POSTER 01-#05

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HIGH SPEED PROBE CARD USING FLEXIBLE MULTILAYER POLYIMIDE FABRICATED BY 3D MEMS PROCESS

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Introduction

- Wafer-level chip-scale packages (WLCSP) have gained widespread adoption in the electronic packaging industry due to their ability to enhance device performance.
- To reduce the manufacturing cost of heterogeneous 3-D integration, Integrated Fan-Out Wafer-Level Chip-Scale Packaging (WLCSP) has emerged.
- As a promising packaging technology has gained significant adoption in the electronic packaging industry.
- Introducing a novel RF probe card specifically designed for WLCSP testing frequency up to 8GHz.
- Employing polyimide-based grounded coplanar waveguide (GCPW) transmission lines and fabricating the polyimide multilayers through a one-time built-up process, utilizing MEMS techniques.

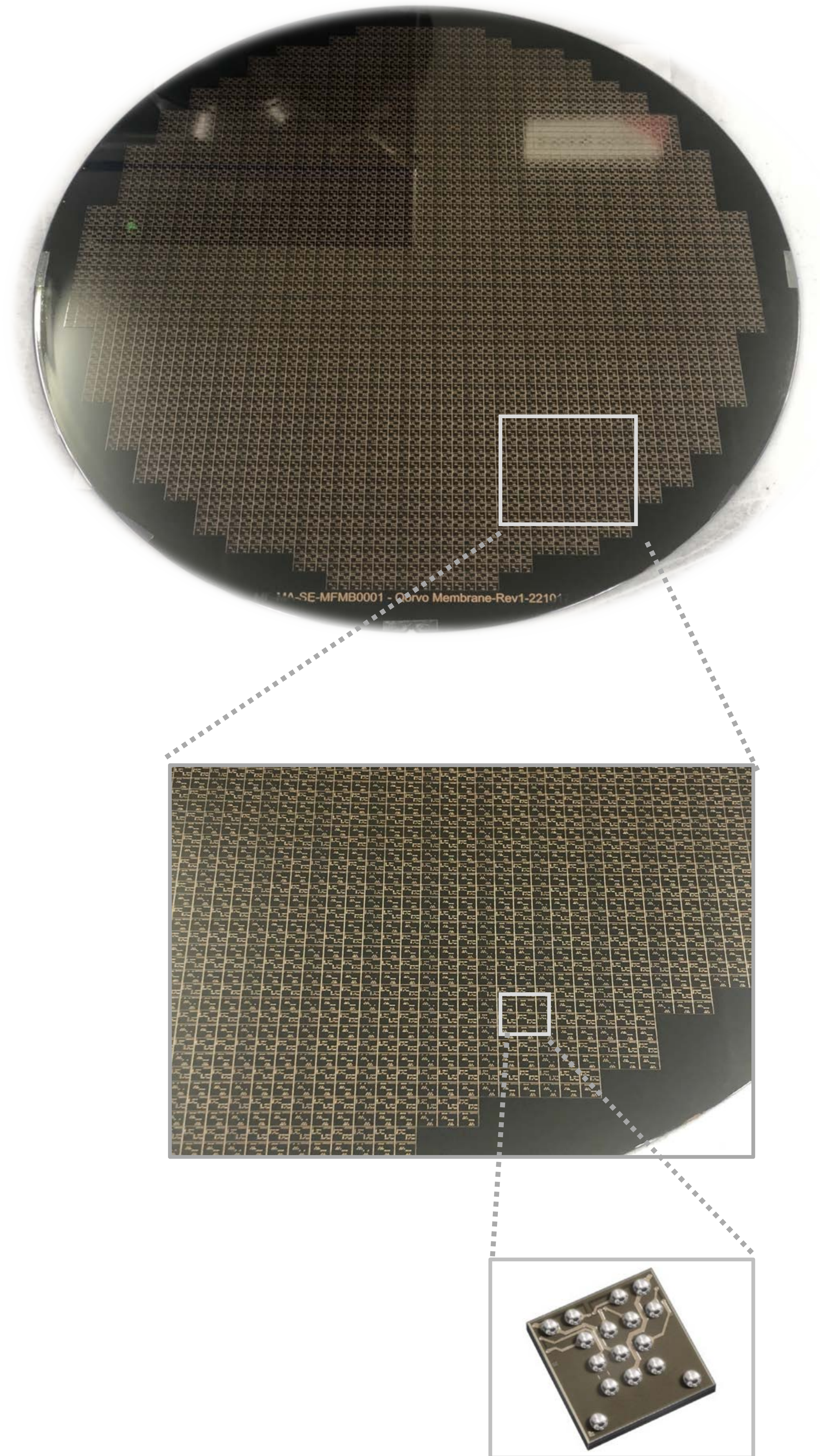


Fig.1. wafer-level chip-scale package (WLCSP).

Proposal of High-Speed Probe Card

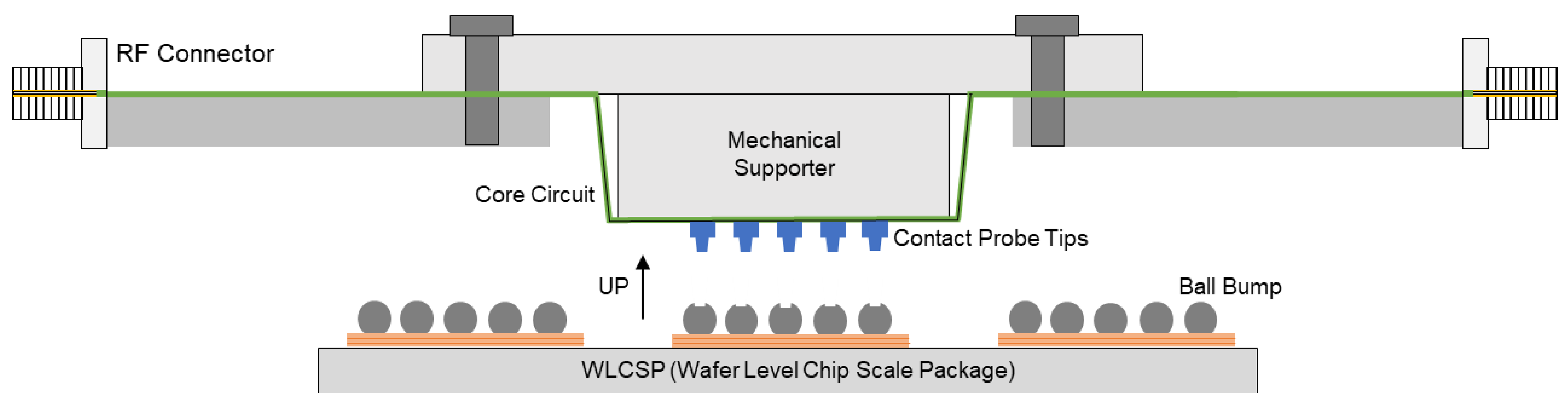


Fig.2. The schematic of wafer-level chip-scale package (WLCSP) test using an RF probe card.

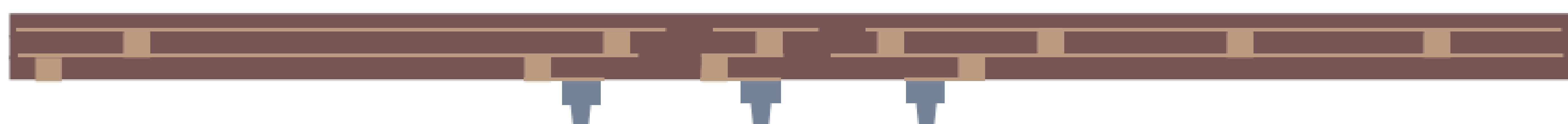


Fig.3. The core circuit polyimide-based with transmission lines.

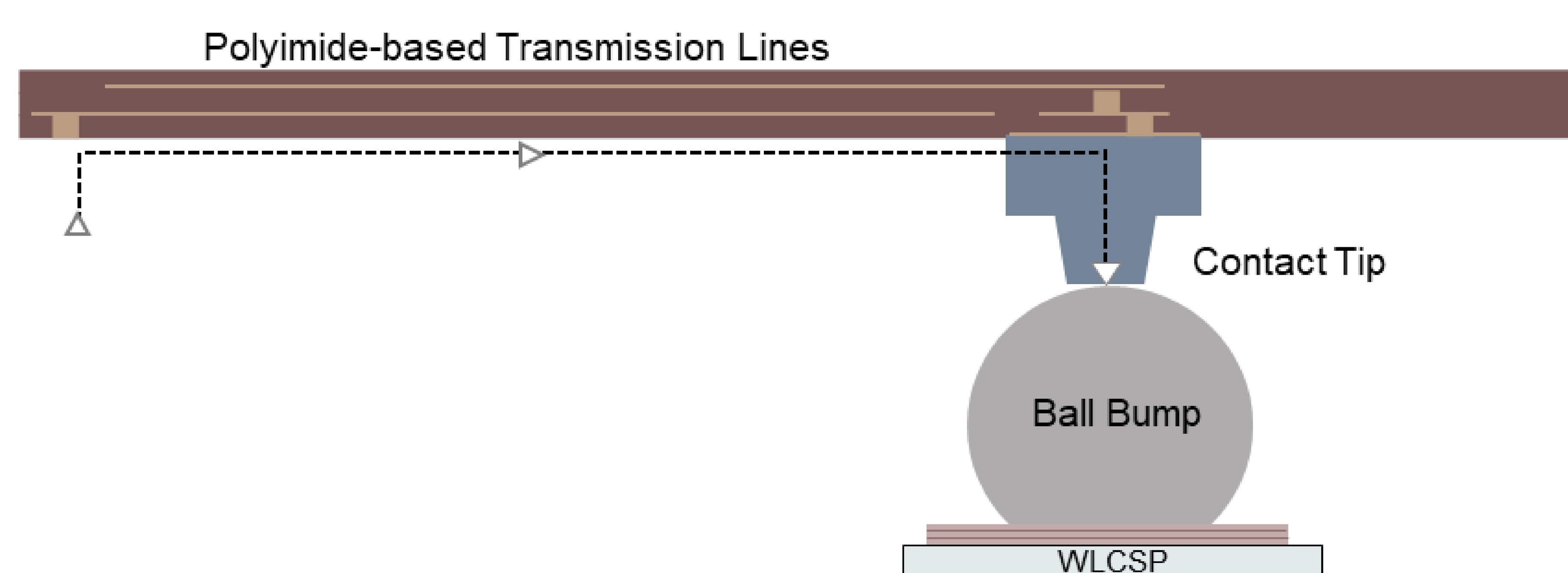


Fig.4. The RF signal from the ATE to the DUT by establishing contact with the ball bump.

Design of Core Circuit on High-Speed Probe Card

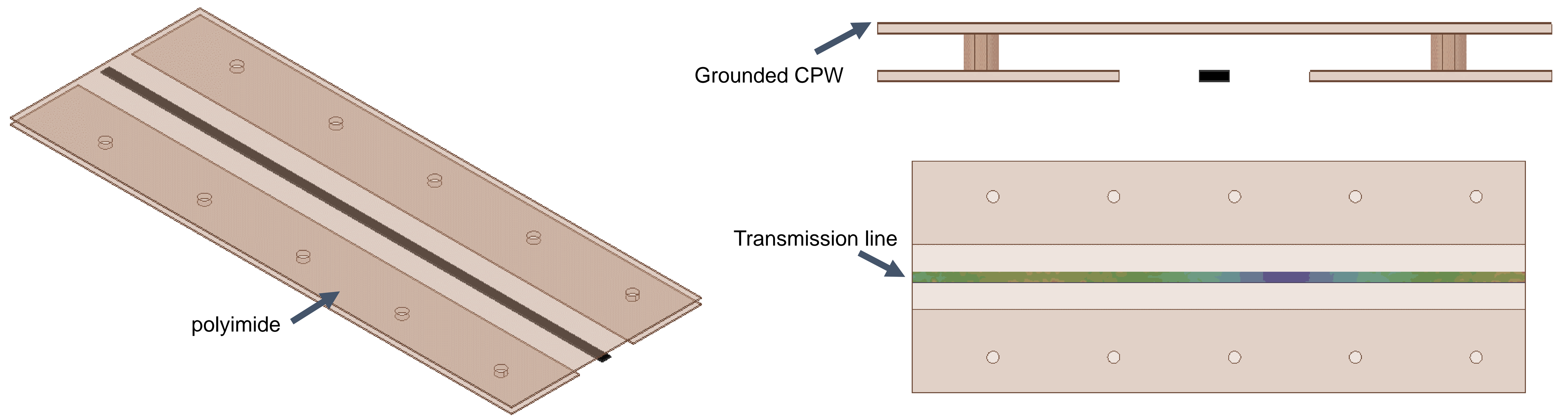


Fig.5. Multilayer polyimide-based with grounded coplanar waveguide (GCPW) transmission lines.

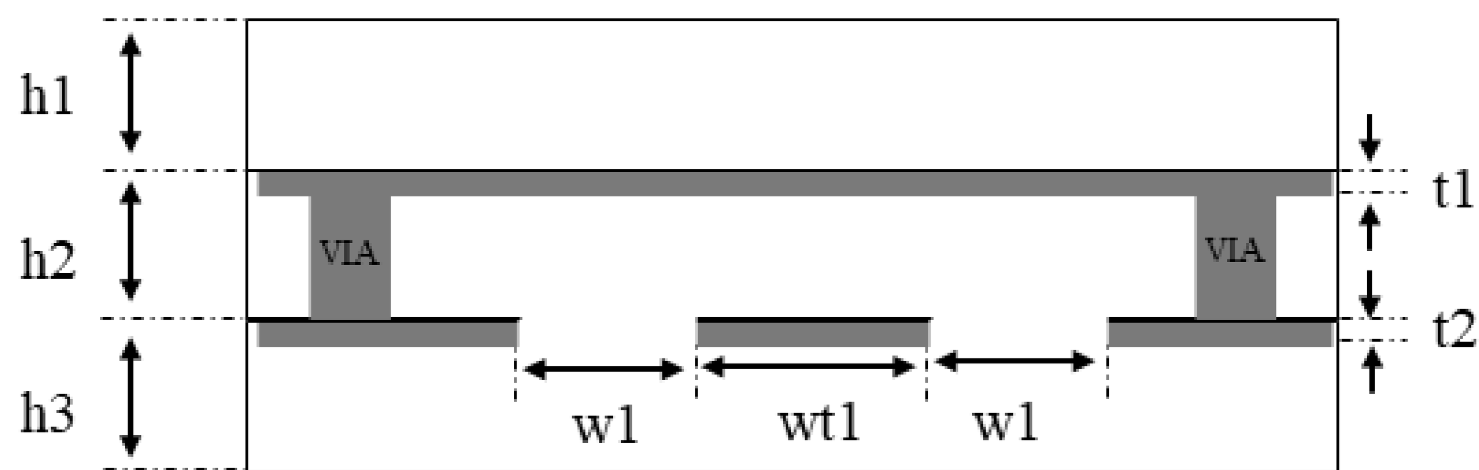


Fig.6. Structure of the multilayer for GCPW (Ground Coplanar waveguide) transmission line.

Symbol	PARAMETER
h1	Height of a substrate
h2	Height of a substrate
h3	Height of a substrate
w1	Space of transmission lines from GND
wt1	Width of the transmission lines
t1	Thickness of the metal traces
t2	Thickness of the metal traces

Table.1. Dimension of the metal trace on polyimide based with transmission lines.

- Adopting a structure and composition of a conventional coplanar waveguide (CPW).
- The GCPW is a type of transmission line commonly used in microwave and RF (Radio Frequency) applications as simplified fabrication, minimized radiation losses, and convenient integration of active and passive components.

Fabrication of the Core Circuit Polyimide-based Transmission Lines

Substrate

Polyimide Coating

Seed Layer & Polyimide

1st Circuit

2nd Circuit Lithography

2nd Circuit Deposition

Base BUMP Lithography

Base Bump Deposition

Contact Tip Fabrication

2nd Circuit

VIA

1st Circuit

Tip

Base

WLCSP

Contact Tip

Tip Base

Ball Bump

Contact Tip

RF Signal

Ground

Ground

RF Signal

Fig.7. The fabrication of the core circuit by employing a one-time built-up through the utilization of the 3D MEMS technique. It involves marking ball bump on WLCSP using contact tips.

Verification of 3D MEMS Co-axial Probe

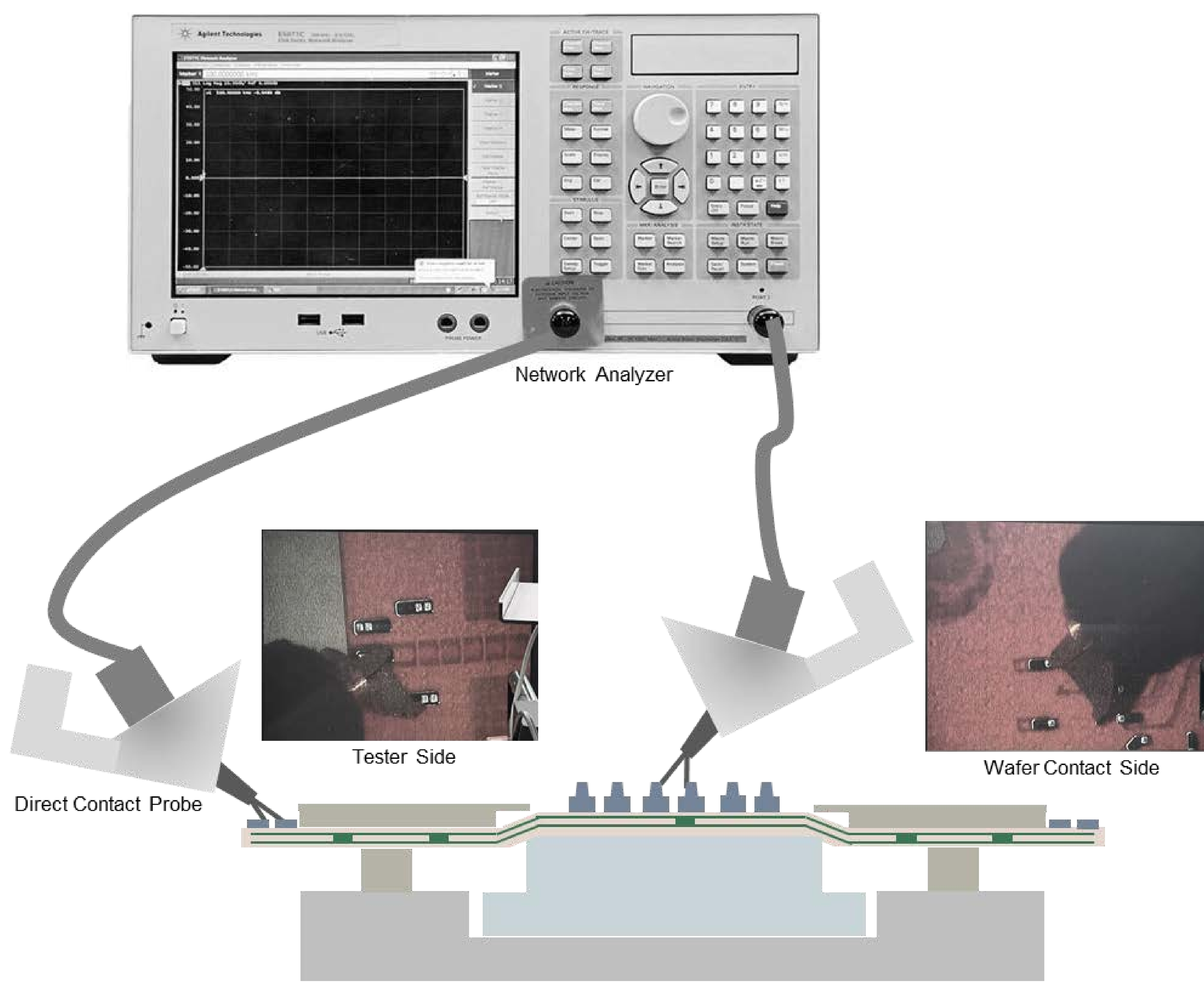
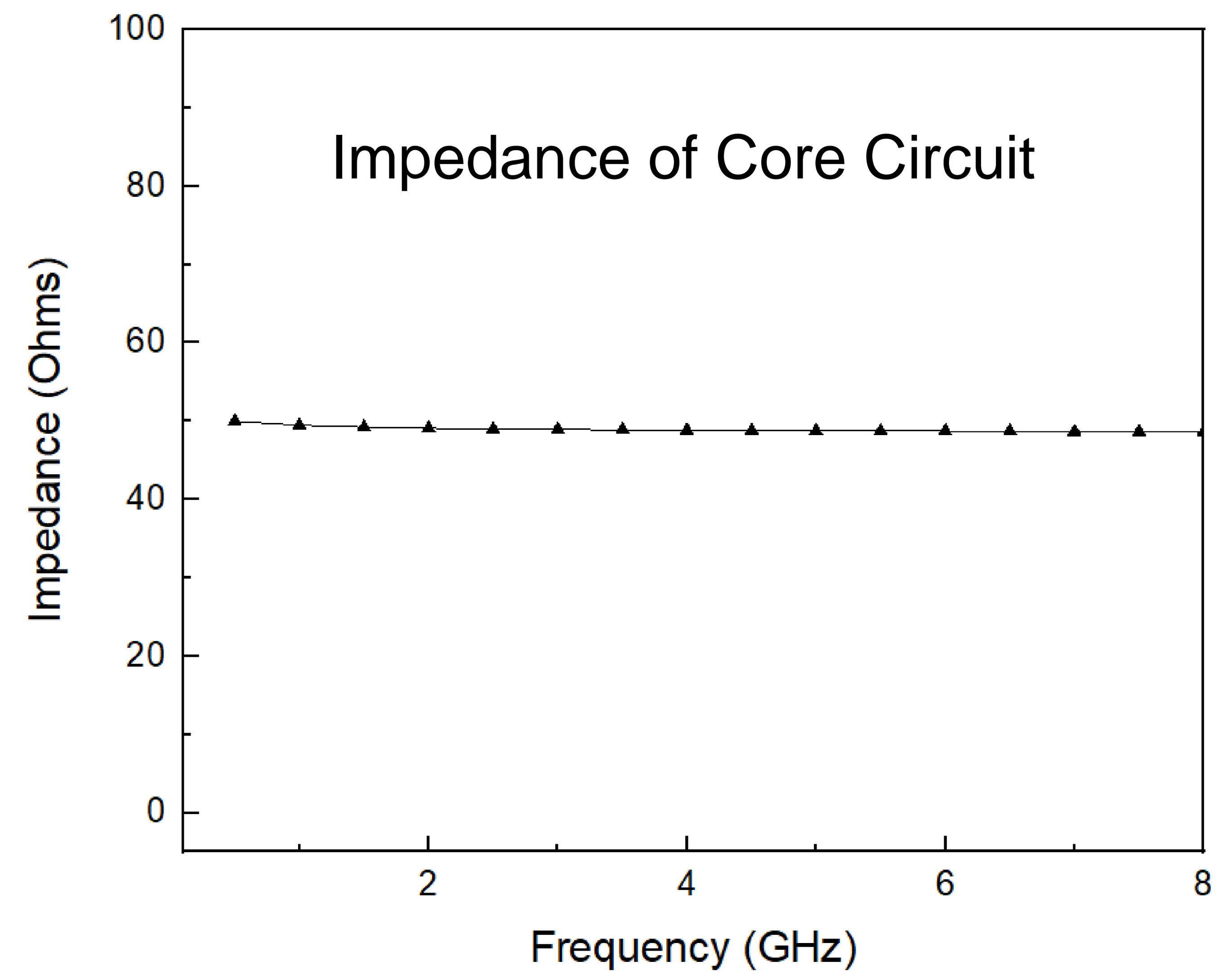
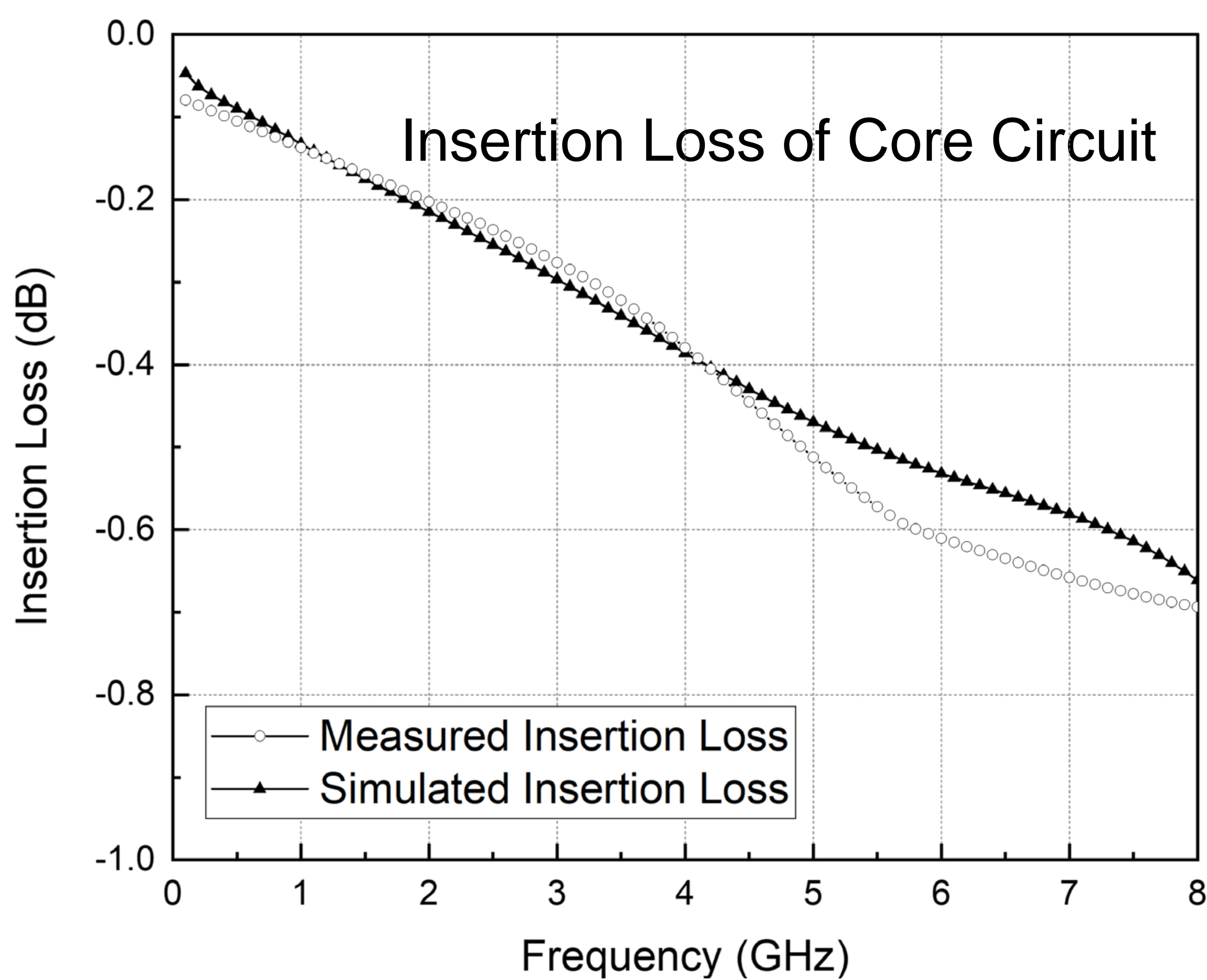
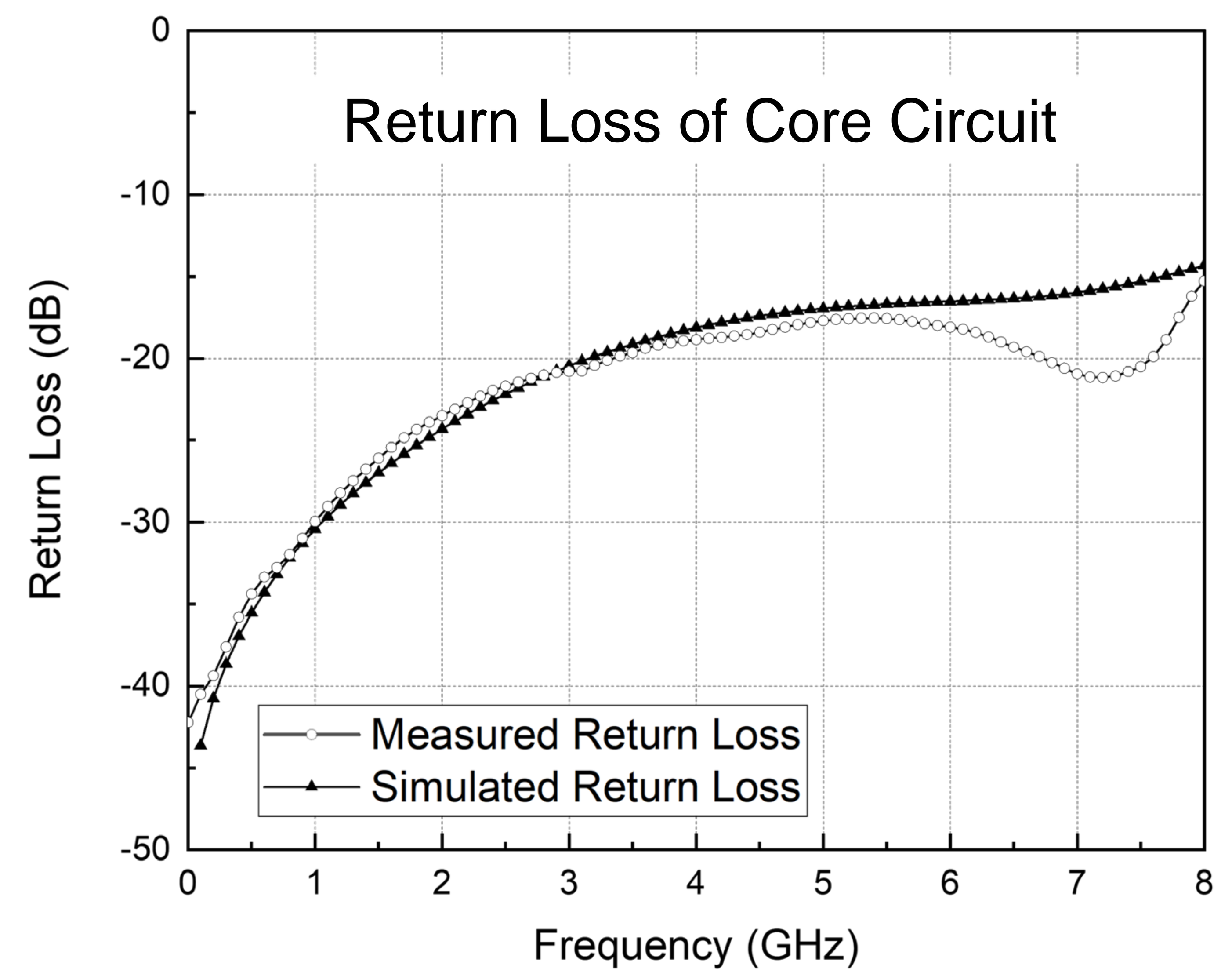
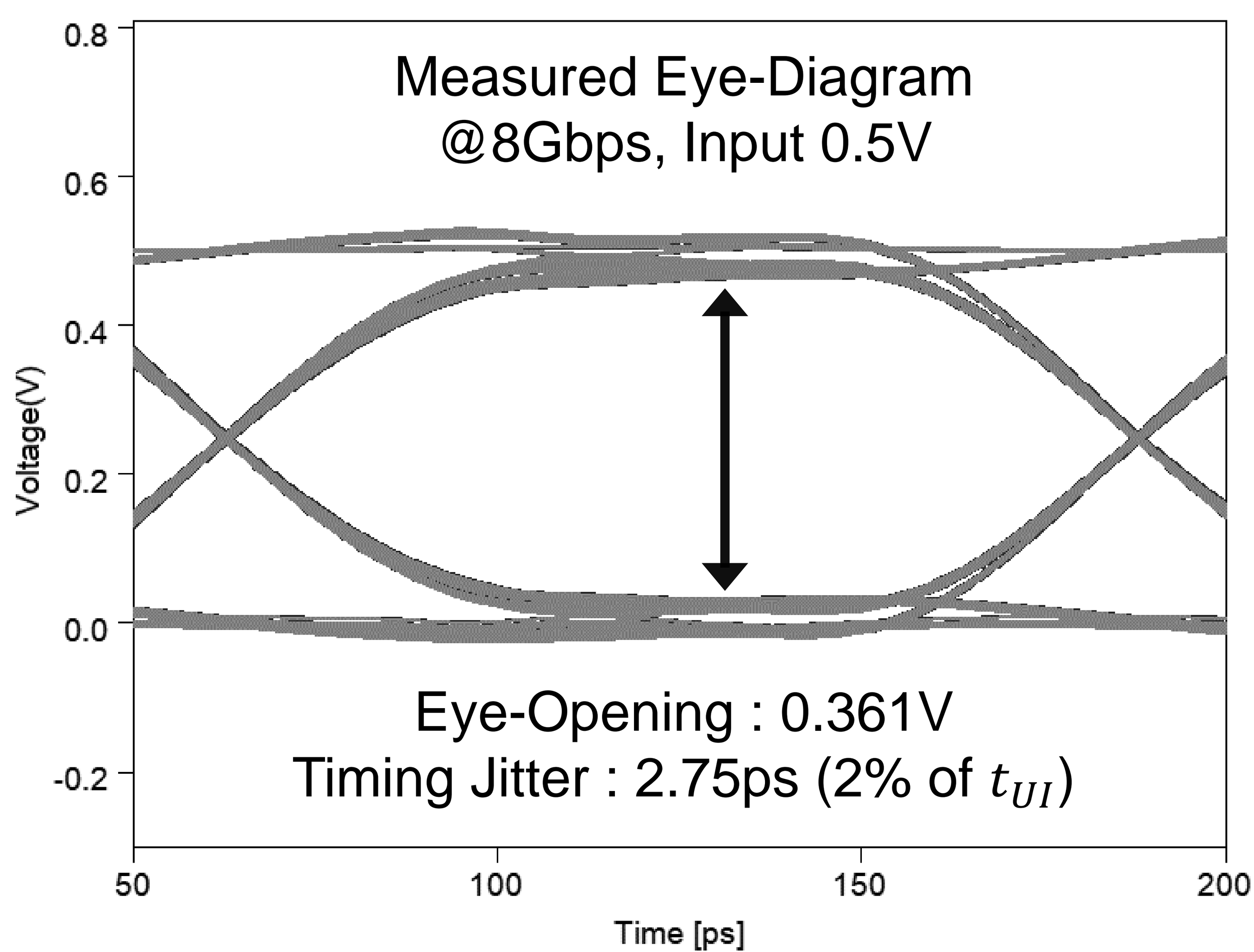


Fig.8. Measurement environment for fabricated core circuit.









- Comparison of the measurement and simulation (HFSS Electronics ANSYS).
- The measurement results for the core circuit that involves using GS/SG probes to connect the ATE signal port 1 to the input of the DUT at port 2.
- The analysis of impedance, S-parameters, and eye-diagram.

Conclusion

- Proposing high-speed probe card, that utilizes flexible multilayer polyimide structure, is fabricated through a one-time built-up process and incorporates contact tips.
- Analyzed the core circuit of an RF probe card for WLCSP testing, utilizing polyimide-based grounded coplanar waveguide (GCPW) transmission lines.
- Verification of high-speed probe card both frequency-domain and time domain method by measurements and simulations expected to be adopted for WLCSP testing.

Questions ?

If you have any questions, please contact

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