Pionic decays of light mesons in relativistic quantum mechanics

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In relativistic quantum mechanics based on point form of Poincare-invariant quantum mechanics obtained the integral representation of $V^{\pm} \to P^{\pm}\pi^{0}$ decay constant. It's shown that soft pion theorem usage leads to the numerical results for $\rho^{\pm} \to \pi^{\pm}\pi^{0}$ and $K^{*\pm} \to K^{\pm}\pi^{0}$ decays consistent with modern experimental data. As a result, self-consistent approach for light meson observed characteristic calculation is proposed.

Bounds on V – V' mixing from resonant production of extra gauge V' boson decaying into VH at the LHC

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The full ATLAS and CMS Run 2 datasets with time-integrated luminosity of 139fb^{-1} and 137 fb^{-1} in the diboson channels are used to probe benchmark models with extended gauge sectors such as E_6, left-right symmetric (LR) and the sequential standard model (extended gauge model, EGM), that predict the existence of neutral Z'- and charged W'-bosons decaying to a pair of bosons ZH and WH in the semileptonic final state. Exclusion limits at the 95% C.L. on the Z' and W' resonance production cross section times branching ratio to electroweak gauge boson pairs in the resonance mass range between 1.0 and 5 TeV are here converted to constraints on Z-Z' and W-W' mixing parameters and masses. We present exclusion regions on the parameter spaces of the Z' and W' and show that the obtained exclusion regions are significantly extended compared to those derived from the previous analysis performed with Tevatron data as well as with the CMS and ATLAS data collected at 7 and 8 TeV in Run 1. The reported limits are the most restrictive to date.

CNT-assembly enhanced scattering of ^{60}Co-gamma-ray in a detector crystal

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Currently, ionizing-radiation detectors which are capable of recoding so-called escape peaks with high accuracy are developed. On the one hand, it allows to use intermediate-size detectors to design high-performance gamma-ray-radiation spectrometers for prospective nuclear applications. On the other hand, it allows to clarify the nature of nuclear decays with creation of electron-positron pairs. The pairs under an electric field action are produced by γ-rays emitted in electron transitions. The high-energy gamma rays converted into an electron-positron pair in the presence of a charged particle feature a beta decay of ^{60}Co into ^{60}Ni. The decay is accompanied by the emission of two gamma quanta with energies, $E_{1.173}$ and $E_{1.334}$, equal to 1.1732 and 1.3324 MeV, respectively. The low-intensity single and double escape peaks, from one and two escaping annihilation photons, respectively, are located at 826.06 and 347 keV, respectively, in an insulator crystal detector response on the ^{60}Co 1.332-MeV gamma ray [1,2]. The single and double escape peaks being recorded by high-purity Ge semiconductor detector are located at 817.6 and 306 keV, respectively [3]. These experimental evidences about the pair-production events are inconsistent with each other. Moreover, the values deviate significantly from the theoretical predictions equal to $E_{1.334} - 2\, m_e c^2 = 821$ keV and $E_{1.334} - m_e c^2 = 310$ keV for single and double annihilation-photon escaping, respectively. Here c is the light speed, m_e is the electron mass. The single and double escape peaks from the pair production by 1.173-MeV photon were not detected. An explanation of this phenomenon is absent. It is possible to increase the resolution by using perfect scintillation crystals and high-purity semiconductors which are capable of recording low-intensity escaping gamma- and X- rays. Today, this problem is unsolvable still. In this report, we will use an single-walled carbon nanotube assemblies (CNT assemblies) to enhance a response of NaI(Tl) detector crystal on gamma-rays from a low-intensity ^{60}Co ionized-radiation source.

Our goal is to reveal and study an enhancement of scintillation-detector response on ^{60}Co ionized-radiation after interaction of the ^{60}Co γ-rays with the CNT assemblies