

Geometric Theory of Fields

what it means

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Abstract: Contrary to common opinion, gravitation is reconcilable with electromagnetism and the omnipresent quantization. The material world is revealed to be fully geometrical. Alleged obstacles like the singularity rule are refuted. This requires a new understanding of the LEIBNIZ calculus. Numerical simulations using simplest method meet this requirement. As a consequence, numerical simulations according to geometric equations let see the discrete values of particle quantities. – Consequences for the understanding of causality, tunnel effects, world models etc. are raised.

Keywords: Theory of relativity, Numerical simulations, Riemannian geometry, Einstein-Maxwell theory, Rainich theory, Geometric field theory.

1. Statement of Grounds

In order to understand the material world in a unitary manner, we have to go from EINSTEIN's General theory of relativity [1]. The left-hand-side of EINSTEIN's field equation

$$R_{ik} - \frac{1}{2} g_{ik} R = -\kappa T_{ik} \quad (1)$$

has geometrical meaning. As well, the divergences of the energy tensor on the right-hand-side have to vanish for energy conservation, and to meet this equation. If we take the energy tensor of

the electromagnetic field

$$T_{ik} = F_{ia}F_k^a - \frac{1}{4} g_{ik}F_{ab}F^{ab} \quad , \quad (2)$$

we get a geometry of the space-time, which already RAINICH found [3, 5]. However, MAXWELL's equations

$$F_{ij,k} + F_{jk,i} + F_{ki,j} = 0 \quad , \quad (3)$$

$$F^{ia}{}_{;a} = S^i \quad (4)$$

do not meet EINSTEIN's equation in general. There are two possibilities to meet this equation and, with it, guarantee force equilibrium respectively energy conservation:

1) Extend the energy tensor or MAXWELL's equations for additional terms.

This way is usual in physics, but it leads to difficult hypotheses. Theories based on this way prove succesful only within a narrow ambit, though they can baffle with exact particular predictions.

2) The sources (distributed charges and currents) have to vanish, and are replaced by integration constants.

It is demonstrated that this way is succesful. Any obstacles are revealed to be irrelevant. This way violates MACH's principle, what means, we have to question this principle. Fields are even not the consequence of any "matter" but do exist by their own. [4]

With this premise, the complete theory is based on the tensor equations [5]

$$R_{ik} + 3K_o g_{ik} = \kappa \left(\frac{1}{4} g_{ik}F_{ab}F^{ab} - F_{ia}F_k^a \right) \quad , \quad (5)$$

$$F^{ia}{}_{;a} = 0 \quad , \quad (6)$$

in which g_{ik} are the components of metrics, R_{ik} those of the RICCI tensor and F_{ik} those of the electromagnetic field tensor. K_o is the constant part of the RIEMANNIAN curvatures [2], and meaningful for global solutions, e.g. [6]. κ is EINSTEIN's gravitation constant. For calculation, we introduce a vector potential with

$$F_{ik} = A_{i,k} - A_{k,i} \quad . \quad (7)$$

The last equation is identical with Eq.(3). These three equations are known as EINSTEIN-MAXWELL equations.

EINSTEIN quoted these equations already in his Four lectures [1]. As well, he quoted the co-variant MAXWELL equations (3,4) and the electromagnetic energy-momentum tensor (2). In order to give the gist of EINSTEIN's remark: If distributed charges and currents vanish, Eq. (5) meets

the BIANCHI identities [2], i.e. the electromagnetic energy tensor is compatible with EINSTEIN's gravitation equation [1] *only under this condition*. The BIANCHI identities are mathematical expression of force equilibrium respectively energy conservation. So EINSTEIN already pointed to the way, and one must wonder why he did not pursue this lately successful way. - We shall see that sources are replaced by integration constants in the solutions [4]. Mass, spin, charge, magnetic momentum are first integration constants. The geometry resulting from the EINSTEIN-MAXWELL equations was already found by RAINICH [3], and derived by a different method in [5].

Analytic solutions (different from zero) based on integration constants lead commonly to singularities. This is seen like an obstacle, as a rule. However, numerical simulations according to the EINSTEIN-MAXWELL equations, which are explained in detail in [8], result in another picture [4]:

Numerical simulations using iterative, non-integrating methods lead always to a boundary at the conjectural particle radius. E. SCHMUTZER told that the singularities from analytic solutions are displaced to this boundary.¹ However, this is the half truth, because the actual singularity appears always within a geometric limit. The area within this geometric limit *according to observer's coordinates* is not locally imaged, i.e. does not exist. The geometric limit is the mathematical reason for the existence of discrete solutions. It has to do with marginal problems, and additionally with chaos, see [4].

2. On Numerical Simulations

In order to support or disprove the theory, one has to do lots of tests, because the particle quantities are integration constants and have to be inserted into the initial conditions (more see [4, 8]), which are set in the electrovacuum around the particle. Values of integration constants are the input of the simulations. The output is the number of iterations, which is a measure for the stability of the solution. Table 1 shows the reference values with a radius unit of 10^{-15}m .

¹private information

	Proton	Free electron	Deuteron	Helium nucl.
m	2.48×10^{-39}	1.30×10^{-42}	4.96×10^{-39}	9.9×10^{-39}
s	2.60×10^{-40}	2.60×10^{-40}	5.2×10^{-40}	0
Q	1.95×10^{-21}	1.95×10^{-21}	1.95×10^{-21}	3.9×10^{-21}
M	5.7×10^{-22}	3.7×10^{-19}	1.76×10^{-22}	0

Table 1

Normalized reference values of first integration constants

m mass, s spin, Q el. charge, M magn. momentum

Conversion into dimensionless values see [8].

The computation is done for all components along the inclination at a radius, and along the radius (with all inclination values) from outside to inside step by step until geometric limits are reached.

The number of steps (iterations) until the first geometric limit of a component (where the absolute value of the *physical* component becomes 1) depends on the inserted values of the integration constants. Fig.1 demonstrates these dependences, as an example.

These first results have been achieved about 20 years ago for 11 parameters in total. The parameters were spin, electrical charge and magnetical momentum at free electron, proton, and deuteron, and mass and charge at the Helium nucleus. Just if the error probability of the single result is more than 10%, the total error probability might be comfortably small. Later achieved robust results (across 2 to 3 parameters) are presented in [4, 8], see Fig.2,3. As well, the step number above a “threshold” is depicted with a more or less fat “point”. The complete results are in the ‘robust’ package on author’s current website.

The success of iterative methods, where transitions to infinitely small differences do not happen, led to the insight that, solving partial differential equations, such transitions must happen first at the end of all calculations if at all.

3. Consequences

3.1. On Causality

The EINSTEIN-MAXWELL equations provide 10 independent equations for 14 components g_{ik}, A_i . With it, causality is not given in principle. It is false to claim, a geometric approach

$z= 730, r_0=1.410, dr=0.0020, K_0= 0.0E+0000,$
 $m= 4.960E-0039, s= 0.000E+0000... 1.040E-0039, Q= 1.850E-0021, M= 1.763E-0022$
 drawn number of steps 80...90

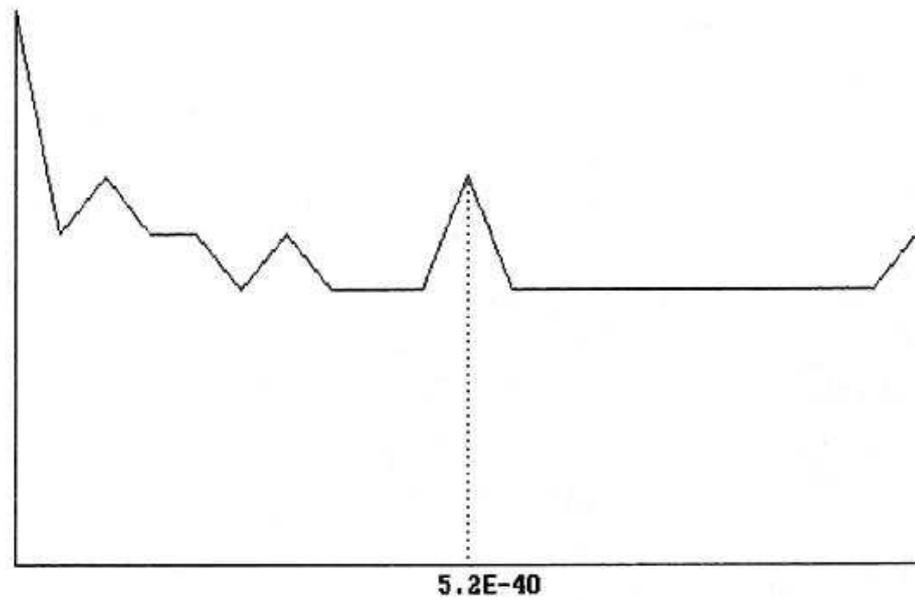


Figure 1: Dependence of iterations on spin at deuteron

would imply causality. Geometry has nothing to do with causality, because causality has not been geometrically defined at all. If we see something causal, it comes from approximations by wave equations. [4]

3.2. Remark on Photons

The numerical simulations pertained particles, which are stationary elementary fields. Photons are a borderline case. If we assume finite extent in $ct - x, y, z$, one can qualitatively derive PLANCK's constant from MAXWELL's equations [7]. As well, the field and the structure of the boundary are unknown. But the resting observer sees a wave with infinite extent in t and x , consistent with Special relativity. See also [9].

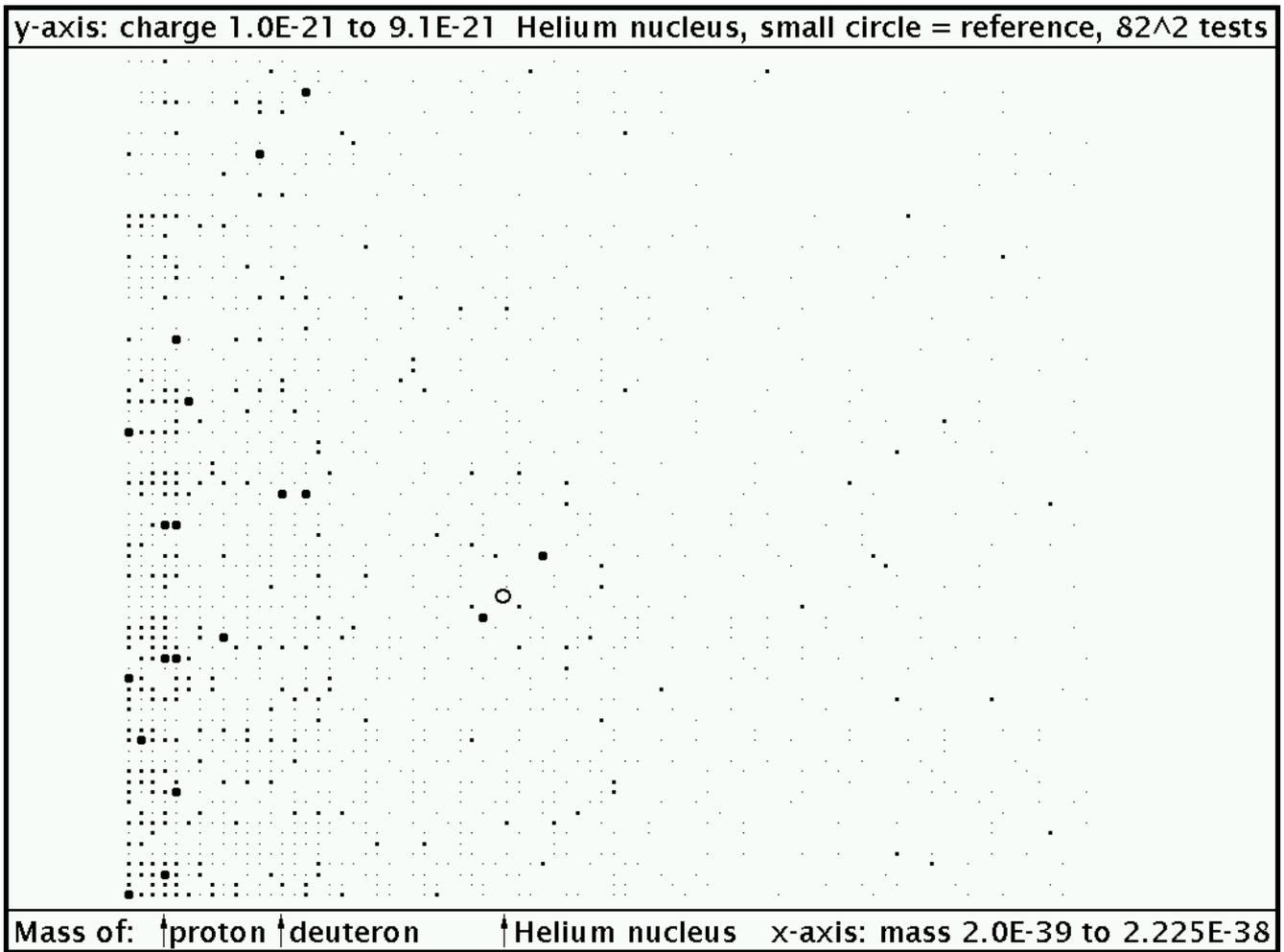


Figure 2: Tests with parameters around the Helium nucleus

3.3. *On Wave-Particle Duality*

The AFSHAR experiment [10] demonstrates that the photon is a wave for the resting observer, see above. However, numerical simulations done by AL RABEH, and reproduced and improved by ECKARDT [9] disprove any wave character of particles. (These were treated as moved COULOMB charges, and still generate interference pattern on a target.) Summarizingly, the wave-particle duality is disproved, see also [9].

3.4. *On Tunnel Effects, EPR Effect, and Electrical Conductivity*

The EINSTEIN-MAXWELL equations allow structures, in which a finite distance (as the outer observer sees it) can locally become zero. That were a real tunnel with an “inner” length of zero. An event at the one side is “instantaneously” seen at the other side. A known effect, that could

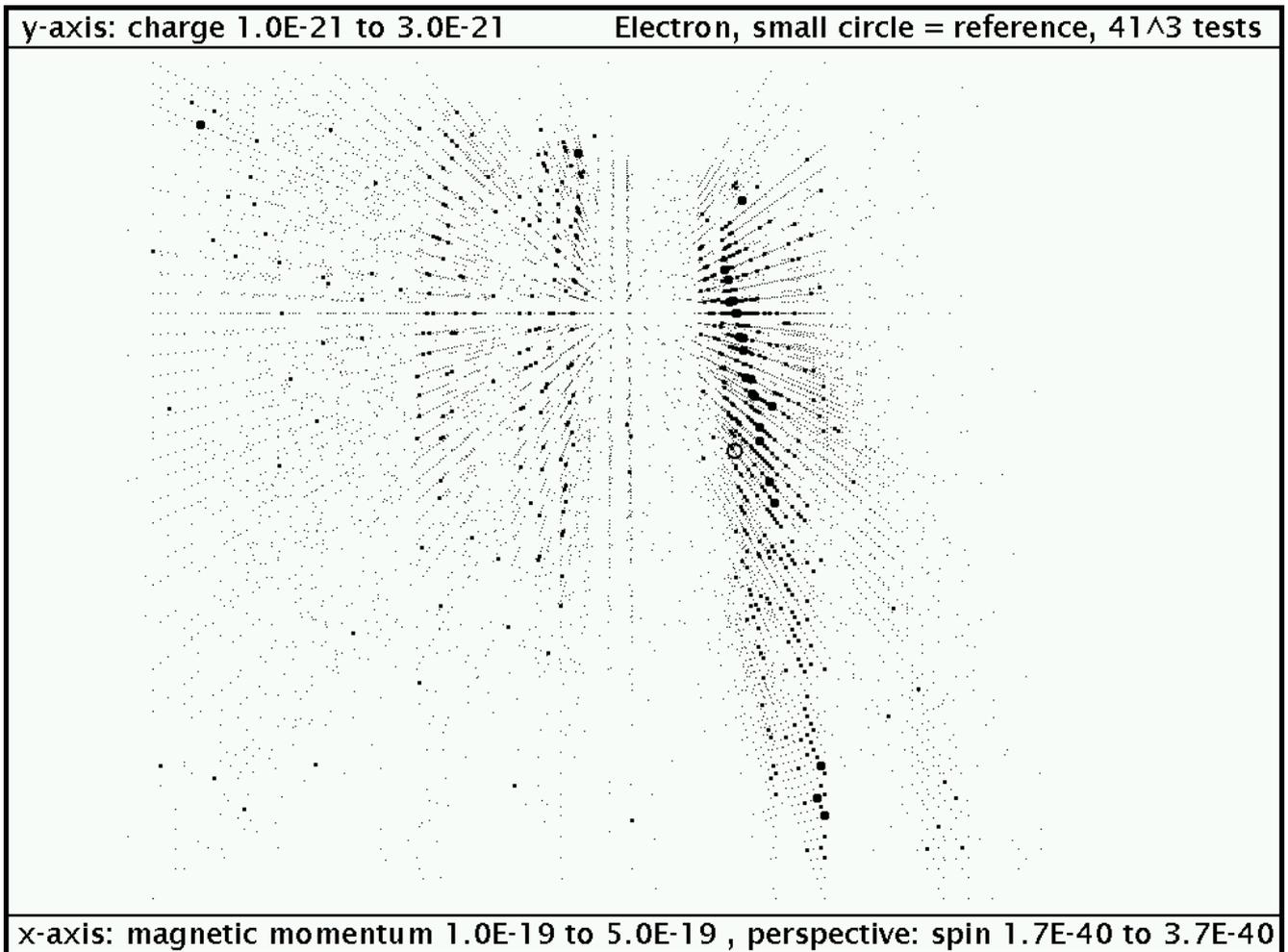


Figure 3: Tests with parameters around the electron

be interpreted this way, is the EPR effect [11]. Such tunnels might arise by accident.

This view is supported with changes of metrics by electromagnetism. Distances are locally shortened (at electric fields in direction of the field strength), what can lead to a feedback. Also lightning and electrical conductivity in general point to this direction. – More see [4].

3.5. *World Model*

The only world model consistent with the Geometric theory of fields is the DE SITTER world. It meets the RAINICH identities (see [5]), what means there is no conflict with the electrovacuum. It is demonstrated in [6] that the DE SITTER world is supported by recent observations.

This fully geometrical world is symmetric in time, what means also a reverse time arrow. – Why do we not see antimatter, and can prove it only at a glance? This is only explicable with

the assumption that antimatter has a negative time arrow (when matter has the positive). That means: If antimatter emits photons, these meet us in our past, i.e. the photons go from us to the antimatter in our time. It is a questionable hypothesis that the background radiation be the rest of a “Big bang”, which is precluded by the DE SITTER world. ROBITAILLE demonstrated that the background radiation could come from oceans [12]. It could be secondary radiation contingent on future processes.

In this context, the fiction, that dark matter consist of antimatter, does not appear as unfounded. Why do we observe dark matter exclusively via gravitation field and nothing else? Gravitation is unipolar, and independent on the time arrow if static. Matter does not interact with antimatter, unless matter meets antimatter purely by accident.

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