

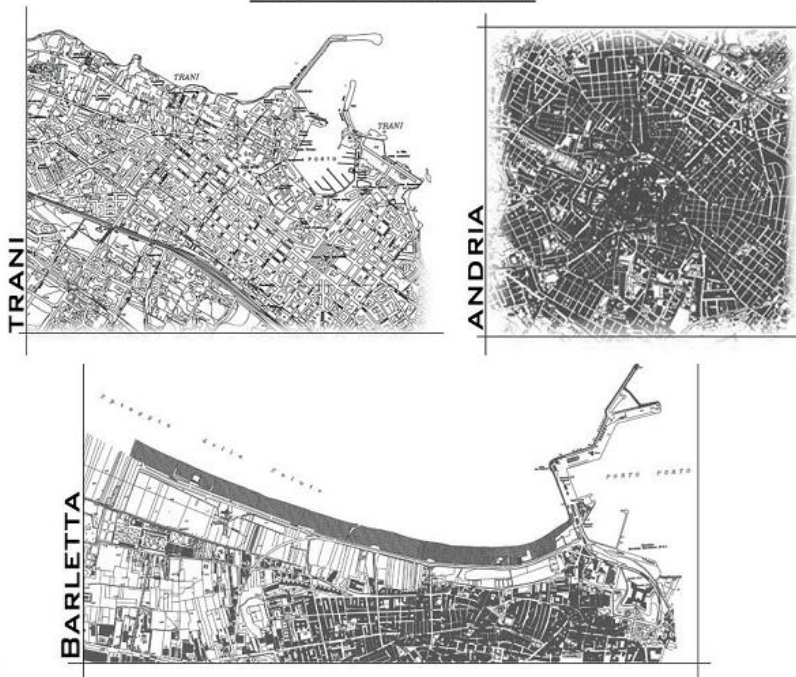


PATTI PER LE CITTÀ'
PPA PO FESR 2007-2013 - PAC
ASSE I - LINEA D'INTERVENTO 1.5 - AZIONE 1.5.2

“BAT innovation”

**Progetto per il
Miglioramento della
Vivibilità, Sicurezza e Tutela
dei Centri Storici dei
Comuni di Andria, Barletta
e Trani.**

BAT INNOVATION



PROGETTO ESECUTIVO

Il Progettista	Responsabile del Procedimento
RTP (Raggruppamento Temporaneo di Professionisti) : Ing. Giuseppe Perillo (Mandatario) Italiantech S.r.l. [D. T. Ing. P. Del Sorbo] (Mandante) Ing. Giampietro Massarelli (Mandante - Giovane Professionista)	Dott. Savino Filannino

ELABORATO	DESCRIZIONE	REV.	DATA
B.006	Relazione di Verifica Link Hiperlan (Comune di Trani)	1	23/03/2021

Il progettista si riserva la proprietà del documento vietandone la riproduzione e la divulgazione senza autorizzazione ai sensi delle vigenti leggi

Project Trani_Progetto_Radio LINKPlanner PTP Proposal Report 23 February 2021

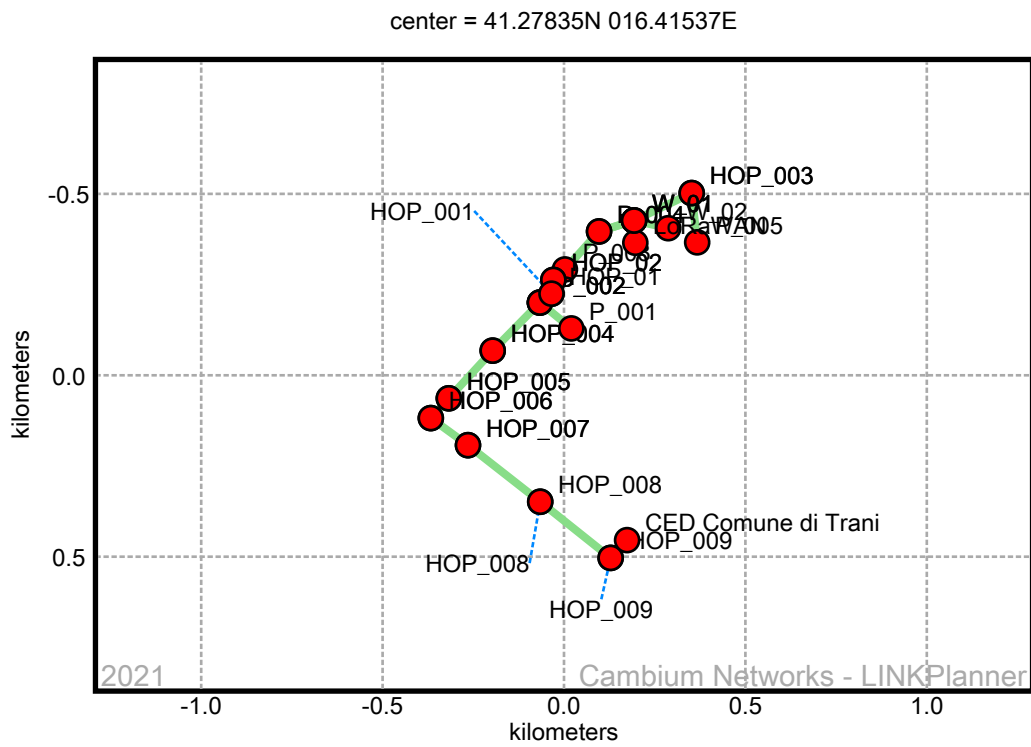


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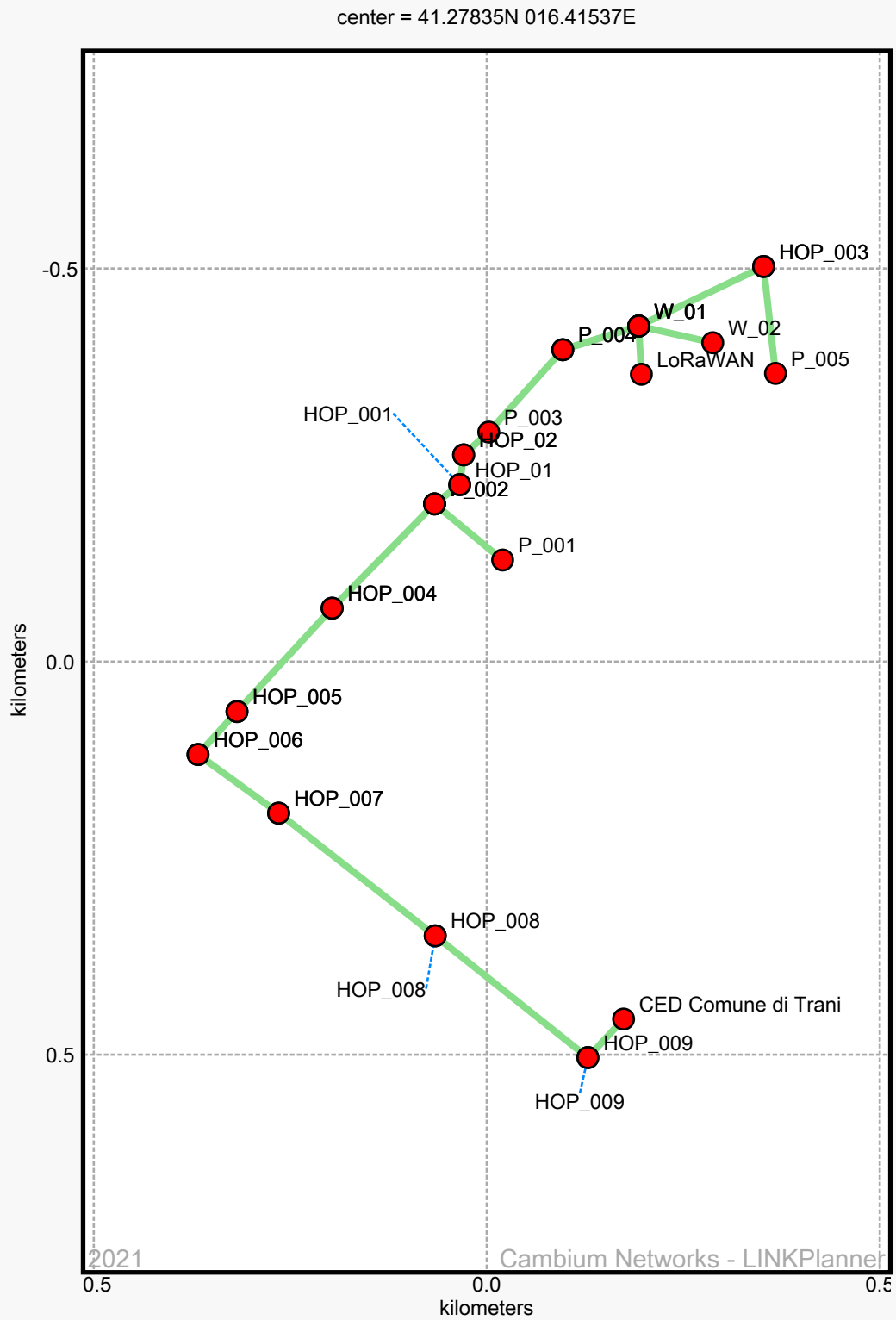
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1. Project Summary

Project: Trani_Progetto_Radio

General Information	
Customer Name	Trani_Progetto_Radio
Company Name	
Address	
Phone	
Cell Phone	
Email	

Network Map

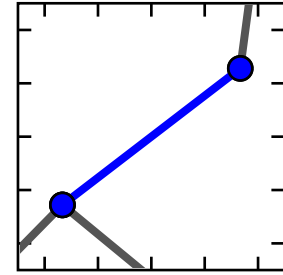


Link name	Product	Local antenna	Remote antenna	Max aggregate IP throughput
HOP_001 direzione P_002	ePMP Force 200	Cambium Networks ePMP Force 200	Cambium Networks ePMP Force 200	276.96 Mbps
HOP_002 direzione HOP_001	ePMP Force 200	Cambium Networks ePMP Force 200	Cambium Networks ePMP Force 200	276.96 Mbps
HOP_003 direzione W_01	ePMP Force 200	Cambium Networks ePMP Force 200	Cambium Networks ePMP Force 200	276.91 Mbps
HOP_004 direzione HOP_005	ePMP Force 200	Cambium Networks ePMP Force 200	Cambium Networks ePMP Force 200	276.91 Mbps
HOP_005 direzione HOP_006	ePMP Force 200	Cambium Networks ePMP Force 200	Cambium Networks ePMP Force 200	276.96 Mbps
HOP_006 direzione HOP_007	ePMP Force 200	Cambium Networks ePMP Force 200	Cambium Networks ePMP Force 200	276.91 Mbps
HOP_007 direzione HOP_008	ePMP Force 200	Cambium Networks ePMP Force 200	Cambium Networks ePMP Force 200	276.84 Mbps
HOP_008 direzione HOP_009	ePMP Force 200	Cambium Networks ePMP Force 200	Cambium Networks ePMP Force 200	276.84 Mbps
HOP_009 direzione CED Comune di Trani	ePMP Force 200	Cambium Networks ePMP Force 200	Cambium Networks ePMP Force 200	276.96 Mbps
LoRaWAN direzione W_01	ePMP Force 200	Cambium Networks ePMP Force 200	Cambium Networks ePMP Force 200	276.96 Mbps
P_001 direzione P_002	ePMP Force 200	Cambium Networks ePMP Force 200	Cambium Networks ePMP Force 200	276.91 Mbps
P_002 direzione HOP_004	ePMP Force 200	Cambium Networks ePMP Force 200	Cambium Networks ePMP Force 200	276.91 Mbps
P_003 direzione HOP_02	ePMP Force 200	Cambium Networks ePMP Force 200	Cambium Networks ePMP Force 200	276.96 Mbps
P_004 direzione P_003	ePMP Force 200	Cambium Networks ePMP Force 200	Cambium Networks ePMP Force 200	276.91 Mbps
P_004 direzione W_01	ePMP Force 200	Cambium Networks ePMP Force 200	Cambium Networks ePMP Force 200	276.91 Mbps
P_005 direzione HOP_003	ePMP Force 200	Cambium Networks ePMP Force 200	Cambium Networks ePMP Force 200	276.91 Mbps
W_01 direzione P_004	ePMP Force 200	Cambium Networks ePMP Force 200	Cambium Networks ePMP Force 200	276.91 Mbps
W_02 direzione W_01	ePMP Force 200	Cambium Networks ePMP Force 200	Cambium Networks ePMP Force 200	276.91 Mbps

Bill of Materials : PTP Network		
Part Number	Qty	Description
C000000L065	36	Gigabit Surge Suppressor (30V)
C050900C063	36	ePMP 1000: 5 GHz Force 200AR5-25 High Gain Radio (EU) (EU cord). Kit includes radio with antenna, power supply, line cord and mounting bracket
EW-E2EPF200-WW	36	ePMP Force 200 Extended Warranty, 2 Addl Years



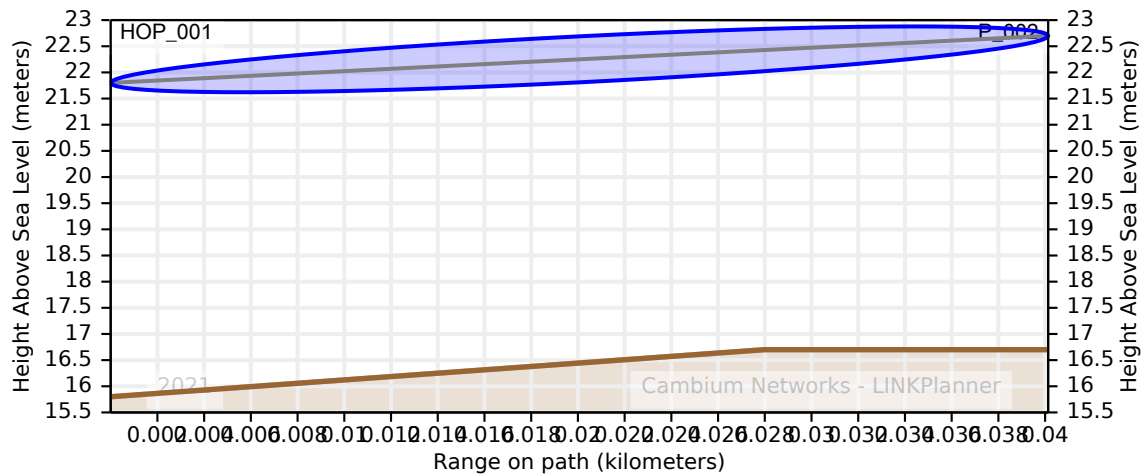
HOP_001 direzione P_002



Equipment: Cambium Networks ePMP Force 200 Integrated

Cambium Networks ePMP Force 200 @ 6 m

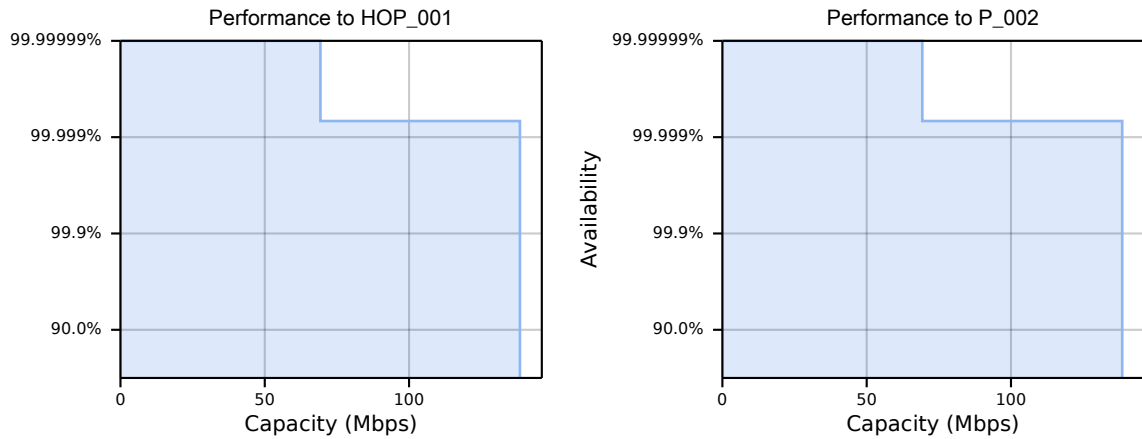
Cambium Networks ePMP Force 200 @ 6 m



	Performance to HOP_001	Performance to P_002
Mean IP	138.42 Mbps	138.54 Mbps
IP Availability	100.0000 % for 1.0 Mbps	100.0000 % for 1.0 Mbps

Link Summary			
Link Length	0.040 km	System Gain Margin	35.65 dB
Band	5.4 GHz	Mean Aggregate Data Rate	276.96 Mbps
Regulation	Italy	Annual Link Availability	100.0000 %
Modulation	Adaptive	Annual Link Unavailability	1 secs/year
Bandwidth	40 MHz	Frame Size	1518 Bytes
Total Path Loss	79.48 dB	Prediction Model	ITU-R P.530-17
System Gain	115.13 dB		

Performance Charts



Climatic Factors, Losses and Standards

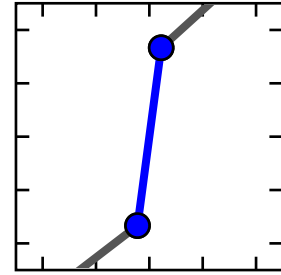
dN/dH not exceeded for 1% of time	-361.80 N units/km	Gaseous Absorption Loss	0.00 dB
Area roughness 110x110km	188.81 metre	Link Type	Line-of-Sight
Geoclimatic factor	3.31e-05	Excess Path Loss	0.00 dB
Fade Occurrence Factor (P0)	8.76e-13	Atmospheric Gasses	ITU-R P.676-12, ITU-R P.835-6
Path inclination	22.43 mr	Diffraction Loss	ITU-R P.526-15
Value of K Exceeded for 99.99% (ke)	0.40	Propagation	ITU-R P.530-17
Excess Path Loss at ke	0.00 dB	Rain Rate	ITU-R P.837-7
0.01% Rain rate	31.39 mm/hr	Refractivity Index	ITU-R P.453-14
Free Space Path Loss	79.48 dB		

Bill of Materials

Part Number	Qty	Description
C000000L065	2	Gigabit Surge Suppressor (30V)
C050900C063	2	ePMP 1000: 5 GHz Force 200AR5-25 High Gain Radio (EU) (EU cord). Kit includes radio with antenna, power supply, line cord and mounting bracket
EW-E2EPF200-WW	2	ePMP Force 200 Extended Warranty, 2 Addl Years



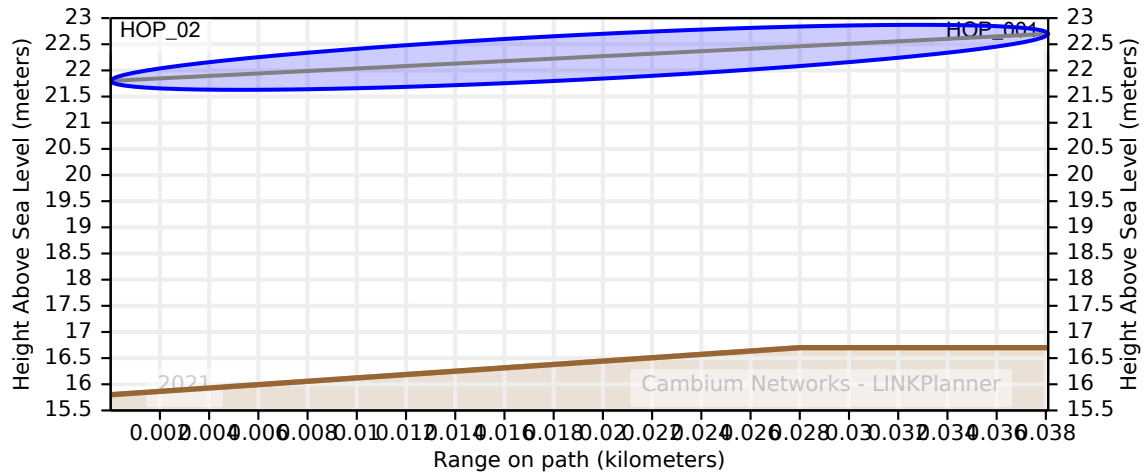
HOP_002 direzione HOP_001



Equipment: Cambium Networks ePMP Force 200 Integrated

Cambium Networks ePMP Force 200 @ 6 m

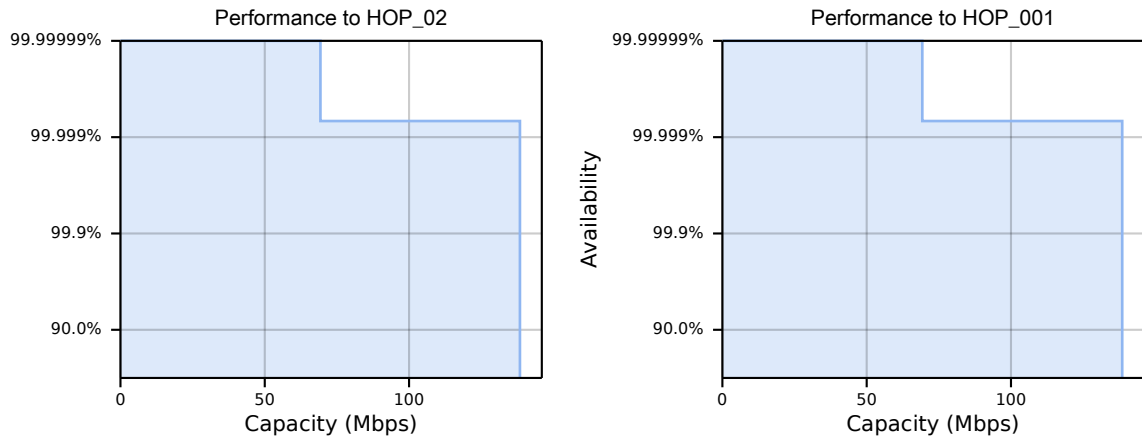
Cambium Networks ePMP Force 200 @ 6 m



	Performance to HOP_02	Performance to HOP_001
Mean IP	138.42 Mbps	138.54 Mbps
IP Availability	100.0000 % for 1.0 Mbps	100.0000 % for 1.0 Mbps

Link Summary			
Link Length	0.038 km	System Gain Margin	35.10 dB
Band	5.4 GHz	Mean Aggregate Data Rate	276.96 Mbps
Regulation	Italy	Annual Link Availability	100.0000 %
Modulation	Adaptive	Annual Link Unavailability	1 secs/year
Bandwidth	40 MHz	Frame Size	1518 Bytes
Total Path Loss	79.02 dB	Prediction Model	ITU-R P.530-17
System Gain	114.13 dB		

Performance Charts



Climatic Factors, Losses and Standards

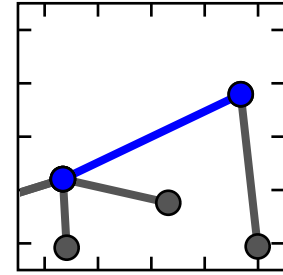
dN/dH not exceeded for 1% of time	-361.88 N units/km	Gaseous Absorption Loss	0.00 dB
Area roughness 110x110km	188.74 metre	Link Type	Line-of-Sight
Geoclimatic factor	3.31e-05	Excess Path Loss	0.00 dB
Fade Occurrence Factor (P0)	6.97e-13	Atmospheric Gasses	ITU-R P.676-12, ITU-R P.835-6
Path inclination	23.63 mr	Diffraction Loss	ITU-R P.526-15
Value of K Exceeded for 99.99% (ke)	0.40	Propagation	ITU-R P.530-17
Excess Path Loss at ke	0.00 dB	Rain Rate	ITU-R P.837-7
0.01% Rain rate	31.39 mm/hr	Refractivity Index	ITU-R P.453-14
Free Space Path Loss	79.02 dB		

Bill of Materials

Part Number	Qty	Description
C000000L065	2	Gigabit Surge Suppressor (30V)
C050900C063	2	ePMP 1000: 5 GHz Force 200AR5-25 High Gain Radio (EU) (EU cord). Kit includes radio with antenna, power supply, line cord and mounting bracket
EW-E2EPF200-WW	2	ePMP Force 200 Extended Warranty, 2 Addl Years



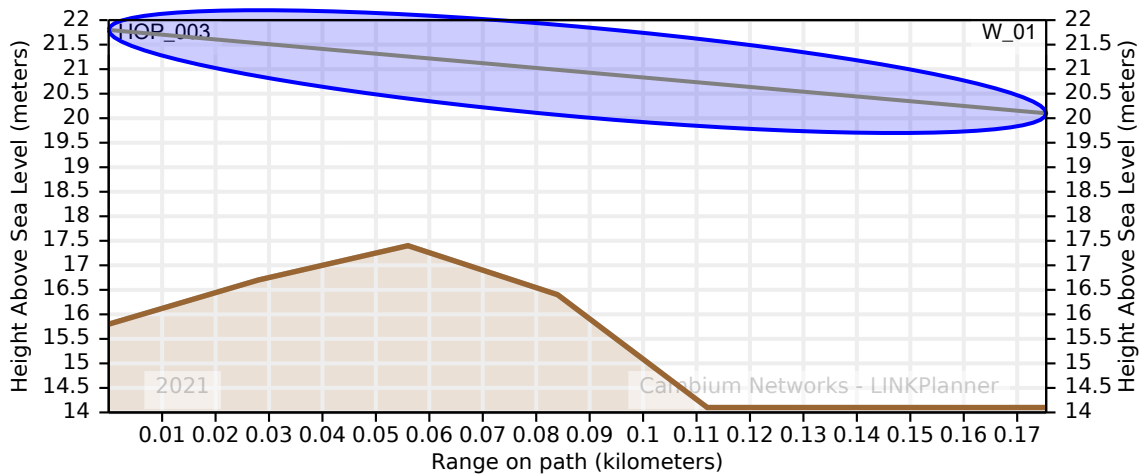
HOP_003 direzione W_01



Equipment: Cambium Networks ePMP Force 200 Integrated

Cambium Networks ePMP Force 200 @ 6 m

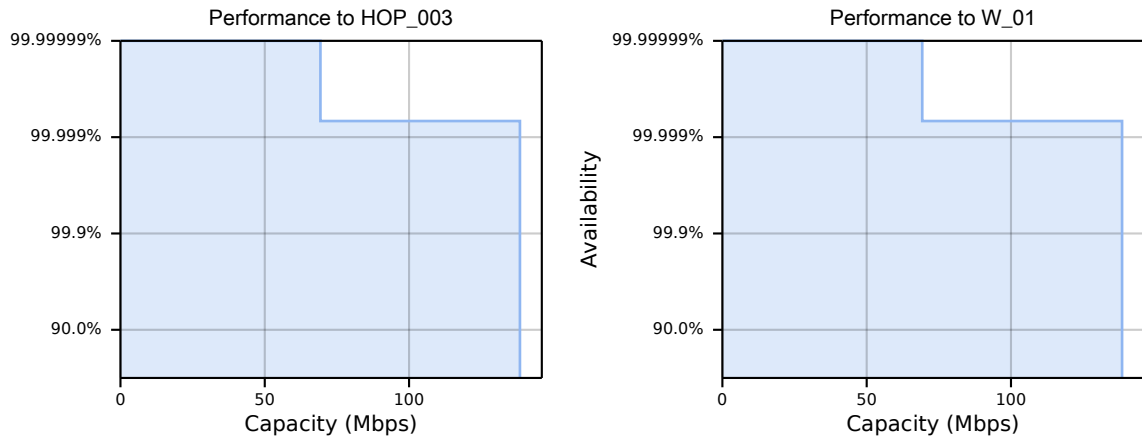
Cambium Networks ePMP Force 200 @ 6 m



	Performance to HOP_003	Performance to W_01
Mean IP	138.42 Mbps	138.49 Mbps
IP Availability	100.0000 % for 1.0 Mbps	100.0000 % for 1.0 Mbps

Link Summary			
Link Length	0.175 km	System Gain Margin	35.84 dB
Band	5.4 GHz	Mean Aggregate Data Rate	276.91 Mbps
Regulation	Italy	Annual Link Availability	100.0000 %
Modulation	Adaptive	Annual Link Unavailability	1 secs/year
Bandwidth	40 MHz	Frame Size	1518 Bytes
Total Path Loss	92.29 dB	Prediction Model	ITU-R P.530-17
System Gain	128.13 dB		

Performance Charts



Climatic Factors, Losses and Standards

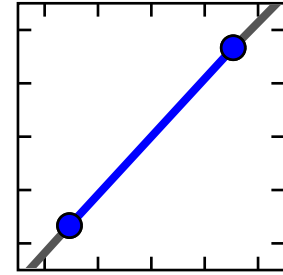
dN/dH not exceeded for 1% of time	-362.57 N units/km	Gaseous Absorption Loss	0.00 dB
Area roughness 110x110km	188.08 metre	Link Type	Line-of-Sight
Geoclimatic factor	3.33e-05	Excess Path Loss	0.00 dB
Fade Occurrence Factor (P0)	2.99e-10	Atmospheric Gasses	ITU-R P.676-12, ITU-R P.835-6
Path inclination	9.69 mr	Diffraction Loss	ITU-R P.526-15
Value of K Exceeded for 99.99% (ke)	0.40	Propagation	ITU-R P.530-17
Excess Path Loss at ke	0.00 dB	Rain Rate	ITU-R P.837-7
0.01% Rain rate	31.41 mm/hr	Refractivity Index	ITU-R P.453-14
Free Space Path Loss	92.29 dB		

Bill of Materials

Part Number	Qty	Description
C000000L065	2	Gigabit Surge Suppressor (30V)
C050900C063	2	ePMP 1000: 5 GHz Force 200AR5-25 High Gain Radio (EU) (EU cord). Kit includes radio with antenna, power supply, line cord and mounting bracket
EW-E2EPF200-WW	2	ePMP Force 200 Extended Warranty, 2 Addl Years



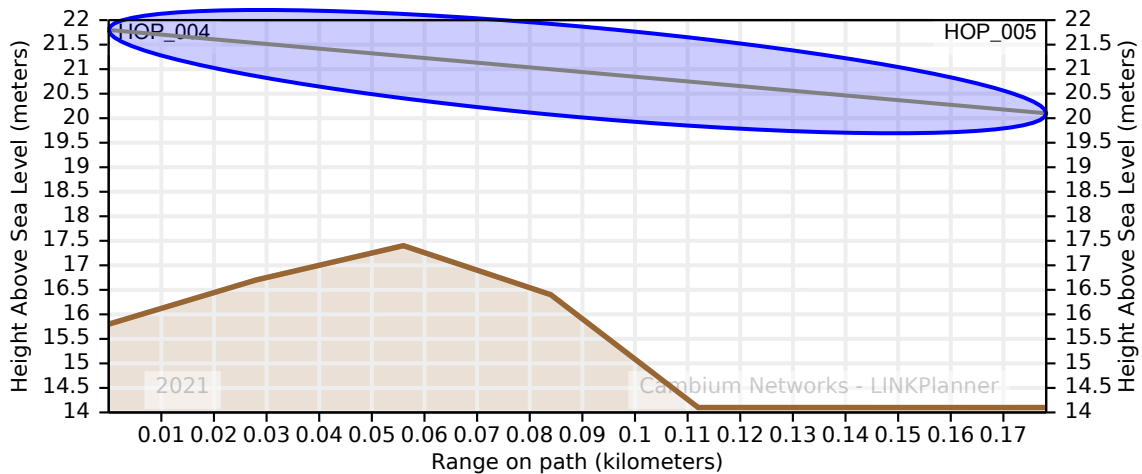
HOP_004 direzione HOP_005



Equipment: Cambium Networks ePMP Force 200 Integrated

Cambium Networks ePMP Force 200 @ 6 m

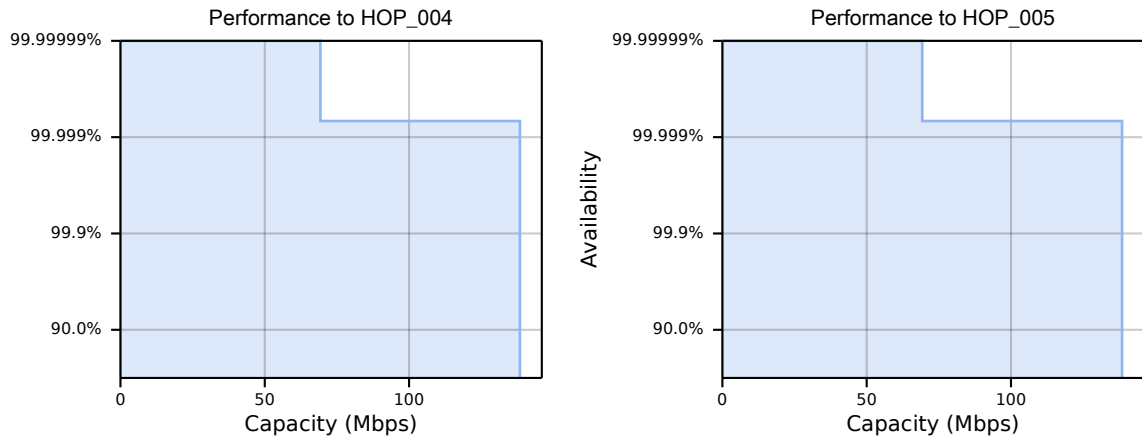
Cambium Networks ePMP Force 200 @ 6 m



	Performance to HOP_004	Performance to HOP_005
Mean IP	138.42 Mbps	138.49 Mbps
IP Availability	100.0000 % for 1.0 Mbps	100.0000 % for 1.0 Mbps

Link Summary			
Link Length	0.178 km	System Gain Margin	35.70 dB
Band	5.4 GHz	Mean Aggregate Data Rate	276.91 Mbps
Regulation	Italy	Annual Link Availability	100.0000 %
Modulation	Adaptive	Annual Link Unavailability	1 secs/year
Bandwidth	40 MHz	Frame Size	1518 Bytes
Total Path Loss	92.42 dB	Prediction Model	ITU-R P.530-17
System Gain	128.13 dB		

Performance Charts



Climatic Factors, Losses and Standards

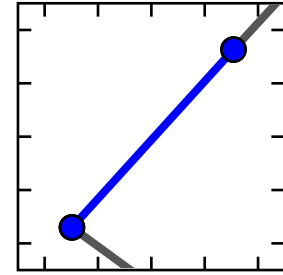
dN/dH not exceeded for 1% of time	-361.19 N units/km	Gaseous Absorption Loss	0.00 dB
Area roughness 110x110km	189.34 metre	Link Type	Line-of-Sight
Geoclimatic factor	3.29e-05	Excess Path Loss	0.00 dB
Fade Occurrence Factor (P0)	3.16e-10	Atmospheric Gasses	ITU-R P.676-12, ITU-R P.835-6
Path inclination	9.54 mr	Diffraction Loss	ITU-R P.526-15
Value of K Exceeded for 99.99% (ke)	0.40	Propagation	ITU-R P.530-17
Excess Path Loss at ke	0.00 dB	Rain Rate	ITU-R P.837-7
0.01% Rain rate	31.37 mm/hr	Refractivity Index	ITU-R P.453-14
Free Space Path Loss	92.42 dB		

Bill of Materials

Part Number	Qty	Description
C000000L065	2	Gigabit Surge Suppressor (30V)
C050900C063	2	ePMP 1000: 5 GHz Force 200AR5-25 High Gain Radio (EU) (EU cord). Kit includes radio with antenna, power supply, line cord and mounting bracket
EW-E2EPF200-WW	2	ePMP Force 200 Extended Warranty, 2 Addl Years



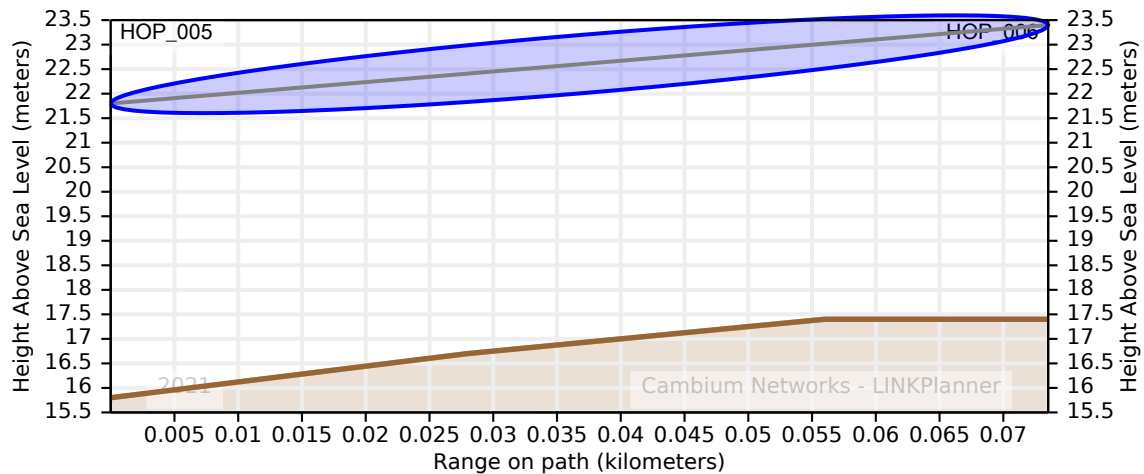
HOP_005 direzione HOP_006



Equipment: Cambium Networks ePMP Force 200 Integrated

Cambium Networks ePMP Force 200 @ 6 m

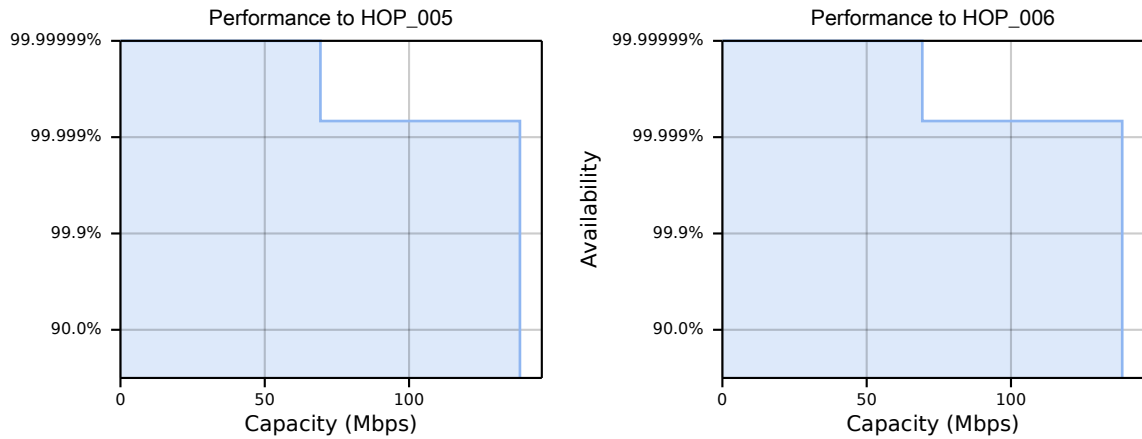
Cambium Networks ePMP Force 200 @ 6 m



	Performance to HOP_005	Performance to HOP_006
Mean IP	138.42 Mbps	138.54 Mbps
IP Availability	100.0000 % for 1.0 Mbps	100.0000 % for 1.0 Mbps

Link Summary			
Link Length	0.074 km	System Gain Margin	35.39 dB
Band	5.4 GHz	Mean Aggregate Data Rate	276.96 Mbps
Regulation	Italy	Annual Link Availability	100.0000 %
Modulation	Adaptive	Annual Link Unavailability	1 secs/year
Bandwidth	40 MHz	Frame Size	1518 Bytes
Total Path Loss	84.74 dB	Prediction Model	ITU-R P.530-17
System Gain	120.13 dB		

Performance Charts



Climatic Factors, Losses and Standards

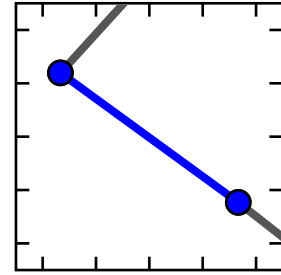
dN/dH not exceeded for 1% of time	-360.92 N units/km	Gaseous Absorption Loss	0.00 dB
Area roughness 110x110km	189.56 metre	Link Type	Line-of-Sight
Geoclimatic factor	3.28e-05	Excess Path Loss	0.00 dB
Fade Occurrence Factor (P0)	7.02e-12	Atmospheric Gasses	ITU-R P.676-12, ITU-R P.835-6
Path inclination	21.76 mr	Diffraction Loss	ITU-R P.526-15
Value of K Exceeded for 99.99% (ke)	0.40	Propagation	ITU-R P.530-17
Excess Path Loss at ke	0.00 dB	Rain Rate	ITU-R P.837-7
0.01% Rain rate	31.36 mm/hr	Refractivity Index	ITU-R P.453-14
Free Space Path Loss	84.74 dB		

Bill of Materials

Part Number	Qty	Description
C000000L065	2	Gigabit Surge Suppressor (30V)
C050900C063	2	ePMP 1000: 5 GHz Force 200AR5-25 High Gain Radio (EU) (EU cord). Kit includes radio with antenna, power supply, line cord and mounting bracket
EW-E2EPF200-WW	2	ePMP Force 200 Extended Warranty, 2 Addl Years



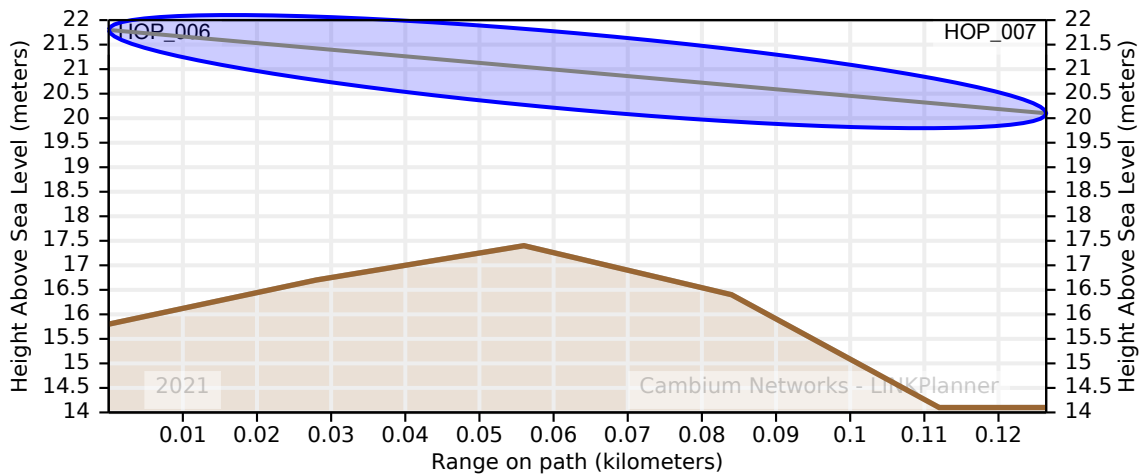
HOP_006 direzione HOP_007



Equipment: Cambium Networks ePMP Force 200 Integrated

Cambium Networks ePMP Force 200 @ 6 m

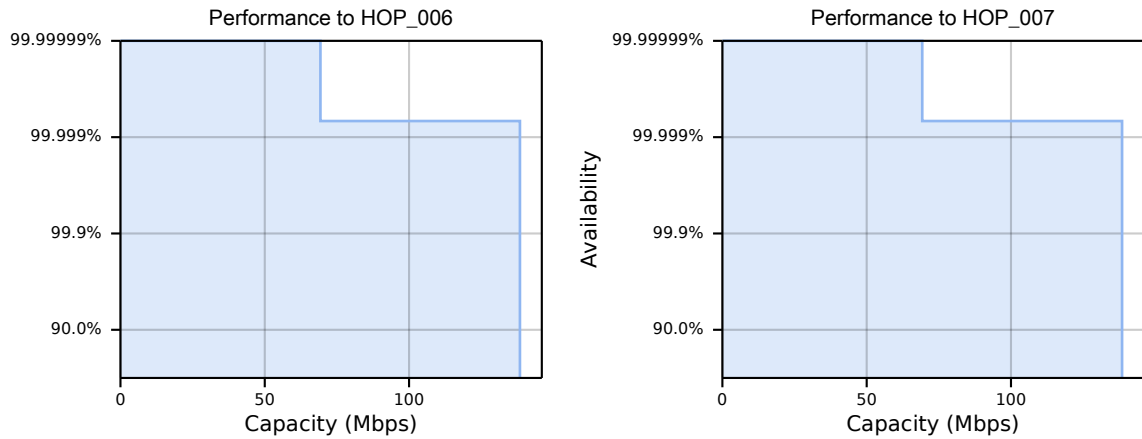
Cambium Networks ePMP Force 200 @ 6 m



	Performance to HOP_006	Performance to HOP_007
Mean IP	138.42 Mbps	138.49 Mbps
IP Availability	100.0000 % for 1.0 Mbps	100.0000 % for 1.0 Mbps

Link Summary			
Link Length	0.126 km	System Gain Margin	35.68 dB
Band	5.4 GHz	Mean Aggregate Data Rate	276.91 Mbps
Regulation	Italy	Annual Link Availability	100.0000 %
Modulation	Adaptive	Annual Link Unavailability	1 secs/year
Bandwidth	40 MHz	Frame Size	1518 Bytes
Total Path Loss	89.45 dB	Prediction Model	ITU-R P.530-17
System Gain	125.13 dB		

Performance Charts



Climatic Factors, Losses and Standards

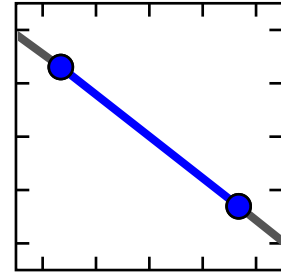
dN/dH not exceeded for 1% of time	-360.78 N units/km	Gaseous Absorption Loss	0.00 dB
Area roughness 110x110km	189.61 metre	Link Type	Line-of-Sight
Geoclimatic factor	3.28e-05	Excess Path Loss	0.00 dB
Fade Occurrence Factor (P0)	7.09e-11	Atmospheric Gasses	ITU-R P.676-12, ITU-R P.835-6
Path inclination	13.45 mr	Diffraction Loss	ITU-R P.526-15
Value of K Exceeded for 99.99% (ke)	0.40	Propagation	ITU-R P.530-17
Excess Path Loss at ke	0.00 dB	Rain Rate	ITU-R P.837-7
0.01% Rain rate	31.36 mm/hr	Refractivity Index	ITU-R P.453-14
Free Space Path Loss	89.44 dB		

Bill of Materials

Part Number	Qty	Description
C000000L065	2	Gigabit Surge Suppressor (30V)
C050900C063	2	ePMP 1000: 5 GHz Force 200AR5-25 High Gain Radio (EU) (EU cord). Kit includes radio with antenna, power supply, line cord and mounting bracket
EW-E2EPF200-WW	2	ePMP Force 200 Extended Warranty, 2 Addl Years



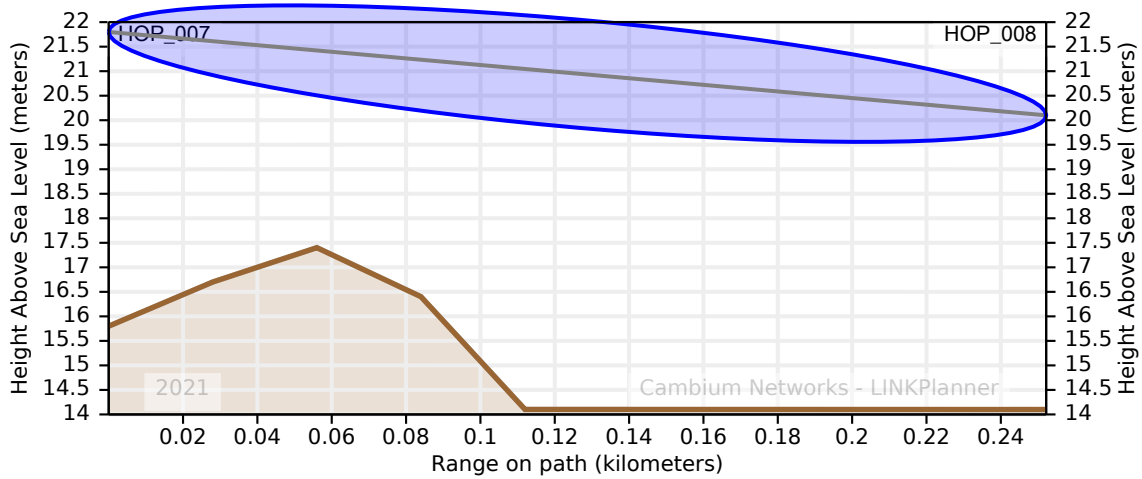
HOP_007 direzione HOP_008



Equipment: Cambium Networks ePMP Force 200 Integrated

Cambium Networks ePMP Force 200 @ 6 m

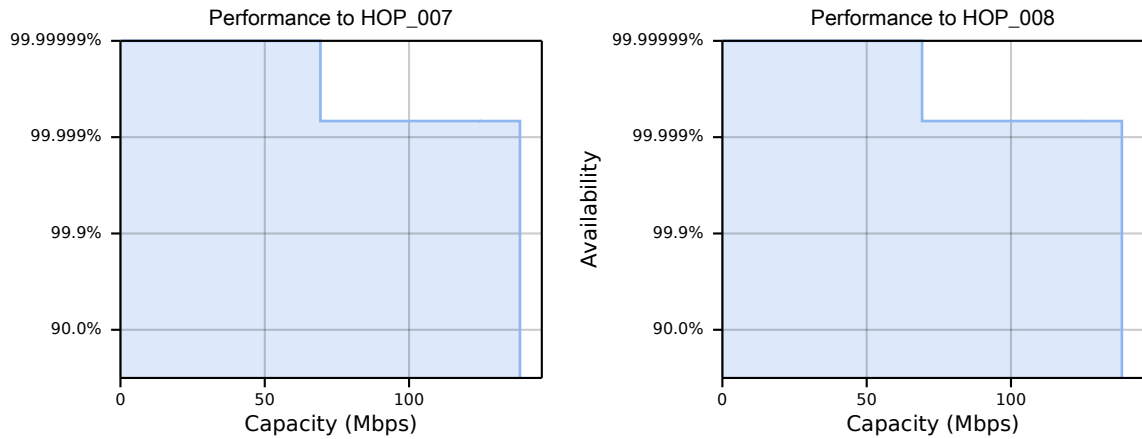
Cambium Networks ePMP Force 200 @ 6 m



	Performance to HOP_007	Performance to HOP_008
Mean IP	138.42 Mbps	138.42 Mbps
IP Availability	100.0000 % for 1.0 Mbps	100.0000 % for 1.0 Mbps

Link Summary			
Link Length	0.252 km	System Gain Margin	33.68 dB
Band	5.4 GHz	Mean Aggregate Data Rate	276.84 Mbps
Regulation	Italy	Annual Link Availability	100.0000 %
Modulation	Adaptive	Annual Link Unavailability	1 secs/year
Bandwidth	40 MHz	Frame Size	1518 Bytes
Total Path Loss	95.44 dB	Prediction Model	ITU-R P.530-17
System Gain	129.13 dB		

Performance Charts



Climatic Factors, Losses and Standards

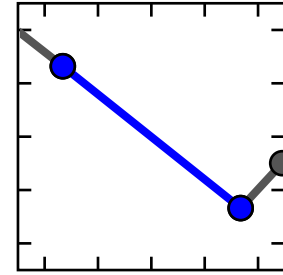
dN/dH not exceeded for 1% of time	-360.56 N units/km	Gaseous Absorption Loss	0.00 dB
Area roughness 110x110km	189.56 metre	Link Type	Line-of-Sight
Geoclimatic factor	3.28e-05	Excess Path Loss	0.00 dB
Fade Occurrence Factor (P0)	1.41e-09	Atmospheric Gasses	ITU-R P.676-12, ITU-R P.835-6
Path inclination	6.74 mr	Diffraction Loss	ITU-R P.526-15
Value of K Exceeded for 99.99% (ke)	0.40	Propagation	ITU-R P.530-17
Excess Path Loss at ke	0.00 dB	Rain Rate	ITU-R P.837-7
0.01% Rain rate	31.37 mm/hr	Refractivity Index	ITU-R P.453-14
Free Space Path Loss	95.44 dB		

Bill of Materials

Part Number	Qty	Description
C000000L065	2	Gigabit Surge Suppressor (30V)
C050900C063	2	ePMP 1000: 5 GHz Force 200AR5-25 High Gain Radio (EU) (EU cord). Kit includes radio with antenna, power supply, line cord and mounting bracket
EW-E2EPF200-WW	2	ePMP Force 200 Extended Warranty, 2 Addl Years



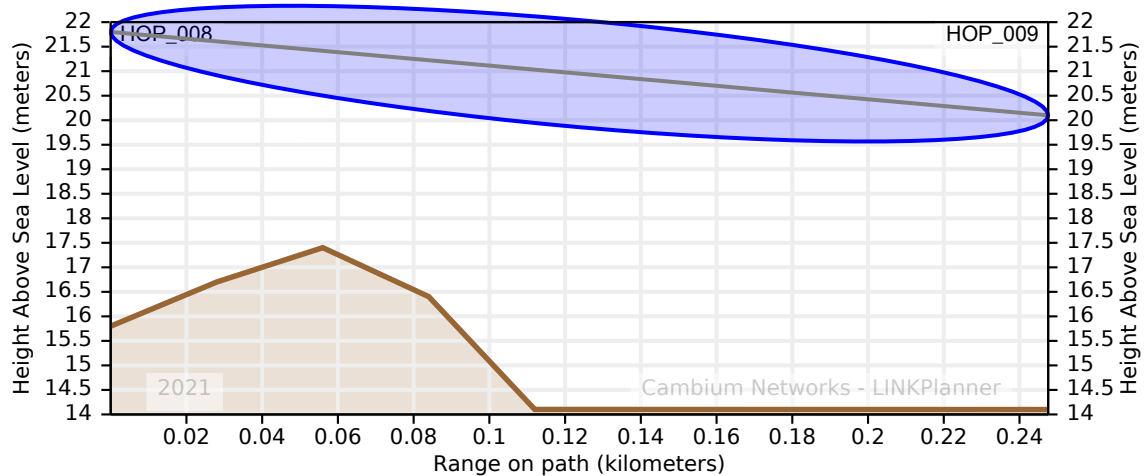
HOP_008 direzione HOP_009



Equipment: Cambium Networks ePMP Force 200 Integrated

Cambium Networks ePMP Force 200 @ 6 m

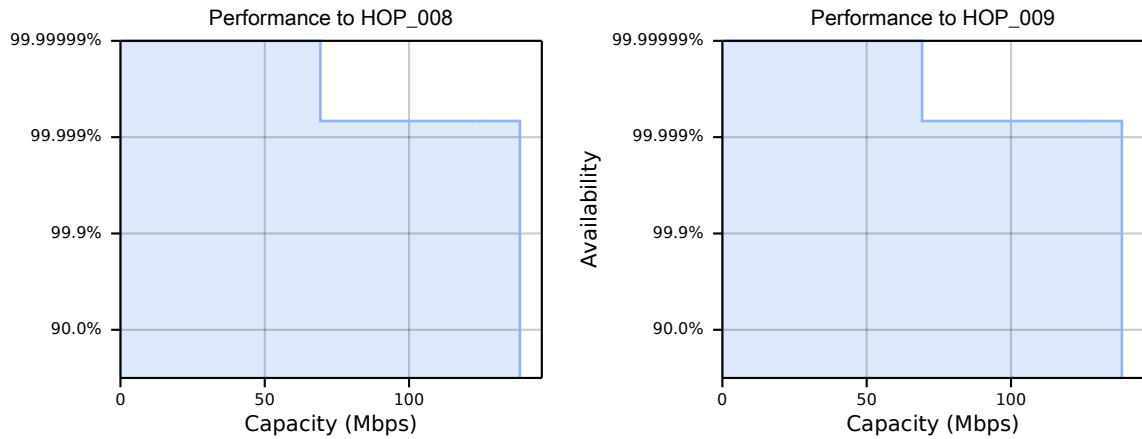
Cambium Networks ePMP Force 200 @ 6 m



	Performance to HOP_008	Performance to HOP_009
Mean IP	138.42 Mbps	138.42 Mbps
IP Availability	100.0000 % for 1.0 Mbps	100.0000 % for 1.0 Mbps

Link Summary			
Link Length	0.248 km	System Gain Margin	33.84 dB
Band	5.4 GHz	Mean Aggregate Data Rate	276.84 Mbps
Regulation	Italy	Annual Link Availability	100.0000 %
Modulation	Adaptive	Annual Link Unavailability	1 secs/year
Bandwidth	40 MHz	Frame Size	1518 Bytes
Total Path Loss	95.28 dB	Prediction Model	ITU-R P.530-17
System Gain	129.13 dB		

Performance Charts



Climatic Factors, Losses and Standards

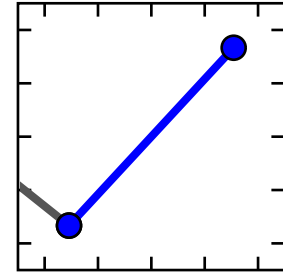
dN/dH not exceeded for 1% of time	-360.28 N units/km	Gaseous Absorption Loss	0.00 dB
Area roughness 110x110km	189.50 metre	Link Type	Line-of-Sight
Geoclimatic factor	3.27e-05	Excess Path Loss	0.00 dB
Fade Occurrence Factor (P0)	1.30e-09	Atmospheric Gasses	ITU-R P.676-12, ITU-R P.835-6
Path inclination	6.87 mr	Diffraction Loss	ITU-R P.526-15
Value of K Exceeded for 99.99% (ke)	0.40	Propagation	ITU-R P.530-17
Excess Path Loss at ke	0.00 dB	Rain Rate	ITU-R P.837-7
0.01% Rain rate	31.37 mm/hr	Refractivity Index	ITU-R P.453-14
Free Space Path Loss	95.28 dB		

Bill of Materials

Part Number	Qty	Description
C000000L065	2	Gigabit Surge Suppressor (30V)
C050900C063	2	ePMP 1000: 5 GHz Force 200AR5-25 High Gain Radio (EU) (EU cord). Kit includes radio with antenna, power supply, line cord and mounting bracket
EW-E2EPF200-WW	2	ePMP Force 200 Extended Warranty, 2 Addl Years



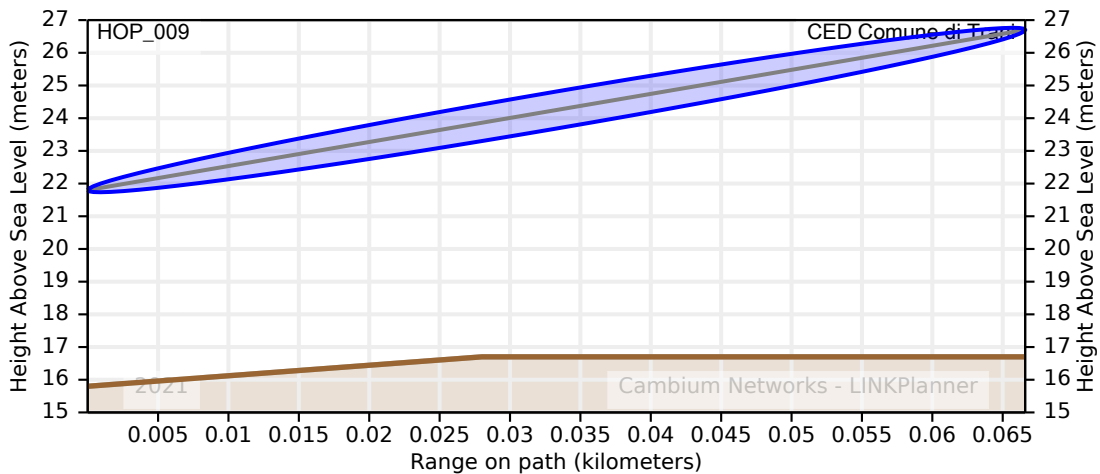
HOP_009 direzione CED Comune di Trani



Equipment: Cambium Networks ePMP Force 200 Integrated

Cambium Networks ePMP Force 200 @ 6 m

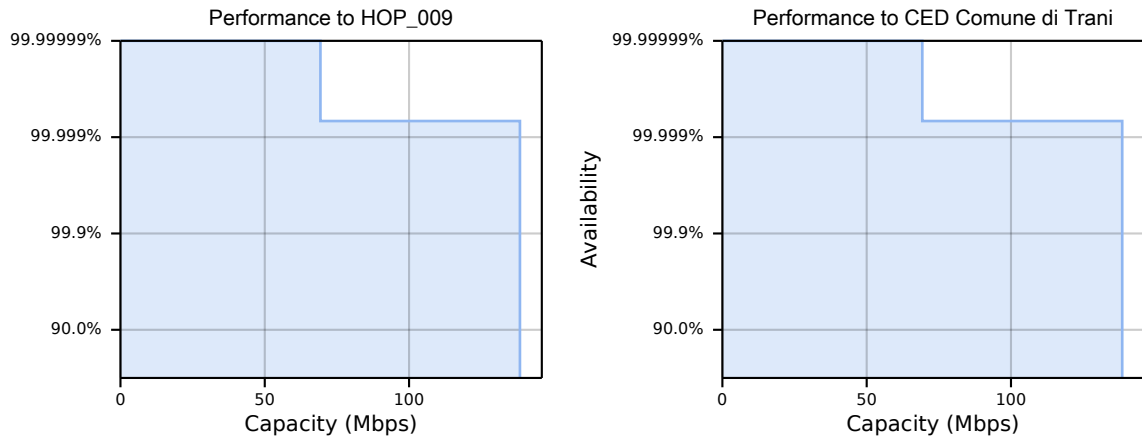
Cambium Networks ePMP Force 200 @ 10 m



	Performance to HOP_009	Performance to CED Comune di Trani
Mean IP	138.42 Mbps	138.54 Mbps
IP Availability	100.0000 % for 1.0 Mbps	100.0000 % for 1.0 Mbps

Link Summary			
Link Length	0.067 km	System Gain Margin	35.25 dB
Band	5.4 GHz	Mean Aggregate Data Rate	276.96 Mbps
Regulation	Italy	Annual Link Availability	100.0000 %
Modulation	Adaptive	Annual Link Unavailability	1 secs/year
Bandwidth	40 MHz	Frame Size	1518 Bytes
Total Path Loss	83.88 dB	Prediction Model	ITU-R P.530-17
System Gain	119.13 dB		

Performance Charts



Climatic Factors, Losses and Standards

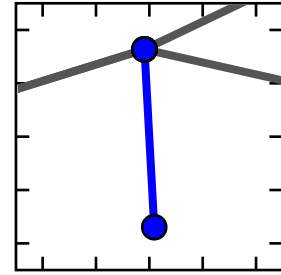
dN/dH not exceeded for 1% of time	-360.20 N units/km	Gaseous Absorption Loss	0.00 dB
Area roughness 110x110km	189.41 metre	Link Type	Line-of-Sight
Geoclimatic factor	3.27e-05	Excess Path Loss	0.00 dB
Fade Occurrence Factor (P0)	1.47e-12	Atmospheric Gasses	ITU-R P.676-12, ITU-R P.835-6
Path inclination	73.58 mr	Diffraction Loss	ITU-R P.526-15
Value of K Exceeded for 99.99% (ke)	0.40	Propagation	ITU-R P.530-17
Excess Path Loss at ke	0.00 dB	Rain Rate	ITU-R P.837-7
0.01% Rain rate	31.38 mm/hr	Refractivity Index	ITU-R P.453-14
Free Space Path Loss	83.88 dB		

Bill of Materials

Part Number	Qty	Description
C000000L065	2	Gigabit Surge Suppressor (30V)
C050900C063	2	ePMP 1000: 5 GHz Force 200AR5-25 High Gain Radio (EU) (EU cord). Kit includes radio with antenna, power supply, line cord and mounting bracket
EW-E2EPF200-WW	2	ePMP Force 200 Extended Warranty, 2 Addl Years



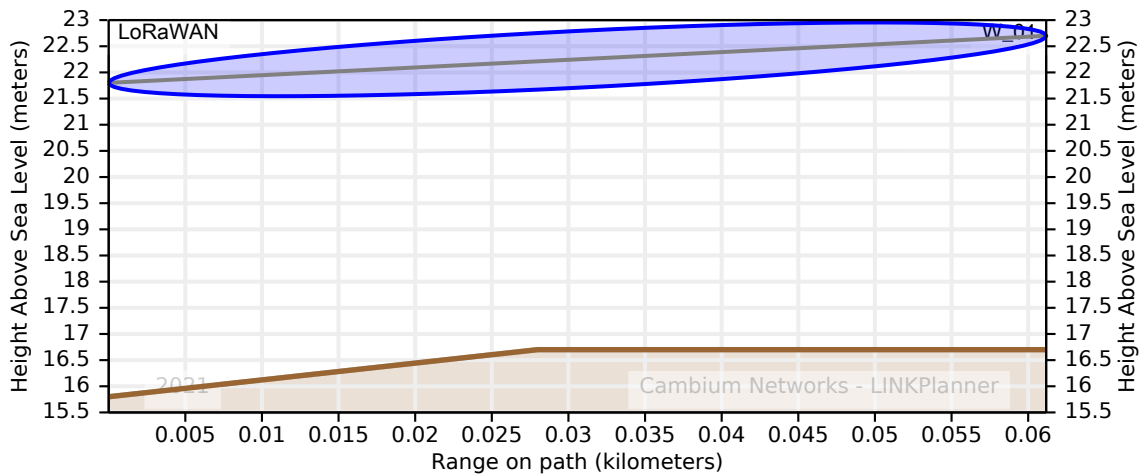
LoRaWAN direzione W_01



Equipment: Cambium Networks ePMP Force 200 Integrated

Cambium Networks ePMP Force 200 @ 6 m

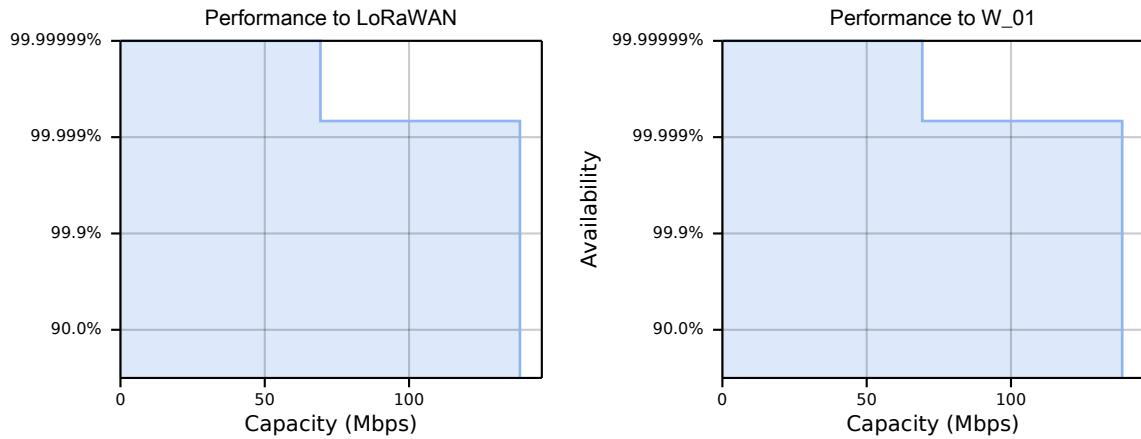
Cambium Networks ePMP Force 200 @ 6 m



	Performance to LoRaWAN	Performance to W_01
Mean IP	138.42 Mbps	138.54 Mbps
IP Availability	100.0000 % for 1.0 Mbps	100.0000 % for 1.0 Mbps

Link Summary			
Link Length	0.061 km	System Gain Margin	35.99 dB
Band	5.4 GHz	Mean Aggregate Data Rate	276.96 Mbps
Regulation	Italy	Annual Link Availability	100.0000 %
Modulation	Adaptive	Annual Link Unavailability	1 secs/year
Bandwidth	40 MHz	Frame Size	1518 Bytes
Total Path Loss	83.14 dB	Prediction Model	ITU-R P.530-17
System Gain	119.13 dB		

Performance Charts



Climatic Factors, Losses and Standards

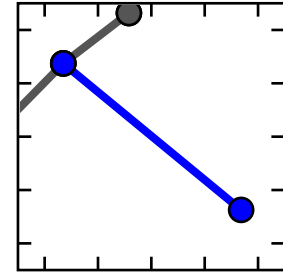
dN/dH not exceeded for 1% of time	-362.36 N units/km	Gaseous Absorption Loss	0.00 dB
Area roughness 110x110km	188.26 metre	Link Type	Line-of-Sight
Geoclimatic factor	3.32e-05	Excess Path Loss	0.00 dB
Fade Occurrence Factor (P0)	5.57e-12	Atmospheric Gasses	ITU-R P.676-12, ITU-R P.835-6
Path inclination	14.71 mr	Diffraction Loss	ITU-R P.526-15
Value of K Exceeded for 99.99% (ke)	0.40	Propagation	ITU-R P.530-17
Excess Path Loss at ke	0.00 dB	Rain Rate	ITU-R P.837-7
0.01% Rain rate	31.40 mm/hr	Refractivity Index	ITU-R P.453-14
Free Space Path Loss	83.14 dB		

Bill of Materials

Part Number	Qty	Description
C000000L065	2	Gigabit Surge Suppressor (30V)
C050900C063	2	ePMP 1000: 5 GHz Force 200AR5-25 High Gain Radio (EU) (EU cord). Kit includes radio with antenna, power supply, line cord and mounting bracket
EW-E2EPF200-WW	2	ePMP Force 200 Extended Warranty, 2 Addl Years



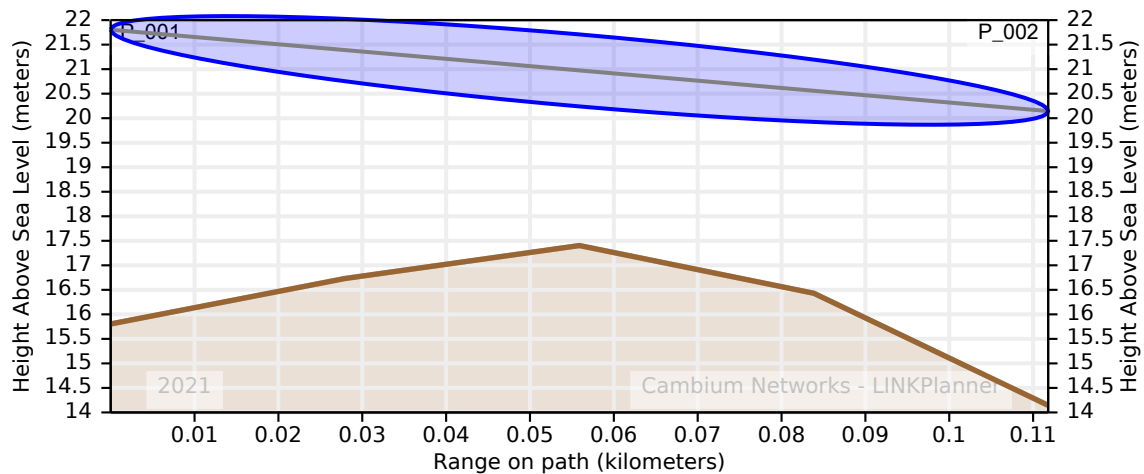
P_001 direzione P_002



Equipment: Cambium Networks ePMP Force 200 Integrated

Cambium Networks ePMP Force 200 @ 6 m

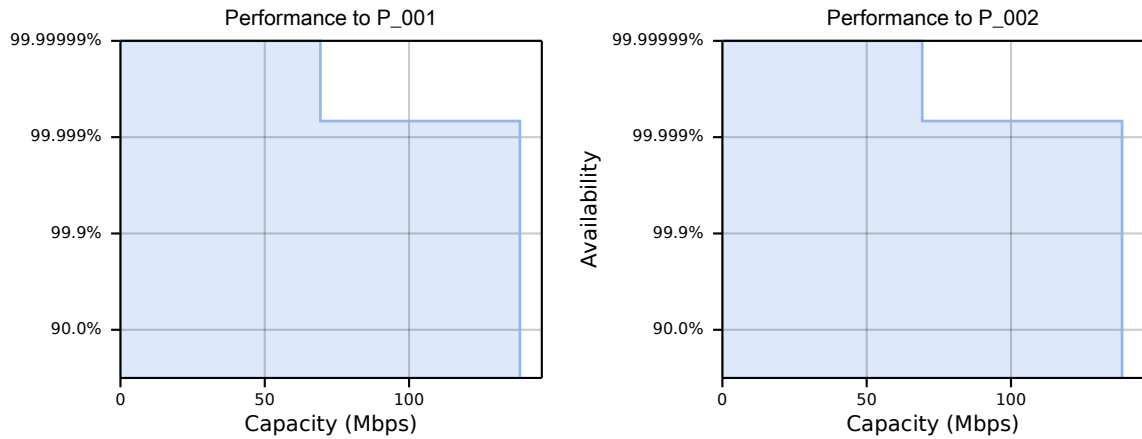
Cambium Networks ePMP Force 200 @ 6 m



	Performance to P_001	Performance to P_002
Mean IP	138.42 Mbps	138.49 Mbps
IP Availability	100.0000 % for 1.0 Mbps	100.0000 % for 1.0 Mbps

Link Summary			
Link Length	0.112 km	System Gain Margin	35.75 dB
Band	5.4 GHz	Mean Aggregate Data Rate	276.91 Mbps
Regulation	Italy	Annual Link Availability	100.0000 %
Modulation	Adaptive	Annual Link Unavailability	1 secs/year
Bandwidth	40 MHz	Frame Size	1518 Bytes
Total Path Loss	88.38 dB	Prediction Model	ITU-R P.530-17
System Gain	124.13 dB		

Performance Charts



Climatic Factors, Losses and Standards

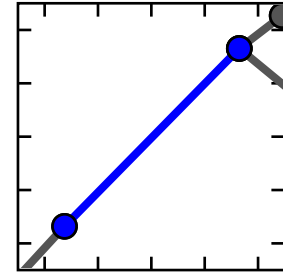
dN/dH not exceeded for 1% of time	-361.69 N units/km	Gaseous Absorption Loss	0.00 dB
Area roughness 110x110km	188.83 metre	Link Type	Line-of-Sight
Geoclimatic factor	3.31e-05	Excess Path Loss	0.00 dB
Fade Occurrence Factor (P0)	4.28e-11	Atmospheric Gasses	ITU-R P.676-12, ITU-R P.835-6
Path inclination	14.84 mr	Diffraction Loss	ITU-R P.526-15
Value of K Exceeded for 99.99% (ke)	0.40	Propagation	ITU-R P.530-17
Excess Path Loss at ke	0.00 dB	Rain Rate	ITU-R P.837-7
0.01% Rain rate	31.39 mm/hr	Refractivity Index	ITU-R P.453-14
Free Space Path Loss	88.38 dB		

Bill of Materials

Part Number	Qty	Description
C000000L065	2	Gigabit Surge Suppressor (30V)
C050900C063	2	ePMP 1000: 5 GHz Force 200AR5-25 High Gain Radio (EU) (EU cord). Kit includes radio with antenna, power supply, line cord and mounting bracket
EW-E2EPF200-WW	2	ePMP Force 200 Extended Warranty, 2 Addl Years



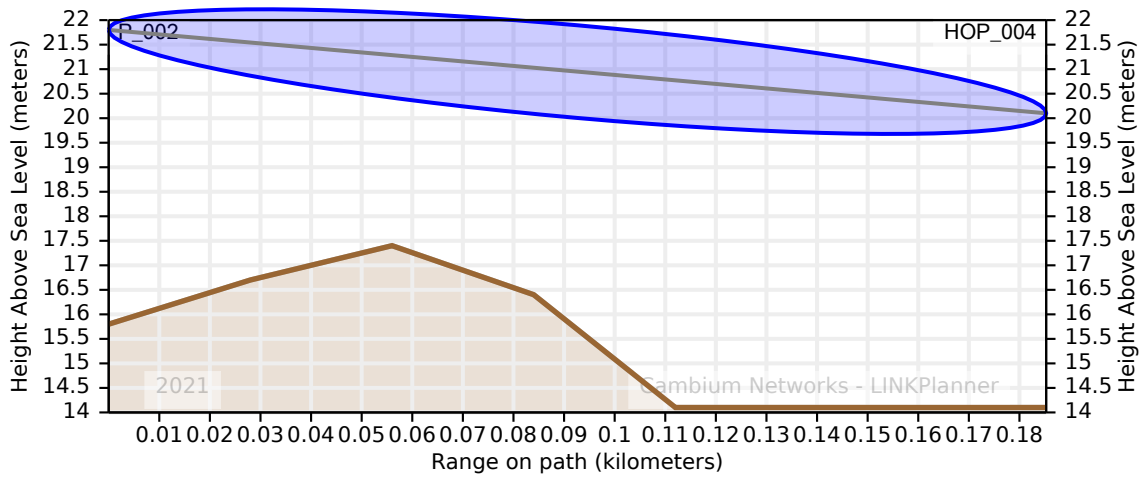
P_002 direzione HOP_004



Equipment: Cambium Networks ePMP Force 200 Integrated

Cambium Networks ePMP Force 200 @ 6 m

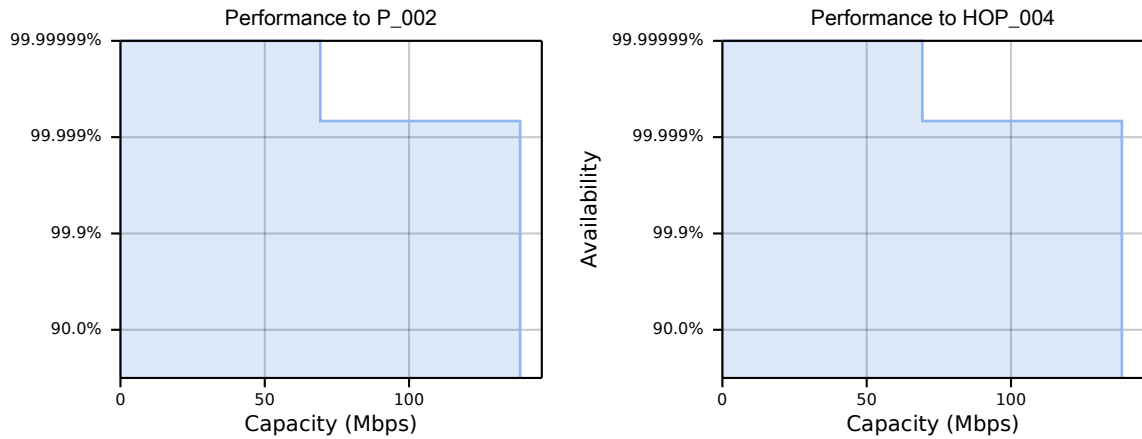
Cambium Networks ePMP Force 200 @ 6 m



	Performance to P_002	Performance to HOP_004
Mean IP	138.49 Mbps	138.42 Mbps
IP Availability	100.0000 % for 1.0 Mbps	100.0000 % for 1.0 Mbps

Link Summary			
Link Length	0.185 km	System Gain Margin	35.36 dB
Band	5.4 GHz	Mean Aggregate Data Rate	276.91 Mbps
Regulation	Italy	Annual Link Availability	100.0000 %
Modulation	Adaptive	Annual Link Unavailability	1 secs/year
Bandwidth	40 MHz	Frame Size	1518 Bytes
Total Path Loss	92.77 dB	Prediction Model	ITU-R P.530-17
System Gain	128.13 dB		

Performance Charts



Climatic Factors, Losses and Standards

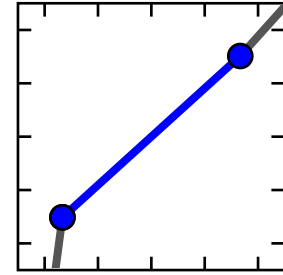
dN/dH not exceeded for 1% of time	-361.57 N units/km	Gaseous Absorption Loss	0.00 dB
Area roughness 110x110km	189.01 metre	Link Type	Line-of-Sight
Geoclimatic factor	3.30e-05	Excess Path Loss	0.00 dB
Fade Occurrence Factor (P0)	3.76e-10	Atmospheric Gasses	ITU-R P.676-12, ITU-R P.835-6
Path inclination	9.18 mr	Diffraction Loss	ITU-R P.526-15
Value of K Exceeded for 99.99% (ke)	0.40	Propagation	ITU-R P.530-17
Excess Path Loss at ke	0.00 dB	Rain Rate	ITU-R P.837-7
0.01% Rain rate	31.38 mm/hr	Refractivity Index	ITU-R P.453-14
Free Space Path Loss	92.76 dB		

Bill of Materials

Part Number	Qty	Description
C000000L065	2	Gigabit Surge Suppressor (30V)
C050900C063	2	ePMP 1000: 5 GHz Force 200AR5-25 High Gain Radio (EU) (EU cord). Kit includes radio with antenna, power supply, line cord and mounting bracket
EW-E2EPF200-WW	2	ePMP Force 200 Extended Warranty, 2 Addl Years



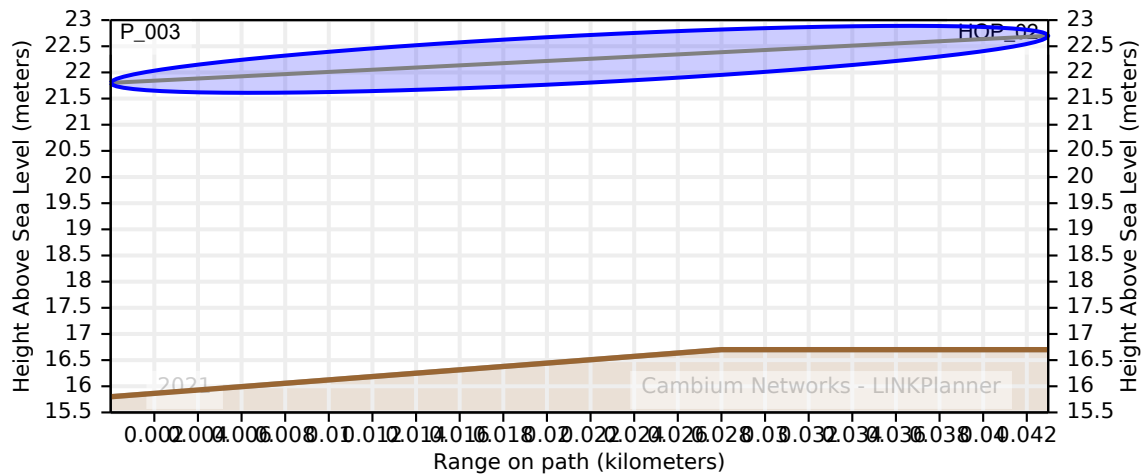
P_003 direzione HOP_02



Equipment: Cambium Networks ePMP Force 200 Integrated

Cambium Networks ePMP Force 200 @ 6 m

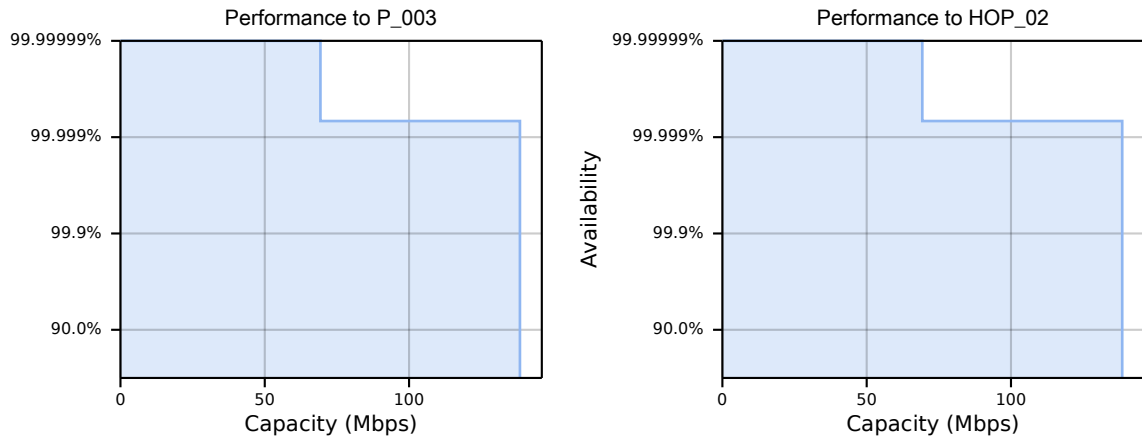
Cambium Networks ePMP Force 200 @ 6 m



	Performance to P_003	Performance to HOP_02
Mean IP	138.42 Mbps	138.54 Mbps
IP Availability	100.0000 % for 1.0 Mbps	100.0000 % for 1.0 Mbps

Link Summary			
Link Length	0.043 km	System Gain Margin	41.11 dB
Band	5.4 GHz	Mean Aggregate Data Rate	276.96 Mbps
Regulation	Italy	Annual Link Availability	100.0000 %
Modulation	Adaptive	Annual Link Unavailability	1 secs/year
Bandwidth	40 MHz	Frame Size	1518 Bytes
Total Path Loss	80.07 dB	Prediction Model	ITU-R P.530-17
System Gain	121.18 dB		

Performance Charts



Climatic Factors, Losses and Standards

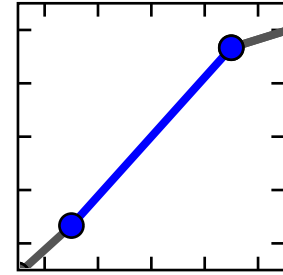
dN/dH not exceeded for 1% of time	-361.97 N units/km	Gaseous Absorption Loss	0.00 dB
Area roughness 110x110km	188.68 metre	Link Type	Line-of-Sight
Geoclimatic factor	3.31e-05	Excess Path Loss	0.00 dB
Fade Occurrence Factor (P0)	1.18e-12	Atmospheric Gasses	ITU-R P.676-12, ITU-R P.835-6
Path inclination	20.94 mr	Diffraction Loss	ITU-R P.526-15
Value of K Exceeded for 99.99% (ke)	0.40	Propagation	ITU-R P.530-17
Excess Path Loss at ke	0.00 dB	Rain Rate	ITU-R P.837-7
0.01% Rain rate	31.39 mm/hr	Refractivity Index	ITU-R P.453-14
Free Space Path Loss	80.07 dB		

Bill of Materials

Part Number	Qty	Description
C000000L065	2	Gigabit Surge Suppressor (30V)
C050900C063	2	ePMP 1000: 5 GHz Force 200AR5-25 High Gain Radio (EU) (EU cord). Kit includes radio with antenna, power supply, line cord and mounting bracket
EW-E2EPF200-WW	2	ePMP Force 200 Extended Warranty, 2 Addl Years



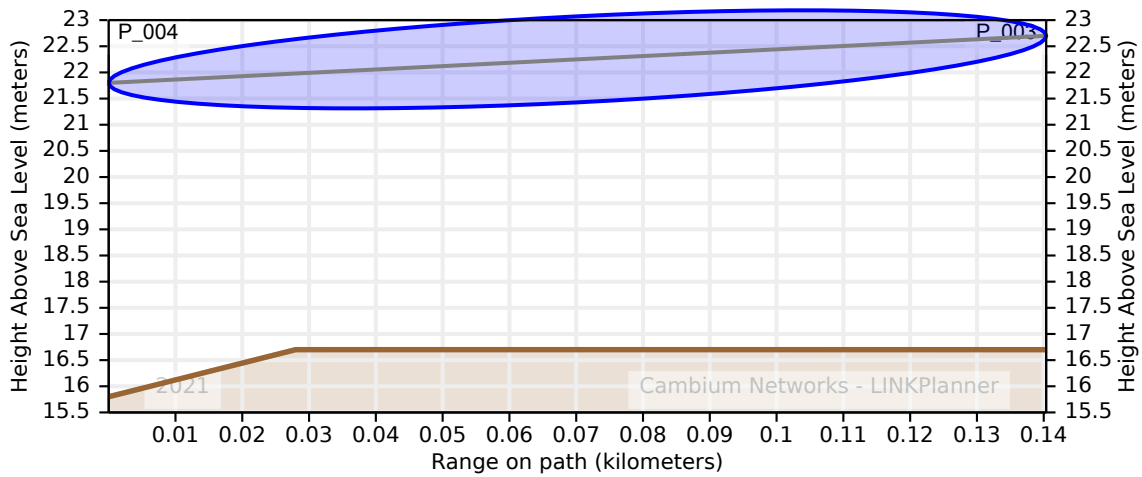
P_004 direzione P_003



Equipment: Cambium Networks ePMP Force 200 Integrated

Cambium Networks ePMP Force 200 @ 6 m

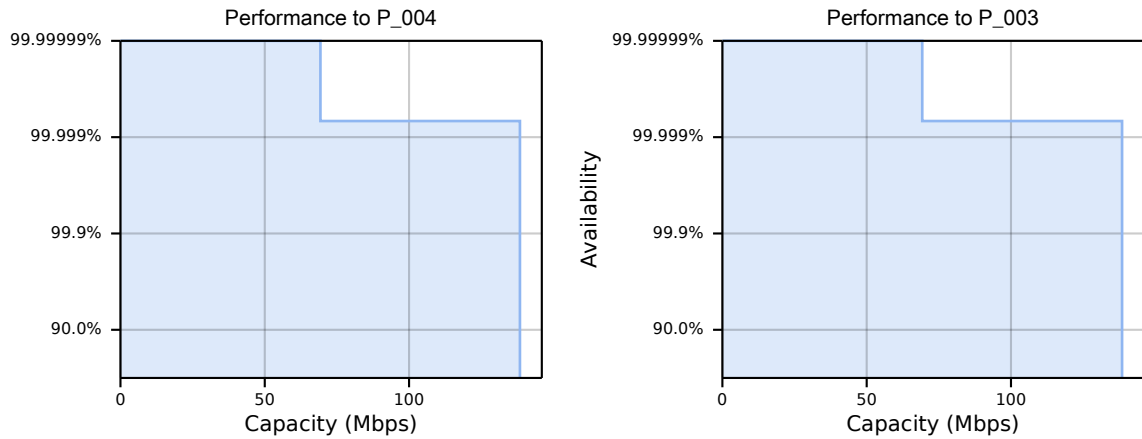
Cambium Networks ePMP Force 200 @ 6 m



	Performance to P_004	Performance to P_003
Mean IP	138.42 Mbps	138.49 Mbps
IP Availability	100.0000 % for 1.0 Mbps	100.0000 % for 1.0 Mbps

Link Summary			
Link Length	0.140 km	System Gain Margin	35.77 dB
Band	5.4 GHz	Mean Aggregate Data Rate	276.91 Mbps
Regulation	Italy	Annual Link Availability	100.0000 %
Modulation	Adaptive	Annual Link Unavailability	1 secs/year
Bandwidth	40 MHz	Frame Size	1518 Bytes
Total Path Loss	90.35 dB	Prediction Model	ITU-R P.530-17
System Gain	126.13 dB		

Performance Charts



Climatic Factors, Losses and Standards

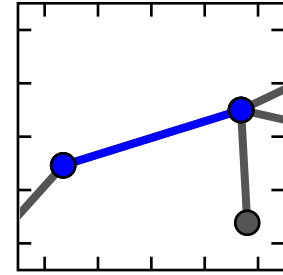
dN/dH not exceeded for 1% of time	-362.17 N units/km	Gaseous Absorption Loss	0.00 dB
Area roughness 110x110km	188.51 metre	Link Type	Line-of-Sight
Geoclimatic factor	3.32e-05	Excess Path Loss	0.00 dB
Fade Occurrence Factor (P0)	2.03e-10	Atmospheric Gasses	ITU-R P.676-12, ITU-R P.835-6
Path inclination	6.41 mr	Diffraction Loss	ITU-R P.526-15
Value of K Exceeded for 99.99% (ke)	0.40	Propagation	ITU-R P.530-17
Excess Path Loss at ke	0.00 dB	Rain Rate	ITU-R P.837-7
0.01% Rain rate	31.39 mm/hr	Refractivity Index	ITU-R P.453-14
Free Space Path Loss	90.35 dB		

Bill of Materials

Part Number	Qty	Description
C000000L065	2	Gigabit Surge Suppressor (30V)
C050900C063	2	ePMP 1000: 5 GHz Force 200AR5-25 High Gain Radio (EU) (EU cord). Kit includes radio with antenna, power supply, line cord and mounting bracket
EW-E2EPF200-WW	2	ePMP Force 200 Extended Warranty, 2 Addl Years



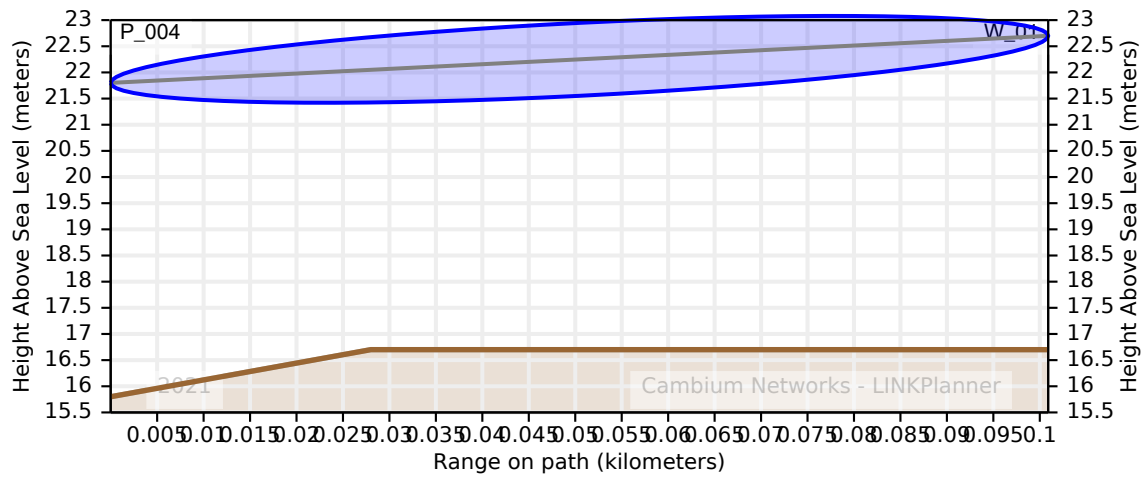
P_004 direzione W_01



Equipment: Cambium Networks ePMP Force 200 Integrated

Cambium Networks ePMP Force 200 @ 6 m

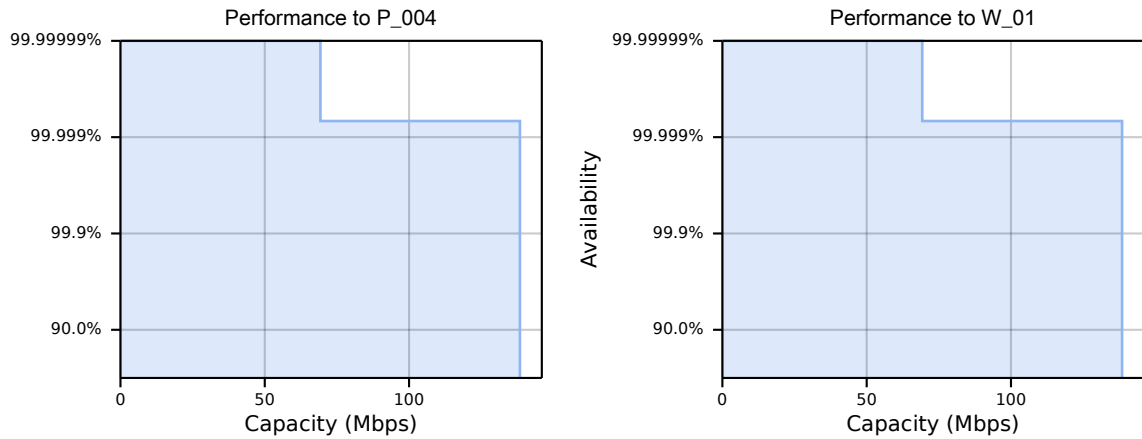
Cambium Networks ePMP Force 200 @ 6 m



	Performance to P_004	Performance to W_01
Mean IP	138.42 Mbps	138.49 Mbps
IP Availability	100.0000 % for 1.0 Mbps	100.0000 % for 1.0 Mbps

Link Summary			
Link Length	0.101 km	System Gain Margin	35.64 dB
Band	5.4 GHz	Mean Aggregate Data Rate	276.91 Mbps
Regulation	Italy	Annual Link Availability	100.0000 %
Modulation	Adaptive	Annual Link Unavailability	1 secs/year
Bandwidth	40 MHz	Frame Size	1518 Bytes
Total Path Loss	87.49 dB	Prediction Model	ITU-R P.530-17
System Gain	123.13 dB		

Performance Charts



Climatic Factors, Losses and Standards

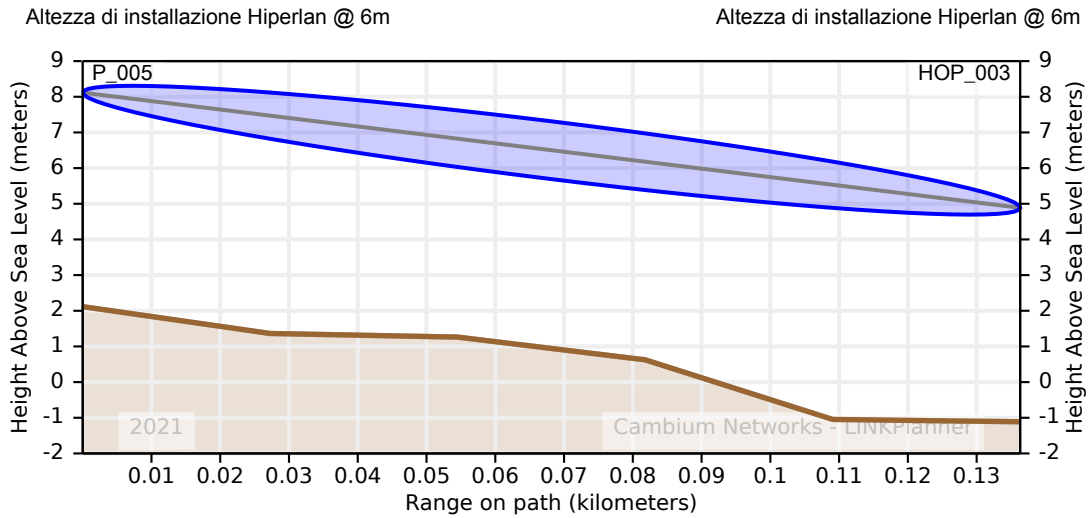
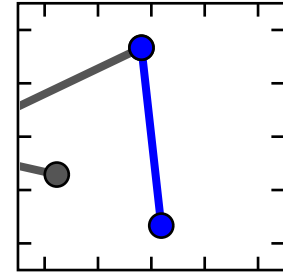
dN/dH not exceeded for 1% of time	-362.38 N units/km	Gaseous Absorption Loss	0.00 dB
Area roughness 110x110km	188.31 metre	Link Type	Line-of-Sight
Geoclimatic factor	3.32e-05	Excess Path Loss	0.00 dB
Fade Occurrence Factor (P0)	4.90e-11	Atmospheric Gasses	ITU-R P.676-12, ITU-R P.835-6
Path inclination	8.92 mr	Diffraction Loss	ITU-R P.526-15
Value of K Exceeded for 99.99% (ke)	0.40	Propagation	ITU-R P.530-17
Excess Path Loss at ke	0.00 dB	Rain Rate	ITU-R P.837-7
0.01% Rain rate	31.40 mm/hr	Refractivity Index	ITU-R P.453-14
Free Space Path Loss	87.49 dB		

Bill of Materials

Part Number	Qty	Description
C000000L065	2	Gigabit Surge Suppressor (30V)
C050900C063	2	ePMP 1000: 5 GHz Force 200AR5-25 High Gain Radio (EU) (EU cord). Kit includes radio with antenna, power supply, line cord and mounting bracket
EW-E2EPF200-WW	2	ePMP Force 200 Extended Warranty, 2 Addl Years



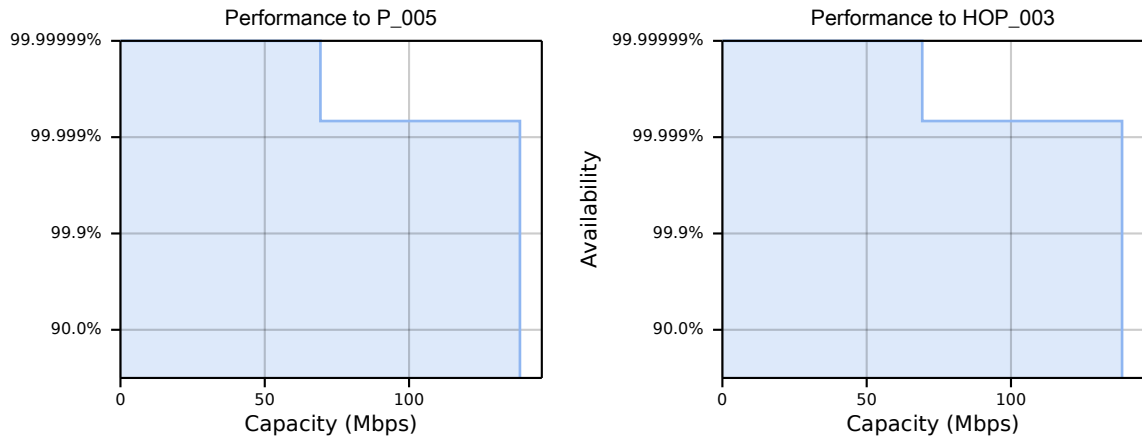
P_005 direzione HOP_003



	Performance to P_005	Performance to HOP_003
Mean IP	138.42 Mbps	138.49 Mbps
IP Availability	100.0000 % for 1.0 Mbps	100.0000 % for 1.0 Mbps

Link Summary			
Link Length	0.136 km	System Gain Margin	35.03 dB
Band	5.4 GHz	Mean Aggregate Data Rate	276.91 Mbps
Regulation	Italy	Annual Link Availability	100.0000 %
Modulation	Adaptive	Annual Link Unavailability	1 secs/year
Bandwidth	40 MHz	Frame Size	1518 Bytes
Total Path Loss	90.10 dB	Prediction Model	ITU-R P.530-17
System Gain	125.13 dB		

Performance Charts



Climatic Factors, Losses and Standards

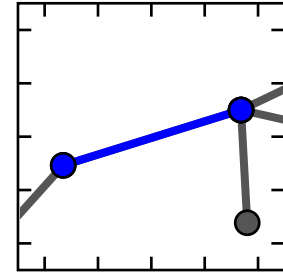
dN/dH not exceeded for 1% of time	-362.53 N units/km	Gaseous Absorption Loss	0.00 dB
Area roughness 110x110km	188.00 metre	Link Type	Line-of-Sight
Geoclimatic factor	3.33e-05	Excess Path Loss	0.00 dB
Fade Occurrence Factor (P0)	5.50e-11	Atmospheric Gasses	ITU-R P.676-12, ITU-R P.835-6
Path inclination	23.68 mr	Diffraction Loss	ITU-R P.526-15
Value of K Exceeded for 99.99% (ke)	0.40	Propagation	ITU-R P.530-17
Excess Path Loss at ke	0.00 dB	Rain Rate	ITU-R P.837-7
0.01% Rain rate	31.41 mm/hr	Refractivity Index	ITU-R P.453-14
Free Space Path Loss	90.10 dB		

Bill of Materials

Part Number	Qty	Description
C000000L065	2	Gigabit Surge Suppressor (30V)
C050900C063	2	ePMP 1000: 5 GHz Force 200AR5-25 High Gain Radio (EU) (EU cord). Kit includes radio with antenna, power supply, line cord and mounting bracket
EW-E2EPF200-WW	2	ePMP Force 200 Extended Warranty, 2 Addl Years



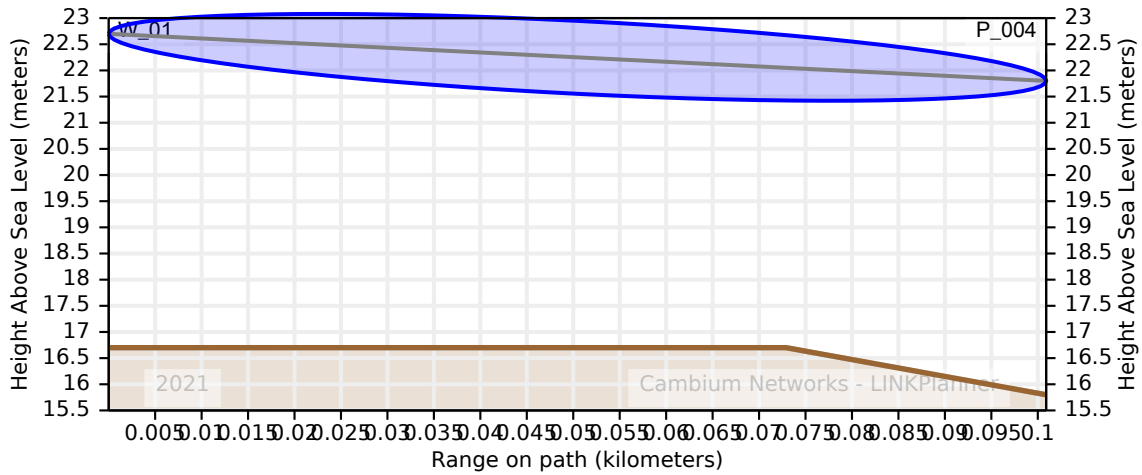
W_01 direzione P_004



Equipment: Cambium Networks ePMP Force 200 Integrated

Cambium Networks ePMP Force 200 @ 6 m

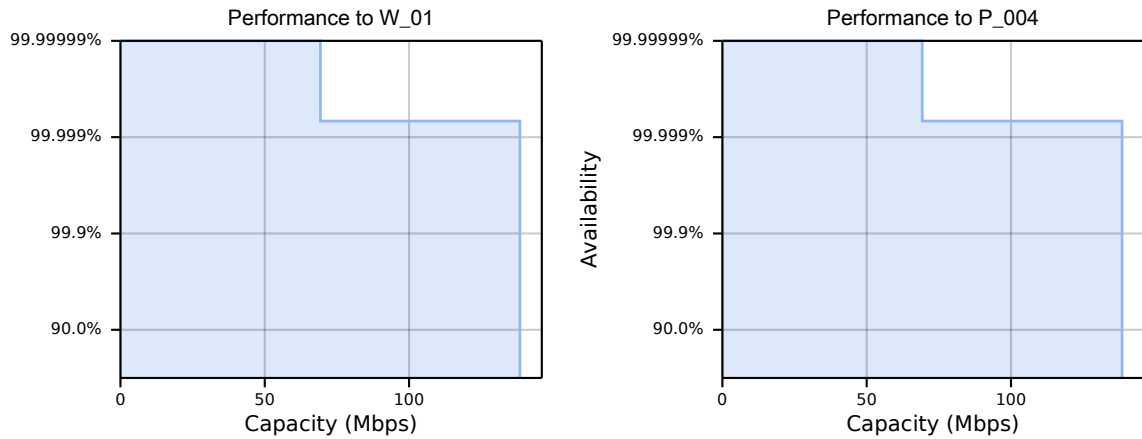
Cambium Networks ePMP Force 200 @ 6 m



	Performance to W_01	Performance to P_004
Mean IP	138.42 Mbps	138.49 Mbps
IP Availability	100.0000 % for 1.0 Mbps	100.0000 % for 1.0 Mbps

Link Summary			
Link Length	0.101 km	System Gain Margin	35.64 dB
Band	5.4 GHz	Mean Aggregate Data Rate	276.91 Mbps
Regulation	Italy	Annual Link Availability	100.0000 %
Modulation	Adaptive	Annual Link Unavailability	1 secs/year
Bandwidth	40 MHz	Frame Size	1518 Bytes
Total Path Loss	87.49 dB	Prediction Model	ITU-R P.530-17
System Gain	123.13 dB		

Performance Charts



Climatic Factors, Losses and Standards

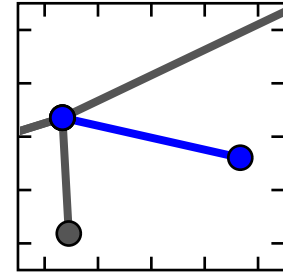
dN/dH not exceeded for 1% of time	-362.38 N units/km	Gaseous Absorption Loss	0.00 dB
Area roughness 110x110km	188.31 metre	Link Type	Line-of-Sight
Geoclimatic factor	3.32e-05	Excess Path Loss	0.00 dB
Fade Occurrence Factor (P0)	4.90e-11	Atmospheric Gasses	ITU-R P.676-12, ITU-R P.835-6
Path inclination	8.92 mr	Diffraction Loss	ITU-R P.526-15
Value of K Exceeded for 99.99% (ke)	0.40	Propagation	ITU-R P.530-17
Excess Path Loss at ke	0.00 dB	Rain Rate	ITU-R P.837-7
0.01% Rain rate	31.40 mm/hr	Refractivity Index	ITU-R P.453-14
Free Space Path Loss	87.49 dB		

Bill of Materials

Part Number	Qty	Description
C000000L065	2	Gigabit Surge Suppressor (30V)
C050900C063	2	ePMP 1000: 5 GHz Force 200AR5-25 High Gain Radio (EU) (EU cord). Kit includes radio with antenna, power supply, line cord and mounting bracket
EW-E2EPF200-WW	2	ePMP Force 200 Extended Warranty, 2 Addl Years



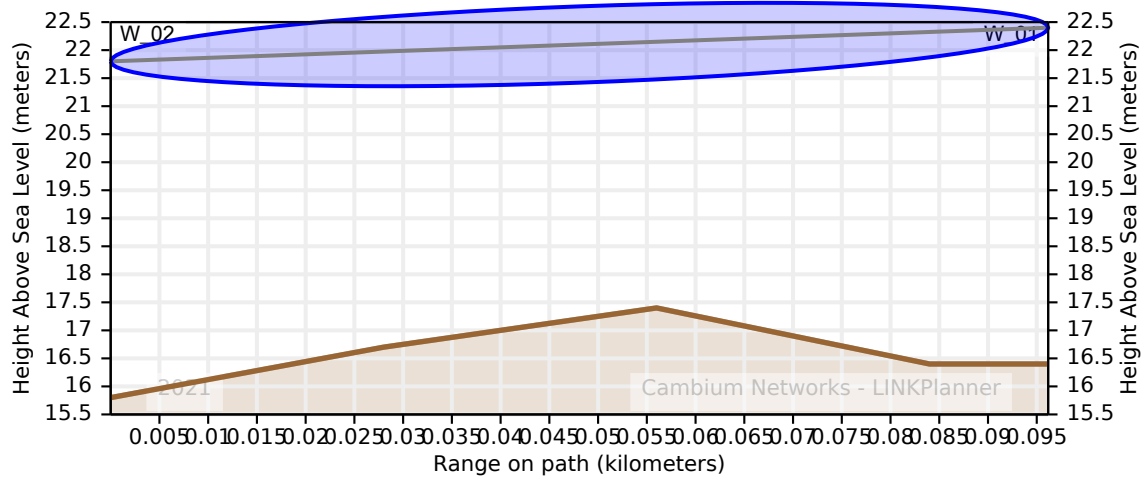
W_02 direzione W_01



Equipment: Cambium Networks ePMP Force 200 Integrated

Cambium Networks ePMP Force 200 @ 6 m

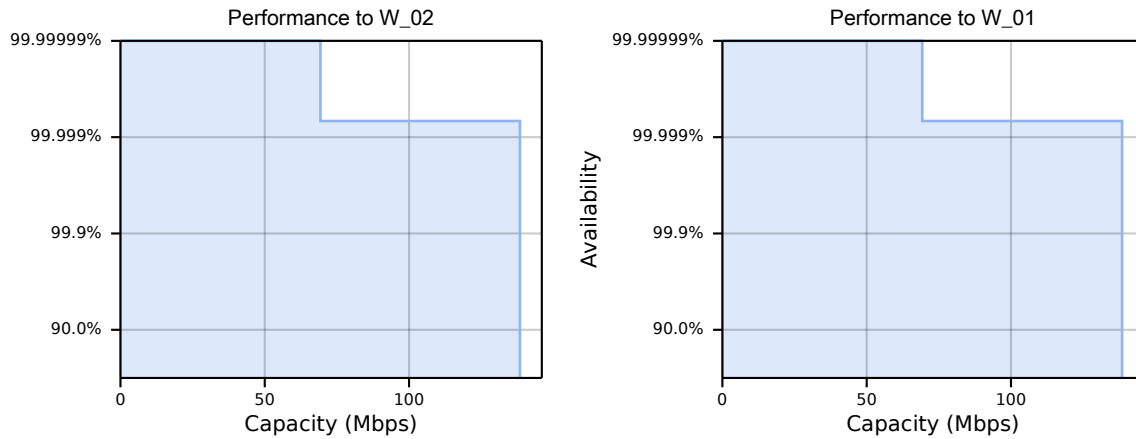
Cambium Networks ePMP Force 200 @ 6 m



	Performance to W_02	Performance to W_01
Mean IP	138.42 Mbps	138.49 Mbps
IP Availability	100.0000 % for 1.0 Mbps	100.0000 % for 1.0 Mbps

Link Summary			
Link Length	0.096 km	System Gain Margin	41.11 dB
Band	5.4 GHz	Mean Aggregate Data Rate	276.91 Mbps
Regulation	Italy	Annual Link Availability	100.0000 %
Modulation	Adaptive	Annual Link Unavailability	1 secs/year
Bandwidth	40 MHz	Frame Size	1518 Bytes
Total Path Loss	87.07 dB	Prediction Model	ITU-R P.530-17
System Gain	128.18 dB		

Performance Charts



Climatic Factors, Losses and Standards

dN/dH not exceeded for 1% of time	-362.43 N units/km	Gaseous Absorption Loss	0.00 dB
Area roughness 110x110km	188.18 metre	Link Type	Line-of-Sight
Geoclimatic factor	3.33e-05	Excess Path Loss	0.00 dB
Fade Occurrence Factor (P0)	5.76e-11	Atmospheric Gasses	ITU-R P.676-12, ITU-R P.835-6
Path inclination	6.24 mr	Diffraction Loss	ITU-R P.526-15
Value of K Exceeded for 99.99% (ke)	0.40	Propagation	ITU-R P.530-17
Excess Path Loss at ke	0.00 dB	Rain Rate	ITU-R P.837-7
0.01% Rain rate	31.41 mm/hr	Refractivity Index	ITU-R P.453-14
Free Space Path Loss	87.07 dB		

Bill of Materials

Part Number	Qty	Description
C000000L065	2	Gigabit Surge Suppressor (30V)
C050900C063	2	ePMP 1000: 5 GHz Force 200AR5-25 High Gain Radio (EU) (EU cord). Kit includes radio with antenna, power supply, line cord and mounting bracket
EW-E2EPF200-WW	2	ePMP Force 200 Extended Warranty, 2 Addl Years

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