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Remarks Page and EL-CIDv5.1r81 Compliance Failures and Warnings

AN/APY-10, AN/APY-10(India) and AN/APS-137D(V)5
Stage 4 Spectrum Certification

Several Systems are reflected in this certification: US Navy AN/APY-10, India Navy AN/APY-10(India) and US Navy AN/APS-137B(V)5, and AN/APS-137D(V)5 systems. All systems provide surface search, synthetic & inverse synthetic aperture radar (SAR/ISAR) functions, primary search and weather avoidance, long range detection and classification of maritime objects by producing recognizable images of targets. All systems provide periscope detection, high altitude maritime surveillance and multiple targets tracking through track-while-scan signal processing. AN/APY-10(India) is also capable air-to-air search functions.

AN/APY-10, AN/APS-137B(V)5 and AN/APS-137D(V)5 are installed on P-3 aircraft. AN/APY-10(India) is installed on P-8 aircraft.

Transmitter:
Table 1. Mode Differences Between Platforms

Platform	Periscope Mode	Nav/Weather Mode	Search Mode	ISAR Mode	SAR Mode	Air-to-Air Mode
AN/APY-10	537MQ3N	10M0Q3N	117MQ3N	607MQ3N	650MQ3N	X
AN/APY-10(India)	537MQ3N	10M0Q3N	117MQ3N	607MQ3N	650MQ3N	7M03P0N
AN/APS-137D(V)5	541MQ3N	7M30Q3N	114MQ3N	114MQ3N, 224MQ3N	727MQ3N	X

Engineering measurements of test transmitter hardware taken at the antenna input yielded the following harmonic levels relative to the fundamental frequency. The only waveform that is calculated is the Air-to-Air mode, emission 7M03P0N.

Periscope Mode
Corresponding Emission Designators: 537MQ3N, 541MQ3N

Mode Descriptions:
Periscope mode is optimized for the detection of limited-exposure submarine snorkels, periscopes and other small targets. Scan-to-scan integration is used to suppress the effects of sea and rain clutter and provides either amplitude or threshold video processing.

Navigation/Weather Mode
Corresponding Emission Designators: 7M30Q3N, 10M0Q3N

Mode Descriptions:
Navigation Mode provides a display of both land and sea return signals, yielding a display of terrain, contour features and coastlines to aid in navigation.

Weather Mode provides avoidance capability and presents a display of rain return information with different rain intensities indicated by the displayed color.

These modes hop over 340 MHz using 68 discrete channels.

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Search Mode
Corresponding Emission Designators: 114MQ3N, 117MQ3N

Mode Descriptions:
Search mode is optimized for high-altitude, long-range surface surveillance and maritime patrol. This mode uses scan-to-scan integration for sea and rain clutter suppression, and provides either amplitude or threshold video processing.

Inverse Synthetic Aperture Radar (ISAR) Mode
Corresponding Emission Designators: 114MQ3N. 117MQ3N, 607MQ3N

Mode Descriptions:
ISAR generates images that enable the operator to classify maritime targets. ISAR is used to distinguish between combatant and non-combatant vessels by identifying the vessel class without the need to directly over-fly the vessel of interest.

Synthetic Aperture Radar (SAR) Mode
Corresponding Emission Designators: 650MQ3N, 727MQ3N

Mode Descriptions:
SAR mode has two sub-modes, Spot Map and Strip Map.

Spot Map sub-mode produces an image of a specific scene, centered at some fixed point on either side of the aircraft. In this mode, the antenna pointing angle and the processing range are automatically adjusted to keep the radar beam pointed at the scene as the aircraft flies past.

Strip Map sub-mode produces images of long narrow scenes oriented parallel to the aircraft ground track at mode initiation. The scene may be located on either side of the aircraft. In this mode, the antenna pointing angle and the processing range are automatically adjusted to keep the radar beam pointed at the scene center line as the aircraft continues, within allowable limits, on the flight vector that was in effect a time of mode initiation.

The radar continually generates and displays images along the scene until another radar mode is selected or until the flight vector variation limits are exceeded.

Air-To-Air Mode
Corresponding Emission Designator: 7M03P0N
Mode Description: Air-to-Air Mode is used for searching and tracking airborne objects in the surrounding area.

Emission bandwidth for Air-to-Air Mode was calculated using Mason-Zimmerman Approximation tool in the EL-CID v5.1 r81 program. The necessary bandwidth (-20dB) was determined using by the Mason-Zimmerman Approximation curve plot.

Receiver:

The receiver operates in Narrowband (NB) and Wideband (WB) modes.

	1st IF (MHz)		2nd IF (MHz)	
	NB	WB	NB	WB
-3 dB	300	900	8	240
-20 dB	500	1500	12	530
-60 dB	1100	3500	N/A	550

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Antennas:

AN/APY-10 and AN/APY-10(India) Antenna:
Antenna scan speeds are dependent on the modes:

Emission:	537MQ3N	10M0Q3N	117MQ3N	607MQ3N	650MQ3N
Mode:	Periscope	Nav/Weather	Search	ISAR	SAR
Scan Rate:	300 rpm	6 rpm	60 rpm	Spotlight	Spotlight

The system is capable of blanking or transmitting 350 degrees in azimuth. When installed in the aircraft the system always blanks when pointing toward the aircraft bulkhead, providing 240 degree field of view (FOV). The operator can also command the radar to radiate in a variable sized sector size (10 deg. to 240 deg.) at any azimuth pointing angle within the FOV. Sectors can be referenced or ground stabilized.

Antenna includes an input port for a separately provided Identification Friend or Foe (IFF) Interrogator set which is not part of this nomenclature or certification.

AN/APS-137B(V)5 and AN/APS-137D(V)5 Antenna:
Vertical Scan maximum elevation is 90 degrees and minimum elevation is 0 degrees
Horizontal scan rate is 36, 360, 1800 deg/sec.

Antenna has integrated compatibility with the air-to-air IFF interrogator set, AN/APX-76 IAW MIL-I-81453.

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List of Failures and Warnings:

EL-CID v5.1 r81 was used to complete this spectrum certification.
Compliance check came up with: 30 Failures, 1 Warnings, 0 Notes.

Warning:

1. This unapproved Location has the same State/Country and City name as an approved Location. If correcting the approved record, that is OK, otherwise, you should use the existing approved Location or give your new Location a unique State/Country or City.

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Warning 1 occurs because location Sherman, TX is not found in EL-CID v5.1 r81.

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Failures in the Receiver Section:

10M0Q3N

1. Group B radar receivers must have IF Selectivity characteristics commensurate with or narrower than the corresponding transmitter bandwidth. The receiver IF Selectivity curve is wider than the corresponding transmitter's RF Fundamental curve. See section 5.5.2 paragraph 7 of the NTIA Manual.

2. Group B radar receivers must have IF Selectivity characteristics commensurate with or narrower than the corresponding transmitter bandwidth. The receiver IF Selectivity curve is wider than the corresponding transmitter's RF Fundamental curve. See section 5.5.2 paragraph 7 of the NTIA Manual.

114MQ3N

3. Group B radar receivers must have IF Selectivity characteristics commensurate with or narrower than the corresponding transmitter bandwidth. The receiver IF Selectivity curve is wider than the corresponding transmitter's RF Fundamental curve. See section 5.5.2 paragraph 7 of the NTIA Manual.

4. Group B radar receivers must have IF Selectivity characteristics commensurate with or narrower than the corresponding transmitter bandwidth. The receiver IF Selectivity curve is wider than the corresponding transmitter's RF Fundamental curve. See section 5.5.2 paragraph 7 of the NTIA Manual.

117MQ3N

5. Group B radar receivers must have IF Selectivity characteristics commensurate with or narrower than the corresponding transmitter bandwidth. The receiver IF Selectivity curve is wider than the corresponding transmitter's RF Fundamental curve. See section 5.5.2 paragraph 7 of the NTIA Manual.

6. Group B radar receivers must have IF Selectivity characteristics commensurate with or narrower than the corresponding transmitter bandwidth. The receiver IF Selectivity curve is wider than the corresponding transmitter's RF Fundamental curve. See section 5.5.2 paragraph 7 of the NTIA Manual.

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224MQ3N

7. Group B radar receivers must have IF Selectivity characteristics commensurate with or narrower than the corresponding transmitter bandwidth. The receiver IF Selectivity curve is wider than the corresponding transmitter's RF Fundamental curve. See section 5.5.2 paragraph 7 of the NTIA Manual.

8. Group B radar receivers must have IF Selectivity characteristics commensurate with or narrower than the corresponding transmitter bandwidth. The receiver IF Selectivity curve is wider than the corresponding transmitter's RF Fundamental curve. See section 5.5.2 paragraph 7 of the NTIA Manual.

537MQ3N

9. Group B radar receivers must have IF Selectivity characteristics commensurate with or narrower than the corresponding transmitter bandwidth. The receiver IF Selectivity curve is wider than the corresponding transmitter's RF Fundamental curve. See section 5.5.2 paragraph 7 of the NTIA Manual.

541MQ3N

10. Group B radar receivers must have IF Selectivity characteristics commensurate with or narrower than the corresponding transmitter bandwidth. The receiver IF Selectivity curve is wider than the corresponding transmitter's RF Fundamental curve. See section 5.5.2 paragraph 7 of the NTIA Manual.

607MQ3N

11. Group B radar receivers must have IF Selectivity characteristics commensurate with or narrower than the corresponding transmitter bandwidth. The receiver IF Selectivity curve is wider than the corresponding transmitter's RF Fundamental curve. See section 5.5.2 paragraph 7 of the NTIA Manual.

650MQ3N

12. Group B radar receivers must have IF Selectivity characteristics commensurate with or narrower than the corresponding transmitter bandwidth. The receiver IF Selectivity curve is wider than the corresponding transmitter's RF Fundamental curve. See section 5.5.2 paragraph 7 of the NTIA Manual.

727MQ3N

13. Group B radar receivers must have IF Selectivity characteristics commensurate with or narrower than the corresponding transmitter bandwidth. The receiver IF Selectivity curve is wider than the corresponding transmitter's RF Fundamental curve. See section 5.5.2 paragraph 7 of the NTIA Manual.

7M03P0N

14. Group B radar receivers must have IF Selectivity characteristics commensurate with or narrower than the corresponding transmitter bandwidth. The receiver IF Selectivity curve is wider than the corresponding transmitter's RF Fundamental curve. See section 5.5.2 paragraph 7 of the NTIA Manual.

15. Group B radar receivers must have IF Selectivity characteristics commensurate with or narrower than the corresponding transmitter bandwidth. The receiver IF Selectivity curve is wider than the corresponding transmitter's RF Fundamental curve. See section 5.5.2 paragraph 7 of the NTIA Manual.

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7M30Q3N
16. Group B radar receivers must have IF Selectivity characteristics commensurate with or narrower than the corresponding transmitter bandwidth. The receiver IF Selectivity curve is wider than the corresponding transmitter's RF Fundamental curve. See section 5.5.2 paragraph 7 of the NTIA Manual.

17. Group B radar receivers must have IF Selectivity characteristics commensurate with or narrower than the corresponding transmitter bandwidth. The receiver IF Selectivity curve is wider than the corresponding transmitter's RF Fundamental curve. See section 5.5.2 paragraph 7 of the NTIA Manual.

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Failures 1 – 17 occur because Receiver IF Selectivity is wider than Emission Bandwidth.

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Failures in the Transmitter Section:

Harmonic 2nd
18. This Group B radar's Spurious Emission or Harmonic curve does not meet the -60 dB attenuation required in Section 5.5.2 paragraphs 4.1 and 4.2 of the NTIA Manual.

Harmonic 3rd
19. This Group B radar's Spurious Emission or Harmonic curve does not meet the -60 dB attenuation required in Section 5.5.2 paragraphs 4.1 and 4.2 of the NTIA Manual.

10M0Q3N
*20. This Group B FM pulsed radar transmitter does not meet the standard emission bandwidth curve as required in section 5.5.2 paragraphs 3.2 and 4.1 of the NTIA Manual. Note that Pavg = Peak Power * Pulse Repetition Rate * Pulse Width is used for Pt in the curve formula. Note also that Radar Pulse Frequency Deviation is used for Bc in the standard curve formula.*

114MQ3N
21. The necessary bandwidth (-20 dB point) on this RF Fundamental curve of this FM-pulse radar does not meet the formula as given in ANNEX J of the NTIA Manual.

*22. This Group B FM pulse radar transmitter does not meet the standard emission bandwidth curve as required in section 5.5.2 paragraphs 3.2 and 4.1 of the NTIA Manual. Note that Pavg = Peak Power * Pulse Repetition Rate * Pulse Width is used for Pt in the curve formula. Note also that Radar Pulse Frequency Deviation is used for Bc in the standard curve formula.*

117MQ3N
23. This Group B FM pulsed radar transmitter does not meet the standard emission bandwidth curve as required in section 5.5.2 paragraphs 3.2 and 4.1 of the NTIA Manual. Note that Pavg = Peak Power * Pulse Repetition Rate * Pulse Width is used for Pt in the curve formula. Note also that Radar Pulse Frequency Deviation is used for Bc in the standard curve formula.

541MQ3N
24. The necessary bandwidth (-20 dB point) on this RF Fundamental curve of this FM-pulse radar does not meet the formula as given in ANNEX J of the NTIA Manual.

25. This Group B FM pulse radar transmitter does not meet the standard emission bandwidth curve as required in section 5.5.2 paragraphs 3.2 and 4.1 of the NTIA Manual. Note that Pavg =

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Peak Power * Pulse Repetition Rate * Pulse Width is used for Pt in the curve formula. Note also that Radar Pulse Frequency Deviation is used for Bc in the standard curve formula.

727MQ3N
26. The necessary bandwidth (-20 dB point) on this RF Fundamental curve of this FM-pulse radar does not meet the formula as given in ANNEX J of the NTIA Manual.

27. This Group B FM pulse radar transmitter does not meet the standard emission bandwidth curve as required in section 5.5.2 paragraphs 3.2 and 4.1 of the NTIA Manual. Note that Pavg = Peak Power * Pulse Repetition Rate * Pulse Width is used for Pt in the curve formula. Note also that Radar Pulse Frequency Deviation is used for Bc in the standard curve formula.

7M03P0N
28. The necessary bandwidth (-20 dB point) on this RF Fundamental curve of this FM-pulse radar does not meet the formula as given in ANNEX J of the NTIA Manual.

7M30Q3N
29. The necessary bandwidth (-20 dB point) on this RF Fundamental curve of this FM-pulse radar does not meet the formula as given in ANNEX J of the NTIA Manual.

30. This Group B FM pulse radar transmitter does not meet the standard emission bandwidth curve as required in section 5.5.2 paragraphs 3.2 and 4.1 of the NTIA Manual. Note that Pavg = Peak Power * Pulse Repetition Rate * Pulse Width is used for Pt in the curve formula. Note also that Radar Pulse Frequency Deviation is used for Bc in the standard curve formula.

Failures 18 and 19 occur because 2nd and 3rd Harmonics exceed NTIA Bounds. Harmonic values were measured.

Failures 20, 22, 23, 25, 27, 30 occur because the radar bandwidth levels are measured and exceed set NTIA RSEC Group B limits.

Failures 21, 24, 26, 28, 29 occur because measured values for (-20dB) necessary bandwidth are used.

These failures and their disposition have been reviewed and discussed with the NTIA/OSM and the EL-CID Help Desk who have advised to submit the .cid file "as is" along with these notes. For questions regarding these failures please contact: Ben Tadesse, NTIA/OSM, btadesse@ntia.doc.gov, +1-202-482-1693