LEONARDO CYBER & SECURITY SOLUTIONS

DTA7000

ECOS-E RADIO BASE STATION

ECOS-E DTA7000 is a new step forward in Leonardo DMR radio base stations.
Designed to ensure compatibility with previous generation ECOS-D systems, it features flexibility and efficiency required by demanding PMR users.

ECOS-E EVOLUTION IN CONTINUITY

Leonardo **ECOS-E (Extended Communications System – Enhanced)** networks are the result of a wide experience in design and deployment of digital DMR networks, both cellular and simulcast, all over the world. Distinguished by an innovative hardware architecture, **ECOS-E DTA7000** maintains leading features of <u>ECOS-D RBS4000</u> radio base stations, including dynamic dual-mode capabilities, and are fully interoperable with ECOS-D equipment, supporting mixed deployments for incremental painless network evolution.
ECOS-E networks can range from single-site to large cellular and simulcast networks. Simulcast can provide advantages in terms of coverage, especially in hard-to-cover areas; is a good alternative to DAS for indoor applications; requires fewer radio licenses; helps scalability, by means of adding repeaters to cover wider areas; helps redundancy in case of RBS failure.

DTA: A NEW FLEXIBLE ARCHITECTURE
DTA is the new family of Leonardo convergent multi technology radio base stations, designed to meet and exceed the requirements of professional mobile radio systems.
Complex DMR networks can be realized by combining the same building block, called DTA carrier, that can realize a complete carrier in terms of computational power, synchronization capabilities, radio and wired interfaces.
A set of DTA carriers, specialized by uploaded software are combined to realize complex infrastructures according to network requirements.

SINGLE HARDWARE MULTIPLE NETWORK ELEMENTS
ECOS-E architecture flexibility allows the design and deployment of DMR networks whose complexity ranges from simple Tier II simulcast up to mixed Tier II and Tier III configurations in simulcast and cellular mode: the same DTA7000 hardware with suitable configuration is used for all needed architectural elements, which are:

Master	Governing the whole simulcast network implementing simulcast voting algorithm
Secondary master	Coordinating mastering in large partitioned simulcast networks
Backup master	Automatically replacing master or secondary master in case of faults
Slave	Repeater in a simulcast network
Master & boundary clock	Generating IEEE 1588v2 PTP (Precision Time Protocol) clock reference and allowing the implementation of sophisticated and resilient clock distribution architectures
Embedded proxy server	Implementing a distributed registrar allowing correct distribution of calls and packets inside the network
Voice Gateway	Managing connection and voice signalling to control center
IP Gateway	Allowing IP connection among ECOS-E networks and application servers
Trunking controller	Managing channel allocation in a DMR Tier III networks

DTA7000 single carrier (rear view)
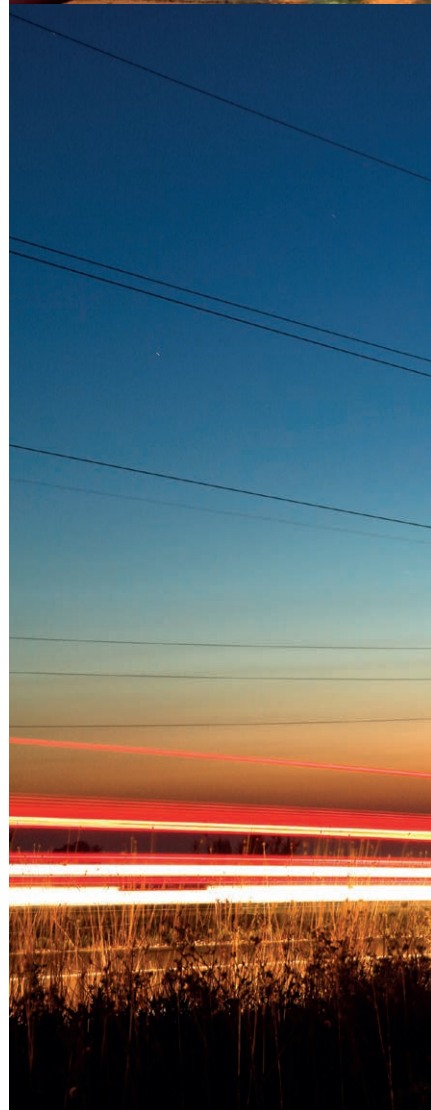
EXTREME RELIABILITY

Availability, maintanability and ease of use of ECOS-E networks are ensured by a combination of hardware characteristics and architectural features that allow to implement effective and robust professional networks solutions:

- Robust DMR protocols with error correcting codes and errorless message delivery
- Intrinsic link redundancy of IP connections and automated link redundancy management
- Event-based redundancy management with automated elements and network reconfiguration
- Increased security thanks to mobile terminal authentication and communications encryption
- Remote firmware upgrade, SNMP management and eased maintenance thanks to modular approach
- Embedded cyber security with cyber agent and embedded firewall.

SIGNAL PROCESSING EFFECTIVENESS: SIMULCAST MADE EASY

ECOS-E DTA7000 takes advantage of several techniques to address equalization, synchronization and delay management issues that may affect correct signal distribution especially in simulcast environment:

- Powerful DSP-based design helping to solve the typical technical issues of simulcast configuration and allowing deployment of complex configurations
- Bi-directional auto-adaptive digital equalization allowing to compensate amplitude and phase distortions on the whole signal bandwidth
- Network and base station synchronization by means of GPS/Galileo or a master-generated reference
- Remotely or locally controlled delay compensation.

MAIN CHARACTERISTICS

- 19" Rack mountable chassis, 1U
- Operating in VHF (136-174 MHz), UHF (380-470 MHz) or UHF2 (420-512 MHZ)
- RBS and stand-alone repeater mode of operation:
  - Conventional analog FM only
  - Digital DMR conventional Tier II only
  - Real-time automatic dual-mode conventional analog FM / Digital DMR Tier II with priority mode setting.

- Digital DMR Trunking Tier III (with embedded trunking controller)
- Native simulcast support:
  - Multi-site simulcast support: available for both conventional and trunking operations:
    - <u>Simulcast Master, Sub-Master, Slave mode within the same HW and SW</u> (virtually no limits in the number of RBS per simulcast channel)
    - <u>Reliable fall-back mode:</u> Slave in-cabinet repeating and Backup Master automatic reconfiguration
    - <u>Synchronization:</u> GPS/Galileo and/or Precise Time Protocol IEEE 1588v2 with fall-back mode
    - <u>Voting:</u> analog FM and digital DMR best-in-class voting
    - <u>Auto Adaptive Technology (A2T):</u> each RBS "adapts" itself to the time and frequency response of the backbone and automatically compensates time variant differences
    - <u>Multiple-link support:</u> IP (SoIP - Simulcast over IP - technology) and 4W+E&M link interfaces
    - <u>Redundant link</u> management between RBSs (IP and 4W+E&M).

- Embedded AMBE+2 vocoder for DMR Tier II clear or encrypted (ARC4) voice communications from a local audio/console port.
- Enhanced security:
  - Cyber agent
  - User authentication features.

- Embedded IP Gateway, to interface with data servers
- Embedded VoIP console interface, either DMR Association AIS, AISIP or SIP standard
- 4W+E&M interface for analog audio console with configurable audio equalizer.

TECHNICAL DATA

Transmitter

Output power (N equipment connector)	VHF-UHF Maximum 50W: +46.8 dBm ±0.5 dB Minimum 1W: +30.0 dBm ±0.5 dB UHF2 Maximum 110W: +50.55 dBm ±0.2 dB Minimum 1W: +30.0 dBm ±0.2 dB
Max duty cycle	100%
TX intermodulation attenuation	> 40 dB (70 dB option)
Adjacent ch. power (ETSI), 12.5/20/25 kHz	VHF–UHF: <-62 dBc (DMR)/<-69 dBc FM 12,5 kHz/<-72 dBc (20/25 kHz FM) UHF2: <-60 dBc (DMR)/<-67 dBc FM 12,5 kHz/<-68 dBc (20/25 kHz FM)
TX FM audio distortion, 12.5/20/25 kHz	1.5 / 1 / 1% (psofo)
Power supply	VHF-UHF 12 Vdc (negative ground) (10.8 Vdc-15.6 Vdc), 48 Vdc option UHF2 48 Vdc
Consumption	VHF-UHF 130W typical (12 Volt) @ 50W (+47 dBm) RF output power UHF2 256W (48 Volt) @ 110W (+50.55 dBm), 93W (48 Volt) @ 25W (+44 dBm),
Clock	Synchronization by internal GPS/Galileo receiver/Internal OCXO
Frequency stability	±0.5 ppm
Operating frequency bands	VHF-UHF 380-470 MHz-136-174 MHz UHF2 420–512 MHz
Channel spacing	12.5 kHz (DMR, FM) / 20 kHz (FM) / 25 kHz (FM)
Duplex spacing	4.6 MHz VHF / 10 MHz UHF-UHF2 (typical)
Modulation type	FM, PM (Analog), 4FSK (DMR)
Operation	Full duplex (with external branching), Simplex (option)
Transmitter type	AB type

Receiver

Receiver type	Super-heterodyne, double conversion, 2-way diversity
Rx sensitivity (SMA equipment connector)	VHF-UHF: · PM mod. @12,5 kHz: <=-116 dBm (UHF)/-114 dBm (VHF)@20 dB SINAD psofo · PM mod. @25 kHz: <=-120 dBm (UHF)/-118 dBm (VHF)@20 dB SINAD psofo · 4FSK mod.: <=-120 dBm (UHF) /-118 dBm (VHF) @ BER 5% UHF2: · PM mod. @12,5 kHz: <=-118 dBm (UHF2) @20 dB SINAD psofo · PM mod. @25 kHz: <=-122 dBm (UHF2) @20 dB SINAD psofo · 4FSK mod.: <=-122 dBm (UHF2) @ BER 5%
RX selectivity (ETSI), 12.5/20/25 kHz	VHF-UHF > 75 / 79 / 79 dB (typical)-UHF2 > 75 / 80 / 80 dB (typical)
RX Intermod. response rejection (ETSI)	> 71 dB
RX spurious rejection (ETSI)	> 80 dB (typical)
RX Blocking (ETSI)	> 98 dB (typical)
Audio distortion 12.5/20/25 kHz	1.5 / 1 / 1% (psofo)

Mechanical Specifications

Dimensions (HxWxD) and weight	43.6x482.5x339 mm [1,72x19"x13,35 in]/9,1 kg approx. [20,06 lb] (1U, 19")
Protection degree	IP20 according to ETSI EN 60529
External interfaces	· 2 RJ-45 LAN connections · 1 DB15 (6+6 IO) · 1 N female RF conn. · 2 (+1) female SMA RF conn. · 1 Mini USB RS232 terminal · 2 x 4W+E&M · 1 (+1) female SMA GPS/Galileo antenna connector

Environmental Conditions

Operation	ETSI EN 300 019-1-3 class 3.1E with extended temperature range -30°C to +60°C [-22°F to 140°F]
Humidity	RH of 95%, non-condensing at 50°C (122 °F)
Storage	ETSI EN 300 019-1-1, class 1.2 (-40°C to +85°C) [-40°F to 185°F]
Transportation	ETSI EN 300 019-1-2, class 2.2 (-40°C to +85°C) [-40°F to 185°F]

Compliances

CE RED-Directive 2014/53/EU(*)	(*) VHF-UHF only
Digital Radio	ETSI EN 300 113
Analog Radio	ETSI EN 300 086
GPS Radio	ETSI EN 303 413
EMC	ETSI EN 301 489-1, ETSI EN 301 489-5 and ETSI EN 301 489-19
Safety class	EN 62368-1
RoHS-Directive 2011/65/EU	
FCC	CFR Title 47-Part 90, Part 22, Part 15B
ISED	RSS-119, ICES-003

For more information:
cyberandsecurity@leonardo.com

Leonardo Cyber and Security Solutions Division
Via R. Pieragostini, 80 - Genova 16151 - Italy

leonardo.com

DMR
DIGITAL MOBILE RADIO ASSOCIATION

Leonardo S.p.a. is Chair of the DMR Association and member of the DMR Association Technical Working Group (TWG)

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