The Modern Michelson Morley experiment needs to be revised concerning its counter frequency acquisition setup and by this way it could check both classic not relativistic prediction and the one from "The New Galilean paradigm".

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Modern Michelson Morley experiment can be used to test both the classic Stokes - Planck and the New Galilean Age paradigm views for entrained ether theory. These two approaches lead to a significant different quantitative prediction of the expected beat frequency modulation from the (adapted to crossed resonators) laser couple beams interference. The modulation is due to variation of the two way light velocities module difference between the crossed resonators orthogonal directions. The modulation to nominal laser frequency ratio prediction is apparently falsified by Modern Michelson-Morley experiment negative outcome in highly rarefied gases that actually pulls its detection limit till 10^{-17}*. This detection ability is criticized by present author. Moreover an improved frequency counter acquisition setup inside Modern Michelson-Morley experiment is proposed in order to detect the beat frequency modulation. This change will allow determine the better prediction among the one offered by Stokes – Planck classic view and the one by the New Galilean Age paradigm.*

The two predictions of the expected beat note modulation coming from the modern Michelson Morley apparatus due to variation of the two way light velocities module difference between the crossed resonators orthogonal directions (the first by classic Stokes-Planck theory and the second by New Galilean paradigm, both pursuing the entrained ether view) are here below presented and compared. The modern MM apparatus [1] built by two orthogonal slowly rotating identical resonators each one coupled with a laser source stabilized with its cavity is considered.

Classic Stokes-Planck entrained ether theory.

Given New Michelson Morley apparatus, $c2$ / $c1$ are the two way light velocities that hold along each resonator as seen by a reference frame fixed with the resonators, *L1 /L2* are the resonators length, $T2/T1$ are the 2 way transit time of light along the resonators and therefore their inverse $\gamma2/\ \gamma1$ are the resonators fundamental resonant frequencies.
Classic approach shows that variations $\Delta c2$ and $\Delta c1$ due to New Michelson Morley orthogonal resonators apparatus [1] small rotation around a vertical axis centered on resonators crossing point in presence of ether drift are proportional to $\Delta\gamma2$ and $\Delta\gamma1$ that are the resonators fundamental frequencies modulation caused by ether drift that is practically

evaluated by stabilizing two Nd:YAG lasers to the resonators cavities and mixing the lasers stabilized frequencies G1and G2 in the way that will be shown hereafter:

$$c1 = \frac{2L1}{T1} = 2L1 * \gamma 1, c2 = \frac{2L2}{T2} = 2L2 * \gamma 2.$$

Let consider the mentioned variation$\Delta c2$ and $\Delta c1$ in respect nominalc2 / c1:

$$\frac{\Delta c2}{c2} = \frac{\Delta \gamma 2}{\gamma 2} \quad (1)$$

$$\frac{\Delta c1}{c1} = \frac{\Delta \gamma 1}{\gamma 1} \quad (2)$$

Due to the fact Nd:YAG lasers are stabilized to the resonators cavities, then their frequencies are (being α1 and α2 the stabilization integers):

$$G2 = \alpha 2 * \gamma 2 \quad (3)$$

$$G1 = \alpha 1 * \gamma 1 \quad (4)$$

It follows from (1) and (3) and from (2) and (4):

$$\frac{\Delta c2}{c2} = \frac{\Delta G2}{G2} \qquad \frac{\Delta c1}{c1} = \frac{\Delta G1}{G1} \quad (5)$$

Due to the fact $\frac{c2}{c1}$ and $\frac{G2}{G1}$ ratios are both ~ 1, then:

$$\frac{\Delta(c2-c1)}{c1} = \frac{\Delta G2}{G2} * \frac{c2}{c1} - \frac{\Delta G1}{G1} \cong \frac{\Delta(G2-G1)}{G1} \quad (6)$$

The relation (6) shows that it is possible to detect the variation of the two way light speeds difference (due to ether drift) $\Delta(c2-c1)$, normalized to nominal two way light speed, in terms of the laser frequencies beat note variation $\Delta(G2-G1)$ normalized to the nominal laser frequency. This is really better than detecting $\frac{\Delta(c2-c1)}{c1}$ as $\frac{\Delta(\gamma 2-\gamma 1)}{\gamma 1}$ thanks to same approximation approach but starting from (1) and (2). The advantage is due to G1 >> γ1 so that the same $\frac{\Delta(c2-c1)}{c1}$ ratio can be inspected through most easy evaluation of higher lasers beat note variation (with respect the lower variation that needs to be appreciated taking directly the resonators beat note).

It is now explicated the dependence of (6) upon ether drift intensity. Afterward the specific ether drift case ($v = 470m/s$ that insists at equator according to the entrained ether hypothesis that locates ether frame at rest with our planet center of mass) will be adopted.

If the first resonator is generically inclined by a ϑ angle with respect the direction of ether flow (and this flow direction coincides with x axis of a reference system **S**(x,y) at rest with ether and with positive x versus according to resonator motion$v$), then the x velocity component of the light beam travelling inside resonator (and being this velocity component according to x axis versus) will be:

$$\text{vxforth1} = v\sin^2\vartheta + \cos\vartheta * \sqrt{c^2 - (v\sin\vartheta)^2} \qquad (7)$$

The same light beam velocity component along the y axis (and according to its positive versus chosen to agree with considered beam motion) will be:

$$\text{vyforth1} = \sqrt{c^2 - (\text{vxforth1})^2} \qquad (8)$$

The conditions (7) and (8) ensure the light beam to reach the opposite resonator side without exiting out the resonator while both the resonator and the light beam are moving as seen by the reference system at rest with ether.

The following analogous conditions hold to ensure the reflected beam (oriented against x and y axis and back to the first resonator side) still keeps inside the travelling resonator:

$$\text{vxback1} = v\sin^2\vartheta - \cos\vartheta * \sqrt{c^2 - (v\sin\vartheta)^2} \qquad (9)$$
$$\text{vyback1} = \sqrt{c^2 - (\text{vxback1})^2} \qquad (10)$$

Let now move to the reference **S'**(x', y'), (parallel to x,y), but at rest with the resonator this time ($-v$ is the ether drift along x' axis).

$$\text{vxforth1}' = v\sin^2\vartheta + \cos\vartheta * \sqrt{c^2 - (v\sin\vartheta)^2} - v \qquad (11)$$
$$\text{vyforth1}' = \text{vyforth1} \qquad (12)$$
$$\text{vxback1}' = v\sin^2\vartheta - \cos\vartheta * \sqrt{c^2 - (v\sin\vartheta)^2} - v \qquad (13)$$
$$\text{vyback1}' = \text{vyback1} \qquad (12)$$

$$\text{vforth1}' = \sqrt{\text{vxforth1}'^2 + (\text{vyforth1}')^2} \qquad (13)$$
$$\text{vback1}' = \sqrt{\text{vxback1}'^2 + (\text{vyback1}')^2} \qquad (14)$$

From (13) and (14) it is possible to evaluate the γ1 value already considered into (2):

$$\gamma 1(\vartheta) = \frac{1}{\frac{L1}{\text{vforth1}'} + \frac{L1}{\text{vback1}'}} \qquad (15)$$

To get the γ2value for the second resonator, (being orthogonal to the first one is inclined by a ϑ+ $\pi/2$angle with respect the direction of ether flow), the same machinery is adopted but changing ϑ to ϑ+ $\pi/2$ into equations (7) to (14) and adopting suffixes 2/2' in place of 1/1'. At the end the new equations set leads to:

$$\gamma 2(\vartheta + \pi/2) = \frac{1}{\frac{L2}{\text{vforth2}'} + \frac{L2}{\text{vback2}'}} \qquad (16)$$

Next step is to evaluate α1 and α2 lasers stabilization integers into (3) and (4). It is necessary to start from lasers nominal frequency G and divide it by γ1 and γ2 to find out two appropriate decimal values. Each of them must be approximated to the nearest integer in order to determine α1 andα2. Afterward through (3) and (4) it is possible to determine

G1 and G2 adapted laser frequencies whose modulation is in turn driven by γ1 and γ2 modulations along their variable ϑ position as here below restated:

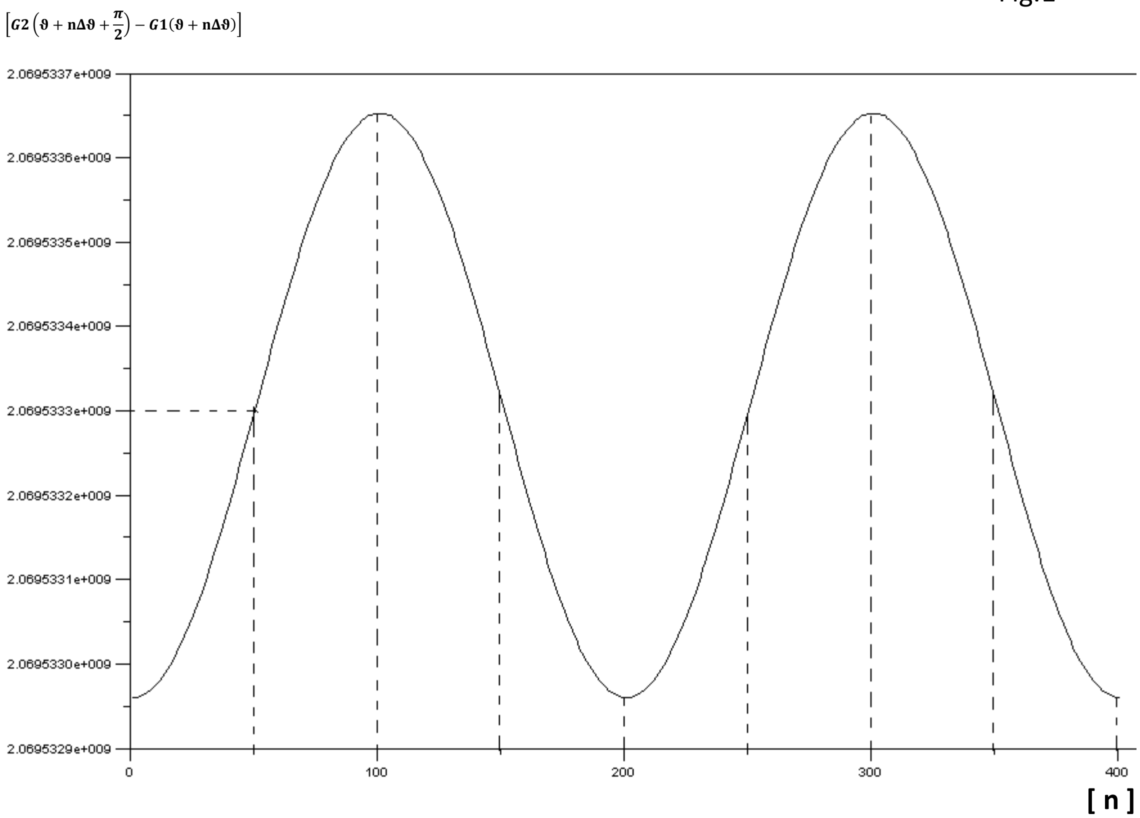
$$G1(\vartheta) = \alpha 1 * \gamma 1(\vartheta) \quad (17)$$
$$G2(\vartheta + \pi/2) = \alpha 2 * \gamma 2(\vartheta + \pi/2) \quad (18)$$

Definitively the numerator of (6) ratio can be found out as ϑ and $\Delta\vartheta$ function:

$$\Delta[G2\left(\vartheta + \frac{\pi}{2}\right) - G1(\vartheta)] = \left[G2\left(\vartheta + \Delta\vartheta + \frac{\pi}{2}\right) - G1(\vartheta + \Delta\vartheta)\right] - [G2\left(\vartheta + \frac{\pi}{2}\right) - G1(\vartheta)] \quad (19)$$

The author has numerically evaluated $\left[G2\left(\vartheta + n\Delta\vartheta + \frac{\pi}{2}\right) - G1(\vartheta + n\Delta\vartheta)\right]$ lasers beat note with $\vartheta = 0$ and $\Delta\vartheta = 2\pi/400$. For a total of 400 equally spaced steps of 2π (from n=1 to n=400) using the machinery listed from (7) to (18) and has plotted the whole 400 steps (one complete 2π rotation of the New Michelson Morley equipment):

Fig.1



The above graph has been computed by adopting the same resonators (declared in [1] Herrmann article) length mismatch (L2-L1 is less than 3 um with L1=0.055m) and the same lasers nominal wavelength (1064nm≅281Thz) and with ether drift $v = 470m/s$ that insists at equator according to the entrained ether hypothesis. The expected adapted to resonator cavities lasers beat note mean value is in agreement with the one declared into the article (2 Ghz versus around $<$ 2 Ghz declared).

In [1] article it has been specified that the frequency counter gate time (the programmed frequency counter acquisition time of the input frequency to be measured that is G2-G1 beat note) has been set to be 1s. This choice has been adopted in order to fully use the potential frequency counter 12 digits resolution. The upper digit is dedicated to Ghz, the lower digit is dedicated to cents of Hertz. By this way it has been considered that the better achievable sensitivity for (6) ratio becomes:

$$\frac{\Delta(\mathrm{c2}-\mathrm{c1})}{c1} \cong \frac{\Delta(\mathrm{G2}-\mathrm{G1})}{\mathrm{G1}} = \frac{10^{-2}}{281*10^{12}} \cong 3*10^{-17} \quad (20)$$

This sensitivity is pulled till10^{-17}, thanks an average got over tons of measurements extended for 1 year in the meantime the equipment continuously rotate at about 45s / lap.

Due to perfectly zero detection of $\Delta(\mathrm{G2}-\mathrm{G1})$, Herrmann conclusion is that light anisotropy (if exists) has been pulled beyond 10^{-17}. This result has been recently used by Levy to disqualify Entrained Ether View in favor of NEAT (Not Entrained Ether Theory) [2].

By the way author above simulation shows that 1s acquisition time is an unfortunate choice in order to check entrained ether hypothesis. It is straightforward noting that 1s consumes 400/45≅8.8 points on the x axis of above graph. Consider this 8.8 points window is centered about n=50 (here resonators are equally displaced one at$\pi/4$, the other at $3\pi/4$ with respect ether direction so that modulation rate is maximum), this implies a 97Hz modulation drift during frequency acquisition (Fig.1 modulation peak to peak is 692Hz). This is randomizing counter frequency digits content even till hundreds of Hertz included so that hundreds of Hertz escalation detection is doubtful. It can be argued that the Khz is the first digit to be almost completely stable in presence of 97Hz drift but as it is possible to see in Fig.1 it is also the less significant digit to not change in between the modulation peaks. Also centering the 8.8 window points near the modulation peaks the situation does not improve due to the tradeoff that exists between modulation drift during acquisition (here it goes better because it reduces) and modulation velocity (here it is bad for modulation detection purposes because it becomes less appreciable).

Author conclusion is actual frequency counter gate time setting (1s) cannot guarantee less than order of Khz modulation resolution due to mentioned tradeoff (to be divided by laser G1 nominal frequency to get 10^{-11} limit for light speed anisotropy investigation that is very much higher than claimed$3*10^{-17}$before averaging). And this limit is just one magnitude order higher than the one needed to detect modulation escalation predicted by simulation.

The author suggests diminishing the frequency counter gate time from actual 1s till 1ms. This cuts the counter frequency resolution from cent of Hertz to about tens of Hertz. But the acquisition time of 1ms means to suffer only of around 0.1 Hertz modulation drift (in place of previous 97Hz). This jeopardizes at most only tenth of Hertz digit. Tens of Hertz and hundreds of Hertz digits surely can follow very well the escalation of the central part of modulation ramp.
By this way the famous light anisotropy investigation limit is improved from 10^{-11} (as above mentioned this is realistically achievable with 1s acquisition time) to 10^{-13}(because 1ms acquisition time guarantees detection till tens of Hertz). This frequency counter setup

change would be very interesting in order to challenge the classic Stokes-Planck theory in regards entrained ether.

The entrained ether theory interpreted with The New Galilean paradigm.

It is presented now a new way to interpreter the Stokes-Planck entrained ether theory. It adopts the New Galilean paradigm that has been developed by current author and accessible for a short synthesis or for an analytical presentation at [3a] and [3b]:

In short the Galilean relativism of any inertial reference frame causes an unacceptable deprivation of the essence of Energy. The New Galilean paradigm to correct this makes the following assumptions: a natural ***Absolute Privileged Reference Frame (System S)*** *is supposed to permeate the universe but without being the solely authorized to host the isotropic propagation of light. A corrective coefficient (into Galilean time transform equation) accounts to regulate the proper time dilatation of particles in absolute motion with respect it. This is enough to restore the absolute essence of Energy, it explains the proved retardation of moving clocks and also the mysterious cosmological phenomena regarding intrinsic quantized red shift in terms of linear progression of quantized absolute velocities. MM and Sagnac experiment outcomes are interpreted by use of this Inertial Galilean model and by the introduction of an innovative Local Ether Theory that holds for any kind of emitted particles from photons to macromolecules.*

The new Galilean transformations (Inertial Galilean model) are the following and will be soon used to calculate the beat note between crossed resonators frequencies in the new Galilean context:

$z' = z$
$y' = y$
$x' = x - vt$ Galilean equations
$t' = e^{-kv/c}\, t$ Inertial equation (21)

Where:
v is velocity module of inertial system S′(x′,t′) as seen by **inertial system S(x,t) that is Privileged**. There is no limit to v value.

c is the **S(x,t)** isotropic light velocity module. Isotropic light velocity can be detected by system **S(x,t)** provided the photons are emitted by a mass at rest with S itself and sufficiently far away by other masses in motion with respect **S**.

k=3.3648219 (1% tolerance error) is the value able to fit the experimentally proved life elongation of muons circulating at 0.9994c into CERN accelerator ring in 1977 performed experiment (it was exactly 28.87 times the value owned when they were at rest with the laboratory). Mentioned tolerance error is due to unknown Privileged System velocity module (the one seen by terrestrial laboratory instantaneous inertial system). It is assumed to lie in between 0 and 500km/s. (Refer to [3b] chapter 5 for k coefficient estimation).

Let briefly go through the chain frequency/energy/mass to show the mass dependence upon its velocity module as seen by Privileged System. The Compton frequency γ of a general rest particle (with respect Privileged System) is linked to the particle intrinsic energy content (it will be called the particle Compton rest energy) by the quantum mechanics relation:

$$E = h\gamma \tag{22}$$

Where h is the Planck constant. Let now introduce $E = mc^2$ relation firstly discovered by Maxwell in second half of XIX century by use of his homonymous electromagnetic equations [4]. He calculated the wave pressure exercised on an absorbing body and the momentum transferred from the wave to the body. Afterward he turned into equivalent mass at c speed the gained momentum retrieving in this way the famous equality.
The relation between a general particle rest mass (with respect Privileged System S) and its rest (or intrinsic) Compton frequency is given by:

$$\mathrm{m} = \frac{\mathrm{h}\gamma}{c^2} \tag{23}$$

c is the light isotropic value that holds for Privileged System that is also assumed to practically coincide with terrestrial lab measured one due to the +1% error accounted for coefficient k=3.3648219 into IG model inertial equation that includes the supposed very limited speed of terrestrial lab as seen by Privileged System. This supposition causes also c value to be well approximated by the terrestrial measured two ways light speed.
The mass of a particle travelling at v (as seen by Privileged System) results to be (due to IG model inertial equation that reduces γ frequency observed by Privileged System when the particle is not at rest with it to account for quantum interactions that slow the observed particle frequency the more is its absolute velocity, see also [3b] chapter 8):

$$\mathrm{m}(v) = e^{-\frac{kv}{c}} * \frac{\mathrm{h}\gamma}{c^2} = e^{-\frac{kv}{c}} * \mathrm{m} \tag{24}$$

It is interesting to calculate the physical kinetic work executed on a particle (initially at rest with Privileged System that also coincides with detecting inertial system to make things not ambiguous) by an external force that acts on it. Let write the net acceleration of the particle subjected to this external force:

$$F = \frac{\mathrm{d}v}{\mathrm{dt}} * m(v) \tag{25}$$

F is the external force, $m(v)$ the particle mass and $\frac{\mathrm{d}v}{\mathrm{dt}}$ is the net acceleration.
The mentioned work executed by F is using (13):

$$\mathcal{L} = \int_0^l F ds = \int_0^l m(v) * \frac{\mathrm{d}v}{\mathrm{dt}} ds \tag{26}$$

Where 0 is the place where the external force starts to act and l is the final application place. Now, $\frac{\mathrm{d}s}{\mathrm{dt}} = v$ and using (26) then:

$$\mathcal{L} = \int_0^l F ds = \int_0^{v1} m * e^{-\frac{kv}{c}} * v * dv \tag{27}$$

The integral in dv can be calculated through integration by parts. For instance a photon is chosen (because in Galilean paradigm photons behave exactly like generic particles), being its rest Compton energy given by (22) where the appropriate γ is the photon Compton frequency that is observed by Privileged System when the photon is still at rest with it. Under these conditions and using (23) the integral evaluation between 0 and c leads to:

$$\mathcal{L} \simeq 0.075 * \mathrm{h}\gamma = 0.075 * \mathrm{m}c^2 \qquad (28)$$

The (28) shows the correct kinetic work in function of the photon rest Compton frequency / mass because they diminish with the photon speed increase (as seen by Privileged System). The final mass value is calculated from (24) with v=c:

$$\mathrm{m(c)} = \mathrm{m} * e^{-k} = \mathrm{m} * 0.0345682 \qquad (29)$$

or, by mean of (10) and (11) intended for $\mathrm{m(c)}$ and $\gamma(\mathrm{c})$:

$$\mathrm{m(c)} = \frac{\mathrm{h}\gamma(\mathrm{c})}{c^2} = \mathrm{m} * 0.0345682 \qquad (30)$$

This implies:

$$E(c) = h\gamma(\mathrm{c}) = \mathrm{m} * c^2 * 0.0345682 = h\gamma * 0.0345682 = E * 0.0345682 \qquad (31)$$

An enormous part of the particle rest Compton Energy (22) disappears when the photon (or generic particle) velocity reaches the c value due to quantum interaction with Privileged System skeleton. At every Δv increase a corresponding ΔE is released to the Privileged System skeleton. This is the amount of interaction energy released by a particle that is pushed from v=0 to v=c:

$$E\mathrm{int} = E - E(\mathrm{c}) = E * (1 - 0.0345682) = \mathrm{h}\gamma * (1 - 0.0345682) = \mathrm{h}\gamma * 0.96543 \qquad (32)$$

To be remarked again that this happens thanks to kinetic work (28) spent by external force to bring the particle to c speed (the kinetic work is released by external force to the particle while the above interaction energy is released by the particle to the Privileged System skeleton).

If the particle (now running at c speed because a photon has been considered) is halted by another external force that acts this time against it, then the kinetic work (this time released by the particle to the new external force) is still exactly given by (28). Instead the interaction energy is this time sent back by Privileged System to the particle that sees its Compton Energy to be gradually restored till the original rest Compton Energy (22). In other words the part retrieves its rest mass / Compton Energy.

It is still needed to present another Galilean postulation before to proceed with the crossed resonators beat note calculation with the new Galilean paradigm.

The classic physical model is forced to consider that photon rest mass / energy is null (by the way this limit is pulled in by the relativistic theory whose model claims a particle mass should increase till infinite to reach the speed of light unless the particle rest mass is zero).

So generally shared view says that, upfront an electronic transition energy Et inside atomic orbitals, the emitted photon acquires exactly this energy. So its relation between proper energy Et (entirely acquired from electronic transition) and proper (fixed) Compton frequency results to be:

$$Et = h\gamma \tag{33}$$

By the way the New Galilean model theory estimates the following relation linking electronic transition energy Et and photon proper (rest) Compton frequency γ because Et provides the energy to create the rest photon inside atomic orbitals plus the kinetic work (28) to build the isotropic speed component c as evaluated by the Privileged System reference:

$$\mathrm{Et} = \mathrm{h}\gamma + 0.075 * \mathrm{h}\gamma = 1.075 * \mathrm{h}\gamma \tag{34}$$

It must be considered that (34) holds without ambiguities if atomic orbital is in turn at rest with Privileged System.

So the kinetic work causes the photon to gain its isotropic speed component. But to avoid any fictitious work misinterpretation let insist in considering the reference frame adopted to recognize the light speed components (the isotropic and the eventual anisotropic one) to be the Privileged System.

The work to add the anisotropic speed component (in case it exists due to some surrounding atoms influence that is in practical terrestrial case our whole planet mass influence) detected by the same Privileged observer is gained or released by mentioned surrounding atoms cooperation on the photon once it is sent out by the emitting atom orbital with only isotropic speed component. This is the Local Ether Theory paradigm, for deeper inside refer [3b] chapter 3 otherwise [3a] first paragraphs.

Now it is possible to come back to orthogonal resonators new MM experiment.

Each exciting laser sends photons through the semitransparent edge of its adapted (external) resonant cavity. Every photon emitting atom, lying into the internal proper laser cavity (that is embedded inside the laser itself), makes an energetic transition of Et energy. It is possible to consider that the laser and all the slow rotating new MM machinery is practically at rest with Privileged System as included into Galilean model K coefficient tolerance error [3b].
Mentioned tolerance error is due to unknown Privileged System velocity module (the one seen by terrestrial laboratory instantaneous inertial system that hosts new MM equipment).

Under this condition the emitting atom energetic transition is transformed into new born emitted photon rest (with Privileged System) Compton Energy $\mathrm{h}\gamma$ plus the kinetic work that occurs to build the photon isotropic velocity component. This leads to following equality:

$$\mathrm{Et} = \mathrm{h}\gamma + \frac{\mathrm{h}\gamma}{c^2}\int_0^c e^{-\frac{kv}{c}} * v * dv = \mathrm{h}\gamma(1 + \frac{1}{c^2}\int_0^c e^{-\frac{kv}{c}} * v * dv) \quad (35)$$

Upon rearranging terms (35) leads for emitted photon rest Compton frequency to:

$$\gamma = \frac{\mathrm{Et/h}}{1+1/c^2\int_0^c e^{-\frac{kv}{c}} * v * dv} \quad (36)$$

But the photon is emitted in presence of surrounding atoms influence. As seen by a detecting system at rest with new MM crossed resonators (that for practical purposes it is assumed to coincide with Privileged System), these surrounding atoms cooperate to absorb or to release a kinetic work from/to the emitted photon in order the constant absolute ether velocity v is sum up (by mean of a vector addition) to the instantaneous isotropic component$c$ in a way that depends by the new MM platform angular displacement ϑ (with respect ether direction) during its slow rotation. (v is the drift of surrounding atoms center of mass perceived by mentioned detecting system as by Local Ether Theory [3a]).

It is clear that choice to coincide Privileged System with instantaneous crossed resonators position is instrumental. It has been made to fix things. But "k" coefficient 1% indetermination into (21) legitimates as well other choices (among them to link Privileged System with ether frame). The other choices would lead (27) or (35) to ambiguous meaning (energy must be evaluated by Privileged System frame). However next pages relations should be intended, under these other possible hypothesis, to hold between light beam perceived velocities and perceived resonant frequencies. They keep their validity even in a not privileged frame simply because perceived resonant frequencies depend by perceived velocities. (velocities and frequencies miss their absolute value and become "perceived" when they are appreciated by a generic inertial reference frame as it is for the case of our experiments and daily life, the important thing is to consider that the relation (24) is transformed accordingly to (21) Galilean equations).

Now it is possible to reuse the same machinery previously retrieved referring to **S'**(x',y') system at rest with first and second new MM resonators (again here it represents also Privileged System or any other inertial system). This machinery leads to (13) and (14) that are light beam forth and back velocities for first resonator displaced by ϑ with respect ether direction. These velocities are predicted in the same way by the chosen paradigm (classic or New Galilean Age).

But due to (24) emitted photon travelling Compton frequencies seen by **S'** for the forth and back light beam cases are ($\gamma 1$ is taken specializing (36) for the first resonator and $\mathrm{vforth1}'$and $\mathrm{vback1}'$ comes from (13) and (14)):

$$\gamma\mathrm{forth1} = \gamma 1 * e^{-\frac{k*\mathrm{vforth1}'}{c}} \quad (37)$$

$$\gamma\mathrm{back1} = \gamma 1 * e^{-\frac{k*\mathrm{vback1}'}{c}} \quad (38)$$

The first resonator fundamental rest resonant frequency $\gamma 1$ can be retrieved solving the following equality that states the resonant condition: the forth travelling wave phase delay plus back travelling wave phase delay is exactly equal to2π.

$$2\pi * \gamma\text{forth1} * \frac{L1}{\text{vforth1}'} + 2\pi * \gamma\text{back1} * \frac{L1}{\text{vback1}'} = 2\pi \quad (39)$$

Using (37) and (38):

$$\gamma 1 * e^{-\frac{k*\text{vforth1}'}{c}} * \frac{L1}{\text{vforth1}'} + \gamma 1 * e^{-\frac{k*\text{vback1}'}{c}} * \frac{L1}{\text{vback1}'} = 1$$

$$\gamma 1(\vartheta) = \frac{1/L1}{\left(\frac{e^{-\frac{k*\text{vforth1}'}{c}}}{\text{vforth1}'} + \frac{e^{-\frac{k*\text{vback1}'}{c}}}{\text{vback1}'}\right)} \quad (40)$$

Adopting the same procedure with the second resonator it is possible determining$\gamma 2$:

$$\gamma 2(\vartheta + \pi/2) = \frac{1/L2}{\left(\frac{e^{-\frac{k*\text{vforth2}'}{c}}}{\text{vforth2}'} + \frac{e^{-\frac{k*\text{vback2}'}{c}}}{\text{vback2}'}\right)} \quad (41)$$

As it was done for the classic approach it is now time to evaluate $\alpha 1$ and $\alpha 2$ lasers stabilization integers into (3) and (4). But here it is necessary to start from lasers nominal rest frequency G and divide it by $\gamma 1$ and $\gamma 2$ to find out two appropriate decimal values.

It must be noted that the best approximation that has been used by the author for laser nominal rest frequency is G=Gte^k. Being Gt the nominal 1064nm frequency considered in the classic theory for the travelling wave.*

Each of the decimal values must be approximated to the nearest integer in order to determine $\alpha 1$ and$\alpha 2$. Afterward through (3) and (4) it is possible to determine G1 and G2 adapted laser rest frequencies whose modulation is in turn driven by $\gamma 1$ and $\gamma 2$ modulations along their variable ϑ position as here below restated:

$$G1(\vartheta) = \alpha 1 * \gamma 1(\vartheta) \quad (42)$$
$$G2(\vartheta + \pi/2) = \alpha 2 * \gamma 2(\vartheta + \pi/2) \quad (43)$$

The variation of the (42) and (43) difference is:

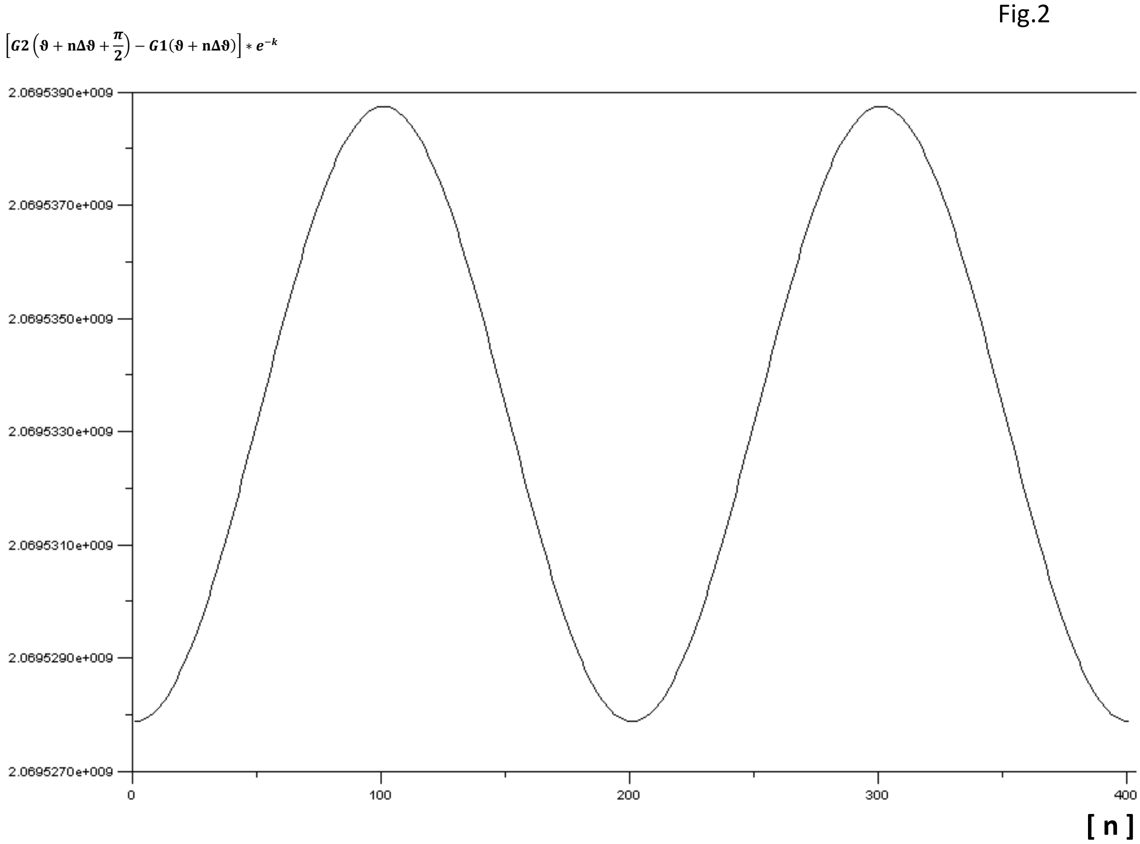
$$\Delta\left[G2\left(\vartheta + \frac{\pi}{2}\right) - G1(\vartheta)\right] = \left[G2\left(\vartheta + \Delta\vartheta + \frac{\pi}{2}\right) - G1(\vartheta + \Delta\vartheta)\right] - \left[G2\left(\vartheta + \frac{\pi}{2}\right) - G1(\vartheta)\right] \quad (44)$$

It is still needed to multiply (44) by the e^{-k} constant to get the exact numerator of the (6) ratio.

This operation defines the variation of the lasers adapted travelling frequencies difference. In fact the travelling waves are the ones that physically interact at the photodiode producing their circuital beat note measured by the new MM experiment:

The author has numerically evaluated $\left[G2\left(\vartheta + \mathrm{n}\Delta\vartheta + \frac{\pi}{2}\right) - G1(\vartheta + \mathrm{n}\Delta\vartheta)\right] * e^{-k}$ lasers beat note with $\vartheta = 0$ and $\Delta\vartheta = 2\pi/400$. For a total of 400 equally spaced steps of 2π (from n=1 to n=400) using the machinery listed from (7) to (14) and from (40) to (44) and has plotted the whole 400 steps (one complete 2π rotation of the New Michelson Morley equipment):

Fig.2



The above graph has been computed by adopting the same resonators (declared in [1] Herrmann article) length mismatch (L2-L1 is less than 3 um with L1=0.055m) and the same lasers nominal travelling wavelength (1064nm≅281Thz) and with ether drift $v = 470m/s$ that insists at equator according to the entrained ether hypothesis. The expected adapted to resonator cavities lasers beat note mean value is in agreement with the one declared into the article (2 Ghz versus around $<$ 2 Ghz declared). The difference between classic graph (Fig.1) and this one (Fig.2) lies in a higher peak to peak variation (10860Hz versus 692Hz) and it is straightforward noting that 1s still consumes 400/45≅8.8 points on the x axis of (Fig.2) graph. Again consider this 8.8 points window is centered about n=50 (here resonators are equally displaced one at$\pi/4$, the other at $3\pi/4$ with respect ether direction so that modulation rate is maximum), this implies a 1530Hz modulation drift during frequency acquisition. (against 97Hz with classic model prediction). Value of peak to peak variation divided by mentioned drift is anyway common to both classic and new Galilean model (its value=7 and this is due to same sinusoidal modulation period).

Also using New Galilean paradigm author Fig.2 simulation demonstrates that 1s acquisition time is an unfortunate choice in order to check entrained ether hypothesis. The 1530Hz drift is randomizing counter frequency digits content even till Khz included so that Khz escalation detection is doubtful. Also centering the 8.8 window points near the modulation peaks the situation does not improve due to the tradeoff that exists between modulation drift during acquisition (here it goes better because it reduces) and modulation velocity (here it is bad for modulation detection purposes because it becomes less appreciable).

Author conclusion is actual frequency counter gate time setting (1s) cannot guarantee less than order of about Khz tens modulation resolution due to mentioned tradeoff (to be divided by laser G1t travelling frequency to get 10^{-10} limit for light speed anisotropy investigation that is several magnitude orders higher than claimed$3 * 10^{-17}$ before averaging). And this limit is still one magnitude order higher than the one needed to detect modulation escalation predicted by simulation.

The author suggests diminishing the frequency counter gate time from actual 1s till 1ms. This cuts the counter frequency theoretical resolution from cent of Hertz to about tens of Hertz. But the acquisition time of 1ms means to suffer only of around 1.5 Hertz modulation drift (in place of previous 1530Hz). This jeopardizes only Hertz digit at most. The upper ones till Khz digit (3 positions upper) surely can follow very well the escalation of the central part of modulation ramp.
By this way the famous light anisotropy investigation limit is improved from 10^{-10} (as above mentioned this is realistically achievable with 1s acquisition time) to 10^{-13}(because 1ms acquisition time guarantees detection improvement till about tens of Hz). This frequency counter setup change would be very interesting in order to challenge the New Galilean paradigm in regards entrained ether.

To wrap up the above considerations, these are the author points and suggested improvements about Modern MM experiment executed by Herrmann [1].

- Actual frequency counter setup is degrading theoretical $3 * 10^{-17}$ detection limit before averaging for $\frac{\Delta(\mathrm{c2}-\mathrm{c1})}{c1} = \frac{\Delta(\mathrm{G2}-\mathrm{G1})}{\mathrm{G1}}$ ratio (this limit should be guaranteed by 1s frequency counter acquisition time but only if not disturbed by modulation drift itself caused by MM equipment slow and continuous rotation). The reasonable realistic detection limit imposed by modulation drift during acquisition becomes 10^{-11} for classic theory and 10^{-10} for New Galilean paradigm.
- Above realistic and less favorable detection limits prevent both theories to be checked due to $\Delta(\mathrm{G2}-\mathrm{G1})$ being not enough appreciable along the path between modulation peaks (classic theory would need at least10^{-12} detection capability while New Galilean would need at least10^{-11}).
- A change of frequency counter acquisition setup from 1s to 1ms is suggested. Even if this deteriorates the theoretical detection limit from $3 * 10^{-17}$ to$3 * 10^{-14}$ (both before averaging), it permits reliable detection of $\Delta(\mathrm{G2}-\mathrm{G1})$ along the path between

modulation peaks due to one thousand less modulation drift during acquisition. Under this new and most favorable condition classic theory foresees 10^{-13} realistic detection capability. Also New Galilean paradigm foresees 10^{-13} realistic detection capability. This new capability will be now more than enough to separately check both theories (see their requirements in the second bullet here above). So, depending by New MM experimental results that will come with the new setup, it would be possible to:

- Falsify both theories (in case of no detection of escalations at all in the range from Hz tens till Khz digits).
- Falsify classic theory and promote New Galilean paradigm (in case of detection of Khz escalation because classic theory does not predict it).
- Falsify New Galilean paradigm and promote classic theory (in case of detection of hundreds of Hz escalation without Khz escalation because New Galilean paradigm does not predict it).

[1]

S. Herrmann et al, [physics .class-ph] Arxiv:1002.1284v1, February 5th 2010

[2]

Joseph Levy**,** “Is the Aether Entrained by the Motion of Celestial Bodies?
What do the Experiments Tell Us?” at:
Arxiv:1204.1885v1 20 March 2012, Subject class: General physics and
www.worldsci.org/php/index.php?tab0=Scientists&tab1=Scientists&tab2=Display&id=302

[3a]
Abstract on New Galilean paradigm is at:

http://www.worldsci.org/pdf/abstracts/abstracts_6611.pdf

[3b]

The more detailed book is at:

http://www.worldsci.org/pdf/ebooks/TheNewGalileanAge.pdf

[4]

Dr. Carl A. Zapffe, ‘A Reminder on $E=mc^2$’,pag. 42 (page 8 of the pdf file) at http://www.wbabin.net/science/rickerzap.pdf