

## MTT-12

Interconnects, Packaging and Manufacturing



### Student Design Competition: A Packaged Diplexer

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IEEE MTT-S Technical Committees MTT-12 (Interconnects, Packaging, and Manufacturing) and MTT-8 (Microwave Filters, Multiplexers, and Passive Components) are co-sponsoring a Student Packaged Diplexer Design Competition at the IEEE International Microwave Symposium IMS2010 to be held at Anaheim, CA. The contest will be similar to the successful contest at IMS2009 in Boston MA.

This competition is open to all IEEE MTT-S members who are enrolled as students at a university. The objective of the competition is to demonstrate new and effective packaging and interconnect techniques for a 3- port filter – a diplexer - application. **Proposals are due by March 1, 2010.** After the submission of a proposal, all contestants will be provided a pre-defined package provided by Stratedge. Teams of up to four (4) student members are allowed, provided each team member has a direct contribution to the solution.

Contestants are required to demonstrate their design and package at the IMS2010. Characterization of the diplexer will be performed by an Agilent team. The designs will be judged by members of MTT-12 and MTT-8 using pre-defined criteria (given below) that include filter performance, robustness and size. Three winners (or teams) will be selected with a first prize of USD600, second prize of USD300, and a third prize of USD100. The prizes shall be equally divided between all members of a winning team. In addition, the winners is given the opportunity to submit an article to the IEEE Microwave magazine.

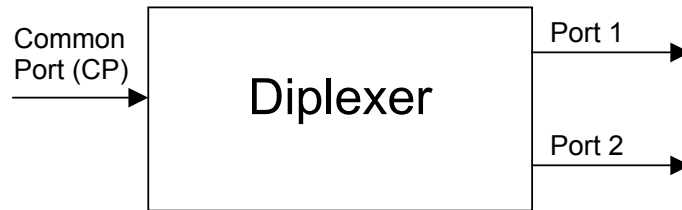
#### How to participate

- Email a proposal describing the intended solution to Prof. Robert W. Jackson at [jackson@ecs.umass.edu](mailto:jackson@ecs.umass.edu), along with documents verifying IEEE MTT student membership and enrollment at a university as a student or PhD student. Deadline is March 15, 2010. If all requirements are met you will receive a confirmation of participation and the package will be shipped to you.
- Bring your piece of hardware to the International Microwave Symposium in Boston for characterization (including a photo of the circuit inside the package and a schematics of the filter structure). Exact date and location of this evaluation event will be announced later.

#### Specifications and Requirements

The filter must be planar, and securely mounted within the package. The provided package will not have any cover (lid), and will require the contestants to provide a metal lid ( or copper tape) and fasten it to the provided package. The contestants are also required to mount the packaged filter to a PCB that will provide interconnect to SMA connectors. The filter and package will be evaluated based on the performance between the SMA connectors.

## Diplexer Specifications



The diplexer shall be designed to operate at two different frequency ranges. The diplexer shall provide a low loss signal path from the Common Port (CP) to Port 1 within the 3-dB frequency range of  $10 \pm 0.250$  GHz. The diplexer shall provide a low loss path from the CP to Port 2 within the 3-dB frequency range of  $15 \pm 0.250$  GHz. Additional specifications are as follows:

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| 1. Insertion Loss (IL) between CP and Port 1 (within $10 \pm 0.250$ GHz):     | $\leq 3$ dB  |
| 2. IL between CP and Port 2 (within $15 \pm 0.250$ GHz):                      | $\leq 3$ dB  |
| 3. Return Loss (RL) for Port 1 (within $10 \pm 0.250$ GHz):                   | $> 15$ dB    |
| 4. RL for Port 2 (within $15 \pm 0.250$ GHz):                                 | $> 15$ dB    |
| 5. RL for CP (within $10 \pm 0.250$ GHz AND $15 \pm 0.250$ GHz):              | $> 15$ dB    |
| 6. Attenuation between CP and Port 1  |              |
| For frequencies $\leq 8$ GHz  | $\geq 25$ dB |
| For frequencies $\geq 12$ GHz (measured up to 20 GHz)                         | $\geq 25$ dB |
| 7. Attenuation between CP and Port 2  |              |
| For frequencies $\leq 13$ GHz   | $\geq 25$ dB |
| For frequencies $\geq 18$ GHz (measured up to 20 GHz)                         | $\geq 25$ dB |
| 8. Isolation between Port 1 and Port 2 (Measured at 12.5 GHz, spot frequency) | $\geq 25$ dB |

The diplexer shall use one of the two Stratedge packages provided to all contestants. Datasheets for the package will be provided, upon an email request to [jackson@ecs.umass.edu](mailto:jackson@ecs.umass.edu). Contestants must also layout and fabricate an evaluation board. The evaluation board will be an unenclosed printed circuit board with 50 ohm traces and standard 50 ohm SMA connectors. The packaged diplexer will be mounted to this board. The diplexer performance shall be measured at the SMA interfaces. If one or more of the specifications are not met, the judges at their sole discretion may award partial credit for the specification(s) that is not met. The Stratedge packages provided are of different sizes, and contestants must choose which to use. However, it should be noted that package size is one of the criteria used to determine the best submission. The Stratedge package shall be securely sealed with a lid when the measurements are made.

The criteria for the best submission are as follows:

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| 9. Worst-Case IL between CP and Port 1 (within $10 \pm 0.250$ GHz):            | 10% |
| 10. Worst-Case IL between CP and Port 2 (within $15 \pm 0.250$ GHz):           | 10% |
| 11. Worst-Case RL for Port 1 (within $10 \pm 0.250$ GHz):                      | 10% |
| 12. Worst-Case RL for Port 2 (within $15 \pm 0.250$ GHz):                      | 10% |
| 13. Worst-Case RL for CP (within $10 \pm 0.250$ GHz AND $15 \pm 0.250$ GHz):   | 10% |
| 14. Worst-Case Attenuation between CP and Port 1                               |     |
| For frequencies $\leq 8$ GHz   | 5%  |
| For frequencies $\geq 12$ GHz (measured up to 20 GHz)                          | 5%  |
| 15. Worst-Case Attenuation between CP and Port 2                               |     |
| For frequencies $\leq 13$ GHz  | 5%  |
| For frequencies $\geq 18$ GHz (measured up to 20 GHz)                          | 5%  |
| 16. Isolation between Port 1 and Port 2 (Measured at 12.5 GHz, spot frequency) | 10% |
| 17. Packaged Filter Size   | 20% |