

# Heat Release and Vibration Suppression Effects of a Tube Radiator

In order to study the heat release effect of a tube radiator, we measured the temperature of a vacuum tube by using thermography. Figs. 1 and 2 show the temperature distribution 15 minutes after the attachment of the tube radiator. Without the tube radiator (Fig. 1), the temperature of the operation part of the vacuum tube increased locally. The temperature distribution was extremely heterogeneous, with the temperature of the top part being about 70 degrees Celsius. On the other hand, with the tube radiator (Fig. 2), **the peak temperature decreased considerably, and the temperature distribution of the vacuum tube became homogeneous as a whole.** This is considered because the attachment of the tube radiator to the vacuum tube enabled the efficient heat release from a broader area of the vacuum tube. In addition, the corrugated surface of the tube radiator is a significant factor that increases the surface area for releasing heat and improving heat radiation rate.

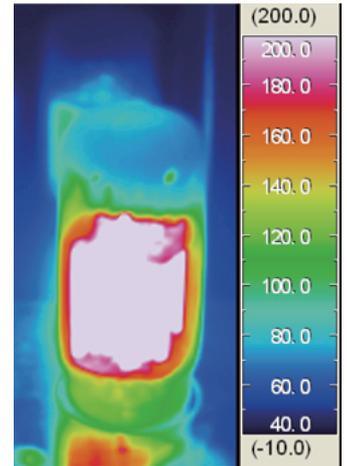


Figure 1 Without the tube radiator

Figs. 3 and 4 show the measurement data of the vibration level of the plate inside the vacuum tube using a laser velocity meter, in order to check the vibration control effect of the tube radiator. The attenuation amount of the second-order harmonic distortion vibration component (vibration level of 2 kHz) when the sine wave of 1 kHz was inputted into an amplifier was 16 dB without the tube radiator, and 19 dB with the tube radiator. **This indicates that the vibration level of harmonic distortion with respect to inputted signals decreased, as the tube radiator was attached.** Since **the high frequency vibration level (inside the green frame), too,** decreased significantly, we can understand that the tube radiator functions to improve the S/N ratio.

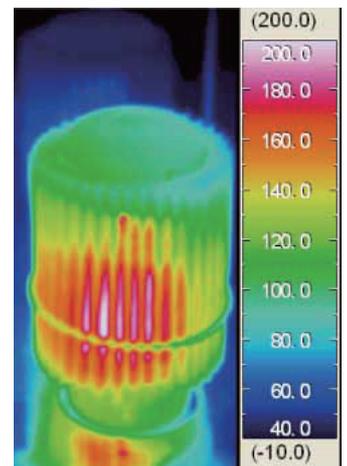


Figure 2 With the tube radiator



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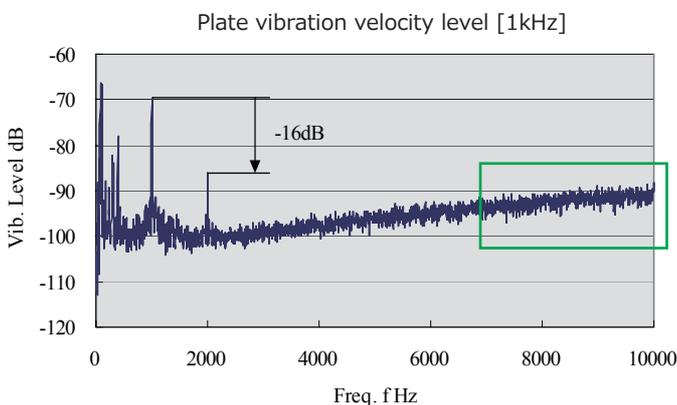


Figure 3 Plate vibration level (without the tube radiator)

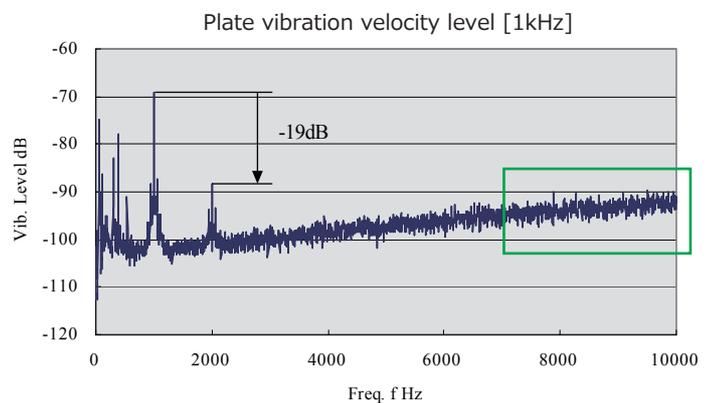


Figure 4 Plate vibration level (with the tube radiator)