

Model isobar fotoproduksi meson- pada nukleon dengan kontribusi suku resonans hingga spin-5/2 = An isobar model for -meson photoproduction on the nucleon with up to spin-5/2 resonance contributions

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Abstrak

Fotoproduksi meson- pada nukleon telah dipelajari menggunakan model isobar dengan pendekatan Lagrangian efektif. Amplitudo invarian tree-level menyertakan kontribusi suku Born, suku pertukaran meson vektor kanal-t, dan suku kontribusi resonans nukleon spin-1/2, spin-3/2, dan spin-5/2. Resonans yang dipertimbangkan, yaitu $N(1895)1\frac{1}{2}$, $N(1900)3\frac{1}{2}+$, $N(2000)5\frac{1}{2}+$, $N(2060)5\frac{1}{2}$, $N(2100)1\frac{1}{2}+$, $N(2120)3\frac{1}{2}$, $N(2300)1\frac{1}{2}+$, dan $N(2570)5\frac{1}{2}$. Penampang lintang diferensial yang diperoleh dari perhitungan amplitudo invarian kemudian dibandingkan dengan data eksperimen kolaborasi A2 (2017) dan CLAS (2009). Tetapannya sambat interaksi kuat diperoleh melalui fitting dengan meminimalkan $2/N$. Begitupun dengan amplitudo helisitas resonans yang tidak tercatat di Particle Data Group (PDG). Ditemukan bahwa resonans nukleon $N(1895)1\frac{1}{2}$ dan $N(2100)1\frac{1}{2}+$ memiliki peran signifikan terhadap model.

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-meson photoproduction on the nucleon has been studied using an isobar model with an effective Lagrangian approach. The tree-level invariant amplitudes consist of the nucleon Born terms, the t-channel vector meson exchanges, and the contribution of spin-1/2, spin- 3/2, and spin-5/2 nucleon resonances. Considered nucleon resonances are $N(1895)1\frac{1}{2}$, $N(1900)3\frac{1}{2}+$, $N(2000)5\frac{1}{2}+$, $N(2060)5\frac{1}{2}$, $N(2100)1\frac{1}{2}+$, $N(2120)3\frac{1}{2}$, $N(2300)1\frac{1}{2}+$, and $N(2570)5\frac{1}{2}$. The calculated differential cross section based on the invariant amplitudes was compared with the A2 (2017) and CLAS (2009) collaboration experimental data. The strong coupling constant was obtained through data fitting by minimizing the $2/N$. Using the same method, also obtained the resonance helicity amplitudes not recorded in the Particle Data Group (PDG). It was found that the $N(1895)1\frac{1}{2}$ and $N(2100)1\frac{1}{2}+$ nucleon resonances play a significant role in the model.