Gravitational Constant
 Revised Expressions using Measurement Quantization (MQ)

Physical Significance
2018 CODATA Measurement: 6.74080 × 10⁻¹¹ m kg⁻¹ s⁻²
MQ Calculation: 6.74071 × 10⁻¹¹ m kg⁻¹ s⁻²

Discussion

When classical expressions are written in terms of physically significant units of measure\(^{(4,\text{Eq}s. 67-69)}\), the gravitational constant may be resolved with quantum precision\(^{(1,\text{tbl. 1})}\). The expression depends only on measures of c and \(\theta_v\)\(^{(4,\text{tbls. 2-3})}\). By example, the calculation of \(G\) stands in sharp contrast to any in modern theory\(^{(4,\text{Eq}s. 29-33)}\). Here, the gravitational constant is resolved using only our understanding of the relational properties between an observer and a target written in a new nomenclature that includes the angular measure of the polarization field with respect to the plain of X-rays optimized for entanglement\(^{(4,\text{Eq}. 56)}\). The approach is a first of its kind in modern theory and forms the foundation to a quantum model of gravitation, a new nomenclature for describing classical phenomena, applicable across most disciplines that make up modern physical theory.

Application of Measurement Quantization (MQ) offers us the ability to resolve descriptions of phenomena not just quantum in measure\(^{(1,\text{Eq}s. 23-24)}\), but also cosmological in scale. For instance, one may replace a description of fundamental mass \(m_f\) with terms defined with respect to the universe\(^{(1,\text{Eq}. 88)}\). As demonstrated below, a description of fundamental mass then becomes a function of the diameter\(^{(1,\text{Eq}. 87)}\) and age of the universe and the speed of light c.

The expression demonstrates that the gravitational constant can be described with respect to physical qualities other than the measure of a local phenomenon. It can, that is, be described as a property of the diameter and age of the universe\(^{(1,\text{Eq}s. 87-99)}\) and length frequency\(^{(1,\text{Eq}s. 15-17)}\). The ability to describe phenomena in terms of nearly any other phenomenon is also new to modern theory. The portability and malleability of terms across any discipline emphasizes the uniformity of the MQ nomenclature\(^{(3,\text{Sec. 2.3})}\) as a ‘fundamental’ framework on which all phenomena may be described.

As a final note, while we have used the equality symbol in the initial expressions that describe gravitational curvature\(^{(1,\text{Eq}. 8)}\), said description carries assumptions not discussed. Along with discrete measure\(^{(4,\text{Sec. 8.8})}\), there exists a new relativistic skew in measure reflective of bounds to measure\(^{(4,\text{Apdx. A})}\). Notably, that skew, although six orders in magnitude smaller than that described by relativity\(^{(4,\text{Apdx. I})}\), is small, it is nevertheless important in the description of G and \(h\)\(^{(4,\text{Sec. III})}\). We find, as such, that the value of \(G\)\(^{(1,\text{Eq}. 89)}\) is a function of distance relative to the observer and is sensitive to the physical qualities of observation described by \(Q_i\). In that \(G\) is typically measured macroscopically and where the above calculation resolves \(G\) for a distance \(b_i\) that corresponds to one meter from a center of mass\(^{(4,\text{Eq}. 3)}\), the effects of that skew - the \textit{Informativity differential} - are far less than the precision quoted. For most purposes, use of the equality symbol is a physically significant and appropriate description. Planck’s unit expressions\(^{(4,\text{tbl. IV})}\), in contrast, are an example of where ignoring the \textit{Informativity differential} will introduce inaccuracies.

Inputs
- \(\theta_v\) is 3.26239 radians or kg m/s (momentum) or no units at all a function of the chosen frame of reference. This is a new constant to modern theory and exists in nearly every equation of the model. It may be measured macroscopically given specific Bell states necessary for quantum entanglement of X-rays such as those carried out by Shwartz and Harris.
- c is the speed of light which may also be written as \(c=1/\tau_f=299,792,458\) m/s.

Terms
- \(Q_i\) is the fractional portion of a count of \(I_f\) when engaging in a more precise calculation.
- \(n_{ij}\) is a count of \(I_f\) from the observer to a center of gravity.
- \(S\) is the symbol assigned to the unknown constant when resolving a description of gravity. The symbol is replaced with \(\theta_v\).
- \(r\) is the distance between an observer and a target.
- \(G\) is Newton’s gravitational constant.
34 MQ Discoveries

- Quantum Gravity
- Fundamental Constant
- Gravitational Constant
- Fundamental Measures
- Bounds to Measure
- Angular Measure & Momentum
- Quantum Entangled X-Rays
- Blackbody Radiation
- Energy: Einstein & Planck
- The Fundamental Expression
- Physical Significance Measure
- **Gravitational Const. Quantized**
- Newton & Planck Constants
- Mass and Light Quantized
- Informativity Differential
- Upper Bound to Mass Density
- Self-ref/defining Frames
- Diameter & Age of the Universe
- Measure Distortion w/ Motion
- Measure Distortion w/ Gravity
- Equivalence Motion & Gravity
- Mass Distributions w/o \( \Lambda \text{CDM} \)
- Hubble’s Constant
- Observable Universe is Dilated
- Universal Mass
- Inflation & the CMB
- Dilation of the CMB Age
- What Defines Measure
- Spacetime Curvature
- Spatial Referencing
- Effective Mass of a Galaxy
- Galactic Rotation
- Newtonian Crossover
- Kinetic Energy

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**Experimental Support—Gravitational Constant**

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<td>0.00003%</td>
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**The MQ Collaboration for Foundational Research**

We are a group of scientists focused on applying MQ to the existing laws of modern theory. There are several groups with differing objectives generally divided by:

- **Classical & Quantum Physics**
- Cosmology
- Gravitation
- Information Theory
- High Energy Physics

Institutions and/or scientists interested in joining the MQ collaboration, please email info@informativity.org.

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**Pre-Print**

4 Physical Significant Units of Measure

**Journal of High Energy Physics, Gravitation and Cosmology**

1 Measurement Quantization Unites Classical and Quantum Physics
2 Quantum Model of Gravity Unifies Relativistic Effects, Describes Inflation/Expansion Transition, Matches CMB Data
3 Measurement Quantization Accounts for Galactic Rotational Velocities and Obviates Dark Matter