

# Alcatel-Lucent Twin Transceiver (TRX)

Cost-Effectively Boosting  
Capacity and Extending Coverage

Alcatel·Lucent 



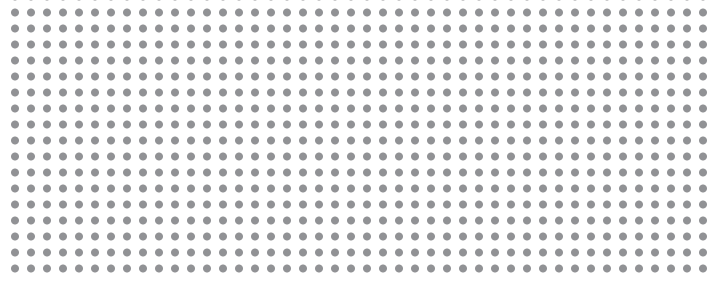


## Overview

Extending your Global System for Mobile Communications (GSM) network coverage can help you cost-effectively capture both new subscribers and ever-growing traffic. The Alcatel-Lucent Twin Transceiver (TRX) helps you meet this challenge by reducing the number of site deployments needed, and doubling the GSM capacity of your Alcatel-Lucent 9100 Base Stations GSM/EDGE (BTs). Extending your Global System for Mobile Communications (GSM) network coverage can help you cost effectively capture both new subscribers and ever-growing traffic.



Alcatel-Lucent Twin TRX



## A Challenging Landscape

To attract new subscribers, you need to seamlessly introduce compelling new services that meet customer needs and combine high quality with acceptable prices — all while optimizing your network investments.

At the same time, you need to anticipate upcoming changes in the mobile market. Changes in both technology and customer needs call for flexible radio access networks with high capacity.

In established GSM markets, equipment is quickly becoming a commodity. Competition is stiff, so you need to clearly differentiate yourself from your competitors.

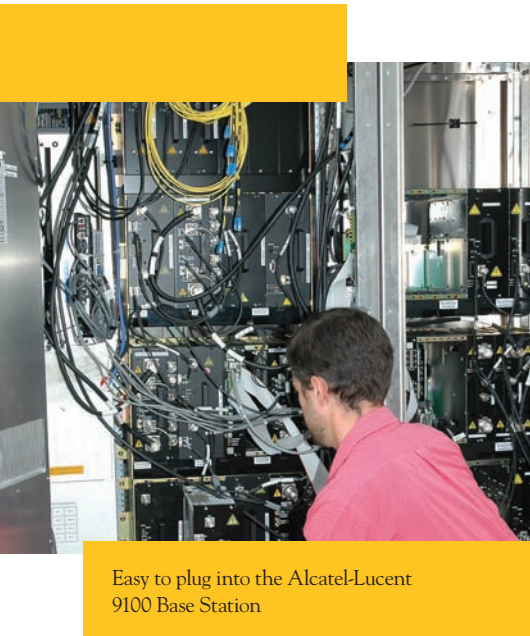
Another challenge is to cost effectively increase your network coverage, especially in rural areas, while boosting the radio network capacity on existing sites.

Radio sites represent more than 70 percent of the cost of a radio network, and new sites are now a rare and expensive resource in urban areas.

To avoid the high cost of new site acquisitions, a better alternative is to increase the coverage of your GSM cells, thereby eliminating the need for some new site acquisitions.

While facing these challenges, you also need to reduce operating expenditures on items such as power consumption, and site rentals.

## Flexibility, Power and OPEX Savings



### Duality: Two Modes

The Alcatel-Lucent Twin TRX module offers the unique capability of working in two modes, (see Figure 1) to provide you with the flexibility to smoothly migrate from extending coverage to boosting capacity as traffic grows. Switching from one mode to the other can be done remotely from the Alcatel-Lucent 9153 Operation & Maintenance Center Radio (OMC-R), without on-site intervention.

In the no-transmission-diversity (capacity) mode, two TRXs (2 x 8 radio time slots) are used in one module. These two TRXs can be connected to different antenna networks belonging to different sectors (Twin TRX sharing).

In the transmission [Tx]-diversity (coverage) mode, one TRX (8 radio time slots) is used, set to the transmission-diversity function. The two branches of the Twin TRX send the same signal, with an optimized time delay between both signals. On-air combining and diversity gain makes this mode equivalent to a very high transmission power (up to 175 W in dense urban areas and GSM-900 areas). For the uplink path, either two-way receive [2-way Rx] diversity, with an optional tower-mounted amplifier (TMA), or four-way receive [4-way Rx] diversity can be used to balance the link budget.

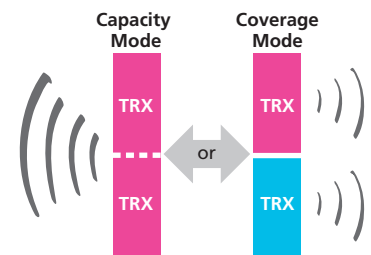
The Alcatel-Lucent Twin TRX deployed in the Alcatel-Lucent 9100 Base Station GSM/EDGE offers you the flexibility, power and OPEX savings to help you compete in an ever-changing market.

The Alcatel-Lucent 9100 Base Station GSM/EDGE uses a three-level modular architecture, consisting of:

- Antenna-coupling level
- Transceiver (TRX) level
- Base station control function (BCF) level

The transceiver manages radio and frequency functionalities, including full rate, half rate, enhanced full rate, adaptive multirate, general packet radio service/enhanced data for GSM evolution (GPRS/EDGE), GERAN (GSM/EDGE Radio Access Network) evolutions, antenna diversity and radio frequency hopping.

Figure 1. Alcatel-Lucent Twin TRX Modes



## Radio-Enhanced Features

The Twin TRX enhances radio functionality and dramatically decreases the number of site deployments needed with its high power capacity and compact design.

## From Extended Coverage to Boosted Capacity

### COVERAGE MODE

For extending coverage, the Twin TRX can provide high power and sensitivity, as illustrated in Figure 2.

In the downlink path, the Tx diversity feature lets each Twin TRX module act as a super TRX, providing the equivalent of a very high-power transceiver — up to 175 W at the antenna connector (at 900 MHz in urban areas) and 136 W (at 1800 MHz).

In the uplink path, the Twin TRX can also optionally support 4-way Rx diversity functionality to enhance the receive sensitivity (for uplink limited environments) up to -121dBm in urban areas TMA systems can also be used.

You can benefit from the Twin TRX in low-density areas where most of the targeted, low-ARPU population is located. It typically reduces the number of radio sites needed by about 30 percent. It also decreases the number of radio sites in urban areas, typically by 20 percent.

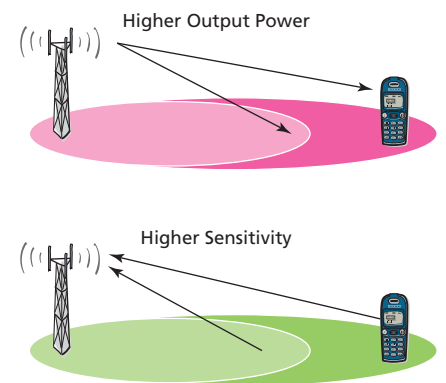
In the extended-coverage mode, the Twin TRX can double the typical power of a standard TRX. Coverage is extended significantly while reducing the base station sites needed. These savings involve both an immediate TCO savings and an OPEX savings from the reduction of the number of sites.

**Table 1. Alcatel-Lucent Twin TRX Features and Benefits**

BENEFIT	FEATURE	FUNCTION
<ul style="list-style-type: none"> <li>Optimum TCO:</li> <li>Decreased low-density radio sites (typically by 30%)</li> </ul>	<ul style="list-style-type: none"> <li>High flexibility with two different modes: coverage and capacity</li> <li>Smoothly migrates from extending coverage to boosting capacity as traffic grows</li> </ul>	<ul style="list-style-type: none"> <li>Coverage mode: very high power and increased sensitivity for low-density areas:</li> <li>Downlink: used as super TRX with 175 W (900 MHz) and 136 W (1800 MHz)</li> <li>Uplink: enhances receiver sensitivity up to -121 dBm</li> </ul>
<ul style="list-style-type: none"> <li>Decreased urban radio sites (typically by 20%)</li> <li>Up to double capacity increase per BTS without new site investments</li> </ul>	<ul style="list-style-type: none"> <li>Supports all frequency bands</li> <li>Fully backwards compatible</li> <li>Introduces UMTS without impact on 2G network capacity</li> </ul>	<ul style="list-style-type: none"> <li>Capacity mode: two TRXs with size of one for urban areas                             <ul style="list-style-type: none"> <li>Up to 24 TRXs per cabinet</li> <li>3 x 4 GSM TRXs + UMTS/WiMAX per cabinet</li> </ul> </li> </ul>
<ul style="list-style-type: none"> <li>Decreased OPEX</li> </ul>	<ul style="list-style-type: none"> <li>Reliable and robust</li> <li>Energy efficient</li> </ul>	<ul style="list-style-type: none"> <li>Based on field-proven Alcatel-Lucent TRXs</li> <li>Very Low Power Consumption</li> </ul>

*In coverage mode, the Alcatel-Lucent Twin TRX can reduce the number of radio sites by about 30%*

**Figure 2. Alcatel-Lucent Twin TRX Uplink and Downlink Paths**



## *In capacity mode, the Alcatel-Lucent Twin TRX supports up to 24 TRXs per cabinet*

*The Twin TRX enables a base station power consumption reduction from 30% to 50% compared to other leading macro solutions*

### **Capacity Mode**

For capacity boosting, the Alcatel-Lucent Twin TRX module acts as two TRXs, housed in a compact module, providing the same radio performance as two previous generation Alcatel-Lucent TRXs. This results in very high-density network base stations for rural and urban sites.

For urban sites, the following configurations are supported:

- Up to 24 TRXs per cabinet
- Up to 3x4 TRXs plus UMTS or WiMAX per cabinet (for base station multistandard configurations).

You can introduce UMTS without impacting your 2G network capacity. In the capacity-boosting mode, the Twin TRX decreases the cost of each base station site. These configurations are highly compact because two TRXs are the size of a single Alcatel-Lucent TRX from the previous generation. This can impact your total cost of ownership (TCO), since you can use smaller cabinets, with reduced footprint and expect easier installation. The Twin TRX doubles the capacity of the current Alcatel-Lucent 9100 Base Station GSM/EDGE and can increase the capacity of multistandard configurations.

Alcatel-Lucent has improved the power consumption on already-optimized TRXs, further improving OPEX. In addition, the Twin TRX supports the features and quality of service (QoS) already available with Alcatel-Lucent TRXs from previous generation, including EDGE.

This flexible TRX offers you:

- Full backwards compatibility, supporting mixed configurations with all previous generation Alcatel-Lucent TRXs
- Both coverage and capacity modes in one cell
- 2-way Rx diversity or optional 4-way Rx diversity or TMA in an uplink-limited environment

The Alcatel-Lucent Twin TRX can help you meet evolving demands since it supports GPRS, EDGE and all third-generation partnership program (3GPP) GERAN evolutions (16 quadrature amplitude modulation [QAM], dual receiver, etc.).

The Alcatel-Lucent Twin TRX also helps reduce your OPEX in several ways:

- You can expect a base station power consumption reduction from 30 percent to 50 percent compared to other leading macro solutions since the Twin TRX has a typical consumption value of 87 W per TRX
- You receive two TRXs and their associated capacity for the same weight and size as one standard TRX
- You benefit from a highly reliable system, based on field-proven Alcatel-Lucent TRXs

The Twin TRX is a flexible, high performance system that addresses your needs — capacity, coverage or both — while decreasing the number of deployment sites needed to minimize your investment, and dramatically reduce power consumption and OPEX.

**Table 2 . Alcatel-Lucent Twin TRX**

TECHNICAL CHARACTERISTICS	
Radio access:	GSM
Multiband frequencies:	850, 900, 1800 and 1900 MHz
GPRS/EDGE/EDGE Evolution:	Yes
Weight (remote part):	7.2 kg
Base-station compatibility:	Alcatel-Lucent 9100 Base Station GSM/EDGE Family Up to 24 TRXs capacity with Twin per Base Station Up to 3x4 TRXs for GSM + W-CDMA/WiMAX per Base Station for Multistandard configurations)
Transmission diversity:	Dense urban: GSM 900: 52.4 dBm (175 W) GSM 1800: 51.3 dBm (136 W) Rural: GSM 900: 50.5 dBm (113 W) GSM 1800: 49.4 dBm (88 W)
2-way RX diversity:	Equivalent receiver sensitivity (without TMA) Dense urban: -117 dBm Rural: -114.5 dBm
4-way RX diversity:	Equivalent receiver sensitivity (without TMA) Dense urban: -121 dBm Rural: -117.4 dBm
Power consumption:	Maximum consumption: 140 W (DC) Typical value: 87 W per TRX (DC)



## Complete Support

As a leading provider of complete 2G/3G solutions, the Alcatel-Lucent approach goes beyond simple transceiver performance to focus on the overall transceiver system and its evolution. The Twin TRX supports current market needs, addresses the challenges of growing traffic and helps protect you from the uncertainties of network evolution.

To best satisfy your particular needs, our products are supported by Alcatel-Lucent service teams with experience in network QoS assessment to maximize capacity, while ensuring optimized deployment through efficient network design and planning. Alcatel-Lucent service teams strive for high performance from your GSM system and your entire network.



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