The magazine for manufacturers and integrators of antennas, components and infrastructure for the wireless communications industry

ANTENNA SYSTEMS & TECHNOLOGY

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Schriever Air Force Base, Colo. - Workers review the assembled Geodesic Dome Phased Array Antenna Advanced Technology Demonstration. Testing is currently underway and the system is scheduled to be connected to the Air Force Satellite Control Network.

Schriever Tests Phased Array Antenna, Prepares For AFSCN Connection

The Geodesic Dome Phased Array Antenna Advanced Technology Demonstration housed in the large white hangar near the Colorado Tracking Station, continues to progress toward its goal of demonstrating advanced capabilities for contacting Department of Defense satellites.

The next step for the system in becoming fully operational is connection to the Air Force Satellite Control Network, already in progress.

"It's exciting that live satellite contacts have started and will continue through May," said Gary Wambold, 50th Space Wing Plans and Programs. "We're getting closer to being able to demonstrate the full range of capabilities this antenna can provide to our AFSCN user community."

A phased array antenna connected to two co-located portable ground stations, as well as the CTS ground station equipment, will be used to accomplish standard AFSCN satellite supports. Satellite operation centers from the 50th Space Wing, NASA and others will participate in this demonstration.

The demonstration, a jointly sponsored effort by the Space and Missile Systems Center and Air Force Research Laboratory, is a representation of the next step in the development of this type of antenna technology able to provide more flexible, responsive and reliable satellite telemetry, tracking and commanding capabilities for the Air Force while reducing life cycle operating costs.

The antenna is a follow-on effort to the 2004 Space Battlelab Initiative, Phased Array for TT&C, which has successfully contacted NASA and DoD Low Earth Orbiting satellites. The ATD antenna is made of a six-panel section of a 10-meter equivalent GDPAA antenna and is capable of contacting satellites in geosynchronous as well as low and medium Earth orbits.

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Lockheed Lands $35.8 Million Navy Contract to Design and Produce Antenna Buoy Systems

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Silver is the New Copper: *Lower Cost Antennas Come of Age*

When it comes to the latest in electronic antenna technology, the answer is printed antenna solutions, silver ink antennas to be exact. Why silver? Printed silver antennas offer a replacement for the current etched copper or stamped antennas, saving manufacturers time and money and offering a plethora of additional benefits.

Read the article on page 6

New Advancement in Sensor-Based RFID Forklift Systems

The new sensor-based RFID system from MA/COM utilizes an acoustic sensor, broad beam antenna and controller logic to identify an RFID pallet tag after it has been loaded onto the forklift.

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Now Accepting Abstracts

The 7th annual **Antenna Systems Conference** will take place September 1-2 in Philadelphia, Pa. The two-day international event will focus on the most recent advancements in antenna systems and technology for a variety of industries and applications. Also included will be a technology track dedicated to short-range wireless standards, technology and applications.

Don't miss this opportunity to present your technology solutions and industry expertise to today's leading design and systems engineers. Only 40 speaking slots are available.

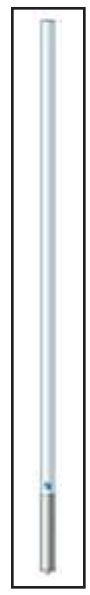
For more information about submitting an abstract visit **www.antennasonline.com** or contact Jeremy Martin at **Jeremym@infowebcom.com**. We are looking for informative sessions on a variety of topics, including but not limited to:

Smart Antennas
Base Station Antennas
Satellite Antennas
Military Antennas
Embedded/Mini Antennas
SRW Antennas
Antennas for WiMAX/LTE
New Antenna Design
Maximizing Peformance
Materials Advancements
Test & Measurement
Standards Developments
Component Technology
Antenna Selection/Integration
Market Forecasts/Updates
DAS

Sinclair Unveils Multifunctional Transport Antennas and Omni-Directional Antennas

Sinclair Technologies, a manufacturer of antenna and filter products, has introduced its new SM300 and SM600 series of transport antennas that are specifically designed to address the need for compact, low profile, broadband antennas. These multifunctional antennas are single port, making them easy to install. Given their broadband capabilities, these models can serve multiple discrete RF systems when used with an X-coupler. SM 300 covers TETRA, UHF, 746 to 869 MHz, GSM, CDMA and TDMA, while the SM 600 covers frequency bands between 746 to 2500 MHz. Designed to withstand constant vibration and harsh environments without compromising performance, these rugged antennas are suited for rooftop mounting.


SM600


SC479

Sinclair's SC412 is a broadband, high gain, collinear, omni-directional antenna. This PIM (passive inter-modulation) certified antenna covers the full frequency range of 746 to 869 MHz, with 11.5 dBd gain and handling 500 watts of power. It offers a wind velocity rating of 170 mph.

Available with 2°, 4° ,6°, 8° and 10° of electrical tilt, this antenna is suited for critical outdoor applications. For optimal performance a top cross bracing kit is recommended (model SMK-345-A7) for side mounted installation. A null fill version of this versatile antenna is also available for close-in coverage enhancement.

Sinclair's SC 479 is a high-power broadband collinear omni-directional antenna. This PIM (passive intermodulation) certified antenna is null fill optimized for ultimate functionality in areas with excessive multipath.

Its heavy duty construction makes it well suited for critical outdoor applications where tower space is limited. Available with 0, 3 and 5° electrical tilt, the SC479 covers the full frequency range of 746 MHz to 869 MHz. For optimal performance the SMK-325-A3 side mounting kit is recommended.

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Winegard Introduces CARRYOUT Automatic Portable Satellite TV Antenna

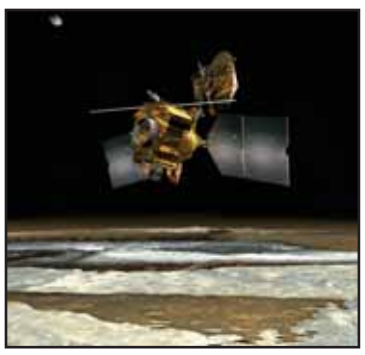
Winegard Company has introduced the CARRYOUT Automatic Portable Satellite TV Antenna. At 15.6 inches high and 20 inches in diameter, it is the most compact automatic portable satellite TV antenna on the market. A perfect partner for RVers, camping, boating, tailgating, races, wooded areas, cabins and vacation homes, the CARRYOUT antenna can be used anytime, anywhere. Simply connect to a receiver and plug into 12 V power source and it'll do the rest. No remote or controls needed.

Featuring DVB technology for fast and accurate satellite acquisition, the CARRYOUT automatically locks on and switches between the desired satellites. The antenna is compatible with all major satellite providers and receives all standard and HD programming for DISH Network and Bell TV, as well as standard DIRECTV programming (not compatible with 110º for HD or KA-band satellites 99º and 103º).

An easy grip handle provides for easy carrying and added security. The CARRYOUT runs off of 12 V and plugs into a vehicle's standard cigarette outlet or Winegard's 110 V power inverter. Unit weight is 13.5 lbs. With an MSRP of $899.00, the CARRYOUT (GM-1518) is the most affordable automatic portable mobile entertainment option on the market. Product availability starting April 2009.

Optional accessories include a 110 V power inverter (GM-1200) and a ladder mount option with quick disconnect for the Carryout (GM-3000), both sold separately.

Northrop Grumman-Built Satellite Antenna Enables NASA's Discovery of Buried Glaciers on Mars



The antenna was developed by Astro Aerospace, a business unit of Northrop Grumman's Aerospace Systems sector, for the Italian Space Agency's SHAllow RADar (SHARAD) instrument. SHARAD probes below the Martian surface using radar waves in the 15-25 MHz frequency band for high-depth resolution.

Scientists analyze the reflection of radar waves to characterize the Martian surface and subsurface layers of rocks, dust and ice. A radar capable of seeing deeply requires a very large antenna such as SHARAD's, which is 10 meters (32.8 feet) in length but weighs less than 3 kilograms (6.6 lbs).

``The SHARAD antenna combines our specialized ability to provide both a super lightweight structure and one with the necessary scale for the successful Mars Reconnaissance Orbiter mission," said Chris Yamada, general manager of Strategic Business Units, Northrop Grumman Aerospace Systems.

Scientists analyzed data from the spacecraft's radar instrument and reported in the journal Science that glaciers cover miles of the Martian surface, extending from edges of mountains or cliffs. These recent glaciers were found at much closer to the equator than is stable at the surface given current Martian conditions. SHARAD is able to see through the surface layer of dust and rock that insulates and preserves the glaciers.

One of the glaciers is triple the size of the city of Los Angeles and up to a half-mile thick. The presence of large amounts of ice at these latitudes could be used as a source of water to support future exploration of the Red Planet.

Astro Aerospace, with a 100 percent success record on hundreds of space deployables, recently was recognized by NASA's Jet Propulsion Laboratory for development, testing and on-time delivery of SHARAD's antenna under the constraints of a short development cycle for the SHARAD radar sounder instrument.

The SHARAD antenna uses a similar technology to the MARSIS antenna built by Astro Aerospace for the European Mars Express spacecraft. The MARSIS antenna successfully deployed to a length of 40 meters (131 feet) once Mars Express entered the desired orbit around Mars.

ANTENNA SHORT-COURSES ANNOUNCED

Antennas for Wireless Communications: Basic Principles & System Applications

This half-day short course will present the basic principles of antennas as applied to wireless communication systems. The fundamental types of antennas (electrically small, resonant, broadband and aperture) will be discussed, including examples of popular antennas for base stations and for satellite, vehicular and handheld terminals. Array antenna basics will be introduced. Special considerations for popular systems such as cellular radio and ultra-wideband radio will be presented. The presentation will conclude with a photo presentation of antennas in practice.

INSTRUCTOR:
Dr. Warren Stutzman, Virginia Tech & Maxtena, Inc.

Smart Antennas: Principles & Applications

This half-day short course will present the basic principles of smart antennas and how they are deployed today. General field of smart antennas will be covered with an emphasis on multi-beam antennas.

Polarization, pattern, space and selection diversity techniques as well as MIMO implementation will be addressed with respect to WiFi, WiMax and ZigBee applications. Peripheral hardware and software that enable operations of the smart antennas will also be discussed. The short course will conclude with live demonstrations of two smart antennas using WiFi and ZigBee hardware.

INSTRUCTOR:
Dr. Tayfun Ozdemir, CTO, Monarch Antenna

The following short-courses will take place August 31st at the Hyatt Regency Penn's Landing in Philadelphia, Pa. the day before the 2009 Antenna Systems Conference. For more information or to register, please visit **www.antennasonline.com** or contact Jeremy Martin at **jeremym@infowebcom.com**.

Continued from cover

"The team has leveraged small business innovative research projects and modern DoD acquisition practices to bring phased array technology to the AFSCN," said Capt. Jason Spindler, SMC project manager for the ATD. "Each step has been a building block, and this demonstration is another monumental step in advancing satellite operations to meet increasing warfighter needs."

In conjunction with 22nd Space Operations Squadron technicians and network schedulers, Ball Aerospace, the main contractor for the project, began testing the antenna to characterize beam patterns, confirm transmit and receive capabilities and ensure function as expected.

"Things are progressing very well and we're on schedule to meet our goals," said Gary Scalzi, Air Force Research Lab Government Demonstration Director for the ATD. "The support from Schriever has been tremendous and we look forward to continuing our work together and making this project a success."

Due to the ongoing tests, the northeast corner of the controlled area on Schriever continues to be restricted. While no hazard is believed to exist, the establishment of a temporary restriction from entering the testing area is a safety precaution until final analysis is completed.

Laird Technologies Releases New Reduced-Size HD RooTenna Antenna Enclosure

Laird Technologies, Inc., recently introduced a new reduced-size HD RooTenna enclosure.

The integrated unit is designed to accommodate smaller-sized equipment requirements for broadband wireless access (BWA) suppliers and carriers who deploy industrial WiFi / WLAN / WiMax / LTE systems, mesh networks, Wi-PoP base stations and/or client antennas using Point-to-Point and WISP applications.

These RoHS-compliant wide-band antennas offer spectral flexibility and operate within 900 to 928 MHz and 2,400 to 2,700 MHz band coverage and include Laird Technologies' patented RJ45-ECS field replaceable feed-through Ethernet connector, as well as UV-resistant radomes made of ASA plastic and stainless steel hardware. Seven different options of antenna connectors are available to adapt to any user's equipment.

The metallic die-cast enclosure is available as a stand-alone unit with an integrated low-gain antenna, a detachable high-gain panel antenna or an aluminum box with no antenna. All models have a removable and customizable user-mounting plate inside for installing electronics, as well as a hinged cover for easy maintenance with an IP-67 water and dust seal rating. The HD RooTenna is available in either pole-mount or wall-mount versions, with or without a heavy duty tilt bracket. There are 11 engineered knockouts (nine for N connectors and two for sized cable) eliminate the need for drilling.

Next Generation 3G Converged RF Architecture for Mobile Devices

TriQuint Semiconductor, Inc., an RF front-end product manufacturer and foundry services provider, recently introduced its TRIUMF Module family, convergence architecture for mobile device manufacturers designing next generation 3G/4G products. The TRIUMF - TriQuint Unified Mobile Front-end -Module family will offer manufacturers a streamlined radio frequency footprint combining GSM, EDGE, WCDMA and HSPA transmit functionality into one module. This convergence of functionality into one power amplifier module should offer up to a 50 percent size reduction over today's multi-band module solutions.

3G convergence refers to the ability to support numerous frequency bands and air-interface modes like GSM, EDGE, WCDMA and HSPA used in 3G mobile devices, into one highly-integrated, streamlined RF module. TriQuint's TRIUMF module architecture will enable manufacturers to use the converged module in place of multiple discrete modules, saving board space for features such as Wi-Fi, GPS, Bluetooth, cameras and FM radios.

New Frequency MIMO Channel Emulator for Testing of LTE, WiMAX, And 2G/3G Wireless Technologies

Azimuth Systems, Inc., a provider of wireless broadband test equipment and channel emulators for broadband wireless technologies, has introduced the ACE MX MIMO Channel Emulator, a purpose-built, enhanced testing solution architected to meet the demanding needs of Multiple-Input, Multiple-Output (MIMO) and orthogonal frequency-division multiplexing (OFDM)-based systems. Built upon the performance of the company's WiMAX and Wi-Fi channel emulators, the ACE MX provides the advanced channel emulation features required for testing LTE and other advanced wireless infrastructure equipment and devices. The new ACE MX also includes all of the backwards-compatible channel emulation features required to test 2G/3G cellular products.

LTE and WiMAX systems employ MIMO technology, which exploits real-world channel conditions such as multipath and fading, to constructively improve channel performance. As a result, laboratory-based testing of MIMO systems necessitates the use of channel emulation techniques such as dynamic channel conditioning, shadow fading, complex antenna correlation and more that are provided by the ACE MX. The ACE MX's rich channel modeling and emulation capabilities enable equipment manufacturers and service providers to reliably and accurately characterize the operation and performance of MIMO-based systems under a multitude of real-world RF conditions.

What's Your Subscription Status? Check the cover of the magazine to make sure you don't miss a single issue of Antenna Systems & Technology Magazine

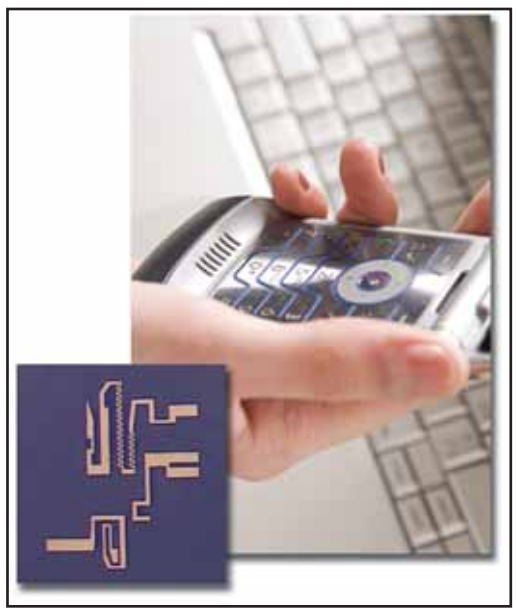
Silver is the New Copper:

Lower Cost Antennas Come of Age

By Steve Dominak,
MACtac ~ A Bemis Company

As electronics become thinner and lighter, OEMs continue to push the boundaries of technology, searching for the next highly advanced, yet cost-effective breakthrough. When it comes to the latest in electronic antenna technology, the answer is printed antenna solutions, silver ink antennas to be exact. Why silver? Printed silver antennas offer a replacement for the current etched copper or stamped antennas, saving manufacturers time and money and offering a plethora of additional benefits.

While a seemingly simple concept on the surface, this new advancement in antenna technology is not only thinner and lighter than conventional antennas, it is less expensive to produce, maintains or improves antenna performance, offers greater flexibility and is tunable for a wide variety of wireless applications in multiple markets.



Printed silver ink antennas can be used for various applications including cell phones, laptop computers and scanners.

Technique is Everything

Using printed silver ink for antenna production is a major advancement in an industry where components are small and design changes are frequent. As opposed to the traditionally slow processes of manufacturing conventional antennas, printing can hold tight tolerances at very high speeds, making it a well suited alternative.

Traditionally, antennas are manufactured using copper etching techniques, flexible printed circuits (FPC) or stamped antennas. These conventional productions require multi-step operations using multiple photo mask and acid baths to remove the excess copper and the etching compound or complex stamping tooling. The copper contacts must then be plated with nickel and gold and the copper coated to prevent oxidizing and greening, for additional protection at an additional cost. With regards to stamped antennas, complexity levels are high as part production requires both expensive hard tooling and long lead times. These antennas still require the costly contact plating for electrical conductivity and just one design change can mean a tremendous tooling cost, scrapped parts and an even longer lead time to get the piece into production.

With a printed antenna, the silver is printed directly on the film in just one step. Since printing silver ink is an additive process, as opposed to the subtractive process of etching the copper layer to create a final image, it is more cost-effective and time-efficient as there is just one printed screen. The printed antenna solution is also more environmentally friendly because production consumes fewer raw materials, limits the amount of waste produced and eliminates acids used in traditional manufacturing processes. Silver has passed even the most stringent tests from the US Environmental Protection Agency (EPA) and meets other worldwide standards. Additionally, in certain regions of the world, etching processes have been banned due to byproduct production.

Vital to the successful manufacturing of the printed antenna is an understanding of the electrical properties of silver ink, which are mostly determined by conductive particles and binders mixed into the ink solution and the way these particles 'connect' in the cured ink. Conductive innovators like MACtac have developed printed silver antennas that use abrasion resistant ink (ARI), which eliminates the need for selectively plating contact areas. This unique ink is used over the entire antenna, making it impervious to damage from mating parts. Designers can change the point of contact without concern over the location of the contact points, making the engineering process easier and allowing for design flexibility in case of alignment issues. ARI is the interface between the antennas' Pogo pins or spring-loaded contacts. Incorporating these inks allows for faster part processing as well as lower tooling cost since there are no additional process steps, resulting in an antenna that can typically be manufactured for at least 20 percent less than the traditional copper antenna.

Going the Distance

MACtac's silver ink printing is a well-tested industrial process at frequencies of 13.56 MHz to 5.8 GHz. Through recent side-by-side testing by select key industry players, printed antennas passed a full set of environmental tests, including salt spray and abrasion. They also performed well during oxidation, flex and thermal cycle tests, ensuring the antennas can withstand heat and maintain performance requirements. In all cases, printed silver antennas proved superior to their etched copper counterparts and also matched or exceeded the performance of copper antennas in efficiency and variable standing wave radio (VSWR) results. Despite the industry perception that printed silver antennas require additional costs with poorer performance results, testing in a number of areas proves the performance benefits of the printed silver at a percentage of the cost incurred with copper.

A growing dependence on wireless technology has lead to the development of antennas that are light weight and precisely tunable, meeting a variety of portability and performance requirements.

Not only do these printed antennas perform better than copper in less space, they provide a number of design options that once were not possible. The silver ink process enables last-minute changes very quickly, delivering greater flexibility in design and production and eliminating scrap. Prototype antennas can be manufactured through laser ablation, employing a low-power laser to burn the silver printed in a block off the face of the polyester, making the antenna to shape during the manufacturing process. This process can provide accurate prototypes in minutes, eliminating the complex process that engineers traditionally use of soldering copper sheets onto a circuit. Engineers can now make design changes and test the final design in minutes for validation. Those who prefer to use sheets for design can use a small plotter to cut the antenna to shape.

As stated, the unique components of silver allow for quick production, in high volumes or individual prototypes, at a significantly lower cost than other technologies and provide better mechanical performance and greater reliability of the antenna. The silver ink antenna is printed directly onto thin films, providing enhanced flexibility and allowing the antenna to conform to curved surfaces better than copper. This is critical as most devices requiring these antennas have curved surfaces that are not friendly to etched copper circuits. The substrate used to print the silver can also be designed to flow or bond into the final shape, which can not be accomplished with etched copper or stamped antennas.

The Future of Printed Silver Ink Antennas

As electronics become smaller and lighter, maximizing space is critical to design engineers. Antennas can now be housed on a device's exterior in a hidden location such as under a label, logo, lens or battery door, while providing performance benefits and offering design engineers greater flexibility in design development.

Final delivery also improves with printed silver ink antennas because die-cutting can be performed in-line, allowing OEMs to deliver antennas faster and in finished format. Final markings and last-minute design changes are possible without creating excessive scrap due to incorrect inventory. Unlike conventional multi-step etching or stamping processes, these last-minute changes don't cause excessive tooling charges or delays. Lasers can be employed to modify finished parts, providing unique tuning that optimizes product performance, which can be done at the OEM's assembly house. With this method, antennas are available in rolls or cingulated to accommodate customers' manufacturing requirements.

The flexibility of printed silver ink antennas allows for seamless, easy integration into a variety of markets, including automotive, personal electronics, medical device systems, navigation devices and special applications like smart cards and RFID (radiofrequency identification) tags. Devices requiring antennas are becoming more prevalent and with that is the increasing demand for wireless technology compatibility and other technologically advanced capabilities.

As electronic and communication industries continue to take shape, so does the future for printed antennas. Printed silver ink antennas solve the problems of weight, shape, reproducibility and cost and provide the ultimate in flexibility for designers and customers, making them a viable solution for the world of wireless connections in all markets.

Printed silver ink antennas can be developed cost effectively to meet the needs of industries and markets that previously had no viable wireless technology solutions.

About the Author

Steve Dominak, Conductive Solutions Business Development Manager, MACtac MACtac is a well known printer of Silver circuits as they have produced the Energizer on-board battery tester since 1992. MACtac is a global company with manufacturing facilities in worldwide.

For more information visit www.MACtac.com.

Developments in Plasma Antenna Technology

By Dr. Ted Anderson
Haleakala Research and Development, Inc.

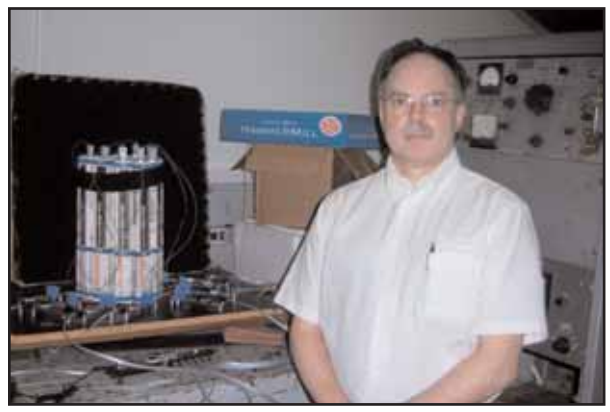
Haleakala Research and Development, Inc. has been awarded five phase 1 SBIRs and two phase 2 SBIRs. The SBIR awards came from the Air Force, Army and Navy.

With that funding, Haleakala R&D, Inc has developed mathematical theories, computer codes, experiments, prototypes and commercial prototypes of plasma antennas, plasma frequency selective surfaces, plasma radomes, plasma waveguides and plasma coaxial cables. While Haleakala has developed a variety of plasma technologies, the primary focus has been on the plasma antenna. The company has researched, developed and prototyped plasma reflector antennas, plasma AM/FM radio antennas, transmitting and receiving plasma antennas up to 20 GHz (we can go much higher), high powered plasma antennas which can transmit up to 5 megawatts of power in the pulsed mode, and a smart plasma antenna which is compact, light and can steer 360° in milliseconds, find and lock onto transmitters, has a reconfigurable beamwidth and the ability to reconfigure from single to multilobe antenna patterns.

Haleakala R&D, Inc. ruggedized smart plasma antenna prototype

This smart plasma antenna uses plasma physics to steer and shape the antenna radiation pattern from one internal plasma antenna surrounded by a cylindrical ring of plasma tubes. Tubes that are off or of low plasma density are transparent to RF waves and are called open plasma windows. A highly directive beam can emerge from open plasma windows. The tubes that are on or of high density plasma are very reflective with a reactive skin depth. Haleakala has determined a way to reduce the amount of energy and power needed to maintain the ionization and even maintain high ionization by pulsing the plasma tubes with microsecond pulses every few milliseconds. This can be done because the plasma will last on the order of milliseconds and does not need a continuous energy source.

The smart plasma antenna currently weighs less than 10 lbs. and costs about $175 to build. Haleakala has ruggedized the tubes by encapsulating them in synfoam and rugged plastic. The synfoam has an index of refraction of nearly one and is transparent to RF waves. It is a very rugged material and provides good protection for the plasma tubes.



Haleakala R&D, Inc. unhoused smart plasma antenna prototype next to prototype engineer

Future smart plasma antennas from Haleakala will steer in microseconds using Fabry-Perot-Etalon Effects. Our smart plasma antenna compared to other smart antennas has a more compact size, is light-weight, stealth and jam resistant.

Haleakala R&D, Inc has researched, developed and prototyped plasma nested antennas and stacked plasma antenna arrays. For plasma nested antennas the higher frequency plasma antennas will transmit through the lower frequency plasma antennas, and we can nest the antennas like the layers of an onion. This design cannot be done with metal antennas but enables the nested plasma antennas to reconfigure from broadband, to multiband and to narrow band in milliseconds. Likewise, the higher frequency plasma antenna arrays can transmit through the lower frequency plasma antenna arrays, yielding broadband, multiband or narrow band reconfigurations.

Haleakala has proved by theory and experiment that plasma antennas have less thermal noise than corresponding metal antennas. This is largely a result of lower electron atom collision rates in a plasma than in a metal, and Ramsuaer Townsend effects in the plasma. This could result in a higher data rate antenna system if the plasma antenna is used in conjunction with plasma feeds, low noise receivers and is pointed at the sky. The company has also shown that the infrared signature is insignificant in a plasma antenna because a plasma antenna is not a Blackbody Radiator and IR radiation does not transmit through glass.

An important feature of plasma antennas is that they can transmit and receive at lower frequencies and be transparent and stealth at higher frequencies. As the frequency goes down, plasma antennas and metal antennas need to be larger. However, as the frequency goes down, the plasma density goes down and the plasma becomes more transparent or stealth for a wider range of frequencies. Hence, the RCS for plasma antennas becomes less as the frequency decreases, whereas for metal antennas the RCS goes up. Plasma antennas can also be made to transmit through each other by changing the relative plasma density in each antenna. One may also turn off all the plasma antennas except the one being used to eliminate antenna interference.

Haleakala has shown that by using plasma antennas in a multipole expansion that electronically steerable, low frequency plasma antennas can be made to fit on an aircraft or a vehicle. The physics of this depends upon being able to turn the plasma antennas off or on, which cannot be done with metal antennas.

Haleakala has participated and published on plasma antennas with major IEEE and APS conferences and has three journal articles published with two more journal articles being processed for publication. The company has seven issued patents on plasma antennas with two more being processed.

The company will continue to ruggedize plasma antennas by making custom made plasma tubes and inserting the plasma tubes in a rugged but light weight material called Synfoam which has an index of refraction of about one making it transparent to RF waves.

Current Features of the Smart Plasma Antenna Include:

- Current weight of about 10 lbs. Some weight (but not much) will be added in the process of making the base rugged and protecting the tubes with SynFoam. Future iterations of the prototype can be made smaller.
- It can steer the antenna beam 360° in milliseconds. Future prototypes will steer in microseconds using Fabry-Perot-Etalon Effects.
- This is an intelligent, high performance steerable antenna that is stealth and jam resistant
- Rugged packaging

Haleakala Research and Development, Inc. intends to place the first commercially feasible gaseous plasma antennas and plasma smart antennas into the general and specialty antennas marketplace. These new technologies offer the potential for a new wide range of intelligent antenna solutions which are not available when using conventional antennas.

For more information visit www.haleakala-research.com

Contact Dr. Ted Anderson at tedanderson@haleakala-research.com

GAO Launches Compact Active RFID Tag

GAO RFID, Inc. has introduced a compact, active RFID tag (GAO 127007). This small form factor tag is well suited for asset tracking and monitoring, inventory control, transportation management and warehousing.

The low power consuming tag can automatically wake-up or be woken-up by receiving command from a reader or generator to transmit its ID and other information. By using unique anti-collision algorithms, GAO's compact active RFID tag ensures that all tag data are received, even when numerous tags are transmitting concurrently. In addition, operation at dual-frequency allows for fast and reliable communication.

MysticMD, Inc. Wins SBIR Grant for Innovative RFID Antenna

MysticMD, Inc. has been awarded a Phase I Small Business Innovation Research (SBIR) grant from the National Science Foundation (NSF). MysticMD will use the $98,622 grant to develop a screen printable conductive ink for Radio Frequency Identification (RFID) antenna applications, teaming with Identica Holdings Corp., a provider of next-generation biometric identification and security solutions.

"Identica's know-how and experience in the RFID marketplace helped us command a competitive advantage in the pursuit of this award," said Heidi Douglas, co-founder and CEO of MysticMD. "Winning this grant will enable us to pursue more technology development and increase our company's market presence."

These bendable RFID antennas are expected to cost about 90 percent less than comparable copper antennas, improving reliability and encouraging expansion of this technology for a wide variety of identification and tracking applications.

"MysticMD's nanotechnology has impressed us from the outset and we were eager to find an opportunity to integrate our RFID knowledge with their methods," said Terry Wheeler, president of Identica. "The SBIR grant allows both of our companies a unique opportunity to explore ways to expand a ground-breaking technology into a number of different marketplaces."

SBIR Phase I research is intended to establish feasibility of technical innovations. MysticMD will develop and print a conductive ink, forming an antenna for an ISO 15693 compliant system that Identica will specify and test. Based on positive Phase I results, MysticMD will seek SBIR Phase II funding to build prototypes for target commercial applications in situations where low cost and reliability are critical.

New Advancement in Sensor-Based RFID Forklift Systems

M/A-COM Technology Solutions, Inc., a provider of microwave and RF design solutions and products, has introduced the company's new sensor-based RFID Forklift System. The RFID Forklift System automatically records an RFID tagged pallet's exact storage location during handling and slotting processes, without requiring the operator to initiate traditional manual data collection methods, resulting in accuracy and efficiency throughout the supply chain.

"Our sensor-based RFID Forklift System automates and streamlines materials movement and management tasks," said Kevin Anderson, product line manager, M/A-COM Technology Solutions. "From increasing inventory accuracy and reducing material losses to processing more pallets per shift while reducing labor costs, this forklift system brings immediate and significant cost savings to the material handling and inventory management operations."

New or existing forklifts can be retrofitted to work with the sensor-based RFID Forklift System. The system utilizes an acoustic sensor, broad beam antenna and controller logic to identify an RFID pallet tag after it has been loaded onto the forklift. The system then identifies a pallet storage location, utilizing a narrow beam antenna, laser-height sensor and controller logic to confirm that the specific pallet has been picked up or dropped off at that location. These slotting transactions are fed to the enterprise system via WiFi connectivity. The RFID Forklift unit employs a high-performance Impinj Speedway reader loaded with fully released and supported forklift firmware.

Forklift systems are an integral part of material handling and inventory management operations. However, the vast majority of forklifts relies solely upon traditional, operator-initiated data collection methods to record all material movement transactions via bar code scanning or keyed entry systems. These methods can be time-consuming and lead to inaccuracies. Organizations that do not have a warehouse management system in place have even greater productivity challenges, requiring employees to scour the aisles searching racks for products. The increased accuracy, time saved from lack of manual labor, and visibility into products' movements within the warehouse present invaluable advantages that can help accelerate both the RFID and forklift industries.

New Long-Range Reader and UHF Antennas from FEIG

New UHF Antenna Generation

FEIG Electronics, a manufacturer of RFID hardware components, recently introduced its new UHF Long Range Reader (ID ISC.LRU3000) along with its latest generation of UHF antennas.

The UHF Long Range Reader follows in the footsteps of the LRU2000, but with a brand-new design. The shapely metal housing is more robust than the plastic housing of the LRU2000, making it more suitable for use in retail- and production logistics, production control or in the truck and bus industry.

The reader can be mounted on the wall directly or integrated into electric control panels due to its compact design. All possible connections for antennas, encoders or indicators are placed on the outside of the reader. Installation no longer requires opening the reader housing.

All four antenna outputs are now equipped with LEDs for signaling the active antenna output in each case, and an available option will increase environmental protection to IP54.

Power consumption of the LRU3000 is low. Sufficient power can be provided via the Ethernet connection. In addition to the USB interface, the reader has an additional USB port for connecting a WLAN stick or an external memory drive.

The new reader offers a total of five digital inputs and outputs, all programmable. Compared to its predecessor, the reader has enhanced reading performance with an ability to receive very weak signals in various environmental conditions.

The new reader now supports sensor tags. The Application Connectivity Controller (ACC) of the reader uses a Linux operating system, contains a Java Virtual Machine and allows system integrators or end users to integrate their own applications on the reader platform, for example to control reader and inputs.

Along with the new UHF Long Range Reader, three new UHF antennas have also been unveiled. The antennas, like the reader, have new, modern-design housing.

The antenna type ID ISC.ANT.U270/270 will replace the current antenna ID ISC.ANT.U250/250, with a new design.

FEIG has also introduced two completely new antennas as part of its latest antenna generation. First is the small antenna ID ISC.ANT.U170/170 and second is the large-scale antenna ID ISC.ANT.U600/270.

The most important feature of the large-scale antenna is the directional antenna field. The antenna has a 3 dB opening angle of 30° and is well suited for gate applications.

CTIA: *Exhibitor Preview*

www.ctia.org

*The 2009 CTIA Expo will take place **April 1-3** at the Las Vegas Convention Center in Las Vegas, Nevada where more than 1,000 exhibitors will showcase the latest products and technology in the telecom industry: wireless and converged communications, mobile Internet, computing and mobile data.*

Connectivity Module from Elektrobit Uses Integrated Design to Enhance the Mobile Experience

EB (Elektrobit Corp.), a developer of embedded technology solutions for automotive and wireless industries, empowers end-users with 'always on' connectivity, even in remote locations with its satellite-terrestrial Connectivity Module proof of concept, which will be on display at the 2009 CTIA Wireless Show. The concept uses an integrated design that ensures ubiquitous data communications via satellite or terrestrial networks.

The Connectivity Module enhances the mobile experience by leveraging multi-radio and emerging technologies to deliver a "connectivity data pipe" to enable next generation broadband mobile IP services and applications.

The concept encapsulates the core wireless modem functionality required to offer services on packet based satellite and HSPA/3G cellular networks. In particular, the Connectivity Module allows users and machines to communicate remotely, while seamlessly and securely staying connected to both the satellite and terrestrial networks.

The characteristics of the Connectivity Module can be tailored for unique customer requirements; allowing it to be easily integrated into existing applications or configured for satellite-only applications. The current prototype is capable of operating on both S-band satellite networks, as well as on existing commercial 3/3.5G HSPA networks.

The concept's form factor and functionality can be customized to meet development partner and end-customer requirements, enabling it to be used for Machine-to-Machine (M2M) vehicular, maritime/boating and Land Mobile Radio (LMR) applications.

Visit Electrobit at booth #6224

AirWalk to Showcase Femtocell Solutions at CTIA

The EdgePoint from AirWalk Communications is a compact cellular access point, or femtocell, which provides premier cellular service inside buildings and at the edge of macro networks. Users that previously had inconsistent cellular service in a specific location can add an EdgePoint femtocell to their existing service plan and experience continuous service throughout a household or small office.

This plug-and-play designed device connects directly into an existing broadband service, configures directly with the operator, and extends 3G wireless CDMA services for voice and data applications to the in-building area.

Visit AirWalk at booth #1088

CTIA: *Exhibitor Preview*

www.ctia.org

Mobile Mark to Showcase Dual-Band Site Antennas at CTIA

Dual-band Site Antennas Cover 850 and 1900 MHz Or 2.4 & 5 GHz

Today's wireless networks need to work twice as hard, and Mobile Mark's new dualband omni-directional site antennas are designed to help.

For GSM/CDMA Cellular applications, the new OD-900/1900 omni-directional Antenna covers both 806 to 894 MHz and 1,850 to 1,990 MHz. The antenna measures 30 inches in length and provides 4 dBi gain on the 850 MHz band, and 5 dBi gain on the 1,900 MHz band. This heavy-duty antenna is designed for uniform coverage and good frequency response. The antennas are ground-plane independent and can be mounted either in-building or outside. Additionally, the rugged radome can withstand harsh weather conditions.

For WiFi applications using 802.11a/b/g/n, the new ECO5-2,400/5,500 omni-directional antenna provides 5 dBi gain on both 2,400 to 2,500 MHz and 5,150 to 5,925 MHz. The slim-line ECO series antennas are encased in a tough fiberglass radome measuring less than 11-inches tall and 1-inch in diameter at its widest point. The standard configuration terminates with an integrated N-female connector, but the antenna can also terminate with a direct connector, or a pigtail with a choice of connectors. Mobile options, with a mag-mount or trunk-lid mount, are also available.

Both the OD series and the ECO series antenna lines are weatherproof and durable enough for either indoor or outdoor use. These antennas are suitable for single site applications or as part of a network of antennas. With more antenna choices, network development is easy and economical.

Visit Mobile Mark at booth #8730

Novatel Wireless Launches Expedite E760 Embedded Module

Novatel Wireless, Inc., a provider of wireless mobility solutions, has introduced its Expedite embedded product line with the introduction of the E760 Mini-Card Module, providing OEMs and laptop manufacturers with a solution for integrating high-speed 3G wireless functionality into their product lines.

Building on the qualities of the current Expedite product line, the E760 features improved power efficiency with decreased weight and cost. Optimized for North America, the product features 3G CDMA EV-DO Rev. A and 1xRTT technologies to provide data speeds up to 3.1 Mbps, faster than many wired broadband services. With dynamic switching between networks and high efficiency compact design, customers can rely on uninterrupted service to stay connected to clients, colleagues and family virtually anytime, anywhere.

E760 is also capable of running the proprietary NovaSpeed software for those carriers who choose to offer it. NovaSpeed software is designed to enhance the speed and performance of Novatel Wireless products through the use of an industry-first network traffic prioritization protocol.

Visit Novatel at booth #7329

RFS Pushes the Diplexer Technology Envelope to Assist in Cellular Longevity

RFS (Radio Frequency Systems), a wireless infrastructure specialist, has developed a wideband diplexer technology that will assist carriers as they migrate their cellular network infrastructures to LTE - Long Term Evolution.

As with previous diplexer and triplexer technology from RFS, the new wideband diplexer systems are designed to enable feeder sharing of several systems on the same site.

Focusing at the highest technical performance standard, designed for easy installation and spear-headed by the ShareLite Diplexer range, the new RFS technology is a positive development for both carriers and end-users alike.

Carriers will have access to antennas and associated electronics that will support multi-band and multi-frequency transmissions without physically overloading the cell tower.

End-users, meanwhile, will get access to the many benefits of LTE, not least the possibility of much higher mobile broadband speeds than seen on 3G/HSPA-enabled systems.

David Kiesling, global product manager for Wireless Infrastructure Solutions with RFS, said that, while cellular has come a long way in the last two decades, LTE is set to propel wireless communications much further forward, and a lot more rapidly than seen before, in just a few short years.

According to Kiesling, it is clear from informal discussions that RFS has had with network customers planning to use LTE, that the world's carriers are keen to generate a faster return on investment with LTE than they achieved with 3G.

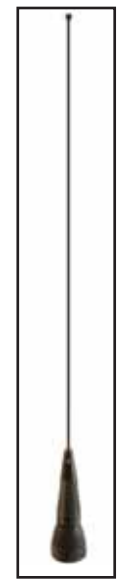
IWCE EXPO: *Exhibitor Preview* | www.iwceexpo.com

*The 2009 IWCE Expo will take place **March 18-20** at the Las Vegas Convention Center in Las Vegas, Nevada where more than 300 exhibitors will showcase the latest in integrated communications systems technology.*

E/M Wave, Inc. Launches New Mobile VHF/UHF Line at IWCE

E/M Wave, Inc. will introduce its family of Black Chromed VHF/UHF mobile antennas at the 2009 IWCE Show in Las Vegas, March 18-20. Model number EM-M10004 is the 3 dB gain, VHF antenna that is field tunable from 132 to 174 MHz, and delivers a VSWR of <1.5:1 at its operating frequency. Model EM-M10003 is the UHF 420 to 470 MHz, 3 dB gain counterpart and exhibits the same electrical performance characteristics.

Both antenna products are impedance matched at 50 ohms and feature open air-wound base load coils for maximum power handling capability. The loading coils are housed in Xenoy molded bases. Xenoy is a patented high-impact, UV stabilized polycarbonate alloy that provides years of durable protection against the weather and elements in a vehicular environment. The base features an insert molded stud and brass ring thread for mechanical strength and inherent weatherproof seals. Both the mounting stud and phosphor bronze contact are silver plated for reliable RF conductivity. The Xenoy base has an o-ring seal for its primary water proof protection, but also features a TPV over molded skirt that resists marring the vehicle's finish, while providing a secondary sealant of protection against dirt, salt and road grime.

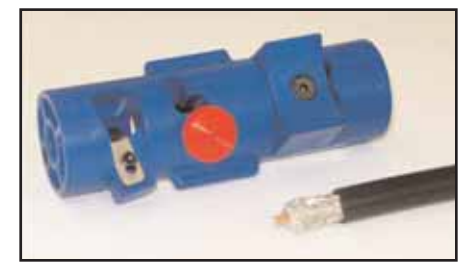


The antenna family's whips and spring assemblies are made from 17-7 stainless steel for dependable strength and resilience while operating in a vehicular application. Both are Black Chrome plated for high conductivity of RF energy and sleek aesthetic appeal. The mechanical interface allows for quick and easy removal of the whip assembly for car washes, while leaving the base intact to fully protect and seal the NMO mount and cable assembly.

Visit E/M Wave at booth #1928

New Prep Tool for LMR-400 Low Loss Coaxial Cables

Times Microwave Systems has recently introduced the CST-400 (3192-004) All-In-One Combination Prep Tool for use with the LMR-400 low loss coaxial cables including standard LMR, DB, FR, PVC, LLP and -75 and can also be used for the first strip step on LMR-400-Ultraflex. The new tool provides the following features and advantages:



- Combination feature allows preparation of LMR-400 cables for either crimp or clamp connector attachment
- Suitable for use with virtually all LMR-400 connectors
- Provides consistently sharp cut of dielectric for best VSWR performance
- Includes a built-in debur tool eliminating the need for a separate debur tool
- Rugged, lightweight construction

The CST-400 (3192-004) All-In-One Combination Prep Tool has a list price of $98.00 and obsoletes the ST-400-EZ and ST-400C prep tools.

Visit Tmes Microwave at booth #1625

IWCE EXPO: *Exhibitor Preview*

www.iwceexpo.com

CSI Showcases New Signal Booster at IWCE

Cellular Specialties, Inc. (CSI) now offers a signal booster that covers the full spectrum of 700/800 Public Safety frequencies. Available in both wide band and band selective options, the 700/800 MHz signal booster provides the following features and benefits:

Rugged, reliable and future proofed coverage extension

- Flexible solution to current and future 700/800 MHz Signal Booster needs
- Protection to industry NEMA-4 standard for demanding environments
- Power failure options in the event of outage
- Alphanumeric user friendly display
- Easy installation and maintenance
- Digital power and AGC readout for precision set up without test equipment
- Local alarm contact closure points and interface for remote monitoring

Oscillation Detection and Automatic Gain Control (AGC)

- Minimize site intervention with built-in oscillation control and self healing
- Shutdown in event of non-correctable severe conditions
- Limit network interference by high 25 dBm AGC range and fine grained 30 dB gain adjustment

Wideband Model is factory upgradeable to band-selective filtering. The Band Selective models:

- Improve vital first-responder communication by reducing interference from competing signals
- Enhance voice transmission by increasing noise rejection
- Provide advanced future-proof technology to support ongoing public safety rebanding
- Include dual 800 MHz adjustable sub-bands (factory set)

Visit CSI at booth #1259

SAFARI Commander Broadband Wireless Mesh Land Mobile Radio (LMR) Infrastructure Station

The SAFARI Commander from Metric Systems Corp. is a standards based net-centric media independent (wireless, wire, satelite, microwave, fiber) mesh backhaul transport system designed to provide the most demanding LMR users and operators with a robust, yet easy to use, end-to-end solution for quickly and economically establishing tactical command, control and communication connectivity between fixed and mobile dispatch centers and field operations.

The SAFARI allows users to quickly and economically deploy wide-area mobile, fixed or transportable multi-agency regional networks, enhance existing Public Safety LMR/IP network robustness and reliability, increase LMR network availability, and extend the capital life and usefulness of existing local and infrastructure communications assets.

Visit CSI at booth #1756

Wireless USB WiFi Adapter 802.11b/g with External and Removeable Antenna from Air802

The AIR802 USB-ADG-2 is a USB wireless adapter fully compliant with the 802.11b/g WiFi standards. The adapter is packaged with a 5 dBi gain dipole antenna and CD for installation. It incorporates the ZyDAS (Atheros) chipset and ZyDAS software wizard. The software quickly and easily installs onto any computer. After the drivers are installed, users plug the adapter into the USB port, connect to the network and enjoy strong signals. A CD is included with drivers for Windows, MAC and Linux plus the Installation Manual.

Visit Air802 at booth #1145

NEC and ArrayComm Collaborate on Enhanced WiMAX Solutions

NEC Corp. and ArrayComm LLC will collaborate to develop new WiMAX products that include ArrayComm's A-MAS multi-antenna signal processing software.

The joint effort will deliver WiMAX base station products beginning mid 2009. NEC's customers will benefit from quality performance at an economical cost while maintaining full profile and standards compliance, including WiMAX Forum IO-MIMO and upcoming IO-Beamforming.

NEC's flexible PasoWings base station allows WiMAX users to connect seamlessly across wide area wireless networks, delivering full mobility and high quality of service. With the established PasoWings platform, NEC brings development, manufacturing, system integration and field installation expertise into the joint effort.

ArrayComm's Multi-Antenna Signal Processing software, A MAS, provides a unique combination of MIMO1 and adaptive interference cancellation that fundamentally enhances WiMAX economics with significant range, capacity and throughput improvement. ArrayComm will contribute by jointly developing the PHY2 software with integrated A-MAS.

"The collaboration with ArrayComm is essential in enhancing NEC's WiMAX base station products, which offer improved radio network economics to mobile operators around the world," said K. Jay Miyahara, chief engineer, Mobile Network Operations Unit of NEC.

Updated Antenna Selection Guide Now Available from Agilent

Agilent's updated Antenna Selection Guide now includes the PNA-X measurement receiver, which offers a 30 percent faster data acquisition speed than other antenna receivers on the market. This selection guide helps customers select the hardware necessary to make accurate antenna and radar and cross section measurements. The Agilent PNA-X measurement receiver is a replacement for the discontinued Agilent 8530A. This guide shows customers how to easily migrate to the PNA-X receiver, understand issues related to antenna equipment selection, and provides insight about interface requirements between components.

Comtech Receives $1 Million Order For High Power Antenna Switches

US-based Comtech Telecommunications has announced that its subsidiary, Comtech PST, has received a $1 million order from a domestic prime contractor to supply high power antenna switches.

According to the company, these high power antenna switches are key components in countermeasure systems manufactured by one of its customers for US Army and Navy aircraft.

Fred Kornberg, president and CEO of Comtech Telecommunications said, We are proud of our RF microwave amplifier segment's continuing success and recognition as a premier supplier of solid state, high power switches to the electronic warfare marketplace.

Lockheed Lands $35.8 Million Navy Contract to Design and Produce Antenna Buoy Systems

Lockheed Martin has been awarded a $35.8 million contract by the US Navy to design and produce antenna buoy systems that will significantly expand the communications capabilities of submarines while they are submerged.

The Navy's Communications at Speed and Depth (CSD) program will use expendable submarine and air-launched communications buoys to enable submarines operating below periscope depth and at tactical speeds to communicate with surface ships and land-based assets via satellite networks. All classes of US Navy submarines will be equipped with this capability.

Under the contract, a Lockheed Martin-led industry team will develop three types of expendable communications buoys: two submarine-launched tethered buoys that provide real-time chat, data transfer and e-mail capabilities via either Iridium or UHF satellites; and an untethered, acoustic-to-radio frequency gateway buoy that can be launched from a submarine or maritime patrol aircraft to enable two-way data transfer between a submerged submarine and surface assets. The contract also includes production of associated shore and onboard equipment needed to support the systems. If all options are exercised, the cumulative value of the contract is estimated at $177.9 million.

EMS Technologies to Build Seeker Antenna for Joint Air-to-Ground Missile Development Program

Lockheed Martin recently awarded EMS Defense & Space a contract for production and capability enhancement work on the millimeter wave radar antenna as part of its recently announced $122 million Technology Development (TD) contract for the Joint Air-to-Ground Missile (JAGM) program.

CALENDAR OF EVENTS

MARCH 2009

- **18-20 - IWCE**, Las Vegas, Nev. - www.iwceexpo.com
- **24-27 - Satellite 2009**, Washington, D.C. - www.satellitetoday.com
- **25-26 - Wireless World 2009**, Sydney, Australia - www.wirelessworld2009.com
- **31-April 2 - Embedded Systems Conference**, San Jose, Calif. - www.cmp-egevents.com

APRIL 2009

- **1-3 - CTIA**, Las Vegas, Nev. - www.ctia.org
- **20-23 - NAB Show**, Las Vegas, Nev. - www.nabshow.com
- **29-May 1 - Entelec**, Houston, Texas - www.entelec.org

MAY 2009

- **12-14 - EDS Show**, Las Vegas, Nev. - www.edsc.org

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