Conference: Interdisciplinary Congress of Renewable Energies, Industrial Maintenance, Mechatronics and Information Technology

BOOKLET

RENIECYT
Registro Nacional de Instituciones y Empresas Científicas y Tecnológicas
1702902 CONACYT

RENIECYT - LATINDEX - Research Gate - DULCINEA - CLASE - Sudoc - HISPANA - SHERPA UNIVERSIA - E-Revistas - Google Scholar
DOI - REDIB - Mendeley - DIALNET - ROAD - ORCID

Title: Optimization of the efficiency of the photovoltaic cell Solar energy.

Authors: SANDOVAL-VILLEGAS, Juan Carlos, TOLOSA-GARMA, Irving Manuel y QUINTAL-VÁZQUEZ, José Francisco.

Editorial label ECORFAN: 607-8695
BCIERMMI Control Number: 2019-128
BCIERMMI Classification (2019): 241019-128

Pages: 11
RNA: 03-2010-032610115700-14

ECORFAN-México, S.C.
143 – 50 Itzopan Street
La Florida, Ecatepec Municipality
Mexico State, 55120 Zipcode
Phone: +52 1 55 6159 2296
Skype: ecorfan-mexico.s.c.
E-mail: contacto@ecorfan.org
Facebook: ECORFAN-México S. C.
Twitter: @EcorfanC

www.ecorfan.org

Holdings

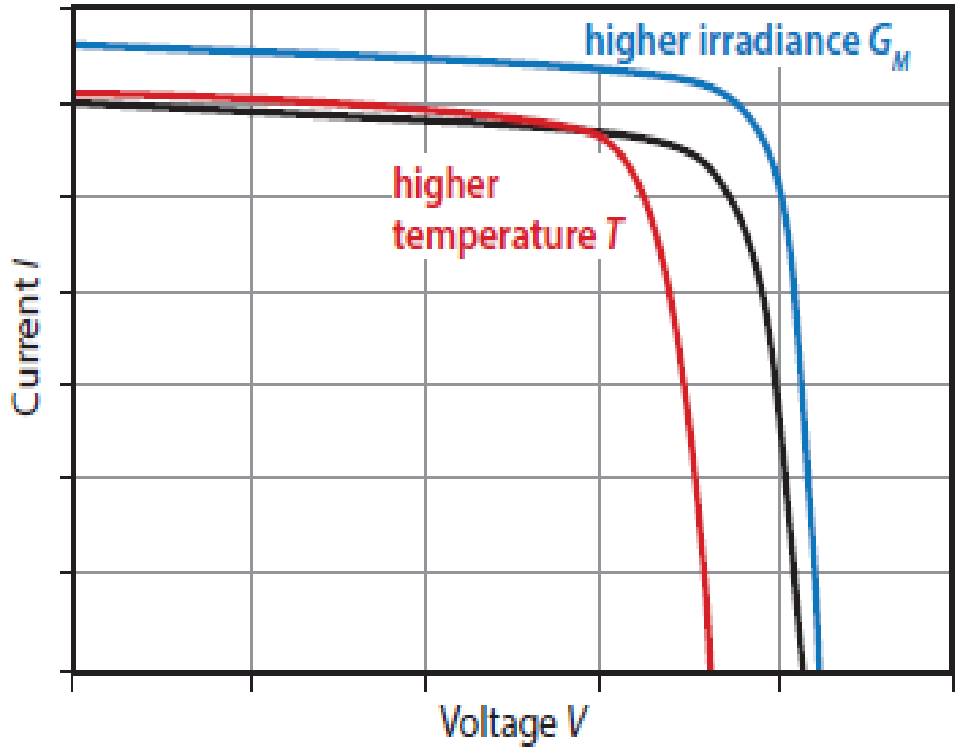
Mexico	Colombia	Guatemala
Bolivia	Cameroon	Democratic
Spain	El Salvador	Republic
Ecuador	Taiwan	of Congo
Peru	Paraguay	Nicaragua

Abstract

The electrical efficiency of a solar cell is affected by its operating temperature: when it increases, efficiency decreases. The aim of this paper is to demonstrate this effect and how the use of heat sinks help to improve the efficiency in photovoltaic cells at temperatures higher than those of design (NOCT 20 ° C). The experiment consisted in measuring environmental temperature, cell's surface temperature, wind speed, voltage, current and power production of the solar cell while an electronically controlled load was connected(or demanding .01A). These measures were taken from two solar cells, one of them with a heatsink and the other (or another) without it. The measurements allowed us to acquire the current-voltage curve from both cells, which reveals that the cell with heat sink is more efficient in the production of energy than the cell without heat sink in a range between 3.4% -5.4%. The study was developed in Cancún city with an average surface temperature of the panel of 40.42 ° C, average solar irradiation of 675 W/m^2 and an average wind speed of 1.88 m/s.

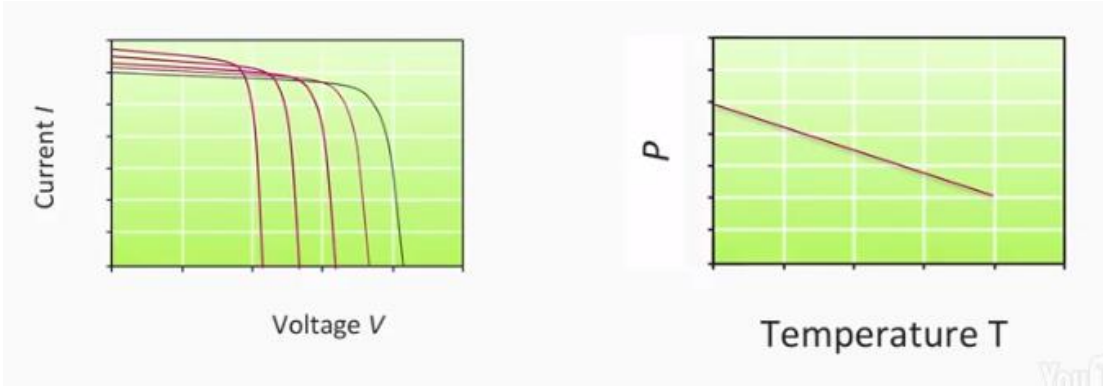
State of art

Current and voltage curve



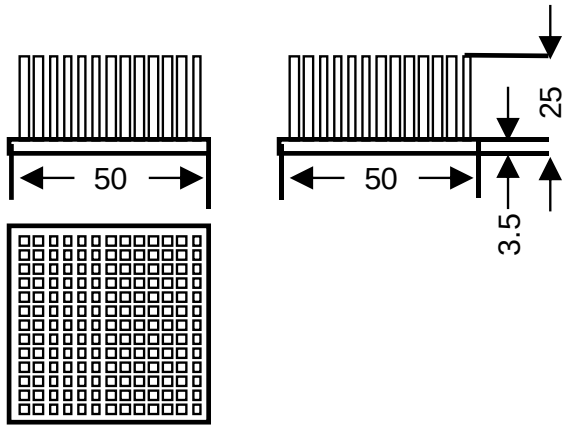
State of art (I)

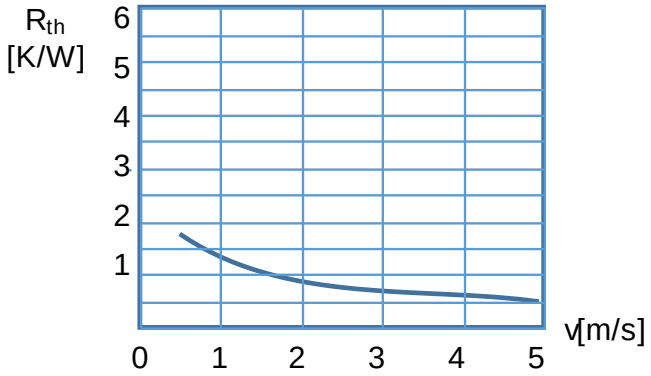
Current and voltaje curve

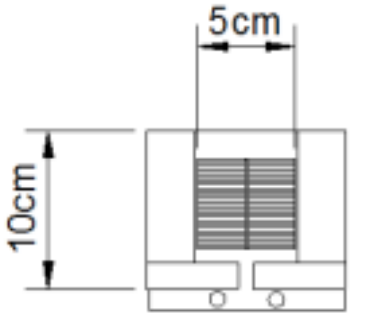


Methodology (I)

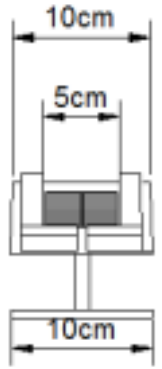
Localization and position of the solar cell

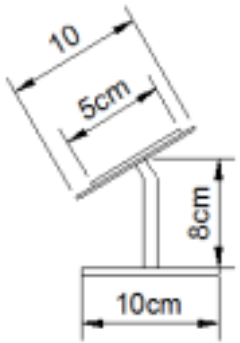






Vista superior de la celda solar



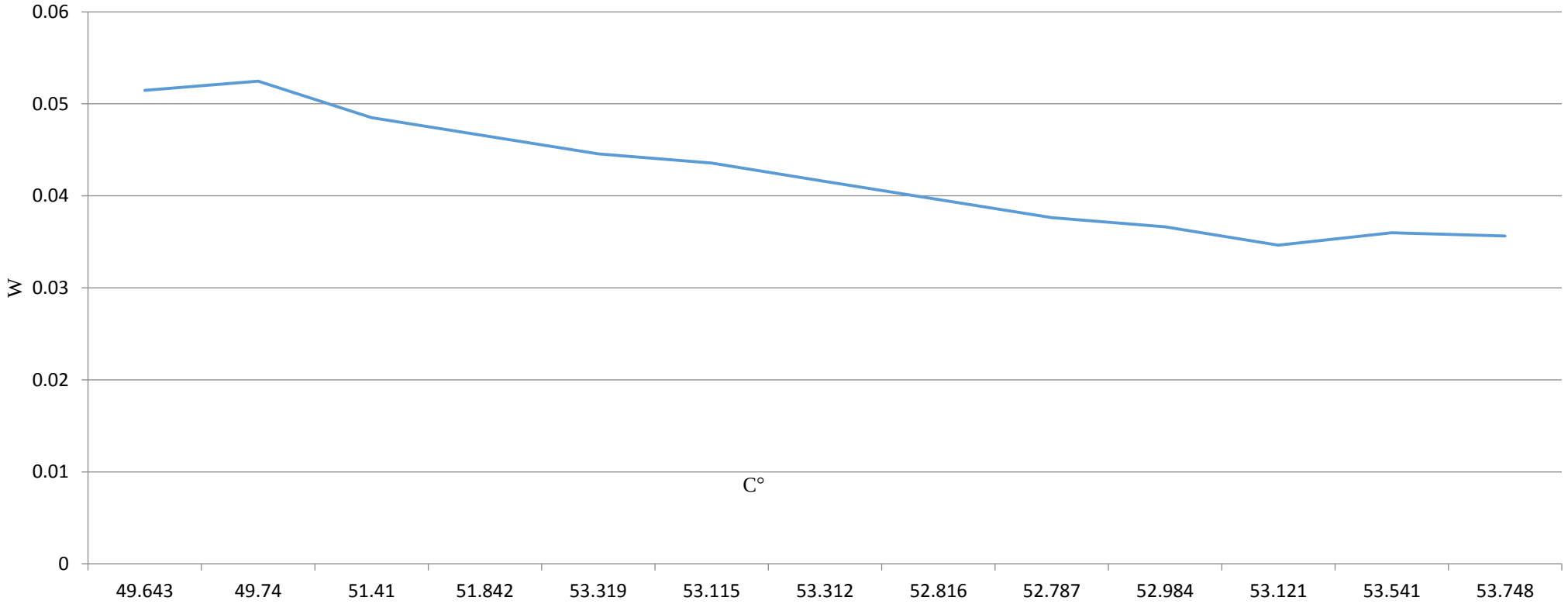


Methodology (II)

BK Precision 8500, Keysight 34970ª, piraometer Eppely 8-48 and hot wire anemometer.

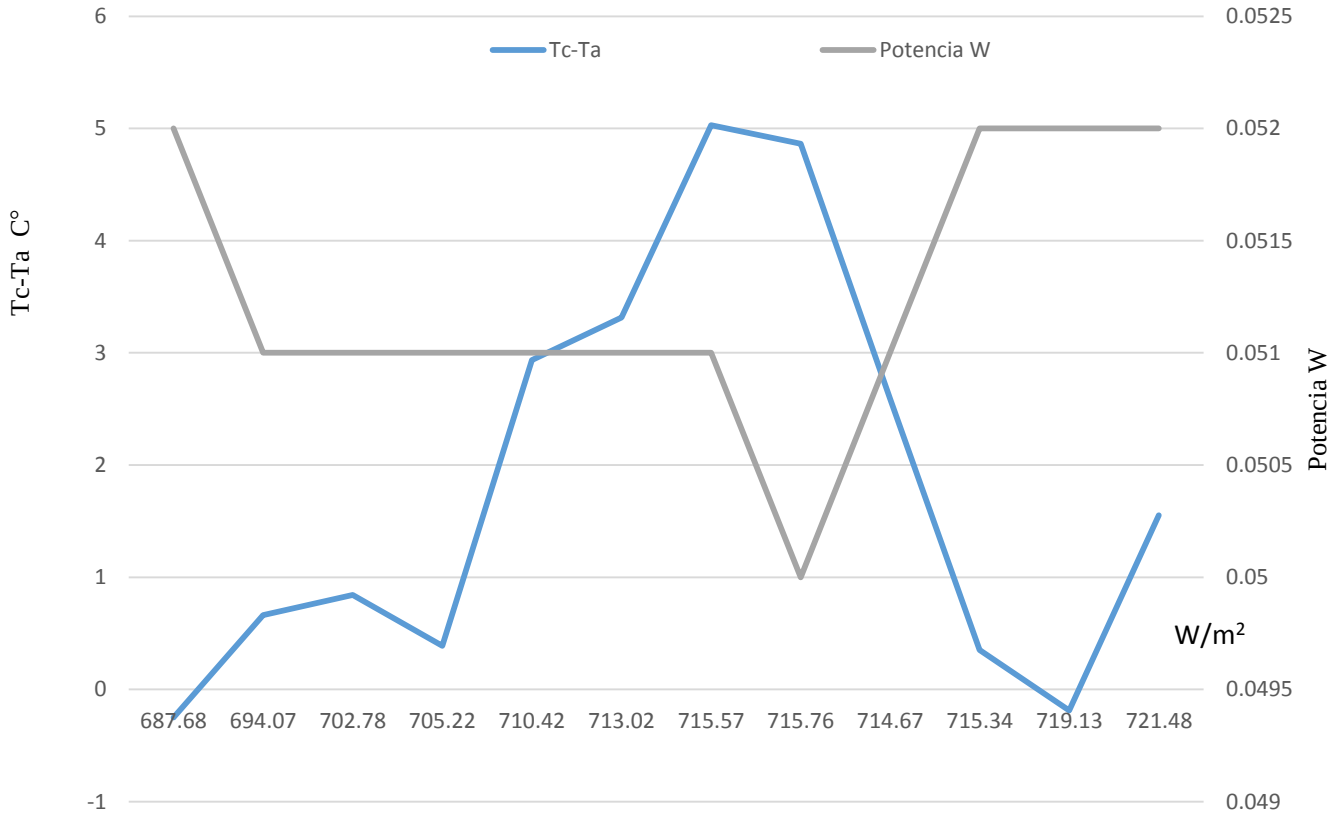
Results (II)

Solar cell and temperature relation.



Results (II)

Effect of the temperature in a solar cell without heat sink.



Results (II)

Comparision

Solar cell vs Solar cell with heat sink.

Potencia (W)	N	Mínimo	Máximo	Media	Desviación estándar
Con Disipador	2218	.00	.06	.0524	.00663
Sin disipador	2218	.00	.05	.0506	.00868
N	2218				

ANOVA

		Suma de cuadrados	gl	Media cuadrática	F	Sig
Inter sujetos		.125	2217	.000		
Intra sujetos	Entre elementos	.004	1	.004	61.59	.000
	Residuo	.139	2217	.000		
	Total	.143	2218	.000		
Total		.268	4435	.000		

Conclusions

The energy production of a solar cell is maintained at an average of: 0.0524 W, when the solar cell reaches the maximum recorded temperature of 53.74 ° C, its efficiency is decreased to 71%.

Acknowledgements

Financial resources was required for the acquisition of laboratory equipment, which we acquired by the approval of the thematic network of academic collaboration of the PRODEP call. Special thanks to Dr. Frédéric J. Lesage of the Département d'informatique et d'ingénierie, Université du Québec in Outaouais for his direction and recommendations for the realization of this project.

References

Alonso García, M. C., & Balenzategui, J. L. (2004). Estimation of photovoltaic module yearly temperature and performance based on Nominal Operation Cell Temperature calculations. Renewable energy, 29(12), 1997-2010.

Arno Smets, K. J. (2016). Solar Energy, t. p. Cambridge: UIT Cambridge.

E. E. Granda-Gutiérrez, O. A.-G. (2013). MODELADO Y SIMULACIÓN DE CELDAS Y PANELES SOLARES. Congr. Int. Ing. Electrón. Mem. Electro, 35, 17-22.

Lesage, F. S. (Marzo de 2017). Eficiencia de las celdas solares. Revista de Aplicaciones de la Ingenieria, 4(19), 19-27. Obtenido de www.ecorfan.org/bolivia

Organización meteorológica mundial. (7 de Mayo de 2019). Servicio de información meteorológica mundial, predicciones oficiales. Obtenido de http://wwis.aemet.es/es/city.html?cityId=1209

Romero, F. C. (2002). Cálculo de la Temperatura de Operación de Células Solares en un Panel Fotovoltaico Plano. Departamento de Energías Renovables. MADRID, ESPAÑA: Editorial CIEMAT.

S. Mekhilef, R. S. (2012/6.). Effect of dust, humidity and air velocity on efficiency of photovoltaic cells. Renewable Sustainable Energy, 16(5), 2920–2925.

ECORFAN®