

Refutation of the complementarity inequality © Copyright 2018 by Colin James III All rights reserved.

We evaluate the modified Mach-Zehnder setup, to confirm the findings of the Afshar experiment from:

Flores, E.V.; De Tala, J.M. (2006). Complementarity paradox solved: surprising consequences. arxiv.org/ftp/arxiv/papers/1001/1001.4785.pdf

We assume the method and apparatus of Meth8/VL4 where τ is the designated proof value, F is contradiction, N is truthity (non-contingency), and C is falsity (contingency). The 16-valued truth table is row-major and horizontal.

$$K \text{ is which-way info, and } V \text{ is visibility: } K^2 + V^2 \leq 1. \tag{1}$$

LET p q r s x y K V ; # necessity, for all; % possibility, for one or some; ~ Not; & And; + Or; - Not Or; > Imply, greater than; < Not Imply, less than; = Equivalent; (%p>#p) 1; (%p<#p) 2; ((%p>#p)-(%p>#p)) 0; $K=K'$; τ ($p=p$).

$$\text{We rewrite Eq. 1 for } K \geq 0 \text{ as } V \leq ((1-K)*(1-K)). \tag{2.1}$$

$$\sim(r>(((\%p>\#p)-s)\&((\%p>\#p)+s))) ; \tag{2.2}$$

$$V \geq \frac{(1-x)/(1-y) - x/y}{(1-x)/(1-y) + x/y} \tag{5.1}$$

$$\begin{aligned} &\sim(\sim(r>(((\%p>\#p)-s)\&((\%p>\#p)+s)))) \\ &< (((((\%p>\#p)-p)\((\%p>\#p)-q))-(p\backslash q))\(((\%p>\#p)-p)\((\%p>\#p)-q)+(p\backslash q)))) = (p=p) ; \end{aligned} \tag{5.2}$$

TTTT TTTT TTTT TTTT

$$K' \geq (1-2x), \text{ rewritten as } K \geq (1-2x) \tag{6.1}$$

$$\sim(r<((\%p>\#p)-((\%p<\#p)\&p))) = (p=p) ; \tag{6.2}$$

TTTT CFCE TTTT CFCE

$$K^2 + V^2 < 2, \text{ rewritten as } (K^2 + V^2 < 2) \text{ which in mathematical logic is } (K + V < 2) \tag{7.1}$$

$$\begin{aligned} &(\sim(r<((\%p>\#p)-((\%p<\#p)\&p)))) \\ &+ \\ &\quad \sim(\sim(r>(((\%p>\#p)-s)\&((\%p>\#p)+s)))) \\ &\quad < (((((\%p>\#p)-p)\((\%p>\#p)-q))-(p\backslash q))\(((\%p>\#p)-p)\((\%p>\#p)-q)+(p\backslash q)))) \\ &< (\%p<\#p) ; \end{aligned} \tag{7.2}$$

NNNN NNNN NNNN NNNN

Eq. 5.2 as rendered for the modified Mach-Zehnder setup is tautologous. This confirms the findings of the Afshar experiment.

Eq. 7.2 as rendered for complementarity inequality is *not* tautologous, although the closest state of truthity (non-contingent). That refutes the findings of the captioned paper. This violates and refutes the complementarity inequality, and confirms the original Afshar paper.