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INTERNATIONAL CENTRE FOR THEORETICAL PHYSICS

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W E A K I N T E R A C T I O N S

26 - 29 June 1973

(SUMMARIES)

1973 MIRAMARE-TRIESTE

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International Atomic Energy Agency

and

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SURVEY ON NEUTRAL CURRENTS

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Unified models of weak and electromagnetic interactions require the presence of either neutral currents or heavy leptons, or both. For purely leptonic reactions, the model developed by Weinberg and Salam makes definite predictions. The Gurr, Reines and Sobel experiment gives a bound for the mixing angle:

$$\sin^2\theta_W \leq 0.40 \quad \text{(better than 90\% c.l.)} \quad , \qquad (1)$$

which is also useful in bounding semileptonic reactions (this bound is used implicitly in the numerical estimates of the table). The comparison with the Gargamelle results concerning leptonic reactions has been summarized by Prof. Franzinetti.

Models of this type have also been developed to account for semileptonic reactions. Within such types of models, the cross-sections can be bounded from below without any additional assumptions. The table summarizes the experimental and theoretical bounds for several reactions. The main conclusion of such a comparison is the proximity between theory and experiment, suggesting that improvements of the experimental bounds can provide critical tests which will either rule out the model or provide convincing evidence for neutral currents.

RATIO	EXPERIMENT (90% C.L.)	THEORY
$\frac{\sigma(\nu N \to \nu X^0)}{\sigma(\nu N \to \mu^- X^+)}$	≤ 0.2	≥ 0.17
$\frac{\sigma(\bar{\nu} N \to \bar{\nu} X^0)}{\sigma(\bar{\nu} N \to \mu^- X^+)}$	≤ 0.5	≥ 0.42
$\frac{\sigma(\nu p \to \nu p\pi^0) + \sigma(\nu n \to \nu n\pi^0)}{2\sigma(\nu n \to \mu^- p\pi^0)}$	≤ 0.14 W. Lee ≤ 0.21 Gargamelle	≥ 0.44 to 0.07
$\frac{\sigma(\nu p \to \nu n\pi^+) + \sigma(\nu p \to \nu p\pi^0)}{\sigma(\nu p \to \mu^- \Delta^{++})}$	≤ 0.46 Cundy et al.[58] ≤ 0.31 ANL	≥ 0.10
$\frac{\sigma(\nu p \to \nu p)}{\sigma(\nu n \to \mu^- p)}$	≤ 0.24	$0.15 \leq R \leq 0.25$
$\frac{\sigma(\nu p \to \nu n\pi^+)}{\sigma(\nu p \to \mu^- \Delta^{++})}$	≤ 0.16	≥ 0.03