South East Asian J. of Mathematics and Mathematical Sciences
Vol. 21, No. 3 (2025), pp. 127-138

DOI: 10.56827/SEAJMMS.2025.2103.8 **ISSN (Online): 2582-0850**

ISSN (Print): 0972-7752

CONTROLLED K-FRAMES IN 2-HILBERT SPACES

Neha Pauriyal and Mahesh C. Joshi*

Department of Applied Sciences and Humanities,
Birla Institute of Applied Sciences,
Bhimtal - 263136, Uttarakhand, INDIA

E-mail : nehapauriyal1996@gmail.com

*Department of Mathematics,
D. S. B. Campus, Kumaun University,
Nainital - 263002, Uttarakhand, INDIA

E-mail : mcjoshi69@gmail.com

(**Received:** *Aug. 21, 2025* **Accepted:** *Dec. 28, 2025* **Published:** *Dec. 30, 2025)*

Abstract: In this paper, we introduce a new generalization of controlled K-frames to the context of 2-Hilbert spaces, thereby extending beyond classical Hilbert space theory. We develop foundational results by examining the operator-theoretic properties of controlled K-frames in this setting, establishing equivalent conditions that characterize them, and exploring their stability under suitable transformations. This builds directly on prior work introducing controlled K-frames in Hilbert C^*-modules, where the concept was first defined, equivalent conditions were established, relationships between K-frames and controlled K-frames were revealed, and invariance and perturbation properties were analyzed. Our work elevates these ideas by adapting them to the richer structure of 2-Hilbert spaces-a framework extending Hilbert spaces through inner products valued in C^*-algebras.

Keywords and Phrases: Frame, Controlled K-frame, Controlled K-frame operator, Controlled K- Bessel sequence.

2020 Mathematics Subject Classification: 42C15, 46C50.