

# System & Printed Circuit Board Design (PCB) Electrical Expertise

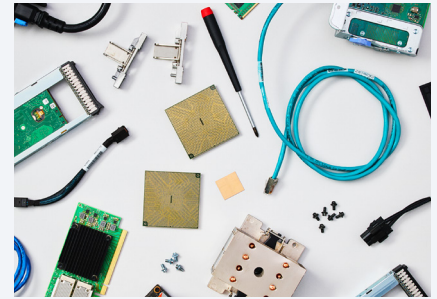
## IBM Card Planning

**Work to develop PCB card definitions within a system including their interconnection, major component placement, and cross-section definitions ensuring each fits within the chassis' constraints.**

The IBM Card Planning team works with system architects and other engineering skills to create a cost-sensitive plan for system electronic implementation within a specific system's chassis. These experts create a detailed placement and wiring plan of all cards in a system to enable efficient card design execution. This planning also includes connector interface pin counts and assignments, card sizing and mounting locations, main component locations, high speed bus routing paths, and power shapes and planes. This team plays an essential role in determining the high-level design of the system and turning the idea into a real product. IBM experts are available to contribute their exceptional skills to your electrical system development needs.

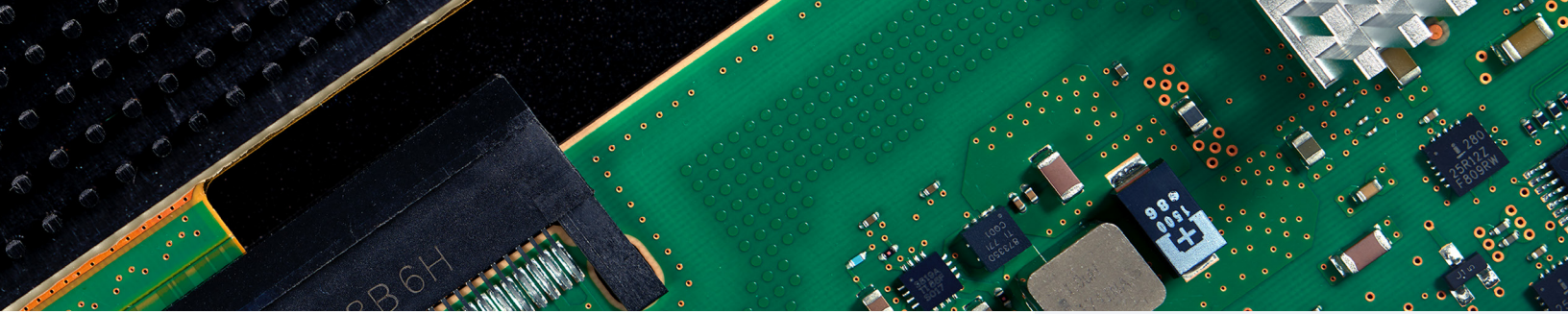
### System Card planning includes:

- Creation of detailed component placement and signal wiring plans to enable efficient execution of the card development phases
- Determine connector interface pin counts to enable early connector selection
- Collaborate cross-functionally to define card sizes and mounting locations
- Establish main component locations to achieve maximum net lengths



### Contact us >

For more information about card design, or email us at:  
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- Define high-speed bus routing paths and enough wiring channels to meet length and spacing constraints
- Define power planes and shapes with sufficient copper including layer assignments and signal referencing
- Define connector pin assignments for all interfaces and with compliance for signal and power integrity
- Define major bus connectivity rules
- Determine cross-section or stack-up definition
- Preliminary PCB layout provided in Cadence's Allegro PCB Editor with major component placement, high-speed bus routing paths and layer assignments, and early power plane assignments

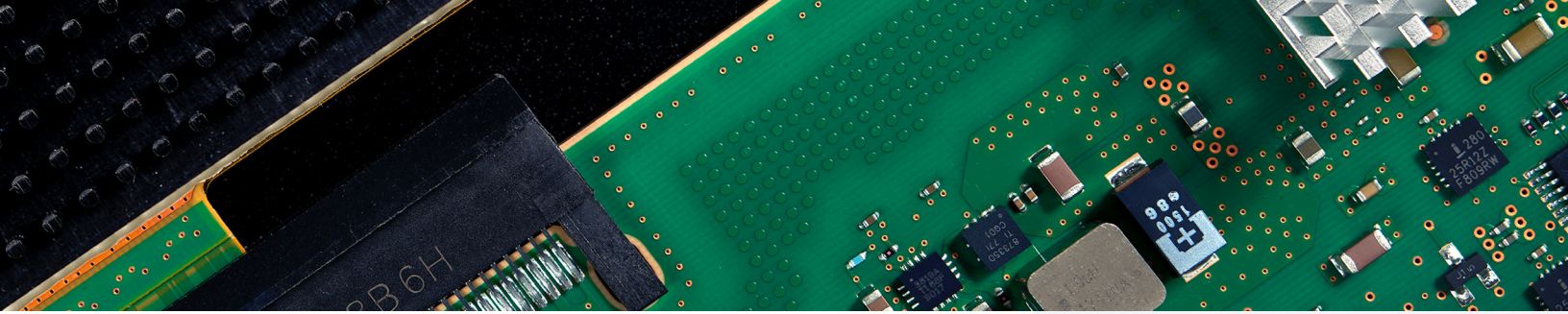
#### **CAE Methods, and Tools:**

- Cadence Allegro CB Editor
- Cadence Allegro Design Entry
- Cadence Allegro System Architect
- Cadence Symbol Editor

## **IBM Signal Integrity Engineering**

### **Leading innovative solutions to ensure signal integrity of systems with data rates of 50Gb/s and beyond**

The signal integrity engineering team leverages advanced electromagnetic simulation methods and measurement techniques to ensure server bus signal integrity for industry standard and IBM proprietary busses on Power Series server hardware. Our engineering team is made up of industry leaders in signal integrity analysis and design, with experience designing successful channels that operate up to 50Gb/s data rates and beyond. This includes modeling and simulation of high-speed bus components using commercial 3D electromagnetic modeling tools, as well as performing time domain simulations of entire channel topologies using internal IBM software. The channel topologies are realized within IBM server systems in complex multi-layered PCB stackups, while maintaining proper signal integrity performance by adhering to rules developed from signal integrity simulations using IBM proprietary tools. Lab verification of the signal integrity performance on the



system busses are performed with cutting edge measurement technology, both in the frequency and time domain to ensure proper timing and bus performance. Full channel model-to-hardware correlation is also performed to guarantee proper system field performance and quality.

### **Modeling Methods and Tools:**

- Electromagnetic modeling using ANSYS FEM EM Suite, Keysight ADS, and CST Microwave Studio.
- Full channel topology time domain simulation using internal IBM HSSC-DR software.
- Design and validation of proprietary buses such as OpenCAPI, OMI, and SMP, as well as industry standards, such as PCIe, USB, I2C, SPI, and reference clocks.
- Model optimization through use of machine-learning algorithms to optimize bus performance.
- Card design and evaluation using Cadence Allegro.

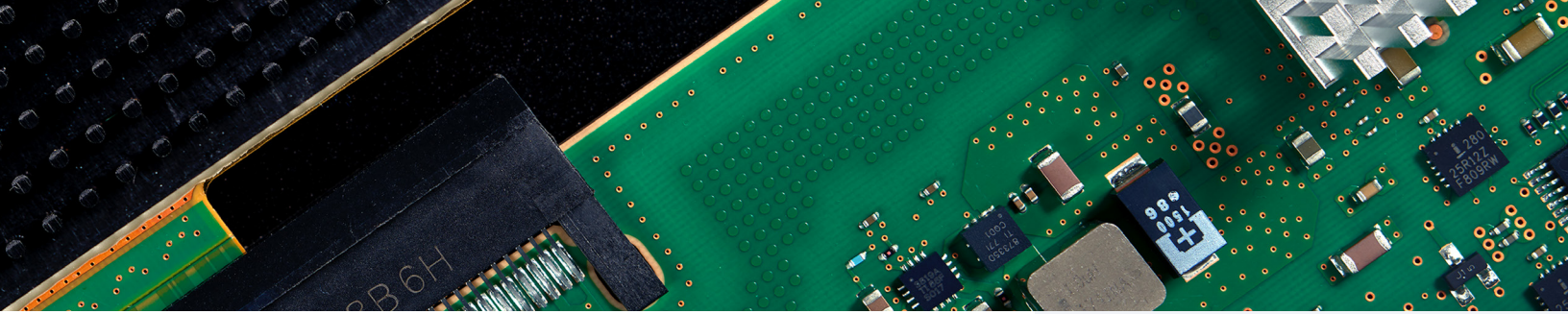
### **Test/Validation Methods and Tools:**

- Frequency and time-domain analysis of buses 50 Gb/s and beyond.
- Post-measurement data processing using Keysight PLTS.
- Custom test-vehicle development and usage.
- Cutting edge measurement technology using industry standard lab equipment, such as Vector Network Analyzers (VNA), Oscilloscopes, BERT, and TDR systems.

## **IBM Design for eXcellence**

### **Working to create safe and reliable products at manufacturing level and beyond**

IBM's Design for eXcellence team improves design safety, minimizes field failures, increases reliability, and enables testing and manufacturing. These experts perform automated and manual reviews dedicated to eliminating



issues with high voltages, spacing violations, temperature sensitivities, and more. These processes can be implemented into your designs to ensure the cards can be manufactured faster, with higher yield, increased safety, high reliability, and at lower costs.

### **Design for eXcellence Processes and Tools:**

- Anti-Smoke Review Process
- Cadence Allegro PCB Editor
- Minimum spacing checks for:
  - Board vias
  - Component pins
  - Voltage shapes
  - Solder mask
  - Card edge to internal layers
- Extensive collaboration with all stakeholders

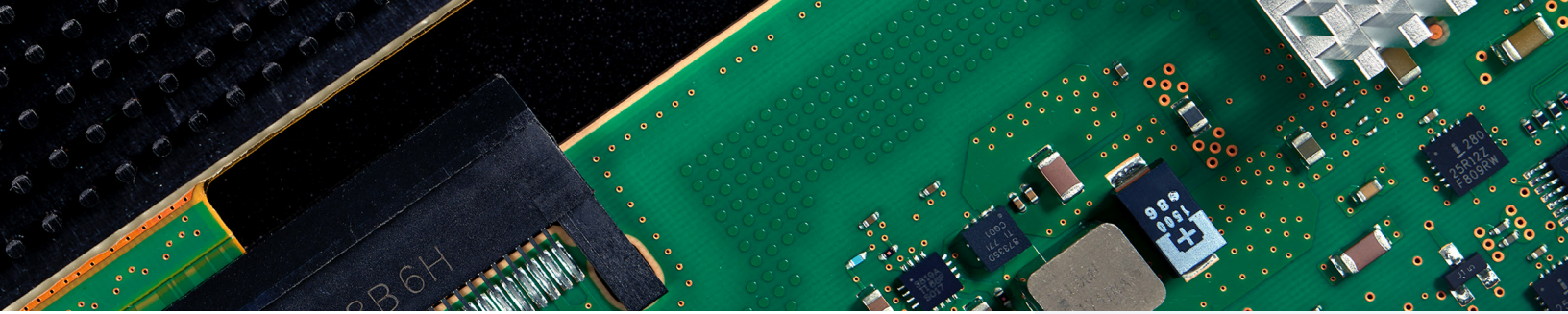
## **IBM PCB Circuit Design**

### **Working to power and enable your quality PCB designs efficiently**

IBM's highly skilled experts can provide support for circuit design needs. The circuit design team provides proper communication between building block devices within a system by designing the logic and physical layout of circuits that power and enable the system's electronics. This team performs validation testing on all designs to ensure functionality and quality are met within the design and components' specifications. Additionally, this team is highly skilled in trouble shooting and can find root cause of issues as they arise. They are available to aid you in constructing high performing designs that will drive your ideas to production.

### **Services:**

- Component evaluation and specification
- Schematic creation
- System-level circuit design



- Validation
- Trouble shooting
- Image creation for PCIe switches and UCDDesign expertise:

### **Design expertise:**

- Operational panel design
- Service processor implementation
  - BMC
- PCIe Switches
- Power sequencing
- Industry Standards
  - I2C
  - DDR
  - SPI

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