8300 Greensboro Dr.
Suite 1200
McLean, VA 22102

(703) 584-8666
WWW.FCCLAW.COM

LNGS | LUKAS, NACE, GUTIERREZ & SACHS, LLP

May 27, 2014

VIA ELECTRONIC FILING

Marlene H. Dortch, Secretary
Federal Communications Commission
445 12th Street, S.W., Room TW-B204
Washington, D.C. 20554

Re: WC Docket No. 13-184
Modernizing the E-Rate Program for Schools and Libraries

Madam Secretary:

On behalf of N.E. Colorado Cellular, Inc., d/b/a Viaero Wireless, Smith Bagley, Inc., Union Wireless, Nex-Tech Wireless, LLC, East Kentucky Network, LLC, d/b/a Appalachian Wireless, PR Wireless, Inc., d/b/a Open Mobile, DoCoMo Pacific, Inc., and Sunshine LMDS Network, Inc., ("Rural Carriers"), we write to provide information for the record in the above-captioned proceeding and urge the Commission to adopt competitively and technologically neutral rules when reforming the Schools and Libraries Program ("E-rate"). Rural Carriers have access to a combination of fiber, fixed wireless and mobile broadband assets, some built with the help of other universal service programs, capable of delivering high-quality E-rate services to anchor institutions if given a fair opportunity.

With requests for program dollars far outstripping available funds, neutral rules will increase competition, reduce the price of service contracts, and deliver broadband to more schools and libraries. As shown below, fixed wireless broadband technology is more than capable of meeting the Commission's program goals, and not just in remote or tribal areas. Accordingly, the Commission must not prioritize fiber connectivity over other types of broadband connectivity.[1] Chairman Wheeler's mantra, "competition, competition, competition," is particularly apt here, where assets are available and carriers with favorable cost structures are willing to participate in the competitive bidding process.

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[1] *See Modernizing the E-rate Program for Schools and Libraries*, Notice of Proposed Rulemaking, FCC 13-100, WC Docket No. 13-184 (July 23, 2013), at para 77 ("*E-rate NPRM*").

One of the Commission's primary goals is "maximizing the cost-effectiveness of E-rate funds."[2] In addition, the Commission seeks to "ensure that recurring costs come down sufficiently over time within the E-rate program to make our proposed connectivity goals achievable and sustainable."[3] To accomplish these goals, the Commission should pattern its E-rate rules after the Rural Health Care Program and require participating entities to select the most cost-effective bid.[4]

Small efficiencies can yield large dividends. For example, the Commission estimated that if all discount rates were adjusted just ten percent, in 2011 USAC would have been able to distribute an additional $338.5 million in priority two funding.[5] If competition for service contracts saved just ten percent of the $4 billion being considered for the first two years of a reformed program, $800 million could be stretched farther to serve eligible schools and libraries.

How can the Rural Carriers help meet the Commission's goals? In many areas, existing cell towers are served by fiber. Current point-to-point microwave technology is capable of delivering 500 Mbps to 1 Gbps of throughput with a reliability that is equal to, or greater than, wireline facilities that are susceptible to cable cuts, ice storms, and falling trees. Today, the Rural Carriers use high capacity digital microwave links to backhaul traffic within their networks and have abundant experience constructing, optimizing, and maintaining these facilities.

Based on a preliminary analysis, the Rural Carriers have identified hundreds of schools and libraries within a relatively short distance of their towers. This "back of the envelope" estimate is consistent with evidence submitted by Fiber Tower, indicating that:

> 80 percent of the nation's 100,000+ schools are located within 3 miles of a tower or building upon which 100 Mbps to 1 Gbps fixed wireless equipment could be mounted and connected to a fiber or wireline backbone. Fifty percent of the

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[2] *Id.* at ¶ 12.

[3] *Id.* at ¶ 89.

[4] *See* 47 C.F.R. §54.603(b)(4) ("After selecting a telecommunications carrier, the health care provider shall certify to the Rural Health Care Division that the provider is selecting the most cost-effective method of providing the requested service or services, where the most cost-effective method of providing a service is defined as the method that costs the least after consideration of the features, quality of transmission, reliability, and other factors that the health care provider deems relevant to choosing a method of providing the required health care services.").

[5] *E-rate NPRM*, supra, at ¶ 124.

schools are within 1 mile of a tower or building structure that could act as a point to interconnect with fiber or another fixed wireless system.[6]

Using off the shelf equipment, available today, the Rural Carriers believe they can construct links to schools and libraries that meet or exceed the proposed initial standard of 100 Mbps per 1000 students, at a cost that is often less than that required to extend fiber.[7] Attached hereto as Exhibit A are materials provided by Ericsson AB, describing some of the equipment that is available today and is capable of fulfilling the Commission's goals. To summarize a few examples:

- Ericsson's Mini-Link CN 510 is capable of delivering 1 Gbps when Cross Polarization Interference Cancellation (XPIC) is employed. The device can be plugged into existing facilities without replacing outdoor units or cabling. It is compatible with a wide range of spectrum, including 6, 7/8, 10, 11, 13, 15, 18, 23, 24, 28 and 38 GHz bands.

- Ericsson's Mini-Link TN, 5.3 offers a capacity of 1.1 Gbps, operating on the 6, 7, 8, 10, 11, 13, 15, 18, 23, 24, 28 and 38 GHz bands. At lower frequencies, service can be delivered over distances of 8 miles or more.

- When shorter point-to-point connections are required, Ericsson's Mini-Link PT 6020 provides up to 1000 Mbps in the 70/80 GHz bands through a device that is less than 13 pounds. Alternatively, the Mini-Link PT 3060 provides up to 400 Mbps of service in the 59-63 GHz bands with a device weighing only 11 pounds, including the antenna and mounting. These devices can be used in a campus environment instead of cabling, when transmitting data among buildings, or from one end of a school roof top to another. These devices do not require construction of a site building, nor do they require auxiliary equipment to be located indoors.

Several of the Rural Carriers using point-to-point microwave equipment report that it is not only capable and reliable, but is cost-effective to deploy. Often, equipment at both ends of a link can be installed, connected, and optimized in less than one week's time. This compares favorably with the range of costs for deploying fiber currently in the record.[8] For example, Union Wireless currently operates over 450 point-to-point microwave links, with full redundancy,

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[6] *See* http://apps.fcc.gov/ecfs/document/view?id=7520957232.

[7] *See E-rate NPRM*, supra, at ¶ 23.

[8] *See* http://apps.fcc.gov/ecfs/document/view?id=7521098819 (Showing a range of $18,000-$500,000 per mile to install fiber.).

achieving 99.999% reliability at up to 500 Mbps. Union reports that the average cost of installing a microwave link, including radiofrequency engineering, equipment and labor, is approximately $62,000. Likewise, on tribal lands it serves, Smith Bagley, Inc. uses scores of digital microwave links to move traffic, some of which are tied into existing fiber assets.

A single fixed wireless link operating at 1 Gbps would today meet the FCC's long-term throughput goal for all schools with 1000 or fewer students. Depending upon the amount of spectrum available, multiple links can be established, increasing capacity as needed. Higher frequency bands, including LMDS (most of which has been underutilized for over a decade) can be used for shorter distances.

Importantly, the Commission has nothing to lose by adopting competitively neutral rules to allow wireless carriers, like the Rural Carriers, to participate on a level playing field. To win a bid, a carrier must seek to deliver the highest possible speed at the lowest possible price. The Rural Carriers will leverage assets, spectrum and equipment choices most efficiently, choosing a combination of wireless or wireline links that meet the requirements and are most likely to win the bid. By making it clear in advance that competition is the watchword, the Commission will encourage multiple bidders, increasing efficiency and stretching program funds. Even if participants like the Rural Carriers are unsuccessful, their presence in the bidding process will drive prices from other participants toward a more efficient level.

We note the BIA's acknowledgement that:

> [T]the situation dictates whatever is available must be leveraged as a viable means of connecting to the Internet. The service providers are responsible to deliver the 'lowest corresponding price' to its education customers. The FCC should be technology neutral in cases that can be substantiated. [9]

In its March 2014 Public Notice seeking additional focused comment, the Commission asked "whether there are demonstration projects or experiments that the Commission should authorize as part of the E-rate program that would help the Commission test new, innovative ways to maximize cost-effective purchasing in the E-rate program."[10] The Rural Carriers submit that the Commission has already conducted the exact experiment needed to maximize cost-effective purchasing, namely the Rural Health Care Pilot Program. The Pilot Program simplified the bidding process, encouraged competition, and streamlined reporting. It is not a stretch to say that the Pilot Program got more bang for the buck and did more to improve rural health care than the main Rural Health Care Program that preceded it. The best way to speed E-rate

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[9] *See* http://apps.fcc.gov/ecfs/document/view?id=7520944008.

[10] *Wireline Competition Bureau Seeks Focused Comment on E-Rate Modernization* (Public Notice), DA 14-308, WC Docket No. 13-184 (March 6, 2014).

funds to schools would be to duplicate and improve upon what was learned in the Rural Health Care Pilot program.

We note the estimate that it would likely take $50-100 billion to bring high-quality gigabit fiber directly to every school and library in the nation and then maintain that connectivity over a ten year period.[11] If that estimate is even close, then adopting competitively neutral rules to increase competition, drive down bids and stretch program dollars to the greatest extent possible is critical to maximizing access.

The Rural Carriers have used legacy high-cost support and are using Mobility Fund support to build towers in rural areas. These towers can be leveraged for efficient E-rate delivery. Accordingly, the Commission should develop policies that leverage Universal Service Fund investments already made, so that all possible infrastructure is brought to bear on this enormous task. There is no reason to have towers built with Mobility Fund Support that cannot be used to compete for E-rate funding.

Lastly, the Rural Carriers suggest that this is a time to think big. Draining funds from other worthy programs risks accomplishing other goals, and will be insufficient to do this job correctly. The Commission should develop a plan that ensures high-quality broadband is delivered to our nation's schools within three years and that the President's long-term goals are met within five. Congress explicitly authorized the FCC to do this, and to collect needed funds through the universal service mechanism to accomplish the goals. If that means increasing the amount collected, whether through the current mechanism or through a revised contribution methodology, then so be it. If this mission is truly a national priority, to maintain our nation's ability to compete and to provide first-class educational opportunities to all Americans, then the Commission should lead by explaining why additional E-rate funding is needed, what it will deliver, and how the nation will benefit.

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[11] Comments of Education SuperHighway, WC Docket No. 13-184 (Sep. 16, 2013) at http://apps.fcc.gov/ecfs/document/view?id=7520944087.

The Rural Carriers respectfully urge the Commission to ensure that all E-rate rules are competitively and technologically neutral in order to deliver the fastest service at the lowest cost to our nation's schools and libraries at the earliest possible date.

Respectfully submitted,

N.E. Colorado Cellular, Inc., d/b/a Viaero Wireless
Smith Bagley, Inc.
Union Wireless
Nex-Tech Wireless, LLC
East Kentucky Network, LLC, d/b/a Appalachian Wireless
PR Wireless, Inc., d/b/a Open Mobile
DoCoMo Pacific, Inc.
Sunshine LMDS Network, Inc.

By:_____
David A. LaFuria
Their Counsel

cc: Daniel Alvarez
Rebekah Goodheart
Priscilla Delgado Argeris
Nicholas Degani
Amy Bender
Julie Veach
Carol Mattey
Trent Harkrader
Kimberly Scardino
Roger Sherman
James Schlichting
Margaret Wiener

Exhibit A – Ericsson Materials

ERICSSON

MINI-LINK™ CN

Ericsson's cost efficient compact nodes for hops and access sites
Ericsson has over 40 years of microwave experience with more than 3 million radio units delivered to over 170 countries. Ericsson is the market leader in microwave transmission, which is the most competitive choice for capacities up to 1 Gbps.

MINI-LINK CN is a compact and easy to install microwave transmission node built with simplicity in mind. MINI-LINK CN is optimized for end sites, single hops, and enterprise networks.

Used in a number of different scenarios:

- **New roll-out of mobile backhaul networks;** in mobile backhaul networks MINI-LINK CN is a perfect fit at the access site with MINI-LINK TN on the other side of the hop, at the aggregation site, supporting the packet network end to end.
- **Evolution of mobile backhaul networks;** MINI-LINK CN supports a cost efficient migration to packet as data traffic increases in the network. Any mix of Native Ethernet and Native TDM is transported over the link.
- **Fixed Broadband over Microwave;** connecting Enterprises or rural areas to existing transport networks with microwave is a well proven cost efficient solution.
- Enterprise, Broadcasting and National security customers can successfully deploy both single hops, and complete networks.

Handling your IP network evolution
MINI-LINK CN supports any network scenario; both new packet-only networks as well as evolutions from TDM to packet. It fully supports carrier grade networks with Native Ethernet and carrier-grade QoS for Ethernet, IP as well as MPLS and sync distribution in packet networks.

Ethernet Switching
Integrated non-blocking Gigabit Ethernet switch and Provider Bridge (IEEE 802.1D, 802.1Q, 802.1ad compliant). Switching capacity up to 24Gbit/s full duplex. QoS with 8 priority queues using SPQ and WFQ. MSTP and 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 squelches on the outgoing interfaces when network synchronization is enabled. Sync output via TDM traffic, dedicated 2 MHz sync port, Sync E, NTP transparent, 1588v2 transparent are supported.

Adaptive Modulation
The Radio Link supports hitless adaptive modulation for 4-1024 QAM over 7-56 MHz channels.

Header Compression
Optimizing the utilization of the available Radio Link resources by compressing headers such as Ethernet, MPLS, IPv4, IPv6, UDP.

TECHNICAL SPECIFICATIONS
MINI-LINK™ CN

Radio link	• 570 Mbps over 56 MHz using 1024 QAM (ETSI). 510 Mbps over 50 MHz using 1024 QAM (ANSI). 1.1 Gbps using XPIC • TX power: -10 to +30 dBm • TRX Receiver threshold (10^{-6} BER): -60 to -92 dBm • 1+0, 2+0 and 1+1 working and hot standby
Antennas	• High performance and super high performance • Single and dual polarized • Integrated and separate installation • 0.2/0.3/0.6/0.9/1.2/1.8/2.4/3.0/3.7 m 8 in. 1/2/3/4/6/8/10/12 ft
Frequencies	5, 6, 7, 8, 10, 11, 13, 15, 18, 23, 26, 28, 32, 38 & 42 GHz (ETSI) 6, 7, 8, 10, 11, 13, 15, 18, 23, 24, 28, 38 GHz (ANSI) 60 and 80 GHz are supported by attaching MINI-LINK PT
Configuration	1+0, 2+0 and 1+1 working and hot standby
Interfaces	• Ethernet 4 x 10/100/1000 BASE-T x 2 x 8FP • PDH and E1 over CES 16 x E1, 120 or 75 Ohm • O&M / Site LAN 100 BASE-T • User I/O 4 input + 2 Output
Power consumption	28.3 W (1+0, with DC Pass)
Synchronization	Sync E, 1588v2, NTP transparent, STM-1, E1 and 2 MHz
Power Supply	-48 VDC, with redundant power supply
Weights	2.82 kg / 6.2 lbs
Dimensions (HxWxD)	240 x 440 x 45 mm, 9.5 x 17.3 x 1.8 inch
Standards and Recommendations	CEN/CENELEC, ETSI, ITU, IEC, IEEE, IETF
Operational Temperature	-45°C to +60°C / -49F to +140F -25°C to +60°C / -13F to +140F
Data Communication Network	• IP DCN and Site LAN service • DCN interfaces via 10/100 BASE-T, E1, E0 • In-band transport over STM-1 and Microwave
Network Management	Supported by IP transport NMS, ServiceON, Craft and CLI SNMP v3, SSH, RADIUS, TACACS+

Ericsson AB
SE-417 56 Göteborg, Sweden
Telephone +46 10 719 00 00
Fax +46 10 712 99 99
www.ericsson.com

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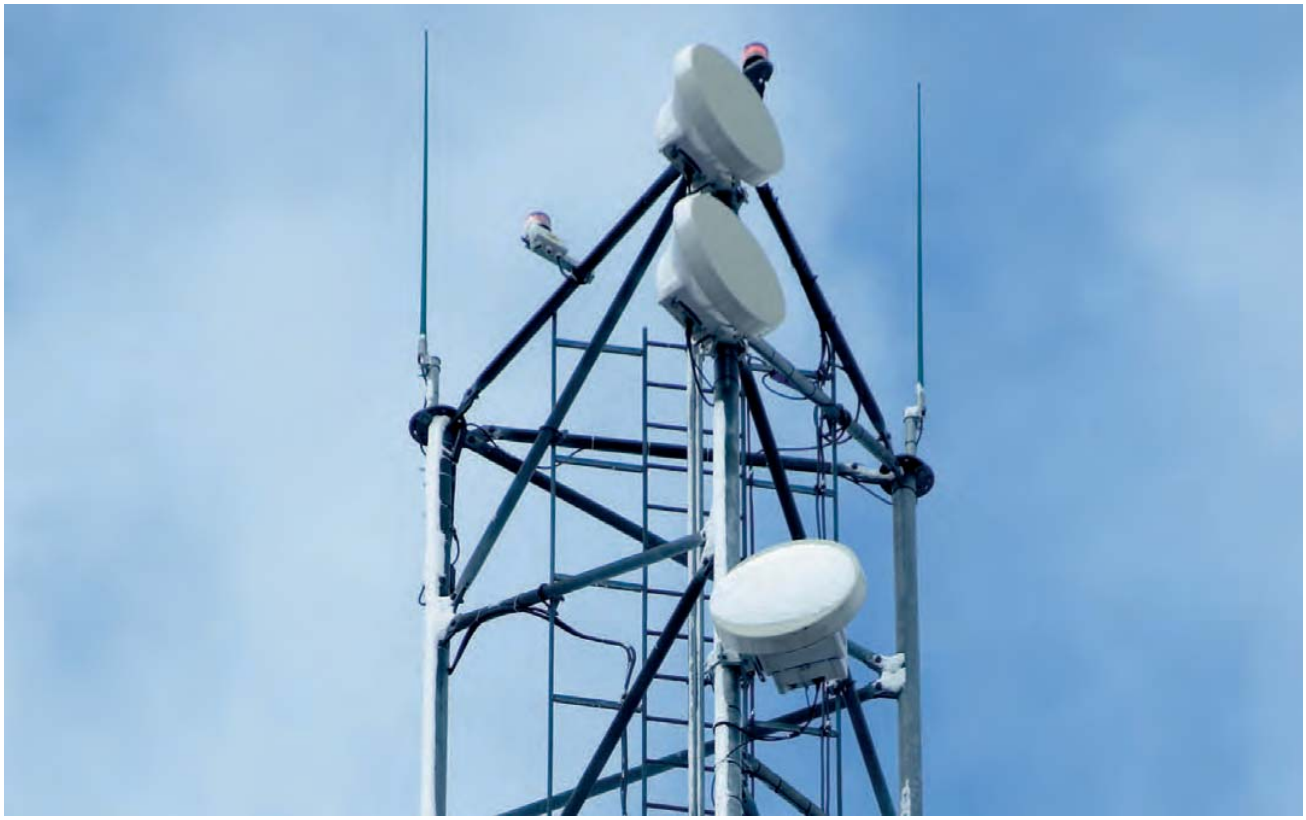

MINI-LINK™ TN

Ericsson's market leading microwave transmission node
Ericsson has over 40 years of microwave experience with more than 3 million radio units delivered to over 170 countries. Ericsson is the market leader in microwave transmission, which is the most competitive choice for capacities up to 1 Gbps.

From access sites to advanced hub sites
MINI-LINK TN is the market leading microwave transmission node, handling access sites, as well as advanced hub sites for large networks. The Hybrid Radio Link transports both Native Ethernet and Native TDM simultaneously and has integrated traffic routing of TDM traffic as well as Ethernet switching of the packet traffic. MINI-LINK TN is produced in the world's largest microwave production facility and has market leading reliability.

Used in a number of different scenarios:

- **New roll-out of mobile backhaul networks;** MINI-LINK TN fully supports all-IP RAN over Ethernet with Ethernet quality of service and packet synchronization.
- **Evolution of mobile backhaul networks;** MINI-LINK TN supports several ways to easily increase capacity and efficient migration to packets.
- **Fixed Broadband over Microwave;** MINI-LINK TN is a cost efficient product that utilizes the integrated solutions for both Carrier and best effort Ethernet.
- **Our Enterprise;** Broadcasting and National security customers successfully deploy both single hops, and complete backhaul networks.

MINI-LINKTN 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. With the Gigabit Ethernet link, MINI-LINK TN is ready for the all-IP over Ethernet network.

Ethernet Switching
Integrated non-blocking Gigabit Ethernet switch and Provider Bridge (IEEE 802.1D, 802.1Q, 802.1ad compliant). Switching capacity up to 24Gbit/s full duplex. QoS with 8 priority queues using SPQ and WFQ. MSTP and 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 squelches on the outgoing interfaces when network synchronization is enabled. Sync output via TDM traffic, dedicated 2 MHz sync port, Sync E, NTP transparent, 1588v2 are supported.

Adaptive Modulation
The Radio Link supports hitless adaptive modulation for 4-1024 QAM over 7-56 MHz channels.

Extensive protection for carrier class equipment
Network, line, equipment and propagation protection are all supported by the MINI-LINK TN equipment.

[1] Including node processor, power filtering and fan (AMM 6p)

Ericsson AB
SE-417 56 Göteborg, Sweden
Telephone +46 10 719 00 00
Fax +46 10 712 99 99
www.ericsson.com

TECHNICAL SPECIFICATIONS
MINI-LINK™ TN, 5.3

Radio link	• 570 Mbps over 56 MHz using 1024 QAM (ETSI). 510 Mbps over 50 MHz using 1024 QAM (ANSI). 1.1 Gbps using XPIC • TX power: -10 to +30 dBm • TRX Receiver threshold (10^{-6} BER): -60 to -92 dBm • 1+0 to 4+0 and 1+1 working and hot standby
Antennas	• High performance and super high performance • Single and dual polarized • Integrated and separate installation • 0.2/0.3/0.6/0.9/1.2/1.8/2.4/3.0/3.7 m 8 in. 1/2/3/4/6/8/10/12 ft
Frequencies	5, 6, 7, 8, 10, 11, 13, 15, 18, 23, 26, 28, 32, 38 & 42 GHz (ETSI) 6, 7, 8, 10, 11, 13, 15, 18, 23, 24, 28, 38 GHz (ANSI) 60 and 80 GHz are supported by attaching MINI-LINK PT
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	Radio terminal: 30-110 W (depending on configuration) Basic Node: AMM 2p/6p/20p 11W[1] / 27W[1] / 37W[1]
Traffic Interfaces	E1, 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 GbE via 1000 BASE-SX/LX/ZX/CWDM IEEE802.3
Synchronization	Sync E, 1588v2, NTP transparent, STM-1, E1 and 2MHz
Standards and Recommendations	CEN/CENELEC, ETSI, ITU, IEC, IEEE, IETF
Operational Temperature	-45°C to +60°C / -49F to +140F -25°C to +60°C / -13F to +140F
Data Communication Network	• IP DCN and Site LAN service • DCN interfaces via 10/100 BASE-T, E1, E0 • In-band transport over STM-1 and Microwave
Network Management	Supported by IP transport NMS, ServiceON, Craft and CLI SNMP v3, SSH, RADIUS, TACACS+

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MINI-LINK™ PT 6020

All Outdoor packet microwave for small cells
Ericsson has over 40 years of microwave experience with more than 2.9 million radio units delivered to over 170 countries. Ericsson is the market leader in microwave transmission, which is the most competitive choice for capacities up to 1 Gbps.

Very High Capacity Microwave
MINI-LINK PT 6020 is an all outdoor and zero footprint microwave solution based on the next generation packet platform, complementing the successful MINI-LINK portfolio.

It is a carrier grade all solution that will save Network Cost since it is compact and easy to install. The all-outdoor solution speeds up and facilitates roll out even further with no need for a site building.

MINI-LINK PT 6020 is based on the E-Band (70/80 GHz), providing opportunity to deploy in this previously unused frequency band, supporting 1 Gbps capacity over a single 250 MHz channel. 2 Gbps capacity can be achieved with 2+0 solution (LAG) using dual polarization.

The well known MINI-LINK portfolio enables smooth implementation of new packet nodes as a natural extension of existing network, providing flexibility to invest when and where it is really necessary.

MINI-LINK PT 6020 can be easily and directly connected to the RBS provided with Ethernet interface, which is nowadays the most common configuration for 3G and LTE sites.

It can also be connected to any other MINI-LINK products using available Ethernet ports, allowing combined implementation in areas that requires specific functionalities and aggregation capacity.

As example, MINI-LINK SP can be deployed together with MINI-LINK PT, expanding the microwave solution with additional Ethernet interfaces, MPLS, CES, switching and routing capabilities when the site has such specific requirement. Together with MINI-LINK Protective Housing (MPH) solution, MINI-LINK SP can also be installed in outdoor environment providing great flexibility for challenge sites.

MINI-LINK PT 6020 can also be used as alternative to expand installed base of MINI-LINK TN nodes with E-Band links.

MINI-LINK PT is also suitable in applications such as Fixed Broadband and Enterprise, providing:

- Cost effective and short implementation time
- DSLAM backhaul
- Fiber extension
- Private Communication

Simple installation with optimized TCO
Configuration via CLI reduces complexity and installation time. All outdoor solution provides further savings compared with traditional split-mount solution: up to 20% installation cost, 33% on site rental and up to 45% reduced power consumption.

Network Synchronization
MINI-LINK PT 6020 supports transport of synchronization signal across the hop. Any synchronization signal is carried over the radio hop without occupying any bandwidth allocated for payload traffic.

Low Delay
The delay performance is typically as low as 65 µs per radio link, enabling best possible end user experience.

Adaptive Modulation
The radio link supports hitless adaptive modulation for 4–64 QAM over 70/80 GHz, which provides an error free transmission and constant delay variation securing sync performance.

Line-of-Sight (LOS) and Non-Line-of-Sight (NLOS)
MINI-LINK PT 6020 support both LOS and NLOS configurations. This will give operator greater flexibility to deploy small cells, enabling high network performance.

TECHNICAL SPECIFICATIONS
MINI-LINK™ PT 6020

Radio link	• 1 000 Mbps over 250 MHz channel using 64 QAM • TX power: +11 to + 15 dBm • TRX Receiver threshold (10^{-6} BER): -71 to -58 dBm
Antennas	• 0.2/0.3/0.6 m (0.7/1/2 ft) single polarized antennas for integrated installation • 0.3/0.6 m (1/2 ft) dual polarized antennas for integrated installation
Frequencies	71 – 76/81 – 86 GHz (duplex distance: 10 GHz)
Typical weights	5.7 kg/12.6 lbs
Nominell dimensions (H x W x D)	98×260×321 mm / 3.9 x10.2x12.6 inch
Power supply	-48 V DC Power over Ethernet
Power consumption	Typical value 45 W
Interfaces	• Traffic: Optical GE via 1000 BASE-X IEEE802.3 Electrical 10/100/1000 BASE-T IEEE802.3 • Maintenance: 10/100 BASE-T IEEE802.3
Standards and recomendations	ETSI, ECC, FCC, IC, IEC, IEEE, IETF, ITU
Operational temperature	-45°C to +60°C / -49F to +140F
Data communication networks	DCN over traffic interface via VLAN IP based DCN for transport of O&M data
Quality of service	• 802.1p • DSCP • MPLS TC • 8 queues of configurable length • WRED or Tail-drop queue management • Strict priority and weighted fair queuing scheduling mechanism
Network management	• Supported by IP transport NMS and ServiceON • SNMP v3 • SSH • RADIUS • TACACS+ • Syslog • RMON • Configuration via CLI • Built-in webpage
Synchronization	• Synchronous Ethernet • Transparent for Frequency Synch over Packet

Ericsson AB
SE-417 56 Göteborg, Sweden
Telephone +46 10 719 00 00
Fax +46 10 712 99 99
www.ericsson.com

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MINI-LINK™ PT 3060

All Outdoor packet microwave for small cells
Ericsson has over 40 years of microwave experience with more than 2.9 million radio units delivered to over 170 countries. Ericsson is the market leader in microwave transmission, which is the most competitive choice for capacities up to 1 Gbps.

Optimized for Small Cells deployment
MINI-LINK PT 3060 is an all packet and zero footprint microwave solution based on the next generation packet platform, complementing the successful MINI-LINK portfolio.

The innovative design with integrated 60 GHz radio and antenna provides capacity, easy installation and minimum visual impact.

The well known MINI-LINK portfolio enables smooth implementation of small cell sites as a natural extension of existing network, providing flexibility to invest when and where it is really necessary.

MINI-LINK PT 3060 can be easily and directly connected to a small cell RBS, fitting into the city environment, which is key for street level deployments such as lamp poles and wall.

It can also be connected to any other MINI-LINK products using available Ethernet ports, allowing combined implementation in areas that requires specific functionalities and aggregation capacity.

As example, MINI-LINK SP can be deployed together with MINI-LINK PT, expanding the microwave solution with additional Ethernet interfaces, MPLS, CES, switching and routing capabilities when the site has such specific requirement.

Together with MINI-LINK Protective Housing (MPH) solution, MINI-LINK SP can also be installed in outdoor environment providing great flexibility for challenge sites.

MINI-LINK: THE WORLD'S MOST WIDELY DEPLOYED MULTI-SERVICE MICROWAVE SYSTEM

Simple installation with optimized TCO
Configuration via CLI reduces complexity and installation time. All outdoor solution provides further savings compared with traditional split-mount solution: up to 20% installation cost, 33% on site rental and up to 45% reduced power consumption.

Network Synchronization
MINI-LINK PT 3060 supports transport of synchronization signal across the hop. Any synchronization signal is carried over the radio hop without occupying any bandwidth allocated for payload traffic.

Low Delay
The delay performance is typically as low as 250 µs per radio link, enabling best possible end user experience.

Adaptive Modulation
The radio link supports hitless adaptive modulation for 4 – 256 QAM over 60 GHz, which provides an error free deployment and constant delay variation securing sync performance.

Line-of-Sight (LOS) and Non-Line-of-Sight (NLOS)
MINI-LINK PT 3060 support both LOS and NLOS configurations. This will give operator greater flexibility to deploy small cells, enabling high network performance.

TECHNICAL SPECIFICATIONS
MINI-LINK™ PT 3060

Radio link	• Up to 400 Mbps over 50 MHz channel using 256 QAM • TX power: +8 dBm • TRX Receiver threshold (10^{-6} BER): -60 to –78 dBm
Frequency	59 – 63 GHz
Weights	6,5 kg/11 lbs incl. antenna and mounting
Dimension	Sphere (Ø) = 21.2 cm/8.3 inch I/F box (W x L x D) = 30.6 x 20.21 x 6.74 cm / 12 x 8 x 2.7 inch
Power supply	-48 V DC Power over Ethernet
Antenna	Embedded antenna, 32 dBi
Power consumption	Typical value 30 W
Power over Ethernet	Electrical 10/100/1000 BASE-T IEEE802.3
Traffic	• Optical GbitE via 1000 BASE-SX/LX IEEE802.3 • Electrical 10/100/1000 BASE-T IEEE802.3 – HW prepared
Maintenance	10/100 BASE-T IEEE802.3
Standards and recomendations	ETSI, ECC, FCC, IC, IEEE, IETF, ITU
Operational temperature	-45°C to +60°C/-49F to +140F
Data communication networks	DCN over traffic interface via VLAN IP based DCN for transport of O&M data
Quality of service	• 802.1p • DSCP • MPLS TC • 8 queues of configurable length • WRED or Tail-drop queue management • Strict priority and weighted fair queuing scheduling mechanism
Network Management	• Supported by IP transport NMS and ServiceON • SNMP v3 • SSH • RADIUS • TACACS+ • Syslog • RMON • Configuration via CLI • Built-in webpage
Synchronization	• Synchronous Ethernet • Transparent for Frequency Synch over Packet

Ericsson AB
SE-417 56 Göteborg, Sweden
Telephone +46 10 719 00 00
Fax +46 10 712 99 99
www.ericsson.com

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