

**DESARROLLO DE UN MODELO PARA EL DISEÑO DE UNA ESTACIÓN DE
RADIODIFUSIÓN DIGITAL EN COLOMBIA**



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**ANEXO B
CATÁLOGOS DE LOS EQUIPOS UTILIZADOS EN EL DISEÑO**

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ANEXO B

El presente anexo contiene los catálogos de los equipos utilizados para el diseño de la estación de radiodifusión digital en FM IBOC. Además se encuentran las curvas E(50, 50), correspondientes a las intensidades de campo de los radiales derecho e izquierdo del sistema de antena.

1. CATÁLOGOS DE LOS EQUIPOS

1.1 EQUIPOS DE LOS ESTUDIOS

1.1.1 DRS 2006

DRS 2006. A difference you can hear and feel. You may ask yourself "Why is this complete and professional radio automation software so cost efficient compared with others?"

The answer is simple. DRS 2006 was developed over the years with the help of our customers and is sold without large advertising expenditure rather as a mass product.

DRS 2006 is also based on available and matured technologies in the database and playback sections, which are world-wide standard. We do not come to you with strange self-developments, whose functionality is often rather doubtful. We use proven technologies to aid in development and reach our goal in the quickest way possible.

DRS 2006 is a huge global project encompassing many radio professionals and programmers throughout the world co-operating to one goal. Therefore take a look into our Development Forum in order to get an impression of this project.

With other products you may also have to pay to fly in sales people and also their time to demonstrate a product. So you pay on top of the product for marketing or costs of sales people. We trust in your specialized self analysis of our product, instead of long winded sales strategies. We let you, as the customer, decide in your own time. Simply compare DRS 2006 with other systems.

Since DRS 2006 is so economical, and is equipped with an open database structure and has only a few hardware requirements, it has not only "taken the world by force" in radio, but has also generally been accepted by discotheques, restaurants, bars, and supermarkets.

DRS 2006 is used from the largest radio stations in the world from the USA down to local radio stations, radio workshops or university radios. Also the so-called webcaster as well as home users use this software. DRS 2006 is held as simple as possible but the possibilities are still endless. Professional radio automation does not have to be expensive, as DRS 2006 shows. Therefore this software is also often used in the home as a replacement for the good old CD player.

The education sector very strongly recommend DRS 2006. In the USA resident radio schools often teach DRS 2006 as the new radio automation standard.

Dip into a radio world, which sets new standards in broadcasting.

Launcher STD/PRO

Database Connector STD/PRO

Audio Manager STD/PRO

Virtual Cart Machine STD/PRO

Playlist Editor STD/PRO

On Air DJ Studio STD/PRO

On Air Radio Studio PRO

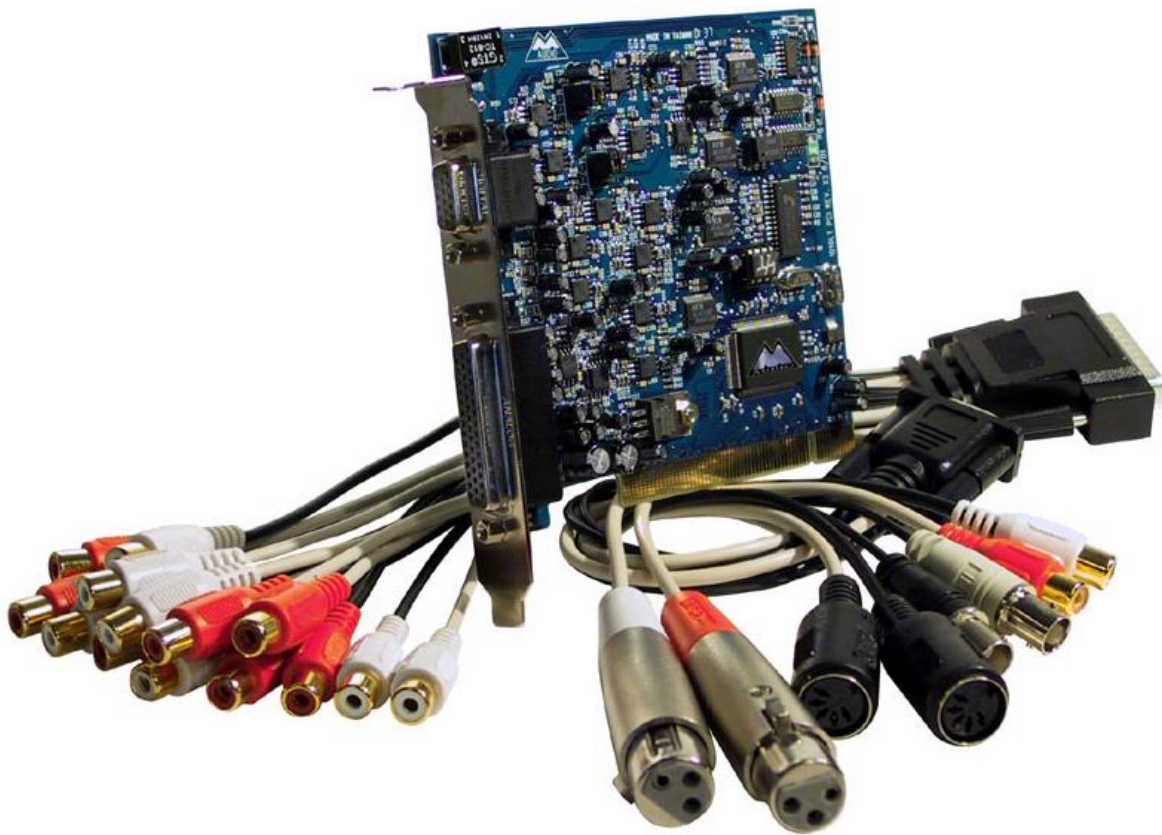
On Air Editor PRO

1.1.2 M-Audio DELTA 1010 LT

(MSRP \$499.95 USD)

Why a Delta audio card?

Sound quality, performance, and superior driver technology are a few of the reasons that Delta audio cards have established worldwide recognition as a top choice in PCI-based digital audio solutions. With superb engineering and ultra-high quality conversion, the fidelity of the Delta 1010-LT outperforms cards that cost many times more. The 1010-LT offers the professional performance required by today's most popular software programs, and provides you with features like 24-bit 96 kHz recording, zero latency monitoring and digital mixing.



Delta 1010-LT Specs:

10 in /10 out 24bit 96kHz audio card with mic preamps,digital i/o,MIDI i/o and more

- 10x10 24-bit/96khz full-duplex recording interface. PCI host card with 2 external, color-coded breakout cables.
- 8x8 analog I/O, balanced on female XLR and unbalanced on gold-plated RCA connectors, with signal level adjustments selectable within the Delta Control Panel.
- S/PDIF digital I/O supports a variety of modes, including AC3 or DTS surround (PC only) and copy protection schemes can be set via the Delta Control Panel.
- 1x1 MIDI I/O on standard DIN jacks.
- External synchronization via word Clock I/O on BNC connectors.
- The two balanced XLR analog inputs can be set via hardware jumpers to accept microphone level or line level signals.
- High dynamic range (A-weighted measured): D/A 101.5 dB, A/D 99.6 dB.
- Low distortion (measured THD @ 0dBFS): A/D and D/A less than 0.002%.
- Frequency Response: 22-22kHz, -0.2,-0.4dB @48kHz; 22-40kHz, -0.2,-0.7dB @96kHz
- All data paths support up to 24bit/96kHz performance, no upgrades necessary.
- Comprehensive digital mixing, routing, and monitoring capabilities with included Delta Control Panel software.
- Hardware sample-accurate sync will allow linking of multiple Delta units.
- Windows XP, 2000/ME and 95/98 multi-card, multi-client drivers with ASIO1 and ASIO2 multi-card, GSIF and EASI drivers included; Windows NT multi-card drivers also included.
- Macintosh control panel and drivers with ASIO1, ASIO2, and legacy ASIO support for OS 8.6 or higher including OS X.

System Requirements (PC):

- Windows 95, 98,NT, 2000, ME, or XP
- Pentium III 500Mhz - (96kHz operation)
- Pentium II 400 - (48kHz operation)
- 128 MB of PC100 RAM - (96kHz operation)
- 64 MB of SDRAM - (48kHz operation)

- UDMA EIDE or ATA 33/66 HDD

System Requirements (Mac):

- G4 or G3
- MacOS 8.6 or higher
- 128 MB RAM - (96kHz operation)
- 64 MB RAM - (48kHz operation)
- OMS 2.3.8 for MIDI operation

1.1.3 Codificador INOVONIC 711

THIS EASY-TO-USE ENCODER SUPPORTS INTERACTIVE RADIO-DATA FUNCTIONS
Inovonics' 711 is a feature-packed RDS/RBDS Encoder for FM broadcasting. It is fully compliant with NRSC and CENELEC radiodata standards and incorporates the Universal Encoder Communications Protocol (UECP).

The usual format identifiers, translator frequencies and other 'static' data are quickly programmed into non-volatile memory using any PC. The Encoder's serial interface may then be tied directly to station automation for sending song titles, telephone numbers, contest results and promotion or advertising messages. These will immediately be displayed on the listener's radio.

Another important 711 feature is the "TA Flag." When your station broadcasts an emergency traffic update, RDS radios automatically tune to your frequency. In some receivers your traffic alert even interrupts cassette or CD playback.

Easy installation: 'loop-through' with failsafe bypass, or 'sidechain' independent of the signal path. Operates with any exciter/stereo-generator combination.

Works with popular hard-disk station automation systems. UECP/ASCII standardized RS-232 interface supports song titles, contests, etc.

Excellent value! Manufactured under license from Aztec Radiomedia, the 711 combines low cost with desired features and an established product track record.

STANDARDS SUPPORTED

European CENELEC and Unites States NRSC.

RDS APPLICATIONS SUPPORTED

PI (Program Identification) Your station's "digital signature" based on call letters (U.S.) or assigned identifier (Europe).

PS (Program Service Name) Your station's "street name" that will appear on the receiver faceplate display. 8 characters, maximum.

PTY (Program Type) This identifies your station format from a listing of pre-defined categories and helps listeners quickly find their preferred programming.

TP (Traffic Program Identification) A data 'flag' that identifies stations that routinely include traffic bulletins in their normal programming.

TA (Travel Announcement) A data 'flag' broadcast only when a critical traffic announcement is being given. This temporarily retunes RDS radios to the station airing the bulletin, and can even interrupt cassette or CD playback.

AF (Alternative Frequencies) This supplies the frequency of any translators or networked stations, allowing car radios to seek the best source for the identical program.

DI (Decoder Information) Indicates whether the transmission is monaural or one of several binaural/stereo options.

M/S (Music/Speech Switch) Indicates whether music or speech-only programming is currently being transmitted.

RT (Radio Text) A 64-character block of plain text for visual display on the front panel of RDS radios. This can carry song title and artist, advertising, contests, promos, etc. Automobile receivers may inhibit this display in moving vehicles per current standards, practices and common sense.

FFG (Free Format Groups) The 711 Encoder is capable of transmitting hidden data within a legitimate RDS group for proprietary communications or other non-standard applications.

MPX/SYNC INPUT The unbalanced, bridging input accepts a composite/MPX stereo-baseband signal (maximum peak level +18dBu) or a dedicated 19kHz TTL SYNC source (maximum level 5V p-p). The Encoder defaults to an internal crystal timebase for monaural transmission.

RDS/MPX OUTPUT. The unbalanced output has a source impedance under 100 ohms. The Encoder may be jumpered internally to provide only the RDS subcarrier (sidechain mode), or the entire composite/MPX baseband (loop-through mode) with unity gain (maximum peak level +18dBu).

RDS INJECTION LEVEL. Under software command the RDS subcarrier may be set at any level between -60dBu and 0dBu in 1dB steps, and shifted in phase $\pm 180^\circ$ in 6 μ s increments.

SERIAL DATA INTERCONNECT. RS-232 port (DB-9 connector) for static ID programming and dynamic messaging. 1200 to 9600 baud (9600 default), 8, N, 1 protocol; plain-text ASCII or standardized UECF data communication.

TA SWITCHING. The temporary TA 'flag' is set either by software command or with a momentary contact closure through a rear-panel BNC connector.

POWER REQUIREMENTS. 105-130VAC or 210-255VAC, 50/60Hz; 15W

SIZE AND SHIPPING WEIGHT. 1-3/4"H x 19"W x 7"D (1U; 7 lbs).

1.2 ENLACE ESTUDIO TRANSMISOR

1.2.1 DMM92 Digital MODEM

GENERAL DESCRIPTION

The DMM92 Series Digital Modems & Multiplexers are very spectrally efficient encoders and decoders which allow digital data or digitally encoded audio channels to be transmitted via TFM Model 9100 Composite STL, Model 8500 TV STL subcarrier system or virtually any analog FM STLs.

DMM92 Encoders convert serial data streams into a spectrally efficient 15-level duobinary, digitally encoded analog signal occupying a baseband bandwidth of approximately 1/6 the aggregate data rate. This analog signal frequency modulates the carrier of any conventional STL or RPU transmitter that has sufficient baseband bandwidth. The decoder converts the digitally encoded baseband signal from the output of a receiver back to the digital data stream for decoding by either an internal APT-x or MUSICAM codec or external codec.

When the DMM92 is added to an existing analog STL system, it is possible to improve the fade margin by 20dB or more, to increase the signal-to-noise ratio of audio channels by at least 10dB and to extend the STL distance by many miles. State-of-the-art forward error correction and adaptive path equalization are coded into the data stream and processed by a Digital Signal Processor (DSP) which allows error free transmission and compensates for any group delay, phase and amplitude distortion. Analog models offer internal APT-x or MUSICAM audio encryption while digital models offer selection of external codecs or from other digital sources.

SPECIFICATIONS

FREQUENCY RESPONSE

- 15 kHz Channels 20 Hz to 15 kHz, +/- 0.1dB
- Optional 7.5 kHz Channels 20 Hz to 7.5 kHz, +/- 0.1dB
- Optional 3 KHz Channels 300 Hz to 3.4 KHz, +/- 0.5dB

GENERAL SPECIFICATIONS

- Analog models. Internal APT-x or MUSICAM codec.
- Digital models. External 256 kbps, 128kbps or 64 kbps.
- Audio delay. Less than 4 msec (APT-x audio codes).
- System clock. Internal or external.
- Audio input level. 0dBm balanced, 600 ohm, front panel adjustable +/- 6dB.
- Audio output level. 0dBm balanced, 600 ohm, internally adjustable +/- 6dB.

TYPE OF CONNECTOR

- 15 kHz and 7.5 kHz audio channel. XLR, PIN 1 Ground, PIN 2 "+", PIN 3 "-".
- 3 kHz audio channel. Barrier strip
- 0-9600 baud data channel. DB-9
- AES/EBU input and output. Barrier strip

Digital composite. BNC

1.3 EQUIPOS EN EL SITIO TRANSMISOR

1.3.1 Procesador ORBAN OPTIMOD FM 6200

OPTIMOD-DAB 6200 is the first audio processor designed specifically for digital radio (DAB). A transparent protection limiter provides optimum control of peaks for absolute protection against digital clipping, while OPTIMOD processing structures ensure source-to-source consistency and also let you create the precise balance of loudness, bass punch, vocal presence and high end sizzle you want.

Presets are provided for all radio formats and webcasting applications. The 6200 is fully compatible with Eureka 147 and all proposed IBOC DAB and Radio Mondial systems.

Features Include:

- Factory processing presets specifically designed for DAB.
- Includes CBS Loudness Controller to prevent viewer annoyance caused by loud commercials.
- Protection Processing for peak control without audible compression.
- Two-Band Processing for gentle control of dynamics while maintaining the frequency balance of the original program.
- Five-Band Processing with flexible set of equalization controls to produce your signature sound.
- Three levels of control over your sound: factory processing presets named for your format, easy, single-knob LESS-MORE control of processing within each preset, and FULL CONTROL for versatile customization of your sound.
- 20kHz bandwidth for wideband DAB. Bandwidth variable to 4kHz for narrow-band, low sample-rate broadcasting, including proposed IBOC shortwave systems.
- Digital I/O: 48, 44.1 and 32kHz input, automatically selected; 48, 44.1, or 32kHz output.
- Dedicated external digital sync input for house reference signal.

- Eight opto-isolated remote control inputs can be programmed to change processing stereo and Dolby Stereo matrix surround material.

1.3.2 HARDEXSTARFM

Features:

- High Performance RF Upconverter
- Broadcast Standard Exciter Controller, Audio IO, RF IO and Remote IO
- Intuitive Touch-Screen Graphical User Interface (GUI)
- Internal GPS receiver with high accuracy 10 MHz and 1PPS clock oscillators
- External GPS antenna with cable

The Harris DEXSTAR FM IBOC exciter generates a high quality FM IBOC DAB signal ready for use by a digital only transmitter in separate amplification or low level combining with an FM exciter where common amplification is employed. DEXSTAR FM includes an exclusive Harris designed RF Upconverter assembly that delivers spectrally clean, on-channel DAB sidebands ready for amplification by a linear transmitter. The DEXSTAR FM exciter offers broadcast standard interface from the audio inputs and outputs to the remote control interface, making installation of the exciter simple and familiar. DEXSTAR FM mounts in standard EIA 19" equipment racks on ball bearing slide rails allowing easy access to the top cover and CD ROM drive.

All audio, RF and remote control connections are made at the rear panel of the exciter.

DEXSTAR FM is 19" wide, 7" tall and 22" deep.

The Harris ePAL provides, digital audio synchronization, rate conversion, digital audio distribution, and "delayed-audio" bypass switching all in one low cost 2 RU unit assembly. Combining these functions into one unit offers less complex and more efficient distribution of digital audio.

1.3.3 IBOC Filter-Injector

Features

- The Most Cost-Effective Solution to Digital Conversion
- Compact Design
- No AC Power Required

General Description

The Shively IBOC filter-injector system was designed to offer the FM broadcaster the most costeffective solution to digital conversion. Beginning with Shively's legendary FM combiner design technology and incorporating a unique feedback loop design, the Shively system not only offers the industry's best electrical performance, but does it in a package that is a fraction of the size and weight of the competition's. No wonder that

Shively filter-injector systems have been the filters used exclusively at iBiquity test sites, and that Shively was the first company to win iBiquity certification.

The Shively IBOC filter-injector is designed to balance the coupling losses to the analog and digital signals for the most efficient overall performance. The Shively filter system works at any analog power level and ensures that when FM radio moves to the digital-only phase, no additional filtering will ever be required.

Specifications



- Size: Filter: 24 in (61 cm) square x 48 in (122 cm) high Injector: 20 in (51 cm)
- Weight: 110 lb (50 kg)
- Power Rating: Up to 30 kW analog transmitter (higher power levels available as specials)
- AC Power Requirement: None
- Mounting: Can be stacked, hung, or sit directly on the floor. The injector may be mounted directly on the side of the filter to minimize package size, or may be removed for remote installation.
- Input/Output: Analog: 3-1/8" EIA - can be adapted
- Digital: 7/8" EIA - can be adapted
- Filter Insertion Loss: 0.75 dB (digital signal only)
- Injector Coupling Loss: Analog: 0.5 dB (10% power)
- Digital: 10 dB (90% power)

1.3.4 HARZ12HDC

Harris Z12HDC, 5kW, solid-state Hybrid FM/IBOC DAB transmitter equipped with the Harris DIGIT(R) CD digital FM exciter.

Features Include:

- One Harris DIGIT CD digital FM exciter with 55-watt power amplifier and three year limited warranty.
- Twelve (12) "Hot-Pluggable" linear RF amplifier modules
- Two (2) auto-switching IPA amplifiers
- One (1) IP1D Linear Preamplifier (optional auto-switching reserve IP1D available)
- Internal harmonic filter with high energy DC return for lightning protection.
- 1-5/8" or 3-1/8" EIA flanged output connector.
- RF directional couplers for system protection, and directional RF sample probe for customer use.
- Back-up "life support" controller; keeps transmitter ON AIR if the main controller becomes inoperative.
- RS-232 port for use in remote diagnostics using customer's external modem and PC.
- Built-in parallel interface for remote control, status and metering; RFI and transient protected.
- Proportional VSWR foldback for safe operation at reduced power into marginal loads (icy antenna, etc).
- Automatic restart after AC mains

1.3.5 Antena

Antena tipo panel-Antenas de Colombia limitada

Ventajas:

Verdadera polarización circular (porque la torre soporte no deforma la relación de campos 50-50) que garantizan el mínimo desvanecimiento selectivo, dando por consiguiente el cubrimiento más uniforme que se puede conseguir en FM.

Economía de energía porque sólo radía señal en las áreas que se desean cubrir y no se desperdicia en áreas de baja densidad de población.

Mayor ancho de banda que las antenas tradicionales, lo que redundo en una mayor capacidad de modulación de todo el sistema y una mejor relación señal a ruido con la consiguiente mejora en la recepción de señal en áreas críticas, por esta característica se pueden combinar varias emisoras en un mismo sistema irradiante.

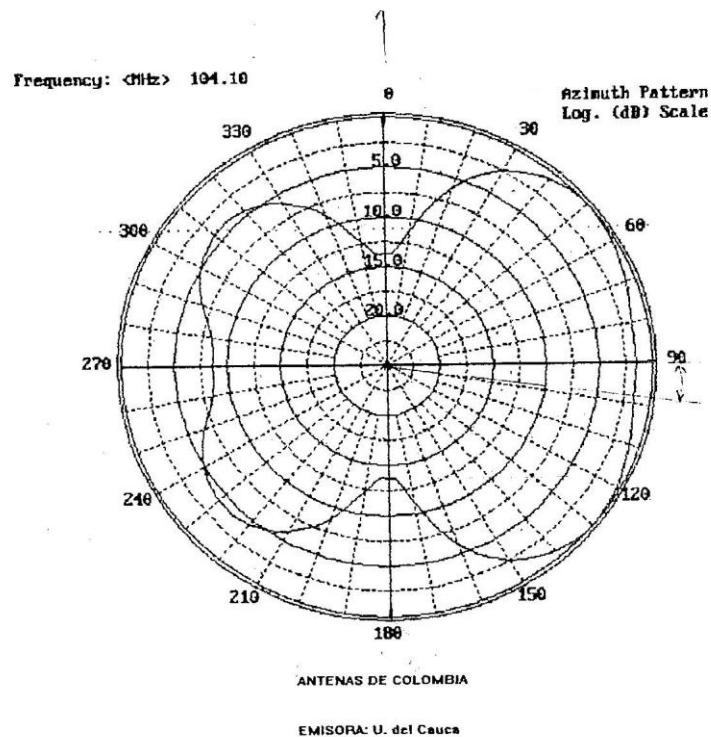
Características eléctricas y mecánicas:

Cada panel de antena consta de dos sistemas radiantes, colocados en cuadratura al frente de un reflector para dar la polarización circular. Para patrones omnidireccionales estos paneles se montan en cada cara de la torre y en tantos niveles como se requiera para la ganancia deseada. Para patrones direccionales, la colocación puede variar de cara a cara y de nivel a nivel. El valor de VSWR es mejor de 1.1: 1 para un 1 MHz en todo el sistema.

Los latiguillos de la antena tienen cables 7/8" que manejan 5 KW.

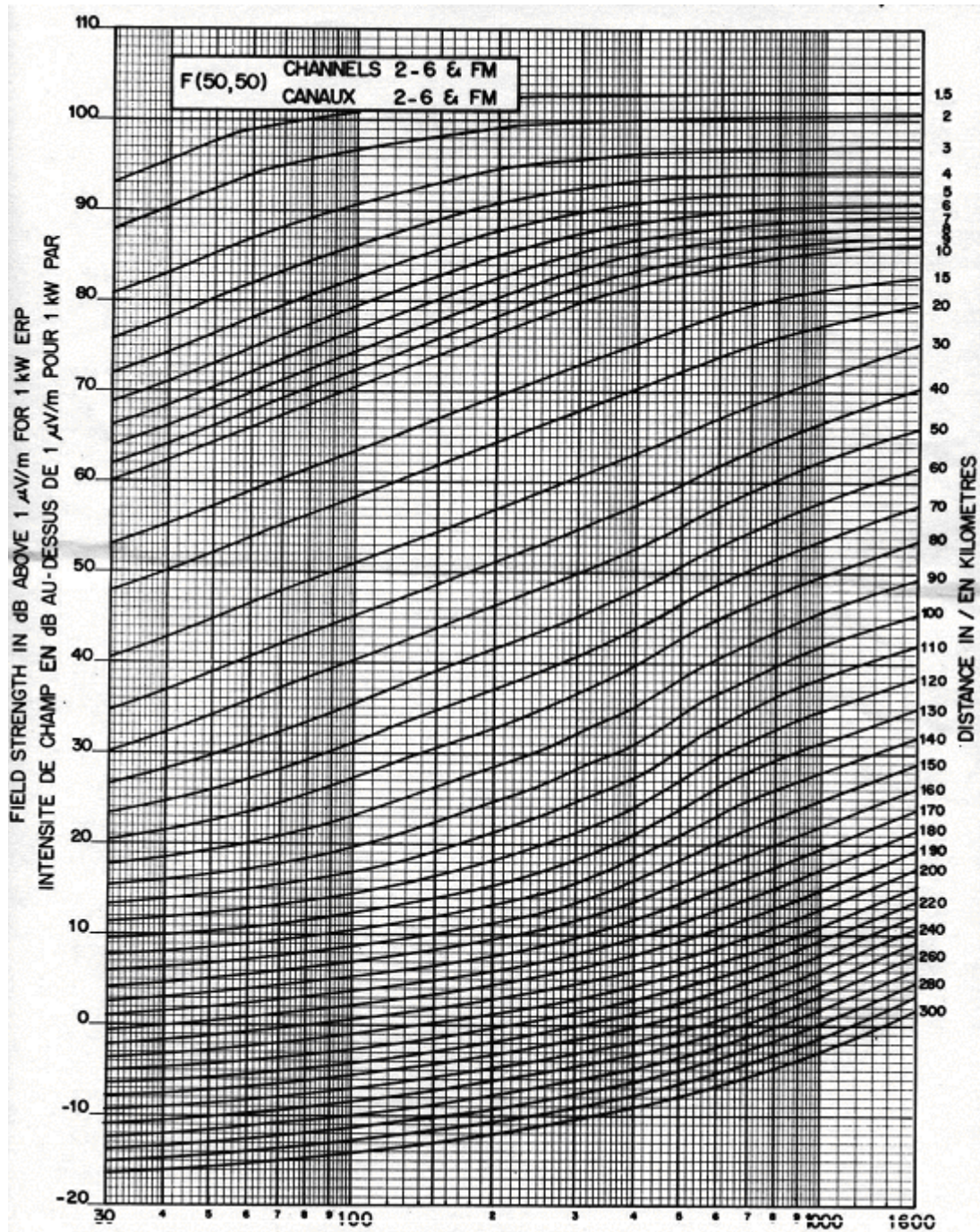
El sistema se puede modificar para permitir un transmisor de mayor potencia con olo cambiar el alimentador inicial.

Patrón de radiación de la antena

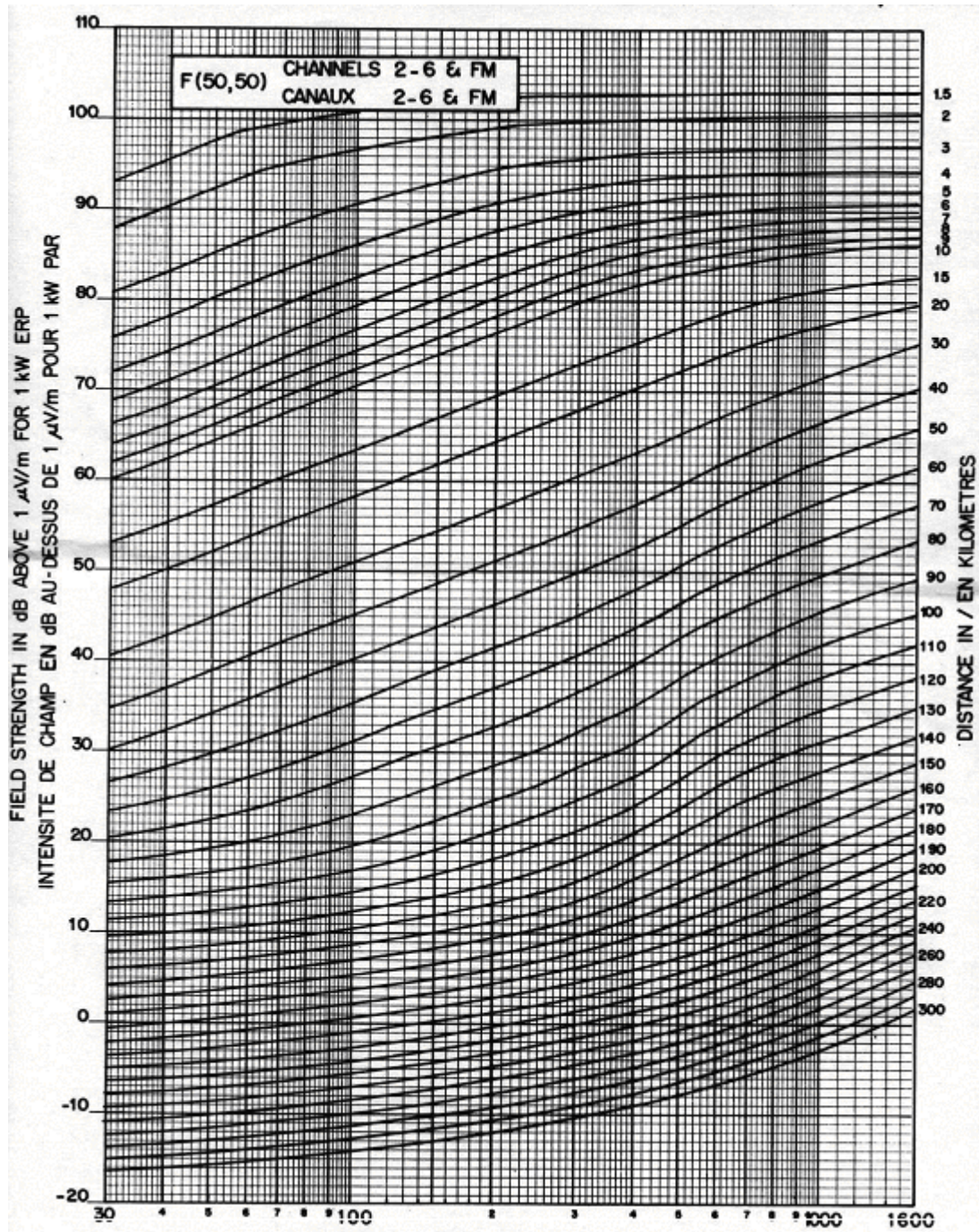


2. CURVAS 50-50

2.1 ALCANCE DEL SERVICIO



2.2 NIVEL DE SEÑAL RADIAL DERECHO



2.3 NIVEL DE SEÑAL RADIAL IZQUIERDO

