12.A.11.3 Phase of crystalization

From previous chapters we know that the longer prism is related to the negative charge, but in fact the charge is defined by the handedness (prism twisting). To avoid the problem of incorrect assignment of the handedness (internal structure twisting) we may use the **attribute positive and negative**, keeping in mind that the positive and negative charges we are acquainted with appear only in CL space environment. Using the adopted assignment, the following ratio is valid (derived from the analysis in Chapter 2, 3 and 4 of BSM).

length ratio between a positive and a negative prism = 2/3

Sometimes when the handedness has to be explicitly used for explanation of some process, the following adopted assignment will be used:

negative (longer) prism: right handed internal twisting
positive (shorter) prism: left handed internal twisted

The crystallization process could start from any free prisms, not integrated into the lattice, but after they are consumed the process will be fed by the prisms integrated into the lattice. The prisms nodes from the positive lattice structure are not connected between themselves, so they could be disintegrated much easier from the lattice. This will provide a definite predomination for crystallization of positive helical structures, first. It is apparent that the crystallization process will begin near the internal surface of the lattice, because it is not connected to the solid egg shell.

Many features of the crystallization process has been already discussed in Chapter 2 of BSM. In the same Chapter the components of the helical structures and their symbolic notations has been also given.

The crystallization starts with a building of elemental node of 7 prisms, as shown in Fig. 12.16. (More detailed sketches about the geometrical features of the real prisms were shown in Chapter 2 of BSM).

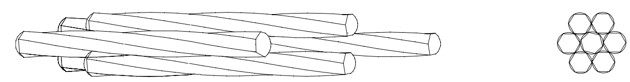

Fig. 12.16. Elemental node of helical structure core (Note: The shown large degree of peripheral twisting is used for the model only. In the real prism the twisting is in its internal structure).

Once started the elemental nodes will continue to grow in the axial direction forming a zero order structure (core). After it becomes long enough it will start to bend, so it will continue to grow in a curvature instead of in a straight line. After completion of one full turn, the both ends will not meet each other due the built helicity in the prisms and the possible small external twisting of the prisms. When the number of helical turns is increased suitable conditions will be created for building of quasirectangular type of lattice (with axial helical symmetry) inside the cylindrical space enclosed by the helical structure. (The property of this lattice has been described in details in Chapter 2). This internal lattice structure will have an empty hole along the central axis, where a condition for a trapping hole mechanism discussed in Chapter 2 will be created (due to prism to prism IG interactions). Negative (right handed) prisms will be favoured to penetrate inside the hole, where suitable conditions exists for crystalization of a core. At some point, the external helix will become quite long and will start to bend. It will start to convert to a second order helical structure, but before making a full turn the internal helical core of negative prisms already will determine the direction of the bending (handedness) of the second order helical structure. So the helicity of the second order helical structure of positive prisms, corresponding to the negative (charge) attribute defined by the handedness (right handed accepted) will be determined by the internal core formed of negative prisms. The second order helical structure will be of type SH_m^2:+(-). A portion of such structure is shown in Fig. 12.17. When the number of turns **m** becomes large enough, the structure will start to bend. This transition is expressed by eqs. (12.18).

Then a full turn from a third order structure of type CH_1^3:+(-) will be formed, which will grow to a multiturn structure according to the Eq. (12.19), where the symbol "->" denotes the crystallization grow process.

$$SH_m^2:+(-) \rightarrow CH_m^2:+(-) \quad (12.18)$$

$$SH_1^3:+(-) \rightarrow SH_m^3:+(-) \quad (12.19)$$

It was pointed out in Chapter 2 of BSM, that the higher order structures have a lower stiffness. **The second order structures still have some stiffness that opposes the intrinsic gravitation to attract the neighbouring coils. This allows the structure to be bent.** For the third order structure the stiffness is much lower, so the IG forces may predominate. Therefore, the third order structures are not expected to bent. This also means that formation of structures with order higher than 3 likely not possible. **We may admit that the highest order structure is of the type** SH_m^3:+(-) (this assumption is in full agreement to the analysis of the structure of the elementary particles provided in the previous chapters).

According to the provided considerations, the crystallization process is expected to lead to formation of clusters made of parallel neighbouring structures. Figure 12.17 illustrates the mutual positions of such clusters, where SH_m^3:+(-) is the cluster envelope helical structure and SH_m^1:-(+(-) is the internal axial helical structure.

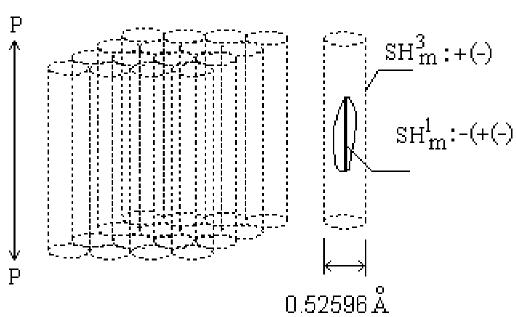

Fig. 12.17. Bunch of clusters

The external diameter of a single cluster is estimated by the proton (neutron) dimensions, calculated in Chapter 6 and verified in Chapter 7 , 8 and 9.

$$DIA = (L_{pc})/\pi + 2(R_c + r_p) = 0.52596\times10^{-10} \text{ (m)} \quad (2.20)$$

Figure 12.18 illustrates a single cluster with an exploded views showing the fine structure of the external shell. One may distinguish three different types of spaces enclosed in the cluster's bunch. Spaces "one" and "two" are denotes as internal, because they are inside of the clusters, while the spaces between the clusters (not shown in Fig. 12.18) are considered as "external".

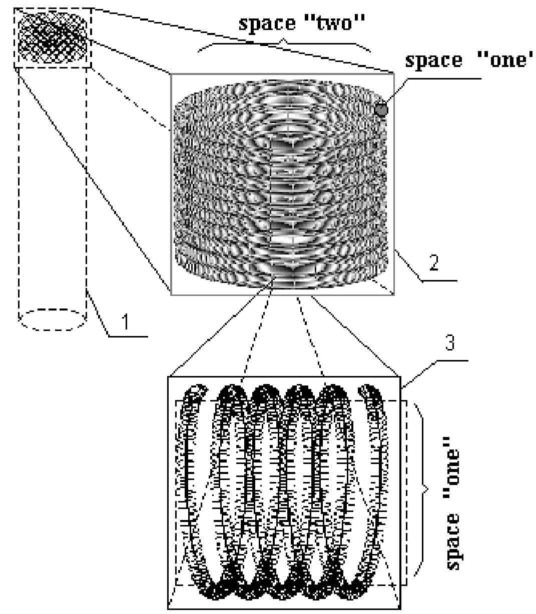

Fig. 12.18
1 - single cluster; 2 - exploded view of the cluster;
3 - exploded view of the helical structure SH_m^3:+(-)

12.A.11.4. Crystallization inside the internal spaces

The external space is not so quiet as the internal one because a motion between the structures could exists. Consequently the internal spaces are much more convenient for crystallization of complex helical structures.

The crystallization in the internal spaces is favoured not only of the quiet conditions but also from the trapping mechanism, discussed in Chapter 2 (with evidence about its existence in some experiments with kaons). This mechanism is quite effective in structures possessing a smaller diameter and a large length to diameter ratio. Consequently, this mechanisms is quite strong in the space "one" and less stronger in the pace "two".

The features of building of internal rectangular lattice in FOHS and the trapping mechanism has been described in Chapter 2 of BSM. Applying these features it is possible to understand how the initially defined conditions allow a crystallization of well defined helical structures with internal rectangular lattices.

Let provide some logical scenario for the crystallization process in space "one", which is inside the structure CH_m^2:+(-). The internal gravitational lattice is of a rectangular type and of the same prism's type as the helical structure core. It is able to provide an internal electrical field (see Chapter 2 of BSM) that in this case is positive. This field will favour trapping of negative prisms. When enough long core of these prisms is built, it will start converting into a first order helical structure. Then this structure will allow building of its own internal rectangular lattice and a new trapping mechanism will favour inserting of positive prisms leading to building of a positive core inside. When this core becomes long enough it will start to bent and convert into a first order positive helical structure with an internal second order cubic lattice. Now the trapping mechanism inside of the positive structure will favour insertion of negative prisms. Then a negative core will be built. In this case a complete first order structure with a core will be built in the space "one'. It will be of type SH_m^1:-(+(-). This structure grows in the lattice space of SH_m^3:+(-). Initially it will occupy the central zone where the trapping mechanism exists but in some moment the whole structure SH_m^1:-(+(-) will start to bend and convert to a second order helical structure inside the lattice space "1":

$$SH_m^1{:}-(+(-) \ -> CH_m^2{:}-(+(-) \qquad (12.22)$$

The structure CH_m^2:-(+(-) forming inside of the space "1" is restricted by diameter. It could not obtain the same second order helical step like the external structure CH_m^2:+(-) because of a minimum bending radius restriction (a critical curvature).

Consequently the structure CH_m^2:+(-) **has a larger helical step than the structure C**H_m^2:+(-)**.**

When the process (12.22) occurs the central zone of the CH_m^2:+(-) becomes free and then a process of a new second order structure will start. But now the trapping mechanism is inverted because of the electrical influence of the new built CH_m^2:-(+(-) structure. Despite the fact that this structure has less number of turns per unit length in comparison to the structure CH_m^2:+(-), it is closer to the central zone. The positive internal radial field of CH_m^2:+(-) also is not so strong and now the negative field of CH_m^2:-(+(-) will predominate (these fields are caused by IG forces propagated through the existed lattice). This means that the next complete built structure will be with a positive external shell. Therefore, the charge sign of every consecutive second order lattice will change. Following this logic, the internal space "one" should be filled with pairs of second order structures with opposite charge of their external shells, until the interaction between the energy of the electric field becomes equal to the radial gravitational energy propagated through the lattice. Such pairs will later convert to internal pion pairs (negative and positive). (In Chapter 6 of BSM, it has been found that a pair of opposite charged pions with an overall shape of double helix exists inside the proton (neutron)).

The protopion pairs contain even number of completed helical structures, so they could not occupy the central region of space "one'. This region, however, could not be left empty, because conditions for the trapping mechanism still exist. Consequently, the internal crystallization in space "one" will be terminated only by a straight helical structure of first order SH_m^{1-}:-(+(-). From this structure the internal kaon of the protoneutron will be formed.

If we review again the structures notified in Table 2.1 and graphically shown in Fig.3.2 we will see that **for structures possessing a central core the higher order helicity is always determined by the core handedness.**

This is an outcome from the initial choice that the denser but shorter prism is of a "positive" type (left handed).

The conditions for crystalization in the internal space "2" are not the same as the space "1". The space "2" has much larger diameter and its internal walls are not so smooth. The trapping mechanism for such conditions may not be so effective. But we may accept that when the cluster becomes long enough the space "2" may create conditions for formation of a negative helical structure. Then the evolution of this structure may create conditions for a trapping mechanisms, so a straight structure of type SH_m^1:-(+(-) could be formed.

We have seen that the initial core for starting the crystalization process is quite simple configuration of 7 prisms, but it leads to creation of long clusters. So, it is quite logical to accept that the described crystalization phase involves multiple parallel crystallization processes. They may begin in many places in the internal lattice layer of the protogalactic egg. The speed of such processes might be extremely fast when taking into account how small is the Planck's time which is related to IG processes. In fact the prisms time constant is expected to be between the Plank's time ($5.39\text{x}10^{-44}$ s) and the CL note resonance cycle ($9.15\text{x}10^{-30}$ s).

It is evident that the cluster growing along the axis P-P shown in Fig. 12.17 will be much faster than the formation of parallel clusters, because the second option requires new crystalization nuclei. This may lead to cluster alignment even between different domains. Then in the end of the crystallization phase all the clusters may get preferential alignment forming aligned superclusters. In such case, the prism's matter in the galaxy egg that had initially a complete central symmetry may obtain some degree of polar symmetry about one axis, named a **galaxy egg polar axis**.

Conclusions:

A. The trapping mechanism of the internal lattice of CH_m^2:+(-) structure is inverted after every built structure of second order. This means that the external shell or charge will be changed in the order: - + - +

B. The whole space of the internal lattice of CH_m^2:+(-) will be filled with structures with pair charges.

C. The crystalization of the lattice space of CH_m^2:+(-) will be terminated with a final central structure of type SH_m^1:-(+(-).

D. The central cores of all structures are negative as a consequence of the fact that the shorter prism is the positive one.

E. The phase of crystallization involves multiple parallel processes

F. In the end of crystallization phase, the clusters may form superclusters with some degree of rotational symmetry about an axis named a galaxy egg polar axis.

12.A.11.5. Cluster refurbishing

We have seen, that in the process of cluster creation and growing the crystallisation of helical structures is more effective in space "1", quite less effective in space "2" and not effective in the "external space" (the space between the clusters). More effective crystallisation means a larger consumption of prisms. Consequently, the space "3" will be more enriched on prisms. The prisms number density for this space will be above the critical value for a lattice formation (see Chapter 2 of BSM). Hence, the lattice structures will be first created in the space "one", then in the space "two", while a possible lattice creation in the space between clusters will be delayed significantly. This feature gives enough time for the crystallization of the subatomic particles in the spaces "1" and "2".

At some particular moment when the clusters become long enough, the conditions for internal cubic type of lattice in the space "2" will prevail over the CL type of lattice. But there is a geometrical incompatibility between the internal cubic lattice and the helicity of the structure. The effect of this incompatibility for the space "1" could be diminished from the influence of the few second order twisted structures built inside. Although for the space "2", where there is only a one central structure, this effect in some particular moment could become quite strong. The cubic lattice space with a boundary shape of a long cylinder could have strong concentric fluctuations. In some moment the phase of this fluctuations could align across the length. This will cause a strong share stress between the clusters coils. The created shear forces will lead to a cutting of the structure SH_m^3:+(-) in a section parallel to the central core of the cluster. In a such process, the internal structures CH_m^2:+(-), CH_m^2:-(+(-) and the central one SH_m^1:-(+(-) will be also cut. Their internal lattices from the first two structures (but not the central one) will get a partial twisting and conversion from a RL(R) to a RL(T) type. The strong IG fields from RL of the cut structures inside the single coil of SH_1^3:+(-) will manage to connect the both ends forming in such way the structures given in the Table 12.4.

Table 12.4

From	Final	Internal RL	description
CH_m^2:+(-) ->	(internal π^+)	RL(T)	curled torus
CH_m^2:-(+(-) ->	(internal π^-)	RL(T)	curled torus
SH_m^1:-(+(-) ->	(internal kaon)	RL(R)	torus
SH_m^3:+(-) ->	protoneutron		complex torus

The connection of the free ends is favoured by two features:

- the axial anisotropy of the IGSPM field built in the prisms
- the existence of internal lattice inside the space "1".

We may call this phase a **cluster methamorphosis**. The external shell expression for such transition is:

$$SH_m^3:+(-) \rightarrow n[TH_1^3:+(-)] \qquad (12.23)$$

where: *n* - is a number of toruses produced from one cluster.

The cluster refurbishing may occur in different domains of clusters, spatially separated. Having in mind the parallel type of the crystallization mechanism discussed in §12.A.11.4, the moments of this transitions in the time scale may have a gaussian type of distribution around some mean moment in the time scale of the matter evolution inside the galaxy egg.

For any refurbished cluster the crystallization process is terminated when torus shape particles are obtained. The internal straight structure SH_m^1:-(+(-) inside the cluster, may still exist, but the new obtained cluster of toruses does not have enough resistance for keeping the new obtained clusters of toruses aligned. Now the alignment of these toruses is kept only by the internal rectangular lattice inside the space "two".

Summary:

The obtained structures after the cluster refurbishment are toruses with external shell of type [TH_1^3:+(-)]. These structures are protoneutrons. They are distinguished from the protons and neutrons only by their overall external shape:

- the protoneutron is a torus

- the proton is a twisted protoneutron (as a figure 8)

- the neutron is a folded protoneutron

12.A.11.6. Explosion phase of the protogalactic egg.

12.A.11.6.1. Final phase of the particle crystallization process and explosion

The protoneutrons are kept in the refurbished clusters as long as the rectangular lattice (RL) inside space "2" is not destroyed. After the cluster refurbishments into aligned toruses, the alignment forces are not strong as before. A cluster disalignment may occur, leading to break-up of the RL lattice structure in space "2". As a result, the released RL nodes will migrate to the space between clusters, where the prisms abundance is low. In such conditions, the RL nodes may undergo transformation into CL nodes. The creation of CL space is quite fast due to the intrinsically small inertial factor of the prisms. In CL space environment, however, the shape of torus is not stable, so it is converted to twisted (proton) or folded shape (neutron). In the same time the neutron obtains near locked electrical field, while the electrical field of the proton is unlocked (far field). The obtained protons are so close, that the energy from the common repulsive forces is enormous. **This will lead to a huge explosion, which initiates a birth of a galaxy.**

We see, that the driving force for the explosion is the creation of CL space from the released prisms of RL space domains, which have been in space "2" during the crystalization phase. The fast creation of CL space appears as an avalanche process. All clusters that has been previously refurbished to columns of toruses are converted to protons and neutrons and contribute to the explosion. In the same time the central structure SH_m^1:-(+(-), that has been in space "2" brakes into pieces which a initially inside the RL structure environment. In such conditions it may break into number of single coils. These coils become normal electrons once they appear in CL space (their internal RL type lattice converts to RL(T). Therefore, enough quantity of electrons is created just in this violent process. Any new born electron is possible to oscillate and emit X-radiation in CL space (see the electron structure in Chapter 3). The combination of electron and protons provides atomic hydrogen, that is also possible to emit photons.

The described process of explosion initiates the birth of a new galaxy. The further development of the process and the detectable “message” sent in the Universe about this process is discussed in §12.B.5.2.

The described process allows understanding some aspects about the possible driving mechanism behind the explosion. There is another aspect of this mechanism which is related to the radial direction of the explosion.

12.A.11.6.2. Interaction between the bulk matter nucleus and the internal egg-shell

According to the described concept the internal egg-shell is positive (see Fig. 12.15). It is comprised of positive prisms, radially aligned in shells with finite thickness. Such structure possesses enormous radial component of IGSPM. This component appears from both sides of the egg-shell towards the bulk nucleus and towards the internal space of the egg (between the two egg-shells). After the eruption of the two most external QB layers from the bulk nucleus, its total energy (of the bulk nucleus) is reduced but some underlying layers of QBs then become external. It is reasonable to expect that the shape of the nucleus is very close to sphere. Then a strong prism-to-prism interaction (see Chapter 2 of BSM) may exist between the QB’s layer of the bulk nucleus and the positive protogalactic egg-shell, which is left after the explosion. These interactions are through empty space, but they are still possible due to the high order alignment of the QPs in the prisms that formes the egg-shell. The whole protogalactic egg may posses rotational motion in respect to the bulk nucleus, which is enclosed in the centre of this egg. Then the interaction between the internal egg-shell and the nucleus may be responsible for:

(a) contributing to smother surface of the spherical bulk nucleus

(b) keeping the bulk nucleus in the centre of the internal egg-shell.

The features (a) and (b) are important not only for the correct process of explosion, followed by formation of well developed galaxy. These features additionally define conditions for stable existence of the galaxy during its active life. For this reason **the existence of the internal egg-shell left over the explosion is of crucial importance.**

12.A.11.6.3.Role of the internal egg-shell on the direction of explosion.

The fast created CL space before the explosion could preferentially fill-up the space enclosed between the two shells of the protogalactic egg. The egg-shells may still influence and modulate strongly the CL space with its radial IGSPM component. So the internal egg-shell of aligned positive prisms will behave as a huge positive charge, while the external one as a negative. During the cluster refurbishment all of not completed toruses (and part of completed) could be destroyed. Their positive and negative FOHS’s could lead to a large production of broken helical structures if second order, which will decay to the stable particles electrons and positrons.

All the protons and positrons will be repulsed from the huge positive charge of the internal egg-shell. **This provides initial direction of the explosion in a radial direction. Consequently the internal egg-shell should be strong enough in order to sustain this initial shock. However, this shock may serve as an initial test for assuring the stable existence of the internal egg-shell during the long active life of the new born galaxy.**

The huge amount of the initially created positrons may contribute to the amount of the positrons still detectable from the space. The large amount of observed cosmic positrons is in agreement with the presented concept.

The other important role of the internal egg-shell is the keeping the bulk nucleus isolated from the new born CL space and matter. It is of key importance about the active life of the new born galaxy. Its behaviour during the active life of the galaxy is further discussed in §12.B.6.1.2.

Summary:

- **The explosion is driven by the repulsive forces between the closely spaced new born protons when they suddenly occur in CL space environment**

- **The birth of new galaxy is successful if the internal egg-shell of the galaxy egg survives the explosion**
- **The internal egg-shell keeps the bulk matter nucleus isolated from the atomic matter of the new born galaxy. Its existence is of crucial importance during the whole active life of the galaxy.**

12.B. BSM concept of stationary universe

The “Big Bang theory” relies on the assumption that the space we observe is homogeneous. Then the observed red shift is assumed to be only of Doppler origin. However, based on the alternative concept about the physical vacuum, we arrived to the conclusion that space of the observed Universe is not homogeneous. The CL spaces of the different galaxies and different galactic lives differ, because the total galactic mass (of the visible matter) participating in the moulding process of the prisms is different. Despite that the intrinsic matter quantity in the prisms is equal, their diameter to length ratio may differ slightly.

The cosmological red shift according to the BSM is contributed by two components: a Doppler shift and a cosmological one. The first component may dominate only in the range of the home galaxy. For larger distances the second component dominates (see §12.B.4.2.2). **This is a fundamental issue, the understanding of which leads to a profound change of our vision about the Universe.** The presented considerations, supported by a theoretical and experimental analysis inevitably leads to the conclusion that the Universe is a stationary instead of expanding. In such aspect the cosmological phenomena and their observational characteristics become fully compatible with the BSM concept about the physical vacuum, the rules of the Quantum mechanics and the relativistic phenomena.

In the new vision about the Universe, all observed cosmological phenomena could find logical explanations in a real three dimensional space with unidirectional time scale. Furthermore, the time scale is not reversible. The analysis of observed cosmological phenomena allows also to infer the whole process of the matter evolution with identification of some cosmological cycles. The most important cosmological cycle appears to be the life cycle of the individual galaxy. We may call it a **galactic cycle**.

The galactic cycle includes the following main phases:

- particle incubation
- active life
- recycling

The transition moment between the particle incubation and the active life could be denotes as a **birth of the galaxy**.

The transition moment between the active life and the recycling phase could be denoted as a **death of the galaxy**, or a **galaxy collapse** (subphase).

The both transition moments posses finite time durations, but they are much shorter, that the time durations of the main phases.

During the recycling phase the former prisms are destroyed and new prisms are created but with the same handedness and matter quantity. In the ideal case this must includes all the prisms - those from CL space and those integrated in the helical structures. In the real case, however, some islands of matter may broke from the process of galaxy collapse and survive as a remnant from the previous galaxy life. We will see later how important is this exclusion for assuring of normal process of recycling and multiple active life of any galaxy. In the recycling phase (and any other processes) the intrinsic matter does not (never) disappear.

It is evident that we may collect observational material about the galaxies only during their active life. But we may observe some phenomena preceding the galaxy collapse and immediately after the galaxy birth. The galactic CL space may exit and appears connected to the CL spaces of the neighbouring galaxies only during the phase of the active life of the galaxy under consideration. Only in such conditions we may get photons from that galaxy. In the first and third phase of the galactic cycle, any radiational exchange with the external world is impossible. Even the gravitational energy exchange could tend to zero due to lack of Newton’s gravitational signature from the galaxy undergoing the recycle process. The concept of the intrinsic gravitation (explained in §12.A.4 by IGSPM vector), and frequency dependence of the low level structure formations (see §12.A.5 and §12.A.6) may provide a good answer why the intrinsic matter of the galaxy during its hidden phases appears completely isolated from the external galactic neighbours.

One factor that may influence the future active life of the galaxy is its **proper space** that appears as an pure void (in a classical sense) space (excluding some small islands that have escaped the collapse). In a typical case this space is unchanged and a new born galaxy will occupy it again. If the space, however is changed due to some abnormal activity of the neighbouring galaxies, then the active life of the new born galaxy could be affected. So it may not reach a good development like the Seifert type of galaxy. The duration of its active life also could be affected. The galaxy may lost some of its quantity and energy also during its active life or due to a not efficient collection of its matter for recycling. It is evident that after number of cycles for all galaxies the mentioned phenomena may lead to differentiation of the shape and life duration of the individual galaxies. One informative observable parameter is the shape of the galaxy. The spiral and barred shaped galaxies are well developed, while the elliptical and lenticular galaxies are underdeveloped. The active life of the latter two types could be shorter.

Every normal galaxy contains a huge amount of intrinsic matter in its centre. We may call it a **galactic nucleus**. This is a logical result from the concept about the particle crystallization processes and the eruption mechanism (previously discussed). The observational material indicating the existence of massive "black holes" (with enormous masses estimated as equal to billion solar masses) in the Milky way and other galaxies is in a good agreement with the BSM concept about the galactic nucleus
(see *http://chandra.harvard.edu/xray_sources/blackholes_sm.html*)
The matter of this nucleus contains not only primary balls, but also primary quasiballs. These lower level formations are able to carry the memory for the correct handedness, which is necessary for correct crystalization process in the phase of particles incubation.

12.B.1 Recycling and incubation phases

While the processes of the hidden phases of the galactic cycles are without interruption we separate them into different phases for convenience. Starting from the moment of the galaxy collapse, the following subphases are inferred:

- galaxy collapse
- prisms destruction
- process of structural formations in the lower level of matter organization (prior to the eruption of the external layers described in §12.A.8)
- eruption and formation of two concentric clouds
- formation of concentric spherical shells and prisms moulding - a protogalactic egg
- internal process of shell pealing between the two shells of the protogalactic egg leading to release of the newly moulded free prisms
- formation of rectangular (cubic) lattice in the internal space of the protogalactic egg between the two shells
- crystallization of helical structures
- explosion of the protogalactic egg (crack of external core only); formation of a new CL space and expansion of the new born atomic matter (from the crystalized elementary particles)
- a birth of a new galaxy (more accurately a new galactic life)

12.B.2. Galaxy collapse

The galaxy collapse could be regarding as a transition subphase between the phases of active life and recycling

One of the causes for the collapse is the disturbance of the energy balance between the galaxy under consideration and its neighbours. While the active life of the well developed galaxy may extend up to a few billions of years it is in continuous balance exchange with the neighbouring galaxies, or in other words with the Universe. A disturbed balance may lead to a fast energy loss (while is not the sole reason for a shorter galaxy life as will be discussed later). The aging of the star population is also one very strong factor. It is known that many stars terminate their life as black holes or pulsars.

The black holes may disturb the radiation balance and may decrease the CL space Zero Point Energy of the home galaxy. The galaxy CL space with less and less moving objects may become poor on ZPE. The zero order waves keeps this energy quite equalised for the whole galactic CL space. So the lower ZPE will provide a build-up tension in the separation surface between the CL spaces of the galaxy under consideration and its neighbours. At some point the CL space structure of the galaxy could not resist to the strong pull-up forces toward the galactic nucleus. At some critical level the galactic CL space could be separated from the neighbouring CL spaces. This is the last moment when we may get a signal from the collapsing galaxy. The separated CL space shrinks in the following way: The distributed CL space energy is reduced in the break-up zone, due to the energy lost from the break-up. In this zone the prisms of the CL nodes exhibit lower IG energy. This disturbs the automatic supporting gaps between the CL nodes. Then the most external zone may generate a stream of folding nodes moving to the galactic nucleus. The CL space begins to collapse. The flying folded nodes create inertial forces on any object made of helical structures, so all the galactic matter: from a single particle to a planet and star obtain acceleration towards the galactic nucleus. The process may develop very fast. In the ideal case the bulk nucleus will collect the prisms of the whole galactic CL space and the whole matter (built by elementary particles). **If the galactic CL space, however, gets some internal break during this violent process, some islands of star formations may left completely isolated.** They will likely loose part of their CL space, which will cause a significant disturbance of the optimal ratio between the Static and Partial pressure given by Eq. (10.18) (Chapter 10 of BSM). While this ratio is an intrinsic parameter of the CL space with atomic matter, the escaped star formation may undergo some peculiar evolution tending to restore the optimal value of this ratio. This, however, could be done for the expense of reduction of the total system energy. The restoration of the optimal ratio will lead to a significant reduction of the previously occupied volume. Some destruction of older stars in the central part of the region will contribute for the partial restoration of the optimal ratio between the Static and Partial CL pressure. **Finally, the escaped from the galaxy collapse islands will be converted to compact Globular Clusters, capable to survive the phase of recycling and particle incubation of the former host galaxy. In the new born host galaxy they will be remnants from the previous galactic live.** In the same time the stars in the **Globular Clusters** may exhibit strange behaviour of their gravitational-inertial interactions in the environment of the new born CL space. The signatures of the strange behaviour of the stars from the Globular Clusters are later discussed in this Chapter.

Another factor that may cause a preliminary ending of the galactic life come from speeding pulsars. They could endanger the enclosure shell of the galactic nucleus of the home galaxy if they move towards it, however the strong galactic magnetic field partly preserves the galactic nucleus.

The physical nature of the pulsars and “black holes” is discussed in §12.B.6.4.

12.B.3. Preservation of the information about the prism’s matter quantity and handedness

The processes of matter evolution in the hidden phases of galaxy recycling have been described from §12.A.8 to §12.A.11. Among the important phenomena assuring the same matter quantity in the prisms from different formations (recycling phases) is the **matter dozation mechanism (or mechanism of the same destruction order of QBs).** It is valid for different galactic lives and for different galaxies, as well.

Another important feature for the prisms recycling is the **lower level memory**. The necessary 1 bit memory about the correct handedness of the prism is carried by the QBs. During the recycling process the prisms are destructed but their internal structure may not be destructed to the lowest level of the matter organization. If the QBs structures from a primary order or any upper order are able to survive the destruction, they will carry the necessary (1 bit) memory about handedness. The information of such memory could be effectively propagated from a lower order QBs to the higher order QBs, which are involved in the process of the prisms formation. The memory of the handedness assures creation of matter and not antimatter in the different galactic cycles. All astronomical and cosmological observation indicate that the Universe is made of matter and not of antimatter.

12.B.4 Variation of diameter to length ratio parameter for prisms from different recycles

12.B.4.1 Condition for interconnection between CL spaces from different galaxies and galactic recycles

While the matter dozation mechanism assures equal matter quantity for prisms from different galactic cycles, the total mass differences between the different galaxies means a different strength of the IG forces involved in the prisms moulding. As a result, the diameter to length ratio (usually less than unity) for prisms from different recycles could be different, as shown in Fig. 12.19. Inside of the home galaxy CL space, the difference of diameter to length ratio is self- compensating by the self-adjusted parameter *node distance*. If estimating the physical constants of any galaxy in units defined by the own CL space, they will look exactly the same. But if estimating them by the CL space units of only one galaxy, they will exhibit differences. These differences will be caused only by the diameter to length ratio difference of the prisms moulded in different recycles (formations). This difference, of cause, could not be estimated from a phenomenon taking place in the host galaxy (because thee CL space here is homogeneous). The signature of the difference can appear only if the investigated phenomenon is created in the CL space of one galaxy and detected in the CL space of another galaxy. For example we may study by optical methods a specific phenomena occurred outside of our home Milky way galaxy. The study of such phenomena are discussed later in this chapter.

Now let consider that the prisms of two neighbouring galaxies have a small difference in their diameter to length ratio. This will affect the interconnection of their CL spaces. In order to avoid the node dislocations in the connection zone, the internode space of the first CL structures will be slightly shrunk, while for the second one - slightly stretched from their optimal node spacing. Consequently, the connected galaxy CL spaces will contain a finite thickness zone. We may call this zone a Galactic Separation Surface (GSS). **The GSS will allow the propagation of the photons (and any EM radiation) but with some small energy loss due to the wavetrain refurbishment. This energy loss, according to BSM, appears as a cosmological redshift**.

The GSS zones are infinitely small in relation to a single galaxy CL space. Evidence of such zones are discussed in §12.B.4.2.5 and §12.B.12.

12.B.4.2 Cosmological red shift

12.B.4.2.1 How the difference of the diameter to length ratio for prisms of different formation may affect the fundamental CL space parameters

Let analyse the conditions for interconnection between the CL space of two neighbouring galaxy whose prisms have different diameter to length ratio, as shown respectively in Fig. 12.19a. and b.

.

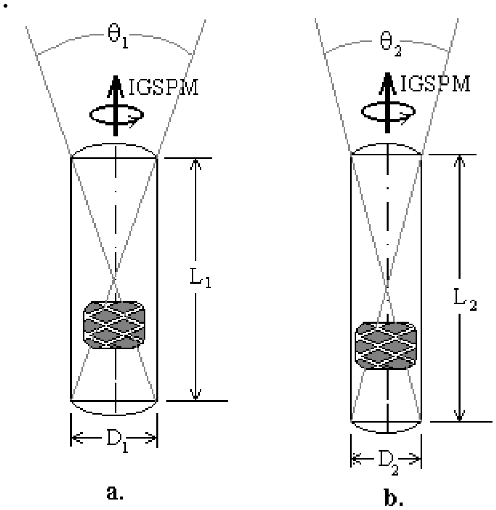

Fig. 12.19. Difference between two prisms of same substance and handedness but from different formations (recycles)

In the analysis of the process of the prisms moulding we concluded that the internal QPs of the prisms are aligned along the prism's axis. For prisms with different diameter to length ratio the subtended angles θ_1 and θ_2 are also different. Consequently, the IGSPM in both cases will have one and same integral strength but the spatial phase diagrams for both cases will be different. The dynamical properties of the CL nodes built of such prisms will also exhibit some differences. One possible difference is illustrated by Fig. 12.13. where the SPM quasispheres for prisms of two different formations (illustrated in Fig. 12.19) are shown.

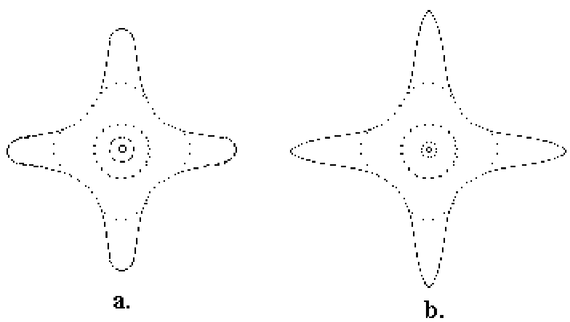

Fig. 12.20. SPM quasispheres of CL nodes from prisms of different formations with a different diameter to length ratio

The quasisphere of SPM vector for case b. exhibits sharper bump regions. The different steepness around the bump regions may cause a difference in the N_{RQ} cycles (number of NRM cycles for one cycle of SPM). Different N_{RQ} parameter means a different permeability of the physical vacuum (see §2.11.3 of Chapter 2 of BSM), which is involved in the definition of the light velocity according to the well known expression $c = (\varepsilon_0\mu_0)^{1/2}$. It is evident that the difference between prisms will lead to a difference in the dynamical properties of the CL nodes formed from them. Then the corresponding two CL spaces will have different CL space parameters. The difference in the CL space parameters would appear as a difference in the following physical constants:

- space time constant λ_{SPM} and consequently the light velocity

- Planck's constant

The difference between the N_{RQ} parameters of galactic spaces is identified by the analysis of observed phenomena discussed in §12.B.4.2.5.

Now let considering the conditions for interconnection between neighbouring galactic CL spaces based on the following considerations:

(a) Prisms of different formations contain one and a same number of QPs and one and a same quantity of intrinsic matter (due to the intrinsic matter dozation mechanism). This means that the internode distances for different prisms formations should be the same. Consequently, the interconnection requirements for the CL spaces of the neighbouring galaxies are satisfied.

(b) The same number of aligned QPs in prisms from different formations will provide the same frequency of the common mode IGSPM of the prisms for both formations

The conclusion in (a) about the same node distance is in agreement with the propagation features of the photons through the CL space. They do not exhibit a scattering from GSS (otherwise GSS will have a visible signature), but only an energy loss.

The same CL node matter quantity and internode distance for CL spaces of different prism's formations allow correct node to node interconnections between both spaces. In the same time the both parameters determine the CL node resonance frequency. Consequently

(c) both CL spaces should have the same resonance frequency ν_R (NRM vector frequency)

(d) the difference between both CL spaces will be in their N_{RQ} parameters

(e) both CL spaces will have different space-time constants $\lambda_{SPM(1)}$ and $\lambda_{SPM(2)}$ respectively.

(f) both CL spaces will have different light velocities (because ν_R and node distance is the same but λ_{SPM} is different)

The space time constant is a main characteristic parameter of quantum waves (see Chapter 2 about the equations of the light velocity). From conclusion (e) and (f) it follows that the next relation is valid

$$\frac{c(1)}{\lambda_{SPM(1)}} = \frac{c(2)}{\lambda_{SPM(2)}} \qquad (12.24)$$

where; *c(1)* and *c(2)* are the light velocities for both spaces referenced to the common parameter - the node distance

(g) Eq. (12.24) is valid for any photon whose frequency is a same subharmonic number of ν_{SPM}

12.B.4.2.2 Energy of photons from other galaxies

A. Energy loss of photon passing through GSS

Figure 12.21 illustrates part of the CL spaces of two neighbouring galaxies G1 and G2 and their common Galactic Separation Surface (GSS).

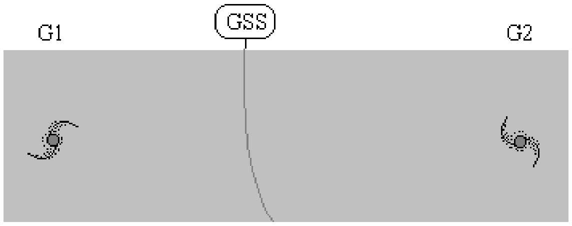

Fig. 12.21. GSS between CL spaces of two galaxies

The geometrical and interaction parameters of the elementary particles composed of helical structures are complied to the parameters of their home galaxy CL space (built of prisms from the same formation). Consequently, **the quantum features and the interaction energies are optimized for particles interactions taking place in own galaxy CL space.** This is valid for EM quantum waves (photons) emitted by own particles and propagated in own CL space and for generated electrical and magnetic fields, as well. Then if a photon emitted in a CL space "1" is detected in the same CL space, its energy should be one and a same (excluding the Doppler shift). The same is valid for photons in the CL space "2". If a photon emitted in a CL space "1", however, is detected in CL space "2" (or vice versa), its parameter are not optimized for a propagation through CL space "2", because of the difference between the N_{RQ} parameters of the both spaces. It will exhibit a loss of energy that will appear as a wavelength change towards the longer wavelength. This is so called redshift, which from the BSM concept about space appears to be not of Doppler type but cosmological. Having in mind the consideration (g) of §12.B.4.2.1, the energy loss corresponding to the cosmological red shift could be expressed by the relation

$$E = \left| \frac{h_o \; c_o}{\lambda_0} - \frac{h_1 \; c_1}{\lambda_1} \right| > 0 \qquad (12.25)$$

where: index "0" denotes the parameter in the space where the photon is emitted and "1" - where the photon is detected.

In the light of the presented consideration, Eq. Eq.(12.25) means that the constants for both CL spaces (h_0 and h_1) are different. Their common relation, however, is difficult to be estimated, because they are defined for their own space parameters only. For this reason the module of the difference is used.

It is apparent, that the conditions of the propagated photon in the new CL space are always less optimal than in the own CL space, where they are generated. Consequently, the process will always be accompanied with some energy loss, but never with energy gain. Such loss may occur only at the GSS, because the CL spaces are homogeneous. The concept of the energy loss in the GSS is confirmed by some observational data discussed in following sections.

Consequently:

(a) A photon passing through a GSS exhibits a small energy loss

(b) The small energy loss is detected as a red shift, the passed photon emerges with a slightly decreased wavelength. We will refer this effect as a Cosmological red shift.

(c) the observed large Z-shift for the distant galaxies is contributed from the cosmological red shifts.

Note: *The GSS is a real spatial domain. It should not be confused with the imaginary separation surface introduces in Chapter 10, for analysis of inertial phenomena of massive astronomical bodies in the CL space of the home galaxy.*

B. About the proper energy of the photon

The duration of the active life of the galaxy depends mostly on its own factors. In very rare cases it could depend on the neighbouring galaxies. One of this factors is the energy lost by emitted radiation if not equivalent absorbed radiation from the Universe is obtained. The energy stored in the galactic nucleus supply energy to the host galaxy during its active life, but the power of this energy may decrees with the time. (Now energy emitted from a supermassive black hole in the galactic nucleus is experimentally confirmed). Then it is reasonable to accept that the CL space of a new born galaxy has slightly higher static Zero Point Energy (ZPE-S) energy (see Chapter 5 of BSM about ZPE-s and ZPE-D) in comparison to the CL spaces of its neighbours. It follows from this that a photon emitted from this galaxy may be detected in the neighbouring galaxy as a blue shifted, despite that it will undergo some red shift when passing the GSS. If the same photon, however, is detected in a more distant galaxy, it will appear as red shifted, because it will undergo multiple redshifts at each of GSSs through which it passes. From these considerations we arrive to the following conclusions:

(1) The cosmological Z-shift is comprised of two components, which are not of Doppler origin: a blues shift and a red shift.

(2) The red shift cosmological component is related to the energy losses of EM radiation when passing through the GSSs between the galaxies.

(3) The blues shift cosmological component is a signature of the hidden ZPE-S of the CL space from where the EM radiation originates

(4) The proper energy of the photon is its energy if it is measured in the same galactic CL space where it is emitted.

The large redshift observed for distant galaxies corresponds to the case (1). The small blue shifts observed from a limited number of small galaxies close to our home galaxy corresponds to the case (2). In the presently adopted concept about space and the Big Bang theory, all cosmological shift is assumed as a Doppler shift. We see that one and a same observational data leads to quite different picture, when examined from a different concept of the physical vacuum.

12.B.4.2.3. Hypothesis of accumulated energy at the Galactic Separation Surface (GSS)

Every photon passing through the GSS loses a fraction of its energy. The amount of the lost energy according to Eq. (12.25) depends on the difference of their constants, which are dependent on the different diameter to length ratio of the prisms from different formations. Evidently, some energy could be accumulated on the GSS region. From logical considerations, we may assume that this energy in fact occupies a region from both sides of GSS with a thickness equal to $\lambda_{SPM(1)}$ and $\lambda_{SPM(2)}$, respectively. These regions could be regarded as **two energy regions of GSS**. In these regions the passing wavetrain of the photon will be refurbished. Photons with different wavelength will occupy different refurbished volume, proportional to the quadrature of the transverse wavetrain radius multiplied by $\pi/4$.

Hypothesis of GSS radiation

The accumulated energy in the GSS region could nor arise indefinitely, because it increases the tension between IG(TP) interactions of both spaces related to the Zero Point Waves. So the accumulated energy is going to be released in form of photons, generated directly by the GSS, without participation of any particles. But what could be the energy of these photons?

The increased energy of the GSS domain appears as an excess ZPE of the CL space in this region. Since there are not particles (atomic matter) in this spatial domain, the excess energy could be released only by radiation. It is apparent that emission of photons as first harmonic quantum waves (with wavelength of λ_{SPM}) is a most probable case, because the wavetrain of such photons could be built by the existing ZPE waves. From the other hand, we can not expect a strong monochromatic radiation (generated from one side of GSS), because it will lead to nonuniformity of ZPE of the energy zones of both sides of the GSS. As a result of the ambiguity of the energy balance on both sides of GSS, the accumulated energy may appear centred around λ_{SPM} but spread in a broader range. Then the spectrum of the emitted X and gamma rays will have **inverse dependence of the photon wavelength**.

There is one specific feature of the radiation from GSS. Let consider a case that the diameter to length ratio of the prisms of both spaces is very close (that appears to be in the most real cases). Then $\lambda_{SPM(1)} \approx \lambda_{SPM(2)}$. In such case the emitted radiation will be influenced of the both emissions with the first harmonics quantum wave (511 Kev) leading to emission of one parallel entagled photon with energy about 1.2 MeV. In fact it is a gamma wavetrain formed of two twisted wavetrains of 511 KeV each (estimated by own CL space). The concept of the gamma wavetrain, proposed in Chapter 2 of BSM, is able to explain the wavetrain of the entagled photon. As a result of this effect, the spectrum will exhibit a small bump at 1.2 Mev and small dimple in 511 KeV.

The above conclusions are in good agreement with the observational data, known as **spectrum of diffused X (and gamma) radiation**. Figure 12.22

shows observational data published by Trobka and Fichtel (1983) with data from other observers.

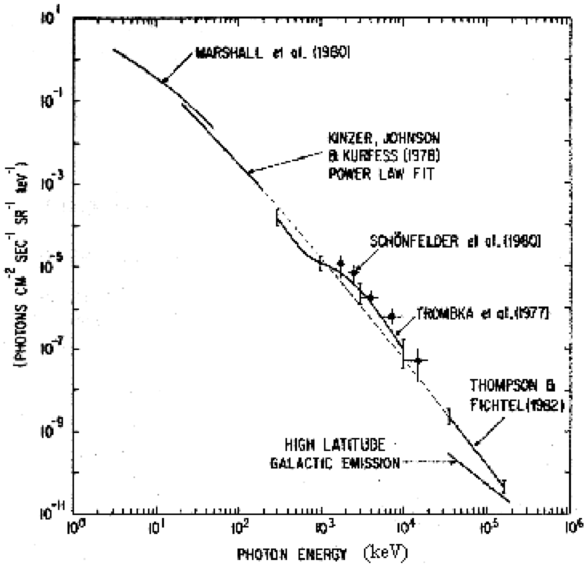

Fig. 12.22. Diffuse X and gamma-ray spectral measurements. Trombka and Fichtel (1983)

The bump at 1.2 MeV is clearly evident, and also the trend below this photon energy showing a dimple at 511 KeV. The both features could not appear very sharp because of the smearing effect from the multiple contributions to the cosmological Z-shift (see the next paragraph).

The described features could be summarized as:

(a) GSS emits X and gamma ray spectrum with specific energy features centred around 511 KeV and 1.2 Mev.

(b) The emitted GSS spectrum appears inverse proportional to the wavelength of the emitted photons

(c) The spectrum exhibits a small bump at 1.2 MeV and a small dimple at 511 KeV

(d) The emitted GSS spectrum appears spatially diffused

The GSS might be involved also in one additional phenomenon related to the observed Gamma Ray Bursts (GRB), which is discussed in §12.B.5.

12.B.4.2.4. Cosmological Z shift with dominating redshift component

All observed galaxies (with exception of two closer ones) exhibit red shifted lines. According to the presently adopted concept about space and the Big Bang theory the space between all galaxies is considered as homogeneous, so the observed red shift is accepted to be of Doppler type. The observed red shift is denoted as a Z - shift, a dimensionless parameter defined by the formula:

$$Z = \frac{\lambda_{obs} - \lambda_o}{\lambda_0} \qquad (12.25.a)$$

where: λ_o and λ_{obs} are respectively the wavelength of the emitted and the observed photon

The same formula can be written in a form:

$$\lambda_{obs}/\lambda_o = Z + 1 \qquad (12.26)$$

According to the BSM concept, the space homogeneity is valid only for the home space of a single galaxy, but not for the Universe. From this aspect the observed photons from other galaxies will contain a wavelength shift component that is not of Doppler origin. Then the observed Z shift must include two major components: a cosmological one and a Doppler shift. The cosmological component contains a blue shift and a red shift as discussed earlier, but for a distant galaxies the redshift is predominate significantly. It predominates also the Doppler shift which is usually inside the home galaxy. For this reason in the following analysis we may address the cosmological redshift only as a cosmological shift, which term is largely adopted in the observational data.

The cosmological red shift component is strongly dependent on the number of crossed GSS. While Eq. (12.25) provides the photon's energy loss for one GSS, the same photon may pass through number of GSSs, exhibiting in such way multiple energy losses. This means that the redshift cosmological component of Z shift will increase with the distance (photons pass through many GSSs). In the same time the contributions from a possible small blue shift or a Doppler shift component becomes comparatively very small and insignificant. For this reason all distant galaxies appear as red shifted.

Figure 12.23 illustrates a photon propagated through a number of galaxies. The GSSs between the galaxies are only shown.

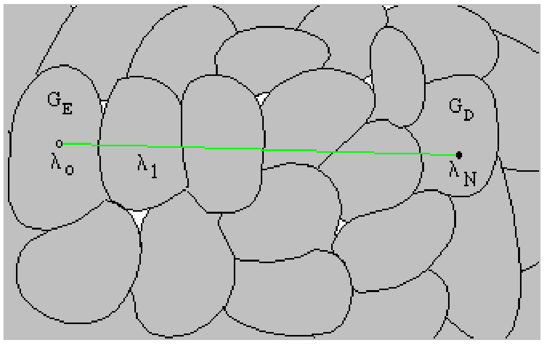

Fig. 12.23. A photon trace (green line) passing through number of galaxies. The galactic CL spaces are shown as gray areas; the GSSs between them are shown as black lines.

The galactic CL spaces are shown as gray areas, while some empty spaces between them (which are not excluded from a theoretical point of view) are shown white. GSS are shown as black lines between the galactic CL spaces.

A single photon with wavelength λ_o is emitted in the CL space of galaxy G_E and detected in the CL space of Galaxy G_D. It may pass only through CL spaces, but not through empty spaces. Due to energy losses in each GSS its wavelength will undergo consecutive red shifts from λ_1 to λ_N, where N is the number of crossed GSSs. We may apply an analogy of a photon emitted in a medium with one value of refractive index and detected in a medium with another value of refractive index. Applying this analogy for two neighbouring CL spaces we may introduce the parameter **GSS quasirefractive index**. It is reasonable to assume that the diameter to length ratio for the prisms from different formations (galaxies) varies around one mean value. Then the GSS quasirefractive index should also vary around one mean value that can be expressed by Eq. (12.27).

$$\bar{n} = \frac{1}{N}\sum_{i}^{N}\left(\frac{\lambda_i}{\lambda_{(i-1)}}\right) \qquad (12.27)$$

where: $\bar{n}$ is a **mean GSS quasirefractive index,** N - is the number of crossed GSSs, *i* - is an index number of the crossed GSSs.

The mean GSS quasirefractive index could be regarded as a valid for a single GSS between CL spaces distinguished by the average value of the prism's diameter to length ratio.

The ratio between the observed and the emitted wavelengths is:

$$\lambda_i/\lambda_o = (\bar{n})^N \qquad (12.28)$$

Combining Eq. (12.28) with Eq. (12.26) we get the **equation of the cosmological Z -shift (redshift only).**

$$(\bar{n})^N = Z + 1 \qquad (12.29)$$

where: *N* - is the number of crossed GSSs by a single photon, $\bar{n}$ - is the mean quasirefractive index of GSS

Eq. (12.29) shows the relation between the total cosmological Z shift and the number of GSS.

Number of observations exists for which the Z parameter is estimated. The parameter N also could be determined. According to BSM, the parameter N is directly related to the number of absorption L_α lines in the Lyman alpha forest observations (see the physical explanation of the phenomena in §12.B.12). Then the parameter $\bar{n}$ is calculable by Eq. (12.29).

12.B.4.2.5 Signature of GSS existence as a result of CL space parameters variations estimated by the red shift periodicity

A significant observational material exists about the red shift periodicity. It could be classified into two groups:

- observations from quasars
- optical observations

The red shift periodicity investigation is pioneered by G. Burbidge (1967, 1968). Studying samples of QSO (quasistellar objects = quasars) and radio and Seyfert galaxies he concluded in 1968 that the distribution of red shift has a peak at $\Delta Z = 0.061$ and integral multiples of it. Later Duary et al. (1992) found that the observed periodicity is described by the expression $Z_n = 0.0035 + 0.0565n$, where n is integer. For $n = 1$, the strongest peak at 0.06 is obtained.

B. Guthrie and W. Napier (1996) write in the abstract: "**Persistent claims have been made over the last 15 years that extragalactic red shift,**

when corrected for Sun's motion around the Galactic centre occurs in multiples of 24 km or 36 km". Investigating 40 spiral galaxies in a range up to 1000 km/s (distance scale used in the presently adopted concept for expanding Universe) and applying the above mentioned correction they found a strong evidence for z-shift periodicity of 37.6 km. Some of their results are illustrated in Fig. 12.23.A showing the relative distribution of red shift differences corresponding to 103 redshifts from spiral galaxies.

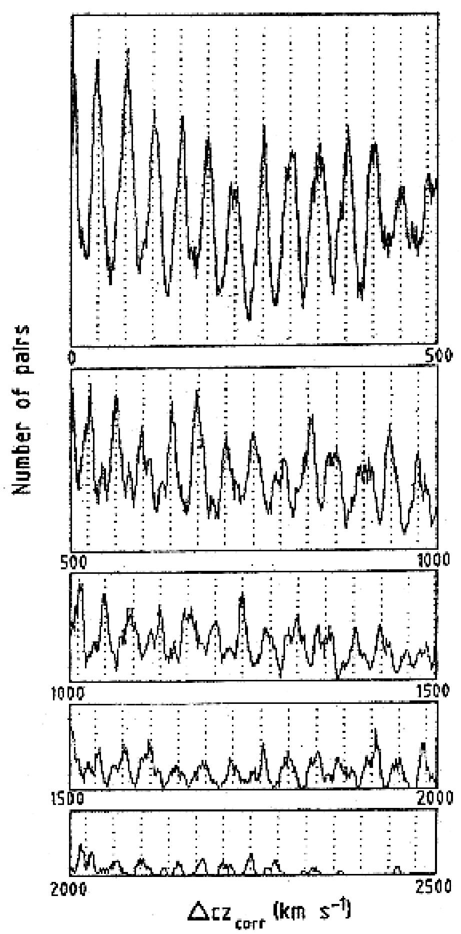

Fig. 12.23.A. Relative distribution of redshift differences. Vertical dotted lines represent the best-fitting periodicity (Courtesy of B.N.G. Guthrie and W. N. Napier (1996)

The red shift periodicity can not be explained by the concept of the expanding Universe. Burbidge in 1968 expressed the idea that the red shift has a cosmological (not a Doppler type) origin. From the BSM point of view, the explanation of the redshift periodicity is the following:

GSS exists between the CL spaces of any neighbouring galaxies whose prisms (as a rule) are from different formations and exhibit differences in their diameter to length ratio. This difference may lead to a slight variation of the space-time constants t_{CL} for the CL space of any galaxy. Then the photon's wavetrain undergoes a process of refurbishing when crossing the GSS. Photons from a distant galaxy cross many galactic GSSs. Let assuming that the variation of the time-space constants of the crossed CL spaces leads to variation of the time delay of the passing photon due to a wavetrain refurbishing process in the GSS. Then for a set of observations where the photon emitters (emitted at known spectral lines) are distributed over a large distance, we may expect some kind of stroboscopic effect with embedded signature of some of the fundamental CL space parameters. In other words we may expect that the accumulated time delay may appear as a whole number multiplier by a term, which is strongly correlated to the space-time constant of our galaxy. If investigating a large number of such sources, the signature of this low number periodicity may become apparent.

The observations show that two types of periodicity exists:

- One type of periodicity appears as related with the variation of the time-space constant of the different galaxies
- Another type of periodicity appears as a signature of the fine structure constant

Table 12.5 provides the results of the analysis of the first type periodicity: 24 km 36.2 km and 72.46 km. The estimation of this periodicity is provided by Guthrie and Napier (1996).

Redshift periodicity of first type **Table 12.5**
(related to the signature of the space-time constant)

1	2	3	4	5
72.46	2.382E-4	2.6936E-13	9.0065	1
36.2	1.2067E-4	1.365E-13	17.77	1.966
24	8E-5	9.046E-14	26.81	2.978

where:
Column 1: $(\Delta z\, c)$ - periodicity in [km/s]
Column 2: Δz - red shift periodicity

Column 3: $\frac{\Delta z}{N_{RQ}}$ - redshift normalized to one resonance cycle referenced to SPM period

Column 4: $\frac{t_{CL}}{\Delta z/N_{RQ}}$ $\left[\frac{\#\,\text{cycles}}{Hz}\right]$ - time delay per normalized redshift

Column 5: value of column 4, normalized to the smallest periodicity value of the column.

The following CL space parameters (for our galaxy) are used:

$t_{SPM} = t_c = 8.0933 \times 10^{-21}$ (s) SPM (Compton) frequency

$N_{RQ} = 0.8843 \times 10^9$ - number of resonance cycles per one SPM cycle (see the calculations of CL space parameters BSM, Chapter 2)

The close values of the term of column 5 to integer indicate a strong correlation between this term and the parameters t_{CL} and N_{RQ}. The process is similar to a stroboscopic effect between two closely spaced frequencies. When the difference between the frequencies is smaller, the periodicity is larger. In our case we have more than two frequencies: these are the N_{RQ} frequencies of the different CL spaces. **Measured by the period of SPM vectors in own spaces they are constants. Every CL space has own SPM frequency (and time-space constant) defined by own CL space and prism's parameters. But if their parameters are estimated by the CL space parameters of our Milky Way galaxy they will exhibit variation. So their N_{RQ} parameter will appear different when referenced to the N_{RQ} parameter of our home galaxy.** The strongest factor contributed to the stroboscopic effect is the ratio between N_{RQ} frequency of our galaxy and some closer neighbouring galaxy.

Another redshift periodicity found initially by Burbidge and analysed latter by Karlsson (1977) exhibits a different set: 0.3, 0.6, 0.96, 1.41, 1.96. In order to remove the error from the solar system motion around the Milky way center we must apply a galactocentric correction (see Duari, 1992):

$$z_{GC} = \frac{1 + z_{obs}}{1 - \upsilon\vec{u}/c} \qquad (12.30)$$

$v = 238$ (km/s) - is the mean velocity of the solar system motion used by Duari (1992).

$\vec{u}$ - is unit vector from Earth to QSO

z_{GC} and z_{obs} are the galactocentric and observational redshift, respectively

Red shift periodicity of the second type (related to the signature of α) **Table 12.6**

1	2	3	4	5
0.3	0.301	3.404E-10	140.3	1.024
0.6	0.601	6.799E-10	280.2	2.045
0.96	0.962	1.087E-9	448.15	3.27
1.41	1.412	1.597E-9	658.05	4.802
1.96	1.962	2.219E-9	914.59	6.677

Columns:

1: z_{obs} - observed redshift periodicity from the Earth

2: z_{GC} - galactocetric corrected redshift according to Eq. (12.30)

3: z_{GC}/N_{RQ} - redshift per one resonance cycle estimated by SPM period time base

4: $\frac{z_{GC}}{N_{RQ}t_{CL}}$ $\left[\frac{\#\,\text{cycles}}{Hz}\right]$ - column 3 normalized to time-space constant

5: $\frac{z_{GC}}{N_{RQ}t_{CL}}\alpha$ $\left[\frac{\#\,\text{cycles}}{Hz}\right]$ - column 4 normalized to $1/\alpha$.

The plot of column 5 is shown in Fig. 12.23.B.

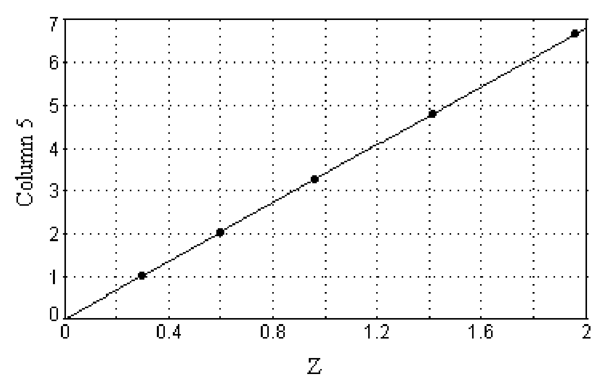

Fig. 12.23.B. Plot of the terms of column 5 (of Table 12.6) vs the observed red shift periodicity. The robust straight line shows a strong correlation between the involved CL space parameters.

The analysis of the data and the plot in Fig. 12.23.B shows that:

(1) the low red shift periodicity is closely proportional to the fine structure constant

(2) the proportionality for higher redshift periodicity decreases, but the slop of the linear dependence is constant

The possible explanation of feature (2) is a following: The fine structure constant (α) is a basic low level structure parameter. For quantum waves generated and detected in own CL space α is always apparent. If considering a single GSS between two galaxy, the cosmological red shift from it is dependent on the ratio between the total masses of the galaxies. The fine structure constant, however, defined by the low level intrinsic matter structures is not related to the total masses of the galaxies. From the other hand, the fine structure constant defines the ratio $E_{IG}(TP)/E_{IG}(CP)$, that is one and a same for any galactic CL space (due to the self adjusted CL node distance) and is related with the quantum energy transfer. Consequently the cosmological redshift (also related to the quantum energy transfer) will contribute to the decrease of the α periodical signature from signals emitted in more distant galaxies. This trend evidently is systematic and the alignment of the data points in a straight line as shown in Fig. 12.23.B is a strong argument for the correctness of the provided concept.

12.B.4.3 Summary

- **Every new born galaxy creates an own new CL space, which assures an optimal environment for the new crystalized particles**
- **The galactic CL spaces are separated by Galactic Separation Surfaces (GSS)**
- **The photon crossing through a GSS exhibits a small energy loss as an increase of its wavelength due to an wavetrain refurbishing. The passed photon appears redshifted. The photons crossing a number of GSSs exhibit multiple energy losses, which appear as a wavelength redshift, an observed cosmological phenomenon which is not of Doppler origin.**
- **The accumulated energy in the GSS from the photons energy losses is reemitted by GSS as a diffused X-ray radiation**
- **In the stationary Universe the mutual motion of the galaxies is an exclusion and a wide spread Doppler shift component from a galaxy motion is not expected. The real Doppler shift should be usually from the relative motion of the astronomical objects referenced to the host galaxy CL space.**
- **For larger distances in the observed Universe the Z-shift of any object is completely dominated by the cosmological redshift.**

Additional observational data confirming the concept of the cosmological **z**-shift and the role of GSS are presented in the next sections.

12.B.5. Phenomena indicating a death (collapse) or a birth of a galaxy in the Universe

The concept of a stationary Universe and galaxy recycling, means that the death or birth of a galaxy are common phenomena in the Universe. The average frequency of such phenomena depends of the mean life of the galaxies and could be estimated if we know the radius of our observational perimeter. The possible signature of such events should be randomly distributed in the observational sphere of 4π srad.

Signatures of death and birth of a galaxy are really observed, but they have not been correctly recognized so far. **The detected phenomena are known as Gamma Ray Bursts (GRB).**

According to some observational features, we may divide the observed GRBs into two categories:

(a) GRB with an optical counterpart

(b) GRB without optical counterpart

According to BSM:

GRB of type (a) corresponds to the phenomena of galaxy birth (denoted by BSM as GRB(B)

GRB of type (b) corresponds to the phenomena of galaxy collapse (denoted by BSM as (GRB(C)

Both types of GRB have also a number of distinctive features. Their decoding may provide a knowledge of exclusive importance. Once these specific features are understood, the identification of the GRB type can be made without detection of the optical counterpart.

BSM identifies one common feature about both type of GRB. They carry a **signature of gravitational shock wave.** The latter is caused by a large pulse of IG(CP) energy moving with gravitation velocity that may exceed the speed of light. Both types of GRB exhibit such features, but their signatures are different.

From the previous analysis and the considerations in §12.B.4.1 it becomes apparent that the front of such shock wave may preserve its integrity moving through number of CL spaces.

12.B.5.1 GRB without optical counterpart

A gamma ray burst (GRB) with a specific signature and without optical counterpart is indication of a galaxy collapse

This phenomenon occurs in the moment of separation of the collapsing galaxy CL space from the CL spaces of its neighbours. It causes interactions between central part of the prisms carrying IG(CP) forces. The CL space separation is in enormous large area, so the generated IG(CP) pulse in the neighbouring galaxy CL space is also enormous. Such strong IG(CP) pulse is propagated through the CL spaces of connected neighbouring galaxies with the velocity of the gravitation. This is a **gravitational kind of shock wave.** Its main feature is the ability to generate gamma and X-ray directly by the CL space (even without atomic matter). **For this reason the gamma ray burst does not carry a signature of thermal radiation.**

The missing of optical counterpart is reasonable (the matter of the collapsing galaxy is already separated from the external world).

Specific features of GRB from a collapsing galaxy: The gamma ray burst is composed of a large amplitude initial pulse followed immediately by a package of closed spaced pulses with slow decreasing amplitude. One example of detected GRB by BATSE (The Burst and Transient Source Experiment) with such features is shown in Fig. 12.23.C. The shape of GRB, shown in the figure, is composed of multiple X rays covering a spectral range up to a few hundreds KeV. It could be considered as a signature of specific gravitational shock wave, the formation of which is described below.

The most important features of the gravitational shock wave are the following:

- isotropical propagation with a light velocity
- finite lifetime of the front formation
- spectral dependence of the generated gamma and X-rays from the region

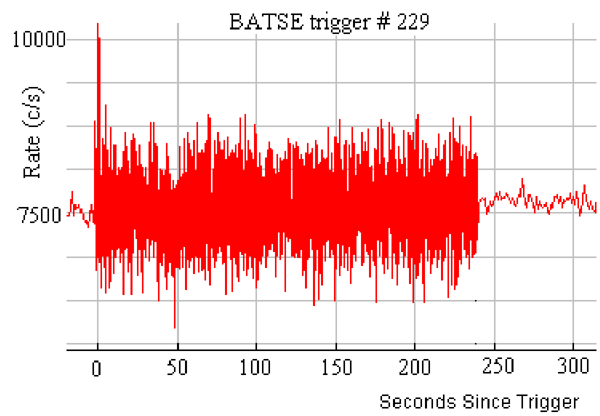

Fig. 12.23.C. GRB from a collapsing galaxy by
BATSE (the pulse is truncated at 240 s due to a lack
of memory of the recording device)

The Newtonian gravitation, we are familiar with, is a propagation of the Intrinsic Gravitation in CL space environment. Between the most important feature of CL space that we must keep in mind is the oscillation properties of the CL node. It is characterised by the NRM and SPM vectors and their frequencies: the node proper resonance frequency and the SPM (Compton) frequency. It is reasonable to expect that these two frequencies may affect the propagated IG field if the gravitational change is too fast. In such aspect we may consider two cases: (A) slow transient state related with a weak gravitational disturbance and (B) fast transient state related with a strong gravitational disturbance.

Gravitational disturbances might be of different cosmological disturbances in CL space and their propagation in CL space may invoke a slow or a fast transient state in the domain where the detector is placed.

In case (A) the propagation of the weak gravitational disturbance could be affected by the CL node NRM and SPM in the following way depending on its strength

(a) Not affecting by NRM and SPM frequencies

(b) Affected only by the SPM frequency

In case (a) there is not generation of X or gamma rays from the event, but it may contribute slightly to the ZPE in the GSS that could be later emitted sporadically.

In case (b) a generation of X or low energy gamma rays from the event may occur. Such rays, for example, are generated in the Earth atmosphere and they are related to some gravitational changes in our Sun.

In case (B) the propagation of the strong gravitational disturbance could not be fully attenuated by the oscillation properties of the CL node (NRM and SPM vectors). In such case, part of the strong disturbance could be propagated with a very high hyperlight velocity defined by the IGSPM vector of the prism, the frequency of which is much higher than the NRM frequency of the CL node. **This case is valid for the GRB from the event of galaxy birth or galaxy collapse.**

Let analyse the beginning of the galaxy collapse event and what kind of signal could be detected in a distance much larger that the size of the collapsing galaxy CL space. In the moment of the local CL space separation from the neighbouring galaxy a large energy could be dissipated in the broken part of the GSS which is connected to the neighbouring galaxy. This should be a very strong gravitational disturbance. According to the above provided considerations, it will propagate isotropically, but within a solid angle defined by the initial conditions (the propagation is possible only through the connected galactic CL spaces). This signal will arrive to the distant detector very fast (with a hyperlight velocity) but attenuated, in a way that its strength may fall with the inverse square of the travelled distance. We may call this kind of energy propagation a **primary gravitational shock wave**. (**PGSW**). When crossing the GSSs closer to the collapsing galaxy the energy of the gravitational shock wave is still quite strong, so it may invoke strong transient states in these GSSs. Then they may become sources of **secondary gravitational shock waves** (**SGSW**) propagating also with a hyperlight velocity. Obviously their amplitudes will be smaller because the process of their formation is different and the involved energy is smaller. One **distinctive feature** of the SGSW is that they are generated by a large number of GSSs (while the PGSW is generated only from one GSS). This feature, namely, provides a package of multiple pulses at the detector. If assuming that a very small time interval is necessary between the moment when the PGSW strikes the particular GSS and the generation of the SGSW, the SGSW will arrive at a distant detector as a package of closely spaced gamma or X rays pulses. The package will start with the strong pulse contributed directly by the PGSW. One may say that the amplitudes of the pulses in the package should be much smaller than the amplitude of the first pulse (pulses). However, we must take into account that the collapsing galaxy is usually quite distant (estimated by the Z shift). Then for the detector, the subtended angle for the source of the PGSW is much smaller than for the sources of the SGSW. Additionally the strength of the sources of SGSW will also fall with the distance from the collapsing galaxy. Then the detector will still detect the signals from SGSW within a finite angle of view.

The presented analysis provides one additionally possibility for studying the GRB events apart of their spectrum. The study of the spatial distribution of the GRB packet with simultaneously measurement of the amplitudes might be also informative. It such way a possible differentiation of the PGSW from the SGSW could be achieved.

In the provided analysis it was assumed that the PGSW and SGSW are both propagated with a hyperlight velocity to the detector. If the detector, however, is very distant their energy may fall below some critical value so they could not be propagated with a hyperlight velocity. Then their temporal and spatial characteristics could be preserved but their energy could be much lower and they will propagate with a light velocity. This may contribute for a weak but very long tail, which follows the GRB event.

12.B.5.2 GRB with an optical counterpart

A gamma ray burst of type (B) with optical counterpart with specific spectral and time characteristics is a signature of a new born galaxy.

The galaxy birth begins with the explosion of the galaxy egg, but the external world could not detect this moment until the new CL space is built and connected to the Universe. The event consequence scenario after the break up of the external egg-shell of the galaxy egg is a following:

(1) building (expanding) of a new CL space

(2) Interconnection of the new CL space to the CL spaces of its neighbours (all or few of them), causing a gravitational shock wave, which generates a GRB(B)

(3) X-ray generation from the new obtained electrons

(4) UV and VIS radiation from the first formed atoms, which are highly excited by the ZPE fluctuations of the newly formed CL space.

(5) Broad band radiation from normally excited H and D atoms and the first simple molecules: H_2 and D_2.

The mechanism of GRB(B) phenomenon from the gravitational shock wave is similar as in the case of GRB(C) event from a collapsing galaxy.

GRB from the new born galaxy is generated in the moment when the new built CL space is connected to its neighbours. Therefore, the events of galaxy collapse and galaxy birth provide two distinctive GRB phenomena:

- GRB(C) from a galaxy collapse is generated by the GSS of its neighbours with their neighbours

- GRB(B) from a galaxy birth is generated by the new formed GSS between a new born CL space and its neighbours

- GRB(B) signal from a galaxy birth may be followed by a strong radiation around 511 KeV, generated from the excited single electrons (electron-positron system), while this component should be missing in the GRB(C) from a galaxy collapse

Specific features of GRB(B) from a new born galaxy:

(a) GRB(B) may have an optical counterpart,

(b) Two large pulses in the X-ray region are very common feature

(c) The pulse packet shape of GRB(B) is different than the pulse packet shape of GRB(C).

Optical counterpart:

In first we have to point out that a missing optical counterpart from some GRB(B) could be a detection problem (very distant galaxy or obscured).

The optical counterpart may contain two time distinctive sources of radiation with distinguishable spacial and time features:

(1) The initial phase of GRB(B) with an exponentially decreased intensity is followed by a detectable strong “point like” optical source with a larger pulse time duration.

(2) A detectable extended light source with a relatively small but almost constant brightness

The optical source in case (1) is formed by highly excited new born atoms (mainly H and small portion of D) during the process of the matter expansion after breaking of the galaxy egg. The detection of the rising edge of the pulse indicates, that the new CL space is just created and connected to its neighbours (in other words - connected to the Universe).

The detectable extended source in case (2) is from the newly born and spread atomic matter of the galaxy away from the galaxy bulge. Firstly, it may obtain a large momentum from the explosion. Secondly, the new CL space initially is without node gaps and does not possess a normal static and partial CL pressure. This phase called a **phase of Transition CL Space** is discussed later. It delays the process of inertial interactions between the newly born atoms and folded nodes, but in the same time it allows the huge potential energy stored in the protogalactic egg to be transferred and distributed in the vast volume of the newly created CL space. The newly born atomic matter obtains a significant portion of this energy.

The simultaneous observation of GRB with an optical counterpart is of great importance for unveiling the process of the galaxy birth. GRBs has been observed for more than 30 years. It is reasonable that they appear completely random in the observable Universe. The observation of optical counterparts of some GRB became possible after the development of BATSE Rapid Burst Response system (http://www.batse.msfc.nasa.gov) and ROTSE project. Fig. 12.24 shows GRB(B) in few spectral ranges.

.

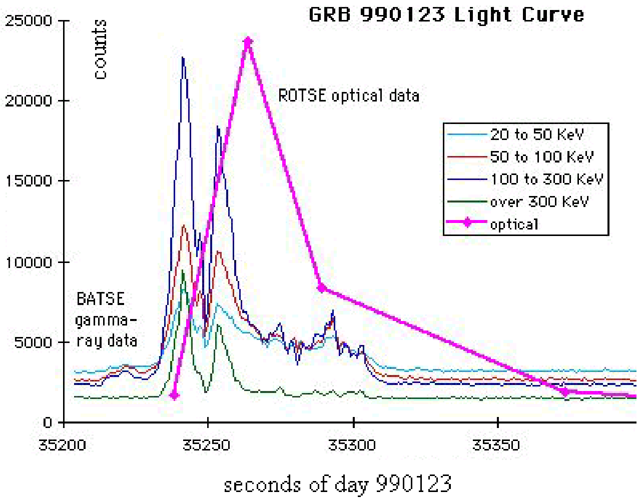

Fig. 12.24. GRB 9901123 light curves (Gamma and optical range). Sources: (http://laastro.lanl.gov/rotse/grb/990123) (from http://laastro.lanl.gov/rotse/grb/990123/)

The shown light curves possesses a feature of signature from a new born galaxy.

The expected extended source of radiation is more difficult for observation, because of its lower intensity in comparison to the "point source". Fortunately, the observation of one GRB with counterpart provided such possibility in 1998. This is the GRB980613 with an observed optical counterpart. The extended source has been identified by the Hubble space telescope. Images from HST 26 and 39 days after the gamma burst are published in Nature v. 387 (29 may 1997) by Kailash et all. In the abstract of the paper the authors write: "The optical counterpart appears to be embedded in an extended source..." Figure 12.25 shows image accumulated from two HST observations after 26 and 39 days from the detected GRB. The size of the image is 11.5 x 11.5 arcsec. The observational data from two other gamma ray bursts: GRB980613 and GRB990123 also show typical characteristics of a new born galaxy. The estimated Z-shifts (cosmological) are respectively 1.096 and 1.6. So the new born galaxy in the first case is closer and the identification of the "extended" source is possible.

More details about the observed phenomenon GRB970228, are provided also in: http://antwrp.gsfc.nasa.gov/apod/ap970407.html

Number of observations of GRBs with optical counterparts confirm the BSM hypothesis that GRB(B) is a signature of a birth of a new galaxy in the observable Universe. S. Holland et all. (2001) have investigated the optical light curve of the host galaxy of GRB 980703 by data from HST taken 17, 551, 710 and 716 after the GRB event. The authors identified very intensive star formation with rate of 8 - 13 $M_{\odot}$/yr in the host galaxy (which must be the newly born galaxy according to BSM). They also write: "This suggests that the host galaxy is undergoing a phase of active star formation similar to what has been seen in other GRB host galaxies". According to BSM concept, the new born stars are the first stars of the new born galaxy.

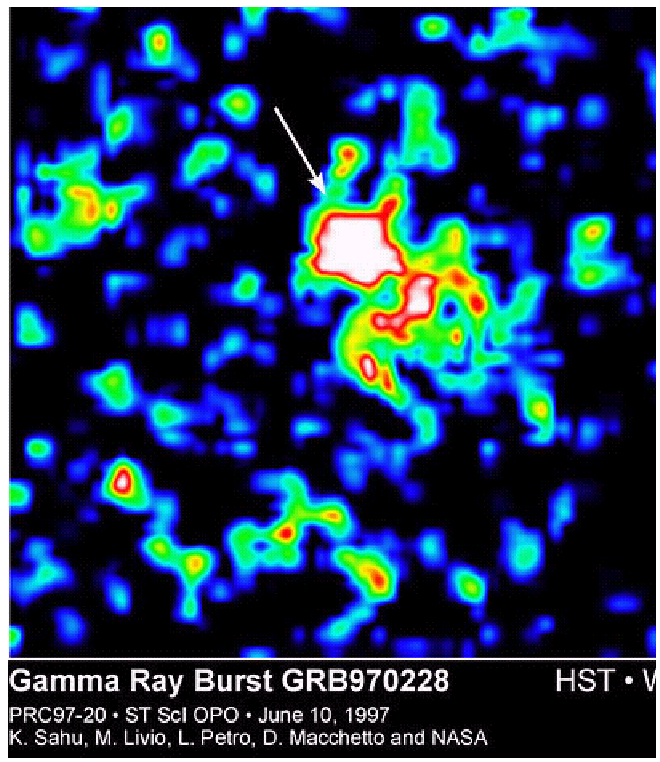

Fig. 12.25. Extended source from a new born galaxy (according to BSM concept) source: http://www.seds.org/hst/gb970228.html

12.B.5.3 Phase of CL space formation. Hypothesis of transition type of CL space.

From the moment of the eruption of the protogalactic egg, the kept inside large amount of IG energy begins to transfer to the newly created CL structure and supply the interaction energy between the new elementary particles

It is logically assumed that in the initial phase of the CL space formation the prisms of the neighbouring CL nodes touches each other (no gaps between the CL nodes as in the case of a normal CL space). This is a temporally state of CL structure that we may call a **Transition Cosmic Lattice (TCL).** TCL structure could not posses the same node oscillation capability as CL one. It will not have also the same type of energy well as the normal CL space.

The first domain with TCL could be formed near the internal egg-shell which is not destroyed after the protogalactic egg explosion. This is the first empty space to be occupied during the egg explosion and the first domain where the TCL structure will be converted to CL one.

The conversion of the TCL to a normal CL space means that the CL nodes become properly separated, providing conditions for a normal node oscillations and equalization of the Zero Point Energy by the ZPE waves. The necessary gap distance between the (alternative type) CL nodes will become adjusted automatically as a result of the self adjustment of the high frequency modes of the IG forces between the two types of prisms.

The released energy in fact will provide the major boost for the expansion of the new born matter into the new created CL space. After the external egg-shell is broken, the process of TCL build-up will continue in a free empty space environment. The TCL, however, is characterised with strong dynamics of expansion, so its existence is temporal. It is spherically expanding, while leaving a newly created CL space in the volume it enclose in any moment. **Consequently, we may expect that the TCL is like a hollow sphere whose thickness continuously decreases with the expansion, while the new born CL space forms inside this hollow sphere.** Then at the time when the TCL reaches the CL spaces of the neighbouring galaxies, its thickness could be quite small.

Let analyse some features of the TCL. It is reasonable to expect that the growing TCL in an empty space exhibits a spherical shape until reaching some boundaries. Let admit that in the time of explosion the protogalactic egg has been near the centre of its proper (void) space. Figure 12.25.A illustrates the moment when the expanding TCL reaches the boundaries of this void space. In this moment the spherical shape of TCL and the created behind it CL space begin to convert to the shape of the void space, which has been preserved for this new born galaxy. In that time the following expected phenomena will take place:

(a) the spherical expansion of the TCL structure, which at this moment must be comparatively thin (in comparison to the galactic proper space) will be stopped by the boundaries of the CL spaces of the neighbouring galaxies.

(b) the energy momentum from the stopped expansion of TLC will cause an interconnection of the new born CL space to the neighbouring galactic CL spaces and a creation of a shock gravitational waves.

The feature (b) means that the interconnection with the neighbouring galaxy CL space requires some energy pulse. The TCL is incompressible and should be able to provide such energy pulse. As a result a strong gravitational shock wave is created. It is a quite fast transitional event for the CL spaces of the interconnected galaxies, so it may be propagated with a hyperlight velocity.

From the provided considerations and analysis it follows that in the moment of generation of the gravitational shock wave (the beginning of CL space interconnection) the TCL space may still exists for a limited short time.

.

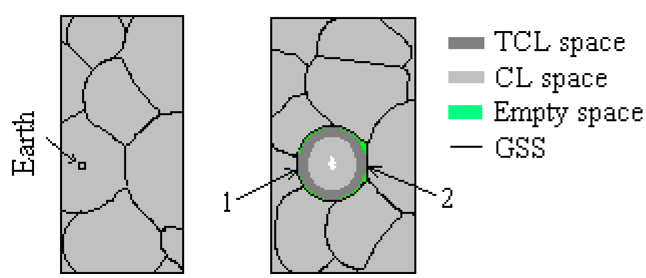

Fig.12.25.A. Illustration an expanded TCL domain during the phase of CL space formation

We may look for a proof of the suggested concept by studying a large set of GRB(C) data and looking for the following features:

- a large first pulse with a finite duration (the first pulse of the GRB), assuming that it corresponds to the moment when the TCL reaches the end 1 (see Fig. 12.25.A).

- a smaller pulse with a finite duration displaced from the first pulse by a time interval t_1.

The described signature of two pulses is clearly evident in the GRB curves shown in Fig. 12.24. The energy components of the two pulses could be also reasonably explained. The reflected pulse does not exhibit so strong accumulated shock wave for generation of hard gamma rays because it does not have a single straight path.

BATSE project provides excellent GRB data web site with curve plotting capabilities:
http://www.batse.msfc.nasa.gov/batse/batse-home-meantime
(**Note:** The truncated pulse packet of the GRBs shown in the BATSE data base is an artifact due to a lack of recording memory).

One very interesting phenomenon may happen between the moment, when the new built TCL reaches the neighbouring galaxy CL space. If assuming that the galaxy nucleus is approximately in the middle of the void space the new TCL space will reach almost simultaneously the two opposite ends 1 and 2 of the previously void space. The obtained gravitational shock wave from end 1 (closer to the Earth) will generate the first pulse of the GRB that will be propagated with a hyperlight velocity. In the same moment, the gravitational shock wave from end 2 will be partially reflected back, but it will propagate through the temporally existed TCL space. It will arrive to the Earth also with a hyperlight velocity. The both strong pulses will have their signature in the created GRB(B). **Then the time duration between the generated two shock waves will provide us information about the value of the hyperlight velocity through the TCL if we know size of the CL space of the new born galaxy.**

For very approximate estimate of the hyperlight velocity, denoted as C_{HL}, we may assume a spherical shape of the TCL in the moment of interconnection to neighbouring spaces. Then we have:

$$C_{HL} = \pi D_G / t_1 \qquad (12.31)$$

where: D_G is the average size of the galactic proper space (the void space before interconnection to neighbouring CL spaces), t 1 - is the time difference between two strong pulses from the GRB(B).

One good example of well separated two pulses of GRB(B) is shown in Fig. 12.25.B.

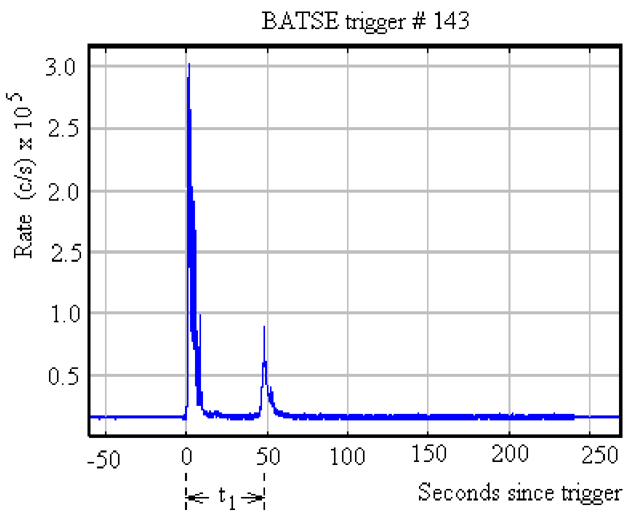

Fig. 12.25.B. GRB from a new born galaxy

The first pulse in Fig. 12.25.B (starting with the gamma ray) indicates the moment of connection from the side closer to the Earth, while the second pulse is a back reflection from the opposite side. It passes the spherical shell of the TCL space for time t_1.

The GRB(B) from a new born galaxy could be distinguished from a GRB(C) from a collapsing galaxy even without optical counterpart. Examining the curves from large number of GRBs we may see, that some of GRB(C) (from collapsing galaxy) have prepulses before the main gamma burst, referenced at zero time (the moment of triggering). This feature is explainable if considering that the separation of the collapsing galaxy CL space could be preceded by consecutive pull-offs and indicates in the same time **that the process of galaxy collapse is triggered by some major event: perhaps the break-off of the galactic nuclear shell (leftover from the internal egg-shell of the protogalactic egg**).

We may detect a GRB(B) with clearly identified two peaks only at the described above ideal conditions. If the galactic nucleus appears not in the central domain of the void space, we may not detect a clearly identified two peaks of GRB(B). The same reason may provide also an answer why the number of identified GRB(B) by the two peaks criteria is much smaller than the number of the total registered GRBs.

Let provide some theoretical insight into the hyperlight velocity propagation in the temporally existed TCL structure. In a normal CL space, the gaps between the CL nodes allows their oscillation properties, which are important for the known quantum features of the physical vacuum. Among them are the constant propagation of the light velocity, defined by the internode distance and the period of the proper resonance cycle of the CL node. (The light velocity in Chapter 2 of BSM was estimated as a energy momentum transfer between two neighbouring CL nodes for one resonance cycle). Behind the EM waves in fact is the IG field, but the velocity of its propagation in a normal CL space is restricted by the CL node resonance cycle. Such restriction is missing in the TCL structure and we may accept that the IG waves is propagated between two neighbouring nodes for one IGSPM cycle of the prism. Then we may solve the following problem: **approximate estimate of the hyperlight velocity through the TLC from a properly selected GRB data corresponding to a birth of a new galaxy, or GRB(B).**

In the case of approximate estimate we may accept that the internode distances for a normal CL space and TCL are equal. Then the ratio between the hyperlight velocity (denoted here by C_{HL}) and the light velocity will be approximately equal to the ratio between the IGSPM frequency ν_{IGSPM} and NRM frequency ν_R.

$$(C_{HL}/c) = (\nu_{IGSPM}/\nu_R) \qquad (12.32)$$

where: $\nu_R = 1.0926 \times 10^{29}$ (Hz) (derived in Chapter 2 of BSM), c - is the light velocity

Combining Eq. (12.31) and (12.32), we may obtain the approximate value of the prism's ν_{IGSPM} frequency

$$\nu_{IGSPM} = (\pi D_G \nu_R)/(c t_1) \qquad (12.33)$$

The average diameter of the proper void space D_G in fact is equal to the average distance between the galaxies. It must be estimated statistically for a large number of galaxies including small and large galaxies. In order to avoid a large error from estimation of the intergalactic distance for a stationary Universe, we will use data about the local clusters galaxies without taking into account the home galaxy, which size is pretty large. The average intergalactic distance in such case is about 100,000 LY.

The average time t_1 can be estimated from a large number of identified GRB(B). Figure 12.25.C shows a histogram of 37 identified GRB(B) from the "light curves" provided by BATSE.

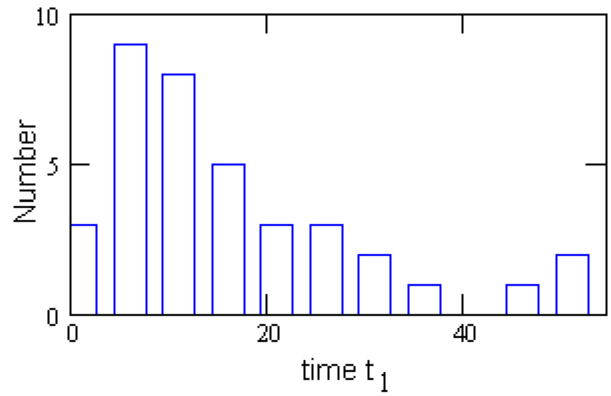

Fig. 12.25.C. Histogram of 37 identified GRB(B) from the "light curves" provided by BATSE. The time t_1 is an indicator for the size of the galactic CL space.

The mean time duration of the set shown in Fig. 12.25.c is 19 sec. Then using Eq. (12.33) we get:

$$\nu_{IGSPM} = 5.697 \times 10^{40} \text{ (Hz)}$$

Now we may put the missing value of the frequency for the level 1 of matter organization in Table 12.1 as

$$\ln(5.697 \times 10^{40}) = 93.84$$

The new plot of the frequency vs the level of matter organization is shown in Fig. 12.25.D. The plotted curve is a Gaussian fit.

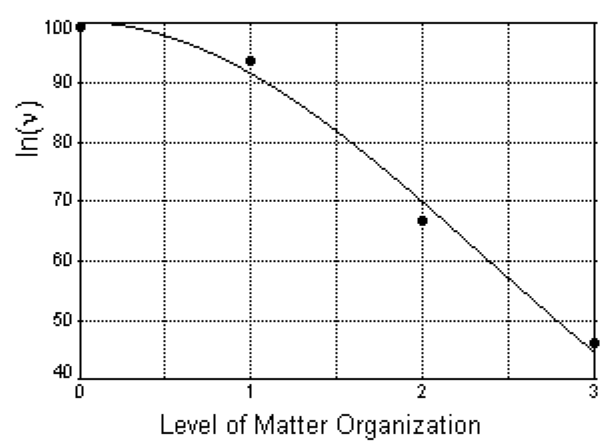

Fig. 12.25.D Frequency vs the level of matter organization with approximate estimate of the frequency for level 1

The shown estimate for the frequency of level 1 is very approximate and may contain error of few orders, but being between the levels 0 and 2 it partly confirms the suggested hypothesis about the formation of the galactic CL space.

Now let see what happens with the enormous energy that has been in a form of potential energy in the protogalactic egg. After the explosion of the protogalactic egg part of the energy is transferred to the TCL. When TCL expands it creates a CL space structure inside of the volume it encloses, while its thickness is decreases. Part of the TCL energy obviously might be transferred to the created CL space.

In Chapter 10 of BSM we found out that for a normal CL space with atomic matter (particles, atoms, molecules, solids) the ratio between the Partial and Static CL pressure tends to satisfy the relation:

$$P_P/P_S = \alpha/\sqrt{1-\alpha^2} \qquad [(10.18)]$$

Consequently, the tendency to approach the above ratio will cause an involvement of the newly created atomic matter into a motion in a newly created CL space. Therefore, the process of the energy transfer is continuous during the time period from the protogalactic egg explosion to the interconnection of the new CL space to its neighbours. After it is interconnected and some transitional fluctuation process of the new CL space is over, this space appears in an absolute rest in respect to the interconnected galactic spaces - or the CL space of the Universe. Then the transferred energy momentum to the new born atomic matter will provide a rotational momentum of this matter in respect to the galactic nucleus. The new born (visible) atomic matter begins its own evolution leading to creation of stars, solar planetary systems and so on.

12.B.5.4 The observable Universe as a conglomeration of galaxies with interconnected CL spaces

The possibility to get information from huge number of galaxies means that their CL spaces are interconnected. The void spaces (empty space in a classical sense) are rear but the option of their existence is theoretically feasible. Such spaces may belong to a galaxies that are currently in its hidden phases of evolution or some of them could be a leftover between some galaxies. Logically the second case could be rare but still possible, because the galaxies are of different size. Additionally the larger galaxies (possessing also a larger matter quantity) may have a longer active life and consequently a longer cycle period. **Then it is reasonable to expect that in a long time of many galaxy cycles the larger galaxies will be interconnected for a longer average time than the smaller galaxies. Then the larger galaxies will form the supergalactic skeleton of the Universe, while smaller galaxies will fill the gaps between them**. Two identified features from GRB data are in favour of this conclusion:

(1) the time variation between the two peaks of GRB as seen from the histogram given in Fig. 12.25.B indicates a different sizes of the galactic CL spaces.

(2) When studying the angular distribution of the observed GRBs in the whole observable sky we see that they are not completely random. Some spatial correlation is observed. This is demonstrated by Fig. 12.25.D showing the angular distribution in galactic coordinates of 1635 BATSE bursts (Meegan et al. 1997)

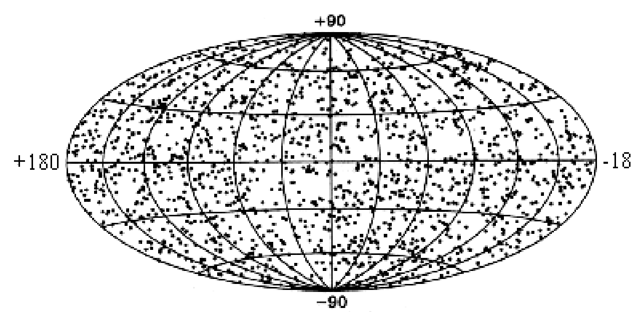

Fig. 12.25.D. The angular distribution in galactic coordinates of 1635 BATSE bursts (Meegan et al. 1997)

12.B.5.5 Galactic nucleus during the phase of recycling and incubation

12.B.5.5.1 The void space obtained after the collapse of the galaxy

From the properties of the boundary zone of GSS it becomes clear, that the connection of the new born CL space with the CL space of its neighbours will involve some **connecting energy**. This energy is evidently supplied by the new born galaxy, more accurately, by its TCL structure. The signature of this energy is the dilation of the first pulse of GRB(B) from the hard gamma ray pulse at zero triggering.

12.B.5.5.2 The galactic nucleus during the phase of recycling and incubation is kept inside the void space

The galactic nucleus has to stay inside the void space during the phases of matter recycling and incubation. It could be a disaster if the nucleus is drifted in the neighbouring galaxy space. How it is kept insight the own empty space?

One probable explanation is that it is kept inside by the Globular Clusters (GC). They are discussed in §12.B.7. The Globular Clusters are formed from islands that have escaped from the matter collection process during the galaxy collapse. This is possible for large star clusters if the CL space around them gets broken during the galaxy collapse. Left disconnected, they may undergo specific evolution converting them to globular clusters with their own CL space, partial of which is generated after the galactic collapse. Globular clusters are observed mostly in the hallo of almost all spiral galaxies. In our galaxy their number is about 150. Massive and tightly packed GCs typically contain from 100,000 to million and more stars. Their age, estimated by the existing methods appears to be in order of 15 billions years. This age is not in agreement with the estimated age of the Universe (~ 12 Billion years) that has been unsolved paradox so far.

The galactic nucleus is much smaller than the size of the void space. It is also very distant from the large masses of the neighbouring galaxies. Having in mind the inverse cubic law of IG and its specific properties for the low level structures (discussed in previous paragraphs) it is evident that any interactions with the neighbouring galaxies are practically eliminated. In such case the IG interactions of the nucleus with the globular clusters could be enough to influence the position of the nucleus. Globular clusters (GC) are discussed in §12.B.7 where it is shown that they possesses lower total energy. Consequently, they could not be able to connect themselves to the CL spaces of the neighbouring galaxies, because a connection energy is required.

From the provided analysis it becomes apparent, that the GCs are able to keep the protogalactic nucleus inside the empty space during the incubation period. GCs may surround the protogalactic nucleus (during incubation period) but not all of them could be swallowed by it. Once it enters the phase of the matter segregation, the peripheral IG energy becomes concentrated in the QB structures and the approaching GC will be not swallowed, but could be kept close. In the same time the nucleus have spin velocity in respect to the Universe and the surrounding GCs may gradually obtain a similar spin. In such way the globular clusters may serve as a buffer zone of the protogalactic nucleus (in the phase of atomic matter incubation). The whole assembly may drift, but if it reaches the boundary zone of neighbouring galaxy CL space it will be reflected back.

The provided concept is in agreement with some GRB(B) data after proper interpretation. If the galactic nucleus (and respectively the protogalactic egg) is well centred in the empty space, the following signature of a GRB(B) should be observed: strong forward pulse and weak reflected pulse separated by the time t_1. BATSE GRB with trigger number 143, shown in Fig. 12.25.A is a such a case. Examining the BATSE lightcurves from other bursts we may find number of cases when the second (reflected) pulse is larger than the forward one. This is an indication, that the galactic nucleus has been biased from the empty space centre. The lower intensity first pulse shows, that the expanding TCL has reached the neighbouring CL space but a complete CL interconnection is not occurred (only a fraction) and it has been reflected back (together with the whole new galaxy including the nucleus) and then a larger CL connection occurred after the expanding TCL has reached the opposite end of the own space. For this reason the second pulse may appear stronger, despite the fact, that it is a reflected pulse for the observer.

Note: We should not be surprised that a superhigh acceleration and velocities are possible in a void space. The Newton's mechanics and especially the inertia we are familiar with are not valid for this type of space and the intrinsic matter formations.

Another confirmation of the role of GCs during the phase of recycling and incubation comes from the observational data from the Milky way galaxy centre. K. I. Uchida and R. Gusten, (1995) discuss the observed linear filaments aligned with the strong magnetic field within the inner 1^o radius of the Galactic center. Large negative velocities are observed from the filaments. Inspection of Bell Labs (Bally et al., 1987) survey data show, there is no other strong negative-velocity emission within immediate region. According to BSM, the emitting low temperature gas (0.4 - 1.6K) in the filaments is a remnant from a GC, which has been very close to the protogalactic egg. The logical conclusion is that the CL space boundary of this GC has been broken during the galactic explosion, however, the CL structure of this remnant is not mixable with the new CL structure of the host galaxy. The trapped matter in the filaments operates in own CL space and is much brighter. The emission is excited by the X-rays emitted from the strong electron oscillations. The red shift is of cosmological origin. The filament structures and their characteristic features are similar as in the Crab nebula. They are typical for the remnants from the previous galactic life.

12.B.5.6 Summary:

- **GRB(C) type is a signal from a collapsing galaxy**
- **GRB(B) type is a signal from a new born galaxy**
- **GRB(B) carry a signature of hyperlight velocity propagated through the new born TCL (the transition phase of the new CL space)**
- **Some correlation between the time recycling sequences of the neighbouring galaxies exists**
- **Globular clusters may play a role of keeping the galactic nucleus inside the own former space (a void space) during the phase of recycling and particle incubation**

12.B.6 Active galactic life

The active galactic life is the apparent phase of the galactic cycle. This is the phase in which we are able to exist and observe. The galaxy during this phase also have evolutional process and the observed phenomena are quite rich. For this reason only the most important phases of the evolution and the related phenomena will be briefly discussed.

12.B.6.1 Some features of evolution after the explosion of the protogalactic egg

We could not try to divide the active galactic life into phases. Some of the phenomena following the eruption of the protogalactic egg has been described in §12.B.5. They include the CL space formation and interconnection, (characterised with a transitional phase, denoted as TCL) and the observed “point” and “extended source” related to the GRB phenomena. The latter is of larger interest as it is related to the expanding new matter that will develop into a new galaxy with one of the following shapes: disk, lenticular, spiral or bared spiral type. The shape that the new galaxy will obtain depends also on the volume and the shape of the void space that has been inherited and preserved from the former galactic life.

The protogalactic egg does not have strong interaction with the neighbouring galaxies and their CL spaces, so the rotational momentum that he eventually get during the galaxy collapse could be preserved. After the explosion the new born matter get the orientation of its spin axis. The spin energy, however, will get interaction with own and neighbouring CL spaces, after the interconnection and transition of the TCL structure into a CL space. Then the matter thrown at larger distance from the galactic nucleus will appear with larger momentum. Once the CL space is interconnected it could not rotate any more. At this moment the energy from the eruption is converted into interaction energy between the FOHS’s of the new born atoms and the new born CL space. In this interaction process, the CL node are forced to fold and deviate by the envelope volume of the FOHS, which contain denser Rectangular Lattices. These is a type of inertial interaction, which may provide both: momentum and excitation of the electrons of the atoms, so they could emit a broad band radiation.

The spiral type of the new born galaxy is obtained as a result of unfolding the transformed clusters which has been obtained in the crystalization phase inside the protogalactic egg.

It is evident, that the final shape of the galaxy depends on some factors , such as:

- a proper balance between the quantity of the crystalised particles and the quantity of the free prisms which will built the CL space

- a proper balance between the galactic matter and the preserved void space in which a new CL space will be created

Optimal balance conditions will lead to a development of galaxy of a spiral type.

Not optimal balance conditions may lead to a disk or lenticular galaxy.

12.B.6.1.1. Interaction of the galactic nucleus with the visible matter of the host galaxy during the active life of the galaxy

The formation of the galactic nucleus, comprised of the internal egg-shell and the enclosed inside intrinsic matter, were explained in §12.A.11.6. The galactic nucleus exists through the whole active life of the home galaxy and the importance of such existence will become evident in the discussion provided later. In §12.A.11.6 it was explained how the egg-shell is able to keep the bulk matter nucleus inside. A new question that needs an answer is: What is the interaction of the galactic nucleus with the visible matter of the host galaxy during the its active life?

The protogalactic egg together with the enclosed bulk intrinsic matter possesses some spin momentum obtained during the collapse of the former galaxy. After the eruption the spin axis of the new galactic nucleus gets feedback initially from the CL space interconnection. Later it gets feedback from the inertial interaction between the spiral arms and the stationary (already interconnected) CL space. In this process one major factor is t**he magnetic field created by the rotating internal egg-shell.** The egg-shell is comprised of highly oriented positive prisms (see §12.A.11.6), so in the established CL space it behaves as a huge rotating electrical charge (dynamo). Such charge is able to provide a huge magnetic field through the galaxy. In the same time, the positive egg-shell is surrounded by a huge amount of electrons obtained from the negative FOHS's that has not been involved in the final product of the matter crystalization - the protoneutrons. The positive FOHSs which has not be involved in the protoneutrons are also thrown during the explosion of the protogalactic egg. They could not be closer to the positively charged external shell of the new born galactic nucleus, so they contribute to the flux of the cosmic positrons.

The electron structure and its oscillation capability has been extensively discussed in Chapter 3 of BSM (referenced as a electron system due to its complexity). Figure 12.25.E shows again the shape of the electron structure, comprised of an external FOHS with a negative RL(T), an internal FOHS with a positive RL(T) and a negative central core. The internal FOHS with a positive RL(T) and a negative central core is a positron.

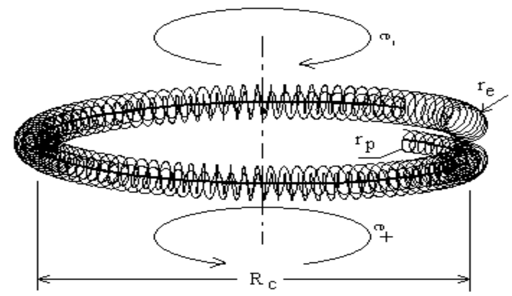

Fig. 12.25.E. Oscillating electron structure
R_c - compton radius, r_e = 8.84E-15 (m), r_p = 5.89E-15 (m). (the internal negative and positive RL(T)'s structures are not shown)

It has been shown in Chapter 3 of BSM that if the electron is strongly excited it performs multiple oscillations with exponentially dumped amplitudes. When the excitation of such type is with a maximum amplitude, it leads to a process of CL space pumping that is followed by a release of two gamma quants 511 KeV each. Strong oscillations with smaller amplitude usually lead to generation of lower energy gamma photons, usually by 3-gamma photon process. Oscillations between one free positron and one electron also lead to emission of two photons of 511 KeV and the obtained particle is a neutral one with a mass of 1.022 MeV (not detectable so far due to its neutrality). (In the modern physics the process of 511KeV gamma radiation is known as “annihilation”, but according to BSM, there is not any type of matter annihilation in such process).

The CL space surrounding the galactic nucleus could not rotate as it is connected to the neighbouring galaxies CL spaces. A large cloud of electrons are attracted by the positive galactic nuclear shell (the internal shell of the protogalactic egg) while they are in the CL space. The rotating positive external shell of the galactic nucleus will attract the electrons and drag in rotation while they will have inertial interactions with the CL space. The rotating electron cloud will cause formation of a large magnetic field that will comply to the rotational axis of the galactic nucleus (the internal positive shell of the protogalactic egg). In the same time the strongly excited electrons (as mentioned above) will emit mostly a 511 keV radiation. Due to the inertial interaction with the CL space the rotating electrons will provide a feedback to the positive galactic nucleus, so the direction of its rotational axis will be kept stable.

The rotating positive egg-shell creates conditions for uniformly distributed electron clouds in angular range centred about the galactic plane, but not near the poles. The rotating and wobbling electrons near the two polar regions of the rotating galactic nucleus will get different magnetic force component: one will be attractive, while the other will be repulsive. For this reason the electron clouds around both poles will have different number density. This difference will appear as a signature of radiation at 511 KeV.

The observations of 511 KeV emission from the central region of Milky way is in complete agreement with the above presented concept. Uchida and Gustein (1995) estimate a large scale magnetic field in the galactic centre by measurements of Zeeman splitting in 1665 and 1667 MHz. Recent results from OSSE (Oriented Scintillation Spectrometer Experiment) provides a map of the galactic emission at 511 KeV (reported by Purcell et al., (1997). Figure 12.25.F shows the map of the radiation. By using data from number of experiments and applying a maximum entropy method L.X. Cheng et al. (2001) suggest that the 511 KeV radiation consists of two components: bulge centroid with $FWHM \approx 5°$ and galactic plane component. The bulge centroid, according to BSM, is from the cloud surrounding the positive galactic nucleus.

.

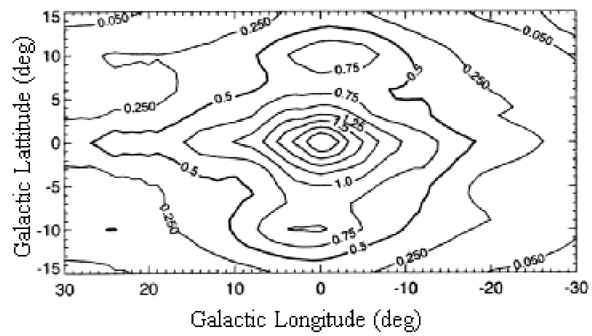

Fig. 12.25. Galactic emission at 511 keV (after Purcell et al. (1997)

Additional observational data indicating a rotating positive galactic nucleus are evident from the measurements of molecular clouds velocities near the Milky way centre. Figure 12.25.G shows the cloud velocity versus the galactic longitude (T. M. Bania, 1977). The measured cloud velocity is from a $^{12}C^{16}O$ molecular cloud in the galactic longitude range of $0 \pm 10°$. .

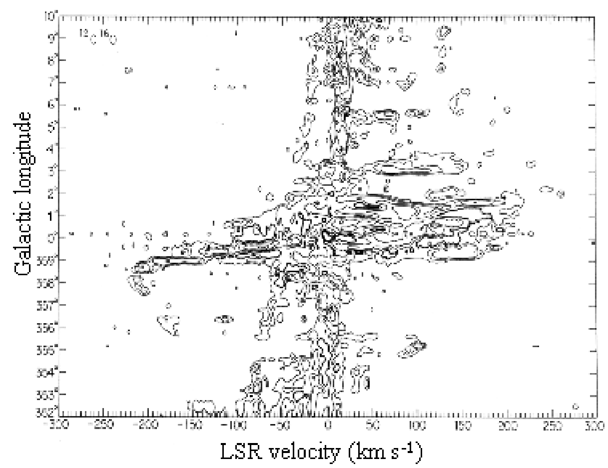

Fig. 12.25.G Longitude-velocity contour diagram of the $^{12}C^{16}O$ emission observed at $b = 0°$ for the region $10° \geq l \geq 352°$. Contour levels correspond to T = 1.4, 3.0, 5.0, 10, 15 K (After T.M. Bania, 1977)

We see that the rotational velocity in the range $0 \pm 2°$ changes between 0 and 200 km/s. The explanation of BSM is the following: The rotating positive galactic nucleus shell induces rotational field component in the stationary CL space through the bearing gap (empty space). The rotational field directly or through the existing electron clouds provides momentum to the molecular clouds. The inertial interactions of the dragged in this way molecules excite them and they emit a not thermal radiation (at very low temperatures). This mechanism obviously has a limited radial range and is influenced by the strong magnetic field from the spinning galactic nucleus positive shell (rotating together with the bulk nucleus of the intrinsic matter enclosed inside).

The assembly of the positive galactic nucleus shell and the internal bulk matter is further referenced as a **galactic nucleus**.

12.B.6.1.2 Kinetic energy storage mechanism of the galactic nucleus

The provided concept shows that the positive galactic nucleus shell together with the internal bulk matter are kept in the centre of the active galaxy by a complex mechanism in which the following processes are involved:

(a) IG interactions of (CP) and (TP) type between the positive galactic nucleus (the internal shell from the protogalactic egg) from one side and:

- the proximity CL space (strong electrical and magnetic field generation)
- the free electrons in the CL space closer to the egg-shell

(b) radiation of high energy photons from the excited free electrons

(c) radiation from molecular clouds in the range of $\pm 2°$ galactic longitude (data valid for Milky way)

(d) long range interaction between the generated strong magnetic field and the galactic matter in the bulge and the disk of the galaxy.

The energy of these interactions comes from one source: the rotational energy of the galactic nucleus in respect to the stationary CL space. The latter is referenced to the stationary Universe. The rotational kinetic energy is like the kinetic energy of a classical flywheel. Evidently this energy is enormous (having in mind the huge matter density of the galactic nucleus). This kind of stored energy may compensate the energy lost from the continuous radiation from the stars, an energy that escapes the home galaxy. When considering an intergalactic energy balance, the stored energy may compensate the inevitably energy imbalance. In such way it provides conditions for a long active life of the host galaxy.

Figure 12.25.H illustrates the model of the interacting galaxy nucleus according to the presented concept. The following notations are used:

1 - bulk nucleus with low level structures from two intrinsic matter substances
2 - external growing layers of QB's with alternative handedness
3 - empty space gap
4 - internal positive shell from the protogalactic egg
5 - empty space gap
6 - boundary zone of the CL space
7- electron cloud

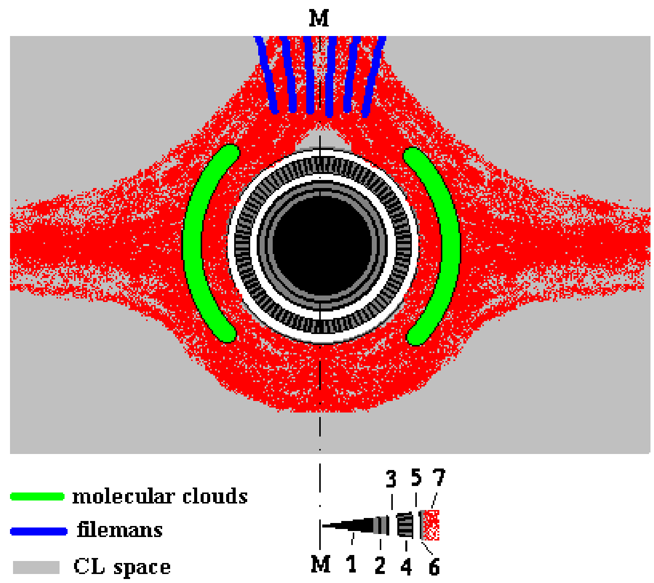

Fig. 12.25.H
Model of Milky way galaxy nucleus illustrating formations involved in various type of interactions

The bulk nucleus contains the very low level structures from two type of intrinsic matter, that are still able to carry the memory of the correct handedness.

The alternative layers 2 are preserved from the phase of the intrinsic matter segregation before the eruption (a phase preceding the formation of the protogalactic egg). The most external of the alternative layers 2 is a negative. (It is not possible to infer only: are the structures of the most external layer still of QB type or destructed to QP type?).

The interactions between the positive shell of the galactic nucleus and the internal intrinsic matter (with a spherical shape) could allow the both formations to have almost zero velocity. In such way the positive galactic nucleus shell will probably tend to reach the rotational velocity of the nucleus, obtained during the galactic collapse.

The gap 5 serves as an ideal bearing between the stationary CL space and rotating positive shell of the galactic nucleus. In the same time it allows the kinetic energy of the nucleus to be transferred to the surrounding electron and molecular clouds and finally to the galactic matter. The boundary zone is of similar type as the TCL space, but it is permanently stable. It protects the gap 5 from penetration of migrating electrons or any elementary particles including folding CL nodes.

The galactic matter could surround the nucleus but in the normal CL space, i. e. outside of the boundary zone. The molecular clouds (green area) showing a rotational velocity in a range of -200 km/s to +200 km/s are in the galaxy longitudinal range about $\pm 1.5^\circ$. The free electrons occupy the closer area (red coulor) with asymmetrical tails for the two magnetic poles. The filaments (blue area) are remnants of these globular clusters, which has been destroyed during the explosion of the protogalactic egg. The CL space of this matter is not mixable with the new galactic matter.

While the stored energy in the galactic nucleus is perhaps exhausting slowly during the active galactic life, the magnetic field that it supports will be also decreasing with the time. The magnetic field may play one important role: deviating the pulsars that occasionally move inside the bulge of the galaxy from falling on the galactic nucleus. The moving pulsars posses a jet propulsion mechanism and superstrong magnetic field (see §12.B.6.4) and if some of them are not properly deviated they may hit the positive shell of the galactic nucleus. If the latter breaks as a result of a such bombardment, the galaxy collapse will occur prematurely. For galaxy nucleus with large kinetic momentum the pulsars could be deviated not only by the galactic magnetic field but also by the radiational pressure from the X-rays emitted by the electron clouds (see §3.2 in Chapter 3 of BSM for X-ray emission from oscillating electron).

The provided BSM concept about the stored energy in the galactic nucleus and the mechanism of its radiation is in agreement with the recently observed phenomenon in the galaxy MCG-6-30-15. Jörn Wilms of Tuebingen University, Germany, and an international team of astronomers identified a phenomenon of “power trapping” by observing a supermassive black hole in the core of the galaxy named MCG-6-30-15 with the European Space Agency's X-ray Multi-Mirror Mission (XMM-Newton) satellite. In a paper posted by NASA at 22 October 2001, titled: “New Study Shows Black Hole Belching Energy” it is written:

Scientists for the first time have seen energy being extracted from a black hole. Like an electric dynamo, this black hole spins and pumps energy out through cable-like magnetic field lines into the chaotic gas whipping around it, making the gas - already infernally hot.
(http://www.space.com/scienceastronomy/astronomy/blackhole_energy_011022.html)

12.B.6.1.3. Summary:

- **The galactic nucleus possesses enormous kinetic energy. This energy may determine the duration of the active life of the galaxy.**
- **The galactic centre is a region of complex phenomena, whose signatures, however, are observable parameters leading to a reasonable logical interpretation from a point of view of BSM concept about the space and the Universe**
- **The superstrong galactic magnetic filed may play a role about the galactic matter evolution and its integrity during the active life of the galaxy**

12.B.6.2. Galaxy rotational problem

The galaxy rotation refers to the phenomenon of the discrepancy between the observed rotational motion of the matter in the galactic disk from the predictions of the Newtonian dynamics. The problem is illustrated by Fig. 12.25.I.

.

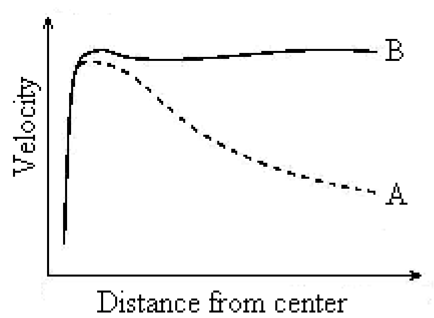

Fig. 12.25.I. Galaxy rotation problem. A - expected rotational curve, B - observed rotational curve

Curve A shows the expected rotational curve based on the Newtonian mechanics. Curve B shows the typical shape of a rotational curve for a spiral galaxy. It appears from the galaxy rotation curve that part of the galactic disk behaves as a solid body. It is in a sharp contrast from the rotation of the planets around the Sun. This has been a big confusion so far. Attempts to resolve this problem led to a suggesting of hypothesis that this is caused by a huge amount of invisible matter in a form of multiple black holes, so called “dark matter” Another hypothesis suggested a “modified Newtonian dynamics”. Avoiding the speculations of the mentioned two hypothesis, BSM analysis leads to quite logical solution of the problem.

The initial spread of the matter occurs after the break-up of the external shell of the protogalactic egg. In the same moment a building process of expanding TCL begins with expanded CL space enclosed inside. The spreading new atomic matter can not be involved in a large inertial interactions with the new built CL space until it is not interconnected to the neighbouring galactic CL spaces. In the phase of CL space interconnection, the new CL space becomes spatially fixed in result of which, the spread new matter appears in motion in respect to the own CL space. But the protogalactic egg generally has been in a relative rotational motion in respect to the neighbouring galaxies. In result of this, all material objects of the new galaxy (particles, atoms, molecules, solids) may obtain a large momentum with two components: a rotational and a radial one. The Newtonian type of gravitation will compensate the radial component of expansion, while the rotational component will be preserved and even increased. This is kind of transition process, which may have extremely long transition period.

The presented scenario leads to a **conclusion that the observed rotational curves of the spiral galaxies is not a stationary but a transitional process.**

In fact all of our observation are taken during an intrinsically small period of the galactic active life. The transitional process could be even comparable with the active life duration of the galaxy (or may be it does not reach a fully stationary rotation). The finite lifetime of the stars ending with explosion and birth of pulsar also may influence the rotational motion.

Figure 12.25.J demonstrates a rotational curve for NGC4138 as a position-velocity map, according to Broelis. A. H. (1995).

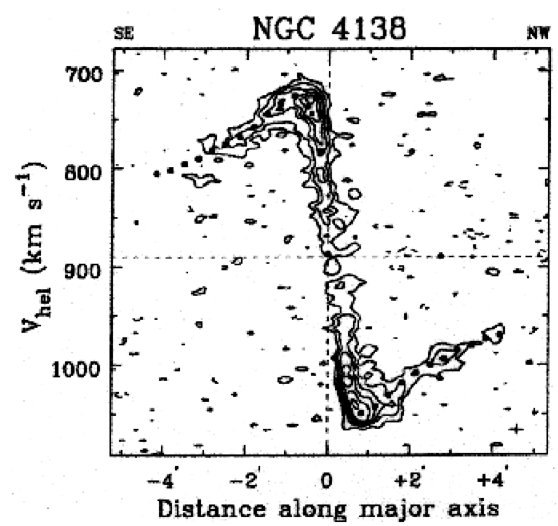

Fig. 12.25.J. Position-velocity map of NGC according to Broelis. A. H. (1995).

It is apparent, that after the CL interconnection the new born galaxy gets feedback in respect to the stationary CL space and stationary Universe. The feedback energy depends mainly of two factors: the amount of the rotational energy momentum and the matter quantity in the new galaxy. One particular case deserves attention. Part of former space of the new born galaxy could be annexed by its neighbours due to some cosmological events in the galaxy neighbourhood. In such case the new galaxy may not have enough room to develop as a spiral type. Rather it will obtain an elliptical or lenticular shape. Then it is quite possible that a part of the newly formed prisms (with some particles) may penetrate in the foreign CL space of its neighbours, where they may disturb the local CL space. The thrown matter will obviously occupy the most peripheral part of the galaxy lying on the galaxy plane. The penetrated matter could not operate effectively in a foreign CL space so it could stay much colder. The possible signature of such phenomena could be a sharp dark features in the galactic disk periphery. The best condition for observation of this hypothetical effect is when the galactic plane is aligned with the line of sight. Number of observed disk type galaxies show sharp dark features in their disk, but they are interpreted so far as strong dust absorptions.

12.B.6.3 Some features in the processes of star formation and their evolution

The current observations from our galaxy may not contain information from its evolution immediately after its birth. Galaxies at such phase of evolution might be quite distant, so we may lack of good observational data from this phase. Then we may extrapolate our vision using some secondary observed features, for example, the abundance of hydrogen and deuterium in the deep space. Due to the extremely large dynamics in the immediate phase after the galaxy birth, more complex atoms or molecule are less likely to be formed. The galaxy birth is accompanied with a huge initial burst of gamma and X-ray. After the release of this energy, one may expect formation of mostly Hydrogen, less likely deuterium and much less likely helium. The only possible reliction of this is the abundance of these atoms in the deep space.

The process of star formation has been studied from many decades and it is not a main issue of the BSM theory. Only some particular moments of the star evolution will be presented for which some new mechanisms are identified. They are related mostly to the evolution phase described as a Main Sequence, which in fact is very time distant from the galaxy birth. Before the Main Sequence a Pre-Main Sequence exists, in which a protostar is formed. (The Pre-Main and Main Sequences a features of the star evolution).

A protostar could be born from condensed gas clouds and its typical evolution is described by the Pre-Main Sequence. The probable scenario is a following:

Cold hydrogen molecules concentrate into giant clouds with 200,000 to 1,000,000 times the mass of our Sun. The matter density of such formation increases slowly until the newtonian gravitation start to play a role causing formations of gas fragments. The cores of this fragment (with a mass much smaller than the gas cloud mass) converts into smaller denser bodies. When the internal mass density reaches some critical level, the increased internal pressure may invoke a fusion reaction. A ptotostar is born. The most probable nuclear reactions are:

$$(p \to n) + p = D + \text{energy} \qquad (12.34)$$
$$D + D = {}^{4}He + \text{energy} \qquad (12.35)$$

About 25% of the protostars are born from gas clouds in a star formations, known as open clusters. Most of the born stars escape from the cluster. It is quite probable some energetic balance between the cluster matter and the CL space environment to be involved in this process. The evolution process of the protostar may take from 100,000 years to 1 million years in the Pre-Main Sequence. It depends mostly on the mass of the protostar. A smaller mass protostar spends much more time than a larger mass until reaching the Main Sequence.

12.B.6.3.1 Main sequence and particular points.

The Main Sequence is a typical process of the star evolution in which the relation between the surface temperature and the luminosity follows particular curves described by the Hertzsprung-Russel diagram (H-R diagram). The observation material about this phase of the star evolution is richer than the Pre-Main sequence. H-R diagram is shown in Fig. 12.26.A.

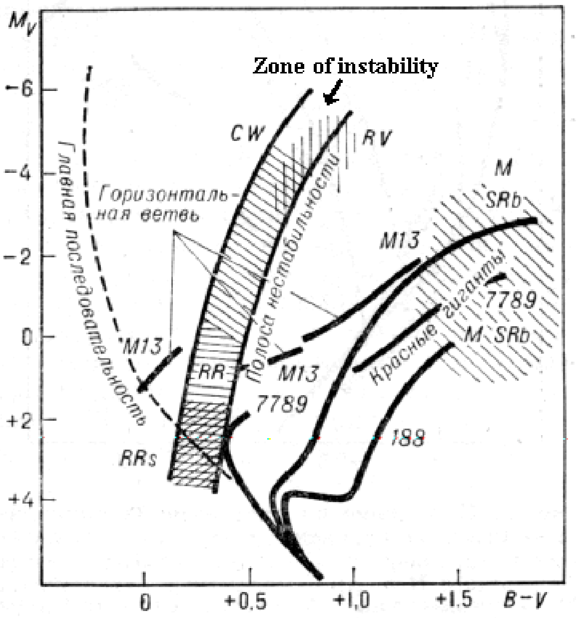

Fig. 12.26.A. Hertzsprung-Russell diagram

According to the classical concept, the evolution of the stars in the Main sequence of H-R diagram depends mostly on its mass. In such aspect, three main cases are distinguishable"

(a) case: the stellar masses is between 0.8 and 11 solar masses

(b) case: the stellar masses is between 11 and 50 solar masses

(c) case: the stellar masses is greater than 50 solar masses

If the born star corresponds to case (a) it spends about 100,000 to 10,000,000 year (according to contemporary astronomy) until reaching the Main Sequence. But stars more massive than 11 Suns are essentially born on the Main Sequence.

The time evolution in the Main Sequence follows the direction from the upper left end of the curve to the down right end. Stars within different mass range, spend different time on the main sequence. Low or intermediate-mass star spends between 80 to 90 % of its life in the Main Sequence phase.

BSM provides analysis only for some particular points or sectors of the Main Sequence. One such sector is the range of instability. It is intercepted by a zone of instability as shown in H-R diagram of Fig. 12.26.A. A star from a Main Sequence in the sector of instability behaves as a variable star. It may pass this critical sector continuing on the Main Sequence as a stable star or it may deviate in a zone of instability. Cepheids are typical representative of the variable stars in the range of instability. They exhibit well defined Period-Luminosity relationship. The cosmological science has not provided so far clear convincing explanation about the mechanism of this instability. The observations shows that the star may have a loop in this region with two exiting options:

- following the main sequence of H-R diagram.
- following a horizontal path of H-R diagram and converting to red giant

The BSM analysis of the star behaviour in the sector and zone of instability, unveils that a hidden so far physical process is behind the instability and the stars known as variable stars.

12.B.6.3.2 Physical process related to the zone of instability in H-R diagram, according to BSM.

The instability sector of the Main sequence of H-R diagram is well after the beginning of the curve, as shown in Fig. 12.26.A. The provided below analysis is focused on this sector.

From a point of view of BSM, the balance between the gravitational energy of the star and the CL space environment is important factor for the star evolution in the main sequence of the H-R diagram. The gravitational pressure in the central region of the star is quite big. The conversion of Hydrogen into He in these region leads to increasing the density. Then the IG forces between the hadrons (proportional to inverse cube of the distance) begin to contribute significantly to the effective gravitational pressure in the central region. At some critical value of this pressure it may affect the structure of the elementary particles proton and neutron from which the atomic nuclei are built. The external positive shell (envelope) of the proton (neutron) is a third order helical structure. Its stiffness is lower than the stiffness of the second and first order helical structures. Therefore, it is reasonable to accept that this structure (of the proton and neutron) may break first. In this process its internal RL(T) structure is obviously destroyed into partly folded LR nodes, which are of the size of the CL nodes and easily escape out. The internal pions and kaons, however, are more resistant on the increased gravitational pressure. They are only cut (in one or two pieces). The most of pions loos their second order helicity and are converted to straight FOHSs structures like the central kaon structure. All they form a bundle of kaon-like structures (FOHSs). In such case **the star obtains a kaon nucleus**. This concept of kaon nucleus in stars is in full agreement in the analysis of the pulsars, presented in §12.B.6.4. (Chapter 12 of BSM), while a small kaon nucleus in planets is discussed in §10.6.2 (Chapter 10 of BSM). The size of the nucleus increases with every pulsation, but it is always surrounded by a large quantity of atomic matter. The latter protects the ends of the kaon nucleus, not allowing destruction of the internal RL(T) structure (as in the decay of a single kaon in CL space - see Chapter 6 of BSM). The axially aligned RL(T) from the aligned FOHSs provide a conditions for a **super strong magnetic field of the star** (this conclusion is apparent from the pulsar analysis in §12.B.6.4). According to BSM, the magnetic field of the star may have important role about the nuclear reactions in the star residing on the main sequence of H-R diagram after the region of instability:

(A). The star's magnetic field probably creates conditions for a larger variety of fusion reactions leading to building of atomic nuclei with higher Z numbers. It helps the protons, neutrons and deuterons to get a suitable alignment for such type of nuclear reactions.

One may argue: Why the critical mass of the planet for obtaining a kaon nucleus (see Chapter 10 of BSM) is much smaller than any stellar mass? The possible answer is: The conditions for formation of such nucleus depends not only of the mass but of the atomic mass density of the astronomical object, because IG forces are also involved. The planets are formed of higher Z number atoms than the stars (especially stars from this part of the main sequence), so the planetary density in the central region is much higher. Consequently in the case of star, much larger mass is necessary for crushing the protons and neutrons in the central region.

The process of crushing the protons (and neutrons) appears in steps, so the kaon nucleus increases in steps. During such event the nodes of the destroyed RL(T) structures fly folded through the star, but they are distinguished from the folded CL nodes (RL nodes are formed of 6 prisms, while CL nodes are formed of 4 prisms). Flying folded RL nodes however may cause excitation of the star matter. It may perhaps cause an eruption of matter from some internal regions and pulsation of the most external gas layer. These phenomena provides possibility for detection of:

- luminosity in function of periodical phase
- estimation of upper layer pulsation by measuring the Doppler shift of some spectral lines

The flying folded nodes (passing also through the molecules, atoms, proton and neutron) may simulate moving of emitting or absorbing atoms with high velocities, while in fact they do not have such. This is a specific effect, theoretically inferred by BSM analysis, that may simulate a relativistic Doppler shift. Then the shifted spectral lines could be mistakenly attributed to a high velocity gas motion. **According to the BSM conceptual analysis, the large radial velocities measured for the cepheids are contributed by such effect.**

Now it is apparent that the emitted radiation is proportional to the quantity of the released RL nodes from the crushed RL(T) structures. The experimental evidence about this is provided later.

The described features are valid for variable stars known as **cepheids of I-st type**. The described process is in agreement with the inferred postulated rules P3 and P5 about energy balance for structures of Intrinsic Matter. The Newtonian mass we are familiar with, is proportional to the Intrinsic Matter. From this and from presented concept the following conclusion follows for these variable stars:

(A) Larger stellar mass -> larger quantity of crushed protons and neutrons -> larger quantity of destructed RL(T) -> larger emitted radiation (larger luminosity) (A)

(B) Larger stellar mass -> larger period of pulsation

The above relations (A) and (B) lead to a logical explanation why the period of the fluctu-

ation is directly related to the luminosity of the cepheid star.

The kaon nucleus is much denser and heavier than the atomic matter. Then it may play a role for triggering a nuclear reaction in the star. Let assume that a critical volume quantity of kaon nucleus (a critical mass) is necessary for this purpose. The formation of kaon nucleus is accompanied with an eruption and lost of some star material. This, however, causes some decrease of the pressure on the central region. So the obtaining of the necessary critical mass of the kaon nucleus for effective nuclear reactions and the loss of matter are two ambiguous processes. For this reason the variable star could make an open loop in this region. If the first process prevails, the star continues on the main sequence path of H-R diagram. If the second process prevails, it continues in the horizontal branch and ends up its evolution as a red giant. In this case it may not have enough kaon nucleus mass and strong magnetic field, necessary for more effective nuclear reactions.

Our Sun follows the main sequence after the region of instability. It possesses a strong and stable magnetic field, so it perhaps has a well formed kaon nucleus.

12.B.6.3.3 Evolution of stars with masses between 11 and 50 Suns.

Evolution process

The evolution process in this case follows the phases:

- red or blues supergiant with a helium core
- or red supergiant with iron core
- supernova
- pulsar (“neutron star”)

Note: BSM concept uses pulsar instead of a “neutron star”, putting the latter term in quotation marks for reasons explained below.

For a star belonging to the Main sequence after the range of instability, the primary elements as H and D are converted to elements with higher Z numbers. It is well-known fact that the mass deficiency (binding energy) increases with the Z number. This is related to the Newton’s gravitational mass. So the inertial mass of the star changes in the same direction as it is changed by the increase of its kaon nuclei. This tendency could be expressed also by the change of the matter density. The increased matter density involves increasing of the intermolecular IG forces and consequently the internal gravitational pressure. In the same time the star have lost a lot of energy due to radiation so the average excited state of the atoms continuously decreases. This provides a compacting effect on the atomic matter. The inverse cubic law IG forces between the atoms then get additional increase. At some point the kaon nucleus may increase by crushing additional matter of the internal surrounding layer. If the amount of the crushed matter (protons and neutrons to kaons) is significant, it may blow out almost all of the atomic matter layers. This phenomenon is a **collapsing star** (according to BSM concept). The process may appear as a huge explosion. Since this phenomenon is strongly influenced by the kaon nucleus, which always have and extended shape, the shape of the explosion is not spherical. Consequently:

The phenomenon of collapsing star shows specific features indicating existence of kaon nucleus:

(a) two jets in a common jet axis

(b) atomic matter thrown around the plane normal to the common jet axis

(c) hardware neutrino particles

The phenomena (a) is from the destructed RL(T) structures of crushed external shell of the protons and neutrons. The released RL nodes (known as neutral current in Electroweak theory) obtain preferential direction along the superstrong magnetic field created by the kaon nucleus.

The phenomena (b) is the released atomic material by the explosion.

The phenomena (c) is mainly from the crushed FOHS envelop of the external proton’s (neutron’s) shell.

The Hubble Space telescope has provided an excellent opportunity for observation of such phenomena. Pictures corresponding to the described events are shown in Fig. 12.27.A, Fig. 12.27.B and Fig. 12.27.C

.

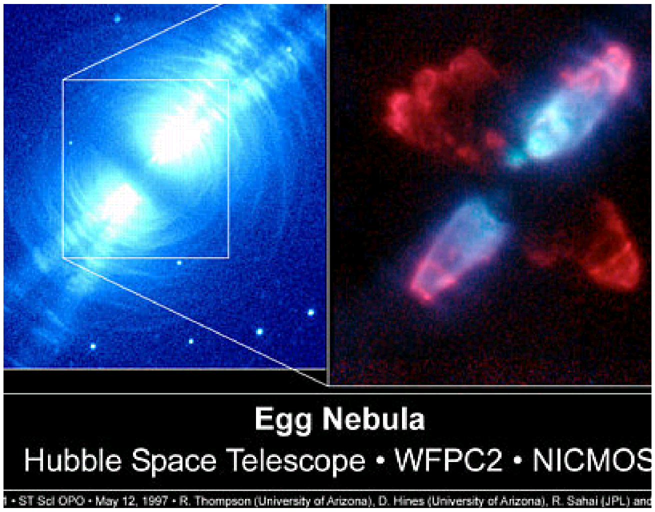

Fig. 12.27.A dying star
(www.seds.org/hst/97-11.html)

The process of star dying may take finite time. It could be interrupted and then starting again. Finally it will lead to simultaneous crush and release of atomic matter until one or two ends of the kaon nucleus become completely uncovered from the possible atomic matter. In the latter case the explosion could be even more powerful. The phenomena of supernova is one option of star dying process. Stars whose initial mass is within the mentioned range inevitably provide a pulsar or object of "black hole". The physical mechanisms of the jets end the eruption become apparent in the BSM analysis of the pulsars provided in the next section.

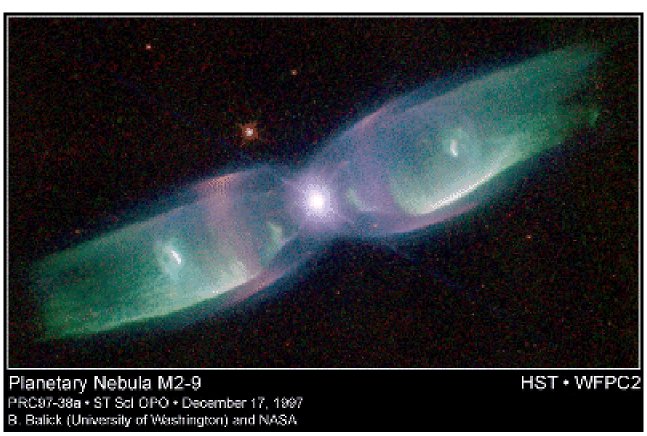

Fig. 12.27.B. Picture of Dying star
(http://oposite.stsci.edu/pubinfo/pr/97/38.html)

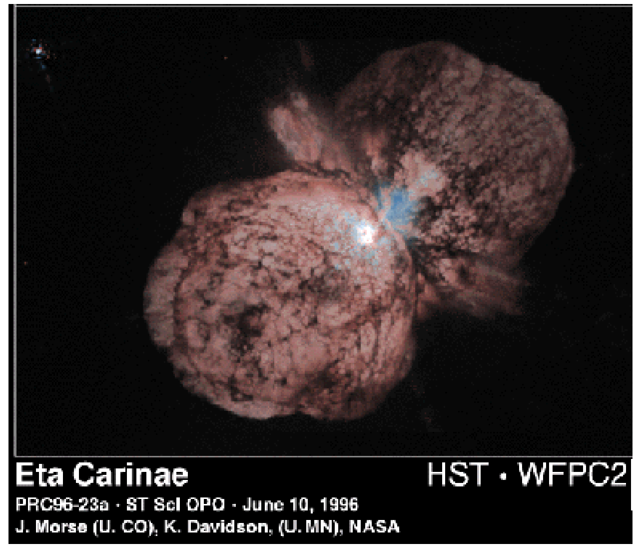

Fig. 12.27.C.
(http://oposite.stsci.edu/pubinfo/pr/97/38.html)

The terms "egg nebula" and "planetary nebula" are adopted only due to geometrical similarities, but does not involve any physical similarities with the galactic formations.

Notes:

1. The references used in this chapter refer to the references of the BSM theory, which are provided in the CD ROM included to this book.

2. Additional analysis of observations from a point of view of BSM is presented in the next sections of Chapter 12 of BSM (enclosed in CD ROM).