Confirming the Signal Integrity in Transmission of Digital Signals on Microstrip Straight Circuits via the Eye Diagrams

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Abstract

Because of the high volume of processing, transmission, and information storage, electronic systems presently requires faster clock speeds tosynchronizethe integrated circuits. Presently the “speeds” on the connections of a printed circuit board (PCB) are in the order of the GHz. At these frequencies the behavior of the interconnects are more like that of a transmission line, and hence distortion, delay, and phase shift- effects caused by phenomena like cross talk, ringing and over shot are present and may be undesirable for the performance of a circuit or system.Some of these phrases were extracted from the chapter eight of book “2-D Electromagnetic Simulation of Passive Microstrip Circuits” from the corresponding author of this paper.

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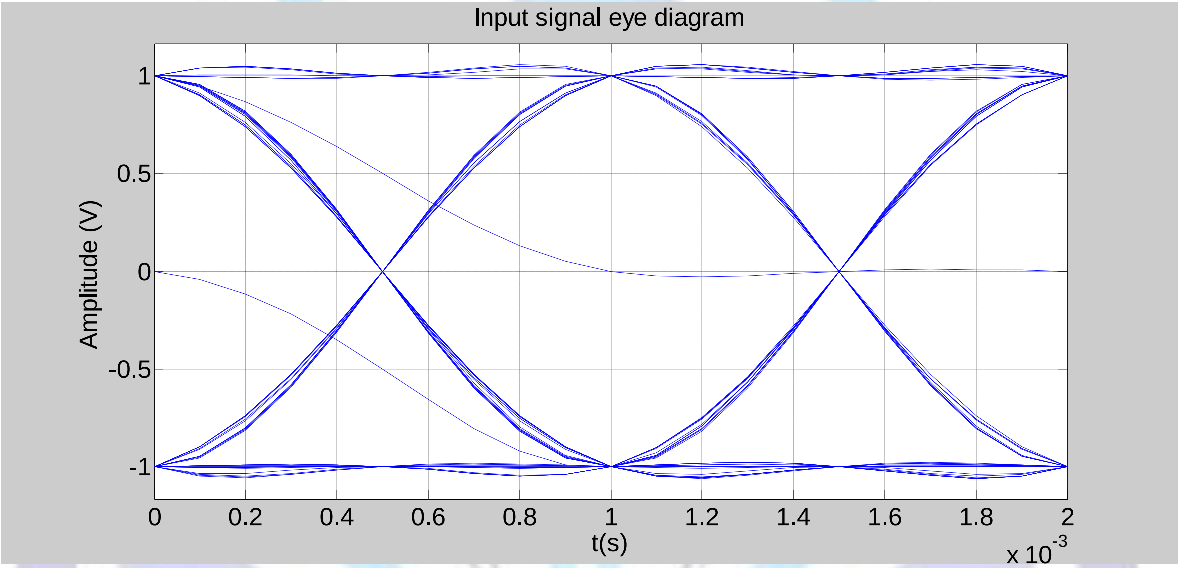

Figure 1. Input signal eye diagram. Frequency (5 GHz).

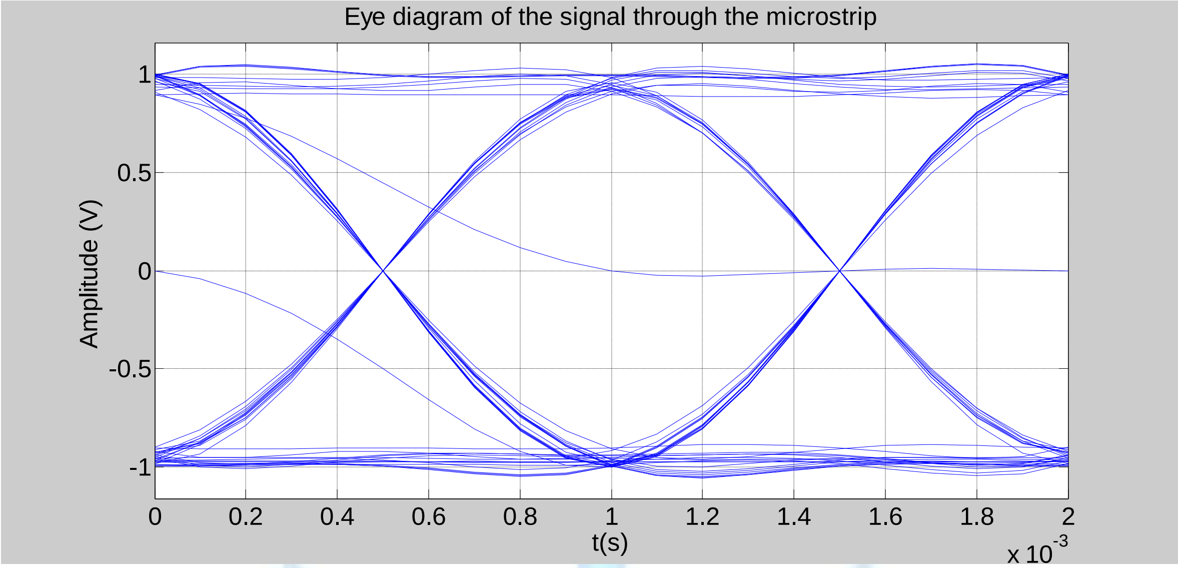

Figure 2. Eye diagram through the microstrip. Frequency (10 GHz).

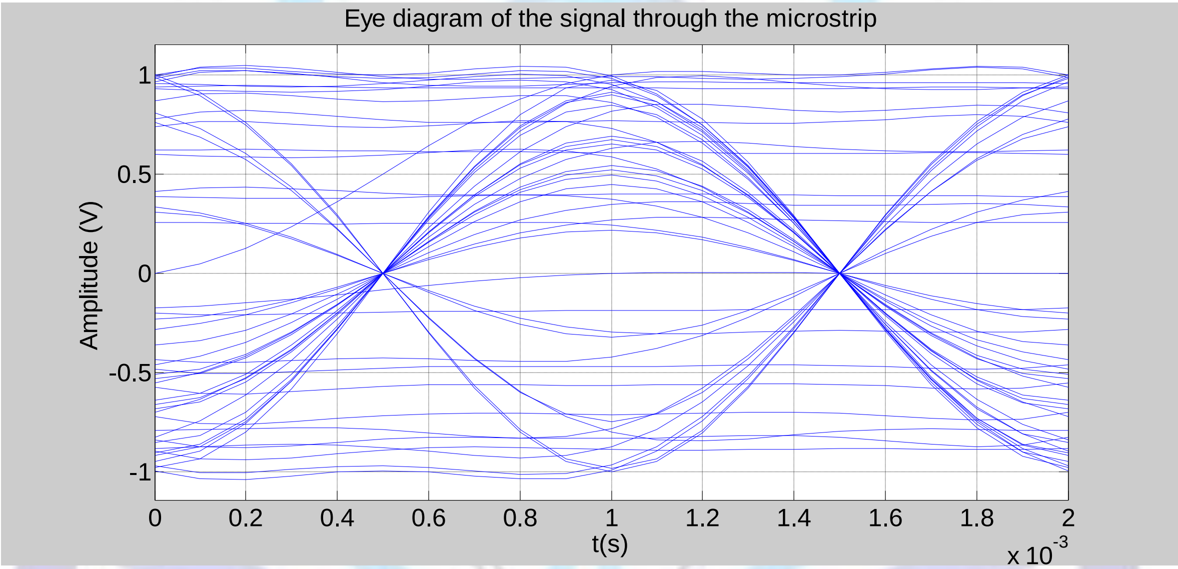

Figure 3. Eye diagram through the microstrip. Frequency (15 GHz).

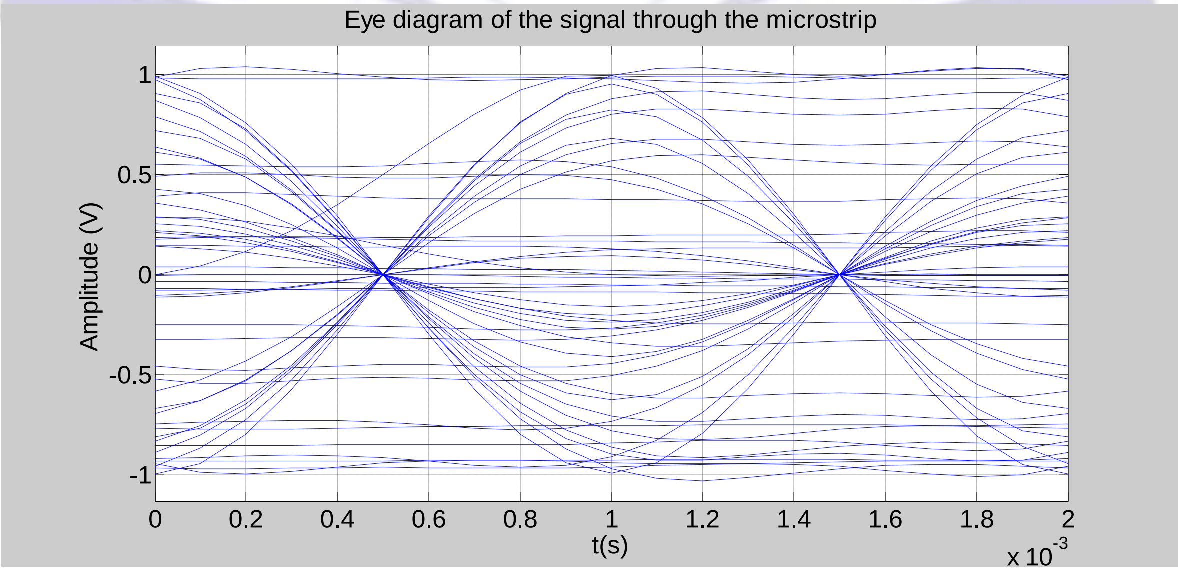

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Figure 4. Eye diagram through the microstrip. Frequency (20 GHz).

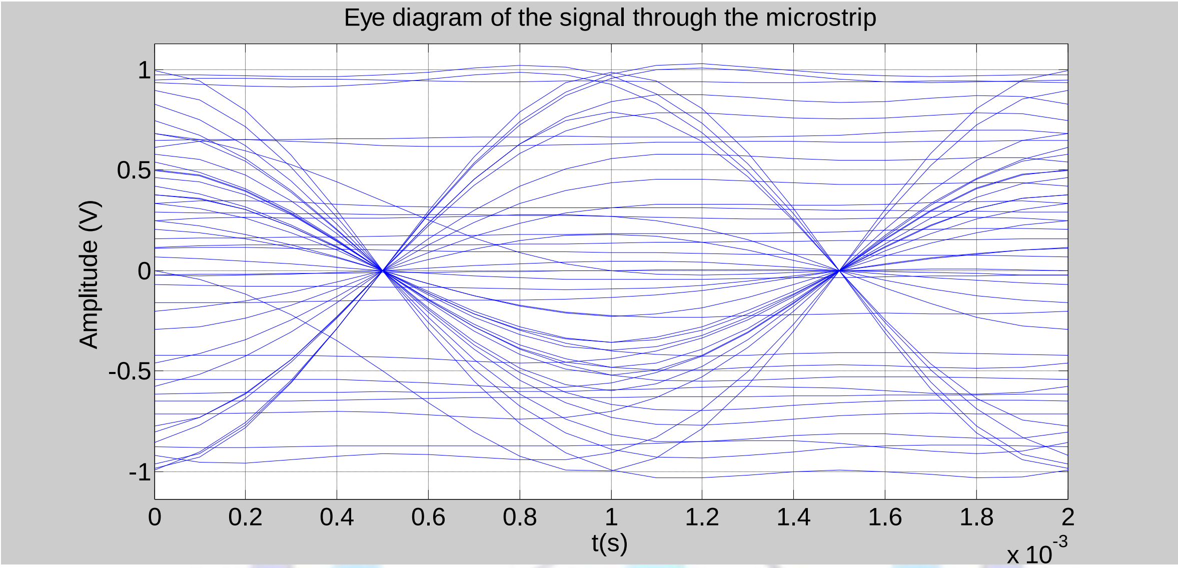

Figure 5. Eye diagram through the microstrip. Frequency (25 GHz).

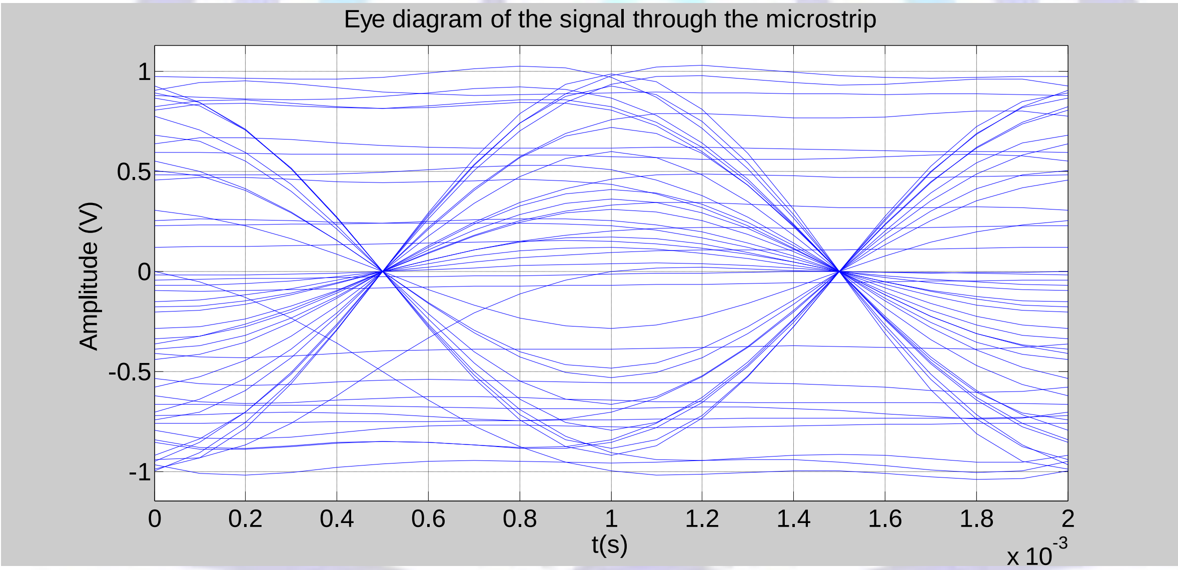

Figure 6. Eye diagram through the microstrip. Frequency (30 GHz).

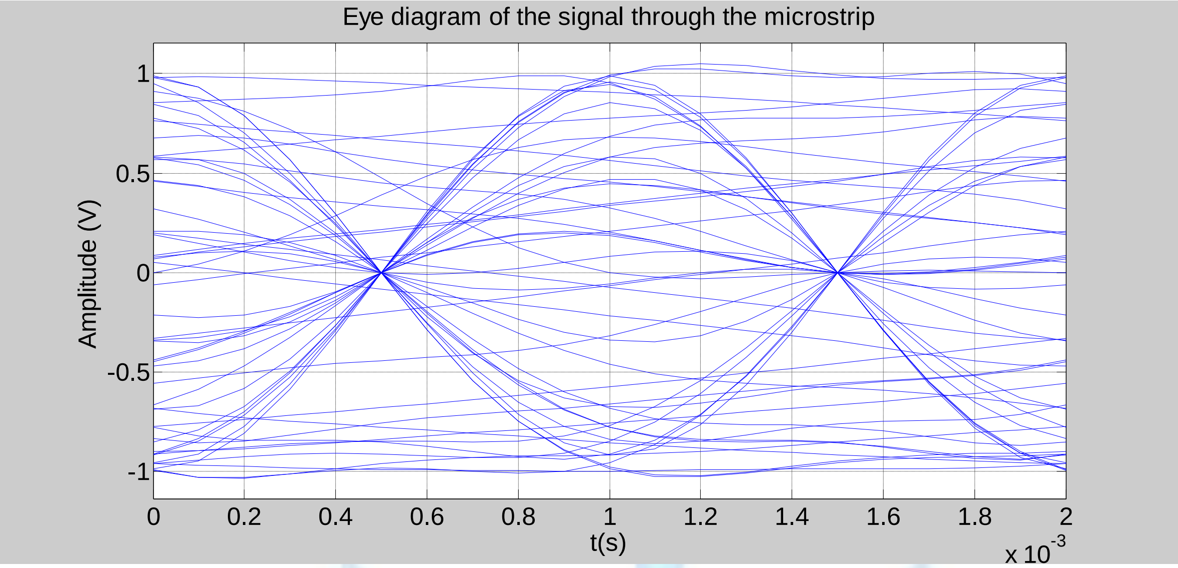

Figure 7. Eye diagram through the microstrip. Frequency (300 GHz).

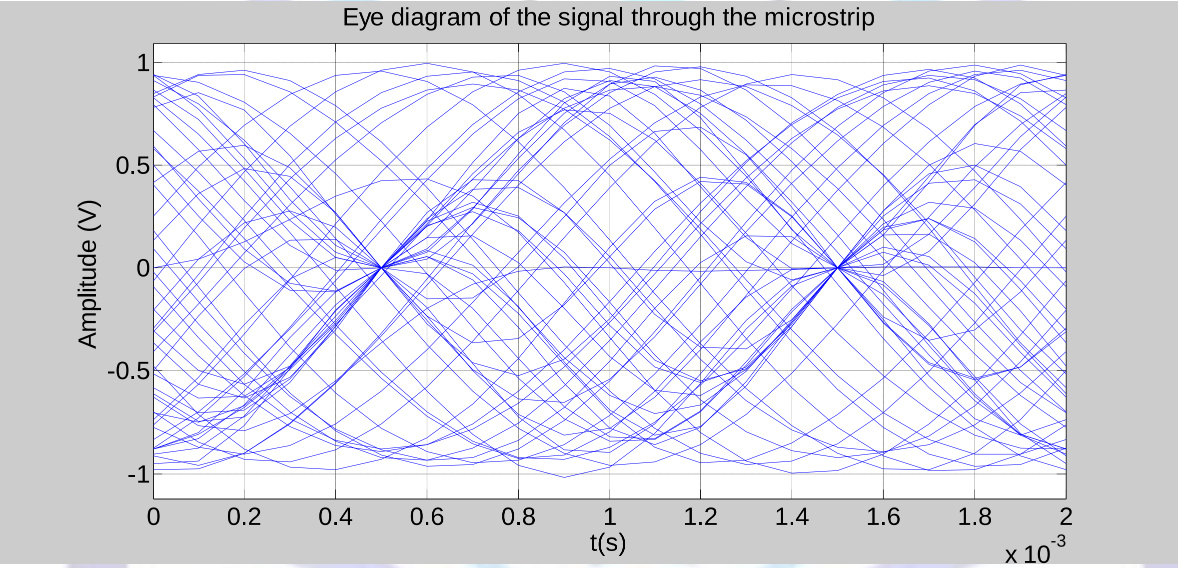

Figure 8. Eye diagram through the microstrip. Frequency (3000 GHz).

A very ingenious procedure to interpret the eye diagrams was presented in [21].The procedure is based on the comparison of a pre-established mask, measured directly from the eye diagram.The pre-established masks define specific regions on an eye diagram inside which the digital pulses should not be introduced.

The figures 1 to 8 showthe input signal eye diagram at 5 GHz and theeye diagram through the microstrip at different frequencies.

As can be seen from these figures, several masks have been generated for studying the signal integrity on microstrip straight circuits via the eye diagrams.

On the other hand, a distributed parameter equivalent circuit of a microstrip, can be conceived by using a transmission line model.

This distributed parameter equivalent circuit can be implemented by using electromagnetic simulation. Two powerful and confident methods to realize a good electromagnetic simulation are the method of moments (MoM)and the Finite-Difference Time-Domain Method (FDTD) (2-D Electromagnetic Simulation of Passive Microstrip Circuits).By employingthese methods the eye diagrams and hence the masks can be obtained.

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