

Not One of the Four Classical Measurements of the Speed of Light Measures One Way

— Vary the outbound and return speeds separately while holding the round-trip average fixed, and Rømer’s delay stays at **998.009567672** seconds, Fizeau’s round-trip time changes by **0.000×10^0** seconds and Foucault’s deflection by **0.000×10^0** rad — open the one-way ratio to **19.0000** and not one of the four responds — Bradley’s is not even a time, but the ratio **9.933539×10^{-5}** — [Paper 499]

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— *From thinking to syncing.* —

Abstract

The speed of light having been measured repeatedly since the seventeenth century, the one-way speed is taken to have been measured too. This paper shows that none of the four classical measurements changes when the outbound and return speeds are varied separately—open the one-way ratio to **19.0000** and not one responds. No new theorem or law is claimed. First, Rømer’s delay is **998.010** seconds, or 16.6335 minutes—the formula carries the orbital diameter (Section 2). Second, Bradley’s aberration is **20.4894** arcseconds, matching the known **20.49**—and it is not a time but the ratio **9.933539×10^{-5}** (Section 2). Third, Fizeau’s wheel turns at **12.0578** revolutions per second, and inverting returns c exactly (Section 2). Fourth, this is the core of the paper. Making the one-way speeds anisotropic while holding the round-trip average fixed changes none of the four—differences of **0.000×10^0** seconds and **0.000×10^0** rad (Section 3). Fifth, changing the round-trip average itself does change them—confirming that the test responds (Section 3). Sixth, the separator is whether the quantity depends on the round trip or on one leg (Section 4).

Keywords: one-way speed of light, synchronisation convention, Rømer, aberration of light, measurement of the speed of light.

Scope of this paper (scope note): No new theorem or law is claimed—that the one-way speed depends on a synchronisation convention, and that these four measurements are all round trips or ratios, are both known. No convention is chosen—whether to adopt Einstein synchronisation or another is not the subject; Paper 24 treats that judgement. History is not reconstructed—the apparatus dimensions and error budgets are not those of the original papers; idealised values inverted from the modern c are used. Modern measurements are excluded—one-way clock transport, GPS and resonator experiments are not the subject. The anisotropy is not physics—a world with different outbound and return speeds is constructed, but not asserted to exist. It is an operation for seeing what the measurements respond to. Relation to earlier papers: Paper 24 showed that the one-way speed of light cannot be measured—this paper applies that claim, in numbers, to four historical measurements. Paper 491 showed that the classical Doppler effect is two formulas—there the question was whether a medium exists, here whether a synchronisation does; both ask which quantity is being measured. Paper 481 showed that without separators a refutation has no destination—this paper writes one of them. Paper 300 showed that a shared root can be decided—the round-trip average and the one-way speed are distinct roots. What is added is placing the four measurements in one table, giving Fizeau’s rate as 12.0578 and checking it by inversion, constructing an anisotropy that preserves the round-trip average and applying it to all four, opening the one-way ratio to 19.0000, and confirming that changing the round-trip average does move them.

1. Notation and the Question

Setting: Let the outbound speed be c_1 and the return speed c_2 , holding only the round-trip average at c . That is, for a length L ,

$$\frac{2L}{c} = \frac{L}{c_1} + \frac{L}{c_2}$$

and with $c_1 = \kappa c$, the parameter κ is varied. At $\kappa = 1$ the propagation is isotropic; otherwise it is not. The question is whether the four classical measurements respond to this operation.

Observation 1.1

The speed of light has been measured repeatedly since the seventeenth century. Römer, Bradley, Fizeau, Foucault—with so many measurements, surely the one-way speed is among them, runs the picture.

Observation 1.2

But measuring one leg requires two separated clocks to be synchronised.And synchronising them requires light—which is where, as Paper 24 showed, the circle closes.

Question: Do the four measurements respond to a one-way anisotropy.

2. The Four Measured Values

Computation 2.1: From the modern *c*, obtain the quantity each measurement reports.

Measurement	Quantity	Value
Rømer (1676)	Delay across the orbital diameter	998.010 s (16.6335 min)
Bradley (1728)	Aberration	20.4894 arcsec
Fizeau (1849)	Rate at first extinction	12.0578 rev/s
Foucault (1862)	Deflection of the image	8.383380 × 10 ^{−4} rad

Observation 2.2

Rømer’s formula carries the diameter.One leg would be 499.005 seconds—what is observed is the difference in delay at the two ends of the orbit, so a diameter and not a radius.

Observation 2.3

Bradley’s value matches the known one.20.4894 against 20.49 arcseconds—an independent check.

Observation 2.4

And it is a dimensionless ratio.9.933539 × 10^{−5}—it is *v/c*, containing no seconds.

Observation 2.5

Fizeau’s rate is of the historical order.12.0578 revolutions per second—close to the roughly 12.6 he reported, and inverting it returns c exactly.

Observation 2.6

The factor in the formula is $4c = 4LNn$ —because a tooth advances into the gap in $1/(2Nn)$; taking the factor as 2 gives 24.1155 rev/s and no longer matches the history.

3. Making the Legs Anisotropic Moves None of Them

Computation 3.1: Vary κ while holding the round-trip average.

κ	Ratio of the legs	Rømer’s delay
1.00	1.0000	998.009567672 s
1.50	2.0000	998.009567672 s
1.90	2.8000	998.009567672 s
10.0	19.0000	—

Observation 3.2

Rømer’s delay does not move in any digit.Still 998.009567672 seconds—with the legs opened to a ratio of 2.8 , every printed digit is the same.

Observation 3.3

Fizeau’s round-trip time does not move either.A difference of 0.000×10^0 seconds—not even within rounding.

Observation 3.4

Nor does Foucault's deflection. A difference of 0.000×10^0 rad—the rotating mirror reads the angle when the light returns, so it sees only the round trip.

Observation 3.5

Bradley's contains no time at all. $v/c = 9.933539 \times 10^{-5}$ —written as a ratio, it has nowhere to ask about a one-way instant.

Observation 3.6

At $\kappa = 10$ the legs stand in a ratio of 19.0000. The outbound leg nineteen times the return—and the round-trip average is still 2.997925×10^8 .

Observation 3.7

But changing the round-trip average does move them. At $0.9c$, a difference of 6.399×10^{-6} seconds—confirming the test responds, and that the four are not insensitive to everything.

4. The Separator

The separator: does the measured quantity depend on the round trip, or on one leg.

Observation 4.1

On the round trip, and it does not respond to anisotropy. $L/c_1 + L/c_2$ —only the sum is fixed; the split is not.

Observation 4.2

On one leg, and it should respond. L/c_1 —and none of the four has this form.

Observation 4.3

The two are distinct roots by the criterion of Paper 300. Both are called “the speed of light”—one a measurable round-trip average, the other a quantity depending on a synchronisation convention.

Observation 4.4

All four are round trips or ratios. Rømer an orbital diameter, Fizeau and Foucault round trips, Bradley a dimensionless ratio—different apparatus and different principles, but the same type of quantity.

Observation 4.5

So this confirms Paper 24’s claim on four worked cases. There, the circularity of synchronisation was argued—here, what the measurements that avoid that circle actually measure is shown in numbers.

Observation 4.6

This is one of the separators of Paper 481. When “the speed of light has been measured enough already” is questioned—writing down what was measured shows it to be a round-trip average and not one leg.

Observation 4.7

To be honest—it is not proved that one leg cannot be measured. What is shown is that these four do not respond—whether some other measurement could respond lies outside this paper, and four cases returning zero is no proof that there is no fifth.

5. Roll Call and Closing

1. Rømer’s delay 998.010 s (Computation 2.1): a diameter.
2. Bradley 20.4894 arcsec (Observation 2.3): matching the known value.
3. It is the ratio 9.933539×10^{-5} (Observation 2.4): containing no seconds.
4. Fizeau 12.0578 rev/s (Observation 2.5): the historical order.

5. The factor is **4** (Observation 2.6): **2 does not match the history.**
6. Rømer unmoved under anisotropy (Observation 3.2): **the core.**
7. Fizeau and Foucault differ by **0** (Observations 3.3 and 3.4): **not even rounding.**
8. A ratio of **19.0000** at $\kappa = 10$ (Observation 3.6): **the average unchanged.**
9. Changing the average does move them (Observation 3.7): **the test responds.**
10. Impossibility is not proved (Observation 4.7): **four cases at zero.**

Closing: The speed of light has been measured repeatedly since the seventeenth century—Rømer, Bradley, Fizeau, Foucault; with so many measurements, surely the one-way speed is among them. But measuring one leg requires two separated clocks to be synchronised, and synchronising them requires light, which is where, as Paper 24 showed, the circle closes. The four measured values—Rømer’s delay is **998.010** seconds or 16.6335 minutes, and since what is observed is the difference in delay at the two ends of the orbit it is a diameter, one leg being 499.005 seconds. Bradley’s aberration is **20.4894** arcseconds, matching the known 20.49, and it is a dimensionless ratio 9.933539×10^{-5} , namely v/c , containing no seconds. Fizeau’s rate is **12.0578** revolutions per second, close to the roughly 12.6 he reported, and inverting returns c exactly. The factor in the formula is **4**, since a tooth advances into the gap in $1/(2Nn)$; taking it as 2 gives 24.1155 rev/s and no longer matches the history. Making the legs anisotropic moves none of them—holding the round-trip average and opening the legs to a ratio of 2.8000 leaves Rømer’s delay at **998.009567672** seconds, every printed digit the same. Fizeau’s round-trip time differs by 0.000×10^0 seconds and Foucault’s deflection by 0.000×10^0 rad, not even within rounding, since the rotating mirror reads the angle when the light returns and so sees only the round trip. Bradley’s contains no time at all: written as a ratio, it has nowhere to ask about a one-way instant. At $\kappa = 10$ the legs stand in a ratio of **19.0000**, the outbound nineteen times the return, and the round-trip average is still 2.997925×10^8 . But changing the round-trip average to $0.9c$ gives a difference of 6.399×10^{-6} seconds, so the four are not insensitive to everything. One thing separates them—does the measured quantity depend on the round trip, or on one leg. On the round trip, and it does not respond: $L/c_1 + L/c_2$ fixes only the sum, not the split. On one leg, and it should respond—and none of the four has the form L/c_1 . The two are distinct roots by the criterion of Paper 300: both are called “the speed of light”, but one is a measurable round-trip average and the other depends on a synchronisation convention. All four are round trips or ratios—Rømer an orbital diameter, Fizeau and Foucault round trips, Bradley a dimensionless ratio—different apparatus and different principles, but the same type of quantity. So this confirms Paper 24’s claim on four worked cases: there the circularity of synchronisation was argued, here what the measurements that avoid it actually measure is shown in numbers. This is one of the separators of Paper 481: when “the speed of light has been measured enough already” is questioned, writing down what was measured shows it to be a round-trip average and not one leg. To be honest—it is not proved that one leg cannot be measured. What is shown is that these four do not respond; whether some other measurement could lie outside this paper, and four cases returning zero is no proof that there is no fifth.

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