R00293A: Results Summary for Veterinary Warming Blanket Testing

Date: 23 June 2019
To: Lloyd Hiebert, Veterinary Warming Solutions LLC
From: Blaine Chronik, Ph.D. (MRIdt Inc.)
Cc:
Regarding: Testing (RF heating at 64 and 128 MHz) of the Veterinary Warming Blanket

No testing conducted or reported here is applicable for evaluation of use of these devices or systems with humans.

Project p19044 (described in this memo) involved testing of a single sample of a veterinary warming blanket for RF heating at both 1.5 T (64 MHz) and 3 T (128 MHz). A single sample was tested at both frequencies. A single heating test was conducted at each frequency (no repeats or variations were tested).

No assessment of magnetically induced force or torque were conducted; however, based on our understanding of the materials used to construct the blanket, no force or torque effects would be anticipated.

No assessment of gradient-induced heating was conducted.

No assessment of image distortion was conducted.

All testing was generally conducted according to the relevant sections of ASTM F2182-11a:

- RF exposure systems were used for 64 and 128 MHz exposure;
- These systems were calibrated for RF power deposition ("Whole-body SAR") using calorimetric methods described in F2182;
- The blanket was placed over the top of an ASTM phantom (as defined in ASTM F2182-11a) filled to a height of 9 cm with saline of conductivity verified to be between 0.45 and 0.5 S/m;
- A finite number of Fiber-optic temperature sensors were employed over the top surface of the blanket during exposure (7 in total);
- A thermal camera was used to obtain a measurement of the final temperature over the entire outer surface of the blanket following exposure at each frequency;
- No attempts were made to measure or monitor the internal temperatures within the blanket;
- No systematic effort was made to identify or monitor the locations of peak heating on the device using the fiber optic probes; however, 7 temperature probes were positioned at the corners, sides, and the middle of the blanket;
- RF exposure was applied for a total of 20 minutes at each frequency.

The results of testing were as follows:

- Following 20 minutes of exposure to a whole-body SAR level of 2.99 +/- 0.15 W/kg at 64 MHz:
  - peak temperature increases of not more than 0.2 deg-C were observed at the fiber-optic sensors. Given that the detection limit of the sensors used was 0.1 deg-C, this result is consistent with the conclusion that no heating of the blanket could be detected at 64 MHz.
  - The thermal camera data indicate no localized heating or hot-spots.
  - Figure 1 shows photographs of the device under test, and the thermal camera images (before and immediately after RF exposure). No significant heating could be detected.
- Following 20 minutes of exposure to a whole-body SAR level of 2.73 +/- 0.15 W/kg at 128 MHz:
  - peak temperature increases of not more than 0.6 deg-C were observed at the fiber-optic sensors. Given that the detection limit of the sensors used was 0.1 deg-C, this result is consistent with the conclusion that very little heating of the blanket could be detected at 128 MHz.
  - The thermal camera data indicate no localized heating or hot-spots.
  - Figure 2 shows photographs of the device under test, and the thermal camera images (before and immediately after RF exposure). No significant heating could be detected.

Blaine A. Chronik, Ph.D. 23 June 2019
Managing Director, MRIdt Inc.

MRIdt Inc. is accredited to ISO/IEC 17025:2005.

Figures and References below.

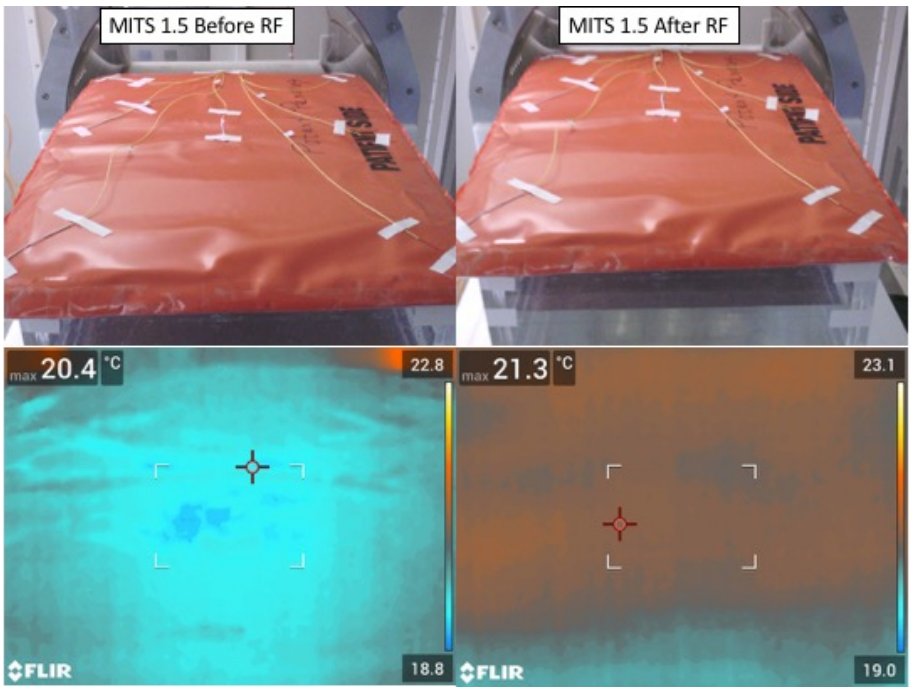

Figure 1: Image showing heating before (left) and after (right) RF exposure at 64 MHz (1.5 T).
The thermal camera images (lower row) show no evidence of any significant localized heating not captured by the fiber-optic sensors.

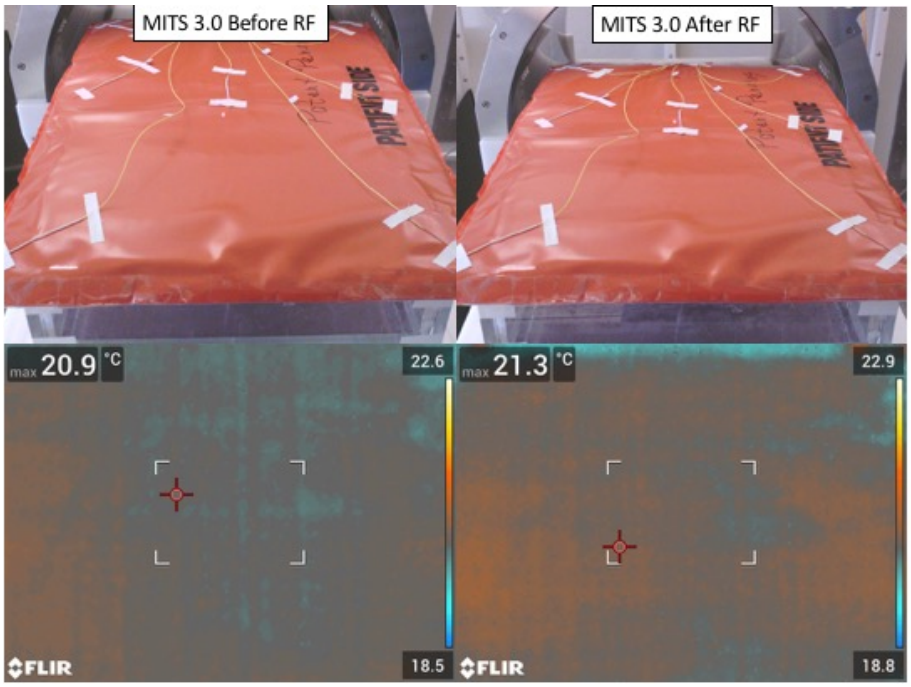

Figure 2: Image showing heating before (left) and after (right) RF exposure at 128 MHz (3.0 T).
The thermal camera images (lower row) show no evidence of any significant localized heating not captured by the fiber-optic sensors.

References

[1] ASTM F2182-11a, “Standard Test Method for Measurement of Radio Frequency Induced Heating On or Near Passive Implants During Magnetic Resonance Imaging” (2011). [DOI: 10.1520/F2182-11a]

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