greater dependence on distance, which is numbered with powers of ten between 6 and 14, instead of just a quadratic dependence, which is attributed to magnetic dipole interaction. Electrostatic forces also have a similar effect and we count them among the association forces.

Vividness in Quantum Mechanics

An important result is the vividness gained, which in quantum mechanics has so far been considered impossible in principle. A new interaction that places many interactions on a common concept brings a deeper understanding.

Particles entanglement

Particles entanglement is a different interaction and is not explained in the Association Interaction Model.

Consequences

There are consequences for the interpretation of quantum mechanics aside from or in Copenhagen interpretation. However, the probability-location wave function is retained as a quantitative description. An unconditional consequence is that the electromagnetic EM waves are only transversal and have no longitudinal movement of their wave crests and are standing waves.

Only one cinematic model of Association Interaction united a wide range of interactions.

The quantum mechanical quantitative description can be carried out with the means of quantum mechanics as usual on the basis of the location-probability spatial waves according to Schrödinger and Dirac. It is a new qualitative interpretation that does not initially have to have any quantitative consequences.

A demystification of Quantum Mechanics was achieved, as a real cinematic interaction in 3D space vividly answers the eternal riddle of the double slit interference. The wave-particle dualism has received one more argument in favour of only particles, although the quantitative description is still made in terms of statistical probability waves.

References

[1] Tonomura Akira, HITASHI double slit experiment, 1970. Available at https://www.hitachi.com/rd/research/materials/quantum/doubleslit/index.html

[2] H. Rauch, The search for the neutron wave, Die Suche nach der Neutronenwelle, Technical University of Vienna, 10.01.2014. Available at https://www.chemie.de/news/146434/die-suche-nach-der-neutronenwelle.html