

REVIEWER'S REPORT

Manuscript No.: IJAR-54354

Date: 16-10-2025

Title: RESILIENT AND FRAGMENTATION-AWARE MULTICAST ROUTING IN DYNAMIC DATA CENTER-ORIENTED SDM-EONS

Recommendation:

Accept as it is

Accept after minor revision✓.....

Accept after major revision.....

Do not accept (Reasons below)

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

Reviewer Name: **Sudhanshu Sekhar Tripathy**

Date: 16-10-2025

Reviewer's Comment for Publication.

(To be published with the manuscript in the journal)

The reviewer is requested to provide a brief comment (3-4 lines) highlighting the significance, strengths, or key insights of the manuscript. This comment will be Displayed in the journal publication alongside with the reviewer's name.

Reviewer's Comment for Publication

The manuscript presents a heuristic framework—**DC-F-MRSA**—for resilient and fragmentation-aware multicast routing in spatially multiplexed elastic optical networks (SDM-EONs). The topic is technically advanced, addressing a critical challenge in data center-oriented optical communication networks involving spectral fragmentation, inter-core crosstalk, and resilience. The study extends the DC-F-RSCA algorithm to multicast traffic and shows clear experimental validation through COST239 and NSFNET simulations. Overall, this is a strong, methodical paper with novel contributions. However, minor refinements are needed in the experimental discussion, figure clarity, and presentation consistency.

Detailed Reviewer's Report

1. Scope & Relevance

- The study directly fits within the scope of **optical network design, resource allocation, and SDM-EON resilience.**

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- The focus on multicast traffic in SDM-EONs fills an identified research gap in fragmentation-aware and crosstalk-managed routing.
- The work is relevant for high-capacity, data-center-oriented optical infrastructures and future 6G backhaul systems.

2. Structure & Technical Presentation

- The paper is well structured (Abstract → Introduction → Related Work → Problem Statement → Methodology → Results → Conclusion).
- Figures (1–7) are informative but captions need better detail and formatting consistency.
- Algorithm pseudocode is clear but would benefit from a flowchart summarizing the DC-F-MRSA process.
- Section headings are coherent; however, long sentences in methodology can be split for clarity.

3. Methodological / Analytical Details

- The **DC-F-MRSA** algorithm extends DC-F-RSCA for multicast with added resilience and fragmentation control.
- Incorporates **SEQ** and **PAR** core selection strategies—an effective approach to balance fragmentation and crosstalk.
- The **mathematical cost function** and protection mechanism are well-defined and theoretically grounded.
- Simulation parameters (network topology, cores per fiber, slot sizes, traffic models) are sufficiently explained.
- However, **algorithm complexity** and performance analysis could be summarized more compactly.

4. References & Citations

- References are comprehensive, current, and cover seminal and recent works (2019–2023).
- Some references (e.g., [5], [12]) could include DOI or page number formatting corrections.
- Citations are adequate but may be shortened where repetition occurs.

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5. Language & Style

- Technical writing is generally clear, though slightly verbose in sections (e.g., 5. Proposed Method).
- Minor grammatical and typographical errors should be corrected (e.g., spacing before parentheses, capitalization consistency).
- Use of symbols and equations is correct but can be formatted uniformly for better visual clarity.

6. Key Strengths

- Addresses a **novel research gap** in multicast traffic management in SDM-EONs.
- Combines **fragmentation awareness, resilience, and crosstalk mitigation** in one unified model.
- Strong experimental validation using well-known **COST239** and **NSFNET** topologies.
- Dual SEQ/PAR strategy provides flexibility for operator requirements.
- Methodology and simulation approach demonstrate technical maturity.

7. Areas for Improvement (Minor Revision Needed)

- Add a **flowchart or schematic** summarizing the DC-F-MRSA framework.
- Standardize **figure captions** and ensure axis labels are readable.
- Improve **language precision** and remove redundancy in algorithm description.
- Provide a short **quantitative comparison table** summarizing improvement percentages vs. baselines.
- Update reference formatting and correct minor citation inconsistencies.

Final Feedback to Author

This is a well-executed and technically strong paper. The DC-F-MRSA algorithm demonstrates clear innovation in optimizing multicast routing in dynamic SDM-EON environments. With minor refinements in figure presentation, language, and clarity of results, the manuscript will be suitable for publication.