



# KINTRONIC LABORATORIES, INC.

## AM DIRECTIONAL ANTENNA PHASING SYSTEM



**PHASOR CABINET REAR VIEW**



**PHASOR CABINET REAR VIEW WITH DOORS REMOVED**



**PHASOR CABINET FRONT VIEW**



**OPEN PANEL AND SHELF PHASOR**

### **KINTRONIC LABS, INC.**

P.O. Box 845, Bristol, TN 37621

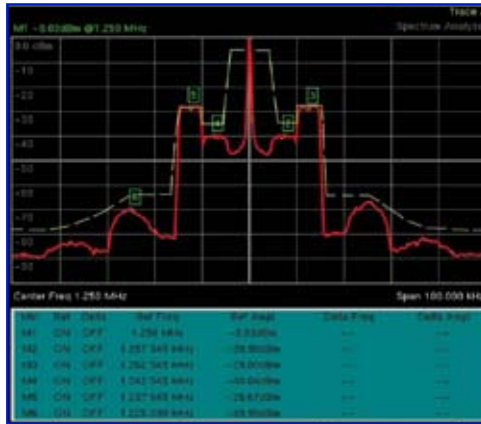
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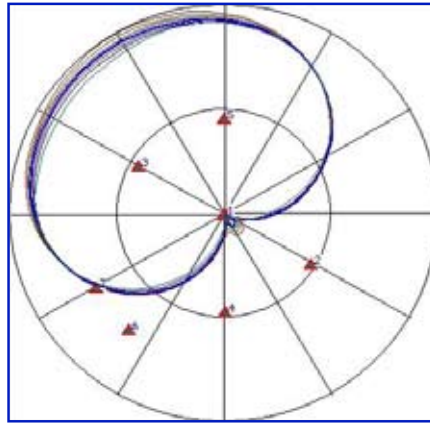
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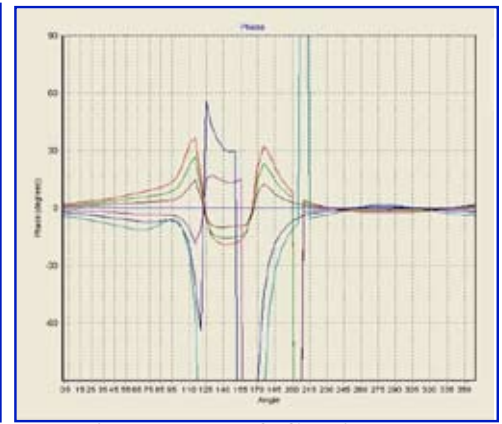
# DESIGN OF AM DIRECTIONAL ANTENNA SYSTEMS



**Ibiquity HD Hybrid Spectrum for Properly Matched Antenna System**

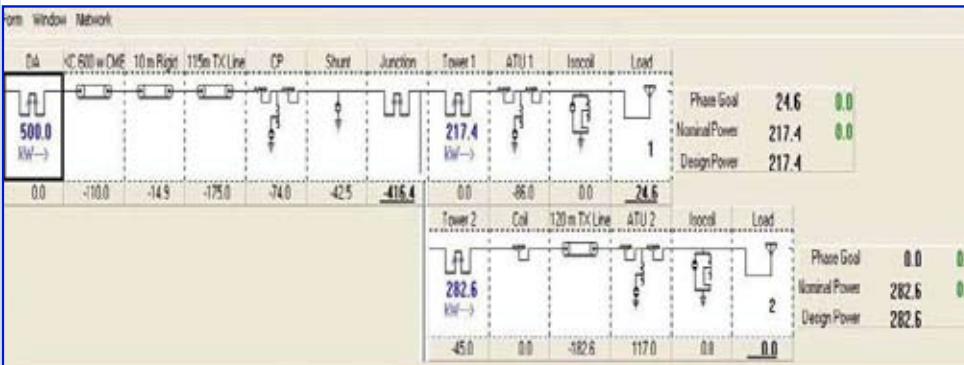


**Polar Plot of Carrier and Sideband Pattern Bandwidth Output of ARRAYPAT**

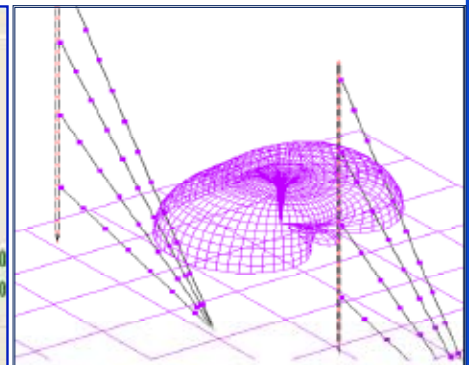


**Linear Plot of Carrier and Sideband Pattern Amplitude**

KTL maintains state-of-the-art design techniques utilizing our in-house developed CKTNET and ARRAYPAT software programs that enable us to meet the requirements for wide impedance bandwidth as dictated by the National Radio Standards Committee (NRSC) approved mask for Ibiquity AM HD hybrid operation and also to yield the corresponding optimum pattern bandwidth that dictates the ultimate fidelity of the received audio. In addition, very conservative component voltage and current ratings are used to yield long life over climatic extremes that are typical for the transmitter site location. KTL's engineering staff has the experience and capabilities to design any type of AM/Medium Wave antenna system whether it is non-directional, directional or multiplexed. Having accumulated a significant empirical database of antenna array measured parameters from previous installations, KTL has developed a high level of confidence in its directional antenna system predictions. Sufficient range in network impedance transformation ratio and phase shift is incorporated into each KTL design so as to minimize or eliminate the need for component changes during the system tune-up and initial operation. It is the desire of KTL to meet the customer's requirements on every job. If the antenna system has been designed by the station's consulting engineering firm, we will submit a proposal based on that design. Otherwise the design will be conducted-in-house.



**Network Topology Output of CKTNET Software**



**Tower Voltage Analysis**

## COMPONENTS

Components of the highest quality are utilized in every KTL antenna system. The objective is to build the systems to operate with a minimum low maintenance life of 30 years. To achieve this result requires the maximum level of skill available in the fabrication of the critical components of a DA Antenna System, including the fixed and variable inductors and the RF contactors. Features of these critical components include:

- Silverplating with anti-tarnish finish on all RF conducting surfaces
- Use of insulators with high surface arc resistance and low water absorption
- Nickelplated brass or stainless steel hardware utilized in all inductor and contactor assemblies
- Silver soldered end lugs on all inductors
- Heat treated inductor clip assemblies for long-term positive pressure
- Variable inductor roller assemblies with unique design to yield long-term positive pressure on inductor winding
- Distributed contact surfaces at high current interconnection points to eliminate localized RF heating
- Corona dissipation devices at high voltage nodes

KTL also maintains a large inventory of mica capacitors as well as fixed and variable vacuum capacitors that are incorporated in antenna systems or are available as spare replacement parts for immediate delivery.

# AM DIRECTIONAL ANTENNA PHASING SYSTEM

## AM DIRECTIONAL ANTENNA SYSTEM

When it comes to AM Directional antenna (DA) systems, Kintronic Laboratories (KTL) comprises complete design, manufacturing and installation capabilities. From the transmitter output port, KTL can supply all of the antenna system equipment, including towers and ground system, transmission and sample lines, phasing and matching equipment, control and monitoring system, transmitter dummy loads and interconnecting rigid transmission lines necessary to put your station on the air. It is the intent of KTL to supply the equipment that meets the specific requirements of each customer. Realizing that each antenna system produces a unique radiated pattern and must be physically tailored to specific installation requirements, KTL has incorporated complete in house fabrication facilities, including CNC machining, sheet metal fabrication, welding and painting, so as to produce the custom equipment for each job to the highest standards of workmanship and engineering practice that are available in the industry.

A DA system is typically comprised of three major elements:(1) the common point,phasing and power dividing cabinet(s). (2) the antenna tuning units (ATU's) and (3) the pattern and/or transmitter selection controller.

## COMMON POINT PHASING AND POWER DIVIDING EQUIPMENT

The principle part of an AM DA system is the common point, phasing and power dividing equipment, which is typically located in the transmitter building. The predominant choice as to the mechanical configuration of these networks is to install them in one or more floor mounted metal cabinets(as shown on the front page of this brochure), which permits the operator to function in a relatively RF-free environment. The common point and phasing networks can also be configured in an open panel and shelf design as shown on the front page of this brochure.

Based on the extensive field engineering experience of KTL, features have been incorporated to simplify the utilization and maintenance of the KTL antenna systems.

Cabinet features include:

- Front and rear access via hinged doors
- Optional front hinged door to conceal controls-lexan or metal
- Light w/installed guard and dual AC receptacle in each bay
- Front dropdown access door to common point J-plug and sufficient to support an Operating Impedance Bridge (OIB)
- J-plugs positioned for ease of access, including adjacent bridge grounding posts
- Interior panels between adjacent cabinet bays permit RF isolation of day and night networks
- Engraved labels to identify each component
- Front panel digital controls with cranks or knurled aluminum knobs
- Copper strap utilized for RF ground throughout and terminated in multiple interconnection brackets at the base level of the cabinet
- Optional paint schemes are available to match the transmitter in use

## TOWER ANTENNA TUNING UNITS (ATU'S)

ATU network designs typically consist of L, T, or PI networks or a combination thereof. ATU standard features include:

- Aluminum housings with hinged, key locked single or multiple doors; meter window; ventilation ports; and multi-coat durable off white paint finish
- Metering options:
  - Thermocouple meter in meter plug
  - Toroidal sampled metering system
  - Remote sensing unit, including sampling loop, rectifier and remote meter
- Static drain choke
- Removable, stowable shelves to support bridge equipment during tune-up
- Optional integrated aluminum knockdown stands to facilitate installation on a concrete pad

A separate brochure is available, which details additional features of the Kintronics ATU series.

## WALL MOUNTABLE OPEN PANEL AND SHELF ATU

Kintronic ATU's are also offered in an open panel and shelf configuration. These units are designed for wall mounting inside a tower tuning house with floor bracing provided if necessary. The coaxial cable input with J-plug and the output J-plug are mounted on individual shelves of sufficient size to support RF bridge equipment. Again, ease of utilization and maintenance are emphasized in the mechanical design and layout. An optional plexiglas or expanded metal mesh cover is offered with each ATU. The same input, output, network and metering options are provided with these units as with the weatherproof ATU's. An example of an open panel and shelf ATU is shown to the left.



Wall Mountable Open Panel and Shelf ATU

## WEATHERPROOF

The ATU's are placed at the base of each tower in the antenna array to match the impedance of the coaxial cable to that of the tower to yield maximum power transfer with optimal audio fidelity. Typically weatherproof housings are utilized for economic reasons in climates where temperatures are not too extreme so as to allow for normal maintenance outdoors.



**Weatherproof ATU on Optional Support Stand**

## ANTENNA SYSTEM ACCESSORIES

KTL also offers a complete line of AM antenna system accessories, including:

- Standard equipment racks indoor or outdoor to match the phasor cabinet styling and paint scheme
  - Model SER-1-78
  - Model SER-1-72
- Dummy loads indoor or outdoor ranging in power rating from 1 to 50 kilowatts + 125% modulation
- Tower lighting chokes
- \* Isocouplers (25 MHz to 1 GHz) for STL, TSL, RPU, Cellular Telephone, Mobile TV, etc.

- Sampling loops or voltage sampling units
- Isolation inductor - single and multi-winding
- Rigid transmission line and accessories
- Ground system copper products
- Flexible transmission and sampling lines with the necessary connectors
- AC and control multi-conductor cables

## INSTALLATION AND SUPPORT

KTL offers complete installation services for the antenna phasing system equipment as well as for the towers, ground system and transmission/sample/AC/control lines. Services include:

- (1) location in the building and permanent mounting of phasor cabinet(s).
- (2) Installation of ATU's at Tower Bases
- (3) completion of all RF connections
- (4) installation and checkout of the transmitter and pattern selection controller.
- (5) installation of towers and ground systems
- (6) trench preparation and installation of transmission/sample/AC/control cables and ground strap and backfilling

Transmitter and/or Pattern Selection Controller

## CONTROLLER OPTIONS:

- Electromechanical Relay Logic Controller
- Programmable Logic Controller-based Control System
- Web Accessible Control System



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