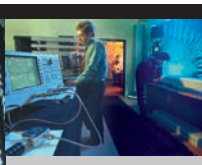
EYECOM

Eyecom Telecommunications Group

- Indoor/Tunnel IRDN Components
- Repeaters
- Antenna

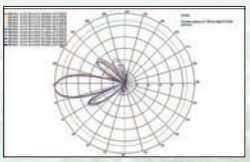
Eyecom Technologies Limited

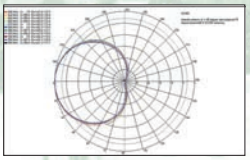


Established in 1996 by Deltec New Zealand Ltd, Eyecom Technologies Ltd is a leading manufacturer in base station antenna, repeater and full line of MDAS components for Cellular, TETRA, DMR, PMR and confined area radio comms safety systems.

Research & Development

AISG
Antenna Interface Standards Group





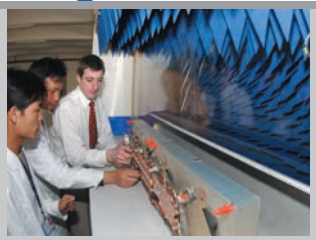
For 20 years, Eyecom has grown behind innovation upon innovation that delivered superior products for the most challenging needs and circumstances where both the customer and end-user have the most demanding requirements.

Eyecom's strength comes not only from the complete flexibility and custom design approach but also from imagination, creativity and care for the slightest detail in order to create solutions that meet clients need, now and in the future. This has led us to become customer 'First Choice Supplier' spanning across many markets including cellular operators, system integrators, government agencies and commercial sector worldwide.

Eyecom granted a large number of patents in BTS antenna and repeater technology.

Patent invention certificates from Eyecom in BTS RET antenna dipole and phase shifter design.

Manufacturing





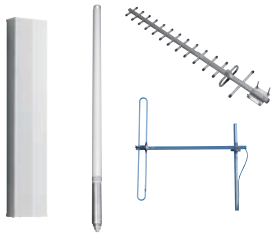

With 'Customer Satisfaction' as our foremost concern and at the same time not compromising on quality and reliability, Eyecom set up a factory in China in 1999 to reduce production cost. The ISO9001 and ISO14001 accredited factory has also equipped with a dedicated production line for ROHS, WEEE, REACH and CE certified products. To further facilitate and cater to customers' constant request for a total solution, Eyecom has extended our product portfolio by investing in a RF and Leaky cable manufacturer and this has allow us to become a full turnkey solution provider for our customers.

Eyecom Products

Base Station Antenna

- Mechanical downtilt and remote control electrical downtilt (RET)

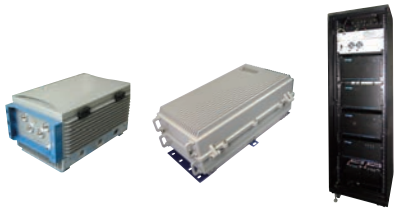
Sector/Omni/Yagi Antennas for PMR,TETRA,DMR, P-25, iDEN and Cellular



Digital RF Repeater; MCPA; Dgital Optical BDA

- Digital Channelized, Digital Optical , FSR, ICS, IP65 and ATEX

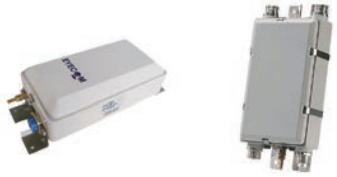
150/350/380/420/450/800/900/1800/2100MHz PMR, TETRA, DMR, P-25, iDEN, GSMR, GSM900/1800, CDMA, 3G, LTE



Tower Mast Amplifier

- TMA with remote control variable gain, UL or UL+DL

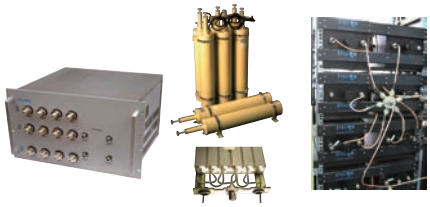
150/350/380/420/450/800/900/1800/2100MHz PMR, TETRA DMR, iDEN, P-25, GSM900/1800, CDMA, 3G, LTE



Multi-Band IRDN POI/Combiner

- Multi-band, multi-system RF combiner (POI)

150/350/380/420/450/800/900/1800/2100MHz PMR, TETRA DMR, P-25, iDEN, GSM900/1800, CDMA, 3G, LTE



Digital Optical Multi-Band MDAS

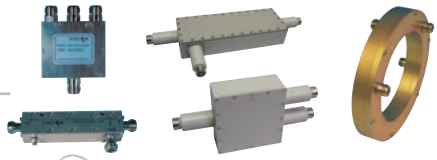
- Broad-band power splitter, directional coupler

PMR, TETRA, DMR, iDEN, GSM900/1800, CDMA, 3G, LTE

Passive Multi-Band IRDN DAS Components

- Broad-band power splitter, directional coupler

60MHz-2700MHz, from PMR, DMR, cellular bands to WiFi



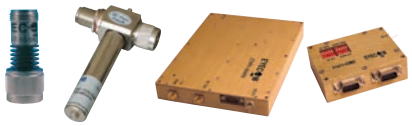
- Multi-band indoor antennas, omni or panel, Siso and MIMO

130MHz to 2700MHz, from PMR, DMR, cellular bands to WiFi

RF Accessories and Modules

- Attenuator, dummy load, lightning arrestor, active component modules

60MHz-5800MHz, from PMR, DMR, cellular bands to WiFi



RF Coaxial Cable and Leaky Cables

- 1/2", 7/8" 1-1/4" and 1-5/8" coaxial and leaky cables

60MHz-3000MHz, low loss, wide band or optimized band, patented water proof LSOH leaky cable

Tunnel Safety Products

- All in one tunnel safety and smart control Data-Bay with full NMS

Integrated tunnel comms and safety system supports DMR, Intercom, Fire alarm, Gas sensing, Flooding alarm, CCTV, RFID/Man down, Plant machine control/monitoring

Eyecom Antenna Product

Performance:

- Designed and manufactured in accordance to ISO9001 accreditation
- Robust single radome enclosure design
- 20 years experience in PIM control from antenna design to production
- Wide band design, Quad-band antenna in one single radome
- Excellent front-to-back and side lobe performance
- Patented technology, best Cross-Polar Ratio performance in the industry

Product Range:

- Mechanical downtilt antenna
- Remote control and variable electrical downtilt antenna
- Single polarization and dual polarization antenna
- MIMO multi-band, multi-port RET panel antenna
- Large RET range antenna (14-29˚ RET range)

Frequency Range:

- **Omni and sector single/dual-band antenna**

  PMR/DMR TETRA/IDEN, CDMA/GSM900, GSM1800, 3G, LTE, WiFi/WiMax

- **Tri-band antenna**

  CDMA/GSM900 + 3G, + LTE

  GSM1800 + 3G+ LTE

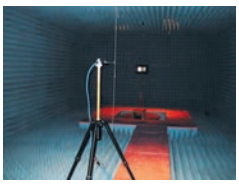
  CDMA/GSM900 + DCS1800+ LTE

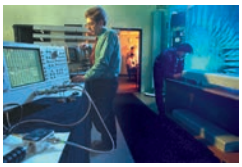
- **Quad-band antenna**

  CDMA/GSM900 + DCS1800 + 3G+ LTE

- **WiFi/Wi-Max low profile antenna**

  2400-2700/5150-5875MHz





Large Electrical Downtilt Range Antenna

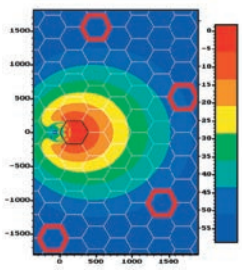
BAP890-1900-65S-12DRE-B

Frequency Range:	806-960MHz/1710-2170MHz
H-V beam width:	H-65˚; V-29˚/18˚
Gain:	12dBi/14dBi
RET Range:	14-29˚
Length	810mm

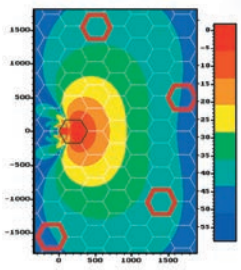
BAP1900-2500-65S-14DRE-B

Frequency Range:	1710-2170MHz/2400-2700MHz
H-V beam width:	H-65˚; V-18˚
Gain:	14dBi/15dBi
RET Range:	14-29˚
Length	810mm

- **Better RF foot-print:**
  antenna radiation pattern remains low distortion in high antenna BTS sites (50-100 meters)
- **Quad-Band:**
  CDMA800/GSM900+GSM1800+3G+LTE in one single radome
- **Small Size:** 810 mm in length



29˚ EDT in 50 meter height



10˚ EDT+17˚ MDT in 50 meter height

Full Band MIMO DAS Anetnna

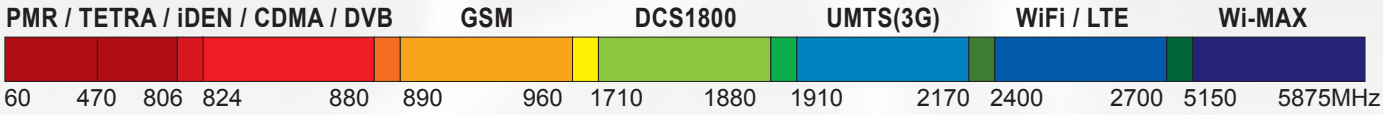
IA-103GDM

Frequency Range:	698-960MHz/1710-2690MHz
Beam width:	Omni-Directional
Gain:	Low band: 3dBi/ High band: 4dBi
MIMO Configuration	698-960MHz/1710-2690MHz, Orthogonal polarization
Isolation between Ports	25dB min. within both high and low bands
Dimension	248mm Dia.; 60mm Height, 30cm plenum rated pig tails
PIM	-153dBc@2x43dBm

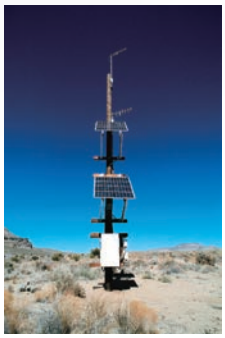
- **Orthogonal dual polarization, Better MIMO performance:**
  antenna dual ports in orthogonal polarization, achiving better MIMO performance for LTE: better data throughput and stability
- **Quad-Band supports all global cellular systems:**
  One single radome antenna supports LTE700/LTE800/LTE900/LTE1800/ LTE2100/LTE2600/CDMA800/GSM900/GSM1800/UMTS2100
- **Full band high Port-Port Isolation:**
  25dB in both bands, better MIMO performance
- **Small Size:** 248 Dia. x 60mm

Repeater and DAS Product

Eyecom Indoor Products:



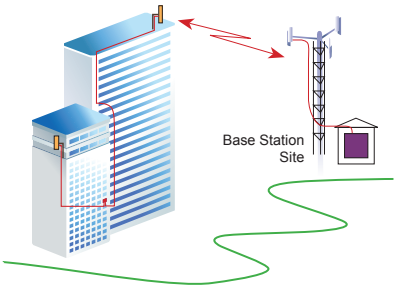
Eyecom Amplifier and Repeater

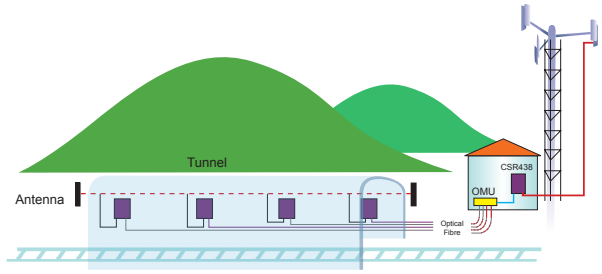


- Large product range support systems:
  PMR, TETRA, DMR, GSM900/1800, CDMA, 3G, LTE, WiFi
- Low Intermod filters, guarantee the best possible product stability, consistent performance over broad temperature range and long period of life cycle
- Standard configuration of dual PSU, ensures the highest system reliability
- ATEX model for explosion sensitive environment
- Advanced digital technology in PA and IF ICS sections
- Railway/Ocean EMC and environmental compatible

Eyecom Digital Repeater and ICS Repeater

Eyecom digital channel selective repeater offers low delay and high selectivity filter configuration. Support multiple optical BDAs in daisy chain cascaded configuration. ICS repeater allows low antenna isolation application, typical 25dB ICS range allows gain can be 25 dB higher than antenna isolation, also features time slot AGC and Squelch control

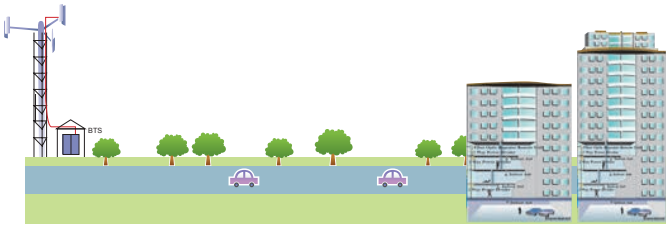




Base station site

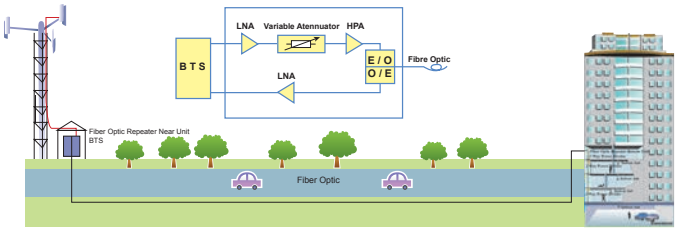
Application 1:

Eyecom Opticom® digital optical MDAS solution for large building complex multi-band DAS



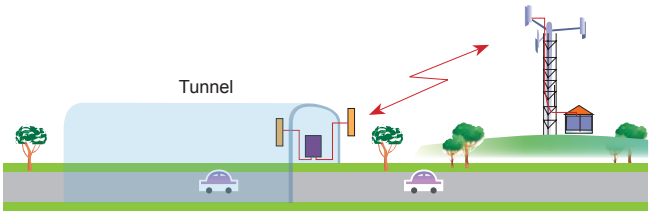
Application 2:

Digital optic repeater for indoor RF coverage



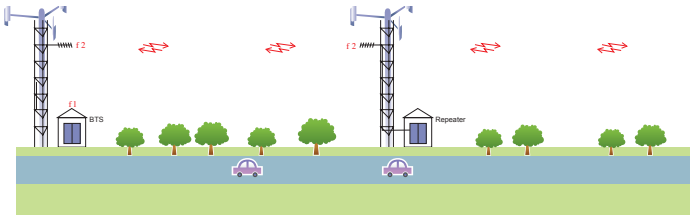
Application 3:

Digital optical MDAS solution for tunnel LCX RF coverage



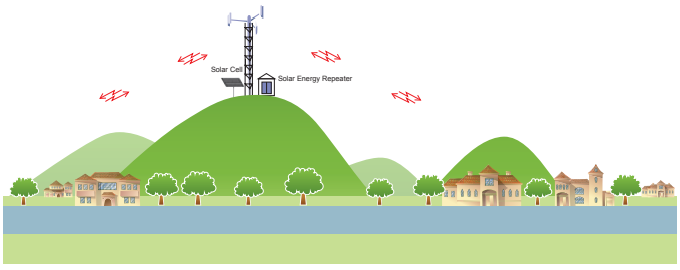
Application 4:

Digital Frequency shifting repeater for highway/railway RF coverage



Application 5:

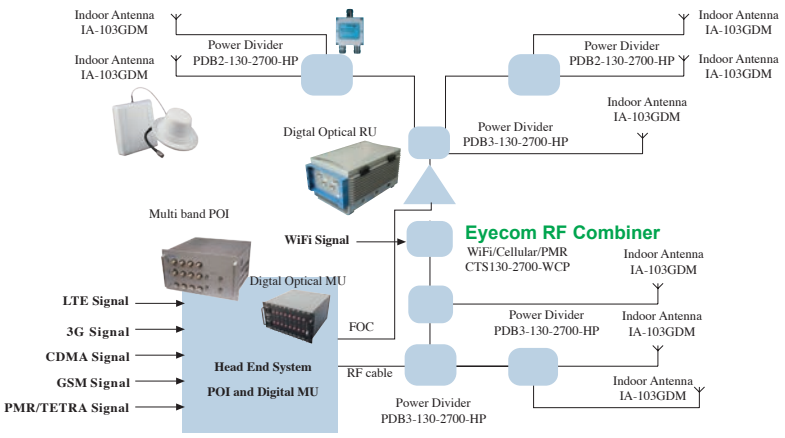
Solar energy repeater for rural/mountain top RF coverage



Multi-Band OD-MDAS System

Eyecom High power Digital Optical Multi-Band DAS

Eyecom high power digital multi-band DAS supports large number of cellular/DMR systems within a single fiber-antenna network. Digital optic technology with advanced digital FFR/DPD MCPA deliver 2G, 3G ,LTE and DMR network performance over a huge building DAS or Metro LCX system. System performance is similar to RRU/Small cell deployed network. Reliable, easy maintenance, Optional transparent path for WiFi and CIPRI signals

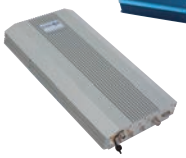


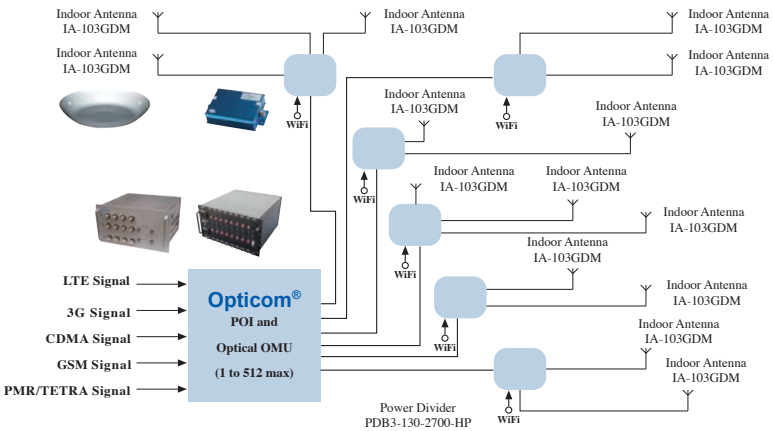
Eyecom RF Head End

Typical system diagram of Eyecom Digital Optical MDAS

Eyecom Digital Optical Multi-Band DAS solutions

Eyecom Pico power digital multi-band DAS supports large number of cellular/DMR systems within single fiber-antenna network. Digital optic technology deliver 2G, 3G ,LTE and DMR network performance over a huge DAS network, high linearity Pico RF power design reduces uplink noise that benefit to high data rate transmission. System performance is identical to RRU/Small cell deployed network. Low cost, reliable, optional transparent path for WiFi and CIPRI signals, full NMS remote control and monitoring





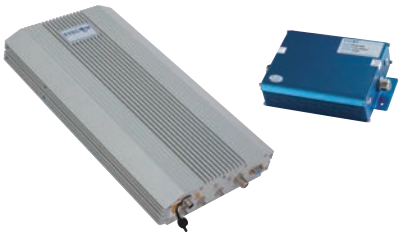
Typical system diagram of Eyecom Opticom series digital optical MDAS

Eyecom Tri-band Lift / Basement Pico-repeater

● Model:	CR900-1800-2100-17A-60RC
● Frequency Range:	880~960/1710~1880/1950~2170 MHz
● Gain:	40~70dB
● Out Put:	≤17dBm
● Noise Figure:	≤3.8dB

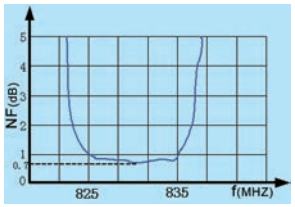
● Features

- ▲ Digital Tri-band pico-repeater, small in size and weight
- ▲ AGC in DL and UL, Digital FPGA IF, convenient setting
- ▲ NMS for remote controlling and monitoring
- ▲ Ultra low NF figure reduces UL noise floor
- ▲ Suitable or lift cartridge and carpark basement coverage



Eyecom Base Station Extension System

Eyecom BTS extension solution extends radio base station coverage distance up to 90Km. Patented pending RF signal processor and unique amplifier - antenna products in this system guarantee the best extended network performance and reliability



● Features and benefits

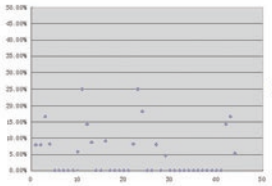
- ▲ Extend cell coverage distance to 90Km
- ▲ Reduce system dropped-call rate
- ▲ Improve Access and Data rate

● Applications

Mission critical and public radio communication system in coast, rural, mountain, desert and railway environment

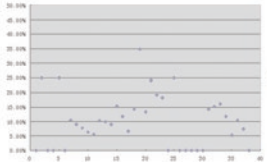
Case: GSM/CDMA Long Distance Coast Coverage (50-100Km)

Dropped-call rate (with Eyecom CES)



Sampling points

Dropped-call rate (Coventional BTS)



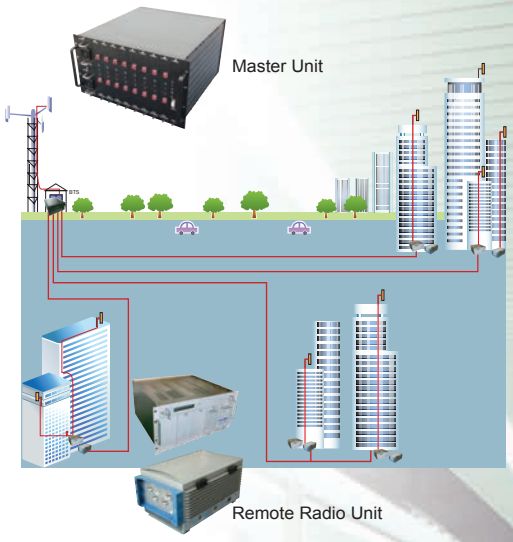
Sampling points

BTS coverage and performance improvement

- ▲ GSM/CDMA BTS coverage distance improved from 45Km to 80 Km compared to conventional long distance BTS solution
- ▲ Access Rate improved from 62% to 95%
- ▲ Drop call rate reduced from 38% to 7%

Eyecom Digital Optical Base Station Hotel

System available:	TETRA, P25, iDEN, GSM, CDMA, WCDMA
Carrier Per Sector:	1-16
Max. RU distance:	20Km
Max. output Power:	40dBm/carrier
Rx diversity :	available
LTE MIMO	available



Features

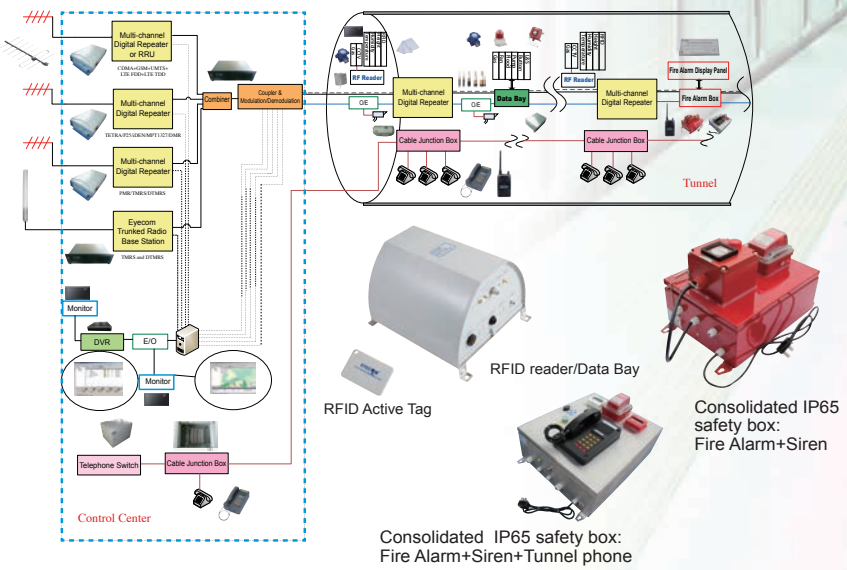
- ▲ Cluster sector BTSs co-located in same shelter room
- ▲ Full NMS, easy system optimization in one location
- ▲ Digital technology, MIMO and up-link diversity
- ▲ Multi band, multi-system, low Rx noise
- ▲ Low power consumption, cost saving

Eyecom Tunnel Consolidated Comms & Safety Solution

Eyecom tunnel Consolidated Communication & Safety solution combines tunnel communication and safety systems in one leaky cable network. Robust plug and play design ideal for applications of tunnel under construction or for metro and utility tunnels. All safety and control data is linked to system OMC via leaky cable. ATEX option available

Systems supported

- ▲ PMR, DMR, TMR and cellular radio systems from 70-2700MHz
- ▲ Intercom, Fire Alarm, RFID for staff positioning, CCTV
- ▲ Remote monitoring gas sensor, flooding alarm, plant machine control
- ▲ Consolidated NMS diplay all information in OCC



RFID Active Tag

RFID reader/Data Bay

Consolidated IP65 safety box: Fire Alarm+Siren

Consolidated IP65 safety box: Fire Alarm+Siren+Tunnel phone

MCPA-Multi-Band Multi-Carrier BDA and ODBDA

TETRA, GSM, CDMA, UMTS and LTE All in One In-line BDA and ODBDA

- ▲ One single BDA cabinet supports TETRA, GSM, UMTS and LTE simultaneously
- ▲ Modualized design, multi-band modules fitted in one single cabinet
- ▲ Digital pre-select filter and digital high linearity PA technology
- ▲ High RF output power
- ▲ NMS remote control and monitoring
- ▲ Low power consumption, convection cooling wall mount or rack mount

Important Terms of TETRA RF Repeater

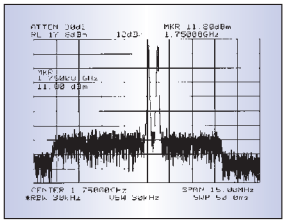
ETSI 101789

- **IMD:** Linearity of amplifier module, downlink in-band IMD <-36dBm
- **Outband Gain:**

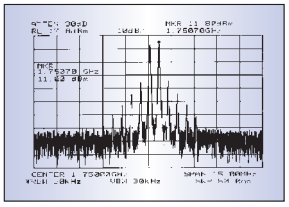
  Out-band Gain < 10dB at 500 KHz from pass band edges
- **IP3:** Formula **IP3=Po+IMPc/2** defines carrier RF output power level in multi-carrier application with ETSI compliance
- **PA Module Output Power (P-1):**

  PA module output power is amplifier 1dB compression point.

  RF output power in multi-carrier application should base on IP3 figure only, not P(-1) power level



High IP3 BDA has limited IMD generation-ETSI compliance



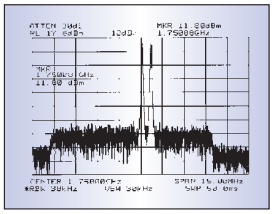
High 1dB compression point BDA generates significant IMD when run in PA full power output level

Eyecom Repeater and RF amplifier

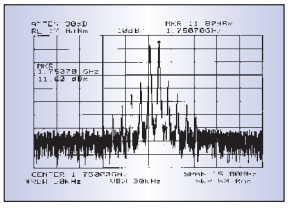
- Digital power amplifier modules, IMP performance both in-band and out-band complies to ETSI101789
- Digital SAW technology: ultra high out-band rejection, supports up to 12 channels, fully complied to ETSI101789
- Low noise figure:

  NF: 3.5 dB (Repeater)

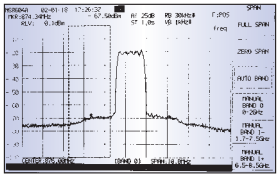
  1.2 dB (TMA)
- Full aluminum casing meets railway / tunnel requirement



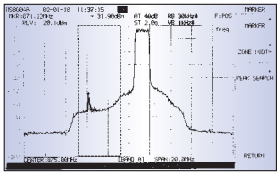
Eyecom amplifier demonstrates low 3rd IMP level



Conventional amplifier generates significant 3rd level IMP level



Eyecom amplifier demonstrates low 3rd IMP level in 3G signal handling



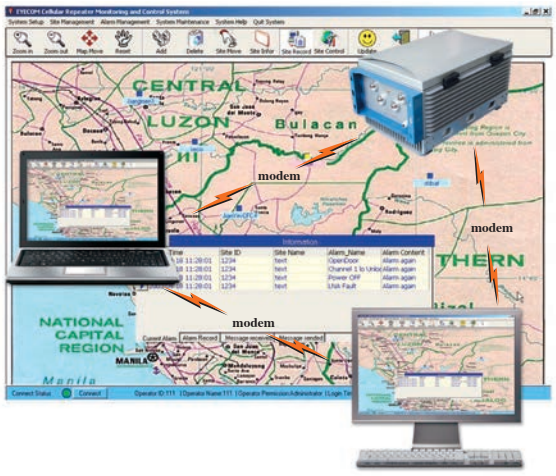
Conventional amplifier generates high spurious signals

Eyecom Remote Control / Monitoring System

Eyecom amplifiers and repeaters are able to be monitored and controlled remotely via Eyecom NMS. (Remote Monitoring and Control System).

NMS sends repeater working status data to OMC via cellular wireless SMS, PSTN modem or LAN line. Service engineers are able to monitor and control every repeater across the country

PSTN, Wireless modem or LAN line transmission



Product Case Study

Digital Frequency Shifting Repeater Police Force SEA

130-170MHz APCO-25 (2012)

Digital FSR for P-25, extends BTS coverage from 20Km to 40Km

Turnkey System Integrator

Hong Kong Metro TETRA Repeater

380-400/410-430 MHz TETRA Repeaters (2007-2010)

Supplied TETRA repeaters/IRDN components

Hong Kong International Airport

380-400/806-870MHz TETRA systems (2007-2009)

Supplied TETRA repeaters/Optical BDA/IRDN components

New Delhi International Airport

400MHz TETRA system (2008-2009)

Supplied TETRA repeaters/Optical BDA/IRDN components

DMRC/DELHI Airport Express Line

380-420 MHz TETRA Repeaters (May 2008-now)

Supplied 400MHz TETRA Optical BDAs/repeaters

India CWG TETRA System

380-430 MHz TETRA (March 2010 - June 2010, India)

Supplied repeater, POI, antenna and IRDN components

Hyderabad Airport TETRA Optical BDA

380-430 MHz TETRA Repeaters (Jan. 2008)

Supplied 400MHz TETRA Optical BDAs/repeaters

China Police TETRA System

350MHz~370MHz TETRA network (Aug. 2009)

System integrator, supplied POI, BTS antenna and repeaters

Shanghai Oriental Pearl Tower Cellular RF Coverage System

800-2100 MHz (Oct 2002, system integrated by Eyecom)

Supplied CDMA+GSM+3G cellular RF signal coverage inside tower and high speed lift shafts.

HK Convention & Exhibition Center

800-1800MHz cellular system POI (Jan. 1997)

440-470MHz DMR DAS system (Feb. 2009)

Supplied POI to support CDMA, USDC, GSM900 and GSM1800 systems

Turnkey system integration of DMR DAS

Macau Encore Tower Cellular DAS

(Feb 2010-2013)

Supplied POI, passive components, antenna, multi-band MCPA for CDMA800, GSM900, DCS1800, WCDMA and LTE

Taipei Metro

800 MHz-1800 MHz LCX POI (1996, 12, supplied by Eyecom NZ Ltd.)

Supplied POI to combine USDC, GSM and DCS1800.

Taiwan Express Railway

Track side TETRA Radio Coverage Network (380-400MHz) (2009-2013)

Supplied Track side BTS sector antennas and RF/Optic repeaters

Shanghai Metro

806-866MHz TETRA Optic repeater (2012-2013)

Supplied optic repeaters

Hangzhou Metro

350-370MHz TETRA Optic repeater (2012-2013)

Supplied optic repeaters

Hong Kong Drainage Tunnels

380-470MHz TETRA/DMR 20Km LCX Radio system (Sept 2009-July 2012)

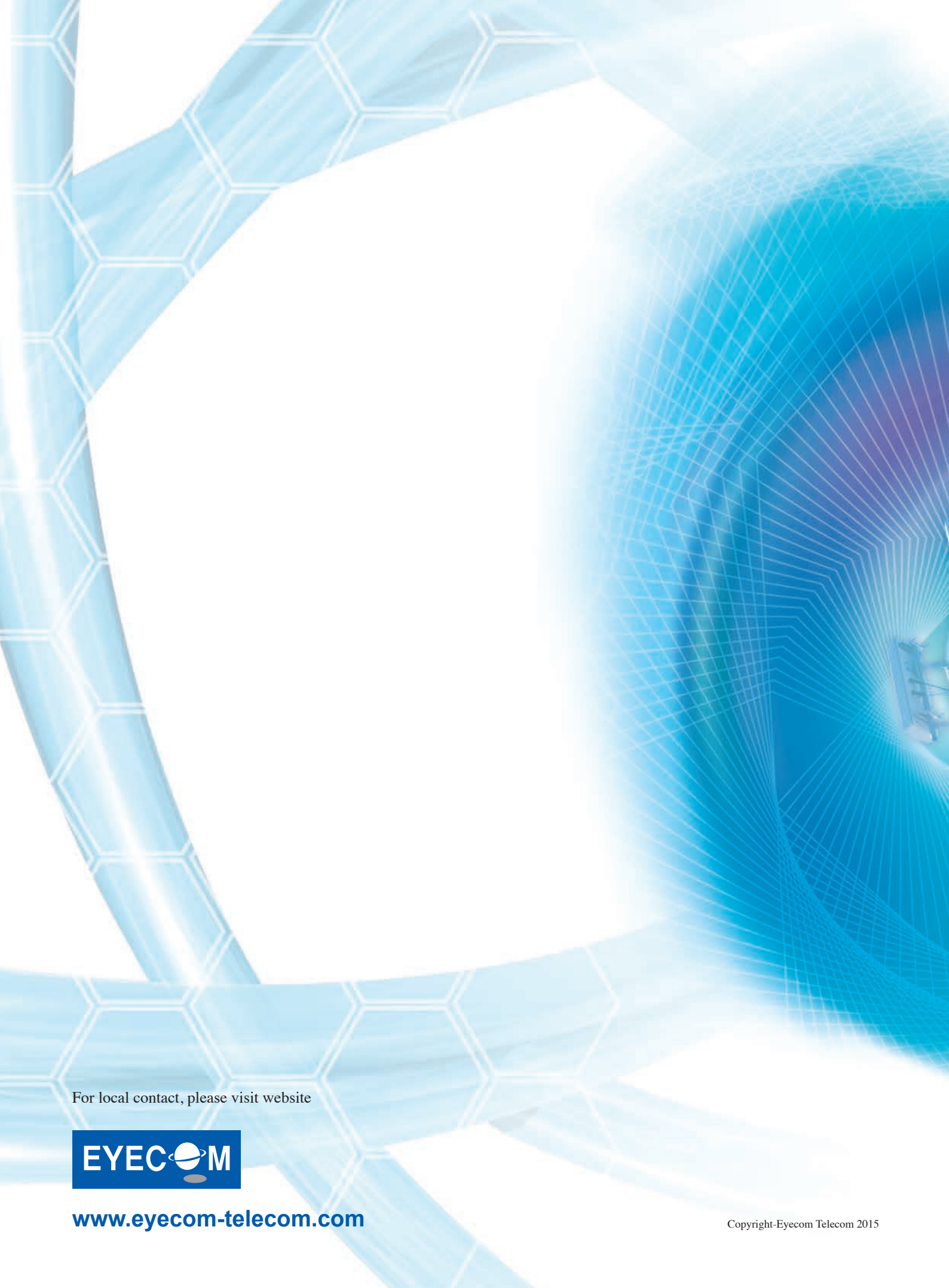
Turnkey system integrator of dual band TETRA/DMR LCX system.
Power fed via patented water resist LSOH LCX, Atex BDA, system supports RFID, CCTV, Gas, Flooding, Intercom, Fire Alarm and plant machine control

Light Tower ICS Repeater Site

380-470MHz TETRA RF Channelized ICS RF Repeater (July 2012)

Supplied dual band channelized TETRA ICS RF repeater system.
ICS repeater gained at 95dB when site antenna isolation reaches 70dB only

MOTOROLA SOLUTIONS
CASSIDIAN AN EADS COMPANY
Alcatel·Lucent
MTR
SIEMENS
PCCW 電訊盈科
SmarTone
Hutchison Telecom
CSL Create a Simple Life
中国移动通信 CHINA MOBILE
中国电信 CHINA TELECOM
HUAWEI
China unicom中国联通
ERICSSON
ZTE中兴



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