

DragonWave HE+ R1.1

FULL OUTDOOR MICROWAVE RADIO

FULL OUTDOOR ZERO FOOTPRINT PACKET MICROWAVE

DragonWave Technologies is offering its HE+ high-performance single-carrier packet microwave radio for deployment in the licensed 6-42 GHz bands and in several unlicensed bands in the 10.5 – 24 GHz frequency range. Using advanced modulation of up to 4096 QAM, and radio channels of up to 112 MHz, 1.03 Gbps of full duplex capacity per single 1+0 link is at your fingertips.

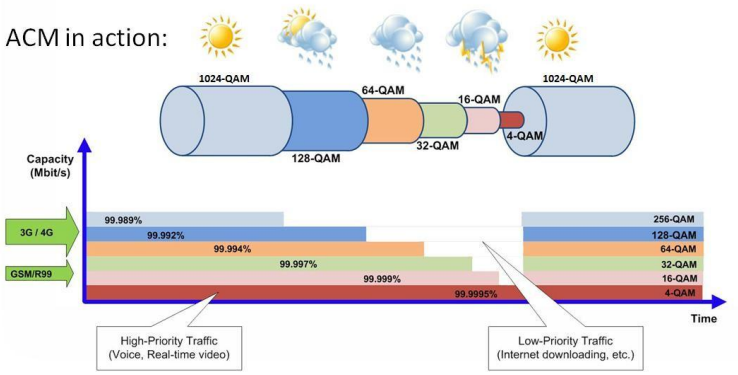
Microwave radio is a well-established technology used by telecommunication operators and private networks alike. Service availability is ensured through careful frequency planning and link engineering. Our HE+ microwave radios are distinguished by being fully licensed out of the box, by delivering solid performance, by their advanced features and by delivering excellent value-for-money.



PERFORMANCE, FLEXIBILITY & FEATURES

DragonWave Technologies has pioneered the use of Software Defined Radio, which enables in-service upgrades, remote configuration and low total cost of ownership. Radio features such as Adaptive Coding and Modulation (ACM) ensure maximum uptime for customers that offer SLAs based on uptime or are limited on antenna size. Networking features such as QoS and QinQ VLAN are there as well. Carrier-centric features such as Rapid Spanning Tree (RSTP) ensure that redundant paths can be utilized, enhancing network resiliency. HE+ also supports Synchronous Ethernet (SyncE) and IEEE1588v2 TC and BC, which is valuable in radio access networks like 5G New Radio.

Attainable link operating distances can vary widely depending on the link frequency, antenna and channel sizes, the prevailing rain zone, and the desired link throughput & link availability. DragonWave Technologies has a complete range of tools and services available to plan your microwave network to meet all design objectives. Generally, higher frequencies are used for short-range, high-capacity links, and lower frequencies are used for long range links. Link lengths exceeding 100 km are possible if properly designed and deployed.



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WIDE RANGE OF FREQUENCIES AND BANDS AVAILABLE

APPLICATIONS

- Backhaul for cellular network operators
- Corporate backbone links
- Resilience & back-up for fibre links
- CCTV backhaul for multiple cameras
- Temporary point-to point networking deployments with rapid deployment





FEATURE HIGHLIGHTS & SPECIFICATIONS

Carrier-grade, zero footprint, fully outdoor, cost-effective solution with up to 1.03 Gbps full-duplex capacity.

Radio & Modem

- 1+0 native configuration
- Supported licensed bands: L6 GHz, U6 GHz, 7 GHz, 8 GHz, 11 GHz, 13 GHz, 15 GHz, 18 GHz, 23 GHz, 26 GHz, 28 GHz, 32 GHz, 38 GHz plus 42 GHz upon request.
- Supported unlicensed bands: 10.5 GHz, 17 GHz and 24 GHz.
- Supported channels:
  - ETSI / ITU: between 3.5 MHz and 112 MHz.
  - ANSI: between 10 MHz and 80 MHz

  Note: not all channel sizes are feasible in all bands.
- Modulation between QPSK and 4,096 QAM
- Hitless Adaptive Coding and Modulation (ACM)
- Advanced multilevel LDPC and RS FEC
- Adaptive Digital Pre-Distortion (DPD)

Baseband Interfaces

- 1 x 10 Gbps SFP+ cages / receptacles, compatible with both SFP (up to 1 Gbps) and SFP+ (up to 10 Gbps) optical transceivers
- 1 x FE/GE electrical RJ45 interface (802.3) with proprietary PoE through Cat5E or CAT6 Ethernet cable
- - 48 V_{DC} power supply with 2-wire or coaxial cable
- RSSI I/F for antenna alignment: BNC

Switching

- Embedded Layer-2 switch
- Auto MDI/MDXI (802.3ab)
- Flow control (802.3x)
- Buffer: 8 Mbit non-blocking store & forward
- Jumbo frames up to 10,240 bytes
- 16k MAC table entries with auto learning & aging
- QoS (802.1p) with Rate-Limiting and Shaping (RLS) based on port, VLAN ID / Priority, and DSCP for traffic prioritization
- VLAN (802.1Q), QinQ (802.1ad)
- STP/RSTP (802.1D) and MSTP path protection mechanisms
- LACP (802.1AX) link aggregation / load balancing
- Header Compression (HC) for enhanced L2 throughput

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Network Synchronization

- Synchronous Ethernet (SyncE)
- IEEE1588v2 (PTP) TC & BC

Network Security

- AES256 payload encryption
- HTTPS / SSH / SFTP / SNMPv3

Diagnostics & Monitoring

- Embedded spectrum scan
- Bit Error Rate (BER) monitoring
- Local and Remote loopback for line checking
- System Log for alarms, events, configuration

NMS & Local Management

- Local management though secure (https) Web GUI
- In-band or out of band (remote) management through SNMPv1/v2c/v3
- SNMP traps, MIB
- In-band & out-of band management
- Radio performance monitor
- PMON & RMON stats

CAPACITY TABLE

This table outlines the physical layer (L1) capacity of HE+ as a function of channel bandwidth and modulation:

Modulation & Throughput (Mbps)										
Channel BW (MHz)	**QPSK**	**16QAM**	**32QAM**	**64QAM**	**128QAM**	**256QAM**	**512QAM**	**1024QAM**	**2048QAM**	**4096QAM**
3,5	5,4	10,6	13,1	16,2	18,9	21,7	24,3	27,1	29,5	31,4
7	11,1	21,9	27,0	33,5	39,1	44,7	50,2	55,9	60,8	64,8
10	16,4	32,3	39,8	49,4	57,7	65,9	74,0	82,4	89,7	95,6
14	22,9	45,1	55,6	69,0	80,5	92,1	103,4	115,1	125,2	133,5
20	32,7	64,5	79,6	98,8	115,3	131,8	148,0	164,8	179,3	191,1
28	46,0	91,7	112,2	138,1	161,2	184,1	207,7	230,3	250,7	256,8
29,65	48,6	97,0	118,6	146,0	170,5	194,7	219,6	243,5	265,1	271,5
40	65,7	131,0	160,3	197,3	230,3	263,0	296,7	329,0	358,1	366,8
56	92,0	183,4	224,4	276,2	322,4	368,2	415,4	460,6	501,4	513,6
60	98,4	196,2	240,1	295,5	345,0	393,9	444,4	492,8	536,5	549,5
80	129,7	258,6	316,4	389,4	454,6	519,2	585,7	649,4	707,0	724,2
112	178,9	357,2	438,5	535,6	625,0	716,5	802,7	892,8	970,6	1.033,8

NOTE: certain channel sizes may not be available in all supported frequency bands.

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PRODUCT SPECIFICATIONS

Radio & RF Parameters	
Rx Sensitivity	-48.1 through -93.4 dBm ±2 dB depending on f-variant, channel size & modulation used
Tx output Power	13 - 28 dBm ±2 dB – depending on frequency variant and modulation used
Forward Error Correction	Advanced multilevel LDPC and Reed-Solomon FEC
Radio configurations	1+0 standalone and 1+1 & 2+0 with external switch and couplers
Antennas	
Antenna types	Parabolic antenna with radome – 30 cm up to 3 m in diameter – depending on frequency
Antenna gain/ beamwidth	Depends on antenna diameter & frequency: refer to appropriate antenna data sheet
Power / Environment	
Power supply voltage	-48V_{DC} ±20%
Power consumption	<40 W
Ingress protection rating	IP67
Operational temperature	-40 to +55 ˚ C (-35 ˚C cold start, +60˚ C peak)
Operational humidity	0 to 100%, condensing
Physical Dimensions	
Dimensions & weight radio	280 x 240 x 110 mm, 3.05 kg
Dimensions & weight indoor power injector	170 x 150 x 39 mm, 0.50 kg

TRANSMIT POWER

This table outlines the transmit power, in dBm, ±2 dB, as a function of HE+ frequency band and modulation:

Max. RF Tx power (dBm)		Frequency Band (GHz)									
		6L	6U	7/7.5	8	10.5/11	13/15	18	23	26	38
Modulation	4096QAM	25	25	25	25	23	23	20	20	18	13
	2048QAM	25	25	25	25	23	23	20	20	18	13
	1024QAM	26	26	26	26	24	24	23	23	19	13
	512QAM	28	28	28	28	26	26	23	23	21	14
	256QAM	28	28	28	28	26	26	23	23	21	15
	128QAM	28	28	28	28	26	26	23	23	21	15
	64QAM	28	28	28	28	27	26	24	24	21	16
	32QAM	28	28	28	28	27	26	24	24	21	17
	16QAM	28	28	28	28	27	26	24	24	21	18
	QPSK	28	28	28	28	27	26	24	24	21	19

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RECEIVER SENSITIVITY

This table outlines the receiver sensitivity, in dBm, ±2 dB, as a function of HE+ frequency band, channel size and modulation:

Rx sensitivity (dBm) @ 10^{-6} BER		Frequency Band								
Channel Size	Modulation	6GL	6GU	7.5G	8G	10.5/11G	13/15G	18/23G	26G	38G
112MHz	4096QAM	N/A	-49,1	N/A	-49,1	-48,6	-48,6	-48,1	-48,1	-48,1
	2048QAM	N/A	-53,0	N/A	-53,0	-52,5	-52,5	-52,0	-52,0	-52,0
	1024QAM	N/A	-56,1	N/A	-56,1	-55,6	-55,6	-55,1	-55,1	-55,1
	512QAM	N/A	-59,3	N/A	-59,3	-58,8	-58,8	-58,3	-58,3	-58,3
	256QAM	N/A	-62,3	N/A	-62,3	-61,8	-61,8	-61,3	-61,3	-61,3
	128QAM	N/A	-65,4	N/A	-65,4	-64,9	-64,9	-64,4	-64,4	-64,4
	64QAM	N/A	-68,3	N/A	-68,3	-67,8	-67,8	-67,3	-67,3	-67,3
	32QAM	N/A	-70,6	N/A	-70,6	-70,1	-70,1	-69,6	-69,6	-69,6
	16QAM	N/A	-73,7	N/A	-73,7	-73,2	-73,2	-72,7	-72,7	-72,7
	QPSK	N/A	-80,1	N/A	-80,1	-79,6	-79,6	-79,1	-79,1	-79,1
80MHz	4096QAM	-50,5	-50,5	N/A	-50,5	-50,0	-50,0	-49,5	-49,5	-49,5
	2048QAM	-54,4	-54,4	N/A	-54,4	-53,9	-53,9	-53,4	-53,4	-53,4
	1024QAM	-57,6	-57,6	N/A	-57,6	-57,1	-57,1	-56,6	-56,6	-56,6
	512QAM	-60,7	-60,7	N/A	-60,7	-60,2	-60,2	-59,7	-59,7	-59,7
	256QAM	-63,8	-63,8	N/A	-63,8	-63,8	-63,8	-62,8	-62,8	-62,8
	128QAM	-66,9	-66,9	N/A	-66,9	-66,4	-66,4	-65,9	-65,9	-65,9
	64QAM	-69,7	-69,7	N/A	-69,7	-69,2	-69,2	-68,7	-68,7	-68,7
	32QAM	-72,1	-72,1	N/A	-72,1	-71,6	-71,6	-71,1	-71,1	-71,1
	16QAM	-75,2	-75,2	N/A	-75,2	-74,7	-74,7	-74,2	-74,2	-74,2
	QPSK	-81,7	-81,7	N/A	-81,7	-81,2	-81,2	-80,7	-80,7	-80,7
56MHz	4096QAM	-51,9	-51,9	-51,9	-51,9	-51,4	-51,4	-50,9	-50,9	-50,9
	2048QAM	-55,8	-55,8	-55,8	-55,8	-55,3	-55,3	-54,8	-54,8	-54,8
	1024QAM	-59,1	-59,1	-59,1	-59,1	-58,6	-58,6	-58,1	-58,1	-58,1
	512QAM	-62,3	-62,3	-62,3	-62,3	-61,8	-61,8	-61,3	-61,3	-61,3
	256QAM	-65,4	-65,4	-65,4	-65,4	-64,9	-64,9	-64,4	-64,4	-64,4
	128QAM	-68,4	-68,4	-68,4	-68,4	-67,9	-67,9	-67,4	-67,4	-67,4
	64QAM	-71,2	-71,2	-71,2	-71,2	-70,7	-70,7	-70,3	-70,3	-70,3
	32QAM	-73,7	-73,7	-73,7	-73,7	-73,2	-73,2	-72,7	-72,7	-72,7
	16QAM	-76,8	-76,8	-76,8	-76,8	-76,3	-76,3	-75,8	-75,8	-75,8
	QPSK	-83,2	-83,2	-83,2	-83,2	-82,7	-82,7	-82,2	-82,2	-82,2
40MHz	4096QAM	-53,3	-53,3	-53,3	-53,3	-52,8	-52,8	-52,3	-52,3	-52,3
	2048QAM	-57,2	-57,2	-57,2	-57,2	-56,7	-56,7	-56,2	-56,2	-56,2
	1024QAM	-60,6	-60,6	-60,6	-60,6	-60,1	-60,1	-59,6	-59,6	-59,6
	512QAM	-63,8	-63,8	-63,8	-63,8	-63,3	-63,3	-62,8	-62,8	-62,8
	256QAM	-67,0	-67,0	-67,0	-67,0	-66,5	-66,5	-66,0	-66,0	-66,0
	128QAM	-69,8	-69,8	-69,8	-69,8	-69,3	-69,3	-68,8	-68,8	-68,8
	64QAM	-72,6	-72,6	-72,6	-72,6	-72,1	-72,1	-71,6	-71,6	-71,6
	32QAM	-75,2	-75,2	-75,2	-75,2	-74,7	-74,7	-74,2	-74,2	-74,2
	16QAM	-78,4	-78,4	-78,4	-78,4	-77,9	-77,9	-77,4	-77,4	-77,4
	QPSK	-84,7	-84,7	-84,7	-84,7	-84,2	-84,2	-83,7	-83,7	-83,7
28MHz	4096QAM	-54,6	-54,6	-54,6	-54,6	-54,1	-54,1	-53,6	-53,6	-53,6
	2048QAM	-58,6	-58,6	-58,6	-58,6	-58,1	-58,1	-57,6	-57,6	-57,6
	1024QAM	-62,1	-62,1	-62,1	-62,1	-61,6	-61,6	-61,1	-61,1	-61,1
	512QAM	-65,4	-65,4	-65,4	-65,4	-64,9	-64,9	-64,4	-64,4	-64,4
	256QAM	-68,5	-68,5	-68,5	-68,5	-68,0	-68,0	-67,5	-67,5	-67,5
	128QAM	-71,3	-71,3	-71,3	-71,3	-70,8	-70,8	-70,3	-70,3	-70,3
	64QAM	-74,1	-74,1	-74,1	-74,1	-73,6	-73,6	-73,1	-73,1	-73,1
	32QAM	-76,8	-76,8	-76,8	-76,8	-76,3	-76,3	-75,8	-75,8	-75,8
	16QAM	-79,9	-79,9	-79,9	-79,9	-79,4	-79,4	-78,9	-78,9	-78,9
	QPSK	-86,2	-86,2	-86,2	-86,2	-85,7	-85,7	-85,2	-85,2	-85,2
14MHz	4096QAM	-57,6	-57,6	-57,6	-57,6	-57,1	-57,1	-56,6	-56,6	-56,6
	2048QAM	-61,6	-61,6	-61,6	-61,6	-61,1	-61,1	-60,6	-60,6	-60,6
	1024QAM	-65,1	-65,1	-65,1	-65,1	-64,6	-64,6	-64,1	-64,1	-64,1
	512QAM	-68,4	-68,4	-68,4	-68,4	-67,9	-67,9	-67,4	-67,4	-67,4
	256QAM	-71,5	-71,5	-71,5	-71,5	-71,0	-71,0	-70,5	-70,5	-70,5
	128QAM	-74,3	-74,3	-74,3	-74,3	-73,8	-73,8	-73,3	-73,3	-73,3
	64QAM	-77,1	-77,1	-77,1	-77,1	-76,6	-76,6	-76,1	-76,1	-76,1
	32QAM	-79,8	-79,8	-79,8	-79,8	-79,3	-79,3	-78,8	-78,8	-78,8
	16QAM	-82,9	-82,9	-82,9	-82,9	-82,4	-82,4	-81,9	-81,9	-81,9
	QPSK	-89,2	-89,2	-89,2	-89,2	-88,7	-88,7	-88,2	-88,2	-88,2
7MHz	4096QAM	-60,1	-60,1	-60,1	-60,1	-59,6	-59,6	-59,1	-59,1	-59,1
	2048QAM	-64,1	-64,1	-64,1	-64,1	-63,6	-63,6	-63,1	-63,1	-63,1
	1024QAM	-67,6	-67,6	-67,6	-67,6	-67,1	-67,1	-66,6	-66,6	-66,6
	512QAM	-70,9	-70,9	-70,9	-70,9	-70,4	-70,4	-69,9	-69,9	-69,9
	256QAM	-74,0	-74,0	-74,0	-74,0	-73,5	-73,5	-73,0	-73,0	-73,0
	128QAM	-76,8	-76,8	-76,8	-76,8	-76,3	-76,3	-75,8	-75,8	-75,8
	64QAM	-79,6	-79,6	-79,6	-79,6	-79,1	-79,1	-78,6	-78,6	-78,6
	32QAM	-82,3	-82,3	-82,3	-82,3	-81,8	-81,8	-81,3	-81,3	-81,3
	16QAM	-85,4	-85,4	-85,4	-85,4	-84,9	-84,9	-84,4	-84,4	-84,4
	QPSK	-91,4	-91,4	-91,4	-91,4	-90,9	-90,9	-90,4	-90,4	-90,4
3.5MHz	4096QAM	-62,1	-62,1	-62,1	-62,1	-61,6	-61,6	-61,1	-61,1	-61,1
	2048QAM	-66,1	-66,1	-66,1	-66,1	-65,6	-65,6	-65,1	-65,1	-65,1
	1024QAM	-69,6	-69,6	-69,6	-69,6	-69,1	-69,1	-68,6	-68,6	-68,6
	512QAM	-72,9	-72,9	-72,9	-72,9	-72,4	-72,4	-71,9	-71,9	-71,9
	256QAM	-76,0	-76,0	-76,0	-76,0	-74,5	-74,5	-75,0	-75,0	-75,0
	128QAM	-78,8	-78,8	-78,8	-78,8	-78,3	-78,3	-77,8	-77,8	-77,8
	64QAM	-81,6	-81,6	-81,6	-81,6	-81,1	-81,1	-80,6	-80,6	-80,6
	32QAM	-84,3	-84,3	-84,3	-84,3	-83,8	-83,8	-83,3	-83,3	-83,3
	16QAM	-87,4	-87,4	-87,4	-87,4	-87,9	-87,9	-86,4	-86,4	-86,4
	QPSK	-93,4	-93,4	-93,4	-93,4	-92,9	-92,9	-92,4	-92,4	-92,4

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