

## Произвольны ли произвольные преобразования в общей теории относительности? Все ли системы отсчета возможны?

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*Показано, что «произвольные» координатные преобразования тензора в римановой геометрии являются линейными преобразованиями по определению (Эйнштейн). Приведен пример ошибочного применения нелинейного преобразования координат декартовых координат в сферические. Рассмотрены ограничения, накладываемые на релятивистские системы отсчета. Решается, так называемый, релятивистский парадокс Белла, парадокс возникает как следствие использованная Беллом не физической системы отсчета. Вводится необходимое условие для системы отсчета с гравитационным полем – зависимость скорости света от гравитационного потенциала.*

**Ключевые слова:** система отсчета, система координат, принцип относительности, ограничения на системы отсчета, скорость света.

**Введение.** Физическое образование обычно включает в себя необходимые основы математики, но при этом, часто профессионал-физик не обладает навыками математического доказательства, применения математических теорем и результатов физических теорий. Ныне количество ошибочных работ приобретает угрожающие размеры.

В 1907 году Эйнштейн вводит понятие релятивистской системы отсчета [1], рассматривая систему отсчета как набор линеек и часов. Теперь у тел отсчета релятивистской системы появляется новый параметр – *собственное время*. Минковский формулирует представление о физическом пространстве как о четырехмерном метрическом пространстве-времени [2].

Однако временная координата в этом пространстве уже не является независимой от остальных координат. При этом ход стандартных часов (одинаковый в собственной системе отсчета) зависит от скорости и от гравитационного потенциала: *«Благодаря теории относительности появляется возможность четырехмерной трактовки «мира», так как в этой теории время утрачивает свою самостоятельность...»*, Эйнштейн [3].

Часто мы видим необоснованное использование, например, в общей теории относительности “произвольного координатного преобразования”, в то время как Эйнштейн и другие авторы говорят о произвольном *линейном* преобразовании [4], правда авторы некоторых учебниках слово “линейный” стесняются употреблять, что ведет к появлению научных работ с нелепыми ошибками.

# Preobrazvaniia Vremeni Dliny I Skorosti V Spetsialnoi Teorii Otnositelnosti

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