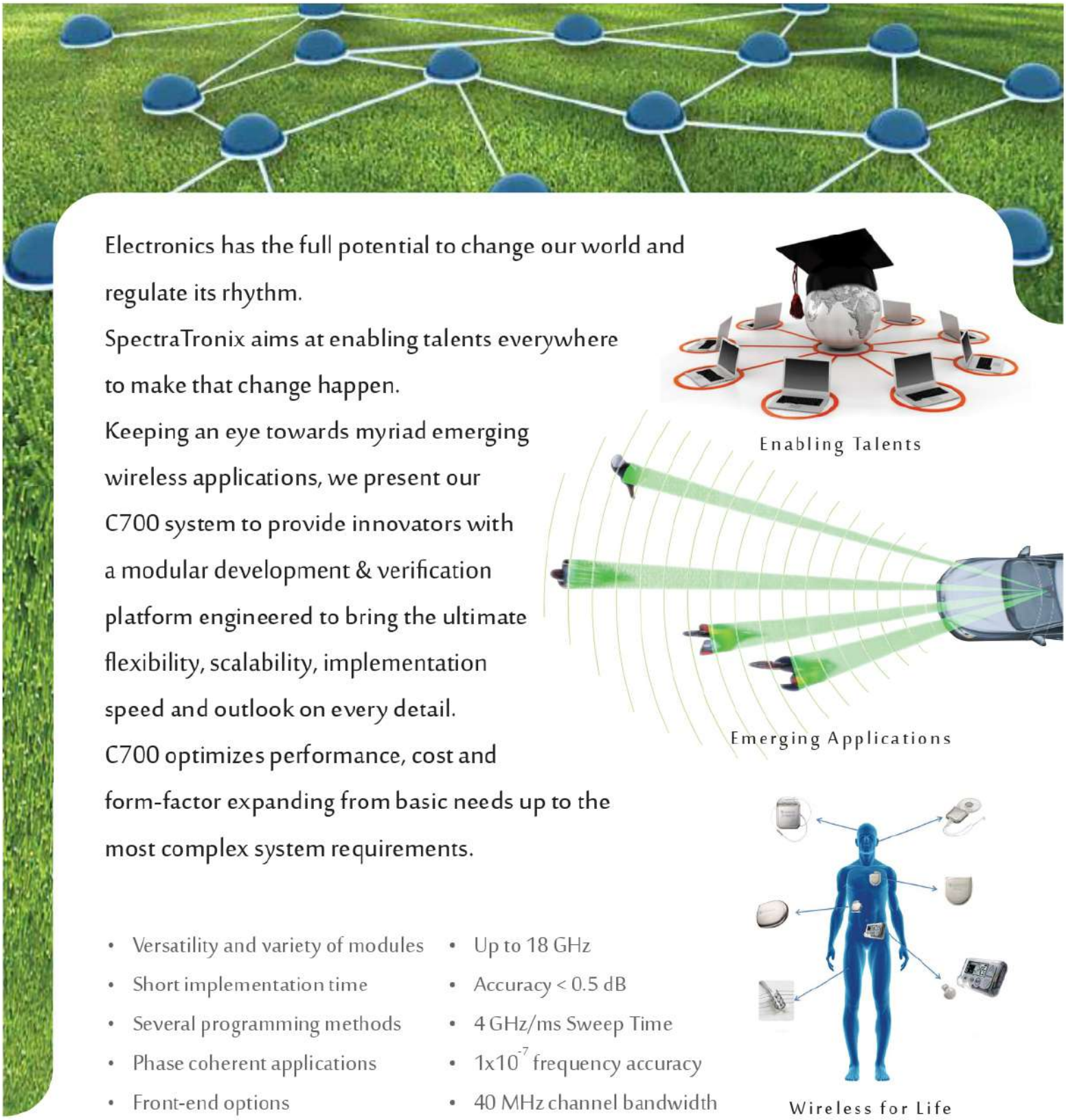
# C700

## NEW DOMAIN IN RADIO SYSTEM DESIGN & VERIFICATION


SpectraTronix™

# Removing Barriers to RF Innovation



Electronics has the full potential to change our world and regulate its rhythm.

SpectraTronix aims at enabling talents everywhere to make that change happen.

Keeping an eye towards myriad emerging wireless applications, we present our C700 system to provide innovators with a modular development & verification platform engineered to bring the ultimate flexibility, scalability, implementation speed and outlook on every detail.

C700 optimizes performance, cost and form-factor expanding from basic needs up to the most complex system requirements.



Enabling Talents



Emerging Applications

- Versatility and variety of modules
- Short implementation time
- Several programming methods
- Phase coherent applications
- Front-end options
- Up to 18 GHz
- Accuracy < 0.5 dB
- 4 GHz/ms Sweep Time
- $1x10^{-7}$ frequency accuracy
- 40 MHz channel bandwidth



Wireless for Life

# System Overview

- The C700 system constitutes an architecture of the primary blocks building any radio system.
- Patented high speed, cost-effective bus providing a base layer for data, power, clock & timing distribution among multiple modules at the same time.
- Readymade modules for most common RF & Processing functions

Modules are divided in two categories:

## Basic Modules

- SYNCH module
  Provides synchronization & timing information to the whole system.
- Control modules :
  Provide embedded controller or external communication to external host
-

## RF and Innovation Modules

- VSM modules
  Vector (digital) signal generator/transmitter
- VSD modules
  Vector (digital) signal demodulator/receiver
- PLL modules : Provide highly stable RF local oscillator to other system modules


Modules are user accessible to allow easy debugging and to enable user insertion of hardware in the loop. Innovation modules are programmable to redefine its functionality and involve user code as a block in the system. In any configuration; C700 can be used as a standalone system (using integrated controller), driven by an external host or employed as a subsystem in more complex systems.

# Academia

Believing that new generations will be able to make a better world when they enjoy education, we designed the C700 platform to bridge the gap between theory and implementation. After studying the underlying theory, students can fully understand the goals and objectives behind their labs, enjoy implementing real life examples, and eventually experience the pleasure of realizing it.

Removing the huge implementation barriers will give students the momentum to innovate new ideas, technologies and will set their abilities free with the right tools to smoothly develop the most advanced RF systems.

C700 provides non specialized students arriving from different disciplines other than telecom and electronics provides them the capability to capitalize on their background and realize systems with minimum learning barriers.

**EDUCATION IS A DELIGHT.. DEVELOPMENT IS A GAME.. INNOVATION IS AN ART... C700**

## Development, Prototyping & Innovation

As a standalone or development platform for:

Flexible and software defined wireless communication setups

MIMO , massive MIMO, and other Multi-Channel technology research

Wireless communications training

RADAR research; CW, FMCW, Doppler, multi-channel and passive RADARs

ATE systems; Analog and digital signal generator/analyzer and Network Analyzer

Radio Monitoring & direction finders

DPD (Digital pre-distortion) Research

Phased array antenna measurements and research

Several other complex radio systems


## A system that provides:

- Ready-made golden blocks
- Reliable architecture
- Comprehensive documentation
- Open source codes
- Support and interface to the industry's standard simulation tools, design environments and community-maintained open-source projects boosted by thousands of innovators around the world.

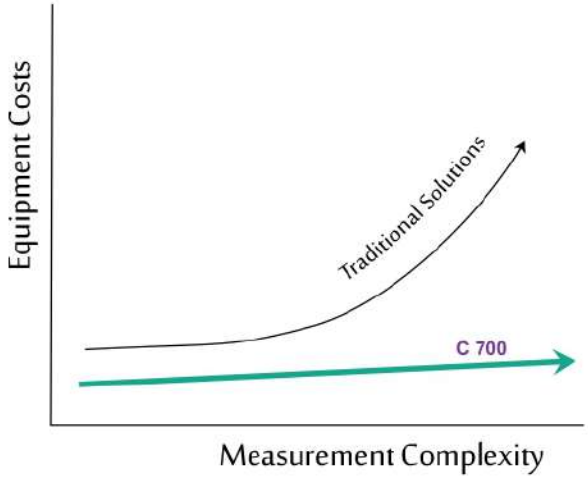
## Test, Measurement and Automation

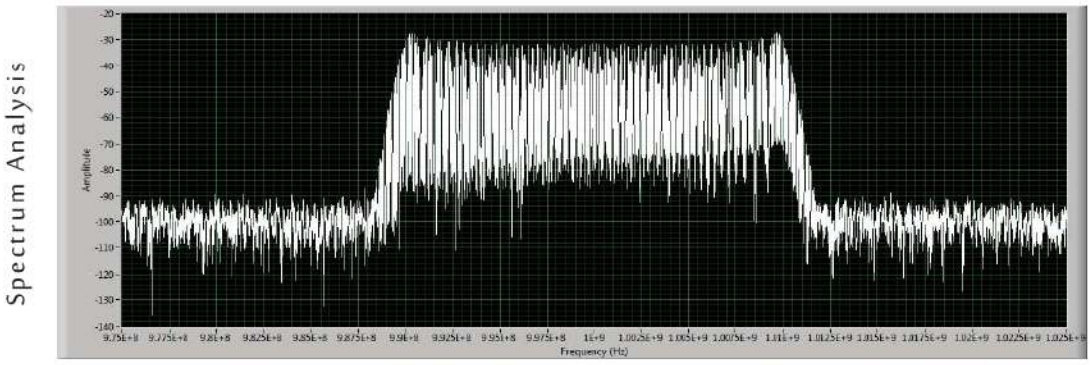
The C700 platform is designed by seasoned engineers with extensive experience in communication and instrumentation.

The RF characteristics of C700 modules outperform many traditional test and measurement devices of the same class.

The architecture of the C700 platform allows the use of the system as a general purpose radio test bench or to be optimized as a specialized test instrument.

Thanks to the internal bus speed, measurement rate and external interfacing that allow the system to be the heart of your automated test process.




## C700 as your own final product

The architecture of C700 and its modules were engineered to fulfill research needs alongside final product realization requirements. The system modules have high specifications and best in class components yet maintaining small form factor which qualifies the system to be a final standalone working product.

Physical & environmental conditions were thoroughly considered while designing the C700 to ensure highest performance for field applications. The C700 control layer is as separate layer that allows either autonomous operation with integrated man-machine interface for standalone operation, or to control the system from an external local or remote host.


| Parameter | Specification |
|---|---|
| Number of modules per chassis | 5, 8, 16, or 32 |
| Frequency ranges | Up to 6 GHz (18 GHz Possible with Front-Ends) |
| Frequency Accuracy | $<1 \times 10^{-7}$ OCXO |
| IQ Resolution | 16 bits |
| IQ Bandwidth | 40 MHz TX, and 40 MHz RX |
| Sampling speed | 50 MSps |
| Phase Noise | -107 dBc (@ 1 GHz Carrier, 10 kHz carrier offset, 1 Hz measurement bandwidth, CW) |
| Level Accuracy | < 0.5 dB TX and RX |

KEEP THE VERSATILITY HIGH GROUND

# Configuration and Control

The system open architecture and drivers support a wide selection of industry standard development environments and control software including but not limited to:

LabVIEW VHDL MATLAB

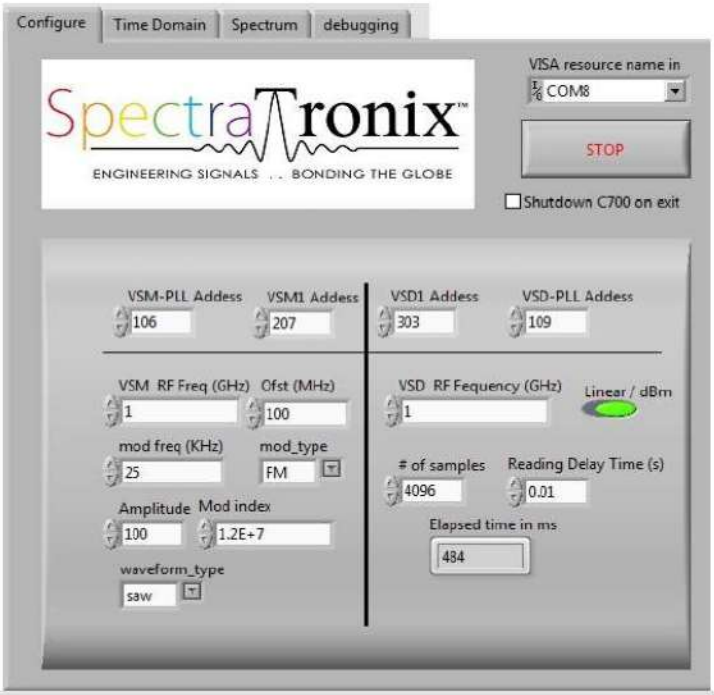
Common technical computing/interpreted languages

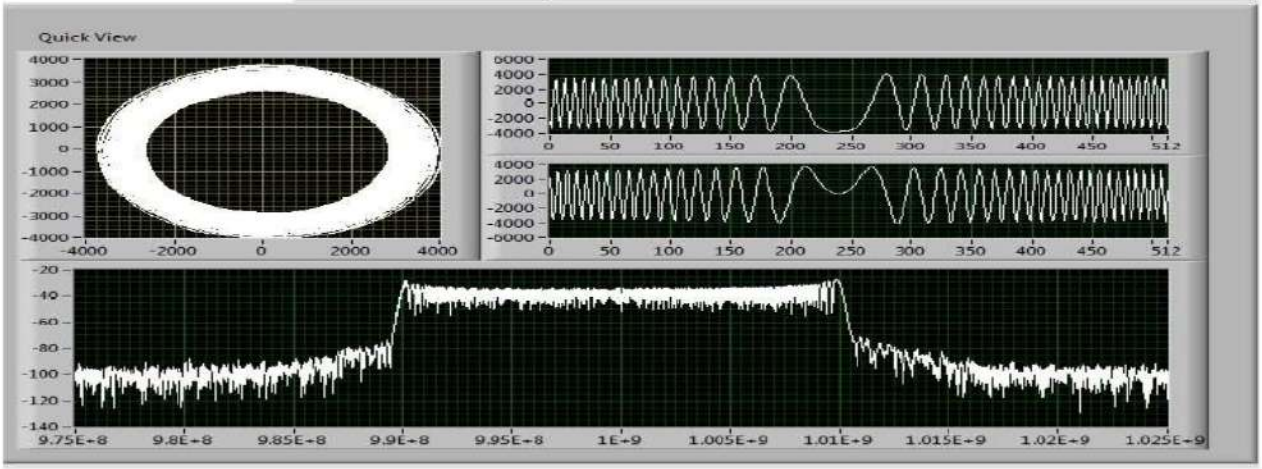
# Collaborative Learning

## C700 LabStore

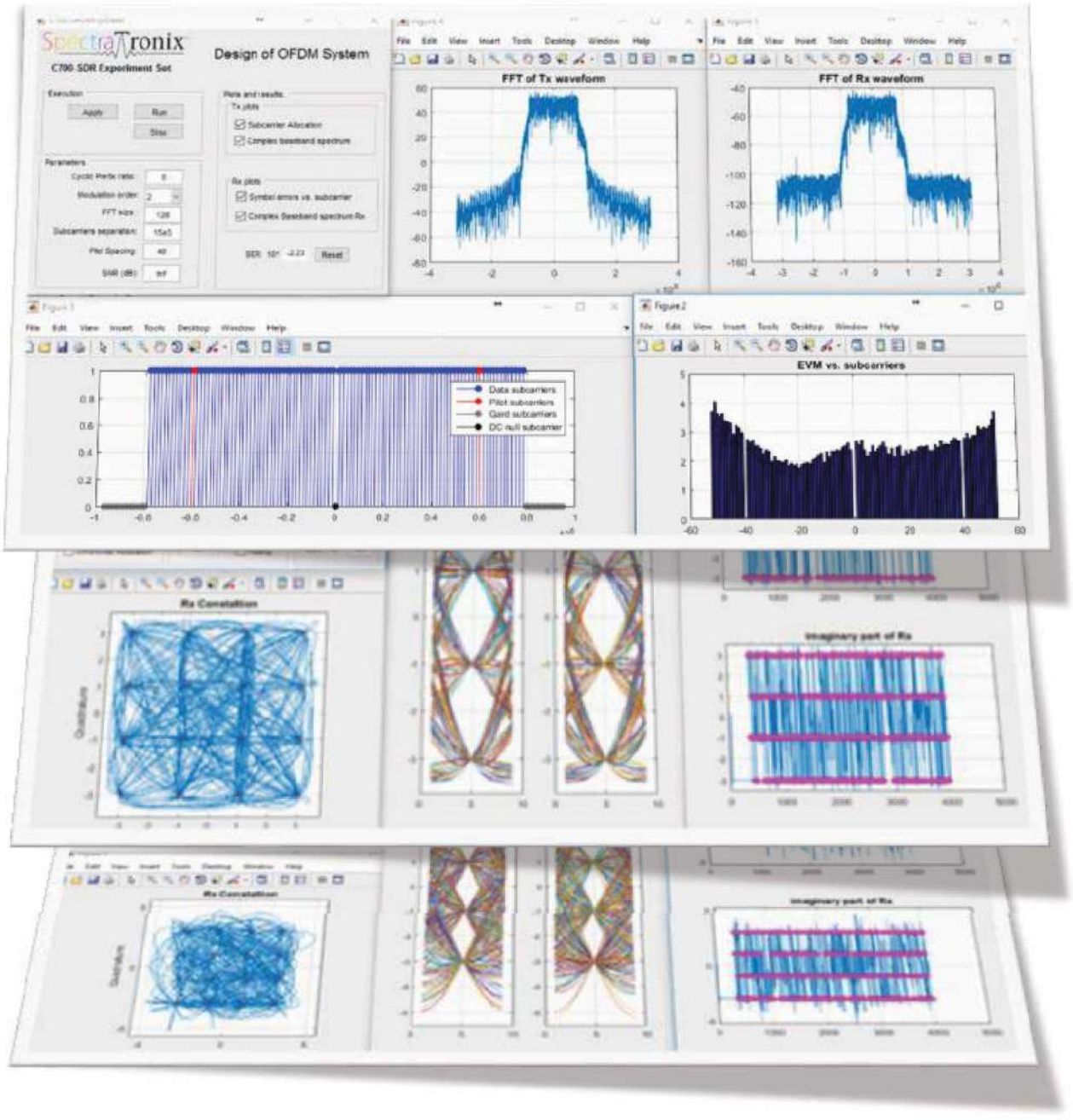
- Revolution in didactic and educational platforms allowing both educators and didactic system providers to connect on a larger and more dynamic scale.
- Hub for educators to browse and obtain ready made experiments to run on C700 platforms.

- Digital Modulations: QPSK, QAM, FSK ...etc.
- Spread Spectrum: FHSS / DSSS
- OFDM Systems
- LTE
- MIMO
    - Channel Matrix Investigation
    - Receive Diversity
    - SpaceTime Coding
- AR Channel Model
- Matched Filter design
- Communication System Design
- Channel Emulator
- Cognetive Radio



# C700 LabStore



WE MAKE SURE YOUR SOLUTION MAKING IS MAKING A SOLUTION

# SpectraTronix Support and Services

## Application Engineering

Our team of top notch experienced application engineers will help you in developing your applications from the definition of the ultimate application requirements to realizing working prototypes.

## H/W Customization

SpectraTronix offers hardware customization services for our standard products to meet any special requirements you may have starting from introducing simple modification to our standard modules up to building fully customized subsystems.

## Communities

Sharing a wide knowledge network of designers, developers, professionals, and innovators allows access to a great pool of software development kits, readily-available libraries, verified codes, signal processing runtime, processing blocks and application notes.

## Product Lifetime, Upgrades and Maintenance Concept

C700 is designed in a way to provide extended product life-cycle, simplify its upgrade and maintenance procedures. Every module constitutes 2 detachable boards:

a) The System Board which is responsible for control and communication with the rest of the system

b) The Functional Board of the module

Once a newer bus speed or controller technology is launched, user may decide to change The System Board to upgrade the system. Similarly if there is a need to upgrade any module functionality to higher performance, user can replace The Functional Board.

# Condensed Specifications

Please refer to C700 datasheet for more details.

| General Specs | |
|---|---|
| Frequency range | 10 MHz to 2.7/6/8/12/18 GHz<br>(Refer to different modules specs in C700 datasheet) |
| Frequency accuracy | 1 × 10−7 (Warm up time 1 minute) |
| Frequency resolution | 100 KHz (1 Hz with VSM or VSD modules) |
| Number of channels | Scalable from 1 to 1000 |
| IQ resolution | 16 bits |
| Real time bandwidth<br>(16 bit resolution) | 40 MHZ/channel<br>(more bandwidth is achievable through channel aggregation) |
| Bus speed<br>(within single chassis) | 700 Mbps<br>Consult SpectraTronix for cluster configurations |
| Number of slot /chassis | 4, 8, 16 or 32 |
| Basic modules<br>(one of each is mandatory) | Controller, Synchronization and PLL |
| Innovation modules | VSM Vector Signal Generator/Transmitter, VSD Vector Signal Demodulator/Receiver, and UDC Up/Down Converter |
| Reference signals | 10 MHz IN, 10 MHz OUT |
| Phase coherence capabilities | Shared Clock & LO |
| Power supply | 9-18 VDC (optional AC power supply integrated in system housing) |
| System housing cooling (Optional) | Forced air |
| Operating temperature | +0 °C to +50 °C |
| **RF Specs (Generator/Transmitter modules)** | |
| Phase noise | -107 dBc (1 Hz) @ 10 KHz from carrier, 1 GHz. |
| Amplitude accuracy | <0.5 dB (Typ. 0.2 dB) |
| Frequency switching speed | PLL1: <0.25 ms (full band)<br>VSM: <10 us (within 320 MHz band)<br>PLL2, PLL3 and PLL4: <1 ms (within 1 GHz band) |
| Continuous sweep modules<br>(PLL2, PLL3 and PLL4) | Sweep range: full band<br>Sweep time: 1 GHz/ms |
| RF output power | -37 dBm to -7 dBm. Overrange -87 dBm to -7 dBm<br>(Optional amplifiers/attenuators available) |
| **RF Specs (Demodulator/Receiver modules)** | |
| Max. RF input level | >12 dBm |
| SFDR (Spurious Free Dynamic Range) | >70 dB |
| Sensitivity | <-90 dBm (Optional -140 dB. Refer to UDC modules specifications) |
| Accuracy | <0.5 dB (Typ. 0.2 dB) |
| Image rejection | >40 dB (optional 80 dB. Refer to UDC modules specifications) |
| Physical dimensions | Refer to detailed datasheet for modules and housing information |
| ROHS | All C700 components are ROHS Compliant |

# Ordering Information

| Order Description | Model Number | | Order Configuration Examples: 4-8 GHz RF Signal Generator | SDR Platform (0.4 to 6 GHz) | FMCW Platform (4 to 6 GHz) | 200MHz BW Receiver/Analyzer (0.4 to 6 GHz) | 8x8 MIMO Platform (0.7 to 2.7 GHz) |
|---|---|---|---|---|---|---|---|
| Base Unit | C700-BU-xx * | | | ● | ● | ● | ● |
| Synchronization module | C700-SYNC1 | | | ● | ● | ● | ● |
| Controller Module (Embedded) | C700-CONT1 | | | | | ● | |
| USB2 communication module | C700-USB2 | | | ● | ● | ● | ● |
| PLL module (100 MHz to 6 GHz) | C700-PLL1 | | | | ● | | x5 |
| PLL module (4 to 8 GHz) | C700-PLL2 | | | ● | | x2 | |
| PLL module (6 to 12 GHz) | C700-PLL3 | | | | | | |
| PLL module (10 to 18 GHz) | C700-PLL4 | | | | | | |
| Vector signal generator/transmitter (0.4 to 6 GHz) | C700-VSM1 | | | | ● | | x8 |
| Vector signal demodulator/receiver (0.4 to 6 GHz) | C700-VSD2 | | | | ● | ● | x5 x8 |
| System Housing | C700-SH-xx * | | | Opt. ** | Opt. ** | Opt. ** | Opt. ** Opt. ** |
| Accessories | *** | | | | | | Splitter needed |

* Refer to C700 datasheet for different models

** Optional

*** For other options & accessories, refer to www.spectratronix.com

SpectraTronix™

SUSTAINABILITY

Beside the countless applications and research fields in which C700 enables employing radio systems to save energy, manage food chains, explore new energy sources, save time and balance world's resources, Spectratronix has a belief system of sustainability as an objective and as a value. In line with this vision, the C700 is offered in a semi-assembled version of enclosures that save more than 50% of shipping volume, consequently reduces CO2 emission considerably during transportation.

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www.spectratronix.com