Principal Engineering Ltd

RADAR / RADOME PERFORMANCE INVESTIGATION

Engineering Case Study

OVERVIEW

This case study summarises a radar performance investigation undertaken to assess degradation in surveillance radar performance associated with installation condition, environmental effects, or radome behaviour.

Radar performance degradation can arise from a range of factors including radome contamination, structural defects, environmental loading, or installation issues. This assessment formed part of a structured engineering investigation to identify root cause and support effective rectification.

SCENARIO

Reduced radar performance was identified within an operational surveillance system, with indications of abnormal clutter, reduced detection performance, or inconsistent return characteristics.

Potential causes included radome condition, environmental contamination, structural defects, or external influences affecting radar propagation and signal integrity.

Radar installation and radome structure illustrating physical condition and construction features relevant to performance assessment.

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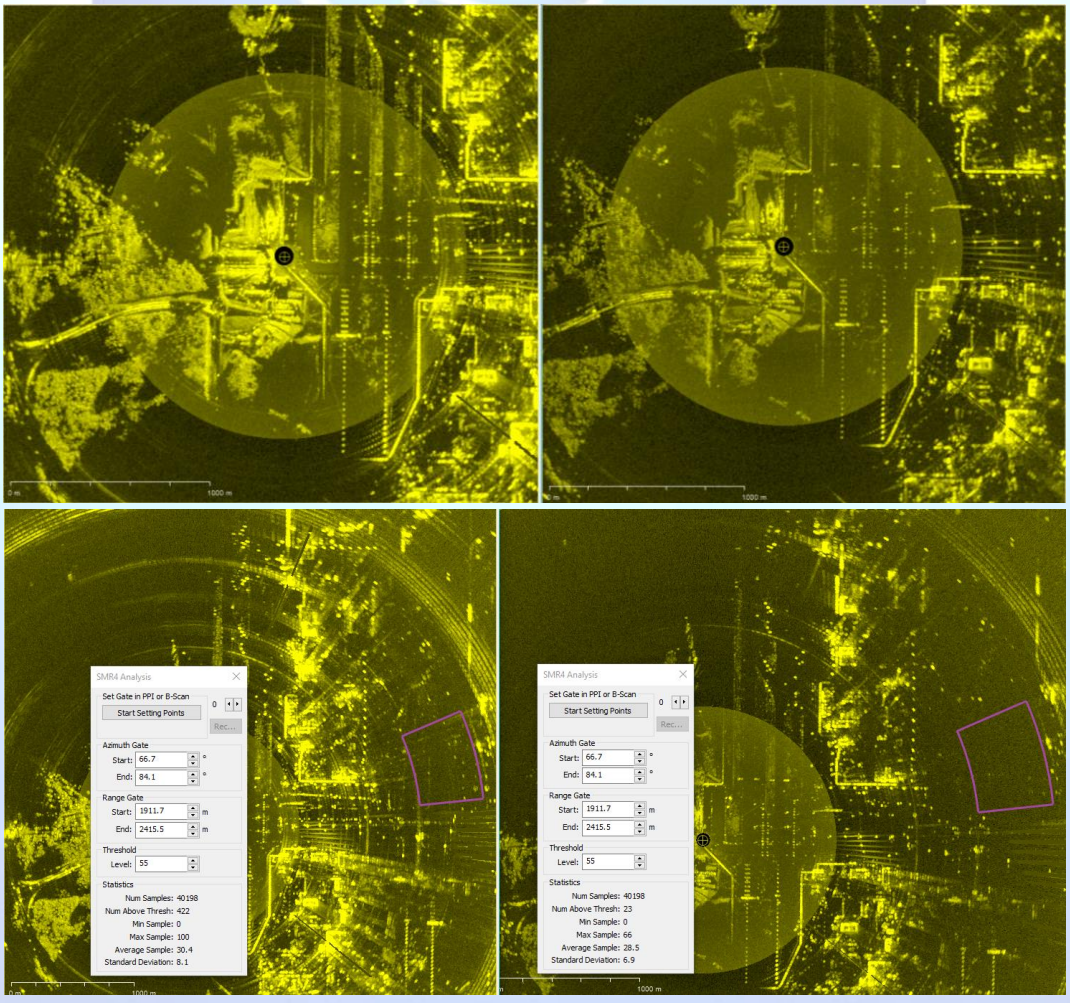
ENGINEERING ASSESSMENT

A detailed engineering investigation was undertaken to evaluate radar performance and identify the underlying cause of degradation.

This included:

- Analysis of radar video and return characteristics
- Identification of abnormal clutter or reflection behaviour
- Assessment of radome condition and structural integrity
- Correlation with environmental or installation factors
- Evaluation of impact on detection and operational performance

The investigation combined system data analysis with physical inspection and engineering judgement to establish a clear understanding of system behaviour.



Radar video comparison illustrating clutter behaviour before and after corrective action, demonstrating improvement in signal quality and detection performance..

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KEY TECHNICAL CONSIDERATION

A key aspect of the assessment was understanding the interaction between radar transmission and the radome structure, particularly in relation to attenuation, reflection, and distortion of the transmitted and received signals.

Radome condition, including contamination, moisture ingress, or structural degradation, can significantly influence radar performance by altering signal propagation characteristics.

These effects may not be immediately apparent without detailed analysis of radar returns and system behaviour.

KEY FINDINGS

The investigation identified the primary cause of performance degradation, supported by correlation between observed radar behaviour and physical or environmental conditions.

Abnormal radar returns and performance variation were traced to identifiable mechanisms, allowing clear differentiation between system faults and environmental influences.

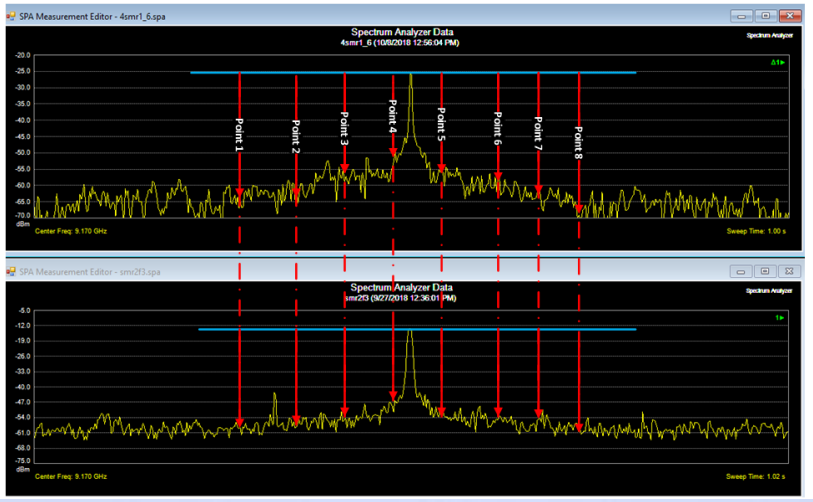
The findings provided a robust technical basis for corrective action.

OUTCOME

The assessment provided a clear engineering pathway to restore radar performance, including identification of required maintenance, repair, or rectification activities.

Implementation of the recommended actions enabled recovery of system performance, improving detection capability and operational reliability.

The structured investigation approach ensured that corrective measures were targeted, effective, and technically justified.



Spectrum analysis of radar signal characteristics showing peak response, sidelobe behaviour and noise floor comparison.

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