Photons experiencing non-electromagnetic interaction are the best explanation of clumpy early galaxies observed by James Webb Space Telescope.

Dmitriy S. Tipikin

Tipikin2001@yahoo.com

Abstract.

Among the most puzzling observations from the JWST data concerning the galaxies with large red shift was the presence of very large black holes in too many of them [1]. Indeed, if the Universe is young (assumption of Big Bang model) and it already had a lot of huge black holes, by now the whole universe should be consisting of them only. That problem of inflationary Universe becomes worse and worse: discoveries of too many too early too mature galaxies is patched by the assumption that the matter was aggregating much faster. But if you apply the same assumption to modern days it instantly means that all the Universe should be already almost dead – all galaxies are eaten by black holes, no stars, only neutron stars, black holes and energy. The proof of the huge black holes in the early Universe comes from clumpy view of early galaxies – they visually have ultrabright center, only possible for very big and very active black hole. The alternative idea is that light itself is not delivering image properly – contrary to the old idea that light is only capable of electromagnetic interaction, it experiences some other interaction, which slowly erodes the image and blur the galaxy view till it seems that it has huge and active nucleus. That means that the need for new physics is finally arrived – by no means may be this possible in old paradigm, either tired light hypothesis (based on new physical principles) or fifth force hypothesis depicts better the observed behavior.

Introduction.

James Webb Space Telescope will certainly generate a history eventually through the ability to see too far and in the infrared spectrum. After instant discovery of too many galaxies the other big problem appeared – there are too many black holes in the high-Z universe. And those black holes are way too active than they should be [1]. While astrophysicists are trying to modify the models of the Universe dynamic from young to modern, the question experimentalist should ask – how reliable is the proof?

From famous Einstein formula (hv=E+mv^2/2) and quantum mechanics everybody knows that light is absorbed in quanta – that is as the whole. It may experience scattering, but obligatory at big angle, so no slow perpetual drain of energy is possible – either the whole quantum or nothing. This paradigm worked well and it was established at Einstein time, when only two fundamental forces were known – electromagnetic and gravitational. Einstein himself reduced gravity to warping of the space-time, so effectively only one force left – electromagnetic. And in this situation the overall idea is correct – light creates or absorbs as quanta (famous photo-effect law created by Einstein). By now we know there are two more forces (weak and strong), and it is not clear how photon of visible light utilizes those forces (possibly no way, because the energy is too small), but the Einstein law should be changed accordingly: light experience electromagnetic interaction only as a quantum, generated or absorbed as a whole. That instantly changes the meaning of that law – nothing forbids photon to experience some other force, like interact with gravity in some bizarre way or through hypothetical fifth force. Those interactions merely not discovered yet, but may start reveal itself in the experiment any minute.

And this is the first thing experimentalist would do – check whether the light itself is not responsible for the change of the images for early Universe. May be it experiences some strange extra-weak scattering which makes the images looks different compare to what is expected?

Main part.

How would it be possible to estimate the quality of the light propagation in the vacuum? Since nothing may be emptier than vacuum, the only way is to see what would be if you spoil the existing vacuum and what effect it would be on image. This is actually easy task – before space telescopes the images were obtained by earth based telescopes and they do demonstrate the results of light scattering by atmosphere. In this case the blurring will generate some discernible effects.

Fig.1

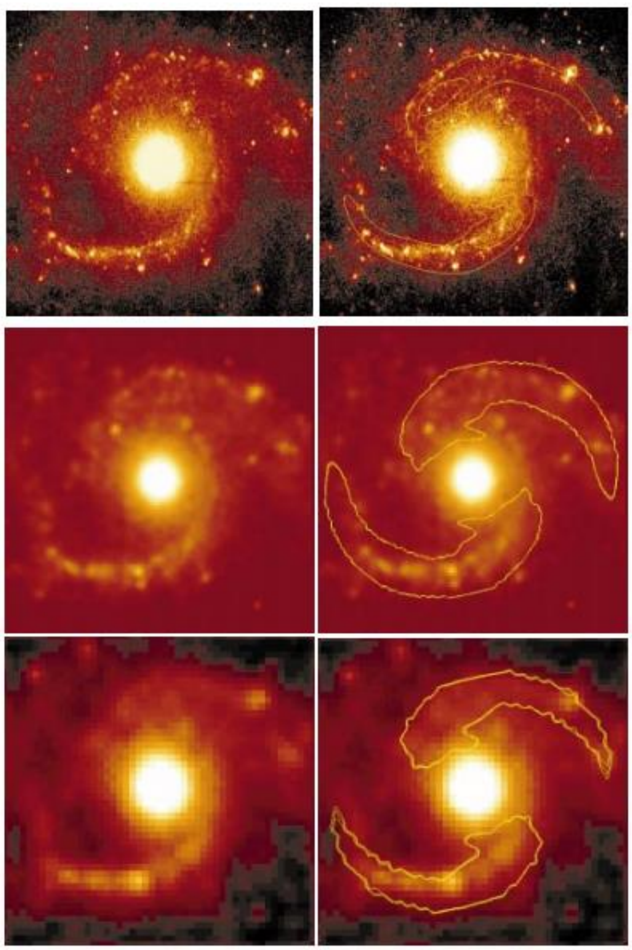
Earth based telescope and space based telescope photos of the same galaxy [2] (the space telescope image was made because of supernova discovered from Earth observation, but presence of supernova has no influence on the overall quality). Left image has visibly much higher nucleus which would be at straightforward interpretation being associated with extra active extra large black hole. Right image demonstrates that the nucleus is very small and the galaxy is quite normal.

The images of the far galaxies with big Z looked clumpy and with big nuclei too:

Fig.2 Too many galaxies at the high Z images look like they have active nucleus associated with big black hole [3]

Some researchers are already paid attention onto this strange look of the galaxies [4]. They utilized the known technique of artificial red-shifting of the image, which would generate appreciable degradation of signal to noise in the image [4]. However, the observed effect on the galaxy appearance was different – such artificial shift to higher Z seems does not influence the size of the nucleus perceptibly [5]:

Fig.3 Artificial red-shifting of the galaxy indeed changes the resolution but not the appearance of the galaxy (image taken from [5])



The importance of the different view of the galaxy at high Z, not possible to explain easily using the known technique of artificial red-shifting hints on the presence of the different mechanism responsible for the clumpier view of the galaxies. If the mechanism is similar to what is responsible for the change of appearance of the galaxy for earth based versus space based views, it means that light experience some subtle scattering even when propagating in the absolute vacuum. The effect is enormously small – indeed, the light only propagates 30 microseconds in the dense atmosphere (10 km) while it propagates 13 billions of years in the vacuum (1*10exp(23) times longer time) in order to demonstrate somewhat similar effect. It means that scattering as it is present should be around 23 orders of magnitude weaker compare to electrostatic induced scattering in atmosphere. In [6] the idea of red shift based on tired light based on new physical principles was developed. It was proposed that instead of electromagnetic scattering (big, change of energy and corresponding change of energy following from E=pc formula are comparable with initial energy and pulse, like Compton scattering) the new type of scattering is present (enormously small, say N=10exp(37) scatterings for energy drop of only 0.5% from initial photon energy) and due to stochastic nature of scattering deviation from the original direction would be only around 1/sqrt(N) – still too small to see the smashing images even at very high Z. But some effects of such blurring should be actually visible well before the image is blurred completely out (as it should be for any tired light hypothesis, because despite the loss of energy takes place very smoothly, but still in discrete steps and sooner or later the image will be smashed completely). And the present unusual observations of the strangely large number of very active galactic forming black holes very early in Universe (based on present paradigm of Big Bang) based on unusual clumpy galaxies view seems like confirming the overall idea: this is not change of shape of galaxies far away, this is demonstration that light itself possess some undiscovered yet properties which makes it not so perfect carrier of information for 10 billions of years. From experimentalist point of view the instrument itself (photons of light) are not perfect any more for such a time scale, the new physics starts to surface and that leads to unusual view of galaxies.

After all, light may be capable of some other interactions in addition to electromagnetic one (that one is well understood and was researched from Einstein time). It may be either gravitational (and I proposed the presence of the gravitational dipole h/c being present for light quantum [6]) or fifth force (some completely new interaction, extremely weak compare to electromagnetism but may be stronger than gravitational one). The strength of fifth force being stronger than gravitational follows from the evaluation made in [6] for the tired light hypothesis based on gravitational dipole – the blurring of images should not be present in James Webb Space Telescope images, because the proposed interaction would be around 35-40 orders of magnitude weaker compare to electromagnetism (in lieu of ratio of gravitational and electromagnetic force, which is 37 orders of magnitude smaller for protons). The effect discussed above seems to be present already at merely 23 orders of magnitude smaller interaction – that may point on new force instead of presence of gravitational interaction in red shift and image blurring.

There may be one “trivial” explanation of such blurring, which preserves the modern physics (Big Bang and Doppler nature of red shift) – nano-scale gravitational lensing. Unfortunately, the micro-scale gravitational lensing (which would reveal itself in sudden short time flickering of stars) was never observed. May be much smaller effects due to some local anisotropy of space generate such smashing of image, which looks similar to scattering in atmosphere and leads to the wrong conclusions about the nature of the galaxies at high Z.

Possibly future more accurate observations made by James Webb Space Telescope (say very long time accumulation of the image which has such a blurred patchy galaxy) will clear the picture and it will turn out to be simple low signal to noise problem. However, if the patchy picture is preserved even at long accumulation time (no improvements) it means that this is not simple signal to noise problem, but rather the different mechanism, like blurring due to scattering. Indeed, even enormously long accumulation of images on largest Earth based telescopes turned out to be unable to break above certain resolution, where the space telescope was considered to be necessary and Hubble telescope idea appeared. Now it is the time to check whether the quantum vacuum based effects are limiting the utmost resolution of the space telescopes (and unfortunately we can not put telescopes in say “sub-space” to eliminate this effect if discovered). If some kind of new physics indeed limits resolution of the space based telescopes that would end the dream of visual observation of alien civilizations on the nearby stars using super-large telescopes – the quantum vacuum itself will preserve the privacy of possible sentient life-forms.

Conclusions.

Recent observations of strange galaxies at high z may mean not the different from expected evolution of them but the undiscovered yet but started to surface properties of light itself. They are very weak and hardly distinguishable from trivial effects, but may mean the presence of long waited new physics from one side and pose the ultimate limitation on the observational abilities of even space based telescopes from another side. More research is necessary in this direction to come to final conclusion.

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