ARMMS – Connected Solutions for DigRF
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Abstract

With the ever-decreasing size of communications devices, the need for lower power consumption and the need for more features, manufacturers of communication products are now looking to reduce the complexity of wireless designs. One such method is to link the rf and digital sections of these devices. This paper reviews the new DigRF standard and how it can be tested.

Communication has changed dramatically, what has triggered this development?
A lot of the technology in today's systems is rather old. The spread spectrum technology that enabled code domain systems like CDMA and WCDMA has been around for decades. The advances in digital technology (through miniaturisation) opens mass markets like wireless telecom.
Moore's Law is still going strong. From the Intel web site, Intel expect it will continue to at least the end of the decade. The mission of the Intel design team is to break down the barriers which may slow down Moore's Law! 13th March 2005.

Increased processing power, both analog and digital leads to reliable, mass-produced low-cost electronics.
Digital technology, increased performance of digital-to-analog and analog-to-digital converters, is the driver for break-though performance. The basic functions do not change; it is the implementation of the technology that changes. The flexibility and cost advantage of digital implementations will assure a continued push of signal processing functions into the digital domain; first as hardware, then programming hardware and finally (power permitting) as software.
The increased the power also enables the convergence of services, from a physical layer aspect, it means the use of radios for multiple frequency bands; the big change is in the base-band processing.

What does this mean from a testing perspective?
In short, the miniaturisation will cause hidden test nodes and because of the increased complexity of modules and devices, the use of high-bandwidth standard (we hope!) buses will prevail.

Is this happening now? Well, there are signs of it…. there are some buses that have been in the technology domain for some time. Examples are – OBSAI (base-stations) and CPRI.
The bus to be discussed in this paper is the DigRF bus. Design architects are using this new bus now, with the evolution of GSM, EDGE and 3G.
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Consider a simple heterodyne transmitter design. In the past, this would have seen the use of encoders, filter, I/Q mixers, etc. Then into an upconverter to rf.
The new technology has replaced all the base-band and IF sections into a large DAC, direct into an upconverter. Based-band to rf (and reversed for receivers).
The DigRF standard is supported and promoted by a number of companies, including the founder members TTPCom, Sony Semiconductors, Motorola, Agere etc.
It defines an efficient physical connection between rf and base-band integrated circuits for cellular terminals and handsets. The standard places as few constraints as possible on the chipsets themselves, to allow for innovation and efficient design.
The DigRF bus defines signalling and handshaking. Logic timing and levels are also set.
The data clock-speed of 26MHz is well within the requirements for testing.
It is a relatively simple bus, which gives hope to the testing world!
The DigRF standard has all the details to allow testing.
The current testing philosophy can be called a 'connected solution' between traditional rf, digital and software solutions. It may well be that no be-spoke test equipment is required.
In fact, industry may have the necessary equipment sat on development benches now!
The main theme is 'connecting the rf and digital world'.
Solution is described uses a standard logic analyser to capture the data, using synch lines to ensure the data start-stop is stored correctly. Then, this data is transferred to a co-hosted analysis software package or linked direct to a standard rf analyser.
This will show typical rf measurements, such as channel power and error vector magnitude.

Conclusion :-
DigRF is one of the many rf-digital buses that we may well see as the technology pushes the needs of telecoms industry.
As the paper describes, standard, off-the-shelf equipment can be used to test this bus.

References :
* DigRF web-site www.ttpcom/digrf/index.php
* Agilent Application Note – Perform Digital IF-RF BER Measurements – Application Bulletin 1476-4.