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LBA Technology, Inc.

Experimental Station WC2XKX

Progress Report of the Experiments

FCC File #: 0159-EX-RR-2002 [Reference Number: 2368]
Confirmation Number: EL12822

LBA's experimental license was used to perform the initial experiments in developing the TUP-3 medium-wave antenna for military use. The U.S. Army currently deploys the first generation of this system.

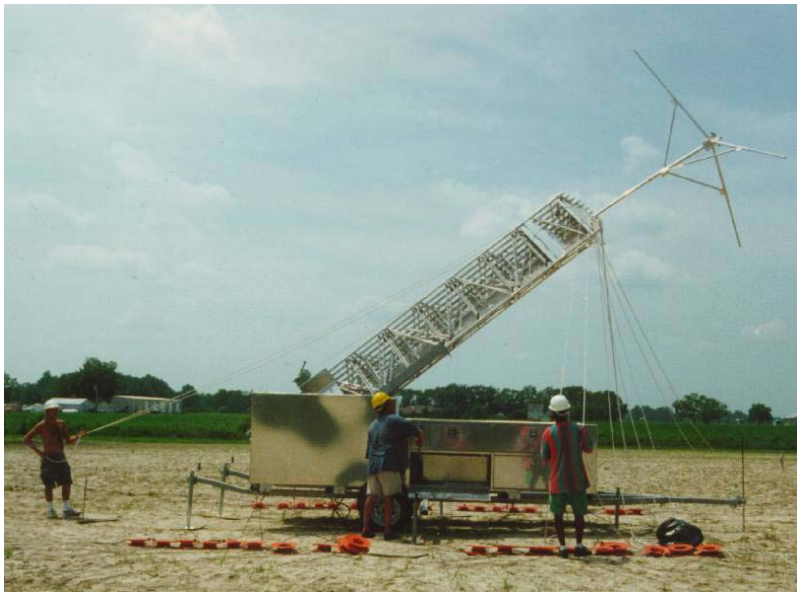

Figure 1: The TUP-3 Antenna being deployed for experimental field tests.

The LBA tactically deployable tunipole-fed transmitting tower TUP-3 at KTRK (KTRK were the call letters used by an Army Broadcast Service [ABS] station during a four day military operation at Ft. Meade, Maryland). The tuning unit is located at the base of the tower. The system included a complement of 120 counterpoise radials. It must have worked pretty well. In the 4 days of testing, the station was heard coast-to-coast and in Europe.

Figure 2: The TUP-3 in use by the Army Broadcast Service

Further information regarding the TUP-3 in its current configuration may be found on the web at http://www.lbagroup.com/technology/index.htm. That information is included as Attachment 1, for convenience.

LBA Technology also has begun developing a new version based upon the TUP-3 antenna to be offered to the Coast Guard and other agencies for emergency replacement of antennas for transmitters in the DGPS and NAVTEX services. LBA is also developing a new line of fixed short, efficient antennas for the NAVTES and DGPS medium wave services, and further testing is expected under the renewal of WC2XKX.

Information about the initial offering of these antennas, called SAMWAS-200 and SAMWAS350, is also attached. These antennas were designed by modeling based upon measurements made under this experimental license. Attachment 2 provides information about the SAMWAS-200, and Attachment 3 provides information about the SAMWAS-350.

Finally, LBA Technology has developed a short, man-portable medium-wave antenna. This is called the TGR-50 and information regarding this antenna is included as Attachment 4. It is also a derivative of test data taken under LBA's experimental license. Further development of this system is being undertaken to improve its performance and utility.

We also performed theoretical and modeling investigation into the CFA "cross-field" antenna with the intention of "on-air" testing. However, performance was not found to support full field-testing, and the project was abandoned.

Additional information will be provided upon request.

January 2003

Attachment 1

TUP-3 Information

Over 40 years of excellence in telecommunications support.

TUP-3

The major objectives faced by *LBA Technology* while designing the TUP-series were: to be mechanically rugged and safe; to be electrically efficient; to require under 20 man-hours to install; to be self-contained and rapidly deployable worldwide; to operate on any AM frequency, field tunable; and to have an affordable purchase cost. *LBA Technology* has addressed these objectives with innovative mechanical design. The 120 foot tower provides an optimum balance between radiation efficiency, frequency coverage, and mechanical ease of transport and installation. The use of the proprietary LBA Tunipole™ folded unipole antenna design achieves significant bandwidth and efficiency improvement over series-fed towers. The TUP-3 system is capable of transmitting efficiently at carrier frequencies from below 1000 kHz to over 1700 kHz. It is rated for power to 5000 watts, 125 percent modulated. Housed is a weatherproof cabinet, the integral tuning unit features high quality electronic components and matches the TUP-3 system to a 50 ohm transmission line. The self-supporting design of the tower also minimizes erection time and complexity.

Return to Transportable Antenna Systems

Attachment 2

SAMWAS-200 Information

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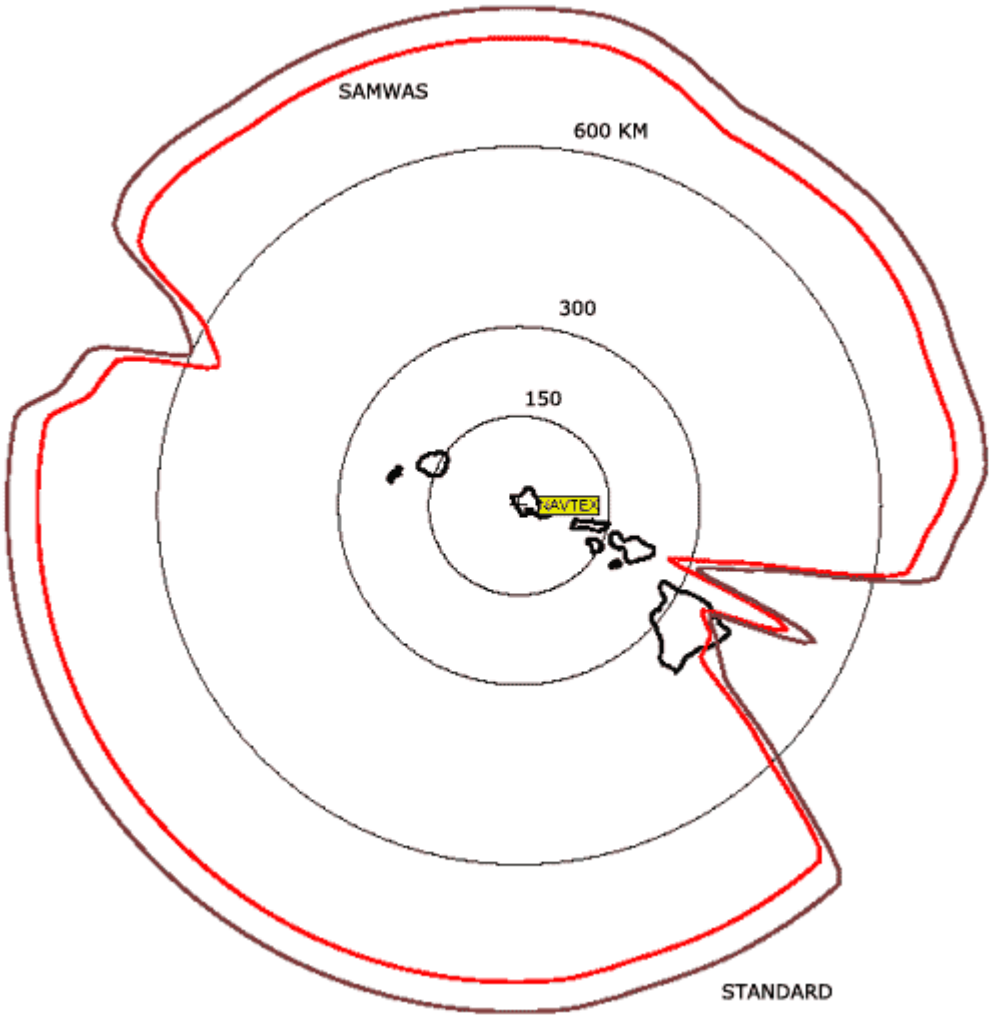
SAMWAS-200 NAVTEX Antenna System

The LBA Technology SAMWAS-200 is a fully configured, immediately deployable, short aperture medium wave antenna system. It uses a unique electrically short radiator and peripherals to provide reliable and cost effective omnidirectional coverage for NAVTEX and radio navigation applications. Single or dual frequency operation is available.



The SAMWAS-200 system provides safety and warning information to mariners over approximately 87% of the groundwave and skywave coverage achievable from a full ¼ wave vertical antenna at 518 or 490 KHz, using a structure only 40% of that height.

The SAMWAS radiating structure uses no base insulator and is directly grounded. The grounded tower provides inherent system lightning protection, and permits easy mounting of other antennas for communications, such as for the USCG Rescue 21 program, or for microwave links, without impact on medium wave transmission. The total system structural height is 199 feet, avoiding the need for aviation hazard lighting and marking in most situations.

The SAMWAS system components are designed for the high reliability and minimum life cycle

support costs demanded by critical NAVTEX and radio navigation missions. The use of standard parts and maximum commonality in subsystems ensures lowest cost life cycle maintenance. Reliability is further enhanced by the use of galvanicaly compatible structural materials, computer confirmed mechanical and electrical safety factors, and special attention to insulator endurance under salt spray and high solar conditions. The conservative mechanical and electrical design of this system is demonstrated by hundreds of similar legacy LBA systems in medium wave broadcast use worldwide for over 30 years.

Since installation and performance can be influenced by geotechnical siting conditions, coupled RF energy from nearby antennas, and other local effects, an LBA site survey before design completion is recommended.

Hardware and documentation deliverables are complete and sufficient to permit installation and commissioning by any suitably equipped and qualified contractor. Alternatively, turnkey installation and commissioning services are available as an option from LBA.

SAMWAS Principal Subsystems

Subsystem A: UP651 Folded Unipole Radiator

The radiator system utilizes a high efficiency grounded vertical radiator with enhanced top loading and a symmetrical folded unipole feed system. The UP-651 radiator is rated for 5000 watts, 100% modulated, continuous duty, which is conservative for reliable service at the typical NAVTEX 2000 watt power level at 518 or 490 kHz. Proprietary Delta Unit™ auto tensioning terminations ensure feed system stability.

Standard subsystem components are designed to EIA/TIA-222-F. Safety features include safety climb device and LBA's patented RF contact personnel protection.

Subsystem B: ATU-2S Antenna Tuning System

The antenna tuning system is designed to provide an interface between the Radiator Subsystem and a 50-ohm coaxial transmission line. The ATU-2S is rated for 2000 watts, 100% modulated, continuous duty at 518 or 490 kHz. It uses a capacitive T-network to match the inverted inductive impedance of the radiator. By using a high-Q capacitor design, inductor losses normally associated with short antenna tuning systems are virtually eliminated, while providing a stable working bandwidth of nominally +/- 5.0 kHz at a VSWR below 3.0:1 (typically 1.8:1), with on-carrier VSWR of 1.1:1 or better. Features include a toroidal antenna current meter, safety, security and AC power convenience systems. The equipment is outdoor-mounted in a freestanding weatherproof cabinet and includes a mounting base.

Antenna tuning systems for higher or lower power operation can be provided with similar performance to the ATU-2S.

Subsystem C: GRP-475 Ground Reference System

For maximum efficiency, components for a full ¼ wave buried ground plane are provided, but with flexibility to adapt to available site space. To enhance stability of the short radiator under varying weather conditions, and to improve displacement current collection at the base of the tower, a copper mesh reference plane is provided for burial about the base of the tower, and a radial capacitance reference is provided for above ground installation on the Radiator Subsystem structure. Ground rods, copper strap, and exothermic welding molds and charges are included.

An abbreviated ground system can be supplied. Please contact LBA for an estimate of space versus performance tradeoffs.

Equipment Options Available:

- ATU-2SFA frequency agile tuning unit for 518/490 kHz: The SAMWAS-200 system can be supplied for dual frequency operation using the ATU-2SFA. This unit is designed to take two inputs and sequentially switch them in accord with non-conflicting time slots to provide a two frequency NAVTEX broadcast capability.
- Security package: Includes a kitted 24' X 24' chain link, heavy-duty security fence system with alarmed, interlocked, and lockable personnel and vehicle access gates. An RF hazard presence detector and warning light are provided to alert personnel to potential exposures. The system is designed to integrate into the GRP-475 ground system with supplied copper grounding conductors, exothermic charges, and ground rods.
- <![endif]>Coaxial cable and connectors to transmitter: All sizes of semi flex components available.
- Remote antenna RF ammeter and status indicators: Custom configurations available.
- SAMWAS-200 spare parts kit: Spare and emergency parts kits can be provisioned to any depth desired by user.

Technical Services Options Available:

- Turnkey construction and commissioning: Site survey, design, permitting, site preparation, construction, and commissioning services on an E, F & I basis using qualified resources. Includes "as-built" documentation.
- A la carte engineering services: Qualified personnel can be provided for such services as site qualification, installation commissioning, and performance verification.
- Emergency and maintenance service: Available on an off-air response or routine basis for all system components, including scheduled inspections and periodic performance revalidation.

Related LBA MW Systems Available:

- TUP-3: Transportable MW system (C-130 qualified)
- TGR-50: Low power man-carry emergency MW system
- SAMWAS-350: DGPS MW short aperture antenna system similar to SAMWAS-200, but based on a 350-foot tower for the 300 kHz DGPS band.
- Other equipment from LBA Technology: A wide selection of equipment and components can be supplied worldwide.

For Quotation or Assistance call 800-522-4464 or E-Mail LBA Technology, Inc. at Lbatech@lbagroup.com

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LBA Site search

Attachment 3

SAMWAS-350 Information

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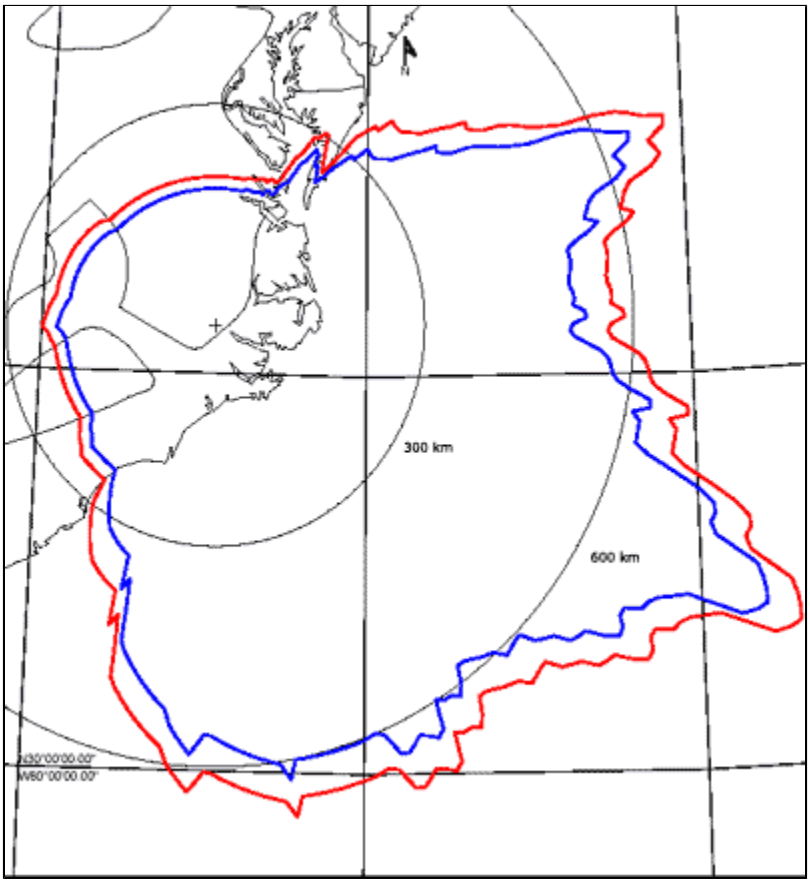
SAMWAS-350 DGPS/NAVTEX Antenna System



The LBA Technology SAMWAS-350 is a fully configured, immediately deployable, short aperture medium wave antenna system. It uses a unique electrically short radiator and peripherals to provide reliable and cost effective omnidirectional coverage for DGPS and radio navigation applications. Single or multiple frequency operation is available.

The SAMWAS-350 system provides digital global positioning system (DGPS) correction signals or safety and warning information to mariners over approximately 87% of the groundwave and skywave coverage achievable from a full ¼ wave vertical antenna in the 300 KHz band, using a structure only 40% of that height.

The SAMWAS radiating structure uses no base insulator and is directly grounded. The grounded tower provides inherent system lightning protection, and permits easy mounting of other antennas for communications, such as for the USCG Rescue 21 program, or for microwave links, without impact on medium wave transmission. Aviation hazard lighting and marking is readily installed, as no electrical isolation is needed.

The SAMWAS system components are designed for the high reliability and minimum life cycle support costs demanded by critical DGPS, NAVTEX and radio navigation missions. The use of standard parts and maximum commonality in subsystems ensures lowest cost life cycle maintenance. Reliability is further enhanced by the use of galvanicaly compatible structural materials, computer confirmed mechanical and electrical safety factors, and special attention to insulator endurance under salt spray and high solar conditions. The conservative mechanical and electrical design of this system is demonstrated by hundreds of similar legacy LBA systems in medium wave broadcast use worldwide for over 30 years.

Since installation and performance can be influenced by geotechnical siting conditions, coupled RF energy from nearby antennas, and other local effects, an LBA site survey before design completion is recommended.

Hardware and documentation deliverables are complete and sufficient to permit installation and commissioning by any suitably equipped and qualified contractor. Alternatively, turnkey installation and commissioning services are available as an option from LBA.

SAMWAS Principal Subsystems

Subsystem A: UP651 Folded Unipole Radiator

The high efficiency radiator system utilizes a grounded vertical radiator with enhanced top loading and a symmetrical folded unipole feed system. The UP-651 radiator is rated for 5000 watts, 100% modulated, continuous duty, which is conservative for reliable service at the typical lower power levels in the 300 kHz DGPS band. Proprietary Delta Unit™ auto tensioning terminations ensure feed system stability.

Standard subsystem components are to EIA/TIA-222-F. Safety features include safety climb device and LBA's patented RF contact personnel protection.

Subsystem B: ATU-2S Antenna Tuning System

The antenna tuning system is designed to provide an interface between the Radiator Subsystem and a 50-ohm coaxial transmission line. The ATU-2S is rated for 2000 watts, 100% modulated, continuous duty in the 300 kHz band. The system is highly reliable, as there are no active components or control circuits in the ATU-2S. The inherent stability of the antenna makes constant retuning unnecessary. The ATU-2S uses a capacitive T-network to match the inverted inductive impedance of the radiator. By using a high-Q capacitor design, inductor losses normally associated with short antenna tuning systems are virtually eliminated, while providing a stable working bandwidth of nominally +/- 3.0 kHz at a VSWR below 3.0:1 (typically 1.8:1), with on-carrier VSWR of 1.1:1 or better. Features include toroidal antenna current meter, safety, security and AC power convenience systems. The equipment is outdoor-mounted in a freestanding weatherproof cabinet and includes a mounting base.

Antenna tuning systems for higher or lower power operation can be provided with similar performance to the ATU-2S.

Subsystem C: GRP-800 Ground Reference System

For maximum efficiency, components for a full ¼ wave buried ground plane are provided, but with flexibility to adapt to available site space. To enhance stability of the short radiator under varying weather conditions, and to improve displacement current collection at the base of the tower, a copper mesh reference plane is provided for burial about the base of the tower, and a radial capacitance reference is provided for above ground installation on the Radiator Subsystem structure. Ground rods, copper strap, and exothermic welding molds and charges are included.

An abbreviated ground system can be supplied. Please contact LBA for an estimate of space versus performance tradeoffs.

Equipment Options Available:

- <![endif]>ATU-2SFA/MX frequency agile tuning unit: The SAMWAS-350 system can be converted to time-share dual frequency operation by substituting this tuning unit. This unit is designed to take two inputs and sequentially switch them in accord with non-conflicting time slots to provide a two frequency broadcast capability. In the "MX"

multiplexer configuration two or more frequencies in the medium wave band (300 – 530 kHz) may be transmitted simultaneously.
- <![endif]>Security package: Includes a kitted 24' X 24' chain link, heavy-duty security fence system with alarmed, interlocked, and lockable personnel and vehicle access gates. An RF hazard presence detector and warning light are provided to alert personnel to potential exposures. The system is designed to integrate into the GRP-800 ground system with supplied copper grounding conductors, exothermic charges, and ground rods.
- Coaxial cable and connectors to transmitter: All sizes of semi flex components available.
- <![endif]>Remote antenna RF ammeter and status indicators: Custom configurations available.
- SAMWAS-350 spare parts kit: Spare and emergency parts kits can be provisioned to any depth desired by user.

Technical Services Options Available:

- <![endif]>Turnkey construction and commissioning: Site survey, design, permitting, site preparation, construction, and commissioning services on an E, F & I basis using qualified resources. Includes "as-built" documentation.
- <![endif]>A la carte engineering services: Qualified personnel can be provided for such services as site qualification, installation commissioning, and performance verification.
- Emergency and maintenance service: Available on an off-air response or routine basis for all system components, including scheduled inspections and periodic performance revalidation.

Related LBA MW Systems Available:

- TUP-3: Transportable MW system (C-130 qualified)
- TGR-50: Low power man-carry emergency MW system
- <![endif]>SAMWAS-200: DGPS MW short aperture antenna system similar to SAMWAS-350, but based on a 200-foot tower for the 500 kHz NAVTEX band.
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Attachment 4

TGR-50 Information

Over 40 years of excellence in telecommunications support.

TGR-50

For AM stations, productive air time must be maintained at all licensed times, in spite of catastrophic events or even planned tower repair work that can render AM antennas unusable. With the advent of LBA Technology's rapidly deployable TGR-50 AM antenna system, AMs now have the means of broadcast continuity with exceptional signal performance, excellent compatibility with the output of all transmitters and compact size for efficient installation and operation.

LBA Technology offers the TGR-50 for purchase or as a leased unit, to be dispatched immediately to any location where AM signal continuity is jeopardized. The 50 foot antenna mast assembly, antenna tuning unit and ground radials (set of 60 at 50' each) are shipped in three containers to the designated site for erection, and the system can be up and running in a morning with minimal labor and assistance. When no longer needed, the TGR-50 is re-packed in the shipping containers and returned to LBA Technology with similar efficiency. Field engineering assistance can be supplied as required.

The TGR-50 uses the proprietary LBA Tunipole™ folded unipole antenna design and is guyed and top-loaded. It exhibits remarkable bandwidth and signal stability for its compact design and is field tunable at the integrated tuning unit for optimal 50 ohm match to the existing transmitter facility output. It is rated for power up to 1,000 Watts, 125 percent modulated, and it is designed for optimum efficiency of performance for AM frequencies above 1000 kHz.

Return to Transportable Antenna Systems