

# Measurement System & De-embedding Procedure

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Component Solution Biz. Unit



**SAMSUNG**  
**ELECTRO-MECHANICS**

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# 01. Overview of Measurement System

- Measurement system consists of network analyzer, probe station, DUT etc.
- Impedance for MLCC can be obtained by de-embedding measured data.

※ Based on EIA-970 standard

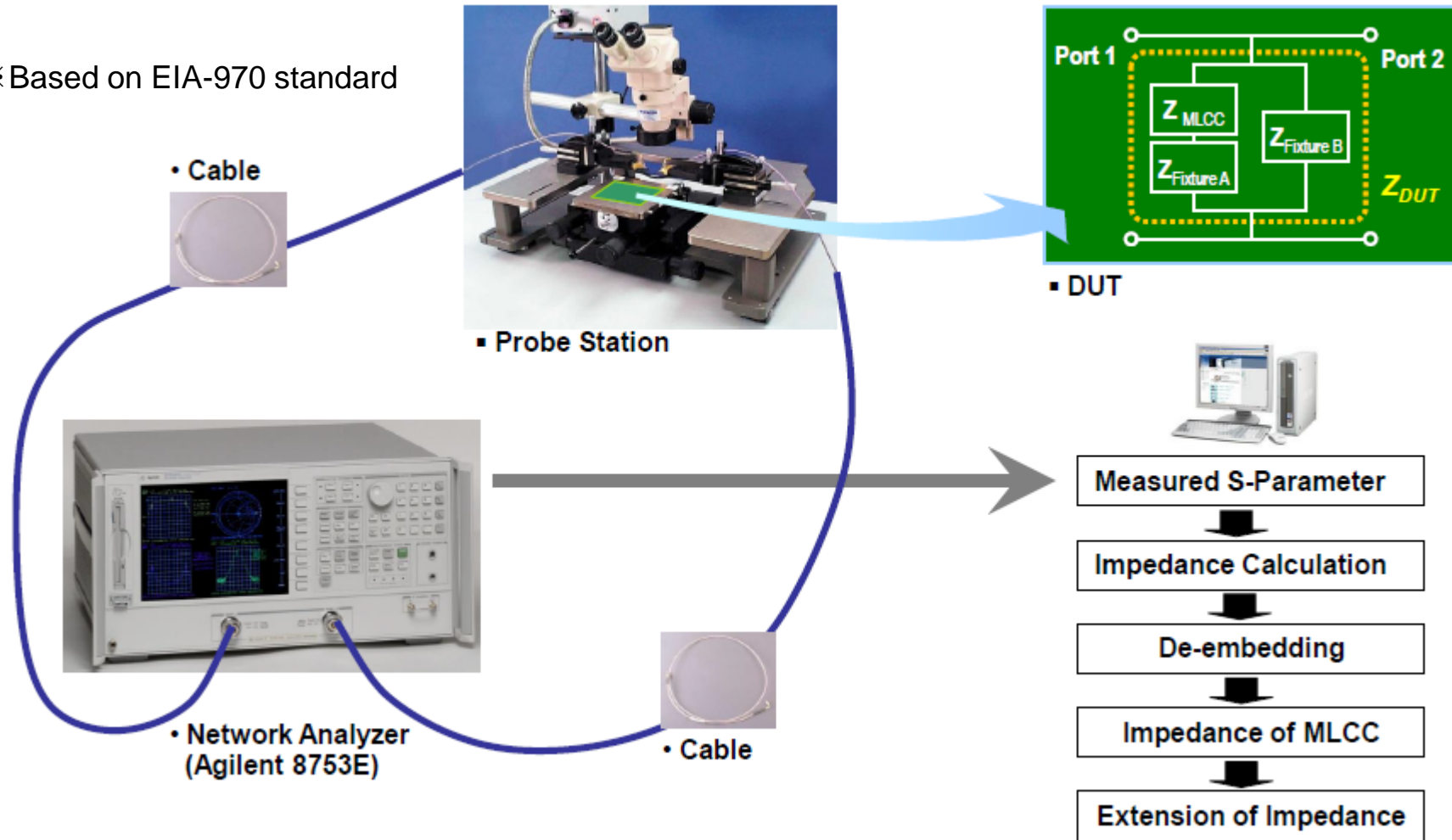


Fig. 1 Overview of the entire measurement system

## 02. Block Diagram for DUT

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- Test board is shunt-thru configuration.
- Block diagram for DUT (Device Under Test) is shown in Fig.2 and the impedance of DUT can be expressed as the formula below.
- Therefore, the impedance of DUT can be obtained by measuring DUT using network analyzer.

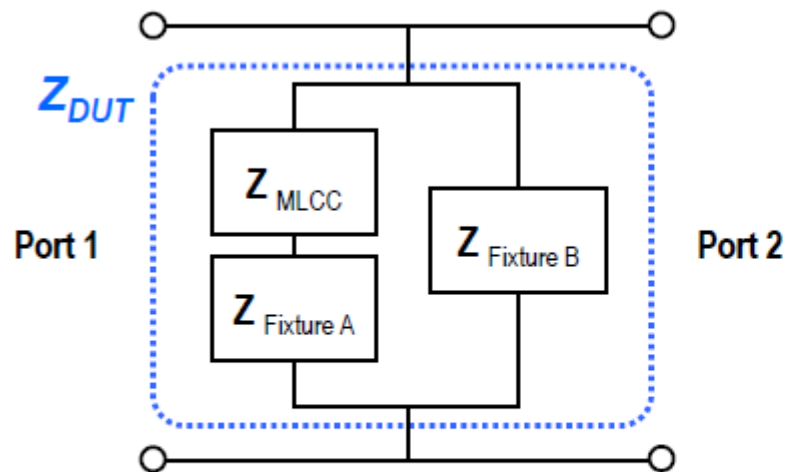


Fig. 2 Block diagram for DUT

$$Z_{DUT} = \frac{Z_0 S_{21}}{2(1 - S_{21})}$$

where  $Z_0$  is characteristic impedance.

# 03. Block Diagram for Open & Short Test Board

- Block diagrams for open & short test board are shown in Fig. 3.
- MLCC characteristics can be extracted by measuring open & short test board and de-embedding each contribution.

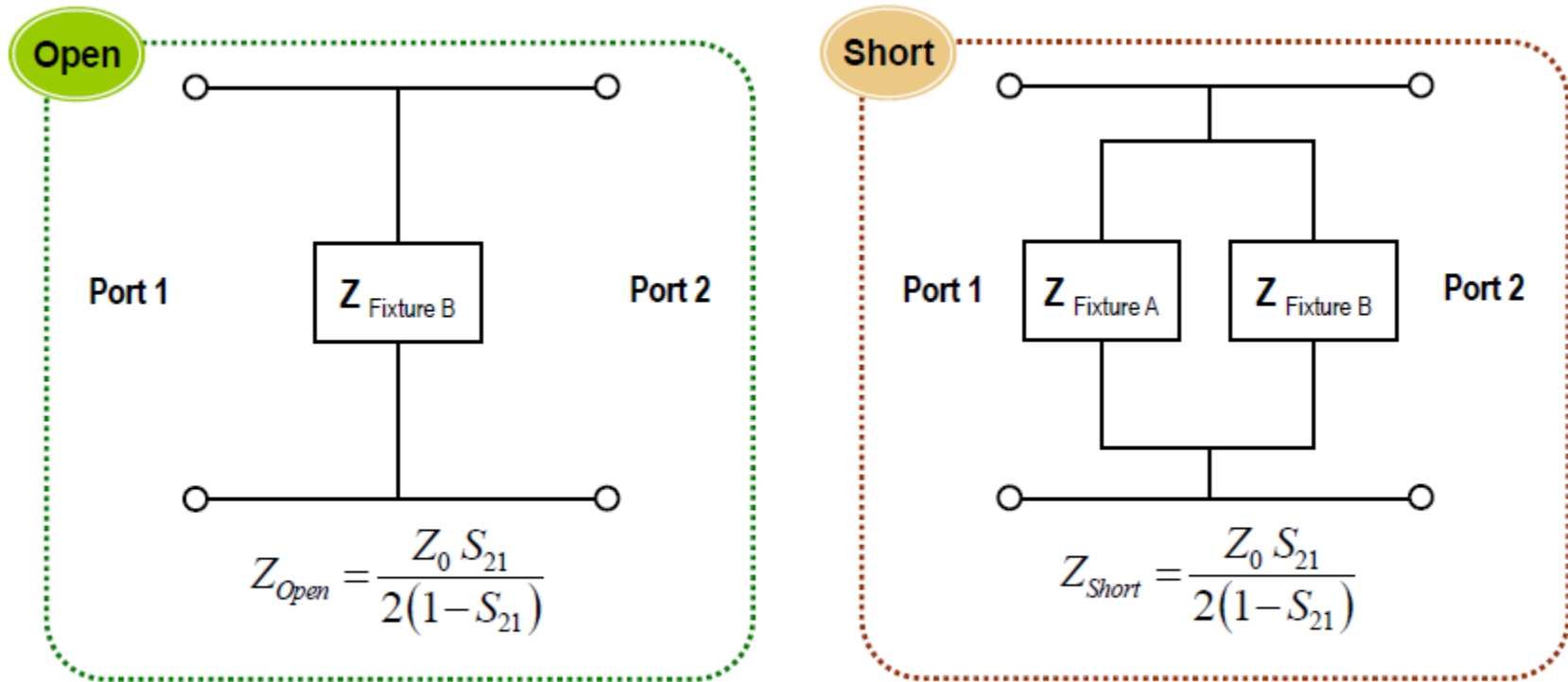


Fig. 3 Block diagram for open & short test board

# 04. Extraction of MLCC characteristics

- MLCC characteristics can be obtained by the following formula.

$$Z_{MLCC} = \frac{1}{\frac{1}{Z_{DUT}} - \frac{1}{Z_{Open}}} - \frac{1}{\frac{1}{Z_{Short}} - \frac{1}{Z_{Open}}}$$

- De-embedded impedance of MLCC is compared with that of DUT.

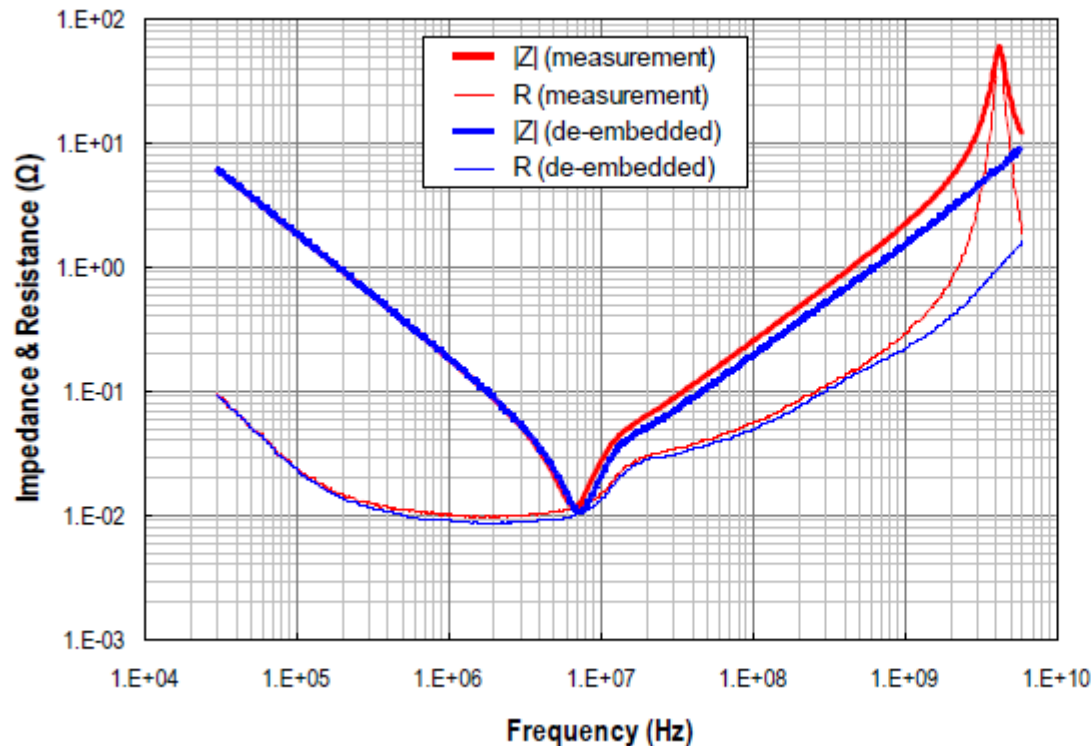


Fig. 4 Comparison of impedance according to de-embedding