May GWs signals by BH-BH merging be associated with any gamma or neutrino burst?

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The Gravitational Wave (GW) events GW150914, GW151226, GW170104 detected by LIGO were very probably a record of Black Hole binary merging system (BH-BH) in nearly empty or a vacuum space; such a kind of events will be mostly with no baryon mass (plasma or dense masses) and therefore mute or blind in any correlated gamma band. By best GW triangulation (as soon as Virgo will be active) their position will be widely located only in a smeared sky (tens or hundred square degree) because of the absence of any correlated spherically-symmetric electromagnetic signal whose photons might be pointing to the exact sources in the sky. If the GWs events might be born inside a globular cluster, a star forming region or along a spiral AGN accretion disk their additional accreting mass may be the needed baryon load to explode and shine: in those dense places BH-BH collapse may also offer an optical-X-γ afterglow via their baryon lightening and photon tracks. However these peculiar orbiting or multi-body systems should also imprint their presence in the inner Kepler period as well as in a perturbed GW signature by unusual time structure. Moreover any Black Hole active (by a relic jets and/or an accretion disk) might shine and blaze during the collapse with a BH by its jet too: however these beams, being extremely collimated, are rarely pointing toward us during the same brief GWs emission. Only very nearby (tens Mpc) BH-Neutron Star (NS) or NS-NS cannibal merging might be associated with a desired, visible and correlated spherical NS explosion; these rare explosion and their GWs might therefore be localized by photon tracks in a near future. But they are lower mass system and they require much lower threshold or just nearer distances. Because of such nearer cosmic volumes (tens Mpc) these kilohertz event are possibly very rare (with present Ligo Virgo array). Within several years or decades a tripled LIGO-VIRGO records might capture a rare BH-NS collapse in a SN-like event that may be correlated by a gamma X precursor few hours or a few days earlier than the GW, when the NS-BH explosive event or its X-gamma precessing jet is still transparent to the surrounding space. For similar reasons gamma X precursor event may also shine days before high energy neutrino burst event offering an opportunity to a sharp UHE neutrino astronomy.
1. Introduction: waiting for a GWs Astronomy?

The Advanced Laser Interferometer Gravitational-Wave Observatory (LIGO) [Aasi et al.(2015)] identified two binary black hole coalescence signals two years ago with high statistical significance, GW150914, [Abbott et al.(2016)] and later on they discovered an additional one GW151226 [Abbott et al.(2016b)] (as well as a less significant candidate LVT151012). On January 4, 2017, a comparable signal was detected with high statistical significance with the signal GW170104 visible as the characteristic chirp of a binary coalescence. The last GW170104 source is a heavy binary black hole system, with a total mass of of 50 solar ones located at far ($z \simeq 0.2$) cosmic distances.

Astronomy is, etymologically, the art of identifying sources in the sky and to collocate them with their names toward the (possible) optical or electromagnetic (EM) counterpart. Many potential astronomies today are still blind or invisible: the relic SN neutrinos (yet to be discovered), the few tens TeV-PeV IceCube neutrinos, the same Cosmic Rays (CR) or even the Ultra High Energy ones (UHECR) are somehow still smeared and they represent a myope and coarse astronomy to come. The recent first GW detection by LIGO[Abbott et al.(2016)] on the 14th of September 2015 does offer the first view of the GW energy density or its energy fluency, but not yet a clear source localization. The nominal first event energy fluency and its power fluency (assuming at 400 Mpc distance and assuming a conservative “one a year” event rate, well calibrated with recent [Abbott et al.(2016c)]) leads to

$$\frac{\Delta E}{4\pi R^2_{400\text{Mpc}}} \simeq \frac{2 \cdot 3 \cdot 10^{33} \cdot 9 \cdot 10^{20}\text{erg}}{4\pi (1.2 \cdot 10^{27}\text{cm})^2} \simeq 0.3\text{erg cm}^{-2}\text{sr}^{-1}$$  \hspace{1cm} (1.1)

$$\frac{dE}{dA\,d\Omega\,dt} = \frac{0.3\text{erg}}{3 \cdot 10^7\text{cm}^2\text{ssr}} \simeq 1.25 \cdot 10^4\text{eV cm}^{-2}\text{s}^{-1}\text{sr}^{-1}.$$  \hspace{1cm} (1.2)

It might be questioned if such a huge cosmic energy density fluency of $\sim 0.3\text{erg cm}^{-2}$ and its apparent brightest power in 0.4 s duration burst over-passed any previous observed radiative one. The unique corresponding energy density fluency has been observed[Yamazaki et al.(2005), Gaensler et al.(2005)] during the giant flare from SGR 1806-20, on 27th of December 2004 (just to remind: this was just a day before the largest tragic tsunami in Sumatra, Malaysia). The gamma satellite RHESSI and its particle detector data implied[Hurley et al.(2005)] a spike of fluence in photons at $\geq 30$ keV energy as large as $(1.36 \pm 0.35)\text{erg cm}^{-2}$. However this SGR event was a galactic one, not cosmic one. Moreover, just for an historical comparison, the nearest SN 1987A and its neutrino burst from Large Magellanic Cloud (LMC) has been even much more energetic[Hirata et al.(1987)] than the SGR 1806-20 and LIGO GW150914, by nearly a million times. However as being a cosmic event LIGO GW150914 overcame any other GRB or AGN cosmic flare event detected in last century. Also the consequent probable averaged GW flux number and its energy fluency will be enormous respect the EM ones. The LIGO collaboration has evaluated its first GW signal as indebted to a wide range of possible cosmic rate: $2$–$400\text{Gpc}^{-3}\text{yr}^{-1}$ where the minimum value of $2\text{Gpc}^{-3}\text{yr}^{-1}$ corresponds to a much (a dozen time) rarer than previous one rate (see equation (1.2)) and at an averaged lower power energy fluency of

$$\frac{dE}{dA\,d\Omega\,dt} \simeq 2 \cdot 10^3\text{eV cm}^{-2}\text{s}^{-1}\text{sr}^{-1}$$  \hspace{1cm} (1.3)
which is to be considered as the most “conservative prudential rate”. The two additional events may in average confirm this typical distance. The low GW energy for each characteristic graviton has a frequency on average of \( f_{GW} = 150 \text{ Hz} \) (and a peak at 250 Hz) leading to a very low energy

\[
E_{GW} \approx 6.2 \cdot 10^{-13} \text{ eV} \left( \frac{f_{GW}}{150 \text{ Hz}} \right) \]

implying an abundant flow of gravitons during the one year rate or 2 Gpc\(^3\) yr\(^{-1}\):

\[
\frac{dN}{dA d\Omega dt} \approx 3.2 \cdot 10^{15} \left( \frac{\phi_{GW}}{2 \text{ Gpc}^3 \text{ yr}^{-1}} \right) \left( \frac{\langle f \rangle_{GW}}{150 \text{ Hz}} \right)^{-1} \text{ eV cm}^{-2} \text{ s}^{-1} \text{ sr}^{-1}
\]

This estimated graviton number flux exceed the 2.7 K cosmic thermal photon number flux by a hundreds times making GWs the most abundant massless cosmic messenger in our universe. Actually, GW in the afterglow of the Big Bang or the very same “virtual” graviton that is keeping the reader sitting on his chair is by many more orders of magnitude the most abundant massless messenger; for an analogy just remind also the well known terrestrial magnetic fields whose virtual photons (huge dense number) are bending our compasses and the Cosmic Rays flight in the Universe; see figure 1.

The more probable binary (a smaller size BH systems, whose smaller mass is of the order of \( \sim 3 M_\odot \)) may be merging at higher frequency at a peak of \( f = 2.5 \text{ kHz} \); these events may contain NS companion whose masses collapse and explosive death are detectable; they are detectable in a narrow located distances by an order of magnitude respect to GW150914 sources and their threshold detection volume is consequently a thousand time smaller; their larger abundance (by a reasonable spectra mass dependence) might compensate (or not) their nearer detection volume leading (or not) to their discover in a near future. Their optical correlation might then be possible. Nevertheless the 30 M\(_\odot\) BH binary systems and their GWs seem to be a quite dominant signal in the overall cosmic energy fluency at LIGO three events as shown in figure 2. Indeed, the absence of detection by LIGO of short NS BH, NS NS collapse, implies a definite narrow windows of GWs of hundreds and thousands Hz, whose fluency are anyway already remarkable in comparison with all the other EM radiations. As a matter of fact, only the cosmic Black-Body Radiation (BBR) at 2.7 K is still a dominant one (\( \phi_{BBR} \approx 10^8 \text{ eV cm}^{-2} \text{ s}^{-1} \text{ sr}^{-1} \)) as well as the probable and “soon to be detected” \( \phi_{SN} \) relic from all integral Super Nova, the Cosmic SN \( \nu \) in figure 1 and in figure 2, which is about \( \phi_{SN} \approx 10^7 \text{ eV cm}^{-2} \text{ s}^{-1} \text{ sr}^{-1} \). For instance, the most celebrated Gamma Ray Burst (GRB) fluency, in average by Compton satellite, is \( \phi_{GRB} \approx 10 \text{ eV cm}^{-2} \text{ s}^{-1} \text{ sr}^{-1} \), similar to the UHECR one \( \phi_{UHECR} \approx 10 \text{ eV cm}^{-2} \text{ s}^{-1} \text{ sr}^{-1} \left( \frac{\text{Flux}_{\text{UHECR}}}{10^{19} \text{ eV}} \right)^{-2} \), it is usually referred as the Waxmann Bachall (WB) bound it is hundreds or thousands times below the LIGO GW one. The natural consequence is that if a tiny (few percent) component of the GW radiation is transferred to EM waves than the correlation GW-EW signal might be found easily. The GRB with a powerful transient luminosity comparable to 0.1% are the best candidate transient event to be associated. Does this connection occur?

2. A LIGO GW connection to GRB?

From above there are many reasons to foresee a fast e.m. transient associated to these LIGO-VIRGO astronomy. Indeed there have been a huge attention and attempts to find correlated gamma
Figure 1: The cosmic energy fluency spectra in logarithmic scale as a function of the particle energy also in logarithmic scale. The huge solar contribute and the high optical galactic plane noise is here ignored. The Big Bang infrared signal is the ruling energy contribute corresponding to nearly $4.7 \cdot 10^{-5} \Omega_c$. The observed LIGO GW in red area and the very probable associated kilohertz additional kHz noise (cyan area) has been marked in approximated box windows. As in the text these energy fluency overcome the corresponding EM ones in gamma and radio by two or more order of magnitude. Note that the optical and infrared e.m. contribute are mostly born in local Universe. Note the relic SN neutrino signals at tens MeV energy whose detection is under rush search in SK (gadolinium implemented) detector, it is somehow comparable to Big Bang infrared signal.

signals with GWs, with no success. However as we have mentioned the BH BH merging in vacuum is a source only (or mostly) of silent EM GWs with no EM tail. Naturally binary collapse in AGN accretion disk or in dense globular cluster may shine in e.m. waves, but their frequency might be rare and their GW signature will be somehow spoiled and disturbed by the third body system and-or mass transfer. Therefore these dense surrounding might be traced in the GW signal anyway. Moreover the surrounding baryon screen will transfer into a gamma signal within an opaque dense wall leading to a long (hours) delay: this is due to baryon photon opacity and its over-Eddington dense electron pair screening. For this reason the very timed (and controversial) gamma flare correlation with LIGO GW150914, event found in FERMI with 0.4 s. detector delay, it seems very improbable.

2.1 NS-NS or NS-BH collapse GRB?

A more noisy neutron binary system while in collapse might be source of GW and also of the associated SN like explosion. However the masses are smaller, the consequent GW signal is much weaker and at higher frequency, the tidal disruption may smear and dilute the GW emission. Also a BH-NS fast cannibal collapse may lead to a very eccentric trajectory encounter or in the late stage of the NS strep-tease to sudden NS instability, causing GWs and an associated NS like a SN correlated explosion [Fargion et al.(2016)]. These events, because a ten times smaller masses,
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Figure 2: The cosmic number spectra in logarithmic scale as a function of the particle energy also in logarithmic scale. The huge solar contribute and the high optical galactic plane noise is ignored. The Big Bang infrared signal is ruling. The observed LIGO GW is the dashed area and the very probable associated kHz additional noise (gray area) has been marked in a box windows. As in the text these number’s contribute overcome the corresponding EM ones in gamma and radio. Note that the optical and infrared contribute are mostly born in local Universe. It will be surprising that such huge GW number flux won’t be visible in astronomy but without a correlated EM afterglow information over direction will be almost lost.

might be observable at much lower (about ten times) intensity and at a consequent much nearer (ten times) distances and at a higher (kHz) frequencies. They are the best candidate for a visible, mostly in optical way, to a correlated GW-SN like explosion [Fargion et al.(2016)]. The observable LIGO volume for such events at the same Signal-to-Noise level is, at present time, thousand times smaller than LIGO GW150914 one, and it might be revealed for instance in Virgo cluster or in a few tens Mpc Universe. The possible UHECR trace are not much correlated observable signals (in our lifetime) because of the slow random walk of charged nuclei or even proton, that will held for century to come in a very delayed time scale.

2.2 A GW spherical signal versus a jetted GRB one

Somehow any discover of any (we believe improbable) LIGO GW correlated GRB event it will be a winning signature of the old spherical explosive GRB Fireball model. Indeed the early GRB model has been a very spherical huge explosion: the celebrated Fireball model[Cavallo & Rees(1978), Goodman(1986), Paczynski(1986), Narayan et al.(1992), Rees & Meszaros(1994), Meszaros & Rees(1993)]
on 1980–2000 years. In our-days this spherical model is no longer alive. It has been de-throned by fountain Fireball, whose beam range ten or few degree. However if a spherical GRB would occur, with its associated GW merging, the EW observation must occur immediately because both GW explosion as well as the GRB burst are almost spherical symmetric. Only a time delay may separate their connection but such connection will be easily found soon. However the GRB has different model today. Indeed, the very high GRB time variability, the huge isotropic power needed and the consequent narrow size of the source (and its high over-Eddington opacity for such GRB hard gamma spectra events) forced most the authors (since 2000s) to consider more and more a beamed fireball-fountain [Waxman(1997), Wijers et al.(1997), Goldstein et al.(2016)] models whose opening angle is at least as wide as $\frac{\Delta \Omega}{H} \approx 10^{-3}$. On the other side we offered since the earliest GRB-SN event on April 1998 a different persistent model: a very beamed and persistent jet model[Fargion(1999), Fargion(2001), Fargion(2001b), Fargion et al.(2016)] $\frac{\Delta \Omega}{H} \approx 10^{-6} - 10^{-8}$, spinning and precessing with a decaying output, able to fit by its blazing geometry the erratic GRB luminosity as well as to explain the very puzzling variable re-brightening of GRB afterglow or their rare, otherwise unexplained, X-ray precursor[Fargion et al.(2006)]. In particular most recent version [Fargion et al.(2016)] based on a NS strep tease by a BH merging guarantees an early electron pair jets (with no neutrino correlated signal) and a late NS fragmentation leading to SN like explosive event. These model explain the rare but puzzling and critical GRB and SN coexistence.

Anyway beamed GRB (Fireball or precessing Jet) are not spherical at all. Therefore the discover, soon or later, of LIGO-VIRGO GW-GRB connection is a benchmark of the GRB model: a spherical GRB will be soon be observed in gamma connection with its GW; a jetted one will be rarely or mostly not observed with the its originating GW. In a more quantitative estimate, the GRB beam pointing inside a solid angle of $\frac{\Delta \Omega}{H} \approx 10^{-3}$ will need hundreds of events and tens LIGO-VIRGO recording years (even more for our thinner GRB jet model [Fargion et al.(2016)]). The LIGO-VIRGO GW visibility is somehow turned in this Amletic question: GRB, beaming or not beaming jet? as we mentioned only some nearer GRB fed by NS-BH or NS-NS merging may also trace by a parasite SN like explosion in a correlated spherical event. Not the BH-BH merging in a vacuum space. As mentioned above, we believe that the jet beam in GRB is quite narrow, below a few micro steradian so that it may spray in long times in little wider cones. In our view GRB is a persistent jet that it may arise as a precursor (of the same main blaze GRB) and it may occur earlier (days, weeks months) before than the GW event where one of the BH jet and its companion are merged in unique BH. This implies that in general the observation of a GRB in axis occurs at a very rare rate (once every thousands or more) appearing mostly off axis or not at all. The contemporaneous GWs it is therefore very improbable.

3. The Photon Graviton conversion

The foreseen kHz to-be-observed-soon GW are reminding us of a relevant connection with a parasite EM radiation: the parametric photon-graviton conversion. The G-$\gamma$ conversion, were first considered in early 60s[Gertsenshtein(1961)] and studied through the last decades [Mitskevich(1970), Boccaletti et al.(1970), Dubrovich(1972), Zel’dovich(1974), Fargion(1995)]. Gertsenshtein first argued that the coupled gravity-EM energy equation will generate EM waves. Historically, gravity bending light was first proposed by Einstein himself, exactly a century ago. The same Feynman
Diagram (a real photon plus a virtual graviton of the gravitational object are leading into a scattered photon again), may occur in the opposite way (a real graviton plus a virtual photon are leading to a real photon). The conversion process occurs because, while GWs propagate and squeeze in space-time, they also force the intergalactic magnetic field lines to tremble and vibrate, thus producing a secondary tuned EM waves.

The G-γ conversion process can be interpreted as a secondary effect of gravitational synchrotron radiation[Gertsenshtein&Pustovoit(1962)] and it has been also analyzed by different authors[Lupanov(1967), Sushkov&Khriplovich(1974), Palazzi&Fargion(1987)]; see also [Fargion(1991), Dolgov&Ejlli(2013)]. Let us briefly recall the equations of the GW ↔ EW oscillations according to Landau and Lifshitz’s notation[Landau&Lifshitz(1975)]: let’s consider a nearly-flat space-time \( \eta^{\mu\nu} \) with a small metric perturbation \( h^{\mu\nu} \) and let’s call the traceless tensor \( \psi^{\mu\nu} \). We can then write

\[
g^{\mu\nu} = \eta^{\mu\nu} + h^{\mu\nu} \quad h^{\mu\nu} = \psi^{\mu\nu} - \frac{1}{2} \psi^{\sigma\delta} \delta^{\mu\nu}, \tag{3.1}
\]

so that the Einstein field equations \( G^{\mu\nu} = (8\pi G/c^4)T^{\mu\nu} \) in the linear approximation become

\[
\Box \psi^{\mu\nu} = \Box h^{\mu\nu} = - \frac{16\pi G}{c^4} \tau^{\mu\nu}, \tag{3.2}
\]

where \( \tau^{\mu\nu} \) is the energy momentum tensor (the first equality in equation (3.2) holds because \( \psi^{\mu\mu} = 0 \)).

In an external stationary EM field \( F_{\sigma\tau}^{(0)} \) and in the presence of a free EW, \( \bar{F}_{\sigma\tau} \), the total EM field is

\[
F^{\mu\nu} \equiv F^{\mu\nu(0)} + \bar{F}^{\mu\nu} \tag{3.3}
\]

The corresponding energy-momentum tensor is then

\[
\tau^{\mu\nu} = \frac{1}{4\pi} \left[ F^{\mu\sigma} F_{\nu\sigma} - \frac{1}{4} \delta^{\mu\nu} \left( F^{\sigma\tau} F_{\sigma\tau} \right) \right] \tag{3.4}
\]

and

\[
\Box h^{\mu\nu} = - \frac{16\pi G}{c^4} \tau^{\mu\nu} = - \frac{8G}{c^4} \left[ F^{(0)\mu\sigma} F_{\nu\sigma} - \frac{1}{4} \delta^{\mu\nu} \left( F^{(0)\sigma\tau} F_{\sigma\tau} \right) \right]. \tag{3.5}
\]

In a few words the spacetime squeeze the magnetic stationary fields making them to emit and the photon with the stationary magnetic field couple and makes energy trembling and generating GW: This idea was rediscovered while we proposed (by one of us)[Palazzi&Fargion(1987)] a twin artificial experiment, firstly producing “optical” waves in magnetic tunnels then high energy graviton and later on getting back observable photons; unfortunately this double EW-GW-EW twin conversion is very poor, today, and it is not feasible. This parametric conversion in low radio band in astrophysics is somehow modulated and diluted by the plasma presence that, in a way, makes photons behave as they had a mass. Therefore this GW-EW conversion in space has the damping related to the free charge in space. The conversion \( \langle \alpha \rangle \) do not grows quadratically \( \langle \alpha \rangle \approx \frac{G}{c^4} B^2 L^2 \) but just linearly:

\[
\langle \alpha \rangle \simeq \frac{G}{c^4} \cdot B^2 L_{\text{Coherence}} L_{\text{Distance}} \tag{3.6}
\]

A first conclusion follows: there is much more GW radiation in our universe than the high energy astrophysical one, but these huge low frequency kHz signals has a trace anyway in a tiny radio
bang waves [Fargion(1995)] at milli-Jansky threshold fluency. We wonder if these weak signals may be observable in future experiment. We would like to notice that underwater submarine may communicate in these lowest radio frequency. Therefore it might be of interest to verify if any military antenna at ground or better in space may have been recording such a radio bang in correlated GWs event.

4. Black Hole progenitors

There is a negligible probability that two single large \( \approx 30 M_\odot \) will interact and bind and merge as the GW150914 merging event in an average dense cosmology, even in the extreme unrealistic assumption that these BH are the total missing dark matter of the Universe: in the whole history of the Universe this may occur only once (for reasonable speed velocity) much below unity \( (\simeq 10^{-4}) \) or just few times in a dozen billion years if one assume that these dark matter BHs are clustered in million times denser galaxy volumes. There are other places that may be a catalyst for such rarest encounter: the inner dense medium of largest giant star (three body event) or along accretion disk or halo of giant AGN BH [Fargion et al.(2016b)]. However these possibilities sound much more rare of a more probable genetic parental birth: the largest giant star binary systems. Such a hottest and most massive double star has been recently discovered in the LMC.

4.1 The Giant star system VFTS 352

The double giant star system VFTS 352 is located about 160000 light-years away in the Tarantula Nebula in LMC. This remarkable region is the most active nursery of new stars in the nearby Universe and new observations from ESO and VLT have revealed that this pair of young stars is among the most extreme and strangest yet found. This system VFTS 352 is composed of two very hot, bright and massive stars that orbit each other in little more than a day. The center of the stars are separated by a dozen of million of kilometers. Their surfaces overlap and a bridge has formed between them. VFTS 352 is not only the most massive known in this tiny class of over-contact binaries it has a combined mass of about 57 times that of the Sun, comparable with the GW150914 binary BH masses. The rarity of such huge giant stellar system stand in front on more mundane and abundant (and less giant) large stars systems able anyway to lead to few (3-6) solar mass BH. Therefore there must be a much larger population of lighter (3-6) solar mass BH binary systems whose detection metric deflection is nearly ten times weaker and whose consequent detection distances are ten times smaller inside a nearby Universe.

4.2 Future few solar masses BH GW event at kHz

Therefore the LIGO result may soon lead to detection of nearer 3M_\odot binary systems masses as it may be better observable via threefold LIGO-Virgo array detection already during few next years or decade. These events would occur in a narrow universe \( (\lesssim 40 \text{ Mpc}) \), possibly within the same GZK cut-off as it is for the UHECRs. Naturally, while one might barely hope for an EM afterglow detection, as it has been widely tried and searched for identification (we actually believe, as shown below, that it will be highly improbable), there won’t be any possible correlation with the quite lazy and slow and bent UHECR arrival signal hundreds or thousand years later. These expected EM events of few solar masses BH could then be better observed by future higher
sensitive LIGO-Virgo array, inside a much narrower universe possibly also correlated to richest dense galaxy clusters. The possibility to reveal a nearby galaxy cluster correlation (like pointing to Virgo or Coma, but not to the individual galaxy or star source) for few solar mass BH system, seem to us the maximal hope of present array GW detectors.

5. A LIGO-VIRGO GW connection to TeVs ν?

If one consider the huge power of the LIGO BH event one may remind the comparable GRB (apparent) huge bursting luminosity. Therefore it is natural to attempt a LIGO connection to EM or neutrino signal somehow correlated to GRB or AGN like flare. At the present no TeV neutrino signal has been found correlated with a GRBs. If the GRB is a blazing ultra-relativistic jet than the inner cone are the most energetic and most collimated component of the jet. The UHE neutrino will be mostly in a thinner hard core of the jet. Therefore the first neutrino event may be probably a precursor of a later secondary (by wider cone gamma jet) gamma signal. If the Gamma correlation will be absent any harder TeV ones sound even much more improbable. Of course the possibility for such connection is related to the binary model and to the GRB ejection model. In the far past (let’s say until 1999) most models suggested, that GRB were just an ideal spherical symmetric fireball: the nearly spherical symmetric GW signal would or could correlate, soon or later, with the spherical Fireball at same power as a natural candidate source. However the Fireball spherical model is fade away for several reasons mentioned above and most model imagine GRB as a beamed jet more (as we suggested 0.1°) or less (5°) beamed and collimated. In this optics the possibility that a GW (spherical) event does correlate with a beamed GRB jet (usually pointing elsewhere) seem quite unlikely. In case of the GRBs searching for an afterglow the opposite was taking place: a very beamed gamma signal was hit our wide angle view gamma satellites; then we could easily follow the X ray afterglow disentangling its inner optical transient. Moreover for GW event there is also a very probable time lag between the its explosions and any correlated erupting signal, that we underline, it is very possibly, pointing elsewhere.

Conclusions

The GW astronomy is a great piece in the widest astronomy puzzle. The discover has been a great achievement. However the half a century we waste in past gamma astronomy is teaching us that the array triangulation (for GRB since 1967 up to 1997) for three decades even by very far (Ulysses) satellite distances, has been useless. Only a fast GRB to narrow X ray windows connection in a very short time would lead telescope to find an inner sky where an optical transient revealed a host galaxy source. The possibility that LIGO-VIRGO tens solar mass merging is catalyzed along dense AGN BH accretion disk might soon or later reveal by Kepler and Lorentz viscous imprint inside the very same early tail of the GWs structure, also via the additional peculiar Shapiro phase delay within the GW structure [Fargion&Conversano(1997)]. In a such a rush and a search for an astronomy, as we mentioned above, there is room to search for rare GWs conversion into kHz radio waves [Fargion(1991)], [Fargion(1995)]; in particular by searching for correlated GW event in radio bangs captured in the same military low radio band records in submarine communicate systems. In conclusion we believe, by a realistic view, that a very long road map is waiting for
GW astronomy; first a real tripled event in GWs should be achieved also with Virgo; then higher sensitivity GW arrays should reach a very nearby (tens Mpc) Universe: therefore the GW detectors may finally reach a NS-NS or NS-BH GW collapse and signal also in optical SN like signature. Its optical SN-like optical transient might shine as a precursor and a first light (gamma) pointing back to its birth place hours or days before the GW: the very first tag for a sharp GW astronomy. Similar signature may occur for UHE ICECUBE TeVs Neutrino whose signals maybe be recorded hours or days before in gamma sky before their last denser collapse stage make the photons trapped inside the explosive core.

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