

# Alcatel 9600 USY/E

URBAN DRRS FOR FAST ETHERNET DATA LINKS

6.2-6.7-7-8-11-13-15-18-23-25-28-38 GHz

New Product



The ALCATEL 9600 USY/E family represents a new version of high capacity urban microwave Radios for Fast Ethernet Data links application.

- ▼ Suitable for several types of applications like LANs connections, between private (Intranets) and public data-centric metropolitan networks, solution for Internet Service Providers to connect corporate clients to their network, last mile wireless IP access, LAN connections, private networks implementation for government, educational institutions, banks and commercial organizations.
- ▼ Data transmission mapped on SDH frame.
- ▼ Frequency plans at 6-7-8-11-13-15-18-23-25-28-38 GHz.
- ▼ Split mounting structure built by indoor (IDU) and outdoor (ODU) units.
- ▼ Compact IDU, 1+0 1+1/2+0, with power, traffic, NMS and alarms interface.
- ▼ Compact ODU 1+0 and 1+1/2+0 with integrated antenna (optional) or external antenna.
- ▼ Modulation: 128 QAM offering excellent spectrum efficiency
- ▼ Configurable for STM-1 and STM-0 transmission capacities on air.
- ▼ Ethernet standard bus interface 100Mb/s with additional E1/T1 interfaces.
- ▼ Network Management function provided by Alcatel platform for local and remote terminal control.
- ▼ Frequency and power agility by software control.
- ▼ Frequency reuse option available for all supported frequencies.
- ▼ Modular design for quick installation and maintenance.

The 9600 USY/E family, exploits the high flexibility and power features of 9600 USY, platform to provide an innovative wireless solution to data transmission services.



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## INTRODUCTION

The Alcatel 9600 USY/E is a new generation of high capacity urban radios microwave offering Data Ethernet access representing an advanced answer to the demand of wireless LAN and Last Mile connections, exploiting wireless SDH technology to provide flexible, reliable and cost-effective solution fast and easy to implement.

## APPLICATION

Alcatel 9600 USY/E family is designed specifically for urban networks and regional areas allowing Fast Ethernet access to transmission or corporate network. Typical applications and addressed customers include:

- Communication across metropolitan areas internally to mid-to-large size corporations, institutions, public agencies and Network Service Providers at speed commensurate with their internal corporate data networks
- Ideal solution to apply to both private (Intranets) and public data-centric metropolitan networks
- It can be applied by Internet Service Providers (ISPs) to connect corporate clients to their network, last-mile wireless IP access and private networks for government, educational institutions, banks and commercial organizations.

The system can be efficiently used in:

- point – to – point connection (example interbuilding radio communication)
- data access to a full IP network
- data access in combination with the standard 9600 USY terminal to

an SDH network transporting partially or totally data traffic and guaranteeing full interoperability with Alcatel OMSN including IP distributed routing capabilities.

The figure 1 shows the above applications.

## EQUIPMENT STRUCTURE AND CONFIGURATION

The family covers the 6-7-8-11-13-15-18-23-25-28-38 GHz mapping data traffic into either STM-1 or STM-0 frame getting all the benefits of field proven SDH technology as performance monitoring, service channels standardization, embedded data channel for TMN etc.

Depending on the chosen mapping process, transmission may happen over 28 MHz or 14 MHz channeling. Several configurations are envisaged: 1+0 compact 1+0 extendible 1+1 hot standby 1+1/2+0 single polar or dual polar Transmission capacity can be configured in different ways according traffic peaks or interoperability requirements of the network where the radio link is inserted:

### Case a

- 1 Fast Ethernet channel 100 Mbit/s mapped into the VC-4 of the STM-1 standard frame by means of fixed length packets with additional 6 plesiochronous channels E1/T1.

### Case b

- 3 Fast Ethernet 100 Mbit/s channels mapped in 3 VC3 of the STM1 frame using GFP protocol with additional 6 E1/T1 channels (2 for each VC-3).

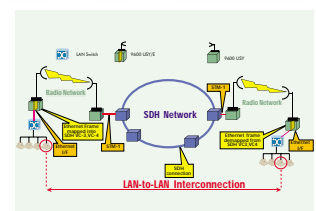
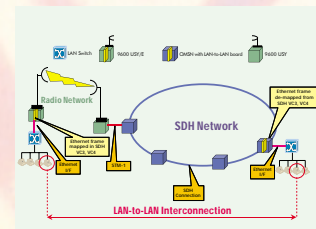
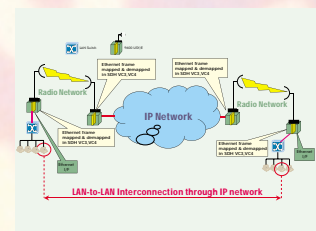
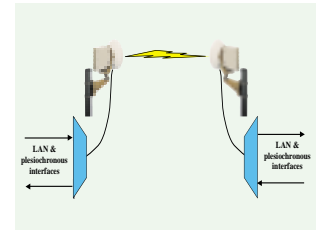


Fig. 1: Typical applications

**Case c**

- 1 Fast Ethernet 100 Mbit/s channel mapped in only one VC3 together with 2 E1/T1 additional channels getting band saving of transmission over 14MHz channelings

**SYSTEM DESCRIPTION**

The product is organized in a Split Mount version built by an outdoor unit (ODU) accomodating transceiver circuits in an outdoor cabinet and by an indoor unit (IDU) housing baseband circuits. IDU may be desk top or suitable for wall or 19"/ETSI rack mounting. Integrated antenna for small diameters ( $\leq 60$  cm), may be directly connected to the ODU; for larger antennas a short piece of wave guide is necessary. The IDU implements the functionalities of user interface, SOH termination, modemodulation, service channel access, system controller while the ODU implements transceiver function with local oscillator and RF branching. Connection between the IDU and ODU is performed by means serial interfaces and a single standard coaxial cable carrying the main traffic, the remote supply voltage and auxiliary informations. In 1+1 configuration both user interface, modem and transceiver functionalities are protected in heterofrequency way co-polar/dual-polar or hot-standby. The physical layout of the 1+0 and 1+1 is shown in fig.2 and 3, while fig.4 represents the 1+0 terminal and 1+1 Het. terminal block diagrams. The system is fully compliant with ITU-R, ITU-T and ETSI and IEE 802 specs.

**TECHNICAL HIGHLIGHTS AND TECHNOLOGY**

The most advanced technologies regarding digital signal processing, VLSI circuits, MMICs and mechanical solutions have been largely adopted resulting in a product family of very compact size, low power consumption, high reliability and modularity characterized by the following main features:

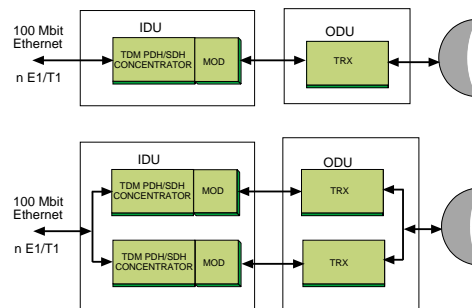
- A best exploitation of the band is achieved with the 128 QAM modulation also at very high frequencies: this allows transmission of STM-1 stream spaced 27.5/28 MHz.
- Frequency reuse technique applied to all the bands provides an extendible scalable system suitable for future traffic increase saving original investement and band cost.
- Frequency agility facilitates network planning, order process and spare management.
- ATPC function is provided to minimize interference at nodes and alternatively transmitted power can be set at a fix value according to the hop length.
- Fully software configurable terminal with local and remote download.
- Flexible access to SOH bytes



*Fig. 2: 1+0 regenerator configuration*



*Fig. 3: 1+1/2+0 regenerator configuration*



*Fig. 4 : 1+0 reg., 1+1 HET reg. and WMSN block diagrams*

- Radio side hitless switch for radio protected configurations.

## NETWORK MANAGEMENT

The platform shown in fig.5 provides a complete end to end subnetwork management solution by means 1353 SH Element Manager, 1354 RM Regional Manager and QB3.SNMP interface available on the equipment.

A simple alternative, or complementary management option, is based on a standard personal computer using a remote craft terminal. The ECT and MP are Information Model compliant with ETSI standard (fig.6 shows a ECT view).

Main management functions are: single or multiple equipment management (Remote Craft Terminal application), Local or Remote SW down loading, QB3 LAN interface, Administrative function, Security management, Alarm Surveillance, Configuration alarm severity, Configuration Management, Performance Monitoring according to ITU-T G.826 & G.784, Remote Inventory, I/O housekeeping, summarizing, and equipment discrete alarms management, Loopback management (near end/far end), BER measurement and Analogue measurement (Tx/Rx Power level), Frequency agility management.

Through SNMP embedded agent 9600 USY/E may be interfaced to other vendor NMS.

## MAINTENANCE POLICY

The particular care dedicated to high reliability of the systems aims to minimize field intervention. A failure in the system is indicated through local and concentrate visual indications (led) and reported to ECT and OS.

The high level of commonalities achieved across frequencies and configurations reduces the sets of spare parts and training needs.

The spare part policy is different depending on the involved configuration: In 1+0 configuration the complete replacement of ODU and IDU is foreseen, in 1+1/2+0 configuration the replacement of the faulty transceiver (ODU) or faulty unit (IDU) can be performed without affecting the working channel.

## INSTALLATION AND COMMISSIONING

9600 USY/E has been designed to allow a quick installation and commissioning thanks to the compact size, the single IDU/ODU connection cable, easy access to the system due to connectors situated in front panel, light weight, enhanced fastening system.

The ODU is easily removable without altering the embedded antenna alignment. Field tests benefit of near end/far end loopbacks, local performance monitoring and measurement capabilities.

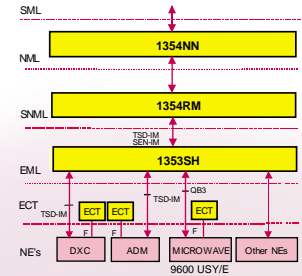


Fig. 5 : Alcatel network Management Platform



Fig. 6 : Info model Craft Terminal

## TECHNICAL CHARACTERISTICS

<b>Interfaces</b> <ul style="list-style-type: none"> <li>• 100Base-T Ethernet IEEE 802.3</li> <li>• E1 PDH (6x2.048 Mbit/s) ITU-T Rec. G.703</li> <li>• T1 PDH (6x1.544 Mbit/s) ITU-T Rec. G.703</li> </ul>	<b>Dimensions mm (l x d x h)</b> IDU (Rack, Desk or Wall mounting) <ul style="list-style-type: none"> <li>• 1+0 c 445 x 258 x 44.45 (1U)</li> <li>• 1+1/2+0 445 x 258 x 88.9 (2U)</li> </ul> ODU (Split mount) <ul style="list-style-type: none"> <li>• 1+0 260 x 342 x 90 (≤ 6 Kg)</li> <li>• 1+1/2+0 268 x 277 x 250 (≤ 15 Kg)</li> </ul>	<b>Power Supply</b> ± 24 Vdc (± 15%) or – 48 to –60 Vdc (± 20%)
<b>Service channel</b> <ul style="list-style-type: none"> <li>• Omnibus voice channel (E1) DTMF (Q.23)</li> <li>• 2 x 64 Kbit/s G.703</li> <li>• 1 x 64 Kbit/s V11</li> <li>• 1 x 9.6 Kbit/s RS 232</li> <li>• TMN embedded channel (D1 ÷ D3)</li> <li>• 2x2 Mbit/s (1 prot.) WST (STM-1 only)</li> </ul>	<b>Indoor/Outdoor connection</b> <ul style="list-style-type: none"> <li>• 1 IF coaxial cable Tx-Rx</li> <li>• Length up to 350 m (depending on the type of cable)</li> <li>• Impedance 50 Ohms</li> </ul>	<b>Environment</b> <ul style="list-style-type: none"> <li>• EMI-EMC ETS 300385 Class A</li> <li>• Safety IEC 950 and IEC 215</li> <li>• Temperature -5 to +50 °C (IDU) -33 to +50 °C (ODU)</li> </ul>
		<b>Network Management</b> <ul style="list-style-type: none"> <li>• F interface RS 232 C</li> <li>• QB3/SNMP interface Ethernet AUI (10 Base 2 and 10 Base T)</li> <li>• QECC interface D1 ÷ D3</li> </ul>

RADIO SYSTEM	9613USY	9615USY	9618USY	9623USY	9625USY	9628USY	9638USY
RF CHANNEL (GHz) ITU - R ITU - R FCC	12.75÷13.75	14.4÷15.35 14.5÷15.35 14.5÷15.35	17.7÷19.7 17.7÷19.7	21.2÷23.6 22.0÷23.6 21.2÷23.6	24.5÷26.5	27.5÷29.5	37.0÷39.5 38.6÷40.0 38.6÷40.0
RF CHANNEL ARRANGEMENTS (ITU-R) FCC (Title / Section)	F.497 ---	F. 636 47/101.147	F. 595 47/101.147	F.637AN.1÷5 47/101.147	F. 748 ---	F. 748 ---	F. 749 47/101.147
RF CHANNEL SPACING (MHz) STM-1 128 QAM ITU-R/FCC STM-0 128 QAM	28/-- 14	28/30 14	27.5/30 13.75	28/30 14	28/-- 14	28/-- 14	28/30 14
TRANSMISSION CAPACITY	From 1xSTM-1 or STM-0 H or V to 2 x STM-1 or STM-0 H & V						
MODULATION	128 QAM	128 QAM	128 QAM	128 QAM	128 QAM	128 QAM	128 QAM
DEMODULATION	COHERENT						
ADAPTIVE EQUALIZER	19 TAPS						
SPECTRUM SHAPING	RAISED COSINE						
CODING TYPE	MLC						
FREQUENCY REUSE STM-1 only	YES	YES	YES	YES	YES	YES	NO
TRANSMITTED POWER WITH ATPC 128 QAM NB1 ITU-R/FCC	+22/--	+22/+22	+20/+20	+20/+20	+20/--	+19/--	+18/+13
ATPC RANGE (dB) ITU-R/FCC	10/--	10/10	8/8	8/8	8/--	7/--	6/10
RECEIVER NOISE FIGURE (dB)	4.8	4.8	4.5	5.0	5.0	5.3	6.3
AGC DYNAMIC RANGE (dB)	60						
RECEIVER THRESHOLD (dBm)							
BER=10 <sup>-3</sup> STM-1/STM-0	-70.5/-75.0	-70.5/-75.0	-71.0/-75.5	-70.5/-75.0	-70.5/-75.0	-70.0/-74.5	-69.0/--
BER=10 <sup>-6</sup> STM-1/STM-0	-68.5/-73.0	-68.5/-73.0	-69.0/-73.5	-68.5/-73.0	-68.5/-73.0	-68.0/-72.5	-67/--
BRANCHING LOSSES T+R 1+0 / 1+1 FD DP	3.5/4.0	4.0/4.5	2.5/2.5	2.5/2.5	3.0/3.0	3.5/3.5	4.0/4.0
NET SYSTEM GAIN (Point C-C') 10 <sup>3</sup> (dB) NB1 ITU-R							
STM-1 1+0 / 1+1 FD DP	89.0/88.5	88.5/88.0	88.5/88.5	88.0/88.0	87.5/87.5	85.5/85.5	83.0/83.0
STM-0 1+0 / 1+1 FD DP	93.5/93.0	93.0/92.5	93.0/93.0	92.5/92.5	92.0/92.0	90.0/90.0	--/--
NET SYSTEM GAIN (Point C-C') 10 <sup>3</sup> (dB) NB1 FCC							
STM-1 1+0 / 1+1 FD DP	--/--	88.5/88.0	88.5/88.5	88.0/88.0	--/--	--/--	77.0/77.0
STM-0 1+0 / 1+1 FD DP	--/--	93.0/92.5	93.0/93.0	92.5/92.5	--/--	--/--	--/--
SYSTEM STANDARD (ETSI)	EN 300 234	EN 300 234	EN 300 430	EN 300 198	EN 300 431	EN 300 431	EN 300 197
SWITCHING CONFIGURATION	1+1 RADIO SIDE						
SWITCHING TYPE	HITLESS REVERTIVE AND NOT REVERTIVE						
CONFIGURATION	1+0 – 1+1 F.D. – 1+1 HST – 2+0 TERMINAL CONFIGURATION						
POWER CONSUMPTION (Watt)	≤ 70 (1+0) / ≤ 130 (1+1)						

RADIO SYSTEM	9662USY	9667USY	9674USY	9681USY	9611USY
RF CHANNEL (GHz)	5.9÷6.4	6.4÷7.1	7.1÷7.9	7.7÷8.3 8.275÷8.5 7.9÷8.4	10.7÷11.7
RF CHANNEL ARRANGEMENTS (ITU-R)	F. 383	F. 384	F. 385	F. 386 ANNEX 1-3-4	F. 387
RF CHANNEL SPACING (MHz)					
STM-1 / STM-0	29.65/--	40/--	28/14	28, 29.65/14	40/--
TRANSMISSION CAPACITY	From 1xSTM-1 H or V to 2xSTM-1 H&V		From 1xSTM-1 H or V to 2xSTM-1 H&V From 1xSTM-0 H or V to 2xSTM-0 H&V		From 1xSTM-1 H or V to 2xSTM-1 H&V
MODULATION	128 QAM				
DEMODULATION	COHERENT				
ADAPTIVE EQUALIZER	19 TAPS				
SPECTRUM SHAPING	RAISED COSINE				
CODING TYPE	MLC				
FREQUENCY REUSE	YES	YES	YES	YES	YES
TRANSMITTED POWER WITH ATPC (Max.) (dBm) NB1	+24	+24	+22	+22	+24
ATPC RANGE (dB)	12	12	10	10	12
RECEIVER NOISE FIGURE (dB)	2.7	2.7	3.3	3.3	3.3
AGC DYNAMIC RANGE (dB)	60				
RECEIV. THRESH. STM-1 (STM-0) AT BER=10 <sup>-3</sup> (dBm)	-72.5 (N.A.)	-72.5 (N.A.)	-72.0 (-76.5)	-72.0 (-76.5)	-72.0 (N.A.)
RECEIV. THRESH. STM-1 (STM-0) AT BER=10 <sup>-6</sup> (dBm)	-70.5 (N.A.)	-70.5 (N.A.)	-70.0 (-74.5)	-70.0 (-74.5)	-70.0 (N.A.)
BRANCHING LOSSES T+R (dB)					
1+0 STM-1(STM-0)	3.5	4.0	4.0 (4.5)	4.5 (5.0)	4.5
1+1 FD DP STM-1 (STM-0)	2.5	3.0	3.0 (4.0)	3.5 (4.5)	4.0
NET SYSTEM GAIN (Point C-C') 128 QAM BER=10 <sup>-3</sup> (dB) NB1					
STM-1 1+0/1+1 FD DP	93.0/94.0	92.5/93.5	90.0/91.0	89.5/90.5	91.5/92.0
STM-0 1+0/1+1 FD DP	--/--	--/--	94.0/94.5	93.5/94.0	--/--
SYSTEM STANDARD (ETSI)	EN301461 (CS 40) EN300324 (CS 30 AP) EN301127 (CS 30 CCDP) EN30216 (STM0)				
SWITCHING CONFIGURATION	1+1				
SWITCHING TYPE	HITLESS REVERTIVE AND NOT REVERTIVE RADIO SIDE				
CONFIGURATION	1+0 – 1+1 F.D. – 1+1 HST - 2+0 TERMINAL				
POWER CONSUMPTION (Watt) (Regenerator Terminal)	≤ 70 (1+0) / ≤ 130 (1+1)				

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The information in this leaflet is generally applicable to the equipment described. However, Alcatel is committed to continuous research and development. Changes may therefore be made in the future without notice.

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NB1 - Tolerance: ± 0.5 dB at ambient temperature  
± 1.5 dB in temperature range -33°C ÷ 50° C ODU  
- 5°C ÷ 50° C IDU

FD: Frequency Diversity  
DP: Dual Polarity  
AP: Alternate Polar  
CS: Channeling Step  
CCDP: Co Channel Dual Polarity

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