# 2085

# TRAVELING WAVE TUBE INSTALLATION AND OPERATING INSTRUCTIONS

## INTRODUCTION

The 2085 is a grid controlled, high power, pulsed traveling wave tube designed to operate 7.0 to 11.0 GHz at 1 KW minimum power output. It is of metal-ceramic construction and is suitable for operation under severe environmental conditions. The 2085 is periodic permanent magnet focused and is conduction cooled. The collector is isolated and may be operated at +100 volts above to -50 volts below the helix-shell voltage. It has a control grid which is used to cut off and pulse on the electron beam. The helix is connected to the shell of the tube, which is grounded through the isolation loss of the tube.

This document gives general installation and operating instructions; for more detailed tube operating procedures in specific equipments, consult applicable equipment manuals and equipment performance standards. In case of conflict, equipment manuals and performance standards shall govern.

## GENERAL HANDLING PRECAUTIONS DURING STORAGE

If possible, the 2085 should always be stored in its shipping container. If this is not possible, store the tube in a clean, dry cabinet without contact with magnetic or magnetized material. Do not store in direct contact with a steel shelf. If kept in a steel cabinet, the tube should be supported on wooden blocks which keep the tube at least two inches away from the steel of the cabinet. Do not store the tubes stacked directly on top of each other or touching along their lengths. Maintain at least a one-inch space between tubes.

## INSPECTION

Before installing the tube, check the tube for evidence of physical damage. Dents, bent connectors or damaged threads may cause malfunction. Using an ohmeter, check for continuity between connector pins C & D (heater). There should be an open circuit between pins C, D, F, and the white (collector) lead, to ground. The resistance between the center conductors of the r.f. connectors should be less than 100 ohms.

## MOUNTING AND CONNECTIONS

1. Apply a thin wipe of heat sink compound to the TWT mounting surface. Mount the tube firmly to heat sink panel or supply cooling air to collector section if the tube is to be operated above .005 duty.



ELECTRON TUBE DIVISION
P.O. Box 100 Easton, Pennsylvania 18042

2. Connect leads:

| | | |
|---|---|---|
| Yellow | - | Heater-Cathode (Winchester Plug Term. C) |
| Brown | - | Heater (Winchester Plug Term. D) |
| Green | - | Grid (Winchester Plug Term. F) |
| White | - | Collector |
| Black | - | Ground |

TURN-ON PROCEDURE

1. Apply negative grid bias (Ec) and heater voltage (Ef). Allow a minimum of two minutes for cathode warm-up.

2. Turn grid drive (ec) control knob to lowest setting. Do not turn on.

3. Apply helix-shell voltage (Ews) and adjust to the value shown on label. At this point, there should be zero cathode current.

4. Increase the grid pulse voltage (ec) and adjust to the value shown in the label and data sheet. The cathode (ik) and collector (ib) currents should rise with the grid voltage to the value shown on the label and/or data sheet. Should the currents be slightly different than specified, readjust the grid pulse voltage until the currents are correct.

5. The helix-shell voltage (Ews) can then be adjusted for the optimum desired characteristics. In general, increasing the beam voltage will increase the maximum power output but reduce the gain at the higher frequencies.

PRECAUTIONS

1. High voltage must NOT be applied in the absence of proper negative grid bias.

2. Positive grid voltage must NOT be applied in the absence of high voltage.

3. A current overload should be incorporated in the high voltage supply to protect the tube and power supply against a loss of grid bias. LOSS OF GRID BIAS PRIOR TO TURN-OFF OF THE HIGH VOLTAGE WILL GENERALLY RESULT IN THE LOSS OF A TUBE.

4. The TWT should not be operated, even for short periods of time, at duty factors above 1%. Excessive duty will cause harmful outgassing which will result in poor performance.

5. This tube contains beryllium oxide ceramics. Avoid performing any operations on the ceramic parts of these tubes which produce dust or fumes. BERYLLIUM OXIDE DUST AND FUMES ARE HIGHLY TOXIC, AND BREATHING THEM CAN RESULT IN SERIOUS PERSONAL INJURY AND DEATH.

6. MICROWAVE RADIATION can cause serious personal injury which can be fatal. DO NOT OPERATE TUBE R.F. PORTS UNTERMINATED.



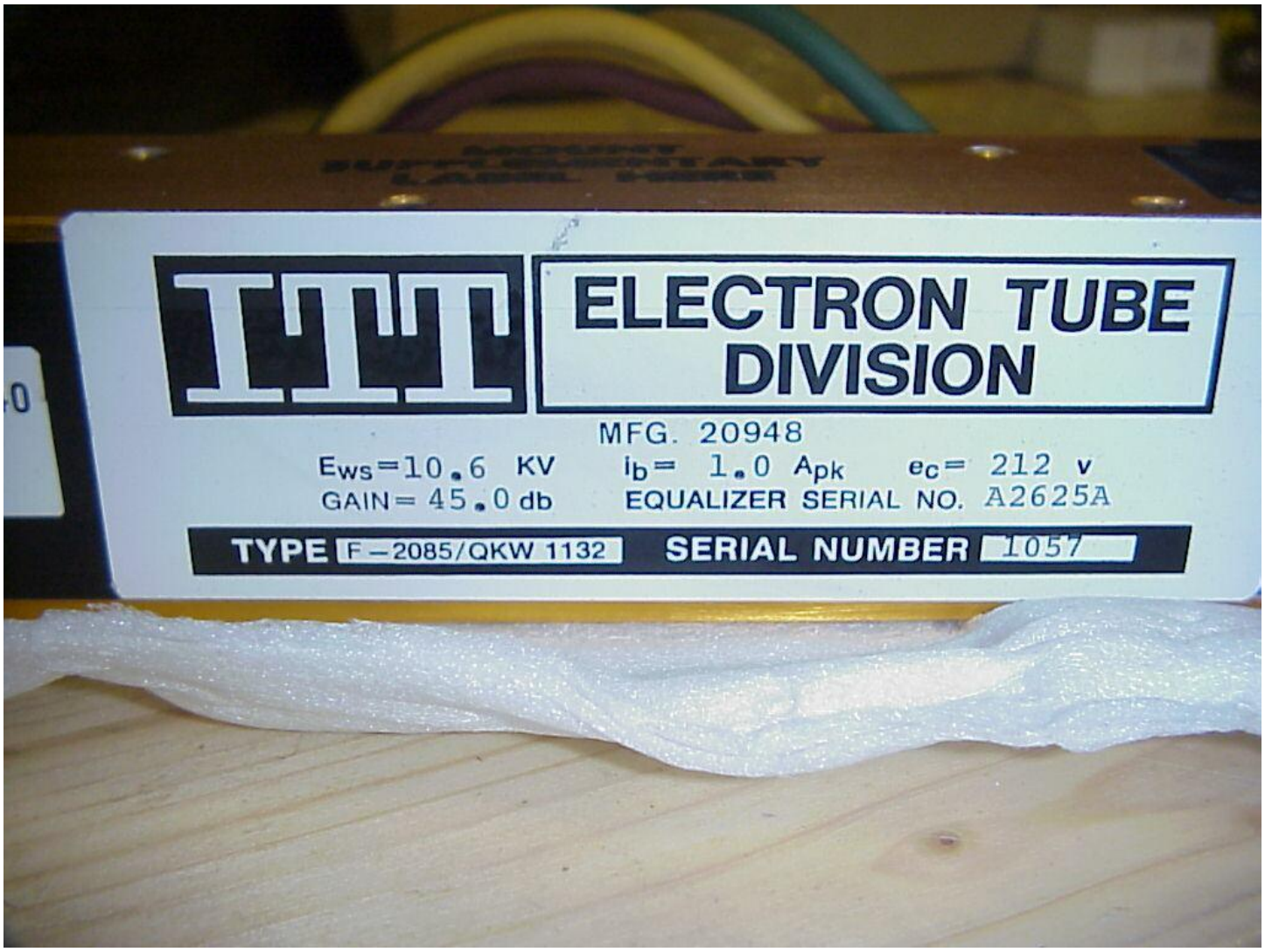
ELECTRON TUBE DIVISION
P.O. Box 100 Easton, Pennsylvania 18042

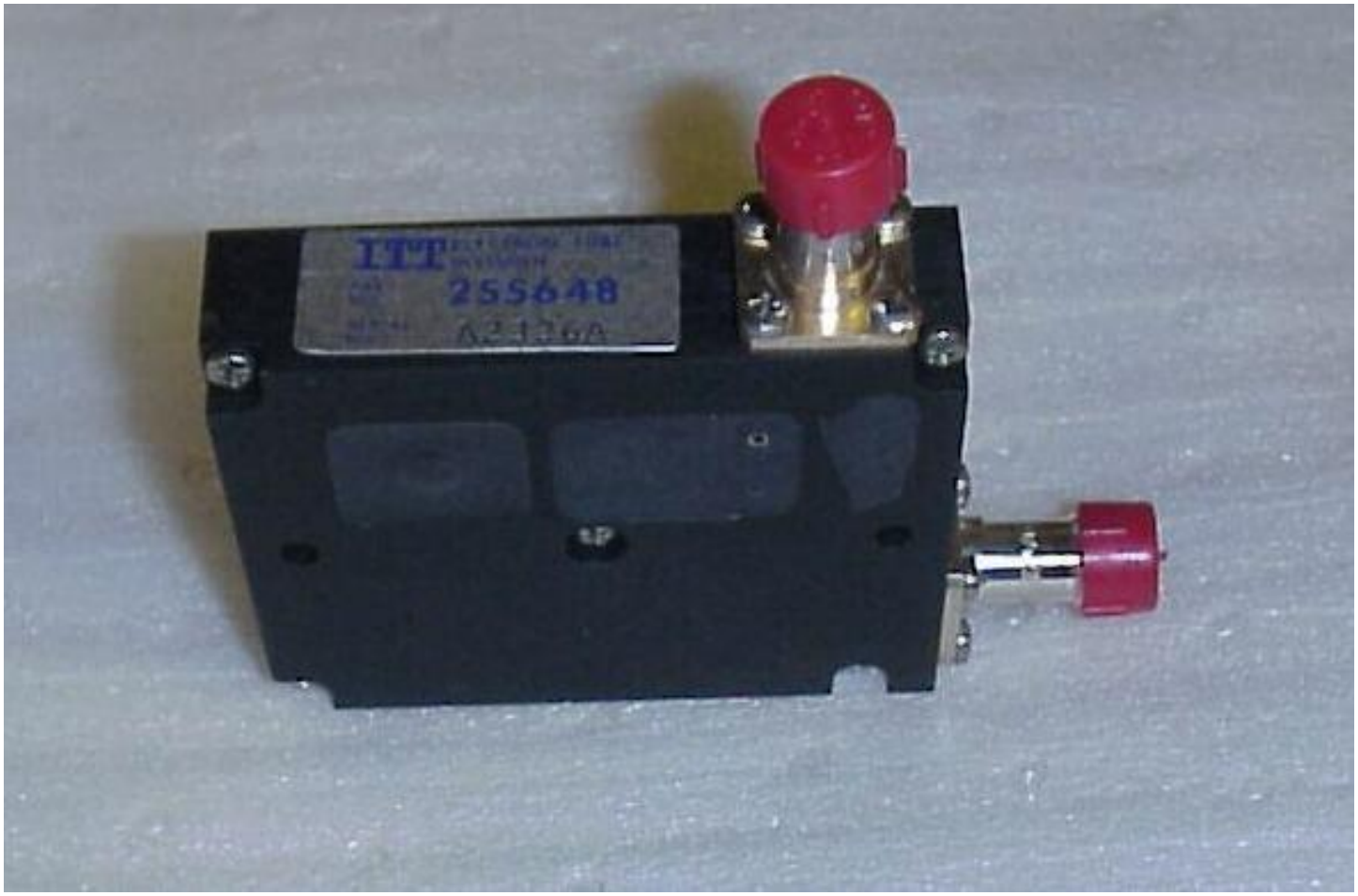
7. If tube has been stored for a long period, follow the procedure below for turn-on:

1. Apply heater voltage (Ef)
2. Wait three minutes
3. Apply grid bias voltage (Ec)
4. Apply helix-shell voltage
5. Apply grid pulse voltage at low duty cycle

Gas in the tube manifests itself by modulation on the r.f. output pulse. The tube should be operated with low grid and r.f. pulse duty cycle until the modulation disappears. The tube should then be gradually brought up to full grid and r.f. duty cycle. The tube is then ready for normal operation.


MOUNT
SUPPLEMENTARY
LABEL HERE
ELECTRON TUBE
DIVISION


TWT
ELECTRON TUBE
DIVISION
MFG. 20948
Ews=10.6 KV
ib= 1.0 Apk
ec= 212 v
GAIN= 45.0 db
EQUALIZER SERIAL NO. A2625A
TYPE F-2085/QKW 1132
SERIAL NUMBER 1057


ITT
255648
A2126A


REUSABLE CONTAINER
FIRM
FIRM
FIRM
RM

ITT ELECTRON TUBE DIVISION
P.O. Box 100 Easton, Pennsylvania 18042

Telephone 215 252-7331

# TRAVELING WAVE TUBE SERVICE REPORT

DATE: _____

TUBE TYPE: _____ SERIAL NO. _____

OPERATING CONDITIONS:

CATHODE VOLTAGE _____
COLLECTOR VOLTAGE _____
GRID BIAS OR FOCUS ELECTRODE VOLTAGE _____
APPLIED GRID PULSE VOLTAGE _____
HEATER VOLTAGE _____
DUTY CYCLE _____

SOLENOID TYPE _____
SOLENOID VOLTAGE _____
SOLENOID CURRENT _____
TYPE OF OVERLOAD
PROTECTION USED _____

STATEMENT OF CONDITIONS OCCURRING AT TIME OF FAILURE _____

REASON FOR RETURN _____

DATE RECEIVED _____ DATE PLACED IN SERVICE _____
DATE FIRST TESTED _____ DATE OF FAILURE _____

TOTAL HOURS OF HEATER OPERATION _____

REPORT PREPARED BY _____
CUSTOMERS NAME _____
ADDRESS _____

NOTE: THIS SERVICE REPORT MUST ACCOMPANY ALL RETURNED TUBES. INCLUDF FULL INFORMATION ON OPERATION AND NATURE OF FAILURE TO PERMIT PROPER CONSIDERATION OF CLAIMS.

*In returning an ITT tube for test and inspection, the customer gives permission to the ITT Electron Tube Division to dissect the tube, in case such procedure is considered necessary, for a complete examination to determine whether failure was caused by a manufacturing defect. Moreover, the customer agrees that, in the event such procedure is necessary, he will not hold the ITT Electron Tube Division liable for the return of any tube so dissected.*

## TRANSPORTATION DAMAGE

All Traveling Wave Tubes should be given a thorough visual inspection and should be tested for continuity and short circuits immediately upon delivery. If found to be in normal condition, they should then be tested under load in the equipment in which they are to be used.

MECHANICAL DEFECTS SUCH AS LOOSE, SHORTED OR OPEN ELEMENTS, OPEN FILAMENTS, CRACKED OR BROKEN CERAMIC, ETC., ARE INDICATIVE OF MISHANDLING IN TRANSPORTATION. If such a condition is found, a damage claim should be filed immediately with the local agent of the transportation company and the tube and its shipping container should be held in exactly the condition received pending instructions from the transportation company.

## PACKING AND SHIPPING INSTRUCTIONS

Tubes returned for inspection should be packed carefully in the original container and shipped unless otherwise stated below via prepaid express to our Service Department, at the following address:

**ITT ELECTRON TUBE DIVISION**
3505 Hartley Avenue
Easton, Pennsylvania 18042

Unusual care should be observed in packing tubes involved in adjustment claims, as proper attention cannot be given to a claim unless the tube is delivered to us in the exact condition existing at the time of failure. If the original shipping container is not available, the tube may be packed as follows: The tube should first be packed with excelsior or some suitable wadding in a box slightly larger than the tube. This package should then be floated in an outer shipping container sufficiently large to allow a minimum of four to six inches of wadding on all sides of the inner package. The outer container should be labeled with notations such as "Glass," "Fragile," "Handle With Care," etc.

ITT Electron Tube Division
2500 Hartley Avenue
Easton, Pa. 18042

RT-251,518 B
SHEET 1 OF 1

# QUALITY CONFORMANCE INSPECTION TESTS, PART I
## FOR QKW 1132 (F-2085) TRAVELING-WAVE TUBE

TUBE
SERIAL No. 1057

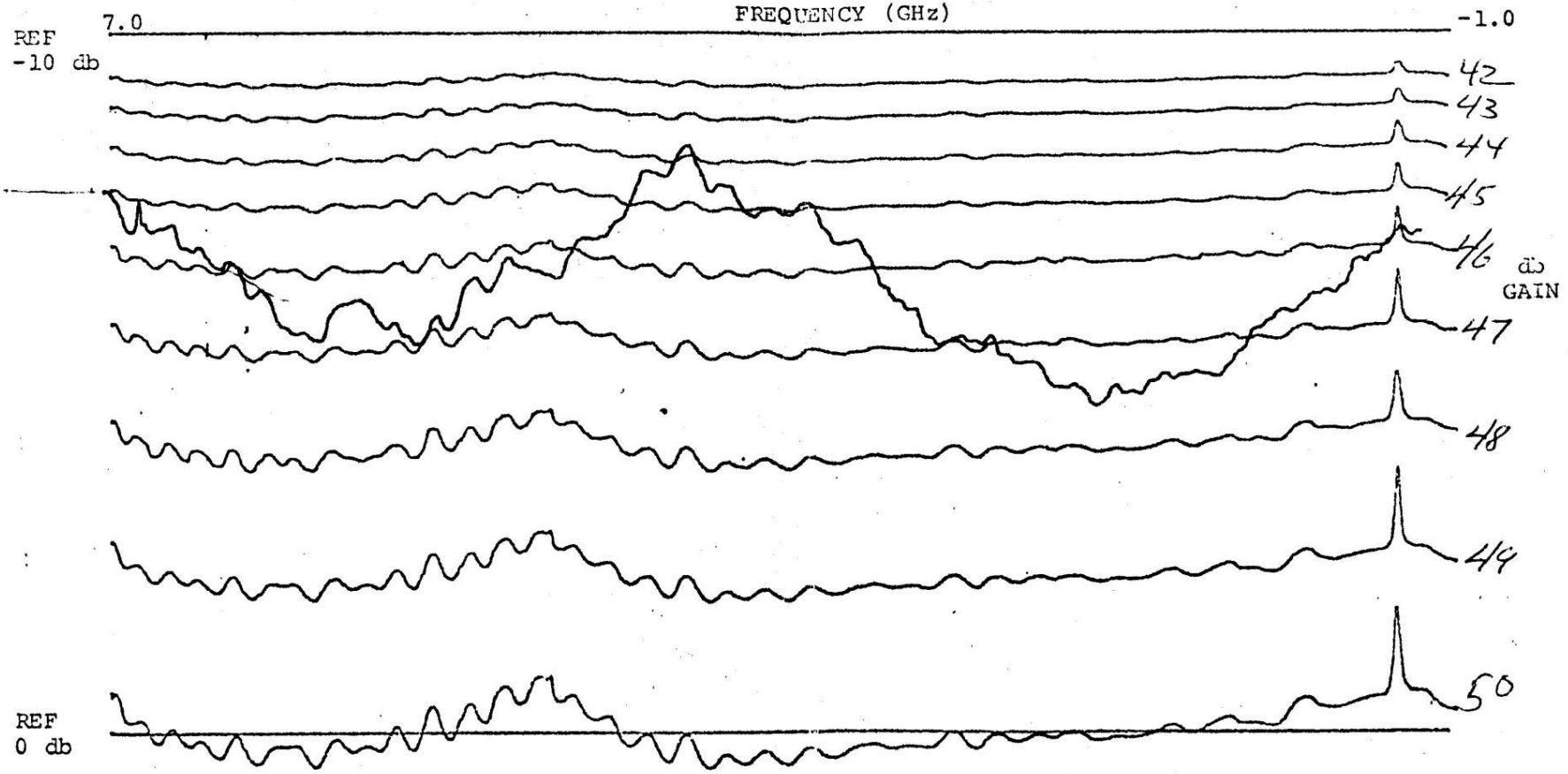
9-16-76

| TEST TITLE | TEST No. | UNITS | LIMITS | | DATE 11SK | DATE | DATE | REMARKS |
|---|---|---|---|---|---|---|---|---|
| | | | MIN. | MAX. | DATA | DATA | DATA | |
| Power Gain $G_{power}$ | | db | 34 | -- | 40.0 | | | See Attached Swept Data |
| Helix/Shell Voltage $E_{ws}$ | | KV | 9.5 | 11.0 | 10.6 | | | |
| Helix/Shell Current $I_{ws}$ | | a peak | -- | 0.8 | 0.26 | | | |
| Peak Grid Pulse Voltage $e_c$ | | v peak | 160 | 270 | 212 | | | |
| Peak Grid Current $i_c$ | | a peak | -- | 0.4 | 0.14 | | | |
| Peak Collector Current $i_b$ | | a peak | -- | 1.5 | 1.0 | | | |
| Peak Cathode Current $i_k$ | | a peak | -- | 2.0 | 1.4 | | | |
| Small Signal Gain $G_{ss}$ | | db | 40 | 52 | 47.5 | | | |
| Small Signal Gain Variation $\Delta G_{ss}$ | | db | -- | 4 | 44.0<br>3.5 | | | See Attached Swept Data<br>See Attached Swept Data |
| Swept Overdrive Curves | | KW peak | 1.0 | -- | 1.05 | | | See Attached Swept Data |
| Overdrive Output Power at 7 GHz | | KW peak | 1.0 | -- | 1.5 | | | |
| Overdrive Output Power at 9 GHz | | KW peak | 1.0 | -- | 1.1 | | | |
| Overdrive Output Power at 11 GHz | | KW peak | 1.0 | -- | 1.3 | | | |
| Small Signal Gain at 9 GHz | | Gss | 40 | 52 | 45.0 | | | |
| Grid Sensitivity $\Delta P_o$ | | db | -- | 6.0 | 4.5 | | | |

ITT ELECTRON TUBE DIVISION
FINAL
ITT KS
COUNTERSIGNED
SEP 21 1976
INSPECTED
EASTON PLANT

SMALL SIGNAL GAIN

Input Level = 1 mw




| | | | |
|---|---|---|---|
| Ews | 10.6 KV | ik | 1.4 a |
| Ec | -40 v | ib | 1.0 a |
| ec | 212 v | If | 3.3 a |
| Ef | 6.3 v | iBe | 426 a |
| | | ic | 0.14 a |

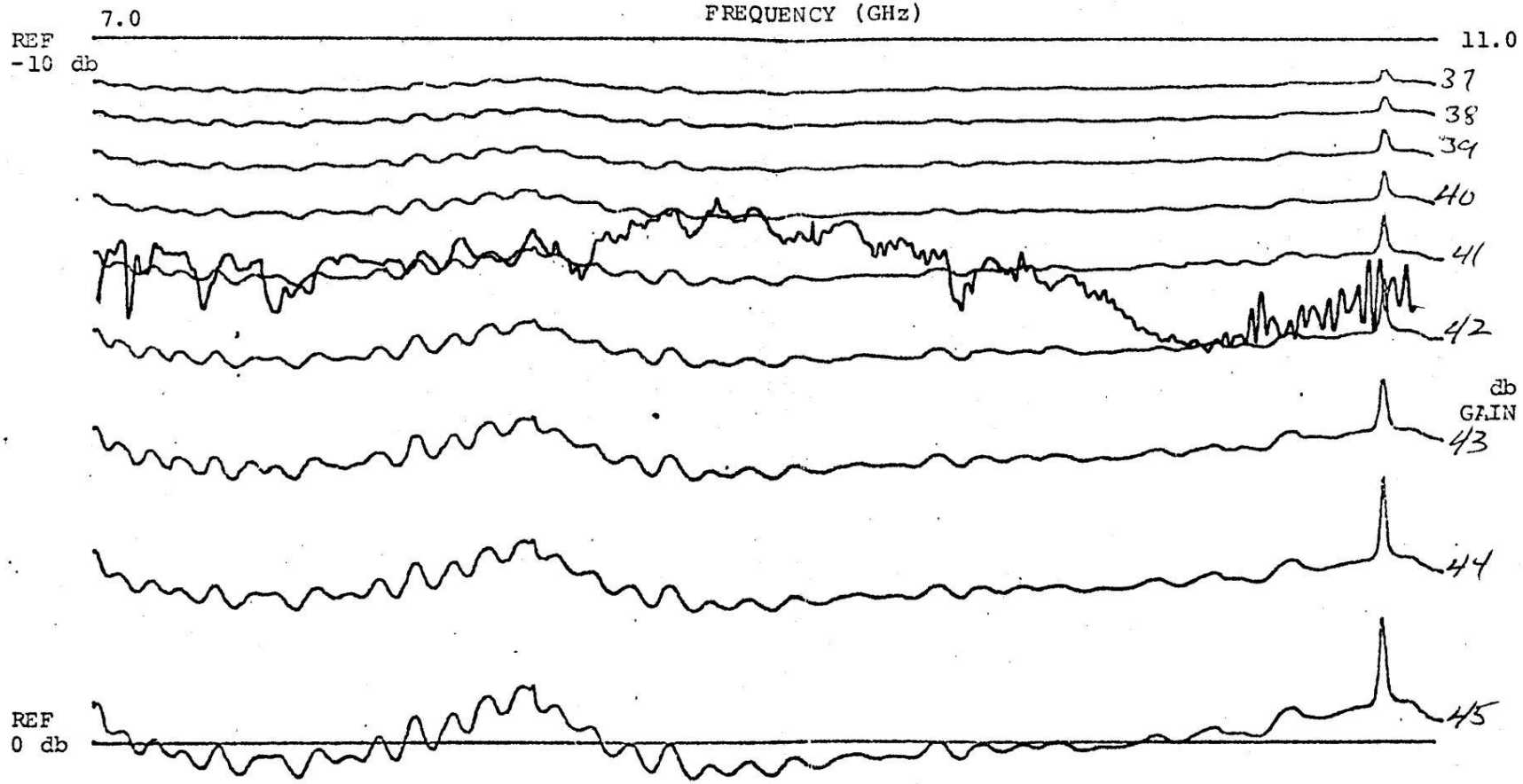
EQUALIZER NO. A26.25A

BENCH NO. 703

SERIAL NO. 1057 DATE: 9-16-76 OPERATOR: HK

POWER GAIN

INPUT LEVEL = 100 mw




| | | | |
|---|---|---|---|
| Ews | 10.6 KV | ik | 1.4 a |
| Ec | -90 v | ib | 1.0 a |
| ec | 212 v | If | 3.3 a |
| Ef | 6.3 v | iBe | 1.26 a |
| | | ic | 0.14 a |

EQUALIZER NO. A2625A

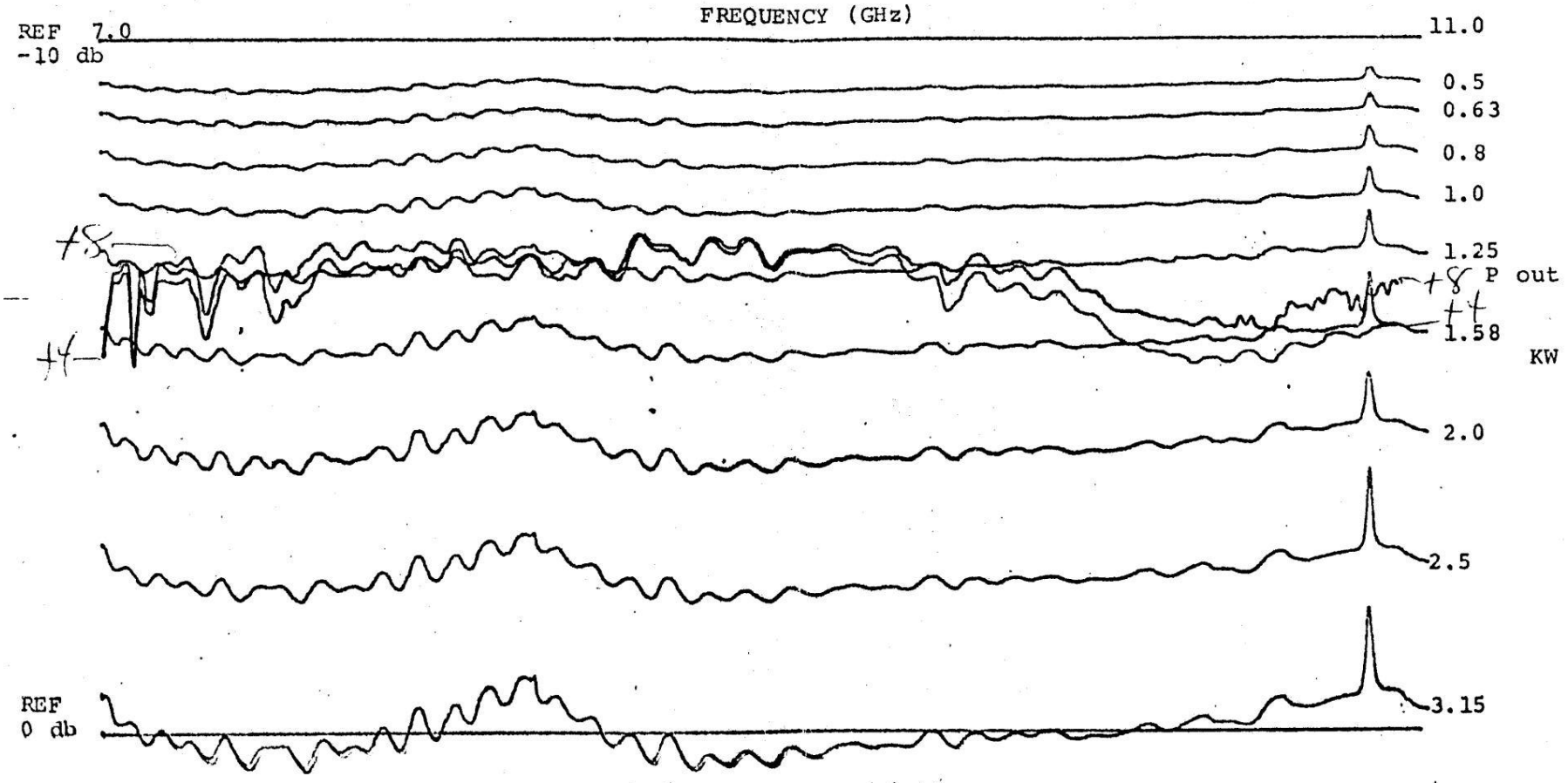
BENCH NO. 703

085

SERIAL NO. 1057 DATE: 9-16-76 OPERATOR: HK

OVERDRIVE

INPUT LEVEL 100 mw




Ews 10.6 KV
Ec -90 v
ec [illegible] v

ik [illegible] a
ib [illegible] a
If [illegible] a