

# CALO PD TROC2 (QM): A Modular Design for Enhanced Reliability

24/01/2024

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# • Motivation

We propose a **modification in the design of the TROC2 boards** to allow for their **replacement during a significant fraction of the QM/FM assembly sequence**

This modification will **allow the substitution of the boards in case of a failure** during the CALO assembly and test sequence (at least) before the support structure of the TROC1 and DC/DC boards is assembled

This modification is also intended to **provide additional flexibility in the assembly schedule** allowing for the complete mechanical assembly of the CALO detector before the final installation of the TROC2 boards

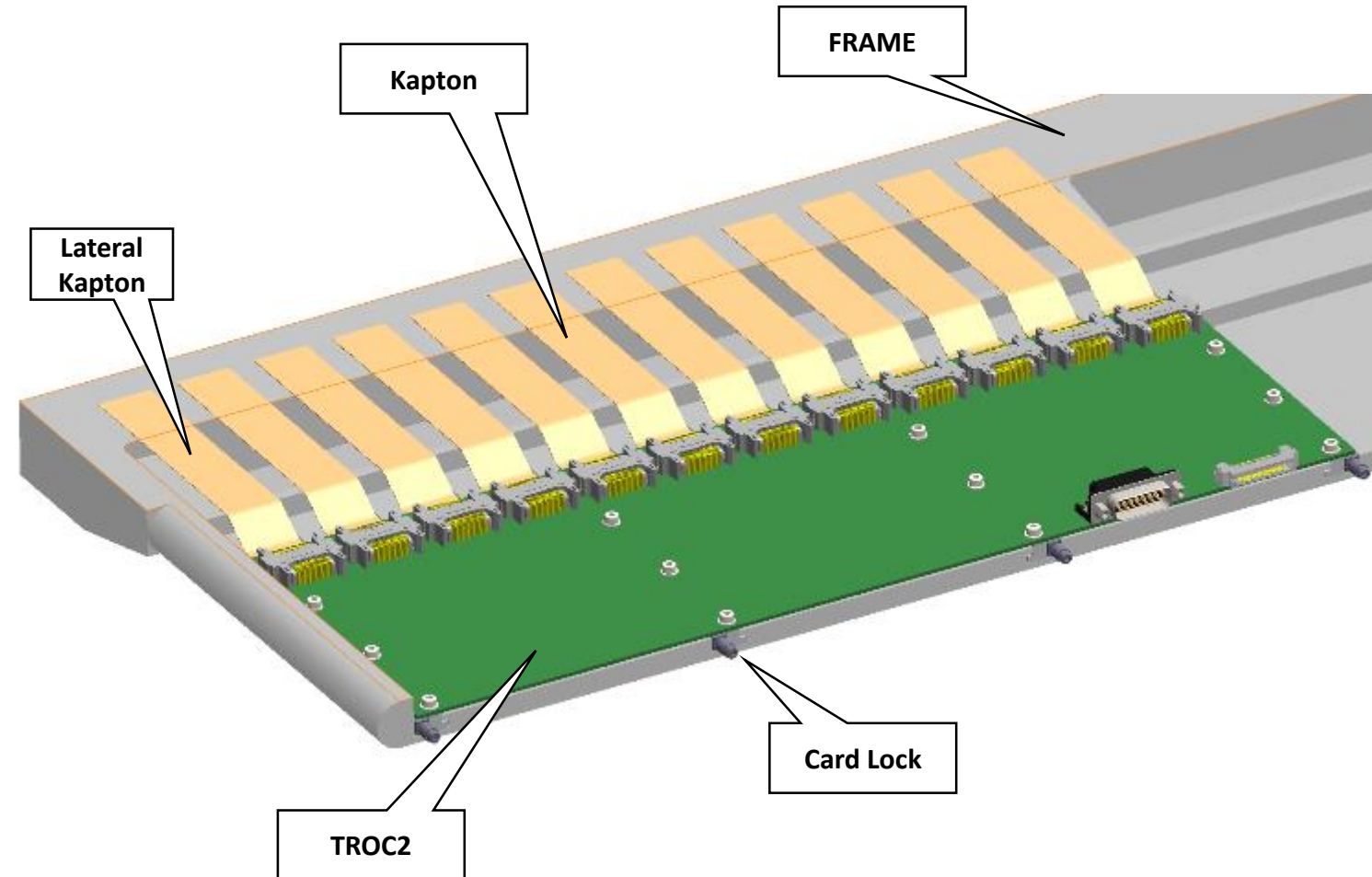
# Proposal for QM

## Modifications:

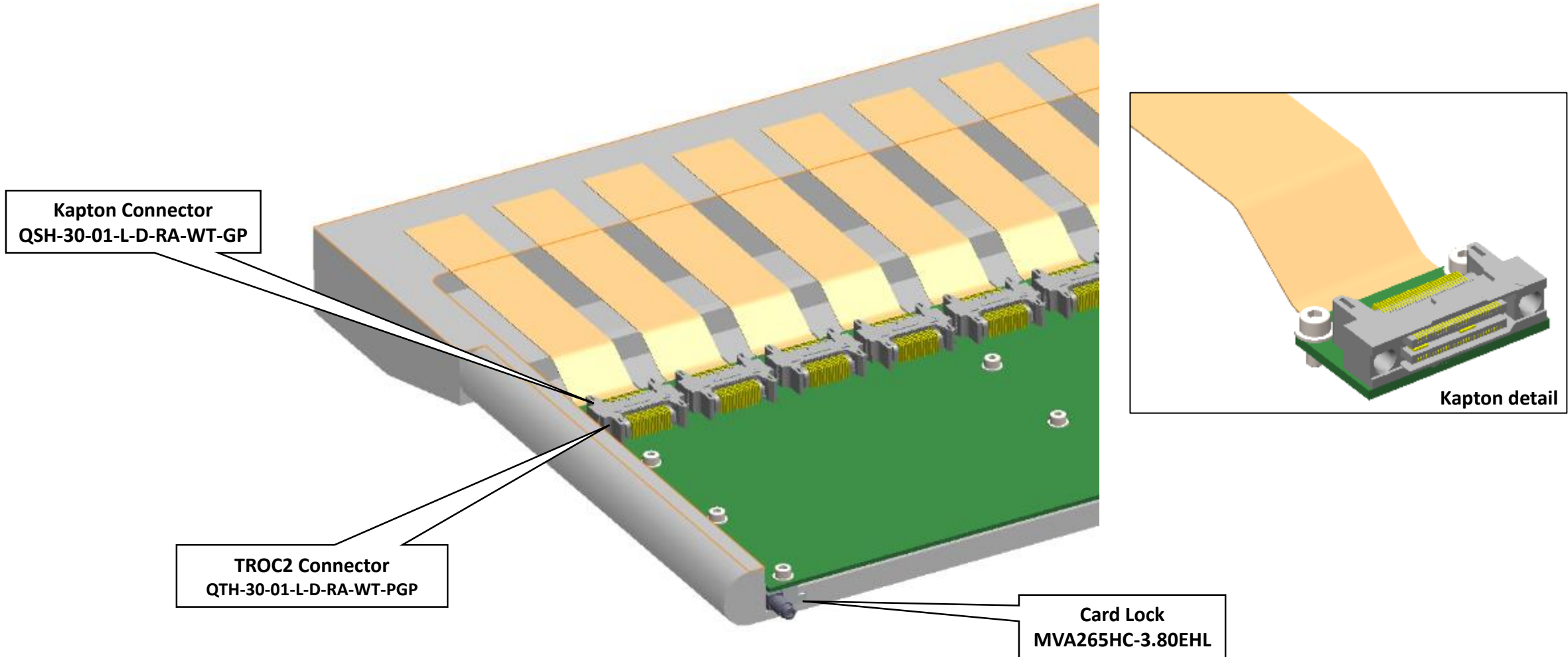
- Change the Kapton connector to a **90 degree connector**.
- Place and **fix each Kapton board connector** on the frame.
- **Modify TROC2** to incorporate **card-locks** and **90 degree Kapton connectors**.
- Add a **protection cover** for the WLSF
- Adapt **frame mechanical design**.
- Modify the **Lateral Kapton design**.

## **Open points to be verified:**

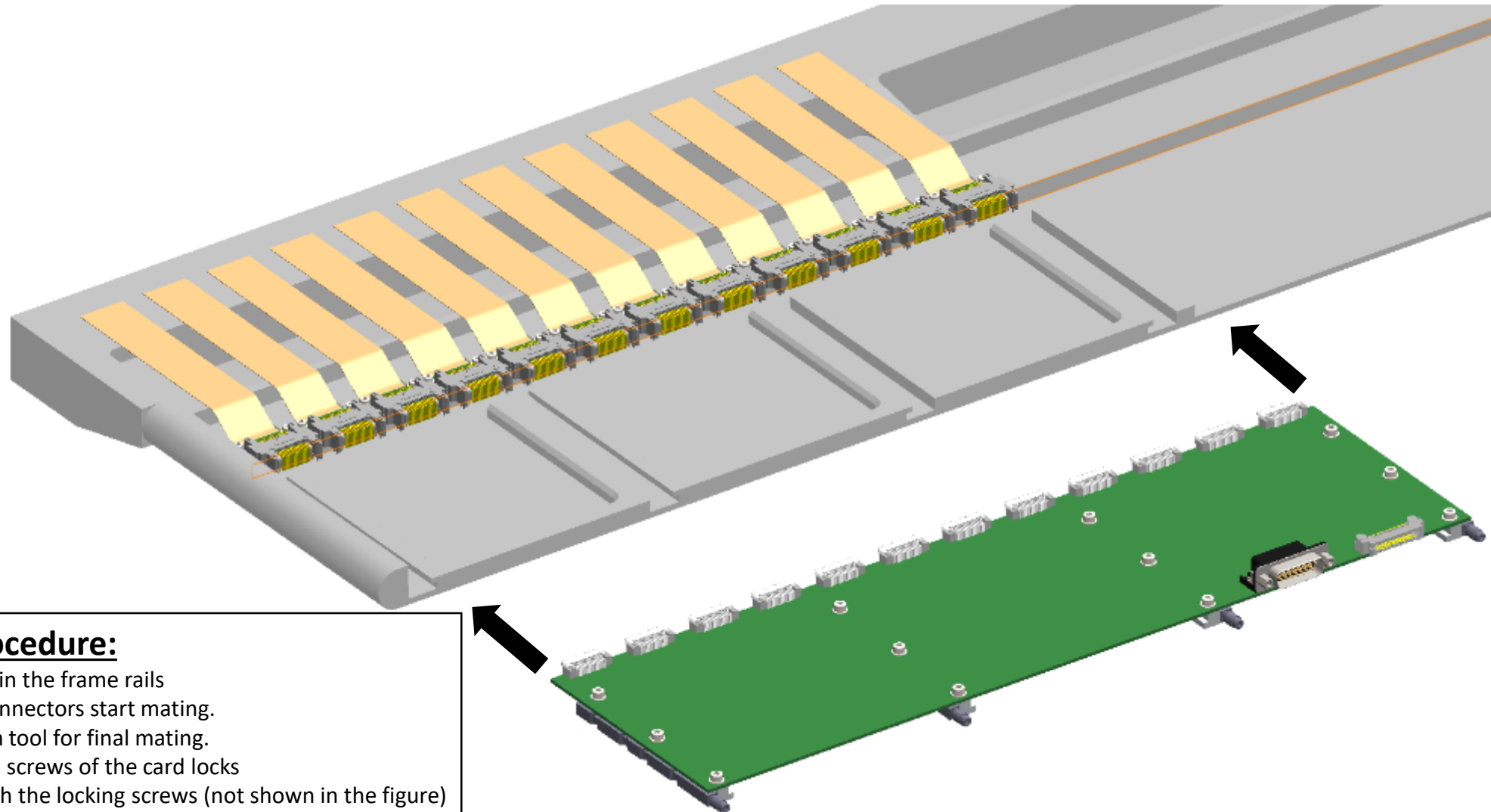
- **Use of several connectors in parallel.**
- **Required insertion force and precision.**
- **Interchangeability of TROC2 boards.**
- **Design space qualification.**



# Connectors and Card Locks



# • Insertion Procedure

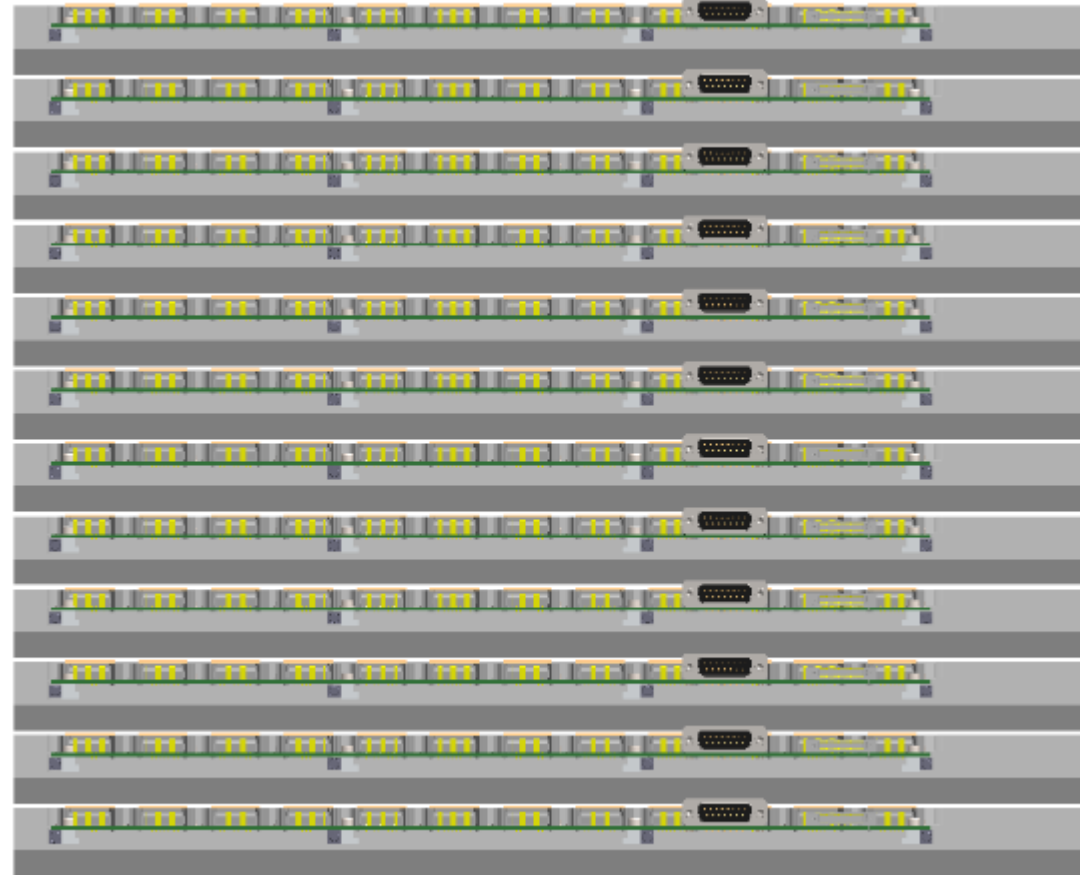
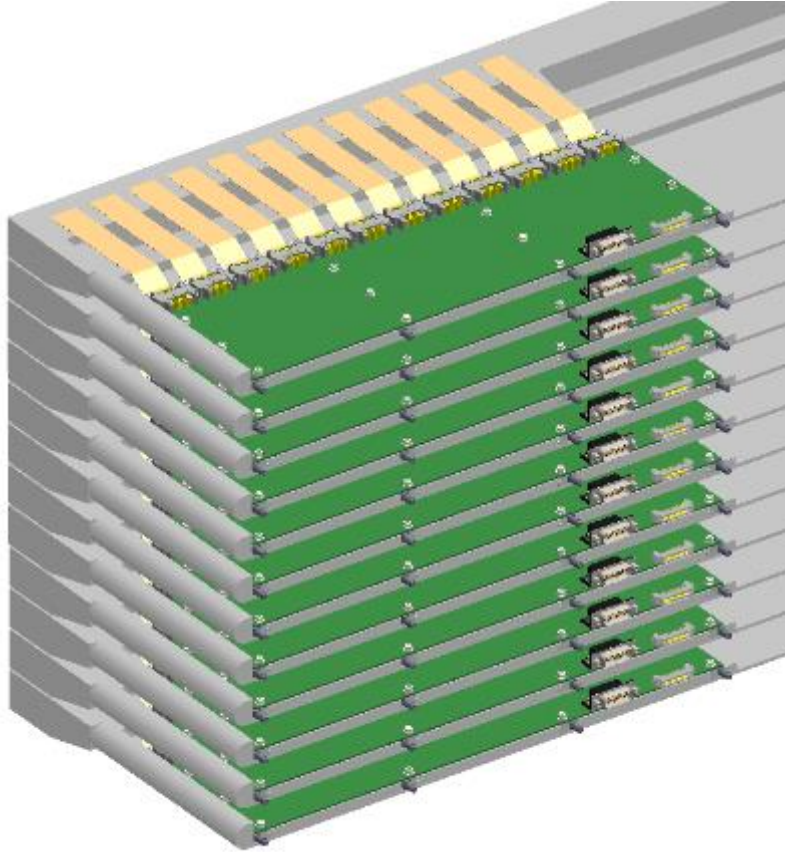


## **Insertion procedure:**

- 1- Insert the board in the frame rails
- 2- Push until the connectors start mating.
- 3- Use the insertion tool for final mating.
- 4- Tight the fixation screws of the card locks
- 5- Fix the board with the locking screws (not shown in the figure)

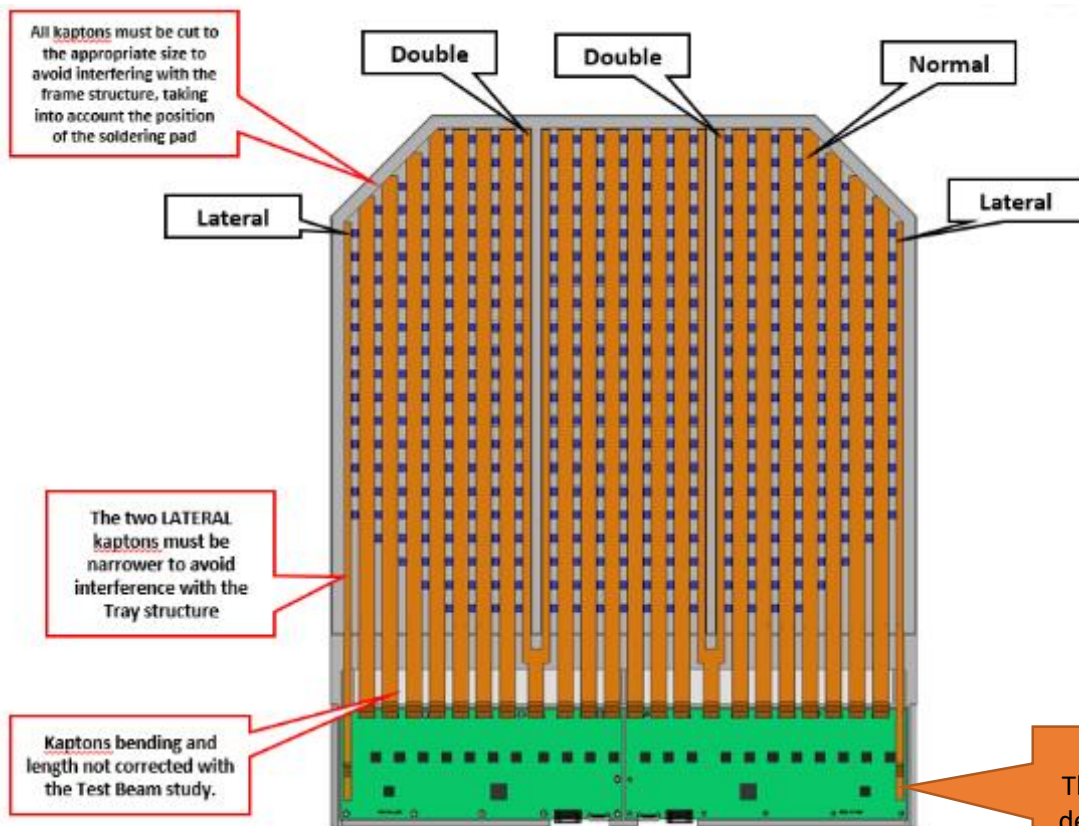


# • Frames Stack



# Kapton Design Proposal for QM/FM I

## Previous design

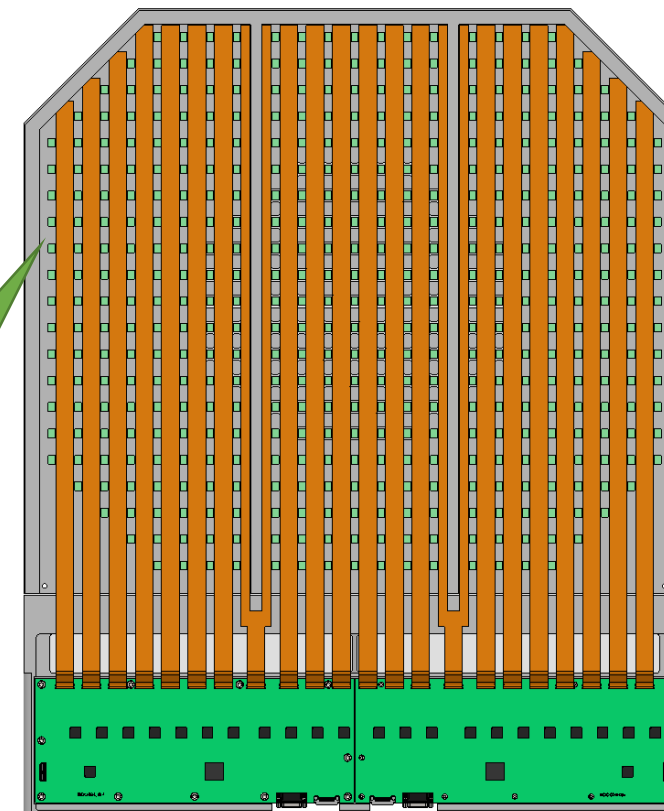


With this design we will have 3 types of Kapton. **Normal**, **lateral** and **double**.

We propose to remove the Lateral Kapton and connect PD sensors of the external column to the next Kapton, which needs a special design

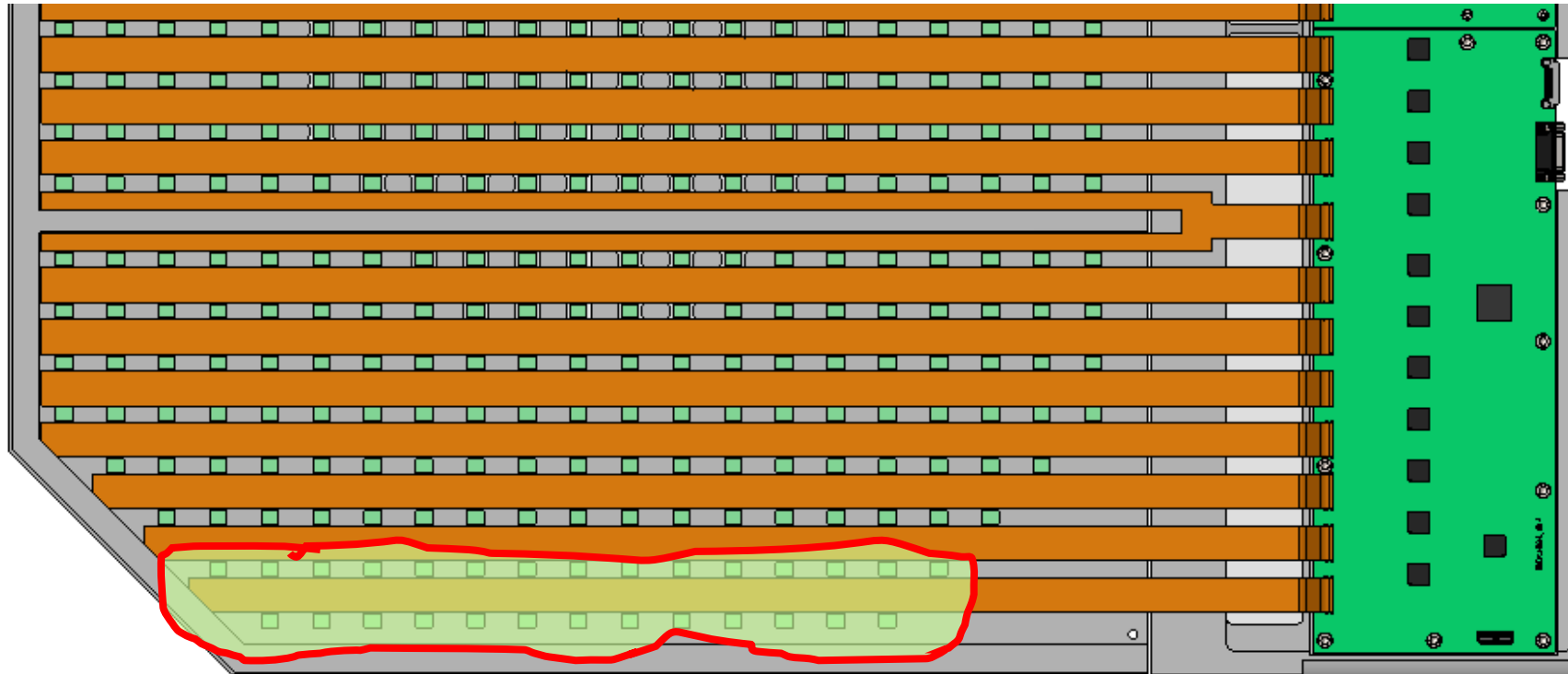
This Lateral Kapton design prevents the TROC2 extraction / insertion

## New design



With this configuration we still have 3 types of Kaptons. **Normal**, **Double**, and **(new)Lateral**.

# • Kapton Design Proposal for QM/FM II



PD Size	Normal Kapton	Lateral Kapton
Large	21	28 (=15+13)
Small	21	13

- The total number of PDs connected to the new Lateral Kapton is less than for a Normal Kapton
- A redesign of the soldering pad positions of the new Lateral Kapton may be required



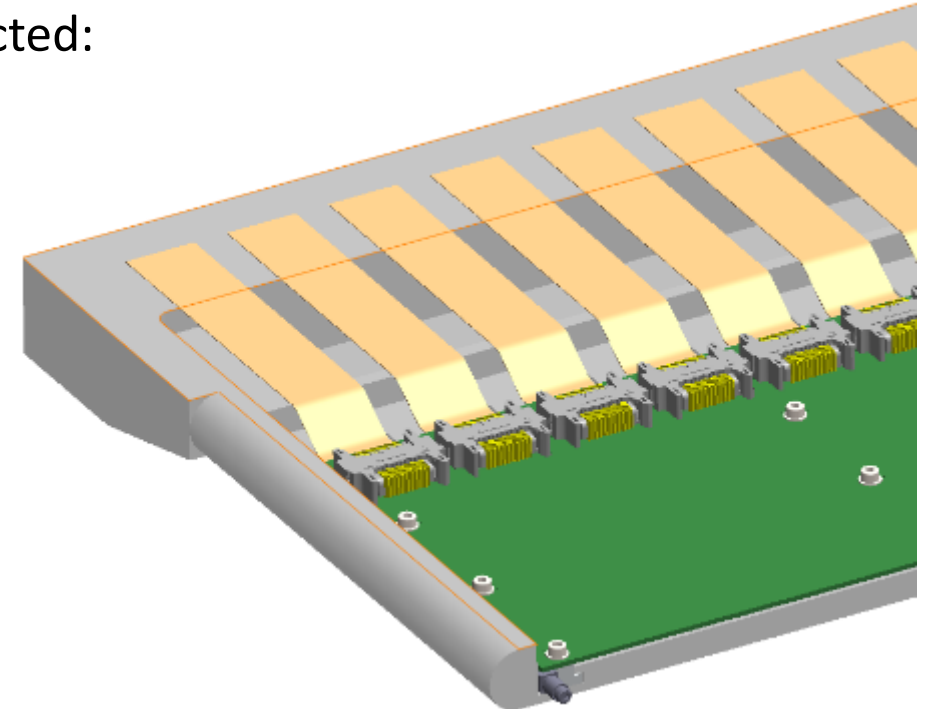
# Validation Tests

The proposed modifications will be tested on a **mechanical prototype** including:

- **2 TROC2 prototype boards** including the Kapton connectors
- **End-of-Kapton boards** with connectors and screws
- **Fixation system** for attaching the TROC2 board to the frame
- **Aluminum frame** with the proposed final geometry

Using this prototype, the following **validation tests** will be conducted:

- **Insertion test** and **I/F check** with WLSF
- Connector **mating** and **demating** test
- Insertion **repeatability** test with two TROC2 prototype boards
- Simulated **thermal** transfer test
- **Vibration** test.



# • Open Points & Schedule

- ❑ In addition to the validation of the TROC2 mechanical solution presented here
  - ❑ **Implications on the Kapton design** to be reviewed and agreed with INFN-Florence
  - ❑ **Implications on the Frame design** to be reviewed and agreed with IHEP
- ❑ To proceed with the mechanical design we need from IHEP
  - ❑ the latest **3D model** of the CALO QM and FM models
  - ❑ the **vibration** and **thermal profiles** to applied during the tests
- ❑ We intend to accomplish the **mechanical validation tests by summer 2024**