

SIR-S/I

INTEGRATED SECONDARY SURVEILLANCE MODE S RADAR

SIR-S/I is a Mode-S Secondary Surveillance Radar with integrated ADS-B channel, for the detection of cooperative targets in Air Traffic Surveillance services, and compliant with the international standards for Secondary Surveillance Radar (SSR) systems.

OPERATIONAL CONTEXT

The SIR-S/I Secondary Surveillance Radar is a modular system fully compliant with ICAO and EUROCONTROL requirements on Mode-S operation.

It can be operated as standalone equipment or combined with a Primary Surveillance Radar (PSR).

SIR-S/I is a dual-channel system with automatic changeover, solid state transmitter and receiver, with embedded tracking function and ADS-B channel.

The dual channel system is housed in a single cabinet, and it is designed for unmanned operation.

The SIR-S/I can operate in SSR Conventional Modes (1, 2, 3/A, C), Mode S Elementary and Enhanced Surveillance up to full Extended data link operation.

The SIR-S/I embedded ADS-B receiving channel is designed to acquire, decode and process 1090MHz Extended Squitter messages coming from both Omni and Sum MSSR antenna channels, and according to ICAO Annex 10, RTCA DO-260, RTCA DO-260A, RTCA DO-260B specifications.

Mode-S allows high data integrity (synchronous garbling elimination, defruiting), unambiguous aircraft identification, improved situation awareness and safety enhancements employing additional information extracted from the transponder (Call-Sign, Selected Altitude, Ground Speed, Magnetic Heading, etc.) and, when combined with ADS-B derived data, it allows a strong reduction in the interrogation rate, thus allowing a reduction in the RF pollution.

The ALE-9 LVA antenna is designed for full monopulse operation, providing high directional properties in azimuth and large aperture in vertical plane, as recommended by ICAO for Enhanced Mode-S Surveillance (EHS) operation. SIR-S/I Mode S operation has been fully verified and tested in the framework of the EUROCONTROL Mode-S Station Programme (EMS).

PERFORMANCE OUTLINES

- Amplitude and Sign Processing (ASP) and Dot Product Processing (DPP) algorithms for improved azimuth angle estimation
- Processing chain for Mode-S and ADS-B replies
- Processing chain decoding ADS-B information, including:
 - Surface and airborne position
 - Aircraft status identification and type
 - Airborne Velocity
 - Test Messages – Mode A Code
 - Target State and Status
 - Aircraft Operational Status
- Mode-S/ADS-B Hybrid Surveillance for EM emission reduction
- Local activation with single click as well as via Remote Control and Monitoring Station.
- Surveillance Coordination (Cluster) among stations, Data link with aircraft, extensive supervision via graphical user-interface.
- Extensive embedded BITE for fault detection with local/remote capabilities.

KEY TECHNICAL FEATURES

- Latest generation of RF power transistors
- Latest generation processor and architectures
- North Alignment by test transponder replies
- Reply generation at RF level with TTG circuitry.
- On-line receiver calibration.
- Antenna Pattern Monitoring.
- High MTBF, low MTTR.



TECHNICAL SPECIFICATIONS

PERFORMANCE

Range	Up to 256 NM
Detection volume	Up to 66000 feet, 360° horizontal plane, up to 45 vertical plane
Scan rate	Up to 15 rpm
Mode-S probability of detection	> 99%
Probability of code validation	≥ 98% (3/A) and ≥96% (C) in the operational environment
Mode-S range accuracy	< 30m (RMS) for SSR equipped transponder aircrafts < 15m (RMS) for MODE S equipped transponder aircraft < 0.068° (RMS)
Mode-S azimuth accuracy	
Range/Azimuth resolution	Eurocontrol Area 1 (Pd > 98 %, Pdc > 98%), Eurocontrol Area 2 (Pd > 98 %, Pdc > 90%), Eurocontrol Area 3 (Pd > 60 %, Pdc > 30%)

PHISICAL CHARACTERISTICS

Single cabine with compact dimensions	Height = 32U, Width = 19", Depth = 27.56"
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TX CHARACTERISTICS

Range	Fully solid state transmitter with plug in modules
Peak power	> 3KW
High TX duty cycle	66% peak- 6% average
ISLS and IISLS capabilities	Map controlled

RX CHARACTERISTICS

Receiver with three matched LOG channels	Automatic digital amplitude and phase matching
Rx dynamic range	> 80 dB
Capabilities	RSLs Range-azimuth programmable STC

PROCESSING CHARACTERISTICS

Multiprocessor	Based on a power PC platform
Capabilities	Embedded ADS-B Processing II/SI code operation management
Output data	Configurable number and data formats, independently for plot/track and service messages

RMA - CHARACTERISTICS

MTBFc	> 63000 Hrs
MTTR	< 20 min
Availability (Ai)	> 0.99999

SSR/MODE S SURVEILLANCE

Target reports (plot/track) data	Asterix Cat 1, 2, 34, 48
Mode-S protocol data:	Asterix Cat 17, 18

ADS-B SURVEILLANCE

Target reports (plot/track) data	Asterix Cat 021
ADS-B messages	Ed . 0.23, 0.26, 2.1
Edition configurable:	
Target reports (plot/track) data	
ADS-B messages	Asterix Cat 010, Edition: 1.1
CSN/ATM Ground Station	
Service messages:	Asterix Cat 023, Edition: 1.2 Asterix Cat 247 rev. 1.2

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