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# Could space be considered as the inertial rest frame?

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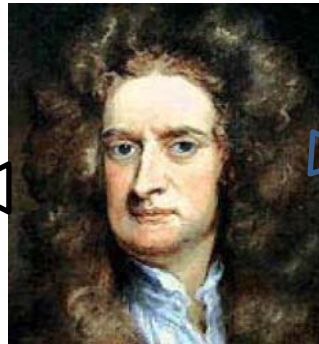
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**Abstract.** This paper attempts to justify space as the inertial rest frame by stitching together discussions on (i) the separability of Doppler effects due to source and detector velocities; hence the star’s “local” velocity as identifiable through clever experiments. (ii) Old ether “drag” experiments can be explained by considering EM waves and particles as diverse types of oscillations of the “vacuum”, treated as a stationary Complex Tension Field (CTF). Further, (iii) we need to appreciate that there are no physical processes that could facilitate either the contraction or the dilation of human conceptualized running time. It is important to recognize that the conceptual running time is not a measurable physical parameter of any object known to us, as yet. We should appreciate what we really measure is the frequency, as a primary parameter, of some physical oscillator; and then invert the frequency to derive a secondary parameter, a period or a time interval. We can indefinitely keep on increasing the time interval and generate the sense of running time by multiplying the inverse of the unit frequency (period) while counting larger and larger number of periods. We do know how to physically alter or modify the frequency of oscillations of most physical oscillators. It does not make logical sense to elevate the conceptual running time to the status of a “physical dimension” (primary physical parameter), in the same footing as the space. We believe the postulate of the space as a Complex Tension Field will facilitate our desire to build a unified field theory of EM waves and stable particles [See Ch.11 and 12 in “Causal Physics: Photon Model by Non-Interaction of Waves” by CR; publisher CRC, 2014].

## Ambitious vision with persistent humility is the key virtue to frame, re-frame, and re-frame enquiring questions to understand nature!

Framing the question determines the answer. But the questions are always subject to individual's overall cultural upbringing and thinking!

“I do not know what I may appear to the world; but to myself I seem to have been only like a boy playing on the seashore, and diverting myself in now and then finding a smoother pebble or a prettier shell than ordinary, whilst the great ocean of truth lay all undiscovered before me.”



“If I have seen further than other men, it is by standing on the shoulders of giants.”

- ❖ Today we are both fortunate and confused. Our guiding giants, individually, have discovered many realities of nature, but they are not merging seamlessly into one harmonious “picture”.
- ❖ We need to initiate a collective approach to re-visit and re-construct the foundational hypotheses behind the most successful theories, for they hold more realities than the weaker theories.
- ❖ We need an iterative approach to enhance the theories by incorporating **Evolution Process Congruent Thinking (EPC-T)** over and above the currently successful approach of **Measurable Data Modeling Thinking (MDM-T)**.

**Nature has been telling us, through all successful theories of physics, that the “empty space” is full of rich physical properties**

- **Electro-statics: Electric tension:**  $\epsilon_0^{-1}$
- **Magneto-statics: Magnetic tension**  $\mu_0$
- **Electromagnetism: Tension field**  $c = (\epsilon_0^{-1} / \mu_0)^{-1/2}$
- **General relativity: “Curvature of space”** [potential gradient in a complex tension field]
- **QM, QED, QCD, String theory: “Zero point energy”, “Background fluctuations”, “Quantum Foam”, etc. But what holds the energy. What does fluctuate? What foams? Where is the physics? The space holds a Complex Tension Field, or CTF?**

**It does not make sense to describe cosmic space as a real vacuum and negate that it is some form of a Complex Tension Field (CTF).**

Even primary school experiments tell us that:

## The space simply cannot be empty. Space is a complex and modifiable “medium”!



Annular magnets with opposite polarity attracts each other.



Annular magnets with same polarity repels each other. Space between them has “magnetic tension” that helps the upper magnet floating against gravitational tension.



A still blade changes the “magnetic tension” from repulsive to attractive by creating opposite polarities on its two sides.



An wooden blade, being “non-magnetic” does not alter the “magnetic tension” of the space.

## The key postulates:

1. **CTF:** Space holds 100% of the energy of the universe as a *stationary* Complex Tension Field (CTF)
2. **Particles:** Particles are localized and resonant (*quantized*) self-looped (“smoke-ring”) oscillations of the CTF triggered by non-linear excitations. The tension gradient moves; not the CTF.
3. **Waves:** EM waves are perpetually propagating oscillations of the CTF gradients triggered by linear excitations by various material dipoles.

## Consequences:

1. The resonant oscillations, or their assemblies (particles, atoms and molecules, etc., moves (acquires velocities) with respect to the stationary CTF
2. The quantum properties of quantum particles, atoms and molecules are identical, whether they are in inter- or intra-galactic dust, or in the stars, or on the planets.
  3. Spectral properties (emission and absorption) are invariant across the galaxies.
4. Most of our experimental knowledge about cosmology comes from spectral studies and are correlate-able with earth-based spectrometry.
5. The very foundation of Quantum Mechanics was also triggered by spectrometric measurements (Ritz-Rydberg formula, Planck’s Blackbody radiation, Bohr’s Hydrogen atom, modern QED, etc.
6. Measurable Doppler spectral shifts (actual due to source movement; apparent due to detector movement) are due to local velocities of emitters and detectors with respect to the stationary CTF.
7. Only a fraction of the Cosmological Redshift is due to Doppler Effect! (Expanding Universe?)

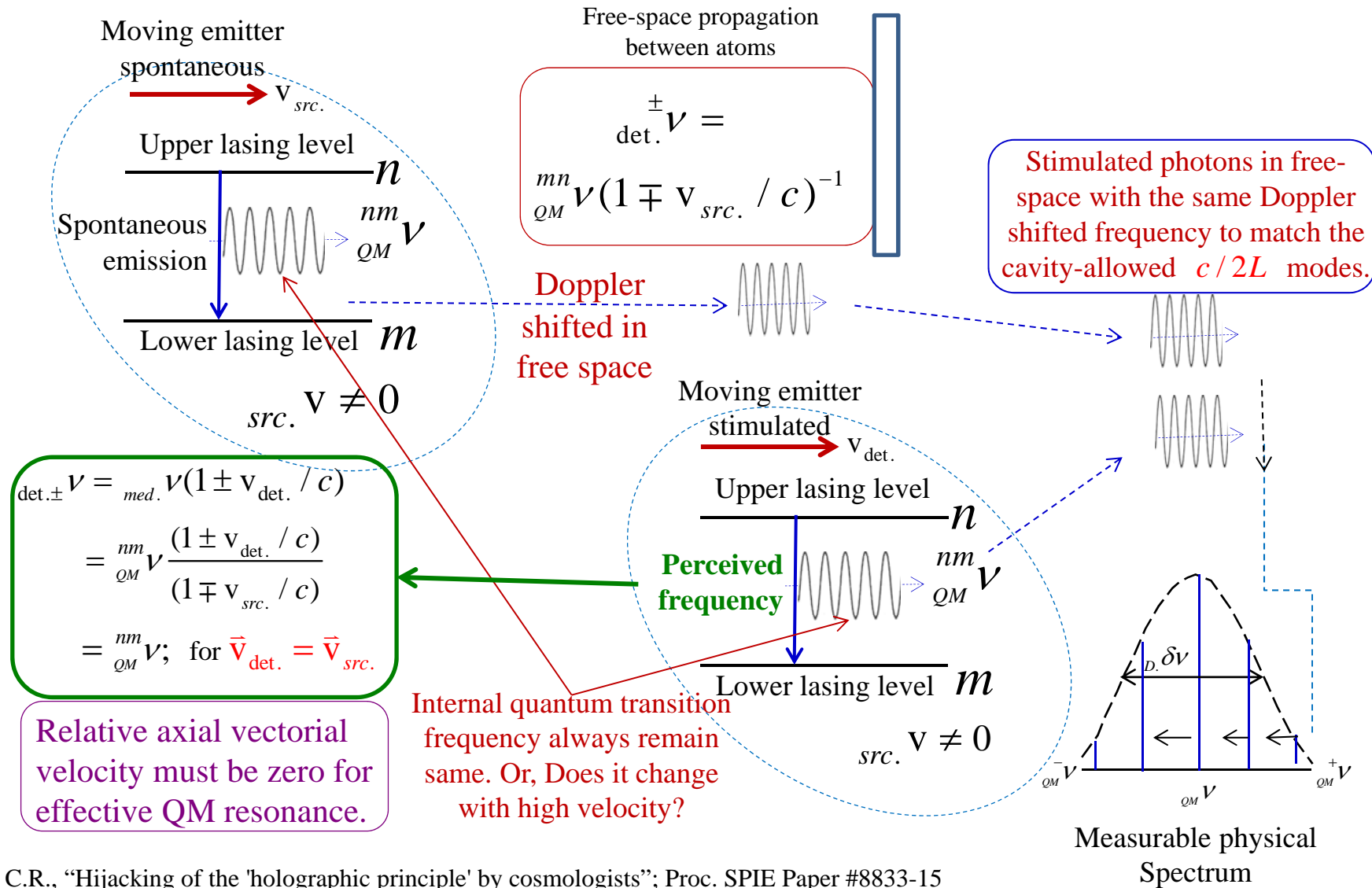
# I. The separability of Doppler effects due to source and detector velocities; hence the star's "local" velocity as identifiable through clever experiments.

1. We have been assuming, without supporting logics, that spectral properties (emission and absorption) are invariant across the galaxies. It turns out to be a correct assumption!
2. The spectral properties of atoms in a discharge tube on earth is the same as in a star in a distant galaxy – they are local oscillations of the same stationary universal CTF , but at different statistically-averaged local temperatures.
3. The next slide analyzes how an excited atom in a laser can produce a stimulated emission with a matching frequency with the stimulating wave frequency. They must have "absolute" and identical vectorial velocity, or zero relative velocity. Understanding the detailed *physical processes* behind a laser function reveals a lot more realities of the atomic world than the original theories have postulated. Einstein did not anticipate longitudinal laser modes in inhomogeneously broadened gas lasers.
4. A similar attempt to understand and compare the physical processes behind the generation of the characteristics of absorption spectra from earth-based discharge tube and star-based corona discharge atmosphere, reveals that the absorptions lines that we measure sitting on earth were fully formed at the outer corona of a star due to absorption of white light generated at the inner corona of the same star. So, the Cosmological Redshift suffered by the absorption line center happens during long distance propagation due to properties of CTF and its contents along the way. The absorption line width remain unchanged. So, cosmological redshift is not a Doppler Effect! See two slides after the next slide.

**The physical processes behind the spontaneous & the stimulated emissions tell us that source & detector velocities are discernible for actual & apparent Doppler Shifts!  
Optical Doppler effect is not determined by the source-detector relative velocity only, albeit mathematically correct!**



# Spontaneous & stimulated emissions tell source & detector velocities are discernible for actual & apparent Doppler Shifts!



C.R., "Hijacking of the 'holographic principle' by cosmologists"; Proc. SPIE Paper #8833-15

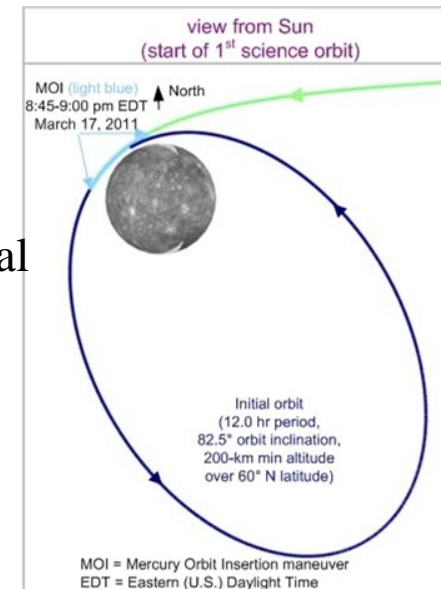
C. Roychoudhuri, Femto macro Continuum & UConn

## Use Doppler shift spectrometry to determine the absolute vectorial velocity of the Sun with respect to the stationary CTF

Send a rocket with a spectrometer at an elliptical orbit to the desired star that will have widely varying velocity during its orbiting. Slowly spin the spectrometer and keep recording some strong spectral line whose Doppler-free line center is well-known. When the spectrometer exactly registers this line center, the vectorial velocity of the rocket at that moment is identical to that of the absolute vectorial velocity of the star.

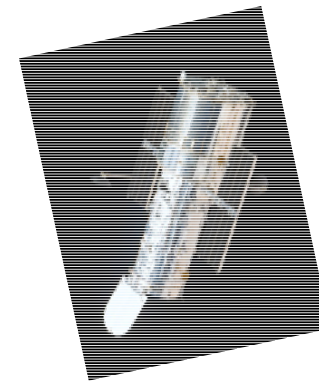
$$\begin{aligned} v_{det.\pm} &= v_{med.} (1 \pm v_{det.} / c) \\ &= v_{QM} \frac{(1 \pm v_{det.} / c)}{(1 \mp v_{src.} / c)} \\ &= v_{QM}; \text{ for } \vec{v}_{det.} = \vec{v}_{src.} \end{aligned}$$

$\vec{v}_{rocket} = \vec{v}_{Sun}$  when the spectral line center registers  $v_{QM}$ .

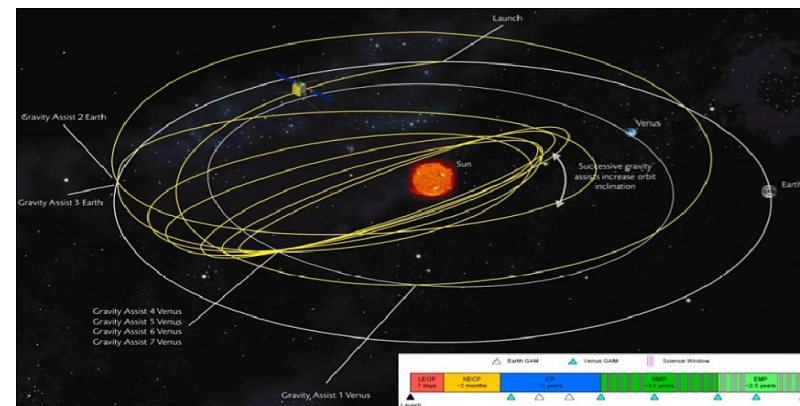


# Is it possible to determine the absolute vectorial velocity of a distant galaxy?

- The same technique as that proposed for the Sun can be applied in principle. Unfortunately, our rocket technology and signal retrieval techniques are too primitive to validate the idea by sending a rocket to a distant galaxy. But:
- A similar but steeper elliptical solar orbital rocket can be utilized, using a good sensitive spectrometer and a large telescope directed towards the desired galaxy:



$\vec{v}_{rocket} = \vec{v}_{galaxy}$  when the spectral line center registers  $\frac{nm}{QM} v$ .

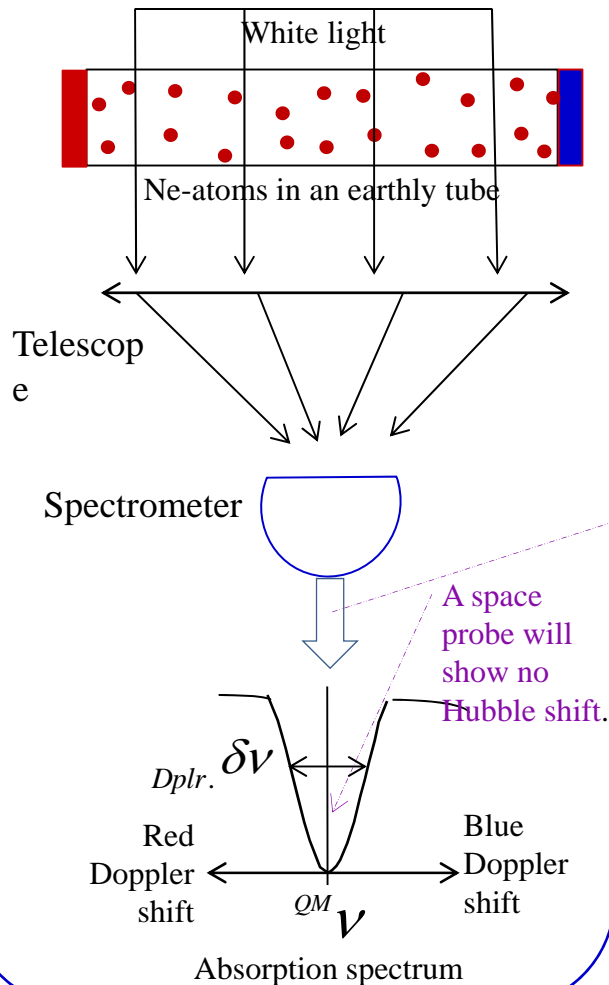


Graphics are from the web

**Understanding the physical processes behind the  
Doppler shift induced line broadening implies  
Cosmological Hubble Redshift is not due to  
Doppler effect.**

# Understanding absorption spectroscopy

## Lab absorption spectrometry



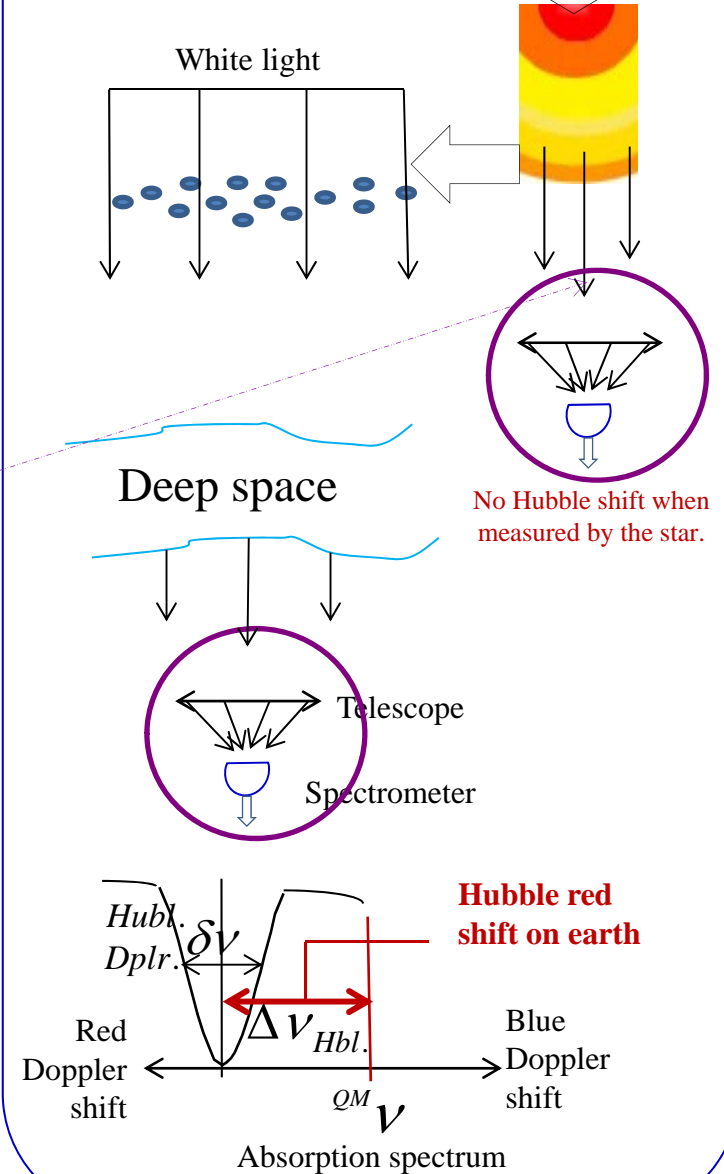
C.R., "Hijacking of the 'holographic principle' by cosmologists"; Proc. SPIE Paper #8833-15

# Do the atoms move with respect to the "star-frame", or the "earth-frame", or the "lab-frame" or the "vacuum-frame" (CTF)?

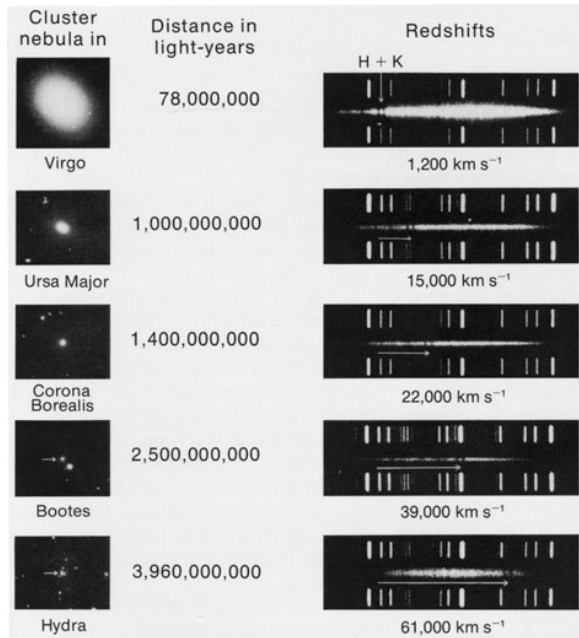
# We posit that it is the "Vacuum-frame" (CTF), which is stationary everywhere!

# Like the stimulated emission frequency, the absorption freq. is determined by the velocity of the "detector" only!

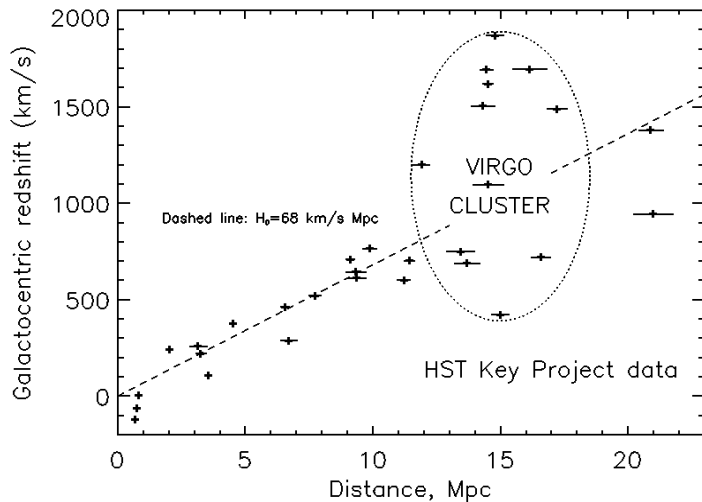
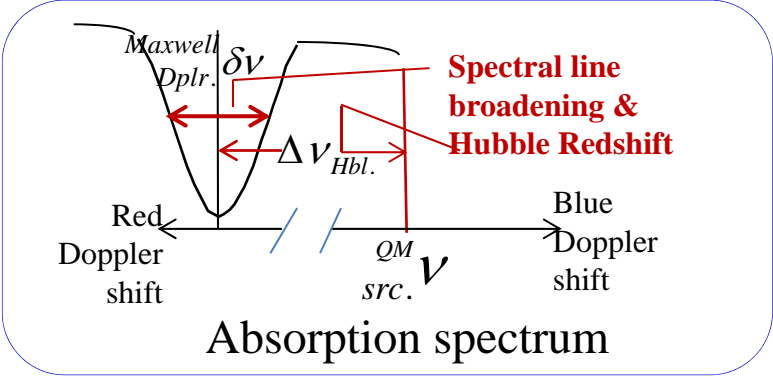
## Stellar absorption spectrometry



# Absorption lines, as absence of real signal, cannot undergo physical changes!



Emission and absorption physical processes are identical in all stars.



$\left[ \begin{array}{c} \text{Hubl.} \\ \text{Redshift } \Delta v \end{array} \right]$  Due to travel to earth.
  $\gggg$ 
 $\left[ \begin{array}{c} \text{Maxwell} \\ \text{Dopler } \delta v \end{array} \right]$  Due to atoms' vel. in star.

We posit that Cosmological (Hubble) Red Shift during cosmic travel of star light is different from source/emitter velocity dependent Doppler shift.

**Do we really have an expanding universe?**

C.R., "Hijacking of the 'holographic principle' by cosmologists"; Proc. SPIE Paper #8833-15

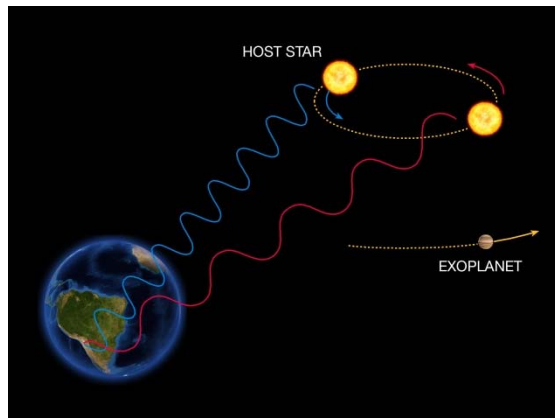
[http://asu0.wku.edu/asu100/fl\\_k\\_reusim1.jpg](http://asu0.wku.edu/asu100/fl_k_reusim1.jpg)

# Exoplanet detection by Doppler shift measurement due to relative velocity

The measurement approach relies upon measurement of differential Doppler frequency shift equating with the differential relative velocity

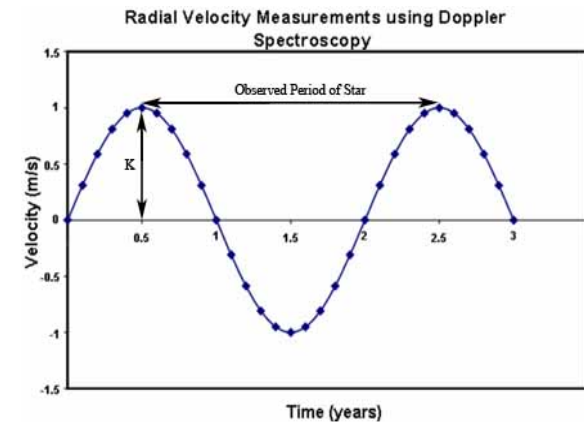
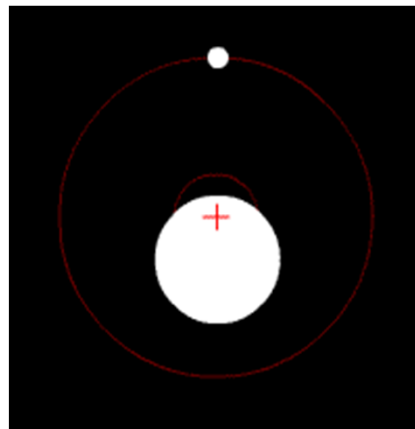
$$\Delta \nu = \frac{nm}{QM} \nu (\Delta v / c)$$

Quantum transition frequency is same in all galaxies!



The Radial Velocity Method

ESO Press Photo 22a/07 (25 April 2007)  
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[https://en.wikipedia.org/wiki/Doppler\\_spectroscopy](https://en.wikipedia.org/wiki/Doppler_spectroscopy)

$$\text{det.} \pm \nu = \frac{nm}{QM} \nu \frac{(c \pm v_{\text{det.}})}{(c \mp v_{\text{src.}})}$$

$$\text{det.} \pm \nu = \frac{nm}{QM} \nu (1 + \Delta v/c); \text{ for } v \ll c. \quad \Delta \nu = \frac{nm}{QM} \nu (\Delta v / c)$$

## Atomic clocks “zeros” the Doppler shift by zeroing the absolute velocity to achieve super stable Invariant Clock

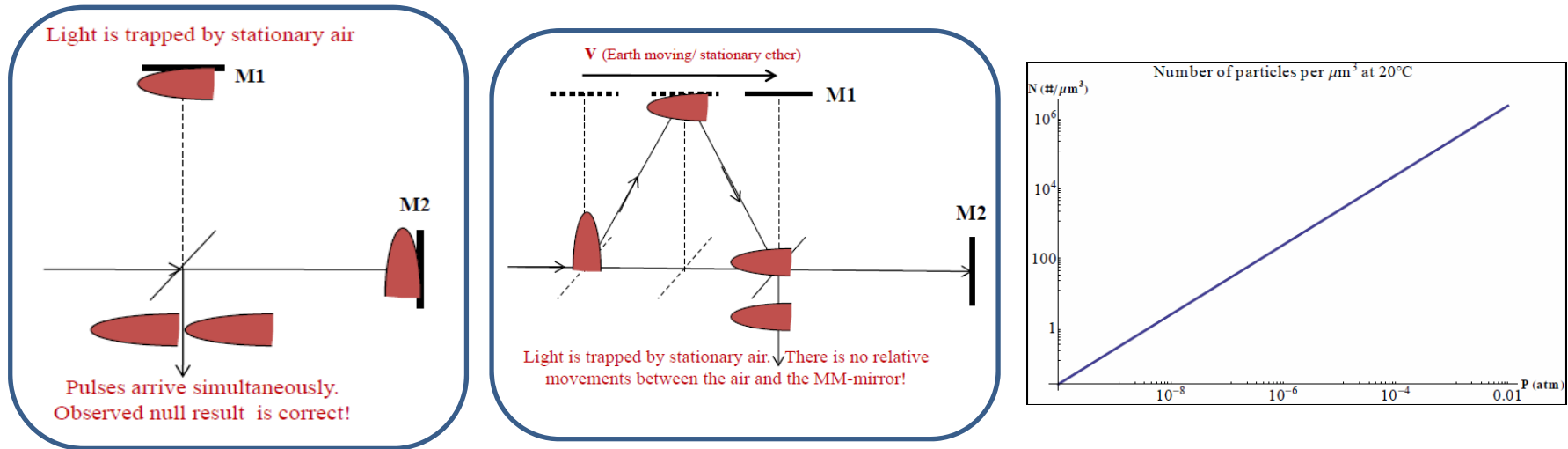
- Invariant atomic clock at absolute zero temperature.
- Zero Doppler shift of the emitted EM wave frequency.
- The satiability of the atomic clock remains same on the Earth suffering from five different velocity vectors. In a satellite, the atomic clock is suffering from seven, two more velocity vectors, its own spin and its orbital velocity w.r.t. earth.
- So, the quantum transition energy and the frequency are invariant at absolute zero irrespective of the macro velocities of the macro container. The atoms are at rest w.r.t to the absolute space, vacuum or CTF; even though the encasing container is moving. It makes sense to hypothesize elementary particles as self looped vortices of a universally stationary CTF.
- **There are no measurable “time” to “dilate”!** The running time is not a measurable physical parameter of anything in this universe. The frequency of oscillation is a physical parameter of most entities in the universe and they are alterable by physical process. We measure frequency; invert it to get a time period or time interval. Counting larger and larger number of frequencies allows us to get a semblance of “running time”.



**M-M and ether “drag” experiments can be explained by considering EM waves and particles as diverse types of oscillations of the “vacuum”, treated as a stationary Complex Tension Field.**

1. Concept of “ether” has not been wiped out by MM experiments.
2. A moving mirror approaching an oncoming light pulse will reach it earlier than a stationary one. That is how we do interferometry.
3. Bring the pulse laser in MM experiment. How far the vertical mirror should be so that a pico second pulse misses it.

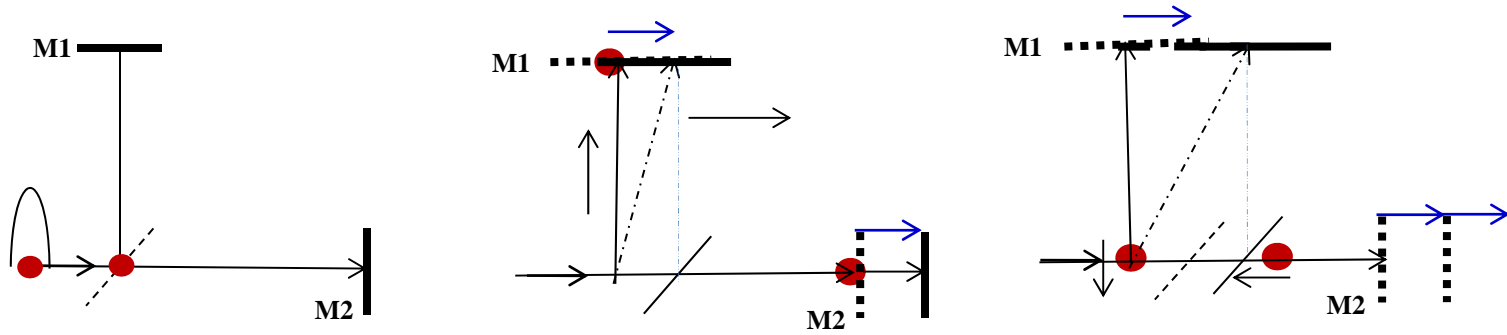
## Michelson-Morley null result does not invalidate the existence of a “ether” [Cosmic Tension Field (CTF)]



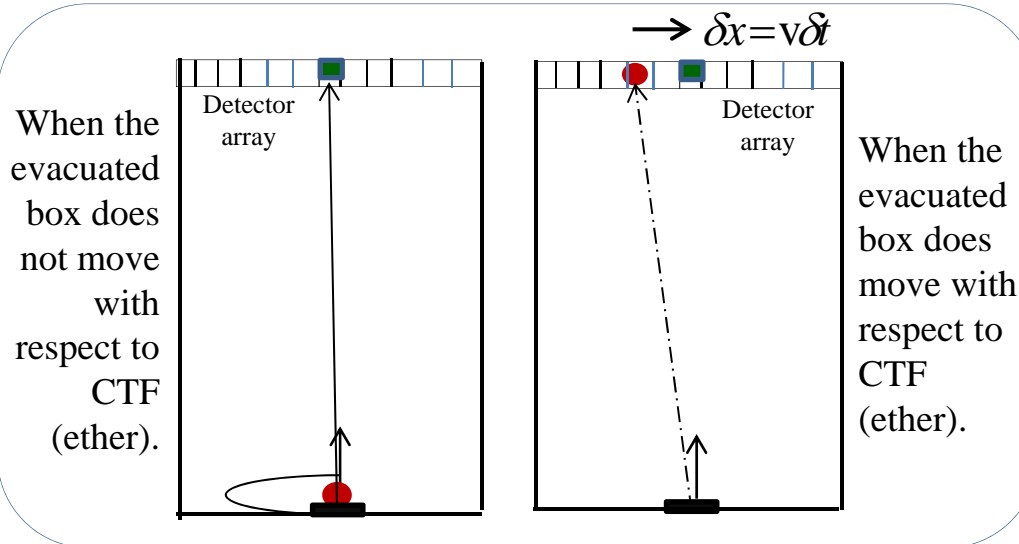
- Light beams travel along the original Poynting vector, which can be re-directed as per Snell's laws. Light beam does not follow a moving mirror. The vertical beam would go straight up and come straight down, if the horizontal mirror size is wide enough to reflect it even after lateral translation.
- M-M experiment measure relative phase difference between the returned beams. The set up does not directly measure light velocity. Drawing inference becomes complex because CTF, that sustains the EM waves, is stationary and even the air is stationary with respect to the interferometer!
- The vacuum of 19<sup>th</sup> and 20<sup>th</sup> century vacuum is not good enough to simulate pure CTF. 100 particles per micron cube, giving  $10^{-6}$  atmos. is still a physical medium for light.
- Modified space experiment is suggested in the next slide.

# We need to measure the real velocity of light.

## M-M experiment tries to measure relative phase difference!



A short pulse of light illustrates the point. The M-M interferometer is immersed in stationary air or stationary CTF (modified ether). Light travel direction is completely controlled by the Poynting vector, not by the direction of the movement of the interferometer. So, the pulse on its vertical journey, on arrival, may just get reflected from the edge of the top mirror. On its return, it may not even encounter the beam splitter, if the interferometer arm-length is made very very long! No interferometry can be done either in air or in vacuum.



### Measuring non-drift of ether (CTF) in deep space. Or, one-way velocity of light!

- Exploit earth's orbital velocity 30km/s
- Use "centering" detector array of pitch 100 micron.
- The necessary distance between the pico second pulsed diode and the detector array should be a minimum of 1meter. For 1 pixel shift in the arrival of light.

**We believe the postulate of the space as a Complex Tension Field will facilitate our desire to build a unified field theory of EM waves and stable particles.**

- Ch.11 and 12 in “Causal Physics: Photon Model by Non-Interaction of Waves” by CR; publisher CRC, 2014.
- See also various papers in this conference and the panel discussion of this year.

## Conclusion

**We propose affirmatively that space constitutes a stationary Complex Tension Field (CTF):**

- (i) CTF is stationary and hence serves as the inertial reference frame for all of our galaxies.
- (ii) The dynamics of the observable universe is due to simple and complex, primary and secondary, potential gradient changes of the CTF and some of which oscillate.
- (iii) Oscillating gradients of CTF are our observables. Waves are perpetually propagating excitations. Particles are self-looped localized resonant (quantized) oscillations.
- (iv) CTF Holds 100% of the energy of the universe as various tension energy within the same volume.
- (v) We should learn to utilize the various embedded tension energies anywhere in space to become the true space faring species!



## Perpetual velocity of all propagating waves are an intrinsic property of the relevant tension field

### Where from do the waves derive their propensity of moving perpetually from the site of origination?

A uniform tension field tends to stay at its lowest energy state of unperturbed equilibrium. When external energy imparts any disturbance, the tension field attempts to get rid of the disturbing energy, but all it can do is to push it away, which generates the perpetually moving wave packet. Uniform tension field gives uniform “push away” velocity and a gradient provides a “bending” of the wave front, since the propagation is a local and regional “collective phenomenon” that gives rise to the very existence of the wave packet.

**Water waves** – leverage surface tension and the gravitational tension of the water.

**Sound waves** – leverage the pressure tension of air molecules (a result of gravitational force of the earth).

**String waves** - leverage mechanical tension (stretching) applied on a string.

**Etc. -**

**EM waves** – leverage the Complex Cosmic Tension Field,  $C^2TF$ , filling the entire cosmic space (19<sup>th</sup> century “ether” concept modified)..

# Similarities between wave equations

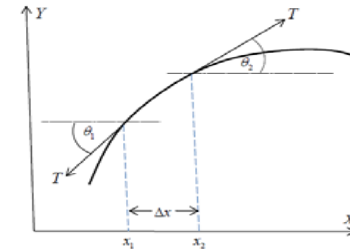
## Classical string wave derivation:

The wave equation for a string under tension is derived by equating two balancing forces. Mass times acceleration of an elemental string length equals the restoring tension force. Displacement of string position is “y”.

$$ma = F$$

$$\underline{\sigma \Delta x} \frac{\partial^2 y}{\partial t^2}(x, t) =$$

$$\Delta_x (T \sin \theta) \approx T \Delta_x \left( \frac{\partial y}{\partial x} \right)$$



$$\sigma \Delta x \frac{\partial^2 y}{\partial t^2}(x, t) = T \Delta_x \frac{\partial y}{\partial x} \Rightarrow \frac{\partial^2 y}{\partial t^2}(x, t) = \frac{T}{\sigma} \frac{\partial}{\partial x} \frac{\partial y}{\partial x}(x, t) = v^2 \frac{\partial^2 y}{\partial x^2}(x, t)$$

$$\frac{\partial^2 y}{\partial t^2} = v^2 \frac{\partial^2 y}{\partial x^2}; \quad \boxed{v^2 = \frac{T}{\sigma}}$$

## Classical Maxwell's wave equation for light in the vacuum (cosmic medium):

$$\frac{\partial^2 E}{\partial t^2} = c^2 \frac{\partial^2 E}{\partial x^2} \Rightarrow \frac{\partial^2 E}{\partial t^2} = \frac{1}{\epsilon_0 \mu_0} \frac{\partial}{\partial x} \frac{\partial E}{\partial x} = \frac{\epsilon_0^{-1}}{\mu_0} \frac{\partial^2 E}{\partial x^2}; \quad c^2 = \frac{\epsilon_0^{-1}}{\mu_0}$$

$$\underline{(\mu_0 \Delta x)} \frac{\partial^2 E}{\partial t^2}(x, t) = T \Delta_x (\sin \theta) = \epsilon^{-1} \Delta_x \left( \frac{\partial y}{\partial x} \right)$$

$$\frac{\partial^2 E}{\partial t^2}(x, t) = \frac{\epsilon_0^{-1}}{\mu_0} \frac{\partial}{\partial x} \frac{\partial E}{\partial x}(x, t) = c^2 \frac{\partial^2 E}{\partial x^2}(x, t); \quad \boxed{c^2 = \frac{\epsilon_0^{-1}}{\mu_0}}$$

**Schrödinger's equation:**  $\frac{\partial \psi(x, t)}{\partial t} = -\frac{\hbar}{i2m} \frac{\partial^2 \psi(x, t)}{\partial x^2}$  [+V(x,t) needs to be added to move a particle!]

It does not directly represent propagation of any waves manifest in any tension field. There is no acceleration term or second derivative of a physical parameter w.r.t. time!