

**Report on the Evaluation
of Appendix V
Analytical-Equation Derivation of the
Photon Electric and Magnetic Fields
in
“The Grand Unified Theory of
Classical Physics”
by Dr. Randell L. Mills**

Prepared by

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Executive Summary

In my analysis, I verified calculations and equations concerning the calculation and generation of the right-handed and left-handed circularly polarized photon electric and magnetic fields found in Appendix V of the book “The Grand Unified Theory of Classical Physics” (January 2020 edition) by Dr. Randell L. Mills. A value for E_0 is derived at the end of the appendix, and it is shown to be related to the energy of the photon.

There is a remarkable agreement between the equations found in the chapter and the equations I get from my calculations. I verified that all the equations found in the chapter from Equation (1) through Equation (30) were in fact true, and reproducible.

Purpose

Appendix V begins with the generation of the right-handed circularly polarized photon electric and magnetic vector field by the rotation of the great-circle basis elements about the $(\mathbf{i}_x, \mathbf{i}_y, 0\mathbf{i}_z)$ -axis by $\pi/2$. The rotation matrices are presented and the overall rotation is given in Equation (5). The output of the matrix in Equation (1) is visualized in Figure AV.1 where θ is varied from 0 to $\pi/2$. Also, the output of the matrix in Equation (5) is shown in Figure AV.2.

Similarly the generation of the left-handed circularly polarized photon electric and magnetic vector field is described by carrying out the rotation of the great-circle basis elements about the $(\mathbf{i}_x, -\mathbf{i}_y, 0\mathbf{i}_z)$ -axis by $\pi/2$. The rotation matrices are presented and the overall rotation is given in Equation (10). The output of the matrix in Equation (6) is visualized in Figure AV.3 where θ is varied from 0 to $\pi/2$. The output of the matrix in Equation (10) is then shown in Figure AV.4.

Next, the linearly polarized photon electric and magnetic vector field is generated by the superposition of the right-handed circularly polarized and the left-handed circularly polarized photon electric and magnetic vector field. The result is shown in Figure AV.5.

Next is a discussion of photon fields in the laboratory frame. When the vector projection on the transverse fields is superimposed on the manifold of circular rotation at constant pitch, the result is a right handed-helix. The left-handed circularly polarized photon electric and magnetic vector field has the opposite handedness. The field on the spherical surface of the photon electric and magnetic vector field is directed radially inward at each point in its frame, based on Gauss' Law. Thus we see that the electric and magnetic field lines are perpendicular to the direction of the power flow, where the direction of power flow is given by $\text{del}(\mathbf{E} \times \mathbf{H})$. It is argued in this appendix that the transverse electric field has the dependence $\mathbf{E} = E_0 \cos\theta \sin\theta \mathbf{i}_{xy}$, where the photon propagates along the z-axis. This is shown in Figure AV.6. Figure AV.7 shows the visualization of the fields in the laboratory frame for the observer that's shown in Figure AV.6.

Lastly the book derives a relation between E_0 and \hbar . From this and using Planck's Law, an expression for the energy E of the photon is found in Equation (30), which involves E_0 .

Calculations

I have verified that Equations (1)-(30) are in fact correct as listed in the GUTCP book. I also verified that the units of Equation (29) are V/m, as stated in the book in the line after Equation (29).

Conclusion

I was able to verify the results of Appendix V in excellent agreement with my own calculations and derivations of equations. I successfully reproduced all of the equations and derivations found in Appendix V, up through Equation (30).

This appendix concerned itself with the calculation and generation of the right-handed and left-handed circularly polarized photon electric and magnetic fields. A value for E_0 is derived at the end of the appendix, and it is shown to be related to the energy of the photon. I find my results and calculations to be confirmation that the derivations and equations of Appendix V are indeed valid, reproducible, and accurate.