



## REVIEWER'S REPORT

**Manuscript No.: IJAR-57185**

**Title: Influence of Temperature, Irradiation, and Frequency Modulation on the Minority Carrier Diffusion Coefficient in Bifacial Silicon Solar Cell**

**Recommendation:**

Accept after major revision .....

Rating	Excel.	Good	Fair	Poor
Originality		✓		
Techn. Quality				
			✓	
Clarity		✓		
Significance		✓		

**Reviewer's ID: JPR- 019**

*Detailed Reviewer's Report*

# Review Report

## Title:

**“Influence of Temperature, Irradiation, and Frequency Modulation on the Minority Carrier Diffusion Coefficient in Bifacial Silicon Solar Cell”**

## 1. Overall Evaluation

This manuscript presents a **theoretical investigation** of how environmental and operational parameters (temperature, irradiation, and frequency modulation) influence the **minority carrier diffusion coefficient** in bifacial silicon solar cells. The topic is relevant and important for **photovoltaic performance optimization**, especially in harsh environments such as space or nuclear conditions.

### Strengths

- Relevant research problem in solar energy and semiconductor physics
- Strong theoretical foundation using Einstein relation and diffusion models
- Good attempt to integrate multiple influencing parameters
- Logical structure (Theory → Results → Discussion → Conclusion)

### Overall Recommendation:

### Major Revision Required

## 2. Novelty and Contribution

### Positive Aspects:

- Combines **three key parameters simultaneously** (Temperature + Irradiation + Frequency), which is less commonly addressed together
- Introduces **complex diffusion coefficient under dynamic regime**

- Applicable to **bifacial solar cells**, which are currently trending in PV research

### **Limitations:**

- The novelty is **moderate**, as similar studies exist individually for temperature, irradiation, and frequency
- Lack of **experimental validation or simulation comparison** reduces impact

## **3. Technical Quality**

### **Strengths:**

- Proper use of:
  - Einstein relation
  - Diffusion length concept
  - Irradiation damage modeling
- Equations are mostly consistent and logically derived

### **Issues:**

- Some equations are **poorly formatted and unclear**
- Notation inconsistency:
- Complex diffusion coefficient expression needs **clear derivation steps**
- Units are **not consistently presented**

## **4. Methodology**

### **Good Points:**

- Stepwise development:
  - Temperature-dependent diffusion
  - Irradiation-dependent diffusion
  - Combined effects

- Frequency modulation

### **Weaknesses:**

- Purely **analytical model** (no simulation or experimental validation)
- Missing:
  - Boundary conditions
  - Assumptions clarity
  - Parameter justification (e.g., why specific values like 380K, 220 MeV)

## **5. Results and Discussion**

### **Strengths:**

- Clear interpretation of:
  - Diffusion coefficient vs irradiation
  - Diffusion coefficient vs temperature
  - Frequency response behavior

### **Key Observations:**

- Increase in irradiation → decrease in diffusion coefficient
- Increase in temperature → reduced mobility
- High frequency → reduced carrier response

### **Issues:**

- Graphs are:
  - Not clearly labeled (axes, units missing)
  - Low-quality presentation
- Discussion is **qualitative**, lacks:
  - Quantitative comparison
  - Error analysis
- No comparison with **existing literature results**

## 6. Language and Presentation

### Major Concerns:

- Mixed language usage (**English + French**)
- Grammar issues throughout:
  - Example: “influencent” instead of “influence”
- Typographical errors and spacing problems
- Scientific writing needs **professional editing**

## 7. References

### Strengths:

- Adequate number of references (~40+)
- Includes classical and recent works

### Issues:

- Formatting inconsistent
- Some references:
  - Incomplete
  - Contain broken links
- Citation style not uniform

## 8. Conclusion Quality

### Good:

- Summarizes main findings clearly
- Highlights practical importance

### Missing:

- No mention of:
  - Limitations
  - Future work
- No quantitative conclusions

## 9. Key Corrections Required

### Major Technical Corrections:

- Improve equation formatting
- Clearly define all variables and units

### Methodological Improvements:

- Add:
  - Numerical simulation (MATLAB / COMSOL)
  - Validation with literature or experimental data

### Presentation Improvements:

- Convert full paper into **English only**
- Improve:
  - Graph quality
  - Axis labels and units
- Rewrite abstract for clarity

## 10. Suggested Improvements for Publication

To make this paper **journal-ready**, the authors should:

1. Perform **numerical simulation validation**
2. Improve **mathematical clarity and consistency**
3. Enhance **figures and graphical analysis**

4. Revise language (professional English editing)
5. Add **comparative study with previous works**
6. Include **practical implications (efficiency impact)**

## 11. Final Verdict

Criteria	Rating
Novelty	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> ☆ ☆
Technical Depth	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> ☆ ☆
Presentation	<input type="checkbox"/> <input type="checkbox"/> ☆ ☆ ☆
Clarity	<input type="checkbox"/> <input type="checkbox"/> ☆ ☆ ☆
Overall	<input type="checkbox"/> <input type="checkbox"/> ☆ ☆

**Decision: Major Revision required before acceptance**

## 12. Reviewer Comment

The manuscript addresses an important topic in photovoltaic device modeling by analyzing the combined effects of temperature, irradiation, and frequency modulation on the minority carrier diffusion coefficient. However, significant improvements are required in terms of mathematical correctness, language clarity, graphical presentation, and validation. The paper is recommended for major revision before reconsideration for publication.