

Table of contents

1	Scale Changes for Space and for Time.....	1
1.1	Conclusion from the Analysis of Transit-Time-Distance Scale Differentiating of Space and Time.....	2
1.2	Change of the Time Scale and Change of the Path Scale	5
1.3	Change of Scale and Origin of the Universe	13
1.3.1	Redshift Due to Change in Scale.....	13
1.3.2	Electromagnetic Radiation and Scale Change.....	14
1.4	Infinite Distance and Infinite Duration in Time.....	14
1.5	Double Logarithmic Representation	16
1.6	Quantum of Action of Relative Velocity	21
1.7	Waves as a Function of a Conformal Time and a Co-Moving Distance Dimension 26	
1.7.1	Unit-Wave	34
1.7.2	Phase Displacement.....	37
1.7.3	Superposition of Phase-Shifted Waves.....	38
1.7.4	Result.....	39
1.8	Scaling the Scales of a Coordinate System by Quantum	40
1.8.1	Squaring the Hyperbola.....	40
1.8.2	Scaling a Coordinate System by Quantum	43
1.8.3	Scaling by Planck's Quantum of Action.....	43
1.8.4	Scaling with Accelerated Relative Movement	44
1.8.5	Scaling in the Propagation of Waves.....	44
1.8.6	Scaling in Case of a Gravitational Action	44
2	Special Theory of Relativity – Alternative Graphical Representation of the Relationships between the Speed of Light, Relative Velocity, Lengths and Proper Time ...	47
2.1	Length and Time Dilations of SRT	47
2.1.1	Introduction	47
2.1.2	Einstein's Basic Assumptions about the Emission of a Signal	48
2.1.3	Equations of SRT	52
2.1.4	Relative Velocity Limits.....	58
2.2	Alternative Graphical Representations of SRT Equations	62
2.2.1	Direction of Action	62
2.2.2	Pythagorean Theorem.....	62
2.2.3	SRT – Graphical Representations as a Mathematical Irreducible Circle Group 62	

2.2.4	Discussion of Spacetime Unit Circles	64
2.2.5	Spacetime Unit Circle versus Minkowski Diagram and Light-Cone	66
2.2.6	Limit Considerations of the Graphically Descriptions of SRT with Null-Spheres.....	69
2.2.7	Optional Limit Value Considerations by Bijective Mapping.....	70
2.2.8	Change in Relative Velocity and Orientation	72
2.2.9	Features of Inversion on the Circle and its Physical Interpretation	73
2.2.10	Geometrical Relationships Between Separate Unit Circles of SRT	74
2.2.10.1	Two Separate and Isolated Unit Circles	74
2.2.10.2	Physical Interpretation of the Inside and Outside of the Unit Circle	75
2.2.10.3	Two Separate Unity Circles that Tangential Touch Each Other at One Point	76
2.2.10.4	Two Intersecting Unit Circles	77
2.2.10.5	Intersecting Circles of Different Diameters.....	78
2.2.10.6	Circle Within the Unit Circle, Mirrored at the Unit Circle.....	79
2.2.10.7	Tangent Circles of Different Diameters – Geometric Interpretation of Entanglement and Emergence of Dimensions	81
2.2.10.8	Run-through Sense of Inverted Circles of Different Diameters	84
2.2.10.9	Physical Interpretation of Simultaneously Existing Worlds with Different Speeds of Light	84
2.2.11	Variable Speed of Light and Redshift	87
2.2.12	Unresolved Issues of the Geometric Description of SRT.....	89
2.2.13	The SRT Described by Determinant of Square Matrix.....	92
2.2.14	Relative Velocity	93
2.2.14.1	SRT as Description of the Relative Movement of Massless Measuring Points	93
2.2.14.2	The SRT when Considering Masses Located at the Measuring Points	94
2.2.14.3	Measuring Points Versus Mass Points	98
2.3	The Equation of Classical SRT, Described by e-Functions	99
2.4	Speed of Light as Limit versus Event Horizon	104
2.5	Lorentz Factor and Variable Speed of Light.....	104
2.6	Spin Dilation and Cosserrat Continuum	106
2.7	Continuity of Space	107
2.8	Optical Perception.....	107
2.9	Conclusions	113
3	Alternative Graphical Description of the Equations of the GRT	117
3.1	Distinctions of Geometric Descriptions Between SRT and GRT.....	117
3.2	Congruence of SRT and GRT Equations.....	119

3.3	Equation of GRT in Polar Coordinates According to Max v. Laue and the Alternative Geometric Representation of the Schwarzschild Radius	120
3.4	Graphical Representation of the Equation of GRT	128
3.4.1	Time Duration and Distance	131
3.4.2	Time Duration and Distance as Series Development and the Role of Random According to the Law of Small Numbers (Two-Thirds Law)	136
3.4.3	Gravitational Field	138
3.4.3.1	Approximation of the World Line by a Hyperbola. Physical Significance of the Curvature of the Vertex as the Source Point of Time and Space	138
3.4.3.2	Radius of Curvature at the Vertex of the Hyperbola and Gravity	144
3.4.3.3	Change of Space and Change of Time	148
3.4.4	Space and Time as a $1/f$ Spectrum - Double Logarithmic Representation of Space- and Time-Proportions as a Straight Line	151
3.4.5	Structure of the Black Hole - from the Point of View of Infinity	152
4	'Generation' of an Additional Dimension at Energetic Barrier c	156
5	Wave Equation Based on Bernoulli Lemniscate Function	159
6	Alternative Models of Spacetime	161
6.1	Standard Model and GRT	161
6.2	Is Mathematics a Suitable Method for Describing State Changes?	161
6.2.1	Kruskal-Szekeres Coordinates	164
6.3	Various Current Mathematical Methods	165
6.4	Dimensionless Mathematical Equations	166
7	Transverse Dilation	167
8	The Speed of Light as an "Absolute" Frame of Reference	169
9	Annihilation and Pair Generation, Matter and Antimatter	169
10	Past, Infinitesimal Present, Future	171
11	Appendix	179
11.1	Basics of Geometric Mirroring on the Unit Circle	179
11.2	Hyperbola in a Coordinate System Rotated by -45°	181
11.3	Properties of the Function $y = 1/x$	183
11.4	Hyperbolas as Interference Patterns	185
11.5	Lemniscate and Hyperbola	188
11.6	Cassini Curves Versus Potential Lines of Two Equal Point Charges	193
11.6.1	Interpretation of the Cassini Potential Curves	197
11.7	Interpretation of the Rotation of a Distance as a Wave	198
11.7.1	Conclusions and Physical Analogies	201
11.8	Real Number Plane Versus Gaussian Number Plane	203