SAF FreeMile™

Go 100Mbps Full Duplex Licence Free!

38GHz

26GHz

24.25GHz

Go FreeMile™

20GHz

19GHz

24.05GHz

18GHz

17GHz

SAF FreeMile all outdoor system is a new generation Licence Free 17GHz and 24GHz ISM band radio for Ethernet packet data and E1/T1 voice transmission. The new radio system combines excellent features like interference-free operation, high availability, Carrier grade 100Mbps Full Duplex Fast Ethernet capacity with no licensing cost and quick installation, traditionally associated with ISM radios. FreeMile radio also provides a user-friendly Web browser based management interface and a straightforward installation process to ensure a trouble-free experience for any user.
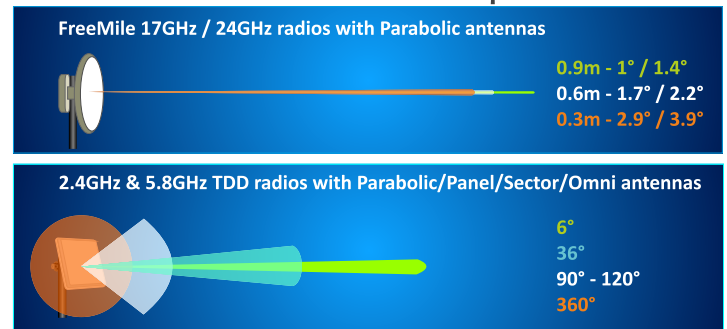
Product highlights

- Full duplex capacity 100Mbps + 2E1/T1
- Low interference comparing to links in 2.4GHz and 5.8GHz
- Hitless modulation switching (ACM) feature ensures high availability even at bad weather conditions
- Easy configuration from Web interface and up-to-date network management over SNMP protocol
- Radio polarization sensor for easier installations
- RF Spectrum analyzer

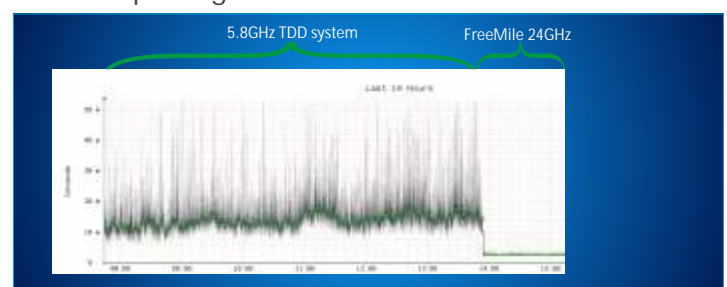## 17GHz & 24GHz features and benefits compared to 2.4GHz and 5.8GHz TDD systems

SAF FreeMile FODU is the best choice for last-mile business customers whereas 2.4GHz and 5.8GHz radios are a great alternative to back-up FreeMile links or for connections which are not of crucial importance. FreeMile 17GHz & 24GHz All Outdoor radios are far more outstanding than other medium capacity wireless equipment for the following reasons:

- Low interference & frequency re-use: 17GHz & 24GHz frequencies are not "polluted", thus there are considerably minor interference risks compared to TDD systems. Furthermore, the narrow beamwidth allows installing more links than with 2.4GHz and 5.8GHz equipment;

- Higher throughput: SAF FreeMile FODU is a Full-duplex FDD radio which means that the capacity is simultaneously transferred in both directions providing a total throughput of 100Mbps while the 2.4GHz and 5.8GHz radio provides only one-way or simplex throughput, thus, 100Mbps of "SAF FreeMile throughput" correspond to 200Mbps of "2.4GHz and 5.8GHz TDD system throughput";

- Lower latency: 2.4GHz & 5.8GHz equipment latency is always more than 2ms whereas the latency for FreeMile radios amounts to only 0.2ms maximum guaranteeing a faster response time from the server, more stable traffic management and synchronization which is important for video and voice traffic (CCTV, VoIP, Skype);

- Carrier-class equipment: FreeMile products have a higher component quality with built-in surge arrester, grounding, EMC protection, wider temperature range, resulting in the higher reliability of the link and a lower RMA percentage;

- Ethernet features: SAF FreeMile radios offer more Ethernet management options than TDD equipment – the built-in managed Layer 2 switch enables the user to configure VLAN, QoS, STP, etc.

Antenna beamwidth comparison

FreeMile 17GHz / 24GHz radios with Parabolic antennas
0.9m - 1° / 1.4°
0.6m - 1.7° / 2.2°
0.3m - 2.9° / 3.9°

2.4GHz & 5.8GHz TDD radios with Parabolic/Panel/Sector/Omni antennas
6°
36°
90° - 120°
360°

Latency illustration showing improved results by replacing 5.8GHz link with SAF FreeMile

5.8GHz TDD system   FreeMile 24GHz

GENERAL

Frequency range (GHz)	17.1 – 17.3	ERC 70-03 (100MHz offset)
	24.05 – 24.25	ERC 70-03 (100MHz offset)
	24.15 – 24.25	UK Ofcom IR2030 (70MHz offset)
	24.15 – 24.25	FCC Part15.249 (100MHz offset)
Channel bandwidth	10 / 30 MHz	
Modulation	QPSK / 16QAM / 32QAM / 64QAM	
Capacity range	100 Mbps Eth / 2 x E1/T1	
Max. permitted radiated power	+20 dBm (100mW) EIRP*	ETSI
	+32.7 dBm EIRP*	FCC
	0 dBm Tx power	IC

PERFORMANCE

Configuration	1+0
Traffic Interfaces	100 Mbps FE (RJ-45) + 2xE1/T1 (RJ-45)
Tx Power (dBm)	-25 to -15 (24GHz) / -25 to -12 (17GHz)
RSL Threshold at BER 10^{-6}	-77 (dBm) (30MHz, 32QAM, 100Mbps)
ACM (Adaptive Coding & Modulation)	Hitless

PORTS

Antenna flange	Circular, 17GHz: 13,8mm / 0,54in; 24GHz: 10,3mm / 0,41in
Ethernet with power over Ethernet cable	RJ-45 (data traffic, management port, power)
Balanced 2xE1/T1, analogue RSSI	1xRJ-45

ETHERNET

Switch Type	Managed Fast Ethernet Layer 2
Max frame size	1916 bytes
MAC table	1K entries; automatic learning and aging
Packet buffer	32KB; non-blocking store&forward
Flow Control	802.3x
VLAN support	802.1Q (up to 15 concurrent traffic VLANs)
QoS	64 level DiffServ (DSCP) or 8 level 802.1P mapped in 4 prioritization queues with VLAN support
Spanning Tree Protocol	802.1D-2004 RSTP

MANAGEMENT FEATURES

Management port	RJ-45 (in-band, optional VLAN tag.)
RSSI	LED on FODU, WEB management,analogue
Management access	WEB, SNMP, Telnet - local & remote monitoring via Telnet, WEB GUI, SAF NMS, SNMP Manager
Loopbacks	Yes, E1/T1, modem, RF loopback

MECHANICAL & TECHNICAL

Stationary use	Ref. ETSI EN 300 019-2-4, class 4.1E, non weather-protected locations
Temperature range	-33°C to +55°C / 27,4°F - 131°F
Dimensions (HxWxD/ weight)	230x230x85 mm / 9,06x9,06x3,35in / 2kg / 4,41lbs
Input DC voltage	48 V DC ±10%
Max. power consumption	<15W

CHANNEL PLAN 17GHz / 24GHz

10MHz channel		30MHz channel	
Tx,Rx (MHz)	Rx, Tx (MHz)	Tx, Rx (MHz)	Rx, Tx (MHz)
24055 / 17105	24155 / 17205		
24065 / 17115	24165 / 17215	24065 / 17115	24165 / 17215
24075 / 17125	24175 / 17225		
24085 / 17135	24185 / 17235		
24095 / 17145	24195 / 17245	24095 / 17145	24195 / 17245
24105 / 17155	24205 / 17255		
24115 / 17165	24215 / 17265		
24125 / 17175	24225 / 17275	24125 / 17175	24225 / 17275
24135 / 17185	24235 / 17285		
24145 / 17195	24245 / 17295		

CHANNEL PLAN 24GHz (UK Ofcom IR2030)

10MHz channel		30MHz channel	
Tx,Rx (MHz)	Rx, Tx (MHz)	Tx, Rx (MHz)	Rx, Tx (MHz)
24155	24225		
24165	24235	24165	24235
24175	24245		

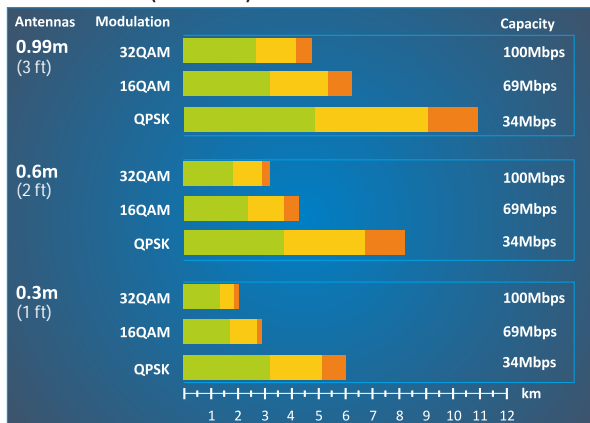* Equivalent isotropically radiated power (EIRP) is the sum of radio Tx power + antenna gain

FreeMile™

Licence-free Microwave radio systems

CAPACITY MODES

Modulation	10MHz	30MHz
QPSK*	12Mbps Ethernet	40Mbps Ethernet
	8Mbps Ethernet+2E1	38Mbps Ethernet+2E1
	9Mbps Ethernet+2T1	39Mbps Ethernet+2T1
16QAM**	25Mbps Ethernet	81Mbps Ethernet
	21Mbps Ethernet+2E1	80Mbps Ethernet+2E1
	21Mbps Ethernet+2T1	81Mbps Ethernet+2T1
32QAM	31Mbps Ethernet	100Mbps Ethernet
	27Mbps Ethernet+2E1	100Mbps Ethernet+2E1
	28Mbps Ethernet+2T1	100Mbps Ethernet+2T1
64QAM	41Mbps Ethernet	
	37Mbps Ethernet+2E1	
	38Mbps Ethernet+2T1	

* ACM mode only

DISTANCES**

24GHz (30MHz***)

Antennas	Modulation		Capacity
0.99m (3 ft)	32QAM		100Mbps
	16QAM		69Mbps
	QPSK		34Mbps
0.6m (2 ft)	32QAM		100Mbps
	16QAM		69Mbps
	QPSK		34Mbps
0.3m (1 ft)	32QAM		100Mbps
	16QAM		69Mbps
	QPSK		34Mbps

km: 1 2 3 4 5 6 7 8 9 10 11 12

17GHz (30MHz***)

Antennas	Modulation		Capacity
0.99m (3 ft)	32QAM		100Mbps
	16QAM		69Mbps
	QPSK		34Mbps
0.6m (2 ft)	32QAM		100Mbps
	16QAM		69Mbps
	QPSK		34Mbps
0.3m (1 ft)	32QAM		100Mbps
	16QAM		69Mbps
	QPSK		34Mbps

km: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

Availability per year, %

Hi	(99.99)
Mid	(99.99 - 99.94)
Lo	(99.94 - 99.88)

** Results are obtained using ITU Rain zone G=30mm/h. The errorless ACM feature will automatically switch to lower modulation during strong rain fading moments.

*** At 10MHz channel bandwidth with QPSK modulation the distance is about 1km longer. For detailed link planning please download SAF path calculator at www.saf-freemile.com

CORPORATE WIRELESS NETWORK

PBX

Mail server

LAN

Office building #1

100Mbps Eth + 2E1/T1 (Full Duplex)

100Mbps Eth (Full Duplex)

LAN

Office Building #2

PBX

LAN

POP
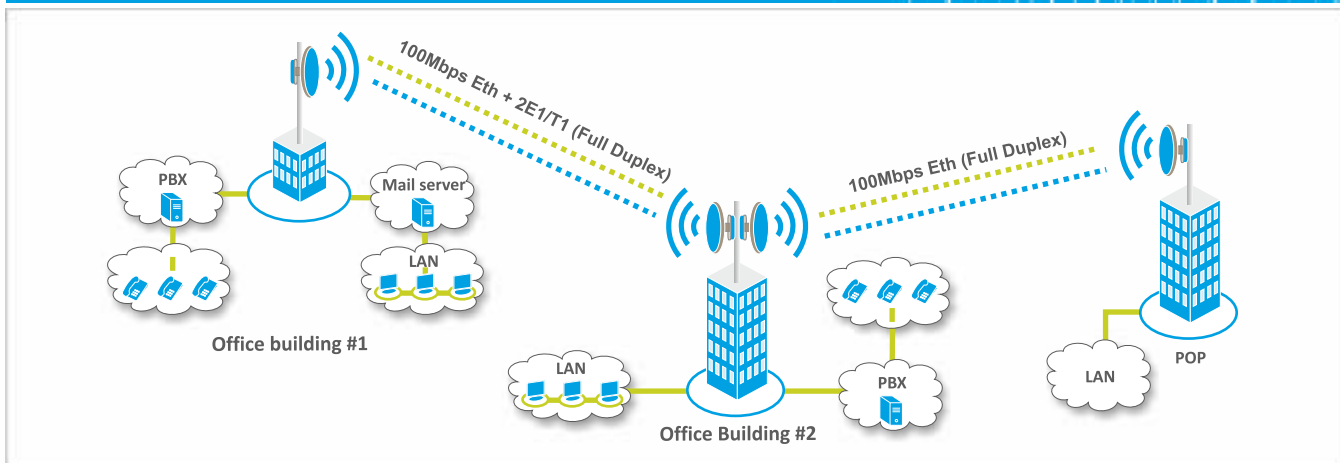
! To specify if 17GHz and 24GHz are available frequency bands in your country, please contact the local spectrum regulating authority or SAF sales representative at sales@saftehnika.com

Go FreeMile™

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EU
Produced in Europe