A LARGE-SCALE ANECHOIC CHAMBER WITH HIGH-POWER MICROWAVE ABSORBERS

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1. INTRODUCTION

Conventional microwave absorbers, which are mainly composed of urethane foams, [1] will not be applied to high-power usage due to their low heat-resistant nature. A large-scale anechoic chamber for high-power applications, such as RF transmission tests, has been constructed utilizing new high-power absorbers. In this paper the structure and test results of the high-power absorber are presented.

2. STRUCTURE OF THE HIGH-POWER ABSORBER

The structure of the high-power absorber is shown in Fig.1. This absorber is composed of multi-layered ceramics, glass fibers and carbon fibers. These new materials, which are inorganic, are excellently heat-resistant, nonflammable, and do not absorb water. Density of carbon fibers is gradually changed from layer to layer so as to reduce reflections. Glass fibers are for reinforcement.

3. TEST RESULTS

High power test was performed by means of a microwave oven on S-band. In this test the door of the oven was kept open to help natural air convection. Fig.2 shows measured temperature of the absorber as a function of time. From Fig.2, it can be said that this absorber withstands RF CW energy of 0.8 W/cm^2 for about 50 minutes without forced cooling air. The temperature at point A rose above 150 ℃, but no degradation was observed. On the other hand, conventional urethane foam absorbers can only withstand RF CW energy of 0.12 W/cm^2 for about 5 seconds.

Reflection tests were performed at 3 frequencies. Fig.3 is the X-band result showing reflected level as a function of incident angles. As for reflections, the high-power absorber is comparable to conventional one. On other frequencies, reflected level was -30 dB at 1 GHz, -34 dB at 3 GHz.

Fig.4 shows our large-scale anechoic chamber which is 16 m high, 16 m wide and 27 m long. Thousands of high-power absorbers are mounted on the front wall.Temperatures of absorbers can be monitored by means of an infrared thermosensitive camera. Fig.5 shows one example of thermal distribution, which was obtained after 30 minutes transmission of 0.25 W/cm^2 C-band energy.

4. CONCLUSION

A large-scale anechoic chamber furnished with high-power absorbers has been constructed. High power test and reflection tests were performed and very satisfactory results were obtained.

REFERENCE

(1) EMERSON & CUMING, Inc., TECHNICAL BULLETIN 8-2-3

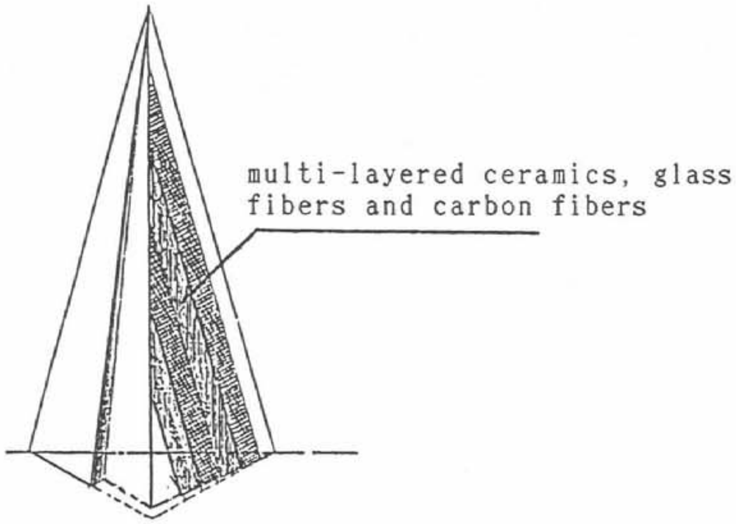

Fig.1 Structure of a high-power absorber

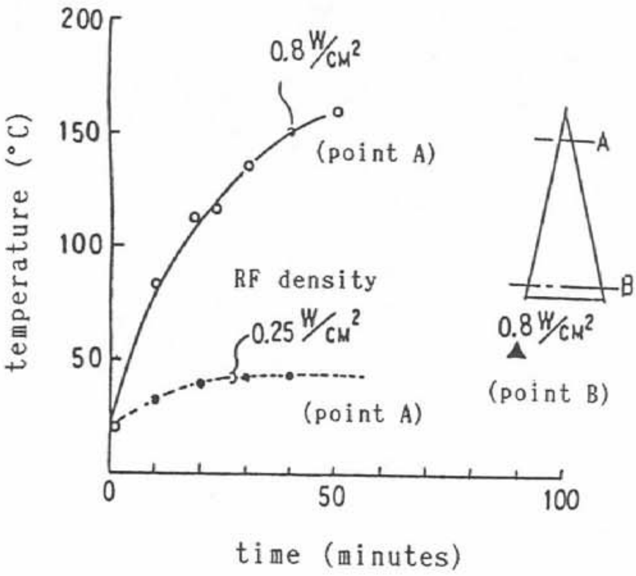

Fig.2 Result of high power test (S-band)

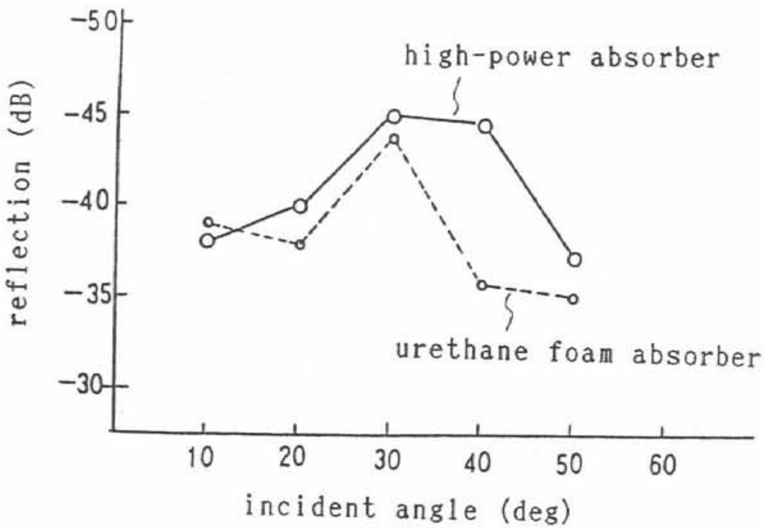

Fig.3 Result of reflection test (X-band)

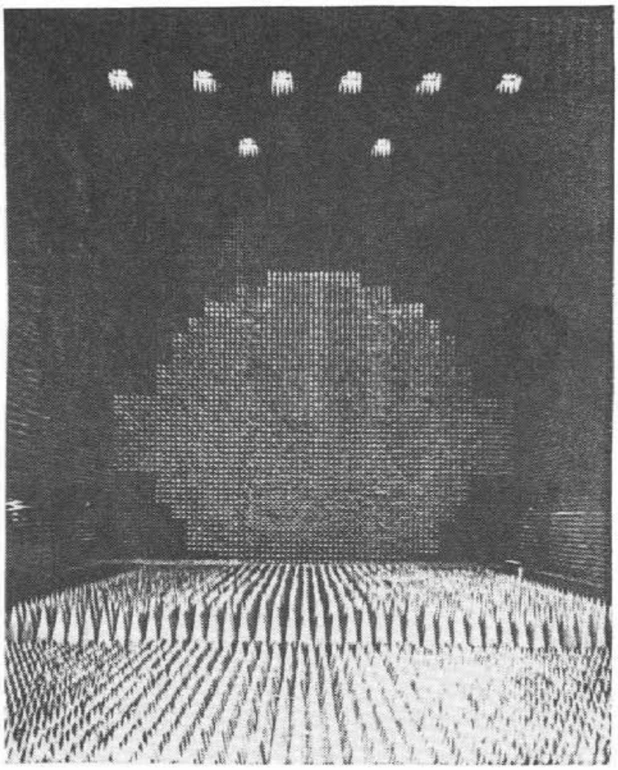

Fig.4 The large-scale anechoic chamber with high-power absorbers mounted on the front wall

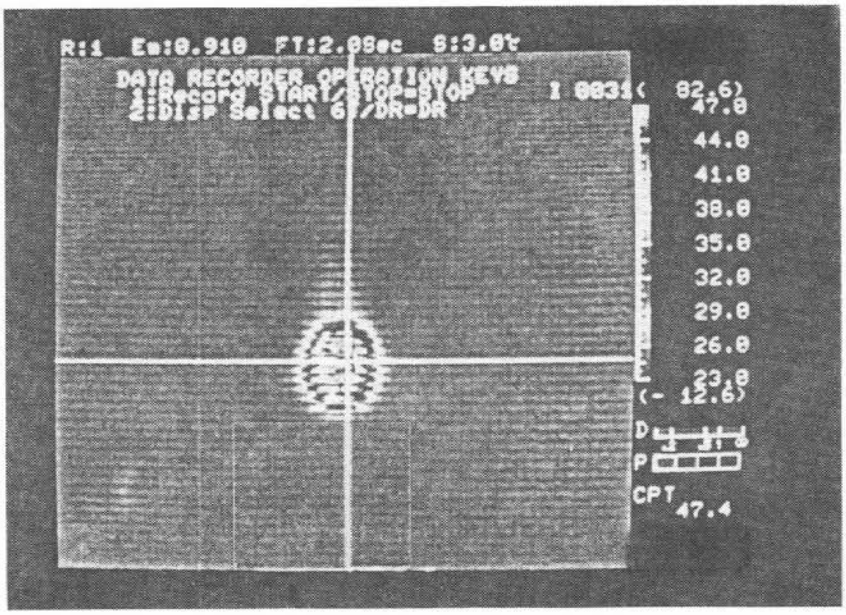

Fig.5 An example of thermal distribution of the front wall