

Thermal sensation induced by MMW exposure

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Background

- **The millimeter-wave usage have recently expanded in our daily life, such as automobile collision avoidance radar system, airport active scanner system, WiGig, and so on.**
- **There are not much enough data of the thermal sensation induced by the millimeter-wave EMF exposure.**
- **The safety parameters (level, averaged area, and so on) differ significantly among the guidelines.**



Purpose



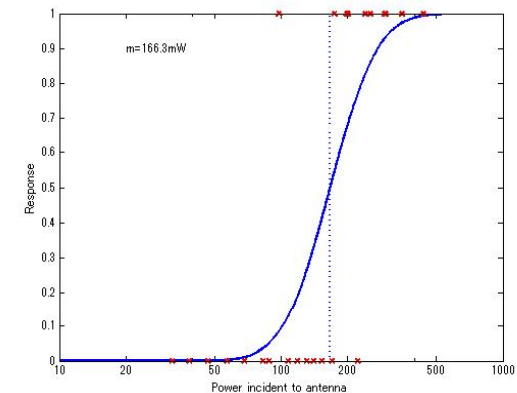
To investigate
the threshold of thermal sensation induced by millimeter waves
in Japanese people.

- ✓ Frequency
- ✓ Exposed area
- ✓ Exposed duration
- ✓ Age
- ✓ Gender



Methods

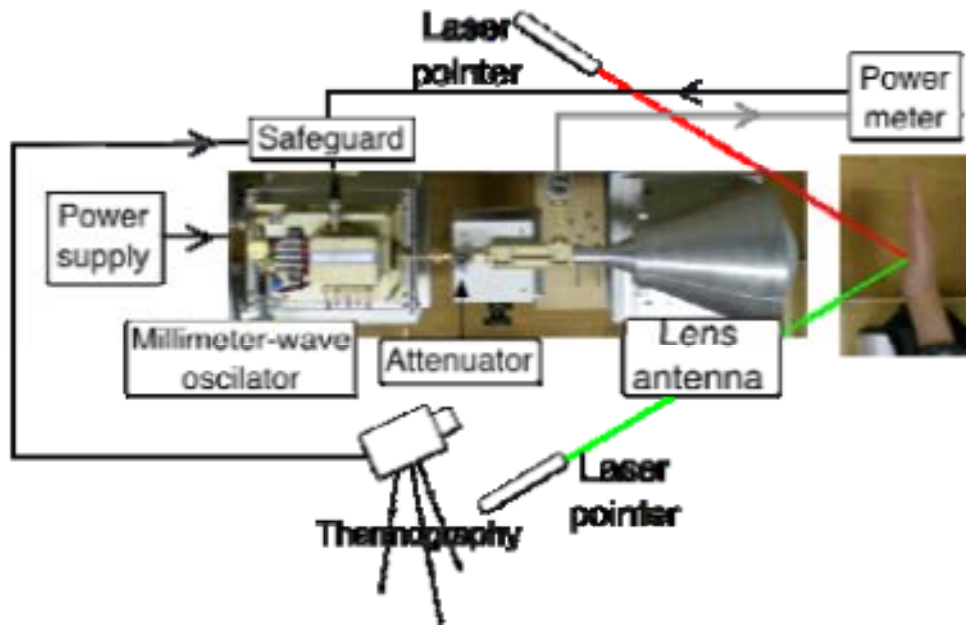
- Method of constant stimuli (MoCS)
- Stimulus (millimeter wave EMF) is exposed to the palm more than 20 times.
- He/she answers whether he/she feels or not at each trial.
- The incident power density evoking thermal sensation at 50% probability is estimate by maximum likelihood method in each subject.
It is defined as the threshold.



Example of results (MoCS)



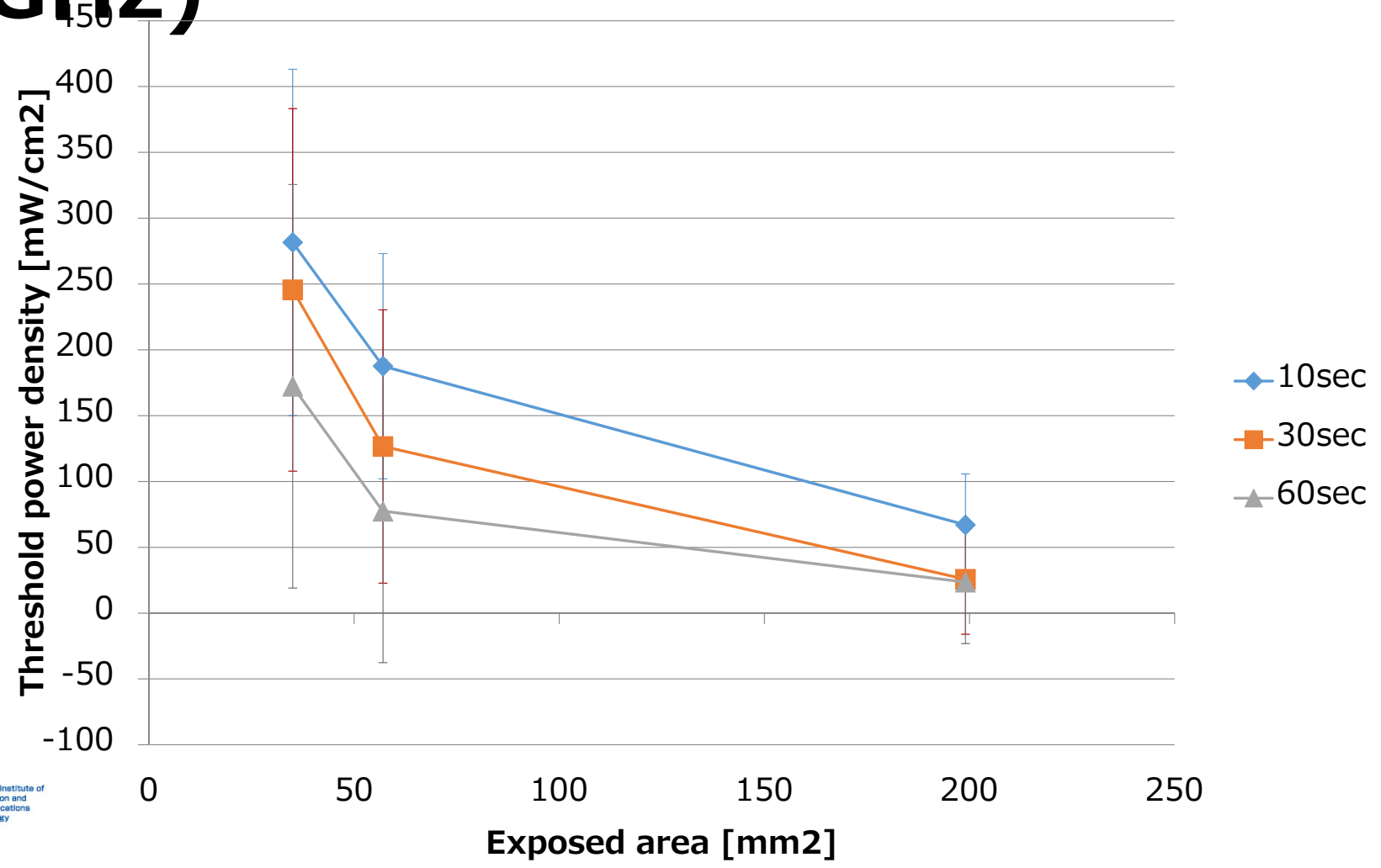
Experiment at 60 GHz



- Frequency: 60 GHz
- Exposed area: 35, 57, 199 mm²
(50 % of total radiation power flowing through)
- Exposed duration: 10, 30, 60 sec
- Method of constant stimuli

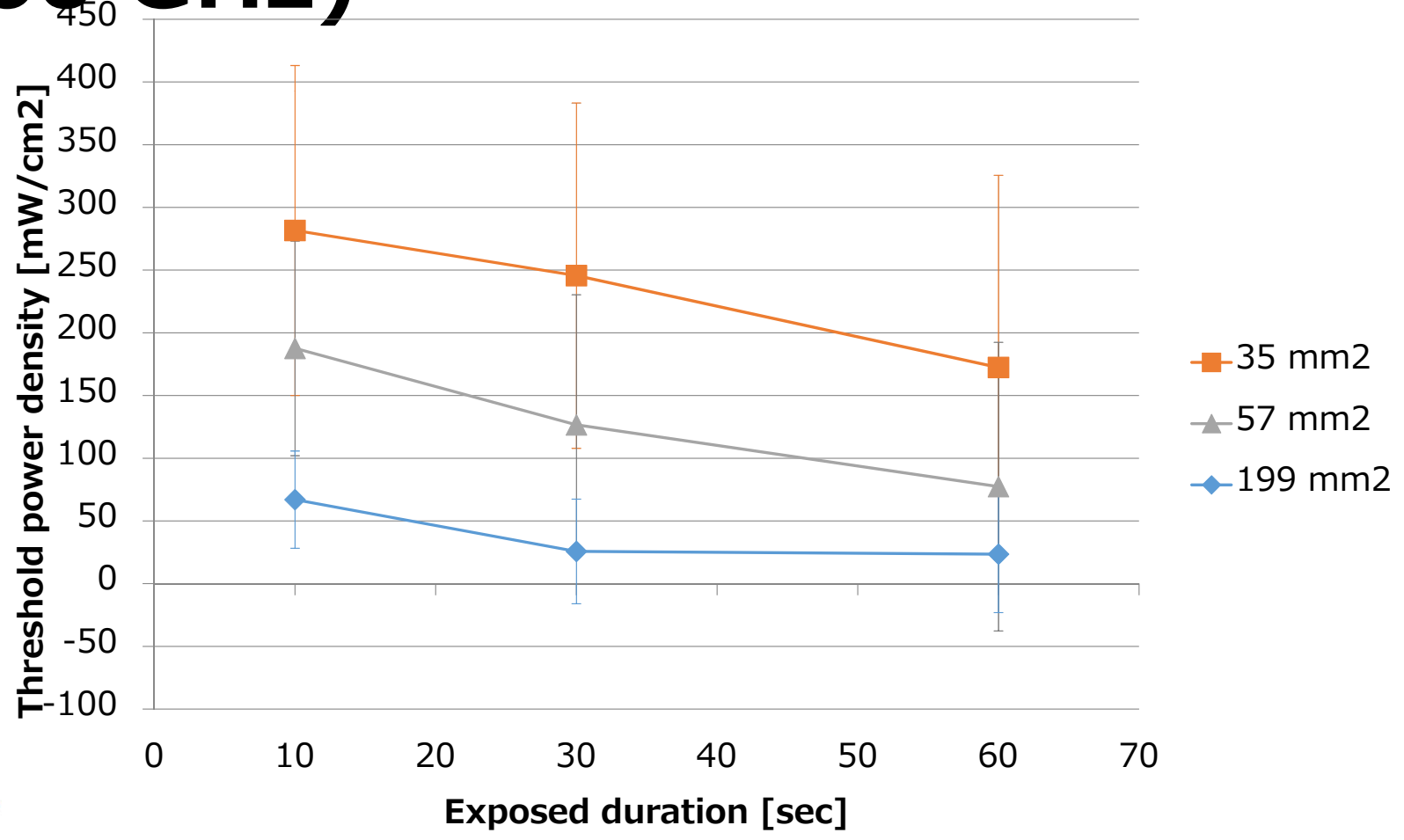


Dependence on exposed area (60 GHz)





Dependence on exposed duration (60 GHz)

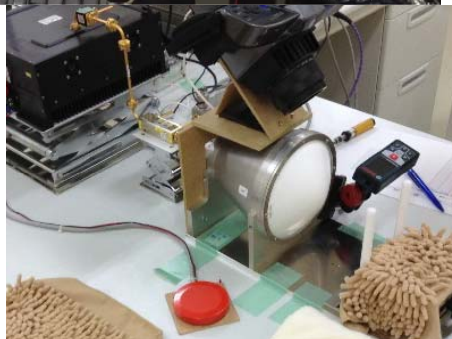




Experiment at 95 GHz

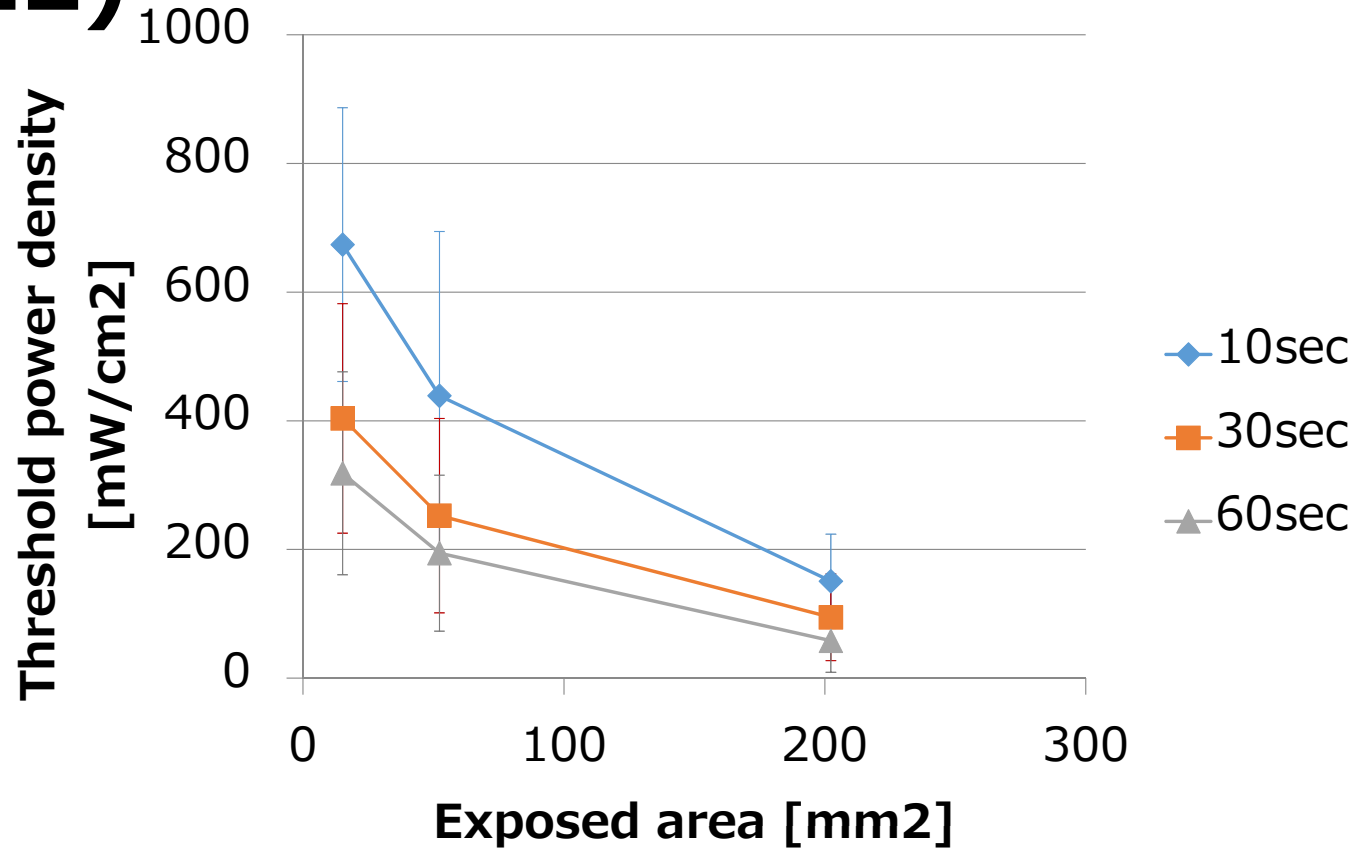


- Frequency: 95 GHz
- Exposed area: 15, 52, 202 mm²
(50 % of total radiation power flowing through)
- Exposed duration: 10, 30, 60 sec
- Method of constant stimuli



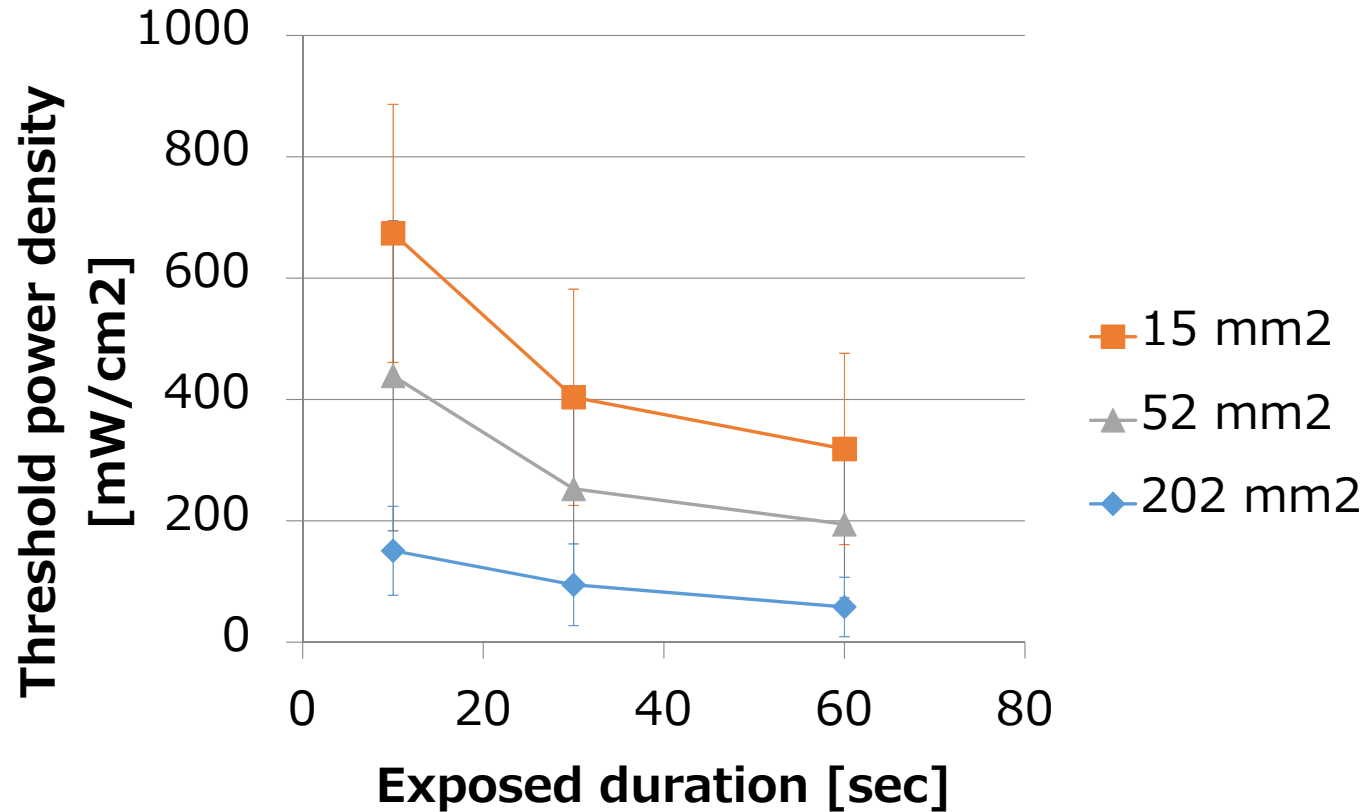


Dependence on exposed area (95 GHz)



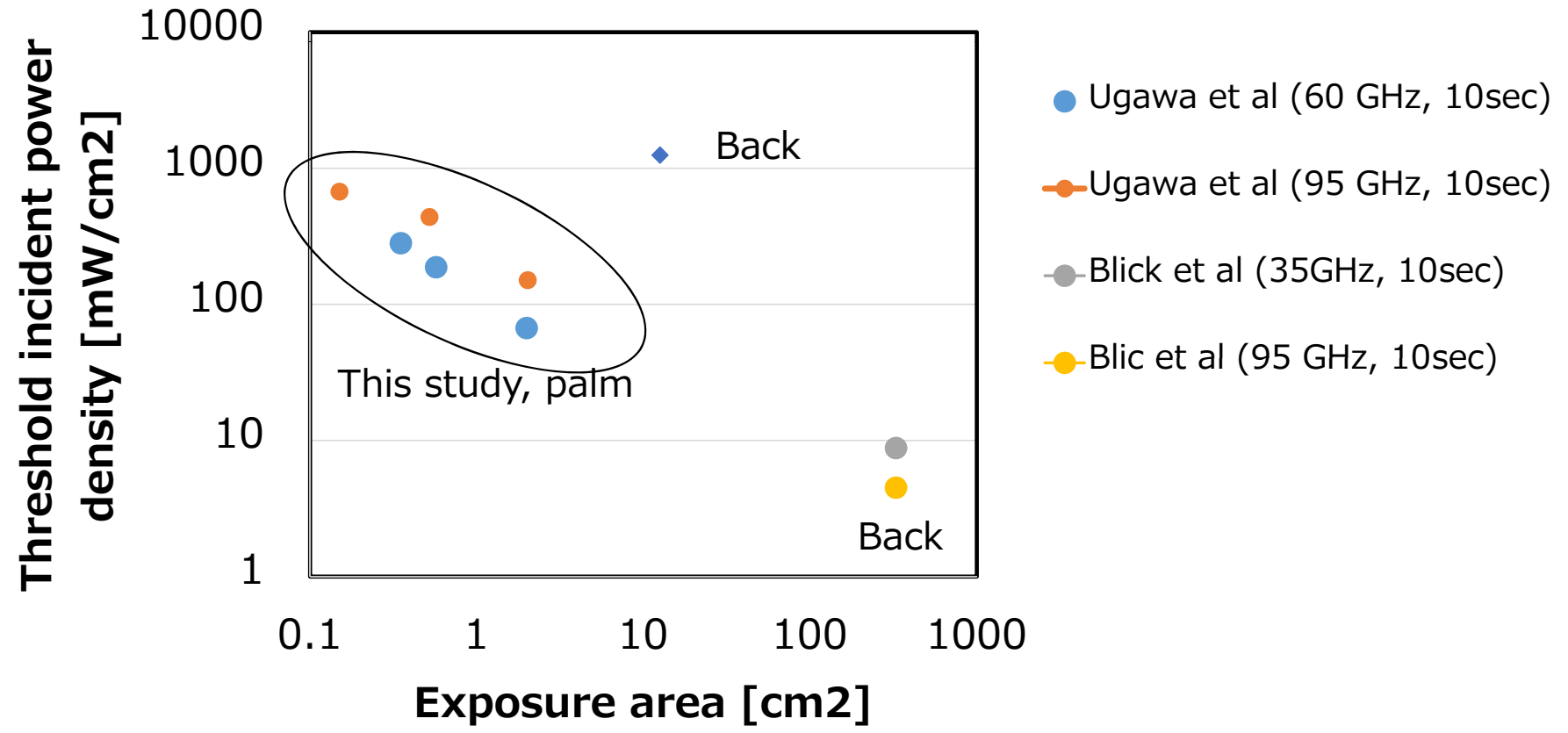


Dependence on exposed duration (95 GHz)



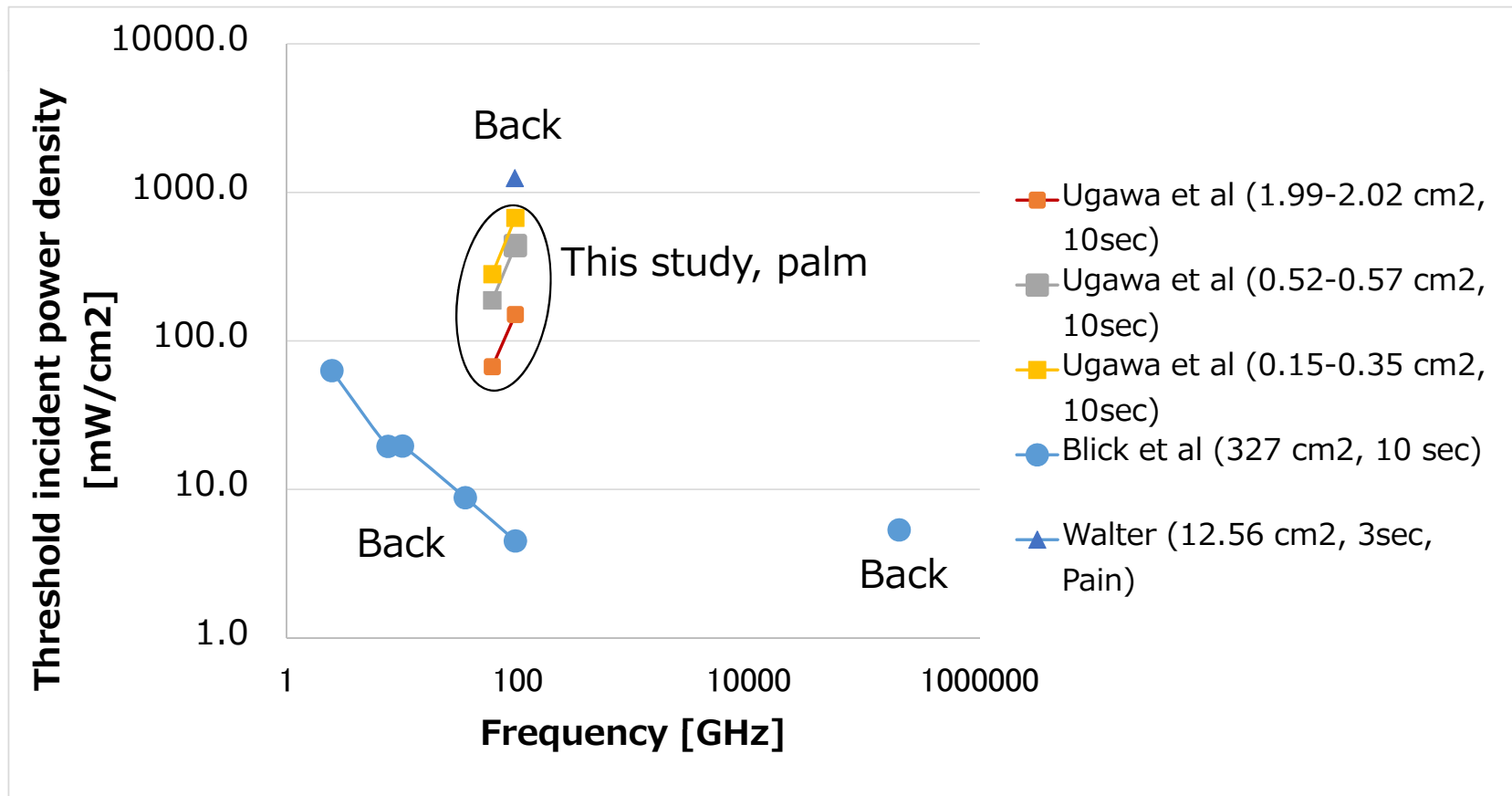


Dependence on exposed area





Dependence on frequency





Conclusions



The thermal sensation threshold induced by MM wave EMF was affected by both area and duration of MM wave exposure, in both 60 and 95 GHz exposure experiments.

The larger area and long duration of exposure made the threshold smaller, but it seems to be almost saturated by 200 mm² area, 30 seconds duration exposure practically.

We are now continue to study the age and gender influence on this threshold in Japanese people.