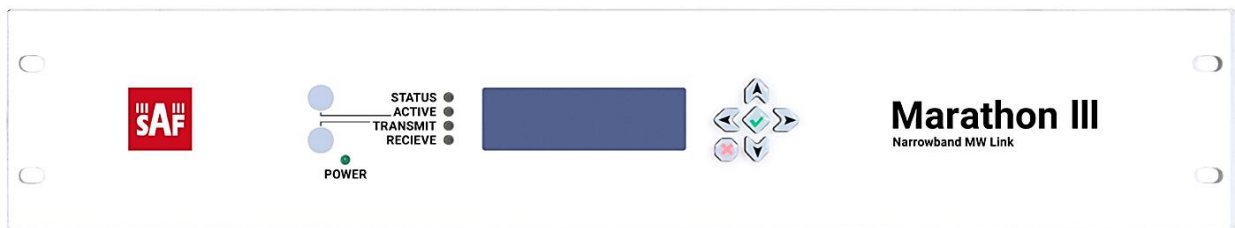


Marathon III

DATASHEET



Front side view



Rear side view

V.1.02

The Marathon III is the narrowband bidirectional radio/microwave link system operating in the FCC part 101 and NTIA 900MHz band.

The Marathon III system uses a digital QAM modulation technique to maximize RF channel utilization. Marathon III modem is based on an FPGA, therefore is flexible for different application requirements. The complete system - radio & modem boards, high power amplifier (HPA), filters and other necessary parts - are all built into a 2U rackmount indoor housing. All data/management connectors, RF connector (for antenna connection) and power supply connector are accessible at rear panel of the Marathon III system. LED display with indication LEDs and navigation buttons on the front of the unit offer control and monitoring of the critical system parameters. The Marathon III system can be configured by management SW (WEB GUI, CLI, SNMP) into different application modes which optimize its function for required application.

TECHNICAL SPECIFICATION

1. SYSTEM PARAMETERS

1.1. Main Features

Hardware

Architecture Full-duplex bidirectional TX/RX radio-modem system

Modulation

Modulation schemes QPSK, 16QAM, 32QAM, 64QAM, 128QAM, 256QAM

ACM Hitless Adaptive Coding and Modulation

Channel bandwidth 100 / 200 kHz

Forward error correction Reed Solomon with strong or medium correction block

Data Transmission

User capacity prioritization High priority Ethernet traffic interface

system Low priority Ethernet traffic interface

Path configuration 1+0

1+1 FD/HSB/SD two interconnected unit protection (full redundancy)

Ethernet data compression Ethernet L1 header compression

Ethernet L2 IP traffic compression

Throughput (w/o header compression) Up to 1239 kbps (200 kHz / 256QAM / medium FEC)

Ethernet data throughput (L1 header compression) Up to 1493 kbps (64B IP packets)

Ethernet data throughput (L2 IP traffic compression) Up to 1831 kbps (64B IP packets)

1.2. RF Parameters

RF Interface

Connector N-type

Duplex Offset

TX – RX spacing 9 MHz

Receiver

Center frequency range High side unit: 933.175 – 934.375 MHz

(at 200 kHz bandwidth) Low side unit: 942.175 – 943.375 MHz

Nominal input level -110 dBm to -25 dBm

Maximal input level 0 dBm

Return loss > 15 dB over BW 30 MHz

Transmitter

Center frequency range High side unit: 942.175 – 943.375 MHz

(at 200 kHz bandwidth) Low side unit: 933.175 – 934.375 MHz

± 0.25 ppm ± 0.5 ppm/year

Output level 23 – 33 dBm ± 1 dBm

Return loss > 15 dB over BW 30 MHz

1.3. Traffic Parameters

Wired Ethernet

Number of ports 3x 10/100/1000Eth (RJ-45)

Basic function Ethernet traffic interface / management access

Encryption AES128/AES256 for Ethernet traffic interface

Optical Interface

Number of Ports 2x 1000BASE-X (SFP)

Basic function Ethernet traffic interface / management access

EMM card connection

Unit interconnection in 1+1 Protection mode

1.4. Ethernet Switch Parameters

Interfaces

Number of ports	3x 10/100/1000Eth (RJ-45) 2x WAN over-the-air interface 1x SFP interface (shared with one WAN Interface) 1x MNG CPU
Maximum Frame Size	Up to 2048 / 10240 bytes
MAC table	Up to 8192 addresses
VLAN	Up to 100 VLANs (VID 2-4095), IEEE 802.1q
QoS	Source Port, IEEE 802.1p, IPv4 TOS/DSCP, IPv6 TC, VLAN VID, SA/DA

1.5. Ethernet Traffic Parameters

L1 Compression Efficiency

64Byte Frames	Max. 21,5% from available Ethernet speed
512Byte Frames	Max. 2,9% from available Ethernet speed
1518Byte Frames	Max. 0,3% from available Ethernet speed

L1 Throughput

256QAM/200kHz Strong FEC

64Byte Frames	1490 kbps
512Byte Frames	1196 kbps
1518Byte Frames	1159 kbps

L1 CT Latency*

256QAM/200kHz Strong FEC

64Byte Frames	Max. 22453 us
512Byte Frames	Max. 25373 us
1518Byte Frames	Max. 32546 us

L1 Back-to-back 256QAM/200 kHz Strong FEC

64Byte Frames	568 Frames
512Byte Frames	153 Frames
1518Byte Frames	51 Frames

**Special lower latency firmware optimization available upon request*

1.6. Network Management System

Ports

Default NMS ports Ethernet port LAN 3

NMS form Max. 2,9% from available Ethernet speed

Protocols – Network HTTPS, SNMP v.1/v.2c/v.3, TELNET, SSH

In-band management Via VLAN

Out-of-band management up to 115.2 kbps

IP addresses

Addresses type Primary IP/ secondary IP

Additional function Static routes, NAT, Ping, Telnet

GUI

Type WEB based

CLI

Type safOS

SNMP

Version SNMP v.1 (traps only), SNMP v.2c, SNMP v.3

Read access Complete MIB

Write access Subset of link parameter

Security

Licenses	Permanent / time limited licenses
Access levels	Guest/User/Admin with password security
HTTPS certificates	Client and server certificates
Authentication	Radius server
SSH/SSL	Secure CLI connection

1.7. Miscellaneous

Mechanical	
Dimension [w x h x d]	482 x 88 x 323 mm (including N-type connector)
Weight	ca. 7.3 kg
Protection	EN 60529 (IP31)
Electrical	
Input Voltage	90 – 260 VAC / 47 – 63 Hz
Power consumption	< 67 W (all ports connected)
Maximum unit current	up to 0,75 A
Environmental operational conditions	
Temperature	-5 °C to +45 °C / +23 °F to +113 °F
Humidity	0 to 95 %, non-condensing
Altitude	4,500 meters
Compliance	
Emission designator	100KD7W (at 100 kHz bandwidth) 200KD7W (at 200 kHz bandwidth)
Operation	ETSI EN 300 019, Part 1-3, Class 3.2
Storage	ETSI EN 300 019, Part 1-1, Class 1.2
Transportation	ETSI EN 300 019, Part 1-2, Class 2.3
Power	ETSI EN 300 132-1
Radio frequency	ETSI EN 302 217-2-2, FCC Part 15
EMC	ETSI EN 301 489-1, EN 301 489-3
Safety	IEC 60950-1/EN 60950-1

2. MODULATION DEPENDENT PARAMETERS

2.1. Throughput

Modem configuration		Strong FEC	Medium FEC
Modulation	BW [kHz]	Data rate [kbps]	Data rate [kbps]
QPSK	100	138	148
16QAM	100	277	297
32QAM	100	347	372
64QAM	100	416	446
128QAM	100	485	520
256QAM	100	555	595
QPSK	200	288	309
16QAM	200	577	619
32QAM	200	722	774
64QAM	200	866	929
128QAM	200	1011	1084
256QAM	200	1155	1239

2.2. Typical S/N and receiver sensitivity at BER 10e-6

Modem configuration		Strong FEC		Medium FEC	
Modulation	BW [kHz]	S/N [dB]	RX Level [dBm]	S/N [dB]	RX Level [dBm]
QPSK	100	-9.5	-110	-10.4	-109.3
16QAM	100	-15.7	-104.2	-16.8	-103.2
32QAM	100	-18.9	-101.3	-20	-100.4
64QAM	100	-22.1	-97.9	-22.8	-97.1
128QAM	100	-25.1	-94.5	-25.9	93.7
256QAM	100	-27.8	-91.4	-28.9	-90.7
QPSK	200	-9.5	-107	-10.3	-106.3
16QAM	200	-16	-100.6	-16.8	-99.6
32QAM	200	-19	-97.7	-20.2	-96.2
64QAM	200	-21.7	-94.8	-22.7	93.6
128QAM	200	-24.7	-91.5	-25.9	-90.5
256QAM	200	-27.7	-88.8	-28.6	-87.8

Note
 All parameters are typical values. For guaranteed values (over time and operation range) subtract 0.5 dB for S/N and add 1 dBm to threshold.

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