

# SPECTRONIC DENMARK

## FCC INFORMATION

## RF Measurement Report

Prepared by:

### National Certification Laboratory

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In Support of:

### FCC CERTIFICATION

For:

Spectronic Denmark  
Skindbjergvej 44  
DK-8500 Grenaa, Denmark

Model: INCA TX-RX-VOX Transmitter

FCCID: QKE-INCA

### Demonstration of Compliance with FCC Rules Part 90.217

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March 15, 2002

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**NCL PROJ.# SPEC-641**

## **1.0 General Information:**

This report has been prepared on behalf of **Spectronic Denmark**, to support the FCC Certification of a Part 90 transmitter. The Equipment Under Test (EUT) was the **Model: INCA TX-RX-VOX Transmitter**. The EUT configuration consisted of one Transmitter and one Receiver unit. The test results reported in this document relate only to the item that was tested.

Radio-Noise Emissions tests were performed according to the ANSI C63.4- 1992, ***“Method of Measurement of RFI from Low-Voltage Electronic Equipment in the Range of 9 KHz- 40 GHz”***. The measuring equipment conforms to ANSI C63.2 Specifications for electromagnetic Noise and Field Strength-Instrumentation

## **1.1 Summary:**

The **Spectronic Denmark**, Model: **INCA TX-RX-VOX Transmitter**, complies with the Part 90.217 Radio Limits for licensed transmitters under 120 mW RF power.

## **1.2 Test Methodology:**

Both RF Antenna Conducted and Radiated out-of-band emissions testing were performed according to the procedures specified in the applicable sections of TIA/EIA- 603 documents. Radiated testing was performed at an antenna to EUT distance of three (3) meters. The Dipole Substitution Method based on Section 2.2.12 was used to measure out-of-band radiated emission levels.

## **1.3 Test Facility:**

The open area test site and conducted measurement facility used to collect the radiated data is located on the parking lot of National Certification Laboratory 8370 Court Avenue, Suite B-1, Ellicott City, Maryland 21043. This site has been fully described in a report dated May 26, 1993, submitted to and approved by the Federal Communications Commission to perform AC line conducted and radiated emissions testing.

## **2.0 Description of Equipment Under Test (EUT):**

The EUT features:

**External Wire Antenna  
155 - 173 MHz Frequency Range  
25 kHz Channel  
+/- 4 kHz FM Modulation Deviation  
50 mW Peak RF Power  
Battery Operation  
Built-in Microphone  
5 PPM Frequency Stability**

## **2.1 EMI Countermeasure:**

The following modifications were made to the EUT, by the project engineer to assure compliance to specifications:

None.

## **3.0 Test Program:**

This report contains measurement charts and data as evidence for the following tests performed:

90.217 ----- Power Rating

90.217 / 2.993 / 2.991 ----- Harmonics & Out-of-Band Emissions

90.209 / 2.202 ----- Frequency Segment/Channel Bandwidth

90.213 / 2.995 -----Frequency Stability

## **4.0 Test Configuration for Radiated and Antenna Conducted RF Emissions:**

For RF Antenna Conducted measurements of Power, Spurious/Harmonics, and Occupied Bandwidth, the RF antenna port was connected directly to the spectrum analyzer. Suitable attenuation was used to prevent overloading of the analyzer front end.

Radiated out-of-band emissions testing was performed according to the procedures specified in the applicable sections of TIA/EIA- 603 documents. Radiated testing was performed at an antenna to EUT distance of three (3) meters. The Dipole Substitution Method based on Section 2.2.12 was used to measure out-of-band radiated emission levels. Once an emission level is found as maximum, the EUT is removed from the test table and replaced with a calibrated tuned dipole antenna in vertical polarity, which is driven by a signal generator. The generator level is adjusted to the duplicate the previous reading on the analyzer which will be the ERP.

**5.0 FCC Part 2.202 / 90.209 - Calculation of Necessary Bandwidth:**

$$B_n = 2M + 2DK$$

Where K= 1, M= Max Modulation, D= Peak Freq Deviation

Based on Designer's Specs.: M = 5.0 KHz , D = 4.0 KHz

Therefore:  $B_n = 10.0 \text{ KHz} + 8.0 \text{ KHz} = 18 \text{ KHz}$

Emission Designator: 18K0F1D

## **6.0 FCC Part 90.217 – Out-of-Band Emission Limits for 25 kHz Channel:**

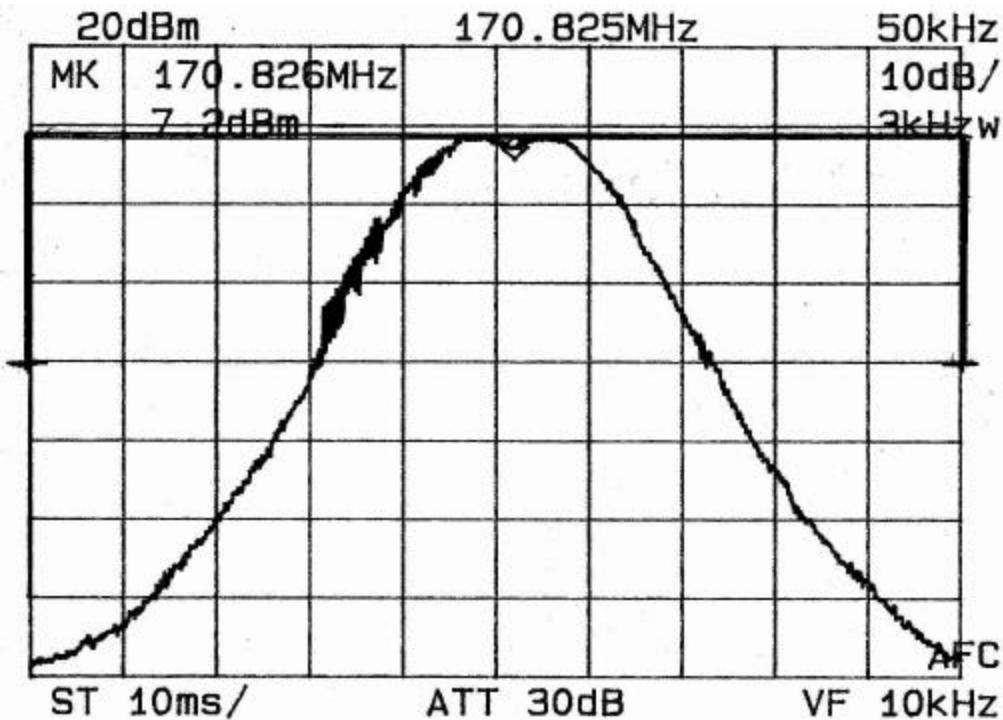
Section 90.217 states:

For 25 kHz Channel: The sum of the Occupied Bandwidth and the Bandwidth for Stability shall be adjusted such that all emission levels 40 kHz or more from the center, are attenuated at least 30 dB below the unmodulated carrier. In this case the frequency stability is 5 PPM or +/- 855 Hz. The occupied bandwidth is 18 kHz.

SPAN: 5 kHz/DIV

RES BW: 3 kHz

10 dB/DIV



## FCC PART 2.993/90.217 - RADIATED SPURIOUS EMISSIONS

Frequency of Carrier = 170.825 MHz  
Limit = 30 dBc

### TEST RESULTS

LIMIT: -30.0 dB FROM PEAK CARRIER

| <u>COMPONENT</u> | <u>FREQUENCY (MHZ)</u> | <u>RESULT (dB FROM PEAK)</u> |
|------------------|------------------------|------------------------------|
| HARMONIC         | 341.650                | - 69                         |
| HARMONIC         | 512.475                | - 72                         |
| HARMONIC         | 683.300                | - 74                         |
| HARMONIC         | 854.125                | - 75                         |
| HARMONIC         | 1024.95                | - 79                         |
| HARMONIC         | 1195.77                | - 77                         |
| HARMONIC         | 1366.60                | - 76                         |
| HARMONIC         | 1537.43                | - 80                         |
| HARMONIC         | 1708.25                | - 80                         |

## FCC PART 2.991/90.217 - CONDUCTED SPURIOUS EMISSIONS

Frequency of Carrier = 170.825 MHz

Limit = 30 dBc

### TEST RESULTS

LIMIT: -30.0 dB FROM PEAK CARRIER

| <u>COMPONENT</u> | <u>FREQUENCY (MHZ)</u> | <u>RESULT (dB FROM PEAK)</u> |
|------------------|------------------------|------------------------------|
| HARMONIC         | 341.650                | - 65                         |
| HARMONIC         | 512.475                | - 68                         |
| HARMONIC         | 683.300                | - 69                         |
| HARMONIC         | 854.125                | - 70                         |
| HARMONIC         | 1024.95                | - 75                         |
| HARMONIC         | 1195.77                | - 77                         |
| HARMONIC         | 1366.60                | - 78                         |
| HARMONIC         | 1537.43                | - 78                         |
| HARMONIC         | 1708.25                | - 78                         |

## **7.0 FCC Part 90.217 - RF Power Rating :**

The RF power may not exceed 120 mW. RF power measurements were taken at the antenna port, using a peak RF power meter.

Results:

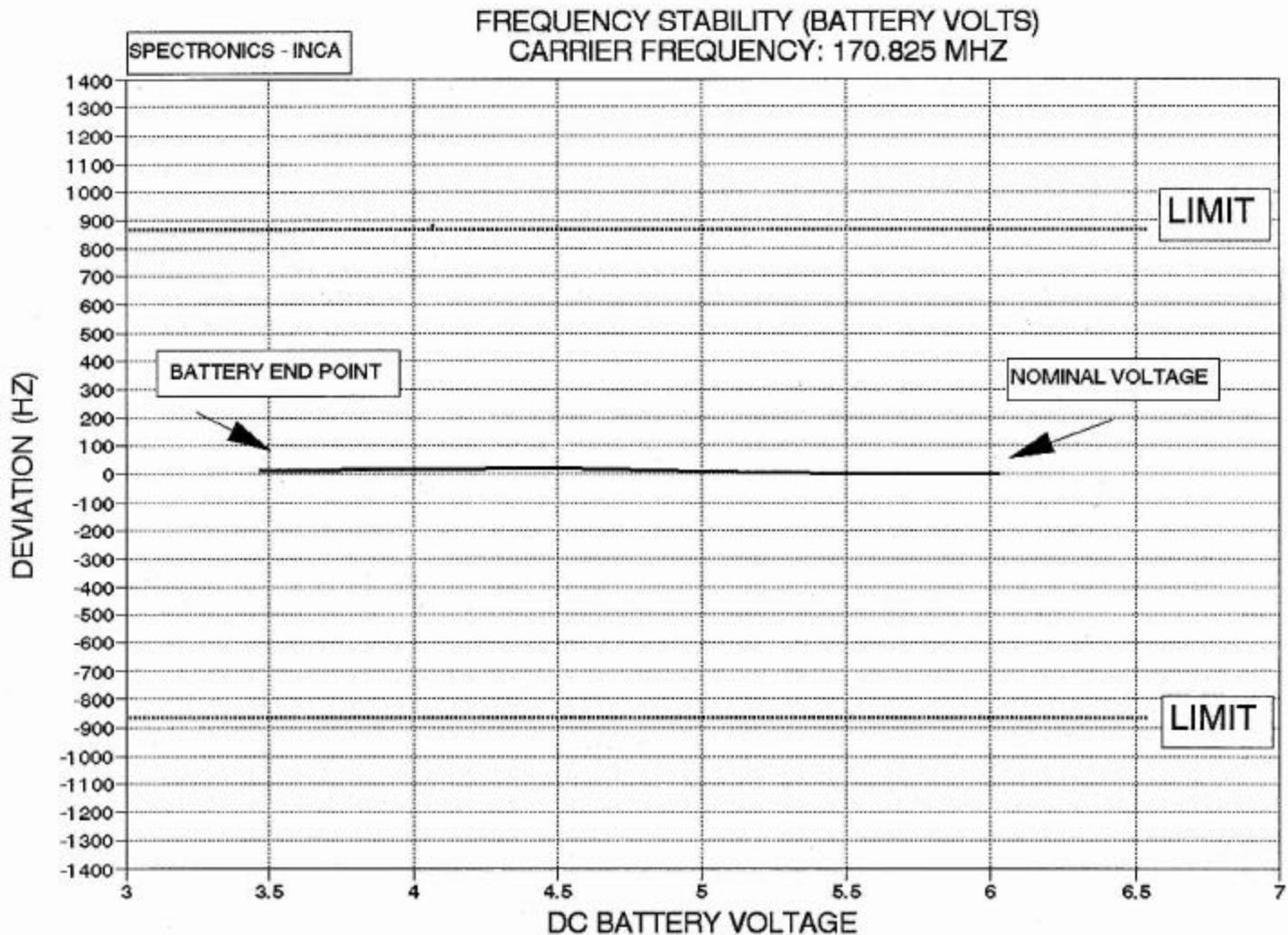
170.825 MHz ..... 17 dBm (50 mW)

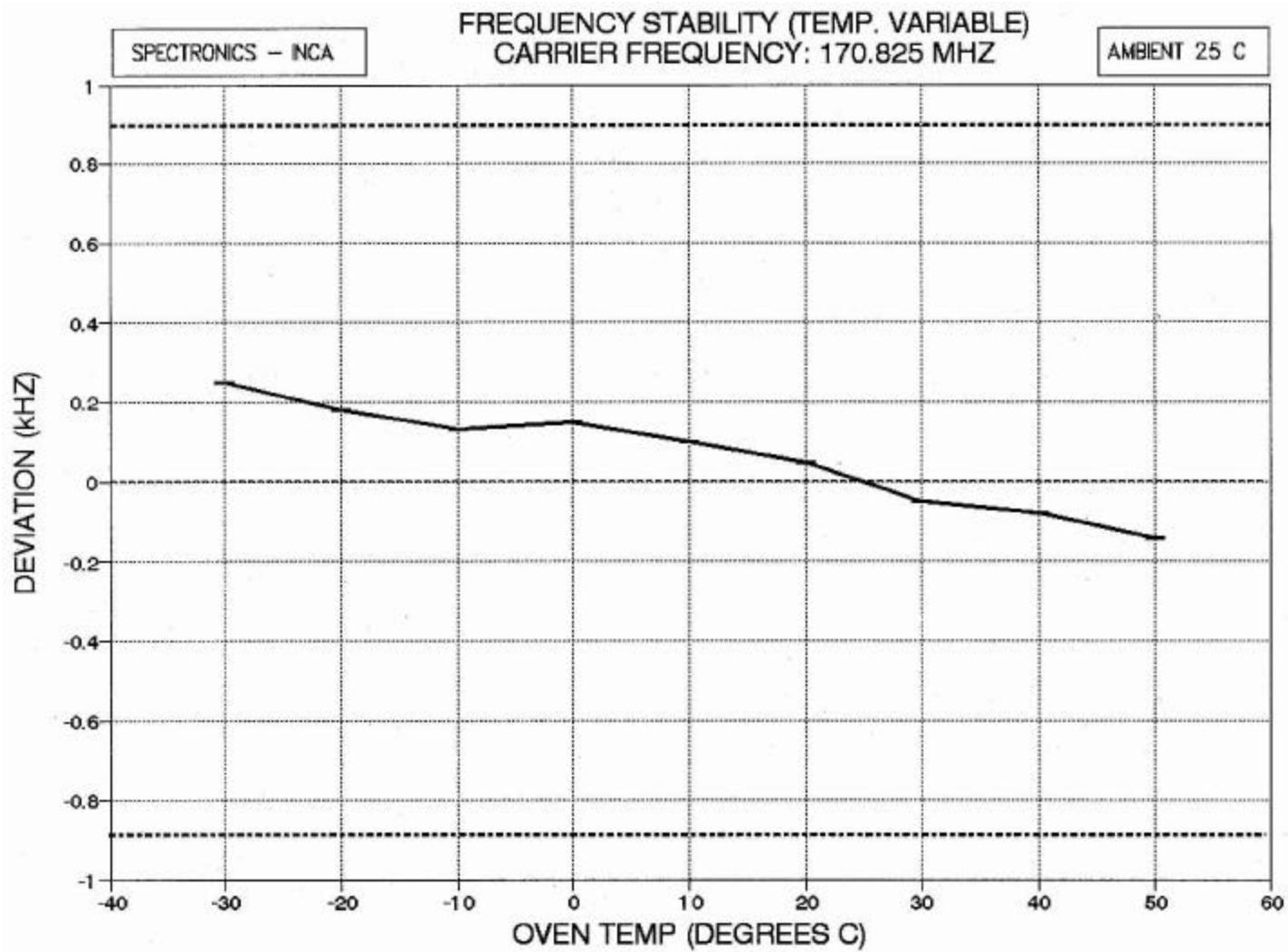
## **8.0 FCC Part 90.213 / 2.995 - Frequency Stability :**

The following charts reveal the Frequency Tolerance of the transmitter carrier frequency as a function of Temperature and Supply Voltage. The charts confirm the rated tolerance of **5.0 ppm**.

The transmitter was placed in the temperature chamber at 25 degrees C and allowed to stabilize for one hour. The transmitter was keyed on for one minute during which a frequency reading was taken. This was considered to be the reference frequency. The temp. was reduced to -30 degrees C and the transmitter allowed to stabilize for one hour. Frequency readings were taken and this procedure repeated in 10 degree increments up to 50 degrees C.

Frequency readings were also taken in increments down to the battery end-point voltage.





**TABLE 1 – EUT ACCESSORIES**

| Type | Make | Model |
|------|------|-------|
| None |      |       |
|      |      |       |
|      |      |       |
|      |      |       |
|      |      |       |
|      |      |       |
|      |      |       |
|      |      |       |
|      |      |       |

**TABLE 2**  
**SUPPORT EQUIPMENT**

| MANUFACTURER | FCC ID # | SERIAL # |
|--------------|----------|----------|
| None         |          |          |
|              |          |          |
|              |          |          |
|              |          |          |
|              |          |          |
|              |          |          |
|              |          |          |

**TABLE 3**  
**MEASUREMENT EQUIPMENT USED**

The following equipment is used to perform measurements:

| EQUIPMENT                                | SERIAL #    |
|--|-------------|
| Wavetek 2410A 1100 MHz Signal Generator  | 1362016     |
| EMCO Model 3110 Biconical Antenna        | 1619        |
| Antenna Research LPD-3500 Log Antenna    | 1005        |
| EMCO Model 3146 Log Periodic Antenna     | 3007        |
| HP 8348A Pre-Amplifier                   | 197-2564A   |
| Solar 8012-50-R-24-BNC LISN              | 924867      |
| Bird 8306-300-N-30dB Attenuator          | 29198391515 |
| Advantest Model R4131D Spectrum Analyzer | 54378A      |
| 4 Meter Antenna Mast                     |             |
| Motorized Turntable                      |             |
| RG-233U 50 ohm coax Cable                |             |
| 4 Meter Antenna Mast                     |             |