EMI Stream™

EMI Supression Tool

WHAT IS EMI Stream?

EMI Stream is the solution that can suppress undesirable electromagnetic radiation or electromagnetic interference (EMI) generated from printed circuit boards.

HOW DOES EMI Stream WORK?

At the placement design stage (pre-routing), EMI Stream examines optimal placement locations for parts by using imaginary routing and verifies the effects of the proposed EMI solution. EMI Stream also can suppress resonance which occurs between the power and ground (GND) planes by analyzing the resonance which occurs by changing the locations of capacitors.

By eliminating the causes of unnecessary electromagnetic radiation from the initial design stage, EMI Stream substantially reduces the time and costs needed for revision after the prototype is developed and enables rapid time-to-market.

INCREASE YIELD & IMPROVE OVERALL EQUIPMENT EFFICIENCY

Electromagnetic radiation regulations of many countries have become more rigorous due to the rapid growth of the number of electronic devices in the market. To find low-noise solutions, many development sites employ the build-and-try approach using prototype devices, and these development sites are now faced with new problems of longer time-to-market and higher product development costs.

FIND THE CAUSES OF EMI CAUSES AT DESIGN STAGE AND DECREASE EMI PROBLEMS AFTER PROTOTYPE.

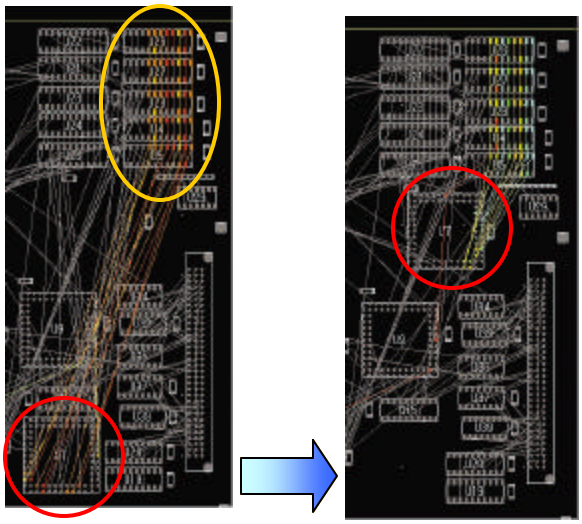
EMI Stream uses the design data for printed circuit boards and performs checks on items that cause EMI. There are no unexpected setbacks because these checks are performed automatically and in a short period of time. EMI Stream has tapped into the EMI design techniques that have been passed down over the years and carefully selected items that have theoretical support. EMI Stream has also included more effective check items based on the latest research results. For the threshold values that are set for individual check items, EMI Stream calculated optimal values from theoretical and actual measurement verifications and provided those values as default values. Of course, the threshold values can also be changed individually.

EMI CHECK FUNCTIONS PERFORMED:

1. Trace length
2. Number of via-holes
3. Traces crossing over G/V planes
4. Discontinuities of return current path
5. Traces near plane edges
6. Estimation of radiated electromagnetic field
7. SG traces
8. Distance between grounding vias of SG traces
9. Grounding vias along ground-plane edge
10. Filters on a trace connected to a connector
11. Decoupling capacitor

PARTS PLACEMENT ANALYSIS

If an error is found in the post-routing check, any remedy for correcting that error, including repositioning parts and changing routing paths, becomes difficult. Since two of the main factors that affect EMI are trace length and placement positions, EMI Stream predicts and checks the routing before any actual routing takes place. If errors occur repeatedly in a net that connects parts, generally the number of errors can be reduced by placing those parts closer together. EMI Stream supports What-If analysis, which lets you change placement positions and analyze how close together parts should be placed.



Example of the EMI results before any actual routing takes place
In the figure to the left, you can see many errors have occurred, indicated by the nets in red, related to parts inside of the red and yellow circles. If you move the part in the red circle to a location closer to the parts in the yellow circle, you can see the decreased errors that have occurred indicated by the net colors changed to green.

CORRECTION PRIORITY DISPLAY

After executing the various check items, EMI Stream adds numerical values to each net based on the severity of the detected errors, color codes the nets in the order they should be corrected, and lists the nets along with the detected errors. Effective corrections can be made in a shorter period of time by correcting the nets sequentially from those with the highest error score. Depending on the check item, EMI Stream also displays explanations of the error causes and advice on how to correct the errors.

RESONANCE OVERLAP DISPLAY

By showing the results of resonance analysis between the circuit operating frequency and the harmonic frequency components in an overlap display, EMI Stream lets you visually check resonance conditions when capacitors are repositioned, added, or deleted. Even if a capacitor for suppressing resonance at a certain frequency is placed at a location having a high resonance voltage amplitude, the overall amount of EMI will not be suppressed if resonance occurs at a different harmonic frequency. This overlap display lets you check whether all resonance, including resonance involving harmonic frequencies, is being suppressed. Consequently, suppression of EMI becomes possible during actual operation of the product.

POWER-GND RESONANCE ANALYSIS

Equipped with theoretically determined know-how, the Power-GND analysis function analyzes common mode radiation and the power-GND resonance, which causes EMI.

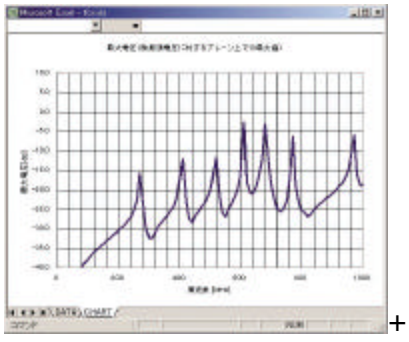
The amount of EMI increases if resonance occurs between the power and ground (GND) planes. The power-GND resonance analysis function creates a simulation model of the plane shapes and the capacitors between the power and GND planes, and uses circuit simulation tools to analyze the resonance. This function displays the size of plane-GND resonance as a gradation map on the printed circuit board. (Locations where the voltage amplitude is large are indicated in red tones; locations where the voltage amplitude is small are indicated in blue tones.) The user can create a design that suppresses resonance between the voltage and GND planes by placing capacitors at locations where the voltage amplitude is large (locations indicated with red tones) and analyzing the resonance again. The user can also change the placement positions, number, and values of the capacitors.

EXCITATION SOURCE MOVEMENT

If the power plane is close to rectangular in shape, the circuit simulation will produce nearly identical resonance results regardless in which of the four plane corners a drive source that becomes a noise source is placed. Therefore if the drive source position is not specified, EMI Stream will place the drive source at the bottom left corner of the plane when it executes resonance analysis. If the power plane has a complex shape or if the drive source is placed at an LSI (?) position, you can specify the drive source position manually for the analysis.

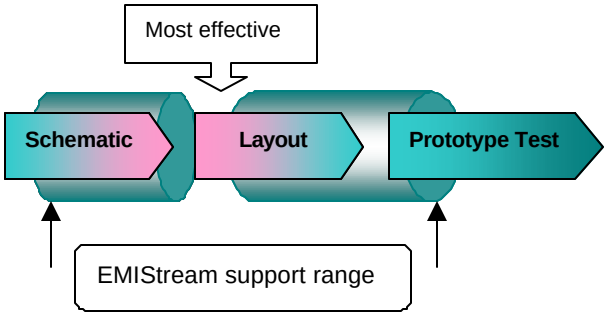
FREQUENCY CHARACTERISTIC DISPLAY

EMI Stream displays a graph that plots the frequency values on the horizontal axis and the maximum voltage values of a plane on the vertical axis. The peak in the graph represent frequencies at which is resonance is occurring. If a harmonic component of the circuit's operating frequency is close to a peak frequency, unnecessary electromagnetic radiation due to resonance can occur. This graph lets you see the sharpness of the resonance peaks and the critical frequency bandwidths.



SUPPORT RANGE

EMI Stream provides support from the schematic stage to the layout design stage to the prototype stage. Not only can the checks be done after routing, but also optimal part placement analysis at the part placement stage can be performed. You can decrease repetitive work and shorten time to market.



INTERFACES

- EDIF200 (only import)
  ex: OrCAD Capture®, PADS Designer®, etc.
- Signal Integrity Simulation Tool
  LineSim®(Mentor Graphics)
  BoardSim® (Mentor Graphics)
- Layout CAD
  Power PCB®(Mentor Graphics)
  Design File(Cadence Design Systems)
  ODBG File (Valor Computerized Systems)
  CR5000/Board Designer® (Zuken)DSN Interface

OPERATING ENVIRONMENT

- OS:
  Windows 2000 or XP
- PC:
  Pentium 500 MHz or faster
- Memory:
  64 MB RAM minimum; 128 MB recommended
- Hard Disk space:
  System 20 MB + data area (100 MB or more recommended)
- Other:
  Microsoft Excel, Berkeley SPICE (free license)

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