Hytera


# Bi–Directional Amplifier (BDA)

Cost effective and flexible radio communication solutions, for coverage in challenging environments.


www.hytera.co.uk

## Overview

A BDA (Bi–Directional Amplifier) is an RF signal booster used to improve radio communications in situations where radio signal levels are degraded due to obstacles in the radio path. This might be in tunnels, high rise buildings and underground car parks where their construction can prevent the signals from a source reaching the users in these areas.

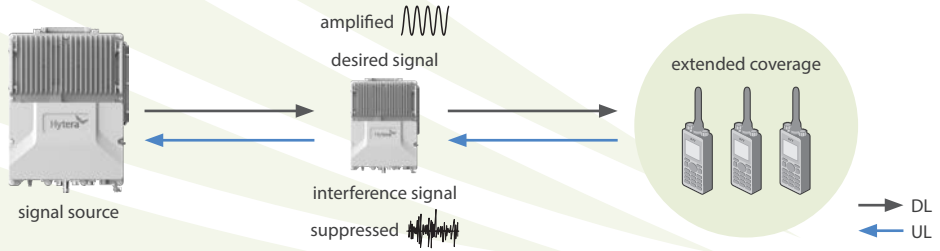
They are available in a number of variants to suit the communications situation, this includes integrated and distributed configurations and band and channel select options.

BDA's are a cost effective and flexible way to:

- Overcome challenges presented by environments like high–rise buildings, basements, tunnels, subways, etc.
- Extend coverage
- They can be used in many different systems, such as Analogue PMR/MPT, Digital DMR Conventional/Trunked, TETRA, etc.

**BDA**

- Wireless emission transfer device (RF signal amplifier)
- Signal coverage for blind/weak signal area to extend coverage, such as inside buildings, tunnels, subways, etc.
- Small capacity with large coverage
- Cost effective and flexible




**Large buildings**

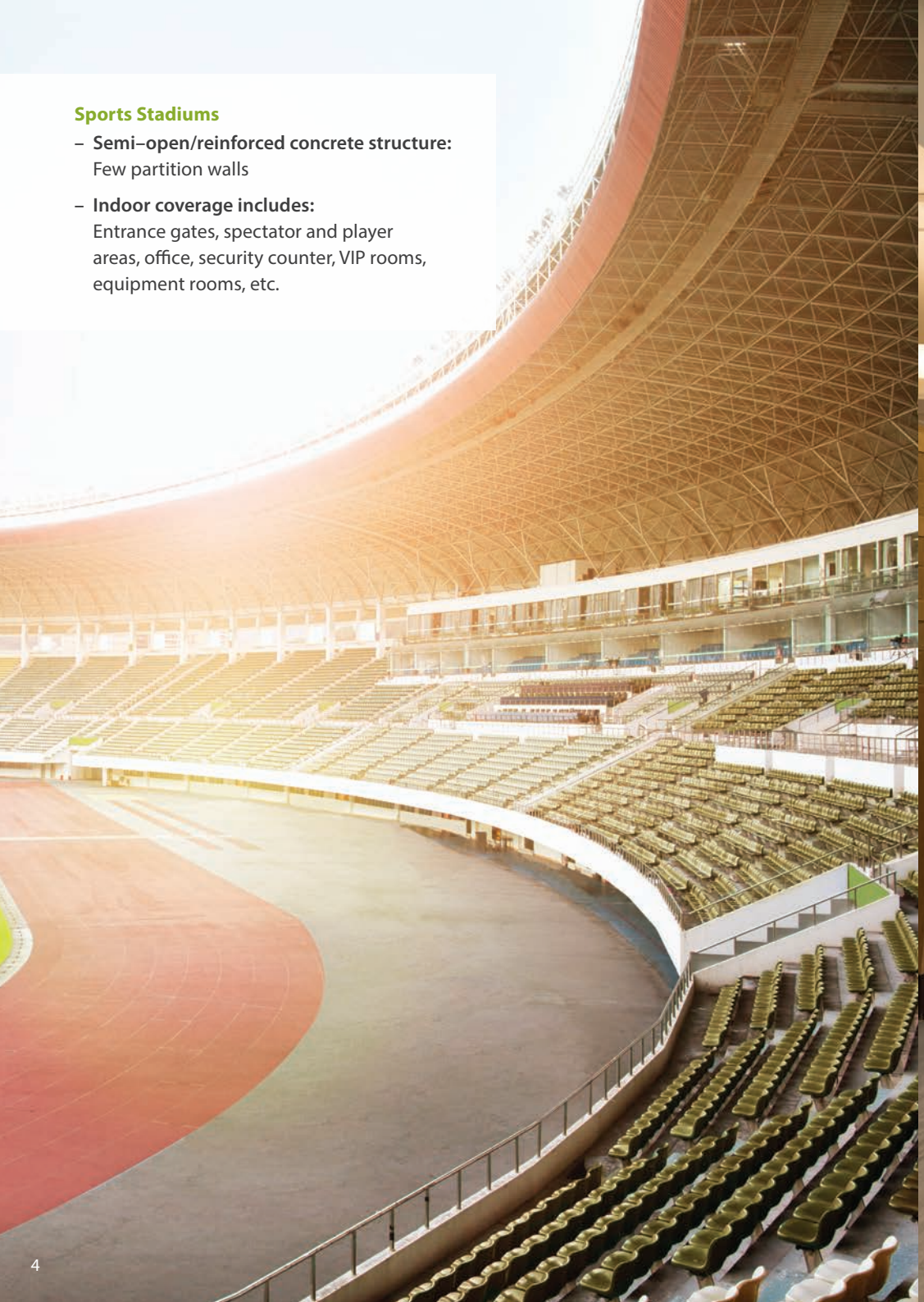
**Shopping centres**

**Transport hubs**

**Metros and tunnels**

**Underground car parks**

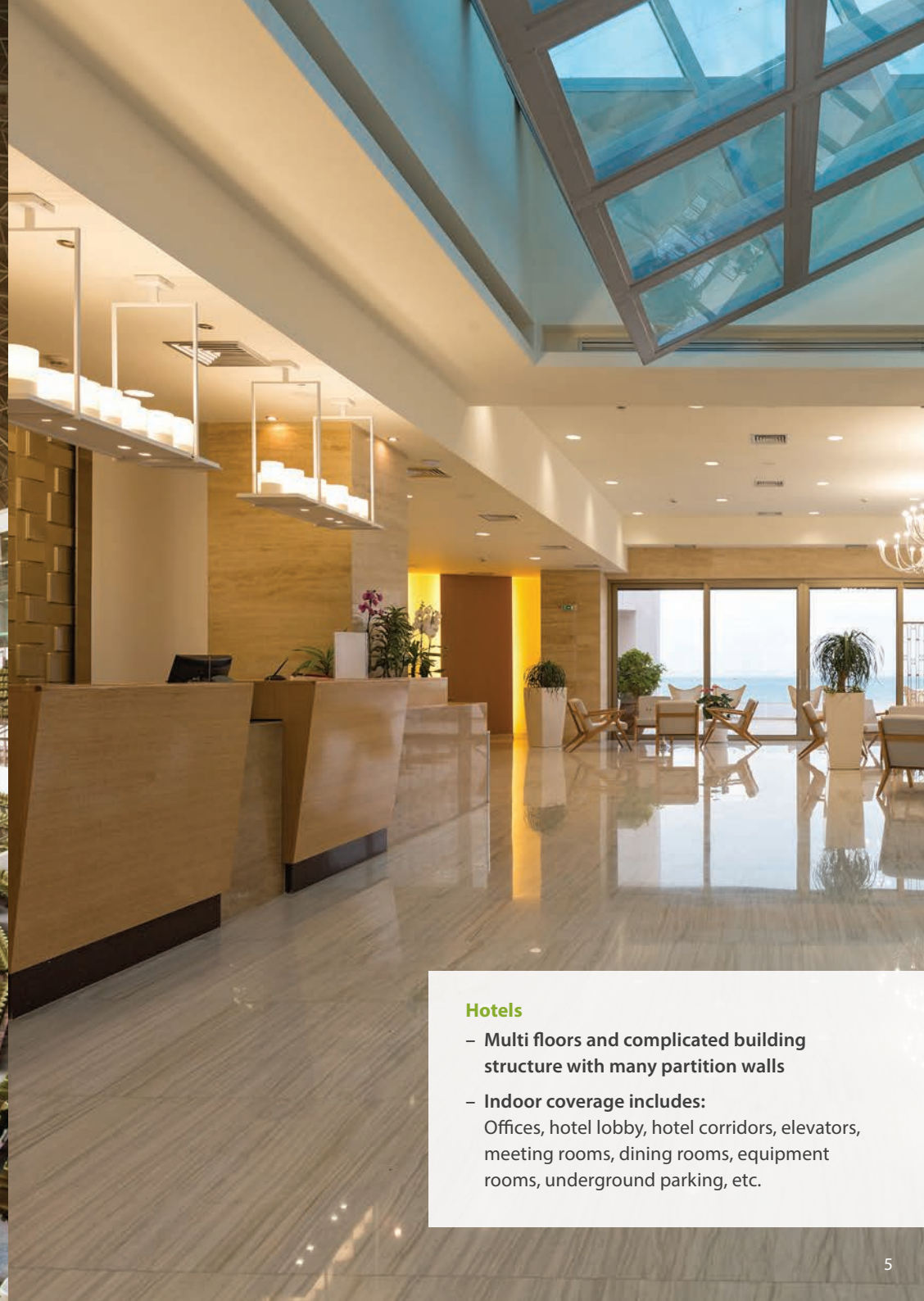
**Elevators**



## Sports Stadiums

- **Semi–open/reinforced concrete structure:**
  Few partition walls
- **Indoor coverage includes:**
  Entrance gates, spectator and player areas, office, security counter, VIP rooms, equipment rooms, etc.





## Hotels

- **Multi floors and complicated building structure with many partition walls**
- **Indoor coverage includes:**
  Offices, hotel lobby, hotel corridors, elevators, meeting rooms, dining rooms, equipment rooms, underground parking, etc.

## Transport Hubs

- **Semi–open/reinforced concrete structure:**
  Few partition walls; high ceiling, etc.
- **Indoor coverage includes:**
  Offices, waiting rooms, security counter, VIP rooms, stores, equipment rooms, underground parking, etc.

## Metros and Tunnels

- **Fully enclosed underground locations that are often long distances**
- **Indoor coverage includes:**
  The tunnel itself, and platforms, and outside or above ground areas.

### Shopping Centres

- **Complicated structural design:**
  Few partition walls, multiple levels
- **Indoor coverage includes:**
  Shopping areas, management offices, security offices, meeting rooms, rest rooms, underground parking, etc.

# Hytera BDAs

### Highlights

- **Rugged construction:**
  Metal housing = good ingress protection and heat dissipation
- **Portable:** small, lightweight, with flexible mounting options
- **Comprehensive range of variants:**
  integrated/distributed, band/channel select, direct/wireless coupling, VHF/UHF

### DS–9300 Highlights

- **Multi–network type:** DMR, PDT, TETRA are supported
- **Easy to deploy:** DS–9300 Is small, light–weight, with flexible mounting options
- **UHF:** DS–9300 supports 400–470MHz
- **Excellent out-of-band rejection:**
  the DS–9300 starts signal rejection from 50KHz, which provides excellent rejection of out-of-band signals, which enhances coverage and voice quality
- **Excellent intermodulation attenuation:** for the DS–9300, 8 carriers deliver –45dBc Intermodulation attenuation which is effective in eliminating the interference of intermodulation signals. This helps to provide better coverage and voice quality
- **Flexible network topologies:**
  tree/star/chain/ring/hybrid – to allow best fit for application

### TS–9200 Highlights

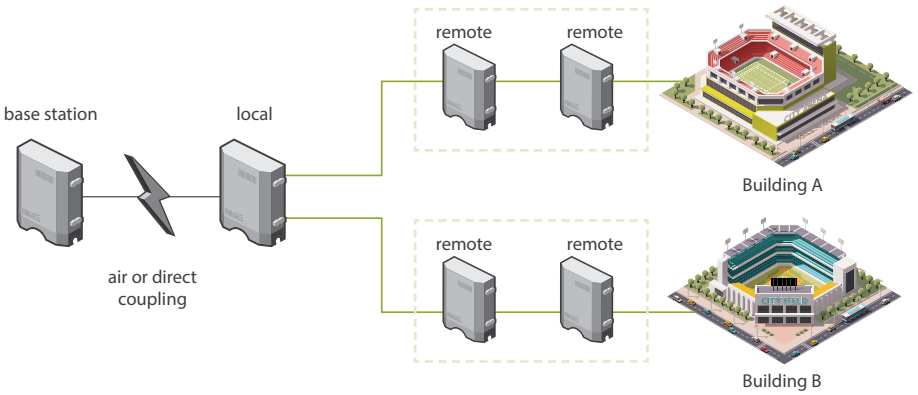
- **Multi-network type:** DMR, PDT, TETRA are supported
- **Integrated and distributed:** TS–9200 offers both options
- **VHF:** TS–9200 supports VHF (136–174MHz) and UHF (Integrated model only) (350–520MHz)
- **Channel and band select variants:** TS–9200 supports both options
- **Analogue fibre:** some TS–9200 BDA's can be connected with analogue fibre

# Flexible networking options

DS–9300 distributed BDA's can offer a number of different network topology options to suit the best distribution of the signals dependent on the coverage requirement.

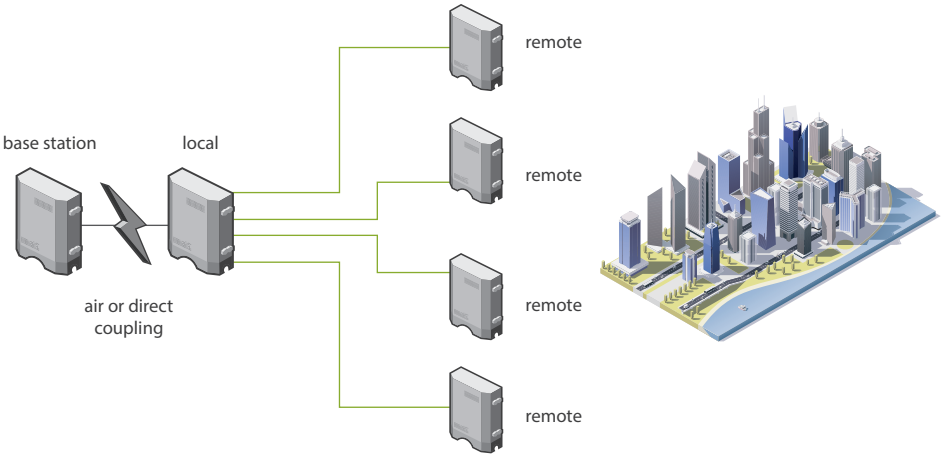
## BDA Network – Tree Network

**Dot Coverage**
Coverage for big public stadium can be realised with one local optical–fiber BDA with some remote BDA's.



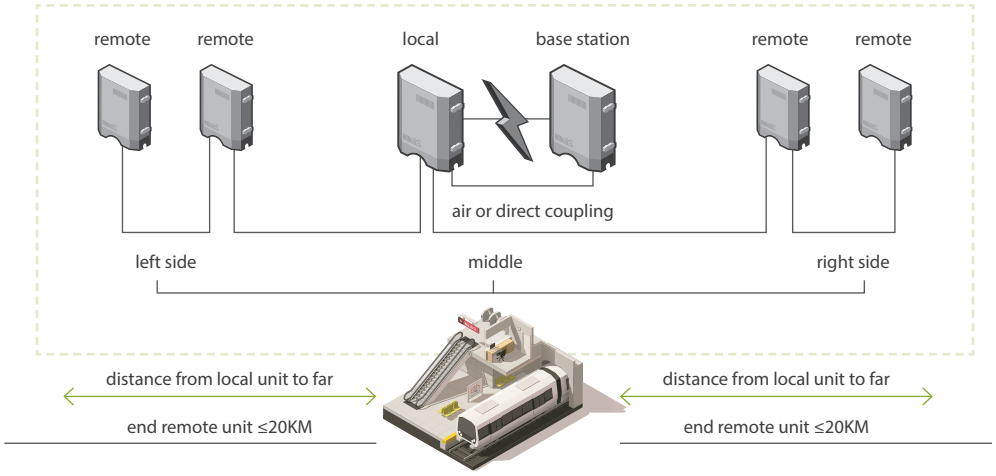

## BDA Network – Star Network

**Example use:**
Office buildings, where multiple remote units can be distributed to provide coverage in blind spots.



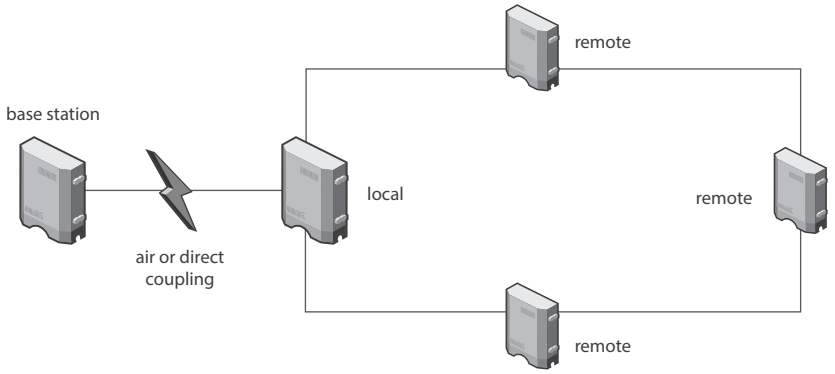

## BDA Network – Chain Network

**Linear Coverage**
Tunnel, subway and other weak coverage area.




## BDA Network – Ring Network

**Optical link backup:**
For customers that require full redundancy, ring networking provides full link backup.

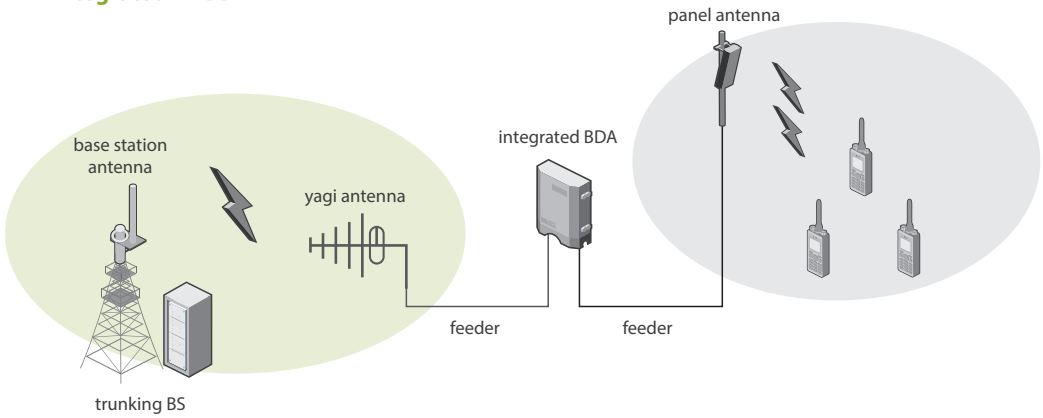


# Classification

- **BDA's are classified under a number of criteria:**
  - Transmission mode – wireless (integrated) or fibre (distributed)
  - Band or channel selective
  - Wireless or direct coupling
- **Hytera offer a range of BDA products to meet the above classifications**
- **Selection of the type depends on the requirements**

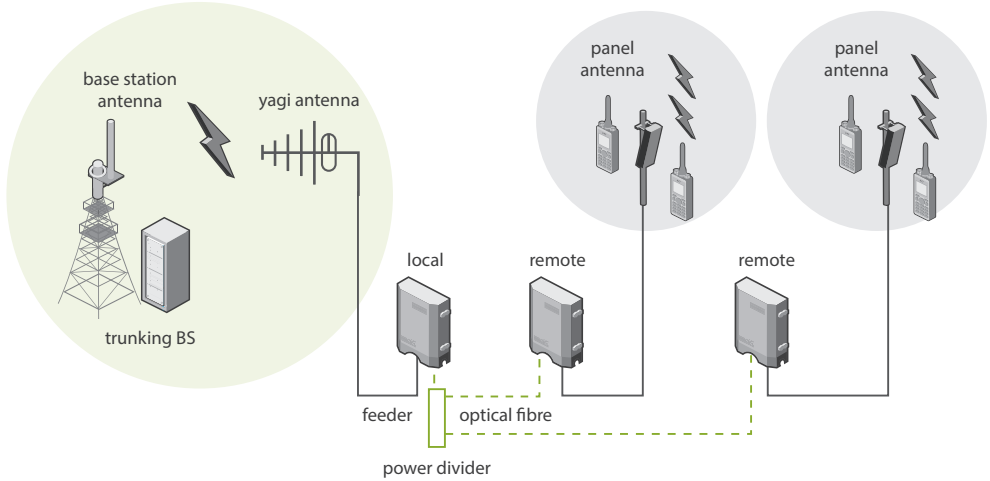
| | | |
|---|---|---|
| **Classified by transmission mode** | Integrated BDA | Obtain wireless signal from the signal source, and transfer it into feeder signal, then use the antenna to provide the coverage |
| | Distributed optical fibre BDA | Composed of local and remote unit, local unit obtains signal from signal source with feed cable, and converts electrical signal into photo–signal and transmits to remote unit, the remote unit converts the photoelectric signal back to electrical and the antenna provides the desired signal coverage |
| **Classified by selection mode** | Band–selective BDA | Select the specified frequency range to amplify |
| | Channel–selective BDA | Select specified frequency points to amplify |

## Integrated RF BDA




- System gain & power output are high enabling wide coverage
- Used to extend coverage or in shorter tunnels & high–storey buildings

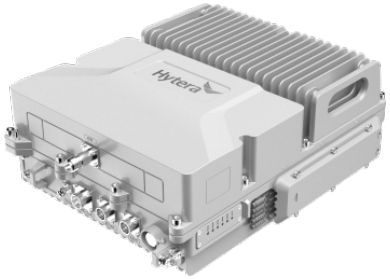
## Distributed BDA




- One local unit can connect several remote units
- Local & remote units connected via optical fibre
- Direct and wireless coupling options available
- High power/wide coverage
- Used in tunnels/large building complexes or areas far away from the BS

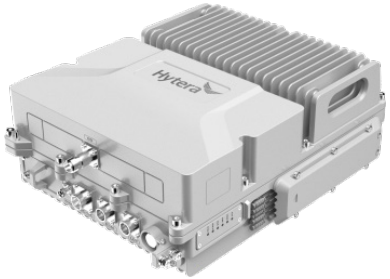
# DS–9300 Range

5W 8/16 channel–selective (local unit)



5W 8/16 channel–selective (remote unit)

5W digital band–selective (local unit)



5W digital band–selective (remote unit)



# DS–9300 Range

| Cable Access Specifications | | | | |
|---|---|---|---|---|
| Category | Name | Item | Specification | |
| | | | Downlink | Uplink |
| Cable–access band–selective | DS-9300 Digital optical fiber band-selective repeater | Frequency range – U1,U3 | 350–400 MHz, 400–470 MHz | |
| | | | Operating bandwidth: 5 MHz, TX and RX spacing: 10 MHz | |
| | | Max. output power | 37±2 dBm | –10±2 dBm |
| | | Max. gain | 50±3 dB | 45±3 dB |
| | | Dimensions | Donor unit: 442mm x 320mm x 44mm (cable–access) | |
| | | | Remote unit: 385mm x 300mm x 142mm | |
| Cable–access channel–selective | DS-9300 Digital optical fiber channel-selective repeater | Frequency range – U1,U3 | 320–400MHz,400–470MHz | |
| | | | Operating bandwidth: 5 MHz, TX and RX spacing: 10 MHz | |
| | | Channel bandwidth | 25 KHz | 25 KHz |
| | | Number of channels | 1 to 16 | 1 to 16 |
| | | Max. output power | 37±2 dBm | –10±2 dBm |
| | | Max. gain | 50±3 dB | 45±3 dB |
| | | Dimensions | Donor unit: 442mm x 320mm x 44mm (L x W x H) | |
| | | | Remote unit: 385mm x 300mm x 142mm | |
| **Wireless Access Specifications** | | | | |
| Wireless–access band–selective | DS–9300 Digital optical fiber band–selective repeater | Frequency range – U1,U3 | 350–400 MHz, 400–470 MHz | |
| | | | Operating bandwidth: 5 MHz, TX and RX spacing: 10 MHz | |
| | | Max. output power | 37±2 dBm | 30±2 dBm |
| | | Max. gain | 95±3 dB | 90±3 dB |
| | | Dimensions | Donor unit: 385mm x 300mm x 142mm (wireless–access) | |
| | | | Remote unit: 385 mm x 300 mm x 142 mm | |
| Wireless–access channel–selective | DS–9300 Digital optical fiber channel–selective repeater | Frequency range – U1,U3 | 350–400MHz,400–470MHz | |
| | | | Operating bandwidth: 5 MHz, TX and RX spacing: 10 MHz | |
| | | Channel bandwidth | 25 KHz | 25 KHz |
| | | Number of channels | 1 to 16 | 1 to 16 |
| | | Max. output power | 37±2 dBm | 30±2 dBm |
| | | Max. gain | 95±3 dB | 90±3 dB |
| | | Dimensions | Donor/remote unit: 385mm x 300mm x 142mm (wireless–access) | |
| | | | Remote unit: 385 mm x 300 mm x 142 mm | |

# TS–9200 Range

5W/10W wireless access band/8 channel selective integrated repeater

5W wireless access fibre band–selective distributed repeater (local unit)*

5W wireless access fibre band–selective distributed repeater (remote unit)*

5W wireless access digital 8 channel–selective distributed repeater (local/remote, split type)*

5W 16 channel digital fibre channel–selective distributed repeater (remote unit, split type)*

5W 16 channel digital fibre channel–selective distributed repeater (local unit, split type)*

*VHF Only – for UHF –please refer to DS–9300 range

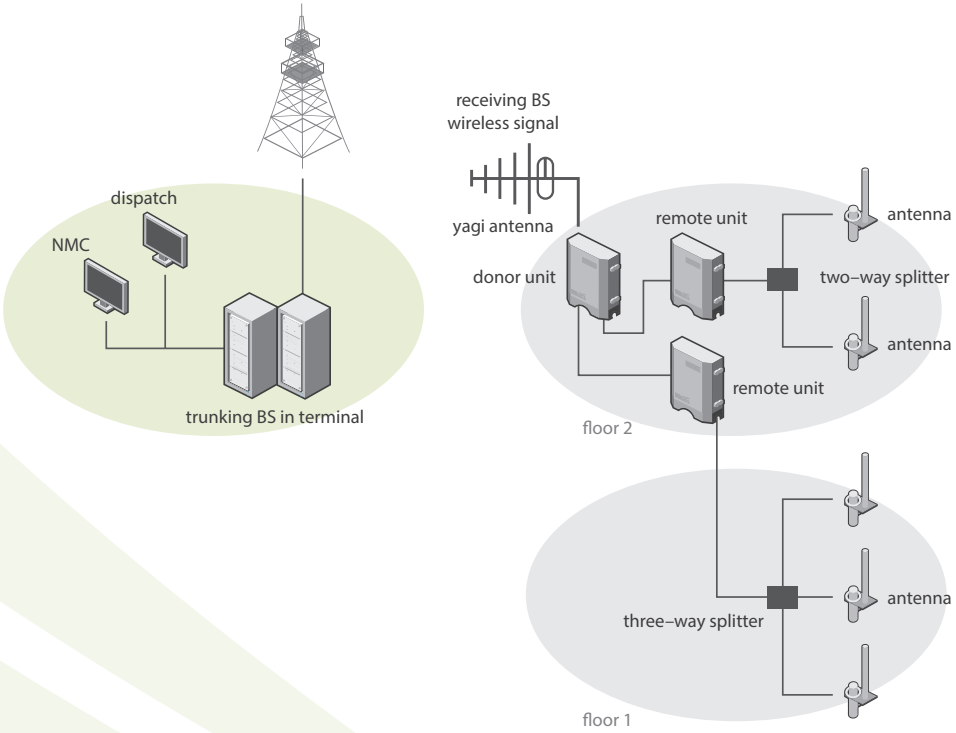
| TS–9200 | | | | |
|---|---|---|---|---|
| Integrated Repeater Specifications | | | | |
| Category | Name | Item | Specification | |
| | | | Downlink | Uplink |
| Wireless–access band–selective repeater | 10W Wireless–access band–selective repeater | Frequency range | 350–520 MHz (UHF) | |
| | | Operating bandwidth | Operating bandwidth: 5 MHz, TX and RX spacing: 10 MHz | |
| | | Max. output power | 40±2 dBm | 33±2 dBm |
| | | Max. gain | 90±3 dB | 85±3 dB |
| | | Dimensions | Cast aluminium case: 453mm x 357mm x 217mm (L x W x H) | |
| | | | Sheet metal case: 530mm x 400mm x 200mm (L x W x H) | |
| | 5W Wireless–access band–selective repeater | Frequency range – VHF | 136–174 MHz | 136–174 MHz |
| | | Operating bandwidth | Operating bandwidth: 1–2 MHz, TX and RX spacing: 5.7–10 MHz | |
| | | Max. output power | 37±2 dBm | 30±2 dBm |
| | | Max. gain | 90±3 dB | 85±3 dB |
| | | Dimensions | Cast aluminium case: 453mm x 357mm x 217mm (L x W x H) | |
| | | | Sheet metal case: 530mm x 400mm x 200mm (L x W x H) | |
| Wireless–access digital 8–channel–selective repeater | 10W Wireless–access digital 8–channel–selective repeater | Frequency range – UHF | 350–520 MHz | |
| | | Operating bandwidth | Operating bandwidth: 5 MHz, TX and RX spacing: 10 MHz | |
| | | Channel spacing | 25 kHz | 25 kHz |
| | | Number of channels | 8 | 8 |
| | | Max. output power | 40±2 dBm | 33±2 dBm |
| | | Max. gain | 95±3 dB | 90±3 dB |
| | | Dimensions | Cast aluminium case: 453mm x 357mm x 217mm (L x W x H) | |
| | | | Sheet metal case: 530mm x 400mm x 200mm (L x W x H) | |
| | 5W Wireless–access digital 8–channel–selective repeater | Frequency range – VHF | 136–174 MHz | 136–174 MHz |
| | | Operating bandwidth | Operating bandwidth: 1–2 MHz, TX and RX spacing: 5.7–10 MHz | |
| | | Channel spacing | 25 kHz | 25 kHz |
| | | Number of channels | 8 | 8 |
| | | Max. output power | 37±2 dBm | 30±2 dBm |
| | | Max. gain | 95±3 dB | 90±3 dB |
| | | Dimensions | Cast aluminium case: 453mm x 357mm x 217mm (L x W x H) | |
| | | | Sheet metal case: 530mm x 400mm x 200mm (L x W x H) | |

| TS–9200 – Distributed Repeater | | | | |
|---|---|---|---|---|
| **Wireless Access Specifications** | | | | |
| **Category** | **Name** | **Item** | **Specification** | |
| | | | **Downlink** | **Uplink** |
| Digital band-selective optical fiber repeater Wireless Access | 5W Digital band–selective optical fibre repeater | Frequency range | 136–174 MHz | |
| | | | Operating bandwidth: 1–2 MHz, TX and RX spacing: 5.7–10 MHz | |
| | | Max. output power | 37±2 dBm | 30±2 dBm |
| | | Max. gain | 90±3 dB | 85±3 dB |
| | | Dimensions | Outdoor donor unit : 530mm x 400mm x 200mm (L x W x H) | |
| | | | Remote unit: 530mm x 400mm x 200 mm (L x W x H) | |
| Digital channel-selective optical fiber repeater Wireless Access | 5W Digital 8-channel-selective optical fiber repeater | Frequency range | 136MHz–174MHz | |
| | | Operating Bandwidth | Operating bandwidth: 1–2 MHz, TX and RX spacing: 5.7–10 MHz | |
| | | Channel bandwidth | 25 kHz | 25 kHz |
| | | Number of channels | 8 | 8 |
| | | Max. output power | 37±2 dBm | 30±2 dBm |
| | | Max. gain | 95±3 dB | 90±3 dB |
| | | Dimensions | Donor/Remote unit: 530mm x 400mm x 200mm (L x W x H) | |

| TS–9200 – Distributed Repeater | | | | |
|---|---|---|---|---|
| **Cable Access Specifications** | | | | |
| **Category** | **Name** | **Item** | **Specification** | |
| | | | **Downlink** | **Uplink** |
| Digital band–selective optical fibre repeater. Cable Access | 5W Digital band–selective optical fibre repeater | Frequency information | 136–174 MHz | |
| | | | Operating bandwidth: 1–2 MHz, TX and RX spacing: 5.7–10 MHz | |
| | | Max. output power | 37±2 dBm | 30±2 dBm |
| | | Max. gain | 90±3 dB | 85±3 dB |
| | | Dimensions | Outdoor donor unit : 530mm x 400mm x 200mm (L x W x H) | |
| | | | Remote unit: 530mm x 400mm x 200 mm (L x W x H) | |

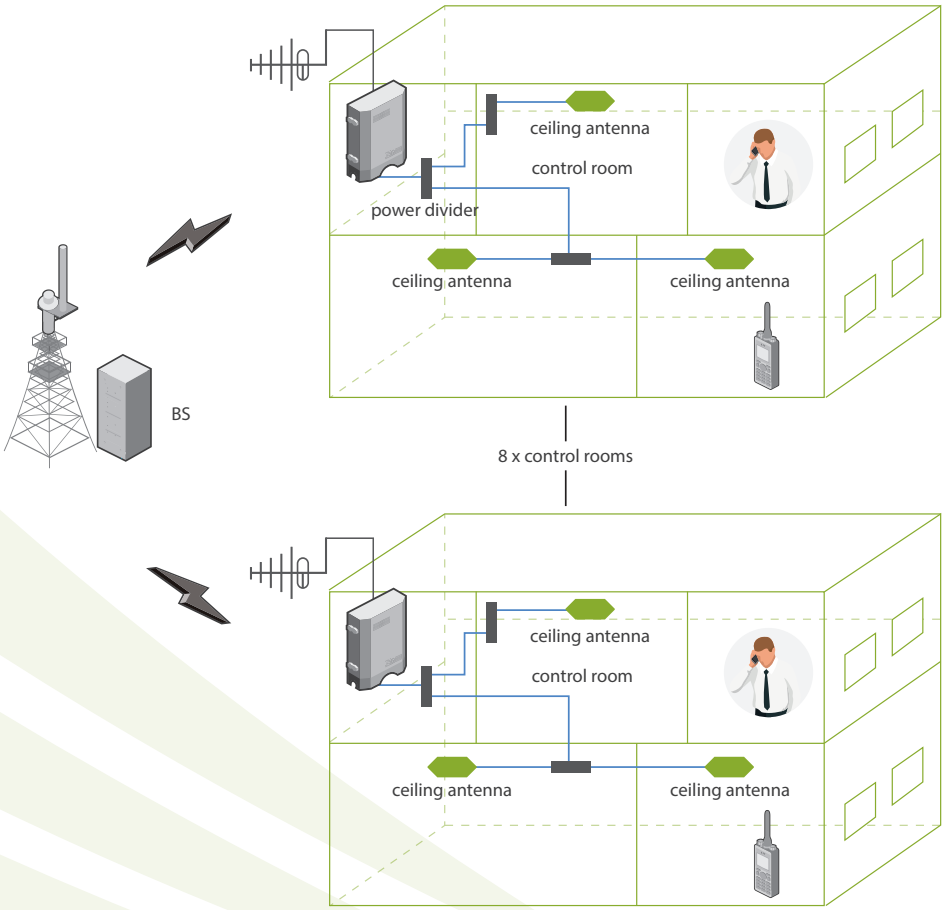
# Example uses

## Distributed BDAs to eliminate blind spots – example at an airport

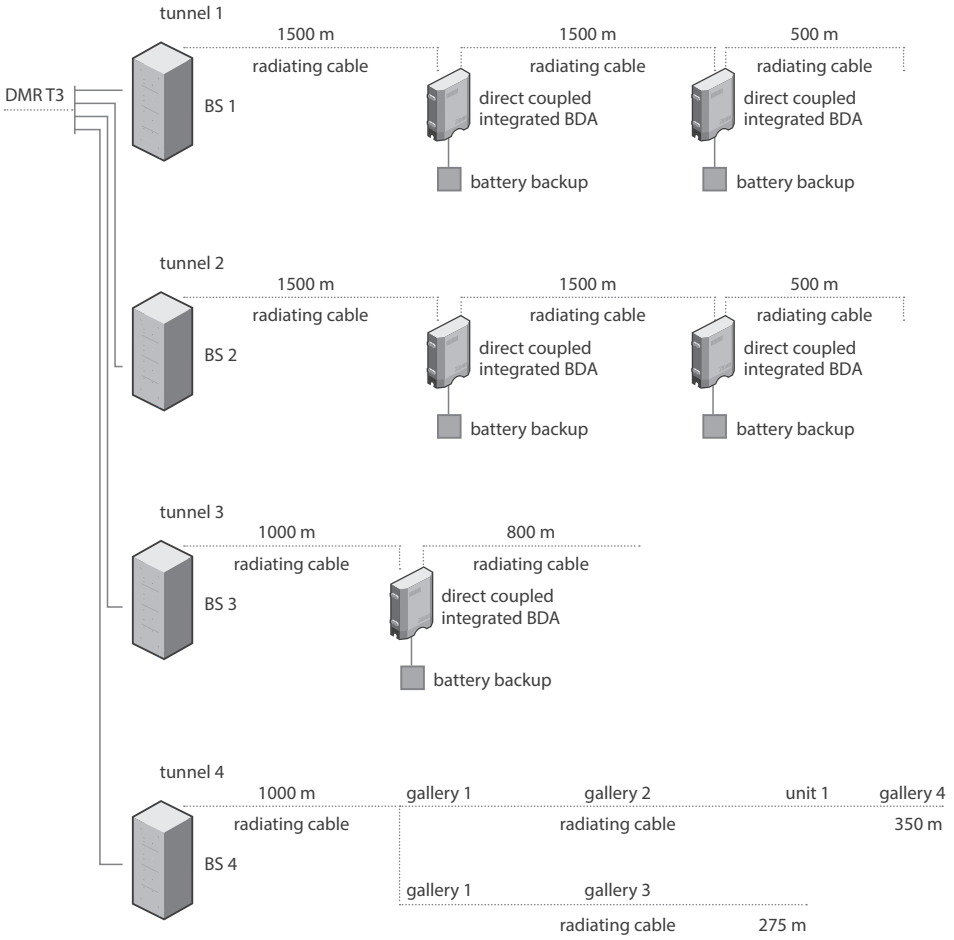



# Example uses

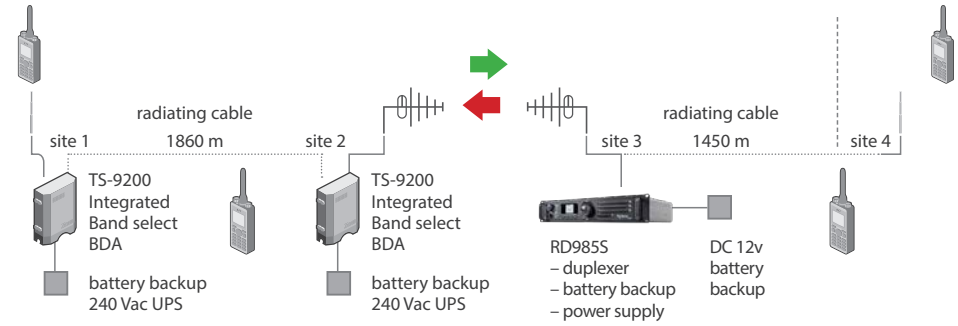
## Extension of base station coverage into buildings



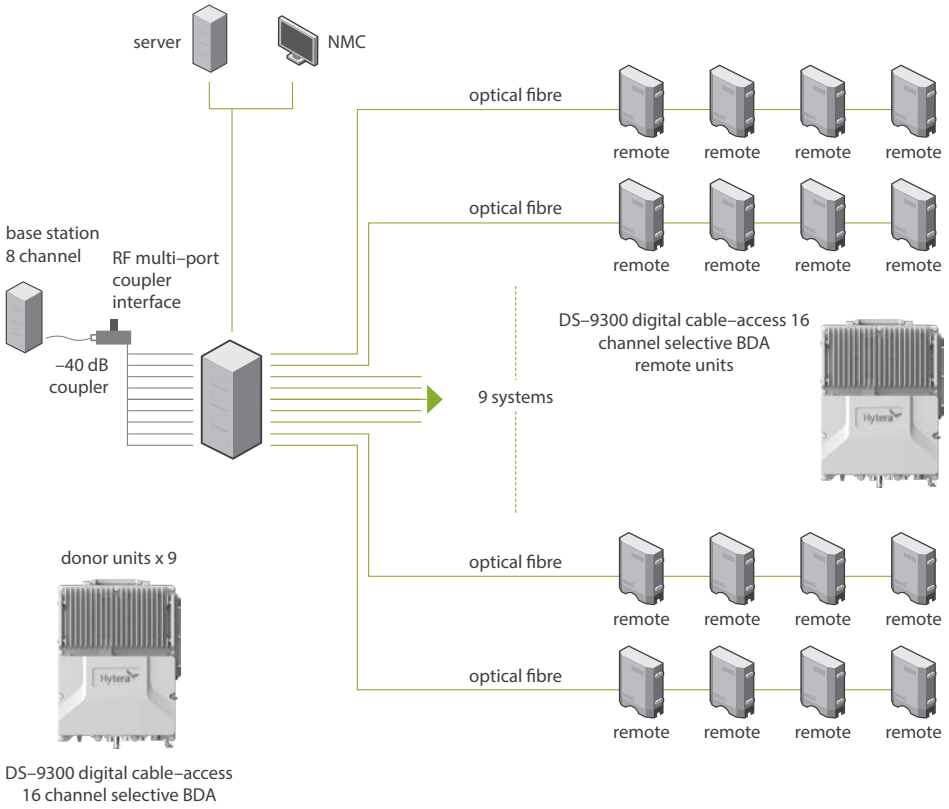
## Tunnel coverage solution




## Multiple tunnel coverage solution



## Distributed BDA – multiple remote connections/extended coverage range – example: wind farm installation



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