SUDAN UNIVERSITY OF SCIENCE AND TECHNOLOGY
COLLEGE OF GRADUATE STUDIES

OPTIMIZATION OF A SOLAR SYSTEM

A THESIS SUBMITTED FOR PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF M.Sc. IN PHYSICS

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Dedication

To my mother . .

To my father’s soul . .

. . To my brothers and sisters

. . To my colleagues

To my honorable mates at Elmahaba

. . company

. . . And to whom I’m indebted a lot

. . . To my best friends

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ABSTRACT

In this work a concentration system was designed and fabricated to concentrate the solar radiation into a photovoltaic module of 55 × 65 cm^2 dimensions with a power of 37.3 Watt at standard conditions. In this concentration system two mirrors were used to reflect solar radiation on the module, which was supported on its place on the designed concentration system.

A test for the module was carried out using a simulation unit. The fill factor was found to be 66.55%. When the module was fixed on a tilted position a peak power of 26.0_27.0 was obtained and an estimated total energy during the day was found to be 190 Wh. When the module was

mounted on the tracker without concentration a peak value of the power about 30 W is reached. When the concentration system was mounted on a tracker it is found that a peak power above 35 is reached, and an estimated energy produced on the day was found to be 310 Wh. It is found that the concentration system with tracking increases the output energy to about 63% compared to that from a fixed module.

It is also found that the ratio of the costs of the concentration system with the tracker to the costs of the modules is equals to 0.4, while the output was increased by more than 60%. This result shows that the system is attractive.

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