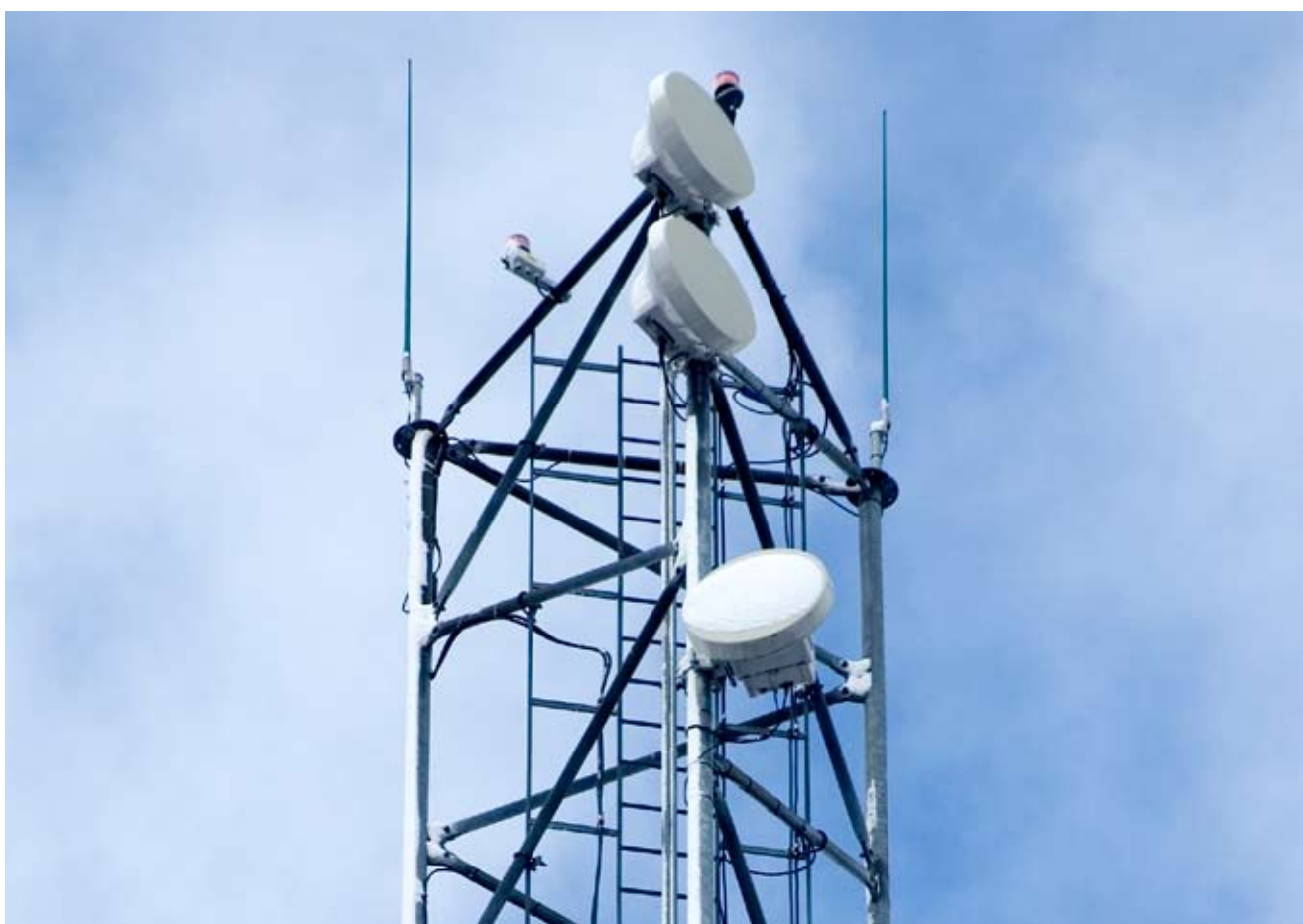# MINI-LINK™ TN R4, ETSI
ERICSSON'S MARKET LEADING MICROWAVE TRANSMISSION NODE

Ericsson has over 40 years of microwave experience with more than 2 million radio units delivered to over 150 countries. MINI-LINK TN is produced in the world's largest microwave production facility and has a market leading reliability. Ericsson is the market leader in microwave transmission.

THE WORLD'S MOST WIDELY DEPLOYED MULTISERVICE MICROWAVE SYSTEM!

MINI-LINK TN is a unique microwave transmission node, handling single hops and access sites as well as advanced hub sites for large networks, optimized for traffic aggregation and capacity savings.

Our customers use MINI-LINK TN in a number of different scenarios:

- **New roll-out of mobile backhaul networks.**
  MINI-LINK TN fully supports all IP RAN over Ethernet Backhaul preferred in new mobile networks, with the necessary Ethernet quality of service.

- **Evolution of mobile backhaul networks.**
  With the current increase of data traffic in the mobile network, MINI-LINK TN is a perfect fit.
  It supports Native Ethernet as well as Native TDM or a mix of them. This enables our customers to start with TDM traffic, add Ethernet when data traffic increases, and move to all Ethernet when required.

- Fixed Broadband over Microwave utilizes the integrated solutions for both Carrier and best effort Ethernet. Backhaul of broadband access over microwave, close to the end user, is a proven cost efficient solution.

- Our Enterprise, Broadcasting and National security customers successfully deploy both single hops, and complete backhaul networks.

MINI-LINK TN is a high performance radio link with high capacities and high availability. Our best in class radio output power provides longer hops with smaller antennas. MINI-LINK TN is able to send twice the capacity in one frequency channel using XPIC, for Ethernet, PDH as well as SDH. With the Gbit Ethernet link MINI-LINK TN is ready for the all IP over Ethernet network.

MINI-LINK TN is a Hybrid Node, perfect for all-IP and your network evolution.

Complete solution for all-IP networks.
Native Ethernet enables maximized Ethernet throughput and with up to 1 Gbit/s Ethernet over the air MINI-LINK supports the necessary high capacities for all-IP. Optimized capacity use is achieved by traffic aggregation, Hitless Adaptive Modulation and Protected 2+0. MINI-LINK TN fully supports Carrier Grade Networks with Carrier Grade QoS for Ethernet, IP and MPLS as well as Sync distribution in packet networks.

Complete solution for your network evolution
The Hybrid Radio Link transports both Native Ethernet

and Native PDH simultaneously over the same hop, which is perfect for a cost effective TDM to packet migration. Start with all E1's or a mix with Ethernet. Add more Ethernet as data traffic increases and complete the migration by moving to all Ethernet.
MINI-LINK TN fully supports Carrier Grade Networks with Layer 1 sync distribution to your existing network and no extra delay or delay variation.

Hitless adaptive modulation is perfect way to supply additional best effort traffic under normal weather conditions. With Ericsson's solution you will get no bit errors during the modulation change and the constant delay is crucial for network sync. The MINI-LINK Adaptive Modulation handles not only Rain fading but also complex Selective/Multipath fading; it is designed for Carrier Grade networks.

Protected 2+0 enables our customers with priority and best effort traffic to add up to 3 times more capacity on an existing hop. By changing a 1+1 hop into a protected 2+0 for both PDH and Ethernet with XPIC you add best effort traffic and keep your priority traffic protected.

MINI-LINK TN is a Network Cost Saver
The integrated traffic routing enables remote reconfiguration of the traffic. When the network grows and the capacity needs increases, the capacity is easily upgraded remotely. The integrated Ethernet switch enables aggregation of the Ethernet traffic with substantial capacity and cost savings. SDH and ATM traffic aggregation is equally possible. MINI-LINK TN is a perfect fit in an SDH ring due to the integrated ADM.

MINI-LINK TN's market leading reliability includes a field proven MTBF of typically over 70 years. The integrated cross connect and switching function minimizes cabling and reduces the site complexity. MINI-LINK TN has the extensive protection necessary for carrier class equipment.

MINI-LINK TN is the world's most widely deployed multiservice microwave system!

Ethernet Switching

Integrated non-blocking Gigabit Ethernet switch (IEEE 802.1D, 802.1Q compliant). Switching capacity up to 24 Gbit/s full duplex. QoS with 8 priority queues using SPQ and WFQ. RSTP functionality. Policing according to MEF. LAG (IEEE 802.1AX). WRED. Link OAM (IEEE 802.3ah). LLF (Link Loss Forwarding) for error detection. Jumbo frames.

Network Synchronization

The Network Synchronization provides selection of clock source for the node and SSM propagation on outgoing interfaces or squelch when network synchronization is enabled. Sync output via TDM traffic or a dedicated 2 MHz sync port.

Radio Link

Native Ethernet and Native PDH are supported over the microwave radio link. The maximum air interface rate over one radio is 345 Mbit/s per radio, line interface rate 349-426 Mbit/s depending on compression and frame size. Using XPIC will double the capacity. With radio link bonding 1 Gbit/s line interface capacity can be achieved.

XPIC

The Radio Link can offer XPIC support for SDH traffic, Native PDH and Native Ethernet traffic in combinations.

Adaptive modulation

The Radio Link supports hitless adaptive modulation for 4-256 QAM over 7-56 MHz channels.

Backplane Traffic Routing

Up to 800 Mbit/s for PDH traffic on shared bus, non-blocking switching. 2 Gbit/s Ethernet (full duplex) traffic on High Speed Buses per board position.

Integrated SDH terminal Multiplexer and ADM

Terminal Multiplexer with 63xE1 capacity.
ADM with 21xE1 drop capacity and Ethernet over SDH functionality with Graceful degradation.

ATM aggregation

ATM Aggregation Unit with capacity for up to 1500 ATM VCC and up to 100 VPC.

TECHNICAL SPECIFICATIONS

ANTENNAS
- 0.2/0.3/0.6/0.9/1.2/1.8 m single polarized antennas for integrated and separate installation
- 2.4/3.0/3.7 m single polarized antennas for separate installation
- 0.3/0.6 m dual polarized antennas for integrated and separate installation
- 1.2/1.8/2.4/3.0/3.7 m dual polarized antennas for separate installation

INTEGRATED POWER SPLITTERS
Available in symmetrical and asymmetrical versions

PROTECTION
1+1 Radio equipment and propagation protection, MSP 1+1 Equipment protection, ELP Protection, EEP Protection, SNCP Network protection

POWER SUPPLY
-48 V DC and +24 V DC

POWER CONSUMPTION
Radioterminal: 30-110 W (depending on configuration)
Basic Node: AMM 2p/6p/20p 11W[1] / 27W[1] / 37W[1]
[1] Including node processor, power filtering and fan (AMM 6p)

WEIGHTS AND DIMENSIONS (HXWXD)
Radio unit: 4 kg, 321x260x97 mm

Basic Node: AMM 1p/2p/6p/20p
1.3 kg, 39x344x263 mm / 2.4 kg[1], 44x(448/438)[3]x240[4] mm / 6.4 kg[1], 133x438[3]x240[4] mm / 7 kg[1], 300[2]x448[3]x240[4] mm

Plug-in unit: 0.5-0.7 kg, 265x225x20 mm
[1] Not including node processor, power filtering and fan. [2] 444 mm with fan unit and cable tray. [3] 483 mm with mounting brackets. [4] 280 mm with mounting brackets and connectors.

TRAFFIC INTERFACES
E1, E3, STM-1 Electrical ITU-T G.703
STM-1 Optical S-1.1 ITU-T G.957
Partially filled STM-1
10/100/1000 BASE-T IEEE802.3
Optical GbitE via 1000 BASE-SX/LX/ZX/CWDM IEEE802.3

MAINTENANCE INTERFACE
USB

DIAGNOSTIC FUNCTIONS
Line, local, and connection loops. Built-in Bit Error Rate Test on all circuits or boards

STANDARDS AND RECOMMENDATIONS
CEN/CENELEC, ETSI, ITU, IEC, IEEE, IETF

OPERATIONAL TEMPERATURE
-50°C to + 60°C (outdoor, full functionality)
-25°C to + 55°C (indoor, full functionality)

DATA COMMUNICATION NETWORK
- IP DCN and Site LAN service provided by built-in IP router
- DCN interfaces via 10/100 BASE-T, E1, E0
- In-band transport over STM-1 and Microwave

TECHNICAL DATA: MINI-LINK TN RELEASE 4.3

Frequency (GHz)	6L 6U*	7 8	10	11	13 15	18	23	26*	28	32	38
Max. RF output power (dBm)											
256 QAM	+23	+25	+24	+24	+20 +24*	+17 +22*	+17 +21*	+19	+18	+17	+16
128 QAM	+26	+26	+25	+25	+21 +25*	+18 +23*	+18 +22*	+20	+19	+18	+17
64 QAM	+26	+26	+25	+25	+21 +25*	+18 +23*	+18 +22*	+20	+19	+18	+17
16 QAM	+27	+27	+26	+26	+22 +26*	+19 +24*	+19 +23*	+21	+20	+19	+18
4 QAM	+29	+29	+28	+28	+24 +28*	+21 +26*	+21 +25*	+23	+22	+21	+20
C-QPSK	+30	+30	+29	+29	+25 +29*	+24 +27*	+24 +26*	+24	+23	+22	+21
* RAU X HP											
Min. RF output power (dBm)											
All modulation schemes	-5	-5	-10	-10	-10	-10	-10	-10	-10	-10	-10

Receiver threshold BER 10^{-6} (dBm)

Frequency (GHz) Net Throughput			6L 6U	7 8	10	11	13 15	18	23	26	28	32	38
Ethernet [Mbps] Air (Line Interface**)	TDM												
4.1 (3.9 - 4.9)	2E1	C-QPSK/3.5 MHz	-91	-91	-91	-91	-90	-90	-90	-90	-89	-88	-88
8.2 (7.8 - 9.9)	4E1	C-QPSK/7 MHz	-88	-88	-88	-88	-87	-87	-87	-87	-86	-85	-85
9 (9.1 - 11.1)	4E1	4QAM/7 MHz	-91	-91	-91	-91	-90	-90	-90	-90	-89	-88	-88
10 (10.1 - 12.4)	5E1	4QAM/7 MHz	-90	-90	-90	-90	-89	-89	-89	-89	-88	-87	-87
16.4 (15.6 - 19.7)	8E1	16QAM/7 MHz	-86	-86	-86	-86	-85	-85	-85	-85	-84	-83	-83
21 (21.2 – 26)	10E1	16QAM/7MHz	-84	-84	-84	-84	-83	-83	-83	-83	-82	-81	-81
31 (31.3 - 38.3)	15E1	64QAM/7 MHz	-77	-77	-77	-77	-76	-76	-76	-76	-75	-74	-74
30 (30.3 - 37.1)	14E1	64QAM/7 MHz	-77	-77	-77	-77	-76	-76	-76	-76	-75	-74	-74
35 (35.4 - 43.2)	17E1	128QAM/7 MHz	-73	-73	-73	-73	-72	-72	-72	-72	-71	-70	-70
16 (16.2 - 19.8)	8E1	C-QPSK/14 MHz	-85	-85	-85	-85	-84	-84	-84	-84	-83	-82	-82
21 (21.2 – 26)	10E1	4QAM/14 MHz	-88	-88	-88	-88	-87	-87	-87	-87	-86	-85	-85
23 (23.3 - 28.4)	11E1	4QAM/14 MHz	-87	-87	-87	-87	-86	-86	-86	-86	-85	-84	-84
34.9 (33.2 - 41.8)	17E1	16QAM/14 MHz	-83	-83	-83	-83	-82	-82	-82	-82	-81	-80	-80
42 (42.5 - 51.9)	20E1	16QAM/14 MHz	-81	-81	-81	-81	-80	-80	-80	-80	-79	-78	-78
45 (45.5 - 55.6)	22E1	16QAM/14 MHz	-81	-81	-81	-81	-80	-80	-80	-80	-79	-78	-78
63 (63.7 - 77.8)	30E1	64QAM/14 MHz	-75	-75	-75	-75	-74	-74	-74	-74	-73	-72	-72
72 (72.8 – 89)	35E1	128QAM/14 MHz	-72	-72	-72	-72	-71	-71	-71	-71	-70	-69	-69
81 (81.9 - 100)	39E1	256QAM/14MHz	-67	-67	-67	-67	-66	-66	-66	-65	-64	-63	-63
33 (33.4 - 40.8)	16E1	C-QPSK/28 MHz	-82	-82	-82	-82	-81	-81	-81	-81	-80	-79	-79
45 (45.5 - 55.6)	21E1	4QAM/28 MHz	-85	-85	-85	-85	-84	-84	-84	-84	-83	-82	-82
65.6 (62.5 - 78.7)	32E1	16QAM/28 MHz	-80	-80	-80	-80	-79	-79	-79	-79	-78	-77	-77
91 (92 - 112)	44E1	16QAM/28 MHz	-78	-78	-78	-78	-77	-77	-77	-77	-76	-75	-75
95 (96 – 117)	46E1	16QAM/28 MHz	-78	-78	-78	-78	-77	-77	-77	-77	-76	-75	-75
134 (135 - 166)	65E1	64QAM/28 MHz	-72	-72	-72	-72	-71	-71	-71	-71	-70	-69	-69
154 (156 - 190)	75E1	128QAM/28 MHz	-69	-69	-69	-69	-68	-68	-68	-68	-67	-66	-66
155 (152- 176)	STM-1	128QAM/28 MHz	-70	-70	-70	-70	-69	-69	-69	-68	-67	-67	-66
172 (174- 212)	80E1	256 QAM/28 MHz	-65	-65	-65	-65	-64	-64	-64	-64	-63	-62	-62
199 (201 – 246)	80E1	64QAM/40 MHz	-70	NA	NA	-70	NA	NA	NA	NA	NA	NA	NA
183 (185 - 226)	80E1	16QAM/56 MHz	-78	-78	-78	-78	-77	-77	-77	-77	-76	-75	-75
155 (152 – 176)	STM-1	64QAM/40 MHz	-74	NA	NA	-74	NA	NA	NA	NA	NA	NA	NA
155 (152 – 176)	STM-1	16QAM/56 MHz	-78	-78	-78	-78	-77	-77	-77	-77	-76	-75	-75
325 (328 – 401)	80E1	128QAM/56 MHz	-66	-66	-66	-66	-65	-65	-65	-65	-64	-63	-63
345 (349 - 426)	80E1	256QAM/56 MHz	-62	-62	-62	-62	-61	-61	-61	-61	-60	-59	-59

** Dependent on packet size

ATPC	Available in all frequencies
Frequency stability	± 10 ppm