

Sending Location-based Keys Using Visible Light Communication

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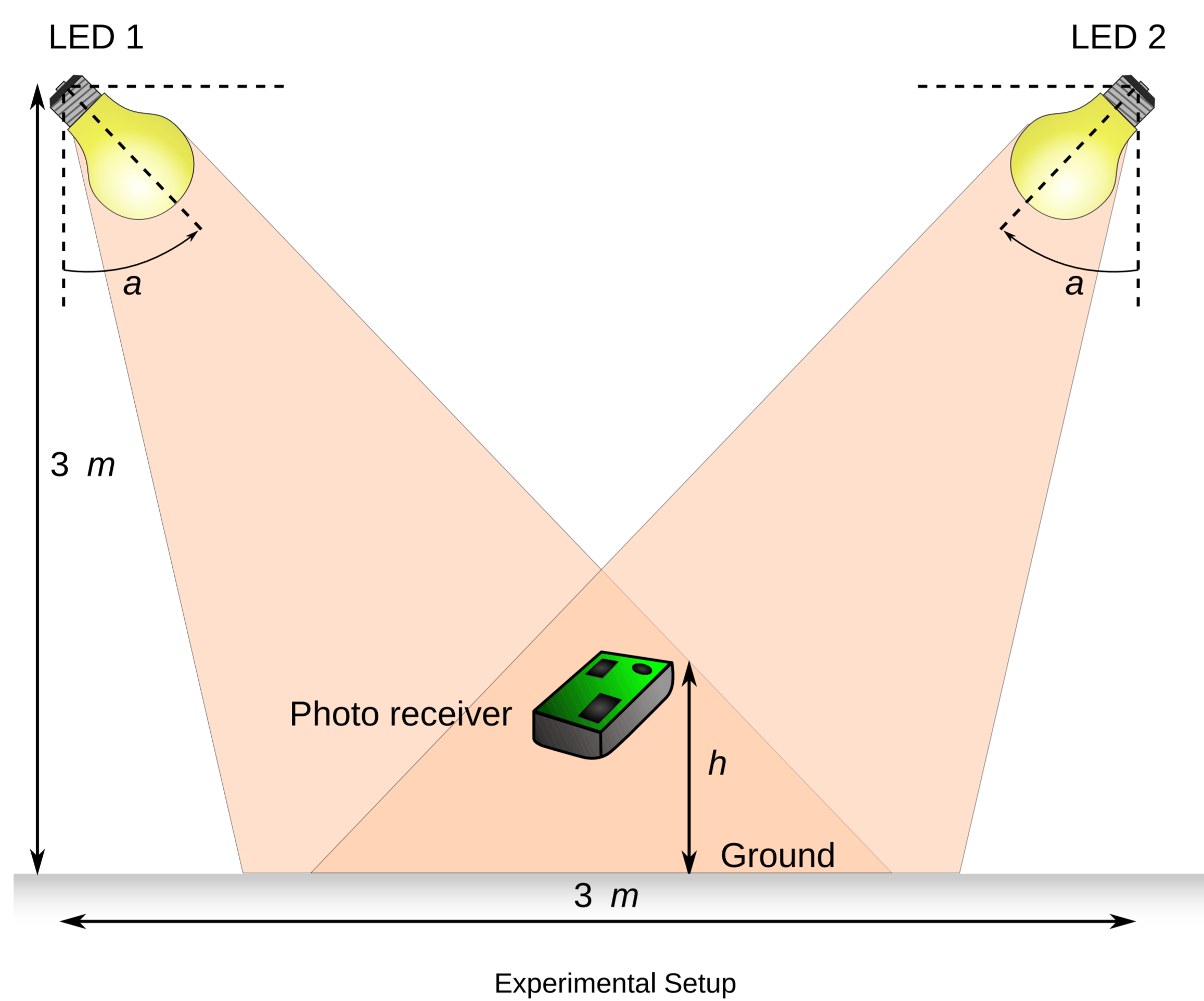
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Goal

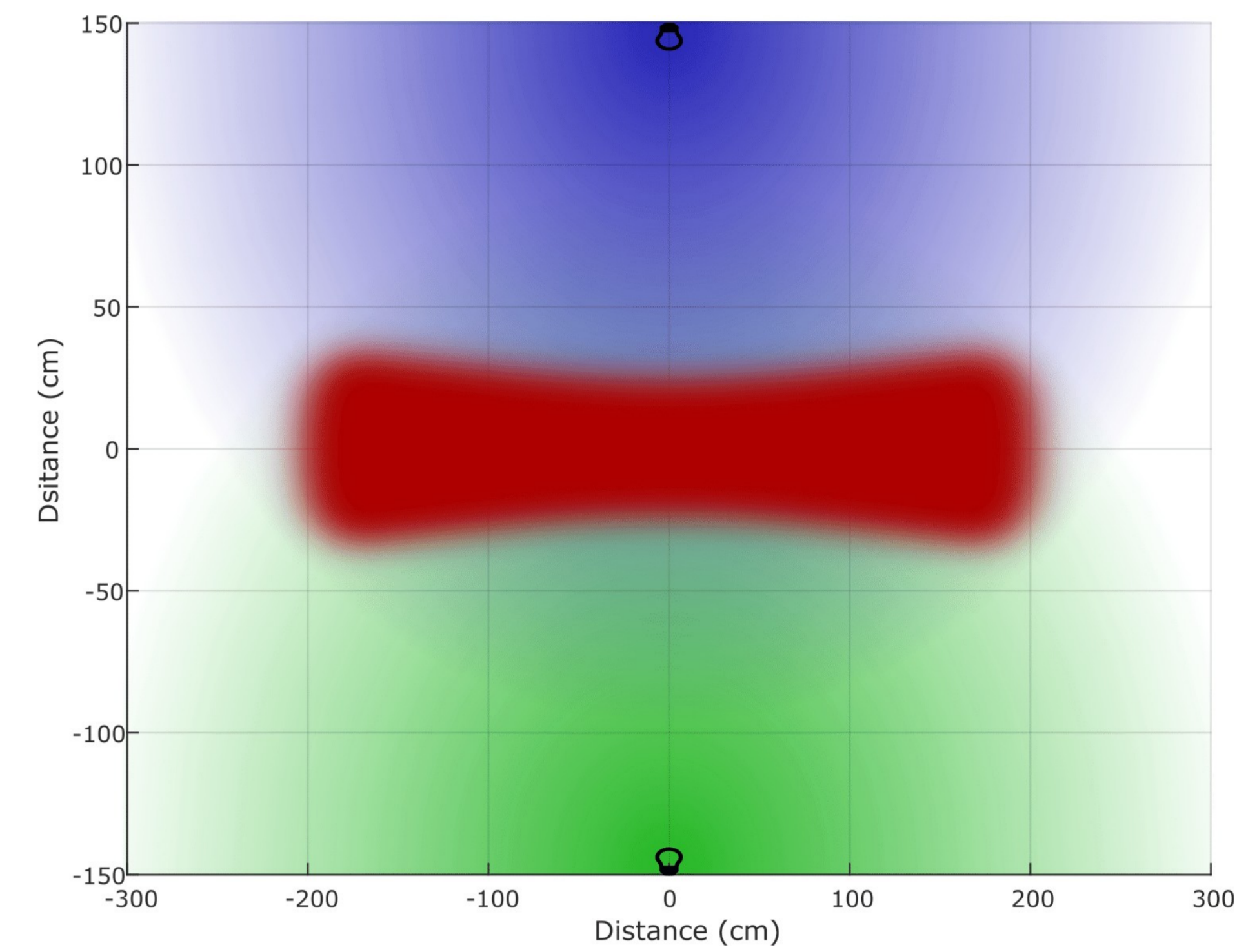
- Securely share data in a boundary defined area
- Explore the aspects that define the reception area
 - Beam angle, intensity and angle of the transmitters
 - Sensitivity of the receiver
 - Distance between the transmitters and receivers
 - Background light intensity
 - Reflections over walls/surrounding objects

Approach

- The VLC system
 - BFSK modulation
 - Frequency detection using the Goertzel algorithm
 - 38° beam angle, 320lm LED bulb
 - Two photodiodes: S1087 & OPT101
- Experimental parameters
 - Transmitter angles
 - Receiver sensitivity
 - Height of the receiver
- Shamir's Secret Sharing to split the data

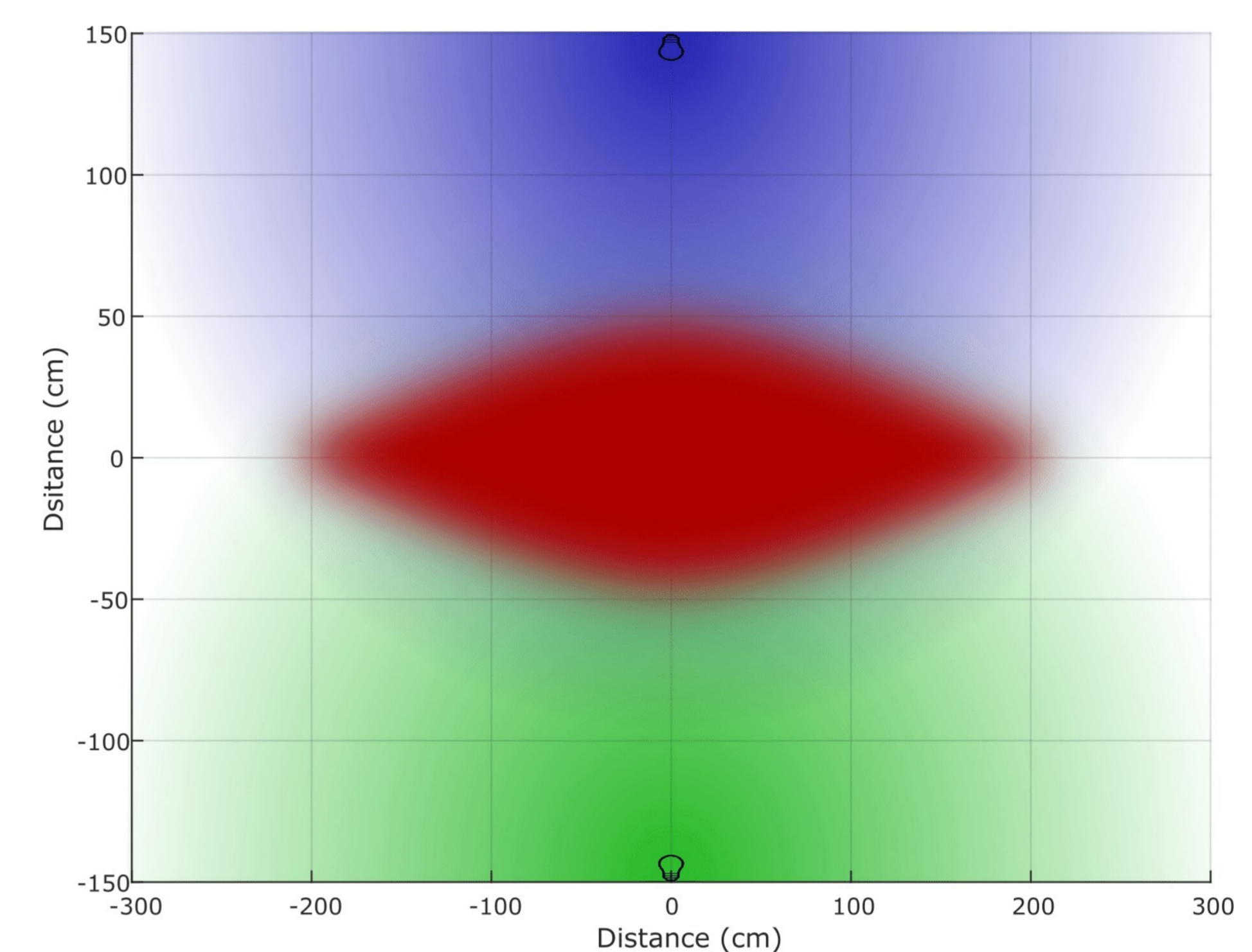


Results



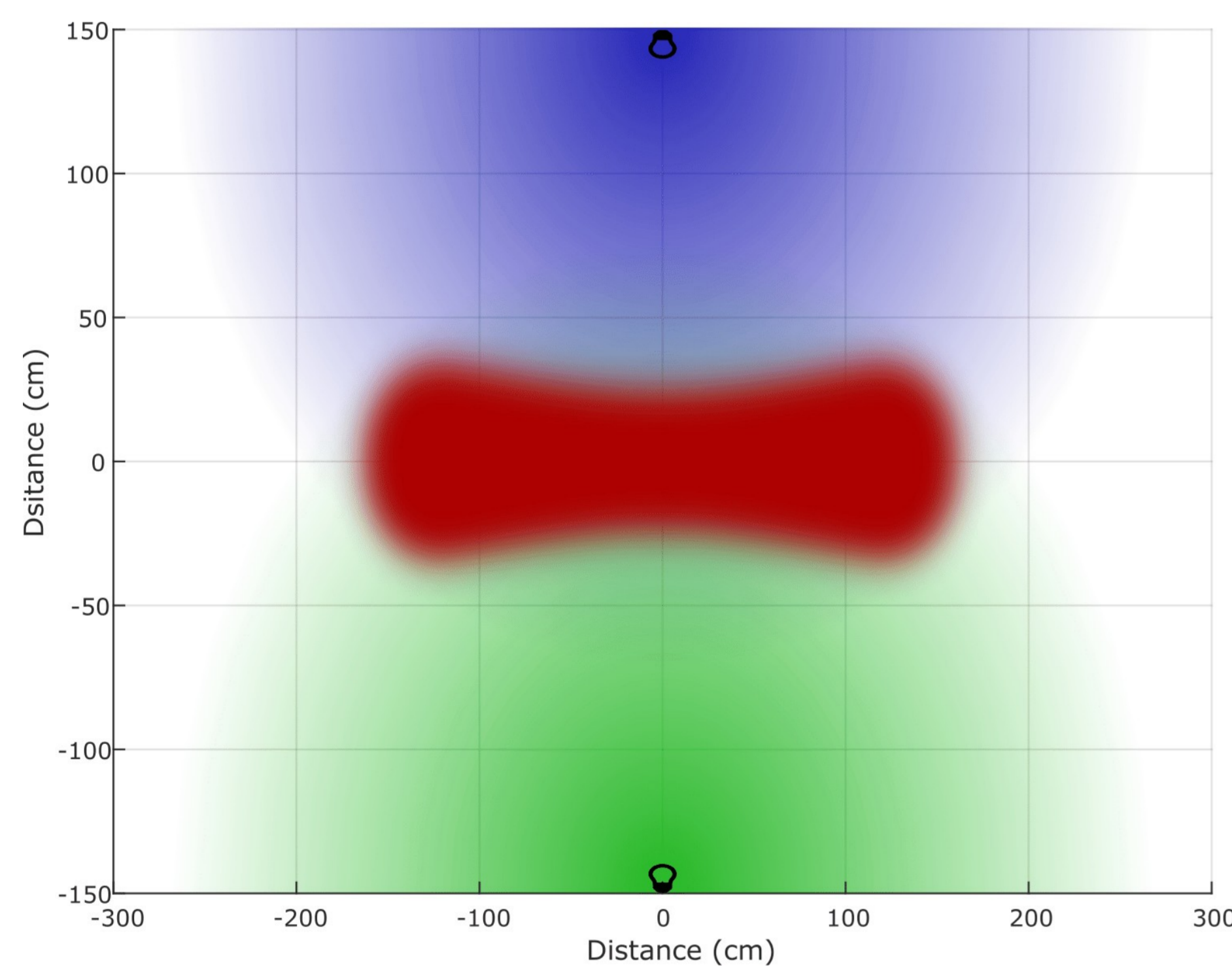
Key reception area using OPT101 with 90° at ground level

The reception area is tighter towards the center and wider towards the sides.



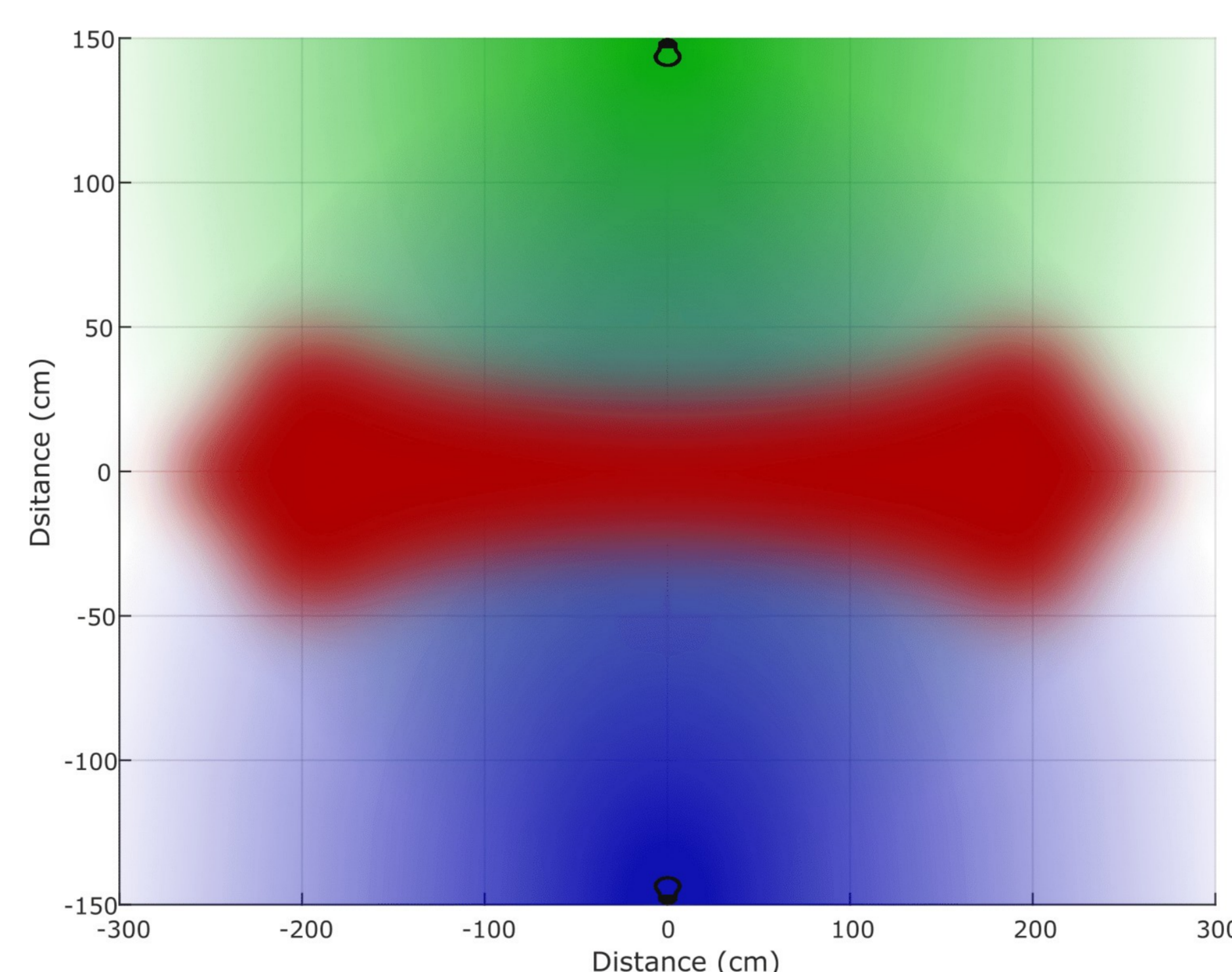
Key reception area using S1087 with 90° at ground level

When using S1087, the contours and size of the reception area are changed. This is most likely because of the difference in characteristics between the two sensors.



Key reception area using OPT101 with 90° at 1m height

Changes to the height of the receiver do not change the contours of the reception area. However their size does.



Key reception area using OPT101 with 45° at ground level

Changes to the angle of the transmitters change the contours of the reception area.

Conclusion

- The contours of the reception area are affected by transmission angle and characteristics of the receiver.
- The size of the reception area is affected by the distance between the receiver and the transmitters.



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