# MARCONI LH, ETSI

Cost effective high capacity microwave transmission over long distances

The Marconi LH (Long Haul) microwave system offers rapid roll-out of high transmission capacity with SDH compatibility and integrated network management. Based on long experience in Trunk Radio, this modern long-haul radio system is a more cost efficient solution than fiber in many applications such as fast modification of network topologies, and the rapid roll-out of backbone and feeder networks.

**High integration, lowest cost of ownership**
Marconi LH can also be used as a redundancy to fiber or when long hop-lengths are needed under difficult conditions. The modern, scalable and highly integrated design provides lowest cost of ownership in all parts of the products life cycle: deployment, expansion and operation.

**Key features/benefits**
- STM-1 transmission, upgradeable to transparent STM-4
- Rapid roll-out
- Frequencies from 3.6 to 13 GHz
- Optimum spectrum efficiency through 64 MLQAM, 128 MLQAM and XPIC (Cross Polarization Interference Canceller)
- Full software download capability
- Outstanding compact building practice and low power consumption
- Highly robust system architecture providing high MTBF (Mean Time Between Failure)
- Multiple protection schemes
- The modern design provides lowest cost of ownership
- Plug and Play for Spare Part Handling

**Greater frequency band utilization**
Up to ten RF channels can be used, depending on the frequency pattern. Using XPIC, each RF channel can be used on two polarizations, thus doubling the transmission capacity. This means that up to twenty STM-1 or five STM-4 signals can be transmitted via a single antenna.

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XPIC equalizes cross-polar channels so that the required transmission quality is achieved. The system is operated with 64 MLQAM or 128 MLQAM, depending on channel spacing.

ATPC (Automatic Transmit Power Control) and RTPC (Remote Transmit Power Control) allow repeated reuse of the same frequencies in different directions, in the network node. It also reduces the effects of co-channel and adjacent channel interference in networks with high traffic density. When possible, the transmit power is reduced by up to 20dB below its maximum value. The highly flexible, software-controlled ATPC and RTPC allow the correction of up- and down-fading and can easily be adapted to local conditions. Marconi LH is designed to make optimum use of available frequency bands, with co-channel operation using dual polarization.

**Increased quality through radio protection switching**

The system uses protection switching functions, such as frequency diversity or hot standby, to increase the availability and quality of the transmission links. These functions are independent of SDH network protection switching, and are implemented as Regenerator Section Protection, without affecting any existing Multiplex Section Protection or Ring Protection. The control channels required for microwave radio protection switching are transported in the Regenerator Section Overhead.

The n+1 protection switching option can be expanded step-by-step up to a 2x(9+1) configuration. Subsequent extensions can be implemented without interruption. Optionally, the protection channels can be released for the transmission of lower-priority data.

Space or angle diversity can be used to guarantee the required transmission quality even with radio hop lengths of more than 30 to 40 km, or where propagation conditions are difficult.

**Compact 10-in-one system architecture**
The system components are all housed indoors in ETSI cabinets. Up to 10 STM-1 channels, including the protection switching function as well as redundant power feed, can be accommodated in a single rack. The system design is highly modular, simplifying installation, expansion and operation.

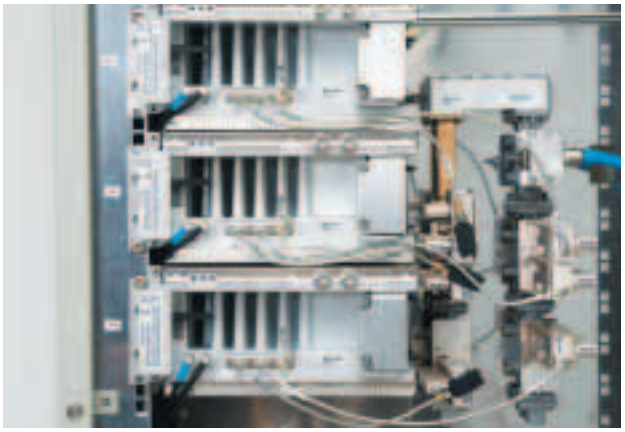
Each system consists of three sub-functions:
- RF branching
- Transceiver unit (TRX)
- Baseband unit (BBU)

Only the RF branching and the Transceiver unit are frequency-dependent.

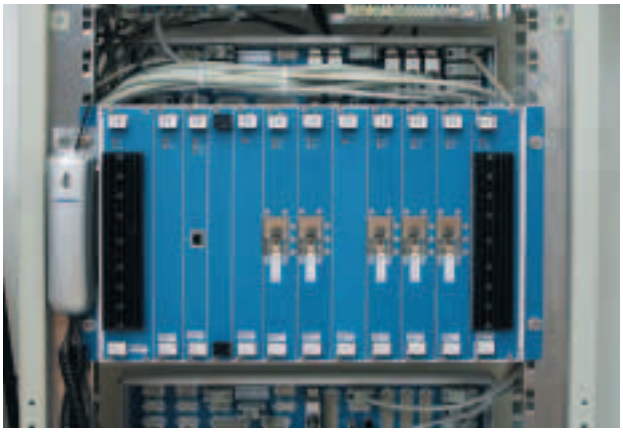
**RF branching**
Channel filters connecting the transceiver units to the antenna system permit low-attenuation connection of all RF channels of one polarization to one antenna. Diplex filters are available for larger structures, minimizing the attenuation of the channel filter chain.

**Transceiver unit (TRX)**
The transceiver units have broadband capacity for a complete frequency band, with the corresponding RF channels being defined by a synthesized oscillator. The associated settings in the transceiver are affected electronically and independently, enabling an on-site channel changeover.

**Baseband unit**
The baseband unit performs all SDH processing and radio protection switching functions. It also



**Transceiver unit (TRX)**



**Baseband unit**

provides optical or electrical baseband interfaces, as well as the interface for up to five transceiver units (STM-1 signals).

Optionally a 1+1 Multiplex Section Protection together with a full equipment protection are provided for the baseband interfaces.

**Ethernet/TDM solution**
Ethernet interfaces (10/100/1000BASE-T) and TDM interfaces (E1) are provided by combining the radio system with the powerful Ericsson multi-service portfolio.

Verified scaleable solutions using Marconi LH in combination with an OMS multiplexer are available – OMS 8xx for low capacities; OMS 12xx or OMS 16xx for higher capacities.

All OMS multiplexers perform a highly efficient cross-connection of Ethernet and/or TDM traffic. The OMS multiplexers and the Marconi LH radio system are supported by the same network management system providing an integrated, easy and effective control.

**Protected STM-4 transmission**
The DPU STM-4 system component, which is connected upstream of the STM-1 microwave radio units, permits the transport of a STM-4 data stream consisting of a concatenated VC-4c via a Regenerator Section in the SDH network. This application meets all the criteria for use within STM-4 trunk and ring networks. All logic and operational functions are implemented in a single integrated chip.

**Optimum antenna systems**
Ericsson develops and manufactures its own complete modular antenna range for a wide variety of applications. The range offers optimum dimensioning and design of the microwave transmission path.

**The convenience of local monitoring**
A monitoring circuit is integrated in each module to check the condition of the transmission link. All alarms, configuration data, measured values and performance data can then be retrieved locally, either via an F interface or centrally via the management interface. Each module can be addressed and controlled separately. The operator PC uses a graphical interface so that several functions can be clearly displayed at the same time. Commissioning and configuration can be carried out electronically, with no need for equipment settings. Software can be downloaded locally or via the management interface.

All the software, together with the configuration for a complete terminal is stored in an on-site memory card, allowing for plug-and-play functionality in case of module replacement.

**Managing the system**
Simple connections are made via the STM-1 Section Overhead (DCCr or DCCm), the QD2 interface or the LAN interfaces Q3p and SNMP to Ericsson's integrated network management systems, such as ServiceOn Access; ServiceOn Optical; ServiceOn Microwave or MINI-LINK Manager.

The radio system will automatically search for and establish the shortest path and the necessary redundancy to maintain reliability under fault conditions. The open OSI Q3p protocol stack and the integrated multi-protocol stack (QD2, OSI and TCP/IP) allow adaptation on any SDH multiplexer or integration of any SNMP-managed equipment. This provides the radio with a simple plug-and-play management solution.

## Technical Data

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|---|---|---|
| **Frequency range** | 3.4 to 4.2 GHz (ITU-R F.382/F.497/F.635)<br>4.3 to 5.0 GHz (ITU-R F.1099/F.746)<br>5.6 to 6.2 GHz (ITU-R F.497)<br>5.9 to 6.4 GHz (ITU-R F.383)<br>6.4 to 7.1 GHz (ITU-R F.384)<br>7.1 to 7.9 GHz (ITU-R F.385/ECC Rec.(02)06)<br>7.7 to 8.5 GHz (ITU-R F.386/ECC Rec.(02)06)<br>10.7 to 11.7 GHz (ITU-R F.387)<br>12.7 to 13.3 GHz (ITU-R F.497) | |
| **Transmission capacity** | 155 Mbit/s, 622 Mbit/s | |
| **Modulation type** | 64 MLQAM (40 MHz) | 128 MLQAM (28 MHz) |
| **Operating mode**<br>40 MHz channel spacing<br>28/30 MHz channel spacing | <br>Co-channel operation with XPIC (CCDP)<br>– | <br>–<br>Co-channel operation with XPIC (CCDP) |
| **Transmit power**[1]<br>4 to 8 GHz<br>11 GHz<br>13 GHz | <br>31 dBm<br>30 dBm<br>– | <br>30.0 dBm<br>29.0 dBm<br>28.0 dBm |
| **ATPC range** (4 to 13 GHz) | 20 dB | 20 dB |
| **Receive level**[1] (BER=$10^{-3}$ /BER=$10^{-6}$)<br>4 to 8 GHz<br>11 GHz<br>13 GHz | <br>-75/-73.5 dBm<br>-74.5/-73 dBm<br>– | <br>73.5/-72 dBm<br>-72.5/-71 dBm<br>-72.5/-71 dBm |
| **Channel filter attenuation**<br>4 to 8 GHz<br>11 GHz<br>13 GHz | <br>1.0 dB<br>1.5 dB<br>– | <br>1.3 dB<br>1.8 dB<br>1.8 dB |
| **Baseband interface**<br>STM-1/STM-1c electrical<br>STM-1 optical<br>STM-4 optical<br>E1 interfaces<br>10/100/1000 BASE-T Ethernet | <br>CMI-coded, according to ITU-T G.703<br>S-1.1, L-1.1 and L-1.2 according to ITU-T G.957<br>S-4.1 according to ITU-T G.957<br>Provided by using OMS multiplexer solutions<br>Provided by using OMS multiplexer solutions | |
| **Service channels** | E1, F1, each 64 kbit/s codirectional, according to ITU-T G.703 additionally<br>up to 8 x 64 kbit/s codirectional, according to ITU-T G.703 | |
| **Wayside channels** | up to 4 x E1 | |
| **Engineering orderwire** | Optional usage of E1 byte, supports selective call, group call and collective call | |
| **Protection switching** | Radio: Bit-error-free switchover, 1+1 to 2 x (9+1) or 1+1 hot standby configurations<br>Line: 1+1 multiplex section protection with full equipment protection | |
| **Management** | Local Maintenance Terminal (LMT) & ServiceOn Access, ServiceOn Optical ,<br>ServiceOn Microwave or MINI-LINK Manager | |
| **Management interfaces** | QD2: RS-485 interface usable as QD2-Master or Slave<br>LAN: 10BASE-T interface supporting Q3p or SNMP<br>LMT: RS-232 interface<br>DCCr/m: Access to the standardised management channels | |
| **Integrated management routing protocols** | QD2 (integrated SISA-V, remote connections using OSI routing)<br>OSI routing (ES-IS, IS-IS L1, IS-IS L2)<br>Static IP routing (IP-Bridge, up to ten static links configurable)<br>Dynamic IP routing (OSPF V2, RFC 2327) | |
| **Power supply** | [+]/[-] 24/48/60 V DC according to ETSI EN 300132 | |
| **Power consumption** | 80 W per data stream | |
| **Temperature range** | - 5°C to + 50°C, according to ETSI EN300019, Class 3.2 (extended up to +50°C) | |
| **Mechanical dimensions** | Up to 10 STM-1 channels, including all options, in one ETSI or 19-inch cabinet | |
| **General standards** | Cenelec EN 55022, EN 60950; ETSI EN 301 489-1; EN 301 489-4; EN 300 132; EN 301 126-1;EN 301 461; EN 301 127; EN 300 390; EN 301 751; EN 302 217 | |

[1]Channel filter losses are not taken into account

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