CHAPTER 15

CREATION OF RADIATION PARTICLES

In Chapter 14 we described the creation of elementary particles from toryces, the prime elements of matter and energy. In this chapter we will describe the creation of radiation particles that are made of helyces. Although, there is a certain similarity between the equations describing the spacetime properties of the toryces and the helyces, the origins of these two prime elements are quite different. The toryces come from Nothingness in accordance with the Heisenberg's uncertainty principle. The helyces are produced by the toryces that give up a part of their energy to create helyces.

CREATION OF HELYCES

A helyx is emitted when its "parental" toryx is transferred from a higher quantum energy state to a lower quantum energy state. The toryx can be either in excitation or oscillation quantum state. The helyces emitted by the excited and oscillated toryces are respectively called the *excited* and *oscillated helyces.*

Excited helyces - Let us consider a case when a toryx remains in the same oscillation quantum energy state N, so the toryx oscillation factor Q remains constant. The excitation quantum energy state of this toryx changes from a higher state $n = k$ to a lower state $n = j$ (Fig. 15.1). Let b_{1k} and b_{1j} be the respective relative radii of the toryx leading strings corresponding to these quantum energy states. According to the law of conservation of energy, the string energy of the emitted helyx $\widetilde{E}_t$ must be equal to a difference between the toryx string energy E_{sk} and E_{sj} in the above quantum energy states. Consequently, when Q is constant, the frequency of both leading and trailing strings of the emitted helyx $\widetilde{f}_{jk}$ is equal to:

$$\widetilde{f}_{jk} = \frac{Qf_i}{2U}\left(\frac{1}{b_{1j}} - \frac{1}{b_{1k}}\right) \quad (Q = const.) \qquad (15\text{-}1)$$

Oscillated helyces - Let us now consider another case when a toryx with the relative radius of the leading string b_1 remains in the same excitation quantum energy state n, so b_1 remains constant. The oscillation quantum energy state of this toryx changes from a higher state $N = n$ to a lower state $N = m$ with the respective toryx oscillation factors Q_n and Q_m. In that case, based on the law of conservation of energy, the frequencies of leading and trailing strings of an emitted helyx are equal to:

$$\widetilde{f}_{mn} = \frac{f_i}{2U}\frac{b_1 - 1}{b_1}(Q_n - Q_m) \qquad (b_1 = const.) \tag{15-2}$$

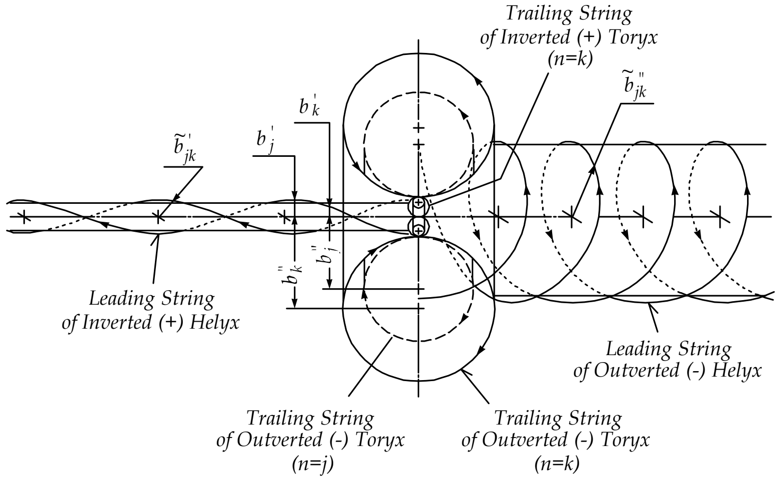

Figure 15.1. Emission of helyces.

Equations describing the physical properties of the helyces are shown in Table 15.1. The equations are based on two principal assumptions that are similar to those made for the physical properties of the toryces:

1. Helyx electric charge e is proportional to the helyx curvature factor $\widetilde{q}$.
2. Helyx gravitational mass m_g is proportional to the absolute value of the helyx curvature factor $\widetilde{q}$.

Table 15.1. Physical properties of a helyx.

Helyx Parameter		**Equations as a function of:**	
		$\tilde{b}_1$	$\tilde{\beta}_{2t}$
Electric Charge	$\tilde{e}$	$-e_0\dfrac{\sqrt{2\tilde{b}_1-1}}{2\tilde{b}_1}$	$-\dfrac{e_0}{2}\sqrt{1-\tilde{\beta}_{2t}^2}$
Gravitational mass	$\tilde{m}_g$	$m_0\left\lvert\dfrac{\sqrt{2\tilde{b}_1-1}}{2\tilde{b}_1}\right\rvert$	$\dfrac{m_0}{2}\left\lvert\sqrt{1-\tilde{\beta}_{2t}^2}\right\rvert$
Inertial mass	$\tilde{m}_i$	$m_0\dfrac{\sqrt{2\tilde{b}-1}}{\tilde{b}_1+2\sqrt{2\tilde{b}_1-1}}$	$m_0\dfrac{\sqrt{1-\tilde{\beta}_{2t}^2}}{1\pm 2\sqrt{1-\tilde{\beta}_{2t}^2}}$
Total string energy	$\tilde{E}_s$	$\tilde{f}_1 h=\tilde{f}_2 h=f_i h\dfrac{\sqrt{2\tilde{b}_1-1}}{\tilde{b}_1(\tilde{b}_1-1)}$	
Angular momentum	$\tilde{P}_a$	$\dfrac{e_0^2}{4\varepsilon_0 c}\dfrac{2\tilde{b}_1-1}{\tilde{b}_1+2\sqrt{2\tilde{b}_1-1}}$	
Orbital magnetic moment	$\tilde{\mu}_1$	$-\dfrac{e_0^2}{\varepsilon_0 m_0 c}\dfrac{2\tilde{b}_1-1}{32\pi\tilde{b}_1}$	

CLASSIFICATION OF RADIATION PARTICLES

The radiation particles are composed of reality-polarized and charge-polarized matched helyces. The names of the radiation particles are similar to the names of their parental elementary particles responsible for the creation of the helyces. Depending on a type of the toryx quantum energy state which change produced a helyx, the helyces are called either the *excited helyces* or the *oscillated helyces*.

Parental elementary particle	**Types of helyces**	
	Excited	**Oscillated**
Electron	Electon	Electrino
Positron	Positon	Positrino
A-tron	A-ton	A-trino
Z-tron	Z-ton	Z-trino

As we described in Chapter 14, the stable elementary particles are made up of both self-sustained and mutually-sustained matched toryces.

Expectantly, the self-sustained toryces create the self-sustained helyces and the mutually-sustained toryces create the mutually-sustained helyces.

ELECTONS & POSITONS

The toryces making up the electrons and the positrons are mutually-sustained. They emit the mutually-sustained helyces propagating in the same direction as shown in Figure 15.2. These helyces form respectively the electons and the positons.

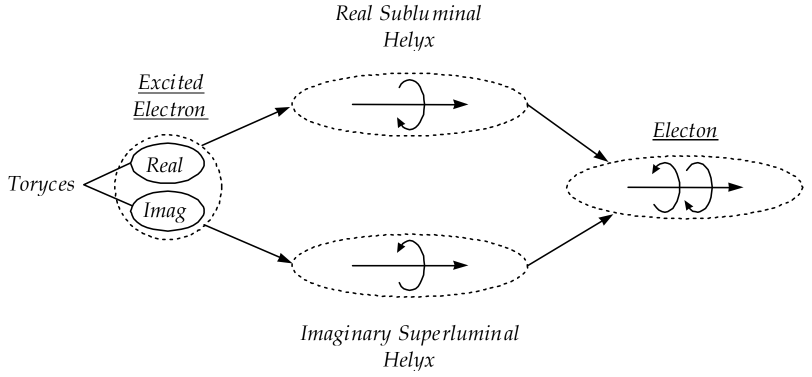

Figure 15.2. Creation of an electon.

Electons - The electons are emitted when the excited electrons are transferred from the higher quantum states n_k to the lower quantum states n_j. As we described in Chapter 14, the excited electrons are composed of negative reality-polarized matched toryces. For various excitation quantum energy states, the relative radii of the toryx leading strings b_1 are defined by the quantization Equations (14-6), (14-7a) and (14-7b) presented in Table 14.3.

Table 15.2 shows the parameters of the matched toryces that compose the excited electrons of the ordinary matter ($m = 2$) in the linear excitation quantum energy states n. Among the shown toryx parameters are the relative rotational velocities β_{2r} and the frequencies f_2 of the real and imaginary trailing strings. In the real toryx (R) of an electron, the rotational velocity β_{2r} is slightly less than the velocity of light ($\beta_{2r} < 1$), while in the imaginary toryx (I), β_{2r} is slightly greater than the velocity of light ($\beta_{2r} > 1$).

As shown in Table 15.2 and Figure 15.2, a real toryx of an excited electron emits a real helyx (R) in which the translational velocity of the leading string $\tilde{\beta}_{1t}$ is subluminal. At the same time, an imaginary toryx emits in the same direction an imaginary helyx (I) in which $\tilde{\beta}_{1t}$ is superluminal. The real and imaginary helyces have opposite spins, and an electon formed by these helyces propagates with the average velocity equal to the velocity of light *c*. The data in Table 15.3 are shown for various exponential and linear excitation quantum energy states *m* and *n*.

Table 15.2. Parameters of real (R) and imaginary (I) toryces of excited electrons of ordinary matter (m = 2) in linear excitation quantum energy states *n*.

Electron		**Electron toryces**			
n	Name	Type	b_1	β_{2r}	f_2, Hz
1	$e^{-1}_{2,1,0}$	R	37557.73	0.99997337	9.0165×10^{17}
		I	-37557.73	1.00002663	-9.0165×10^{17}
2	$e^{-1}_{2,2,0}$	R	150230.92	0.99999334	2.2541×10^{17}
		I	-150230.92	1.00000666	-2.2541×10^{17}
3	$e^{-1}_{2,3,0}$	R	338019.57	0.99999704	1.0018×10^{17}
		I	-338019.57	1.00000296	-1.0018×10^{17}
4	$e^{-1}_{2,4,0}$	R	600923.69	0.99999834	5.6353×10^{16}
		I	-600923.69	1.00000166	-5.6353×10^{16}

Table 15.3. Parameters of real (R) and imaginary (I) electon helyces emitted by excited electrons in exponential excitation quantum energy states *m*.

Electron			**Electon helyces**			
m	n_k	n_j	Type	$\tilde{b}_1$	$\tilde{\beta}_{1t}$	$\tilde{f}_{jk}$, Hz
1	2	1	R	3561.04	0.99943813	2.254×10^{17}
			I	-3560.43	1.00056155	-2.254×10^{17}
	3	2	R	7406.73	0.99972992	7.514×10^{16}
			I	-7405.73	1.00027001	-7.514×10^{16}
2	2	1	R	72223.99	0.99997231	2.467×10^{15}
			I	-72222.99	1.00002769	-2.467×10^{15}
	3	2	R	222301.30	0.99999100	4.569×10^{14}
			I	-222300.30	1.00000900	-4.569×10^{14}
3	2	1	R	1.732×10^{6}	0.99999885	2.101×10^{13}
			I	-1.732×10^{6}	1.00000116	-2.101×10^{13}
	3	2	R	8.012×10^{6}	0.99999975	2.112×10^{12}
			I	-8.012×10^{6}	1.00000025	-2.112×10^{12}
4	2	1	R	4.397×10^{7}	0.99999996	1.642×10^{11}
			I	-4.397×10^{7}	1.00000005	-1.642×10^{11}
	3	2	R	3.097×10^{8}	0.99999999	8.787×10^{09}
			I	-3.097×10^{8}	1.00000001	-8.787×10^{09}

From the data shown in Table 15.3 and Table 12.2 of Chapter 12 we can derive several important conclusions regarding to the properties of the electons corresponding to the exponential excitation quantum energy states *m,* or the matter levels $M = m - 1$.

- The relative radii of the leading strings $\widetilde{b}_1$ of the helyces making up the electons increase with the increase of the matter level M.
- The frequencies of the electons $\widetilde{f}_{jk}$ decrease with the increase of M.
- For $M = 1$, the calculated frequencies of the electons are within the frequency range of X-rays and ultraviolet rays.
- For $M = 2$, the calculated frequencies of the electons are very close to the measured frequencies emitted by the atomic electrons of the hydrogen atom within visible and infrared frequency ranges.
- For $M = 3$, the calculated frequencies of the electons are within infrared and microwave frequency ranges.
- For $M = 4$, calculated frequencies of the electons are within microwave and radio frequency ranges.

Positons - The positons are emitted when the excited positrons are transferred from the higher quantum states n_k to the lower quantum states n_j. As we described in Chapter 14, the excited positrons are made of the positive reality-polarized matched toryces. For various excitation quantum states, the relative radii of the toryx leading strings b_1 are defined by the quantization Equations (14-6), (14-7c) and (14-7d) presented in Table 14.3.

Table 15.4 shows the parameters of the matched toryces that compose the excited positrons of the ordinary matter in the linear excitation quantum energy states n. Among the shown parameters are the relative rotational velocities β_{2r} and the frequencies f_2 of the real and imaginary trailing strings. As in the electrons, in the real toryx (R) of a positron, the rotational velocity β_{2r} is slightly less than the velocity of light ($\beta_{2r} < 1$), while in the imaginary toryx (I), β_{2r} is slightly greater than the velocity of light ($\beta_{2r} > 1$).

Table 15.4. Parameters of real and imaginary toryces of excited positrons of ordinary matter ($m = 2$) in linear excitation quantum energy states n.

Positron		**Positron toryces**			
n	Name	Type	b_1	β_{2r}	f_2, Hz
1	$e^{+1}_{2,1,0}$	R	0.500006657	-0.99997337	6.7727×10^{22}
		I	0.499993344	-1.00002663	-6.7729×10^{22}
2	$e^{+1}_{2,2,0}$	R	0.500001664	-0.99999334	6.7728×10^{22}
		I	0.499998336	-1.00000666	-6.7728×10^{22}
3	$e^{+1}_{2,3,0}$	R	0.500000740	-0.99999704	6.7728×10^{22}
		I	0.499999260	-1.00000296	-6.7728×10^{22}
4	$e^{+1}_{2,4,0}$	R	0.500000416	-0.99999833	6.7728×10^{22}
		I	0.499999584	-1.00000166	-6.7728×10^{22}

Similarly to the electrons, the toryces making up the positrons are mutually-sustained. Therefore, they also emit the mutually-sustained helyces. A real toryx of an excited positron emits a real helyx (R) in which the translational velocity of the leading string $\widetilde{\beta}_{1t}$ is subluminal. At the same time, an imaginary toryx emits in the same direction an imaginary helyx (I) in which $\widetilde{\beta}_{1t}$ is superluminal. The real and imaginary helyces have opposite spins, and a positon formed by these helyces propagates with the average velocity equal to the velocity of light c.

For the same matter level M and the same quantum energy states m and n, the frequencies of the positons are exactly the same as the frequencies of the electons. Notably, the relative radii of the leading strings of the helyces making up the positons $\widetilde{b}_1$ are substantially smaller than these of the electons. In fact, for positons, $\widetilde{b}_1$ is very close to 0.5 and is getting even closer to 0.5 as the matter level M increases.

A-TONS & Z-TONS

The toryces making up the a-tons and the z-tons are self-sustained. They emit the self-sustained helyces propagating in the opposite directions as shown in Figure 15.3. These helyces form respectively the a-tons and the z-tons.

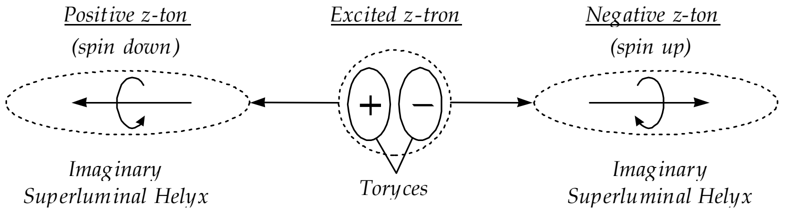

Figure 15.3. Creation of z-tons in exponential quantum states $m \geq 2$.

A-tons – The a-tons are emitted when the excited a-trons are transferred from the higher quantum states n_k to the lower quantum states n_j. As we described in Chapter 14, the excited a-trons are made of charge-polarized matched toryces. The relative radii of the toryx leading strings b_1 in various excitation quantum states are defined by the quantization Equations (14-6), (14-7e) and (14-7f) presented in Table 14.3.

Table 15.5 shows the parameters of the matched toryces that compose the excited a-trons of the ordinary matter (m = 2) in several linear excitation quantum energy states n. Among the shown parameters are the relative rotational velocities β_{2r} and the frequencies f_2, of positive and negative trailing strings. The rotational velocities of these strings have opposite signs; these velocities are very small in comparison with the velocity of light ($\beta_{2r} << 1$), while the translational velocities are very close to the velocity of light.

Table 15.5. Parameters of positive and negative real toryces of excited a-trons of ordinary matter (m = 2) in linear excitation quantum energy states n.

A-tron		**A-tron toryces**			
n	Name	Type	b_1	β_{2r}	f_2, Hz
1	$a^0_{2,1,0}$	(−)	1.0000266264	0.000026626	3.38632×10^{22}
		(+)	0.9999733750	-0.000026626	3.38650×10^{22}
2	$a^0_{2,2,0}$	(−)	1.0000066565	0.000006656	3.38638×10^{22}
		(+)	0.9999933436	-0.000006656	3.38643×10^{22}
3	$a^0_{2,3,0}$	(−)	1.0000029584	0.000002958	3.38640×10^{22}
		(+)	0.9999970416	- 0.000002958	3.38642×10^{22}
4	$a^0_{2,4,0}$	(−)	1.0000016641	0.000001664	3.38640×10^{22}
		(+)	0.9999983359	-0.000001664	3.38641×10^{22}

Table 15.6. Parameters of positive and negative real a-ton helyces emitted by excited a-trons in exponential excitation quantum energy states m.

A-tron			**A-ton helyces**			
m	n_k	n_j	Type	$\widetilde{b}_1$	$\widetilde{\beta}_{1t}$	$\widetilde{f}_{jk}$, Hz
1	2	1	(−)	3561.04	0.99943813	-2.254×10^{17}
			(+)	→ 0.5000	→ 1.0000	2.254×10^{17}
	3	2	(−)	7406.73	0.99972992	-7.532×10^{16}
			(+)	→ 0.5000	→ 1.0000	7.532×10^{16}
2	2	1	(−)	72223.99	0.99997231	-2.467×10^{15}
			(+)	→ 0.5000	→ 1.0000	2.467×10^{15}
	3	2	(−)	222305.60	0.99999100	4.569×10^{14}
			(+)	→ 0.5000	→ 1.0000	-4.569×10^{14}
3	2	1	(−)	1.732×10^{6}	0.99999885	2.101×10^{13}
			(+)	→ 0.5000	→ 1.0000	-2.101×10^{13}
	3	2	(−)	8.012×10^{6}	0.99999975	2.112×10^{12}
			(+)	→ 0.5000	→ 1.0000	-2.112×10^{12}
4	2	1	(−)	4.397×10^{7}	0.99999996	1.642×10^{11}
			(+)	→ 0.5000	→ 1.0000	-1.642×10^{11}
	3	2	(−)	3.097×10^{8}	0.99999999	8.787×10^{09}
			(+)	→ 0.5000	→ 1.0000	-8.787×10^{09}

Table 15.6 of shows the parameters of the a-ton helyces emitted by the excited a-trons in several exponential excitation quantum energy states m. In both negative and positive helyces, the translational velocities of the leading strings $\widetilde{\beta}_{1t}$ and the trailing strings $\widetilde{\beta}_{2t}$ are subluminal. The helyces propagate in the opposite directions, forming respectively negative and positive a-tons, as shown in Figure 15.3. When the a-trons are transferred between the same quantum energy states as the electrons, the velocities and frequencies of emitted negative a-tons and electons are

the same. The same is true for the velocities and frequencies of emitted positive a-tons and positons.

Z-tons – The z-tons are emitted when the excited z-trons are transferred from the higher quantum states n_k to the lower quantum states n_j. As we described in Chapter 14, the z-trons are made of imaginary charge-polarized matched toryces. The relative radii of the toryx leading strings b_1 in various excitation quantum states are defined by the quantization Equations (14-6), (14-7g) and (14-7h) presented in Table 14.3.

Table 15.7 shows the parameters of the matched toryces composing the z-trons in several excitation quantum energy states m and n. In the z-trons, the rotational velocities of the trailing strings of positive and negative toryces have opposite signs, and they are much greater than velocity of light (β_{2r}>> 1).

Table 15.7. Parameters of positive and negative imaginary toryces of excited z-trons in excitation quantum energy states m and n.

Z-tron			Z-tron toryces			
m	n	Name	Type	b_1	β_{2r}	f_2, Hz
1	1	$z^0_{1,1,0}$	(−)	-0.00366204	274.07	-9.25×10^{24}
			(+)	0.00363541	-274.07	9.32×10^{24}
	2	$z^0_{1,2,0}$	(−)	-0.00182767	548.14	-1.85×10^{25}
			(+)	0.00182102	-548.14	1.86×10^{25}
	3	$z^0_{1,3,0}$	(−)	-0.00121771	822.22	-2.78×10^{25}
			(+)	0.00121475	- 822.22	2.79×10^{25}
	4	$z^0_{1,4,0}$	(−)	-0.00091300	1096.29	-3.71×10^{25}
			(+)	0.00091134	-1096.29	3.72×10^{25}
2	1	$z^0_{2,1,0}$	(−)	-0.0000266264	37557.73	-1.27×10^{27}
			(+)	0.0000266250	-37557.73	1.27×10^{27}
	2	$z^0_{2,2,0}$	(−)	-0.0000066565	150230.9	-5.09×10^{27}
			(+)	0.0000066564	-150230.9	5.09×10^{27}
	3	$z^0_{2,3,0}$	(−)	-0.0000029584	338019.6	-1.15×10^{28}
			(+)	0.0000029584	- 338019.6	1.15×10^{28}
	4	$z^0_{2,4,0}$	(−)	-0.0000016641	600923.7	-2.04×10^{28}
			(+)	0.0000016641	-600923.7	2.04×10^{28}

Table 15.8 of shows the parameters of the z-ton helyces emitted by the excited z-trons in two exponential excitation quantum energy states m. When m = 1, both negative and positive helyces propagate in the same direction; the translational velocity of the leading strings $\widetilde{\beta}_{1t}$ of the negative and positive helyces are respectively superluminal and subluminal. When m = 2, the negative and positive helyces propagate in the opposite directions, forming respectively negative and positive z-tons, as shown in Figure 15.3. In that case, the translational velocities of the

leading strings $\tilde{\beta}_{1t}$ of both helyces are superluminal. The same is true when $m > 2$.

Table 15.8. Parameters of positive and negative imaginary z-ton helyces emitted by excited z-trons in exponential excitation quantum energy states *m*.

Z-tron			**Z-ton helyces**			
m	n_k	n_j	Type	$\tilde{b}_1$	$\tilde{\beta}_{1t}$	$\tilde{f}_{jk}$, Hz
1	2	1	(−)	0.4689899	-1.225530	3.386×10^{22}
			(+)	0.5310101	-0.705746	-3.386×10^{22}
	3	2	(−)	0.4689899	-1.225230	3.386×10^{22}
			(+)	0.5310101	-0.705746	-3.386×10^{22}
	4	3	(−)	0.4689899	-1.225530	3.386×10^{22}
			(+)	0.5310101	-0.705746	-3.386×10^{22}
2	2	1	(−)	-0.0024324	412.1104	1.392×10^{25}
			(+)	0.0024324	-410.1105	-1.392×10^{25}
	3	2	(−)	-0.0014595	686.1815	2.320×10^{25}
			(+)	0.0014595	-684.1810	-2.320×10^{25}
	4	3	(−)	-0.0010425	960.2530	3.248×10^{25}
			(+)	0.0010425	-958.2534	-3.248×10^{25}

ELECTRINOS & POSITRINOS

Electrinos and positrinos are emitted when the oscillated negative and positive leptons are transferred from the higher oscillation quantum energy states N_k to the lower oscillation quantum energy states N_j. As we described in Chapter 14, the leptons are made of real and imaginary matched toryces. The relative radii of the toryx leading strings b_1 in various oscillation quantum energy states are defined by quantization Equation (14-8).

Table 15.9 shows the parameters of the matched toryces that compose the oscillated leptons in the oscillation quantum energy states N for two values of the exponential excitation quantum energy states *m*. Among the shown toryx parameters are the relative rotational velocities β_{2r} and the frequencies f_2 of the real and imaginary trailing strings. In the real toryx (R) of a lepton, the rotational velocity β_{2r} is slightly less than the velocity of light ($\beta_{2r} < 1$), while in the imaginary toryx (I), β_{2r} is slightly greater than the velocity of light ($\beta_{2r} > 1$).

As shown in Table 15.10, when an electron is transferred from the oscillation quantum energy state $N_k = 1$ to $N_j = 0$ and from $N_k = 2$ to $N_j = 1$, it emits in the same direction a real helyx in which $\tilde{\beta}_{1t}$ is subluminal and an imaginary helyx in which $\tilde{\beta}_{1t}$ is superluminal. Both helyces have opposite spins, and an electrino formed by these helyces propagates with the average velocity equal to the velocity of light.

Table 15.9. Parameters of real and imaginary toryces of oscillated leptons in exponential excitation quantum energy states *m* and oscillation quantum energy states *N* ($n = 1$).

Lepton			**Lepton toryces**			
m	N	Name	Type	b_1	β_{2r}	f_2, Hz
0	0	$e^{-1}_{1,1,0}$	R	2.00	0.50000000	1.693×10^{22}
			I	-2.00	1.50000000	-1.693×10^{22}
	1	$e^{-1}_{1,1,1}$	R	2.00	0.50000000	5.080×10^{22}
			I	-2.00	1.50000000	-5.080×10^{22}
	2	$e^{-1}_{1,1,2}$	R	2.00	0.50000000	3.480×10^{24}
			I	-2.00	1.50000000	-3.480×10^{24}
	3	$e^{-1}_{1,1,3}$	R	2.00	0.50000000	5.962×10^{25}
			I	-2.00	1.50000000	-5.962×10^{25}
2	0	$e^{-1}_{2,1,0}$	R	37557.73	0.99997337	9.017×10^{17}
			I	-37557.73	1.00002663	-9.017×10^{17}
	1	$e^{-1}_{2,1,1}$	R	37557.73	0.99997337	2.706×10^{18}
			I	-37557.73	1.00002663	-2.706×10^{18}
	2	$e^{-1}_{2,1,2}$	R	37557.73	0.99997337	1.853×10^{20}
			I	-37557.73	1.00002663	-1.853×10^{20}
	3	$e^{-1}_{2,1,3}$	R	37557.73	0.99997337	3.175×10^{21}
			I	-37557.73	1.00002663	-9.017×10^{17}

Table 15.10. Parameters of the electrino helyces emitted by oscillated leptons in the linear excitation quantum energy state $n = 1$.

Electron			**Electrino helyces**			
m	N_k	N_j	Type	$\tilde{b}_1$	$\tilde{\beta}_{1t}$	$\tilde{f}_{jk}$, Hz
0	1	0	R	0.5000004	-0.99999667	1.236×10^{20}
			I	0.4999963	-1.00002995	3.707×10^{20}
	2	1	R	0.5042666	-0.96525641	1.251×10^{22}
			I	0.4620368	-1.27201345	3.754×10^{22}
	3	2	R	0.1622005	-5.25755601	2.048×10^{23}
			I	-0.0550345	19.19641825	6.145×10^{23}
2	1	0	R	0.5000017	-0.99998669	2.471×10^{20}
			I	0.4999983	-1.00001331	2.471×10^{20}
	2	1	R	0.5170283	-0.85240684	2.503×10^{22}
			I	0.4829699	-1.12846434	2.503×10^{22}
	3	2	R	0.0823331	-11.1901967	4.097×10^{23}
			I	-0.0824221	13.1704698	4.097×10^{23}

When an electron is transferred from $N_k = 3$ to $N_j = 2$, it emits in the opposite directions both real and imaginary helyces in which $\tilde{\beta}_{1t}$ is superluminal. The same type of radiation occurs when the electron is transferred from any higher oscillation quantum energy state.

COMPARISON WITH EXPERIMENTAL DATA

Let us compare the frequencies of electons emitted by atomic electrons of hydrogen atom calculated from equations of 3D-SST with the measured frequencies of the spectra lines for hydrogen atom. As we described in Chapter 6, the frequencies $\tilde{f}_{jk}$ of some spectra lines for hydrogen atom are accurately described by Rydberg's equation:

$$\tilde{f}_{jk} = R_{\infty} c \left(\frac{1}{n_j^2} - \frac{1}{n_k^2} \right) \tag{15-3}$$

where R_{∞} is the Rydberg constant.

Table 15.11 shows the frequencies $\tilde{f}_{jk}$ of the spectra lines for hydrogen atom obtained from both Equation (15-1) of 3D-SST and Rydberg's Equation (15-3). The difference between the frequencies calculated by using the two equations is less then 0.055%.

Table 15.11. Comparison of frequencies of some spectra lines for hydrogen atom obtained from Equation (15-1) and Rydberg's equation (15-3).

Quantum states		**Spectra lines of hydrogen atom**	**Frequencies** $\tilde{f}_{jk}$, Hz		**Difference**
n_k	n_j	Symbol	3D-SST	Rydberg's	%
3	2	H_α	4.5691×10^{14}	4.5668×10^{14}	0.0547
4	2	H_β	6.1683×10^{14}	6.1651×10^{14}	0.0547
5	2	H_γ	6.9085×10^{14}	6.9049×10^{14}	0.0547
6	2	H_δ	7.3106×10^{14}	7.3068×10^{14}	0.0547

MESSENGERS OF VARIOUS UNIVERSE LEVELS

As we discussed in this Chapter, the elementary mass particles emit four kinds of elementary radiation particles: electons, positons, a-tons and z-tons. The properties of the emitted particles depend on the quantum energy states of their parental elementary mass particles: the exponential excitation quantum state *m*, the linear excitation quantum state *n*, and the oscillation quantum state *N*. Table 14.19 of Chapter 14 shows a relationship between the exponential excitation quantum state *m* and the matter level *M*.

Electons - Table 15.12 shows the properties of the electons emitted by the atomic electrons of various matter levels M. The electons of all the matter levels M are made of the reality-polarized negative helyces propagating in the same direction with the velocity of light. As the matter level M increases, the relative radii $\widetilde{b}_1$ of the helyces composing the electons increase, while their frequencies $\widetilde{f}_{jk}$ decrease. The electons of various matter levels M cover various ranges of some known radiation particles, including X-rays, ultraviolet, infrared, microwave, radio waves, and other lower-frequency particles.

Table 15.12. Parameters of electons emitted by atomic electrons of various levels of matter $M = m$ transferred from excitation quantum energy state $n_k = 2$ to $n_k = 1$.

Matter/Energy		**Electon parameters** ($\widetilde{V}_{1t} = c$)		
Name	M	Frequency range	$\widetilde{b}_1$	$\widetilde{f}_{jk}$,Hz
Light dark	1	X-rays	3.56×10^{03}	2.254×10^{17}
Ordinary	2	Ultraviolet	7.22×10^{04}	2.467×10^{15}
Heavy dark	3	Infrared	1.73×10^{06}	2.201×10^{13}
	4	Microwave	4.40×10^{07}	1.642×10^{11}
	5	Radio	1.14×10^{09}	1.239×10^{09}
	6	HF	3.00×10^{10}	9.183×10^{06}
	7	LF	7.95×10^{11}	6.755×10^{04}
	8	ULF	2.11×10^{13}	4.948×10^{02}
	9	ELF	5.60×10^{14}	3.618×10^{00}
	10	XELF	1.49×10^{16}	2.643×10^{-2}
Dark energy	11	Energy waves	3.95×10^{17}	1.930×10^{-4}
	12		1.05×10^{19}	1.408×10^{-6}

Positons - The positons are emitted by the nuclear positrons of various matter levels M. The positons of all the matter levels M are made of the reality-polarized positive helyces propagating in the same direction with the velocity of light. Their properties change with the change of M in the same manner as in the electons.

A-tons - The a-tons can be emitted either by the nuclear a-trons or by the ether a-trons. The a-tons of all the matter levels M are made of the charge-polarized real helyces propagating in the opposite directions with the velocity of light. For the same conditions, the frequencies of the helyces propagating in one direction are the same as these of the electons, while the frequencies of the helyces propagating in the opposite direction are the same as these of the positrons. Because the emission is split in two opposite directions, the energy of the a-tons is two times smaller than the energy of either the electons or the positons. The a-tons probably create the *background radiation*, including the well-known microwave background radiation.

Z-tons - The z-tons are emitted either by the nuclear z-trons or by the ether z-trons. Table 15.13 shows the parameters of the ether z-tons. The ether z-tons of all the matter levels M are made of the charge-polarized imaginary helyces propagating in the opposite directions with the superluminal velocity $\widetilde{V}_{1t}$. As the matter level M increases, the relative radii $\widetilde{b}_1$ of the helyces of the z-tons decrease, while their frequencies $\widetilde{f}_{jk}$ increase. Also increases with the increase of M is the velocity of propagation of the ether z-trons $\widetilde{V}_{1t}$. Because the z-tons propagate at the extremely high velocity, one might expect that the z-tons may be responsible for the communication between the particles of not only the same matter level, but also between the particles of various matter levels.

Table 15.13. Parameters of the z-tons emitted by ether the z-trons of various levels of matter M transferred from excitation quantum level $n_k = 2$ to $n_j = 1$ ($m = M$).

Matter/Energy		**Z-ton parameters**		
Name	M	$\widetilde{b}_1$	$\widetilde{V}_{1t}$	$\widetilde{f}_{jk}$, Hz
Light dark	1	0.50	$1.0c$	3.386×10^{22}
Ordinary	2	2.43×10^{-03}	$4.10 \times 10^{02}\, c$	1.392×10^{25}
Heavy dark	3	7.61×10^{-06}	$1.31 \times 10^{05}\, c$	4.452×10^{27}
	4	2.59×10^{-08}	$3.86 \times 10^{07}\, c$	1.307×10^{30}
	5	9.15×10^{-11}	$1.09 \times 10^{10}\, c$	3.702×10^{32}
	6	3.29×10^{-13}	$3.04 \times 10^{12}\, c$	1.031×10^{35}
	7	1.19×10^{-15}	$8.41 \times 10^{14}\, c$	2.848×10^{37}
	8	4.32×10^{-18}	$2.31 \times 10^{17}\, c$	7.837×10^{39}
	9	1.57×10^{-20}	$6.36 \times 10^{19}\, c$	2.152×10^{42}
	10	5.74×10^{-23}	$1.74 \times 10^{22}\, c$	5.904×10^{44}
Dark energy	11	2.09×10^{-25}	$4.78 \times 10^{24}\, c$	1.619×10^{47}
	12	7.63×10^{-28}	$1.31 \times 10^{27}\, c$	4.438×10^{49}