Meeting: 1001, Evanston, Illinois, SS 24A, Special Session on Hopf Algebras at the Crossroads of Algebra, Category Theory, and Topology

1001-18-160 **Zbigniew Oziewicz*** (oziewicz@servidor.unam.mx), Universidad Nacional Autonoma de Mexico, Facultad de Estudios Superiores Cuautitlan, Campus 4, Apartado Postal 25, C.P. 54714 Cuautitlan Izcalli, Mexico, Mexico. *Groupoid-enriched groupoid category, Frobenius algebra, and relativity.* Preliminary report.

We consider connected groupoid category ω, enriched over connected groupoid category V. Every object of ω is initial and terminal. An enrichment bifunctor $\omega \times \omega \xrightarrow{\omega} V$, for every object $p \in \text{obj}\omega$ give rise to one-functor $\omega^p : \omega \mapsto V$. We are interested in natural isomorphism for every pair of objects $p, q \in \text{obj}\omega$, $p \odot q \in \text{nat}(\omega^q, \omega^p)$, with $p \odot p$ a natural identity on a functor ω^p. With every object in a groupoid category ω we associate an idempotent generator of biunital Frobenius algebra (u denotes unit and counit is given by a tracial state $\gamma^2 \equiv \text{tr}(pq)$) with ternary relations $pqp = \gamma^2 p$. The folowing axioms are imposed

$$(p \odot q)(q \odot p) = p \odot p = u - p, \qquad (p \odot q)q = p(p \odot q) = 0.$$

These axioms give the unique representation of natural isomorphism $p \odot q$ in the Frobenius algebra generated by a pair of idempotents p and q. The minimal polynomial of $p \odot q$ is $x(x-1)(x-\gamma) = 0$. The family of natural ismorphisms $\{p \odot q\}$ for a prefered object p gives the categorical version of the Einstein special relativity theory. (Received August 28, 2004)