October 22, 1999

Mr. Thomas W. Phillips
Federal Communications Commission
Equipment Authorization Division
7435 Oakland Mills Road
Columbia, Maryland 21046

Subject:	FCC ID DV8HLX501A
Applicant:	Fukuda Denshi Co Ltd
Correspondence Number:	10309
Reference:	Attached Test Plan approved by George Tannahill 2/13/97 for a previous application of this device (FCC ID DV8HLX501A)

Dear Mr. Phillips:

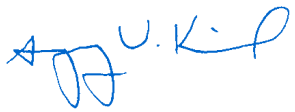
Thank you for your e-mail this morning regarding the subject application. The following response and attachments address the requested information:

1. **"Please explain how the upper frequency range was determined."**

   The frequency range was selected based upon the licensing guidelines found in 90.267(a5). This section allows the operation of a biomedical telemetry device with an output power of not more than 20mW in the frequency range of 450 MHz to 470 MHz.

Your attention to this matter is greatly appreciated.

Sincerely,



Greg Kiemel

Director of Engineering

Attachments

FEDERAL COMMUNICATIONS COMMISSION

Equipment Authorization Division, Application Processing Branch
7435 Oakland Mills Road, Columbia, MD 21046
Telephone: (301) 725-1585, Facsimile: (301) 344-2050

Date: 2/13/97 Time:

From: George Tannahill Extension: 237

To: Greg Kiemel

Organization: Northwest EMC

Telephone: (503) 537-0728 Facsimile: (503) 537-0735

This cover sheet is page 1 of 1 pages. Please direct inquiries to the sender at the above extension.

Reference: Your Fax dated 2/6/97

The items indicated below must be submitted before processing can continue on the above referenced application. Failure to provide the requested information within 60 days may result in application dismissal pursuant to Section 2.917(c) and forfeiture of the filing fee pursuant to Section 1.1106.

☐ Block diagram(s) showing all clocks/oscillators or schematic diagrams

☐ Additional detailed photographs of _____

☒ Other Review of your fax shows the described procedure is basically acceptable but please see the following comments for some clarifications and corrections. For the occupied bandwidth tests the resolution bandwidth setting should be 100 Hz and the video bandwidth should be equal to or greater than that. For the spurious test data which shows emissions beyond the area of modulated spectrum, a resolution bandwidth of 10 kHz is acceptable. Also for radiated and conducted spurious testing, any emissions within 500 dB of the unmodulated carrier level should be reported. The necessary bandwidth should be calculated using Carson's Rule 2M+2D, not shown by measurement. Also, please clearly describe the modulating signal parameters. Also, note that the 90.217 requirements have changed with the Memorandum Opinion and Order PR Docket # 92-235 and 92-257 adopted 12/23/96 and released 12/30/96.
When testing frequency stability vs temperature, the frequency range -30° to +50°C must be tested unless the unit will not operate at the edges of that range. Be sure to specify at what frequencies the unit stops operating and measure tolerance at those points.

Initials _____

Preliminary Test Plan - Subject to FCC Approval

Revision: 2/02/97

This device will be seeking type acceptance from the Commission under 90.267(a5) and 90.217(b).

1.0 EUT Specifications

Classification:	One way, non voice, biomedical telemetry device
Modulation Method:	Digital, Frequency Shift Keying (F1D)
RF Output Power:	1mW
Transmission Frequency Band:	460 to 470 MHz (approx. 474 channels)
Channel Spacing:	12.5 kHz
Occupied Bandwidth:	8.5 kHz

2.0 Required Measurements

All measurements will be made with the EUT set to the lowest, a mid-range, and the highest frequency channels.

2.1 RF Power Output (2.985(a), 90.205, 90.217, 90.267(a5))

Power output will be measured at the RF output terminals with the transmitter biased for normal operation. The output power level is factory set (≈1mW), and not adjustable by the user.

The output terminals will be directly coupled to a spectrum analyzer input through a 20dB (2W) attenuator. The characteristic impedance of the attenuator and the front end of the analyzer are 50Ω. Power measurements will be made with the carrier unmodulated using both peak and average detectors on the spectrum analyzer. Resolution bandwidth will be set to 120kHz.

Maximum permissible power is 20mW or the minimum required for satisfactory operation. This measurement will verify 1mW of power output as specified by the manufacturer.

2.2 Modulation Characteristics (2.987(d))

The modulation characteristics will be measured at the RF output terminals with the EUT set for normal operation. A typical load (antenna or resistive load) will be attached to the output terminals. A high speed oscilloscope (≥500 MHz) will be connected to the output terminals through a high impedance, low capacitance probe (e.g. 10MΩ, 8pF probe). The carrier will be modulated (typical of normal operation).

A waveform of the modulating signal as stored on the oscilloscope screen will be recorded on a plotter.

For telemetry operations, only A1D, A2D, F1D, and F2D emissions are authorized. This measurement will verify F1D emissions.

Revision: 2/02/97

2.3 Occupied Bandwidth (2.989(h), 2.202(c), 90.217(b))

The occupied bandwidth will be measured at the RF output terminals with the EUT set for normal operation. The output terminals will be directly coupled to a spectrum analyzer input through a 20dB (2W) attenuator.

The spectrum analyzer will be set with a peak detector, a resolution bandwidth of 10kHz, and a frequency span of 125kHz. No video filtering will be used. The carrier will modulated (typical of normal operation). The peak envelope of the out-of-band emissions, as stored on the spectrum analyzer screen, will be recorded on a plotter.

"...the sum of the bandwidth occupied by the emitted signal plus the bandwidth required for frequency stability shall be adjusted so that any emission appearing on a frequency 25 kHz or more removed from the assigned frequency is attenuated at least 30 dB below the unmodulated carrier."

2.4 Spurious emissions at antenna terminals (2.991, 2.997, 90.217(b))

No testing is required for spurious emissions at the antenna terminals if the antenna is integral to the construction of the EUT. If the antenna is detachable, then measurement data is required:

Spurious emissions will be measured at the RF output terminals with the EUT set for normal operation. The output terminals will be directly coupled to a spectrum analyzer input through a 20dB (2W) attenuator. The carrier will be modulated (typical of normal operation).

The spectrum will be scanned from 30MHz to 1GHz with a 10kHz resolution bandwidth and a peak detector. The spectrum will also be scanned from 1GHz to 5GHz (10th harmonic of carrier is 4.6 to 4.7 GHz) with a resolution bandwidth of 1MHz and a peak detector. No video filtering will be used. The peak envelope of the spurious emissions, as stored on the spectrum analyzer screen, will be recorded on a plotter. The magnitude and frequency of any spurious emission attenuated less than 40 dB (within 20 dB of the limit) below the power of the unmodulated carrier will be recorded.

For up to 5GHz, any spurious emission appearing on a frequency 25 kHz or more removed from the assigned frequency should be attenuated at least 30 dB below the unmodulated carrier.

2.5 Field strength of spurious radiation (2.993, 90.217(b))

The field strength of spurious emissions that may be radiated from the EUT will be measured in the far field. The EUT will be taken to an Open Area Test Site on file with the FCC and set for normal operation. The carrier will be modulated by patient data from the host device (typical of normal operation). The EUT's antenna will be attached to the transmitter.

The measurement antenna to EUT test distance will be 3 meters. With the spectrum analyzer connected to the appropriate measurement antenna, the spectrum will be scanned from 30MHz to 1GHz with a 10kHz resolution bandwidth and a peak detector. The spectrum will also be scanned from 1GHz to 5GHz with a resolution bandwidth of 1MHz and a peak detector. No video filtering will be used.

The measurement antenna will be scanned in height from 1 to 4 meters and the orientation of the EUT varied to maximize the level of any spurious emissions. Each spurious emission will be maximized with the magnitude and frequency recorded for any signal attenuated less than 40 dB (within 20 dB of the limit) below the power of the unmodulated carrier. Measurement procedure ANSI C63.4 (1992) will be referenced.

For up to 5 GHz, the field strength of any radiated spurious emission appearing on a frequency 25 kHz or more removed from the assigned frequency should be attenuated at least 30 dB below the unmodulated carrier.

2.6 Frequency Stability (2.995(a1)(b)(d), 90.213, 90.217(b))

The frequency stability of the EUT's unmodulated carrier will be measured. The transmitter will be biased for normal operation. The output power level is factory set (≈1mW) , and not adjustable by the user. Although 2.995(a1) specifies that the ambient temperature will be varied from -30° to +50° centigrade, the EUT is specified to be used from +10° to +40° centigrade (hospital or clinic environment). The test will be destructive if performed from -30° centigrade. Therefore, frequency measurements will be made at the extremes of the operating range (+10° to +40° centigrade), and at intervals of not more than 10° centigrade through the range. A sufficient period of time will be allowed at each temperature interval to allow the components of the oscillator / clock circuitry to stabilize.

Frequency stability of the unmodulated carrier will also be measured for variations in supply voltage. For AC powered devices, the primary supply voltage will be varied from 85% to 115% of the nominal value. Frequency measurements will be made at the nominal supply voltage and at each extreme.

For battery powered devices, the primary supply voltage will be reduced to the battery operating end point specified by the manufacturer. Frequency measurements will be made at the nominal battery voltage and at the end point.

The carrier frequency must be within the assigned frequency by a margin no greater than the sum of: the bandwidth occupied by the emitted signal, plus the bandwidth required for frequency stability (2.5ppm ≈ 1.15kHz), plus 25 kHz. This is equal to 12.5 kHz + 1.15 kHz + 25 kHz, which is equal to 38.65 kHz.