



SIR-S SECONDARY SURVEILLANCE MODE S RADAR

SIR-S is the Selex ES Mode S solution for the detection of cooperative targets in surveillance services. SIR-S has been designed to comply with the international standards for Secondary Surveillance Radar (SSR) systems and to guarantee a high degree of maintainability and reliability.

THE SOLUTION

The SIR-S Secondary Surveillance Radar is a modular system fully compliant with ICAO and EUROCONTROL recommendations on Mode-S operation that can be installed as standalone equipment or integrated (co-mounted) with a Primary Surveillance Radar (PSR).

SIR-S is a dual-channel system with automatic changeover, solid state transmitter and receiver designed for unmanned operation. Each SSR channel consists of a transmitter, a receiver, and a programmable extractor/controller. SIR-S can operate in SSR Conventional Modes (1, 2, 3/A, C), Mode-S Elementary & Enhanced Surveillance up to full Extended data link operation employing level 5 transponders.

Mode S allows high data integrity (synchronous garbling elimination, defruiting), unambiguous aircraft identification, improved situation awareness and safety enhancements by the use of the additional information extracted from the transponder (Call-Sign, Selected Altitude, Ground Speed, Magnetic Heading, etc..).

The powerful processing platform is based on COTS equipment and is completely programmable in order to exploit improvements of commercial platforms and prevent obsolescence problems.

The antenna typically used in conjunction with the equipment is the ALE-9 LVA antenna, designed for full monopulse operation. It provides high directional properties in azimuth and high aperture in the vertical plane, as recommended by ICAO, in particular for Enhanced Mode-S Surveillance (EHS) operation.

The antenna pedestal is fitted with dual asynchronous motors and dual azimuth encoders. The SIR-S Mode-S operation has been fully tested and validated using third party international evaluation tools developed in the framework of the EUROCONTROL Pre-Operational Mode-S Station Implementation Programme (POEMS).

In addition, the system is compliant with all the SSR and Mode S performance requirements demonstrating outstanding performances in terms of accuracy figures and de-garbling, defruiting algorithm efficiency.



SYSTEM FEATURES

Use of state-of-the-art technology

- Latest generation of RF Power Transistors
- Very Large Scale Integration (SMD technique)
- Latest generation processor and architectures.

Full redundancy of critical items

- Two Transmitter Units
- Two Receiver Units
- Two Processor Units
- One automatic changeover unit.

Cross-coupled configuration

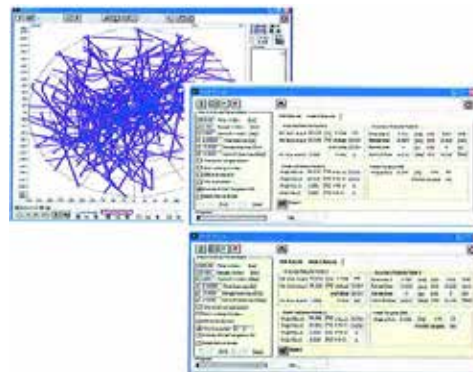
In case of critical failures and as an extreme operational configuration SIR-S automatically crosses the operational channels, using the extractor of one channel with the Transmitter/Receiver of the other.

Improved azimuth monopulse estimation

Two algorithms are used for the azimuth angle estimation in order to improve detection performance:

- Amplitude and Sign Processing (ASP)
- Dot Product Processing (DPP)

A selection logic activates DPP algorithm for replies very close to boresight in order to minimise estimate errors.



Full Mode-S operation

SIR-S fully complies with ICAO latest Mode-S requirements and with the Eurocontrol EMS (European Mode-S Station) ones. Mode-S can be enabled or disabled with just one click both locally and remotely via Remote Control and Monitoring Station.

Mode-S functionalities include

- Surveillance Coordination (Cluster) among stations
- Data link with aircraft
- Extensive supervision by a graphical user-friendly interface.

Extended Performance Monitoring

- Extensive embedded BITE for fault detection with local/remote capabilities
- Processing of replies from test transponder
- Generation of replies at RF level with TTG circuitry
- On-line receiver logarithmic characteristic calibration

TECHNICAL CHARACTERISTICS

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

Fully solid state transmitter with plug in modules
High TX duty cycle (65% peak - 6% average)
ISLS and IISLS capabilities
Receiver with three amplitude and phase matched LOG channels (RX Dynamics > 80 dB)
RSLs capability
Range-azimuth programmable STC
Multiprocessor based on a power PC platform
Extensive monitoring logic for failure detection/ isolation
II/SI code operation management

Mode S probability of detection:	> 99%
Probability of code validation:	≥ 98 % (3/A) and ≥ 96 (C) in the operational environment
Mode S range accuracy:	< 30 m (RMS)
Mode S azimuth accuracy:	< 0.068° (RMS)
Range/Azimuth resolution:	Area 1 (Pd > 98 %, Pdc > 98 %), Area 2 (Pd > 98 %, Pdc > 90 %), Area 3 (Pd > 60 %, Pdc > 30 %)
MTBFc:	> 63000 Hrs
MTTR:	< 21 min