

Evaluating Altium for Circuit Simulations Using the EIC-DIRC Laser Interlock Circuit

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DSG frequently develops and designs custom PCBs, the latest being a PCB for the EIC-DIRC laser test area's interlock system. Frequently, during the initial design process, there are uncertainties in component selection or how components should be connected to get the desired behavior. In such situations, a simulation of circuit components and behavior is extremely helpful. For PCB design, DSG uses Altium, which also has a built-in simulation peripheral. To evaluate this simulation feature, the EIC-DIRC laser interlock circuit schematic was modified and used.

For the simulation, a few steps were needed. First, the power inputs in the circuit must be replaced with simulation sources (one 5 VDC source and one 24 VDC source). Next, any component without simulation models must either be replaced with generic models or a model must be found for that component. Then, any interlock input to the circuit must be replaced with a switch model. Finally, circuit outputs must be replaced with components that can indicate the output status, like LED models.

Once the schematic has been modified, the simulation parameters must be configured. Altium has four simulation modes—operating point, DC sweep, transient, and AC sweep. For the EIC-DIRC interlock circuit, the most relevant modes are operating point and transient. In operating point mode, the circuit is run in DC steady state to simulate how it would behave in normal, steady state operation, allowing component power dissipation, voltage, and current draw behavior. Transient analysis mode runs for user-set duration with set intervals between analysis points. The difference between operating point mode and transient is that in transient analysis mode, parameters of the circuit (input values and voltage levels, for example) can be modified at certain points in time to see how the circuit behaves with those changes.

The simulation results for the EIC-DIRC interlock circuit were as expected and the circuit acted like its previously created physical prototype.

In evaluation of Altium as a circuit simulation program, a few points were learned. First, Altium does not have an interactive simulation that allows the user to change parameters as the simulation runs, mimicking sitting in front of a physical circuit and changing parameters. While this is not a problem, it just requires more thought in setting up the circuit simulation to properly configure the circuit inputs and monitor the desired outputs. Additionally, since not all components have simulation models, it was learned that it would be best to perform the simulation before selecting specific components for the circuit to avoid having to make modifications to the circuit schematic. Despite this, Altium simulation will indeed be a helpful tool in DSG's tool box for determining that circuits behave as expected before physical prototyping or PCB production.

- **Evaluated simulation features of Altium**
 - Used EIC – DIRC laser interlock circuit for evaluation

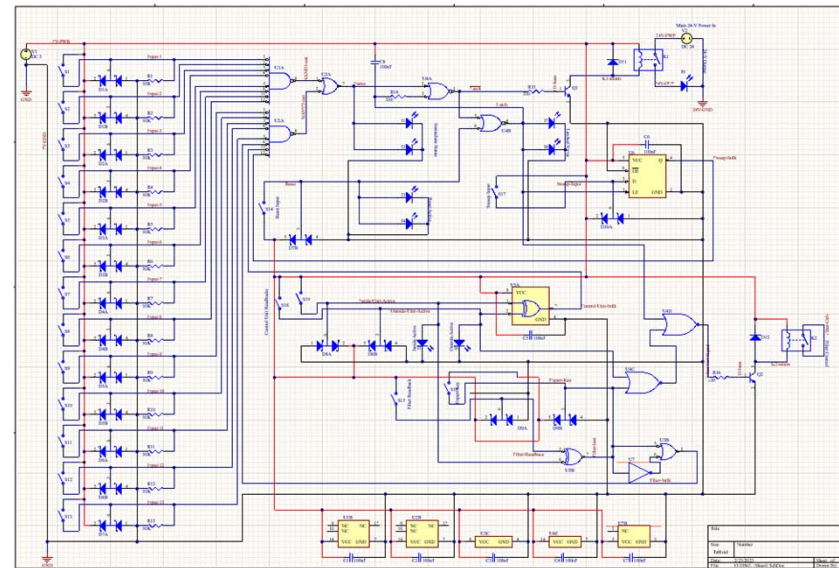


FIG.1. EIC-DIRC laser interlock circuit in Altium after modification for simulation.