



UNIVERSITI KUALA LUMPUR
MALAYSIAN INSTITUTE OF MARINE ENGINEERING TECHNOLOGY

FINAL EXAMINATION
JANUARY 2016 SEMESTER

COURSE CODE : LEB 40103

COURSE NAME : RADAR SYSTEM

PROGRAMME NAME : BACHELOR MARINE ELECTRICAL & ELECTRONIC
(FOR MPU: PROGRAMME LEVEL) TECHNOLOGY

DATE : 19 MAY 2016

TIME : 2.00 PM – 5.00 PM

DURATION : 3 HOURS

INSTRUCTIONS TO CANDIDATES

1. Please CAREFULLY read the instructions given in the question paper.
2. This question paper has information printed on both sides of the paper.
3. This question paper consists of TWO (2) sections; Section A and Section B.
4. Answer ALL questions in Section A. For Section B, answer THREE (3) questions. Question No 3 COMPULSORY.
5. Please write your answers on the answer booklet provided.
6. Answer all questions in English language ONLY.

THERE ARE 9 PAGES OF QUESTIONS, INCLUDING THIS PAGE.

SECTION A (Total: 40 marks)

INSTRUCTION: Answer ALL questions.

Please use the answer booklet provided.

Question 1

- (a) With the aid of a diagram, explain the basic RADAR concept.
(10 marks)
- (b) With the aid of a diagram, explain block diagram of a simple RADAR system. The explanations should include the function of each module in the diagram
(10 marks)

Question 2

- (a) A pulse RADAR has a pulse repetition frequency (PRF) of 5000 Hz, a pulse width of 20 microsecond, and a peak power of 100 kilowatts, recovery time of 1 microsecond. Solve and calculate for the minimum range.
(2 marks)
- (b) A search RADAR has a pulse width of 1.0 microsecond, a pulse repetition frequency (PRF) of 900 Hz, and an average power of 18 watts. Solve and calculate for the unit peak power.
(4 marks)
- (c) A pulse RADAR has a pulse repetition frequency (PRF) of 400 Hz, a pulse width of 20 microsecond, and a peak power of 100 kilowatts, recovery time of 1 microsecond. Solve and calculate for the maximum ambiguous range.
(2 marks)
- (d) Show the relationship between pulse repetition rate or pulse repetition frequency and pulse width.
(2 marks)
- (e) For a range of 100 nautical miles, solve and calculate for the RADAR pulse repetition frequency.
(2 marks)
- (f) Navigational RADAR mostly use TWO (2) types of RADAR Band that is S Band and X Band. State the frequency of S Band Radar?
(2 marks)

- (g) A shipboard RADAR antenna situated 90 feet above sea level. Solve and calculate for the Radar range at horizon?
(2 marks)
- (h) A Tracking Radar is tracking an aircraft. With the aid of a diagram, estimate the altitude of the aircraft if the slant range is 2000 feet and the antenna elevation angle is 45 degree?
(4 marks)

SECTION B (Total: 60 marks)

INSTRUCTION: Answer THREE (3) questions.

Question No. 3 is COMPULSORY.

Please use the answer booklet provided.

Question 3

- (a) Analyze the diagram of a klystron in Figure 1. Explain the operation of a klystron. Component A, B, C, D, E, F, G and H should be included in the circuit explanation.

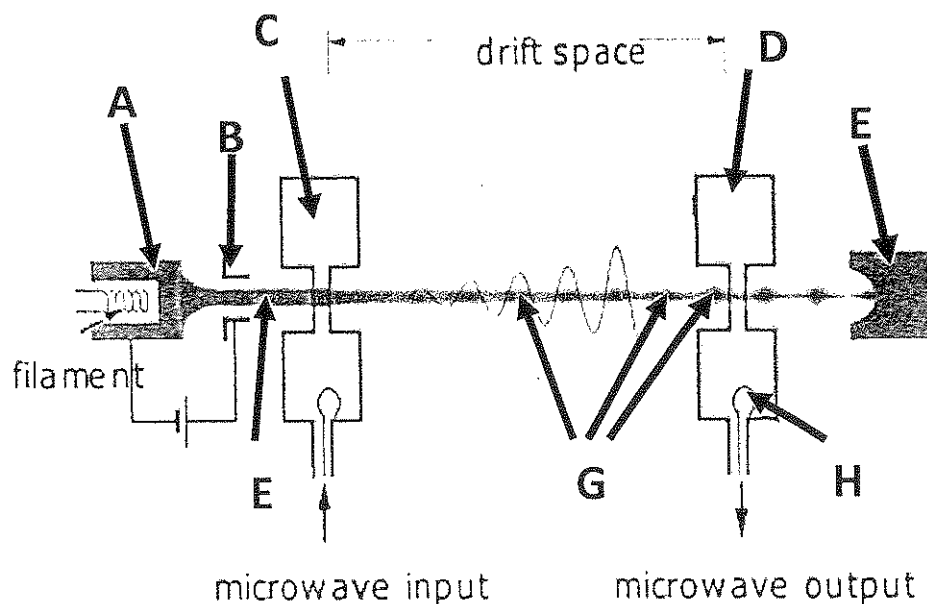


Figure 1

(16 marks)

- (b) Analyze the diagram of a magnetron in Figure 2, identify and state 4 types of cavities used in Radar or Microwave devices.

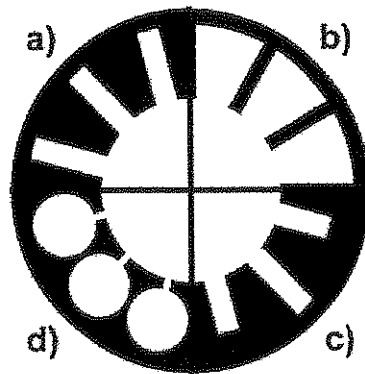


Figure 2

(4 marks)

Question 4

- (a) Refer to Figure 3. Describe the function of box F, G, H, J, K, L, M, N in the Pulse RADAR block diagram. Discuss the operation of pulse radar superheterodyne receiver.

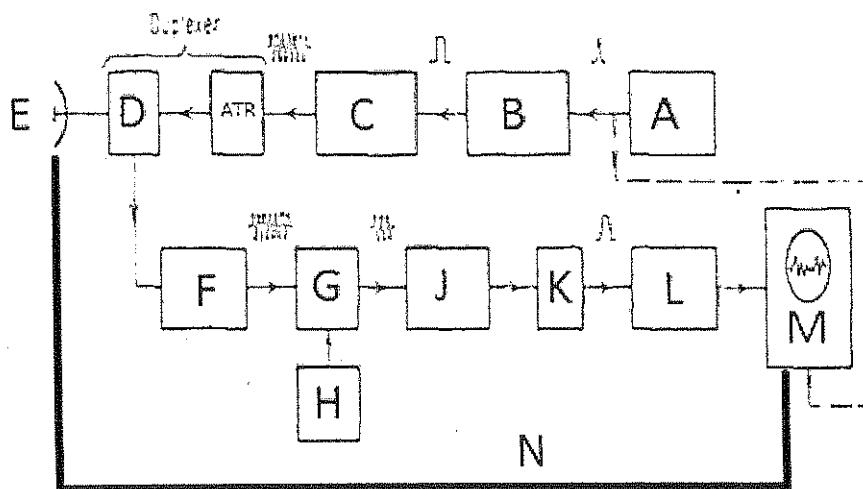


Figure 3

(16 marks)

- (b) There are 3 types of display unit for the radar system. With the aid of a diagram, discuss the function, operation and how the data or related target information transmitted or transferred to the screen of an A scope / display unit.

(4 marks)

Question 5

- (a) RADAR can be classified by its function. Describe and explain TWO (2) of Radar function in the Civilian World.
(4 marks)
- (b) With the aid of a block diagram, draw and produce the block diagram of simple Frequency Modulation Continuous Wave (FM CW) radar altimeter.
(10 marks)
- (c) With a Continuous Wave (CW) transmit frequency of 5 GHz. Solve and calculate the Doppler frequency seen by a stationary radar when the target radial velocity is 100 km/h or 62.5 mph.
(6 marks)

Question 6

- (a) You are representing Indera Mulia Electronic Services Sdn Bhd as an Engineer to a Radar Maintenance talk. Write FIVE (5) Radar Preventive Maintenance Activities and explain each activities.
(10 marks)
- (b) You are the Service Engineer at PRIMUS-RADAR Electronic Services Sdn Bhd. Your client sent you the photos of their Navigational RADAR display. Help your client and advise them on trouble shooting their radar. Evaluate the photos as attached in attachment 1, 2, 3 and 4. Figure 4 in Attachment 1 is the normal operating display.
- i. Compare and evaluate Figure 4 and Figure 5. Justify and describe the operators fault / defect in Figure 5. Propose the remedy for that fault?
(4 marks)
- ii. Compare and evaluate Figure 5 and Figure 6. Justify and describe the operators fault / defect in Figure 6. Propose the remedy for that fault.
(4 marks)
- iii. Compare and evaluate Figure 4, Figure 6 and Figure 7. Justify what is the effect and difference between all the images during the operation in Figure 7.
(2 marks)

END OF EXAMINATION PAPER

Attachment 1

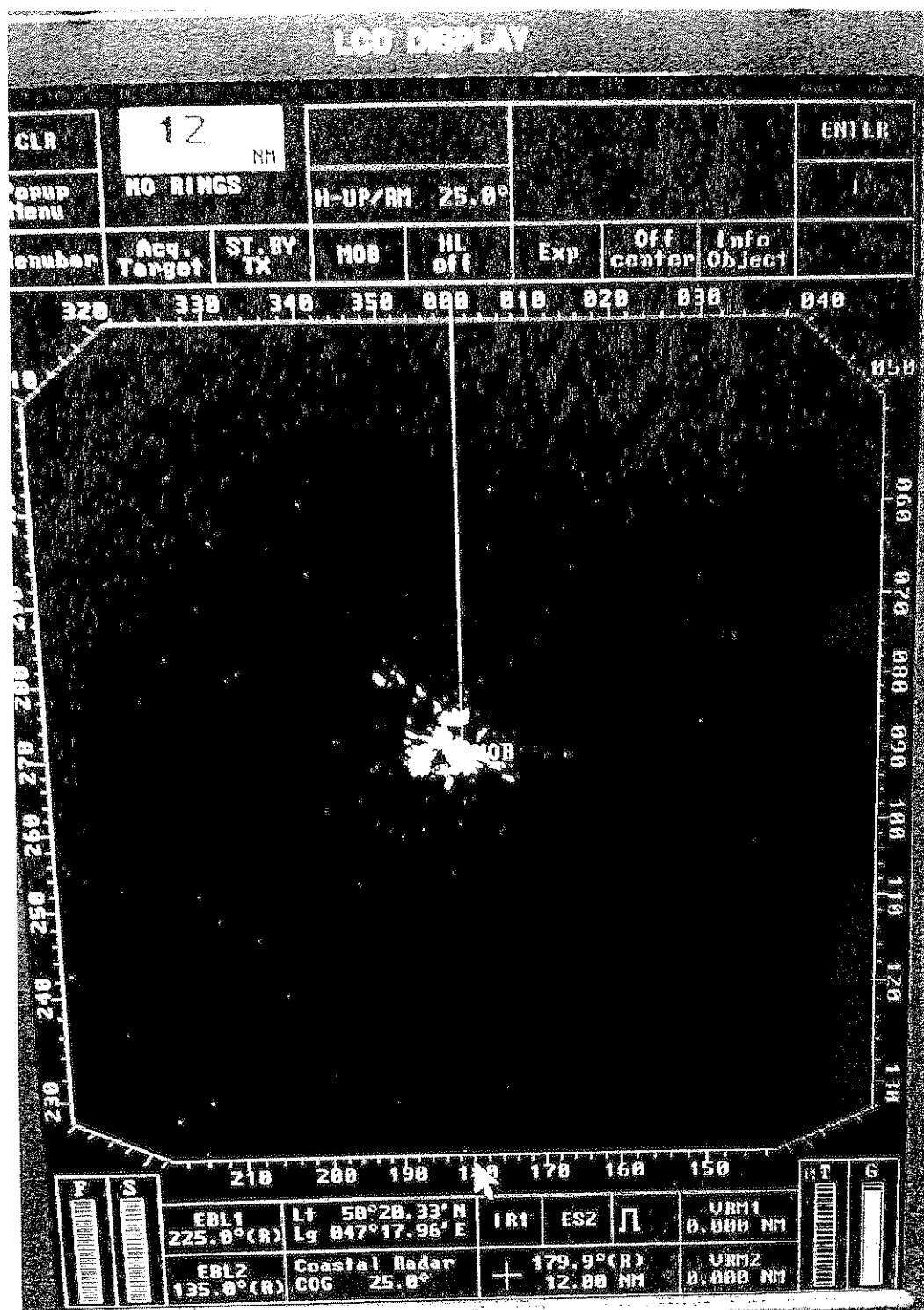


Figure 4

Attachment 2

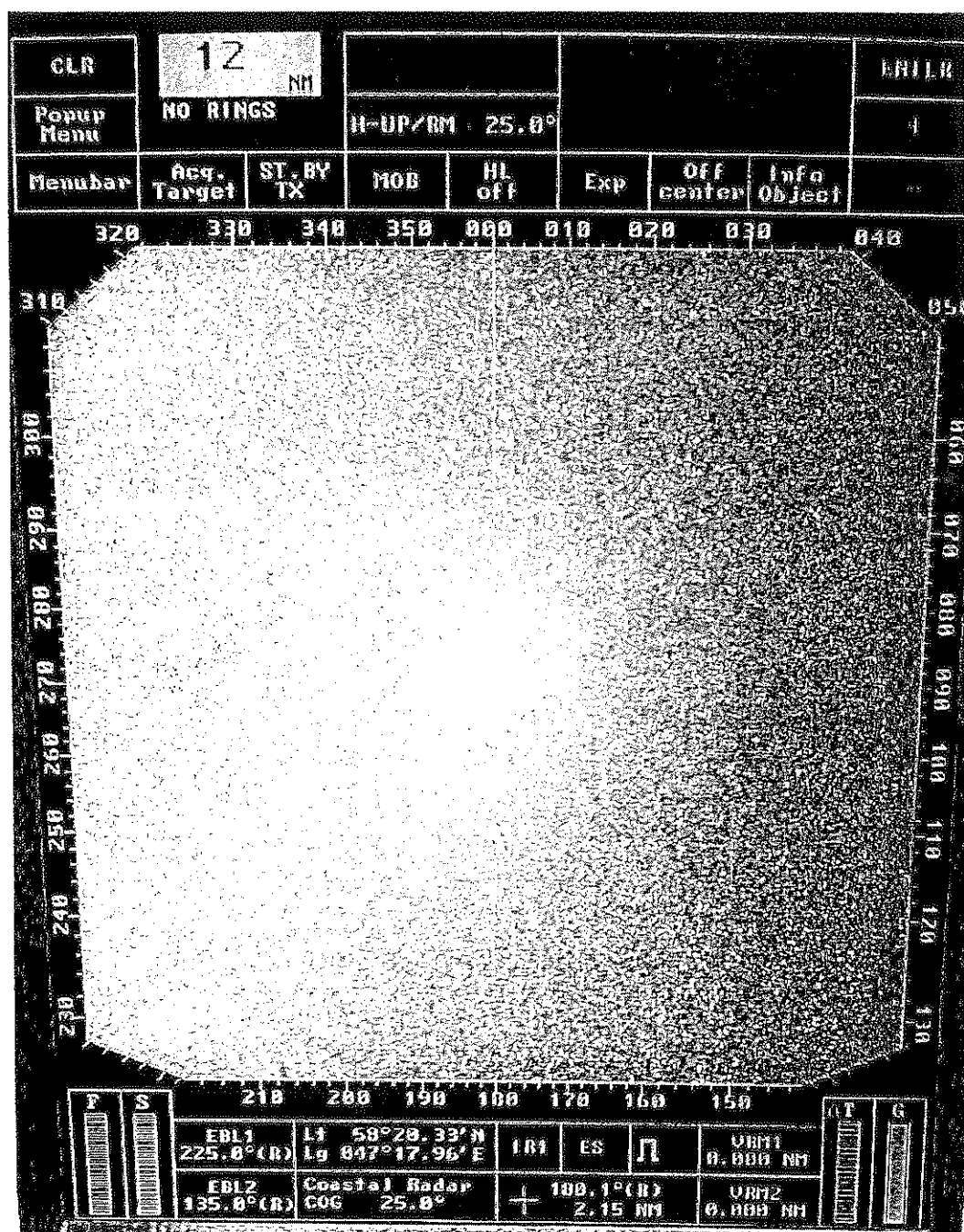


Figure 5

Attachment 3

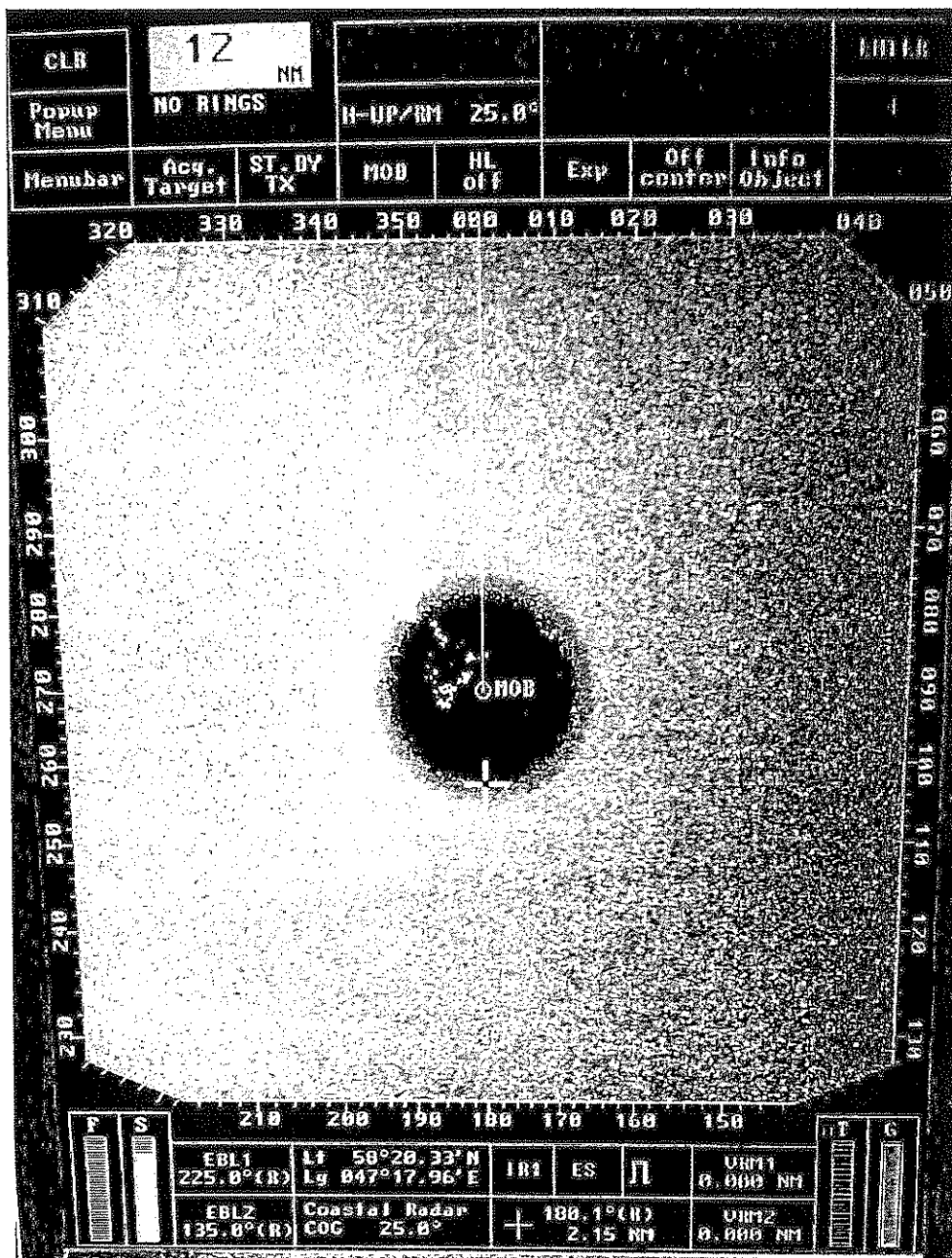


Figure 6

Attachment 4

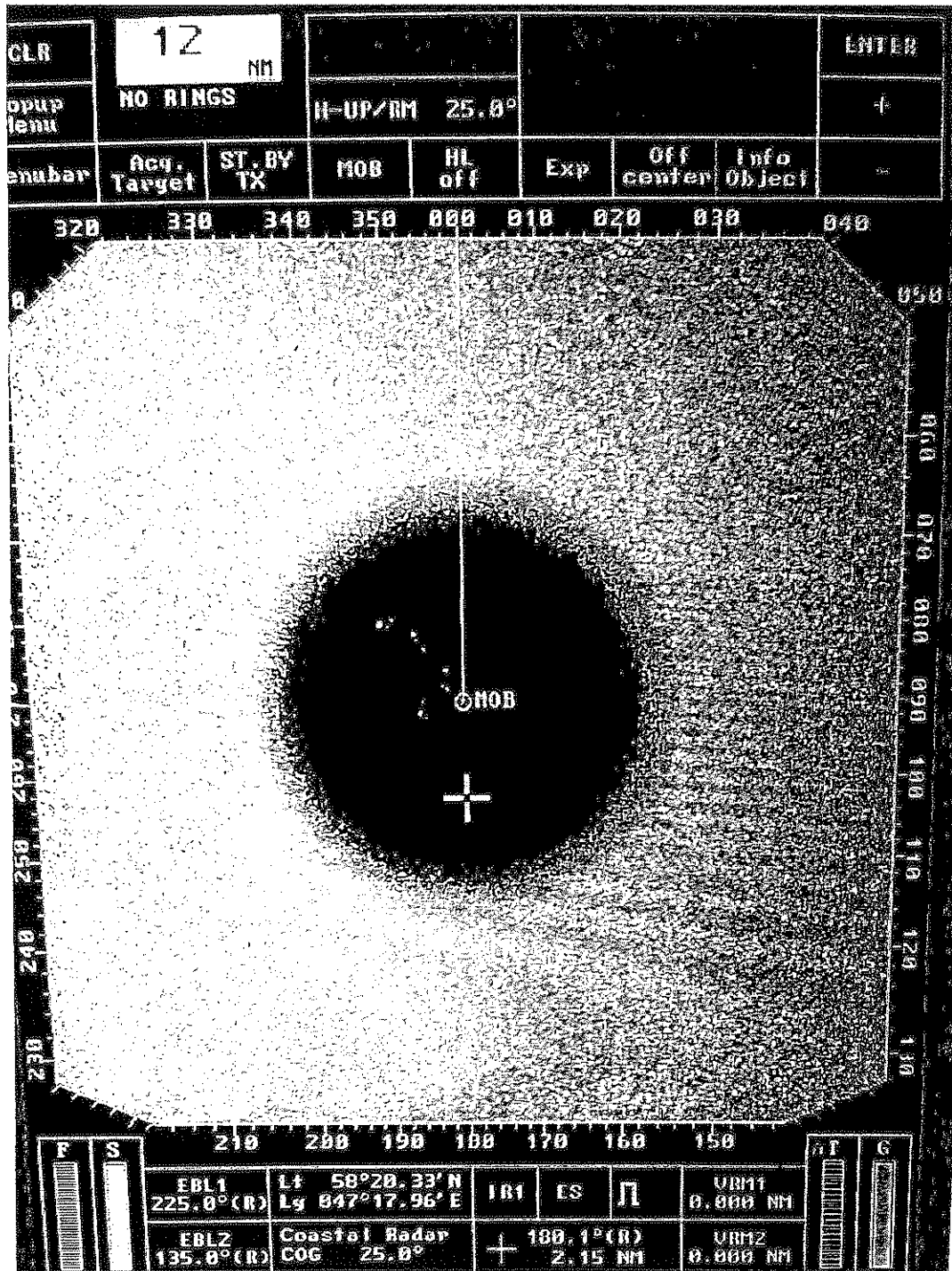


Figure 7