

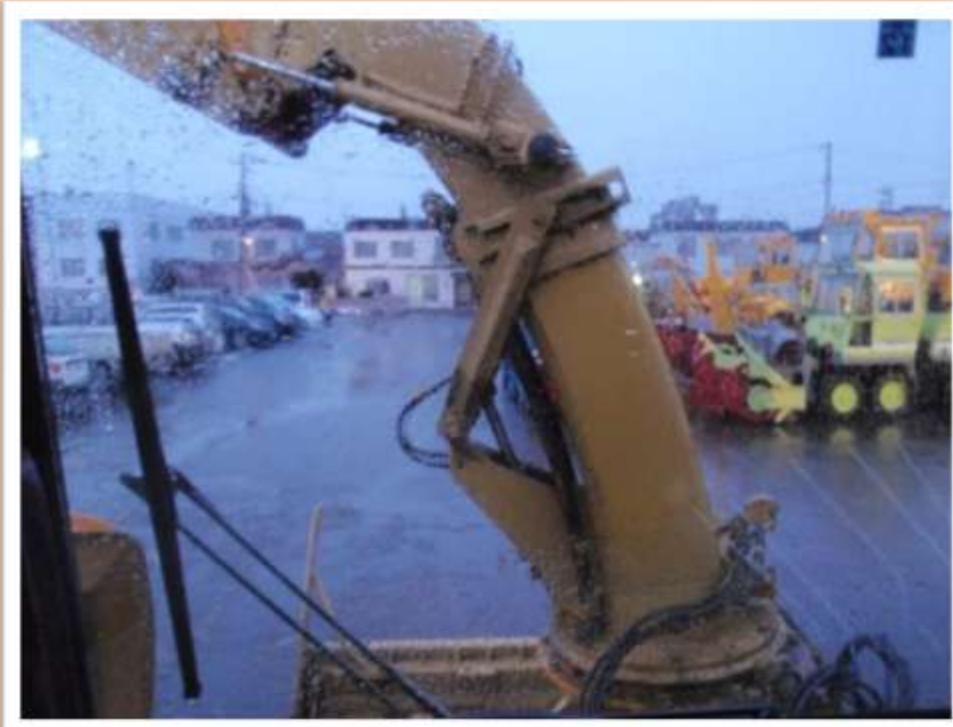
Approach Warning System for Snowplow Using Aerial-High-Power Ultrasonic Wave with Radio Wave

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Research Background

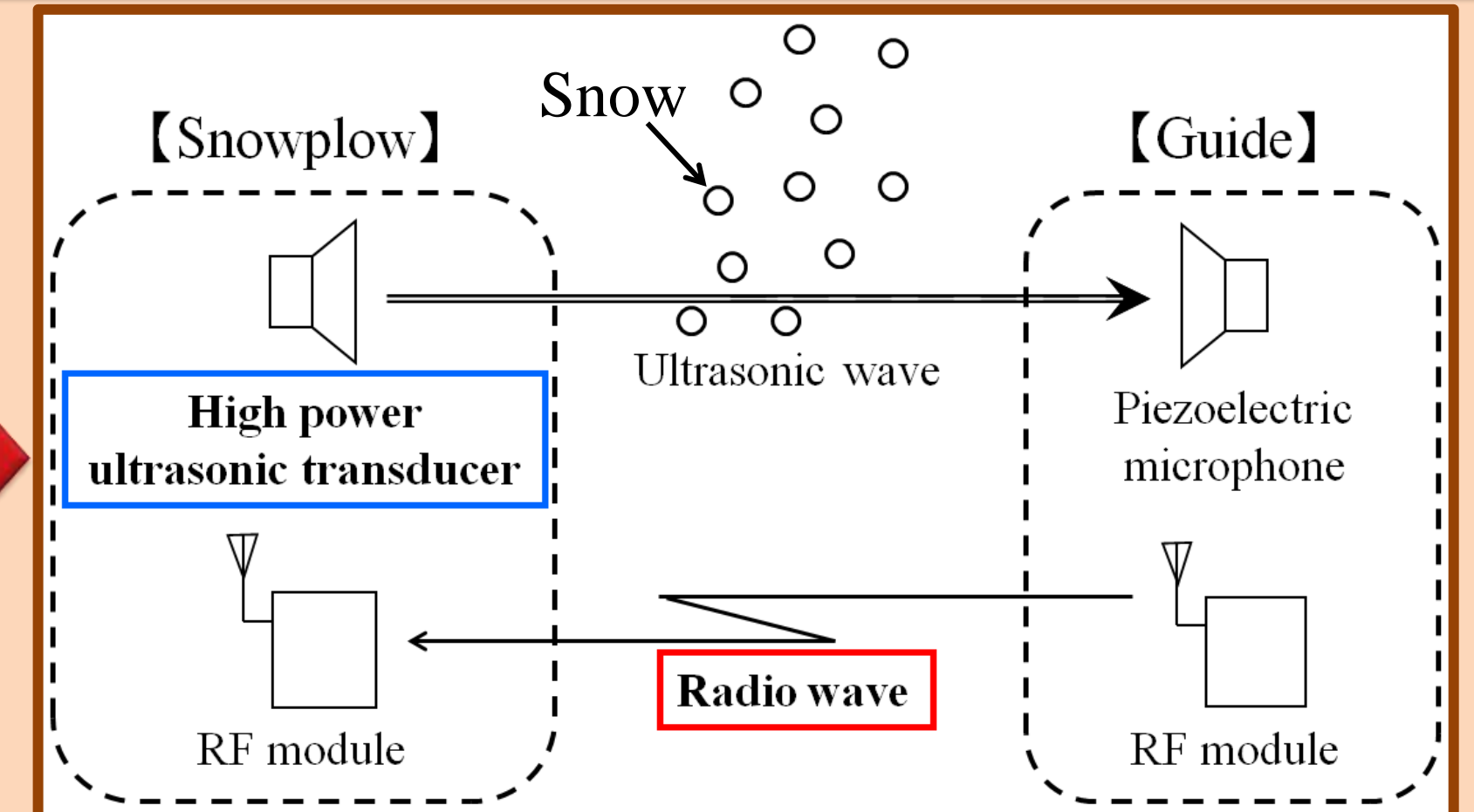


Under bad weather, a driver on a rotary snowplow working cannot see a guide keeping safety of a passer-by. Hence, injury accidents happens on guide.

Urgent to ensure safety of guide.

Objective

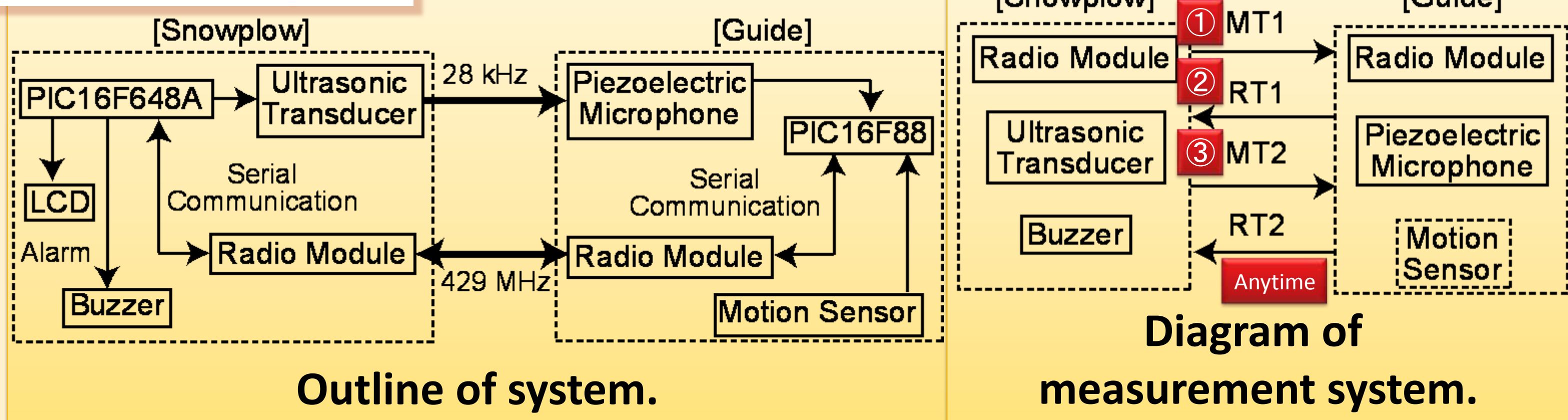
Distance measurement under worse condition. → Inspection of influence in snowfall, snow accretion, icing, and rainfall.



Developed approach warning system

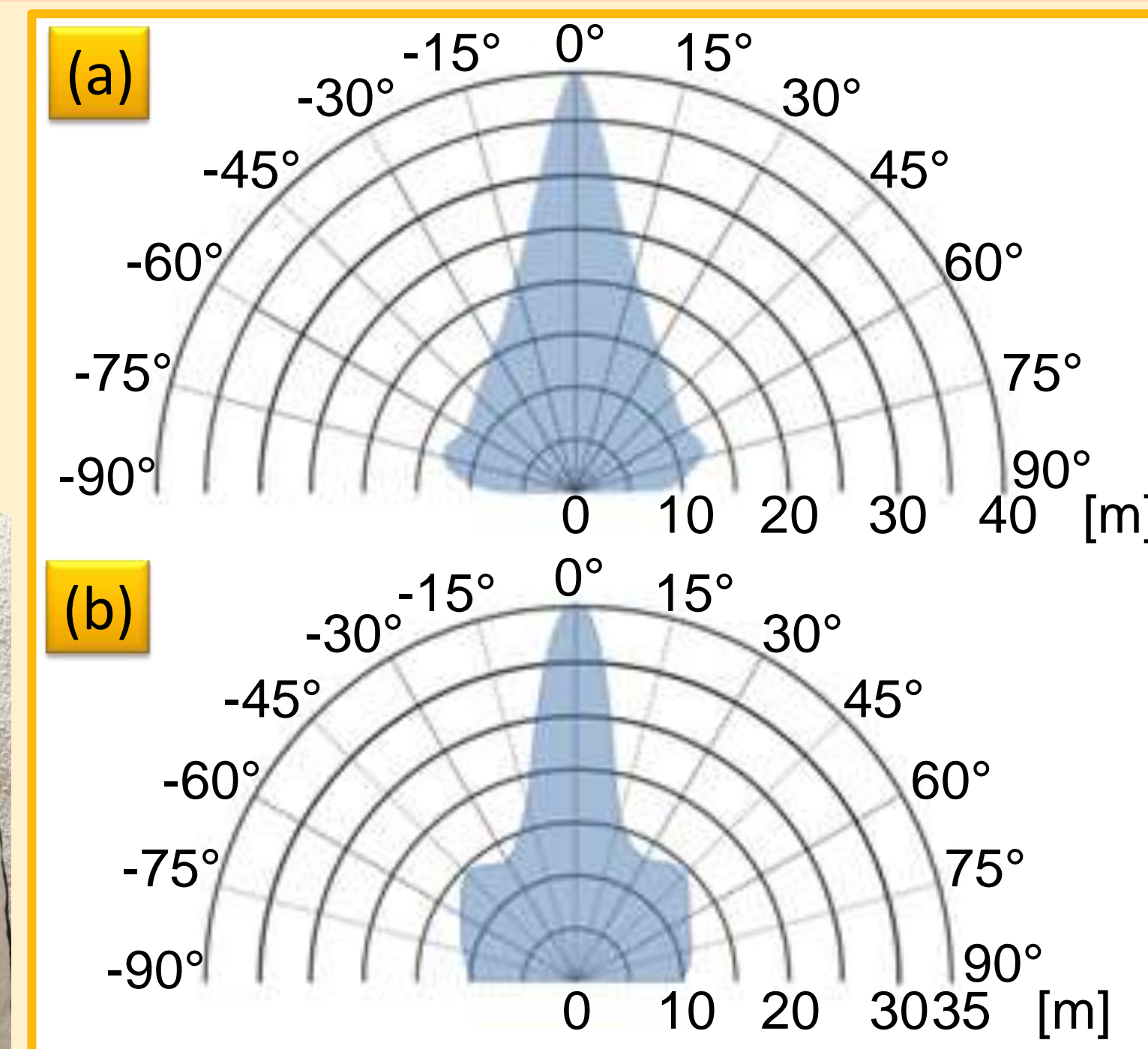
- Features: Combination of aerial-high-power ultrasonic and radio waves.
- Large transmit signal level even under worse environment.

Overview of system

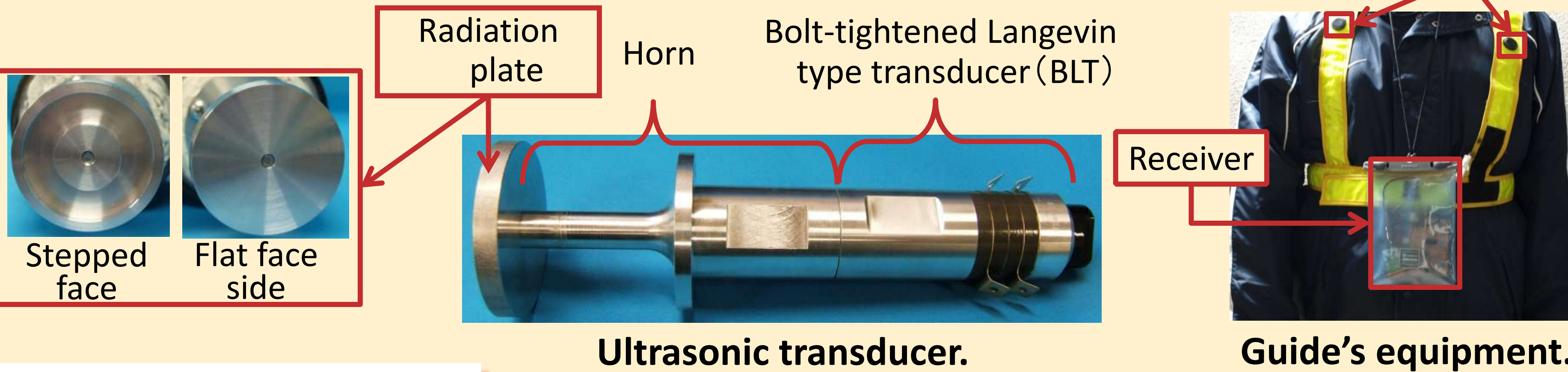


Outline of system.

Diagram of measurement system.



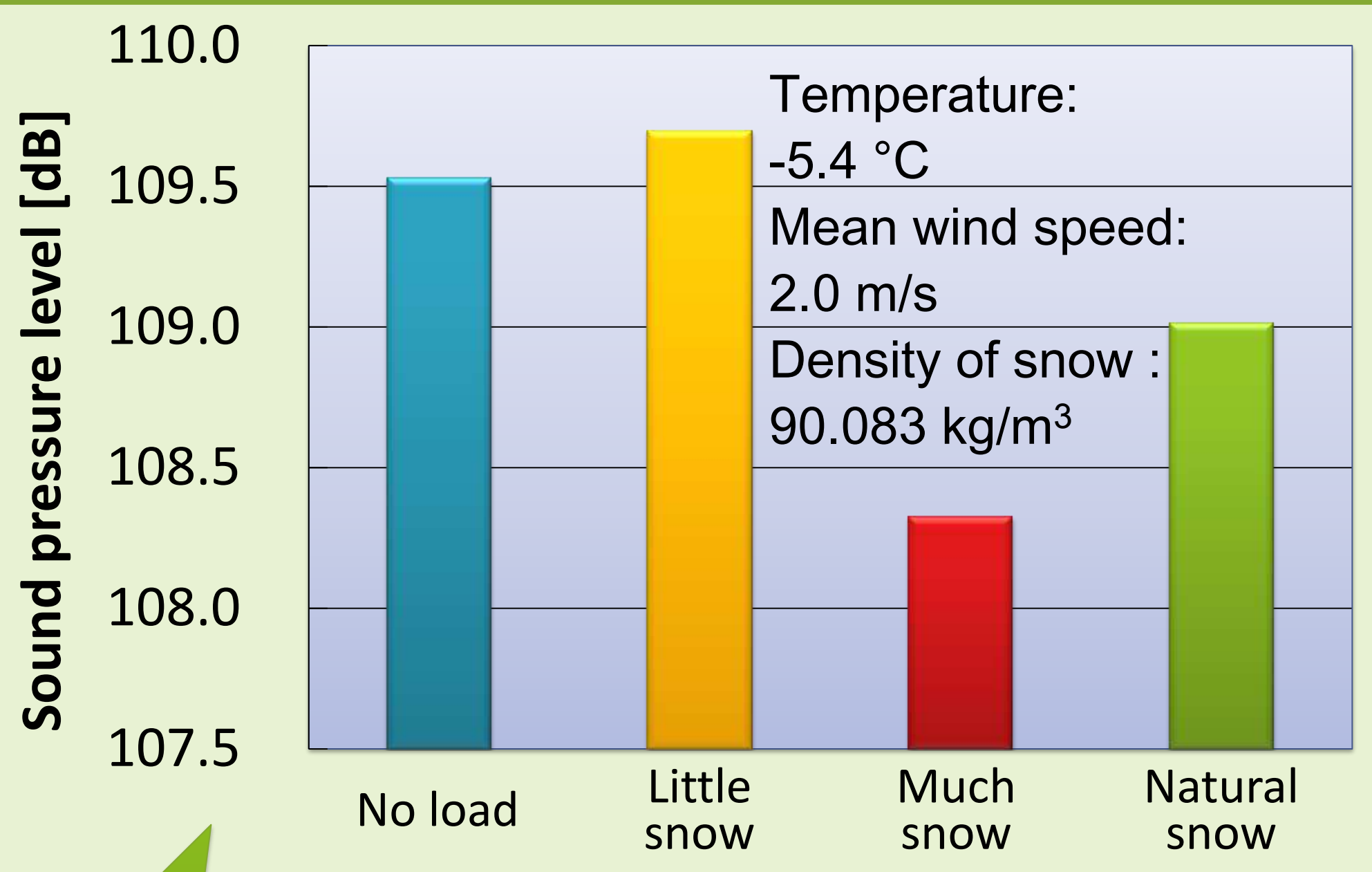
Measurable ranges of (a) stepped circular vibrating plate and (b) reverse face of one.



Ultrasonic transducer.

Guide's equipment.

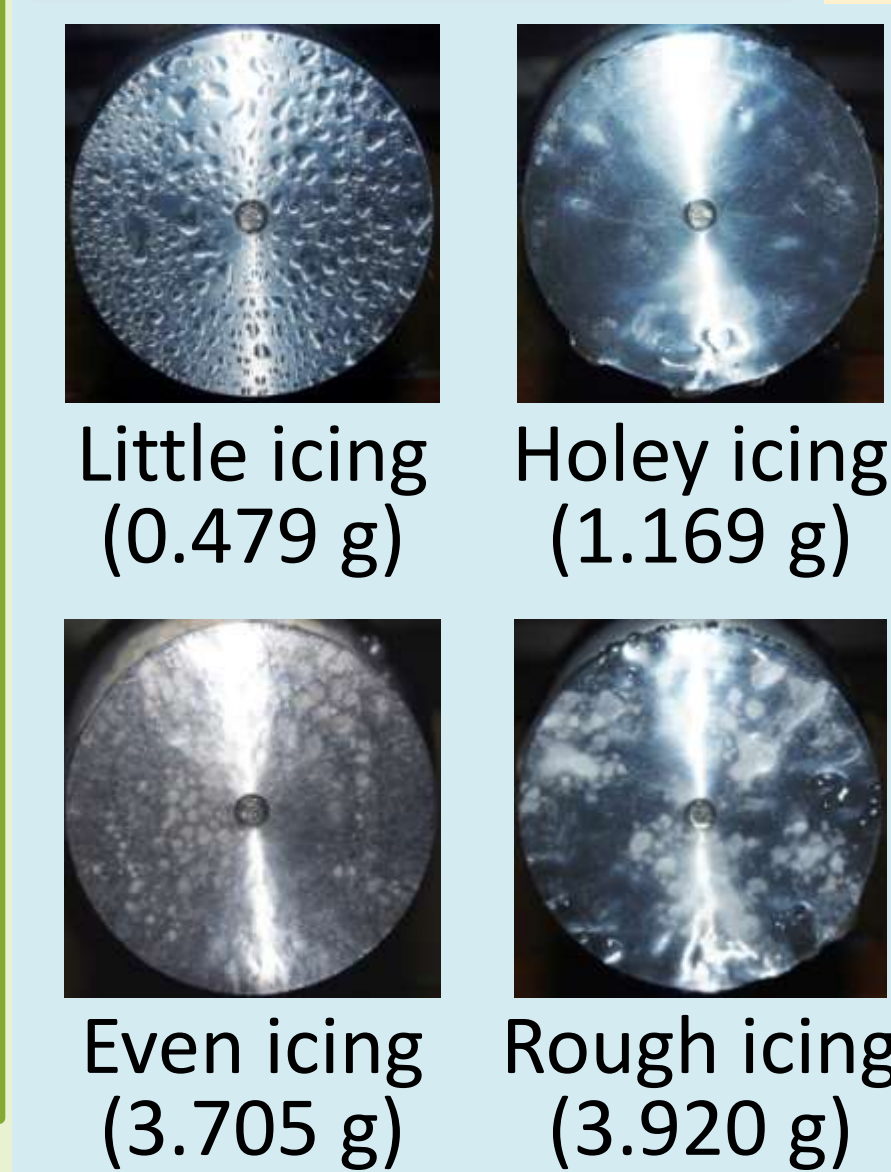
Influence of snow accretion



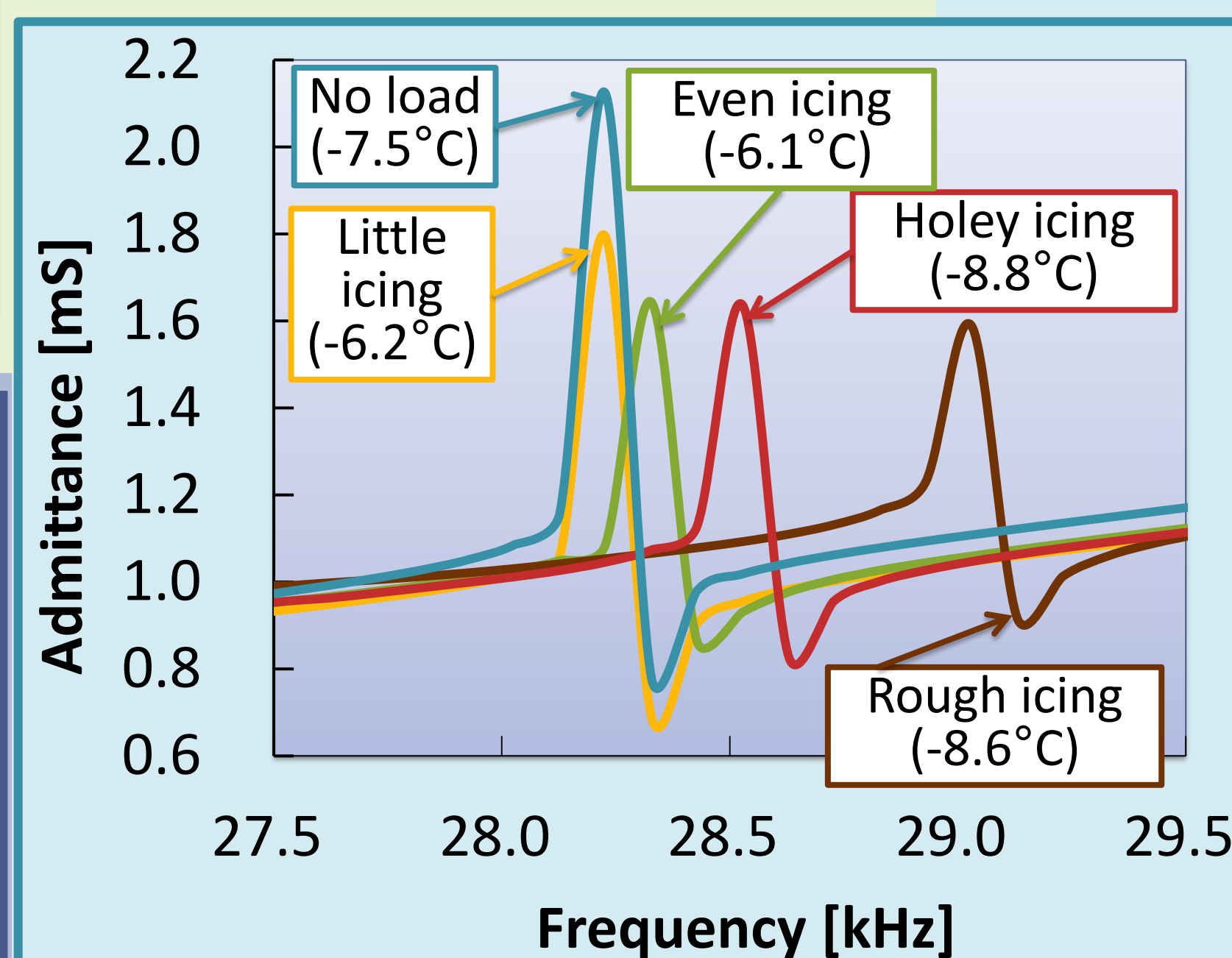
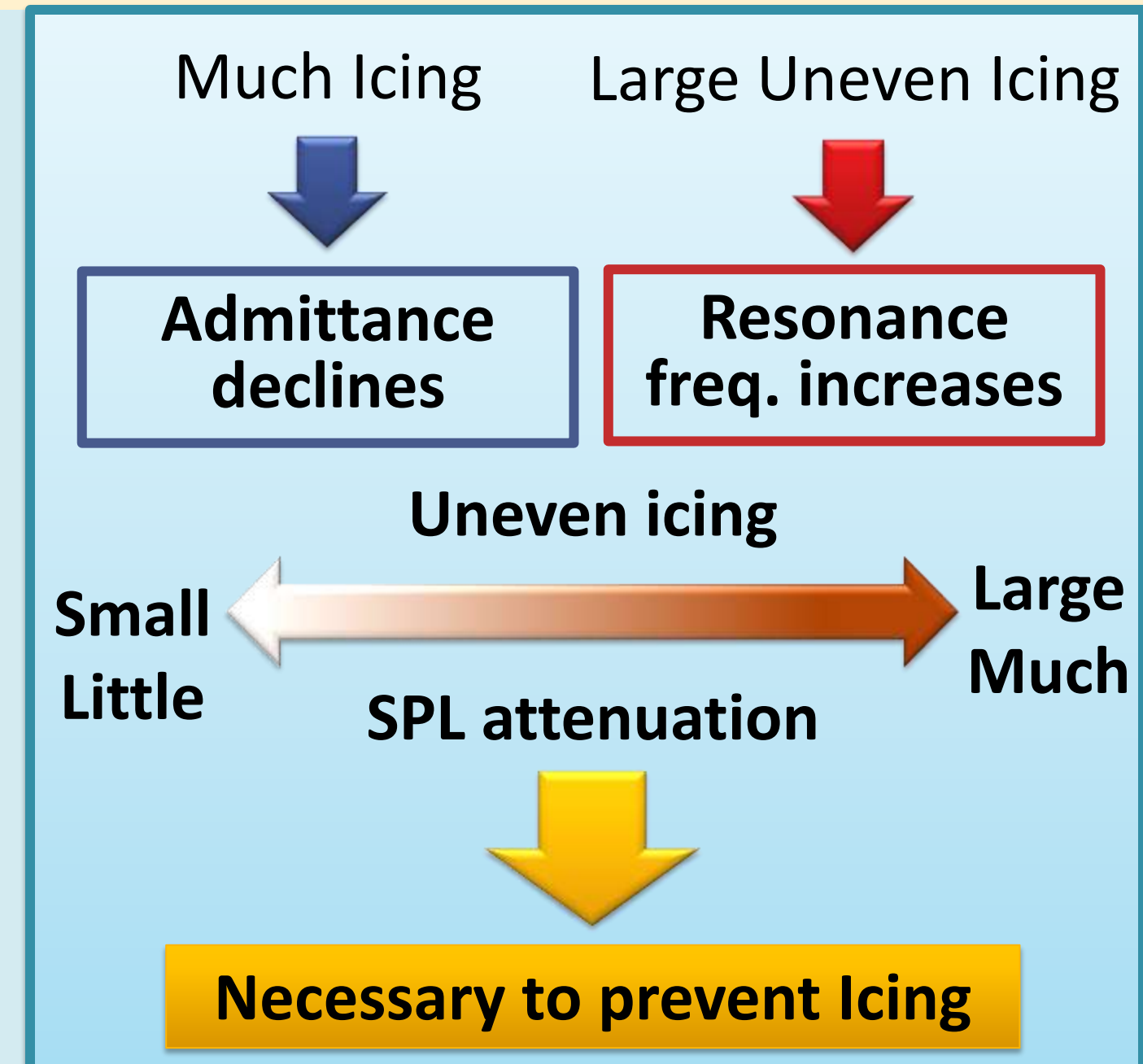
SPL under snow accretion.

- ▶ SPL declined as snow accretion increases.
- ▶ No effect of little snow accretion.

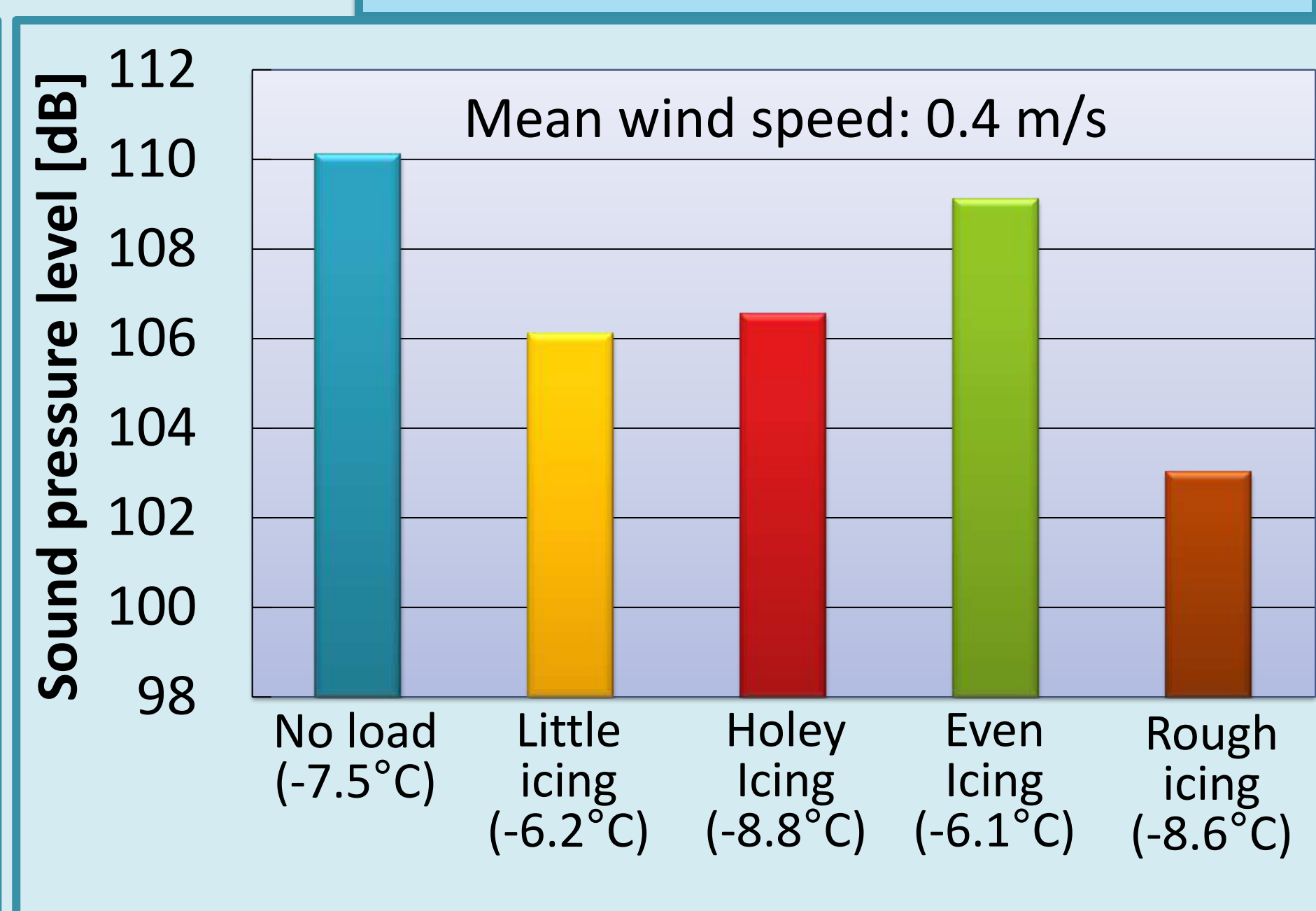
Influence of Icing



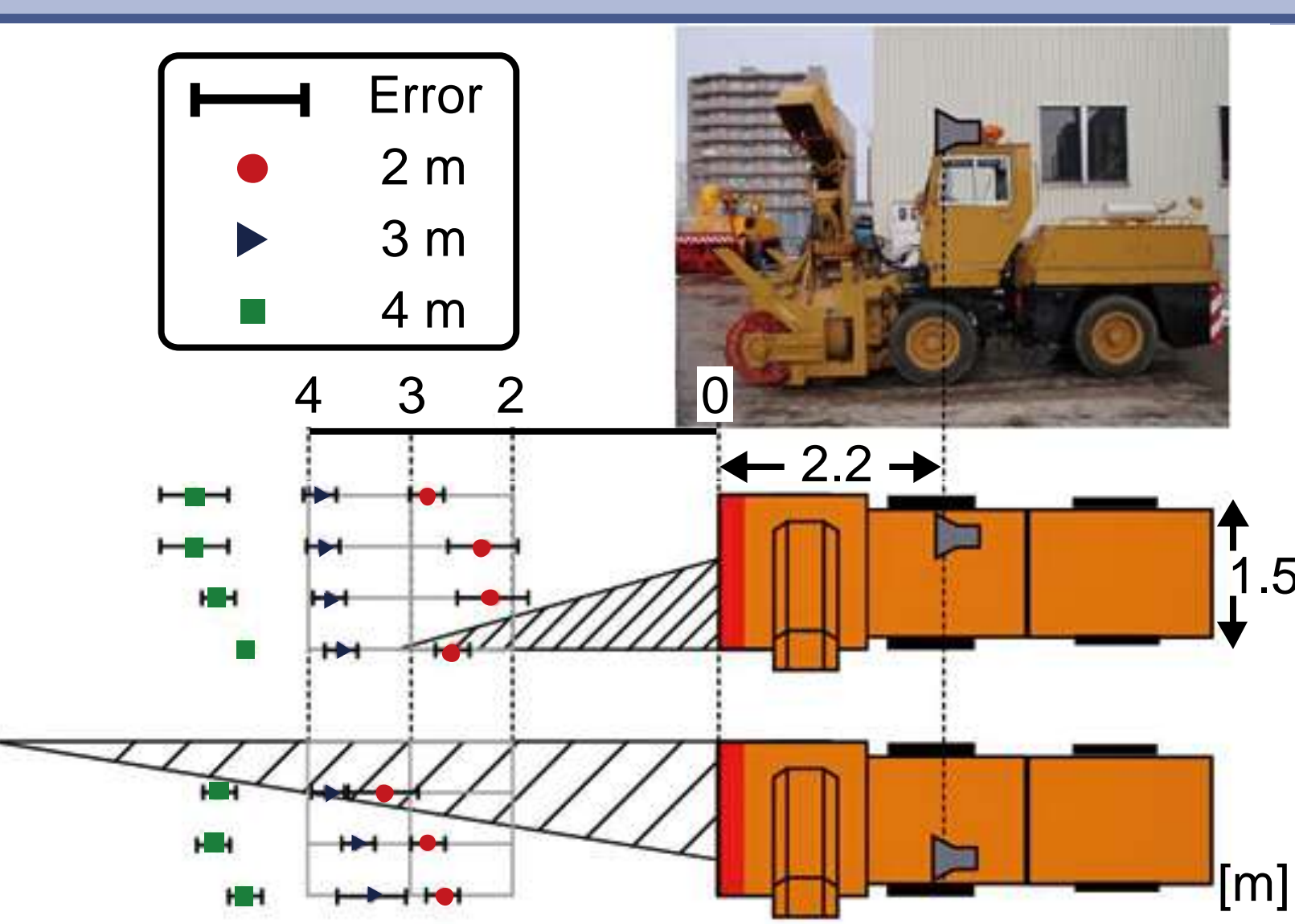
Front view



Admittance characteristics under icing.



SPL under icing.



Distance measurement results in the case of transducers set on snowplow.

Summary

Developed warning system is effective to prevent the accident on a guide. Reasons are described below:

- Key point is to utilize flat face side of stepped radiation disk! Flat face is still effective to radiate directive ultrasonic wave.
- Hard to correct water, uneven icing and much snow which make SPL lower.
- Little snow accretion and even icing, which are easy to appear on flat surface, have small influence upon transducer performance.
- Double transducers enable to measure distance all over warning area.