



Irradiation Tests of Copper Polyimide Flex circuit

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Page: **1 of 5**

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Irradiation Tests of Copper Polyimide Flex circuit

abstract

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History of Changes

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Table of Contents

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1. High-light the section title to include
2. From the menu, click “Special” > “Marker”
3. In the pop-up window, select “Cross-Ref”, and click “Marker”
4. Repeat from the 1 for the next

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8. If the paragraph format is not appropriate, edit the preference page of xxx.TOC from the menu, “View” > “Preference page”, and the last page in the preference page

1 Introduction

Concerning radiation damage, especially, mechanical deterioration of an adhesive layer used to laminate copper and polyimide, completed flex circuits as well as some simple base materials were irradiated at the 12 GeV KEK proton synchrotron. Some mechanical tests were carried on to the irradiated samples.

Recently the latest version flex circuits were irradiated at CERN-PS. They are now under preparation for the measurements.

In this note we summarize the results of the KEK-PS irradiation.

2 Proton irradiation and samples

2.1 KEK-PS irradiation

12 GeV proton irradiation at KEK-PS;
Fluence: 2×10^{14} protons/cm²

Irradiated samples:

- Completed four layer copper polyimide flex circuits

- Simple copper polyimide laminated sample using epoxy Nitric adhesive for peel tests.

The layer structure of this sample is as follows;

Polyimide coverlayer (25µm) - adhesive (15µm) - Copper layer (8µm) - adhesive (10µm) - polyimide baselayer(25µm)

2.2 CERN-PS irradiation

24 GeV proton irradiation at CERN-PS;
Fluence: 3×10^{14} protons/cm²

Irradiated samples:

3 Visual inspection

No noticeable color change was observed on the surfaces of the flex circuits.

4 Mechanical tests

4.1 peel tests

1) When the polyimide coverlayer of a 3mm wide strip was pulled with the pulling velocity of 45mm/min;

Peel force (per unit width) for the irradiated sample = 0.56 N/mm

Peel force (per unit width) for the non-irradiated sample = 0.52 N/mm

2) When the polyimide base layer of a 3mm wide strip was pulled with the pulling velocity of 45mm/min

Peel force (per unit width) for the irradiated sample = 0.44 N/mm

Peel force (per unit width) for the non-irradiated sample = 0.46 N/mm

4.2 bonding pad peel tests

Strength of the bond pads was examined by putting a sticky Kapton tape on top of the irradiated flex circuit.

All pads stayed with no damage as the tape was peeled off.

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References

[1] Author(s), "Title", reference id, date