Investigasi resonan nukleon pada fotoproduksi kaon elementer = Investigation of nukleon resonances on elementary kaon photo production

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Abstrak

Keberadaan resonansi nukleon yang hilang dapat dicari dengan menggunakan produksi elektromagnetik dari kaon pada total energi c.m. sampai dengan 2,2 GeV. Penelitian ini didasarkan pada model isobar dan menemukan bahwa resonansi nukleon tertentu sangat diperlukan untuk menjelaskan beberapa proses hamburan. Resonan-resonan nukleon S11(1650), D13(2080), P11(1710), P13(1720), S11(2090), P11(2100), P11(1840), resonan meson K(892), dan resonan hyperon S01(1800), S01(1810) dilibatkan untuk perhitungan dalam penelitian ini.
Hasil perhitungan dengan melibatkan resonan-resonan ini menunjukkan hasil kecocokan yang dengan data. Sesuai dengan penelitian sebelumnya [17], dengan sangat kecilnya kontribusi dari resonan P11(1710), maka dapat dikatakan bahwa resonan ini tidak harus digunakan untuk mereproduksi data dengan baik. Hasil dari penelitian ini menguatkan hasil penelitian dari grup Bonn-Gatchina [10,11,12] bahwa penyertaan dari resonan P13(1900) dan P11(1840) memperbaiki nilai dari fi2 dengan cukup signifikan. Khususnya untuk resonan P13(1900) mempunyai kontribusi yang sangat penting untuk mereproduksi data polarisasi Cx dan Cz [15].
.....Recently, it has been realized that the constituent quark models predict much more nucleon resonance states than that found in the pion-nucleon scattering and recorded in the Particle Data Book. Those resonances missing in the Particle Data Book are later called as missing resonances. We have searched for the existence of these missing nucleon resonances by using electromagnetic production of kaon at total c.m. energies from threshold up to 2.2 GeV. Employing the diagrammatic techniques called isobar model, the scattering amplitude of p(;K+) has been derived with the coupling constants being determined phenomenologically by a least-squares t to the available experimental data.
It is found that certain nucleon resonances are strongly needed to explain the process. Born terms meson-baryon interaction are included in the model via nucleon intermediate state in the s- and u-channels and meson exchanges in the t-channel amplitude. The nucleon resonances S11(1650), D13(2080), P11(1710), P13(1720), P13(1900), S11(2090), P11(2100), P11(1840), meson resonances K(892), and hyperon resonances S01(1800), S01(1810) are taken into account explicitly in the calculation. Comparison between the extracted resonance parameters and those of the quark models shows a good agreement with experimental data. Similar with previous study [17], we do not nd any compelling requirement for including the P11(1710) state in order to reproduce the experimental p(;K+) data. Our result corroborates the claim of Bonn-Gatchina group [10,11,12] on the importance of P13(1900) and P11(1840) states in improving the 2. Especially for P13(1900), its contribution is very important to reproduce the Cx and Cz data [15].