Introducing Antennas, Coverage Predicting and Planning
The Group

INTRODUCTION

Elenos Group - History

Elenos was founded in 1977 in Ferrara, Italy
- Focused on providing a wide range of FM Transmitters, featuring the most compact and efficient products on the market
  *(First in the world to provide a 10KW FM in 4U only)*

Itelco Broadcast began in 1962 in Orvieto, Italy
- Specialized in digital modulation and high-power liquid-cooled systems
  *(Supplier of CERN for High-power amplifier involved on the Large Hadron Collider)*

BE was established in Quincy, Illinois in 1959,
- Broadcast Electronics has an illustrious history that has played an influential role in many radio milestones
  BE offers a wide range of high quality radio broadcast products, including automation software, transmitters for AM, FM and HD Radio and Marti Electronics.

PROTELEVISION TECNOLOGIES established in Denmark, over 50 years of experience,
- Broadcast formerly Philips TV & Test Equipment, is a leading designer and manufacturer of advanced future-proof modulation solutions for Digital TV and Radio standards (DVB-T/T2, ISDB-T, DAB+, ATSC 1.0 and ATSC 3.0) represented worldwide in more than 50 countries with over 30,000 installed units in daily operation.
Today

The mission of the **Elenos group**, by utilizing its state-of-the-art production capabilities and international sales network, is to provide consumers with the best radio and TV broadcasting experience for all global modulation standards.

**With over 90 years of experience in the field**, the Elenos group has developed technologies for Network applications, Digital and Analog TV / FM Radio Systems, scientific RF applications and remote software control and management.

The Elenos group is an ideal partner in helping develop your networks for your next digital migration.
60,000 Installations
130 Countries
90 Years of Experience

More than 20 Centers of EXCELLENCE

- Radiocomm
- LEGA Ltd
- Clyde Broadcast Products Ltd
- Broadcast Partners
- FPG SERVIS s.r.o.
- Nagyfrekvencia Kft
- RTV-TEC
- Roussillon FM
- SiteMaster LDA
- Matel Elettronica Snc
- RS Telekomunikasyon

- Athenas Comunicación y Logistica SL
- Shanghai Yi Hui Nuo Broadcast
- PT. Solitech multi-media & broadcast sol.
- Vtek Engineering Ltd
- Headway High Tech
- BTSi
- Broadcast Solution International Ltd
- Cakrawala Gemilang
- Ponto de Apoio Tecnico
  Eletronico LTDA
- Vec Srl
Some of our customers in ASIA

- Audio Visual communicators Inc.
- Allawan Enginneering
- Aliw Broadcasting
- Baganian Broadcastind Corp
- Brigada News FM
- Brigada Mass Media Corp
- Cristian Music Power
- Capitol Broadcasting Center
- DXKB 89,1
- DXJM FM
- DJIB 96,1 FM Municipality Pamploma
- Efren Tenizo
- First United Broadcasting
- UM Broadcasting Network
- Insular Broadcasting
- Radio Mindanao
- Southern Broadcasting Network
- Primax Broadcasting
- Radio Corporation Philippines
- Ramil Uy
- RMC Broadcast Corporation
- RT Broadcast Specialists
Elenos Group
World Broadcast

Turnkey Project Capability
Antenna Theory

A transmitting antenna converts the energy that arrives from the cable into energy that is radiated in free space.

It is important that the antenna redistributes the energy in the most efficient way.

Different characteristics or physical properties of the antenna determine the good functioning of this process of conversion.

A receiving antenna converts the intercepted signal into energy that is propagated along the cable.
The Elenos Group
More than single transmitter
Transmitter system N+1 / 1+1
Has the capability to design complete turnkey projects
This means integration of:
Headend Planning
Towers, Facilities and Foundations
Antenna Installation and Field Verification
Today we talk about... TV Antennas
Antenna Theory

What’s an antenna?

An antenna is a transducer, it’s a device that converts one form of energy into another.

Fundamental equation:

\[ f = \frac{c}{\lambda} \]

Where:
- \( c \) is the speed of light
- \( f \) is the frequency
- \( \lambda \) is the wavelength

Consequently, frequency has an inverse relationship to the wavelength.

As soon as the frequency increases, the dimensions of the antenna must be reduced further. The final dimension of the antenna is therefore determined from the working frequency.
Antenna Theory - Broadcasting Polarization

VERTICAL

Vertical polarization is the most used in FM broadcasting transmissions since it is preferable to radiate - or to receive - the signal in all directions. It also guarantees a slight immunity to the suburban or country environment.
A signal having a horizontal polarization is more suitable to be received by antennas installed in fixed places. Generally, it is less affected by interferences than vertical polarization. Normally, a horizontally polarized signal is less affected by building and mountain reflections and offers a stronger resistance to noise interference.
Antenna Theory - Types

The basic antenna might have different gains according to its particular radiation pattern.

Omni-directional

Semi-directional

Directional
Antenna Theory - Types

The basic antenna might have different gains according to its particular radiation pattern.

- **Omni-directional**
- **Semi-directional**
- **Directional**
Antenna Theory – Broadcasting ARRAY

Choosing the horizontal amplitude of the antenna diagram

Depending upon transmitter position you have to define horizontal aperture of your antenna system. Basically your system may be directive, if transmitting point is, for example, over a mountain or omnidirectional (if your transmitter is over a building into a town).

By means of same antenna, in different configuration, you can reach several configuration.
Using directional antennas installed in many stacks and bays, it is possible to create systems with different radiation characteristics ...
Antenna Theory – Broadcasting ARRAY
Choosing the horizontal amplitude of the antenna diagram

Omnidirectional Antenna system two bays configuration (4+4 antennas)
Antenna System Gain = 5 dBd gain (3 kW ERP)
Antenna Theory – Broadcasting ARRAY

Choosing the horizontal amplitude of the antenna diagram

Directional Antenna system 8 antennas in 1 direction
Antenna System Gain = 17 dBd gain (140 kW ERP)
Antenna Theory – Broadcasting ARRAY

Choosing the vertical amplitude of the antenna diagram

Vertical sections are generally represented on a Cartesian graph, rather than a polar one:

Vertical sections plotted on a polar graph

Vertical sections on a Cartesian graphic from -5° to +85°
Antenna Theory – Broadcasting ARRAY
Choosing the vertical amplitude of the antenna diagram

Area coverage problem

Vertical Diagram optimization: Null filling & Electrical Tilt
Antenna Theory – Broadcasting ARRAY

Vertical Diagram optimization: Null filling & Electrical Tilt

Secondary lobes can be modeled according to the Tchebyscheff polynomials or changing the feeding magnitude of the antenna system.

Null filling is usually made by appropriate variations of the relative **phases of each antenna**. The combination of phases should be calculated in order to avoid a null vector in the vectorial sum. This can be easily done by changing the lengths of the feeding cables.
Antenna Theory – Broadcasting ARRAY

We have to pay special attention to the SFN digital coverage

Digital transmission give us a big advantages in spectrum frequency exploitation. Digital transmission allows adjacent and coadjacent channel transmission. It doesn’t need both-sides channel guard... BUT,

Special attention has to be made during the digital propagation coverage design to avoid too many overlapping areas and To achieve reasonable field intensity. To do this we use a professional software tool to to simulate the propagation, let us see what is it...
ALL IN ONE SOFTWARE “EMLAB from ALDENA”

Antenna design

Coverage calculation

Network Planning

EM Health Safety (NIR)
MAIN FEATURES

ANTENNA LIBRARY

More than 1500 different elementary antennas form different antenna manufacture.

Upgradable by the user or by ALDENA staff. Create and import new antennas manually or using MSI/TXT files.

For each antenna, it’s possible to add different data:
- Frequencies
- H/V amplitude diagrams
- H/V phase diagrams
- Gain
MAIN FEATURES

ANTENNA DESIGN
(Array design & optimization)
Base Antenna selection from ANTENNA LIBRARY
(yagi, panels, log periodic, ...)

Geometry Definition
(Mechanical position: offset, vertical distance)

Electrical Data Definition
(phases and power at each single antenna)

Automatic optimization utilities for:
- H Diagram
- Electrical Tilt, Null creation in specific direction
- V Elevation Diagram
- Null filling
MAIN FEATURES

ANTENNA DESIGN
(Array design & optimization)

ERP Authority Limitation management
- import & overlap
MAIN FEATURES

ANTENNA DESIGN (Array design & optimization)

Check points – target area management (View & EM Field prevision)
MAIN FEATURES

COVERAGE AREA

«Country» DTM included
“Standard” (45mt) o “High definition”

Different propagation model use
(ITU-R 1546, ITU-R 1812, ...)

CLUTTER

Advanced reports (population) – Export results
The Group | Itelco | Antenna coverage

MAIN FEATURES

COVERAGE AREA
The Group | Itelco | Antenna coverage

MAIN FEATURES

COVERAGE AREA
MAIN FEATURES

SFN COVERAGE AREA
AREA COVERAGE DTV

SELF-INTERFERENCE DTV

REAL–TIME ANALYSIS

AUTOMATIC FEATURES FOR ERP TX / DELAY TX optimization
MAIN FEATURES

Field Strength Exposure – EM Health safety

«Respect Volume» calculation

Horizontal & vertical sections

Check point management

Advanced 3D urban view

Additional features for mobile operators
- TILTSCAN
- Power reductions
MAIN FEATURES

Field Strength Exposure – EM Health safety

«Respect Volume» calculation

Horizontal & vertical sections

Check point management

Advanced 3D urban view

Additional features for mobile operators
- TILTSCAN
- Power reductions
The Group  Itelco | Antenna coverage

MAIN FEATURES

Field Strength Exposure – EM Health safety

«Respect Volume» calculation

Horizontal & vertical sections

Check point management

Advanced 3D urban view

Additional features for mobile operators
- TILTSCAN
- Power reductions
Our network of dealers are supported by our field engineering team World-Wide.
Thank You and mail us for info

Radio & TV
Broadcast Equipment
and solutions Worldwide

Elenos Confidential | Transmitters and Service Solutions

Elenos
Headquarters:
44028 Via Amendola 9 - Poggio Renatico FE
Italy Telephone +39 0532 82 99 65 –
Fax +39 0532 82 51 77
www.elenos.com - info@elenos.com

Broadcast Electronics
Headquarters:
4100 North 24th Street Quincy, IL 62305
Phone: (217)-224-9600
Fax: (217)-224-9607
www.be.22hbg.com - bdcast@bdcast.com

Itelco
Headquarters:
65818 Via Dell’Innovazione 2 - Orvieto TR
Italy Telephone +39 0763 96 03 00 –
Fax +39 0763 34 18 10
www.itelco.tv/ - info@itelco-electrosys.com

ProTelevision
Headquarters:
Valhøjs Allé 176, 1st floor - DK-2610 Rødovre
Denmark Telephone: +45 44700000
www.protelevision.com - sales@ProTelevision.com