MP 6 Wave Equations and Scattering Theory

Zeit: Mittwoch 12:05–13:05 Raum: TU MA043

Fachvortrag MP 6.1 Mi 12:05 TU MA043

"Normalization" and "Completeness" of the Volkov Solutions — •Stephan Zakowicz — Institut für Theoretische Physik, Justus-Liebig-Universität Giessen, Heinrich-Buff-Ring 16, 35392 Gießen

The (non-square-integrable) Volkov solutions [1] fulfil the Dirac equation for a charged spin-1/2 particle in the field of a classical plane electromagnetic wave.

It was demonstrated before [2] that under certain assumptions on the external electromagnetic vector potential, square-integrable wave packets may be constructed from these Volkov solutions. Two commonly believed conjectures have been rigorously proved by the author recently and will be discussed in this contribution [3]: (1) Wave packets from "electronic" and "positronic" Volkov solutions are orthogonal to each other when the vector potential and its first derivative are bounded; this fact leads to the correct "normalization" of wave packets. (2) On the same assumptions as in (1), the wave packets fulfil the Dirac equation.

Apart from the "normalization" of the Volkov solutions, their "completeness" is also of relevance for the computation of physical processes. The current state of a possible proof of this supposition is briefly addressed.

[1] D. M. Wolkow, Z. Phys. **94**, 250 (1935)
[2] S. Zakowicz, Verhandl. DPG (VI) **39**, 5/2004, p. 27
[3] S. Zakowicz, J. Math. Phys. (in print, 2005); Preprint: `http://www.ma.utexas.edu/mp_arc-bin/mpa?yn=04-234`

Fachvortrag MP 6.2 Mi 12:25 TU MA043

Erweiterung der Cox-Thompson-Methode für das Inverse Streuproblem bei fester Energie auf Potentiale mit einem asymptotischen Coulombabfall — •Oliver Melchert[1] und Barnabás Apagyi[2] — [1]Institut für Theoretische Physik, Justus-Liebig-Universität Giessen, Heinrich-Buff-Ring 16, 35392 Giessen — [2]Department of Theoretical Physics, Budapest University of Technology and Economy, Budapest, Ungarn

Ausgehend von der Povzner-Levitan-Darstellung der regulären Streuwellenfunktion und unter Berücksichtigung der asymptotischen Eigenschaften der auftretenden Funktionen erhalten wir in Anlehnung an die Vorgehensweise in [1] ein System komplexwertiger, nichtlinearer Gleichungen.

Der Input der Inversionsprozedur ist eine endliche Menge komplexer Phasenverschiebungen. Mit dem nichtlinearen Gleichungssystem werden die zu den Phasenverschiebungen korrespondierenden komplexwertigen asymptotischen Normierungskonstanten und verallgemeinerten komplexwertigen Drehimpulse ermittelt. Diese Informationen ermöglichen es, das invertierte Potential zu berechnen.

[1] B. Apagyi, Z. Harman und W. Scheid, J. Phys. A **36** (2003) 4815

Fachvortrag MP 6.3 Mi 12:45 TU MA043

Perturbation theory for scattering at a slightly changed object — •Ivo Knittel[1], Andreas Ziroff[2], and Uwe Hartmann[1] — [1]Institute of Experimental Physics, University of Saarbrücken, 66041 Saarbrücken — [2]Siemens AG, Unternehmensbereich CT PS 7, Otto-Hahn-Ring 6, 81730 München

In the engineering of microwave and photonic devices, the definition of tolerances is an important problem. We sugggest a perturbation approach to the scattering matrix of an arbitrary object after a slight change in the geometry, in particular a small shift of a reflecting surface that is part of the object. We present the theory for electromagnetism, but the approach is valid for any time-symmetric wave equation.