PM microwave

TELECOMMUNICATIONS
FOR BROADCASTING MARKET

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THE ROLE OF PM MICROWAVE
IN TELECOM BUSINESS

PM Microwave began its activity in 2001, as a response to the increasing demand in railway and broadcast telecommunication market. Since 1992 the previous company PM Progettazione Microonde had dealt with consulting services for radiofrequency applications.

Its field of work branched progressively out to the design and development of printed circuit boards, RF modules and subsystems on behalf of other telecom companies.

The company became quickly a reference point for those who, both in Italy and worldwide, need "special microwave applications": the solutions proposed by PM Microwave represent a synthesis between the customer requirements and the most advanced and reliable technologies available on the market.

The ISO 9001 certification, successfully achieved in 2007, allowed and still allows to improve the organizational processes and the overall quality of products and services.

The production involves two distinct branches of the company core business: the railway and the broadcasting market. PM Microwave deals with both markets offering and supplying customized products (often developed on OEM base) aligned to the state of the art. In this way the customer's requirements are always satisfied and fulfilled.

In 2012 PM Microwave was proud to open the new operative headquarter in Rivalta sul Mincio, increasing its production capacity and aiming to revive its image in a more and more selective telecommunication market.

OUR COMPANY

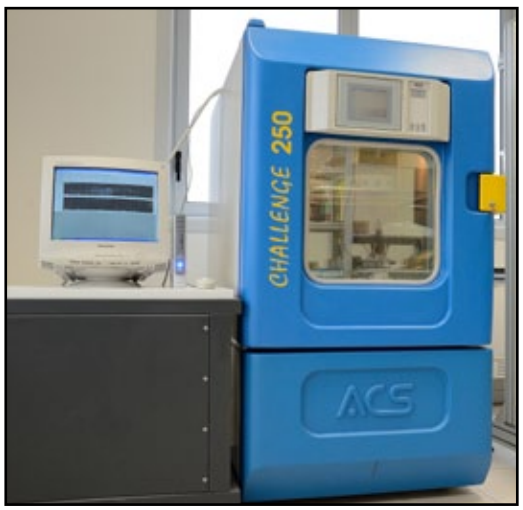
AREAS AND FACILITIES

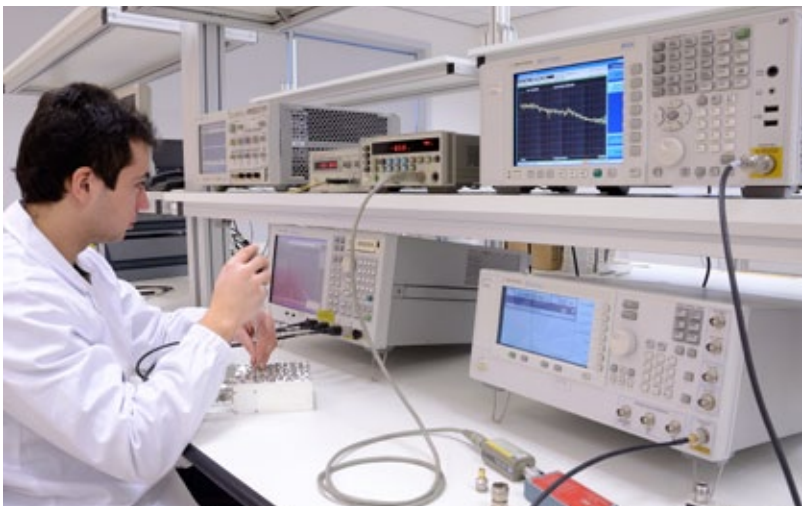
The PM Microwave operative site in Rivalta sul Mincio (MN) covers an area of 1200 sqm where the following facilities are located: directional, administrative and technical offices, laboratories, assembly rooms, warehouse for components storage and a small mechanical workshop.

OUR COMPANY

INSTRUMENTS AND EQUIPMENTS

PM Microwave can develop products for applications up to 20 GHz and it can also support measuring and testing activities thanks to its advanced instruments which include scalar and vector network analyzers, spectrum analyzers, signal analyzers, oscilloscopes, power meters and signal generators. PM Microwave is also equipped with a climatic chamber which allows to test final products at controlled temperature and humidity.





OUR COMPANY

RESEARCH AND DEVELOPMENT

The continuous investment in Research and Development allows PM Microwave to operate in the design area with greater accuracy and quality, guaranteeing more and more advanced and reliable solutions.

The design team has at his disposal many advanced instruments for 3D mechanical design, 3D electromagnetic simulation, PCB design, firmware and software development. The customer may rely on the efficiency and experience of the design team, having the possibility to agree with the functionalities, the performances bonds and the layout of the desired product.

SERVICES
FOR BROADCASTING MARKET

The services offered by PM Microwave for the broadcasting market range from the consultancy to the maintenance of the installed products. The high technical competences, added to instruments in the van, allow to offer highly professional and technologically advanced solutions and services.

PM Microwave is available to offer full support for activities concerning:

- on-site surveys to define the parameters of system design
- support to system design for fixed and mobile applications
- installations and testing of broadcasting systems either on national area or abroad
- products customization and OEM development
- checks and measures on the field of electro-magnetic nature (radio coverage, interference, etc.)
- maintenance intervention, repairing and on-site replacement (antennas, devices, cables, connectors)
- know-how and refresher courses
- editing of technical handbooks

PRODUCTS
FOR BROADCASTING MARKET

The products PM Microwave proposes for the broadcasting market cover several categories, such as Analog and Digital Transmitters and Receivers, Modulators and Demodulators, Encoders and Decoders, and Up and Down Converters. These are all active devices available in multiple hardware and software configurations, which can be preliminarily customized according to specific customer requirements.

PM Microwave also offers solutions of Antennas and antenna systems for various applications. Furthermore, the product portfolio includes a range of RF Modules (i.e., Power Amplifiers, LNA, low power RF Amplifiers, Up and Down Converters, Splitters and Combiners, and Filters), able to meet the most demanding needs of system integrators.

TRANSMITTERS AND RECEIVERS

MODULATORS AND DEMODULATORS

ENCODERS AND DECODERS

UP AND DOWN CONVERTERS

ANTENNAS

RF MODULES

TIME REFERENCE

ANALOG UP CONVERTERS (TRANSMITTERS) AML-TX

The analog transmitters proposed by PM Microwave are devices designed to be used both in analog and digital broadcasting. They are available in both 19'' rack for indoor use and waterproof box for outdoor use. The available versions work in the 7 GHz, 10 GHz, and 14 GHz bands, with output powers of 500 mW (+27 dBm) or 1 W (+30 dBm).
The internal oscillators designed by PM Microwave and used in the conversion stages are characterized by high levels of stability and spectral purity, and allow to fully support digital modulations.

TECHNICAL SPECIFICATIONS*

*specifications may be changed in accordance with the technical department

TRANSMITTERS	AML-T7	AML-T10	AML-T14
IF input frequency	typ. 70 MHz	typ. 70 MHz	typ. 70 MHz
Input level	typ. -10 dBm	typ. -10 dBm	typ. -10 dBm
Input impedance	50 Ω	50 Ω	50 Ω
Input return loss	> 18 dB	> 18 dB	> 18 dB
RF output frequency	6.8 ÷ 7.2 GHz	10.3 ÷ 10.7 GHz	14.0 ÷ 14.5 GHz
Output level	+27 dBm / +30 dBm	+27 dBm / +30 dBm	+27 dBm / +30 dBm
RF structure	PLL synthesized double conversion	PLL synthesized double conversion	PLL synthsized double conversion
Frequency stability L.O.	± 5 ppm standard ± 2 ppm HS option	± 5 ppm standard ± 2 ppm HS option	± 2.5 ppm standard ± 1 ppm HS option
Phase Noise L.O.	-102 dBc/Hz @ 100 kHz	-96 dBc/Hz @ 100 kHz	-102 dBc/Hz @ 100 kHz
L.O. steps	typ. 1 MHz	typ. 1 MHz	typ. 1 MHz
System gain	35 dB	35 dB	35 dB
Spurious emissions	< -60 dBc	< -60 dBc	< -60 dBc
GENERAL			
Power supply	110 ÷ 240 Vac (indoor) 12 ÷ 15 Vdc (outdoor)	110 ÷ 240 Vac (indoor) 12 ÷ 15 Vdc (outdoor)	110 ÷ 240 Vac (indoor) 12 ÷ 15 Vdc (outdoor)
Power consumption	typ. 20 W	typ. 20 W	typ. 20 W
Operating temperature	-10 ÷ +45 °C	-10 ÷ +45 °C	-10 ÷ +45 °C
Storage temperature	-20 ÷ +80 °C	-20 ÷ +80 °C	-20 ÷ +80 °C
Storage relative humidity	10% ÷ 80%	10% ÷ 80%	10% ÷ 80%
Dimensions	Rack 19'' 1U (483 × 45 × 270 mm, indoor) Custom box (220 × 96 × 228 mm, outdoor)	Rack 19'' 1U (483 × 45 × 270 mm, indoor) Custom box (220 × 96 × 228 mm, outdoor)	Rack 19'' 1U (483 × 45 × 270 mm, indoor) Custom box (220 × 96 × 228 mm, outdoor)
Protection degree	IP50 (indoor) IP67 (outdoor)	IP50 (indoor) IP67 (outdoor)	IP50 (indoor) IP67 (outdoor)

ANALOG DOWN CONVERTERS (RECEIVERS)

AML-RX

The analog receivers are typically used in both analog and digital broadcasting, for point-to-point and point-to-multipoint applications. Each receiver is usually combined with the transmitter of the same series to form the desired radio link. Available in both 19'' rack for indoor use and waterproof box for external use, analog receivers work in the 7 GHz, 10 GHz and 14 GHz bands, but can be customized as well according to the specific application.
As inside the transmitters, also in analog receivers the internal oscillators (designed by PM Microwave and used in the conversion stages) are characterized by high values of stability and spectral purity, and allow to fully support digital modulations.

TECHNICAL SPECIFICATIONS*

*specifications may be changed in accordance with the technical department

RECEIVERS	AML-R7	AML-R10	AML-R14
RF input frequency	6.8 ÷ 7.2 GHz	10.3 ÷ 10.7 GHz	14.0 ÷ 14.5 GHz
Input level	-70 ÷ -25 dBm	-70 ÷ -25 dBm	-70 ÷ -25 dBm
IF output frequency	typ. 70 MHz	typ. 70 MHz	typ. 70 MHz
Ouput level	max. +10 dBm	max. +10 dBm	max. +10 dBm
Ouput impedence	50 Ω	50 Ω	50 Ω
Output return loss	> 18 dB	> 18 dB	> 18 dB
RF structure	PLL synthesized double conversion	PLL synthesized double conversion	PLL synthsized double conversion
Frequency stability L.O.	± 5 ppm standard ± 2 ppm HS option	± 5 ppm standard ± 2 ppm HS option	± 2.5 ppm standard ± 1 ppm HS option
L.O. steps	typ. 1 MHz	typ. 1 MHz	typ. 1 MHz
System gain	35 dB	35 dB	35 dB
Noise figure	2 dB typ.	3 dB typ.	2 dB typ.
GENERAL			
Power supply	110 ÷ 240 Vac (indoor) 12 ÷ 15 Vdc (outdoor)	110 ÷ 240 Vac (indoor) 12 ÷ 15 Vdc (outdoor)	110 ÷ 240 Vac (indoor) 12 ÷ 15 Vdc (outdoor)
Power consumption	typ. 10 W	typ. 10 W	typ. 10 W
Operating temperature	-10 ÷ +45 °C	-10 ÷ +45 °C	-10 ÷ +45 °C
Storage temperature	-20 ÷ +80 °C	-20 ÷ +80 °C	-20 ÷ +80 °C
Storage relative humidity	10% ÷ 80%	10% ÷ 80%	10% ÷ 80%
Dimensions	Rack 19'' 1U (483 × 45 × 270 mm, indoor) Custom box (220 × 96 × 228 mm, outdoor)	Rack 19'' 1U (483 × 45 × 270 mm, indoor) Custom box (220 × 96 × 228 mm, outdoor)	Rack 19'' 1U (483 × 45 × 270 mm, indoor) Custom box (220 × 96 × 228 mm, outdoor)
Protection degree	IP50 (indoor) IP67 (outdoor)	IP50 (indoor) IP67 (outdoor)	IP50 (indoor) IP67 (outdoor)

DVB-T 1W TRANSMITTER

DML-TT141

The TT141 model consists of a DVB-T modulator in a 19'' 1U rack that can be connected to an external up converter unit. The modulator foresees 4 ASI inputs, through which it is possible to modulate 2 flows according to hierarchical mode: one HP (High Priority) and one LP (Low Priority).
The TT141 transmitter is typically used for broadcast applications in both MFNs (Multi Frequency Networks) and SFNs (Single Frequency Networks). Thanks to '1 PPS' and '10 MHz' inputs the device allows synchronization with respect to an external reference (e.g., GPS).

TECHNICAL SPECIFICATIONS*

*specifications may be changed in accordance with the technical department

MODULATOR	
Input type	4 x ASI continuous modes, compliant with EN50083-9 (1 Vpp, BNC, 75 Ω)
IF output frequency	36 MHz, 70 MHz, 140 MHz (others on request)
IF output level	-20 dBm ÷ 0 dBm adjustable
MER	> 48 dB
Modulation type	DVB-T COFDM compliant with ETSI EN 300 744 v1.5.1
Channel bandwidth	7 MHz, 8 MHz
Carriers	2048 (2k mode), 8192 (8k mode)
Constellation	QPSK, 16QAM, 64QAM
FEC	1/2, 2/3, 3/4, 5/6, 7/8
Guard interval	1/4, 1/8, 1/16, 1/32
Network type	MFN, SFN with GPS reference (1 PPS e 10 MHz)
Bitrate	Up to 31.6 Mbps
UP CONVERTER	
RF output frequency	7 GHz or 10 GHz bands
RF output level	+30 dBm (1 W) CW +26 dBm typ. QPSK
GENERAL	
Local control	Rotary encoder and display on front panel
Remote control	RS232, HTTP or SNMP
Power supply	110 ÷ 240 Vac
Power consumption	30 W typ.
Operating temperature	-10 ÷ +45 °C
Storage temperature	-20 ÷ +80 °C
Storage relative humidity	10% ÷ 80%
Dimensions	Rack 19'' 1U (483 x 45 x 270 mm, Modulator) Custom box (220 x 96 x 228 mm, Up Converter)
Protection degree	IP50 (Modulator) IP67 (Up Converter)

DVB-T 50W & 100W TRANSMITTER

DML-TT110

The TT110 transmitter consists of a 19'' 4U rack that contains all the functionalities to connect analog (CVBS) and digital (SDI and ASI) sources and to transmit their signals directly in antenna. Thanks to the power amplifier which is fitted to, together with the robust COFDM modulation, the transmitter is able to cover large distances even in critical scenarios such as high-multipath urban or metropolitan areas.
This system can be used both on fixed stations and on mobile vehicles: good results have been obtained for example in the field of avionics, where a transmission distance of about 400 km was reached.

TECHNICAL SPECIFICATIONS*

*specifications may be changed in accordance with the technical department

VIDEO ENCODING

Input video	1 CVBS, 1 SDI, 1 ASI (1 Vpp, BNC, 75 Ω)
Standard	PAL-BGH, PAL-I, PAL-D, PAL-N, NTSC 4.43, Comb PAL-N, NTSC-N, SECAM-DKL, SECAM-BG, NTSC-M @ 60 Hz, PAL 4.43 @ 60 Hz, NTSC 4.43 @ 60 Hz, PAL-M @ 60 Hz, NTSC-J @ 60 Hz
Encoder	MPEG-2 (ISO/IEC 13818-2) MP@ML
Video processor	9 bit, 4:2:2 Output format, 4:2:0 MPEG
Video bitrate	Up to 15 Mbps
Video resolution	Up to 720 × 576 (SD)

AUDIO ENCODING

Audio input	2 analog (0 dBm, XLR, 600 Ω balanced)
Sampling rate	32 kHz, 44.1 kHz, 48 kHz
Encoding	MPEG-1 (ISO/IEC 11172-3) Layer 1/2
Bitrate	Up to 448 kbps

MODULATOR

MER	typ. 35 dB
Modulation	DVB-T COFDM compliant with ETSI EN 300 744
Constellation	QPSK, 16QAM, 64QAM
Carriers	2048 (2k mode), 8192 (8k mode)
FEC	1/2, 2/3, 3/4, 5/6, 7/8
Guard interval	1/4, 1/8, 1/16, 1/32
Channel bandwidth	7 MHz, 8 MHz
Bitrate	Up to 31.6 Mbps
RF output frequency	2.5 ÷ 2.7 GHz
RF output level	+47 dBm (50 W) CW +43 dBm QPSK / +50 dBm (100W) CW +46 dBm QPSK

GENERAL

Local control	Navigation keys and display
Remote control	RS232, HTTP or SNMP
Power supply	180 ÷ 240 Vac or 13 Vdc
Power consumption	360 W typ.
Operating temperature	-10 ÷ +45 °C
Storage temperature	-20 ÷ +80 °C
Storage relative humidity	10% ÷ 80%
Dimensions	Rack 19'' 4U (483 × 178 × 435 mm)
Protection degree	IP50

DVB-T/H 2-WAY RECEIVER

DML-RT111

The RT111 receiver allows to receive 2 signals from a diversity receiving system, thus making possible a robust demodulation even at low SNR values.
This receiver can be used in microwave radio point-to-point or multipoint links, for example in combination with DVB-T transmitter TT141.

TECHNICAL SPECIFICATIONS*

*specifications may be changed in accordance with the technical department

DEMODULATOR

RF input frequency	2500 ÷ 2700 MHz
Number of inputs	2
Sensitivity	typ. -99 dBm
Demodulation	DVB-T COFDM compliant with ETSI EN 300 744
Channel bandwidth	7 MHz, 8 MHz
Carriers	2048 (2k mode), 8192 (8k mode)
Constellation	QPSK, 16QAM, 64QAM
FEC	1/2, 2/3, 3/4, 5/6, 7/8
Guard inteval	1/4, 1/8, 1/16, 1/32

VIDEO DECODING

Video output	2 CVBS 1 SDI 1 ASI (1 Vpp, BNC, 75 Ω)
Standard	PAL-BGH, PAL-I, PAL-D, PAL-N, NTSC 4.43, Comb PAL-N, NTSC-N, SECAM-DKL, SECAM-BG, NTSC-M @ 60 Hz, PAL 4.43 @ 60 Hz, NTSC 4.43 @ 60 Hz, PAL-M @ 60 Hz, NTSC-J @ 60 Hz
Decoding	MPEG-2 (ISO/IEC 13818-2) MP@ ML, MP@LL, SP@ML MPEG-1 Bitstream (ISO-11172-2) decoder DVB compliant
Conversion	4:2:2 -> 4:2:0 for DAC video processor
Error correction	Syntax Checker, Concealment Vectors
Video resolution	Up to 720 × 576

AUDIO DECODING

Audio output	4 analog (0 dBm, XLR, 600Ω balanced)
Sampling rate	16/22.05/24/32/44.1/48 kHz
Decoding	MPEG-1 (ISO/IEC 11172-3) Layer 1/2
Oversampling	384 fs / 256 fs

GENERAL

Local control	Rotary encoder and display
Remote control	RS232, HTTP or SNMP
Power supply	100 ÷ 240 Vac or 48 Vdc
Power consumption	20 W typ.
Operating temperature	-10 ÷ +45 °C
Storage temperature	-20 ÷ +80 °C
Storage relative humidity	10% ÷ 80%
Dimensions	Rack 19'' 1U (483 × 45 × 435 mm)
Protection degree	IP50

DVB-T/H 6-WAY RECEIVER

DML-RT110

The receiver RT110 allows to receive up to 6 signals from a diversity receiving system, thus making possible a robust demodulation even in conditions of low SNR values.
This receiver can be used both on fixed stations and on mobile vehicles: good results have been obtained for example in the field of avionics where a distance of about 400 km was covered.

TECHNICAL SPECIFICATIONS*

*specifications may be changed in accordance with the technical department

DEMODULATOR

RF input frequency	2500 ÷ 2700 MHz
Number of inputs	6
Sensitivity	typ. -99 dBm
Demodulation	DVB-T COFDM compliant with ETSI EN 300 744
Channel bandwidth	7 MHz, 8 MHz
Carriers	2048 (2k mode), 8192 (8k mode)
Constellation	QPSK, 16QAM, 64QAM
FEC	1/2, 2/3, 3/4, 5/6, 7/8
Guard inteval	1/4, 1/8, 1/16, 1/32

VIDEO DECODING

Video output	2 CVBS 1 SDI 1 ASI (1 Vpp, BNC, 75 Ω)
Standard	PAL-BGH, PAL-I, PAL-D, PAL-N, NTSC 4.43, Comb PAL-N, NTSC-N, SECAM-DKL, SECAM-BG, NTSC-M @ 60 Hz, PAL 4.43 @ 60 Hz, NTSC 4.43 @ 60 Hz, PAL-M @ 60 Hz, NTSC-J @ 60 Hz
Decoding	MPEG-2 (ISO/IEC 13818-2) MP@ ML, MP@LL, SP@ML MPEG-1 Bitstream (ISO-11172-2) decoder DVB compliant
Conversion	4:2:2 -> 4:2:0 for DAC video processor
Error correction	Syntax Checker, Concealment Vectors
Video resolution	Up to 720 × 576

AUDIO DECODING

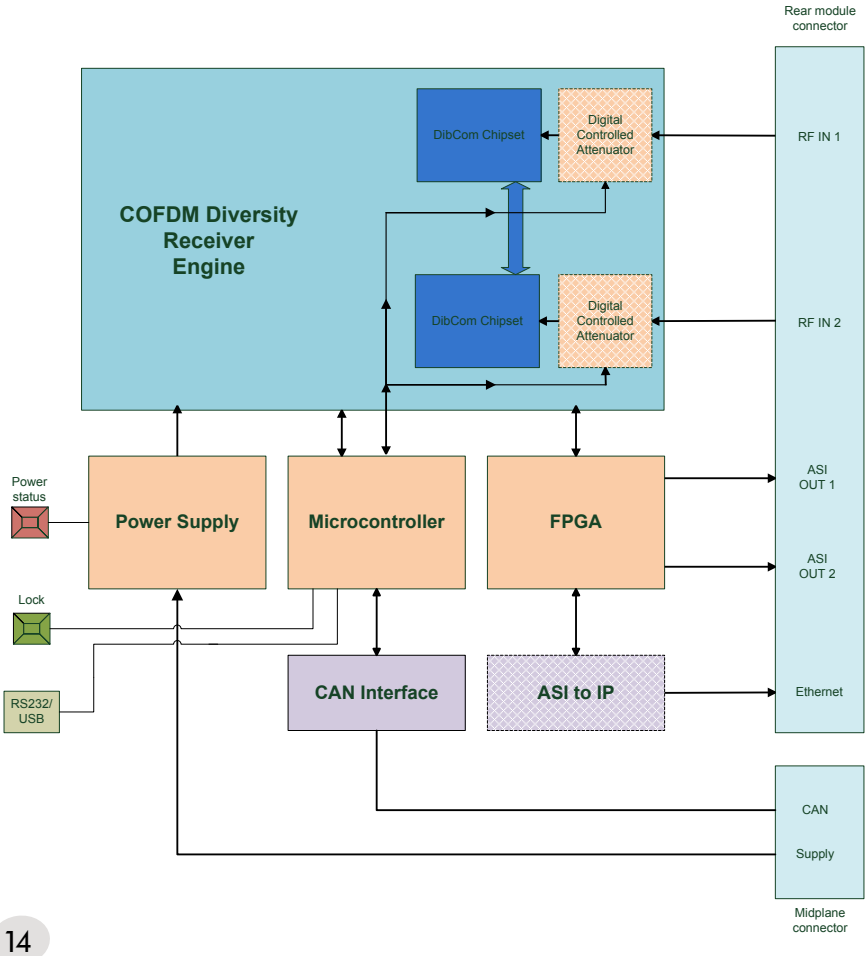
Audio output	4 analog (0 dBm, XLR, 600Ω balanced)
Sampling rate	16/22.05/24/32/44.1/48 kHz
Decoding	MPEG-1 (ISO/IEC 11172-3) Layer 1/2
Oversampling	384 fs / 256 fs

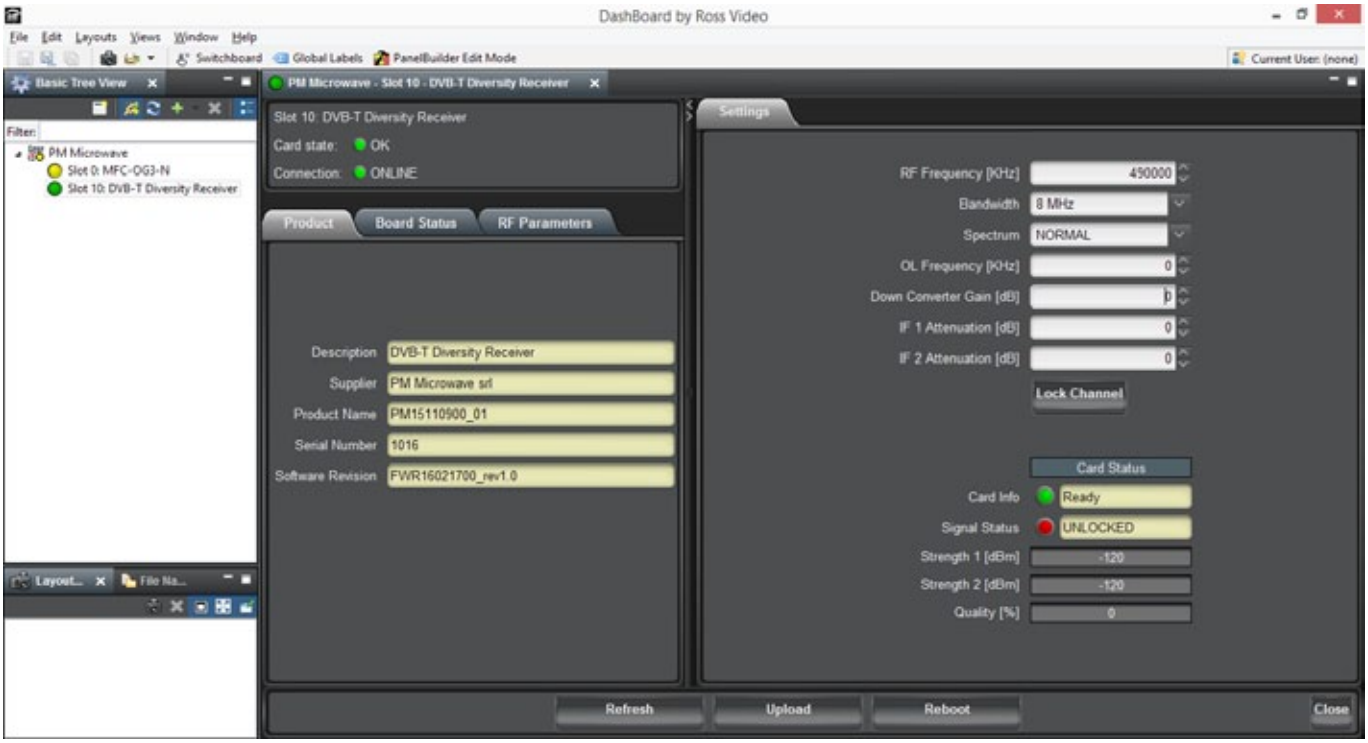
GENERAL

Local control	Rotary encoder and display
Remote control	RS232, HTTP or SNMP
Power supply	100 ÷ 240 Vac or 48 Vdc
Power consumption	90 W typ.
Operating temperature	-10 ÷ +45 °C
Storage temperature	-20 ÷ +80 °C
Storage relative humidity	10% ÷ 80%
Dimensions	Rack 19'' 1U (483 × 45 × 435 mm)
Protection degree	IP50

openGear® DVB-T DIVERSITY RECEIVER OGDR

This product is a compact and powerful COFDM (DVB-T) diversity receiver and demodulator, equipped with dual ASI interface output and one ETHERNET connection.
It is designed to easily fit into a standard openGear® 2RU frame, which allows a flexible, robust and powerful control of the board inserted.
The card is equipped with a custom-design rear interface module that provide fast and reliable connection in order to achieve good radio performances.





▲ DashBoard control and monitoring system automatically recognizes connected boards and creates a custom easy-to-use interface

- ▶ Flexibility
- ▶ Easy board management
- ▶ Modular frame architecture
- ▶ Robust power supplies
- ▶ Advanced cooling system
- ▶ Ethernet remote control

TECHNICAL SPECIFICATIONS*

*specifications may be changed in accordance with the technical department

ELECTRICAL

DVB receiver standard	ETSI 300 744 DVB-T compliance
Reception freq. range	VHF-UHF band (160 MHz - 860 MHz)
Channel bandwidth	6, 7, 8 MHz
Modulation	QPSK, 16-QAM, 64-QAM
FFT mode	2K, 8K
Guard interval	1/32, 1/16, 1/8, 1/4
Code rate	1/2, 2/3, 3/4, 5/6, 7/8
RF sensitivity	-85 dBm typ (64-QAM)
Input RF attenuator (each input)	Digitally controllable, 30 dB range in 0.5dB step
Power supply	12Vdc through openGear® frame
Power consumption	5W typ.
Power supply @ RF inputs	12 Vdc, 250 mA each for down converter module

SOFTWARE

Local control	USB interface
Remote control	Ethernet connection with openGear®
	2RU frame

MECHANICAL

RF input connector	2 x SMA female
ASI output connector	2 x BNC female
IP output connector	1 x RJ 45 (optional)
Dimensions	openGear® 2RU standard card
Weight	approx. 180 g

ENVIRONMENTAL

Operating temperature	0 ÷ +45 °C
Storage temperature	-20 ÷ +80 °C
Storage realtive humidity	10% ÷ 80%
Protection degree	IP40

DVB-T MICROLINK
TRANSMITTER

DML-TT112

The DVB-T MICROLINK system is a compact and reliable solution that allows short distance transmissions of analog or digital videos without the need of a coaxial cable between the transmitter and the receiver. The RF frequency can be selected between 6 channels in the 2450 ÷ 2500 MHz band.

TECHNICAL SPECIFICATIONS*

*specifications may be changed in accordance with the technical department

VIDEO ENCODING

Input video	1 CVBS, 1 SDI
Standard	PAL, NTSC
Encoder	MPEG-2 (ISO/IEC 13818-2) MP@ML
Video bitrate	Up to 15 Mbps
Video resolution	Up to 720 x 576 (SD)

MODULATOR

RF output frequency	2456 ÷ 2496 MHz on 6 channels
RF output level	typ. +20 dBm
Modulation	DVB-T COFDM
Channel bandwidth	6 MHz, 7MHz, 8 MHz
Carriers	2k mode, 8k mode
Constellation	QPSK, 16QAM, 64QAM
FEC	1/2, 2/3, 3/4, 5/6, 7/8
Guard interval	1/4, 1/8, 1/16, 1/32

GENERAL

RF control	6 channels via rotary switch
Power supply	12 ÷ 13.8 Vdc
Power consumption	15 W typ.
Operating temperature	-10 ÷ +45 °C
Storage temperature	-20 ÷ +80 °C
Storage relative humidity	10% ÷ 80%
Dimensions	Rack 1U 28TE (172 × 45 × 215 mm)
Protection degree	IP30

DVB-T MICROLINK

2-WAY RECEIVER

DML-RT112

The DVB-T MICROLINK system is a compact and reliable solution that allows short distance transmissions of analog or digital videos without the need of a coaxial cable between the transmitter and the receiver. The RF frequency can be selected between 6 channels in the 2450 ÷ 2500 MHz band. The 2-way diversity receiver allows to reach great performance even in case of mobile links.

TECHNICAL SPECIFICATIONS*

*specifications may be changed in accordance with the technical department

DEMODULATOR

RF input frequency	2456 ÷ 2496 MHz on 6 channels
Number of RF inputs	2 diversity mode
Output signal	1 ASI (1 Vpp, BNC, 75 Ω)
Sensitivity	typ. -99 dBm
Demodulation	DVB-T COFDM compliant with ETSI EN 300 744
Channel bandwidth	6MHz, 7 MHz, 8 MHz
Carriers	2k mode, 8k mode
Constellation	QPSK, 16QAM, 64QAM
FEC	1/2, 2/3, 3/4, 5/6, 7/8
Guard interval	1/4, 1/8, 1/16, 1/32

VIDEO DECODING

Video output	1 CVBS, 1 SDI
Standard	PAL, NTSC
Decoding	ML, MP@LL, SP@ML MPEG-1 Bitstream (ISO-11172-2) decoder DVB compliant
Video resolution	Up to 720 x 576

GENERAL

RF Control	6 channels via rotary switch
Power supply	12 ÷ 13.8 Vdc
Power consumption	6 W typ.
Operating temperature	-10 ÷ +45 °C
Storage temperature	-20 ÷ +80 °C
Storage realtive humidity	10% ÷ 80%
Dimensions	Rack 1U 28TE (172 x 45 x 214 mm)
Protection degree	IP30

DVB-S2 TRANSMITTERS

DML-TS220

The TS200 series transmitters are the ideal solution for DVB-S2 digital broadcasting. The second generation of digital satellite transmission standard (backward compatible with DVB-S systems) has introduced architectural enhancements that allow to manage more transmission capacity. Among the various peculiarities stands the ability to handle multiple data streams encoded according to standards MPEG-2 or MPEG-4 (H.264) for the support of HDTV.
The transmitter TS220 consists of an indoor unit in the form of 19'' 1U rack, having functionality of DVB-S2 Modulator at intermediate frequency IF, and an outdoor unit with the role of Up Converter from IF to RF.

TECHNICAL SPECIFICATIONS*

*specifications may be changed in accordance with the technical department

MODULATOR

Input signal	2x ASI continuous modes, compliant with EN50083-9 (1 Vpp, BNC, 75 Ω)
IF output frequency	70 MHz
IF output level	0 ÷ -20 dBm typ. (in 0.5 dBm steps)
Modulation	DVB-S2 QPSK / 8PSK / 16APSK / 32APSK compliant with ETSI EN 302 307
FEC	1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10
Symbol rate	1 ÷ 45 MSymbol/s (in 1 kSymbol steps)
Roll-off factor	20%, 25%, 35%
Pilot	On / Off
Spectral inversion	On / Off

UP CONVERTER AND AMPLIFIER

RF output frequency	7 GHz or 10 GHz bands
RF output level (CW)	+27 dBm (0.5 W) +30 dBm (1 W) +33 dBm (2 W) +37 dBm (5 W) +40 dBm (10 W)

GENERAL

Local control	Rotary encoder and display on front panel
Remote control	RS232, HTTP or SNMP
Power supply	110 ÷ 240 Vac
Power consumption	20 W typ. (Modulator)
Operating temperature	-10 ÷ +45 °C
Storage temperature	-20 ÷ +80 °C
Storage relative humidity	10% ÷ 80%
Dimensions	Rack 19'' 1U (483 × 45 × 435 mm, Modulator) Custom box (220 × 96 × 228 mm, Up Converter)
Protection degree	IP50 (Modulator) IP67 (Up converter)

DVB-S2 RECEIVERS

DML-RS220

The system RS220 is a professional solution for receiving digital multi-channel DVB-S/S2 signals. It consists of one external unit of frequency conversion and one internal unit for demodulation.
These receivers are designed to be used in 7 or 10 GHz radio links (point-to-point or multipoint), in combination with DVB-S2 transmitters TS220.

TECHNICAL SPECIFICATIONS*

*specifications may be changed in accordance with the technical department

DEMODULATOR	
Input frequency	70 MHz
Sensitivity	typ. -93 dBm
Output signal	2 x ASI continuous modes, compliant with EN50083-9 (1 Vpp, BNC, 75 Ω)
Demodulation	DVB-S2 / DVB-S compliant with ETSI EN 302 307
Constellation	8PSK, QPSK
Symbol rate	1 ÷ 45 MSymbol/s (in 1 kSymbol steps)
DOWN CONVERTER	
RF input frequency	7 or 10 GHz band
IF output frequency	70 MHz
Output impedance	50 Ω
Return loss on output port	> 18 dB
RF structure	PLL synthesized, single or double conversion
Frequency stability L.O.	± 5 ppm standard, ± 2 ppm HS option
L.O. steps	1 MHz standard (others on request)
GENERAL	
Local control	Rotary encoder and display on front panel
Remote control	RS232, HTTP
Power supply	110 ÷ 240 Vac
Power consumption	25 W typ.
Operating temperature	-10 ÷ +45 °C
Storage temperature	-20 ÷ +80 °C
Storage relative humidity	10% ÷ 80%
Dimensions	Rack 19" 1U (483 x 45 x 435 mm, Demodulator) Custom box (220 x 96 x 228 mm, Down Converter)
Protection degree	IP50 (Demodulator) IP67 (Down Converter)

DVB-T/H MODULATOR

MDLT-DVBTH

The digital DVB-T/H modulator is the ideal solution for those who requires high performances in high multipath environments, typically urban or metropolitan. The COFDM modulation (Coded Orthogonal Frequency Division Multiplexing) makes it possible to transmit digital signals at high bitrates even in harsh environments, where the intersymbol interference (ISI) due to multiple reflections is consistent.
The modulator foresees 4 ASI inputs, through which it is possible to modulate 2 flows according to the hierarchical mode: one HP (High Priority) and one LP (Low Priority).

TECHNICAL SPECIFICATIONS*

*specifications may be changed in accordance with the technical department

MODULATOR

Input signal	4x ASI continuous modes, compliant with EN50083-9 (1 Vpp, BNC, 75 Ω)
Output frequency	36 MHz (20 ÷ 200 MHz others on request)
Output level	typ. -10 dBm (0 dBm others on request)
MER	> 48 dB
Modulation	DVB-T/H COFDM compliant with ETSI EN 300 744 v1.5.1
Channel bandwidth	7 MHz, 8 MHz
Carriers	2k mode, 4k mode, 8k mode
Constellation	QPSK, 16QAM, 64QAM
FEC	1/2, 2/3, 3/4, 5/6, 7/8
Guard interval	1/4, 1/8, 1/16, 1/32

GENERAL

Local control	Rotary encoder and display on front panel
Remote control	RS232, HTTP
Power supply	110 ÷ 240 Vac
Power consumption	25 W typ.
Operating temperature	-10 ÷ +45 °C
Storage temperature	-20 ÷ +80 °C
Storage relative humidity	10% ÷ 80%
Dimensions	Rack 19" 1U (483 × 45 × 435 mm)
Protection degree	IP50

DVB-T/H 2-WAY DEMODULATOR

DMDLT-DVBTH

The DVB-T/H demodulator allows to receive 2 IF signals coming from a diversity receiving system in the 50 ÷ 850 MHz band, thus making possible a robust demodulation even at low SNR values.
The diversity DVB-T/H demodulator supports all demodulation modes defined in the ETSI DVB-T standard (EN 300 744). The ASI output stream is compliant with EN50083-9 standard.

TECHNICAL SPECIFICATIONS*

*specifications may be changed in accordance with the technical department

DEMODULATOR

Input frequency	50 ÷ 850 MHz
Input level	max. -30 dBm
Sensitivity	typ. -99 dBm
Output signal	ASI continuous mode, compliant with EN50083-9 (1 Vpp, BNC, 75 Ω)
Demodulation	DVB-T COFDM compliant with ETSI EN 300 744
Channel bandwidth	5, 6, 7, 8 MHz
Carriers	2k mode, 4k mode, 8k mode
Constellation	QPSK, 16QAM, 64QAM
FEC	1/2, 2/3, 3/4, 5/6, 7/8
Guard interval	1/4, 1/8, 1/16, 1/32

GENERAL

Local control	Rotary encoder and display on front panel
Remote control	RS232, HTTP
Power supply	110 ÷ 240 Vac
Power consumption	20 W typ.
Operating temperature	-10 ÷ +45 °C
Storage temperature	-20 ÷ +80 °C
Storage realtive humidity	10% ÷ 80%
Dimensions	Rack 19" 1U (483 × 45 × 435 mm)
Protection degree	IP50

DVB-T COMPACT MODULATOR

MDLT-DVBT-CMPCT

The DVB-T Compact modulator is a device for digital terrestrial transmission of an ASI signal. It is designed for those who need a size and price effective solution with no compromise on performances.

TECHNICAL SPECIFICATIONS*

*specifications may be changed in accordance with the technical department

MODULATOR

Input signal	ASI continuous modes, compliant with EN50083-9 (1 Vpp, BNC, 75 Ω)
Output frequency	36 MHz (20 ÷ 200 MHz on request)
Output level	typ. -10 dBm (0 dBm on request)
MER	> 48 dB @ 36 MHz
Modulation	DVB-T/H COFDM compliant with ETSI EN 300 744 v1.5.1
Channel bandwidth	7 MHz, 8 MHz
Carriers	2k mode, 4k mode, 8k mode
Constellation	QPSK, 16QAM, 64QAM
FEC	1/2, 2/3, 3/4, 5/6, 7/8
Guard interval	1/4, 1/8, 1/16, 1/32

GENERALE

Remote control	RS232 (others on request)
Power supply	110 ÷ 240 Vac
Power consumption	20 W typ.
Operating temperature	-10 ÷ +45 °C
Storage temperature	-20 ÷ +80 °C
Storage relative humidity	10% ÷ 80%
Dimensions	Rack 1U 28TE (172 × 45 × 215 mm)
Protection degree	IP50

DVB-S2 COMPACT MODULATOR

MDLT-DVBS2-CMPCT

The DVB-S2 Compact modulator is a device for digital satellite transmission of an ASI signal. It is designed for those who need a size and price effective solution with no compromise on performances.

TECHNICAL SPECIFICATIONS*

*specifications may be changed in accordance with the technical department

MODULATOR

Input signal	ASI continuous modes, compliant with EN50083-9 (1 Vpp, BNC, 75 Ω)
RF output frequency	950 ÷ 1550 MHz (100 kHz resolution)
IF output level	-10 ÷ -30 dBm (in 1 dBm steps)
Output signal	DVB-S2 modulated or carrier only
Modulation	DVB-S2 QPSK / 8PSK / 16APSK / 32APSK compliant with ETSI EN 302 307
FEC	1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10
Symbol rate	1 ÷ 30 MSymbol/s (in 1 kSymbol steps)
Roll-off factor	20%, 25%, 35%
Pilot	On / Off
Spectral inversion	On / Off

GENERAL

Control	RS232 (others on request)
Power supply	110 ÷ 240 Vac
Power consumption	20 W typ.
Operating temperature	-10 ÷ +45 °C
Storage temperature	-20 ÷ +80 °C
Storage realtive humidity	10% ÷ 80%
Dimensions	Rack 1U 28TE (172 × 45 × 214 mm)
Protection degree	IP50

DVB-T REPEATER

2-WAY RECEIVER AND TRANSMITTER

RPT-DVB-T

The DVB-T REPEATER is a compact and transportable solution to extend the range of a DVB-T link without the need of a coaxial cable. The RF frequency can be selected in the ISM band (2400 ÷ 2500 MHz). The 2-way diversity receiver allows to reach great performance even in case of mobile links. The rechargeable and easy-to-be-replaced battery allows to reach an autonomy between 5 and 7 hours.

TECHNICAL SPECIFICATIONS*

*specifications may be changed in accordance with the technical department

DEMODULATOR

RF input frequency	1 channel of 6 selectable in ISM band (2400 ÷ 2500 MHz)
Number of RF inputs	2 diversity mode
Video output	1 CVBS for monitoring opt. (MPEG-2 decoding)
Receive sensitivity	typ. -99 dBm
RF output frequency	1 channel of 6 selectable in ISM band (2400 ÷ 2500 MHz)
Minimum offset from receive channel	TBD
Numero of RF outputs	1
RF output level	typ. +20 dBm
Modulation	DVB-T COFDM compliant with ETSI EN 300 744
Channel bandwidth	6MHz, 7 MHz, 8 MHz
Carriers	2k mode, 8k mode
Constellation	QPSK, 16QAM, 64QAM
FEC	1/2, 2/3, 3/4, 5/6, 7/8
Guard interval	1/4, 1/8, 1/16, 1/32

GENERAL

RF Contol	2 x rotary switch to select input and output channels
Status	Lock, Input signal strength, Battery level via LED indicators
Power supply	rechargeable and replaceable battery 12 ÷ 13.8 Vdc
Autonomy	5 ÷ 7 hours
Power consumption	20 W typ.
Operating temperature	-10 ÷ +45 °C
Storage temperature	-20 ÷ +80 °C
Storage realtive humidity	10% ÷ 80%
Dimensions	Rack 1U 28TE (172 × 45 × 214 mm)
Protection degree	IP30

A/V RADIOCAMERA MODULATOR MDLT-AVCAM

The modulator for radio camera is a compact, rugged, reliable and easy to use device for the transmission of an analog audio/video signal. The input signal is modulated (FM) in the band 2.4 ÷ 2.6 GHz, but, upon request, the customer can choose from any 200 MHz sub-bands between 1.2 and 3 GHz. The system architecture ensures excellent audio/video signal quality, excellent frequency stability, and absence of distortions due to the PLL block.
The modulator is typically used in professional environments as transmission module for TV radiocameras. Its solid and compact aluminum box allows easy use even in harsh environmental conditions.

TECHNICAL SPECIFICATIONS*

*specifications may be changed in accordance with the technical department

MODULATOR

Frequency band	1.2 ÷ 3 GHz in 200 MHz sub-bands
Number of channels	200
RF output level	typ. +30 dBm
Video input level	1 Vpp
Video format	C.C.I.R. 625 lines
Video connector	BNC female 75 Ω
Audio input level	0 dBm
Audio subcarrier	typ. 7.5 MHz synthesized

GENERAL

Audio connector	Q-G 600 Ω, unbalanced
Output signal connector	N female 50 Ω
Setting	Rotary switches for frequency setting
Power supply	12 ÷ 15 Vdc
Absorbed current	15 mA standby, 380 mA typ., 450 mA max.
Operating temperature	-10 ÷ +45 °C
Storage temperature	-25 ÷ +55 °C
Storage realtive humidity	10% ÷ 80%
Dimensions	145 × 75 × 28 mm
Protection degree	IP50

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GPS REFERENCE

GPS-REF

The GPS controlled receiver for time/frequency reference allows to distribute up to 6 reference signals '10 MHz' and up to 6 signals '1 PPS' (Pulse Per Second) thanks to the integrated professional GPS receiver.
This device can therefore be used in all those scenarios where a time reference common to multiple devices is needed: e.g., in SFNs (Single Frequency Networks) with digital DVB-T transmitters, or in laboratory measurements with high precision temporal sources.

TECHNICAL SPECIFICATIONS*

*specifications may be changed in accordance with the technical department

GPS RECEIVER

Number of channels	50
Acquisition and tracking time	1 min
Sensitivity	-160 dBm

1 PPS

Number of outputs	6 (BNC connectors)
Holdover PPS 10 µs duration	24 h (±10°C or ±25°C)
Phase stability when locked	±30 ns typ.
Level	3.3 Vpp / 1 kΩ

10 MHz

Number of outputs	6 (BNC connectors)
Phase alignment	±5 ns @ 25°C
Phase noise	-125 dBc @ 10 Hz
(10 MHz sine)	-140 dBc @ 100 Hz
	-140 dBc @ 1 kHz
Level of 10 MHz square	3.3 Vpp / 1 kΩ

TRACKING, FILTERING, HOLDOVER

OCXO performance ageing	1E-10
OCXO performance thermal	1E-9 peak to peak

COMMUNICATION INTERFACES

Ethernet	100baseT - TCP/IP, HTTP
RS232	9600, 8, N, 1

GENERAL

Antenna connector	N, female, 50 Ω
Primary power supply	110 ÷ 240 Vac
DC Backup	36 ÷ 72 Vdc
Operating temperature	-20 ÷ +65 °C
Storage temperature	-25 ÷ +80 °C
Storage relative humidity	10% ÷ 80%
Dimensions	Rack 19'' 1U
	(483 × 45 × 270 mm)
Protection degree	IP50

ENCODER MPEG-2

ENC-MPEG2

The MPEG-2 encoder can compress up to 4 analog (CVBS) or digital (SDI) video streams according to the MPEG-2 standard (ISO/IEC 13818-2) MP @ ML, and up to 8 analog audio channels according to MPEG-1 standard (ISO/IEC 11172-3) Layer 1/2. The encoder output is an ASI stream of the 4 multiplexed MPEG-2 Transport Streams.

TECHNICAL SPECIFICATIONS*

*specifications may be changed in accordance with the technical department

VIDEO ENCODING

Input signals	Up to 4 CVBS or SDI (1 Vpp, BNC, 75 Ω)
Video standard	PAL-BGH, PAL-I, PAL-D, PAL-N, NTSC 4.43, Comb PAL-N, NTSC-N, SECAM-DKL, SECAM-BG, NTSC-M @ 60 Hz, PAL 4.43 @ 60 Hz, NTSC 4.43 @ 60 Hz, PAL-M @ 60 Hz, NTSC-J @ 60 Hz
Video encoding	MPEG-2 (ISO/IEC 13818-2) MP@ML
Video processor	9bit, 4:2:2 Output format, 4:2:0 MPEG encoding
Video bitrate	Up to 15 Mbps per channel, Max 31 Mbps stream
Video resolution	Up to 720 x 576 (SD)

AUDIO ENCODING

Input signals	Up to 8 analog (0 dBm, 600 Ω)
Sampling frequencies	32 kHz, 44.1 kHz, 48 kHz
Audio encoding	MPEG-1 (ISO/IEC 11172-3) Layer 1/2
Audio bitrate	Up to 448 kbps

GENERAL

Output signal	ASI continuous mode, compliant with EN50083-9 (1 Vpp, BNC, 75 Ω)
Local control	rotary encoder and display on front panel
Remote control	RS232, HTTP, SNMP (on request)
Power supply	110 ÷ 240 Vac
Power consumption	50 W typ.
Operating temperature	-10 ÷ +45 °C
Storage temperature	-20 ÷ +80 °C
Storage relative humidity	10% ÷ 80%
Dimensions	Rack 19" 1U (483 x 45 x 270 mm)
Protection degree	IP50

DECODER MPEG-2

DEC-MPEG2

The MPEG-2 decoder can decode an ASI stream according to the MPEG-2 standard (ISO/IEC 13818-2) MP @ ML, and provide analog (CVBS) or digital (SDI) video streams with relative audio channels.

TECHNICAL SPECIFICATIONS*

*specifications may be changed in accordance with the technical department

VIDEO DECODING

Output signals	CVBS or SDI (1 Vpp, BNC, 75 Ω)
Video standard	PAL-BGH, PAL-I, PAL-D, PAL-N, NTSC 4.43, Comb PAL-N, NTSC-N, SECAM-DKL, SECAM-BG, NTSC-M @ 60 Hz, PAL 4.43 @ 60 Hz, NTSC 4.43 @ 60 Hz, PAL-M @ 60 Hz, NTSC-J @ 60 Hz
Video decoding	MPEG-2 (ISO/IEC 13818-2) MP@ML, MP@LL, SP@ML MPEG-1 Bitstream (ISO-11172-2) decoder DVB compliant
Video conversion	4:2:2 -> 4:2:0 for DAC Video Processor
Error correction	Syntax Checker and Concealment Vectors
Video resolution	Up to 720 x 576

AUDIO DECODING

Output signals	Analog (0 dBm, 600 Ω)
Sampling frequencies	16 / 22.05 / 24 / 32 / 44.1 / 48 kHz
Audio coding	MPEG-1 (ISO/IEC 11172-3) Layer 1/2
Oversampling clock	384 fs / 256 fs

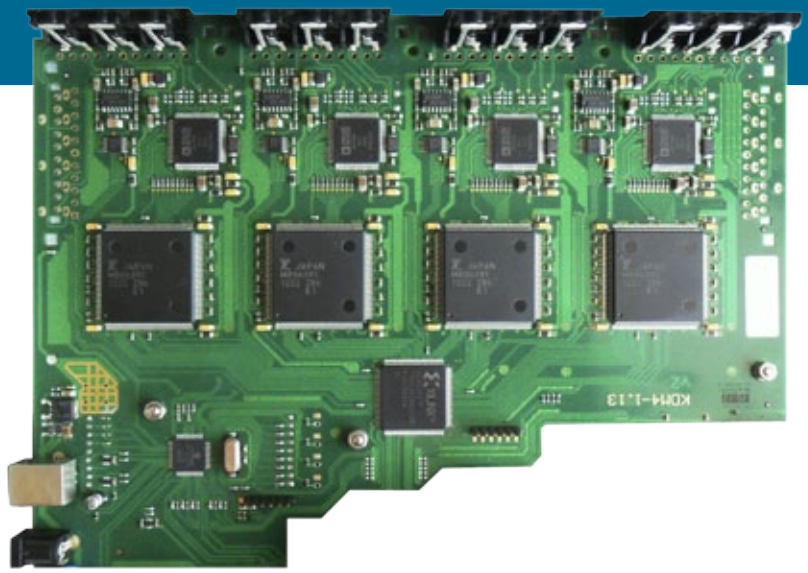
GENERAL

Input signal	ASI continuous mode, compliant with EN50083-9 (1 Vpp, BNC, 75 Ω)
Local control	Rotary encoder and display on front panel
Remote control	RS232, HTTP, SNMP (on request)
Power supply	110 ÷ 240 Vac
Power consumption	40 W typ.
Operating temperature	-10 ÷ +45 °C
Storage temperature	-20 ÷ +80 °C
Storage relative humidity	10% ÷ 80%
Dimensions	Rack 19" 1U (483 x 45 x 270 mm)
Protection degree	IP50

ENCODER IP MPEG-2

4 AUDIO/VIDEO CHANNEL ENCODER WITH IP OUTPUT

ENC-MPEG2-IP



The MPEG-2 encoder with IP output can encode up to 4 audio / video inputs and provides a UDP / IP output stream containing the Transport Stream of the 4 channels. It is proposed as a series of modules that allows for easy integration into existing solutions.

TECHNICAL SPECIFICATIONS*

*specifications may be changed in accordance with the technical dept

ENCODER

Video inputs	4 x CVBS / RGB / COMP
Video input level	0.5 ÷ 1.6 Vpp
Video standard	PAL, NTSC, SECAM
Audio inputs	4 x L+R
Audio input level	0.5 ÷ 2 Vpp
Video compression	MPEG-2 MP@ML
Video resolution	576i (PAL), 480i (NTSC)
Audio compression	32 ÷ 348 kbps MPEG-1 Layer II Stereo, Mono, Joint Stereo
Video aspect ratio	4:3, 16:9, 1:1, 2.21:1

GENERAL

Audio/Video connectors	RCA
Power supply	12 Vdc
Power consumption	15 W typ.
Operating temperature	-10 ÷ +45 °C
Storage temperature	-20 ÷ +80 °C
Storage realtive humidity	10% ÷ 80%
Dimensions	220 x 200 mm

PM Microwave provides an optional software based on VLC libraries to decode the transmitted Transport Stream over IP. The interface, configurable according to customer needs, allows to simultaneously view the 4 channels, record them, resize windows and much more.

ASI-IP / IP-ASI CONVERTER

CONV-ASI-IP

The ASI-IP / IP-ASI converter is a compact standalone module that allows to convert an ASI stream in one IP stream and vice versa. It is mainly used for video signal distribution systems, encoding and multiplexing. The device is able to manage IP flows with UDP or RTP encapsulation and can be easily configured through a dedicated serial interface.

TECHNICAL SPECIFICATIONS*

*specifications may be changed in accordance with the technical department

ETHERNET CHARACTERISTICS

Input / Output protocol	UDP, RTP over IP
FEC	SMTPE 2022
Ethernet standard	IEEE 802.3a
Data rate	100/1000 Mbps auto detect
Connector	RJ45 with LED indicators
IP address assignment	DHCP or static
Multicast support	IGMPv2

ASI CHARACTERISTICS

Input / Output standard	EN50083-9
Connector	BNC female 75 Ω
Bitrate	214 Mbps max.
Packet size	188/204 bytes

GENERAL

ASI - IP latency	1 ms max.
IP - ASI latency	1 ms min.
IP jitter tolerance	120 ms max.
Control	RS232 (USB or Ethernet opt.)
Power supply	110 ÷ 240 Vac
Power consumption	6 W typ.
Operating temperature	-10 ÷ +45 °C
Storage temperature	-20 ÷ +80 °C
Storage realtive humidity	10% ÷ 80%
Dimensions	Rack 1U 28TE (172 × 45 × 214 mm))
Protection degree	IP50

UP CONVERTERS (OUTDOOR)

UC-OU

The Up Converter devices allow to convert signals form intermediate frequency IF to radio frequency RF. They are typically provided in waterproof external boxes so as to be placed as close as possible to their respective antennas.
The Up Converters are remotely powered by the same input connector of the IF signal. Their internal local oscillators (designed by PM Microwave) boast excellent stability and spectral purity.

TECHNICAL SPECIFICATIONS*

*specifications may be changed in accordance with the technical department

UP CONVERTER

IF input frequencies	typ. 36 / 70 / 1200 / 2400 MHz (others on request)
Input level	typ. -10 dBm
RF output frequencies	1.8 ÷ 14.5 GHz
Output level	27 / 30 / 33 / 37 dBm (0.5, 1, 2, 5 W)
Input signal bandwidth	max. 30 MHz
Input characteristic impedance	50 Ω
Return loss on input port	> 18 dB
RF structure	PLL synthsized, single or double conversion
Frequency stability L.O.	± 5 ppm standard, ± 2 ppm HS opt.
L.O. steps	1 MHz standard (others on request)
Spurious emissions	< -60 dBc

GENERAL

Power supply	13 ÷ 15 Vdc via IF input
Power consumption	30 W max.
Operating temperature	-10 ÷ +45 °C
Storage temperature	-20 ÷ +80 °C
Storage relative humidity	10% ÷ 80%
Dimensions	Custom box (220 × 96 × 228 mm)
Protection degree	IP67

DOWN CONVERTERS (OUTDOOR)

DC-OU

Like the Up Converters, also the Down Converters are generally proposed in the version of waterproof box for outdoor environments. This allows installations closer to the antenna, minimizing losses due to wiring. The Down Converters are powered via the output connector of the IF signal and they internally contain PM Microwave local oscillators, which boast excellent stability and spectral purity.

TECHNICAL SPECIFICATIONS*

*specifications may be changed in accordance with the technical department

DOWN CONVERTER

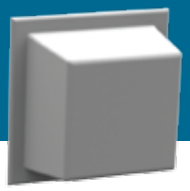
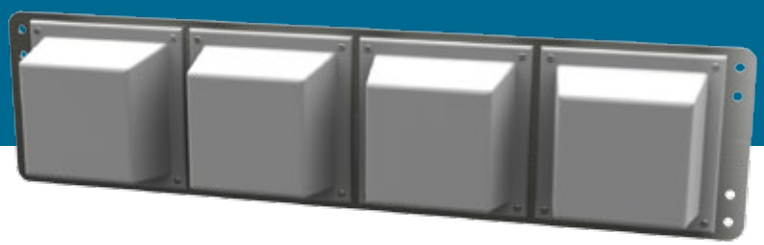
RF input frequencies	1.8 ÷ 14.5 GHz
IF output frequencies	typ. 36 / 70 / 1200 / 2400 MHz (others on request)
Output level	typ. -10 dBm
Output signal bandwidth	max. 30 MHz
Output characteristic impedence	50 Ω
Return loss on output port	> 18 dB
RF structure	PLL synthesized, single or double conversion
Noise figure	2 dB typ.
Frequency stability L.O.	± 5 ppm standard, ± 2 ppm HS opt.
L.O. steps	1 MHz standard (others on request)
Spurious emissions	< -60 dBc

GENERAL

Power supply	13 ÷ 15 Vdc via IF input
Power consumption	15 W typ.
Operating temperature	-10 ÷ +45 °C
Storage temperature	-20 ÷ +80 °C
Storage relative humidity	10% ÷ 80%
Dimensions	Custom box (220 × 96 × 228 mm)
Protection degree	IP67

ANTENNAS PATCH

ANT-AOF
ANT-SIXT

The antennas that PM Microwave offers for broadcasting applications are mainly in 2.1 ÷ 2.7 GHz band for Multichannel Multipoint Distribution Service (MMDS).
The portfolio includes both illuminators AOF for standard OFFSET or PRIME FOCUS reflective dishes whose diameter is between 0.65 and 2 m, and radiating arrays SIXT for high gain systems with unidirectional, omnidirectional, horizontal and vertical radiation diagrams.

TECHNICAL SPECIFICATIONS

	AOF-N-M-065-FD	AOF-N-M-095-FD	AOF-N-M-120-FD	AOF-N-M-150-FD
Main dish	Offset / Prime Focus reflector 0.65 m	Offset / Prime Focus reflector 0.95 m	Offset / Prime Focus reflector 1.2 m	Offset / Prime Focus reflector 1.5 m
Frequency range	2.1 ÷ 2.7 GHz	2.1 ÷ 2.7 GHz	2.1 ÷ 2.7 GHz	2.1 ÷ 2.7 GHz
Impedance	50 Ω	50 Ω	50 Ω	50 Ω
Gain (mid-band)	22.6 dBi	24.6 dBi	26.5 dBi	28.3 dBi
VSWR	< 1.25	< 1.25	< 1.25	< 1.25
Polarization	H / V	H / V	H / V	H / V
Max. input power	10 W	10 W	10 W	10 W
Radiation pattern (mid-band)				
-3dB E-plane	10.9°	8.3°	7°	5.8°
-3dB H-plane	10.2°	8.2°	7°	5.8°
Side-lobe suppression	< 19 dB	< 19 dB	< 22 dB	< 25 dB
Front-to-back ratio	< 25 dB	< 30 dB	< 35 dB	< 42 dB
Input connector	N female	N female	N female	N female
Dimensions	110×110×105 mm	110×110×105 mm	110×110×105 mm	110×110×105 mm
Weight	0.4 kg	0.4 kg	0.4 kg	0.4 kg
Material	Steel, Aluminium, Polyester	Steel, Aluminium, Polyester	Steel, Aluminium, Polyester	Steel, Aluminium, Polyester
Protection degree	IP65	IP65	IP65	IP65

	SIXT-HVD 4H / SIXT-HVD 4V
Frequency range	2.3 ÷ 2.7 GHz
Impedance	50 Ω
Gain (mid-band)	16 dBi
VSWR	< 1.3
Polarization	H / V
Max. input power	200 W
Radiation pattern (mid-band)	
-3dB E-plane	18°
-3dB H-plane	68°
Side-lobe suppression	< 18 dB
Input connector	N female
Dimensions	490×120×132 mm
Weight	1.8 kg
Materials	Steel, Aluminium, Brass, Polyester
Wind surface	0.6 m^2
Lighting protection	All metal parts are DC grounded
Icing protection	Full radome
Radome colour	White
Protection degree	IP65

ANTENNAS HORN

ANT-HRN

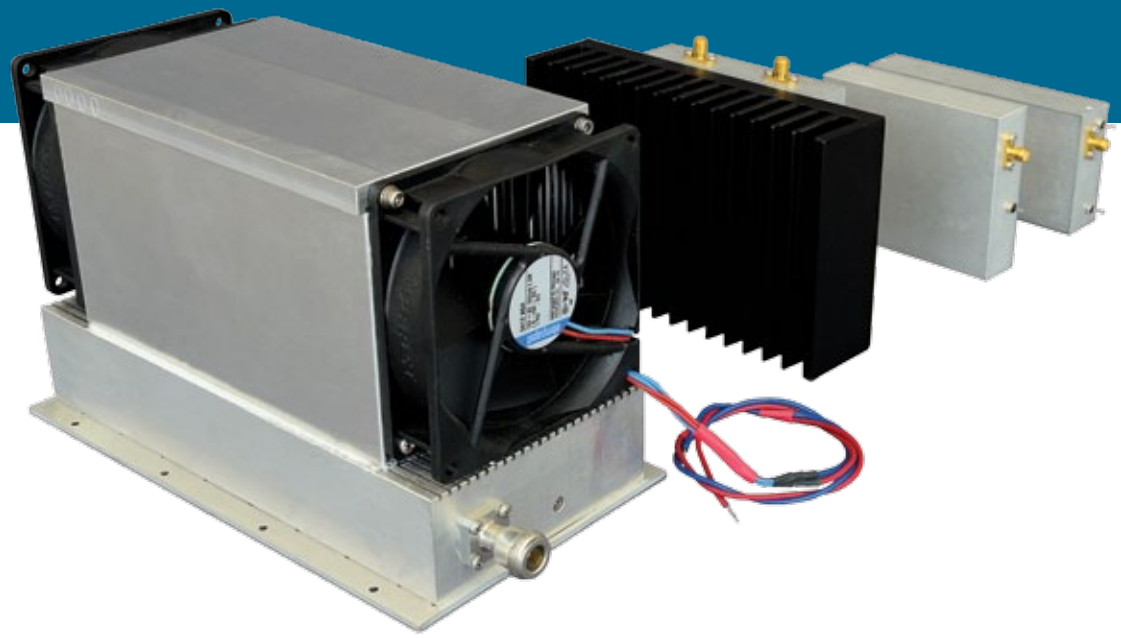
The horn antennas proposed by PM Microwave are designed to be used as offset feeds for parabolic reflectors with f/D = 0.6. They are also suitable for point-to-point transmission of microwave signals in the 5 GHz, 7 GHz and 10 GHz bands.
They are typically used in the field of WLANs, in video surveillance applications or for experimental, radio amateur and educational purposes.

TECHNICAL SPECIFICATIONS

	HRN-SMA-005	HRN-SMA-007	HRN-SMA-010
Frequency band	5 GHz	7 GHz	10 GHz
Impedance	50 Ω	50 Ω	50 Ω
Gain (midband)			
VSWR			
Max. input power	please contact	please contact	please contact
Radiation pattern (midband)	PM Microwave	PM Microwave	PM Microwave
-3dB E-plane	for more details	for more details	for more details
-3dB H-plane			
Dimensions			
Connector	SMA female	SMA female	SMA female
Material	Aluminium	Aluminium	Aluminium
Protection degree	IP65	IP65	IP65

POWER AMPLIFIERS

PWR-AMP



The power amplifiers that PM Microwave includes in its products portfolio are able to cover applications that require signal powers up to 50 W. These are Class A amplification modules with excellent linearity, and are therefore suitable to work with digital modulations of high order and complexity.
Depending on the model, the devices can be equipped with passive or active heat sinks. All modules are tested in temperature to ensure the maximum reliability of operation over time. The RF powers and frequency bands are customizable according to the customer needs.

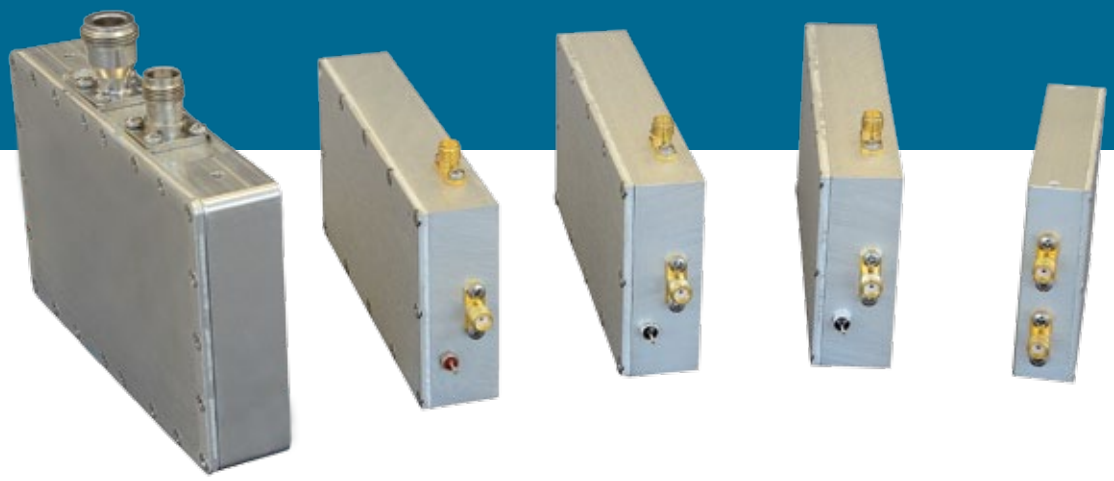
PRODUCT FAMILY

RF Band	CW Power (P_{SAT})					
	100 mW	0.5 W	1 W	5 W	10 W	50 W
1 ÷ 2 GHz	×	×	×	×	×	
2 ÷ 3 GHz	×	×	×	×	×	×
5 ÷ 6 GHz	×	×	×			
7 ÷ 8 GHz	×	×	×			
10 ÷ 11 GHz	×	×	×			
11 ÷ 12 GHz	×	×	×			
14 ÷ 15 GHz	×	×	×			

Please contact Microwave PM for more information or customization of the modules.

LOW NOISE AMPLIFIERS

LNA

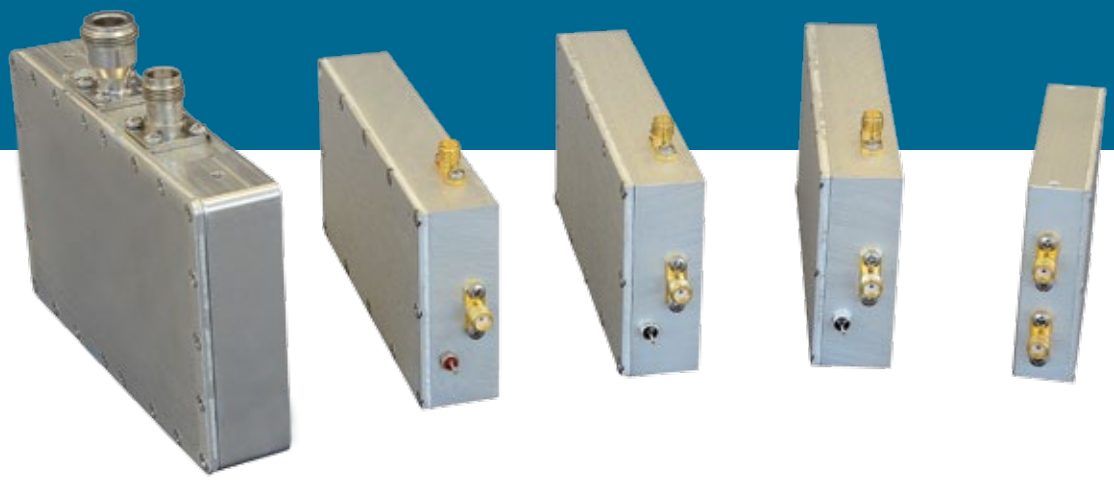


PM Microwave designs and manufactures a full range of LNAs suitable for different applications, ranging from broadcast to data transmission, up to OEM devices ready for integration into complex systems.
The frequency range extends from DC to 18 GHz. Features such as gain, subband, etc. can be easily customized according to the customer needs.

Please contact Microwave PM for more information or customization of the modules.

AMPLIFIERS RF

AMP

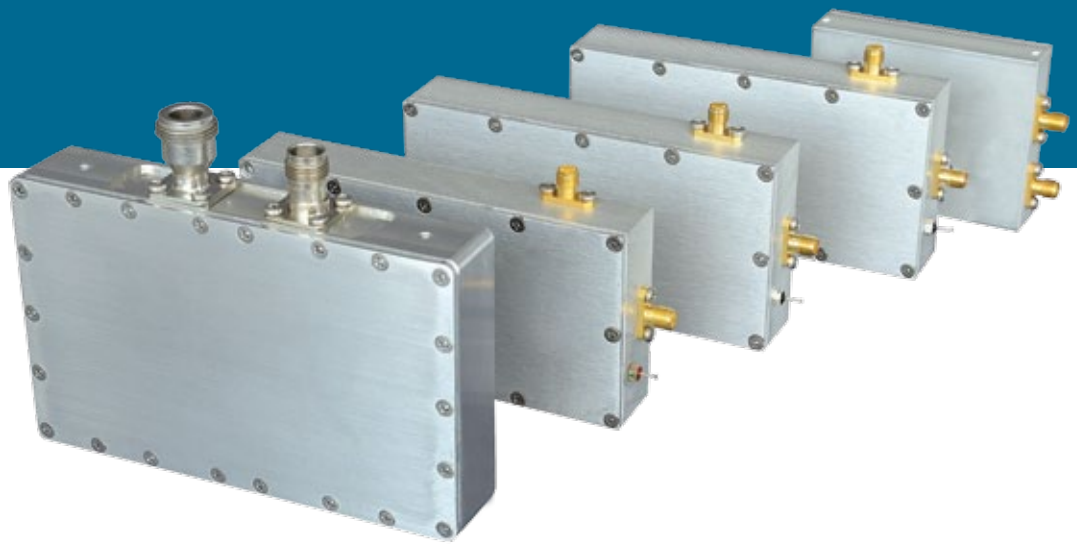


PM Microwave offers a wide range of amplifiers for low power RF signals. They are typically used as line amplifiers, drivers for power amplifiers or for laboratory applications.
The covered frequencies range from DC to 18 GHz. Gain, bandwidth, noise figure, etc. of each device can be easily customized according to the needs of the customer.

Please contact Microwave PM for more information or customization of the modules.

UP & DOWN CONVERTERS

UP-CONV
DW-CONV

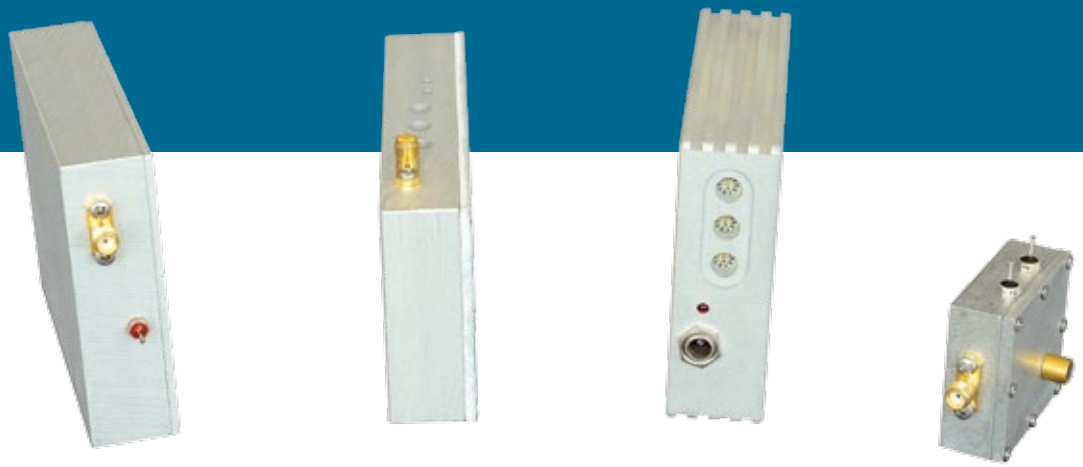


The range of Up and Down Converters offered by PM Microwave is able to meet the demands of customers in various fields of application. The characteristics of stability and spectral purity of the oscillators, combined with the high linearity of mixers and amplification chains, make these devices the optimal choice for many applications.
The fully customizable RF/IF/LO frequencies make these modules extremely flexible and suitable for OEM integrations. The frequency range extends from 0.1 to 14 GHz.

Please contact Microwave PM for more information or customization of the modules.

OSCILLATORS

OSC

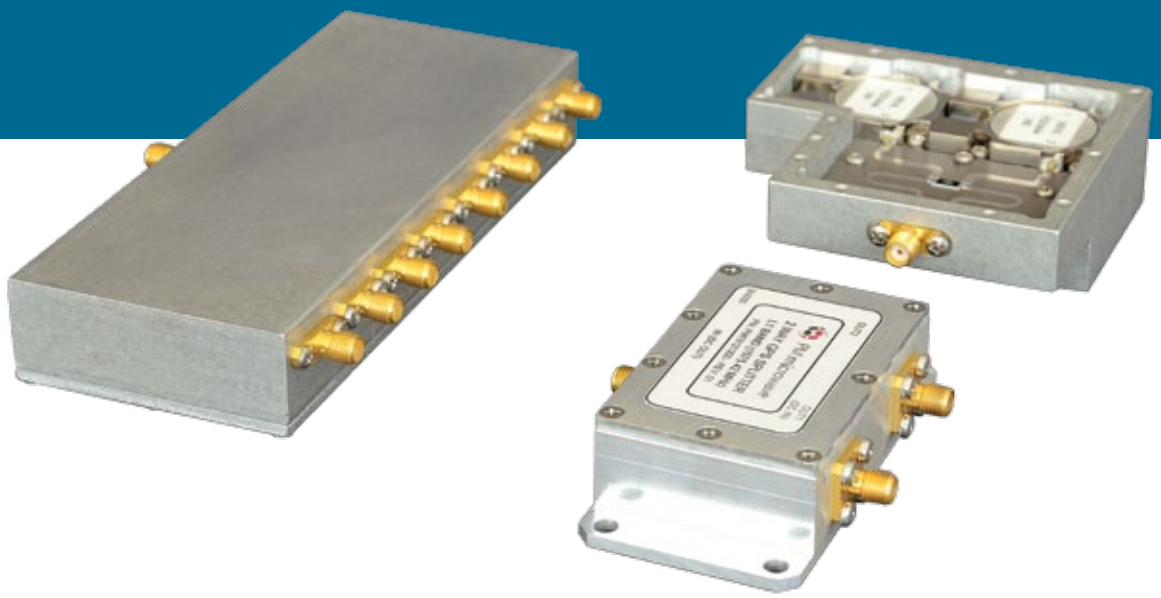


The range of modular oscillators produced by PM Microwave covers the band from a few MHz up to 12 GHz with PLL or DRO technology.
The high stability and the spectral purity of the synthesized devices makes them suitable for applications in conversion chains of digital signals with complex modulations.
The frequency can be fixed or tunable, for example through practical rotary switches or other types of interfaces.
The internal frequency references are generally TCXO with stability of ±2.5 ppm or less on demand.

Please contact Microwave PM for more information or customization of the modules.

SPLITTERS & COMBINERS

SPLT-COMB



PM Microwave designs and manufactures a wide range of RF power dividers and combiners. The layout and the quality of mounted components ensure low insertion losses, high isolation and a very good VSWR on every port.
The devices are designed for various applications of RF signals distribution: for example, one can connect two modems to a single antenna or two antennas to a single modem.

Please contact Microwave PM for more information or customization of the modules.

BAND-PASS FILTERS

BPF

PM Microwave offers a range of bandpass filters consisting of mechanical structures with resonant cavities that are characterized by low losses, strong selectivity and the ability to handle high power levels. All filters are designed and developed based on specifications agreed with the customer, in order to always propose the most technologically and economically suitable solution.

PRODUCTS FAMILY

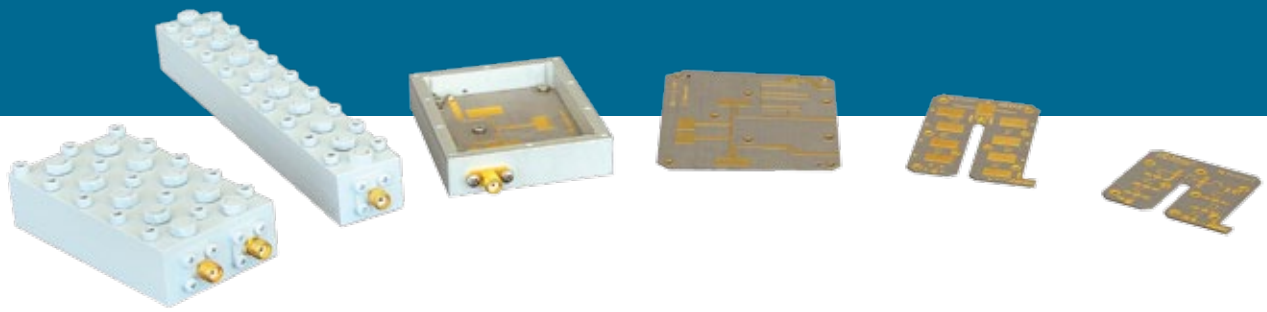
CENTER FREQUENCY	BANDWIDTH
from 900 to 1300 MHz	from 20 to 60 MHz
from 1700 to 2500 MHz	from 30 to 200 MHz
from 2500 to 3200 MHz	from 30 to 200 MHz
from 3000 to 5800 MHz	from 30 to 200 MHz
from 1100 to 1800 MHz	from 300 to 400 MHz
from 2200 to 2800 MHz	from 300 to 500 MHz

Note: other bands or frequencies on request.

Fill out the form on our website to request technical and economic information of the desired filters.

LOW-PASS FILTERS

LPF



The low pass filters that PM Microwave is able to realize, range from coaxial structures in air to lumped and distributed elements circuits. As for the band pass filters, even the low pass filters are designed and developed specifically for the customer, in order to always propose the most technologically and economically suitable solution.

Fill out the form on our website to request technical and economic information of the desired filters.

CASE STUDY
AMERICA'S CUP: 2003 AND 2007 EDITIONS

Here are some photos of the COFDM transmitters and receivers operating at 2.5 GHz, provided by PM Microwave to New Zealand TV for the 2003 edition of the America's Cup.

For this event, PM Microwave has provided sixteen COFDM transmitters and sixteen receivers, that have transmitted digital audio/video signals from yachts to receivers installed on the tower of TVNZ in Auckland.

Each yacht has been equipped with two COFDM transmitters mounted on a supporting bar placed at the stern of the boat. Many cameras and microphones, installed both on board the yacht and on board a helicopter, allowed to directly film the exciting scenes of the crews engaged in difficult and acrobatic operations.

The high quality of the MPEG-2 video encoder, the high robustness of COFDM technology and absolute reliability of RF devices have guaranteed the highest quality of broadcasting. In addition, the small size and low power consumption of the components have helped to make a difference in the choice of board electronic equipment.

The 16 COFDM receivers were installed in the TV reception center of New Zealand in order to receive "live" signals from the race course, in the Bay of Auracky 30 km away. State television in New Zealand then proceeded to broadcast these images around the world.

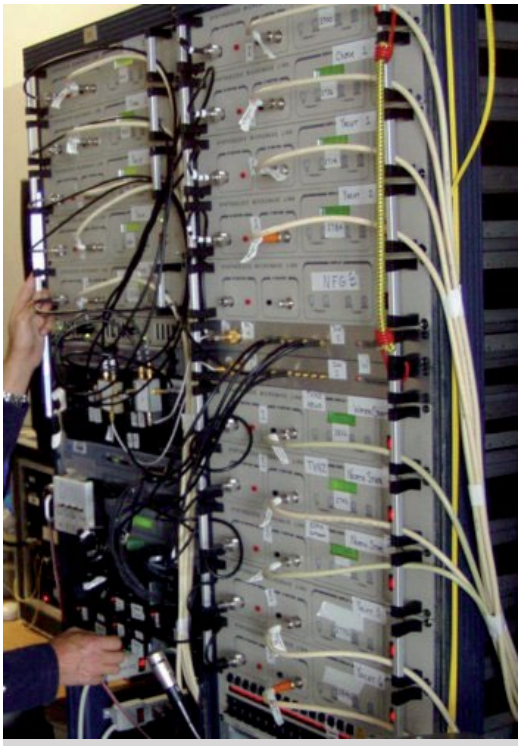
Thanks to Swiss team Alinghi, America's Cup returned to Europe, which was missing from the 1851. The 2007 edition took place in Spain, in the sea in front of Valencia, and PM Microwave has been appointed for the second time to provide the RF equipment for filming the event.

The system aboard an unlucky yacht that broke the tree

A detail of the transmitter on board

The receiving center in Auckland

The transmission system on board the yacht from an aerial view



COFDM receivers installed at TVNZ

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CASE STUDY

COFDM RF SUBSYSTEMS FOR BUSH SETTLEMENT IN WHITE HOUSE

It is completely Italian-based the TV transmission technology used for the Bush inaugural parade in Washington. The USA Networks have chosen the Italian technology in order to get the images of the inaugural parade of the second mandate of President Bush into all American houses.

PM Microwave, a company specialized in microwave links, provided the whole radio subsystems that carry the signal and merged the two technologies for encoding and digital modulation (provided by M.B. International, a leader in the digital TV development) in a single integrated system weatherproof.

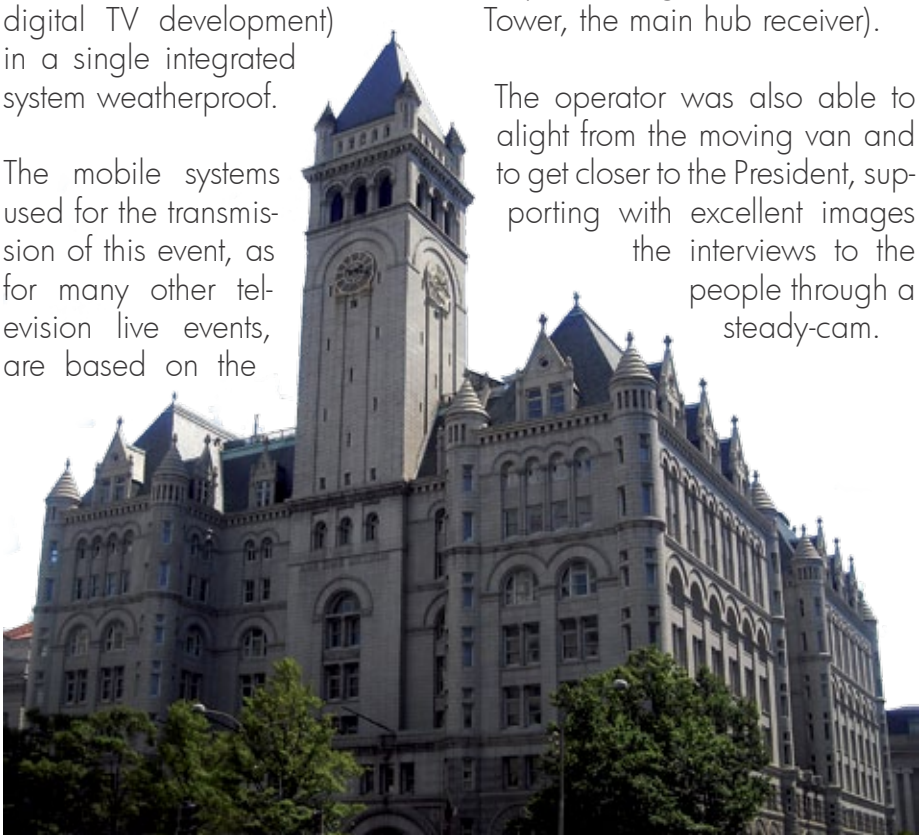
The mobile systems used for the transmission of this event, as for many other television live events, are based on the DVB-T digital technology, that allows to transmit perfect images from moving vehicles and without the need of optical visibility between the transmitter and the receiver antenna.

It was thus possible to switch among the skyscrapers without ever losing the contact with the lives in motion.

For the first time it was possible to closely live follow the inaugural parade: a mobile van, specially equipped, sent the live signal to the receiving stations located on some buildings along the way (including the historic Clock Tower, the main hub receiver).

The operator was also able to alight from the moving van and to get closer to the President, supporting with excellent images the interviews to the people through a steady-cam.

▲ The mobile unit used for filming during the snowstorm. In the last photo above, you can see the transmitter provided by PM Microwave and mounted on a tripod on the roof of the vehicle.



◀ The Old Post Office Clock Tower in Washington, the main receiving hub.

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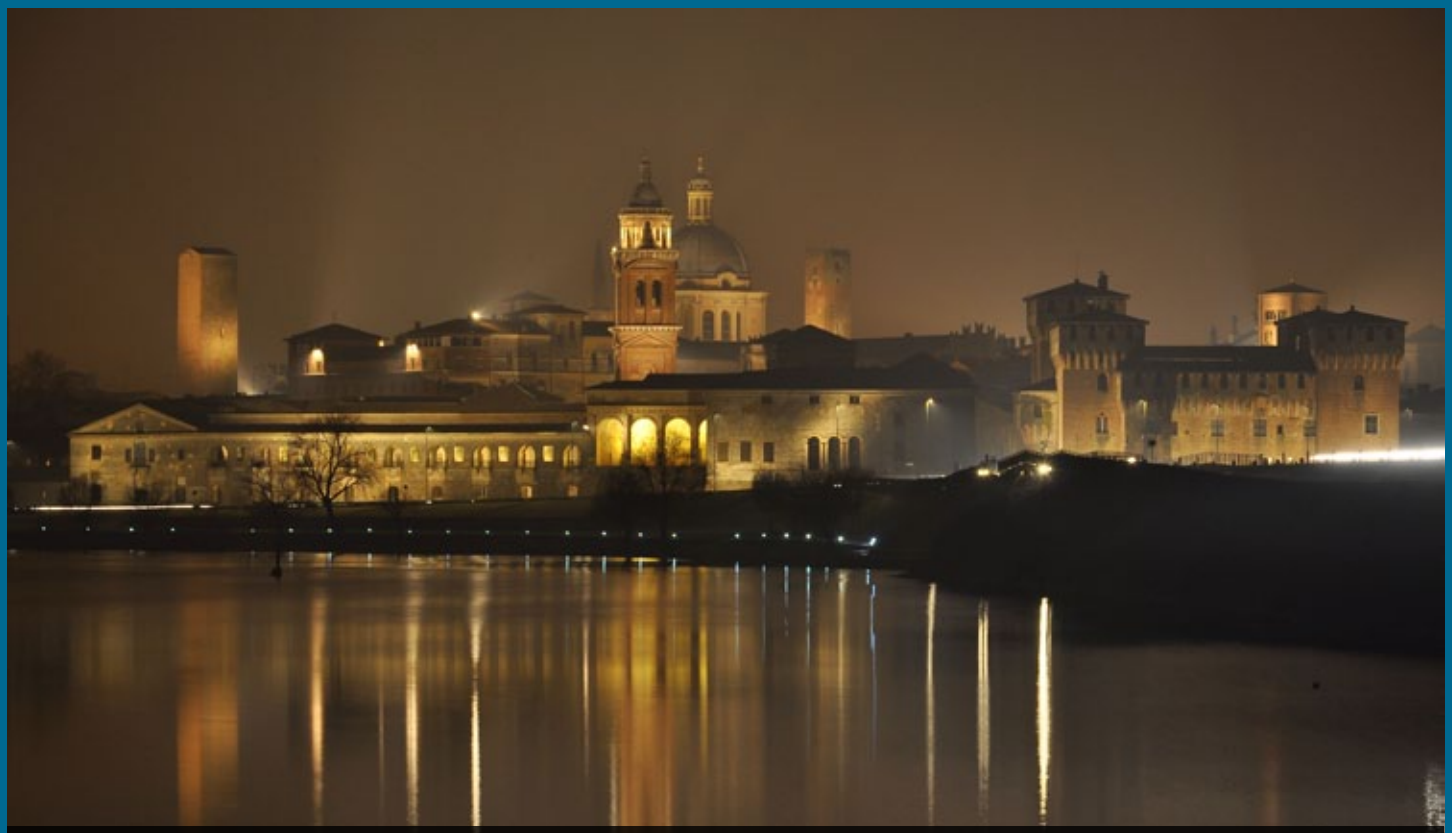

LOCATION

PM Microwave is located in Northern Italy between Milan and Venice, and few kilometers far from Verona. Its geographical position allows the company to take advantage of the high volume of business of the entire area, as well as to cooperate with several technologically advanced suppliers.

The operational site is situated in Rivalta sul Mincio. Mincio is a river that flows from Lake Garda about 65 km past Mantua into the Po River. Around Mincio River a natural park called "Parco del Mincio" arises and includes many typical beautiful towns like Rivalta and Mantua (in the above picture, the characteristic Mantua skyline).

PM Microwave operational site is easily reachable from Verona, Bergamo, Bologna, Milan and Parma airports.

By car, it is also well connected to A4 and A22 highway.

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