The CMB Power Spectrum
Revised Expressions using Measurement Quantization (MQ)

In MQ Form
The CMB power distributions are recognized in MQ as a temporal distribution, that which is presently visible $\Omega_{\text{obs}}$, that which will be observable $\Omega_{\text{obs}}$, the difference $\Omega_{\text{obs}}$ and that which will never be seen due to the expansion of space $\Omega_{\text{obs}}$.

\[
\begin{align*}
\Omega_{\text{obs}} &= \frac{\theta_0^2 - 2}{\theta_0^2 + 2} = 68.362416104 \% \\
\Omega_{\text{obs}} &= \frac{4}{\theta_0^2 + 2} = 31.637583896 \% \\
\Omega_{\text{obs}} &= \frac{\Omega_{\text{obs}}}{2\theta_0} = 4.8488348953 \% \\
\Omega_{\text{obs}} &= \Omega_{\text{obs}} - \Omega_{\text{obs}} = 26.788749000 \%
\end{align*}
\]

Discussion
The Cosmic Microwave Background (CMB) data is a physically significant doorway with which to view our universe’s past. It allows us to inspect radiation that appeared at the dawn of our universe. But, how was it created?\[^{5,\text{Sec. III.M}}\] How much was created and why that quantity?\[^{5,\text{Sec. III.M}}\] With respect to modern theory, very little can be said with certainty. The reason for this is not specific to any one discipline, but a function of the number of disciplines at play. In short, there are so many measured values, that we cannot always constrain a conjecture. Estimates can be wrong yet go unnoticed because of the significant range of valid estimates for the remaining measures.

With better measurements, we are starting to constrain the unknown values. The picture is becoming clearer. But what may come as a surprise, is that the constraints we know most about are with respect to the measure of phenomena that formed after the formation of the CMB. How much CMB should have formed and why any particular amount exists is unknown.

With all that said, there is then the CMB power spectrum. What do the power spectrum curves mean? Are they, just as the name implies, mass and/or energy differences? This is presently the leading understanding and with that we have given the distributions names such as visible mass, dark matter and dark energy. There are other distributions which are separately identified as decompression curves, an expected property of electromagnetic radiation. The model seems natural, that the fluctuations are a consequence of different source targets. Or is it?

We present that this interpretation is unnecessary and inconsistent with MQ. Rather, the curves are mass distributions distinguished in time by our point-of-view. More important, we do not need any conjectures to reach this understanding. Classical mechanics is sufficient to resolve everything needed.

Specifically, discrete measure constrains the way the universe expands.\[^{5,\text{Eq. 44}}\] It allows us to define its properties as a quantum singularity and resolve specific milestones in our evolutionary history.\[^{5,\text{Eq. 118}}\] Answers to each of the above questions are calculated predictions of MQ. The results match the measurement data to the same precision as our best data, the age, quantity, density and temperature of the CMB. But, those calculations are carried elsewhere\[^{5,\text{Eq. 109, 110, 113 \& 115}}\]. Our focus is with respect to the curve itself.

A quick summary, the universe comes into existence with no mass. Mass accretes at a steady rate as described by $M_{\text{acc}} = n_{\text{t}} m_{\text{p}} \theta_0^3/2$\[^{5,\text{Sec. G}}\]. Initially, the universe is a quantum singularity less than one Planck length\[^{5,\text{Sec. 3.15}}\]. This creates a spatial referencing problem.\[^{5,\text{Sec. III.I}}\] From inside the universe it is not possible to reference points external to the universe. As such, the universe expands incredibly slow until reaching the size of square root of three Planck lengths. It takes 363,309 years\[^{5,\text{Sec. 4}}\] during which mass accretes in the form of cosmic radiation due to the intense density of the singularity. Moreover, the universe becomes more and more homogenous and isotropic. Once reaching the critical radius\[^{5,\text{Eq. 113}}\], external referencing is possible, and the universe begins expansion at the speed of light. No additional CMB is formed and the density of the universe decreases. When we compare these calculations to what we see, we find a match to four significant digits, the best measurement data we have available.\[^{5,\text{Eq. 142}}\]

More importantly, we find that the power spectrum is not a combination of differing forms of energy, but a consequence of our temporal point-of-view. There is what we see now $\Omega_{\text{obs}}$\[^{5,\text{Eq. 79}}\], what we see and will see in the future $\Omega_{\text{obs}}$\[^{5,\text{Eq. 76}}\], the difference

Inputs
- $\theta_0$, 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 Schwart and Harris.
- $\Omega_{\text{obs}}$ is the mass that is presently seen from a point in space.
- $\Omega_{\text{obs}}$ is the mass that is presently or will eventually be seen from a point in space.
- $\Omega_{\text{obs}}$ is the mass that will eventually be seen from a point in space, but has not presently in view.
- $\Omega_{\text{obs}}$ is all the mass in the universe.

Terms
- $l_t$, $m_t$, and $t_f$ are effectively Planck’s Units for length, mass and time, but not precisely the same. In MQ we recognize them as the fundamental units.
- $D_{l_t}$ is the diameter of the universe.
- $n_{l_t}$ is a count of $l_t$.
- $n_{l_f}$ is a count of $l_f$.
- $n_{l_f}$ is a count of $l_t$ equal to the age of the universe.
- $n_{l_f}$ is a count of $l_f$ equal to the diameter of the universe.

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46 MQ Discoveries

Physical Constants
- Fundamental Measures
- Fundamental Constant
- Physical Significance Measure
- Bounds to Measure
- Upper Bound to Mass Density
- What Defines Measure
- Frames of Reference
- Gravitational Constant
- Newton & Planck Constants
- Hubble’s Constant
- Fine Structure Constant
- Electric Constant
- Magnetic Constant
- Coulomb’s Constant
- Elementary Charge
- Planck’s Constant
- Physical Constants—Extended

Classical & Quantum
- Quantum Gravity
- Angular Measure & Momentum
- Quantum Entangled X-Rays
- Blackbody Demarcation
- Energy: Einstein/Planck
- The Fundamental Expression
- Informativity Differential
- Measure Distortion w/ Motion
- Measure Distortion w/ Gravity
- Equivalence Motion & Gravity
- Particles vs. Waves
- Properties of the Atom
- Singularities
- Spacetime Curvature
- Dimensions in Space
- Kinetic Energy
- Quantization Ratios
- Unification Gravity/EM

Cosmology
- Diameter & Age of the Universe
- Quantum Inflation & the CMB
- Dilation of the CMB Age
- Observable Universe is Dilated
- Mass Accretion in the Universe
- **CMB Power Spectrum**
- Mass Distributions w/o Λ CDM
- Dark Energy
- Galactic Rotation (dark matter)
- Effective Mass of a Galaxy
- Newtonian Crossover

between these two $\Omega_{\text{obs}}$ (5, Eq. 80) and that which we will never see due to the expansion of space $\Omega_{\text{dkm}}$ (5, Eq. 75). The acronym 'dkm' stands for dark mass describing that mass that will never be seen. The distribution is typically called dark energy. Notably, it has no relation to dark matter, the free-floating term that corresponds to $\Omega_{\text{obs}}$ (5, Eq. 80).

The relationship between the distributions is temporal. They represent time differences that are applicable of any expanding universe. Conversely, models of non-expanding universes show the visible and observable distributions match and the unobserved distribution does not exist. [1, Eqns. 109-114] Likewise, there is also no dark energy.

Finally, it is because of this rigid and geometrically correlated temporal relation that the peak power spectrum values for each curve can easily be described. Their x and y coordinates are, [5, Eq. 82-90].

And finally, we account for the dilation with respect to the x-coordinate [5, Sec. III.6]. Each x-value must be multiplied by,

$$\left( \frac{\pi}{\theta_{zi}} \right)^{2/3}$$

The effect is a function of the dilation between the two epochs [5, Sec. III.6]. And as such, we have a complete picture of the CMB as well as the physical events that transpired during the earliest epoch. Moreover, inflation theory is incorrect. MQ predicts no faster-than-light inflationary period, although there is a very lengthy quantum inflationary period [5, Sec. III.6] during which the universe expands to a radius of square root of three Planck lengths. Notably, all the calculations are classical. The observations presented require no fitting, no conjectures and no new physics. The CMB distributions are correlated to today's best measurements [2, Eq. 146] and upon this foundation a straightforward story that spans from the earliest epoch to the present unfolds.

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**Peer Review**

6 Measurement Quantization Describes the Physical Constants

**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
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