Enigmas, etc.

Off-Nadir Angle

■ Takashi Ohira

Continuing from the last two quizzes concerning straight line segments on an impedance plane [1], [2], we now move on to a curved-segment case. Consider an origin-centered circular arc standing at 50 Ω upon the horizon, as shown in Figure 1. We can measure this arc in the Poincaré metric and express the length in terms of the off-nadir angle ϕ. Which of the following is equal to the arc length?

(a) $ln\ \phi$
(b) $ln\ \sin\ \phi$
(c) $ln\ \cos\ \phi$
(d) $ln\ \tan\ \phi$

Note that *ln* stands for natural logarithm.

One clue is that ϕ ranges from 45° to 90° when the arc stretches upward along the quarter circle. The correct answer will be revealed next month along with a simple *LCR* circuit scheme of the impedance locus specified by this arc. The solution also demonstrates what the Poincaré length physically signifies from the wave engineer's perspective.

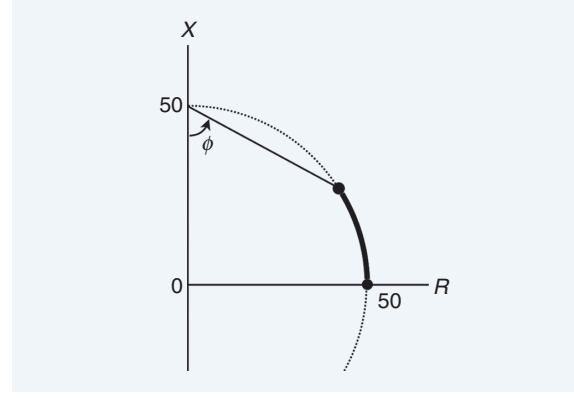

Figure 1. *How long is the circular arc in the Poincaré metric?*

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References

[1] T. Ohira, "Horizontal line segment [Enigmas, etc.]," *IEEE Microw. Mag.*, vol. 25, no. 5, p. 177, May 2024, doi: 10.1109/MMM.2024.3365063.
[2] T. Ohira, "Vertical poles [Enigmas, etc.]," *IEEE Microw. Mag.*, vol. 25, no. 7, p. 102, Jul. 2024, doi: 10.1109/MMM.2024.3387188.