The Magnetic Effect As An Angle-Effect Of The Electrical Field

H.-J. Hochecker
Donaustr. 22, 30519 Hannover, Germany
Email: physics@hochecker.eu
Web-site: http://www.hochecker.eu

Abstract: When an electrical charge moves, then, in a vertical direction to its velocity, an angle φ results between the propagation direction of the electrical field of this charge (which propagates with light speed) and the connecting line of the field points issued by the charge one after each other. The aim of this work is to show that this angle (φ) is suitable to describe the magnetic effect.
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1. Introduction

The theory of special relativity [1] explains perfectly how the electrical forces have to be converted to different reference systems so that it doesn't come to any contradictions with the magnetic forces. In this, the magnetic force is taken as given, its emergence isn't further explained.
Although it is clear that the magnetic forces arise due to the relative motions of the electrical charges it, however, cannot be explained how this happens. I can offer a possible explanation here - though only as an abstract intellectual thought (Idea) which, however, can explain the emergence of the magnetic force in a simple way very well.

2. Tension condition and field points

It is known that the electrical field [2][3] of an electrical charge propagates with light speed (c). For the graphic representation one can imagine that the charge emits points in even intervals in all directions (which propagate with c). If one connects all those points with each other which move in the same direction, then lines which start at the charge arise. At a resting charge all these points along such a line are equally away from each other and the direction of their velocity (c) coincides with the direction of the line. But, as soon as the charge moves with a velocity (V_Q), the points emitted in movement direction will move up closer and the points emitted contrary to the movement direction will move from each other. In addition, for points which move vertically to V_Q (or which have a velocity component vertically to V_Q) there will be an angle φ between their propagation direction (that is $\vec{c}$) and the connecting line between them.
These considerations are represented (two-dimensionally) for some directions in Figure 1. The points are replaced by little lines which are vertical to $\vec{c}$. (Q_Q is the source of the field.)
There is now the following interpretation for the distances between the points (along a line): The points are emitted by the source (that is the charge) after each other. Inside the charge all of them stick together closely (are at the same place). As soon as a point is emitted it increases its distance to the following point so that a kind of tension condition arises between them. The longer the distance between two points is, all the greater the tension also is. The effectiveness of the electrical field shall be directly proportional to this tension now. So, the longer the distance between two points is the stronger the field is at this place. But, it is known now that the electrical field of a charge is neither stronger nor weaker in or contrary to the movement direction of this charge, however. This is explained as follows: an electrical

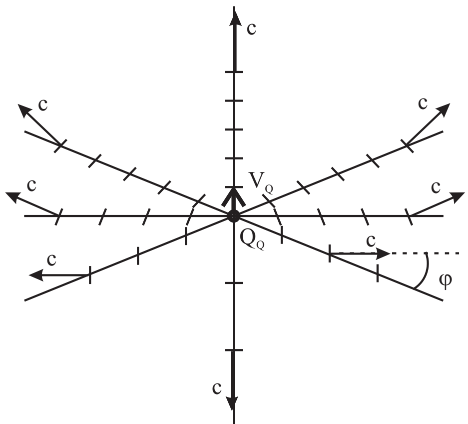

Figure 1 Lines with points of the same velocity direction

field has an effect on other charges; the effectiveness of the field on a charge depends not only on its tension but also on the frequency with which the points of the field have an effect on the charge. So, when the distance between two points gets longer, then the tension increases, but the frequency decreases in the same way so that the effect remains the same. (In the following I label the field producing charge source (Q_Q) and I label the charge on which the field has an effect receiver (Q_E).) Now, it is so that of course the receiver charge (Q_E) also can move (with the velocity V_E). By this the frequency with which the field has an effect on this charge changes. When Q_E moves toward Q_Q, then the frequency gets greater and since the tension of the field remains the same, the effect had to be greater now. But, however, it is so that also the tension of the field of $\mathbf{Q_E}$ is smaller in the direction of the Q_Q according to the V_E. From this the following acceptance arises: The effect of a field on a charge is proportional to the tension which the field **of this charge** has in the direction from which the effecting field comes from. So, if e.g. Q_E moves with V_E towards Q_Q then the frequency indeed increases, but the tension of Q_E decreases in the same way so that the effect remains unchanged. Here it helps to imagine that a charge has a kind of inner structure by which its field is produced. (So that a charge is not only a point.) The effect of a field on a charge then corresponds to the effect on these inner structures. Of course, the tensions of these inner structures are then also changed by V_E correspondingly.

So the effectiveness of a field on a charge doesn't only depend on the tension condition of the field but also on the tension condition of the charge (which it has in the direction from which the effecting field comes from). The changes of this tension conditions of the charge (e.g. the ones of QE caused by VE) can be seen as compressions (in movement direction) and strechings (contrary to the movement direction).

3. Angle-effect

So we have seen: Due to the velocities of the charges the electrical effects change. But, however, these changes are undone by the strechings and compressions connected to the velocities. This is only valid, though, as long as the charges move on the same (straight) line. But how is it if there is the angle φ between the propagation direction of the field (with $\vec{c}$) and the connecting line between the points?
To this we look at the part of the field which propagates vertically to the velocity V_Q with which the charge moves. (See partial Figure 2a in Figure 2.)

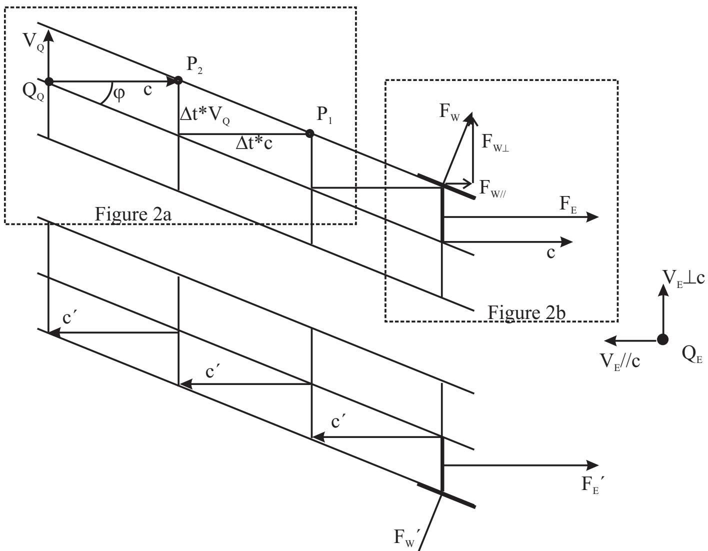

Figure 2 Field and opposite field

For φ it is: $\tan\varphi = \dfrac{V_Q}{c}$. One immediately awards (in Figure 2a) that the distance between two points (e.g. P_1 and P_2) , which is vertical to V_Q, is equally long as in the case of a resting Q_Q (except for relativistic corrections), namely $\Delta t * c$. In addition, a distance parallel to V_Q (which is vertical to $\vec{c}$) arises between the points, namely $\Delta t * V_Q$.
The logical acceptance is the following now: just as the distance $\Delta t * c$ between two points corresponds to a tension of the field through which the field has an effect, the distance $\Delta t * V_Q$ also corresponds to a tension of the field which also develops an effect.
One can recognize two directions in Figure 2: the connecting lines of the points, which I call the parallel lines, and the lines vertical to $\vec{c}$ (with which the field propagates), that are the vertical lines.
For the field of a resting charge (V_Q=0) the electrical effect direction is vertical to the vertical line (therefore parallel to $\vec{c}$). For the field of a moving charge (with the velocity V_Q) the normal electrical effect remains unchanged and its effect direction is still vertical to the vertical line. In addition here there

is also the angle effect (according to $\Delta t * V_Q$). This additional effect acts, in analogy to the normal electrical effect, vertical to the parallel line. For V_Q=0 (therefore φ=0) this additional angle effect would be vertical to the normal effect (since 90° are here between the vertical and the parallel line), but its magnitude is zero.
So the effect of a moving charge (with V_Q) vertical to its movement direction has two components: the normal electrical effect F_E and the angle effect F_W (see partial Figure 2b in Figure 2).
This would mean, though, that the field of a moving charge would have also on a resting charge the additional effect F_W which, of course, cannot exist. The problem can be solved, if one thinks over in which way the field has an effect on a charge.

4. Opposite field and multiple reflections

The following acceptance is made: When a field acts (has an effect) on a charge, then an opposite field arises (is created) at or in this charge - this (the opposite field) is a field of the same manner but with an opposite movement direction. The emergence (creation) of the opposite field corresponds to a reflection [4][5] of the field at the charge. A reflection means, that the field is repelled at the charge. This means that the opposite field acts (has an effect) in the same direction as the original field. But here now there is to be distinguished between the normal electrical effect F_E and the angle effect F_W. The F_E now results from the sum of the effects of the field and the opposite field (which both act in the same direction).
The field and the opposite field move in opposite directions. So, when the charge Q_E moves with V_E, then the frequency of the field will change in exactly the opposite way to the frequency of the opposite field so that the effect doesn't change in the sum. This corresponds to the statement already made that "the effect of a field on a charge is proportional to the tension which the field of this charge has in the direction from which the effecting field comes from".
For the angle effect (F_W) things are different. The angle effect of the opposite field doesn't act in the same direction as that one of the original field because then an overall effect greater than zero would result. The angle effect of the opposite field acts exactly in the opposite direction to the original field so that the overall effect is zero (in the sum). This is explained by the fact that the angle φ isn't reflected at the emergence (creation) of the opposite field so that the field and the opposite field have the same angle while they move in opposite directions, which leads to opposite effects.
At this point now one still can wonder how it happens that the component in the direction of $\vec{c}$ of the angle effect (F_W) of the opposite field is oppositely to that of F_E (the F_E of the original field is meant and not that one of the opposite field). To this the following: one can imagine that there are multiple reflections at or in the charge by the field, therefore that there is not only one single reflection. Since F_E acts exactly in the direction of $\vec{c}$, each two reflections (that are the reflection and its accompanying counter/opposite-reflection) will always cancel each other out exactly mutually so that always only one F_E (the original F_E) is left. This doesn't apply to F_W. Here the sum effect depends on whether φ is turned at the reflection or not. If in or at a charge there is both reflections with and without angle turn, then there can result, in the sum, an angle effect differently from zero after 2*n (n = a natural number) reflections. Since F_E doesn't have an angle, there cannot be any reflection for F_E with and without angle turn either, so that there cannot be any overall effect either (for 2*n reflections). I cannot explain the exact processes in this place either but, however, it is obvious to assume that the part of the field which has an angle (φ<45°) to $\vec{c}$ is reflected differently than the part of the field which is always exactly vertical to $\vec{c}$. It has to be mentioned here perhaps, which might be interesting, that there are not only reflections as one knows them from the mirror. Reflections can take place also at gratings [6]. The angles of reflection resulting in this process can be considerably different from these at the mirror. I find it not at all erroneous to give charges these possibilities, even if of course this is only speculative. So the reflections at or in the charge can be very complex under circumstances.
To make such theoretical acceptances is, in the end, justified by the results, too. Therefore, if the opposite field has (in the sum) the mentioned qualities, then, in combination with the original field, exactly the magnetic effect results.

More exact considerations show that the conditions are actually even fundamentally more complicated. It is necessary to take into account frequency changes and angle changes which arise by the movements of the charges. In addition, the reflection planes also get velocity dependent angles contingent on the relativity. Relativistic effects must be taken into account generally, particularly at grater velocities.
In the sum, the simplified representation, with the opposite field, results, which I will show in the following. The more exact development will follow in a later work - and this is worthwhile since there can be seen some quite interesting "side effects" when having a more exact look, not at least some interesting recognitions about the gravitation result.

5. The magnetic effect / frequency calculations

I will show now how the field and the opposite field cause the magnetic effect. In this simplified representation the opposite field acts in the sum (or resulting) in the way that the $F_E´$ of the opposite field acts in the same direction as the F_E of the original field, and the $F_W´$ acts in an opposite direction to the F_W. This is represented in Figure 2.
In the following considerations I confine myself to the case, in which the $\vec{c}$ of the field is vertical to the V_Q.
The F_W can be represented by the addition of two components: one parallel to $\vec{c}$ ($F_{W//}$) and one vertical to $\vec{c}$ ($F_{W\perp}$). The $F_{W\perp}$ is directly proportional to V_Q therefore to that velocity which produces the angle φ. (So: $F_{W\perp}$ ~V_Q.) By this assignment it is ensured that the strength of the parallel lines of the field is proportional to the velocity of the field producing charge.
As I have already explained, the magnitude of the effect of the field on a charge depends not only on the strength of the field but also on the frequency with which the points of the field are absorbed. For the F_E and the F_W these are the frequencies with which the vertical (for F_E) or parallel (for F_W) lines are absorbed. This type of a frequency dependence of the electrical field resembles the frequency dependence of the momentum of electromagnetic waves. - The reflection of the electrical field corresponds to a collision, a collision corresponds to a transfer of momentum, and the momentum is proportional to the frequency. So one could assign a hypothetical frequency to the electrical field. The magnitude of this frequency and which broader meaning it has isn't clear yet. (One could imagine, e.g., that the electrical field is subdivided into units similar to the energy units of radiation.) In any way, here the frequency is only and alone used as a tool for the calculation of the effectiveness of the field.
So how does the frequency change if the charge (Q_E), on which the field has an effect, moves with a velocity (V_E)?
One could calculate this very generally now but I find it more clearly to distinguish between two cases: 1.) V_E is parallel to the $\vec{c}$ of the field and 2.) V_E is vertical to the $\vec{c}$ of the field.
For V_E=0 the frequency is f_0.

For $\vec{V}_E // \vec{c}$ it is: $f_{//} = f_0 * \left(1 \pm \frac{V_E}{c}\right)$

For $\vec{V}_E \perp \vec{c}$ it is: $f_{\perp} = f_0 * \left(1 \pm \frac{V_E}{V_Q}\right)$

The plus and minus represents respectively the effect of the field and the opposite field.
The angle effect (F_W) changes according to the frequency. Therefore: $F_W = f*F_{W0}$. (F_{W0} is the effect for V_E=0.)
For V_E=0 the F_{W0} of the field and the F_{W0} of the opposite field cancel each other out exactly (their sum is zero).
What is it like for $V_E \neq 0$? To this the following: The F_W is vertical to the parallel line. The angle of the parallel line results from V_Q and $\vec{c}$. The $F_{W\perp}$ is proportional to V_Q, so $F_{W\perp} = K * V_Q$. (K is a general constant not determined yet.)

Therefore, from simple geometric considerations we get: $F_{W//} = K * \frac{V_Q^2}{c}$.

The resulting effect from field and opposite field is their sum (under consideration of the signs). And the F_W is multiplied with the respective frequency.

So, for $\vec{V}_E // \vec{c}$ we get: $F_{W\perp} = K * V_Q * f_0 * \left(1 + \frac{V_E}{c}\right) - K * V_Q * f_0 * \left(1 - \frac{V_E}{c}\right)$

$\Rightarrow F_{W\perp} = K * 2 * \frac{V_Q * V_E}{c}$ (For $V_E = 0 \Rightarrow F_{W\perp} = 0$)

For $\vec{V}_E \perp \vec{c}$ we get: $F_{W//} = K * \frac{V_Q^2}{c} * f_0 * \left(1 + \frac{V_E}{V_Q}\right) - K * \frac{V_Q^2}{c} * f_0 * \left(1 - \frac{V_E}{V_Q}\right)$

$\Rightarrow F_{W//} = K * 2 * \frac{V_Q * V_E}{c}$.

Here, for the time being, I have calculated only the respective strength component which is vertical to V_E because that represents the magnetic effect. One immediately recognizes that the magnetic effect is equally grate in both cases. But, of course, in both cases there is, in addition to the strength component vertical to V_E, naturally also a strength component parallel to V_E. However, these strength components parallel to V_E are cancelled exactly by the strechings and compressions of Q_E which are also caused by V_E. I have already further described this process above. It corresponds exactly to the process in which two charges move on the same line.

An arbitrary V_E can be represented always by a $V_{E//}$ and a $V_{E\perp}$. The resulting magnetic effect is then simply the sum of the magnetic effects of the two components.

If V_E isn't represented by components, then it is very important **not** simply to apply the strechings and compressions of Q_E to the resulting force (-effect); instead, the strechings and compressions have to be applied separately to the force (-effect) of the field and that one of the opposite field respectively, and only then the resulting force (-effect) is calculated. (One recognizes this if Q_E moves by V_E in a way that the frequency remains constant (so e.g. f_0). Without the strechings and compressions of Q_E the resulting force (-effect) would be zero, and it would be senseless to apply the strechings and compressions to a zero force. If one, however, applies the strechings and compressions to the respective force (-effect) of the field and the opposite field in the first place separately, then a resulting force (-effect) results.)

At this place I would like to remark that the angle φ can be understood as a real geometric change of the electrical field.

6. Closing remark and outlook

I will not carry out any extensive calculations here now. The aim of this work was to show that the angle φ, which results from the movement of a charge, is suitable to describe the magnetic effect. I think that the idea has got understandable.

Now, still, a remark on the gravitation: If the gravitation is an independent effect for which the constancy of the light speed is valid, then there should be an effect vertical to the velocity for the gravitation, too, just corresponding to the magnetic effect. If such an effect couldn't be proved, then this could be an indication that the gravitation is "only" an additional "side effect" of the electrical effect, for which the velocity dependent vertical effect is already given by the magnetism. On the other hand, even when the gravitation would be "only" a "side effect" of the electrical effect, it nevertheless could still have an additional to the velocity vertical effect of "second order"; the theory of general relativity [7-9] indicates something like that. All this is, however, still very unclear, but it shows which the next steps could be: working out the idea described here to the magnetism mathematically and then applying it to the gravitation.

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