**Key Features of Alcatel 9400 AWY Short-haul Microwave Systems Product Family**

- A complete homogeneous family from 7 to 38 GHz
- All traffic capacities from:
  - 2xE1 to 16xE1/E3 for ETSI market
  - 4xT1 to 16xT1/DS3 for FCC market
  - 2x10/100BT for Ethernet interface
- Enhanced transmission performance with 16 QAM or 4 QAM satisfying both requirements of high spectrum efficiency and higher system gain modem, powerful forward error correction and adaptive equalization
- Compliance to the relevant ITU, ETSI and FCC standards
- Very compact Indoor and Outdoor units
- Integration in Base Stations (GSM, UMTS)
- Integrated and separated antenna
- Single coax interconnection
- Frequency agility
- Capacity agility
- Modulation flexibility by software configuration with same IDU and ODU
- Mixed voice and data interfaces
- Built-in service channels
- Link identity code
- Multilevel loopback and test facilities
- User-friendly Windows™ based PC interface
- Integrated network management (TMN)
- SNMP Agent with TCP/IP re-routing capability
- Software download capability

The Alcatel 9400 AWY microwave is a family of digital point-to-point radio systems designed to satisfy the numerous digital transmission needs of public and private networks for multiple applications, such as cellular mobile networks and microcellular networks (2G, 2.5G and 3G), private data networks (WAN, LAN), utility networks, etc.

The short-haul Alcatel 9400 AWY microwave family systems offer homogeneous technical solutions from 7 GHz up to 38 GHz thereby ensuring maximum radio performances in each frequency band.
Applications
The 7, 8, 13, 15, 18, 23, 24, 25, 28, 31, 32 and 38 GHz bands are internationally normalized frequency bands for the transmission of low and medium capacities. The short-haul microwave systems are particularly recommended for the interconnection of cellular networks base stations and base station controllers. They can also be used for the rollout of public and private networks, in urban or suburban zones and by means of the new and flexible Ethernet interfaces they provide a wireless solution in the access area for data connectivity. In particular:
- Cellular mobile networks and microcellular networks (2G, 2.5G and 3G)
- Cellular LMDS
- Regional and local traffic for telephone transmission and data
- Private data networks (WANs, LANs) and digital terminals connections (PABX, videoconference, Ethernet application, ATM application, …)
- Utility networks (pipelines, electricity, railways, etc.)
- Full product line: Combination with Alcatel 9600 USY in the same network to fulfil different capacity needs.

Flexible Capacity
The short-haul microwave system features embedded multiplexing and transmission functions for the following capacities:
- 2xE1, 4xE1, 8xE1, 16xE1 and E3 for ETSI market
- 4xT1, 8xT1, 16xT1 and DS3 for USA market
- 2 x 10/100BT for data interface
- n x 2 + 2 x10/100BT mixed voice and data ETSI
- n x 1.5 + 2 x 10/100BT mixed voice and data FCC

Standards
The Alcatel 9400 AWY Microwave family is fully compliant to the relevant ITU-R, ITU-T, ETSI, FCC standards, including EMC and safety standards.

Technical Highlights
- Thanks to a dual configurable modulation excellent spectrum efficiency is achieved, using 16 QAM modulation while high system gain is possible with 4 QAM.
- The modem features Forward Error Correcting (FEC) (using Reed-Solomon and Interleaving) and transversal equalizer achieving excellent radio performances.
- The digital frame incorporates a link identity code to prevent from the capture of an unwanted signal;
- Frequency agile front-ends provide coverage of a complete frequency band with only four different outdoor units.
- Different software packages make the system capacity/modulation-agile, up to a maximum (defined as an option).
This maximum can be as high as 16xE1/T1 for Bit Rate and 16QAM for modulation format with the same unit. This feature permits an optimization of the used spectrum and easy upgrade;
Transmitter Power Agility for all frequency bands:
• Automatic Transmit Power Control (ATPC)
• Static power control (RTPC)

The system features near-end and remote-end loop-back facilities for test.

1+1 configuration uses, as an option, embedded automatic errorless receiver switching to protect the most critical transmission paths;

The system incorporates built-in test functions such as a pseudo random bit sequence generator able to insert a standard test signal for bit error rate measurements.

Data applications or mixed data and voice applications can be supported thanks to two optional 10/100Mbit/s data interfaces capable to adapt the transmitted data rate according to the traffic needs.

Compact Design
The short-haul microwave system consists of two main parts:

> Outdoor Unit (ODU)
> Indoor Unit (IDU)

Between the two main units above, the system uses a single standard coaxial cable carrying the main traffic, the remote supply voltage and auxiliary information over long runs.

The ODU was designed for operation in harsh climatic conditions.

The ODU gives the received signal level indication available and a connection to the service channel of the link by means of a service kit enabling quick installation.

The ODU can be used with:
> Integrated antenna (13 GHz and above) up to 600 mm diameter.
The ODU is fixed by means of quick latches. A specific pole mounting, provided with an accurate antenna alignment system, permits easy installation.
It features compact light-weight design.
> Separate antenna

Two versions of IDU are available covering wide configuration range:
> Compact IDU supporting 1+0 unprotected configuration
> Protected IDU able to support all possible configurations: 1+0 extendible, 1+1 HSB , space diversity, frequency diversity with optional hitless switch
A Full Range of Options

> Software determines maximum system capacity, and maximum modulation format, defining the capacity/modulation agility range.
> ODUs can house an integrated RF loop allowing standalone tests of a terminal.
> Loop-backs for testing are also available at IDU level
> The short-haul microwave systems provide auxiliary service channels with a wide range of voice and data options
> Multiplex elements can be protected on request in 1+1 configurations

Easy Installation, Setup and Operation

Thanks to its mechanical design, built-in test functions and user-friendly PC interface (Windows™ environment), the Alcatel 9400 AWY allows fast and affordable installation as well as quick set-up and easy operation. Antenna alignment can be easily performed by means of powerful tool kit or a simple voltmeter.

Simplified Maintenance

The Alcatel 9400 AWY microwave family achieves maximum commonality across frequencies and capacities, hence greatly reducing the sets of spare part and training requirements.
Replaceable units guaranteed both in 1+0 and 1+1 configuration to maintenance activity without intervention on station cabling.
Same spare parts support 1+0 and 1+1.

The high reliability is obtained through the use of advanced technologies, highly qualified components and severe test procedures in factory. High MTBF limits the maintenance to routine visits.

Network Management and Network Interworking

The Alcatel 9400 AWY Microwave family features a leading concept of network management, using SNMP Agent over TCP/IP protocol. Thanks to SNMP the NE can be placed in a multi-vendor environment and managed both by Alcatel 1300 equipment and others NMS provider.
The SNMP protocol brings also a valuable facility to re-route automatically the TMN messages over all the operational TCP/IP interfaces of the equipment.

Local monitoring is performed by user friendly software application running on a PC in a Windows™ environment (Equipment Craft Terminal ECT). In fact each terminal is able to support remote craft terminal (RECT) functionality without NMS or in cooperation with NMS.

RECT feature builds a standalone integrated management solution for small/medium networks allowing the addition of NMS system only when the network size increase. Interoperability at user interface level and at network management level with other Alcatel urban radios (9400UX and 9600USY) are guaranteed.

**Services**

Fulfilling any customer requirement, supporting operators is a key issue for Alcatel.

Therefore, a full range of services are proposed such as:

- **Hot line**
- **On line**: repair and return express, swap and repair, spare parts, software update, ...
- **On site**: on site intervention, on site urgent intervention, technical assistance, ...
- **Advanced services**: network design, contract management, software upgrade, ...
- **Training**: on factory or on site
- **Bundle of services**: services during warranty period, warranty extension, ...

**Technical Summary**

**User Interfaces**

- 2 x 10/100 Base-T Ethernet
- IEEE 802.3
- N x E1/T1 (N \(\leq 16\))
- E3 / DS3

**Service Channels**

- Omnibus voice channel DTMF (Q.23)
- EOW + 2 ways Party Line
- 1 x 64 Kbps G.703 or V11 codirectional or 1 x 9.6 Kbps V28 configurable
- 1 x 64 Kbps 1 port V11 codirectional-1port
- G703 codirectional (Network Management)

**Network Management**

- Local Craft Terminal (LCT) interface: RS 232 C
- Network Management System interface: Ethernet 10/100 Base-T
- Network Management Data channel interface: 64 Kbps RS422 / G703

**Power Supply**

- Standard: ±40 to ±60 Vdc (+ 20%) floating inputs
- Option: ±24 to ±60 Vdc (+ 20%) floating inputs

**Indoor/Outdoor Connection**

- Single coaxial cable
- Length up to 300 m
- Impedance 50 Ohms

**Dimensions (WxDxH); Weight**

- IDU (Rack, Desk or Wall mounting):
  - 1+0: 449 x 210 x 49 mm; <3 Kg
  - 1+1: 449 x 210 x 88 mm; <5 Kg
- ODU (Split mount):
  - 235 x 235 x 72 mm; <4 Kg

**Environment**

- EMI-EMC:
  - ETS 300385
  - ETS 300386-2
  - EN 50022 class B
- Safety:
  - IEC 60950
  - IEC 60215
  - IEC 60825
- Ecological: ECMA TR/70
- Temperature
  - IDU: -5 to +55 °C
  - ODU: -33 to +55 °C
## Technical Summary

<table>
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<tr>
<th>Radio System</th>
<th>9470 AWY</th>
<th>9413 AWY</th>
<th>9415 AWY</th>
<th>9418 AWY</th>
<th>9423 AWY</th>
<th>9425 AWY</th>
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<th>9432 AWY</th>
<th>9438 AWY</th>
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<tr>
<td><strong>RF Frequency Band</strong></td>
<td>GHz</td>
<td></td>
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<td>ITU-R</td>
<td>7.425÷7.9</td>
<td>12.75÷13.25</td>
<td>14.25÷15.35</td>
<td>17.7÷19.7</td>
<td>21.2÷23.6</td>
<td>24.5÷26.5</td>
<td>27.5÷29.5</td>
<td>31.8÷33.4</td>
<td>37.0÷39.5</td>
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<tr>
<td>FCC</td>
<td>-----</td>
<td>-----</td>
<td>14.5÷15.35</td>
<td>17.7÷19.7</td>
<td>21.8÷23.6</td>
<td>24.25÷25.25</td>
<td>27.35÷31.225</td>
<td>31.0÷31.3</td>
<td>38.6÷40.0</td>
</tr>
</tbody>
</table>

| **System Standard** | EN 301 216 | EN 301 128 | EN 301 128 | EN 300 198 | EN 300 431 | EN 300 431 | EN 300 197 | EN 300 197 |
| **RF Channel Arrangements** | F.385-7 | F.637-6 | F.385-7 | F.637-6 | F.595-7 | F.748-4 | F.108/9 | F.748-1 |
| **RF Channel Arrangements** | F.385-7 | F.637-6 | F.385-7 | F.637-6 | F.595-7 | F.748-4 | F.108/9 | F.748-1 |

| **RF Channel Spacing (MHz)** | | | | | | | | |
| 4QAM/16QAM | 4E1 | 7 / 3.5 | 14 / 7 | 28 / 14 | 7E1 | 14 / 7 | 28 / 14 | 7E1 | 14 / 7 |

| **Transmission capacity** | 2 E1, 4 E1/T1, 8 E1/T1, 16 E1/T1, E3/DS3, N x 10/100 BT+4 E1/T1, N x 100/100 BT |

| **Modulation** | 4 / 16 QAM |

| **Demodulation** | Coherent |

| **Adaptive Equalizer** | 19 TAPS FSE |

| **Spectrum Shaping** | Raised Cosine |

| **Coding Type** | Reed-Solomon (255,239) |

| **STD Transmitted Power with ATPC (dBm)** | | | | | | | | |
| Point C-C' Antenna Port 4QAM/16QAM | +24 / +21 | +23 / +20 | +21 / +18 | +22 / +19 | +19 / +16 | +17 / +14 | +16 / +13 | +16 / +13 |

| **ATPC Range (dB)** | 20 |

| **Static Tx Power Adj. Range (dB)** | 30 |

| **AGC Dynamic Range (dB)** | 65 |

| **10-3 Receiver Threshold (Point C-C') Antenna Port (4/16QAM)** | 16E1/E3 | 16E1/E3 | 16E1/E3 | 16E1/E3 | 16E1/E3 | 16E1/E3 | 16E1/E3 | 16E1/E3 |
| **Switching Configuration** | 1+1 |

| **Switching Type** | Hitless and Not Hitless / Revertive and Not Revertive |

| **Configuration** | 1+0 / 1+1 HST / 1+1 HST+SD / 1+1 PD |

| **Max. Power Consumption (W)** | 45 (1+0) / 90 (1+1) |

(*) **Tolerance:**
- ± 0.5 dB at ambient temperature
- ± 1.5 dB at in temperature range -5°C to +55°C

(**) **Guaranteed values**