Relativity Challenge

Paper Review and Discussion

Revisiting the Michelson-Morley Experiment to Reveal an Earth Orbital Velocity of 30 km/s

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Revisiting the Michelson-Morley Experiment to Reveal an Earth Orbital Velocity of 30 km/s

AGENDA

Conceptual Foundation

Describe the conceptual foundation of the Michelson-Morley experiment

Analytical Model

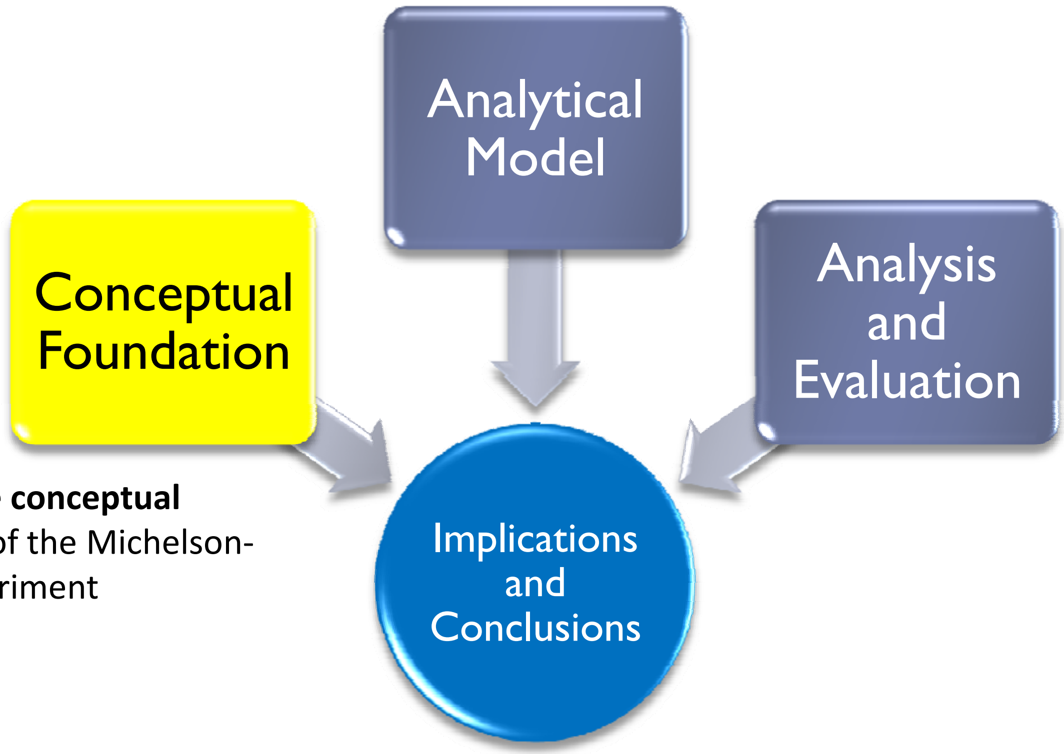
Show how the revised equations compare to the original equations to highlight how they are distinguished from one another

Analysis and Evaluation

Present the data and results that **illustrate that the revised equations and analytical model produces less error** to the expected result

Implications and Conclusions

AGENDA



Describe the conceptual foundation of the Michelson-Morley experiment

Lorentz's Conceptual Foundation

"As Maxwell first remarked and as follows from a very simple calculation, the time required by a ray of light to travel from a point A to a point B and back to A must vary when the two points together undergo a displacement without carrying the ether with them."

\- H.A. Lorentz, 1895

This is an **Incomplete** Coordinate System

Lorentz's Conceptual Foundation

"As Maxwell first remarked and as follows from a very simple calculation, the time required by a ray of light to travel from a point A to a point B and back to A [does not] vary when the two points together undergo a displacement [while] carrying the ether with them."

- H.A. Lorentz, 1895 (adapted 2008)

This is a **Complete** Coordinate System

Lorentz's Conceptual Foundation

"As Maxwell first remarked and as follows from a very simple calculation, the time required by a ray of light to travel from a point A to a point B and back to A must vary when the two points together undergo a displacement without carrying the ether with them."

\- H.A. Lorentz, 1895

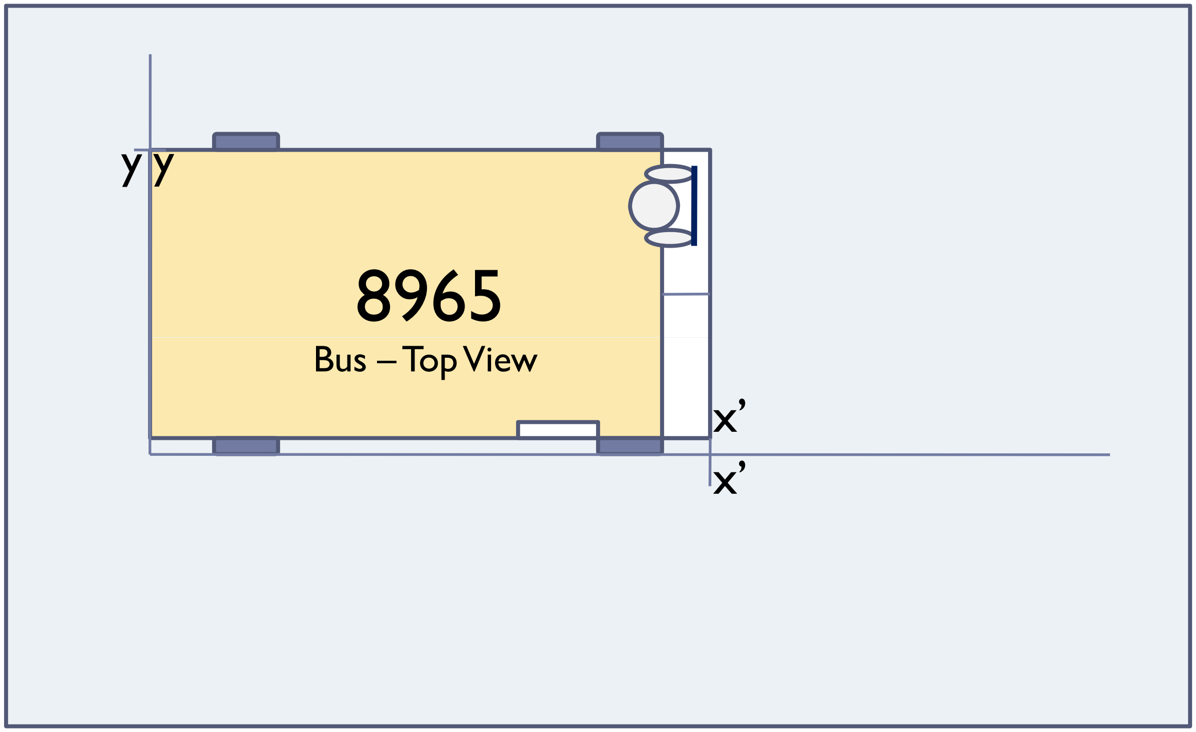
Lorentz's Conceptual Foundation

"As Maxwell first remarked and as follows from a very simple calculation, the time required by a [person] to travel from a point A to a point B and back to A must vary when the two points together undergo a displacement without carrying the [ground] with them."

- H. A. Lorentz, 1895 (adapted 2008)

Oscillation in an Incomplete Coordinate System

We begin with an Incomplete Coordinate System and place two "objects" at the rear right corner of the "bus".



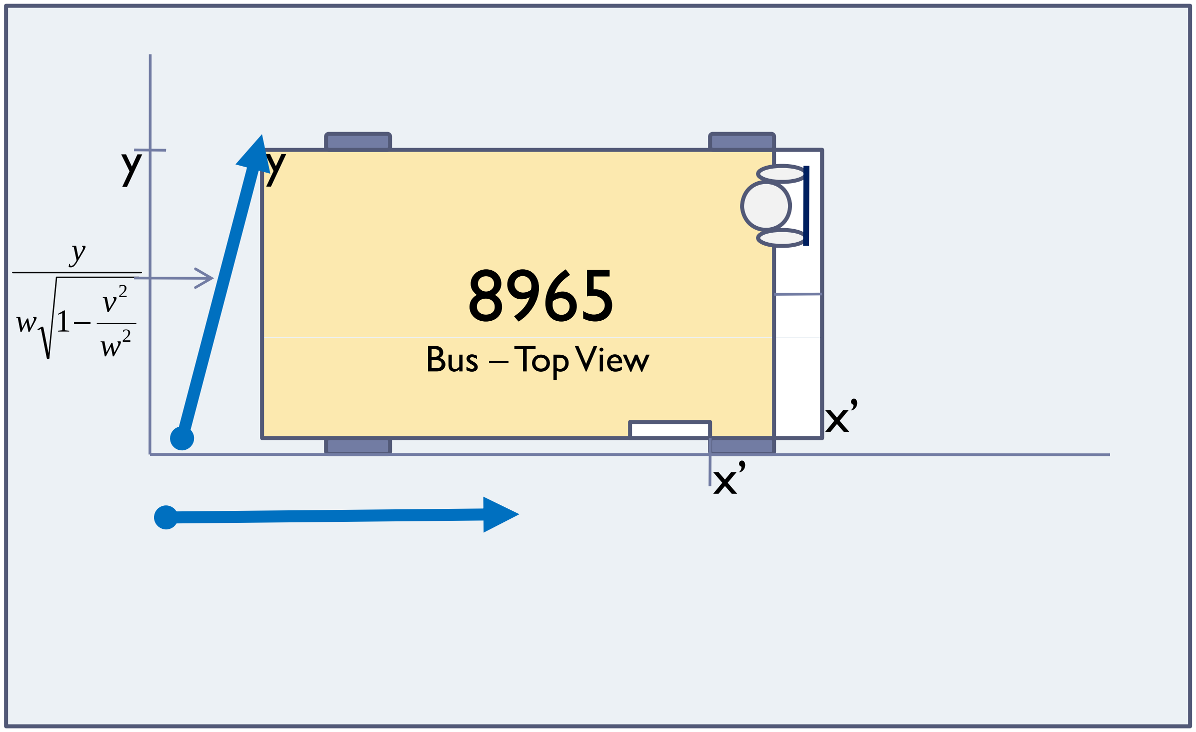
Note

An "object" is the term for the "phenomena under observation" with respect to one or move coordinate systems.

Note: The same equations that apply to the Y axis also apply to the Z axis.

Oscillation in an Incomplete Coordinate System

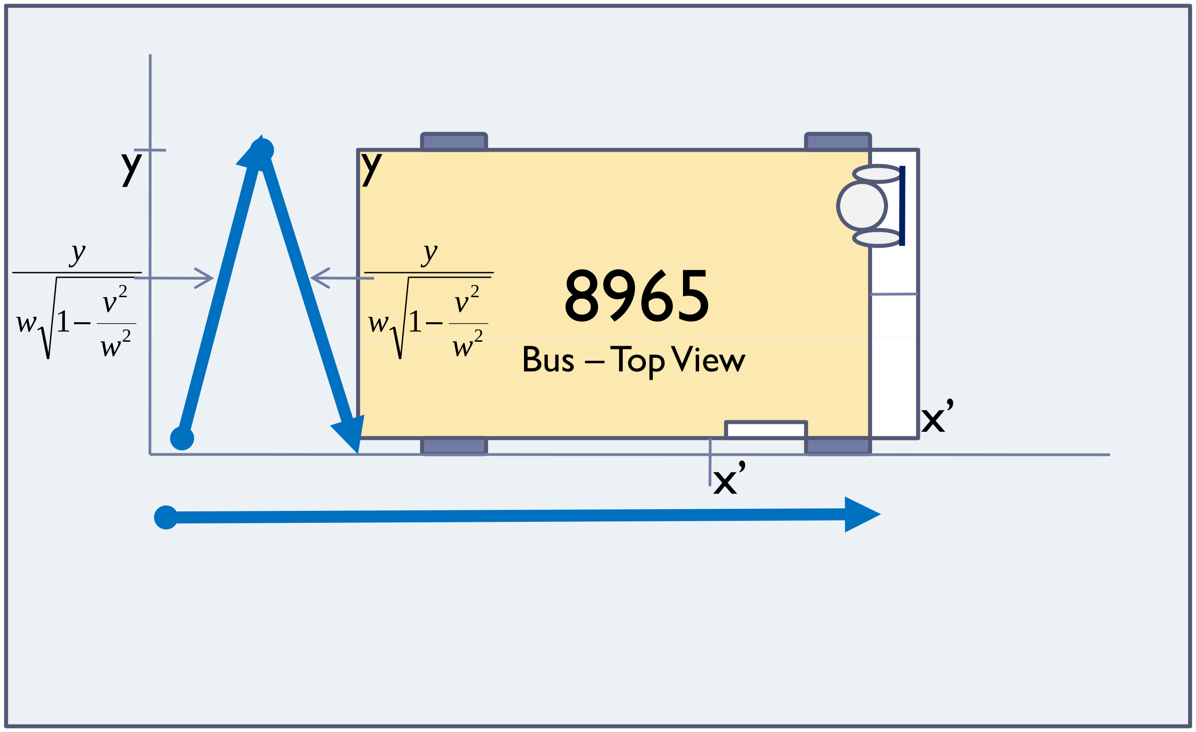
As the bus moves, one object moves toward the left corner of the bus and the other moves toward the front.



Note: The same equations that apply to the Y axis also apply to the Z axis.

Oscillation in an Incomplete Coordinate System

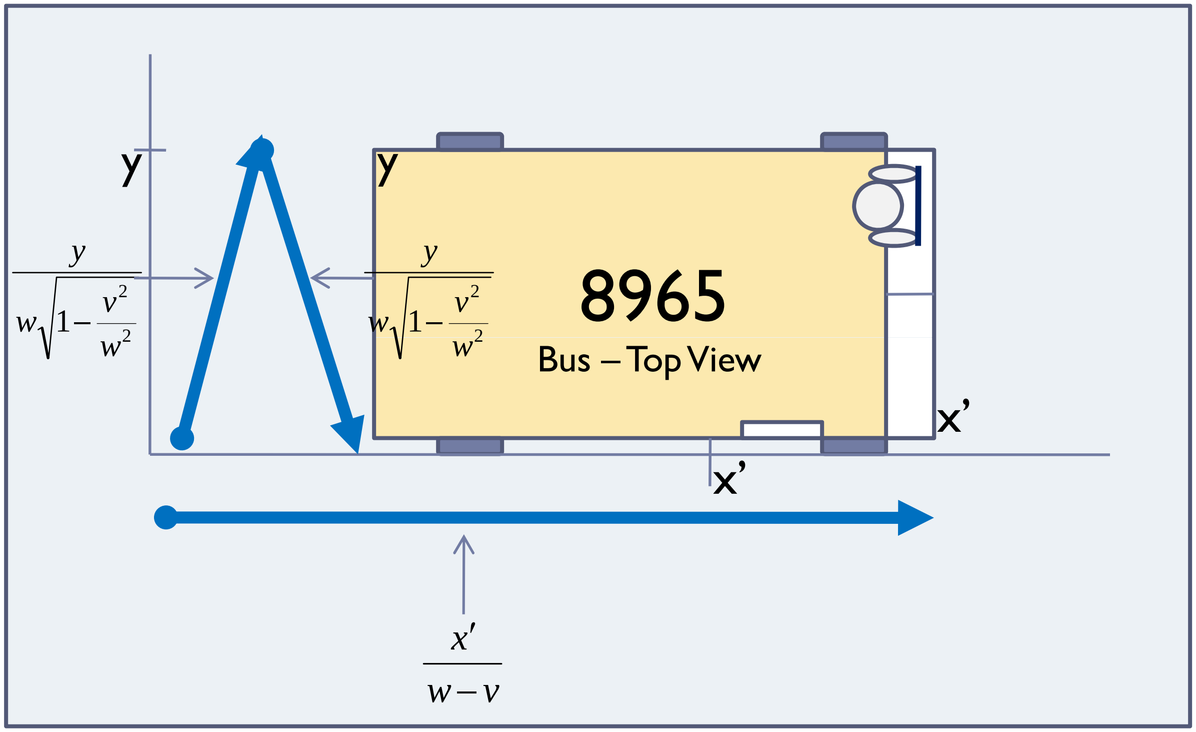
When the object reaches the left corner of the bus, it changes direction and heads back toward the right corner. It stops when it reaches the right corner because it has completed one "oscillation."



Note: The same equations that apply to the Y axis also apply to the Z axis.

Oscillation in an Incomplete Coordinate System

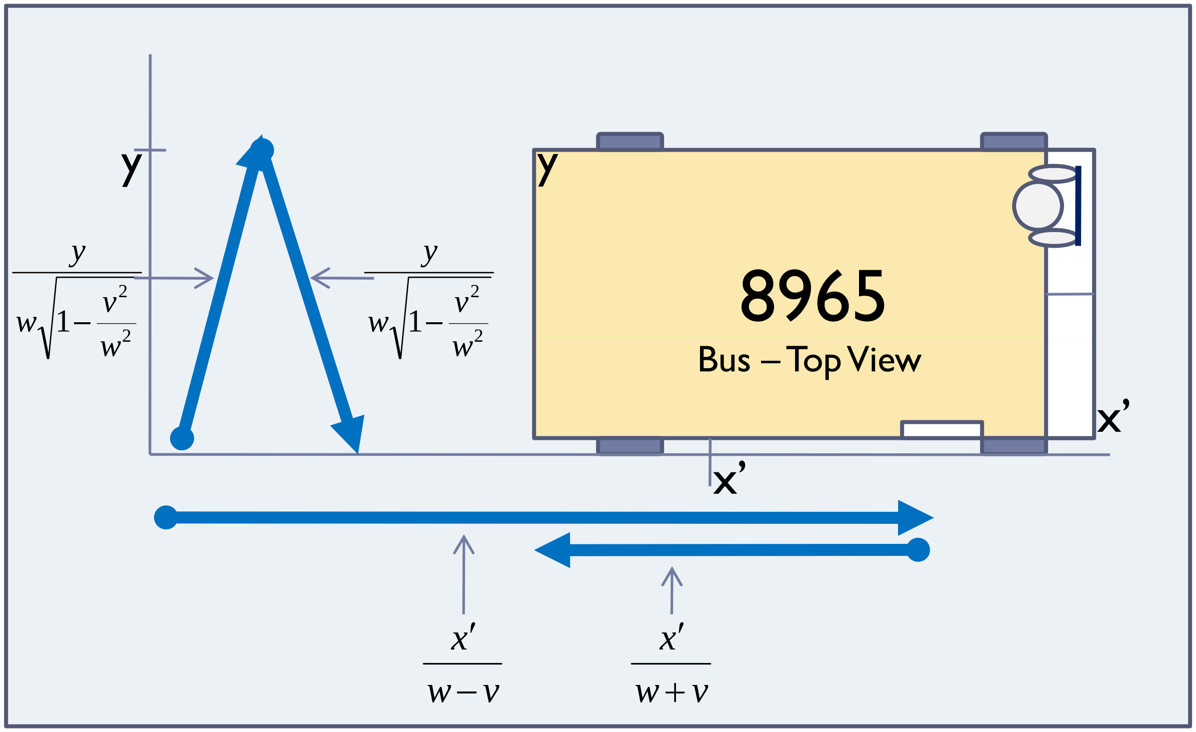
Once the other object reaches the front of the bus, it changes course to head back to the right rear corner of the bus.



Note: The same equations that apply to the Y axis also apply to the Z axis.

Oscillation in an Incomplete Coordinate System

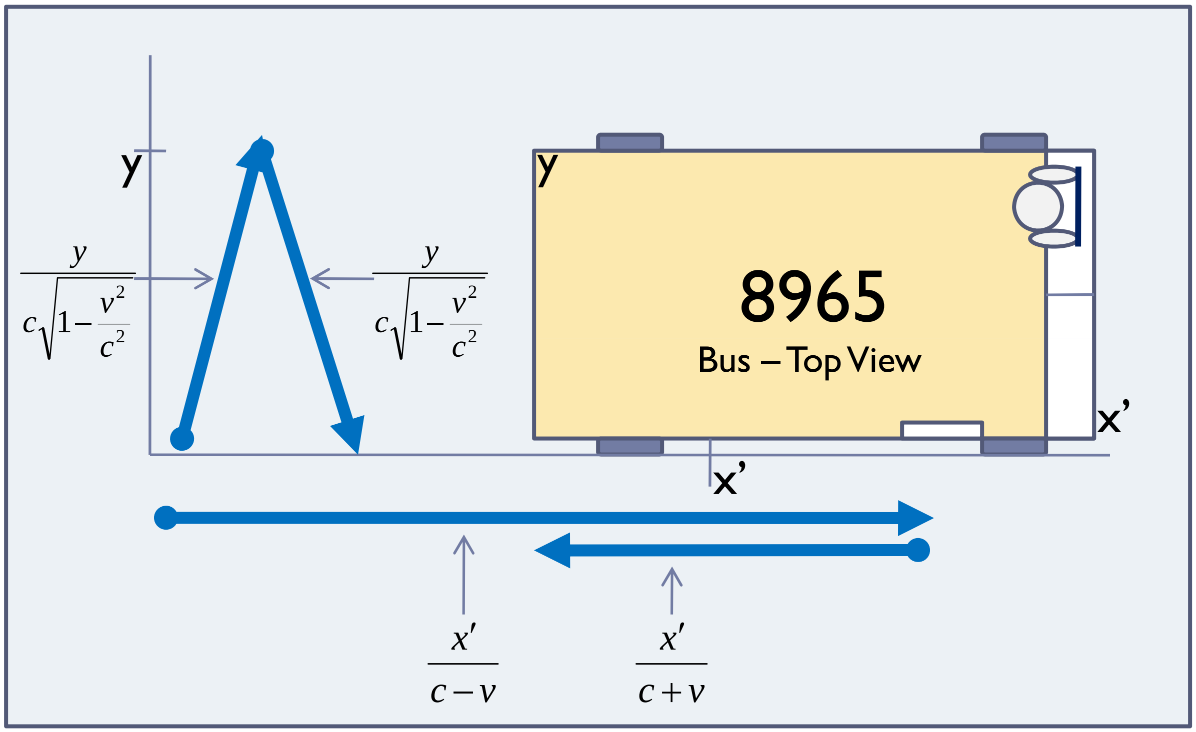
When the second object reaches the rear right corner of the bus, it stops since it has completed one "oscillation."



Note: The same equations that apply to the Y axis also apply to the Z axis.

Building the Michelson-Morley Experiment

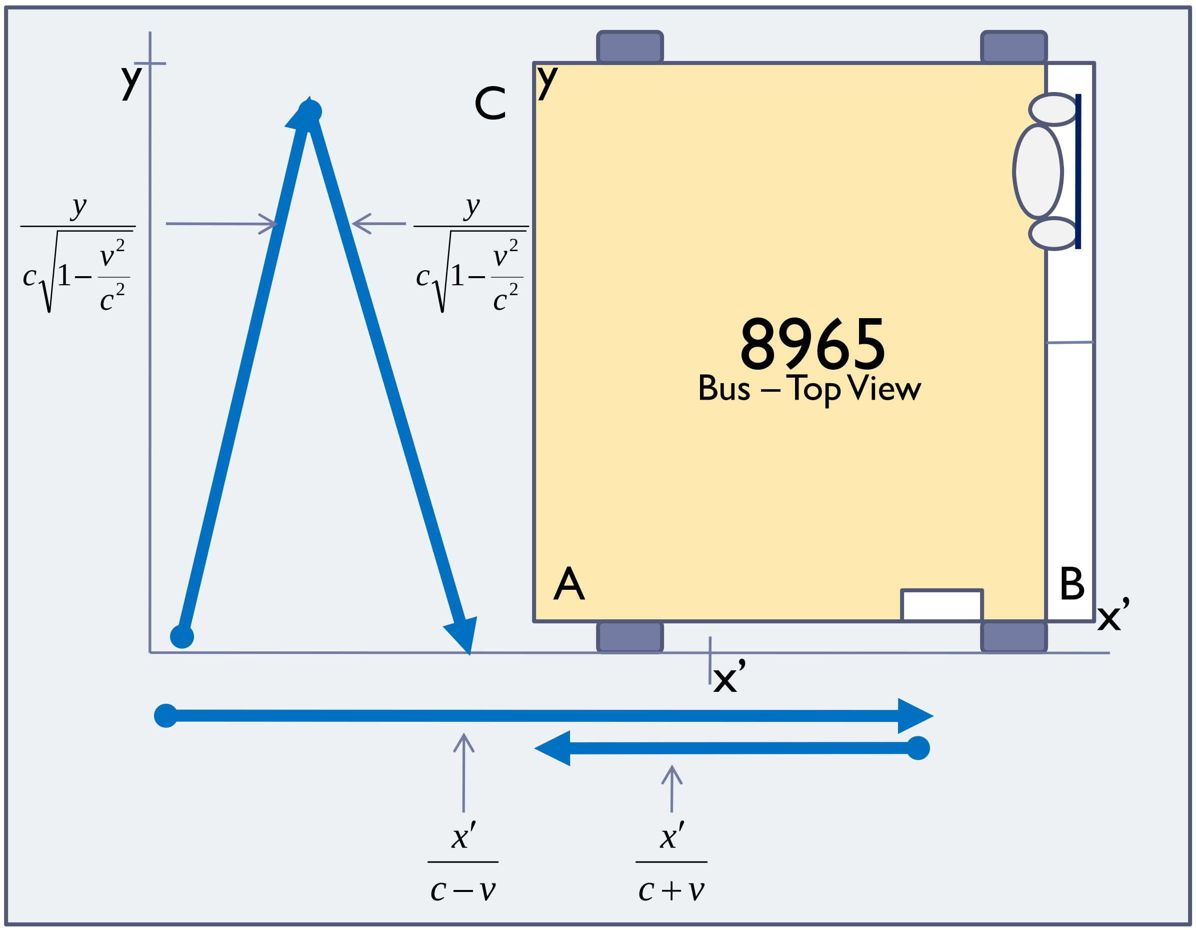
We move from the "bus" example by setting the velocity of the "object" (e.g., the light wave) to c.



Note: The same equations that apply to the Y axis also apply to the Z axis.

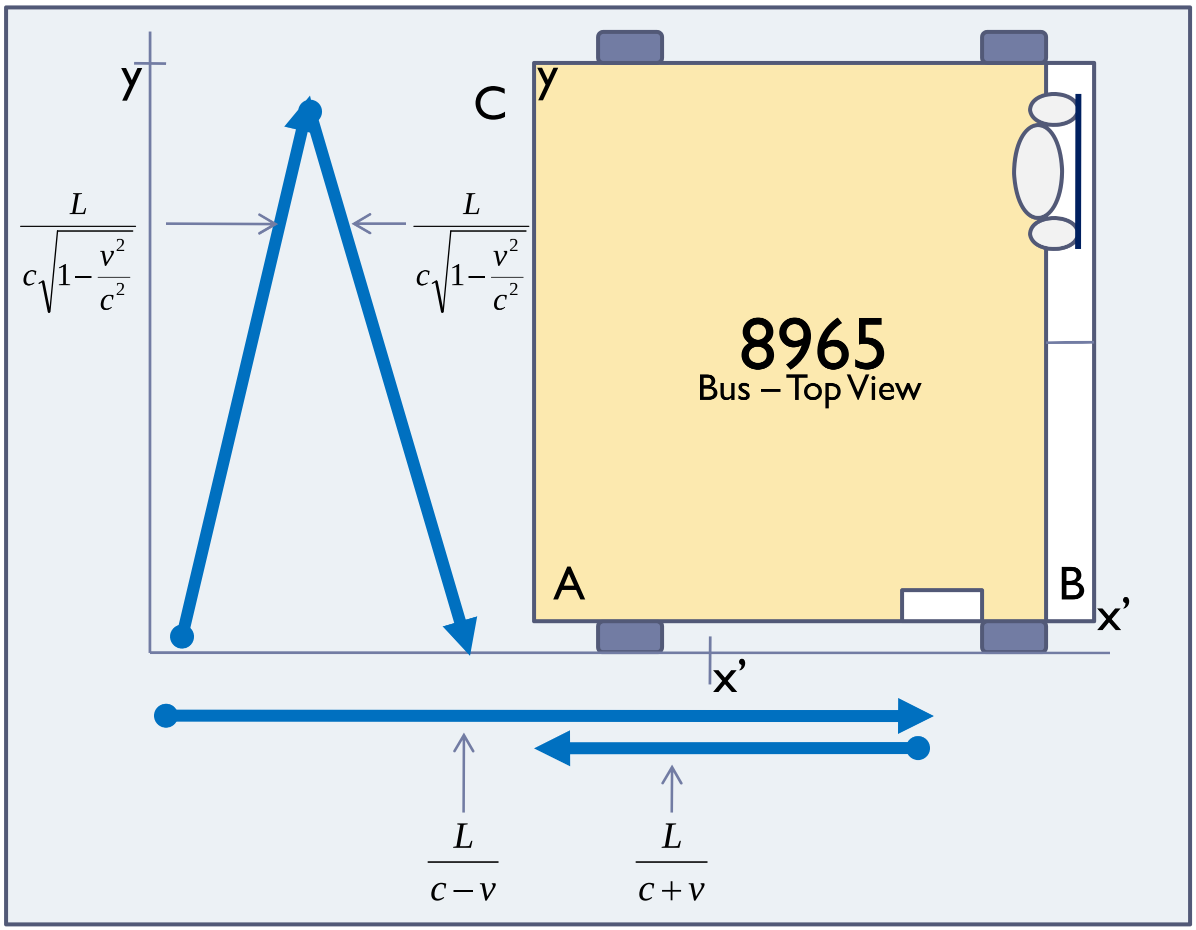
Building the Michelson-Morley Experiment

We then make the "physical" size of the bus equal on along the X and Y axes.



Building the Michelson-Morley Experiment

Since the length of the sides are equal, we revise the equations appropriately by calling the length L.

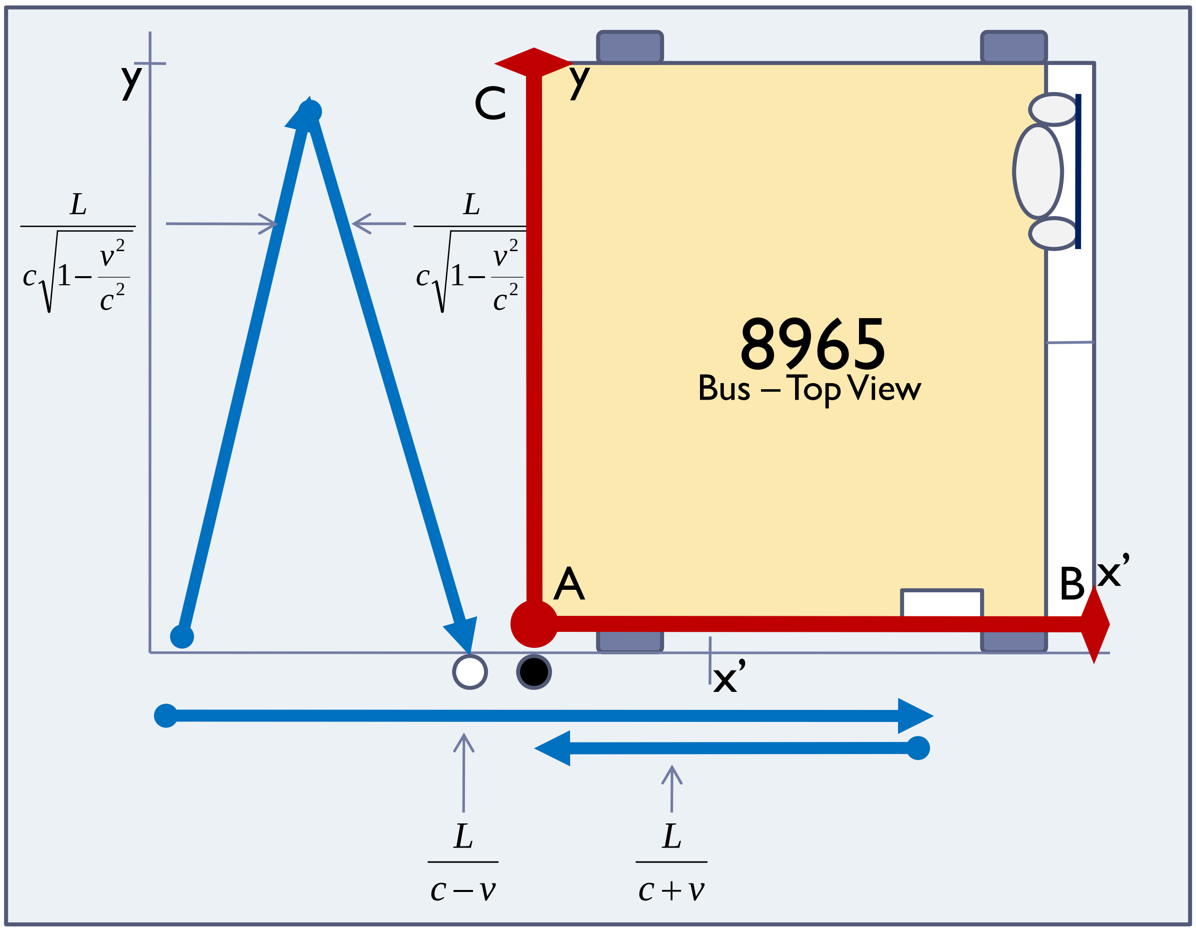


Demonstration / Simulation

The simulation will help us create the “Conceptual Foundational” inherent in the Michelson-Morley experiment.

Building the Michelson-Morley Experiment

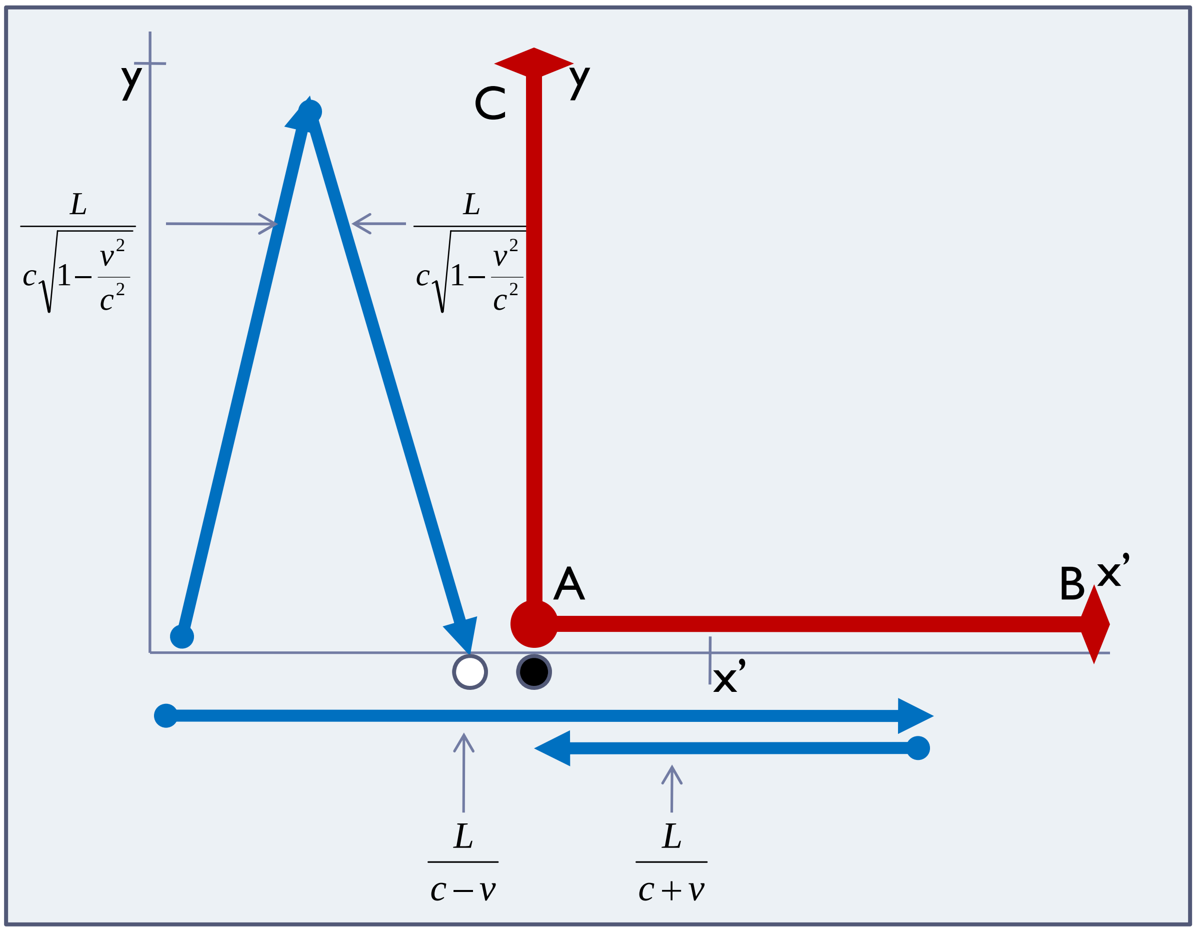
We place a light source in the right rear corner of the bus and reflective mirrors in in the right front corner and left rear corner.



Note We introduce "arms" and "mirrors" to represent the Michelson-Morley Interferometer

Building the Michelson-Morley Experiment

Once we remove the “bus”, we now have the model and mathematics for the Interferometer.



The Michelson-Morley Experimental Equations

Based on the model, we produce the equations for the time to complete one oscillation when the device is in motion through the Aether.

MMX Time Equations

$$x\ axis = \frac{2L}{c\left[1-\frac{v^2}{c^2}\right]}$$

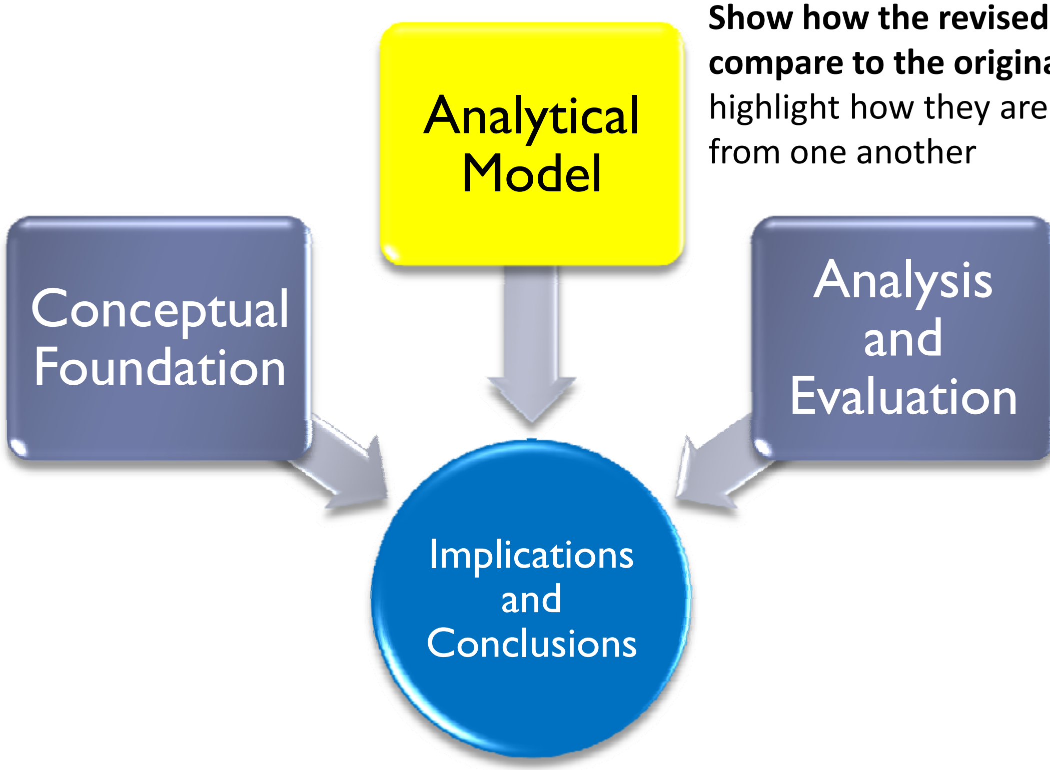
$$y\ axis = \frac{2L}{c\sqrt{1-\frac{v^2}{c^2}}}$$

$$z\ axis = \frac{2L}{c\sqrt{1-\frac{v^2}{c^2}}}$$

- If the Interferometer (e.g., bus) is not moving, the equations for the X and Y axes would produce the same result
- When the Interferometer is moving, the equations for the X and Y axes produce different results
- Michelson and Morley did not have a way of capturing this “phase shift” directly.
- They ingeniously “rotated” their Interferometer to measure the phase shift

Note: Z axis shown only for completeness. The MMX experiment was conducted along the X and Y axis.

AGENDA



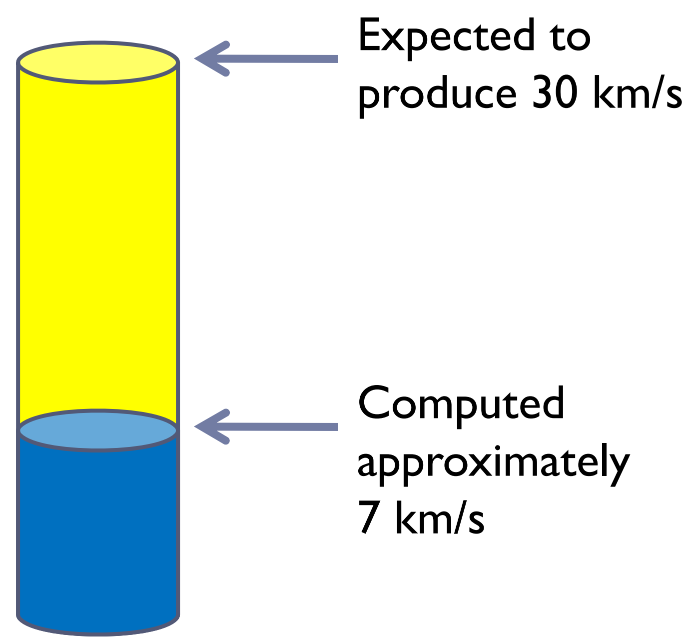
Show how the revised equations compare to the original equations to highlight how they are distinguished from one another

Michelson-Morley Summary

Michelson and Morley produced an equation that they used to compute their expected measurement results if the earth was traveling at 30 km/s and found their actual experimental result was much lower.

Original MMX Equation

$$d = 2\left[\frac{2L}{1-\frac{v^2}{c^2}} - \frac{2L}{\sqrt{1-\frac{v^2}{c^2}}}\right]$$



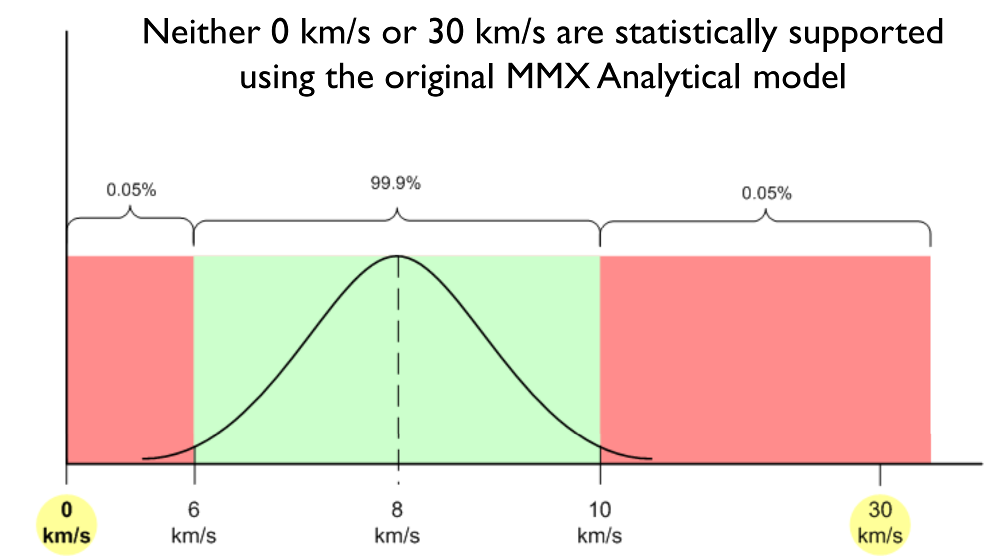
Detailed Analysis of the MMX experiment

An analysis of the MMX experimental data (using a computer-adapted version of their original model) confirms that the experiment did not produce 30 km/s and is much closer to approximately 8 km/s.

Measurement	Actual Results			
	Average micrometer divisions per 360 degree rotation of the Interferometer	Number of micrometer divisions per 22.5 degree rotation of the Interferometer	Displacement per 22.5 degree rotation of the Interferometer (Hertz)	Computed Earth Velocity (approx. - meters per second)
Morning Results				
Jul 08	31.00	1.9375	0.0388	9340
Jul 09	22.60	1.4125	0.0283	7975
Jul 11	22.20	1.3875	0.0278	7905
Morning Average	25.27	1.5792	0.0316	8425
Evening Results				
Jul 08	21.10	1.3188	0.0264	7990
Jul 09	19.40	1.2125	0.0243	7390
Jul 12	22.20	1.3875	0.0278	7905
Evening Average	20.90	1.3063	0.0261	7661
Overall Average	23.08	1.4427	0.0289	8060
Standard Deviation				655

Our "crisis" with MMX

The failure of MMX to support Fresnel's Aether-based model, does not result in the success of SRT as a non-Aether-based model.



Source: Bryant, May 2008 (anticipated) Galilean Electrodynamics

- Based on **original** (previously unstated) foundational assumptions
- Using the MMX analytics, there is less than 0.05% chance that 0 km/s (or 30 km/s) is the experimentally supported actual result.
- Experimental Divergence w/ Miller
- 0 km/s is only obtained only if the MMX experimental raw data is rejected in its entirety as "experimental error"
- **SRT result of 0 km/s is not statistically supported**

Michelson-Morley Post Mortem

Because we didn't get the desired result, we must ask several question to confirm that we approached the problem properly.

1. Is the approach sound and rational?	Yes
2. Does the math make sense?	Yes
3. Do multiple people reach the same conclusions?	Yes
4. Can the device detect a 30 km/s velocity?	Yes

Critical Question

If everything about MMX checks out, what does it mean?

a. MMX is valid and does not support Fresnel
b. The experiment is worthless
c. We haven't asked the right question yet.

Answer: c, We haven't asked the right question yet!

The Critical MMX Question

If we haven't asked the right question yet, what is that question?

Critical Question

If we knew with 100% certainty that the earth was moving through an Aether with an Earth Orbital Velocity of 30 km/s, would the measurements obtained using the Interferometer and analyzed using the Michelson-Morley Analytical Model produce an actual result of 30 km/s?

Answer: No, it would not!

The MMX Counting Problem

The problem with the Michelson-Morley experiment can be summarized as a “units” problem.

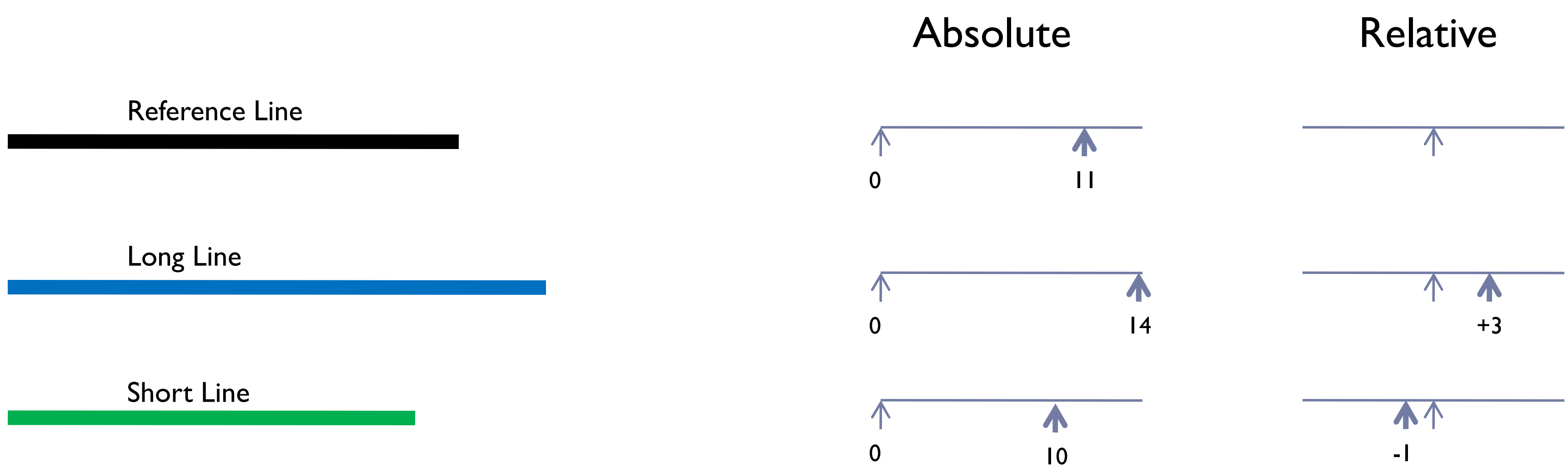
❶ Units of Frequency – Absolute versus Relative Measurements

❷ Units of a “Fringe”

❸ Size of the Actual and Expected Results

Relative versus Absolute Measurements

Relative measurements are taken from a non-static reference, which absolute measurements are taken from a static reference.



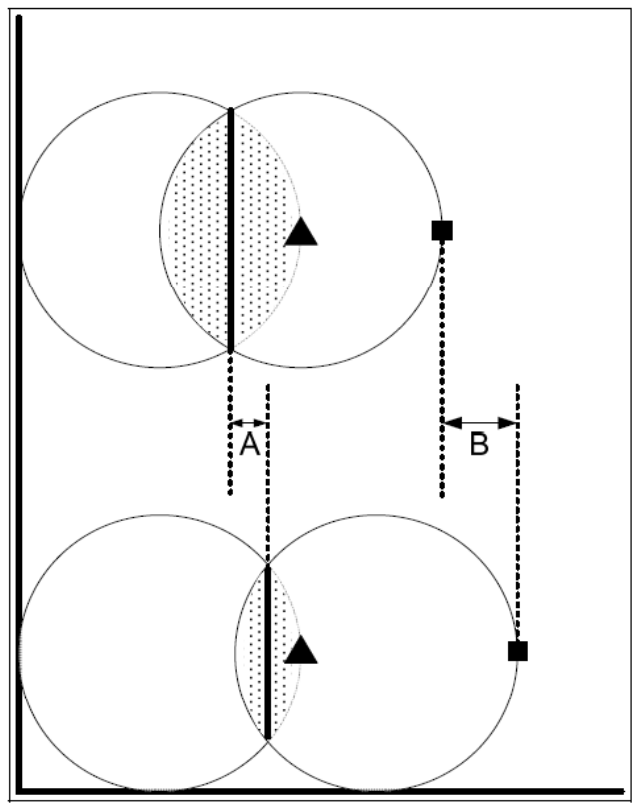
Combination of Long Line and Short Line — 24 — Ref +1

Note: Both Answers Are Correct! Although, using the Relative approach it is easier to “add” the bi-directional events. This also corrects for the events occurring over 2 seconds instead of 1.

Measuring an Optical "Fringe"

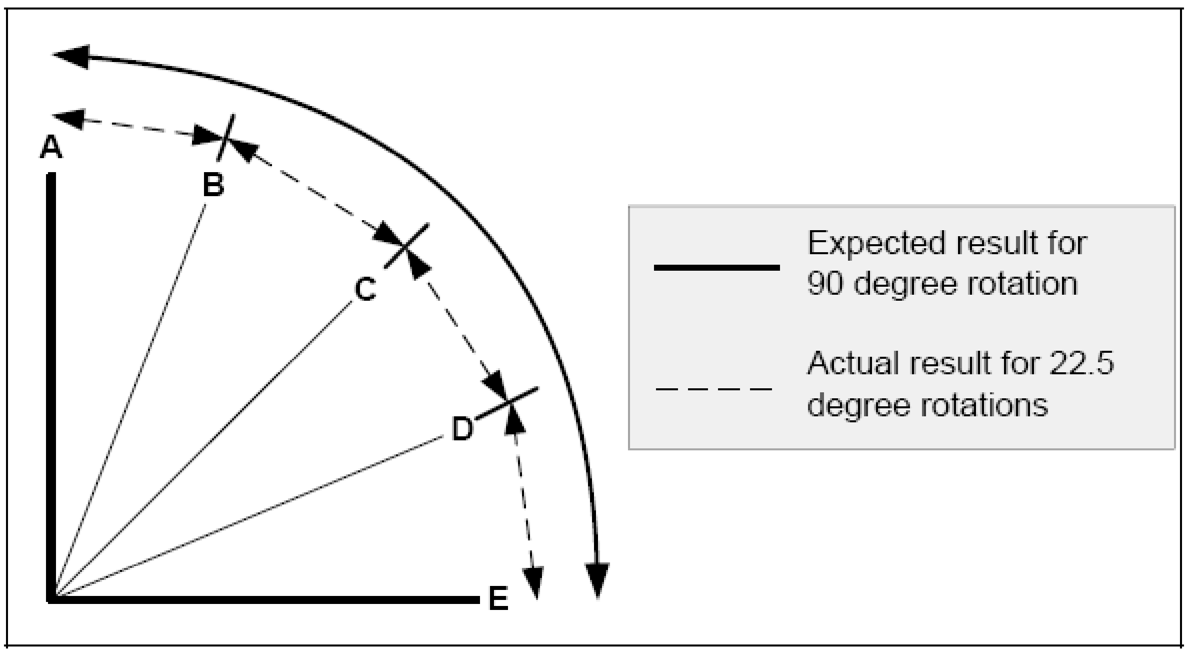
A shift of a given amount (B) between the two light paths will result in a shift of ½ of that amount (A) in the fringe.

Conceptual Representation

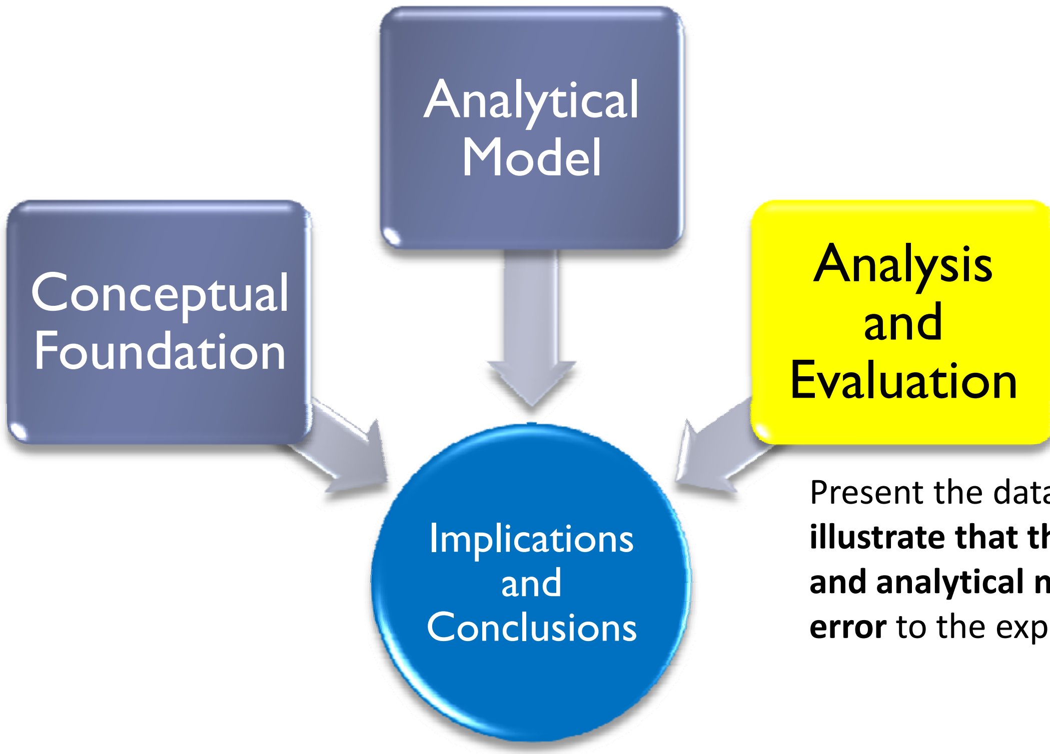


Comparing Actual and Expected Results

Either the expected result must be divided by 4 to get the amount for a 22.5 degree turn of the device, or four of the 22.5 degree measurement must be summed to equal a 90 degree turn used to create the expected result.



A
G
E
N
D
A



Present the data and results that **illustrate that the revised equations and analytical model produces less error** to the expected result

Michelson-Morley Analytics Adjustments

Since the Interferometer measures in Relative terms, we have to adjust the equations appropriately

❶ Divide by 2 to account for expressing Frequency in Hertz

❷ Divide by 2 to account for amount of movement in a "Fringe"

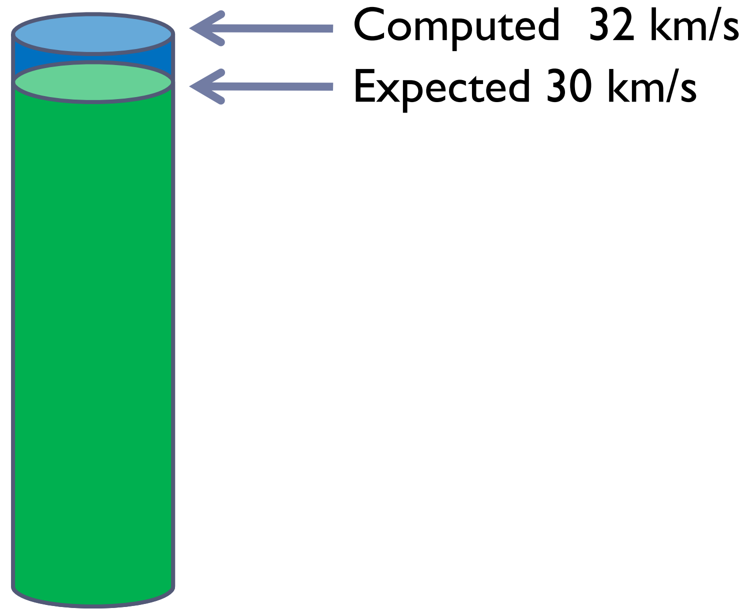
❸ Sum 4 expected result columns (each for a 22.5 degree turn) to match 90 degree rotation the expected result

Michelson-Morley Summary

The revised, "Relative Measurement" based analytical model produces an equation that finds an actual result of 32 km/s, a result that is confirm by **analyzing Miller's 1933 repeat experiment in the same way, yielding 30 km/s!**

Revised MMX Equation

$$d = \left[\frac{L}{1-\frac{v^2}{c^2}} - \frac{L}{\sqrt{1-\frac{v^2}{c^2}}} \right]$$



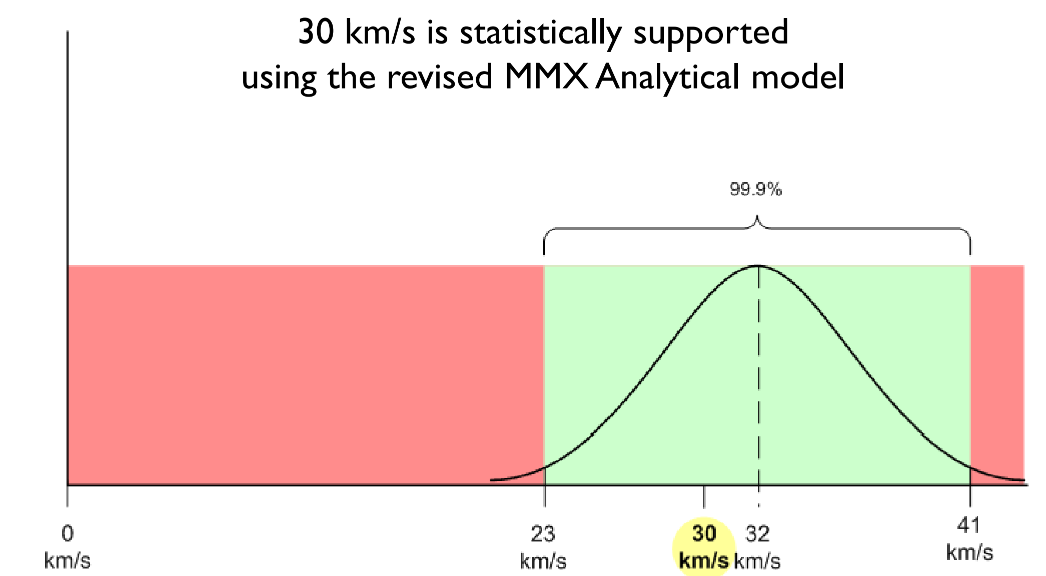
Detailed Analysis of the MMX experiment based on Relative Measurements

An analysis of the MMX experimental data a Relative Measurement-based analytical model reveals that the experiment produced 32 km/s.

	Actual Results			
Measurement	Average micrometer divisions per 360 degree rotation of the Interferometer	Number of micrometer divisions per 90 degree rotation of the Interferometer	Displacement per 90 degree rotation of the Interferometer (Hertz)	Computed Earth Velocity (approx. - meters per second)
Morning Results				
Jul 08	31.00	7.7500	0.1550	37325
Jul 09	22.60	5.6500	0.1130	31870
Jul 11	22.20	5.5500	0.1110	31590
Morning Average	25.27	6.3167	0.1263	33700
Evening Results				
Jul 08	21.10	5.2750	0.1055	30800
Jul 09	19.40	4.8500	0.0970	29530
Jul 12	22.20	5.5500	0.1110	31590
Evening Average	20.90	5.2250	0.1045	30500
Overall Average	23.08	5.7708	0.1154	32210
Standard Deviation				2689

Revised MMX Actual Results Range

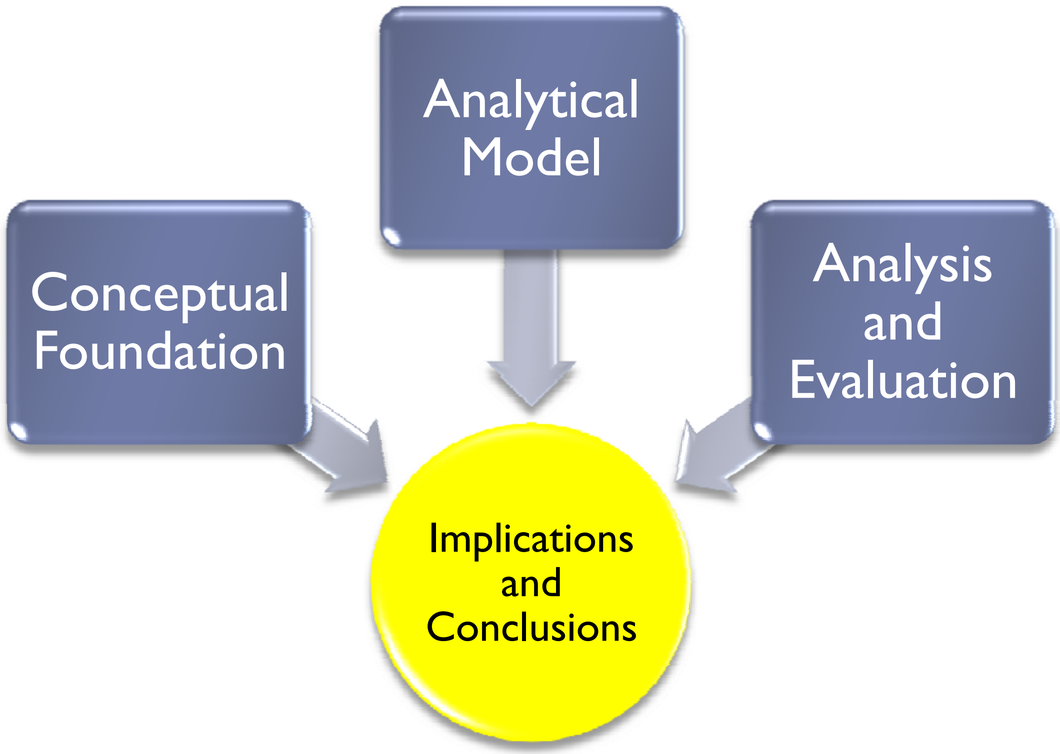
The MMX data, when analyzed against the revised foundational assumptions, produces the experimenter's expected result of 30 km/s.



Source: Bryant, May 2008 (anticipated) Galilean Electrodynamics

- Based on **revised** (previously unstated) foundational assumptions
- Produces an actual result of 32 km/s (actual result) when it was expected to produce 30 km/s
- Using the MMX equations, and new analytical model, the experiment statistically supports the expected result of 30 km/s
- Experimental Convergence w/ Miller
- Miller's repeat 1933, more accurate experiment, produced an actual result of 30 km/s – **An Exact Match!**

AGENDA


Analytical Model
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Implications and Conclusions

MMX Analysis Assessment

The original Michelson-Morley experiment incorrectly compares expected results based on Absolute measurements against values obtained from a device capable of providing Relative measurements.

		Measurement Type	
		Absolute	Relative
Experimental Attribute	Equations	Original MMX Equations	
	Device		Original MMX Interferometer

MMX Analysis Assessment

The revised equations are based on relative measurements and enable the proper analysis of the Michelson-Morley data.

		Measurement Type	
		Absolute	Relative
Experimental Attribute	Equations	Original MMX Equations	**Revised MMX Equations**
	Device		Original MMX Interferometer

MMX Analysis Assessment

This suggests that modern technology may enable the development of an Interferometer that performs absolute measurements.

		Measurement Type	
		Absolute	Relative
Experimental Attribute	Equations	Original MMX Equations	Revised MMX Equations
	Device	**New MMX Interferometer**	Original MMX Interferometer

Note: The proper analysis occurs by using the equations and devices in the same columns

Implications

If MMX supports an Aether, then the Model of Complete and Incomplete Coordinate Systems could be used for all transport mediums, *taking into account the factors that affect that velocity*.

Foundational Length Equations

$$x\ axis = \frac{x'}{1-\frac{v^2}{w^2}}$$

$$y\ axis = \frac{y}{\sqrt{1-\frac{v^2}{w^2}}}$$

$$z\ axis = \frac{z}{\sqrt{1-\frac{v^2}{w^2}}}$$

- **Sound –** *w is replaced with the velocity of the sound wave*
- **Water –** *w is replaced with the velocity of the water wave*
- **Light –** *w is replaced by the velocity of the light wave*. Traditionally, this is written as **c** for light in a vacuum
- **Quantum –** if (or when) discovered, *w is replaced by the velocity of the quantum wave*
- **Other (e.g., Gravity)** – if (or when) discovered, *w is replaced by the velocity of propagation through that transport medium*

Summary of Key Findings

The Michelson-Morley Interferometer must be analyzed using a Relative Measurement based analytical model to detect movement through the Aether at a velocity of 32 km/s and obtains experimental convergence with Miller's 1933 experiment!

Key Findings

- **Absolute versus Relative** Measurements
- The **Interferometer is a Relative Measuring Device**
- The **original MMX analytical model** is correct for a device that captures **Absolute Measurements.**
- The **revised MMX Analytical model** is properly used for a device that captures **Relative Measurements**.

Thank You

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