



LEONARDO ELECTRONICS



# NAVAL RADIOS

LEONARDO is a worldwide leading integrator of shipboard communications. Our role goes beyond the 'generic' systems integration and how we execute is peculiar to tactical communications in a maritime environment. Our Integrated naval Communications System (ICS) and the packages of the supported HF/VHF/UHF Standard and IP Proprietary Waveforms are the solid foundations on which Maritime Domain Awareness (MDA) rely on.

## NAVAL SDR PRODUCT FAMILY



The SWave family of Maritime Radio equipment includes the following products:

- 150 W long-range HF Beyond-Line-Of-Sight (BLOS) Radio Unit;
- 100 W Line-Of-Sight (LOS) V/UHF Radio Unit;
- 500 W, 1 KW, 2x1 KW HF Radios;
- HF Multi-Channel Radio;
- V/UHF Multi-Channel Radio;
- 5/10 Kw High-Power Stationary HF Radios.

## KEY BENEFITS

- State-of-the-art, single-source, integrated communications system;
- Scalable for a wide variety of naval vessels, from light support ships, large frigates, corvettes, interceptors, patrolers, aircraft carriers and submarines;
- Option for Use in Coastal Naval Bases up to 5 and 10 Kw of transmitted power;
- Combined and joint missions;
- Modular architecture: native common processing module as hardware core in HF, VHF and UHF base radio units;
- Support of broadband and integrated antennas for the on-deck remote antennas;
- NEC-enabling reconfigurable radios;
- IP-over-Air (IPoA);
- Custom video, voice, data and high-speed message transfer;
- Secure communications relaying on site/aboard Crypto subsystem;
- Software Defined Radios for video, voice and data;
- Standard Waveforms protocols and proprietary IP Networking solutions;
- Ease of operations.

Naval SDR products from Leonardo are turnkey communications systems designed to bring maritime radios to the next state of the market, in-service ashore and aboard ships. Already used by many Marine Corps, Security Authorities and Military users, this configurable shortwave communications are easy to set up and offer extreme reliability in accordance with the requirements from Legge Navale Program from the Italian Navy.

These SDR Radios are designed to support the external communications of the military vessels by successfully coping with the today emerging needs about the MDA of the naval missions.

Alongside HF BLOS communications, our portfolio also encompasses V/UHF communications for delivering Navies with IP-over-Air and High Speed MANET WFs, NATO HaveQuick I/II, Saturn IV, Link 11/22 and Satcom WFs. Specifically designed for the maritime environment, the SWave Radio portfolio is the keystone of the Naval ICS, offering solutions for different naval scenarios. An example is our multichannel SWave installed in a 19" rack on Patrol vessels, fully interoperable with a 150W HF and a 100 V/ UHF transceiver unit on small ships or rigid inflatable boats. This includes HF, VHF and UHF SDR-based radios in a fully Integrated Communications Systems (ICS) for all classes of vessels, small ships/boats and stationary coastal communications platforms.

## HF & V/UHF BASE MARITIME RADIOS

The SWave 150 W long-range HF BLOS Radio Unit is the base element of the SDR HF Radio Subsystem of the Maritime ICS.

The radio is designed around the highly modular concept of the Common Core radio Module (CCR) combining all the common functions through the HF, VHF and UHF bands.



The CCR is a new generation, multi-band and multi-processing module specifically designed to extend the capabilities of the land and airborne Swave SDR family to the naval communications domain.

The CCR accomplishes the following main tasks:

- is compliant with the US DoD Software Communications Architecture SCA v.2.2.2 and with the extensions of the EU ESSOR Consortium;
- hosts the Operating Environment (OE) of the SWave family radios;
- runs any standard and new waveforms;
- performs all the user interface functionalities.

Then, a 150 W Radio Frequency Front-End is co-hosted into the product case. The CCR is located in the left half, with the front-end and the 150W HF power amplifier, with agile pre/post-selectors, at the right. This pre/post selector significantly reduces the out-of-band noise emissions that interfere with other equipment so improving the transceiver's capability to operate in proximity of other receivers/transceivers. As such, the HF Maritime Radio is based on the modular and high performant computing architecture of the CCR module combined with the mixed receiver architecture, direct conversion and analog/digital zero-IF, of the RF Front-End module.

The SWave 100 W LOS V/UHF Radio Unit is the main component of the V/UHF Radio Sybssystem of the Maritime ICS and relies on a twin architecture of the 150W HF Radio Unit. The modular architecture also provides the capability to host the latest, next-generation high data rate waveforms supporting both STANAG and proprietary waveforms, including ECCM/EPM and MANET waveforms.

Both the 150 W HF and the 100 W V/UHF are IPoA radios operating in both stationary and shipboard installations. They support wideband data and voice services also providing full interoperability with fielded C4ISR systems. They are housed in a light alloy 3U rackmount drawer suitable for standard EIA 19" racks.

## HIGH POWER MULTI-CHANNEL RADIOS

The SWave HF High Power-enabled Multi-Channel Radio is the aggregation of the base HF SDR radios in a multi-channel radio subsystem. A variety of channel configurations may be set on factory for satisfying specific customer requirements. The 15U high 1 KW single channel HF Radio is the basic one. Thanks to a Common Aerial Working Unit, the Multi-Channel Radio is able to manage up to four independent HF carriers and to combine them on a single antenna.

Just anyone of the following provisions may fit the four channels capacity of these wideband HF Radios dependent by missions' needs. Possible examples are:

- Two 2 KW channels;
- One 2 KW channel and two 500W channels;
- Four 500W channels.

The SWave V/UHF Multi-Channel Radio is the aggregation of as many base V/UHF SDR radios the customer wants in a multi-channel radio subsystem. The maximum supported number per rack is four 100 W channels. V/UHF Maritime Modular Radio Transceiver Units along with four double bridge modules may operate on a single antenna.

Both the 1 KW / 2 KW HF and the 100 W V/UHF multichannel radios are 19" racks, 40U high. The radios are suitable for both stationary and aboard vessel installations.



## HF WAVEFORMS

Voice service:

- Plain voice according to STANAG 4203;
- Secure voice according to STANAG 4197.

Data services: STANAG 4285, STANAG 4529, STANAG 4481, STANAG 4539 (up to 9.6 kb/s), STANAG 5065, MIL-STD-188-110 B Appendix C, MIL-STD-188-141B Appendix C, ready for EPM STANAG 4444

Interoperability: embedded 2nd and 3rd generation ALE; HF Co-Supported in Naval ICS: STANAG 5066, STANAG 5069, MIL-STD-188-141D Appendix G, HF Link 11/22.

## V/UHF WAVEFORMS

Narrowband: V/UHF AM/FM (STANAG 4204/ 4205);

Wideband: SelfNET Broadband Waveform;

EPM/ECCM: HQ I/II (STANAG 4246), SATURN IV (STANAG 4372);

Data link: High-Data Rate interface for external Sub Network Relay (SNR);

V/UHF Co-Supported in Naval ICS: Sincgars, SatCom DAMA/IW, Marlin, Link 11/22, ESSOR HDR.

## TECHNICAL SPECIFICATIONS

### 150W HF RECONFIGURABLE RADIO

#### GENERAL

<b>Frequency range</b>	Tx: 1.5MHz to 30MHz Rx: 10KHz to 30MHz
<b>Tuning step</b>	1Hz
<b>Frequency stability</b>	±0.1ppm over 24h
<b>Modes</b>	J3E, A3E, A1A, B7D, B9W, F1B/F2B

#### PHYSICAL/ENVIRONMENTAL

<b>Size (H x W x D)</b>	133mm x 483mm x 530mm
<b>Weight</b>	25kg
<b>Input Voltage</b>	115/220Vac (50 Hz)±10%
<b>Power Feeding</b>	28Vdc ±10%
<b>Power Consumption</b>	Maximum 400VA
<b>Temperature</b>	-30°C to +55°C (operational)
<b>Humidity</b>	IAW MIL-STD-810F (method 507.5)
<b>Vibration</b>	IAW MIL-STD-810G (method 528 type I)
<b>Shock</b>	MIL-STD-810G (Method 516.6 Procedure I)
<b>EMC/EMI</b>	IAW MIL-STD-461

#### RECEIVER (EMBEDDED PRE/POST SELECTOR)

<b>Sensitivity</b>	-115dB @10dB SINAD, J3E mode
<b>Image and IF rejection</b>	>90dB
<b>Spurious Response</b>	>90dB @ 10% off tuned frequency

#### TRANSMITTER

<b>RF Output Power</b>	150W ±1dB average or PEP @50Ω load
<b>Harmonics</b>	At least 63dB below PEP
<b>Carrier Suppression</b>	J3E carrier is at least 60dB below PEP
<b>Intermodulation Distortion</b>	IMD3 <-35dB below tones

#### HIGH POWER HF RADIOS

<b>RF Output Power</b>	N-Modular (N=1,2,...) x 1KW Booster 1KW±1dB for multi-tone mod. in matched load
<b>Size</b>	One 19" rack, 15U high per each 1KW output
<b>Stationary HF Radios</b>	5KW in one 19" rack, 42U high 10KW in two 19" rack, 42U high

### 100W VHF/UHF RECONFIGURABLE RADIO

#### GENERAL

<b>Frequency range</b>	V/UHF 30MHz to 512MHz
<b>Bandwidth</b>	NB: In range 3KHz to 100KHz WB: Up to 5MHz
<b>Frequency stability</b>	±0.1 ppm over 24h

#### PHYSICAL/ENVIRONMENTAL

<b>Size (H x W x D)</b>	133mm x 483mm x 530mm
<b>Weight</b>	25kg
<b>Input Voltage</b>	115/220Vac (50Hz) ±10%
<b>Power Feeding</b>	28Vdc ±10%
<b>Power Consumption</b>	Maximum 400VA
<b>Temperature</b>	-30°C to +55°C (operational)
<b>Humidity</b>	IAW MIL-STD-810F (method 507.5)
<b>Vibration</b>	IAW MIL-STD-810G (method 528 type I)
<b>Shock</b>	MIL-STD-810G (Method 516.6 Procedure I)
<b>EMC/EMI</b>	IAW MIL-STD-461E

#### RECEIVER (EMBEDDED CO-LOCATION FILTERS)

<b>Sensitivity</b>	Better than -115dBm, @10 dB SINAD
<b>Image and IF rejection</b>	>90dB
<b>Spurious Response</b>	>90dB @ 10% off tuned frequency

#### TRANSMITTER

<b>RF Output Power</b>	100W ±1dB FM, 30W AM@50Ω load
<b>Harmonics</b>	At least 55dB below PEP
<b>Tx Spurious Emission</b>	-80dBc @±5% off tuned frequency -100dBc ±10% off tuned frequency
<b>Tx ultimate noise floor</b>	-155dBc/Hz, @±10%

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