

Charge Quantization from a Number Operator

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In the early seventies, Günaydin and Gürsey discovered $SU_c(3)$ quark structure in the split octonions, [1]. Using their anti-commuting ladder operators, α_i , we show a direct route to a new $U(1)$ generator. This $U(1)$ generator behaves like electric charge, thereby allowing us to further identify states behaving like the electron and neutrino.

Our proposed electric charge turns out to be proportional to a number operator, consequently illuminating why it is quantized.

Using only this trio of ladder operators, and their conjugates, we construct a pair of *minimal left ideals*, which is shown to transform under $SU_c(3)$ and $U_{em}(1)$ as does a full generation of the standard model.

References

[1] M. Günaydin, F. Gürsey, *Quark Statistics and Octonions*, Phys. Rev. D, Vol. 9, No. 12 (1974)

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