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Impact of Supernova Explosions on Super-Unification

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Abstract: *The cosmic ray intensity data were collected in 2017 for a period of twelve months (one year). Linear regression analysis was carried out using the cosmic ray intensity, I and the coupling parameter, α associated with the four fundamental interactions of particles. The value of the correlation coefficient, r of the events for each month is greater than 0.00 but less than 1.00. This shows that there is a positive relationship between the two variables. The slope, m of the regression equations changes as the cosmic ray intensities changes. The intercept, c has approximately same value, $c \approx 7.0$. Since the intercept, c is constant, the regression equation transforms into: $I = k_0\alpha^m$; where $k_0 = 10^c = 10^{7.0} = a\, constant$. At slope, $m = 1$, it suggest a linear dependence between the intensity, I and the coupling parameter, α of particle interactions. As we relate our equation to Stefan's law, we obtain: $T= (3642.32)\sqrt[4]{\alpha}$. This depicts that change in the temperature, T of the activities from supernova explosions is proportional to the coupling parameter, α of the fundamental interactions of particles. Thus, supernova explosions have an impact on coupling parameters of fundamental interactions and super-unification.*

Keywords: *Cosmic ray intensity, Coupling parameter, Supernova explosions, Super-* unification.

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I. Introduction

The Super-unification theory is the most powerful analytical means of investigating matter. The theory of super-unification shows that the superstrong electromagnetic interaction (SEI) is the sole energy source in the universe. This theory intended to describe the electromagnetic force, the strong force, the weak force and gravity as a single unified force (Leonov, 2010).

Each of the known fundamental interactions can be described mathematically as a field (Perkins, 2000). A coupling parameter (or an interaction parameter), α is a parameter in the field theory, which determines the relative strength of interaction between particles or fields. It's actually the coupling parameter, which determines the strength of an interaction and it depends on the energy scale (Peskin and Schroeder, 1995).

The shockwaves of supernova explosions accelerate charged particles such as protons, some of which end up raining on Earth as cosmic rays. High energy collisions in the upper atmosphere produce cascades of lighter particles. Pions and kaons are produced, which decay to produce muons (Rao, 1998).

II. Materials And Method

Mexico City Observatory (http://132.248.105.25/index.php) is the source of cosmic ray intensity, a carrier of neutrinos emanating from supernova explosions. Neutrino and graviton rest mass estimations by a phenomenological approach, carried out by Dimitar (2010) provided a table for the coupling parameter of particle interactions.

The cosmic ray intensity was collected in the year 2017 for a period of twelve months. Linear regression analysis was carried out for each month using the cosmic ray intensity, I and the coupling constants α associated with the four fundamental interactions. Both were presented in a double-logarithmic scale. This gave us a straight line equation which was transformed into: $I = k_0\alpha^m$

(1)

where the intercept, c remain same as the cosmic ray intensities changes with the coupling parameters of the interactions; and $k_0 = 10^c = 10^c = a\, constant$.

At slope $m = 1$, in equation (1), we were able to arrive at a relationship that suggests a linear dependence between the cosmic ray intensity, I and the coupling constant, α of the four fundamental interactions. Stefan's law was used to relate to equation (1). This entails how gravity traction from the supernova influences the internal temperature of particles and volume of particles.

III. Results

Coupling Constants of Particle Interactions

Table 1: Coupling Parameters of Particle Interactions

Fundamental Interaction	Coupling parameter, α	Particle	$log\ \alpha$
Strong	14	p	1.1461
Electromagnetic	$7.30\ X\ 10^{-3}$	e	-2.1367
Weak	$3.00\ X\ 10^{-12}$	v_e	-11.5229
Gravitational	$3.21\ X\ 10^{-42}$	g	-41.4935

Observations carried out in the Year 2017

Table 2: Sorted Cosmic ray (CR) Intensity data for the month of January, 2017

CR for the month of January, 2017		
	CR Intensity (I)	$log\ I$
Week 1	11907543	7.0758
Week 2	13953115	7.1447
Week 3	11961104	7.0778
Week 4	17957818	7.2543
TOTAL = 55779580		

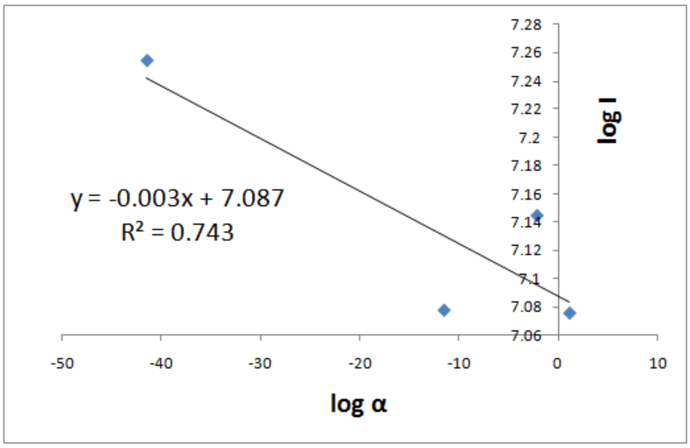

Figure 1: Plot of log I against log α for the month of January, 2017

Table 3: Sorted Cosmic ray (CR) Intensity data for the month of February, 2017

CR for the month of February, 2017		
	CR Intensity (I)	$log\ I$
Week 1	13967842	7.1451
Week 2	14021703	7.1468
Week 3	4006455	6.6028
Week 4	10024423	7.0011
TOTAL = 42020423		

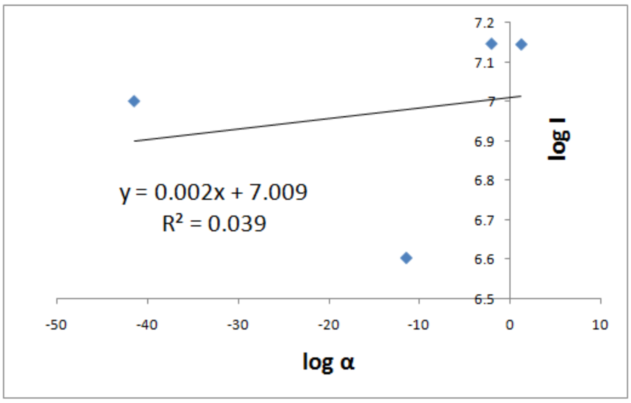

Figure 2: Plot of log I against log α for the month of February, 2017

Table 4: Cosmic ray (CR) Intensity for the month of March, 2017

CR Month of March, 2017		
	CR Intensity (*I*)	***log I***
Week 1	14012251	7.1465
Week 2	12029108	7.0802
Week 3	12040197	7.0806
Week 4	20074231	7.3026
TOTAL = 58155787		

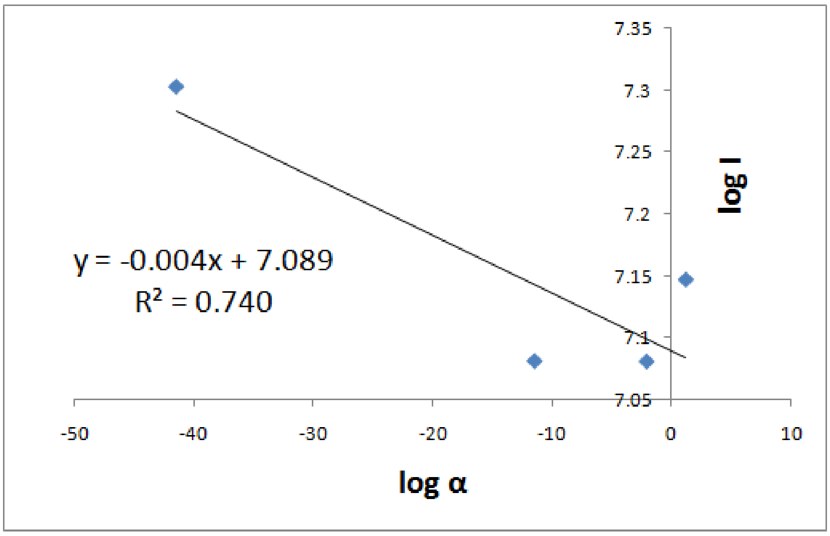

Figure 3: Plot of log I against log α for the month of March, 2017

Table 5: Cosmic ray (CR) Intensity for the month of April, 2017

CR Month of April, 2017		
	CR Intensity (*I*)	***log I***
Week 1	13890830	7.1427
Week 2	13977665	7.1454
Week 3	14068487	7.1482
Week 4	11923442	7.0764
TOTAL = 53860424		

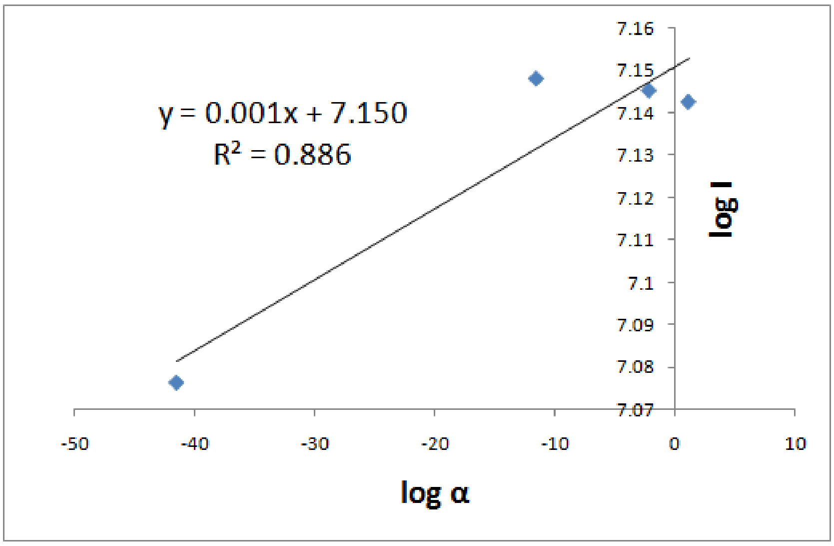

Figure 4: Plot of log I against log α for the month of April, 2017

Table 6: Cosmic ray (CR) Intensity for the month of May, 2017

CR Month of May, 2017		
	CR Intensity (I)	*log I*
Week 1	13930889	7.1440
Week 2	10012671	7.0005
Week 3	10023972	7.0010
Week 4	19924674	7.2994
TOTAL = 53892206		

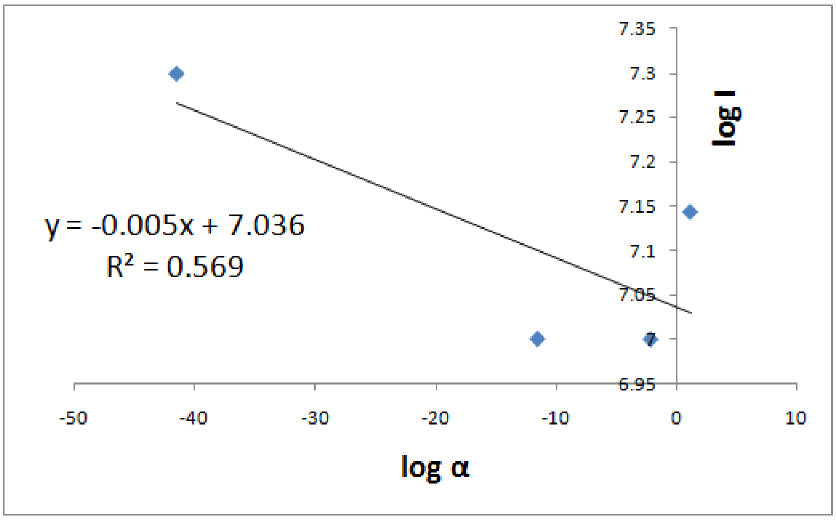

Figure 5: Plot of log I against log α for the month of May, 2017

Table 7: Cosmic ray (CR) Intensity for the month of June, 2017

CR Month of June, 2017		
	CR Intensity (I)	*log I*
Week 1	11953865	7.0775
Week 2	8022377	6.9043
Week 3	8041463	6.9053
Week 4	17923508	7.2534
TOTAL = 45941213		

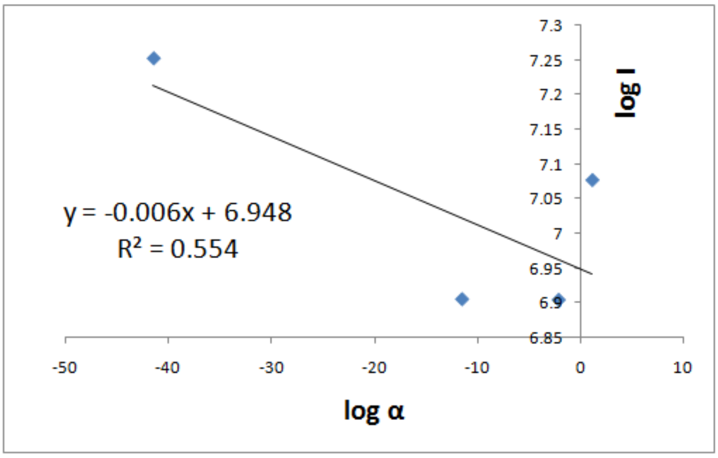

Figure 6: Plot of log I against log α for the month of June, 2017

Table 8: Cosmic ray (CR) Intensity for the month of July, 2017

CR Month of July, 2017		
	CR Intensity (I)	*log I*
Week 1	13915969	7.1435
Week 2	13952594	7.1447
Week 3	13927418	7.1439
Week 4	19754940	7.2957
TOTAL = 61550921		

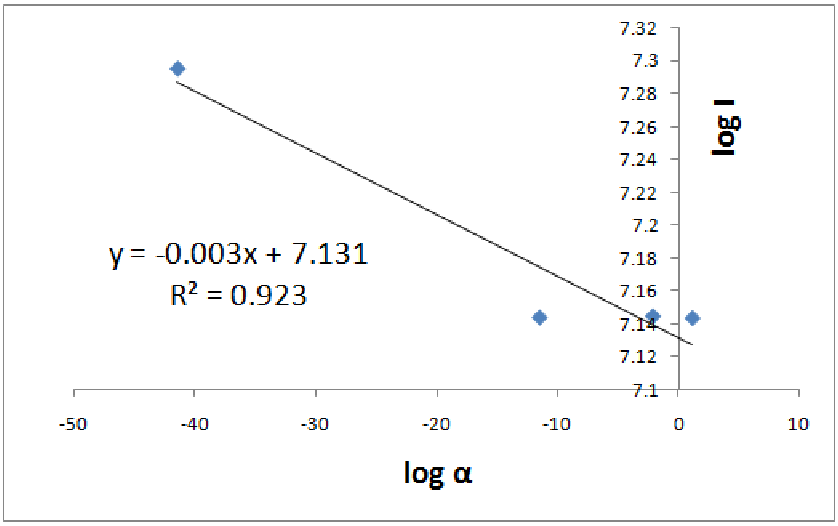

Figure 7: Plot of log *I* against log *α* for the month of July, 2017

Table 9: Cosmic ray (CR) Intensity for the month of August, 2017

CR Month of August, 2017		
	CR Intensity (*I*)	***log I***
Week 1	11816113	7.0725
Week 2	5972893	6.7762
Week 3	13807086	7.1401
Week 4	14024483	7.1469
TOTAL = 45620575		

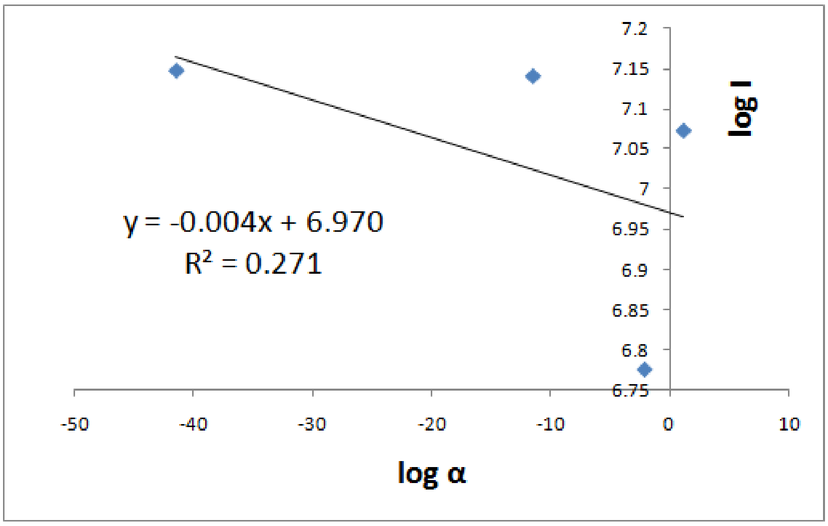

Figure 8: Plot of log *I* against log *α* for the month of August, 2017

Table 10: Cosmic ray (CR) Intensity for the month of September, 2017

CR Month of September, 2017		
	CR Intensity (*I*)	***log I***
Week 1	13867763	7.1420
Week 2	13730118	7.1377
Week 3	13792933	7.1397
Week 4	17613480	7.2458
TOTAL = 59004294		

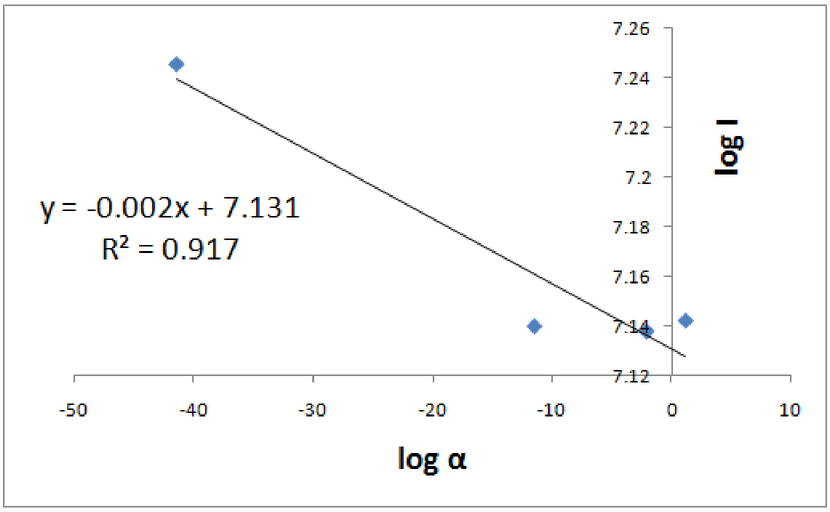

Figure 9: Plot of log *I* against log *α* for the month of September, 2017

Table 11: Cosmic ray (CR) Intensity for the month of October, 2017

CR Month of October, 2017		
	CR Intensity (*I*)	***log I***
Week 1	11812828	7.0724
Week 2	13784052	7.1394
Week 3	13840809	7.1412
Week 4	15875664	7.2007
TOTAL = 55313353		

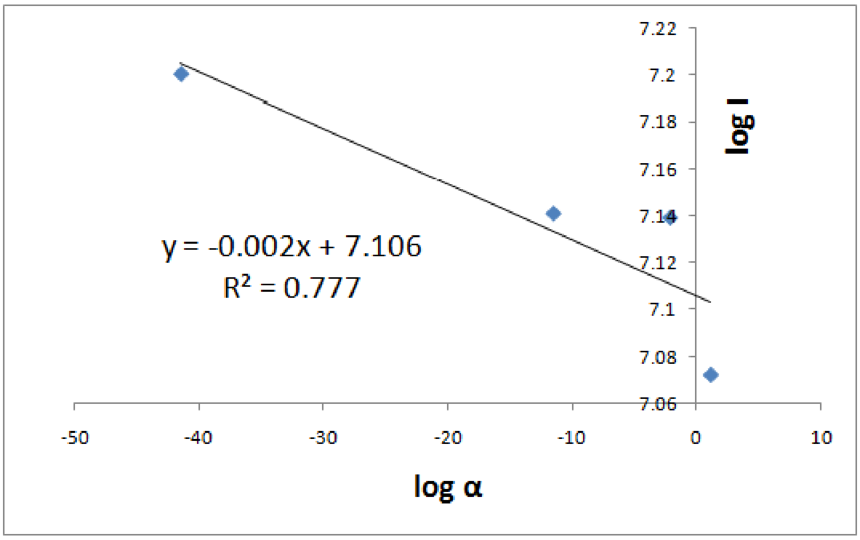

Figure 10: Plot of log *I* against log *α* for the month of October, 2017

Table 12: Cosmic ray (CR) Intensity for the month of November, 2017

CR Month of November, 2017		
	CR Intensity (*I*)	***log I***
Week 1	13897836	7.1429
Week 2	9913448	6.9962
Week 3	11974028	7.0782
Week 4	13848798	7.1414
TOTAL = 49634110		

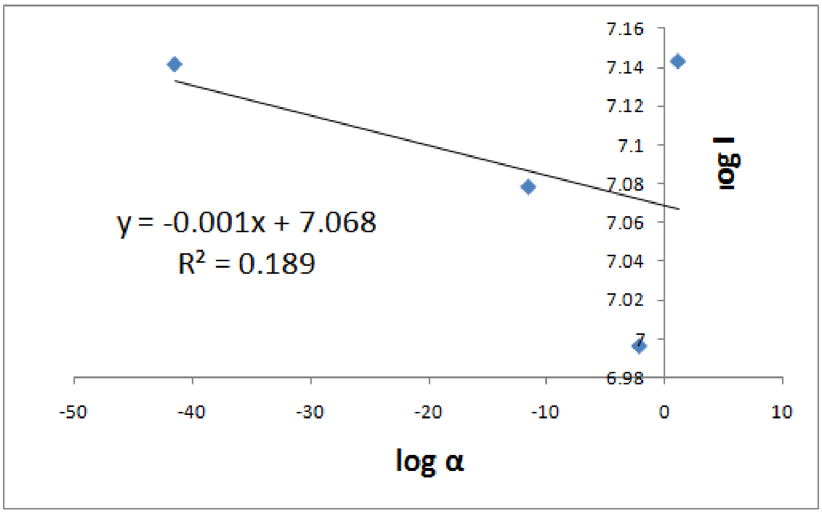

Figure 11: Plot of log I against log α for the month of November, 2017

Table 13: Cosmic ray (CR) Intensity for the month of December, 2017

CR Month of December, 2017		
	CR Intensity (I)	***log I***
Week 1	7935826	6.9000
Week 2	11909123	7.0759
Week 3	13939728	7.1443
Week 4	19914938	7.2992
TOTAL = 53699615		

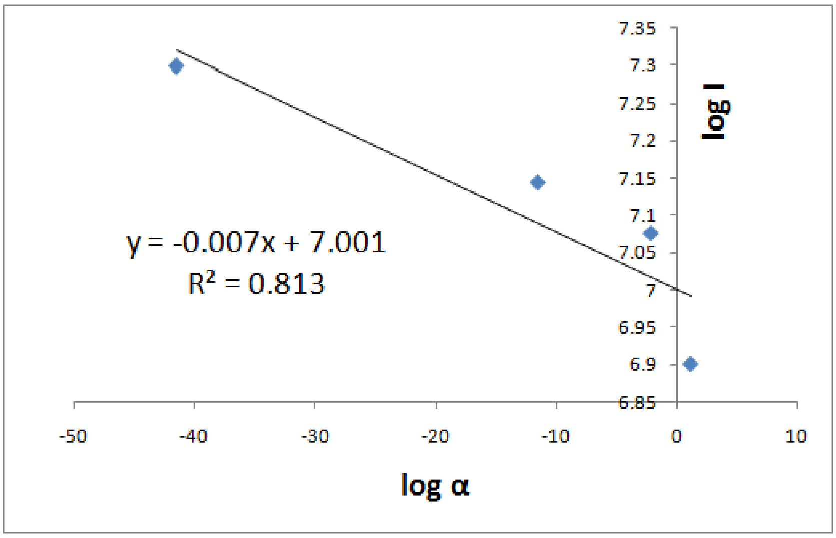

Figure 12: Plot of log I against log α for the month of December, 2017

IV. Discussion

In the investigation of the impact of supernova explosions on super-unification using cosmic ray intensity as a signature from supernova explosions, collected for twelve (12) months (one year), the cosmic ray intensities I of each month were plotted against the coupling parameters, α of the particle interactions. The value of the correlation coefficient, r of the events for each month is greater than 0.00 but less than 1.00; this shows that there is a positive relationship between the two variables.

The slope, m of the regression equations changes as the cosmic ray intensities changes. Thus, in the month of July 2017 and September 2017 where the intensity, I peaks to 61550921 and 59004294 respectively, the slope, m of the regression equation appreciates to $m = -0.003$ *and* -0.002 (Figures 7 and 9). The slope of the regression equation depreciates to $m = -0.006$ and $m = -0.007$ when the intensity reduced to 45941213 and 53699615 in the month of June 2017 and December 2017 respectively (Figures 6 and 12).

Analogously, looking closely to the regression equations plotted for the twenty four (24) months (two years), the intercept, c has approximately the same value, $c \approx 7.0$. This therefore supports power law:

$\mathrm{I} = k_0 \alpha^m$ (2)

where $k_0 = 10^c = 10^{7.0} = a\, constant$.

At $m = 1$, in equation (2), it suggest a linear dependence between the intensity, I and the coupling parameter, α.

Relating our equation (2) to Stefan's law, we obtain: $k_0 \alpha^m = \sigma T^4$ (3)

where $= 1$, $k_0 = 10^7$, and $\sigma = 5.67\, X\, 10^{-8} W m^{-2} K^{-4}$ (the Stefan constant).

Substituting all into equation (3), we obtain: $T = (3642.32)\sqrt[4]{\alpha}$ (4)

Equation (4) depicts that change in the temperature, T of the activities from supernova explosions due to gravitational traction is proportional to the coupling parameters of the fundamental interactions. This has something in common with the work of Moran and Shapiro (2000): "The gravitational compression can reduce the volume V of the particles, diminishing their internal temperature, T and the gravitational traction can increase the volume V of the particles, increasing their internal temperature T, and consequently increasing their electric charges". Thus, supernova explosions have an impact on coupling parameters of fundamental interactions and super-unification.

V. Conclusion

Owing to the above information, an attempt has been made to investigate the impact of supernova explosions and on super-unification. The work depicts a linear dependence between the cosmic ray intensity, I and the coupling parameters, α of the four fundamental interactions. The cosmic ray intensity and gravitational traction from the supernova can affect the internal temperature and even the volume of particles.

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