

# Design and Analysis of Low Cost Line Impedance Stabilization Network for ISM Equipment

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**Abstract** -EMI/EMC testing is done to calculate the ability of the device which meets out all the required characteristics needed by a product to enter into the market. It includes immunity testing and emission testing. Immunity testing shows how a device will react when it is exposed in an electromagnetic energy. Emission testing measures the amount of EMI generated by the device. The device which fails to meet the EMI/EMC test Standard will lead to a number of negative consequences. In order to carry out this emission testing a low cost Line Impedance Stabilization Network (LISN) is proposed. Typical LISN is nothing but a filter placed between the source and EUT to create known impedance. LISN is particularly used to remove the unwanted RF signals from the power source. In this project the LISN is designed by using ADS software. LISN is designed by combining a low pass filter and the band pass filter in order to provide stable input impedance followed in the CISPR-11 standard. Spectrum analyzer is connected at the end of the LISN to analyze the test equipment results. This LISN device will provide good input impedance to the test equipment at low cost.

**Key Words:** immunity testing, emission testing, Line Impedance Stabilization Network (LISN), ADS, CISPR-11

## I. INTRODUCTION

Products that enters into the market has to undergo EMI/EMC standard test. And all the EMI/EMC standard measurement has to follow the CISPR standards. These standards was categorised by their equipment and product class, by so many CISPR standards are available. One among that is CISPR-11 standard which is a standard used for ISM (Industrial, Scientific, Medical) equipment. EMC test involves

Emission testing and immunity testing. Immunity testing is done to check the immunity level of the product when its supposed to be exposed in unpleasant environmental condition. Emission test is to determine whether the emission of EM energy of particular product affect the other product or not. To carry out the emission test the DUT must be connected to the power supply. In order to avoid the noise entering through power supply we use LISN in between the supply and DUT. The existing LISN is so costly. So, a low cost Line Impedance Stabilization Network (LISN) is proposed.

## II. RELATED WORKS

Kang-Rong Li, Kye-Yak See, Rathnayaka Mudiyansele Sooriya Bandara [1] proposed a conducted emission test for switch mode power supply which is used as a DUT here. In that they undergo in circuit Common mode and differential mode impedance measurement without LISN and then compare the results with LISN to see the difference in the outcome. The difference in their behavior of the system with and without LISN can be noted by using the Known impedance. In without LISN attenuation is poor when compared to the Presence of LISN in EMI/EMC standard test.

Francois Ziade, Miha Kokalj, Mohamed Ouameur, Borut Pinter, Denis Belieres, Andre Poletaev, Djamel Allal [2] proposed a LISN which is improved in accuracy. In this they provide calculable adapters for their accuracy measurement. They provide two sets of adapters for removing the error on magnitude and phase of the input impedance. In this frequency variation is calculated by COMSOL software. Adapters improve the reliability and accuracy and at the same time it reduces errors in both industry and test laboratories.

Grobler, MN Gitau [3] proposed a pre-compliance measurement setup to measure the conducted emission of the product/system without using spectrum analyzer up to 100 MHz frequency range. In that they use oscilloscope for their noise measurement. In addition to that they undergo common mode and differential mode impedance measurement. These method will save time and cost.

Pontt, Olivares, Carrasco, Keller, Lopez, Robles, Diaz, Toro, Fuentes [4] proposed a system that could conduct the EMI/EMC standard test even in an absence or in unavailability of equipment that used in the test process with an alternate. In this instead of LISN they use current for their standard test. This method speeding up the test process and provide warning when mishappenings occur.

Yi Sun, Xiaodong, Zhang, W. Chien, C.H. Sun, C. C. Chiu [5] proposed a new Linear impedance Stability network. In this they use a Labview language as a measurement software for the entire process test.

VuttiponTarateeraseth, Kye Yak See, Flavio G. Canavero, RichardWeng-Yew Chang[6] proposed a EMI filter design based on the source noise obtained from the SMPS and termination impedance (LISN).In this they undergo incircuit impedance measurement for their EMI filter design.

Juergen Stahl, Daniel Kuebrich, Alexander Bucher, Thomas Duerbaum[7] proposed a EMI filter design based on common mode and differential mode noise. In this they undergo noise rejection by separating common mode and differential mode impedance and in addition they provide separate LISN setup for the noise rejections.

Sakulhirirak, Tarateeraseth, Khan-ngernand, Yoothanom[8] proposed low cost Line impedance stabilization network. They provide how to design a air coil inductors for number of layers.

### III.CONCLUSION

The various analysis and design of LISN device have been proposed previously.Although they are proposed they are too costly and are not accurate enough. They also involved in changing the EMI filter design for their measurement accuracy but it incurs additional cost. In order to carry out the emission test at Low cost and high accuracy, a new low cost line impedance stabilization network is proposed for ISM equipment satisfying the CISPR standard.

### IV.REFERENCES

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