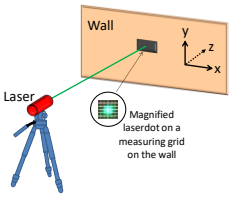

On Einstein's relativity of simultaneity thought experiment as a flawed contemporary paradigm.

Private communication/publication

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1.0

Keywords: Einstein, relativity, simultaneity, thought experiment, paradigm, light, light clock, laser, laser pulse, photon, phenomena, trajectory, real space, real location, real velocity, reference frame, perfect rest

Abbreviations: CS (contemporary science), CPBD (Contemporary Paradigms Believer and Defender), RS (Real Space), RV (Real Velocity), RVMD (Real Velocity Measuring Device), LPA (Laser Pulse A), LPB (Laser Pulse B), MWF (My Website Figure; reference to a dynamic Figure through an internet web link since it is not possible to directly implement dynamic/animated time stamp type of Figures in a Word or PDF format based static publication/document)

Dynamic figures in this publication are referred to as e.g. MWF2 (see *Abbreviations*). By clicking the link in Table 1 the dynamic figures will automatically open in your web browser. This publication is extracted from section 12.6 in the extended publication (book) (1) and therefore Figure 12.2 in this publication corresponds to the same Figure 12.2 in section 12.6 of (1).

Equations: in this publication the equations extracted from section 12.6 in (1) are showing the same equation reference numbers as used in section 12.6 of (1).

Table 1: (dynamic) MWF figures and their link

MWF#	Link
MWF1	www.absolute-relativity.be/figures/Figure01.gif
MWF2	www.absolute-relativity.be/images2/G6_Animation.gif
MWF9	www.absolute-relativity.be/figures/Figure09_Animation.gif
MWF11	www.absolute-relativity.be/figures/Figure11.jpg
MWF30	www.absolute-relativity.be/figures/Figure30_Animation.gif
MWF31	www.absolute-relativity.be/figures/Figure31_Animation.gif

a) Private research contact : all contacts should go through the Contact facility at the Home page of www.absolute-relativity.be

1. Abstract

In this publication the core information about Einstein's flawed relativity of simultaneity thought experiment paradigm was specifically extracted from section 12.6 in the extended publication (1). This flawed contemporary paradigm was/is also explained at www.absolute-relativity.be. Einstein introduced in his thought experiment a train (track), an "Observer1 at rest" and an Observer2 travelling in a train compartment. Observer1 is located along the train track (railway embankment) in location_M which is precisely the midpoint M between a location_A on the train track to the left of Observer1 and a location_B on the train track to the right of Observer1. The train and Observer2 are travelling at a constant velocity in the direction of location_B. Precisely at the time instance that Observer2 passes Observer1 at the location_M, a lightning strike A occurs in location_A. Precisely at the same time instance another lightning strike B occurs in location_B. Einstein then reasons in his thought experiment that Observer1 must observe the lightning strike A and the lightning strike B at the same time instance in the midpoint location_M. However, Einstein claims that Observer2 observes the lightning strike B earlier than the lightning strike A. He claims such from "*Observer2 moves towards the lightning strike B and observes the lightning strike B earlier than the lightning strike A*". He then states that Observer2 must conclude that the two lightning strikes were not simultaneous while Observer1 concludes that the two lightning strikes were simultaneous. He calls such the "*relativity of simultaneity*" for both observers. According to Einstein, moving observers will experience the relativity of simultaneity for events happening simultaneous. In contemporary science, Einstein's thought experiment is still considered as a proof of that "relativity of simultaneity". However, in this publication it will be demonstrated that his thought experiment is flawed and that his relativity of simultaneity claim is wrong. Moreover, this publication and the preceding publications (1-9) are part of a series of publications in the project being indicated at ResearchGate as "*Karl Popper's type of falsification, through theoretical and experimental anomalies, of multiple contemporary paradigms based on light phenomena*". From (1-5,8,9) it should be clear that multiple contemporary paradigms are flawed as a result of a massive experimental anomaly, proven by a straightforward laser experiment (1,3) (MWF2). Next to the experimental proof through that laser experiment, the multiple theoretical inconsistencies and anomalies reported in (1-5) also clearly show that numerous CS paradigms based on light are flawed and definitely should be reconsidered. When using photons in the analysis, such becomes evident. The extended publication (1) and the publications (2-9) are informing in more detail about the existence/proofs of multiple flawed paradigms within CS, as well about important applications (on our planet and in space) resulting from those views. All the information within the patent text on the RVMD, in the publications (1-9), in this publication and at the website was registered in front of a notary, therefore resulting in an author's copy right protection.

(1) Etienne Brauns, *A shattered Equivalence Principle in Physics and a future History of multiple Paradigm Big Bangs in "exact" science ?* ; this extended (notary registered) publication can be downloaded at http://www.absolute-relativity.be

(2) Etienne Brauns, *On multiple anomalies and inconsistencies regarding the description of light phenomena in contemporary science*
Website : http://www.absolute-relativity.be/pdf/MultipleAnomalies_EBrauns.pdf (version including the Annex)

Researchgate :
https://www.researchgate.net/publication/312190993_On_multiple_anomalies_and_inconsistencies_regarding_the_description_of_light_phenomena_in_contemporary_science
https://www.researchgate.net/publication/312591154_Annex_1_to_On_multiple_anomalies_and_inconsistencies_regarding_the_description_of_light_phenomena_in_contemporary_science

(3) Etienne Brauns, *On a massive anomaly through a straightforward laser experiment falsifying the equivalence principle for light.*
Website : http://www.absolute-relativity.be/pdf/ExperAnomLaser_EBrauns.pdf
Researchgate :
https://www.researchgate.net/publication/313030370_On_a_massive_anomaly_through_a_straightforward_laser_experiment_falsifying_the_equivalence_principle_for_light

(4) Etienne Brauns, *On the flawed Michelson and Morley experiment null-result paradigm*
Website : http://www.absolute-relativity.be/pdf/MichelsonMorley_EBrauns.pdf
Researchgate :
https://www.researchgate.net/publication/318969438_On_the_flawed_Michelson_and_Morley_experiment_null-result_paradigm

(5) Etienne Brauns, *On a flawed Lorentz contraction paradigm caused by an erroneous Michelson-Morley model and null-result.*
Website: http://www.absolute-relativity.be/pdf/Lorentz_EBrauns.pdf
Researchgate :
https://www.researchgate.net/publication/319128677_On_a_flawed_Lorentz_contraction_paradigm_caused_by_an_erroneous_Michelson-Morley_model_and_null-result

(6) Etienne Brauns, *On the inconclusiveness of the results from the Eddington 1919 solar eclipse mission to measure the bending of light.*
Website: http://www.absolute-relativity.be/pdf/Eddington_EBrauns.pdf
Researchgate :
https://www.researchgate.net/publication/319262673_On_the_inconclusiveness_of_the_results_from_the_Eddington_1919_solar_eclipse_mission_to_measure_the_bending_of_light

(7) Etienne Brauns, *The Mercury perihelion precession: a critique on the anomaly and a plausible additional effect of the sun.*
Website: http://www.absolute-relativity.be/pdf/Mercury_Anomaly_EBrauns.pdf
Researchgate :
https://www.researchgate.net/publication/319395513_The_Mercury_perihelion_precession_a_critique_on_the_anomaly_and_a_plausible_additional_effect_of_the_sun

(8) Etienne Brauns, *On the totally flawed contemporary light clock paradigm and on Paul Langevin's twin paradox being to the point.*
Website: http://www.absolute-relativity.be/pdf/LightClock_EBrauns.pdf
Researchgate :
https://www.researchgate.net/publication/320187876_On_the_totally_flawed_contemporary_light_clock_paradigm_and_on_Paul_Langevin%27s_twin_paradox_being_to_the_point

(9) Etienne Brauns, *On a device, measuring in real space the real velocity of an object and on Mach's flawed relativity thought experiment.*
Website: http://www.absolute-relativity.be/pdf/RealVelocityDevice_EBrauns.pdf
Researchgate :
https://www.researchgate.net/publication/320417484_On_a_device_measuring_in_real_space_the_real_velocity_of_an_object_and_on_Mach's_flawed_relativity_thought_experiment

2. The relativity of simultaneity

2.1 The relativity of simultaneity, as claimed by Einstein from his train-and-railway embankment thought experiment

In Einstein's first publication on his special relativity theory, he used a thought experiment involving a train (track/railway embankment), an Observer1 "at rest" along the railway embankment and an Observer2 travelling in a compartment of the train (p. 25 Part I: The Special Theory of Relativity *The Relativity of Simultaneity*):
www.absolute-relativity.be/pdf/Einstein_SpecialAndGeneralTheory.pdf

Observer1 is positioned in location_M which is precisely in the midpoint between the location_A (at the left of Observer1) and the location_B (at the right of Observer1) along the train track. So the distance AM is exactly the same as the distance MB. The train travels at a constant velocity in the direction of location_B. Einstein reflected on the effect of two lightning strikes occurring simultaneously, thus at the very same time instance, one in location_A and one in location_B. The light flash A produced by the lightning strike A in location_A would need a time interval Δt to travel the distance AM from A to M. Since AM= BM, he stated that the light flash B from the lightning strike B in location_B would need exactly the same time interval Δt to travel the distance BM from location_B to location_M. As a result, he claimed that Observer1 would observe both light flashes in location_M at the same time instance and that Observer1 thus could conclude that the two lightning strikes must have occurred simultaneously (in Einstein's thought experiment it is assumed that Observer1 knows that AM=BM, that the lightning strike A occurred in location_A and that the lightning strike B occurred in location_B).

Regarding Observer2 in the train compartment, Einstein considered Observer2 to exactly pass location_M at the very same time instance that the lightning strikes occurred in location_A and location_B. Einstein then reasons that, since Observer2 moves along with the train towards location B, Observer2 must observe the lightning flash B (from the lightning strike B occurring in location_B) earlier than the lightning flash A (from the lightning strike A occurring in location_A). He thus claims that Observer2 will not observe the flashes A and B simultaneous and therefore he also concludes that for the moving Observer2 there is no simultaneity for the event of the lightning strike A and the event of the lightning strike B. Einstein called this the *relativity of simultaneity* for both observers. Einstein's thought experiment is still considered as a proof of that relativity of simultaneity (as an additional support for Einstein's special relativity theory) which thus became a CS paradigm. Next to multiple other flawed CS paradigms based on light/photons (1-5,8,9, website, patent text) the relativity of simultaneity CS paradigm is however wrong, as explained in the next sections 2.2, 2.3 and 2.4.

2.2 A straightforward series of events analysis of Einstein's train thought experiment

Einstein's thought experiment thus involves a train railway embankment and two observers, Observer1 and Observer2. Observer1 is thus indicated by Einstein to be "*at rest*" along the railway embankment. An eventual critique from the CPBDs on the approach, as will be presented in this publication, will be countered and reversed here first: one should remark that the introduction by Einstein of a train and a railway embankment in his thought experiment could be linked to a material configuration (train, railway embankment, ...) on our planet. As frequently indicated in (1-9), our planet evidently travels at a high velocity through space (e.g. already from the obvious fact of its orbit around the sun). As a result Einstein's Observer1 would, in a real case on our planet for a real train on a real railway embankment, only be "*at rest*" relative to the railway embankment but, in reality, thus would move at a very high velocity through space. Einstein's Observer1 thus would not be "at rest" at all, in the real case.

Einstein's notion "*at rest*" for Observer1 in his train thought experiment is thus merely a theoretical and virtual notion, only existing in a human's mind but not conform to Einstein's Observer1 travelling at a high velocity in space, in the case of a real configuration on the surface of our planet (see also 2.5 regarding the totally flawed approach in whatever type of the CS reference frames used in CS when modeling real photon phenomena in RS; even Einstein's postulate on the velocity of light/photons is wrongly defined, which is the basic

cause of the actual existence of multiple flawed CS paradigms based on light/photon phenomena).

Even Einstein's Observer1 would thus face in the real case the very same "*simultaneity*" problem as Einstein's Observer2 since both observers then would not be at rest. Einstein thus in fact already created a "fuzzy" train thought experiment from that "glitch" aspect of his thought experiment, but there are even more important/significant glitches in Einstein's thought experiment, as explained in this publication.

As a result and to counter eventual remarks from CPBDs, Einstein's train thought experiment "set-up" needs to be fine tuned by implementing two observers Obs1 and Obs2 in the same way as done in the preceding publications in this series of publications, e.g. (1,4,5,8,9) where two reference frames were introduced involving an observer Obs1 at perfect rest in RS and an observer Obs2 moving in RS, conform to the approach which was used by Michelson and Morley in Figures part 1 and part 2 on p. 335 of their world famous paper:
http://history.aip.org/history/exhibits/gap/PDF/michelson.pdf

Since CS and the CPBDs clearly accept the Obs1 "at rest" approach and also the moving Obs2 approach, as introduced/used by Michelson and Morley in their Figures part 1 and part 2 in their publication, CS and CPBDs thus obviously should also accept in this publication the use of that very same Obs1 and Obs2 approach. In this publication the notion train, railway embankment and train compartment will however be abandoned and replaced by another, fully analogous, thought experiment but occurring in RS. Such however needs the introduction of the clock concept as described in (8) and the RVMD concept as discussed in (9).

In (8) the CS view regarding the graphical representation of a photon's trajectory in the case of a light clock was shown to be totally wrong and a correct view was introduced/discussed (click the MWF30 link in Table 1 to eventually view the animation of the flawed CS view and the correct view). Also the animation MWF9 was discussed in (8) with respect to a correct graphical representation of the photon phenomena in RS in the case of a laser which produces photons (or laser pulses) in the y_{Obs1} direction while the laser is moving in the x_{Obs1} direction in RS. It is therefore advised to read publication (8) first in detail since the views explained in (8) about the light clock are moreover, in addition, also extremely linked to the views regarding a RVMD in (9). A first reference frame is thus at rest in RS and is linked to an observer Obs1 at rest. A second reference frame thus moves in RS and is linked to an observer Obs2, moving along with that second reference frame

A clock of the type as presented in (8, Figure H) was introduced in (8) of which the time registration is not influenced by its velocity in RS. Obs1 has a clock_1 of that build and also Obs2 has a clock_2 of the same build. Both clocks are running in sync and, as explained in (8), will continue to do so for whatever velocity at which Obs2 is travelling in RS. This statement evidently clashes (8) with the actual CS paradigms and will be totally ignored by multiple CPBDs on a frozen-in-the-box-type-of-thinking basis and e.g. arguments that *"experiments have proven/verified that the reading of clock_2 (linked to the moving Obs2) will differ from the reading of clock_1 (linked to Obs1 at rest) according to the Lorentz contraction paradigm"*. But then the CPBDs should read the publications (1-9) and counter the multiple anomalies (experimental and CS theoretical inconsistencies). Up to now these anomalies and inconsistencies were not countered by any CPBD and certainly not the very important experimental anomaly as presented in (1,3) and in MWF2. The only strategy in that

respect by CPBDs up to now seems to be a "hiding in silence" (chapter 13 in (1)). Such strategy is indeed an efficient strategy but does not help much regarding the needed Thomas Kuhn type of normal paradigm shift processes, which are typical in the history of science. An unexplainable experimental anomaly is, according to the view by Karl Popper, much stronger as a falsification of a CS paradigm (or multiple CS paradigms based on light in this case) then any number of experimental "verifications". Even Einstein supported that same view: "*No amount of experimentation can ever prove me right; a single experiment can prove me wrong*"! MWF2 demonstrates the result of such a single experiment, thereby disproving many CS paradigms based on light, as explained in (1-9) and in this publication. Therefore the so-called CS experimental proofs/"verifications" of the Lorentz contraction of time as a function of velocity [the flawed CS light clock paradigm (8)] should be definitely re-evaluated by CS/CPBDs since in (1,5) that Lorentz contraction CS paradigm is shown to be flawed. Obs1 and Obs2 thus will notice exactly the same clock reading, notwithstanding the fact that:

- Obs1 and the clock_1 are both at perfect rest in RS
- Obs2 and the clock_2 both travel along with the space ship in RS

CPBDs should also read the views of Thomas Kuhn:
https://en.wikipedia.org/wiki/Thomas_Kuhn,
regarding the specific (r)evolution processes of scientific paradigm shifts in the history of science:
https://en.wikipedia.org/wiki/The_Structure_of_Scientific_Revolutions).

CPBDs should not think that contemporary paradigms are rock-solid and "*untouchable on their scientific pedestals*". Perhaps by reading the work of Thomas Kuhn they will start to think otherwise and learn from the erratic "paradigm" trajectories in science during its history.

The CPBDs should also read the work by Karl Popper and his extremely important falsification principle, in order to understand that the CPBD's arguments of "*that many experimental verifications/proofs*" (thus the untouchable pedestal attitude) is a weak argument which can be totally eradicated by a single experiment, producing an insurmountable anomaly.

From (9) it also became clear that it is possible to build a 3D (three axis's based) RVMD which allows for Obs1 and Obs2 to measure their full RV vector in RS. Several conceptual schematics of RVMD builds can be found in the RVMD figures in (9) and in the original patent text (as reported in (9) and being linked to the RVMD). In the thought experiment a RVMD1 is available to Obs1 while a RVMD2, of the same build as the RVMD1, is available to Obs2.

Consider then Obs1, as an astronaut, being located in RS while reading v_x=0, v_y=0 and v_z=0 values on the RVMD1. Obs1 thus concludes to be really at perfect rest in RS, in sharp contrast with Einstein's so-called-at-rest Observer1 along the train track on our planet. In reality Einstein's Observer1 would indeed move at a high velocity along with our planet in RS. Consider also in RS a linear trajectory AB and M as the precise midpoint of AB. Assume the location of Obs1 in RS to be also exactly at the location_M. In the location_A there is a laser_A which has also a build-in $RVMD_A$ which also reads v_x=0, v_y=0 and v_z=0 for the laser_A, thus indicating a perfect rest status in RS for laser_A. In the same way there is a laser_B in location_B which also has a build-in $RVMD_B$ which reads v_x=0, v_y=0 and v_z=0 for the laser_B, thus also indicating a perfect rest status in RS for laser_B. Laser_A points exactly towards the location_B and thus can fire a photon_A (or e.g. a femtosecond laser pulse A

(LPA)) in the precise direction of location_B. The photon_A or LPA from the laser_A thus will travel precisely along AB towards location_B. In the same way laser_B is pointing exactly towards the location_A and thus can fire a photonB (or e.g. a femtosecond laser pulse B (LPB)) in the precise direction of location_A. The photonB or LPB from the laserB thus will travel precisely along BA towards A.

Consider also a space ship that travels parallel and very close to AB in the direction of B. Obs2 is located inside the space ship and thus travels in RS, along with the space ship. Obs2 reads the RVMD2 values v_x, v_y and v_z. The trajectory AB is assumed in this case to be fully parallel to the x-axis of the RVMD2 (which is also the longitudinal axis of the space ship), while the values v_y=0 and v_z=0. Obs2 has informed Obs1 that the velocity of the space ship will be controlled to show a velocity value v_x in the x-direction.

The laserA fires a LPA in the direction of location_B at the very same time instance that the:

- laserB fires a LPB in the direction of location_A
- the space ship passes the location_M at a constant velocity v_x

For the observer Obs1 at perfect rest an Obs1 type of reference frame at perfect rest is introduced with the origin x=0 of the x-axis in location_M and the x-axis directed towards location_B. It is also possible to define the:

- position of the space ship in the Obs1 reference frame as x_{Ship}
- positions of the laser pulses in the Obs1 reference frame as x_{LPA} and x_{LPB}
- distance from M to B as d_{MB}
- distance from A to M as d_{AM}
- the time interval Δt_{Ship} as the travelling time interval of the space ship after passing location_M (the latter at x = 0 in the Obs1 reference frame)
- the time interval Δt_{LPA} as the travelling time of the laser pulse, produced by the laserA
- the time interval Δt_{LPB} as the travelling time of the laser pulse, produced by the laserB

Evidently $d_{AM} = d_{MB} = AB/2$

The time instances can be calculated when:

- the space ship is meeting the laser pulses LPA and LPB, thus when Obs2 observes LPB and LPA (evidently both time instances are different)
- Obs1 observes the laser pulses LPA and LPB

a) consider first the meeting of the space ship and the laser pulse LPB launched from location_B.

Since the RVMD2 is available, the observer Obs2 is able to control and read the ship's RV scalar value $v_x=v_{Ship}$ in the x-direction in RS. The ship's RV value v_{Ship} in the x-direction can be implemented in equation (12.2) which enables both Obs1 and Obs2 to calculate the position x_{Ship} of the space ship for the Obs1 reference frame for a travelling time interval Δt_{Ship}:

$$x_{Ship} = v_{Ship} \cdot \Delta t_{Ship} \qquad (12.2)$$

In an analogous way Obs1 and Obs2 know that the x-position of LPB in the Obs1 reference frame, after a travelling time Δt_{LPB} can be calculated from:

$$x_{LPB} = d_{MB} - c \cdot \Delta t_{LB} \qquad (12.3)$$

Obs1 and Obs2 also know that the space ship and LPB are meeting one another when $x_{LPB}=x_{ship}$:

$$x_{Ship} = v_{Ship} \cdot \Delta t_{Ship} = x_{LPB} = d_{MB} - c \cdot \Delta t_{LPB} \qquad (12.4)$$

At the time instance of meeting one has $\Delta t_{LPB}= \Delta t_{Ship}$. As a result from (12.4):

$$v_{Ship} \cdot \Delta t_{Ship} = d_{MB} - c \cdot \Delta t_{Ship} \qquad (12.5)$$

Thus from (12.5):

$$\Delta t_{Ship} = \frac{d_{MB}}{v_{Ship} + c} \qquad (12.6)$$

Obs1 and Obs2 are able to calculate from equation (12.6) for a specific value of $v_x=v_{Ship}$ and for the time instance of the meeting of the LPB and the space ship, the value of the travelling time interval $\Delta t_{LPB} = \Delta t_{Ship}$. In sections 2.3 and 2.4 two examples will be calculated. At the meeting time instance of the LPB and the space ship it is trivial that $\Delta t_{LPB} = \Delta t_{Ship} >0$ and $x_{Ship}>0$: the meeting location $x_{Ship}=x_{LPB}$ will thus be situated to the right of location_M, indicated as location_C.

b) consider secondly the meeting of the space ship and the laser pulse LPA, launched from location_A.

It is trivial that in the meeting location $x_{Ship}=x_{LPA}$ of the space ship and LPA the numeric value for the travelling interval $\Delta t_{LPA} = \Delta t_{Ship}$ is different from the numeric value for the travelling interval $\Delta t_{LPB} = \Delta t_{Ship}$ in the meeting location $x_{Ship}=x_{LPB}$ of the space ship and LPB. Indeed: the space ship will first meet LPB in the location $x_{Ship}=x_{LPB}$ while LPA can only catch up later with the space ship in a location $x_{Ship}=x_{LPA}$ further to the right of the meeting location $x_{Ship}=x_{LPB}$. The travelling time interval $\Delta t_{LPA} = \Delta t_{Ship}$ and the location $x_{Ship}=x_{LPA}$ linked to the meeting location of LPA and the space ship can be obtained in an analogous way:

$$x_{LPA} = c \cdot \Delta t_{LPA} - d_{AM} \qquad (12.7)$$

The meeting location of the space ship and LPA:

$$x_{Ship} = v_{Ship} \cdot \Delta t_{Ship} = x_{LPA} = c \cdot \Delta t_{LPA} - d_{AM} \qquad (12.8)$$

The meeting time instance of the space ship and LPA:

$$v_{Ship} \cdot \Delta t_{Ship} = c \cdot \Delta t_{Ship} - d_{AM} \qquad (12.9)$$

Thus also:

$$\Delta t_{Ship} = \frac{d_{AM}}{c - v_{Ship}} \qquad (12.10)$$

Obs1 and Obs2 are thus able to calculate from equation (12.10) for a specific value of $v_x=v_{Ship}$ and for the time instance of the meeting of the LPA and the space ship, the value of the travelling time interval $\Delta t_{LPA} = \Delta t_{Ship}$. As already indicated: two demonstration examples will be calculated in sections 2.3 and 2.4. Obviously $\Delta t_{LPA} = \Delta t_{Ship} > 0$ and the meeting location $x_{Ship}=x_{LPA}$ will be situated to the right of location_M (even to the right of location_C). That meeting location is indicated as location_D.

2.3 A first arbitrary example to demonstrate the meeting locations C and D, to the right of location M

In 2.2 the equations (12.6) and (12.10) were derived which enable the observers Obs1 and Obs2 to calculate the meeting locations C and D. It is trivial that increasing values of $v_{Ship}=v_x$ of the space ship will cause the locations C and D to shift further to the right from location_M. The distances MC and MD will thus increase with an increasing v_{Ship} value. It is thus also clear that very low values of v_{Ship} will result in very low values for MC and MD. Such is also the reason that Einstein's thought experiment remained extremely vague and unintelligible for so long. Indeed, even for Einstein's extremely low train velocity values the equations (12.6) and (12.10) calculations could be performed but in such case the time interval values which need to be considered are that small that the resulting MC and MD values would also become extremely small and thus much less illustrative. Therefore in a first (arbitrary) example a "larger" v_{Ship} value is introduced in order to make this point very clear. After examining the results of this first illustrative (arbitrary) example, one then can decide to calculate oneself in the same way the events in the case of a very low velocity linked to e.g. Einstein's "train thought experiment". However, to detect the effect of a low velocity v_{Ship} value one needs to perform in such " low train velocity case" the calculations at an adequate high number precision, in order to retain sufficient significant digits in the calculated numbers. Anyway, one definitely will learn from such high precision calculations that there will be no difference in the final conclusions (from both examples in this publication) at all. The fuzziness of his train thought experiment will then disappear and the facts will become very clear.

As a first example one can perform a calculation linked to a "much easier apprehendable" situation involving a "much faster" (when compared to Einstein's "very slow" train) space ship travelling at a constant velocity of 7E05 m/sec (which, as a demonstration, is still only about 0.2 % of the speed of light; see 2.4 for case where the space ship is travelling at 50% of the speed of light, making things extremely obvious).

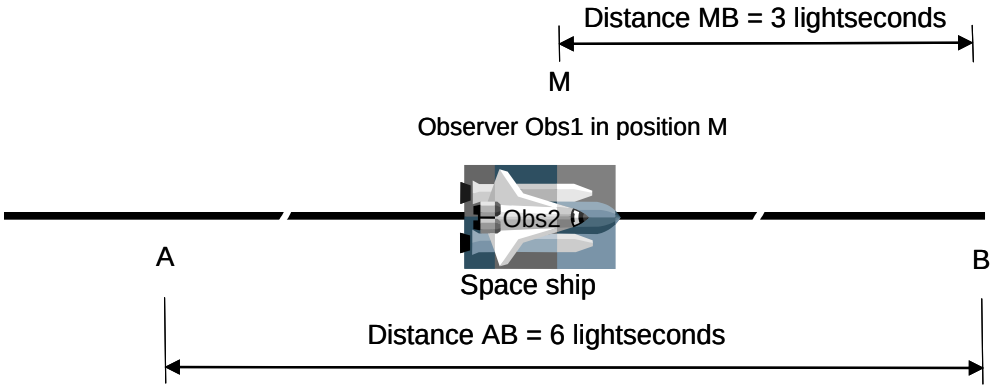

Figure 12.2 (as in (1)) An alternative thought experiment

Consider thus a situation for this first example, as depicted in Figure 12.2. To facilitate the graphical representation in the animation the unit of distance is expressed as light seconds. A distance of one light second equals to the distance being travelled by a photon in RS in one second. Assuming the velocity of a photon to be 3E08 m/sec in RS, the distance of 1 light second thus equals to 300 000 km.

Obs1 and Obs2 have both all of the following information:

- the distance d_{AM} (between location_A and location_M) is 3 light-seconds (900 000 km) (that value is arbitrarily chosen in this example),
- the distance d_{BM} (between location_B and location_M) is exactly the same as the distance d_{AM} (location_M is exactly at the midpoint of AB), thus $d_{AM} = d_{BM}$,
- in both locations A and B there is a laser,
- both lasers are at perfect rest, as checked by the RVMDs linked to those lasers (thus $v_x=v_y=v_z=0$ for both lasers),
- the laser_A points exactly to location_B,
- the laser_B points exactly to location_A,
- both lasers fire at exactly the same time instance a laser pulse (LPA and LPB),
- the LPA thus travels from location_A towards location_B along the trajectory AB,
- the LPB thus travels from location_B towards location_A along the trajectory BA,
- Obs1 is in location_M and reads the RVMD1 values: $v_x=v_y=v_z=0$. Obs1 thus knows to be at perfect rest in location_M in RS,
- the space ship and Obs2 pass exactly at t=0 at location_M, thus at the same time instance (t=0) that the two laser pulses LPA and LPB are fired,
- in the space ship, Obs2 reads from the RVMD2 the RV values $v_y=v_z=0$ and v_x=7E05 m/sec.

Regarding Obs1, since:

- Obs1 is indeed at perfect rest in location_M,
- the laser_A is at perfect rest in location_A,
- the laser_B is at perfect rest in location_B,
- the distance d_{AM} (3 lightseconds) is the same as the distance d_{BM} (3 lightseconds),

it is trivial that LPA and LPB will arrive at exactly the same time instance at location_M, thus after a travelling time interval of 3 seconds. Obs1 thus will observe after 3 seconds LPA and LPB at location_M in RS. Since Obs1 is at perfect rest in RS in location_M it is thus trivial that Obs1 can back-calculate and thus conclude (now for sure since being at perfect rest in RS, in sharp contrast with Einstein's Observer1 who would not be at all at perfect rest when situated on our moving planet) that the laser pulses indeed were launched at the same time instance in the past (since Obs1 knows the exact distances AM and BM, thus Obs1 knows that AM=BM; since Obs1 also knows that LPA was launched in location_A; since Obs1 also knows that LPB was launched in location_B). Thus Obs1 can conclude that both events were occurring simultaneously (but still and not to forget : simultaneously occurring in the past in location_A and in location_B).

Regarding Obs2, since Obs2:

- also has all the information regarding the location_A, location_B, location_M and both lasers,
- can read the RVMD2 values and thus knows the $v_x = v_{Ship}$ value,

it is obvious that Obs2 can:

- register the time instances when Obs2 observes LPB and LPA,
- use equations (12.6) and (12.10) to calculate the time characteristics of the two events (the launch of LPA and LPB in the past).

Thus for LPB, from equation (12.6), the time of the registration of the LPB by Obs2 on her/his clock will be:

$$\Delta t_{Ship} = \frac{d_{MB}}{v_{Ship} + c} = \frac{900000000}{700000 + 300000000} = 2.9930162953109 \text{ sec} \quad (12.6)$$

So one notices that Obs2 will register LPB after 2.9930162953109 sec.

Obs2 can then also use equation (12.4) to calculate the location of the space ship in the reference frame of Obs1 and obtains x_{Ship}= 2095111.407 m.

As a conclusion regarding the observations of Obs2 of LPB, Obs2 will observe LPB:

- about 0.00698 sec earlier than Obs1 will observe LPB in location_M,
- in location_C which is situated 2095111.407 m to the right of location_M. Evidently that is not in location_M.

The calculation results with respect to LPB as observed by Obs2 already largely clears in a quantitative manner the fuzziness of the train thought experiment. It is now obvious that LPB will be observed in location_C to the right of location_M at a time instance before the time instance of the arrival of LPB in location_M.

Since Obs2:

- knows all the information as described above,
- has read the ship's value $v_x = v_{Ship}$ from the RVMD2,
- has registered on his clock the LPB meeting time instance t=2.9930162953109 sec,
- has calculated the location of the ship as x_{Ship}= 2095111.407 m when meeting LPB,

such evidently means that Obs2 can easily back-calculate the fact that LPB was launched in the past at location_B at the time instance t=0

As an in-between-check for LPB: that laser pulse has travelled during that time interval a distance 300000000 m/sec x 2.9930162953109 sec = 897904888.59327 m from location_B and thus arrives at x_{LPB} =900000000 m - 897904888.59327 m = 2095111.407 m which of course fully corresponds to the calculated location of the space ship at that time instance when meeting LPB.

For LPA, Obs2 will register on her/his clock the time instance of the observation of LPA:

$$\Delta t_{Ship} = \frac{d_{AM}}{c - v_{Ship}} = \frac{900000000}{300000000 - 700000} = 3.007016371536 \text{sec} \quad (12.10)$$

Obs2 can then also use equation (12.8) to calculate the location of the space ship in the reference frame of Obs1 and obtains x_{Ship}= 2104911.460 m.

As a conclusion regarding the observations of Obs2 of LPA; Obs2 will observe LPA:

- about 0.007016 sec later than Obs1 will observe LPA in location_M.
- in location_D which is situated 2104911.460 m to the right of location_M. Evidently, as with the location_C regarding the meeting of the space ship and LPB, location_D is also different from location_M and, of course, even ~ 9800 m to the right of location_C at a time instance (~3.007 sec) (thus after the time instance of the arrival of LPA in location_M).

Again, since Obs2:

- knows all the information as described above,

- has read the ship's value $v_{Ship} = v_x$ from the RVMD2,
- has registered on his clock_2 the LPA meeting time instance t=3.00701633715336 sec,
- has calculated the location of the ship as x_{Ship}= 2104911.460 m when meeting LPA,

such evidently means that Obs2 can easily back-calculate that LPA was launched in the past in location_A at the time instance t=0

As an in-between-check for LPA: that laser pulse travelled during that time a distance of 300000000 m/sec x 3.0070163715336 sec = 902104911.46008 m from location A and thus arrives at x_{LPA} =902104911.46008 m - 900000000 m = 2104911.460 m which of course corresponds to the very same location of the space ship, being caught up at that time instance by LPA.

Final conclusions:

- since the space ship was already at location M at the time instance that the laser pulses were launched at the time instance t_0 it is now very clear that the space ship will not be at location M at the different time instances when the laser pulses from location_A and location_B meet the space ship
- the space ship and Obs2 will first meet LPB in location_C to the right of location_M at a time instance $t_1 > t_0$
- LPA and LPB thereafter will coincide in location_M at a time instance $t_2 > t_1 > t_0$ as observed by Obs1
- the space ship and Obs2 will thereafter meet LPA in location_D to the right of location_C at a time instance $t_3 > t_2 > t_1 > t_0$
- Obs2 is perfectly able to back-calculate that LPB was launched in the past at the time instance t_o=0 sec.
- Obs2 is also perfectly able to back-calculate that LPA was launched in the past at the time instance t_o=0 sec.
- Obs2 is thus perfectly able to make the statement that LPA and LPB were launched at the very same time instance t_o=0 sec <u>in the past</u>.

It should therefore be clear, from the revealing time analysis of the sequence of events, that Obs1 and Obs2 can simply back-calculate and conclude that the light flashes occurred simultaneously in the past in location_A and location _B. It is important to realize that Obs1 and Obs2 are back-calculating a simultaneity of two events which have occurred in the past, in different locations in RS and at different time instances. Indeed, the two signals themselves of the two events, the latter occurring simultaneous in the past in RS, will of course not show a lasting simultaneity in time:

- for two different observers each in a different location in RS,
- when observing the phenomena signals of the two events,
- moreover observing the phenomena signals at two different time instances,
- after the time instance that the simultaneity of the two events actually occurred in RS.

It is thus necessary to involve the time instances and the location of the observations by the observers (from their location in RS) in their analysis to trace back a simultaneity of two events which have occurred in the past in two other locations of RS. Such has been totally overlooked in Einstein's train thought experiment. He did not implement the straightforward series-of-events analysis in his train thought experiment.

However, from the series-of-events analysis it should now also be clear from the arbitrary example that there is no simultaneity problem at all for Obs1 and Obs2. Both observers are indeed able to claim the simultaneity of the launching of the two laser pulses. Einstein's relativity of simultaneity paradigm is thus wrong. The simultaneity of the launching events of the two laser pulses is only linked to the time instance of that launch which happened at the time instance t_0 in the past. Two observers in RS who are each situated in a different location in RS and who are moving at different velocities in RS, will never observe immediately a simultaneity of two events as to conclude on that simultaneity. Both observers will need to use the RV information from the RVMDs, the events observation time instances information from the available clocks (always in sync; of the type as presented in (8, Figure H)) and the locations information (distances) in RS. That information allows both observers, to back-calculate the time instances of the two events (the launching time instance LPA and LPB in this case) in the past which then will allow both observers to conclude on the eventual simultaneity of both events.

2.4 A second arbitrary example, in a graphical animation format representation, to clearly demonstrate the meeting locations C and D to the right of location M, for a space ship now moving at 50% of the speed of photons in RS

Note: a general video regarding a graphical representation/animation of the series of events in time, for the situation described in section 2.3, was already available as:
https://www.youtube.com/watch?v=Ex0bATIFg3M)
The video can also be downloaded as a mp4 file:
http://www.absolute-relativity.be/video/RelativSimultThoughtExpEinsteinHD_v1_0.mp4
(*if your browser would not show directly the mp4 video image after clicking the mp4 file link, then click eventually (in the initiated window in your browser) the download arrow to first download and store the complete mp4 file to your computer and then use the mp4 file on your computer to view the video through player software on your computer (thus not in the browser itself)*).

In this section an animation (MWF31) is presented regarding the thought experiment as described in section 2.3, but for the case of a space ship which would travel at 50% of the speed of light, thus at a much higher value of $v_{Ship} = v_x$ compared to the first example in section 2.3.

In this example:

- $x_{location\_A}$=0 light seconds,
- $x_{location\_B}$=60 light seconds,
- $x_{location\_M}$=30 light seconds.

At t=0:

- the laser pulse LPA is launched, thus x_{LPA}=0 at t=0,
- the laser pulse LPB is launched, thus x_{LPB}=60 at t=0,
- the space ship passes location_M, thus $x_{SpaceShip}$=30 at t=0.

The x-values (in light seconds) for LPA, LPB and the space ship as a function of time are extremely trivial in this example and can be found in Table 2.

The animation presented in MWF31 is very illustrative regarding the series of events regarding the locations of LPA, LPB and the space ship in time. The events are:

- firstly, the space ship will meet LPB at the time instance t=20 sec in location $x_{LPB}=x_{Ship}=40$
- secondly, LPA and LPB meet one another at the time instance t=30 sec in location $x_{LPA}=x_{LPB}=30$
- thirdly, the space ship will meet LPA at the time instance t=60 sec in location $x_{LPA}=x_{Ship}=60$

As explained in 2.3, Obs2 is also able in this case to read the space ship's RV vector component scalar $v_{Ship}=v_x$ value (in the x-direction; $v_y=v_z=0$ in this example) from the RVMD2. Obs2 can also read from clock_2 the time which is in perfect sync with the clock_1 being available to Obs1. Obs1 is at perfect rest (the reading from RVMD1 is $v_x=v_y=v_z=0$). Obs1 concludes in an analogous way as in the example described in 2.3 that LPA and LPB were launched simultaneous. Obs2 can also easily back-calculate from the data/readings from RVMD2 and clock_2 that LPA and LPB were launched simultaneous. This confirms again that there is no simultaneity problem at all for both observers and that the "relativity of simultaneity" paradigm is therefore flawed.

Table 2 x-values as a function of time for LPA, LPB and the space ship

t (sec)	x_{LPA} (light sec)	x_{LPB} (light sec)	x_{Ship} (light sec)	t (sec)	x_{LPA} (light sec)	x_{LPB} (light sec)	x_{Ship} (light sec)	t (sec)	x_{LPA} (light sec)	x_{LPB} (light sec)	x_{Ship} (light sec)
0	0	60	30								
1	1	59	30,5	21	21	39	40,5	41	41	19	50,5
2	2	58	31	22	22	38	41	42	42	18	51
3	3	57	31,5	23	23	37	41,5	43	43	17	51,5
4	4	56	32	24	24	36	42	44	44	16	52
5	5	55	32,5	25	25	35	42,5	45	45	15	52,5
6	6	54	33	26	26	34	43	46	46	14	53
7	7	53	33,5	27	27	33	43,5	47	47	13	53,5
8	8	52	34	28	28	32	44	48	48	12	54
9	9	51	34,5	29	29	31	44,5	49	49	11	54,5
10	10	50	35	30(2)	30	30	45	50	50	10	55
11	11	49	35,5	31	31	29	45,5	51	51	9	55,5
12	12	48	36	32	32	28	46	52	52	8	56
13	13	47	36,5	33	33	27	46,5	53	53	7	56,5
14	14	46	37	34	34	26	47	54	54	6	57
15	15	45	37,5	35	35	25	47,5	55	55	5	57,5
16	16	44	38	36	36	24	48	56	56	4	58
17	17	43	38,5	37	37	23	48,5	57	57	3	58,5
18	18	42	39	38	38	22	49	58	58	2	59
19	19	41	39,5	39	39	21	49,5	59	59	1	59,5
20(1)	20	40	40	40	40	20	50	60(3)	60	0	60

(1) the meeting of LPB and the space ship
(2) the meeting of LPA and LPB
(3) the meeting of LPA and the space ship

2.5 The basic cause of multiple CS paradigms (based on light) being flawed

Einstein's relativity of simultaneity paradigm is based on a wrong model. With respect to his train thought experiment "model" CPBDs have not been aware of:

- the lack of a straightforward "meeting in time" analysis of the signals linked to the

events in RS. Einstein's train thought experiment is therefore flawed. Einstein's approach is a pure linguistic "model", totally lacking any quantification and as a result, it is shown in this publication that Einstein's conclusion about a "relativity of simultaneity" is wrong. An eventual CPBD's reaction on this statement on the basis of Einstein's postulate about the constancy of the velocity of light is moreover also countered further in this section

- the theoretical inconsistencies within the CS modelling of light/photons phenomena as discussed in (1,2)
- the extremely important experimental anomaly as discussed in (1,3) and illustrated in MWF2 resulting from a straightforward laser experiment. MWF2 is as very strong Popper type of falsification of multiple CS paradigms based on light (/photons)
- the modelling mistake in the Michelson and Morley experiment (1,4) and their flawed null-result CS paradigm
- the resulting flawed Lorentz contraction paradigm (1,5)
- the inconclusiveness of the Eddington solar eclipse experimental results (1,6)
- the influence of the significant wobbling effect of our sun in the configuration of our planetary system on the so-called Mercury perihelion anomaly, as a plausible explanation of that anomaly (to be further looked into by experts and to be calculated on high end computers with high end software) (1,7)
- the feasibility of clocks in sync at any RV value (1,8)
- the possibility to measure RV while using a RVMD (1,9)

In Einstein’s thought experiment and from a RS point of view, the definition of the observer Observer1 to be “at rest” would only be true if the Observer1 would actually read $v_x=v_y=v_z=0$ from her/his RVMD1. Such is not the case in a real situation on our planet and a CPBD who would insist on claiming an "at-rest" situation for Observer1 along a real train track on our planet and moreover would insist on claiming that Observer1 would indeed observe the light flash A and the light flash B at the same time instance are simply forcing an illusion, which only exists in that CPBD's mind, upon reality. In the very same way as the CPBD's illusionary and theoretical MWF1 CS approach (1,8,9) which is totally countered by the real and experimental result shown in MWF2 (1-9). Consequently it is definitely necessary to introduce the RVMD device in the thought experiment of Einstein for both observers.

In Einstein's thought experiment involving a train compartment, the total aspect of location, time and velocity as a sequence of events is masked to many people, when staring at the graphical representation of the thought experiment, as a result of their perception of the (extremely high) speed of light but nevertheless the same reasoning and equations as in the example of the space ship are valid. The observer in the train compartment will simply register the lightning flash A (produced in location_A) later than the lightning flash B (produced in location_B) but, importantly, the train compartment and Obs2 will also no longer be present in location_M at the time instances of both meetings with the two lightning flashes. So CS and the CPBDs clearly face that problem in Einstein's thought experiment and moreover also the "glitch" problem, on top of that, with respect to the fact that Observer1, in reality, would not be at rest since travelling along with our planet.

The fact that Obs2 in the examples is able to calculate the RS coordinates and time instances of all events simply results from Obs2 having a full RVMD2 at her/his disposal and also a clock_2, which runs perfectly synchronous with the clock_1 of Obs1. It is thus possible to perceive this opportunity of the RVMD2 and the clock_2 from the perspective of the find of the “*missing equations*” in the CS models within the infinite number of relative inertial frames

(only existing in a human's mind as model tools) and relative values for v_{Ship}. Having an infinite number of relative inertial frames could be compared with an “underdetermined” (thus unsolvable) mathematical problem as a result of some missing crucial equations. But with the possibility to ultimately determine the RV by using the RVMD2 and to determine the time by using the clock_2, that “underdetermined” situation vanishes totally and as a result, the special relativity concept involving e.g. the flawed Lorentz contraction and relativity of simultaneity becomes obsolete and irrelevant (moreover flawed) for correctly modelling the real events.

Moreover, in (1,9) (and at the website) the importance of MWF11 is highlighted and explained. My claim "*In (any of the) the contemporary mathematical reference frames it is even impossible to graphically represent correctly a photon’s past location in RS in a reference frame, linked to an observer such as Obs2 moving in RS*" should in that respect be recognized by CS. MWF11 points to the need of a completely different modeling approach in the mathematical (thus virtual) reference frames which are used by the human mind as mathematical tools in trying to model as accurately as possible real photon events occurring in RS. In such mathematical modeling approach by the human mind it is key to save the phenomena of the real photon events occurring in RS. In (1,9) it is also explained from MWF11 (based on photons) and the preceding figures that the constant velocity of light (photons) in RS indeed can be considered as to be saved in the Obs1 and Obs2 reference frames but only on a completely different reasoning basis when compared to the flawed reasoning by Einstein and Lorentz with respect to the special relativity "reference model" approach. Therefore Einstein's postulate about the constant velocity of light in any inertial reference frame is wrongly defined, thereby causing the creation and existence of multiple flawed CS paradigms based on light. When reasoning on the basis of photons, those inconsistencies within the CS paradigms approach becomes very clear. It is therefore very peculiar in that respect that Einstein did not use at all the photon approach in his thought experiment. Einstein received a Nobel Prize on the basis of his very early work on the photoelectric effect by which he proved light to be build from quanta (photons). What would have been the outcome of his reasoning when on the basis of photons...?

CS uses reference frames and mathematical models very successfully on a daily basis, in scientific research and engineering applications. I myself used mathematical modelling frequently as illustrated here, merely as one/an arbitrary example:

E. Brauns, *Finite elements-based 2D theoretical analysis of the effect of IEX membrane thickness and salt solution residence time on the ion transport within a salinity gradient power reverse electrodialysis half cell pair*, Desalination and Water Treatment, 51 (2013) 6429–6443, http://dx.doi.org/10.1080/19443994.2013.807905.

CPBDs however should be aware of the fact that mathematical modelling and mathematical reference frames (of whatever type in CS) are linked to a virtual approach by the human mind, whatever the degree of success in specific cases/areas. However, it is clear that a real photon only travels in reality in RS and any modelling of a photon's real trajectory in RS in any CS type of virtual mathematical reference frame is a modelling attempt of the human mind in a virtual space, only existing in the human mind. The prime demand in that modelling attempt by the human mind is that the real photon phenomena are saved in the mathematical model. The publications (1-9) and this publication show that such attempt by the human mind with respect to multiple CS paradigms was flawed and that the real photon phenomena were not saved at all. Some CPBDs even mix up the virtual (3D) mathematical space with RS or other

CPBDs believe that e.g. the Einstein-Minkowski space-time approach is linked to a 1-to-1 correspondence with "RS". However, the experimental result shown in MWF2 is a major Popper type of experimental falsification of the Lorentz contraction paradigm and multiple other CS paradigms based on light (1-9) and therefore even also a falsification of special relativity. The resulting MWF2 from the straightforward laser experiment is simply a massive anomaly with respect to multiple CS paradigms based on light. That anomaly definitely will, at some point in the future, eradicate those flawed and multiple CS paradigms according to the paradigm shift processes described by Thomas Kuhn. Therefore again, a call here for an independent re-performing of that type of laser experiment by a research centre or university.

3. Conclusions

In this publication, Einstein's "relativity of simultaneity" paradigm is shown to be flawed. In the project, being indicated at ResearchGate as "*Karl Popper's type of falsification, through theoretical and experimental anomalies, of multiple contemporary paradigms based on light phenomena*", this publication thus complements the series of publications (1,4-5,8,9) on flawed CS paradigms. From the information within these publications CS should urgently reconsider all those flawed CS paradigms after re-performing independently a straightforward laser experiment(1,3). The latter is an experiment which was already executed several years ago, published in a patent text, at the website and in the extended publication (1) (a result was/is shown in MWF2). An independent re-performing at a university or research centre of that laser experiment was suggested numerous times at the website and in the publications (1,4-5,8,9), but still not re-performed yet independently by CS up to now. An independent confirmation of the result of such type of laser experiment will evidently start the paradigm shift type of processes, as described by Thomas Kuhn, and will then cause the eradication of multiple and specific CS paradigms based on light (1,4-5,8,9). Also multiple important applications on our planet and in space will become feasible from the multiple paradigm shifts involved.