Wisp versus Special Relativity Test

A.1
Transverse Doppler effect experiment

Wisp theory predicts that a receiving device travelling through wisp space at a greater speed than a frequency source will record an increase in transverse Doppler frequency. Special relativity predicts the opposite – a decrease in frequency.

By subtracting the two results from each other, a small difference should be detectable when the receiver is moving directly above the source.

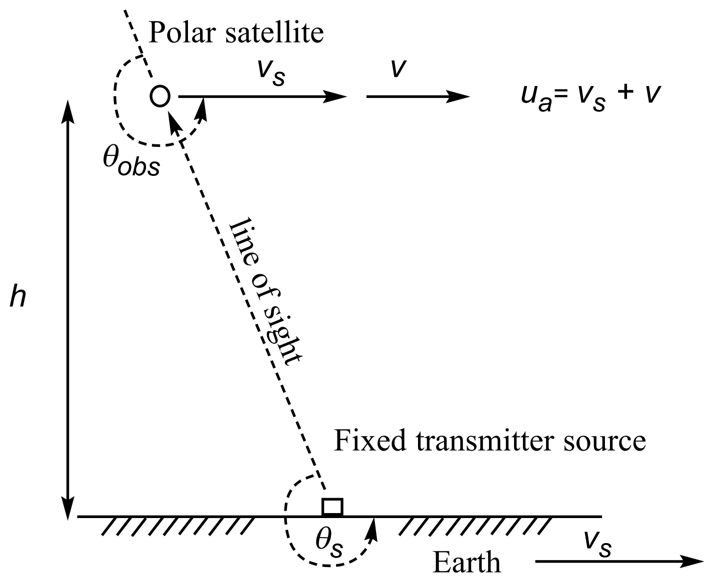

Figure A.1 Transverse Doppler experiment setup

For maximum effect the source is placed at the North Pole (Figure A.1), and a polar satellite carrying a receiver passes overhead.

A.2 Initial data

We will assume that the speed of the Earth v_s around the sun (30,000 m/s) is its absolute speed through wisp space.

The relative speed v – measured in absolute terms – of the satellite to the Earth's surface is 7,700 m/s, and the total speed of the satellite through wisp space is u_a. It has a maximum value when the direction of the satellite is the same as the direction of the Earth's orbit. Let the satellite's altitude h = 380,000 m.

The satellite's position must be tracked to an accuracy of +/- 5 m, an error greater than this could cause the experiment to produce a null result.

Both receiver and transmitter devices should be tuned to the frequency of radiation emitted from a caesium-133 atom – (f_o = 9,192,631,770 Hz +/- 1 Hz). The receiver must have a measurement accuracy of about +/- 1 Hz.

The presence of the Earth's atmosphere and the jiggle dilation effect will slow the speed of light down. However, we can ignore these effects, as they are negligible.

A.3 Special relativity's formula

We do not derive any of special relativity's formulas in this book, but we do use them for comparison purposes.

Equation set A.1 shows special relativity's formula for calculating the frequency received by the satellite.

A computer is used to calculate the frequencies for time inter-

(Equation set A.1)
Wisp versus special relativity test
Equations for special relativity

$h =$ Satellite's altitude (m)

$v =$ Satellite's speed with respect to the Earth (m/s)

$c =$ Absolute speed of light (m/s)

$\theta_{obs} =$ Angle $-$ satellite to transmitter source (radians)

$t =$ Time from zenith point (negative for approaching and positive for receding)

$$\cos\theta_{\text{obs}} = \frac{vt}{\sqrt{(vt)^2 + h^2}}$$

$f_0 =$ Earth based transmitter frequency

The satellite receives a predicted frequency of

$$f'_{sr} = f_0 \frac{\sqrt{1 - \frac{v^2}{c^2}}}{1 - \frac{v}{c}(-\cos(\theta_{obs}))}$$

vals ranging from 100 seconds before to 100 seconds after (t = -100 to t = + 100 seconds) the point of zenith, $t = 0$. The results are stored in readiness for comparison with wisp theory's predictions.

At the zenith point, special relativity predicts a frequency decrease of 3 Hz from the source frequency f_o.

(Equation set A.2)

Wisp versus special relativity test

Equations for wisp theory

$h =$ Satellite's altitude (m)

$v =$ Satellite's speed wrt earth (m/s)

$v_s =$ Earth's speed through wisp space (m/s)

$u_a = v_s + v$ Absolute speed of satellite (m/s)

$c =$ Absolute speed of light (m/s)

$\gamma_s = \dfrac{1}{\sqrt{1 - \dfrac{v_s^2}{c^2}}}$ Earth's dilation factor (Source)

$\gamma_{obs} = \dfrac{1}{\sqrt{1 - \dfrac{u_a^2}{c^2}}}$ Satellite's dilation factor (Receiver)

$\theta_s = \theta_{obs}$ Receiver and source have equal angles

$$\cos\theta_{\text{obs}} = \frac{vt}{\sqrt{(vt)^2 + h^2}}$$

Wisp theory predicts a received frequency of

$$f'_{wt} = f_0 \frac{[\gamma_{obs}](c - u_a \cos(\theta_{obs}))}{\gamma_s (c - v_s \cos(\theta_s))}$$

(Equation set A.3)

Wisp versus special relativity test

f_{diff} = Difference in predicted frequencies (Hz)

$$f'_{sr} = f_0 \frac{\sqrt{1-\frac{v^2}{c^2}}}{1-\frac{v}{c}(-\cos(\theta_{obs}))}$$ Special relativity's prediction

$$f'_{wt} = f_0 \frac{[\gamma_{obs}](c-u_a\cos(\theta_{obs}))}{\gamma_s(c-v_s\cos(\theta_s))}$$ Wisp theory's prediction

$$f_{diff} = f'_{wt} - f'_{sr}$$

A.4 Wisp theory’s formula

Equation set A.2 shows wisp theory’s formula (it is wisp’s general Doppler equation, which we derived earlier – see Equation set 9.6).

The predicted frequency values are calculated and compared with special relativity’s values.

A.5 Comparison

The frequency difference is found simply by subtracting the two sets of values from one another (Equation set A.3).

The graph in Figure A.2 shows a maximum difference in frequency of 29.7 Hz occurs at the zenith point.

The difference between the actual position of the satellite and

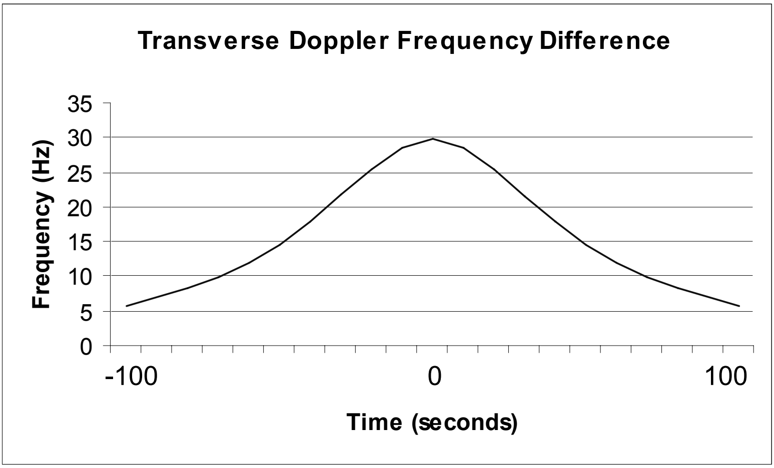

Figure A.2 Frequency difference (maximum)

special relativity's predicted position will be reduced to near zero, if an error in tracking the satellite places it 51 m behind its actual position (Figure A.3).

For the difference value to be detected the satellite's position must be known to within +/- 5 m.

A.6 Analysing data

In order to achieve a maximum result the absolute speed of the satellite through wisp space must be greater than that of the Earth's.

When the satellite passes the South Pole, its absolute speed will be less than Earth's, and so it will produce a smaller negative difference of -17.5 Hz.

If the Earth's speed through wisp space is greater than that

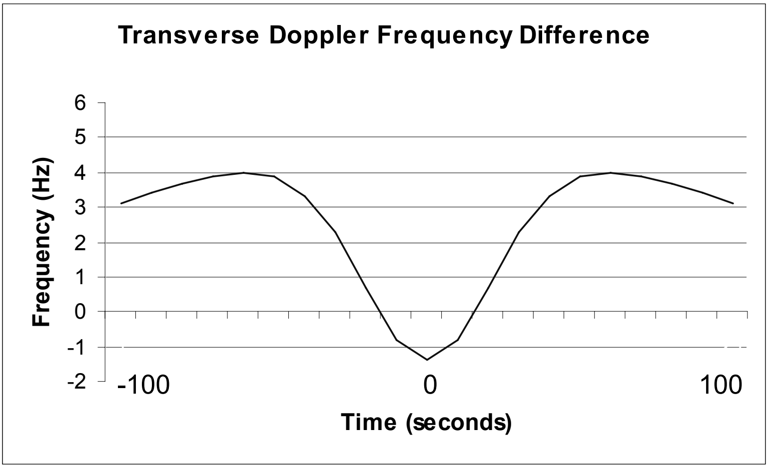

Figure A.3 Frequency difference (position error of 51 m)

assumed, then the difference result will be greater than that predicted and easier to detect.

If at the time of measurement the speed of the Earth through wisp space is near zero, then the difference will be 6 Hz, and a tracking error of 10 m could reduce the difference result to zero. An error of 5 m could reduce it to 3 Hz, making detection impossible.