Photonen sind Quantenobjekte und zeigen Phänomene, die mithilfe des

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| \_\_\_\_\_\_\_\_\_\_\_\_\_ modells-z.B. registriert Detektor ein „Klick“ |  | Wellenmodells-z.B. können Photonen \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ zeigen |

erklärt werden können. Sie sind aber weder Teilchen noch Welle!

**Leitfrage 4: „Entscheidet“ das Photon vorher, ob es Phänomene zeigt, die mit dem Teilchen- oder Wellenmodell erklärt werden können?**

**Delayed-Choice**

**Aufgabe 1**: Lies dafür den angegebenen Text von Müller und fasse die relevanten Punkte so zusammen, dass du mithilfe von diesen das Thema vorstellen kannst.

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**Merksatz**

Photonen „entscheiden“ nicht, welche Phänomene gezeigt werden. Sie sind Quantenobjekte und erst bei der Detektion treten Phänomene auf, die mit dem Teilchen- oder Wellenmodell erklärt werden können.

**Leitfrage 5: Kann man eine „Wegmarkierung“ dem Photon geben und ihm die Information „Weg“ aufprägen?**

**Polarisation**

**Definition**

Polarisation bezeichnet die Schwingungsrichtung einer Welle im Wellenmodell.

Durch Experimente beobachten wir bei Polarisationsfiltern:

Das Photon wird \_\_\_\_\_\_\_\_\_\_\_\_ transmittiert oder absorbiert. Das geschieht mit einer bestimmten \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Photonen haben nach Passieren des Polarisationsfilters dessen Polarisation.

**Weginformation und Interferenz**

**Aufgabe 1**: Beschreibe deine Beobachtung, wenn beide Polarisationsfilter gleich eingestellt sind.

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| klassisches Licht | Einzelphotonen |
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**Aufgabe 2**: Beschreibe deine Beobachtung, wenn die beiden Polarisationsfilter senkrecht zueinander eingestellt sind.

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Wenn man \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_beobachten will, kann man keine Wegmarkierung setzen.

Wenn man den \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ markieren will, tritt keine Interferenz auf.

**Definition**

Wegmarkierung und Interferenz schließen sich gegenseitig aus.

**Quantenradierer**

**Aufgabe 1:** Mit deinem bisherigen Wissen: stelle eine Vermutung auf, welches Phänomen man mit dem dritten Polfilter beobachten wird.



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**Aufgabe 2**: Überprüfe deine Vermutung mittels Simulation und erkläre das Phänomen. Warum heißt eine solche Anordnung „Quantenradierer“?

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