The role of IBIS in near-field Emission Prediction of ICs

Etienne SICARD, Alexandre BOYER
etienne.sicard@insa-toulouse.fr
Alexandre.boyer@insa-toulouse.fr
http://www.ic-emc.org

Gilles PERES
Gilles.peres@eads.net
http://www.aseris-emc2000.com
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1. Context

More Complex Embedded electronic systems

- 32b Micro-controler units
- Interfere with Mobile 0.9, 1.8, 1.9GHz
- Interfere with Computer 2.45Ghz
- Interfere with Airbags 100MHz
- Interfere with ABS 100MHz
1. Context

Existing methods and tools for IC emission

Measurement methods

Radiated
DC-1GHz

IEC 61967-2

IEC 61967-3

Ibis (Package, I/Os)
ANSI EIA 656

Conducted
DC-1GHz

IEC 61967-4

ICEM (Core)
IEC 62014-3

Above 1GHz

Under standardization

March 2005

E. Sicard-IBIS summit DATE 05
1. Context

Help to simulate IC Electromagnetic Emission before fabrication
2. Near-Field scanning

- Measured Near field scan
- Package Parasites (Ibis)
- IC size
- Pin location
- Time domain Simulation
- Fourier Transform of the current
- Current Dipole Magnetic field
- Tuning

From IZM

IC-Emc

WinSPICE
2. Near-Field scanning

Measurement

- Hy similar, Hz less important
- Also Ex, Ey, Ez, but less important

Hx, 40MHz

Hx, 120MHz
3. The IC-EMC software

Schematic Editor, post processor

Package model

Supply model

Access to EMC analysis

IC core model

Basic symbols

Critical Embedded Systems
Electromagnetic compatibility of Integrated Circuits
3. The IC-EMC software

Use IBIS information to build the supply network

- Equivalent R,L,C of supply networks
- Buffer strength
- Package size
- IC size
4. Near field simulation

Construct ICEM models
4. Near field simulation

Specific Interface for Near-field scan

\[ H_\phi = I_0 l \frac{e^{j(\omega t - \beta r)}}{4\pi} \sin \theta \left( \frac{j\omega}{cr} + \frac{1}{r^2} \right) \]
5. Experimental Results

CESAME Norm Core

Simulation at 80MHz

Measurement at 80MHz
5. Experimental Results

- Good correlation also obtained with C51 near-field scan
- Similar study undergoing on Infineon Tricore
Conclusion

- An environment for near-field simulation has been developed
- The schematic diagram uses IBIS information for package and I/Os
- A post processor computes Hx,Hy from lead currents
- Interesting correlations have been demonstrated on CESAME test chip
- Other chips are being tested to validate the methodology
- The package is online at www.ic-emc.org
- Demos at Iconic 05, EmcCompo 05, IEEE EMC 2005 Chicago