
KATHREIN
KATHREIN
Professionelle Antennen

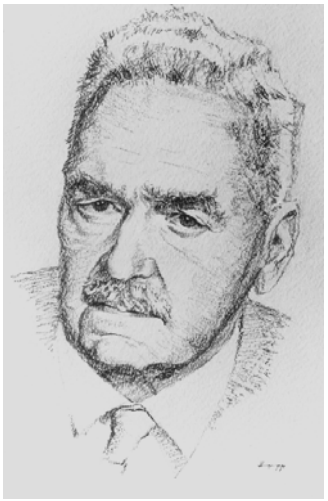
Company history

In 1919, Anton Kathrein senior founded the company.

Back then, merely lightning arresters and overvoltage protectors were produced.

KATHREIN
90 Jahre
1919 - 2009
Der weltweit älteste und größte Antennenhersteller.

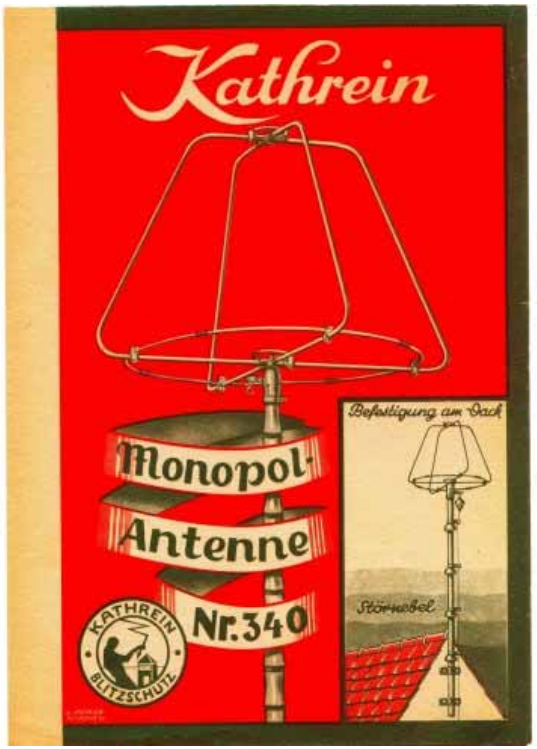
Anton Kathrein, engineer (1888-1972)



KATHREIN

Company history

- 1919 Invention of lightning arrester
- 1926 Extension of product line with medium wave antenna
- 1949 First FM antenna manufactured industrially
- 1953 TV goes on air in Germany;
  Kathrein starts producing transmitting antennas

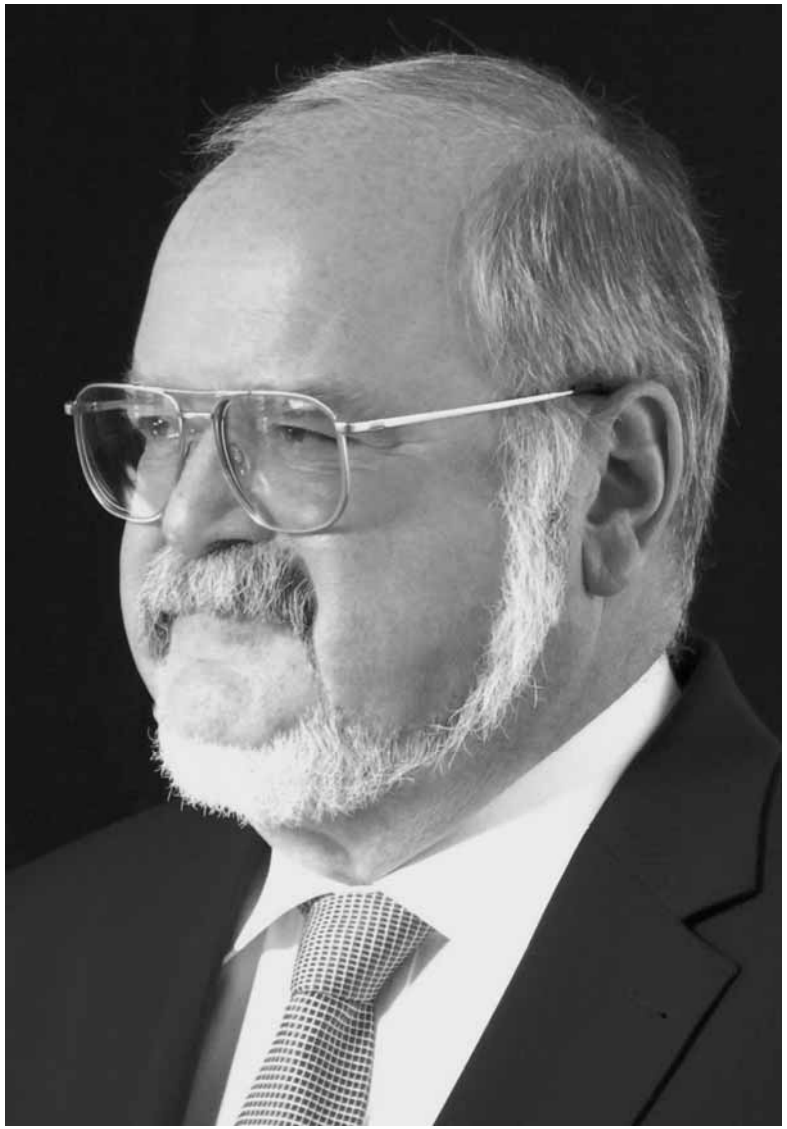


KATHREIN

Company history

Prof. Dr. Dr. h. c. Anton Kathrein led our company from 1972 until his untimely death on 13th November 2012.
He held various offices, including the following:

- Vice President of the German ZVEI, Frankfurt (German Electrical and Electronics manufacturers‘ association)
- President of the Bavarian ZVEI
- Vice President of the Chamber of Industry and Commerce for Munich and Upper Bavaria in the Federal Republic of Germany
- Vice President of the Federation of the Bavarian Economy



KATHREIN

Our Executive Board

Anton Klaus Kathrein
Chief Executive Officer

Christian Harel
Sales & Marketing

Walter Staniszewski
Research & Development

Frank Ullmann
Operations & IMS

Norbert Schindler
Finance & Administration

Our Executive Board

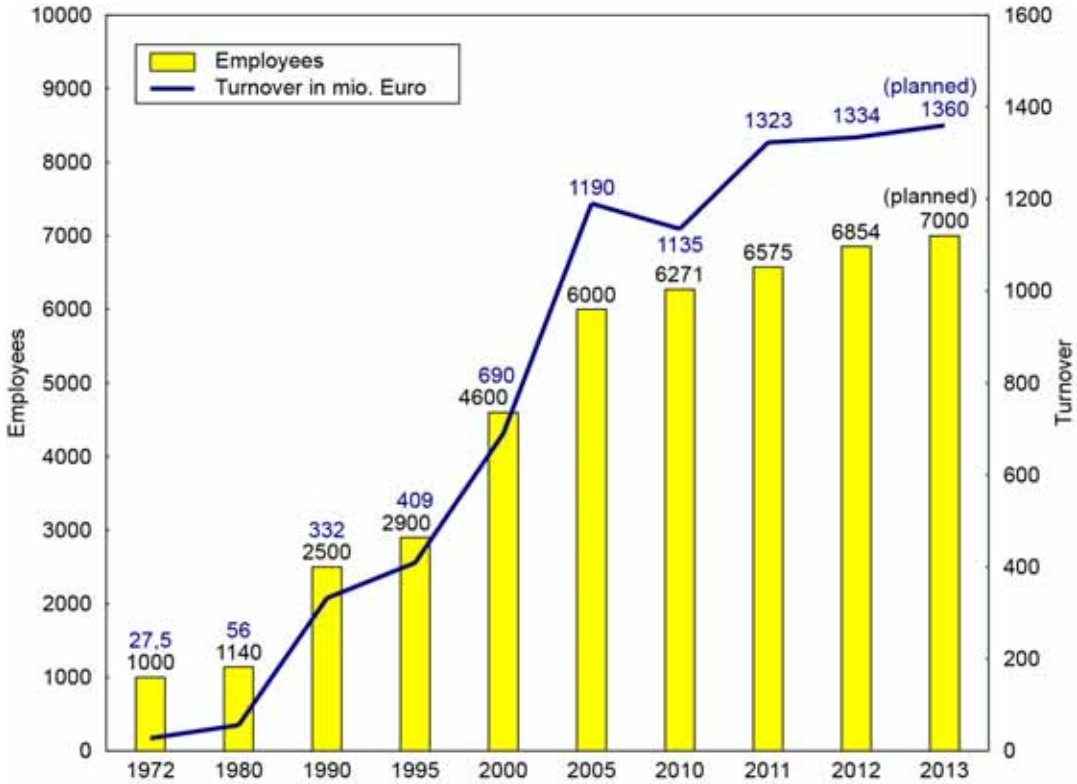
Anton Kathrein with the Executive Board (from left to right): Walter Staniszewski, Frank Ullmann, Christian Harel and Norbert Schindler.

The Kathrein-group in figures

Turnover rose from
27.5 million € in 1972 to
1,360 million € in 2013 (planned).

Number of employees

- Kathrein-group 7,000 (planned)
- KATHREIN-Werke KG 1,900



Quality

You can find Kathrein systems wherever top quality, maximum reliability and long durability are required.

Kathrein antennas in Egypt, Africa

Kathrein antennas on Mount Säntis, Switzerland

KATHREIN

Quality

The worldwide committed group has kept on feeling bound to the company founder‘s credo - going for top quality. So, “Quality leads the Way“ is Kathrein‘s company philosophy and key to success.

Currently KATHREIN-Werke KG and 20 subsidiaries all over the world already produce to the DIN EN ISO 9001 (quality) and ISO 14001 (environment) quality management systems.

Quality

ISO TS 16949: 2002 is the automotive quality standard. It specifies the quality system requirements for the design, development, production and installation/ servicing of automotive-related products.

The Kathrein-group companies *katek*, KATHREIN-Sachsen and Olimpus Ltda. have been ISO TS 16949 certified.

Associations and Memberships

The Kathrein-group is among others associated with these task forces and associations:

- ANGA, Verband Privater Kabelnetzbetreiber e. V.
- Zentralverband der Deutschen Elektronikindustrie ZVEI e.V.
- European Committee for Electrotechnical Standardization
- Digital Video Broadcasting
- Multimedia Home Platform
- European Telecommunications Standards Institute (ETSI)

The Kathrein-group

Kathrein‘s currently 61 subsidiaries and affiliates are located among others

in Europe:

- Germany
- Austria
- Italy
- Romania
- Czech Republic

in America:

- USA
- Brazil

in Asia:

- China
- India

Some of the group companies

Kathrein in Rosenheim

Plant 1

Plant 2

Plant 3

Plant 4

KATHREIN

Departments

KATHREIN-Werke KG

Satellite and terrestrial antenna products and systems
SAT

Mobile communication antennas
MCA

Hybrid fibre coax networks
HFC

Filters, combiners and amplifiers
FIL

Radio Frequency Identification
RFID

Broadcast antenna systems
BCA

Car antennas and automotive systems
CAR

Digital technology
DIG

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Satellite and terrestrial antenna products and systems (SAT)

- Satellite antennas from 57 to 220 cm Ø
- Feed systems
- DVB-S, DVB-C and DVB-T receivers
- Signal processing systems and
  IF distribution systems
- Multimedia sockets
- Terrestrial antennas (analogue + digital)
- Mounting accessories
- Measuring instruments

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Broadband communication systems for cable networks (HFC)

- HFC network infrastructure
- Optical transmission and reception systems
- IPTV package solutions with signal reception, middleware and set-top boxes
- DOCSIS solutions
  - CMTS DOCSIS 3.0
  - Modem/Gateway
    Voice over IP,
    WLAN router functionality
- Monitorable
  house connection amplifiers
- Fibre-to-the-Home (FttH)

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Car antennas and automotive systems (CAR)

Continental

BLAUPUNKT
ELECTRONIC GmbH

KATHREIN

Technological leadership in automotive antenna reception systems.
Pioneer in the implementation of intelligent antennas in cars.

Mobile communication antennas (MCA) & Filters, combiners and amplifiers (FIL)

- Base station antennas and antenna systems for mobile communication networks (GSM, UMTS, WiMAX, LTE)
- Combiner and filter components for multi-frequency systems in mobile communication networks
- Active and passive OEM filters and amplifier systems
- Intelligent combiners with multi-functional technologies (SmartPlex®)

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Mobile communication antennas (MCA) & Filters, combiners and amplifiers (FIL)

- Tower-mounted amplifiers (TMA)
- Antenna systems for security services, the police, rescue service (TETRA), air-traffic control
- Indoor antennas and distribution systems
- Antennas for trains and buses
- Professional antennas, Filter, Combiner and Multicouplers for Ground-to-Air Communications

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Mobile communication antennas (MCA)
& Filters, combiners and amplifiers (FIL)

Products for highest and extreme demands

Kathrein antennas are to be found wherever the highest standards are required, e.g. for the fastest trains in Europe, on the highest towers in Asia, and in the coldest regions of the world ...

Broadcasting services in over 124 countries around the world rely on Kathrein‘s antenna systems.

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Broadcast antennas (BCA)

- Professional transmitting and receiving antennas, combiners and filters for TV and radio transmissions

  - FM Radio
  - Analogue TV
  - Digital Radio (DAB, DAB+)
  - Digital TV (DVB-T, DVB-T2, DTV, DVB-H, DMB)

Kathrein antennas on top of the television tower „Olympiaturm“ in Munich

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KATHREIN BCA - Where we are...

KATHREIN Factory 4, Floor 2 ZG

KATHREIN BCA - Our Tradition - Milestones

1919

Kathrein was founded

1955

Kathrein started with Broadcast Antennas

Since 2004

DVB-T Rollout in most European countries

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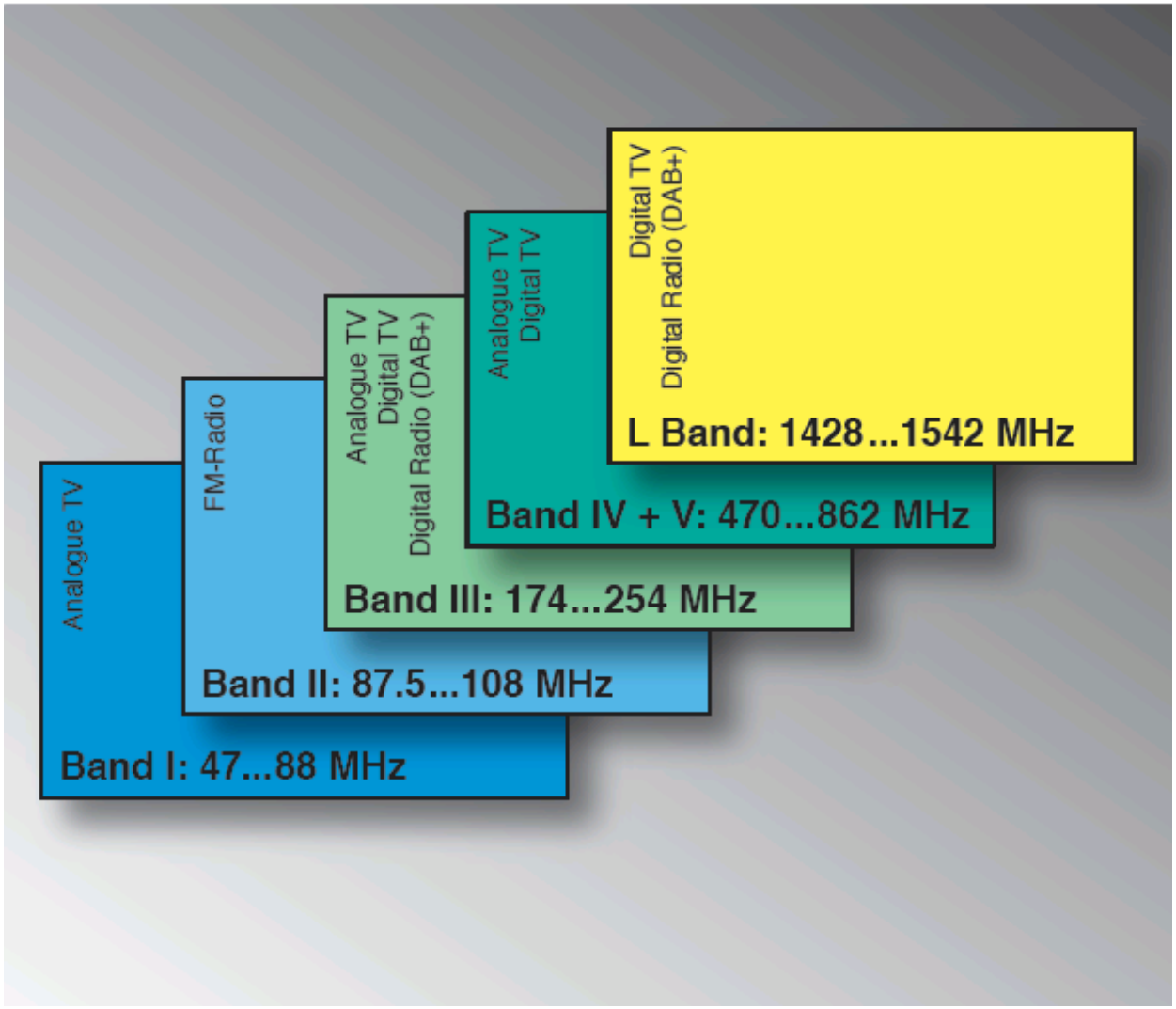
KATHREIN BCA - Our Product Range

Transmitting Systems consisting of:

- Antenna Arrays
- Feeder Cables
- Combiners
- Patch Panels
- GRP Radomes
- UHF Steel Spines
- Mounting Hardware
- Installation Accessories
- Pressurization Devices



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Broadcast antennas (BCA)

FM combiners

UHF transmission antenna

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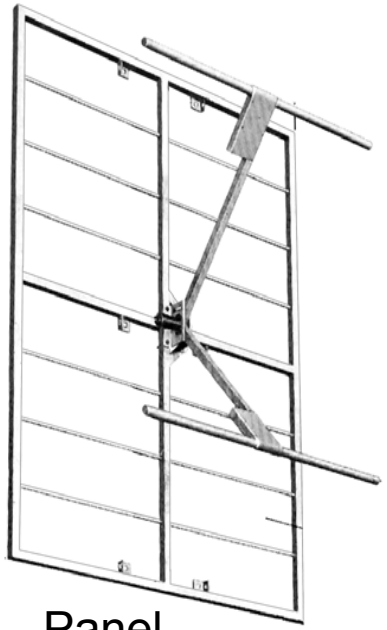
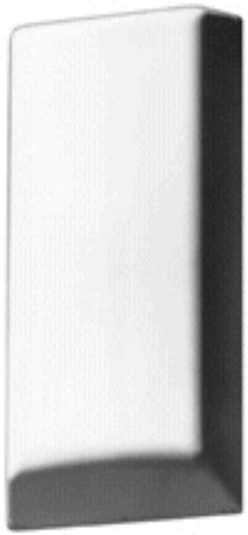
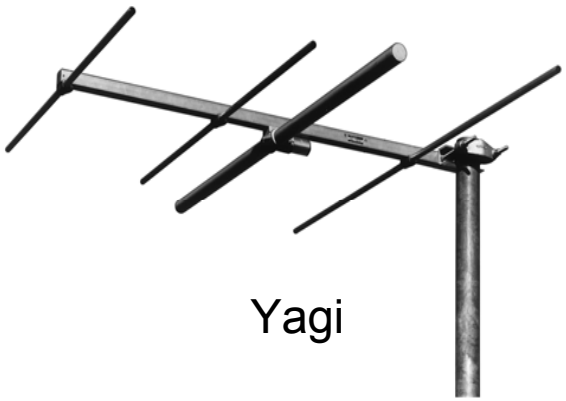
KATHREIN BCA - Antenna Radiators



Panel

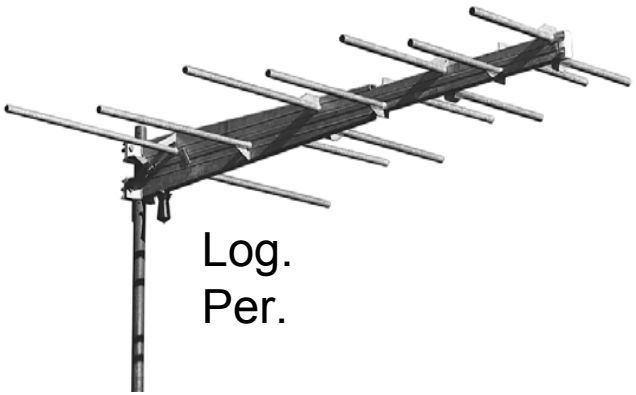


Panel with Radome



Yagi

Dipole



Log. Per.

Superturn-stile in GRP Radome

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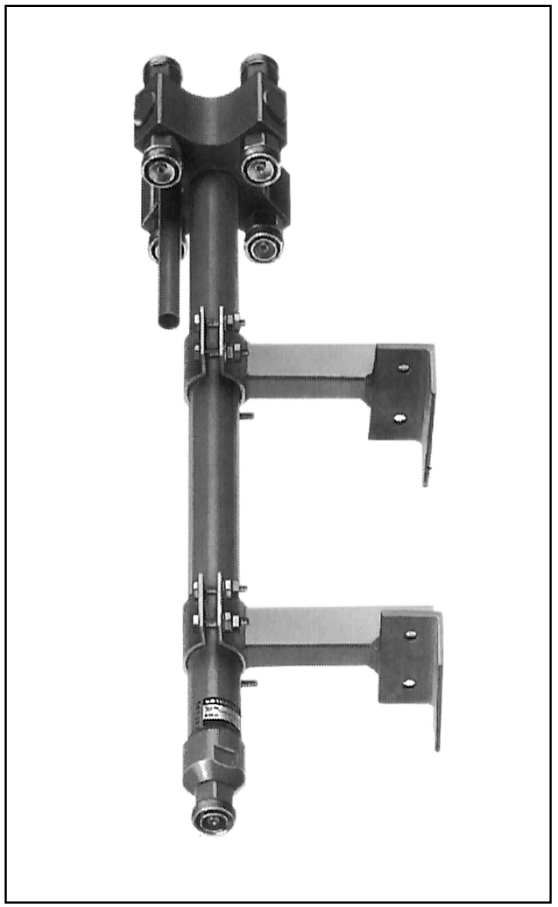
KATHREIN BCA - Power Splitters

High Power Splitter
(up to 16 outputs)

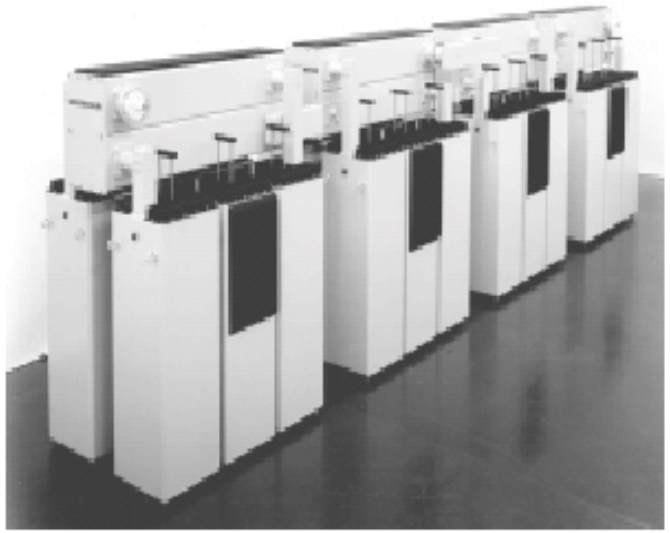
Medium Power Splitter
(up to 12 outputs)



Low Power Splitter
(up to 4 outputs)

KATHREIN BCA - Combiners

Directional Filter Combiner



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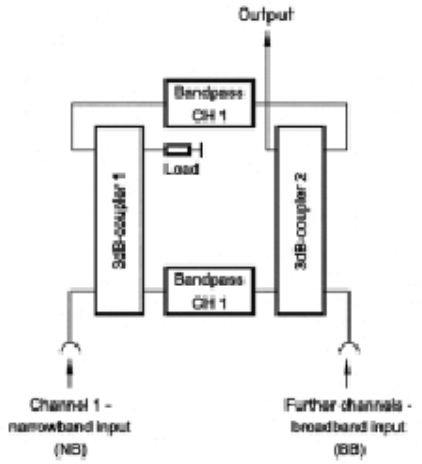
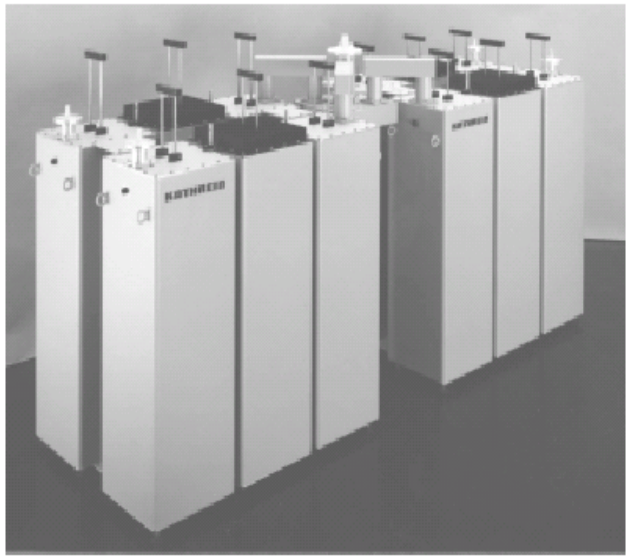


Starpoint Combiner



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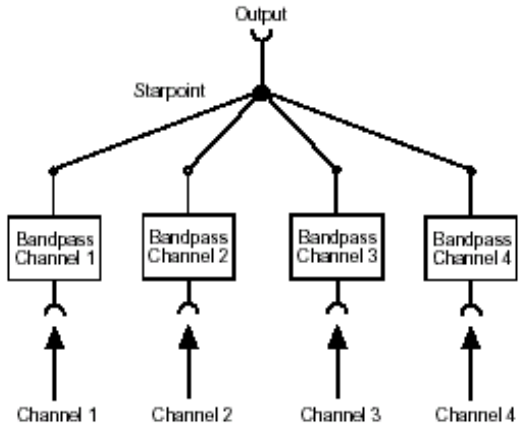
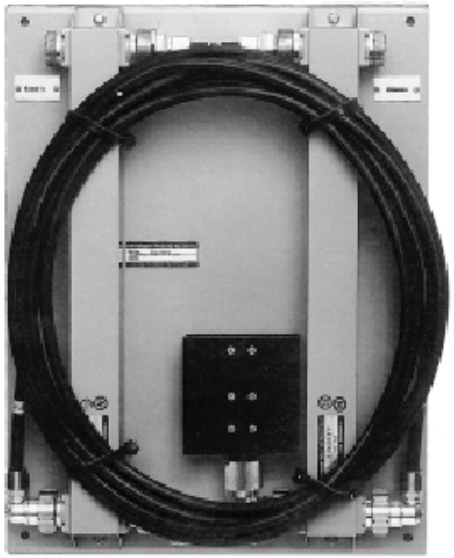


Stretchline Combiner



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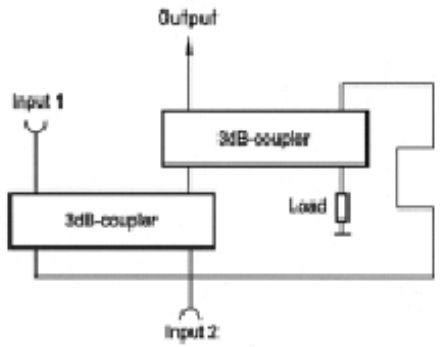

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KATHREIN BCA - Accessories from First Class Subsuppliers

Measuring link with 3 1/8" EIA-flanges

ANDREW

RFS kabelmetal

SPINNER

COM-TECH
HIGH FREQ & BROADCAST COM-TECH.IT

Exir
Broadcasting & Telecom

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KATHREIN BCA - Components Production

Kathrein Broadcast Antenna Components (radiators, splitters, connection cables and fixations) are solely manufactured in our plant 4, Rosenheim, Germany. Many of the production workers are Kathrein employees for more than 10 years!

Our range of broadcast radiators comprises approx. 500 different types.

Our range of broadcast splitters comprises approx. 2000 different types.

KATHREIN BCA - Quality Assurance

Kathrein is certified according to DIN EN ISO 9001 und ISO 14001. 100% of our manufactured components are tested and measured before shipment.

Example: Tuning of FM combiner

Example: VSWR-Test of Power Splitter

KATHREIN BCA - Turnkey Project Realization

Delivery of system hardware

Installation

Site-test and commissioning

KATHREIN BCA - Antenna Fixations and Carriers

Panel Fixation Steelwork

UHF Steel Spines

GRP Radomes

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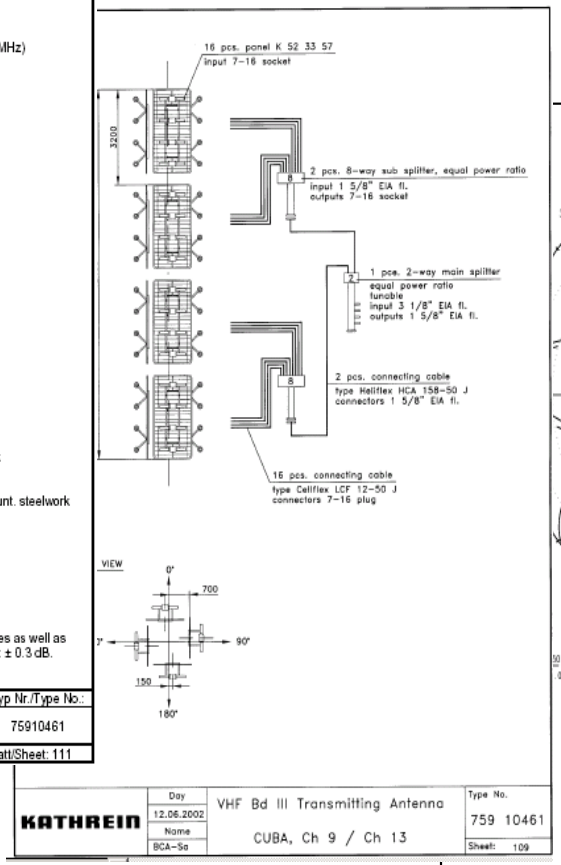
KATHREIN BCA - Project Planning

Pattern, Gain & ERP Calculations, Power Handling Studies, VSWR Optimization...

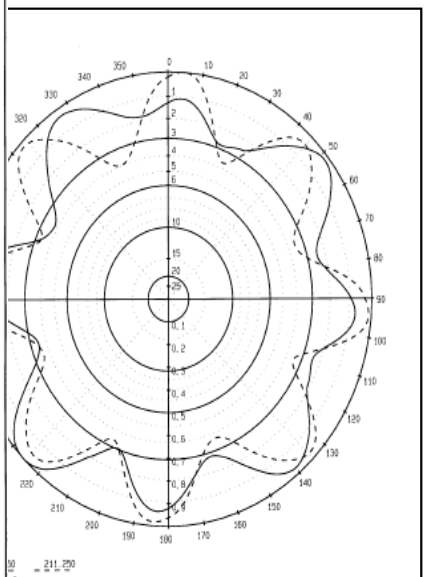
Constructional features	see sheet 109
Frequency range	174 – 216 MHz
Operating channel	Ch 9 (186 – 192 MHz); Ch 13 (210 – 216 MHz)
Polarization	horizontal
Impedance	50 Ohm unbalanced
Gain (reference: λ/2 dipole)	10.9 dB (Ch 9); 11.5 (Ch 13)
VSWR within operating channels	≤ 1.05 at the input of main splitter
Horizontal radiation pattern	see sheet 101
Vertical radiation pattern	see sheet 102
Max. power	2 x 10/1 kW Tx
Input connector	3 1/8" EIA flange
Weight	approx. 1100 kg, excl. mounting steelwork
Wind load	approx. 20 kN (at v = 160 km/h), excl. mount. steelwork
Max. windspeed	225 km/h

Remark: The gain figures are referred to input of main splitter level. Nullfill losses as well as distribution cable losses have already been taken into consideration. Tolerance: ± 0.3 dB.

KATHREIN Antennen - Electronic | Tag/Date: 11.06.02 | Name/Sign: BCA/Sa | VHF Band III Transmitting Antenna CUBA, Ch 9 / Ch 13 | Typ Nr./Type No.: 75910461 | Blatt/Sheet: 111

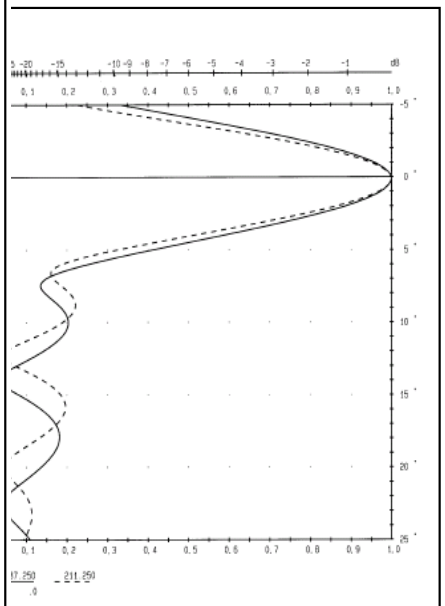


KATHREIN | Day 12.06.2002 | Name BCA-Sa | VHF Bd III Transmitting Antenna CUBA, Ch 9 / Ch 13 | Type No. 759 10461 | Sheet: 109



Calculated HRP

KATHREIN Rosenheim Germany | BCA/Sa 11.6. 2 13 0 | VHF Bd III Transmitting Antenna CUBA, Ch 9 / Ch 13 | Typ Nr. 75910461 | Bl.: 101



KATHREIN Rosenheim Germany | BCA/Sa 11.6. 2 13 0 | VHF Bd III Transmitting Antenna CUBA, Ch 9 / Ch 13 | Typ Nr. 75910461 | Bl.: 102

... Electrical and Mechanical System Design

DAB+ / DVB-T antennas made by Kathrein

DVB-T antenna being installed on top of the „Olympiaturm“ television tower in Munich.

DAB+ / DVB-T antennas made by Kathrein

DAB+ / DVB-T antenna being installed on the Wendelstein mountain.

Latest Products and Solutions for VHF and UHF

Digital Transmitting Antennas all over the World

Afghanistan
Albanien
Algeria
Argentina
Austria
Belgium
Brazil
Bulgaria
Canada
Chile
China
Czech Republic
Denmark
Egypt
England
Finland
France
Germany
Ghana
Hungaria
Kasakstan
Korea
Netherlands
India
Indonesia
Ireland
Iran
Italy
Lithuania
Latvia




...more than 1000 Kathrein antenna systems for DTV...




Malaysia
Myanmar
Namibia
Norway
Poland
Portugal
Qatar
Romania
Russia
Saudi Arabia
Serbia
Singapore
Slovakia
Spain
Sri Lanka
Sweden
Switzerland
South Africa
Spain
Syria
Taiwan
Tansania
Tunesia
Turkey
Turkmenistan
Venezuela
UAE
Ukraine
Uruguay
USA
Uzbekistan
Vietnam

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DVB-T antennas: Taschkent (Usbekistan) and Munich

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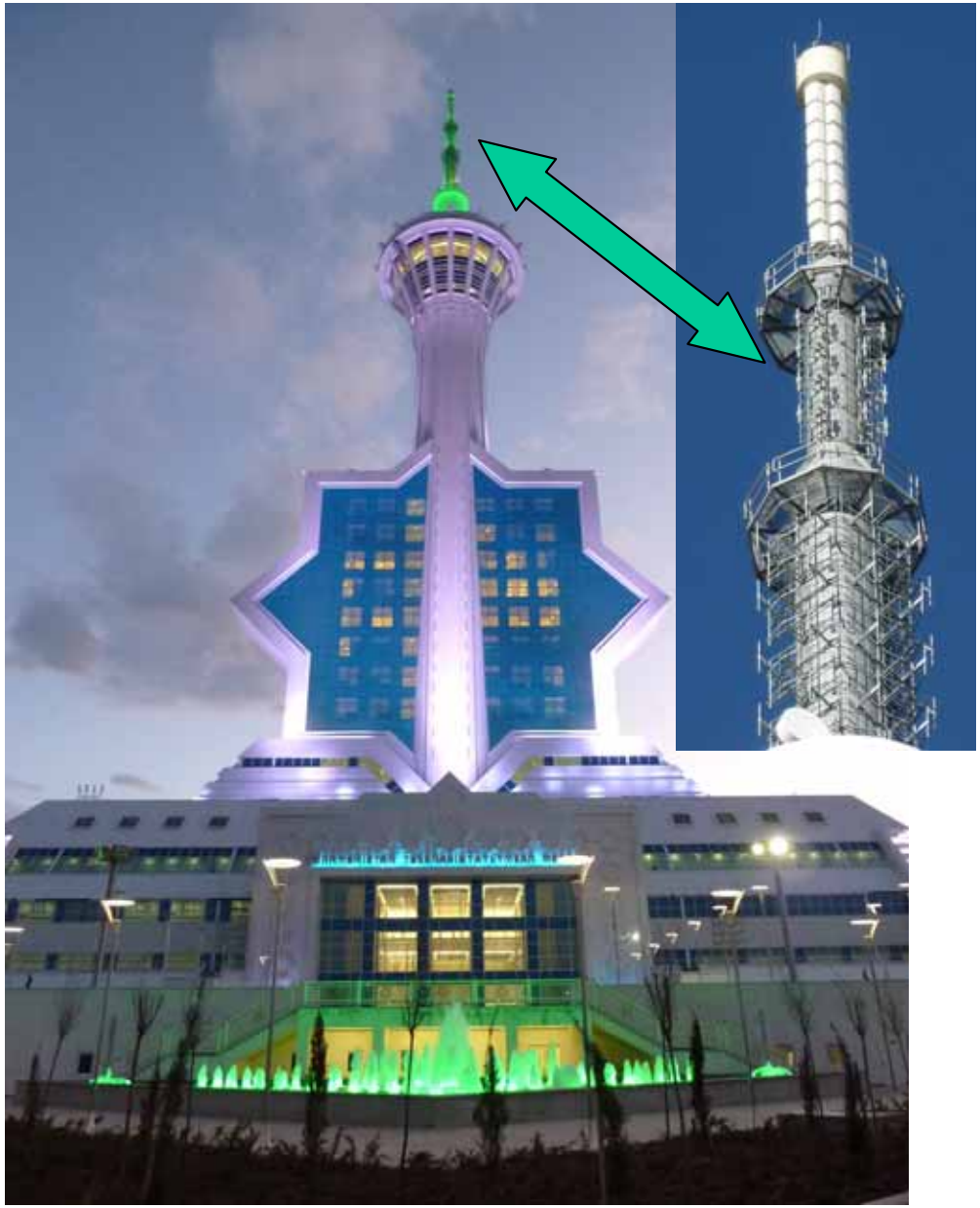
DAB+ / DVB-T antennas:
Ashgabat – Turkmenistan

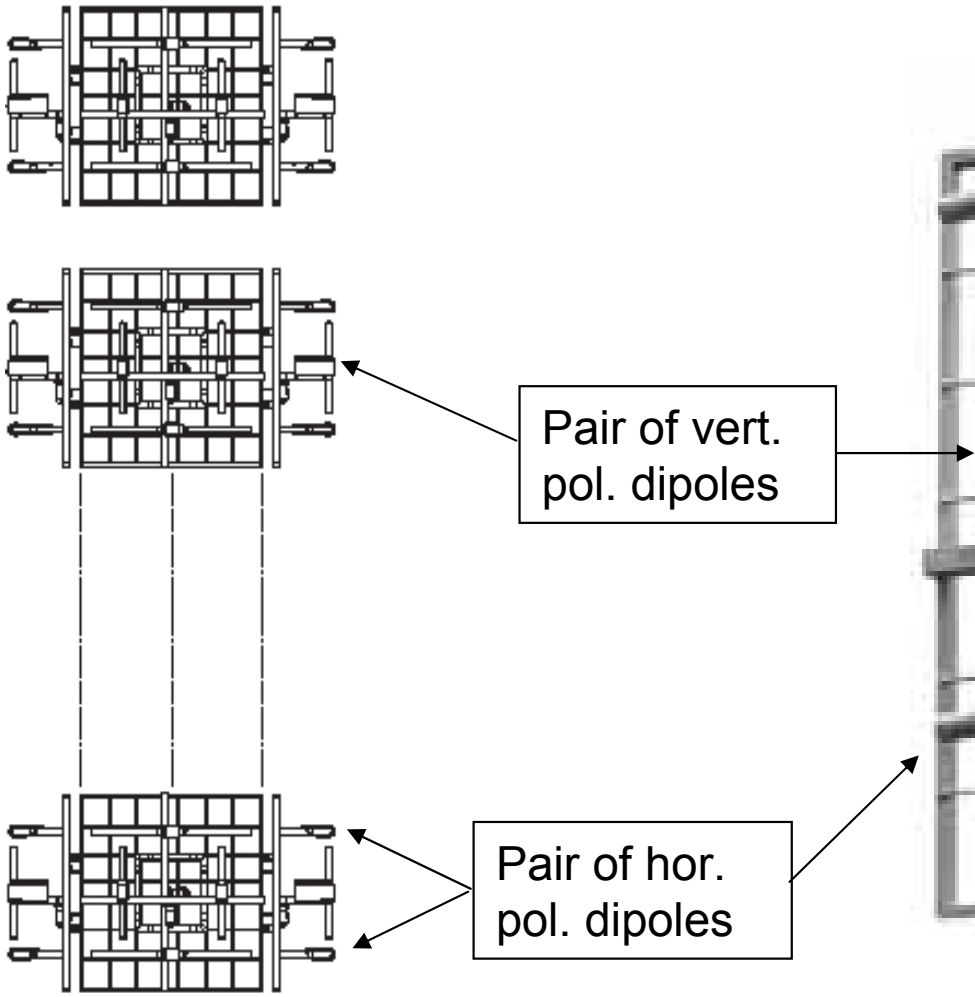


Brasil – Belo Horizonte

KATHREIN

VHF Band III: Common Antenna for Hor. and Ver. Polarization

Broadband panel antenna with horizontal and vertical dipoles…



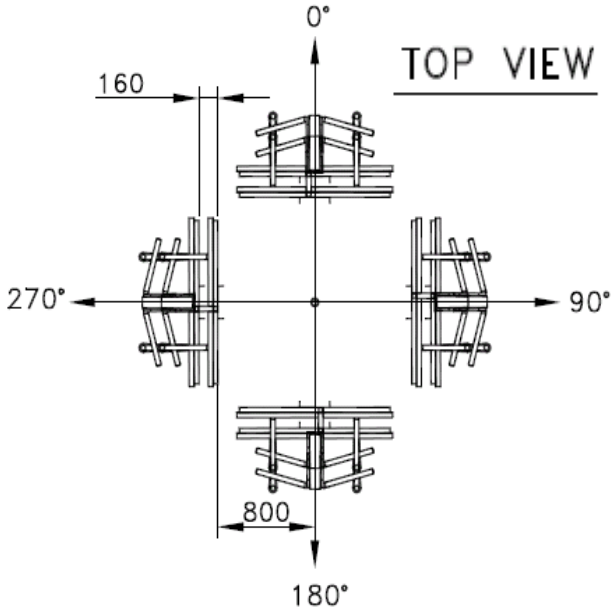
Kathrein panel type 750 10085

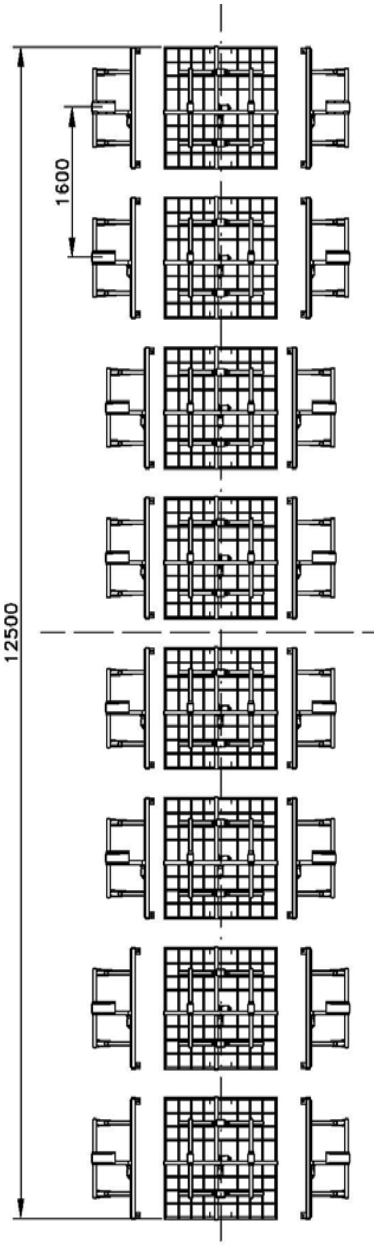
… with separate feeder and distribution network for horizontal and vertical system part

VHF Band III: Common Hor / Ver Antenna – System Example

System Example:

- 8 bays of 4 panels each
- Gain ca. 10 dBd @ midband
- Omnidirectional pattern
- Vertically Polarized System for e.g. T-DAB+ use
- Horizontally Polarized System





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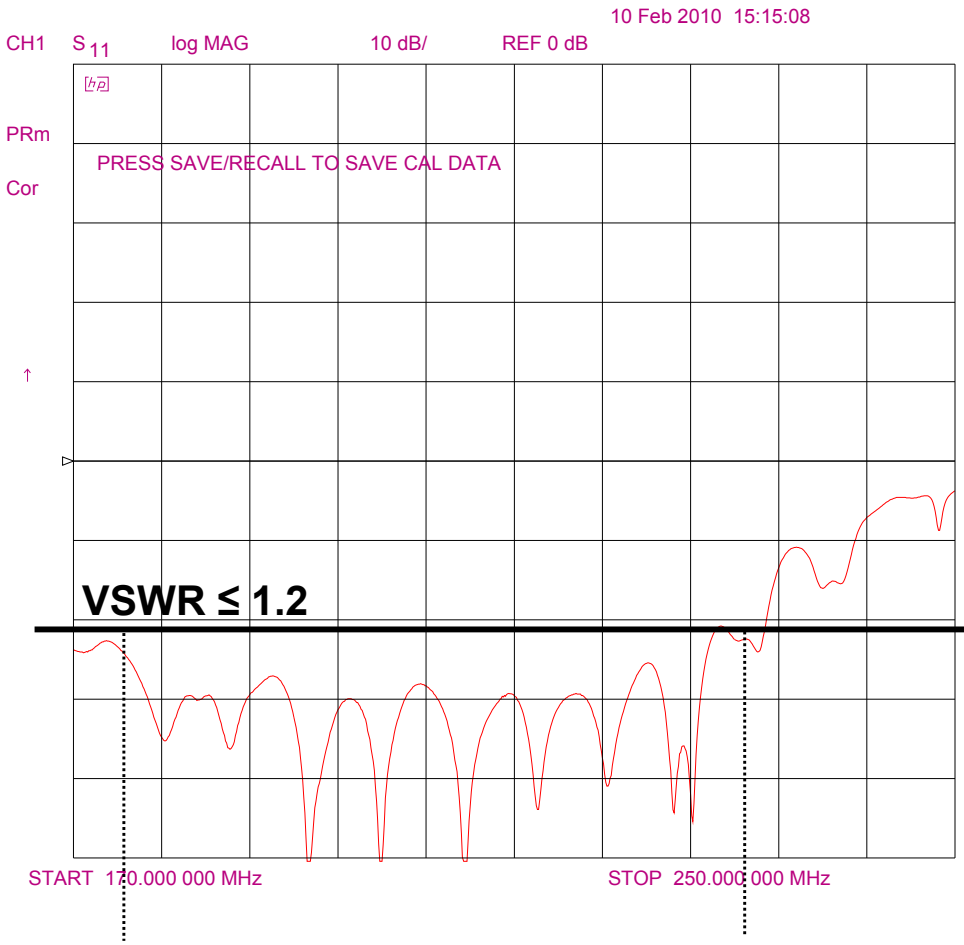
VHF Band III: Common Hor / Ver Antenna – VSWR Test Results

VSWR at main splitter input

Horizontally polarized svstem

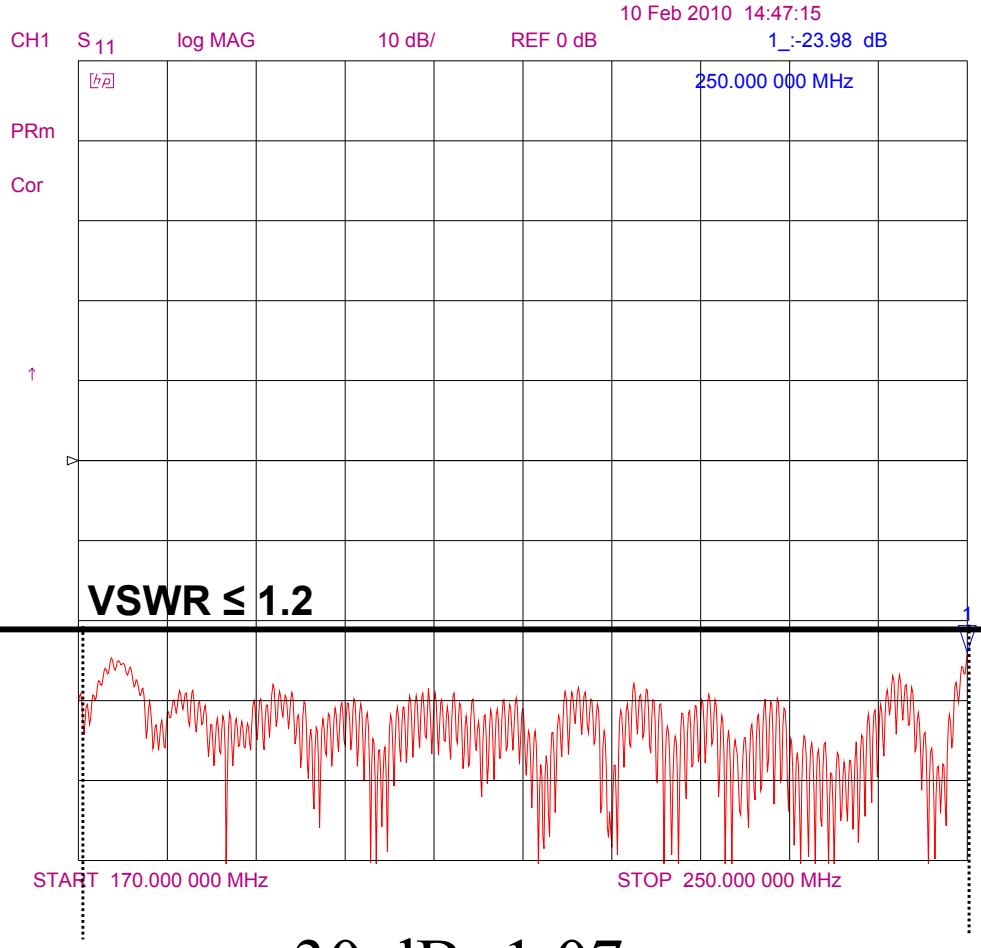


174 MHz

230 MHz

VSWR at main splitter input

Vertically polarized system



170 MHz

30 dB~1.07

250 MHz

Introduction of DAB

Technical possibilities and features with introduction of DAB (Digital Radio according to standard Eureka 147 / ETSI 300 401):

- Improved portable / mobile reception due to OFDM (multicarrier) modulation
- Increasing number of programmes
- Add-on data (e.g. traffic news, program info guide, etc…)
- Better use of the given frequency spectrum
- Reduced network operation costs
- http://www.worlddab.org/products_manufacturers/

Digital Radio DAB in Germany - History

- DAB was introduced in Germany in 1995
- Technical Parameters:
  - VHF Ch 12
  - 1 kW max. ERP
  - „MUSICAM“ coding
- Due to unfavorable technical and promotional circumstances…

  - Limited frequency resources
  - No indoor coverage
  - Limited number of programs mainly only from public broadcasters

  …DAB suffered from lack of acceptance.

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The end of DAB and the beginning of DAB+

- DAB was not successful in Germany. Very few DAB receivers were sold. The people kept on using their existing FM receivers which offered acceptable quality and a good choice of programs.
- The old German DAB network in Ch 12 was supposed to be switched off because of high costs and lack of listeners.
- By the end of 2010 the German public and private broadcasters plus the network operator Media Broadcast decided to give DAB one last chance.
  They agreed on the joint introduction of the more sophisticated DAB + standard.

DIGITALRADIO

Radio der Zukunft

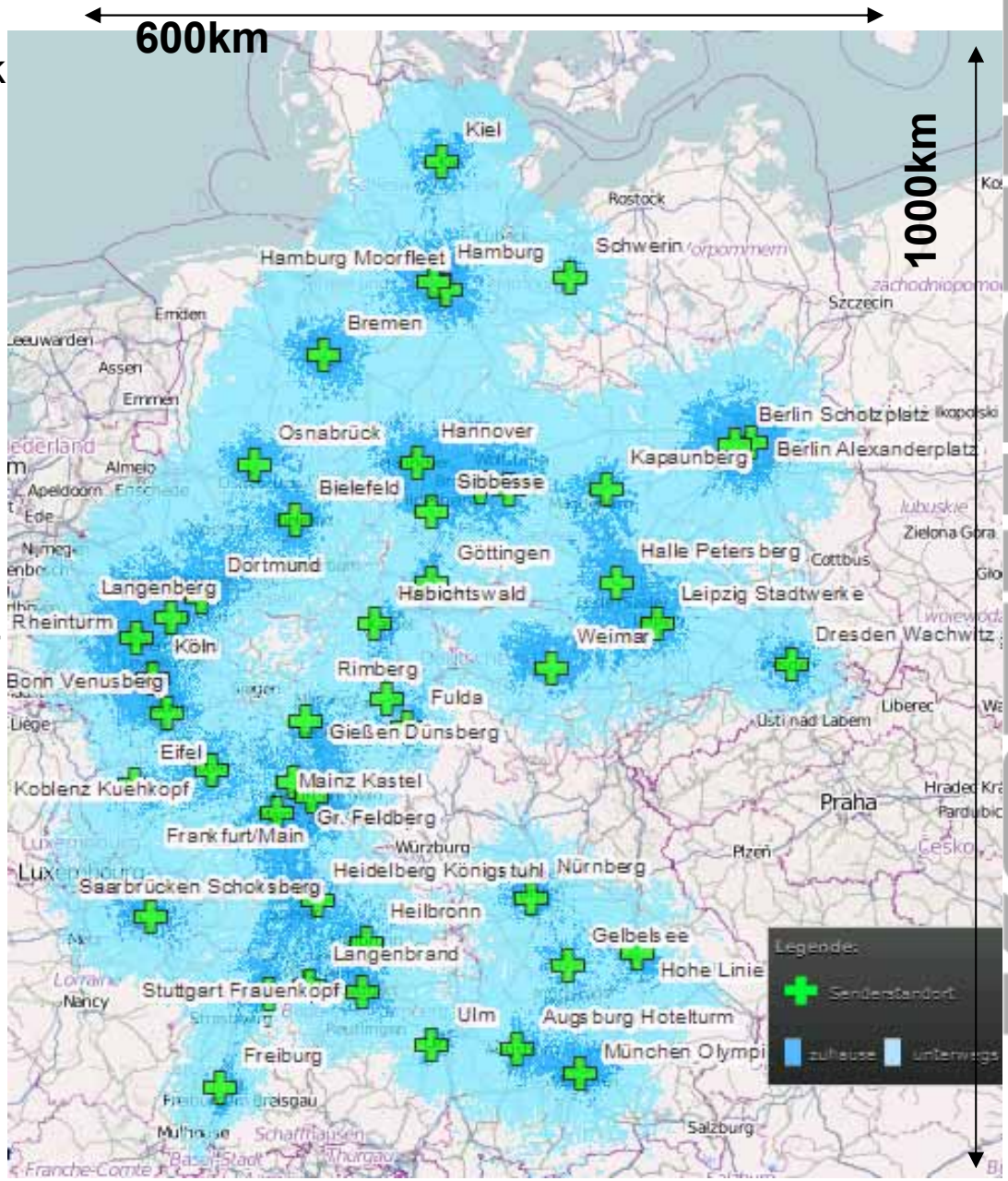
Radio of the future

VHF Ch 12 (4 blocks)	Frequency Resource	VHF Ch 5 – Ch 11 (28 blocks) *> 80 radio programs possible!*
1 kW ERP	Radiated Power	10 kW ERP *Better indoor coverage!*
MPEG 1 MUSICAM	Coding	MPEG 4 HE AAC v2 *More programs per block!*
Supported by Public Broadcasters only	Supporters	Supported by Public and Private Broadcasters *Wide variety of programs!*

DAB+ Introduction in Germany August 1st, 2011

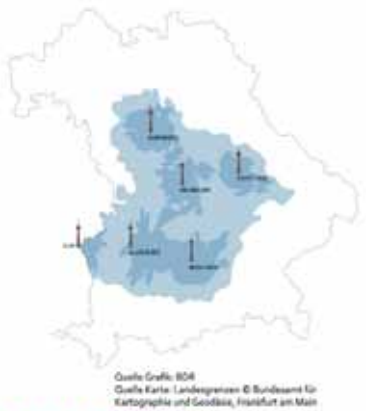
DAB+ Introduction

- In December 2010 Public Broadcasters and the private network operator Media Broadcast agreed to start with **nation-wide DAB+** transmission in 27 major cities in Germany by August 1st, 2011.
- Network roll-out planning was completed and Tx antennas were ordered in March 2011.
- In **only 4 months** KATHREIN managed to ***deliver and install* 15 master antenna systems** (turn-key). For the rest of the sites, existing antennas were used.
- The German DAB+ network will be completed by 2014/2015. In October 2013, 155 transmitter sites will be on air.
- But no switch-off date for the FM network in Germany has been fixed yet - due to the large number of FM receivers in use.



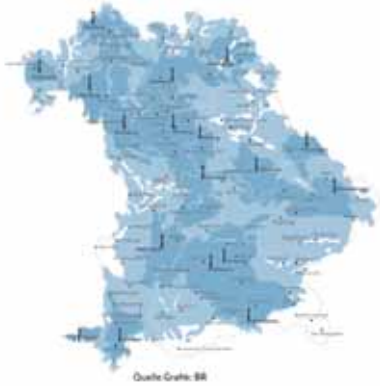
DAB+ Service in Germany – and Bavaria

DAB+
Introduction



Digitalradio-Programme
Deutschland-Bouquet [Kanal 5C]
Netzbetreiber: Media Broadcast

9oelf
Absolut Radio
Deutschlandfunk
Deutschlandradio Kultur
DRadio DokDeb



Digitalradio-Programme
Bayern-Bouquet [Kanal 11D]
Netzbetreiber: Bayerischer Rundfunk

Bayern 1 Mittel- und Oberfranken
Bayern 1 Mainfranken
Bayern 1 Niederbayern und Oberpfalz
Bayern 1 Oberbayern
Bayern 1 Schwaben
Bayern 2 plus/Nord
Bayern 2 Süd
BAYERN 3
B5 aktuell
BR Verkehr

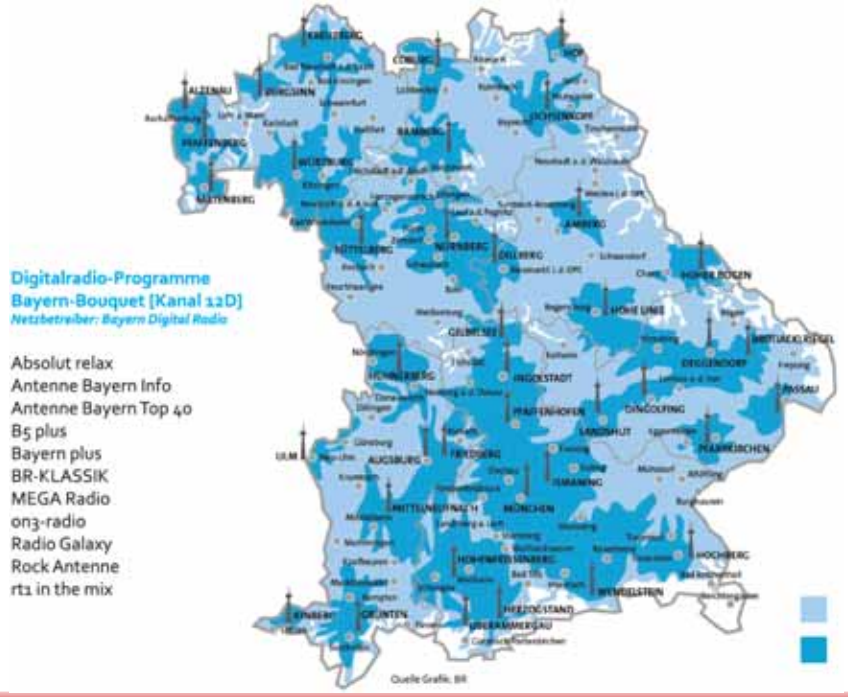
Digitalradio-Programme
Lokale Bouquets in Bayern
Netzbetreiber: Bayern Digital Radio

München [K 11C]
95.5 Charivari*
afk M 94,5*
Bayern 1 München
Digital Classix
Energy München*
MagicStar
Radio 2Day
Radio Arabella*
Radio Gong 96,3
Radio Gong mobil
Radio Lora / Radio Feierwerk / Christliches Radio München*

Ingolstadt [K 11A]
Coolradio 1
Coolradio Jazz
MagicStar
ND1*
Radio Galaxy Ingolstadt*
Radio IN digital

Nürnberg [K 10C]
afk max*
Energy Nürnberg
Galaxy Ansbach*
Hit Radio N1 (Pray 92,9 / AREF/ Camillo 92,9, Radio Meilensteine)*
MagicStar
Pirate Gong
Radio 8
Radio Charivari 98,6*
Radio F / Jazztime Nürnberg*
Radio Gong 97,1*
Radio Z*
star fm*
vilradio

Augsburg [K 9C]
Fantasy Aktuell
hitradio.rt1 augsburg
MagicStar
Radio Augsburg
Radio Fantasy
Smart Radio



Digitalradio-Programme
Bayern-Bouquet [Kanal 12D]
Netzbetreiber: Bayern Digital Radio

Absolut relax
Antenne Bayern Info
Antenne Bayern Top 40
B5 plus
Bayern plus
BR-KLASSIK
MEGA Radio
on3-radio
Radio Galaxy
Rock Antenne
rt1 in the mix

In Munich, you can receive >40 programs
***) = status, end of 2012**

Outdoor reception
Indoor reception

New Antennas to be switched on in 2012/2013

- Rhineland-Palatinate:
- Eifel, Linz/Rh., Koblenz
- Bavaria:
- Kreuzberg, Pfaffenberg, Büttelberg, Bamberg
- Other federal states:
- Fulda, Kassel, Göttingen, Baden-Baden, Langenbrand, Habichtswald, Braunschweig, Magdeburg, …
- 2013: Rostock, …
- Norway: 2012: 20+x
- http://www.worlddab.org/public_document/file/112/V-0951E-SummaryReportNo8_2010-11.pdf
- Denmark: http://www.dr.dk/OmDR/digitalradio/Hjaelp/20110315104649.htm

Magdeburg

New Antenna Requirements for DAB+ Transmission

The Tx Antennas of the old DAB network in Germany mostly utilised dipoles and panels which were optimized for VHF Ch12 (223 – 230 MHz)

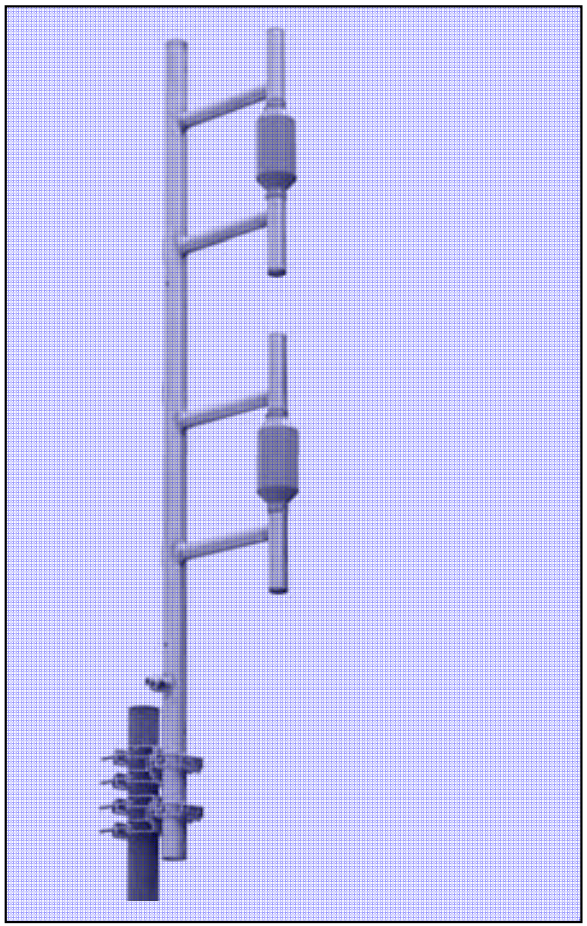
General requirements for new antenna systems for the German DAB + network:

- Broadband in the whole VHF Band III 174 – 223 (230) MHz
  - Horizontal radiation patterns with minima not deeper than 3 – 4 dB
  - VSWR typically better than 1.2
- Being able to handle up to 5 – 7 VHF Tx of ca. 1 - 2 kW
- Occupying minimal mast space and producing lowest possible mast loads
- Suitable for a variety of installation requirements (e.g. mast top; side mount; GRP-cylinder; panel antenna solution for wide-cross-section masts)

Challenge: Space allocation for new DAB+ antennas on existing masts/tower structures.

Antenna Solutions for various DAB Transmission Applications

1) Single Radiators



2) Panel Antenna Systems

Heidelberg

3) Antenna Systems in GRP Cylinder and for Special Applications

Frankfurt/Main

KATHREIN

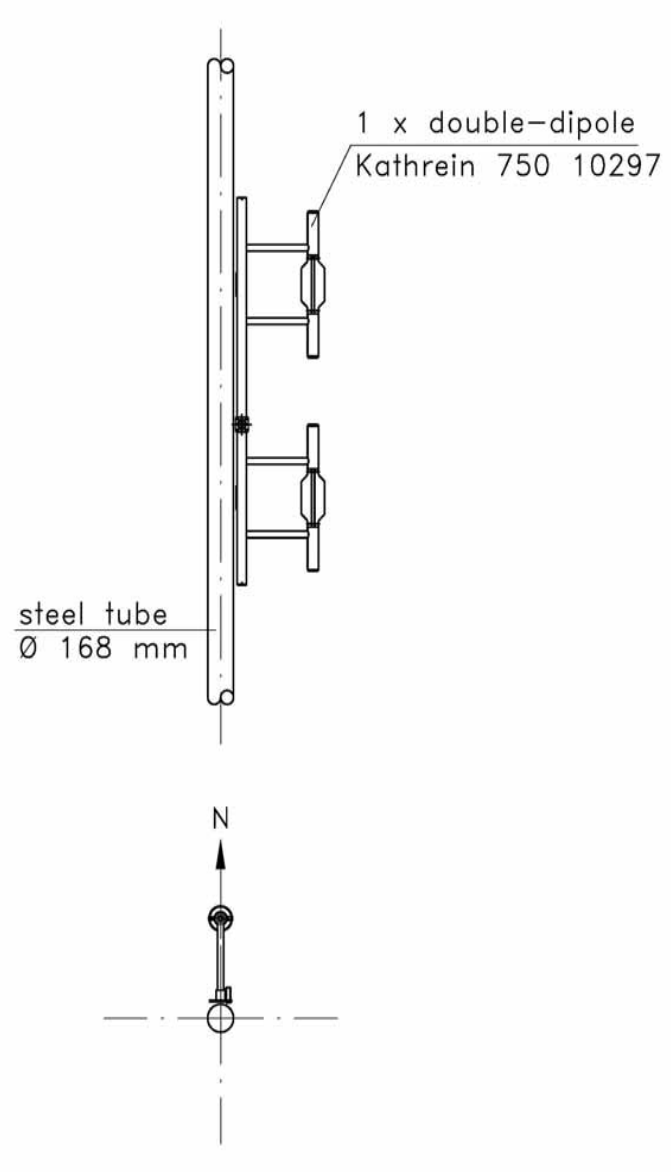
Broadband Double-Dipole for VHF Band III

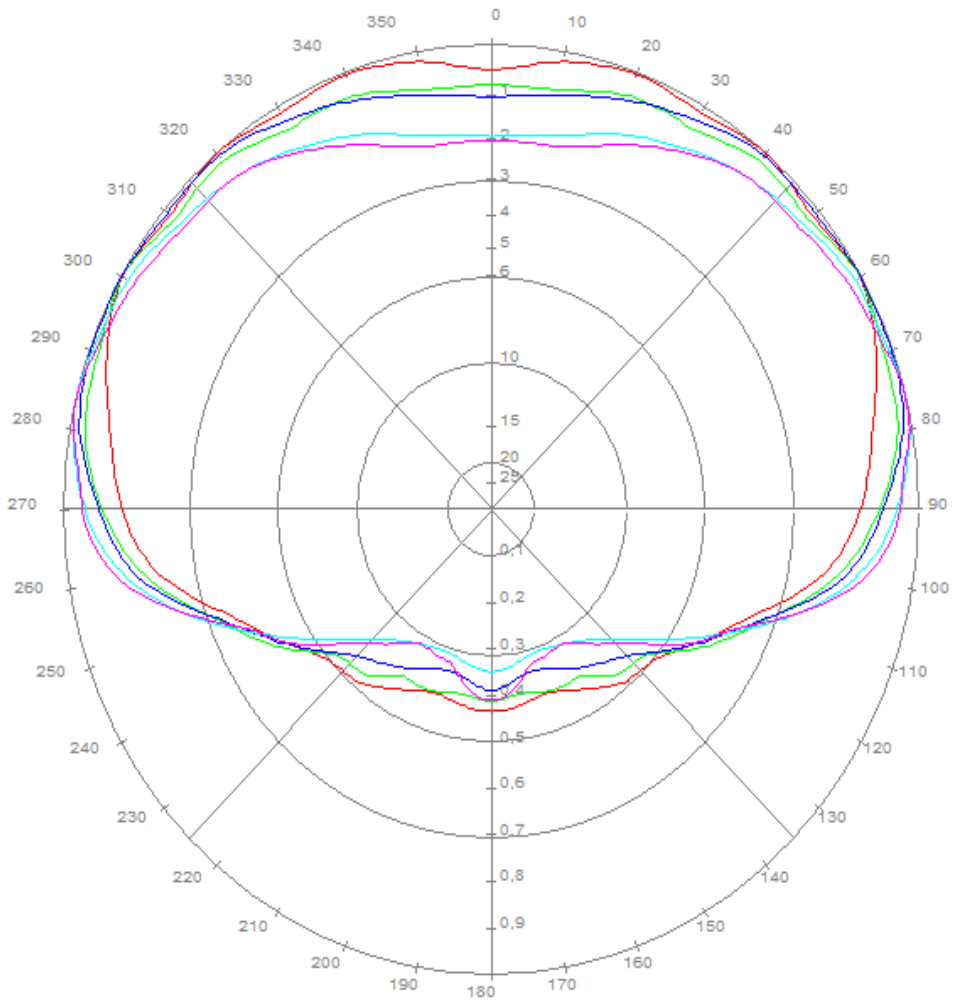
- Quasi-omni radiation
- Vertically polarized
- For side- or top-mount
- Pmax = 5 kW
- Gain g = 5 dBd nominal
- Low wind load
- Can be stacked for higher gain

VHF Transmitting Antenna „Raichberg“

KATHREIN

Broadband Double-Dipole for VHF Band III - Example





Example for pattern with dipoles mounted on a tubular mast with a diameter of 168 mm.

Broadband Panel Antenna System for VHF Band III

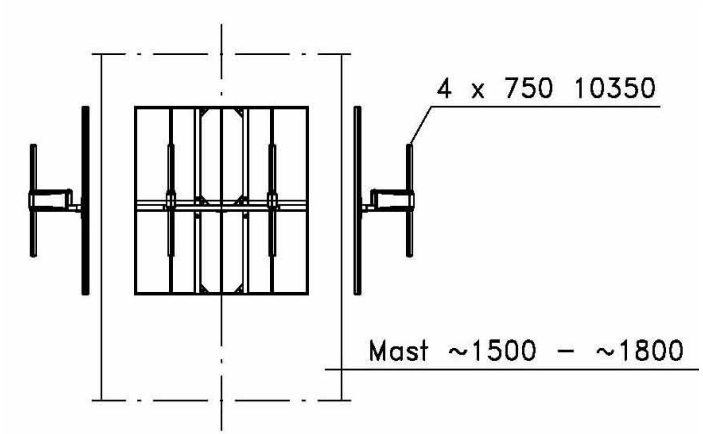
- 2-Dipole panel as a universal building block for omni-directional or directional antenna systems (examples see KATHREIN catalogue page 60)
- High power antenna systems
- Especially suitable for round/square masts - side lengths up to 1.5–1.8 m.

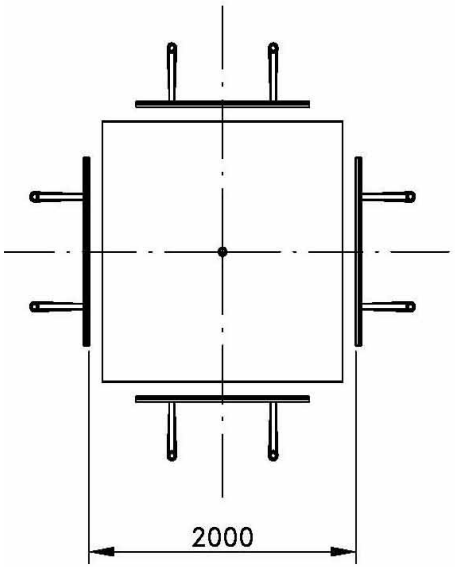
Heidelberg

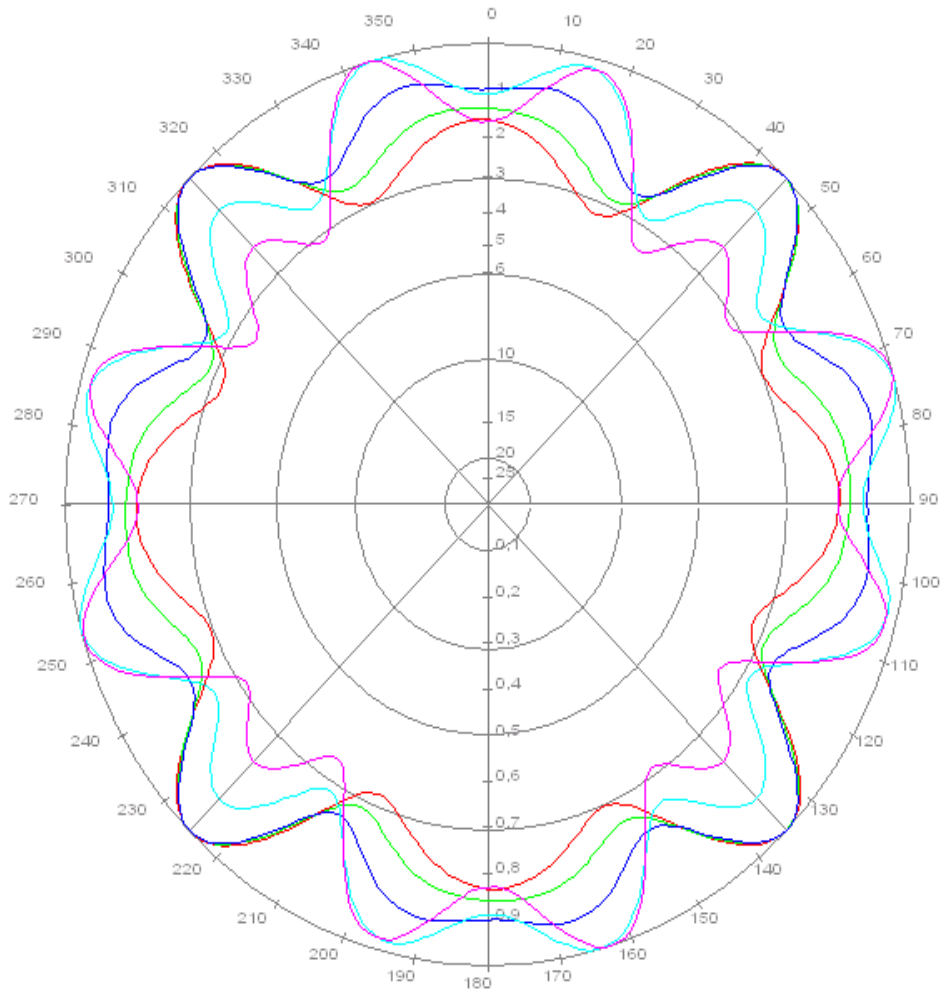
Augsburg

KATHREIN

Broadband Panel Antenna System for VHF Band III - Example



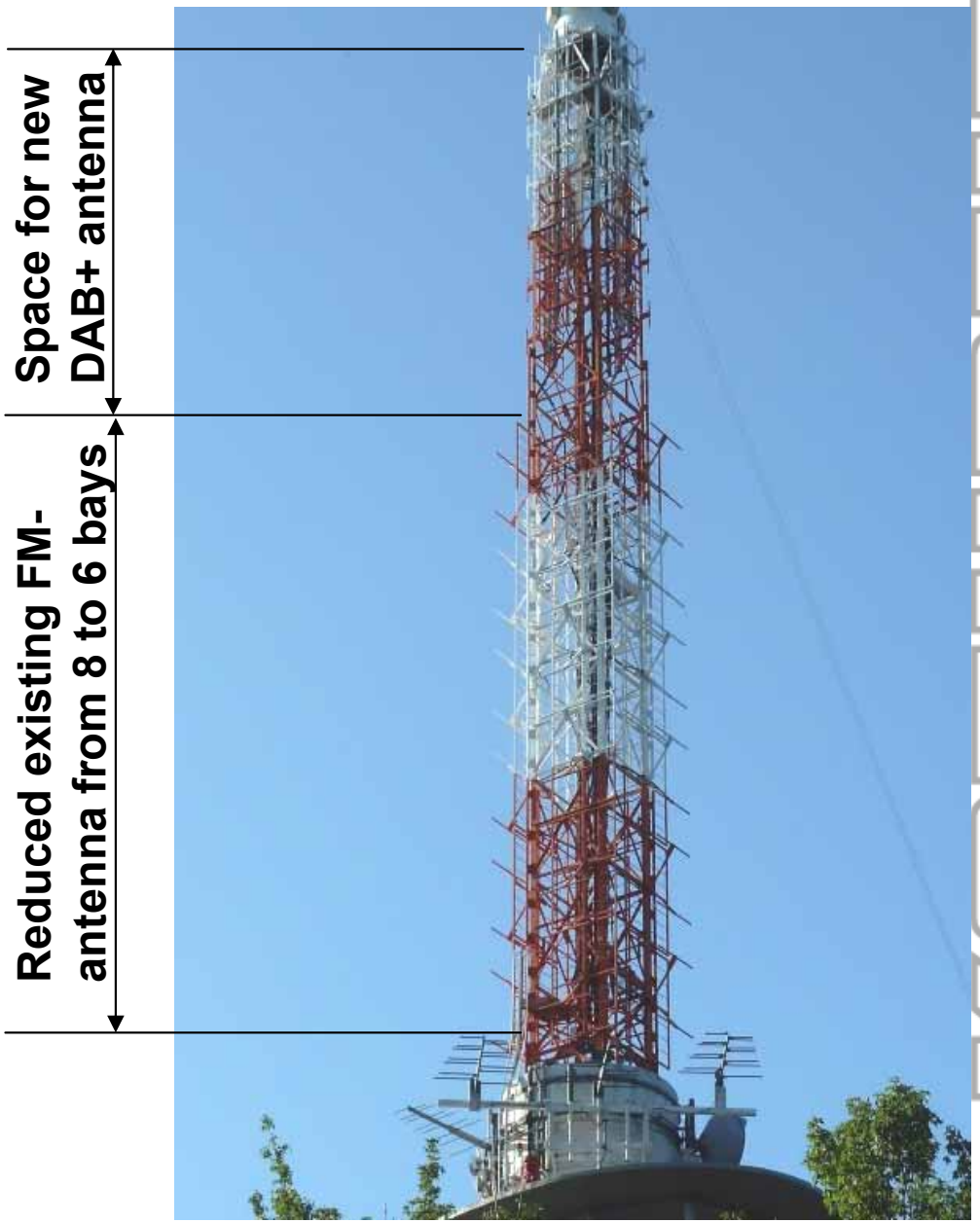




Example for omni-directional pattern – directional patterns possible!

Gaining mast space for VHF Band III Antennas by reducing FM Tx system

- Existing FM-antenna is reduced from 8 to 6 bays to provide mast space for new DAB+ antenna
- FM transmission with reduced ERP will lead listeners to DAB+



Gaining mast space for VHF Band III antennas by using smaller FM antennas

- New FM antenna (here only one bay) is of much lower gain than the new DAB+ antenna (here 8 bays)
- FM transmission with reduced ERP will lead the listeners to DAB+

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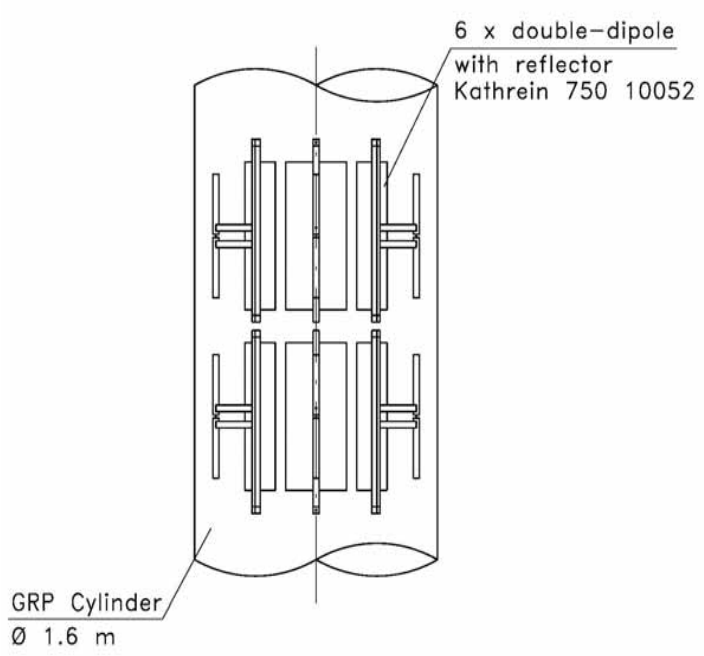
Broadband Antenna System for VHF Band III in GRP Cylinder

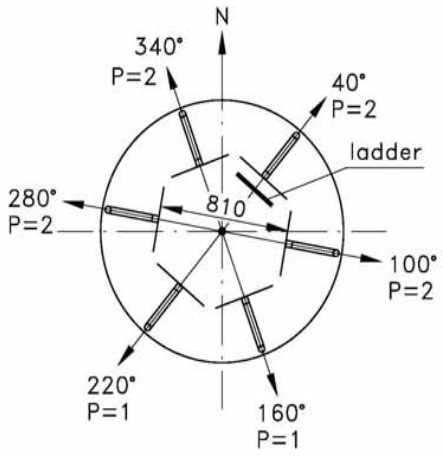
- Antenna System inside GRP-cylinder D = 1.6 m
- Fully protected against ice and snow
- Omni-directional or directional patterns
- Horizontal or vertical polarization
- 6-sided standard arrays or customized solutions

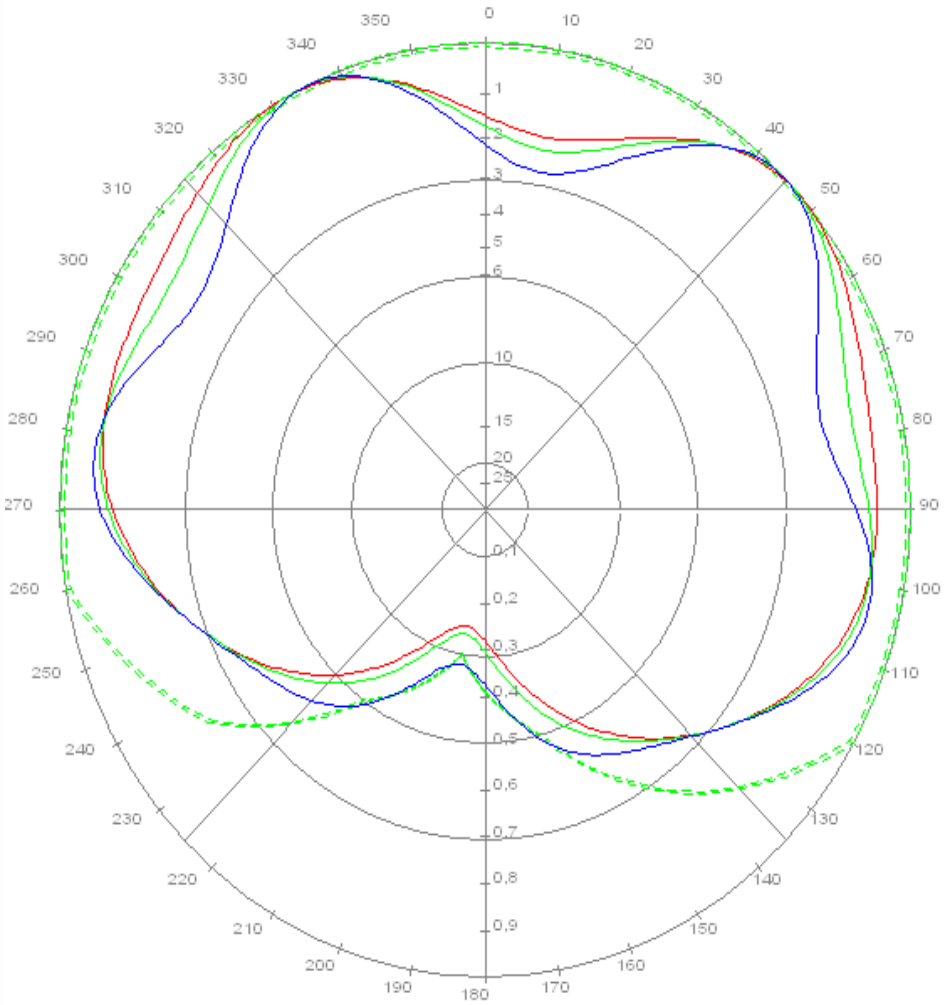
Saarbrücken

KATHREIN

VHF Band III Antennas in GRP Cylinder – Example







Example for directional pattern for a border zone transmitter

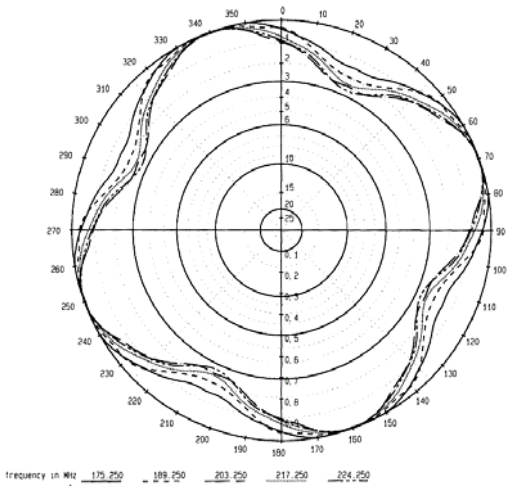
Modification of existing VHF-Super Turnstile Antennas

- **Modification advantages:**

- Quick turn-around
- Cost effective

- **Result:**

- Broadband
- Very good VSWR

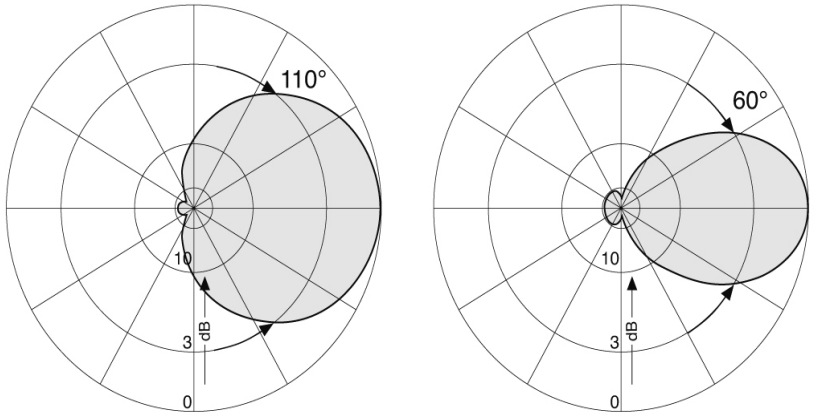


Langenberg/NRW

Broadband Log-Per Antenna for VHF Band III

- Directional Antenna
- Installation for horizontal or vertical polarization
- Pmax. = 2 kW
- Gain g = 5 dBd nominal
- Very low weight and windload
- Ideal for transmission along railways or highways
- Can be used as an element for mixed polarized antenna systems

Radiation Patterns (at mid-band)



in H-plane

in E-plane

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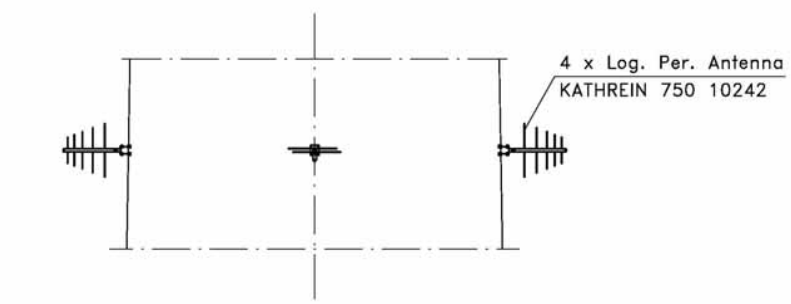
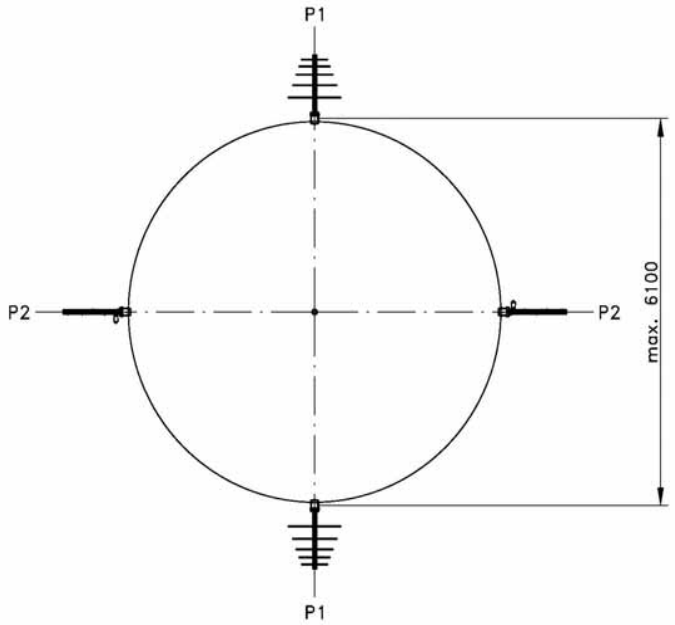
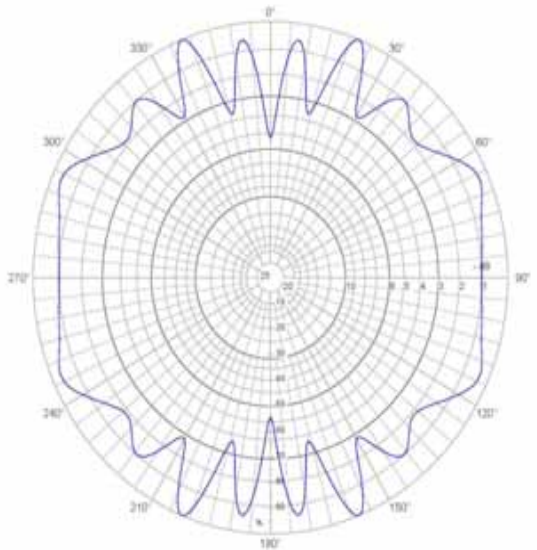
VHF Band III Antennas for Special Applications – Mixed Polarized Systems

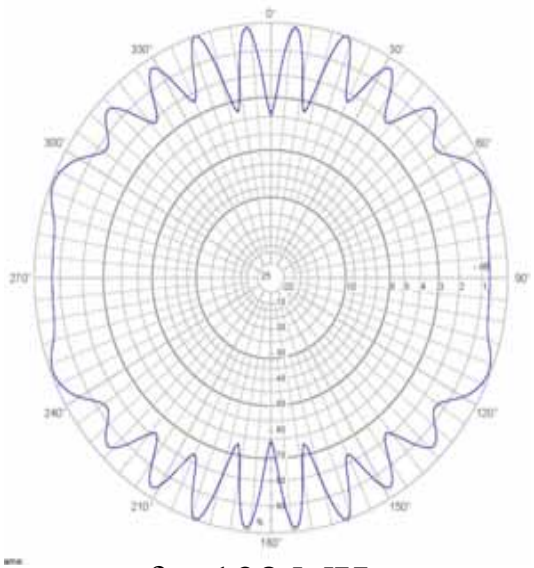




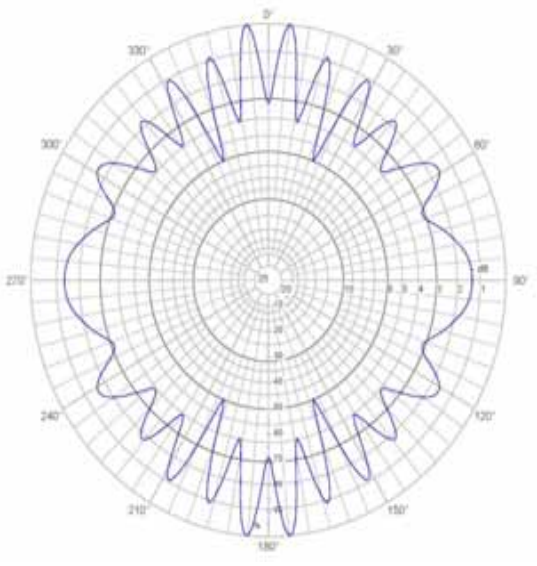
- **Omni-directional pattern for very large tower cross sections**
- **Mixed polarization**
- **Very low tower loads**



f = 177 MHz



f = 198 MHz



f = 220 MHz

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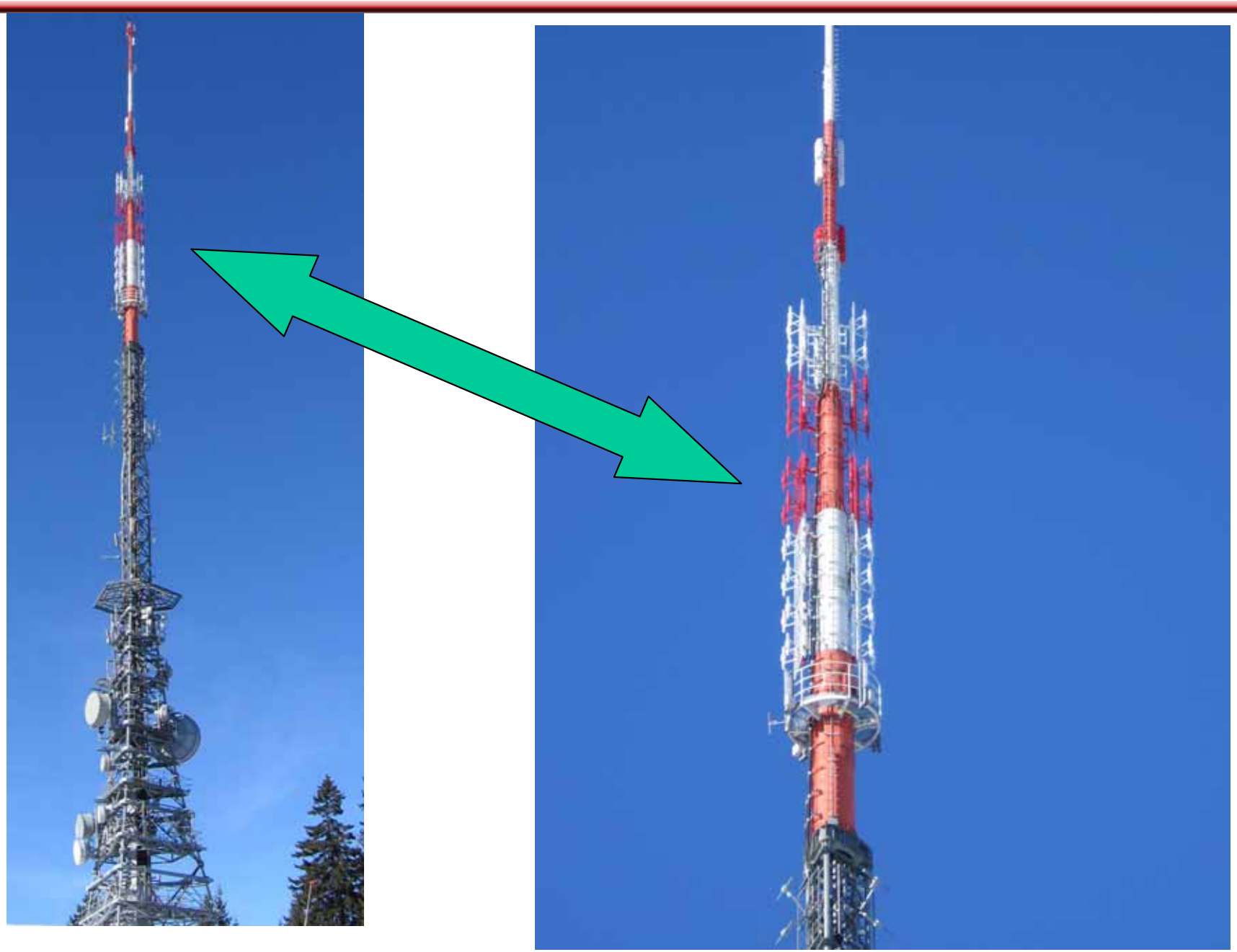
Example: Valzeina/CH



Example: Magdeburg/Germany

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Example: Aurich, Northern Germany

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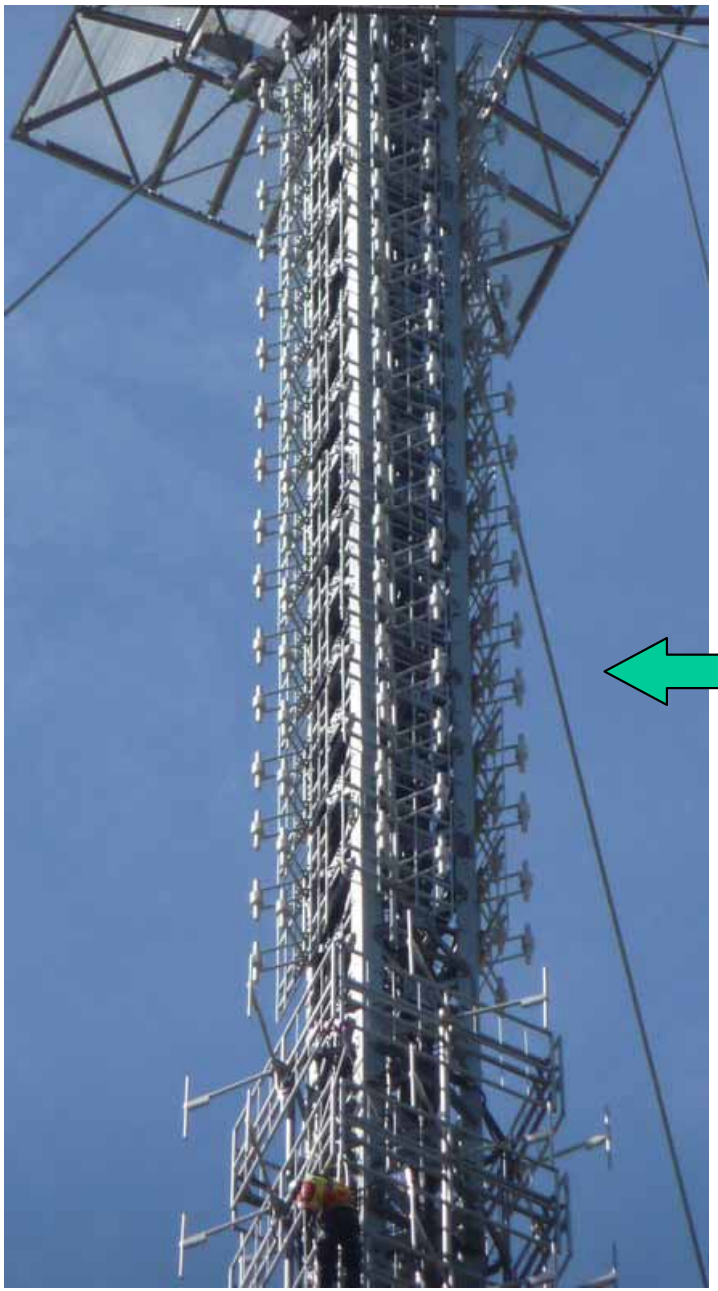
Example: Norway / Austria

St. Petersburg / Ireland



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THANK YOU for your Attention!

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