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The Ubiquitous Photon, Helicity Method for QED and QCD

The ubiquitous photon: helicity method for QED and QCD By Raymond Gastmans and Wu Tai Tsun Topics: General Theoretical Physics

The ubiquitous photon: helicity method for QED and QCD

Multiplication of the photon helicity by \hbar gives the eigenvalues of the photon angular momentum in quantum field theory. In direct analogy to Eq. (17), the pseudo four-vector V_{μ} can be defined as the dual of the electromagnetic four-tensor $F_{\mu\nu}$, $i V_{\mu} = -\epsilon_{\mu\nu\rho\sigma} F_{\nu\rho} e_{\sigma}$, (22) so that the components of V_{μ} must be electric and magnetic field components.

The photomagneton and photon helicity - ScienceDirect

The helicity formalism leads to simpler intensity and polarization formula over the conventional method in the study of scattering and reaction of particles. The advantages of using the helicity states are many. 1. There is no need to separate the total angular momentum J into orbital

THE HELICITY FORMALISM 13.1. The Helicity States

We discuss the use of helicity methods in evaluating loop diagrams by analyzing a specific example: the one-loop contribution to $e^{+}e^{-}\rightarrow q\bar{q}g$ in massless QCD. By using covariant helicity representations for the spinor and vector wave functions we obtain the helicity amplitudes directly from the Feynman loop diagrams by covariant contraction.

Use of helicity methods in evaluating loop integrals: A ...

I provide a basic introduction to modern helicity amplitude methods, including color organization, the spinor helicity formalism, and factorization properties. I also describe the BCFW (on-shell) recursion relation at tree level, and explain how similar ideas — unitarity and on-shell methods — work at the loop level.

A Brief Introduction to Modern Amplitude Methods - INSPIRE

The Ubiquitous Photon: Helicity Methods for QED and QCD (Oxford University Press, 1990). With Raymond Gastmans Lateral Electromagnetic Waves: Theory and Applications to Communications, Geophysical Exploration, and Remote Sensing (Springer-Verlag, 1992).

Tai Tsun Wu - Wikipedia

Once the graviton couplings to spin-0, 1/2, 1, and 3/2 particles are given, we exhibit the reach of this method by evaluating, as an example, the helicity amplitudes for the process electron + positron \rightarrow photon + graviton in a very straightforward way.

Helicity amplitudes for matter-coupled gravity | SpringerLink

Therefore, in a parity-invariant theory like QED you have to include both the $+\$1\$$ and $\$-1\$$ helicity photon fields. The representations do not have to be irreducible, so no one can stop us from thinking about a photon field with two polarizations. Reference [Weinberg] Weinberg, 5.

special relativity - Why photon only have helicity other ...

We present the helicity amplitudes for the unequal mass single photon reaction $pp^{-}\rightarrow l+l^{-}$ in the schannel including the lepton mass. The relative signs of these amplitudes are determined using simple invariance properties.

Helicity amplitudes and crossing relations for antiproton ...

Gastmans and T.T. Wu, The ubiquitous photon: helicity method for QED and QCD, Int. Ser. Monogr. Phys. 80 (1990) 1 [INSPIRE]. [7] L.J. Dixon, Calculating scattering amplitudes efficiently, in QCD and beyond. Proceedings, Theoretical Advanced Study Institute in Elementary Particle Physics, TASI-95, SLAC-PUB-7106, Boulder CO U.S.A., 4{30 June 1995 ...

Helicity amplitudes for QCD with massive quarks (pdf ...

The photon is a type of elementary particle.It is the quantum of the electromagnetic field including electromagnetic radiation such as light and radio waves, and the force carrier for the electromagnetic force.Photons are massless, and they always move at the speed of light in vacuum, 299 792 458 m/s.. Like all elementary particles, photons are currently best explained by quantum mechanics and ...

Photon - Wikipedia

Historically, the theory of monopoles and dyons has been plagued with nonlocality and broken Lorentz covariance, leading to difficulty in calculations of amplitudes involving magnetic currents. We present the Zwanziger two-gauge formalism that addresses these problems, and use spinor helicity methods to extract results in dyon-dyon and light-light scattering.

Dualities, Helicity Amplitudes, and Little Conformal ...

L. Witthauer's 80 research works with 771 citations and 6,906 reads, including: Helicity-dependent cross sections for the photoproduction of π^0 pairs from nucleons

L. Witthauer's research works | University of Basel, Basel ...

Fig. 9. The unpolarised (a) and helicity-dependent (b) differential cross section for the $\gamma p \rightarrow \pi^+n$ channel at $E_{\gamma} = 340$ MeV as predicted by the MAID07 multipole analysis [23]. Continuous lines: full calculation; dashed lines: calculation without the Born term contribution. - "Helicity dependence of the γ 3 He \rightarrow π X reactions in the Δ (1232) resonance region A 2 collaboration"