TECHNOLOGY GUIDE

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Shunyata Research is dedicated to the advancement of power delivery and signal transmission technologies through research and development programs. Companies that achieve long-term success share an ability to develop intellectual properties and technologies allowing them to create state-of-the-art products.

Shunyata Research's designer Caelin Gabriel's seven published patents and materials science background speak for themselves. The performance advantages of Shunyata Research products as reported by industry professionals and consumers are a direct result of our development program and materials science approach.

Shunyata Research produces its own specialized connectors, exotic conductors, patented filter technologies and proprietary metallurgic treatments that all contribute to the exceptional performance of our products.

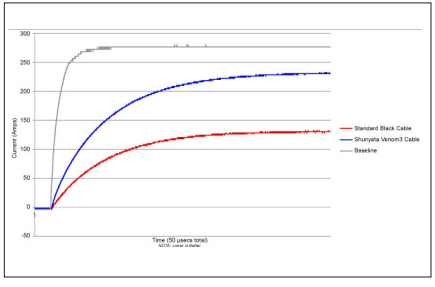
The following descriptions of unique technologies, parts, materials and processes explain why Shunyata Research has achieved worldwide success throughout the world's finest recording studios and consumer home entertainment systems.

DYNAMIC INSTANTANEOUS CURRENT DELIVERY

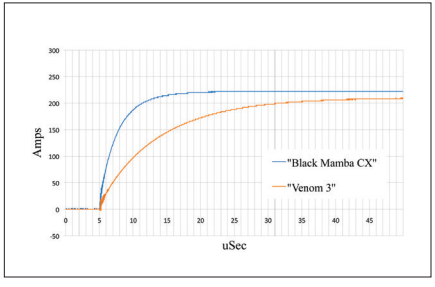
DTCD™ Analysis is a proprietary measurement technique developed to measure instantaneous current flow through very low impedance electrical conductors and contacts. It is used to optimize the design of electrical parts and materials, ensuring optimal instantaneous current delivery. DTCD™ Analysis gives Shunyata Research a clear competitive advantage in the design and development of high performance power delivery products.

DTCD™ test results indicate that designing power delivery systems around the concepts of minimized AC impedance, high quality contact integrity and maximum instantaneous current delivery ensures maximum performance and electrical reliability in home entertainment and professional recording systems.

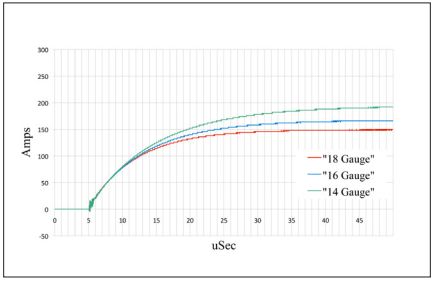
DTCD® MEASUREMENTS



This DTCD™ graph demonstrates the clear current delivery superiority of a Venom power cord versus the stock, commodity power cord.



DTCD™ Analysis demonstrates that wire geometry can have a significant impact on current delivery even between cables that have the same wire gauge.

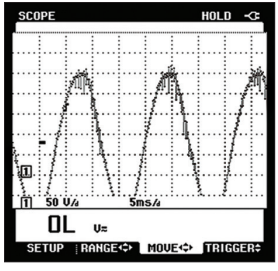


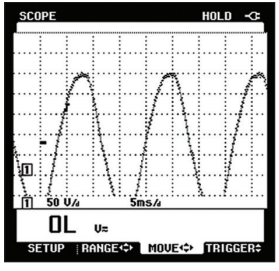
DTCD™ illustrates that differences in wire gauge and inductive reactance clearly affect instantaneous current delivery.

COMPONENT-TO-COMPONENT INTERFERENCE

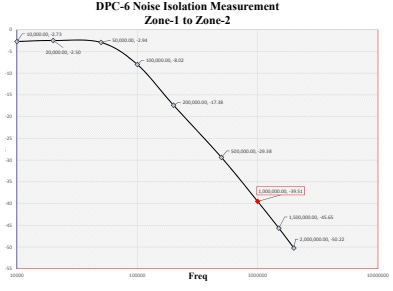
Traditional power conditioners are designed to block noise coming from outside the home but do not address the noise that is generated by the electronic components themselves. In fact, many conditioners act as a 'brick wall' and reflect noise back into other components that are connected to the same power conditioner. CCI™ (component-to-component interference) is one of the most significant, and often overlooked, aspects to power system performance. Shunyata Research has developed several noise reduction technologies to control CCI™ interference without using heavy transformers, coils, or large capacitors; avoiding the hum, buzz and heat associated with the use of these reactive components. CCI™ filters measurably reduce noise and interference, allowing the electronic components to operate in a noise-free environment.

CCI™ MEASUREMENTS





Using a Fluke Power Analyzer: the first graph shows impulse noise on the power line. The second graph shows the reduction in line noise when using a Shunyata Research NR (noise reduction) power cord.



Dramatic CCI™ noise reduction as demonstrated by the Hydra DPC-6 power conditioner that was designed specifically for computer-based audio systems.

DISTRIBUTED POWER CONDITIONING

Distributed Power Conditioning is a solution developed by Shunyata Research to solve the problems associated with power line noise in large, complex entertainment systems. Entertainment and pro-audio systems may include multiple electronic components that may be located in multiple locations making it impossible to use a single-box power conditioner solution.

Shunyata Research solves this problem by intercepting noise at several power line entry and exit points in the entertainment system. System-wide CCI™ interference can be significantly improved by using a combination of noise reduction products including; power conditioners, NR power cords and small outlet filters.

RESEARCH PROGRAMS

Our research programs guide the development of parts and materials used to improve the performance of our products. We have amassed a huge technical knowledge base that we use in the design of our products. Shunyata Research builds its own test equipment and power supplies specifically to test the effects of DTCD™ and CCI™ (component-to-component interference).

SHUNYATA TECHNOLOGY AT WORK IN MEDICAL ELECTROPHYSIOLOGY IMAGING SYSTEMS.

NOISE REDUCTION

The **NIC**™ (Noise Isolation Chamber) is a patented Shunyata Research device that reduces high frequency power line noise. It employs a ferroelectric substance that actually absorbs high frequency noise without any of the reactive negatives associated with transformers and large capacitors as used in conventional power conditioners. ~ Patent US 8,658,892 ~

The **ZrCa-2000** is a proprietary compound, used in NICs, that absorbs and dissipates high-frequency noise when used in power conditioners or power supplies. The ZrCa-2000 materials are ferroelectric, crystalline materials that act on the electric field similar to the manner in which ferrite (ferrous metals) acts on the magnetic field. Both absorb high frequency noise; however, the ZrCa-2000™ compounds do so without the negative sonic side effects commonly associated with the use of ferrite in an audio system. ~ Patents US 8,658,892 and US 6,242,689 ~

CCI™ filters have the unique ability to reduce component-generated power line noise without inhibiting DTCD™ (dynamic transient current delivery). This unique filter element prevents power line noise from one component contaminating the other adjacent electronic components. Shunyata Research's CCI™ filter modules consist of proprietary multi-stage filters that reduce power supply-generated noise without the use of heavy transformers, coils or large capacitors.

The **CGS** (Chassis Grounding System) is an internal ground-buss that uses patented NIC™ technology to reduce ground plane noise. CGS provides a common grounding point and extends the noise reduction capability of the power conditioner's internal NICs to other electronic components. CGS helps to minimize inter-component voltage differences between component chassis and may reduce the hum associated with ground loops.

PROPRIETARY TECHNOLOGIES

KPIP™ (Kinetic Phase Inversion Process) was developed by Caelin Gabriel after years of research into the underlying causes of various effects such as burn-in, wire directionality and the effects of cryogenic treatment. He discovered that there was an underlying core principle that burn-in and cryogenics only "partially" addressed. Once the governing principle was understood it became possible to create a processing technique and machine that could virtually eliminate the need for burn-in and cryogenic treatment.

The **QR/BB**™ is a patent-pending device that dramatically enhances the perception of dynamic impact and timing when connected to amplifiers or other high-current electronics. The QR/BB™ is unique in that it provides a local reserve of energy, or Coulomb charge, that mitigates the inductive reactance of the AC power line without using coils, transformers or capacitors. The QR/BB™ acts as an instantaneous energy reserve when placed in-line with an AC power supply.

Crimping, soldering, brazing and cold soldering are all inferior methods of joining two wires or terminals together. **Sonic welding** uses high energy sonic waves to literally join two metals together at a molecular level. There is no solder or intermediary metals involved in the process.

Shunyata Research operates its own on-site Cryogenics International **Computer Controlled Cryogenic** plant. Liquid nitrogen is used to reduce the temperature of the contents to -320 degrees Fahrenheit. The computer monitors and lowers the temperature by a single degree at a time to prevent thermal shock. We use this process to improve the performance of wire, conductors, connectors and terminals that are used in our power products and signal cabling.

VIBRATION MANAGEMENT

After years of research into the negative effects of vibration, Shunyata Research developed its own **vibration isolation** using sub-miniature accelerometers that accurately measure the effects of floor and airborne sound waves. We use it in the development of vibration absorbing materials such as energy absorbing footers, AC outlet gaskets and chassis dampeners that reduce resonant vibration. Recognizing that vibration control is important to overall performance, our chassis are made with optimally dampened steel and aluminum, rather than plastic or thin-wall sheet metals.

Power distributors react very similarly to power amplifiers in their sensitivity to vibration. Using the Shunyata vibration analyzer, Caelin Gabriel developed the Shunyata **Isolation Footer**, which possesses excellent measured vibration dampening characteristics. Shunyata Research also produces several SSF (stainless steel feet) that employ energy absorbing polymers. (Note: SSF feet are standard on some models and optionally available on others)

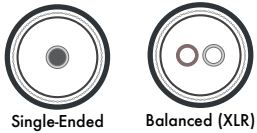
SONIC-WELDING IS SUPERIOR TO CRIMPED OR SOLDERED CONNECTIONS.

SIGNAL TRANSMISSION TECHNOLOGY

Conventional audiophile signal cable designs focus primarily on metal purity, insulation materials, connectors, and different types of geometry. After 25 years of military and signal transmission research, scientist Caelin Gabriel discovered that often-overlooked factors in achieving high resolution cable performance were self-induced signal micro-distortions. Gabriel was able to identify many, including 'dielectric distortion', through years of rigorous scientific measurement and listening tests. In the subsequent 18 years, numerous patented technologies and proprietary processes that measurably and audibly improved cable performance were developed.

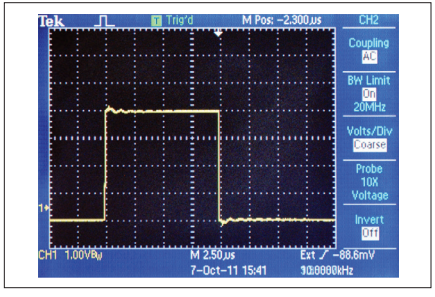
The technologies described herein are part of an overall design imperative that seeks to preserve the original signal integrity without alteration. Shunyata cables perform these functions without mysterious pseudo-science explanations or intentional signal manipulations in the form of 'networked cables'. Shunyata Research uses the finest conductors and metals available. Using these materials, Shunyata Research designs its own cabling using Ohno copper, VTX™ (virtual tube) conductors and our own line of custom connectors. Many competing manufacturers don't even make it this far –but this is just the beginning for Shunyata Research in the quest for signal transmission perfection.

Many manufacturers use the same cable construction for both RCA and XLR cables. Singe-ended and balanced signal transmission is fundamentally different with each requiring a different cable design for optimal signal transmission and minimal RFI/EMI interference. All Shunyata Research cables are specifically designed for each type of signal interface. A coaxial design is best for single-ended connections while a shielded twisted pair design is best for balanced connections.

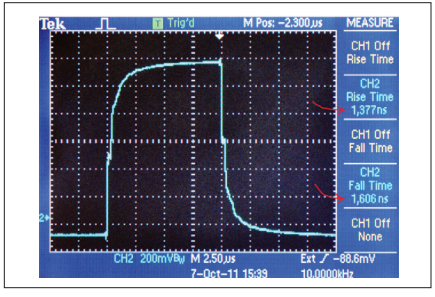


More than twenty years of research into the science of high-resolution signal propagation has produced some of the world's most advanced patented and patent-pending technologies. ΞTRON® technology reduces dielectric distortion; TAP (Transverse-Axial Polarizer) technology addresses electromagnetic polarization distortion; HARP deals with current mode cable resonance; and VTX™ conductors eliminate skin effects. All of these technologies are benign, meaning they do not alter the original signal in any form. Rather, these technologies preserve the original signal by minimizing several different forms of micro-distortion.

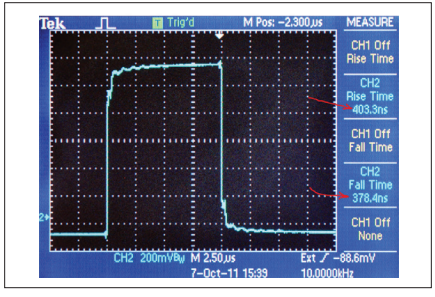
SIGNAL COMPARISON



Source Signal: Note the relative symmetry to the square wave rise and fall. The small variations following the top and bottom of the wave are caused by harmonic ringing.



No ΞTRON®: Notice the rounded lead edge and sloped, falling edge of the signal. This indicates signal absorption by the dielectric in the cable.



ΞTRON®: Notice that the clean rise and fall of the signal is closer to the source signal. The amount of dielectric absorption has been reduced.

SIGNAL TRANSMISSION

ΞTRON® is a technology developed by Shunyata Research that prevents dielectric absorption and re-radiation in signal transmission. It requires a special type of conductor that has two signal paths and an electric field compensation circuit that creates a cancellation signal that prevents the insulation from developing a charge. ΞTRON® cables preserve the integrity of the source signal even when using very long runs of cable. Patent US 8,912,436, Patent Ch ZL201180047344.2.

TAP (Transverse Axial Polarizer) is a device that interacts with the electromagnetic field generated by the signal traveling along the signal cable. TAP improves the sonic performance of the cable by modifying the behavior of the electromagnetic wave that surrounds the signal cable. In effect, the TAP blocks longitudinal-oriented waves while passing transverse-oriented waves. The effect in sonic terms is like using polarized sunglasses to reduce reflected sunlight. Correcting polarization micro-distortion reduces what some call sonic glare. ~ Patent Pending ~

HARP was discovered through Gabriel's research into 'current drift' and audio frequency current resonances that occur in speaker cables. Theoretically, a speaker cable may develop current resonances in the audio band, being roughly analogous to standing waves (modals) in room acoustics. The HARP module acts as a current mode diffraction device that breaks up these resonances, improving the perceived resolution and coherency of the system.

WIRE & CABLE

Shunyata Research uses only the highest purity of copper available for the production of its wire products. **OFE Alloy 101** or C10100 is the highest grade of copper with a minimum 99.99% purity and a conductivity rating of 101% IACS. OFE stands for oxygen-free electrolytic and supersedes the term OFHC (oxygen-free high conductivity). C10100 is the only grade of copper that comes with a written certification of purity. Certified by ASTM F68 C10100.

Ohno wire, also called PCOCC was invented in 1986 by professor Atsumi Ohno of the Chiba Institute of Technology in Japan. Copper wire is created by an extrusion process that pulls a rod of cold copper through a small orifice which creates multiple crystalline boundaries. By contrast, Ohno wire is made by a process using heated molds that cast a wire to form a single crystalline structure. Ohno wire is well known for its exceptionally pure, grain-free sonic qualities.

Shunyata Research's exclusive **VTX**™ conductors are made in the shape of hollow tubes. Since current can only travel through the outer rim on the wire, there are no skin effects or random eddy currents. VTX™ conductors are made from pure OFE C10100 or Ohno (single crystal) copper.

ArNi® is a type of wire created by Shunyata Research designed to be the finest quality wire available for audio purposes. It begins with the highest purity of copper available – OFE C10100 or Ohno (single crystal). Then it is formed in virtual hollow tubes eliminating skin effects and eddy current distortions. In addition, the wire undergoes our proprietary KPIP™ process.


DIGITAL
HIGH CURRENT
HIGH CURRENT
DIGITAL
ANALOG
CopperCONN™

CONNECTORS & TERMINALS

Many audiophile grade connectors are made from brass or bronze. While some may get a plating of silver, gold or rhodium, the majority of the current is carried by the contact's base-metal. **CopperCONN®** connectors contain pure copper contacts which has a much higher conductivity than brass. The difference in performance is clearly audible.

The **STIS**™ speaker terminal system was designed to eliminate the high cost and complication of speaker cable termination. The system makes it possible to use the same speaker cable with a variety of different amps and speakers. If a spade is damaged, you can simply replace it without sending it to the factory for re-termination. STIS™ interchangeable terminals have undergone extensive user listening tests to ensure that they provide the finest audio performance that is equal or superior to non-replaceable, soldered terminals.

SHUNYATA RESEARCH®

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