From antenna radiation pattern acquisition to a system emission and immunity characterisation

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Abstract: SAMS is an Antenna Pattern Acquisition system which can be adapted for various area. The objective of this article is to detail the integration of SAMS on a application for test the electromagnetic compatibility.

Keywords: Electromagnetic compatibility, antenna measurement, test bands.

1. Introduction

SAMS is a product family in the area of antenna radiation pattern acquisition and processing system. It has been developed and is commercialised since 1998, by SILICOM, in partnership with the CNES (French Spatial Agency).

The CNES expertise in antenna measurements together with SILICOM's proficiency in software development and in hyper-frequency studies led to producing a modern, reliable and user adapted software system, both in its user modes and in its parameter setting, maintainability, speed and measurement accuracy.

Beyond the innovation included in this system we can promote the automatic measurement speed calculation in order to optimise the compromise velocity/precision, but also a separated data analysis module that allows to compare data issued from any simulation code and the one from experiment.

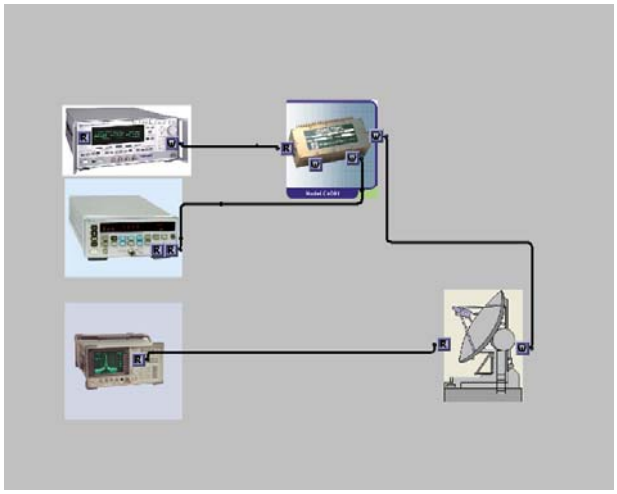
This document presents the characteristics and the technical innovations of our system and describes how we applied the SAMS technical innovations to another field of expertise : the electromagnetic compatibility.

The new application is based on the simulator development and exploitation platform, available as a freeware. It is based on the free API Juzzle (www.juzzle.com) and may be used in many domains (telecommunication, electronics, network, signal processing, vulnerability,...).

2. From antenna radiation pattern acquisition to a system emission and immunity characterisation

2.1 Customizes your Generation and Acquisition test stands

The electromagnetic compatibility test stand is specific to each system under test. It is necessary to customize both generation and acquisition chain. First the software allows



to define the experimentation close behind the physical test stands.

Figure 1 : Generation and acquisition chains

The "figure 1" describes the configuration of connections between devices.

2.2 Define the generation chain and control measurements on the acquisition chain

One of the major improvement of our system is a permanent control of the level of the generation chain with a customable control loop function.

The application can pilot a complex system of axes supporting the element to be measured. In SAMS, the axis notion is very general, and can represent dimensional variables (translating or rotating mechanical axes), electrical variables (frequency, radio-frequency power, polarisation…) and time. The axis are built from the customization of the Generation and Acquisition tests stands. The test band configuration is stored in the Windows register or into readeable files. So the user does not know the high level notion of axes and it can focuse upon its experimentation.

An acquisition consists in defining one **sweep** axis (mechanical, electrical or temporal). Then all or part of the other axes are considered as **section** axes. As well as to customize the test stands, the user does not matter to define a sweep axis. So the SAMS acquisition system is

integrated into an application based upon the Juzzle framework that provides graphic controls to define and control the test band according to the user requirements.

2.3 Instrument drives

If the system is user centric around the user requirements. During the experimentation, the system shall be closed to devices fonctionnalities.

The application defines an interface for each kind of devices (generator, spectrum analysor, power meter, …); Some of these devices can be controlled by several drivers according to the number of axes defined for the device.

The number of implemented drivers represents more than 100 different devices, among the most spread constructors: HP, ROHDE & SCHWARZ , SA, MI,… and is in constant progression.

3. Managed dynamickly the configuration of all yours test stands

3.1 An experimentation data base

One of the main objectives to a test stand is to check that a system under test has the same characteristics than during a previous experimentation.

The previous experimentation configuration and results are imported to the application and the user can modified parameters (devices setting, set of valid axies positions) before a new run.

All mesured data of an experiementation are saved with their test stand configuration.

3.2 Management of a stand configuration

At each experimentation, measurements are different but the test stand configuration shall also be changed (a new device, new parameters for a chain).

To ensure the reused of a previous experimentation, the chain configuration shall be managed using a version control system. The juzzle framework allows to do that. It becomes possible to save and retrieve all configurations of all chains and also all configurations of all devices used by those chains.

3.3 Management of devices' drivers

A device is defined by its characteristics (immuable), a set of parameters and some drivers. Drivers use the SAMS interface to communicate with the earth of the system. But if the software allows to manage all experimentations, it shall also manage the revision of devices drivers. This is a major requirement to test the evolutions of all test bands.

4. Processing measurements

4.1 Data analysis

The system allows to save and retrieve a great quantity of data provided by different experimentations. This is allowed to compare and analyse some experimentations to each other.

These analyses depend on the system under test an can be very different. For an antenna radiation pattern acquisition, SAMS DA allows to display the antenna radiation pattern.

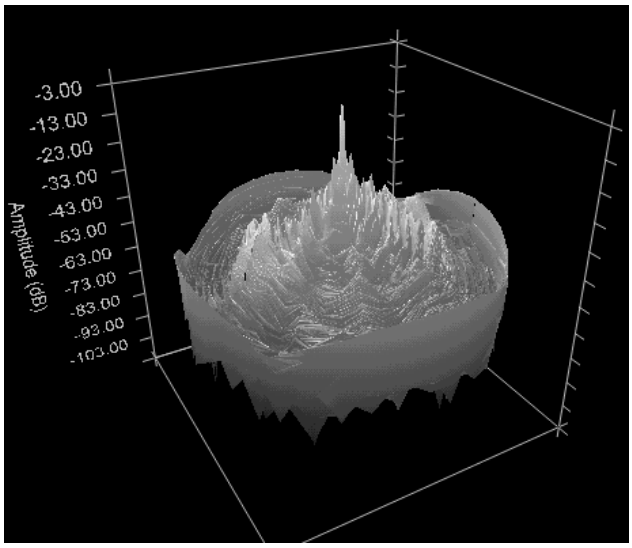


Figure 2 : A antenna radiation pattern

4.2 Data conversion

The application shall produce synthesis results to create reports. Each experimentation can be diferent. So it is necessary to define processing to convert measurement data into useful information.

4.2 Export data

The application data shall be able to export some of these results towards external applications for simply build reports (Word, openOffice, Excel, …) or for other traitements.

5. Conclusion

Extend the features of SAMS for antenna radiated pattern acquisition to the electromagnetic compatibility leads to focuse the application on the user and its goal.

The challenge is to improve the software and keep its main characteristics of reliable, user adapted software system, maintainability, speed and measurement accuracy.

The goal is reached using new sotwares technologies of integration and inter-communication between applications.

We have merged the world of simulation, with the framework Juzzle, and the world of experimentation with the software SAMS. The result is a user centric application who can easily evoluate with the user's needs.