



FCC Type Acceptance Application

ATTACHMENT TO

EXHIBIT 4

TEST REPORT

“Personal Safeguard Companion”

731 Confirmation Number: EA93547

FCC ID – N6TSCACEJ

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FILE NAME:	C:\Ready_To_Convert\Doc\37053.DOC		
FILE DATE:	05/12/99 9:07 AM		
	Specification Number:	TR101/100/002	
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1 Objective

This Attachment to the Test Report refers to the measurements for ERP and SAR requested by the FCC in their correspondences of April 19 and May 03, 1999, Correspondence Reference Numbers 7269 and 7565 respectively.

2 ERP

2.1 MEASUREMENT OF RADIATED FIELD INTENSITY

Radiated Field Intensity measurements were carried out at the FAU EMI R & D Laboratory, Boca Raton, Florida. The results are given in their Technical Report No. 99-032, which is attached to this document.

The Chapman Personal Safeguard Companion uses a helical antenna. The measured maximum “peak” field intensity was 123.6dBuV/m, or 1.514V/m, at a distance of 3 meters.

2.2 CALCULATION OF ERP FROM MEASUREMENT

Assuming Free-Space radiation, for a half-wave dipole in the direction of maximum radiation, the power density, P (watts/meter²) due to the power radiated, P_t (watts), is

$$P = 1.64P_t/4\pi R^2$$

Where R is the distance in meters.

The electric field strength, E (volts/meter) and power density, P at any point are related by

$$P = E^2/120\pi$$

Hence, $E^2 = (49.2P_t)/R^2$

Or, $P_t = E^2 R^2 / 49.2$

For $E = 1.514V/m$, $R = 3$ meters

$$P_t = 1.514^2 \times 9 / 49.2 = 419mW$$

Hence, maximum measured ERP is 419mW.

2.3 THEORETICAL CALCULATION OF ERP

The Chapman Personal Safeguard Companion uses a short helical antenna with dimensions of: Height 0.66 ins, Diameter 0.144ins, Wire diameter 0.0245ins, and 13 turns. Using formulas for helical antennas given in “*ITT Reference Data for Radio Engineers*”, 1973, Section 25-11.

Calculated Radiation Resistance = 1.39ohms

Calculated Wire resistance = 0.31ohms

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This gives an ideal efficiency of 66.7%. A Helical antenna has the same directivity as a dipole, hence, there is a 1.64 gain in the direction of maximum radiation. The conducted transmit power is controlled to be nominally 400mW by the ALC circuitry.

Therefore, the maximum ERP, $P_{max} = 400 \times 1.64 \times 0.667 = 437\text{mW}$

In practice, the resistance of the matching components must also be added to that of the wire resistance. There are two series inductors in the matching network with a maximum resistance of 0.08ohm each. This reduces the efficiency to 55.8%.

Thus, by calculation, the worst case, maximum ERP, $P_{ERP} = 400 \times 1.64 \times 0.534 = 366\text{mW}$

Hence the calculated maximum ERP is 366 to 437mW. This agrees well with the measured result of 419mW.

2.4 RATED RF OUTPUT

The conducted power output, out of the antenna terminal is nominally 400mW, set by the Automatic Level Control (ALC), as described in Exhibit 2, “Technical Information”, para. 5.3.4.2, of our FCC Application. The maximum measured value, at mid band, was 380mW.

On Form 731 1.0W ERP was inserted in the mistaken belief that “Rated RF power output” referred to the maximum specification allowed for, which corresponds to $-2\text{dBW} +2 -4\text{dB}$, i.e. 0dBW. “Rated” was interpreted as being the level at which the equipment is capable of, similar, say, to a 1W rated resistor that is only actually dissipating 600mW in the circuit. The Personal Safeguard Companion (PSC) does not emit 1W under any conditions.

Based on the above results, the “Rated RF power output, in watts”, Form 731Section IV, 8 (b), should read 450mW, corresponding to the maximum ERP.

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3 SAR

3D-EMC Laboratory, Inc, Fort Lauderdale, independently tested the Chapman Personal Safeguard Companion. A copy of the “Product Compliance SAR Test Report”, reference 10032, with the measurements and Data, is provided to the FCC.

The Personal Safeguard Companion (PSC) is fitted with a 1W loudspeaker and a sensitive microphone able to pick up conversation from up to 30 feet away. The unit is designed to be a “Hands-Free” device. In a vehicle, for example, the unit is placed in a bracket on the dashboard and stays in the bracket during all calls. When being carried, a person normally holds the unit out in front of them, and only under conditions of extremely high background noise, is the unit held up towards the ear, and even then, never to the ear as with a conventional cellular phone. In the normal position, therefore, the unit’s antenna is at least 9 inches from the person’s body. In the worst case condition, which is unusual, the unit’s antenna is still at least 4 inches away from the person’s head.

As there is no physical restraint to prevent the user holding the PSC directly to the head, tests were performed to establish the maximum value of the SAR (Specific Absorption Rate) in a person holding the product directly against the head and over the ear. The D.U.T was found to be in compliance with the FCC 96-326 document.

The maximum SAR was 0.77 W/Kg averaged over 1 gram of tissue.

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