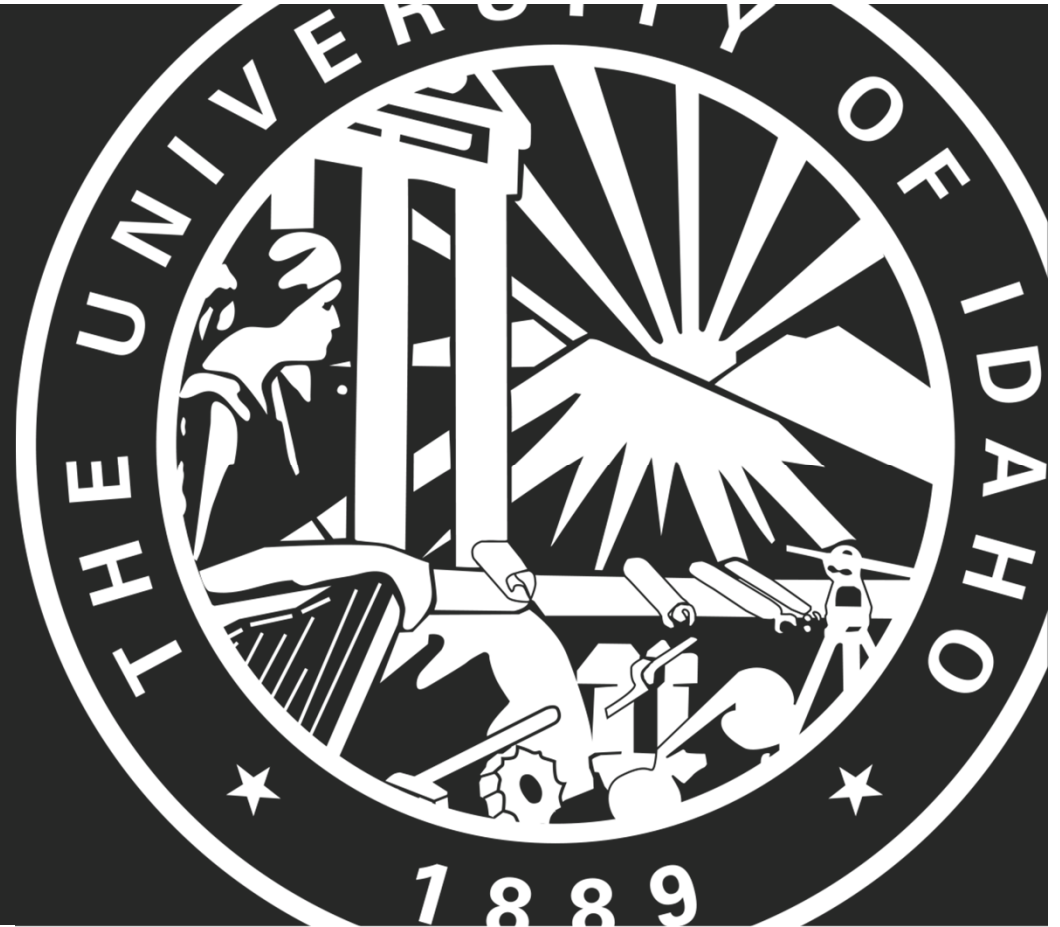


SOLAR TRACKER

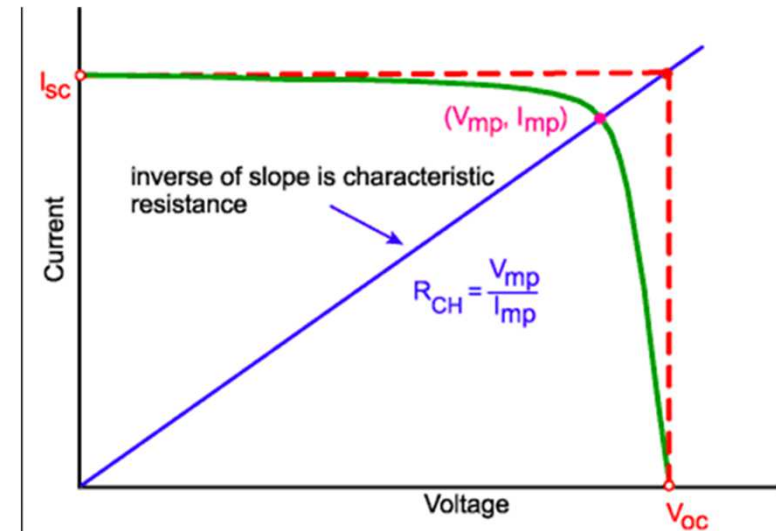
Team: John Gergen, Claire Majors, Daniel Cox



University of Idaho
College of Engineering

BACKGROUND

- Solar panels have a VI curve associated with them base of the amount of energy that they receive.
- Altering the voltage output will change the current output, and visa versa.
- The inverse slope from 0 to point of max power is the Characteristic Resistance



OBJECTIVES

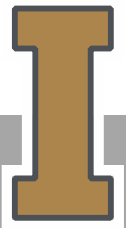
- Compare the solar panel data with given manufactures data
- Compare the affect of angle on power out put

DiffuseAngle0	11/30/2017 1:16 PM	Microsoft Excel W...	21 KB
DiffuseAngle15	11/30/2017 1:16 PM	Microsoft Excel W...	23 KB
DiffuseAngle30	11/30/2017 1:16 PM	Microsoft Excel W...	21 KB
DiffuseAngle45	11/30/2017 1:19 PM	Microsoft Excel W...	21 KB
DiffuseAngle60	11/14/2017 1:23 PM	Microsoft Excel W...	16 KB
Beta13.6+ Gamma198-	11/28/2017 1:40 PM	Microsoft Excel W...	20 KB
Beta14+ Gamma151+	11/28/2017 1:41 PM	Microsoft Excel W...	32 KB
Beta65- Gamma200-	11/28/2017 1:41 PM	Microsoft Excel W...	25 KB
Beta66.35- Gamma153+	11/28/2017 1:41 PM	Microsoft Excel W...	26 KB



EXPERIMENTAL METHODS

- Used BK precision instrument and LabView to collect data
- Used a t-slot bar and a bracket to set the beta angle
- Used a Fowler Angle Device to record angle (internal accelerometer).



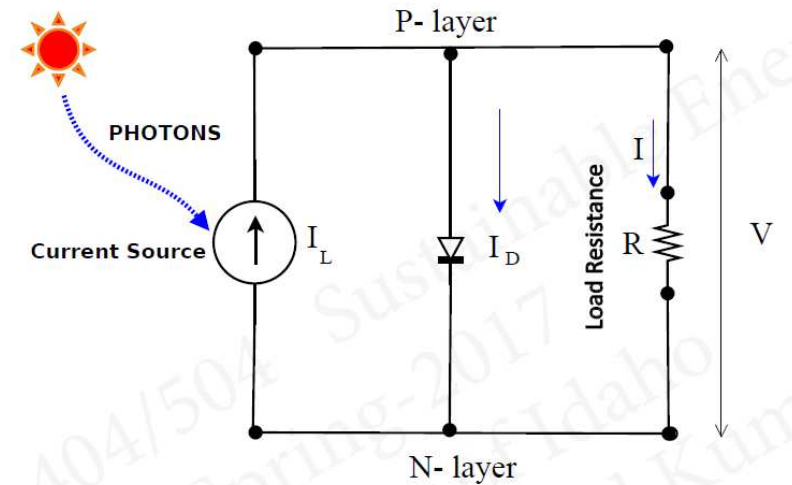
EXPERIMENT MATH MODELS

Solar Panel Theoretical Equation

$$I = I_L - I_0 \left[\exp\left(\frac{qV}{nkT}\right) - 1 \right]$$

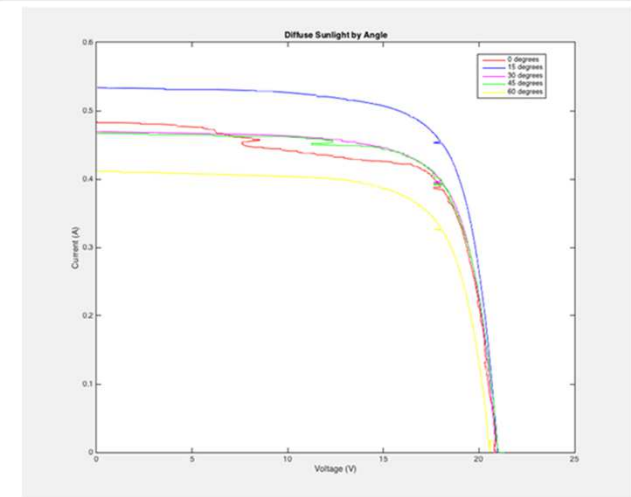
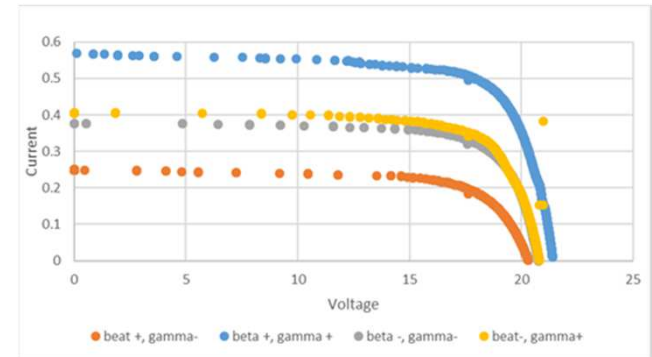
Solar Panel Curve Fit Equation

$$I = A - B[\exp(Cv) - 1]$$



RESULTS I

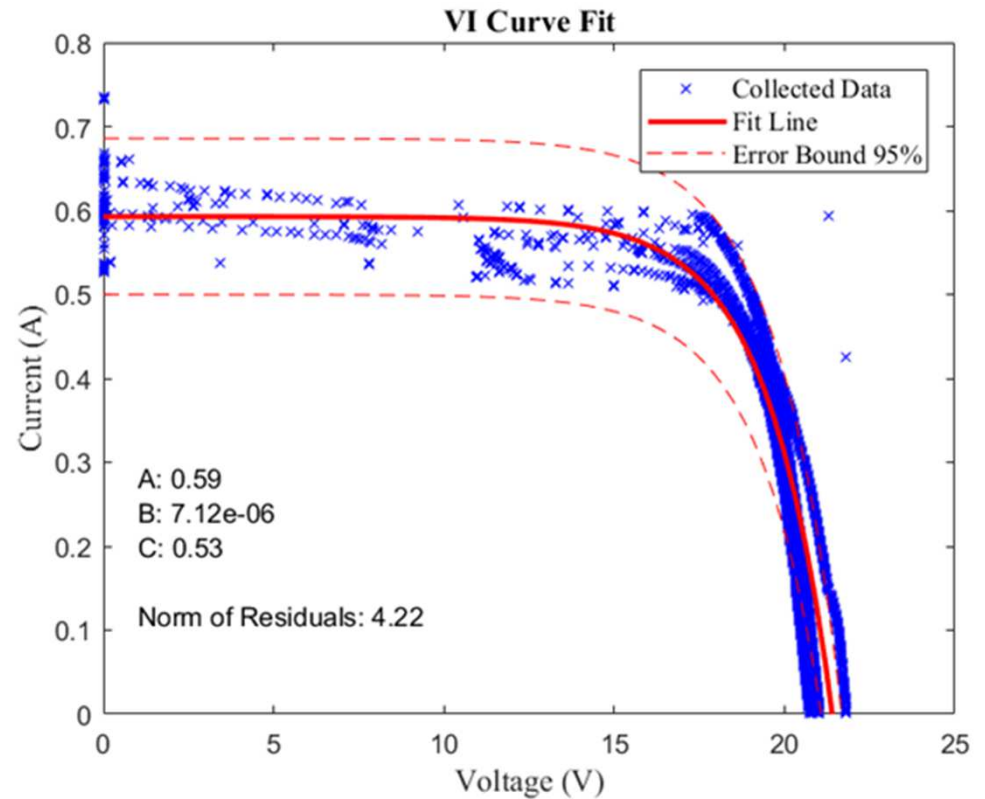
- Both angles look to have an effect on the power outputted.
- The Beta-angle seems to have less of an effect than Gamma.
- Optimum angle found to be ~15 degrees from ground (Beta, south-facing).
- Need more variables to use interaction and statistical significance graphical method.



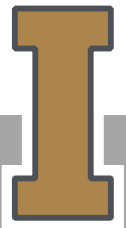
Run	mean	x1 Beta	x2 Gamma	x1x2	Max Power
1		1	-1	-1	5.867067521
2		1	1	-1	3.590754408
3		1	-1	1	6.223283849
4		1	1	1	8.974798333
sumproduct	24.65590411	0.475201371	5.740260253	5.027827597	
effect	6.163976028	0.237600685	2.870130127	2.513913799	
				order #	order effect labi percentile
				1	0.237601 beta x1 0.166667 -0.96742
				2	2.513914 x1x2 0.5 0
				3	2.87013 gamma x2 0.833333 0.967422

RESULTS II

- Curve fitted the VI collected data
- Used coefficients to satisfy experimental math model
- Calculated error and norm

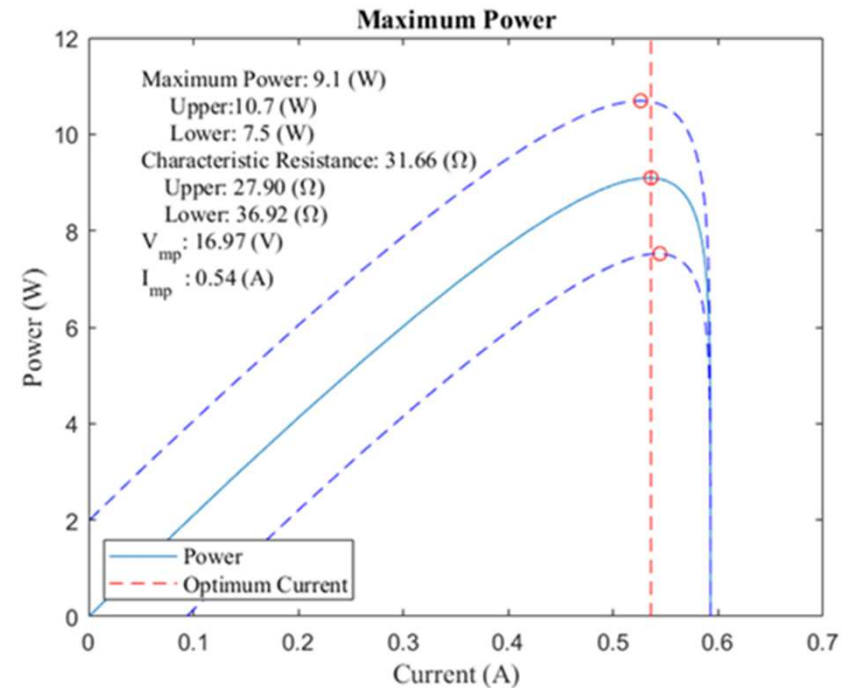


$$I = 0.59 - 7.12 \times 10^{-6} [\exp(0.53v) - 1] \pm 0.093$$



■ ACCURACY

- Accuracy was affected by weather
- Hoped to remove the weather variable but there were no clear days to test.
- Due to the uncertainty in the curve fit, the characteristic resistance falls between 27.9 – 36.92 ohms with a maximum power between 7.5 – 10.7 watts.



QUESTIONS?

