

MITRE National Security Engineering Center (NSEC) - Defense Holiday Patents (January 2026), contact: Allison Reardon, AREARDON@mitre.org

App Number	Application Date	Title	Category	Patent Number	Issue Date	Abstract
18/141,279	4/28/23	Compact piezoelectric photonic crystal modulator	Microelectronics	12,663,664	6/23/26	Provided herein is a photonic modulator and methods for controlling a photonic modulator that can control the phase and/or amplitude of photons being transmitted through the modulator to minimize photonic loss while remaining power efficient and operating at high speeds. The photonic modulator can include a substrate with a pair of piezoelectric cantilevers spaced apart from one another by a gap, with a photonic waveguide disposed in the substrate that extends across the modulator and bridges the gap between the piezoelectric cantilevers. In one or more examples, the piezoelectric cantilevers can be configured to move away from the substrate in response to an electrical signal, such that a refractive index of the photonic waveguide is altered.
18/101,229	1/25/23	Delay-based PUF for chiplet interconnects	Microelectronics	12,664,250	6/23/26	Embodiments described herein include a system, apparatus, article of manufacture, method and/or computer program product embodiments, and/or combinations and sub-combinations thereof, for delay-based physical unclonable functions (PUFs) for chiplets to verify system integrity. A die may include a plurality of chiplets including a first chiplet and a second chiplet. The first chiplet may be connected to the second chiplet via an interposer. As part of an authentication process, the first chiplet may request the second chiplet to transmit a signal via one or more wires of the interposer. A first signature based on the characteristics of the transmitted signal may be measured at a first time, which constitutes the first evaluation of the PUF. The first signature may be used as a baseline comparison for subsequent signatures as a means to confirm that the chiplets, interposers, and/or interconnects have not been altered or modified.
17/717,874	4/11/22	Quantum state vector implementation toolkit	Microelectronics	12,639,611	5/26/26	A method for generating a complete quantum circuit from a text-based quantum algorithm comprises receiving a text-based quantum algorithm comprising a first state vector and a second state vector, generating a first syntax tree based on the first state vector and a second syntax tree based on the second state vector, generating transition information characterizing a transition from the first state to the second state, selecting, based on the generated transition information, a type of transition that characterizes the transition from the first quantum state to the second quantum state, and generating a complete quantum circuit which indicates the first quantum state characterized by the first state vector, the selected type of transition, and the second quantum state characterized by the second state vector.
18/735,834	6/6/24	Systems and Methods for Synchronizing Transmission Rates of Data Hosts and Radio	Microelectronics	12,519,606	1/6/26	A method for synchronizing data transmission rates of a data host and a radio frequency (RF) transmitter comprises: transmitting a time request from the data host at a first time of a data host clock to the RF transmitter; receiving, by the data host, a time response from the RF transmitter comprising a first time of a RF transmitter clock associated with when the RF transmitter received the time request; generating, by the data host, an operating clock ratio between the data host clock and the RF transmitter clock based on the first time of the data host clock and the first time of the RF transmitter clock; generating, by the data host, an estimate of a second clock time of the RF transmitter clock based on the operating clock ratio; and transmitting data from the data host to the RF transmitter at a data transmission rate.
17/726,261	4/21/22	Implanting Photonic Crystals into Polymers	Microelectronics	12,455,402	10/28/25	Disclosed herein are embodiments of photonic crystals implanted into polymers to create durable, flexible structures that can respond to a series of external stimuli for sensing applications. Also disclosed are method embodiments of fabricating such photonic crystals.
17/964,692	10/12/22	Rydberg Atom-based Vector and Polarization Sensor	Microelectronics	12,188,971	1/7/25	An electric field sensor may include an atomic vapor cell and a plurality of lasers configured to excite atoms in the vapor cell from a low-energy state to a high-energy state. The sensor may be configured to split signals from the plurality of lasers into multiple polarized signals. The polarized signals may be transmitted through the atomic vapor cell. A subset of the polarized signals may be received by photodetectors after the subset exits the vapor cell. Based on signals from the photodetectors, the electric field sensor may determine an angle of arrival and polarization information about an electric field that is incident upon the atomic vapor cell.
17/706,186	3/28/22	Characterizing fault injection on power distribution networks with voltage sensors	Microelectronics	12,147,284	11/19/24	Power and electromagnetic fault injection vulnerabilities in an integrated circuit (IC) can be characterized sampling one or more integrated timing sensors in real-time or by equivalent-time sampling. To achieve equivalent-time sampling, a series of fault injection attempts are performed. An array of timing sensors implemented in part of the IC capture a measure of relative propagation delay, which fluctuates proportionally with instantaneous voltage. Increased voltage fluctuation can indicate elevated probability of faults in digital logic. Related apparatus, systems, techniques and articles are also described.
17/693,036	3/11/22	A Self-Locked Rydberg Atom Electric Field Sensor	Microelectronics	12,038,465	7/16/24	A system for automatically locking a control laser in a Rydberg atomic sensor may comprise an atomic vapor cell, a probe laser configured to excite the atoms in the atomic vapor cell to an intermediate energy state, and a control laser configured to excite the one or more atoms in the atomic vapor cell from the intermediate energy state to a higher energy state. The light generated by the control laser may be dithered at a pre-determined frequency. The system further comprises a photodiode configured to convert light received from the vapor cell into an electrical signal, a lock-in amplifier configured to generate an error signal based on the electrical signal received from the photodiode and a received reference oscillation frequency, and a servo configured to receive the generated error signal from the lock-in amplifier and adjust a frequency of the control laser based on the received error signal.

16/585,343	9/27/19	VECTOR SENSOR ARRAY SURFACE WAVE RADAR	Microelectronics	11,194,030	12/7/21	System and methods for implementing a vector sensor array surface wave radar is provided. In one or more examples, the system can include a vector sensor array antenna that includes electromagnetic elements collectively configured to receive surface wave reflections generated by radar transmit antenna waves reflecting back from targets of interest. Once received by the vector sensor array, in one or more examples, the system can further include components that can process the incoming signal and use the incoming single to determine the location of one or more targets. In one or more examples, the vector surface array antenna can include three separate loop antennas that are arranged orthogonally to one another, and three dipole antennas that are arranged orthogonally to one another. In one or more examples, the vector surface array antenna can be configured to receive signals in the high frequency (HF) band.
16/428,327	5/31/19	HIGH FREQUENCY SYSTEM USING A CIRCULAR ARRAY	Microelectronics	11,183,774	11/23/21	A transportable, resilient, high frequency system with a compact footprint is provided. The system may include a plurality of antenna elements arranged around a circle. A circular array provides a resilient radiation pattern that does not change based on the number of antennas in the array and is tolerant of errors in antenna placement. The gain of the system may be increased by increasing the number of antenna elements in the array to compensate for reduced efficiency of antenna elements having a radiating element with a length of less than half the wavelength of an operating frequency of the array.
16/115,306	8/28/18	Low-Profile Wideband Antenna Array Configured to Utilize Efficient Manufacturing Pro	Microelectronics	10,886,625	1/5/21	A low profile phased array antenna that is configured to be manufactured using additive manufacturing techniques is provided. In one or more embodiments, the phased array can include a plurality of signal ears, ground ears, and clustered pillars that can be arranged in relation to a base plate such that each component of the antenna can be manufactured from a single piece of material, thereby allowing for the use of additive manufacturing techniques which can substantially reduce the cost and time of the manufacturing process. The phased array can include a signal ear that include one or more posts that interface with an airgap located within a base plate of the array, wherein the size of the airgap in relation to the size of the post is configured to achieve an optimal level of impedance matching.
15/708,035	9/18/17	LOW-PROFILE, WIDEBAND ELECTRONICALLY SCANNED ARRAY FOR GEO-LOCATION	Microelectronics	10,854,993	12/1/20	An antenna element including a base plate, a first ground clustered pillar projecting from the base plate, a second ground clustered pillar projecting from the base plate and spaced apart from a first side of the first ground clustered pillar is provided. The ground clustered pillars, the signal ears, and the ground ears can be shapes so that the capacitive coupling between the ears and the pillars is sufficient to allow them to be spaced further apart, thereby reducing the number of elements required in the phased array. In some embodiments, the ground ear can be directly machined with the base plate thereby obviating the need for the ground ear to be overmolded into the base plate with the signal ear. In other embodiments the phased array antenna can utilize elastomeric connectors to further improve the mechanical and electrical reliability of the connections of the phase array antenna.
15/897,624	2/15/18	Mechanically Reconfigurable Patch Antenna with Polarization Diversity	Microelectronics	10,777,894	9/15/20	A polarization configurable patch antenna including a radiating layer, wherein the radiating layer has a corner truncated rectangular patch shape; and a feed capacitively coupled to the radiating layer for exciting the radiating layer, wherein the radiating layer is rotatable with respect to the feed, and the antenna is configured to generate a right-hand circularly polarized radiation field when the radiating layer is in a first rotational position and a left-hand circularly polarized radiation field when the radiating layer is in a second rotational position.
15/702,085	9/12/17	QUANTUM KEY DISTRIBUTION INFORMATION LEAKAGE DUE TO BACKFLASHES IN SI	Microelectronics	10,666,433	5/26/20	A quantum cryptography apparatus and system includes a photon emitter, a photon receiver, a first photodetector, a second photodetector, a first polarization optic, and a second polarization optic. The photon emitter is configured to emit a photon at a wavelength, wherein the photon emitter is coupled to the photon receiver by at least one quantum channel. The photon receiver includes the first polarization optic configured to output a polarization state of the emitted photon. The first photodetector is configured to detect the photon emitted from the output of the first polarization optic. The second photodetector is configured to detect a backflash from the first photodetector. The second polarization optic is between the first photodetector and the second photodetector. The quantum cryptography apparatus may be a quantum key distribution system for characterizing backflashes.
15/981,348	5/16/18	System and Methods for Monitoring Aviation RF Environments	Microelectronics	10,602,395	3/24/20	An RF congestion monitoring system and method is provided. In one or more examples, the RF congestion monitoring system can include a modified aircraft transponder capable of receiving signals associated with Air Traffic Control and Traffic Collision Avoidance Systems, analyzing the received signals to determine the presence on one or more events occurring in the received signals, and generating an event count that identifies the types of signals associated with the events being received. A processor can receive the generated event count and based on the received count can calculate a transponder occupancy percentage metric indicative of the amount of RF congestion in a given air space. In one or more examples, the modified transponder can be configured to receive various radar signals in the 1030 and 1090 MHz frequency signal bands and process those signals to determine the amount of RF congestion in the airspace.
15/937,395	3/27/18	Cavity-Backed Annular Slot Antenna Array	Microelectronics	10,483,648	11/19/19	Cavity backed slot antenna arrays for conformal antenna applications are provided. A cavity backed slot antenna array may include an aperture, first and second feed structures, and a backing cavity configured to support the aperture and the first and second feed structures. The aperture may have a dielectric layer and a metal layer disposed on the dielectric layer. The metal layer may have first and second annular regions. The first annular region may have a first slot region and the second annular region may have a second slot region, where the second slot region may partially overlap the first slot region. The metal layer may further include first and second radiating elements configured to radiate energy. Each of the first and second feed structures may include a central portion and a plurality of fin structures arranged radially around the central portion.

15/276,227	9/26/16	DECOUPLED CONCENTRIC HELIX ANTENNA	Microelectronics	10,483,631	11/19/19	A multi-band helix antenna including one or more first arms extending helically about an axis at a first distance from the axis; and one or more second arms extending helically about the axis at a second distance from the axis that is greater than the first distance, wherein each of the one or more second arms comprises at least one trap circuit configured to have a first impedance at a resonant frequency of the one or more first arms and a second impedance at a resonant frequency of the one or more second arms, and the first impedance is greater than the second impedance.
15/276,353	9/26/16	HORIZON NULLING HELIX ANTENNA	Microelectronics	10,424,836	9/24/19	A helix antenna including a first radiating element extending helically about a longitudinal axis and tuned to resonate in a frequency band, a reactive element electrically connected to a first end of the first radiating element, and a second radiating element extending helically about the axis and electrically connected to the reactive element at a first end of the second radiating element, wherein the second radiating element is tuned to resonate in the frequency band.
14/871,880	9/30/15	SHORTED ANNULAR PATCH ANTENNA WITH SHUNTED STUBS	Microelectronics	10,205,240	2/12/19	A microstrip antenna for circularly polarized radiation including a substrate, a ground layer disposed on a first side of the substrate, a first radiating layer disposed on a second side of the substrate opposite the first side, one or more first electrically conductive pathways extending from the ground layer to the first radiating layer, wherein the one or more first electrically conductive pathways form a ring about an axis, one or more second electrically conductive pathways extending from the ground layer to the first radiating layer, wherein the one or more second electrically conductive pathways are disposed along a portion of a first line extending outwardly from the ring, and a feed conductor for connecting the antenna to a feed line.
15/280,006	9/29/16	SYSTEMS AND METHODS FOR RADIO FREQUENCY SPECTRUM SHARING	Microelectronics	10,194,438	1/29/19	A system for sharing a shared frequency band including one or more processors, memory, and one or more programs, wherein the one or more programs are stored in the memory and configured to be executed by the one or more processors, the one or more programs including instructions for receiving a request for use of the shared frequency band from a first transceiving system operating at least partially in the shared frequency band, in response to receiving the request for use of the shared frequency band, determining one or more second transceiving systems within a coverage area of the first transceiving system, wherein the one or more second transceiving systems operate at least partially in the first frequency band, and sending a request to at least one of the one or more second transceiving systems to cease at least transmission in the first frequency band.
13/552,890	7/19/12	Conformal Electro-Textile Antenna and Electronic Band Gap Ground Plane for Suppression of Back Radiation	Microelectronics	10,141,638	11/27/18	An antenna system having reduced back radiation is disclosed. The antenna system includes an antenna and ground plane. The antenna includes electro-textiles and is configured to operate in at least the frequency range between 1.1-1.6 GHz. The ground plane includes electro-textiles and is configured to operate as a frequency selective surface with electronic band gap characteristics to suppress edge and curved surface diffraction effects. In this system, the antenna and ground plane are configured to be located on a curved surface and to radiate with a directional radiation pattern having attenuated back lobes.
13/856,218	4/3/13	Photonic quantum memory with time-bin entangled photon storage	Microelectronics	9,851,742	12/26/17	A photonic quantum memory is provided. The photonic quantum memory includes entanglement basis conversion module configured to receive a first polarization-entangled photon pair and to produce a second entangled photon pair. The second polarization-entangled photon pair can be a time-bin entangled or a propagation direction-entangled photon pair. The photonic quantum memory further includes a photonic storage configured to receive the second entangled photon pair from the basis conversion module and to store the second entangled photon pair.
13/856,213	4/3/13	Method and Apparatus for Quantum Mechanical Entanglement Protection	Microelectronics	9,720,437	8/1/17	Embodiments of the present invention provide systems and methods to robustly inter-convert between polarization-entangled photon pairs and time-entangled photon pairs, such that produced polarization-entangled photons pairs can be converted into time-entangled photon pairs, stored as time-entangled photon pairs to preserve the entanglement for longer periods of time, and then converted back to polarization-entangled photon pairs when ready for manipulation, processing, and measurement by a quantum application.
13/653,763	10/17/12	MULTI-BAND HELICAL ANTENNA SYSTEM	Microelectronics	9,614,293	4/4/17	A multi-use antenna system that can be used in, for example, integrated communications and navigation capability is provided. In an embodiment, an antenna system is provided. The antenna system includes a first antenna having a plurality of radiating elements substantially wrapped around an axis and a second antenna located within the first antenna. The first and second antennas are coupled to the same ground plane and are configured to operate in different frequency bands.
14/804,667	7/21/15	Quantum Dot - Polymer Nanocomposite Sensor Array for Chemical Vapor Sensing	Microelectronics	9,599,564	3/21/17	A quantum dot-polymer nanocomposite sensor array for chemical vapor sensing includes plurality of sensors respectively formed by different nanocomposite films. Each nanocomposite film is formed by a plurality of QDs and a polymer solution made from a polymer and a corresponding solvent. The plurality of sensors are disposed on a substrate for impingement by an excitation light source. Fluorescence emission intensity of the sensors is measured for a preselected duration of time and then the sensors are placed into contact with a chemical vapor. The changes in fluorescence emission intensity for all sensors are detected over time and the combined changes in fluorescence are compared to establish a unique combined response for each target chemical vapor. Using this unique combined response from a sensor array, target chemical vapor can be detected, classified, and identified.
13/915,701	6/12/13	QUANTUM DOT - POLYMER NANOCOMPOSITE FOR OPTICAL SENSING	Microelectronics	8,969,470	3/3/15	A quantum dot-polymer nanocomposite for optical chemical and biological sensing is formed by stably incorporating functionalized quantum dots into a pH sensitive hydrogel polymer network. At least one monomer of the pH sensitive hydrogel has functional groups selectively chosen to correspond to functionalized groups on the quantum dots to enable conjugation between the hydrogel polymer network and the functionalized quantum dots. The resulting quantum dot-polymer nanocomposite is placed in a solution having a known pH and addition of a chemical composition or biological agent of interest generates a change in pH of that solution. The nanocomposite expands or contracts responsive to the pH change. The pH change is optically detected by measuring the intensity level of fluorescence from the quantum dots when the nanocomposite is subjected to an excitation light source.

11/399,387	4/7/06	DYNAMIC RULE-BASED DISTRIBUTED NETWORK OPERATION FOR WIRELESS SENSORS	Microelectronics	8,892,704	11/18/14	Methods and systems for smart data processing and dissemination in wireless sensor networks are provided herein. In one aspect, the present invention provides dynamic and independent data processing and dissemination at individual sensor nodes in a wireless sensor network. In another aspect, the present invention provides data processing and/or dissemination methods at a sensor node that are responsive to, among other parameters, network traffic conditions, network connectivity conditions, conditions at the sensor node, and the data characteristics and QOS (Quality of Service) requirements of the data being processed and/or disseminated. In yet another aspect, data processing and/or dissemination rules according to the present invention are easily configurable and modifiable depending on the specific sensor networking application.
13/423,982	3/19/12	Ultra-High Frequency (UHF)-Global Positioning System (GPS) Integrated Antenna System	Microelectronics	8,749,439	6/10/14	Embodiments provide an integrated antenna system that enables dual-use operation (e.g., communications and navigation). In an embodiment, the integrated antenna system includes a sleeve monopole antenna system and stacked shorted annular ring (SAR) patch antenna system, which are compactly integrated to fit on a military handset or a smart phone. In an embodiment, the integrated antenna system enables communication in the 225-450 MHz Ultra-High Frequency (UHF) band and reception of various Global Navigation Satellite System (GNSS) bands.
13/150,677	6/1/11	LOW-PROFILE MULTIPLE-BEAM LENS ANTENNA	Microelectronics	8,730,114	5/20/14	An antenna is provided for transmitting and receiving electromagnetic energy. A circular-shaped lens is disposed within a volume that has a first surface, a second surface, and a center, has an axis of rotation that passes substantially through the first surface, the second surface and the center. A plurality of feed elements are positioned at a plurality of focal points of the circular-shaped lens along at least a portion of a circle which is centered substantially on the axis of rotation. The thickness of the antenna is $\frac{1}{2}$ or less of the diameter of the antenna.
11/984,671	11/20/07	Location-based method to specify radio frequency spectrum rights	Microelectronics	8,712,426	4/29/14	The disclosed methods, systems, and computer-program products generate location-based RF spectrum rights for components in a radio frequency (RF) system. In an embodiment, a location-based spectrum right for an RF system's operational use of RF spectrum includes the spectrum rights of each component of the system, a definition of all locations at which each component might possibly operate, and a specified time period of this operational use. In an additional embodiment, the location-based RF spectrum right include a transmitter right and a receiver right, and the transmitter and receiver rights may be based on a combination of maximum power density, spectrum masks, underlay masks, power maps, locations, minimum power density, start times, end times, protocol specifications, and rules. Most transmitter rights and all receiver rights include propagation maps to articulate the rate at which signals attenuate away from transmitters and toward receivers.
12/793,534	6/3/10	Compact Ultra-Wide Bandwidth Antenna with Polarization Diversity	Microelectronics	8,284,110	10/9/12	Described are methods and apparatus, including a method of manufacture, for a compact antenna. Two biconical dipole antennas and a monocone monopole antenna are displaced in an adjacent and orthogonal configuration. The two biconical dipole antennas are each shunted to the monocone monopole antenna.
12/271,590	11/14/08	Quantum Sensor Miniaturization Utilizing Entangled Photon Signals	Microelectronics	7,928,356	4/19/11	The resolution obtained by an imaging system utilizing separable photons can be achieved by an imaging system making use of entangled photons. Since resolution is not being increased from the separable-photon system, the imaging system utilizing entangled photons can take advantage of a smaller aperture. This results in a smaller and lighter system, which can be especially valuable in satellite imaging where weight and size play a vital role.
11/882,546	8/2/07	Efficient Construction of quantum Computational Clusters Using Hadamard Rotations	Microelectronics	7,778,951	8/17/10	A method of creating two-dimensional quantum computational cluster states is demonstrated that is considerably more efficient than previously proposed approaches. The method uses local unitaries and type-I fusion operations. The increased efficiency of the method compared to previously proposed constructions is obtained by identifying and exploiting local equivalence properties inherent in cluster states.