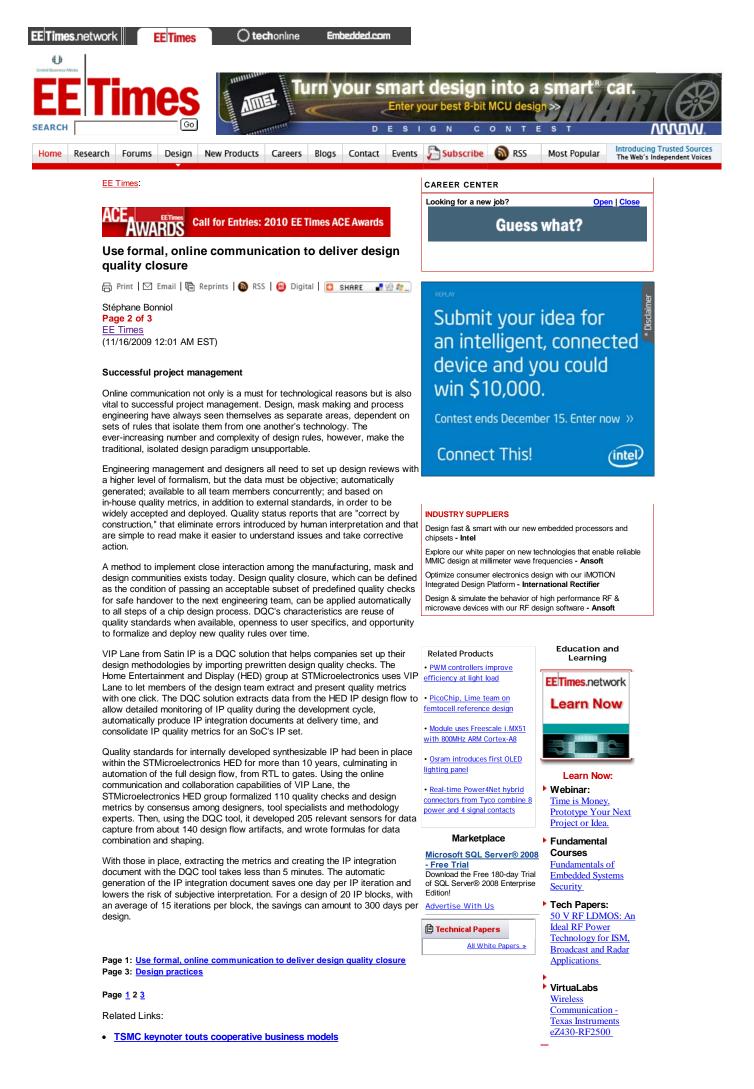


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Stéphane Bonniol Page 3 of 3 <u>EE Times</u> (11/16/2009 12:01 AM EST)

## Design practices

Methodology is nothing if it's not deployed. In DFMM, the challenge is twofold: Design practices have to be formalized so that design engineers become more "DFMM aware," and those practices must be used proactively, based on real mask shop-level parameters, rather than simply being documented and then ignored. Adopting online communication as the norm at the same time as practices are formalized greatly increases adoption and compliance by global team members.

Industry initiatives such as the European Crystal collaborative research and development program are intended to significantly improve DFMM by identifying and formalizing recommended design practices to make mask manufacturing a more efficient and less iterative process. While the old design rule checkers (DRCs) developed into sophisticated and proactive design-for-manufacturing tool suites, mask rule checks are still implemented at the final phase, when the GDSII data is released. Resolution enhancement techniques and optical proximity correction further restrict the ability to revise the design or even to take into account the mask manufacturability issues for an additional design cycle.

Crystal's goal is to help improve design consistency, on-time delivery and the cost of photomask design by providing online, real-time access to real data about the manufacturing challenges at mask shops and about the design practices in the upstream design phases that could solve those challenges. Such initiatives also align the development and availability of the real-time data points to the need for leading-edge design quality check libraries in addition to the standard libraries.

One of the Crystal work packages is devoted to identification and formalization of recommended design practices to make mask manufacturing more efficient. Crystal will also provide the tools to deploy and monitor those practices throughout the design chain, a process greatly enhanced by online collaboration among chip design teams, semiconductor fabs, mask shops and EDA vendors.

Crystal is sponsored by the Cluster for Application and Technology Research in Europe on Nanoelectronics (CATRENE). Participants include Atmel, CEA-LETI, Satin IP Technologies, Toppan Photomasks France and Xyalis.

Today, close interaction among the manufacturing, mask and design communities is key to successful product development. A formalized design quality closure methodology, with technology deployed through a secure Internet connection, enables multisite development teams to improve design productivity and significantly reduce risk.

Stéphane Bonniol is director of R&D and co-founder of Satin IP Technologies. He has an engineering degree from the Engineering Sciences Institute of Montpellier.

Page 1: Use formal, online communication to deliver design quality closure Page 2: Successful project management

## Page <u>1</u> 2 3

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