Investigation of GLM series microphone tolerance to high temperatures.

1. Objective.

To establish if the GLM series of microphones could be used at temperatures above their 50 degree Celsius stated range.

2. Background.

Microphones for use in hot environments can either be specialist units or, in certain circumstances, standard units that have been checked for reliable operation at temperatures outside their normal range. Typically specialist microphones are expensive and/or bulky while “normal” microphones are competitively priced and often small and light. Small and light make attachment and positioning easy, reducing operator frustration that occurs when microphones are found to have repositioned themselves on the floor when decommissioning takes place.

3. Experimental Method

3.1Test item

The GLM200 model was used; it is identical in construction to the GLM100 and should prove a valid test object for the whole GLM range.

3.2 Test Equipment.

Sony EX data acquisition system with nVision post processing software.
Domestic Electric Fan Oven
Domestic cooking thermometer.
Cirrus microphone calibrator.

3.3 Test procedure

1. Calibrate the microphone at 20 degrees C.
2. Calibrate the thermometer in boiling water
3. Place thermometer in oven and heat to 150 degrees C viewing the temperature rise shown on the thermometer through the glass door of oven.
4. Place microphone in oven while connected to Sony, cable being 3mm diameter it was easily accommodated by the oven’s rubber seal.
5. Heat oven to 125 degrees C (250 degrees F)
6. Observe the fan noise profile on Sony during heating and cooling of oven.
7. Check calibration by taking microphone out of Oven at 125 degrees c and putting into calibrator.
8. Replace microphone in Oven and leave at 125 degrees C for 40 minutes.
9. Re-check calibration and log change in sensitivity as microphone cools.

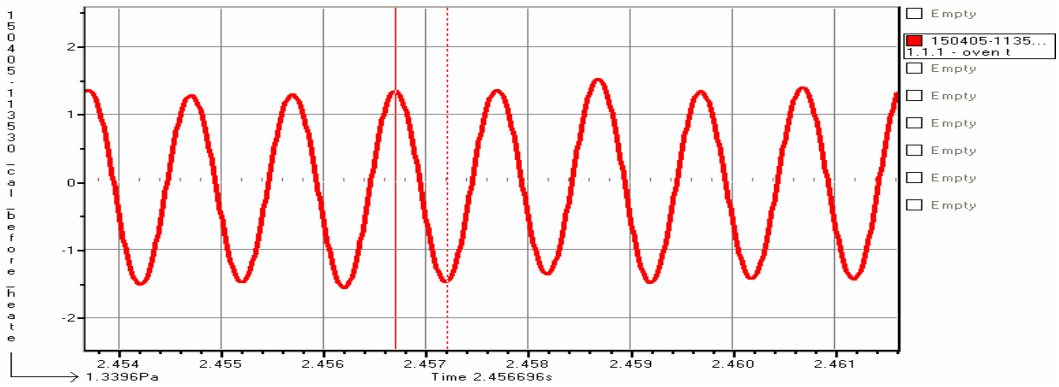
4. Results

Table 1. Calibration tone values after heating.

Time of day	Mic in temperature of:	Calibration reading of 93.8 tone
12.20	20	93.8dB
Put in oven		
12.40	60	
Take out of oven		
12.46	20	92.6
12.52	20	93.4
13.00	20	93.6
Put in oven		
13.03	50	
13.05	60	
13.06	75	
13.08	90	
13.09	106	
13.14	125	
Take out of oven		
13.18	20	91.8
13.19	20	91.9
13.20	20	92.1
13.25	20	93.05
13.27	20	93.66
Put back in oven		
13.28	125	
14.17	125	
14.18	20	91.1
14.20	20	91.7
14.21	20	92.1

The original calibration tone is shown in figure 1.

Figure 1. Calibration tone of 93.8dB



The effect of a sustained period of 5 minute/300 seconds at 60 degrees can be in figure 2. and in figure 3 the spectrum is shown of the oven's fan at 1 second and at 300 seconds.

Figure 2. Linear overall and Awtd overall levels recorded by the GLM 200 while in the oven.

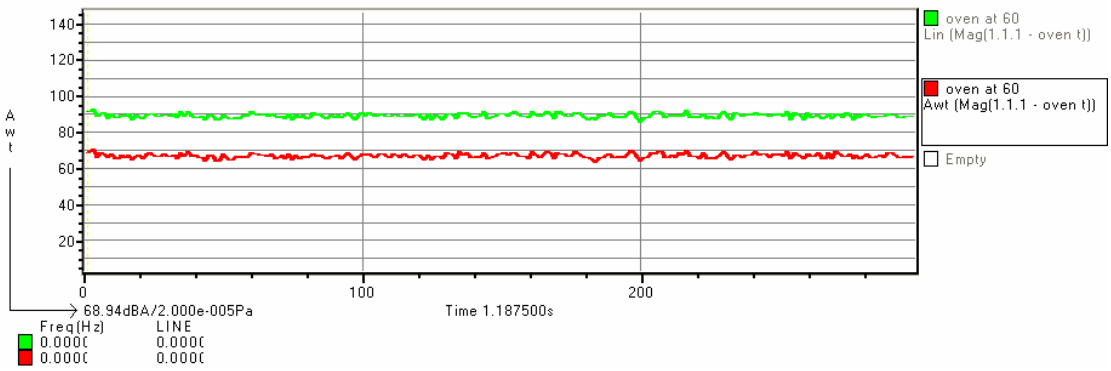
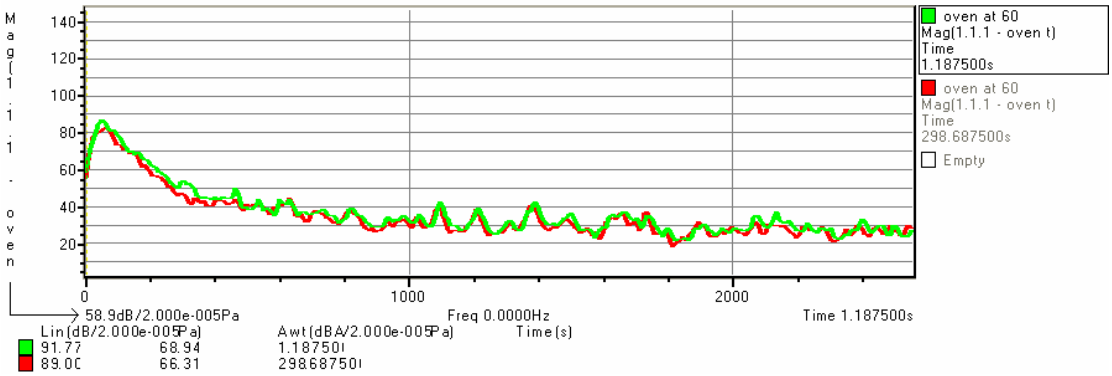


Figure 3. Spectrum of the oven at the beginning and end of the 5 minutes.



The effect of raising the temperature to 125 degrees can be seen in figure 3.

Figure 3. Oven at 125 degrees C over 10 minutes

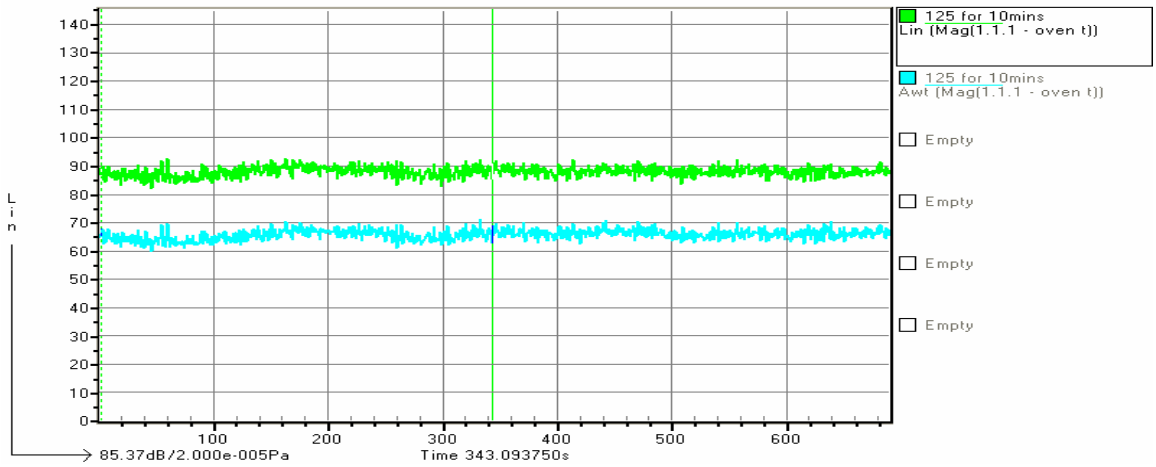
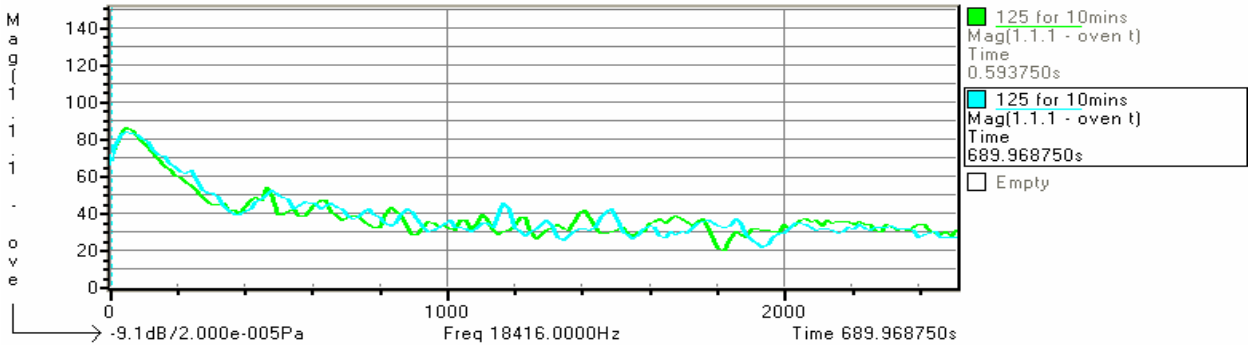


Figure 4. The spectra t 125 degrees C at the start and end of the 10minutes



5. Conclusions.

5.1 Raising the temperature to 60 degrees had no visible effect on either the spectra or the overall level and caused only a marginal offset of 1dB on the calibration tone level. This initial 1dB reduced to 0.2 dB after 15 minutes at 20 degrees C. The microphone can therefore be safely used at 60 degrees C without changing its sensitivity.

5.2 Raising the temperature to 125 degrees C did “stress” the microphone. The level of the cal tone was now 2.7dB different immediately after the 40 minutes spent at 125 degrees. However no significant change to the ovens internal fan noise was detected and the spectra were still in close agreement. The time taken for the calibration value to return by 1dB was 3 minutes; a similar rate of change to the 60 degree C test..

5.3. If the microphones are exposed to 125 degrees C then any measurement made at or within 10 minutes is likely to be recorded at a level up to 3dB lower than the true level.

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