

Progress on designing a dedicated electrical test board for the IZM structure

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The HEP Group and the Electronics Laboratory

The aim of our activity

We are interested in designing a PCB to host and electrically interface the **IZM structure** with **emphasis on characterizing the data transmission lines**.

- We need a **supporting PCB** with the necessary wire bond pads and some routing of traces, as well as appropriate connectors to interface the differential pair to the measuring equipment.
- Apart from the careful design of the high-speed traces, we must understand **how to achieve impedance matching**, in principle and in practice, **for the wire bonds** connecting the transmission lines of the structure to the traces and connectors on the PCB; another test board to study the matching.
- Use the **simulation software Ansys** (HFSS and SIwave tools) for modeling the structure and calculating the electrical properties of differential pairs.

Using our Tektronix **differential TDR device** (BW 20 GHz), the following measurements can be taken:

- **S-parameters**: input reflection coefficient (S11) and transmission coefficient (S12).
- **Impedance profile** of differential pair traces.
- From it, we can build an electrical model of the transmission line from the S-parameters for use in SPICE simulation.
- Predict the **maximum transmission rate** with the simulation.
- Verify this rate and **measure the bit error rate** as a function of the transmission rate.

Brief status of our activities

1) Impedance matching of the wires bonds

We are about to submit for production our PCB design with test structures for studying the impedance matching of the wire bonds.

Stefan is carrying out final optimizations of the layout for the individual SMP coaxial sockets.

The submission to production is scheduled for tomorrow.

2) TDR measurements of the S-parameters

Regarding the second PCB, which is intended for TDR measurements of the S-parameters,

we will tailor the PCB layout to the actual length of the IZM structure, individually for two IZM structures, in order to keep the wire bonds on both sides of the structure as short as possible.

This PCB will be submitted for production next week.

Brief status of our activities

3) Ohmic resistance measurement setup

Our Master's student Darshil has set up the laboratory equipment to measure the ohmic resistance of the traces. This involves connecting the traces to their pads using four probe needles and applying a four-wire measurement using a Keithley source meter unit.

4) Preparing for the Ansys simulation

Darshil is learning the basic steps for using Ansys. He has imported the geometry of the IZM design into an Ansys project. The next step is to define the physical material parameters of the structure.