



Chapter

2

Relativistic Consideration of Field-Space-Mechanics

2.1 Special Theory of Relativity of Field-Space-Mechanics

This chapter deals with the relativistic consideration of Field-Space-Mechanics. It becomes clear here that space-time behaves trigonometrically in relation to its spatial mechanical effects. The following results first show how space-time and field deformation are parameterized in the field-space model and that these follow a periodic inertial motion, which resembles the representation of a gravitational wave. The modeling takes place in the wave-field.

Creating the inertial system:

Both velocity parameters V_4 and V_5 each form a reference system in relation to the maximum velocity $V_{max} = c$. Due to the orthogonal alignment of the dimensional plane D_{45} to D_{56} , the following applies to each other: $V_4^2 + V_5^2 = c^2$.

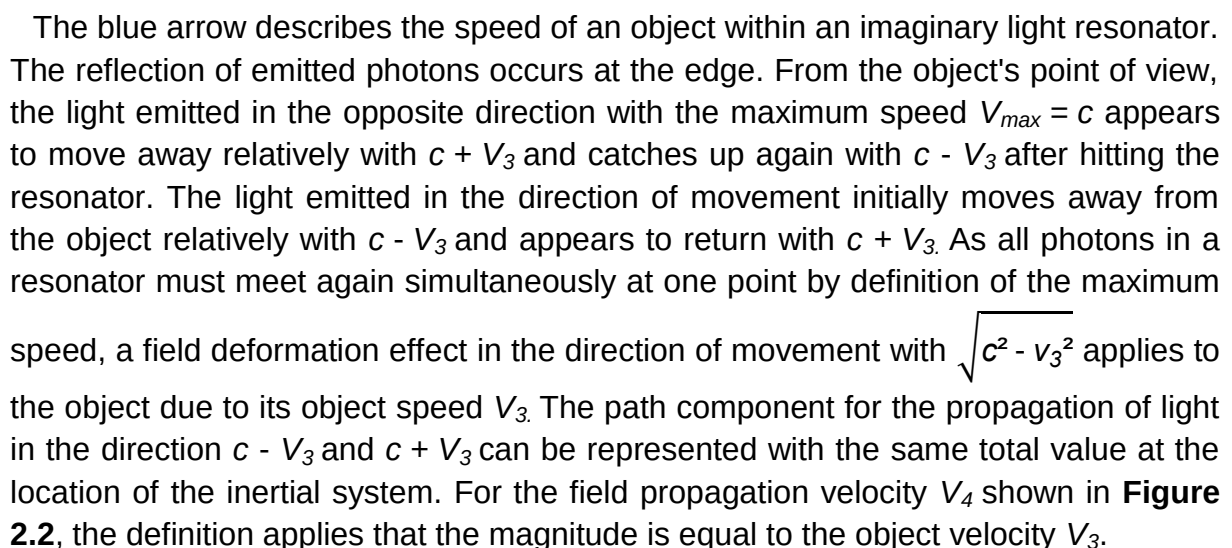
Extreme cases:

An object moves in the particle-field with $V_3 = V_4 = c$, then $V_5 = 0$ applies.

An object moves in the particle-field with $V_3 = V_4 = 0$, then $V_5 = c$ applies.

Special case for the measurable photon in the particle-field: $V_3 = V_5 = c$, then $V_4 = 0$ applies

Figure 2.1 supplements **Figure 1.5** with two possible observation points for the detection of a field deformation within a 6-dimensional field-space, which could be observed outside a space-time deformation.



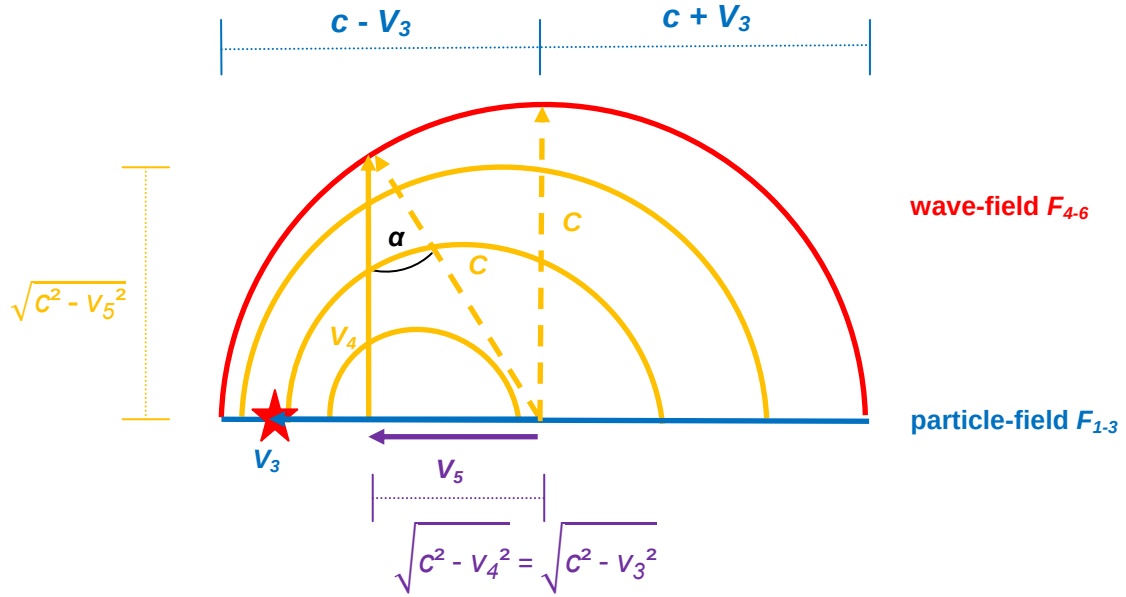


Figure 2.2: Field deformation orthogonal to the direction of movement, 4-dimensional representation

At maximum speed $V_{max} = c$ in the direction of movement towards the object:

$$V_a = \frac{\text{Raum}}{\text{Zeit}} = c \frac{(c - V_3)}{\sqrt{c^2 - V_3^2}} = c \sqrt{\frac{c - V_3}{c + V_3}} \quad (2.01)$$

With maximum speed $V_{max} = c$ against the direction of movement of the object:

$$V_b = \frac{\text{Raum}}{\text{Zeit}} = c \frac{(c + V_3)}{\sqrt{c^2 - V_3^2}} = c \sqrt{\frac{c + V_3}{c - V_3}} \quad (2.02)$$

Temporally resulting clocking t_{res} for an imaginary resonator over an equal path s :

$$t_{res} = t_{hin} + t_{her} = \frac{s}{V_a} + \frac{s}{V_b} = \frac{2s}{\sqrt{c^2 - V_3^2}} \quad (2.03)$$

This speed of light is measured in a light resonator over a distance s if the observer is orthogonal to the direction of movement:

$$V_{res} = V_5 = \sqrt{c^2 - V_3^2} \quad (2.04)$$

A **space-time deformation** caused by a moving object in the particle-field F_{1-3} with an object velocity V_3 acts in the wave-field F_{4-6} with the field propagation velocity V_4 **orthogonally** to a **field deformation**, which in turn is expressed by the field propagation velocity V_5 . The speed of light is reduced to the field propagation velocity



V_5 with the term $\sqrt{c^2 - v_3^2}$. Lorentz contraction and gravitational redshift are perceived as real space-time mechanical effects for the 5-dimensional view of space.

→ The trigonometric solution for the space-time deformation is:

$$V_4 = V_3 = c \cos(\alpha) \quad (2.05)$$

→ The trigonometric solution for the field deformation is:

$$V_5 = c \sin(\alpha) \quad (2.06)$$

→ For length contraction: $x' = x \sin(\alpha) = x \frac{V_5}{c}$ (2.07)

The object time of the moving object must be slower by a factor of $\frac{c}{\sqrt{c^2 - V_3^2}}$ than in a reference system that is at rest with respect to the surrounding field-space.

→ The trigonometric solution for the object time is:

$$t_{obj} = \frac{c}{V_5} t = \frac{t}{\sin(\alpha)} \quad (2.08)$$

The greater the field propagation velocity V_4 is effected, the longer the periodic inertial movements in the wave-field F_{4-6} , which increases the object time.

An inertial frame can be determined by assigning both velocity parameters $V_4(t) = c \cos(\alpha)$ and $V_5(t) = c \sin(\alpha)$. At the end of the spatial expansion of the universe with the maximum volume radius $r(t) = R$, the space-time mechanical effect with the Lorentz factor 1 for $V_5(t) = c \sin(\alpha)$ is present. This corresponds to the minimum length contraction of a spatial segment. The field angle α is 90° in this case. In the FSM model, the space-time mechanical effects are considered relative to the minimum Lorentz contraction at the point of maximum expansion of the universe. These results provide a reference point for space-time and its space-time mechanical equalising forces during the expansion of the universe, which gives it a beginning and an end according to the extreme cases mentioned above. If there were an imaginary observer outside the universe, then this observer could register the field propagation velocity V_5 depending on space-time mechanical influences in the universe. The imaginary observer recognises the electromagnetic photon field and the accelerated movement of the space expansion of the universe with $r''(t)$ from outside. The length of a space segment is now registered as dynamic. From the point of view of the inertial system, electromagnetic waves such as those of a visible photon are always detected as a gravitational redshift in the area of influence of a space-time deformation.



The observer should now stand parallel to the direction of movement in the universe and recognise the space-time mechanical effects:

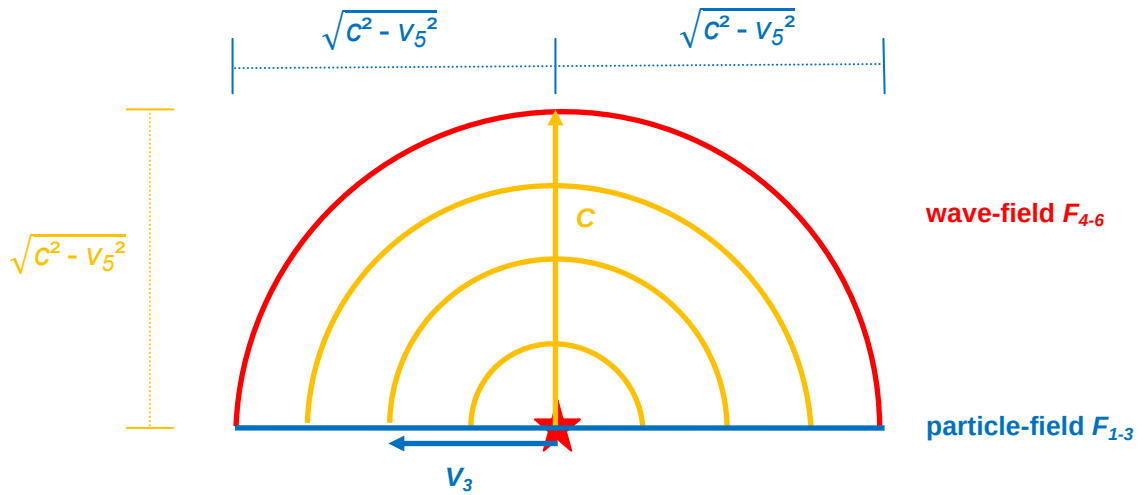


Figure 2.3: Field deformation parallel to the direction of movement

Lorentz transformation of time: The time dilation resulting from the Lorentz transformation and the gravitational redshift is also recognised.

Lorentz transformation of space: Parallel to the direction of movement, no contraction can be detected because the observer does not detect any change in the maximum velocity $V_{max} = c$.

The speed of light from a parallel perspective:

$$V_{res} = c \frac{\sqrt{c^2 - V_5^2}}{\sqrt{c^2 - V_5^2}} = c \quad (2.09)$$

The light resonator determines the field propagation velocity with the maximum velocity $V_{max} = c$ instead of with a shortened V_5 , with and without the influence of the moving reference system. Even if the resonator were located in a non-moving reference system with $V_3 = 0$, the speed of the light could also only be determined with this value c . The observer is therefore unable to determine the magnitude of his own length contraction if the direction of motion is parallel. All other spatial directions result in the same solution from this perspective.

A field deformation between the current field propagation velocity V_5 and the maximum velocity $V_{max} = c$ is only registered if the observer is outside the influence of the space-time deformation and observes a movement orthogonal to the direction of movement.

Factor for the relativistic increase in energy of accelerated objects in space-time:

The FSM postulates that the **mass M** of an object is invariant relative to the inertial system. Consequently, in the FSM, the energy-mass equivalence only applies to the special case when the propagation of light with the speed V_5 just coincides with the maximum speed V_{max} . The 7-dimensional theory of relativity of the FSM differs from Einstein's theory in that the complete reference system is integrated according to formula (2.06). According to assumption 2), a **space-time-energy equivalence** is assumed.

The relativistic mass effect from Einstein's theory is therefore no longer dependent on the mass M , but also depends on the effect of the deviation of a field propagation velocity V_5 relative to the maximum velocity V_{max} according to formula (2.06). In FSM, this effect is referred to as **relativistic energy increase**. The surface measure in the wave-field describes the additional relativistic deviation from its energy state at the location of the inertial system.

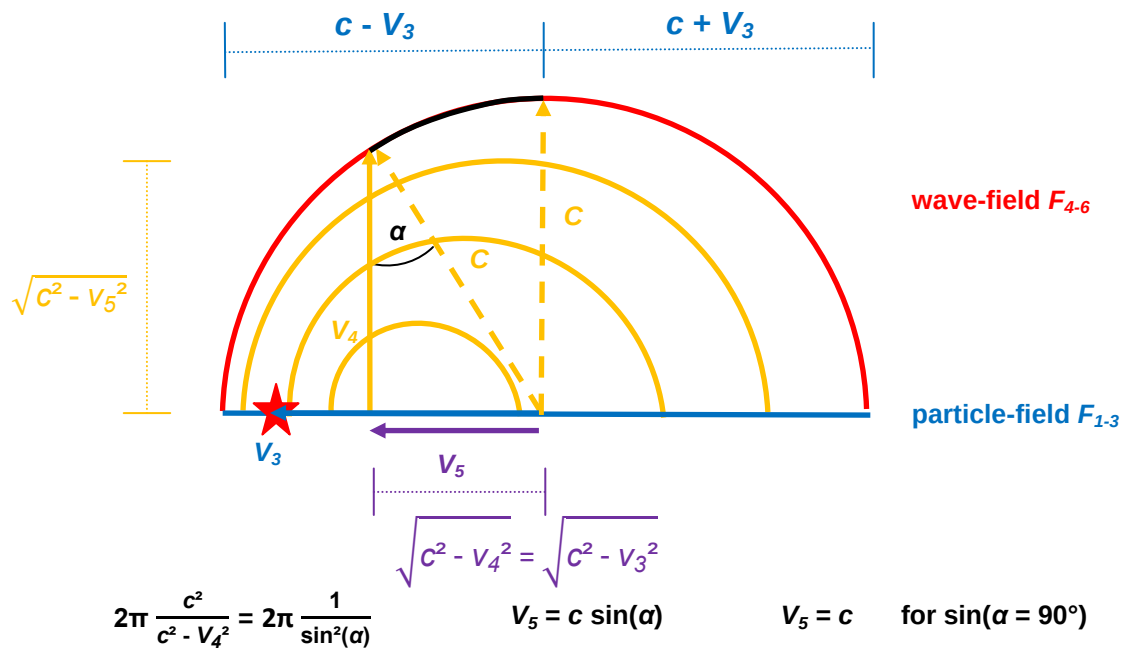


Figure 2.4: Solution 1, for a relativistic energy increase with the surface measure of a field deformation

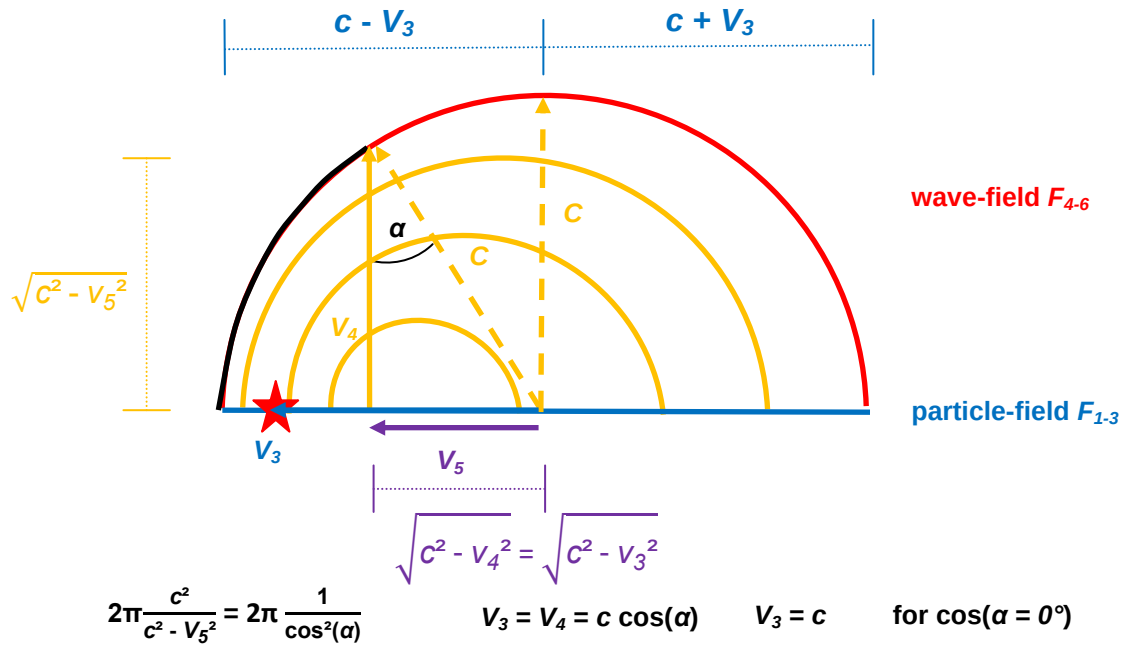


Figure 2.5: Solution 2, for a relativistic energy increase with the surface measure of a space-time deformation

The relativistic increase in energy is considered from the relative deviation from the inertial system. Solution 1 is therefore used for the calculation. If the field angle α is replaced by the term (kt) , the general case of the 7-dimensional theory of relativity applies, as will be shown in the next chapter.

The terms

$$\frac{c^2}{c^2 - V_5^2} = \frac{1}{\cos^2(\alpha)} \quad (2.10)$$

and

$$\frac{c^2}{c^2 - V_3^2} = \frac{1}{\sin^2(\alpha)} \quad (2.11)$$

show the frame in which objects can be found in space-time. Both reference frames move relative to the maximum speed $V_{max} = c$ as follows:

$$c^2 = V_4 \frac{1}{\cos(\alpha)} V_5 \frac{1}{\sin(\alpha)} \quad \text{for: } 0^\circ < \alpha < 90^\circ \quad (2.12)$$

Between the birth of the universe and its maximum expansion, the space-time mechanical effects can be described using the formula (2.12). For the extreme cases, $V_4 \approx 0$ and $V_4 \approx c$ or $V_5 \approx 0$ and $V_5 \approx c$, please refer to the paper with characterizing the universe.

**Findings from FSM-STR for 6-dimensional field-space:**

- 1) The field propagation velocity V_4 is proportional to the space-time mechanical effects of a space-time deformation.
- 2) The field propagation velocity V_5 is proportional to the space-time mechanical effects of a field deformation.
- 3) The field propagation velocity V_5 corresponds to the speed of light of photons.
- 4) The energy-mass equivalent only applies at the location of the inertial system if the field propagation velocity V_5 corresponds to the maximum velocity $V_{max} = c$. In this case, the Lorentz factor = 1 applies.
- 5) An energy-space-time equivalence applies to any deformation of space-time with a Lorentz factor > 0 .
- 6) An object with an object velocity V_3 in the particle-field F_{1-3} can move through the connection in the wave-field F_{4-6} by reducing its field propagation velocity V_5 in favour of V_4 :
 - an object moves in the particle-field with $V_3 = V_4 \rightarrow c$, then $V_5 \rightarrow 0$
 - an object moves in the particle-field with $V_3 = V_4 \rightarrow 0$, then $V_5 \rightarrow c$
- 7) A measurable photon propagates faster and faster with $V_5 = c \sin(\alpha)$ as the universe expands and the space-time mechanical effects diminish.
- 8) In the FSM model, photons have certain object masses which are subject to relativistic influences.

Interpretation of the Lorentz factor for the 6-dimensional field-space model:

Case a. Lorentz factor = 1:

The space-time deformation is minimal. Space-time slows down the field propagation velocity V_5 to the maximum velocity $V_{max} = c = V_5$. There is an energy-mass equivalence at this location. Consequently, the nominal quantities such as the object mass refer to the maximum velocity $V_{max} = c$. The nominal masses from the particle model are predicted under this premise.

Case b. Lorentz factor > 1 :

There is an increased space-time deformation, which requires additional energy for the contraction work. The field propagation velocity V_5 is contracted relative to the maximum velocity $V_{max} = c$. Another paper calculates the cosmic processes for cases with a Lorentz factor > 1 .

Case c. Lorentz factor < 1 :

As soon as the Lorentz factor falls below 1, an electromagnetic wave expands further in space-time. Consequently, a wave period with its field propagation speed V_5 travels a greater distance relative to the nominal case with the maximum speed V_{max} . This case has not yet been observed.



2.2 Sinusoidal Periodicity and General Relativity

As indicated at the beginning, space-time opposes an electromagnetic wave with a resistance. Such a wave motion is to be abstracted for the universe. For a propagation of the first quarter period, it can be recognised that the inertial force of the universe has a maximum at the beginning of the expansion, which diminishes as the expansion continues. The energy it contains, which is necessary for this work, is converted into the volume of space. The gravitational force is the counterforce to this inertial force. The photon field is subject to the existing field deformation during this expansion dynamic. If an infinitesimal number of measurement points are recorded for the field deformation relative to the inertial system, a prospective trajectory curve is created over a period T . This trajectory curve describes a representation of the state of the universe in space-time during a complete period as an electromagnetic wave and is shown in **Figure 2.6**. The particle-field is abstracted as a 2-dimensional blue band and runs completely back into itself.

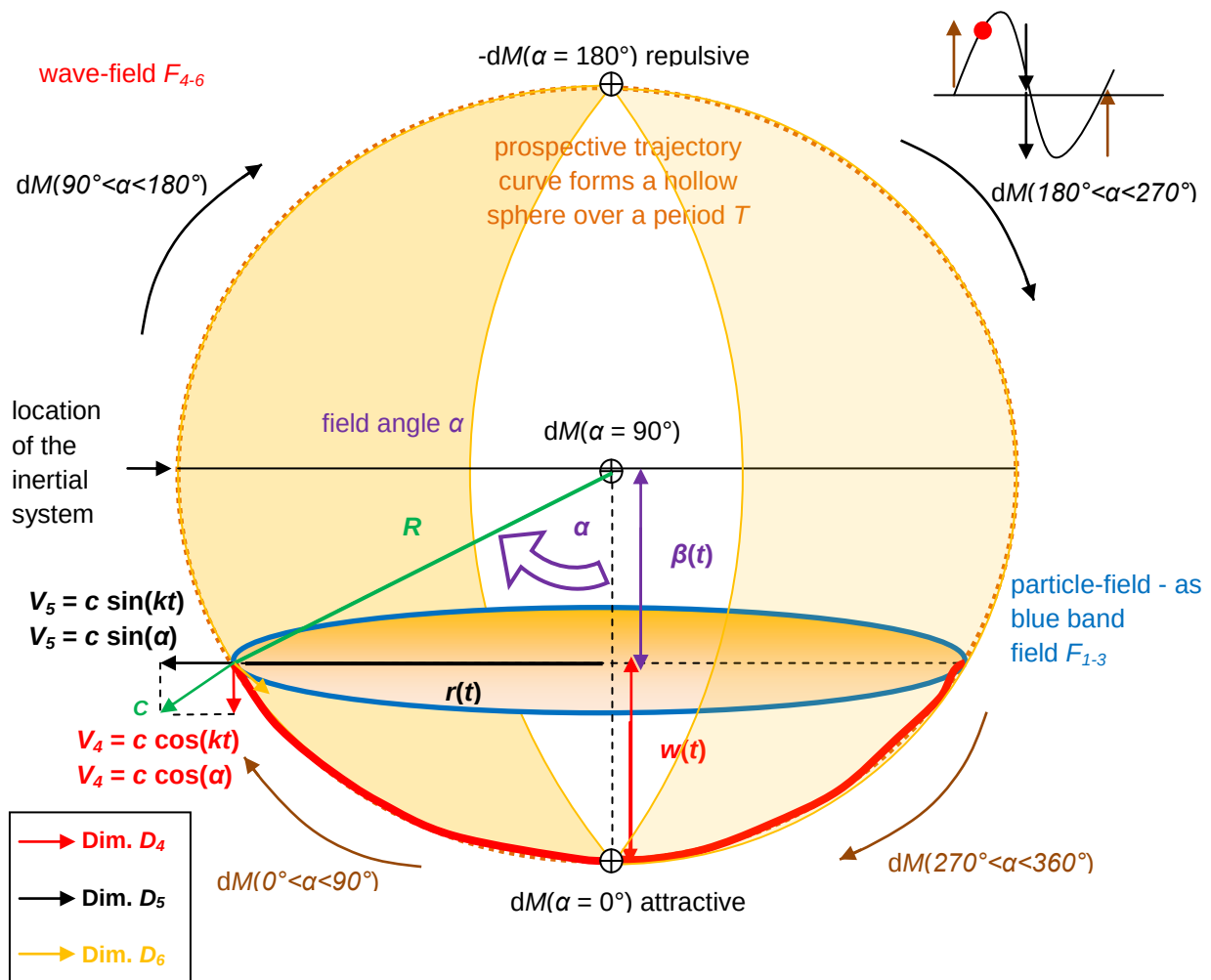


Figure 2.6: 7-dimensional state diagram of the universe with one oscillation period



The sine representation in **Figure 2.6** top right is an example of the course of the field deformation. The corresponding cosine function describes the dynamics of the space-time deformation. The relativistic inertial force acts parallel to the space-time deformation and can be related via its reference system.

A space-time tension that triggers the relativistic inertial force of the universe is referred to as the **gravitational potential** $dM(\alpha) = M \cos(\alpha)$. A gravitational potential $dM(\alpha)$ that depends on the field angle α describes the relativistic state of the inertial force of the photon field within the universe with an invariant mass M at any space-time deformed location $dM(\alpha)$ relative to the inertial system at the location $dM(\alpha = 90^\circ)$. In this way, the relativistic development of the effect of a mass-dependent gravitational force can be determined.

Gravitational forces act between objects in the framework of space-time. The gravitational force is also the equalising force that causes a deformed space-time. The magnitude depends on the object masses, the distance to each other and the current gravitational potential. Gravitational forces are transmitted into the particle-field F_{1-3} via the wave-field F_{4-6} . As soon as the universe is at the point of its maximum expansion $r(t) = R$, the space-time mechanical effects diminish to a Lorentz factor of 1. The inertial forces and the associated gravitational forces tend towards their **minimum value** at the location $dM(\alpha = 90^\circ; \alpha = 270^\circ)$ for $V_5 = c; V_4 = 0$. In this case, the light is no longer slowed down by any additional relativistic equalising forces and reaches its maximum speed in this state with $V_{5_max} = c$. This is, among other things, the defined location of the inertial system.

As the wave motion continues, the gravitational potential $dM(\alpha)$ exceeds the field angle α with $M \cos(\alpha > 90^\circ)$. Consequently, the sign of the gravitational force reverses in the direction of $-dM(\alpha)$ and periodically moves towards its next starting point. This point is labelled $-dM(\alpha = 180^\circ)$ in **Figure 2.6**. Associated with this state is the change of pointer directions for the inertial force, which occurs after its first quarter period. The spatial expansion $r(t)$ of the universe decreases according to the field angle α back to the location $-dM(\alpha)$. Using this mathematical description of the model, the field force directions are categorised as follows:

$270^\circ < \alpha < 90^\circ$ attractive and **$90^\circ < \alpha < 270^\circ$** repulsive field forces.

In a 6-dimensional field-space with a 5-dimensional surface, several 4-dimensional subspaces could arise mathematically between the wave-field F_{4-6} and the particle-field F_{1-3} . These **4-dimensional field bodies** form the **quantised matter** within the photon field.

**Derivation of the sine periodicity of the universe:**

The gravitational force always exists between objects plus the prevailing gravitational potential $dM(\alpha)$. This gravitational potential changes sinusoidally for the universe and all objects in it during a full period. The sinusoidal periodicity ultimately describes the force of relativistic surface gravity between its photon field and any quantisable matter in the universe at any point in its space-time deformation.

$$F_{gravity} = \frac{G M m}{R^2} \quad (\text{Newton's law of gravity})$$

$$r(t) = \frac{1}{2} a t^2 \quad v(t) = \int a(t) \quad r'(t) = v(t)$$

$$r(t) = \iint a(t) \quad v(t) = at \quad r''(t) = a(t)$$

G	- gravitational constant	m_{obj}	- mass of an object
M_{Uni}	- mass of the universe	R_{Uni}	- maximum field radius of the universe
F	- force between M_{Uni} and m_{Obj}	α	- field angle
$r(t)$	- volume radius at a certain time t		
$v(t)$	- velocity at a specific time t		
$a(t)$	- acceleration		

$$\frac{G dM(\alpha) m_{obj}}{R^2} = a(t) m = \frac{\int_{G dM(\alpha) m_{obj} d\alpha}^{\alpha\text{-field angle}}}{R^2} \quad \text{and} \quad r(t) = R \sin(\alpha)$$

$r(t)$ is the variable volume radius of the universe depending on the gravitational potential $dM(\alpha)$ to an object with mass m .

For $F(r) = \frac{dM}{dr r}$ applies:

Maximum possible gravitational potential between $dM(\alpha)$ and m_{Obj} results from:

$$dM(0) = M_{Uni} \cos(0) \rightarrow \text{at the birth of the universe}$$

The change in the gravitational force along the field angle α results from

$$dM(\alpha) = M_{Uni} \cos(\alpha)$$

- ➔ Depending on the sign of the $\cos(\alpha)$, attractive and repulsive forces result.
- ➔ The relativistic gravitational force runs in the reference field F_{4-6} with the cosine function parallel to the field propagation velocity V_4 . The smaller the field angle α between objects with a mass m_{Obj} and the location $dM(\alpha \rightarrow 0)$, the greater the gravitational forces between them.
- ➔ The gravitational potential of matter diminishes with the expansion of the universe.

If the universe is exactly mirrored at the location $dM(\alpha = 90^\circ)$ and $-dM(\alpha = 270^\circ)$, then the field force effect of matter is minimal.



The surface distance of a mathematical hollow sphere, which represents the relativistic increase in energy, is: $2\pi \frac{R^2}{r(t)^2} = 2\pi \frac{1}{\sin^2(\alpha)}$

$$dM(\alpha) = \frac{1}{\sin^2(\alpha)} M_{Uni} \cos(\alpha) d\alpha \quad r(t)^2 = R^2 \sin^2(\alpha) \rightarrow R^2 = \frac{r(t)^2}{\sin^2(\alpha)}$$

$$\frac{G dM(\alpha) m_{obj}}{R^2} = a(t) m = \frac{G dM(\alpha) m_{obj}}{R^2} = \frac{\int_{\sin^2(\alpha)}^{\alpha\text{-field angle}} G \sin^2(\alpha) = M_{Uni} m_{obj}}{\sin^2(\alpha) r(t)^2} \cos(\alpha) d\alpha$$

$$F_{gravity}(t) = \frac{G M_{Uni} m_{obj}}{r(t)^2} \int_{\cos(\alpha)}^{\alpha\text{-field angle}} \cos(\alpha) d\alpha \quad \text{with: } \int_0^\alpha \cos(\alpha) d\alpha = \sin(\alpha) - \sin(0)$$

$$F_{gravity}(t) = \frac{G M_{Uni} m_{obj}}{r(t)^2} \sin(\alpha) = \frac{G M_{Uni} m_{obj}}{R^2} \frac{1}{\sin(\alpha)} \quad [F] = N \quad (2.13)$$

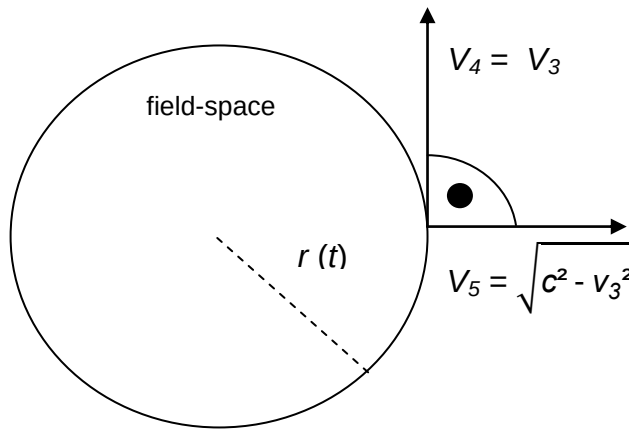
Findings:

- ➔ The course of the relativistic gravitational force of the photon field is sinusoidal-periodic
- ➔ The sine function reflects the field shape of the deformed space-time

The sign of the rise in the sine wave corresponds to the direction of its gravitational force. If the slope of the sine function is therefore positive, then attractive forces prevail, whereas repulsive forces act on a negative slope.

7-dimensional FSM-GTR :

Up to this point, the space-time mechanical effects with fixed field propagation velocities V_4 and V_5 and the corresponding field angle α were considered. With the generalisation of the field angle α , a constant movement becomes a dynamic acceleration depending on the nominal time t . In other words, this means that the dynamic expansion of the universe also changes the object time of its fields. The field propagation velocity V_4 decreases at a reduced rate, while the field propagation velocity V_5 increases at an accelerated rate. **Figure 2.7** uses the mathematical hollow sphere to relate the relativistic relationship between the maximum velocity $V_{max} = c$ and an object velocity V_3 in the particle-field with the variable volume radius $r(t)$:



This results in the following equation for the field angle α :

$$\alpha = \int_0^t \frac{\sqrt{c^2 - V_3^2}}{r(t)} dt \quad (2.14)$$

Figure 2.7: View of the hollow sphere

$$\alpha = \int_0^t \frac{\sqrt{c^2 - V_3^2}}{r(t)} dt \quad \rightarrow \text{The field angle } [\alpha] \text{ in angle } ^\circ$$

$$\frac{\sqrt{c^2 - V_3^2}}{r(t)} = \frac{c \sin(\alpha)}{R \sin(\alpha)} = \frac{c}{R} = k = \text{constant} \quad (2.15)$$

The field angle α parameterises the available gravitational potential $dM(\alpha)$ for an object mass m_{Obj} at all locations in the universe. For the FSM-GTR, the field angle α is generalised as follows:

$$\alpha = \sin^{-1}(kt) \text{ (general)} \quad \alpha = \sin^{-1}\left(\frac{V_5}{c}\right) \text{ (special)} \quad (2.16)$$

7-dimensional FSM-GTR between two objects in the universe:

The effect of the gravitational force, taking into account the sinusoidal periodicity, relates to the photon field and thus also to all objects in the universe simultaneously. A single object as part of the photon field cannot register its own gravitational force without any other object. For the relativistic observation of objects within the universe, gravitational forces can only be made measurable between at least two objects. The mutual attraction of objects requires at least two gravitational fields of their own. Thus, within the sinusoidal periodicity of the universe, an additional local deformation of space-time applies between two objects.

For a force F , an acceleration of $a_5(t) = r''(t)$ acts on an object. The acceleration $a(t)$ is already determined by the sine periodicity. In order to represent the additional deformation in space-time caused by two objects within the photon field, the formula (2.13) is extended with the product of the factor $\sin(kt)$ for object 1 and a further factor $\sin(kt)$ for object 2.

**Derivation of the relativistic force formula between two objects:**

$$r(t) = \frac{1}{2} a t^2 \quad r(t) = \iint a(t) \quad v(t) = at \quad v(t) = \int a(t)$$

$$r'(t) = v(t) \quad r''(t) = a_5(t)$$

k - angular frequency t - elapsed time along the period time T

With the help of trigonometry, mathematical expressions for the solutions of the FSM-GTR are obtained:

$$r(t) = R \sin(kt); \quad r'(t) = Rk \cos(kt) = V_4(t); \quad |r''(t)| = |a_5(t)| = | - Rk^2 \sin(kt) | \quad (2.17)$$

Between two accelerated (scalable) moving objects within a sine-periodic universe, the aforementioned additional quadratic factor for the space-time deformation is obtained with $\sin^2(kt)$:

$$a_5(t) = r''(t) = a(t) \sin^2(kt):$$

$$F_{gravity}(t) = m r''(t) = m a(t) \sin^2(kt) = \frac{G m_{obj1} m_{obj2}}{r(t)^2} \sin(\alpha) \sin^2(kt):$$

$$\text{with: } \alpha = \int_0^t \frac{\sqrt{c^2 - V_3^2}}{r(t)} dt = \int_0^t \frac{c}{R} dt = kt$$

$$F_{gravity}(t) = \frac{G m_{obj1} m_{obj2}}{r(t)^2} \sin(kt) \sin^2(kt)$$

$$\text{with the variable radius of the universe: } r(t) = R \sin(kt) \quad (2.18)$$

$$F_{gravity}(t) = \frac{G m_{obj1} m_{obj2} \sin(kt) \sin^2(kt)}{R^2 \sin^2(kt)} \quad \text{with: } \sin(kt) = \frac{r(t)}{R}$$

$$F_{gravity}(t) = \frac{G m_{obj1} m_{obj2} r(t)}{R^3} \quad (2.19)$$

$$F_{gravity}(t) = \frac{G m_{obj1} m_{obj2}}{R^2} \sin(kt) \quad (2.20)$$

to formula (2.20): R^2 - quadratic distance between the two objects

In the wave-field F_{4-6} , the formulae (2.19) and (2.20) describe that a field emission between two objects has a maximum effect if it is transmitted parallel in the dimensional plane D_{56} . The maximum unfolds with $\sin(\alpha = 90^\circ) = 1$. A quantised field is maximally mediated when the formation of 4-dimensional subspaces is orthogonal, i.e. $\alpha = 90^\circ$ to the dimensional plane D_{56} . This configuration is used in the photon model.



The formulae (2.19) and (2.20) describe objects in the particle-field F_{1-3} that have angular momentum within the universe and, due to their inertial motion, have the greatest effect of their gravitational force orthogonal to their axis of rotation, while their centrifugal force tends to a maximum near the poles. These formulae explain the inertial motion of an approaching object along its spherical sector, which is caused by a centrally rotating gravitational field.

The FSM-GTR derives the solution for the radius R and angular frequency k from the acceleration $a_5(t) = r''(t)$. The total mass of the photon field and the gravitational constant remain unchanged. If the field radius of quantised matter is sought, the indices of the mass are swapped accordingly. The second derivative of $r(t)$ from the force equation (2.19) must be used:

$$r''(t) = F_{gravit}(t)_y \frac{1}{m_{obj2}} = \frac{G m_{obj1} r(t)}{R^3} \quad \rightarrow \text{Acceleration on an object}$$

$\rightarrow$ 2nd order differential equation: characteristic part of the equation

$$r''(t) - \frac{G m_{obj1} r(t)}{R^3} = 0 \quad \text{with: } r(t) = e^{kt}; r'(t) = k e^{kt}; r''(t) = k^2 e^{kt}$$

Insert into differential equation:

$$k^2 e^{kt} - \frac{G m_{obj1}}{R^3} e^{kt} = 0 \quad \rightarrow \quad e^{kt} \left(k^2 - \frac{G m_{obj1}}{R^3} \right) = 0$$

Characteristic equation:

$$k^2 - \frac{G m_{obj1}}{R^3} = 0 \rightarrow k_{1/2} = \pm \sqrt{\frac{G m_{obj1}}{R^3}} \rightarrow k = \sqrt{\frac{G M}{R^3}} \quad [k] = \frac{1}{s} \quad (2.21)$$

$\rightarrow$ continue with the temporal amount

The volume radius $r(t)$ with the smallest field influence corresponds to the expansion of the universe at $r(t) = R$, the extreme value calculation for V_5 with the first derivative of $r(t)$ results:

$$c = V_5(0) = r'(0) = R \sin'(k \cdot 0) = Rk \cos(0) = Rk$$

$$c = R \sqrt{\frac{G m_{obj1}}{R^3}} \rightarrow c^2 = R^2 \frac{G m_{obj1}}{R^3} \rightarrow R = \frac{G M}{c^2} \quad [R] = m \quad (2.22)$$

Comparison: The solution for the field radius according to the Schwarzschild equation for a non-rotating black hole:

$$R = \frac{2 G M}{c^2} \quad (2.23)$$

Effect of the velocities on the gravitational force:

- ➔ The greater the magnitude of V_4 , the stronger the effect of the gravitational force $F_{gravity}$ with its field between objects.
- ➔ The greater the magnitude of V_5 , the further the fields of an object with its relativistic field radius $r(t)$ have an effect.

The **field radius R** describes the spatial range in which photons and other exchange particles can no longer avoid each other. A field exchange takes place between them. The field radius R of an object contributes to the volume space in space-time. The field radius is considered relativistically with $r(t)$ and the amount changes sinusoidally periodically depending on the nominal time t .

The **angular frequency k** is an invariant, non-relativistic reference value and specifies the cycle time of how often a field can be exchanged per second. The fixed angular frequency k is the reason for the correlation between an existing gravitational force and its space-time deformation.

The **wavelength λ** determines the spatial size of the field body in which the fields oscillate mathematically and periodically. The wavelength λ is the quotient of the maximum velocity $V_{max} = c$ and its **frequency f** . The wavelength is considered relativistically with the gravitational red and blue shift.

From the perspective of the particle-field on a gravitational field, the surface gravity behaves like a kt - sinusoidal periodic gravitational field. It is registered as a **gravitational wave**, which is modelled in the wave-field. The angular frequency k represents the repetition of such a wave, while the time t describes the nominal time at the location of the inertial system. The sine function models the relativistic effects on an object. If only the maximum value is considered for the gravitational wave, which is repeated quickly, a source for a gravitational field is registered, from which a constant gravitational force emanates.

Mass-time constant and space-time constant relative to the inertial system:

The mass-time and space-time constants are characteristic constants for a 7-dimensional universe that define the property relationships between the various quantities (k - angular frequency, M - mass and R - field radius) independently of space-time mechanical effects. The mass-time constant describes the linear mass flow during a periodic cycle. In contrast, the space-time constant defines the linear relativistic increase of the field radius or the volume of space per second during a cycle. These constants describe not only the properties of the universe, but also all the objects in it. The constants result exclusively from the ratios of their sizes to each other. The nominal time t also links space and mass with the help of these constants.

$$G = 6,67 \cdot 10^{-11} \text{N} \frac{\text{m}^2}{\text{kg}^2} ; c = 299792458 \frac{\text{m}}{\text{s}}$$

**a) Space-time constant**

$k_{Uni} \sim \frac{1}{R_{Uni}}$ A closed spherical universe requires precisely aligned universal constants so that a circular frequency k_{Uni} is exactly inversely proportional to the maximum volume radius R_{Uni} of the universe.

$$R_{Uni} k_{Uni} = \frac{G M_{Uni}}{c^2} \sqrt{\frac{G M_{Uni}}{R^3}} = \sqrt{\frac{(G M_{Uni})^3 (c^2)^3}{(G M_{Uni})^3 (c^2)^2}} = c$$

$$R_{Uni} k_{Uni} = R_{obj} k_{obj} = \text{constant} = c = 299792458 \frac{\text{m}}{\text{s}} \quad (2.24)$$

→ The **space-time constant** is the product of the field radius R and the angular frequency k of an object.

b) Mass-time constant

$k_{Uni} \sim \frac{1}{M_{Uni}}$ During a period T , a mass M_{Uni} moves through space-time:

$$M_{Uni} k_{Uni} = M_{Uni} \sqrt{\frac{G M_{Uni}}{R^3}} = \sqrt{\frac{G (M_{Uni})^3 (c^2)^3}{(G M_{Uni})^3}} = \sqrt{\frac{(c^2)^3}{(G)^2}}$$

$$M_{Uni} k_{Uni} = m_{obj} k_{obj} = \text{constant} = 4,0396 \cdot 10^{35} \frac{\text{kg}}{\text{s}} \quad (2.25)$$

→ The **mass-time constant** is the product of the mass M and the angular frequency k of each object.

c) Mass-space constant

$$\frac{c}{R_{Uni}} = \frac{4,0396 \cdot 10^{35} \frac{\text{kg}}{\text{s}}}{M_{Uni}} \rightarrow \frac{M_{Uni}}{R_{Uni}} = \frac{4,0396 \cdot 10^{35} \frac{\text{kg}}{\text{s}}}{299792458 \frac{\text{m}}{\text{s}}}$$

$$\frac{M_{Uni}}{R_{Uni}} = \frac{m_{obj}}{R_{obj}} = \text{constant} = 1,34746 \cdot 10^{27} \frac{\text{kg}}{\text{m}} \quad (2.26)$$

→ The **mass-space constant** describes the directly proportional relationship between the event horizon or field radius of matter, depending on its mass.

**Amount of force of the photon field against space-time:**

The photon field in the universe and the quanta scaled within it exert a constant force F against the inertial force of space-time in order to propagate as an electromagnetic wave. During the dynamic expansion of the universe, its relativistic unfolding of force is taken into account with $F(t)$. This force is represented by the sinusoidal periodicity according to formula (2.13).

$$F_{gravity}(t) = \frac{G M_{Uni} m_{obj}}{R^2} \frac{1}{\sin(kt)} = m_{Obj} R_{obj} k_{obj}^2 \frac{1}{\sin(kt)} = m_{obj} c k_{obj} \frac{1}{\sin(kt)}$$

The constants summarised above apply:

$$F(t) = \{m_{obj} k_{obj}\} \{R_{obj} k_{obj}\} \frac{1}{\sin(kt)} = 4,0396 \cdot 10^{35} \frac{\text{kg}}{\text{s}} 299792458 \frac{\text{m}}{\text{s}} \frac{1}{\sin(kt)}$$

$$F(t) = 1,211 \cdot 10^{44} \text{ N} \frac{1}{\sin(kt)}$$

The magnitude of the inertial force of the photon field against space-time is $1,211 \cdot 10^{44} \text{ N}$. The relativistic force of the photon field at any space-time deformed location is formed from the quotient with the sine function. The greatest effect of the inertial force unfolds at the location where the space-time deformation is greatest. This is the state where most of the work has to be done to expand space. Accordingly, the relativistic inertial force of the photon field acts least against space-time at the location of the inertial system or at the location of maximum expansion.