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# 1 SYSTEM DESCRIPTION

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## 1.1 INTRODUCTION

The TDD Mini repeater system is designed to improve coverage for customers using TDD broadband 2500-2700 Mhz in medium size indoor areas.

The system implements BDA technology to enhance coverage in urban areas.

Repeaters are used to fill out uncovered areas in cellular mobile systems, such as base station fringe areas, road tunnels, business and industrial buildings, etc.

A repeater receives signals from a base station, amplifies the signals and retransmits them to mobile stations. It also receives, amplifies and retransmits signals in the opposite direction. Both directions are served simultaneously.

To be able to receive and transmit signals in both directions, the repeater is connected to a donor antenna directed towards the base station, and to a service antenna directed towards the area to be covered.

The repeaters are controlled through the Cellvine Operation Software Terminal, installed on desktop or laptop computers, which enables communication with the repeaters either locally or remotely via a modem (optional). Remote operation can also be performed via a Bluetooth device (optional).

## 1.2 TDD REPEATER AND ANTENNA KIT

**Description:** TDD Repeater and Antenna Kit

**Part number:** BDA-TDD/ANT-KIT-AA

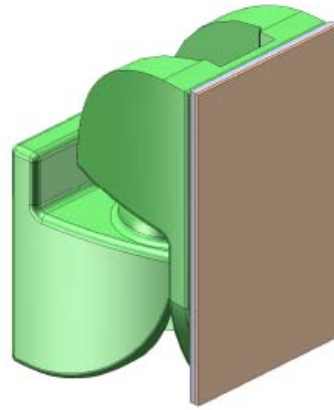
**Vendor material no.:** 43220000\_EA

- TDD Mini Repeater, 16 dBm, 80 db Gain : BDA-TDD-25-16-19-AA
- Donor antenna: ANT-2527-10-19-AA
- Donor antenna front window mounting bracket
- Donor antenna Rear wall mounting bracket with 4X4m hardware
- Bracket for BDA-TDD-25-16-19-AA repeater with 4XUNC 6X32:1/2 inch hardware : BRK-TDD-19-AA
- Service In-Building multipurpose antenna :MPA-2300
- Two flexible coaxial cables (10m): for donor and service antenna: CON0343
- Power supply 110VAC 7.5V 5A: PSL0025
- Local Communication cable USB to Mini USB: COMC-19-AA
- Software installation CD
- User manual/Installation guide

### 1.3 WHAT'S IN THE BOX - REPEATER ACCESSORIES



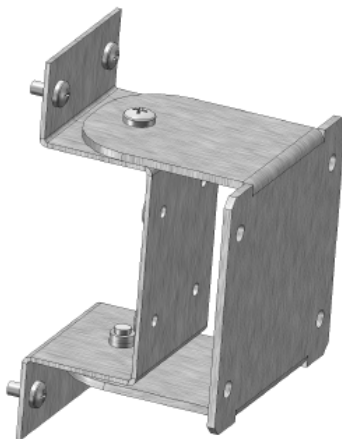
**Donor antenna  
ANT-2527-10-19-AA**



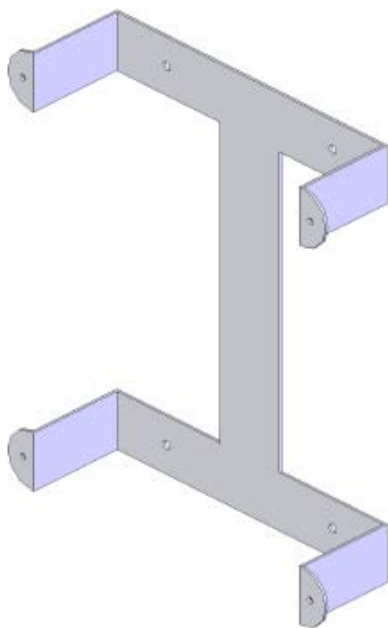
**Donor antenna front window  
mounting bracket**



**Service In-Building multipurpose  
antenna MPA-2300  
(Not supplied by Cellvine)**



**Donor antenna rear wall mounting bracket**



**Bracket for TDD repeater: BRK-TDD-19-AA**



**Flexible coaxial cables (10m)  
0- CON0343**

## **1.4 INDOOR REPEATER**

Cellvine's indoor repeaters are intended for installation in indoor locations only.

Do not install in places where the repeater might be exposed to direct sunlight and rain/snow conditions, as this could result in the damage to the unit and other hazards. For normal operation, the environmental conditions should be as follows: Ambient temperature range: 23 °F to 122 °F, Maximum humidity: 90%.

## **1.5 PREPARATION FOR INSTALLATION**

Determine the following before beginning the repeater installation:

- Base station location and receiving power (TX power in dBm)
- Location where the Base/Mobile antenna is to be installed
- Location where the repeater is to be installed
- Length and type of coaxial cable needed to connect from the outdoor antenna to the repeater unit
- Length and type of coaxial cable needed to connect from the repeater unit to the indoor antenna
- Estimation of the isolation between the donor and the coverage antenna/s

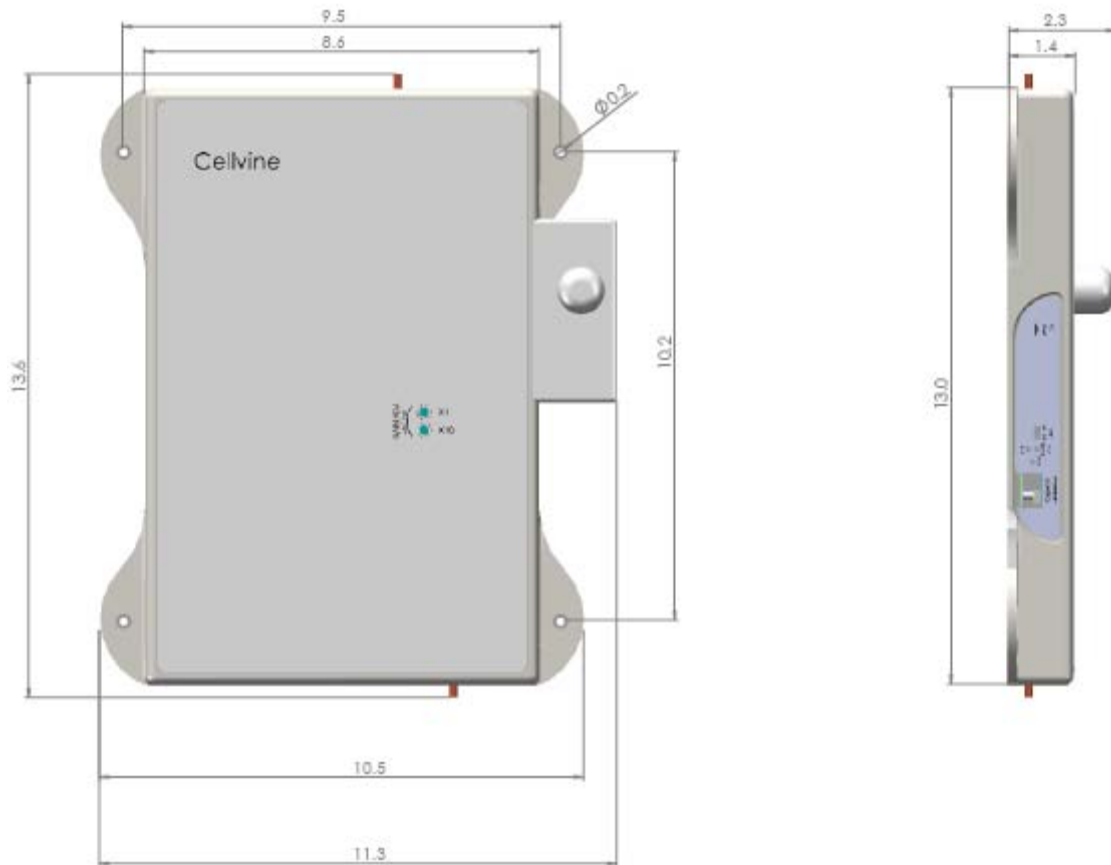
## 1.6 REPEATER UNIT RF SPECIFICATIONS

Parameter	Specifications
Frequency range	2500-2690 Mhz
Output composite power	UL : 16 dBm , DL : 16 dBm
System max gain	80 dB
Noise figure	Less then 7 dB
Pass band ripple	4 dB p-p in 10 Mhz bands
IF filter rejection	40 dB @ 1 Mhz
Band filter options	Center frequency –200 Khz steps BW OF : 10 Mhz,
Gain tuning range	23 dB in 1 dB steps
Switching time	Less then 2 $\mu$ sec
Absolute delay	Less then 4 $\mu$ sec
Protection	Overpower Programmable shut down
VSWR	2:1 MAX
Operating conditions	Indoor (-23 to +122 $^{\circ}$ F)
Indicators/Controls	Led : DC Power ,AGC, alarm Gain tuning knobs
Available software tuning	Full software control by local PC terminal
Sync method	IP -Wireless 3G broadband wireless modem TTL signal
Dimension	13.77" X 9.00" X 3.93"
Power requirements	7.5 VDC, 1.5A Max. from included power supplier

**Table 1: Repeater technical specifications**

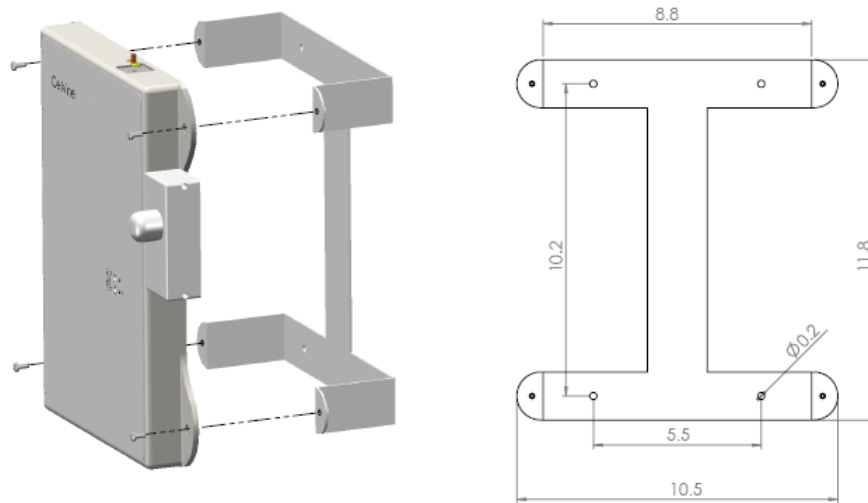
## 1.7 REPEATER DIMENSIONS

(In inches)



**Figure 1: Repeater dimension**

## 1.8 BRACKET DIMENSIONS



**Figure 2: Bracket dimensions**

## 1.9 REPEATER INTERFACES

Name	Type	Function
MOBILE	SMA Female connector	Connect to service antenna
BASE	SMA Female connector	Connect to donor antenna
POWER	Cross connector	Connect to power supply
Software Control	Mini USB-USB	Connect to maintenance and control software GUI

**Table 2: Repeater interfaces**

## 1.10 ANTENNAS

The system incorporates two antenna types:

- **Donor panel antenna:** Installed facing out the area to be covered
- **Coverage antenna(s):** One or more antennas installed at the area to be covered.

The donor antenna receives cellular signals (assuming sufficient coverage exists outside the building or near a window). The BDA amplifies the signals transmitted by the coverage antennas in the coverage areas. The mobile handset signals are received by the coverage antennas, amplified by the BDA, and transmitted through the donor antenna back to the cellular base station site. This enables cellular signals to be re-transmitted in some locations, in order to extend cellular coverage.

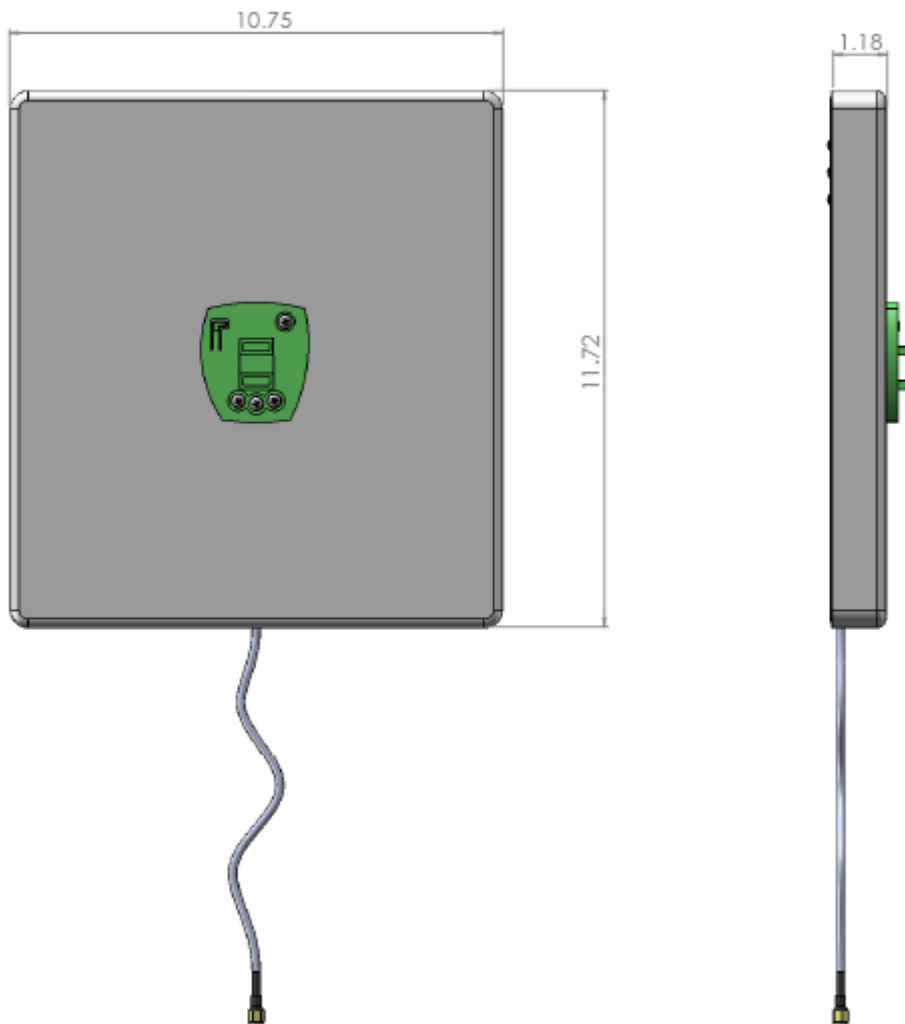


### 1.10.1 Donor Panel Antenna

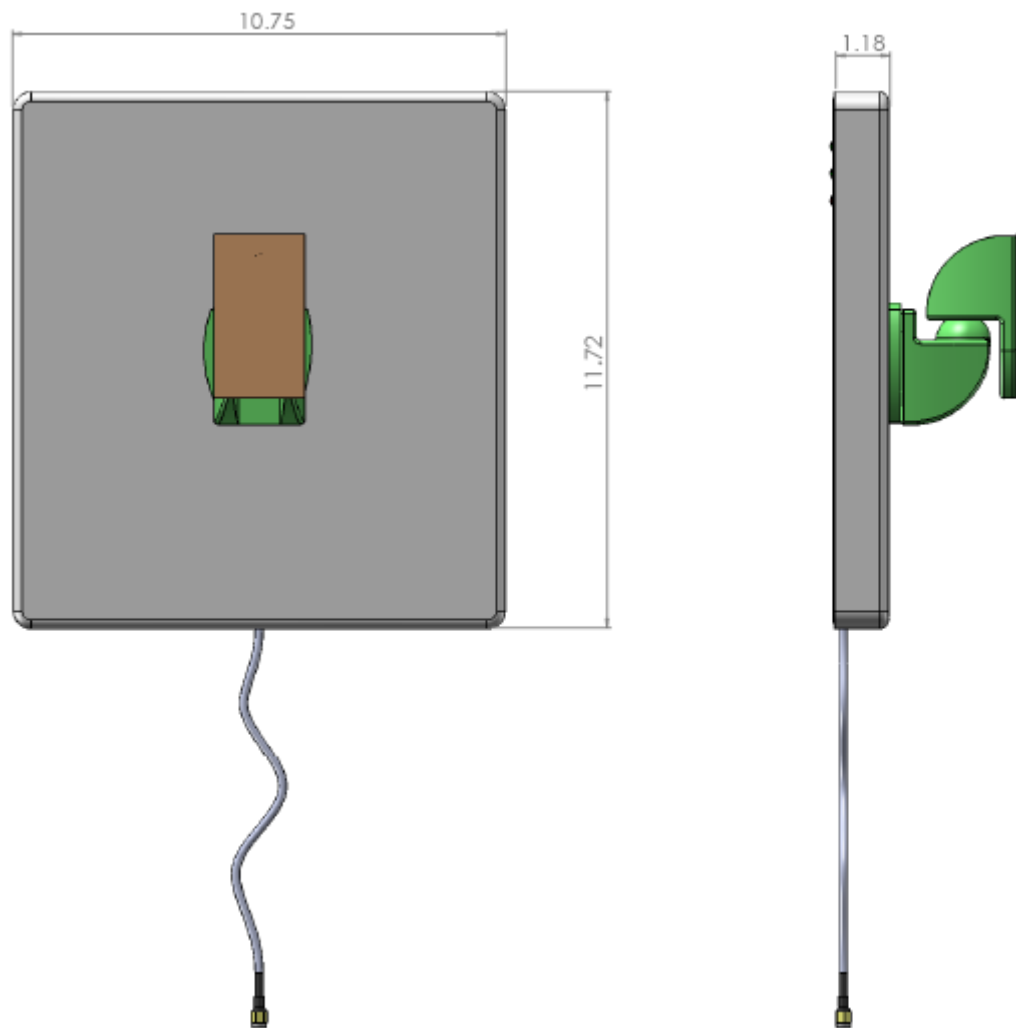
Cellvine provides a unique, slim and well-designed donor antenna in the repeater kit, instead of a regular Yagi antenna. This antenna is designed to provide attractive appearance and smaller dimension when installed in private homes or public places. The solution is based on a panel antenna with a narrow beam pattern of  $24^\circ$ .

The advantages of this antenna are being aesthetically more appealing, lightweight, relatively small dimensions, and simple installation. Although this is a panel antenna, it performs much better than other panel antennas with similar dimensions, especially in the pattern beamwidth (see Figure 5). The antenna gain is  $> 9$  dBi.

The antenna is designed to be mounted on a glass window, using a window bracket that is attached to the window with two-sided adhesive tape. For the adhesive tape specifications, please see *Adhesive tape specifications*, page 13.



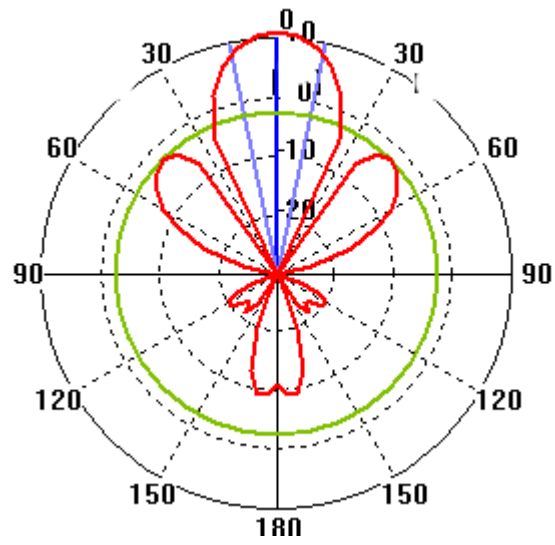
**Figure 3: Donor panel antenna dimension in inches**



**Figure 4: Donor panel antenna dimension in inches with front window bracket**

Frequency range	2500-2700 MHz
Directivity	Above 9 dBi
VSWR	1.8:1 (typical)
3 dB Beam width	24° X 24°
Polarization	Lineal
Input impedance	50 (ohm)
F/B ratio	20 dB (typical)
Input power	10W
Size	307X277X30mm
Weight	2 Kg

**Table 3: Panel donor antenna unit specifications**



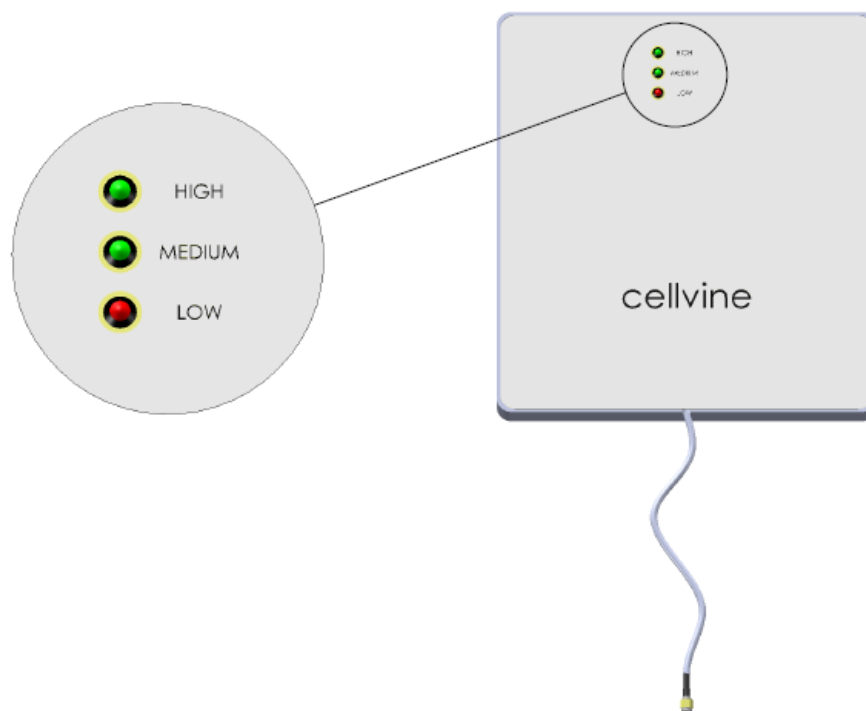
**Figure 5: Donor antenna horizontal radiation pattern**

### 1.11 DONOR SIGNAL STRENGTH MEASUREMENT TOOL

The donor panel antenna includes a signal level meter indicator (Figure 6) for measuring the RSSI signal level from the donor BTS in the neighboring area.

The measurement tool receives a signal from the repeater controller through the coax cable connected to the donor antenna. It measures the signal output level of the repeater output according to the signal received at the donor antenna from the BTS. This will help installing the donor antenna in the optimal direction and at the optimal angle, in order to achieve the highest RSSI level signal from the BTS.

For operation instructions, please refer to *Tuning Donor Antenna via Signal Level Indicator*, page 24.



**Figure 6 : Donor signal level measurement tool**

### 1.11.1 Indoor Omni Coverage Antenna Specifications

Electrical Specifications	
Frequency Range	2300-2700MHz
VSWR	≤2.0
Input Impedance	50Ω
Gain	3dBi
Polarization	Vertical
Maximum Input Power	50W
Connector Type	SMA -Male
Lightning Protection	DC ground
Mechanical Specifications	
Height	105mm
Weight	62g
Cable Length	3m
Antenna Color	Black
Working Temperature	-40~140 °F

**Table 4 : Indoor Omni coverage antenna specification**

### 1.11.2 Adhesive tape specifications

**Time:** After application, the bond strength will increase as the adhesive flows onto the surface. At room temperature approximately 50% of ultimate bond strength will be achieved after 20 minutes, 90% after 24 hours and 100% after 72 hours. This flow is faster at higher temperatures and slower at lower temperatures. Ultimate bond strength can be achieved more quickly (and in some cases bond strength can be increased) by exposure of the bond to elevated temperatures (e.g. 150°F [66°C] for 1 hour). This can provide better adhesive wetout onto the substrates. Abrasion of the surfaces or the use of primers/ adhesion promoters can also have the effect of increasing bond strength and achieving ultimate bond strength more quickly.

## 2 INSTALLATION

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This section provides information about the installation and setup of the Cellvine repeaters. The information consists of procedures for unpacking, inspection and preparation for the installation, as well as the actual installation and setup. It is important to install the repeater correctly at its working location.

It is recommended that installation be performed by a certified radio technician.

The repeater installation consists of four basic steps:

1. Antenna installation
2. repeater installation
3. Cable installation
4. Repeater parameters setup and tuning with the control application.

### 2.1 UNPACKING AND INSPECTION

1. Examine the shipping package for damage before unpacking the unit. If the shipping package is damaged, try to unpack the equipment in the presence of the carrier's agent. If visual inspection reveals physical damage to the equipment, you should send it back for replacement.
2. Verify that the equipment includes all components, as listed in the packing slip. If components are missing, contact Cellvine Ltd.

### 2.2 ANTENNA INSTALLATION

**Coverage (mobile) antenna** – facing to the "no coverage" area. The most commonly used antennas for indoor applications are Omni or panel antennas. When multiple indoor areas should be covered, more than one antenna can be used. Indoor antennas are usually placed near the ceiling with decorative covers. Decisions as to where to locate the antenna take into account isolation issues, and the need to overcome interfering signals. For outdoor coverage, panel antennas are commonly used. The location of the antenna is determined by coverage and isolation matter.

**Base (donor) antenna** – installed behind a window glass, facing the donor BTS. The choice of donor cell site should take into consideration capacity, range and signal level in the outdoor antenna location. The location should be chosen so, that donor cell site reception will be at a higher level than all other adjacent cell sites. For this purpose, the outdoor antenna should have high directivity and high Gain. If possible, this antenna should directly face the nearest cellular site with a line-of-sight view. For further installation instructions, please refer to paragraph *Donor Antenna Installation*, page 15.

**Isolation issue** – to assure proper repeater operation, the isolation between the indoor (Mobile) and outdoor (Base) antennas should be at least 15 dB higher than the repeater's maximal gain.

This isolation parameter can be measured simply by transmitting a continuous, CW unmodulated pilot signal of 0 dBm at the repeater Base port (donor antenna), and measuring the received signal at the repeater Mobile port (service antenna port).