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EMF AND ELECTROMAGNETIC RADIATION PARAMETER DECISION. (BASED ON TAGUCHI ANALYSIS.)

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Abstract: Electromotive force generates electromagnetic radiation. It is therefore necessary to study the mathematical equations related to electromotive force. This paper focuses on electromagnetic radiation generated due to electromotive force. Depending upon the mathematical equations governing emf, certain parameters affecting electromagnetic radiation are decided based on Taguchi Analysis. Taguchi analysis is carried out for only those factors which affect and cause more electromagnetic radiation. Accordingly after carrying out Taguchi analysis, a condition is finalized so that it causes least electromagnetic iation. This condition is optimum condition which can be applied in any situation. It can also take care of human health as more electromagnetic radiation is harmful to human health.

Keywords-

Electromagnetic Radiation; Electromagnetic flux

I. INTRODUCTION

In 1831, Faraday proved that current can be produced by magnetism. He wound two separate windings on an iron toroid and placed a galvanometer in one circuit and a battery in the other. Upon closing the battery circuit, he noted a momentary deflection of the galvanometer, a similar deflection in the opposite direction occurred when the battery was disconnected. This of course was the first experiment he had made involving a changing magnetic field, and he followed it with a demonstration that either a moving magnetic field or a moving coil could also produce galvanometer deflection.

In terms of fields, we can say that a time varying magnetic field produces an electromotive force (emf) which may establish a current in a suitable closed circuit.

An electromotive force is merely a voltage that arises from conductors moving in a magnetic field or from changing magnetic fields. Faraday's law is stated as

 $Emf = -d\Phi/dt \quad V.----(1)$

Above equation implies a closed path, although not necessarily a closed conducting path. The magnetic flux is that flux which passes through any and every surface whose perimeter is the closed path, and $d\Phi/dt$ is the time rate of change of this flux.

A non zero value of $d\Phi/dt$ may result from any of the following situations:

- 1. A time changing flux linking a stationary closed path
- 2. Relative motion between a steady flux and a closed path.
- 3. A combination of the two.

The minus sign is an indication that the emf is in such a direction as to produce a current whose flux , if added to the original flux , would reduce the magnitude of the emf. This statement that the induced voltage acts to produce an opposing flux is known as Lenz's law.

Emf is also expressed as

 $\operatorname{Emf} = \int \operatorname{E.dL}_{-----(2)}$

Note that it is the voltage about a specific closed path. If any part of the path is changed, the emf in general changes.

Emf is also denoted as $Fmf = \int F dI = -d/dt \int B dS$

 $Emf = \int E.dL = -d/dt \int_{s} B.dS -----(3)$

The fingers of our right hand indicate the direction of closed path and our thumb indicates the direction of dS. A flux density B in the direction of dS and increasing with time thus produces an average value of E which is opposite to the positive direction about the closed path.

We first consider a stationary path. The magnetic flux is the only time varying quantity on the right side of (3), and a partial derivative may be taken under the integral sign,

 $Emf = \int E.dL = -\int_{s} \partial B / \partial t.dS -----(4)$

Applying Stoke's theorem to the closed line integral , we have

 $\int_{s} (\Delta x E) . dS = - \int_{s} \partial B / \partial t . dS$

Where the surface integrals may be taken over identical surfaces. The surfaces are perfectly general and may be chosen as differentials,

 $(\Delta xE) .dS = -\partial B/\partial t.dS -----(5)$

And

 $\Delta x E = - \partial B / \partial t - \dots - (6)$

This is one of Maxwell's four equations as written in differential ,or point form .

Equation 5 is the integral form of this equation and is equivalent to Faraday's law as applied to a fixed path.If B is not a function of time ,(5) and (6) evidently reduce to the electrostatic equations, $\int E.d L = 0$ (Electrostatics)

And

 $\Delta x E = 0$ (electrostatics)

As an example of the interpretation of (5) and (6) , let us assume a simple magnetic field which increases exponentially with time within the cylindrical region $\rho < b$,

 $\mathbf{B} = \mathbf{B}_0 \mathbf{e}^{\mathrm{kt}} \mathbf{a}_{\mathrm{z}} - \dots - (7)$

Where

 $\mathbf{B}_0 = \mathbf{constant}.$

Choosing the circular path $\rho=a$, a
b in the z=0 plane , along which E_{Φ} must be constant by symmetry, we then have from (4)

Emf= $2\Pi a E_{\Phi}$ = $-kB_0 e^{kt} \Pi a^2$ -----(8) If we replace a by ρ , $\rho < b$, the electric field intensity at any point is E= $-1/2 k B_0 e^{kt} \rho a_{\Phi}$ ------(9)

2. Modelling of system:

The basic system is radiation measurement system. Depending on the equations governing electromotive force(emf) first the parameters affecting are decided according to priority. Thus following parameters which affect emf the most are decided.

- 1. Flux density
- 2. Time
- 3. Electric field intensity
- 4. Distance

However more study reveals that electric field intensity and flux density equally are responsible for emf, hence any one can be considered hence we will consider flux density, time and distance as three parameters.

Another important thing is that it is proved that plants/trees reduce emf.

Hence in our system we will measure emf nearby plants/trees.

The system will measure radiation at two different values of time, distance and flux density in an area without plants/ trees, and similarly it will measure radiation at two different values of time, distance and flux density in an area having plants/trees.

The system will also record radiation values at early morning, afternoon and night.

The system will also record radiation values in different climate i.e hot, cold and rainy. also in airy atmosphere radiation values can be measured.

A detailed analysis of all above measurements will be done to reach some definite conclusions. Thereafter an optimum condition can be decided to have less amount of radiation.

3. Results and Discussions:

During experimentation following readings were taken.

Table	e 1		
parameters	Minimum and max values	Mean value of Radiation measured at minimum values	Mean value of Radiation measured at maximum values
Rainy atmosphere (at home)	32 μTesla,35 μTesla	33.565 μTesla	23.098 μTesla
Rainy atmosphere (outside home)	34 μTesla, 36 μTesla	33.86µTesla	35 µTesla
Without gomutra bottle (at 7 p.m)	37.94 μTesla,,42.84 μTesla,	37.94 μTesla,	42.84 μTesla,
With gomutra bottle (at 7 p.m)	37.5 μTesla,38.2 μTesla,	37.82 μTesla,	42.51 μTesla,

Each experiment is repeated 15 times and then mean value of radiation is decided in above tables.

Table 3

parameters	Mean value of Radiation measured at minimum values during day time	Mean value of Radiation measured at maximum values during evening.
Radiation near plants such as aloe vera and cactus	 33.86 μTesla(for aloe vera) 33.47 μTesla(for cactus) 	 38.53 μTesla(for aloe vera) 39.47 μTesla(for cactus)

Table 4	
Direction	Mean value of Radiation
EAST	42.47 µTesla
WEST	40.07 uTesla

EAST42.47 μTeslaWEST40.07 μTeslaNORTH40.67 μTeslaSOUTH40.73 μTesla

The above readings are taken at evening time at 7.15 pm.

Table 5 : readings taken at 7 p.m evening with and without gomutra bottle.

Direction	Mean value of Radiation With gomutra bottle	Mean value of Radiation Without gomutra
	With goindra bottle	bottle
EAST	37.82 µTesla	37.94 µTesla
WEST	41.66 µTesla	41.75 µTesla
NORTH	42.51 µTesla	42.84 µTesla
SOUTH	37.92 µTesla	38.32Tesla

Conclusions:

It is a common observation that in evening, emf is highest in east direction, it is lowest in west, in north and south direction emf is high.

In morning emf is least in east direction and high in west.

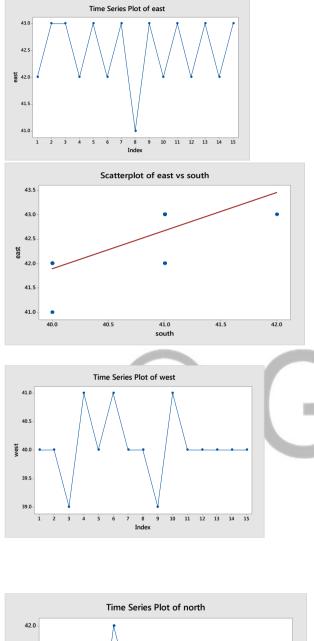
The emf is less than the emf outside home near the plants such as aloe- vera and cactus during day time. However it increases than emf outside home near plants such as aloe- vera and cactus. This indicates that during day time such plants absorb radiation and serve to minimise radiation in atmosphere.

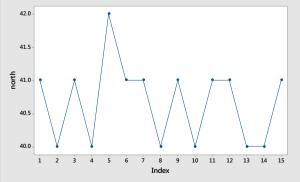
Emf is different at different times and in different seasons also it varies. In hot atmosphere emf values are high.

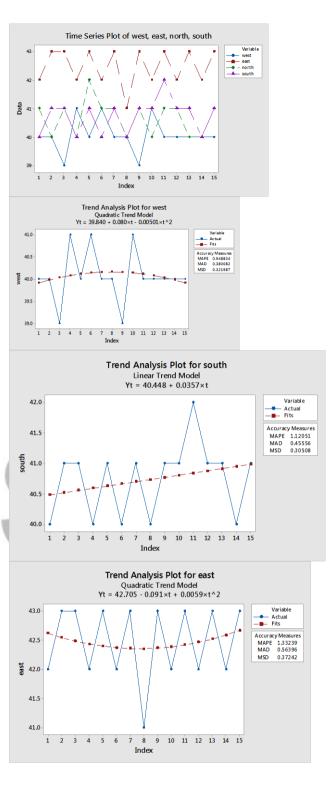
In cold atmosphere emf is low.

EMF decreases due to gomutra bottle as seen by readings in table 5.

Hence gomutra has capacity to decrease radiation.

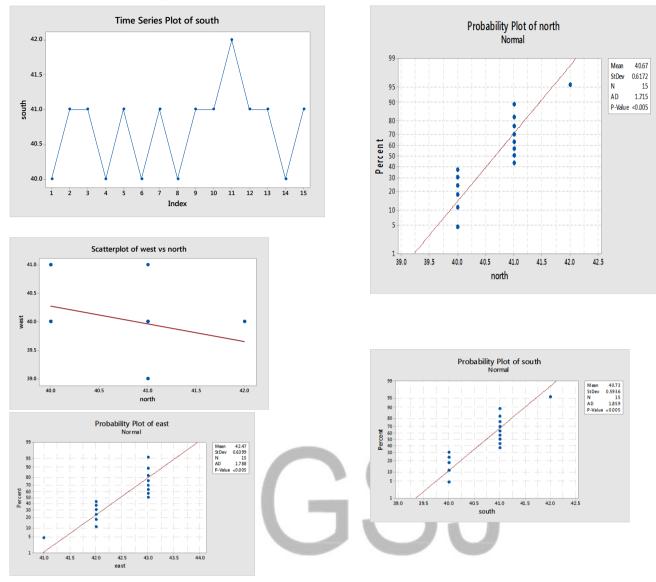


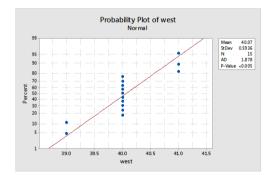


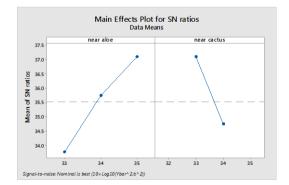


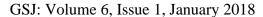
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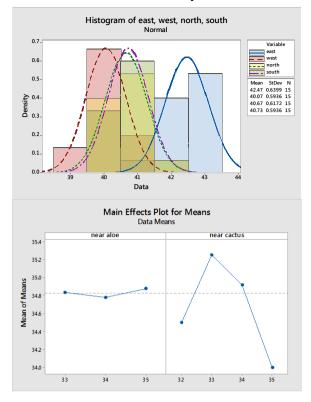


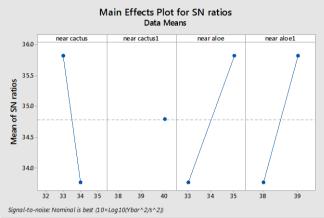


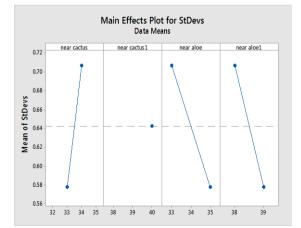




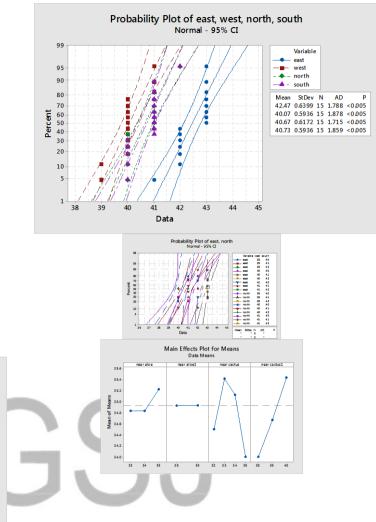


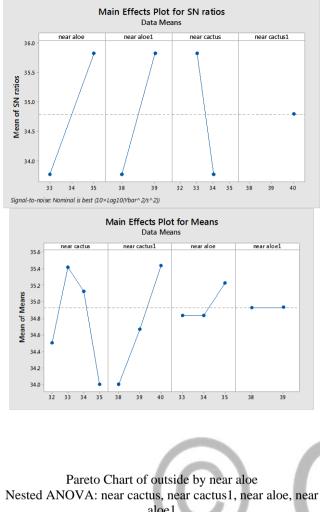






From above graph it is clear that all points lie in a balanced way above average value of 0.64.





aloe1 Nested ANOVA: near cactus versus outside Analysis of Variance for near cactus Source DF SS MS outside 2 1.5548 0.7774 Error 12 10.1786 0.8482 Total 14 11.7333 Variance Components Source Var Comp. % of Total StDev -0.015* outside 0.00 0.000 Error 0.848 100.00 0.921 Total 0.848 0.921 * Value is negative, and is estimated by zero. **Expected Mean Squares** 1 outside 1.00(2) + 4.80(1)2 Error 1.00(2)Nested ANOVA: near cactus1 versus outside Analysis of Variance for near cactus1 Source DF SS MS outside 2 2.0190 1.0095 Error 12 3.7143 0.3095

Total 14 5.7333 Variance Components % of StDev Source Var Comp. Total outside 0.146 32.03 0.382 67.97 0.556 Error 0.310 0.455 0.675 Total **Expected Mean Squares** 1 outside 1.00(2) + 4.80(1)2 Error 1.00(2)Nested ANOVA: near aloe versus outside Analysis of Variance for near aloe Source DF SS MS outside 2 2.7548 1.3774 Error 12 6.1786 0.5149 Total 14 8.9333 Variance Components % of Total StDev Source Var Comp. outside 0.180 25.87 0.424 74.13 0.718 Error 0.515 0.695 0.833 Total **Expected Mean Squares** 1 outside 1.00(2) + 4.80(1)2 Error 1.00(2)Nested ANOVA: near aloe1 versus outside Analysis of Variance for near aloe1 Source DF SS MS outside 2 0.5548 0.2774 Error 12 3.1786 0.2649 Total 14 3.7333 Variance Components % of StDev Source Var Comp. Total 0.97 0.051 outside 0.003 Error 0.265 99.03 0.515 Total 0.267 0.517 **Expected Mean Squares** 1 outside 1.00(2) + 4.80(1)2 Error 1.00(2)General Linear Model: near cactus versus outside Method Factor coding (-1, 0, +1)Factor Information Factor Type Levels Values outside Fixed 3 34, 35, 36 Analysis of Variance

Source DF Adj SS Adj MS F-Value P-Value

GSJ: Volume 6, Issue 1, January 2018 outside 2 1.555 0.7774 0.92 0.426 Error 12 10.179 0.8482 Total 14 11.733 Model Summary S R-sq R-sq(adj) R-sq(pred) 0.920985 13.25% 0.00% 0.00% Coefficients Term Coef SE Coef T-Value P-Value VIF Constant 33.512 0.246 136.15 0.000 outside 34 0.488 0.362 0.203 1.24 1.35 35 -0.71 0.490 1.24 -0.226 0.318 **Regression Equation** 33.512 + 0.488 outside_34 - 0.226 outside_35 near 0.262 outside_36 cactus Fits and Diagnostics for Unusual Observations near Obs Fit Resid Std Resid cactus 14 32.000 34.000 -2.000 -2.51 R R Large residual General Linear Model: near cactus1 versus outside Method Factor coding (-1, 0, +1)Factor Information Factor Type Levels Values outside Fixed 3 34, 35, 36 Analysis of Variance Source DF Adj SS Adj MS F-Value P-Value outside 2 2.019 1.0095 3.26 0.074 Error 12 3.714 0.3095 Total 14 5.733 Model Summary S R-sq R-sq(adj) R-sq(pred) 0.556349 35.22% 24.42% 0.00% Coefficients Term Coef SE Coef T-Value P-Value VIF Constant 39.476 0.149 265.49 0.000 outside 0.050 1.24 34 -0.476 0.219 -2.1835 -0.048 0.192 -0.25 0.808 1.24 **Regression Equation** 39.476 - 0.476 outside_34 - 0.048 outside_35 near cactus1 + 0.524 outside 36 Fits and Diagnostics for Unusual Observations near Resid Std Resid Obs Fit cactus1 12 40.000 39.000 1.000 2.08 R 14 38.000 39.000 -1.000 -2.08 R

R Large residual General Linear Model: near aloe versus outside Method Factor coding (-1, 0, +1)Factor Information Factor Type Levels Values outside Fixed 3 34.35.36 Analysis of Variance Source DF Adj SS Adj MS F-Value P-Value outside 2 2.755 1.3774 2.68 0.109 Error 12 6.179 0.5149 Total 14 8.933 Model Summary S R-sq R-sq(adj) R-sq(pred) 0.717552 30.84% 19.31% 0.00% Coefficients Coef SE Coef T-Value P-Value VIF Term Constant 34.155 0.192 178.10 0.000 outside 34 -0.155 0.282 -0.55 0.594 1.24 35 -0.440 0.248 -1.780.101 1.24 **Regression Equation** 34.155 - 0.155 outside 34 - 0.440 outside 35 near + 0.595 outside 36 aloe General Linear Model: near aloe1 versus outside Method Factor coding (-1, 0, +1)**Factor Information** Factor Type Levels Values outside Fixed 3 34, 35, 36 Analysis of Variance Source DF Adj SS Adj MS F-Value P-Value outside 2 0.5548 0.2774 1.05 0.381 Error 12 3.1786 0.2649 Total 14 3.7333 Model Summary R-sq R-sq(adj) R-sq(pred) S 0.514666 14.86% 0.67% 0.00% Coefficients Term Coef SE Coef T-Value P-Value VIF Constant 38.512 0.138 279.98 0.000 outside 34 -0.012 0.202 -0.06 0.954 1.24 -0.226 0.178 35 -1.270.227 1.24 **Regression Equation** 38.512 - 0.012 outside_34 - 0.226 outside_35 near + 0.238 outside_36 aloe1 Autocorrelation Function: east

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Autocorrelations					
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1 -0.700775 -2.71 8.94 2 0.563566 1.55 15.17					
3 -0.532558 -1.27 21.20 4 0.475060 1.02 26 45					
4 0.475969 1.03 26.45 Toruchi Analysis cost wast north south varius outside					
Taguchi Analysis: east, west, north, south versus outside, ar cactus1					
* NOTE * Design is not orthogonal.					
Response Table for Signal to Noise Ratios Nominal is best (10×Log10(Ybar^2/s^2))					
Level outside near aloe near near near cactus aloe1 cactus1					
1 32.62 30.62 31.15 30.90 32.15					
2 29.95 31.57 30.59 31.71 30.55					
3 32.43 31.39 31.57 31.72					
4 32.16					
Delta 2.67 0.95 1.57 0.81 1.60					
Rank 1 4 3 5 2					
Response Table for Means					
Level outside near aloe near near near near cactus aloe1 cactus1					
1 40.94 41.19 41.00 41.06 40.50					
2 41.14 41.00 41.02 40.94 41.17					
3 40.79 40.84 40.95 40.95					
4 41.13					
Delta 0.35 0.34 0.17 0.13 0.67					
Rank 2 3 4 5 1					
Taguchi Analysis: east, west, north, south versus outside, ar					
cactus l * NOTE * Design is not orthogonal.					
Predicted values					
* NOTE * Design is not orthogonal.					
Prediction					
S/N Ratio Mean StDev Ln(StDev)					
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Settings					
outside near near near aloe cactus aloe1 cactus1					
34 33 32 38 38					
Taguchi Analysis: east, west, north, south versus outside, ar cactus 1					
* NOTE * Design is not orthogonal.					
Predicted values					
* NOTE * Design is not orthogonal. Prediction					
S/N Ratio Mean StDev Ln(StDev)					
S/N Ratio Mean StDev Ln(StDev) 33.7348 40.5455 0.835915 -0.181412					

aloe cactus aloe1 cactus1

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			1.2752		
			1.7278		
			1.7959		
			2.6834		
			1.8901		
			2.2719		
near al	lo 38 -	0.4522	0.8830	-0.512	0.644

GSJ: Volume 6, Issue 1, January 2018 near cac 38 -1.6192 3.7096 -0.436 0.692 near cactus1 2 0.17479 0.17479 0.08740 0.79 0.530 near cac 39 -0.6041 2.5969 -0.233 0.831 Residual Error 3 0.33221 0.33221 0.11074 Model Summary Total 13 1.13951 R-Sq R-Sq(adj) S Unusual Observations for Means 2.2974 68.63% 0.00% SE Fit Residual Resid **Observation Means** Fit Analysis of Variance for SN ratios 2 41.000 41.000 0.333 0.000 Source DF Seq SS Adj SS Adj MS F Ρ 5 41.500 41.500 0.333 0.000 2 23.4900 15.602 7.801 1.48 0.357 outside 12 41.000 41.000 0.333 0.000 1.6903 6.590 3.295 0.62 0.593 near aloe 2 3.2046 5.427 14 40.500 40.500 0.333 0.000 near cactus 3 1.809 0.34 0.799 Linear Model Analysis: StDevs versus outside, near aloe, near 1 0.0817 1.384 1.384 0.26 0.644 near aloe1 cactus, near aloe1, near cactus1 2 6.1690 6.169 3.085 0.58 0.610 near cactus1 Estimated Model Coefficients for StDevs Residual Error 3 15.8336 15.834 5.278 Coef SE Coef T Term Total 13 50.4692 Constant 1.21971 0.2211 5.518 0.012 Unusual Observations for SN ratios outside 34 -0.32003 0.2795 -1.145 0.335 Observation SN ratios Fit SE Fit Residual Resid outside 35 0.28988 0.1714 1.692 0.189 near alo 33 -0.00162 0.2322 -0.007 0.995 2 29.245 29.245 2.297 Х 0.000 near alo 34 -0.25889 0.2413 -1.073 0.362 5 30.142 30.142 2.297 0.000 Х near cac 32 -0.32876 0.3606 -0.912 0.429 12 34.017 34.017 2.297 -0.000 Х near cac 33 -0.15486 0.2540 -0.610 0.585 14 32.149 32.149 2.297 0.000 X near cac 34 0.14977 0.3053 0.491 0.657 X denotes an observation whose X value gives it large near alo 38 0.04902 0.1187 0.413 0.707 leverage. Linear Model Analysis: Means versus outside, near aloe, near near cac 38 0.21759 0.4985 0.437 0.692 cactus, near aloe1, near cactus1 near cac 39 0.06276 0.3490 0.180 0.869 Estimated Model Coefficients for Means Model Summary Term Coef SE Coef T R-Sq R-Sq(adj) S Constant 40.7880 0.2383 171.180 0.000 0.3087 67.06% 0.00% outside 34 0.0781 0.3012 0.259 0.812 Analysis of Variance for StDevs outside 35 0.1392 0.1847 0.754 0.506 Source DF Seq SS Adj SS Adj MS F near alo 33 0.1174 0.2503 0.469 0.671 2 0.413907 0.27481 0.13740 1.44 0.364 outside near alo 34 -0.0104 0.2601 -0.040 0.971 near aloe 2 0.017237 0.11346 0.05673 0.60 0.606 near cac 32 0.2844 0.3887 0.732 0.517 3 0.055201 0.10046 0.03349 0.35 0.793 near cactus near cac 33 -0.0266 0.2738 -0.097 0.929 1 0.000281 0.01627 0.01627 0.17 0.707 near aloe1 near cac 34 -0.2667 0.3291 -0.810 0.477 near cactus1 2 0.095332 0.09533 0.04767 0.50 0.649 near alo 38 -0.0895 0.1279 -0.700 0.535 Residual Error 3 0.285918 0.28592 0.09531 near cac 38 -0.6330 0.5373 -1.178 0.324 Total 13 0.867875 near cac 39 0.2604 0.3762 0.692 0.539 Unusual Observations for StDevs Model Summary Observation StDevs Fit SE Fit Residual S R-Sq R-Sq(adj) 0.3328 70.85% 0.00% 2 1.414 1.414 0.309 -0.000Analysis of Variance for Means 5 1.291 1.291 0.309 -0.000DF Seq SS Adj SS Adj MS F Р Source 12 0.816 0.816 0.309 0.000 2 0.28757 0.15341 0.07670 0.69 0.566 outside 14 1.000 1.000 0.309 0.000 2 0.07586 0.02628 0.01314 0.12 0.892 near aloe Response Table for Signal to Noise Ratios 3 0.23883 0.11215 0.03738 0.34 0.802 near cactus Nominal is best (10×Log10(Ybar^2/s^2)) near aloe1 1 0.03025 0.05421 0.05421 0.49 0.535 Level outside near aloe near near near

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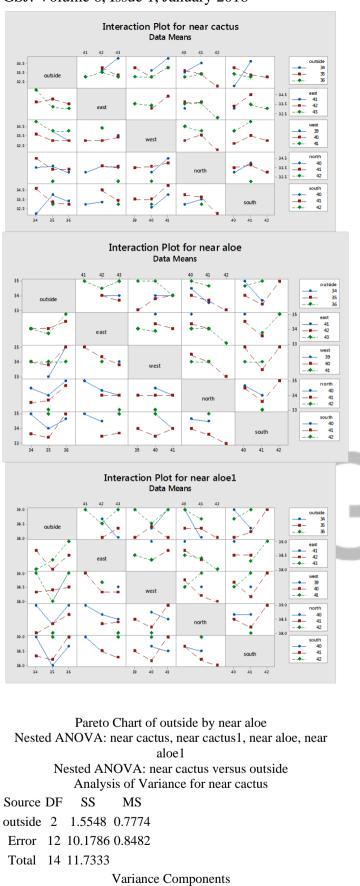
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	267	0.05	32.16	0.01	1.60	
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Level	outside	near aloe	cactus a			
1	40.94	41.19	41.00 4	41.06	40.50	
2	41.14	41.00	41.02 4	40.94	41.17	
3	40.79	40.84	40.95		40.95	
4			41.13			
Delta	0.35	0.34	0.17	0.13	0.67	
Rank	2	3	4	5	1	
	Res	sponse Ta	able for S	Standa	ard Deviations	
Level	outside	near aloe	near cactus	near a	lloe1 near cactus1	
1	0.9728	1.2497	1.1455	1.19		
2		1.1129				
3		1.1090			1.0942	
4			1.0374			
Delta	0.3499	0.1407	0.1843	0.11	06 0.2421	
Rank	1	4	3	5	2	
Rank 1 4 3 5 2 Probability Plot of east Probability Plot of west Probability Plot of north Probability Plot of south Stability Worksheet						
			Sumi			
	Testir	ng times:		9 Ba	atches: 3	
Samp	les per ba				tal runs: 27	
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	*	NOTE *	• Design	is not	orthogonal.	
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		.1833 1.				
		2436 1.				
		0028 1.				
		4000 2.				
	ac 33 1.				0.584	

near cac 34 -1.1606 2.2719 -0.511 0.645 near alo 38 -0.4522 0.8830 -0.512 0.644 near cac 38 -1.6192 3.7096 -0.436 0.692 near cac 39 -0.6041 2.5969 -0.233 0.831 Model Summary S R-Sq R-Sq(adj) 2.2974 68.63% 0.00% Analysis of Variance for SN ratios DF Seq SS Adj SS Adj MS F Source Ρ 2 23.4900 15.602 7.801 1.48 0.357 outside 1.6903 6.590 3.295 0.62 0.593 2 near aloe 3 3.2046 5.427 1.809 0.34 0.799 near cactus near aloe1 1 0.0817 1.384 1.384 0.26 0.644 near cactus1 2 6.1690 6.169 3.085 0.58 0.610 Residual Error 3 15.8336 15.834 5.278 Total 13 50.4692 Unusual Observations for SN ratios Observation SN ratios Fit SE Fit Residual Resid 29.245 29.245 2.297 2 0.000 Х 5 30.142 30.142 2.297 Х 0.000 12 34.017 34.017 2.297 Х -0.000 * 32.149 32.149 2.297 * Х 14 0.000 X denotes an observation whose X value gives it large leverage. Linear Model Analysis: Means versus outside, near aloe, near cactus, near aloe1, near cactus1 Estimated Model Coefficients for Means Term Coef SE Coef Т Ρ Constant 40.7880 0.2383 171.180 0.000 outside 34 0.0781 0.3012 0.259 0.812 outside 35 0.1392 0.1847 0.754 0.506 near alo 33 0.1174 0.2503 0.469 0.671 near alo 34 -0.0104 0.2601 -0.040 0.971 near cac 32 0.2844 0.3887 0.732 0.517 near cac 33 -0.0266 0.2738 -0.097 0.929 near cac 34 -0.2667 0.3291 -0.810 0.477 near alo 38 -0.0895 0.1279 -0.700 0.535 near cac 38 -0.6330 0.5373 -1.178 0.324 near cac 39 0.2604 0.3762 0.692 0.539 Model Summary S R-Sq R-Sq(adj) 0.3328 70.85% 0.00% Analysis of Variance for Means DF Seq SS Adj SS Adj MS F Source Р outside 2 0.28757 0.15341 0.07670 0.69 0.566

near aloe 2 0.07586 0.02628 0.01314 0.12 0.892

near cactus 3 0.23883 0.11215 0.03738 0.34 0.802	Nominal is best (10×Log10(Ybar^2/s^2))
near aloe1 1 0.03025 0.05421 0.05421 0.49 0.535	Level outside near aloe near near near
near cactus1 2 0.17479 0.17479 0.08740 0.79 0.530	cactus aloe1 cactus1
Residual Error 3 0.33221 0.33221 0.11074	1 32.62 30.62 31.15 30.90 32.15
Total 13 1.13951	2 29.95 31.57 30.59 31.71 30.55
Unusual Observations for Means	3 32.43 31.39 31.57 31.72
Observation Marcon Fig. OF Fig. Decided St	4 32.16
Observation Means Fit SE Fit Residual Resid	Delta 2.67 0.95 1.57 0.81 1.60
2 41.000 41.000 0.333 0.000 * X	Rank 1 4 3 5 2
5 41.500 41.500 0.333 0.000 * X	Response Table for Means
12 41.000 41.000 0.333 0.000 * X	Level outside near aloe near near near
14 40.500 40.500 0.333 0.000 * X	cacius aloe1 cacius1
Linear Model Analysis: StDevs versus outside, near aloe, near	1 40.94 41.19 41.00 41.06 40.50
cactus, near aloe1, near cactus1	2 41.14 41.00 41.02 40.94 41.17
Estimated Model Coefficients for StDevs	3 40.79 40.84 40.95 40.95
Term Coef SE Coef T P	4 41.13
Constant 1.21971 0.2211 5.518 0.012	Delta 0.35 0.34 0.17 0.13 0.67
outside 34 -0.32003 0.2795 -1.145 0.335	Rank 2 3 4 5 1
outside 35 0.28988 0.1714 1.692 0.189	Response Table for Standard Deviations
near alo 33 -0.00162 0.2322 -0.007 0.995	Level outside near aloe $\frac{\text{near}}{\text{cactus}}$ near aloe $1 \frac{\text{near}}{\text{cactus}}$
near alo 34 -0.25889 0.2413 -1.073 0.362	
near cac 32 -0.32876 0.3606 -0.912 0.429	1 0.9728 1.2497 1.1455 1.1983 1.0000
near cac 33 -0.15486 0.2540 -0.610 0.585	2 1.3227 1.1129 1.2217 1.0877 1.2421
near cac 34 0.14977 0.3053 0.491 0.657	3 0.9872 1.1090 1.1275 1.0942
near alo 38 0.04902 0.1187 0.413 0.707	4 1.0374
near cac 38 0.21759 0.4985 0.437 0.692	Delta 0.3499 0.1407 0.1843 0.1106 0.2421
near cac 39 0.06276 0.3490 0.180 0.869	Rank 1 4 3 5 2
Model Summary	Main Effects Plot for Means
S R-Sq R-Sq(adj)	Main Effects Plot for SN ratios
0.3087 67.06% 0.00%	Taguchi Analysis: east, west, north, south versus outside, ar cactus1
Analysis of Variance for StDevs	* NOTE * Design is not orthogonal.
Source DF Seq SS Adj SS Adj MS F P	Predicted values
outside 2 0.413907 0.27481 0.13740 1.44 0.364	* NOTE * Design is not orthogonal.
near aloe 2 0.017237 0.11346 0.05673 0.60 0.606	Prediction
near cactus 3 0.055201 0.10046 0.03349 0.35 0.793	S/N Ratio Mean StDev Ln(StDev)
near aloe1 1 0.000281 0.01627 0.01627 0.17 0.707	33.7348 40.5455 0.835915 -0.181412
near cactus1 2 0.095332 0.09533 0.04767 0.50 0.649	Settings
Residual Error 3 0.285918 0.28592 0.09531	outside near near near near aloe cactus aloe1 cactus1
Total 13 0.867875	
Unusual Observations for StDevs	34 33 32 38 38
Observation StDevs Fit SE Fit Residual St Resid	
2 1.414 1.414 0.309 -0.000 * X	
5 1.291 1.291 0.309 -0.000 * X	
12 0.816 0.816 0.309 0.000 * X	
14 1.000 1.000 0.309 0.000 * X	
Response Table for Signal to Noise Ratios	





Source Ver Comp. 1/ of Total StDay
Source Var Comp. % of Total StDev outside -0.015* 0.00 0.000
Error 0.848 100.00 0.921
Total 0.848 0.921
* Value is negative, and is estimated by zero. Expected Mean Squares
1 outside $1.00(2) + 4.80(1)$
2 Error 1.00(2)
Nested ANOVA: near cactus1 versus outside
Analysis of Variance for near cactus1
Source DF SS MS
outside 2 2.0190 1.0095
Error 12 3.7143 0.3095
Total 14 5.7333
Variance Components
Source Var Comp. % of Total StDev
outside 0.146 32.03 0.382
Error 0.310 67.97 0.556
Total 0.455 0.675
Expected Mean Squares
1 outside $1.00(2) + 4.80(1)$
2 Error 1.00(2)
Nested ANOVA: near aloe versus outside
Analysis of Variance for near aloe
Source DF SS MS
outside 2 2.7548 1.3774
Error 12 6.1786 0.5149
Total 14 8.9333
Variance Components
Source Var Comp. % of Total StDev
outside 0.180 25.87 0.424
Error 0.515 74.13 0.718
Total 0.695 0.833
Expected Mean Squares
1 outside $1.00(2) + 4.80(1)$
2 Error 1.00(2)
Nested ANOVA: near aloe1 versus outside
Analysis of Variance for near aloe1
Source DF SS MS
outside 2 0.5548 0.2774
Error 12 3.1786 0.2649
Total 14 3.7333
Variance Components
% of
Source Var Comp. 70 of StDev
outside 0.003 0.97 0.051

GSJ: Volume 6, Issue 1, January 2018 99.03 0.515 Error 0.265 Total 0.267 0.517 **Expected Mean Squares** 1 outside 1.00(2) + 4.80(1)2 Error 1.00(2)General Linear Model: near cactus versus outside Method Factor coding (-1, 0, +1)Factor Information Factor Type Levels Values outside Fixed 3 34, 35, 36 Analysis of Variance Source DF Adj SS Adj MS F-Value P-Value outside 2 1.555 0.7774 0.92 0.426 Error 12 10.179 0.8482 Total 14 11.733 Model Summary S R-sq R-sq(adj) R-sq(pred) 0.920985 13.25% 0.00% 0.00% Coefficients Term Coef SE Coef T-Value P-Value VIF Constant 33.512 0.246 136.15 0.000 outside 34 0.488 0.362 1.35 0.203 1.24 0.490 1.24 -0.71 35 -0.226 0.318 Regression Equation 33.512 + 0.488 outside_34 - 0.226 outside 35 near 0.262 outside 36 cactus Fits and Diagnostics for Unusual Observations near Obs Resid Std Resid Fit cactus 14 32.000 34.000 -2.000 -2.51 R R Large residual General Linear Model: near cactus1 versus outside Method Factor coding (-1, 0, +1) Factor Information Factor Type Levels Values outside Fixed 3 34, 35, 36 Analysis of Variance Source DF Adj SS Adj MS F-Value P-Value outside 2 2.019 1.0095 3.26 0.074 Error 12 3.714 0.3095 Total 14 5.733 Model Summary S R-sq R-sq(adj) R-sq(pred) 0.556349 35.22% 24.42% 0.00% Coefficients

Coef SE Coef T-Value P-Value VIF Term Constant 39.476 0.149 265.49 0.000 outside 34 -0.476 0.219 -2.180.050 1.24 -0.048 0.192 -0.25 0.808 1.24 35 **Regression Equation** 39.476 - 0.476 outside 34 - 0.048 outside 35 near + 0.524 outside 36 cactus1 Fits and Diagnostics for Unusual Observations near Obs cactus1 Fit Resid Std Resid 12 40.000 39.000 1.000 R 2.08 14 38.000 39.000 -1.000 -2.08 R R Large residual General Linear Model: near aloe versus outside Method Factor coding (-1, 0, +1)Factor Information Factor Type Levels Values outside Fixed 3 34, 35, 36 Analysis of Variance Source DF Adj SS Adj MS F-Value P-Value outside 2 2.755 1.3774 2.68 0.109 Error 12 6.179 0.5149 14 8.933 Total Model Summary S R-sq R-sq(adj) R-sq(pred) 0.717552 30.84% 19.31% 0.00% Coefficients Coef SE Coef T-Value P-Value VIF Term Constant 34.155 0.192 178.10 0.000 outside 34 -0.155 0.282 -0.55 0.594 1.24 35 -0.440 0.248 -1.78 0.101 1.24 **Regression Equation** 34.155 - 0.155 outside_34 - 0.440 outside_35 near + 0.595 outside 36 aloe General Linear Model: near aloe1 versus outside Method Factor coding (-1, 0, +1)Factor Information Factor Type Levels Values outside Fixed 3 34, 35, 36 Analysis of Variance Source DF Adj SS Adj MS F-Value P-Value outside 2 0.5548 0.2774 1.05 0.381 Error 12 3.1786 0.2649 Total 14 3.7333

GSJ: Volume 6, Issue 1, January 2018 Model Summary S R-sq R-sq(adj) R-sq(pred) 0.514666 14.86% 0.67% 0.00% Coefficients Coef SE Coef T-Value P-Value VIF Term Constant 38.512 0.138 279.98 0.000 outside 34 -0.012 0.202 -0.06 0.954 1.24 35 -1.27 -0.226 0.178 0.227 1.24 **Regression Equation** 38.512 - 0.012 outside 34 - 0.226 outside 35 near aloe1 + 0.238 outside_36 Autocorrelation Function: east Autocorrelations Т LBO Lag ACF 1 -0.700775 -2.71 8.94 2 0.563566 1.55 15.17 3 -0.532558 -1.27 21.20 4 0.475969 1.03 26.45 Taguchi Analysis: east, west, north, south versus outside, ... ar cactus1 * NOTE * Design is not orthogonal. Response Table for Signal to Noise Ratios Nominal is best (10×Log10(Ybar^2/s^2)) near near near Level outside near aloe cactus aloe1 cactus1 31.15 30.90 32.15 1 32.62 30.62 2 29.95 31.57 30.59 31.71 30.55 3 32.43 31.39 31.57 31.72 4 32.16 0.95 1.57 0.81 2.67 Delta 1.604 5 2 1 3 Rank **Response Table for Means** near near near Level outside near aloe cactus aloe1 cactus1 1 40.94 41.19 41.00 41.06 40.50 2 41.14 41.00 41.02 40.94 41.17 3 40.79 40.84 40.95 40.95 4 41.13 0.17 0.13 Delta 0.35 0.34 0.67 2 3 Rank 4 5 1 Taguchi Analysis: east, west, north, south versus outside, ... ar cactus1 * NOTE * Design is not orthogonal. Predicted values * NOTE * Design is not orthogonal. Prediction S/N Ratio Mean StDev Ln(StDev) 33.7348 40.5455 0.835915 -0.181412

Settings near near near near outside aloe cactus aloe1 cactus1 38 34 33 32 38 Taguchi Analysis: east, west, north, south versus outside, ... ar cactus1 * NOTE * Design is not orthogonal. Predicted values * NOTE * Design is not orthogonal. Prediction S/N Ratio Mean StDev Ln(StDev) 33.7348 40.5455 0.835915 -0.181412 Settings outside near near near near aloe cactus aloe1 cactus1 32 38 38 34 33 Probability Plot of east, north * NOTE * Distribution could not be fit. The number of distinct rows of data in east (for west = 39, south = 41) must be greater than or equal to the number of estimated distribution parameters. * NOTE * Distribution could not be fit. The number of distinct rows of data in east (for west = 40, south = 42) must be greater than or equal to the number of estimated distribution parameters. * NOTE * Distribution could not be fit. The number of distinct rows of data in east (for west = 41, south = 40) must be greater than or equal to the number of estimated distribution parameters. * NOTE * Distribution could not be fit. The number of distinct rows of data in east (for west = 41, south = 41) must be greater than or equal to the number of estimated distribution parameters. * NOTE * Distribution could not be fit. The number of distinct rows of data in north (for west = 39, south = 41) must be greater than or equal to the number of estimated distribution parameters. * NOTE * Distribution could not be fit. The number of distinct rows of data in north (for west = 40, south = 42) must be greater than or equal to the number of estimated distribution parameters. * NOTE * Distribution could not be fit. The number of distinct rows of data in north (for west = 41, south = 41) must be greater than or equal to the number of estimated distribution parameters. Taguchi Analysis: east, west, north, south versus outside, ... ar cactus1 * NOTE * Design is not orthogonal.

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Linear Model Analysis: SN ratios versus outside, near aloe,						
near cactus, near aloe1, near cactus1	1					
Estimated Model Coefficients for SN ratios	,					
Term Coef SE Coef T P	1					
Constant 30.7384 1.6450 18.686 0.000	1					
outside 34 2.4240 2.0796 1.166 0.328						
outside 35 -2.1833 1.2752 -1.712 0.185	(
near alo 33 0.2436 1.7278 0.141 0.897						
near alo 34 2.0028 1.7959 1.115 0.346						
near cac 32 2.4000 2.6834 0.894 0.437						
near cac 33 1.1570 1.8901 0.612 0.584						
near cac 34 -1.1606 2.2719 -0.511 0.645						
near alo 38 -0.4522 0.8830 -0.512 0.644						
near cac 38 -1.6192 3.7096 -0.436 0.692						
near cac 39 -0.6041 2.5969 -0.233 0.831]					
Model Summary						
S R-Sq R-Sq(adj)						
2.2974 68.63% 0.00%						
Analysis of Variance for SN ratios	,					
Source DF Seq SS Adj SS Adj MS F P						
outside 2 23.4900 15.602 7.801 1.48 0.357						
near aloe 2 1.6903 6.590 3.295 0.62 0.593						
near cactus 3 3.2046 5.427 1.809 0.34 0.799						
near aloe1 1 0.0817 1.384 1.384 0.26 0.644						
near cactus1 2 6.1690 6.169 3.085 0.58 0.610						
Residual Error 3 15.8336 15.834 5.278						
Total 13 50.4692						
Unusual Observations for SN ratios						
Observation SN ratios Fit SE Fit Residual St Resid						
2 29.245 29.245 2.297 0.000 * X	1					
5 30.142 30.142 2.297 0.000 * X	1					
12 34.017 34.017 2.297 -0.000 * X	1					
14 32.149 32.149 2.297 0.000 * X	1					
X denotes an observation whose X value gives it large	1					
leverage.	1					
Linear Model Analysis: Means versus outside, near aloe, near cactus, near aloe1, near cactus1	1					
Estimated Model Coefficients for Means	1					
Term Coef SE Coef T P						
Constant 40.7880 0.2383 171.180 0.000						
outside 34 0.0781 0.3012 0.259 0.812	(
outside 35 0.1392 0.1847 0.754 0.506						
near alo 33 0.1174 0.2503 0.469 0.671						
near alo 34 -0.0104 0.2601 -0.040 0.971						

0.732 0.517

near cac 32 0.2844 0.3887

near cac 33 -0.0266 0.2738 -0.097 0.929

near cac 34 -0.2667 0.3291 -0.810 0.477 near alo 38 -0.0895 0.1279 -0.700 0.535 near cac 38 -0.6330 0.5373 -1.178 0.324 near cac 39 0.2604 0.3762 0.692 0.539 Model Summary S R-Sq R-Sq(adj) 0.3328 70.85% 0.00% Analysis of Variance for Means Source DF Seq SS Adj SS Adj MS F Ρ 2 0.28757 0.15341 0.07670 0.69 0.566 outside 2 0.07586 0.02628 0.01314 0.12 0.892 near aloe 3 0.23883 0.11215 0.03738 0.34 0.802 near cactus near aloe1 1 0.03025 0.05421 0.05421 0.49 0.535 near cactus1 2 0.17479 0.17479 0.08740 0.79 0.530 Residual Error 3 0.33221 0.33221 0.11074 Total 13 1.13951 Unusual Observations for Means Fit SE Fit Residual Resid **Observation Means** 41.000 41.000 0.333 2 0.000 Х 5 41.500 41.500 0.333 Х 0.000 * 12 41.000 41.000 0.333 * Х 0.000 14 40.500 40.500 0.333 0.000 * Х Linear Model Analysis: StDevs versus outside, near aloe, near cactus, near aloe1, near cactus1 Estimated Model Coefficients for StDevs Term Coef SE Coef Т Ρ Constant 1.21971 0.2211 5.518 0.012 outside 34 -0.32003 0.2795 -1.145 0.335 outside 35 0.28988 0.1714 1.692 0.189 near alo 33 -0.00162 0.2322 -0.007 0.995 near alo 34 -0.25889 0.2413 -1.073 0.362 near cac 32 -0.32876 0.3606 -0.912 0.429 near cac 33 -0.15486 0.2540 -0.610 0.585 near cac 34 0.14977 0.3053 0.491 0.657 near alo 38 0.04902 0.1187 0.413 0.707 near cac 38 0.21759 0.4985 0.437 0.692 near cac 39 0.06276 0.3490 0.180 0.869 Model Summary S R-Sq R-Sq(adj) 0.3087 67.06% 0.00% Analysis of Variance for StDevs Source DF Seq SS Adj SS Adj MS F Р 2 0.413907 0.27481 0.13740 1.44 0.364 outside near aloe 2 0.017237 0.11346 0.05673 0.60 0.606 3 0.055201 0.10046 0.03349 0.35 0.793 near cactus 1 0.000281 0.01627 0.01627 0.17 0.707 near aloe1

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near cactus1 2 0.095332 0.09533 0.04767 0.50 0.649						
Residual Error 3 0.285918 0.28592 0.09531						
Total 13 0.867875						
		Unusual	Observa	tions for S	StDevs	
Observ	vation S	tDevs F	Fit SEF	it Residua	al St Resid	
2	: 1	1.414 1.4	414 0.30	9 -0.000	*	Х
5]	1.291 1.2	291 0.30	9 -0.000	*	Х
12	2 (0.816 0.8	816 0.30	9 0.000	*	Х
14	4 1	1.000 1.0	000 0.30	9 0.000	*	Х
	Res	ponse Ta	ble for Si	ignal to N	oise Rati	os
	Nor	ninal is b	best (10×10)	Log10(Yb	ar^2/s^2))
Level	outside	near aloe		near nea aloe1 cact		
1	32.62	30.62	31.15 3	30.90 32.	15	
2	29.95	31.57	30.59 3	31.71 30.	55	
3	32.43	31.39	31.57	31.	72	
4			32.16			
Delta	2.67	0.95	1.57	0.81 1.6	50	
Rank	1	4	3	5 2		
		Resp		le for Mea		
Level	outside	near aloe		near nea aloe1 cact		
1	40.94	41.19	41 00 4	11.06 10	50	
			71.00 7	1.06 40.	50	
2	41.14			40.94 41.		
2 3		41.00	41.02 4		17	
	41.14	41.00	41.02 4	40.94 41.	17	(
3	41.14	41.00	41.02 4 40.95	40.94 41. 40.9	17 95	(
3 4	41.14 40.79	41.00 40.84	41.02 4 40.95 41.13	40.94 41. 40.9	17 95	(
3 4 Delta	41.14 40.79 0.35 2	41.00 40.84 0.34 3	41.02 4 40.95 41.13 0.17 4	40.94 41. 40. 0.13 0.6	17 95 57	IS
3 4 Delta Rank	41.14 40.79 0.35 2 Res	41.00 40.84 0.34 3	41.02 4 40.95 41.13 0.17 4 able for S	40.94 41. 40.9 0.13 0.6 5 1	17 95 57 Deviation	IS
3 4 Delta Rank Level	41.14 40.79 0.35 2 Res	41.00 40.84 0.34 3 sponse Ta near aloe	41.02 4 40.95 41.13 0.17 4 able for S near cactus	40.94 41. 40. 0.13 0.6 5 1 Standard E near aloe1	17 95 57 Deviation near	s
3 4 Delta Rank Level	41.14 40.79 0.35 2 Resoutside	41.00 40.84 0.34 3 sponse Ta near aloe 1.2497	41.02 4 40.95 41.13 0.17 4 able for S near cactus 1.1455	40.94 41. 40. 0.13 0.6 5 1 Standard E near aloe1	17 95 57 Deviation near cactus1	IS
3 4 Delta Rank Level 1 2	41.14 40.79 0.35 2 Resoutside 0.9728	41.00 40.84 0.34 3 sponse Ta near aloe 1.2497 1.1129	41.02 4 40.95 41.13 0.17 4 able for S near cactus 1.1455 1.2217	10.94 41. 40. 0.13 0.6 5 1 Standard E near aloe1 1.1983	17 95 57 Deviation near cactus1 1.0000	IS
3 4 Delta Rank Level 1 2	41.14 40.79 0.35 2 Resolution 0.9728 1.3227	41.00 40.84 0.34 3 sponse Ta near aloe 1.2497 1.1129	41.02 4 40.95 41.13 0.17 4 able for S near cactus 1.1455 1.2217	10.94 41. 40. 0.13 0.6 5 1 Standard E near aloe1 1.1983	17 95 57 Deviation near cactus1 1.0000 1.2421	s
3 4 Delta Rank Level 1 2 3 4	41.14 40.79 0.35 2 Resolution 0.9728 1.3227	41.00 40.84 0.34 3 sponse Ta near aloe 1.2497 1.1129 1.1090	41.02 4 40.95 41.13 0.17 4 able for S near cactus 1.1455 1.2217 1.1275	10.94 41. 40. 0.13 0.6 5 1 Standard E near aloe1 1.1983	17 95 57 Deviation near cactus1 1.0000 1.2421	IS
3 4 Delta Rank Level 1 2 3 4	41.14 40.79 0.35 2 Resolutside 0.9728 1.3227 0.9872	41.00 40.84 0.34 3 sponse Ta near aloe 1.2497 1.1129 1.1090	41.02 4 40.95 41.13 0.17 4 able for S near cactus 1.1455 1.2217 1.1275 1.0374	10.94 41. 40.9 0.13 0.6 5 1 Standard E near aloe1 1.1983 1.0877	17 95 57 Deviation near cactus 1 1.0000 1.2421 1.0942	s
3 4 Delta Rank Level 1 2 3 4 Delta	41.14 40.79 0.35 2 Re: outside 0.9728 1.3227 0.9872 0.3499	41.00 40.84 0.34 3 sponse Ta near aloe 1.2497 1.1129 1.1090 0.1407 4 Pro	41.02 4 40.95 41.13 0.17 4 able for S near cactus 1.1455 1.2217 1.1275 1.0374 0.1843 3 bability	0.94 41. 40. 0.13 0.6 5 1 Standard E near aloe1 1.1983 1.0877 0.1106	17 95 57 Deviation near cactus1 1.0000 1.2421 1.0942 0.2421 2 st	s
3 4 Delta Rank Level 1 2 3 4 Delta	41.14 40.79 0.35 2 Re: outside 0.9728 1.3227 0.9872 0.3499	41.00 40.84 0.34 3 sponse Ta near aloe 1.2497 1.1129 1.1090 0.1407 4 Pro Pro Pro	41.02 4 40.95 41.13 0.17 4 able for S near cactus 1.1455 1.2217 1.1275 1.0374 0.1843 3 bability I bability I bability F	0.94 41. 40. 0.13 0.6 5 1 5tandard E near aloe1 1.1983 1.0877 0.1106 5 Plot of eas Plot of weight	17 95 57 Deviation near cactus 1 1.0000 1.2421 1.0942 0.2421 2 0.2421 2 st st th	IS
3 4 Delta Rank Level 1 2 3 4 Delta	41.14 40.79 0.35 2 Re: outside 0.9728 1.3227 0.9872 0.3499	41.00 40.84 0.34 3 sponse Ta near aloe 1.2497 1.1129 1.1090 0.1407 4 Pro Pro Pro Pro	41.02 4 40.95 41.13 0.17 4 able for S near cactus 1.1455 1.2217 1.1275 1.0374 0.1843 3 bability I bability P pability P	40.94 41. 40.9 0.13 0.6 5 1 0.13 0.6 5 1 0.13 0.6 1 5 1 0.1 1.08 7 0.1106 5 Plot of ease Plot of ease Plot of nor Plot of sou	17 95 57 Deviation near cactus 1 1.0000 1.2421 1.0942 0.2421 2 0.2421 2 st st th	s
3 4 Delta Rank Level 1 2 3 4 Delta	41.14 40.79 0.35 2 Re: outside 0.9728 1.3227 0.9872 0.3499	41.00 40.84 0.34 3 sponse Ta near aloe 1.2497 1.1129 1.1090 0.1407 4 Pro Pro Pro Pro	41.02 4 40.95 41.13 0.17 4 able for S near cactus 1.1455 1.2217 1.1275 1.0374 0.1843 3 bability P bability P bability P	40.94 41. 40.9 0.13 0.6 5 1 0.13 0.6 5 1 0.13 0.6 5 1 0.106 5 1.0877 0.1106 5 Plot of ease Plot of ease Plot of nor Plot of sou Vorksheet	17 95 57 Deviation near cactus 1 1.0000 1.2421 1.0942 0.2421 2 0.2421 2 st st th	IS
3 4 Delta Rank Level 1 2 3 4 Delta	41.14 40.79 0.35 2 Resolutside 0.9728 1.3227 0.9872 0.3499 1	41.00 40.84 0.34 3 sponse Ta near aloe 1.2497 1.1129 1.1090 0.1407 4 Proi Proi Proi St	41.02 4 40.95 41.13 0.17 4 able for S near cactus 1.1455 1.2217 1.1275 1.0374 0.1843 3 bability I bability P pability P	40.94 41. 40.9 0.13 0.6 5 1 0.13 0.6 5 1 0.13 0.6 5 1 0.106 5 1.0877 0.1106 5 Plot of ease Plot of ease Plot of nor Plot of sou Vorksheet	17 95 57 Deviation near cactus 1 1.0000 1.2421 1.0942 0.2421 2 st st th	s
3 4 Delta Rank Level 1 2 3 4 Delta Rank	41.14 40.79 0.35 2 Resoutside 0.9728 1.3227 0.9872 0.3499 1 Testin	41.00 40.84 0.34 3 sponse Ta near aloe 1.2497 1.1129 1.1090 0.1407 4 Pro Pro Pro Stan Stan	41.02 4 40.95 41.13 0.17 4 able for S near cactus 1.1455 1.2217 1.1275 1.0374 0.1843 3 bability I bability I bability F pability W Sumr	$\begin{array}{c} 10.94 \\ 41. \\ 40. \\ 40. \\ 10.13 \\ 0.13 \\ 0.6 \\ 5 \\ 10. \\ 1.1983 \\ 1.0877 \\ 0.1106 \\ 5 \\ 1.0877 \\ 0.1106 \\ 5 \\ 100 \\ 0.106 \\ 5 \\ 100 \\ 0.106 \\ 100 \\ 0.106 \\ 100 \\ 100 \\ 0.106 \\ 100$	17 95 57 Deviation near cactus1 1.0000 1.2421 1.0942 0.2421 2 0.2421 2 st st th th	IS
3 4 Delta Rank Level 1 2 3 4 Delta Rank	41.14 40.79 0.35 2 Resoutside 0.9728 1.3227 0.9872 0.3499 1 Testin	41.00 40.84 0.34 3 sponse Ta near aloe 1.2497 1.1129 1.1090 0.1407 4 Pro Pro Pro Pro St ng times: atch at ea	41.02 4 40.95 41.13 0.17 4 able for S near cactus 1.1455 1.2217 1.1275 1.0374 0.1843 3 bability I bability I bability P bability P tability W Sumr	$\begin{array}{c} 10.94 & 41. \\ 40.9 \\ 40.9 \\ 40.9 \\ 10.13 & 0.6 \\ 5 & 1 \\ 10.13 & 0.6 \\ 5 \\ 10.13 & 0.6 \\ 10.1$	17 95 57 Deviation near cactus1 1.0000 1.2421 1.0942 0.2421 2 0.2421 2 0.2421 2 st st th th	s
3 4 Delta Rank Level 1 2 3 4 Delta Rank	41.14 40.79 0.35 2 Res outside 0.9728 1.3227 0.9872 0.3499 1 Testir es per b	41.00 40.84 0.34 3 sponse Ta near aloe 1.2497 1.1129 1.1090 0.1407 4 Pro Prol Prol Prol State atch at ea Main E	41.02 4 40.95 41.13 0.17 4 able for S near cactus 1.1455 1.2217 1.1275 1.0374 0.1843 3 bability P bability P bability P tability W Summer ach time:	10.94 41. 40.9 40.9 10.13 0.6 5 1 10.13 0.6 5 1 1.1983 1.0877 0.1106 5 Plot of ease Plot of sou Vorksheet nary 9 Batched 1 Total ru ot for near orth, south	17 95 57 Deviation near cactus1 1.0000 1.2421 1.0942 0.2421 2 0.2421 2 st st th th es: 3 ins: 27 aloe	s butside, ar

* NOTE * Design is not orthogonal. Linear Model Analysis: SN ratios versus outside, near aloe, near cactus, near aloe1, near cactus1 Estimated Model Coefficients for SN ratios Term Coef SE Coef Т Constant 30.7384 1.6450 18.686 0.000 outside 34 2.4240 2.0796 1.166 0.328 outside 35 -2.1833 1.2752 -1.712 0.185 near alo 33 0.2436 1.7278 0.141 0.897 near alo 34 2.0028 1.7959 1.115 0.346 near cac 32 2.4000 2.6834 0.894 0.437 near cac 33 1.1570 1.8901 0.612 0.584 near cac 34 -1.1606 2.2719 -0.511 0.645 near alo 38 -0.4522 0.8830 -0.512 0.644 near cac 38 -1.6192 3.7096 -0.436 0.692 near cac 39 -0.6041 2.5969 -0.233 0.831 Model Summary S R-Sq R-Sq(adj) 2.2974 68.63% 0.00% Analysis of Variance for SN ratios Source DF Seq SS Adj SS Adj MS F Р outside 2 23.4900 15.602 7.801 1.48 0.357 2 1.6903 6.590 3.295 0.62 0.593 near aloe 3 3.2046 5.427 1.809 0.34 0.799 near cactus 0.0817 1.384 near aloe1 1 1.384 0.26 0.644 near cactus1 2 6.1690 6.169 3.085 0.58 0.610 Residual Error 3 15.8336 15.834 5.278 13 50.4692 Total Unusual Observations for SN ratios SE Fit Residual Resid St Observation SN ratios Fit 2 29.245 29.245 2.297 0.000 Х 5 30.142 30.142 2.297 0.000 Х 12 * Х 34.017 34.017 2.297 -0.00014 32.149 32.149 2.297 0.000 * Х X denotes an observation whose X value gives it large leverage. Linear Model Analysis: Means versus outside, near aloe, near cactus, near aloe1, near cactus1 Estimated Model Coefficients for Means Term Coef SE Coef Т Ρ Constant 40.7880 0.2383 171.180 0.000 outside 34 0.0781 0.3012 0.259 0.812 outside 35 0.1392 0.1847 0.754 0.506 near alo 33 0.1174 0.2503 0.469 0.671 near alo 34 -0.0104 0.2601 -0.040 0.971

near cac 32 0.2844 0.3887

near cac 33 -0.0266 0.2738 -0.097 0.929

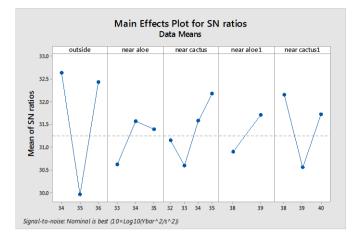
0.732 0.517

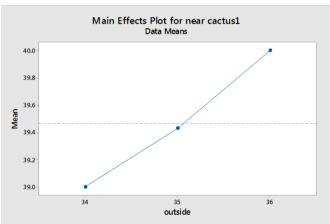
GSJ: Volume 6, Issue 1, January 2018 near cac 34 -0.2667 0.3291 -0.810 0.477 2 0.095332 0.09533 0.04767 0.50 0.649 near cactus1 near alo 38 -0.0895 0.1279 -0.700 0.535 Residual Error 3 0.285918 0.28592 0.09531 near cac 38 -0.6330 0.5373 -1.178 0.324 Total 13 0.867875 Unusual Observations for StDevs near cac 39 0.2604 0.3762 0.692 0.539 Observation StDevs Fit SE Fit Residual Resid Model Summary S R-Sq R-Sq(adj) 1.414 1.414 0.309 2 -0.000 * Х 0.00% 0.3328 70.85% 5 1.291 1.291 0.309 Х -0.000 Analysis of Variance for Means 12 Х 0.816 0.816 0.309 0.000 Source DF Seq SS Adj SS Adj MS F Ρ * 14 1.000 1.000 0.309 0.000 Х 2 0.28757 0.15341 0.07670 0.69 0.566 outside Response Table for Signal to Noise Ratios 2 0.07586 0.02628 0.01314 0.12 0.892 near aloe Nominal is best (10×Log10(Ybar^2/s^2)) 3 0.23883 0.11215 0.03738 0.34 0.802 near cactus near near near near aloe1 1 0.03025 0.05421 0.05421 0.49 0.535 Level outside near aloe cactus aloe1 cactus1 near cactus1 2 0.17479 0.17479 0.08740 0.79 0.530 1 32.62 31.15 30.90 32.15 30.62 Residual Error 3 0.33221 0.33221 0.11074 2 29.95 31.57 30.59 31.71 30.55 Total 13 1.13951 3 32.43 31.39 31.57 31.72 Unusual Observations for Means 4 32.16 Fit SE Fit Residual Resid **Observation Means** Delta 2.67 0.95 1.57 0.81 1.60 2 4 5 Rank 1 3 2 41.000 41.000 0.333 0.000 Х **Response Table for Means** 5 41.500 41.500 0.333 * Х 0.000 near near near 12 41.000 41.000 0.333 * Х Level outside near aloe 0.000 cactus aloe1 cactus1 14 40.500 40.500 0.333 0.000 * Х 40.94 41.19 41.00 41.06 40.50 1 Linear Model Analysis: StDevs versus outside, near aloe, near 2 41.14 41.00 41.02 40.94 41.17 cactus, near aloe1, near cactus1 3 40.79 40.84 40.95 40.95 Estimated Model Coefficients for StDevs 41.13 4 Term Coef SE Coef T Ρ 0.17 0.13 0.35 0.34 0.67 Constant 1.21971 0.2211 5.518 0.012 Delta Rank 4 5 outside 34 -0.32003 0.2795 -1.145 0.335 2 3 1 **Response Table for Standard Deviations** outside 35 0.28988 0.1714 1.692 0.189 near near cactus near aloe1 near alo 33 -0.00162 0.2322 -0.007 0.995 Level outside near aloe cactus1 near alo 34 -0.25889 0.2413 -1.073 0.362 1 0.9728 1.2497 1.1455 1.1983 1.0000 near cac 32 -0.32876 0.3606 -0.912 0.429 2 1.3227 1.1129 1.2217 1.2421 1.0877 near cac 33 -0.15486 0.2540 -0.610 0.585 3 0.9872 1.1090 1.1275 1.0942 near cac 34 0.14977 0.3053 0.491 0.657 4 1.0374 near alo 38 0.04902 0.1187 0.413 0.707 Delta 0.3499 0.1407 0.1843 0.1106 0.2421 near cac 38 0.21759 0.4985 0.437 0.692 1 Δ 3 5 2 Rank near cac 39 0.06276 0.3490 0.180 0.869 Main Effects Plot for Means Model Summary Main Effects Plot for SN ratios S R-Sq R-Sq(adj) Taguchi Analysis: east, west, north, south versus outside, ... ar 0.3087 67.06% 0.00% cactus1 * NOTE * Design is not orthogonal. Analysis of Variance for StDevs Predicted values DF Seq SS Adj SS Adj MS F Р Source * NOTE * Design is not orthogonal. 2 0.413907 0.27481 0.13740 1.44 0.364 outside Prediction near aloe 2 0.017237 0.11346 0.05673 0.60 0.606 S/N Ratio Mean StDev Ln(StDev) 3 0.055201 0.10046 0.03349 0.35 0.793 near cactus 33.7348 40.5455 0.835915 -0.181412 1 0.000281 0.01627 0.01627 0.17 0.707 near aloe1 Settings

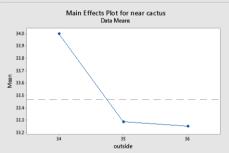
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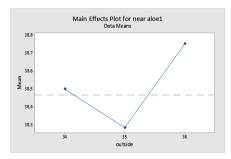
outside near near near near aloe cactus aloe1 cactus1 38

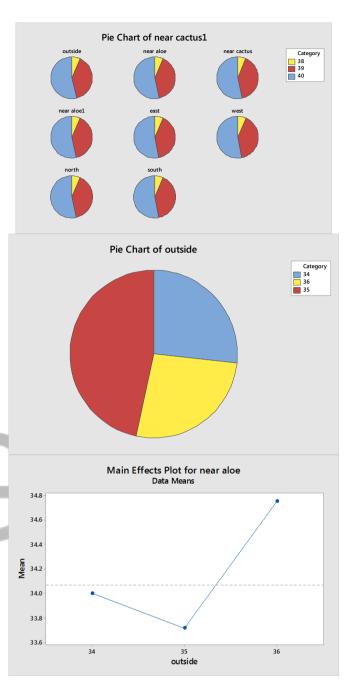
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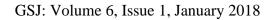


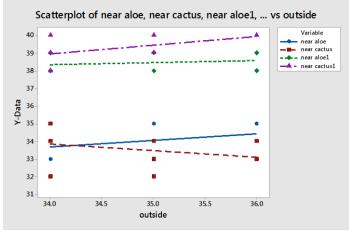


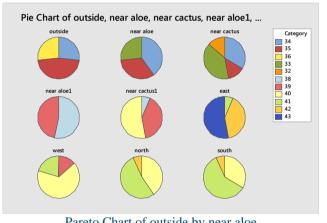




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	Pareto	Chart of	f outside by near aloe
Nestee	ANOVA:	near cac	tus, near cactus1, near aloe, near
			aloe1
	Nested Al	NOVA: r	near cactus versus outside
	Analy	sis of Va	riance for near cactus
Source	DF	SS	MS

outside	2	1.5548	0.7774	
Error	12	10.1786	0.8482	
Total	14	11.7333		
		Va	riance Com	oonents
Source	Var	Comp.	% of Total	StDev

outside	-0.015*	0.00	0.000
outside	-0.015	0.00	0.000

	Error		0.848	100	.00	0.921
	Total		0.848			0.921
		* Val		<i>ative, ar</i> bected M		estimated by zero. Squares
	1 outsi	ide	1.00(2)	+ 4.80(1)	
	2 Erre	or	1.0	00(2)		
						us1 versus outside or near cactus1
	Source	DF	SS	M	S	
	outside	2	2.0190	1.009	5	
	Error	12	3.7143	0.309	5	
	Total	14	5.7333			
	Source	Var	Va Comp.	ariance C % of Total	-	
	outside		0.146	32.03	0.38	82
1	Error		0.310	67.97	0.5	56
	Total		0.455		0.6	75
			Exp	pected M	lean S	Squares
	1 outsi	ide	1.00(2)	+ 4.80(1)	
	2 Erre	or	1.0	00(2)		
						be versus outside for near aloe
	Source	DF	SS	M	S	
	outside	2	2.7548	1.377	4	
	Error	12	6.1786	0.514	9	
	Total	14	8.9333			
			Va	ariance C	Comp	onents

Source	Var Comp.	% of Total	StDev		outside	Fixed	. 3	34, 3	35, 36			
		Iotui					Ana	alysis o	f Variance	÷		
outside	0.180	25.87	0.424		Source	DF	Adj SS	Adj I	MS F-Va	alue P-V	Value	
Error	0.515	74.13	0.718		outside	2	1.555	0.77	774 ().92 (0.426	
Total	0.695		0.833		Error	12	10.179	0.84	482			
	Ex	pected N	Jean Squares		Total	14	11.733					
1 outsid	de 1.00(2)	+ 4.80	(1)									
									ummary			
2 Erro	or 1.	00(2)			S	I	R-sq R-	-sq(adj)	R-sq(pi	red)		
			ar aloe1 versus outside ance for near aloe1		0.920985	13.2	25%	0.00%	0.0	0%		
Source	DF SS	M	IS					Coeffi	cients			
					Term	C	oef SE	Coef	T-Value	P-Value	VIF	
outside	2 0.5548	0.277	74									
					Constant	33.5	512 ().246	136.15	0.000		
Error	12 3.1786	6 0.264	19									
T . (. 1	14 2 7222				outside							
Total	14 3.7333)			24	0.4	00 (262	1 25	0 202	1.24	
	V	ariance	Components	_	34	0.4	68 ().362	1.35	0.203	1.24	
Source	Var Comp.	% of Total	StDev	(· ·	35	-0.2	226 ().318	-0.71	0.490	1.24	
							Reg	gressior	n Equation			
outside	0.003	0.97	0.051		near cact	us =	33.512	2 + 0.48	8 outside_	_34 - 0.22	6 outside	e_35 - 0.262
Error	0.265	99.03	0.515		F	its and	l Diagnos	stics for	r Unusual	Observati	ons	
					Obs	near	Fit	Resid	l Std Re	sid		
Total	0.267		0.517		ca	ctus						
	Ex	pected N	Mean Squares		14 32	.000	34.000	-2.000) -2.	.51 R		
1 outsid	de 1.00(2)	+ 4.80	(1)				מ	Lanos	noni de al			
2 Erro	or 1.	00(2)			Ger	neral L			<i>residual</i> ear cactus1 hod	versus o	utside	
Ge	eneral Linear		near cactus versus outside ethod		Factor co	ding	(-1, 0, +	1)				
Factor co	ding (10						Fa	ctor Inf	formation			
ractor co	oding (-1, 0,	, +1)			Factor	Туре	Levels	s Va	lues			
		Factor I	nformation			-						
Factor	Type Lev	els V	<i>v</i> alues		outside	Fixed	3	34, 3	35, 36			
							An	alvsis o	f Variance			

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Source DF Adj SS Adj MS F-Value P-Value	Source DF Adj SS Adj MS F-Value P-Value
outside 2 2.019 1.0095 3.26 0.074	outside 2 2.755 1.3774 2.68 0.109
Error 12 3.714 0.3095	Error 12 6.179 0.5149
Total 14 5.733	Total 14 8.933
Model Summary	Model Summary
S R-sq R-sq(adj) R-sq(pred)	S R-sq R-sq(adj) R-sq(pred)
0.556349 35.22% 24.42% 0.00%	0.717552 30.84% 19.31% 0.00%
Coefficients	Coefficients
Term Coef SE Coef T-Value P-Value VIF	Term Coef SE Coef T-Value P-Value VIF
Constant 39.476 0.149 265.49 0.000	Constant 34.155 0.192 178.10 0.000
outside	outside
34 -0.476 0.219 -2.18 0.050 1.24	34 -0.155 0.282 -0.55 0.594 1.24
35 -0.048 0.192 -0.25 0.808 1.24	35 -0.440 0.248 -1.78 0.101 1.24
Regression Equation	Regression Equation
near cactus1 = 39.476 - 0.476 outside_34 - 0.048 outside_35 +	near aloe = $34.155 - 0.155$ outside_34 - 0.440 outside_35 + 0.595 o
Fits and Diagnostics for Unusual Observations	General Linear Model: near aloe1 versus outside Method
Obs near Fit Resid Std Resid cactus1	Factor coding $(-1, 0, +1)$
	Factor Information
12 40.000 39.000 1.000 2.08 R	Factor Type Levels Values
14 38.000 39.000 -1.000 -2.08 R	outside Fixed 3 34, 35, 36
<i>R Large residual</i> General Linear Model: near aloe versus outside	Analysis of Variance
Method	Source DF Adj SS Adj MS F-Value P-Value
Factor coding $(-1, 0, +1)$	
Factor Information	outside 2 0.5548 0.2774 1.05 0.381
Factor Type Levels Values	Error 12 3.1786 0.2649
outside Fixed 3 34, 35, 36	Total 14 3.7333
Analysis of Variance	Model Summary

οι

	,	,										
S	R-sq	R-sq(adj) R-sq(p	red)		Total	15 18	80.47	1.96			
0.514666	14.86%	0.67%		00%		Alpha	Cro	onbach'	s Alpha	L		
			icients									
Term	Coef	SE Coef	T-Value	P-Value	VIF	0.3629						
Constant	38.512	0.138	279.98	0.000			Omitt	ed Item	n Statisti	ics		
Constant	00.012	01120		0.000		Omitted Varia	able Adj.	Fotal	Adj.	Item-Adj.	Squared	Cronb
outside							Ν	Mean	Total StDev	Total Corr	Multiple Corr	1
34	-0.012	0.202	-0.06	0.954	1.24	outside	145	5.467	1.598	0.2957	0.5970	0
35	-0.226	0.178	-1.27	0.227	1.24	near aloe	146	5.400	1.595	0.2579	0.4581	0
near aloe1		Regression $512 - 0.012$			outside_35 +	near aloe1	142	2.000	1.732	0.3194	0.4185	0
near aloc1	- 50	512 - 0.012	2 outside_:	0.220	Sutside_55	0						
Item Analy	ysis of ou	cac	tus1	aloe1, nea	r s, near	near cactus	s 147	.000	1.890	-0.1651	0.3724	0
	outric	Correlation le near a	on Matrix	aloo1 no	ar cactus	near cactus	1 141	.000	1.604	0.4176	0.5524	0
	outsic	ie near a	ioe iieai	aloe1 lie	ai cactus		Interacti	on Dlot	for non	r aloo		
near aloe	0.35	55			1	Johnson Tr	ansformatio		utside, 1	near aloe, nea	ar st,	
near aloe1	0.18	33 0.6	512				f outside, no	ear aloe	e, near c	actus, near al actus, near al		
near cactus	s -0.31	0 -0.2	- 241	0.040		5	Scatterplot Scatterplot Scatterplot of	of near	aloe vs	outside		
near cactus	1 0.59	0.0)75 -	0.058	0.211	5	Scatterplot of Scatterplot of	of near of near	cactus v aloe1 v	vs outside s outside		
		Cell C	ontents				Scatterplot o					
	-	Pearson	ı correlatio				catterplot o	f near c	actus1	vs outside		
** • • •		tem and To		ics			Chart of e		th, sout sis for e			
Variable	Total Count		StDev				Trenu	Meth		ust		
	Couli	ı				Model type	Quadratic T	Frend M	Iodel			
outside	15	5 35.00	0.76			Data	ea	ast				
near aloe	15	5 34.07	0.80									
. .		a a a a	0.75			Length	1	.5				
near aloe1	15	5 38.47	0.52			NMissing	(0				
near cactus	s 15	5 33.47	0.92				Fitted	1 Trend	Equation	on		
near cactus	1 15	5 39.47	0.64			Yt = 42.705 -						
near cactus	1 1.	, 37.47	0.04				Acc	uracy N	Measure	S		

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MAPE	1.33239			Variance estimation Restricted maximum likelihood							
MAD	0.56396			DF for fixed effects Kenward-Roger							
MSD	0.37242			Factor Information							
MSD	0.37242			Factor	r	Туре	Leve	ls	Values		
		rend Analysis Plot for east Trend Analysis for south Method		outsid	e	Randor	n	3	34, 35, 36	i	
Model ty	ype Linea	r Trend Model		near al	be	Fixed		3	33, 34, 35	i	
Data		south		near alo	e1	Fixed		2	38, 39		
Lengtl	h	15		near cact	us1	Fixed		3	38, 39, 40)	
NMissi	ng	0		near cac	tus	Fixed		4 3	32, 33, 34, 2	35	
		Fitted Trend Equation				V	ariance C	lomp	onents		
$\mathbf{Yt}=40.$	448 + 0.03	57×t		Source			% of Tota	-	SE Var	Z-Value	P-Value
		Accuracy Measures									
MAPE	1.12051	,		outside	0.00	00000	0.00%	6	*	*	*
MAD	0.45556	\frown		Error	0.62	8788	100.00%	60	0.363031	1.732051	0.042
MSD	0.30508	(\mathbf{C})		Total	0.62	8788					
	Single	Exponential Smoothing for east Method					g <i>likelihoo</i> ests of Fi		27.967311 Effects		
Data	east	Articulou -		Term		DF Nu	m DF I	Den	F-Value	P-Value	
Length	15			near al	be	2.0	00 6	.00	0.12	0.891	
		Smoothing Constant		near alo	e1	1.0	00 6	.00	0.10	0.767	
α 0.07	83544										
		Accuracy Measures		near cact	us1	2.0	0 6	.00	0.53	0.614	
MAPE	1.40720			near cac	tus	3.0	00 6	.00	0.12	0.942	
MAD	0.59686						Model S	umm	nary		
				S	5	R-sq	R-sq(adj))			
MSD	0.42412			0.70205		1.0004	0.000				
		Symmetry Plot for east		0.792961	1 34	4.20%	0.00%)			
Mixe	d Effects M	Iodel: east versus outside, near aloe	e, near				Coeff	icien	ts		
		ear cactus Method		Term		С	oef SI	E Coe	ef DF	T-Value	e P-Value

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Constant	42.318182	0.379863	6.00	111.403876	0.	outside	Random	3	34, 35, 30	б	
near aloe						near aloe	Fixed	3	33, 34, 35	5	
33	0.000000	0.560708	6.00	0.000000	1.	near aloe1	Fixed	2	38, 39		
34	-0.272727	0.593719	6.00	-0.459354	0.	near cactus	1 Fixed	3	38, 39, 40	0	
near aloe1						near cactus	s Fixed	4	32, 33, 34,	35	
29	0.00000	0 202820	6.00	0.210460	0.2	-	Varia	ince Com	ponents		
38	0.090909	0.292820	0.00	0.310460	0.	Source		f Total	SE Var	Z-Value	P-Value
near cactus1						outside 0.	.000000	0.00%	*	*	*
38	-0.386364	0.934939	6.00	-0.413250	0.				0.227441	1.732051	0.042
39	0.704545	0.773191	6.00	0.911217	0.		.393939		0.22	1.,	
near cactus								elihood :	= 25.161729	C	
20	0 112626	0770101	< 00	0.146009	0			of Fixed			
32	-0.113636	0.778181	6.00	-0.146028	0.	Term	DF Num	DF Den	F-Value	P-Value	
33	0.022727	0.565467	6.00	0.040192	0.	near aloe	2.00	6.00	2.08	0.206	
34	0.340909	0.759595	6.00	0.448804	0.	near aloe1	1.00	6.00	0.35	0.578	
-	-			l Observations		near cactus	1 2.00	6.00	0.67	0.548	
Obs	east	Fit R	Resid	Std Resid		nour cutter	1	0.00		0.2.0	
2 43.00	00000 43.000	000.0	0000	* X		near cactus	s 3.00	6.00	0.42	0.743	
5 43.00	00000 43.000	0000 -0.000	ባባበባ	-0.000002 X				odel Sum	amary		
3 43.00	0000 45.000	000 -0.000	JUUU	-0.000002 A		S	R-sq R-s	q(adj)			
14 42.00	00000 42.000	0000 0.000	0000	* X		0.627646	52.09%	0.00%			
Mixed Eff		Unusual X		near aloe, s1,			(Coefficie	nts		
Mines L.		near cactus Method	noide, i	licar aroe, 51,		Term	Coef	SE C	oef DF	T-Valu	e P-Value
Variance est	timation Res	stricted maxin	mum li	ikelihood		Constant	40.106061	0.3006	669 6.00	133.389204	4 0.000
DF for fixed	l effects	Kenward	d-Roge	er		near aloe					
	Fact	or Informatio	on			33	0.000000	0.4438	813 6.00	0.00000	0 1.000
Factor	Type 1	Levels	Values	3							

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34	0.909091	0.469941	6.00	1.934478	0.	near cactus1	Fixed	3	38, 39, 40	0	
near aloe1						near cactus	Fixed	4 32	2, 33, 34,	35	
38	-0.136364	0.231774	6.00	-0.588348	0.	5	Varia	nce Compo	nents		
near cactus	1					Source	Var % of	f Total	SE Var	Z-Value	P-Value
		0 7 4000 4	< 00	0.1.COTOF	0	outside 0.00	00000	0.00%	*	*	*
38	0.121212	0.740024	6.00	0.163795	0.	Error 0.30	03030 10	0.00% 0.	174955	1.732051	0.042
39	-0.515152	0.611997	6.00	-0.841754	0.	Total 0.30	03030				
near cactus	\$							elihood = 2		4	
32	0.545455	0.615947	6.00	0.885555	0.	Term	Tests DF Num	of Fixed Ef		P-Value	
33	0.090909	0.447579	6.00	0.203113	0.	near aloe	2.00	6.00	0.93	0.446	
34	-0.636364	0.601236	6.00	-1.058427	0.						
	al Fits and Diag					near aloe1	1.00	6.00	0.05	0.830	
Obs	west		Resid	Std Resid		near cactus1	2.00	6.00	2.12	0.201	
2 40.00	00000 40.000	0000 -0.00	0000	* X		near cactus	3.00	6.00	1.07	0.428	
5 40.00	00000 40.000	0000 -0.00	00000	-0.000006 X		G		del Summa	ary		
						S	R-sq R-so	q(adj)			
14 40.00	00000 40.000		00000	* X		0.550482 6	5.91% 20).45%			
Mixed Ef		<i>Unusual X</i> orth versus of		, near aloe, 1,				Coefficients			
	1	near cactus Method				Term	Coef	SE Coef	f DF	T-Value	e P-Value
Variance es	stimation Res	stricted maxi	mum li	kelihood		Constant	40.409091	0.263705	5 6.00	153.236220	0.000
DF for fixe	d effects	Kenwar	d-Roge	r		near aloe					
		tor Informati				33	0.333333	0.389249	9 6.00	0.856349	0.425
Factor	Туре	Levels	Values	1		34	-0.303030	0.412166	6.00	-0.735215	0.490
outside	Random	3 3	34, 35, 3	36						••••	•••
near aloe	Fixed	3 3	33, 34, 3	35		near aloe1					
near aloe1	Fixed	2	38, 39			38	0.045455	0.203279	9 6.00	0.223607	0.830

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near cactus1						outside 0	.362934	58.11%	0.542839	0.668584	0.252		
38	-1.151515	0.649044	4 6.00	-1.774171	0.	Error 0	.261615	41.89%	0.182010	1.437365	0.075		
39	0.393939	0.53675	7 6.00	0.733925	0.	Total 0	.624548						
							-2 Log li	kelihood =	= 25.02639	4			
near cactus								s of Fixed					
32	0.818182	0.54022	1 6.00	1.514531	0.	Term	DF Num	DF Den	F-Value	P-Value			
33	-0.363636	0.39255	3 6.00	-0.926337	0.	near aloe	2.00	4.50	0.60	0.585			
34	-0.454545	0.52731	8 6.00	-0.861994	0.	near aloe1	1.00	4.25	1.47	0.289			
Marginal l	Fits and Diag	gnostics for	Unusual	Observations		near cactus	1 2.00	5.04	0.46	0.655			
	orth	Fit		Std Resid									
						near cactus	s 3.00	4.77	0.08	0.967			
2 40.000	000 40.00	0000 0.0	00000	* X			Μ	odel Sum	marv				
						Model Summary S R-sq R-sq(adj)							
5 42.000000 42.000000 -0.000000 -0.000003 X S K-sq K-sq(adj)													
14 40.000	000 40.00	14 40.000000 40.000000 0.000000 * X 0.511483 75.17% 42.06%											
Coefficients													
	χ	K Unusual	X					Coefficie	nts				
Mixed Effe	cts Model: s		outside,	near aloe, 1,	1	Term	Coe			T-Value	P-Value		
Mixed Effe	cts Model: s	outh versus	outside,	near aloe, 1,	1			f SE Co	bef DF				
	cts Model: s	outh versus near cactus Method	outside,		1	Term Constant		f SE Co	bef DF	T-Value 76.415445	P-Value 0.000		
Mixed Effe Variance estin	cts Model: s	outh versus	outside,			Constant		f SE Co	bef DF				
	ects Model: s	outh versus near cactus Method stricted mat	outside,	telihood				f SE Co	bef DF				
Variance estin	cts Model: s mation Res effects	outh versus near cactus Method stricted max Kenwa	kimum lik	telihood		Constant	40.393650	f SE Co 5 0.5286	bef DF				
Variance estin	cts Model: s mation Res effects Fac	outh versus near cactus Method stricted ma Kenwa tor Informa	s outside, s ximum lik ard-Roger tion	telihood		Constant near aloe 33	40.393650 0.198785	f SE Co 5 0.5286 5 0.3921	Def DF 06 2.29 04 4.49	76.415445 0.506971	0.000 0.636		
Variance estin	cts Model: s mation Re: effects Fac	outh versus near cactus Method stricted max Kenwa	kimum lik	telihood		Constant near aloe	40.393650 0.198785	f SE Co 5 0.5286 5 0.3921	06 2.29	76.415445	0.000		
Variance estin	cts Model: s mation Res effects Fac	outh versus near cactus Method stricted ma Kenwa tor Informa	s outside, s ximum lik ard-Roger tion	zelihood		Constant near aloe 33	40.393650 0.19878 -0.357149	f SE Co 5 0.5286 5 0.3921	Def DF 06 2.29 04 4.49	76.415445 0.506971	0.000 0.636		
Variance estin DF for fixed Factor	cts Model: s mation Re: effects Fac Type	outh versus near cactus Method stricted max Kenwa tor Informa Levels	ximum lik ard-Roger tion Values	telihood		Constant near aloe 33 34	40.393656 0.19878 -0.35714	f SE Co 5 0.5286 5 0.3921 9 0.4033	Def DF 06 2.29 04 4.49 70 4.36	76.415445 0.506971	0.000 0.636		
Variance estin DF for fixed Factor outside	cts Model: s mation Re: effects Fac Type Random	outh versus near cactus Method stricted mat Kenwa tor Informa Levels 3	ximum lik ard-Roger tion Values 34, 35, 30	telihood		Constant near aloe 33 34 near aloe1	40.393650 0.19878 -0.35714 -0.23754	f SE Co 5 0.5286 5 0.3921 9 0.4033	Def DF 06 2.29 04 4.49 70 4.36	76.415445 0.506971 -0.885413	0.000 0.636 0.422		
Variance estin DF for fixed Factor outside near aloe	ets Model: s mation Res effects Fac Type Random Fixed	outh versus near cactus Method stricted max Kenwa tor Informa Levels 3 3	ximum lik ard-Roger tion Values 34, 35, 30 33, 34, 35	telihood		Constant near aloe 33 34 near aloe1 38	40.393650 0.19878 -0.357149 -0.23754	f SE Co 5 0.5286 5 0.3921 9 0.4033 5 0.1960	Def DF 06 2.29 04 4.49 70 4.36	76.415445 0.506971 -0.885413	0.000 0.636 0.422		
Variance estin DF for fixed Factor outside near aloe near aloe	cts Model: s mation Res effects Fac Type Random Fixed Fixed	outh versus near cactus Method stricted max Kenwa tor Informa Levels 3 3 2 3 3	ximum lik ard-Roger tion 34, 35, 30 33, 34, 35 38, 39	celihood		Constant near aloe 33 34 near aloe1 38 near cactus	40.393650 0.198785 -0.357149 -0.237545 1 -0.846029	f SE Co 5 0.5286 5 0.3921 9 0.4033 5 0.1960	Def DF 06 2.29 04 4.49 70 4.36 11 4.25 03 5.73	76.415445 0.506971 -0.885413 -1.211897	0.000 0.636 0.422		
Variance estin DF for fixed Factor outside near aloe near aloe1 near cactus1	cts Model: s mation Res effects Fac Type Random Fixed Fixed Fixed Fixed	outh versus near cactus Method stricted max Kenwa tor Informa Levels 3 3 2 3 3	ximum lik ard-Roger tion 34, 35, 36 33, 34, 35 38, 39 38, 39, 46 2, 33, 34, 3	celihood		Constant near aloe 33 34 near aloe1 38 near cactus 38	40.393650 0.198785 -0.357149 -0.237545 1 -0.846029	f SE Co 5 0.5286 5 0.3921 9 0.4033 5 0.1960 9 0.8860	Def DF 06 2.29 04 4.49 70 4.36 11 4.25 03 5.73	76.415445 0.506971 -0.885413 -1.211897 -0.954883	0.000 0.636 0.422 0.289		

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32 -0	.187871 0.6	26812 5.13	3 -0.29972	24	0.77	Clu		vsis of Obser idean Distar Amaloz		ete Linkage		
33 0	.090097 0.4	37857 4.94	4 0.20570	67	0.8	Step	Number of	_	Distance level	Clusters joined	New cluster	Number of obs.
34 -0	.107027 0.5	14490 4.25	5 -0.20802	25	0.8		clusters	level	level	Joined	cluster	in new cluster
Marginal Fits	and Diagnosti	cs for Unusu	al Observat	ions								
Obs south	Fit	Resid	Std Resid			1	14	100.000	0.00000	7	15	7
2 41.000000	40.681383	0.318617	0.739944	Х		2	13	100.000	0.00000	2	13	2
5 41.000000	40.681383	0.318617	0.739944	Х		3	12	100.000	0.00000	3	9	3
14 40.000000	39.755665	0.244335	0.679704	Х		4	11	66.667	1.00000	8	14	8
	ARIMA N	<i>usual X</i> Aodel: east				5	10	66.667	1.00000	7	12	7
* ERROR * Mo		ge term		oving		6	9	66.667	1.00000	4	10	4
Model type Lin	Me	thod				7	8	66.667	1.00000	1	6	1
Data	near aloe					8	7	52.860	1.41421	7	11	7
Length	15	-		1		9	6	52.860	1.41421	5	7	5
NMissing	0)		1	10	5	52.860	1.41421	3	5	3
141411351112		d Equation				11	4	42.265	1.73205	4	8	4
Yt = 34.410 - 0.04		*				12	3	42.265	1.73205	1	4	1
	Accuracy	Measures				12	5	42.205	1.75205	1	-	1
MAPE 1.84264						13	2	33.333	2.00000	2	3	2
MAD 0.62730)					14	1	0.000	3.00000	1	2	1
MSD 0.56127	,							Fina	l Partition			
0.50127							Nu	mber of	Within	Average	Maximur	n
								vations cl	uster sum of squares	distance from centroid	distanc fror centroi	e n
					1	Cluste	er1	15	20.9333	1.13600	1.7713	8

ABRIKOSOV, I. A.

0 1954

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n at the end of a paragraph. Do not add any kind of pagination anywhere in the paper. Do not number text headsthe template will do that for you.

Finally, complete content and organizational editing before formatting. Please take note of the following items when proofreading spelling and grammar:

A. Abbreviations and Acronyms

Define abbreviations and acronyms the first time they are used in the text, even after they have been defined in the abstract. Abbreviations such as IEEE, SI, MKS, CGS, sc, dc, and rms do not have to be defined. Do not use abbreviations in the title or heads unless they are unavoidable.

B. Units

- Use either SI (MKS) or CGS as primary units. (SI units are encouraged.) English units may be used as secondary units (in parentheses). An exception would be the use of English units as identifiers in trade, such as "3.5-inch disk drive."
- Avoid combining SI and CGS units, such as current in amperes and magnetic field in oersteds. This often leads to confusion because equations do not balance dimensionally. If you must use mixed units, clearly state the units for each quantity that you use in an equation.
- Do not mix complete spellings and abbreviations of units: "Wb/m2" or "webers per square meter," not "webers/m2." Spell units when they appear in text: "...a few henries," not "...a few H."
- Use a zero before decimal points: "0.25," not ".25." Use "cm3," not "cc." (bullet list)

C. Equations

The equations are an exception to the prescribed specifications of this template. You will need to determine whether or not your equation should be typed using either the Times New Roman or the Symbol font (please no other font). To create multileveled equations, it may be necessary to treat the equation as a graphic and insert it into the text after your paper is styled.

Number equations consecutively. Equation numbers, within parentheses, are to position flush right, as in (1), using a right tab stop. To make your equations more compact, you may use the solidus (/), the exp function, or appropriate exponents. Italicize Roman symbols for quantities and variables, but not Greek symbols. Use a long dash rather than a hyphen for a minus sign. Punctuate equations with commas or periods when they are part of a sentence, as in

$$a+b = \gamma \tag{1}$$

Identify applicable sponsor/s here. If no sponsors, delete this text box (sponsors).

Note that the equation is centered using a center tab stop. Be sure that the symbols in your equation have been defined before or immediately following the equation. Use "(1)," not "Eq. (1)" or "equation (1)," except at the beginning of a sentence: "Equation (1) is ..."

D. Some Common Mistakes

- The word "data" is plural, not singular.
- The subscript for the permeability of vacuum μ_0 , and other common scientific constants, is zero with subscript formatting, not a lowercase letter "o."
- In American English, commas, semi-/colons, periods, question and exclamation marks are located within quotation marks only when a complete thought or name is cited, such as a title or full quotation. When quotation marks are used, instead of a bold or italic typeface, to highlight a word or phrase, punctuation should appear outside of the quotation marks. A parenthetical phrase or statement at the end of a sentence is punctuated outside of the closing parenthesis (like this). (A parenthetical sentence is punctuated within the parentheses.)
- A graph within a graph is an "inset," not an "insert." The word alternatively is preferred to the word "alternately" (unless you really mean something that alternates).
- Do not use the word "essentially" to mean "approximately" or "effectively."
- In your paper title, if the words "that uses" can accurately replace the word using, capitalize the "u"; if not, keep using lower-cased.
- Be aware of the different meanings of the homophones "affect" and "effect," "complement" and "compliment," "discrete" and "discrete," "principal" and "principle."
- Do not confuse "imply" and "infer."
- The prefix "non" is not a word; it should be joined to the word it modifies, usually without a hyphen.
- There is no period after the "et" in the Latin abbreviation "et al."
- The abbreviation "i.e." means "that is," and the abbreviation "e.g." means "for example."

An excellent style manual for science writers is [7].

II. USING THE TEMPLATE

After the text edit has been completed, the paper is ready for the template. Duplicate the template file by using the Save As command, and use the naming convention prescribed by your conference for the name of your paper. In this newly created file, highlight all of the contents and import your prepared text file. You are now ready to style your paper; use the scroll down window on the left of the MS Word Formatting toolbar.

A. Authors and Affiliations

The template is designed so that author affiliations are not repeated each time for multiple authors of the same affiliation. Please keep your affiliations as succinct as possible (for example, do not differentiate among departments of the same organization). This template was designed for two affiliations.

1) For author/s of only one affiliation (Heading 3): To change the default, adjust the template as follows.

a) Selection (Heading 4): Highlight all author and affiliation lines.

b) Change number of columns: Select the Columns icon from the MS Word Standard toolbar and then select "1 Column" from the selection palette.

c) Deletion: Delete the author and affiliation lines for the second affiliation.

2) For author/s of more than two affiliations: To change the default, adjust the template as follows.

a) Selection: Highlight all author and affiliation lines.

b) Change number of columns: Select the "Columns" icon from the MS Word Standard toolbar and then select "1 Column" from the selection palette.

c) Highlight author and affiliation lines of affiliation 1 and copy this selection.

d) Formatting: Insert one hard return immediately after the last character of the last affiliation line. Then paste down the copy of affiliation 1. Repeat as necessary for each additional affiliation.

e) Reassign number of columns: Place your cursor to the right of the last character of the last affiliation line of an even numbered affiliation (e.g., if there are five affiliations, place your cursor at end of fourth affiliation). Drag the cursor up to highlight all of the above author and affiliation lines. Go to Column icon and select "2 Columns". If you have an odd number of affiliations, the final affiliation will be centered on the page; all previous will be in two columns.

B. Identify the Headings

Headings, or heads, are organizational devices that guide the reader through your paper. There are two types: component heads and text heads.

Component heads identify the different components of your paper and are not topically subordinate to each other. Examples include ACKNOWLEDGMENTS and REFERENCES, and for these, the correct style to use is "Heading 5." Use "figure caption" for your Figure captions, and "table head" for your table title. Run-in heads, such as "Abstract," will require you to apply a style (in this case, italic) in addition to the style provided by the drop down menu to differentiate the head from the text.

Text heads organize the topics on a relational, hierarchical basis. For example, the paper title is the primary text head because all subsequent material relates and elaborates on this one topic. If there are two or more sub-topics, the next level head (uppercase Roman numerals) should be used and,

conversely, if there are not at least two sub-topics, then no subheads should be introduced. Styles named "Heading 1," "Heading 2," "Heading 3," and "Heading 4" are prescribed.

C. Figures and Tables

1) Positioning Figures and Tables: Place figures and tables at the top and bottom of columns. Avoid placing them in the middle of columns. Large figures and tables may span across both columns. Figure captions should be below the figures; table heads should appear above the tables. Insert figures and tables after they are cited in the text. Use the abbreviation "Fig. 1," even at the beginning of a sentence.

TABLE I.	TABLE STYLES

Table	Table Column Head		
Head	Table column subhead	Subhead	Subhead
сору	More table copy ^a		

a. Sample of a Table footnote. (Table footnote)

Fig. 1. Example of a figure caption. (figure caption)

We suggest that you use a text box to insert a graphic (which is ideally a 300 dpi resolution TIFF or EPS file with all fonts embedded) because this method is somewhat more stable than directly inserting a picture.

To have non-visible rules on your frame, use the MSWord "Format" pull-down menu, select Text Box > Colors and Lines to choose No Fill and No Line.

Figure Labels: Use 8 point Times New Roman for Figure labels. Use words rather than symbols or abbreviations when writing Figure axis labels to avoid confusing the reader. As an example, write the quantity "Magnetization," or "Magnetization, M," not just "M." If including units in the label, present them within parentheses. Do not label axes only with units. In the example, write "Magnetization (A/m)" or "Magnetization (A (m(1)," not just "A/m." Do not label axes with a ratio of quantities and units. For example, write "Temperature (K)," not "Temperature/K."

Acknowledgment (HEADING 5)

The preferred spelling of the word "acknowledgment" in America is without an "e" after the "g." Avoid the stilted

expression "one of us (R. B. G.) thanks ...". Instead, try "R. B. G. thanks...". Put sponsor acknowledgments in the unnumbered footnote on the first page.

References

The template will number citations consecutively within brackets [1]. The sentence punctuation follows the bracket [2]. Refer simply to the reference number, as in [3]—do not use "Ref. [3]" or "reference [3]" except at the beginning of a sentence: "Reference [3] was the first …"

Number footnotes separately in superscripts. Place the actual footnote at the bottom of the column in which it was cited. Do not put footnotes in the reference list. Use letters for table footnotes.

Unless there are six authors or more give all authors' names; do not use "et al.". Papers that have not been published, even if they have been submitted for publication, should be cited as "unpublished" [4]. Papers that have been accepted for publication should be cited as "in press" [5]. Capitalize only the first word in a paper title, except for proper nouns and element symbols.

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