**INTERPRETING WHY TRIPLE-ADJUSTED PLANCK UNIT OBSERVABLE FUNDAMENTAL PROPERTIES ARE SIMPLE POWERS OF**

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This paper follows on from earlier papers which eliminated four important constants of nature, Planck’s constant *h*, the Gravitational constant , Permeability and Boltsmann’s constant by showing, after adjusting misaligned S.I. units, that they are only dimensionless ratios. Shown here is the interpretation of what it means that the relative values in any units of all of the observable set of TAPU parameters can be described simply as powers of the ratio , where *c* is the speed of light and the fine structure constant.

 *Keywords*: Gravitational constant; Planck constant; Planck units; SI units; Dimensionality; Parameters; Unification.

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**1. Background**

This paper follows on from two previous ones [1,2] where the realignment of SI units across mechanical and electromagnetic properties enabled the relationship between the observable set of triple-adjusted Planck unit values of those properties to be described as powers of only one ratio where is the fine structure constant and *c* light speed.

The paper considers what it means to have those properties, here also described as parameters, as ratios of .

The starting point is to consider how each of the parameters could be most simply described in terms of the product the normal length, velocity and time parameters (LVT) and respectively (mass *m*) and (charge *q*) parameters. This is done to understand better what the electromagnetic properties represent when considered as mechanical properties. This analysis is the reversal of the way that the description of the properties was parameterised into powers of .

**2. Comparisons**

Tables 1 and 2 show the final tables from the last paper [2] so that the comparison in Table 3 can be understood here. The set is the observable set of TAPU parameters which can be compared with the maximal TAPU set as described in that last paper. Although the set is described as maximal because it is based on all adjusted Planck unit sizes, it does contain smaller values when takes positive powers.

Note that the L*v*T groups used may not correspond to the normally accepted set due to the inclusion of *m* or *q* in every parameter formula.

**3. Foundations**

It is clear from a comparison of Table 3 columns 1-3 and 4-6 that the same grouping of L*v*T parameters with mass *m* and with the product *qc* can be described identically. The two sets have the same powers of which should make the properties the same. However it is not clear that, for example, Shear Viscosity and Electric Field are the same properties, or Acceleration is equivalent to Magnetic Inductance.

The alternative interpretation has the same L*v*T groups with mass *m* and then with charge *q* only, comparing columns 1-3 and 7-9 in Table 3. This misaligns the powers of and can be shown to be incorrect by considering the constant mass parameter which aligns with conductance in the electromagnetic parameters. It cannot be the case that a constant in the mass set matches with a variable in the electromagnetic set. So the only possible alignment between mass and charge parameters sets is by comparing *m* with *qc*, rather than *m* with *q*.

The accepted definitions of the electromagnetic properties are therefore shown to be incorrect. They should all be adjusted by the extra *c* factor.

One difficulty in considering the alignments across all possible powers of is that there are gaps where no known properties exist for that power of , at powers and .

These gaps are properties that we have not yet realised actually exist. Doubtless they will be uncovered experimentally in due course.

Table 1. Values of the set of parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter  |  DAPU set’s NSI Value | NSI Units | DAPU equivalent | As Constants |
| Permeability  |   |   |   |   |
| Angular Momentum  |   |   |   |   |
| Boltzmann  |   |   |   |   |
| Mass  |   |   |   |   |
| Magnetic Flux  |   |   |   |   |
| Charge-mass  |   |   |   |   |
| Velocity  |   |   |   |   |
| Resistance  |   |   |   |   |
| Momentum  |   |   |   |   |
| Current  |   |   |   |   |
| Action  |   |   |   |   |
| Angular Frequency  |   |   |   |   |
| Frequency  |   |   |   |   |
| Energy  |   |   |   |   |
| Temperature  |   |   |   |   |
| Potential Difference  |   |   |   |   |
| Acceleration  |   |   |   |   |
| Magnetic Inductance  |   |   |   |   |
| Magnetic Field  |   |   |   |   |
| Force  |   |   |   |   |
| Electric Field  |   |   |   |   |
| Shear Viscosity  |   |   |   |   |
| Mass Density  |   |   |   |   |
| Current Density  |   |   |   |   |
| Power  |   |   |   |   |
| Pressure  |   |   |   |   |
| Energy Density  |   |   |   |   |
| Charge  |   |   |   |   |
| Conductance  |   |   |   |   |
| Moment  |   |   |   |   |
| Distance  |   |   |   |   |
| Inductance  |   |   |   |   |
| Permittivity  |   |   |   |   |
| Time  |   |   |   |   |
| Area  |   |   |   |   |
| Volume  |   |   |   |   |
| Capacitance  |   |   |   |   |

**4. Interpretation**

What, for example, does it mean that the maximal value of the Triple-Adjusted Planck Unit (TAPU) of observable energy is whilst that of mass is ?

This tells us that regardless of the relative size of the electronic charge in the set to its maximum value in the set, the relationship will always be the same, only the actual measurable value in whatever units are used will differ, dependent on the value of .

It is also possible to infer that the root of the value of the fine structure constant must be motional, because it is part of the ratio . This would be more obvious if the inverse were used instead, because then the ratio would be and would simply be a dimensionless ratio adjusting velocity *c*.

Beyond these two points, it is difficult to make much more progress without an underlying theory of the structure of matter. But the hints are that what we observe at the most fundamental level is based on motion.

Assuming this to be the case, it might be possible to use a metaphor based on length to infer a similar relationship for . We call a length, an area and volume, each increase representing a different dimension based on length. It may be possible to consider as mass, as = velocity etc where each different power is a different mass dimension and a different property. The actual value of the property along that dimension is what is observed.

This would suggest that there must be at least 16 + 9 + 1 = 26 dimensions existing to accommodate all the properties that we currently observe, even if we do not have names for either the mechanical or electromagnetic properties at some values of powers of .

Note that, other than for *m* and *q* parameters, the formulae used to provide the appropriate powers of for each parameter do not use the target parameter in the formula, so velocity *v* does not have *v* in its formula, for example.

**5. Conclusions**

This paper presents new ways of understanding the relationships between parameters. It strongly infers that the underlying relationships and values of observable parameters are based on motion. This in turn suggests that there is structure underlying our current interpretation of the building blocks of matter and that hypotheses based on pre-quark frameworks should be given greater consideration by both theoretical and experimental practitioners.

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| Table 2. Values of parameters in BNSI, ratios of *c* and *d* and powers of  |
| Parameter  |  TAPU set’s BNSI Value |  TAPU set’s BNSI Value |  as Constants |  as Constants | BNSI Units (*h*-adjusted) |  set as powers of  |
| Permeability  |   |   |   |   |   |  |
| Angular Momentum  |   |  |   |   |   |  |
| Boltzmann  |   |  |   |   |   |  |
| Mass  |   |   |   |   |   |  |
| Magnetic Flux  |   |   |   |   |   |  |
| Charge-mass  |   |   |   |   |   |  |
| Velocity  |   |   |   |   |   |  |
| Resistance  |   |   |   |   |   |  |
| Momentum  |   |   |   |   |   |  |
| Current  |   |   |   |   |   |  |
| Action  |   |   |   |   |   |  |
| Angular Frequency  |   |   |   |   |   |  |
| Frequency  |   |   |   |   |   |  |
| Energy  |   |   |   |   |   |  |
| Temperature  |   |   |   |   |   |  |
| Potential Difference  |   |   |   |   |   |  |
| Acceleration  |   |   |   |   |   |  |
| Magnetic Inductance  |   |   |   |   |   |  |
| Magnetic Field  |   |   |   |   |   |  |
| Force  |   |   |   |   |   |  |
| Electric Field  |   |   |   |   |   |  |
| Shear Viscosity  |   |   |   |   |   |  |
| Mass Density  |   |   |   |   |   |  |
| Current Density  |   |   |   |   |   |  |
| Power  |   |   |   |   |   |  |
| Pressure  |   |   |   |   |   |  |
| Energy Density  |   |   |   |   |   |  |
| Charge  |   |   |   |   |   |  |
| Conductance  |   |   |   |   |   |  |
| Moment  |   |   |   |   |   |  |
| Distance  |   |   |   |   |   |  |
| Inductance  |   |   |   |   |   |  |
| Permittivity  |   |   |   |   |   |  |
| Time  |   |   |   |   |   |  |
| Area  |   |   |   |   |   |  |
| Volume  |   |   |   |   |   |  |
| Capacitance  |   |   |   |   |   |  |
|  |  |  |  |  |  |  |

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| Table 3. Comparison of the parameterisation of properties at each power of  |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|  mass set as powers of  | Mass Parameter (Accepted) | Mass Formula |  *qc* set as powers of  | Charge Parameter (Proposed) | Charge (*qc*) Formula |  *q* set as powers of  | Charge Parameter (Implied by grouping without *c*, but incorrect) | Charge (*q*) Formula |
|  | Angular Momentum |  |  | Magnetic moment x2/*c* |  |  | Magnetic moment x2 |  |
|  | Mass |  |  | Magnetic Flux |  |  | Charge |  |
|  | Velocity |  |  | Resistance |  |  | Resistance |  |
|  | Momentum |  |  | - |  |  | - |  |
|  | Action |  |  | Current |  |  | Current |  |
|  | Energy |  |  | Energy |  |  | Energy |  |
|  | - |  |  | Potential Difference |  |  | Potential Difference |  |
|  | Acceleration |  |  | Magnetic Inductance |  |  | Magnetic Inductance |  |
|  | Acceleration |  |  | Magnetic Field  |  |  | Magnetic Field  |  |
|  | Force |  |  | Force |  |  | Force |  |
|  | Shear Viscosity  |  |  | Electric Field |  |  | Electric Field |  |
|  | Mass Density |  |  | Current Density |  |  | Current Density |  |
|  | Luminance |  |  | - |  |  | - |  |
|  | Kinetic viscosity |  |  | - |  |  | - |  |
|  | Intensity |  |  | - |  |  | - |  |
|  | Pressure |  |  | - |  |  | - |  |
|  | - |  |  | - |  |  | - |  |
|  | Radiance |  |  | - |  |  | - |  |
|  | - |  |  | Charge mass  |  |  | - |  |
|  | Moment |  |  | Conductance  |  |  | Conductance |  |
|  | Distance |  |  | Inductance |  |  | Inductance |  |
|  | - |  |  | Permittivity  |  |  | Permittivity |  |
|  | Time |  |  | Time |  |  | Time |  |
|  | Area |  |  | Area |  |  | Area |  |
|  | - |  |  | Capacitance |  |  | Capacitance |  |
|  | - |  |  | - |  |  | - |  |
|  | Volume |  |  | Volume |  |  | Volume |  |

**Appendix A. References**

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