Limits on the Mixing of τ Neutrino to Heavy Neutrino

by A. Rozanov

on behalf of

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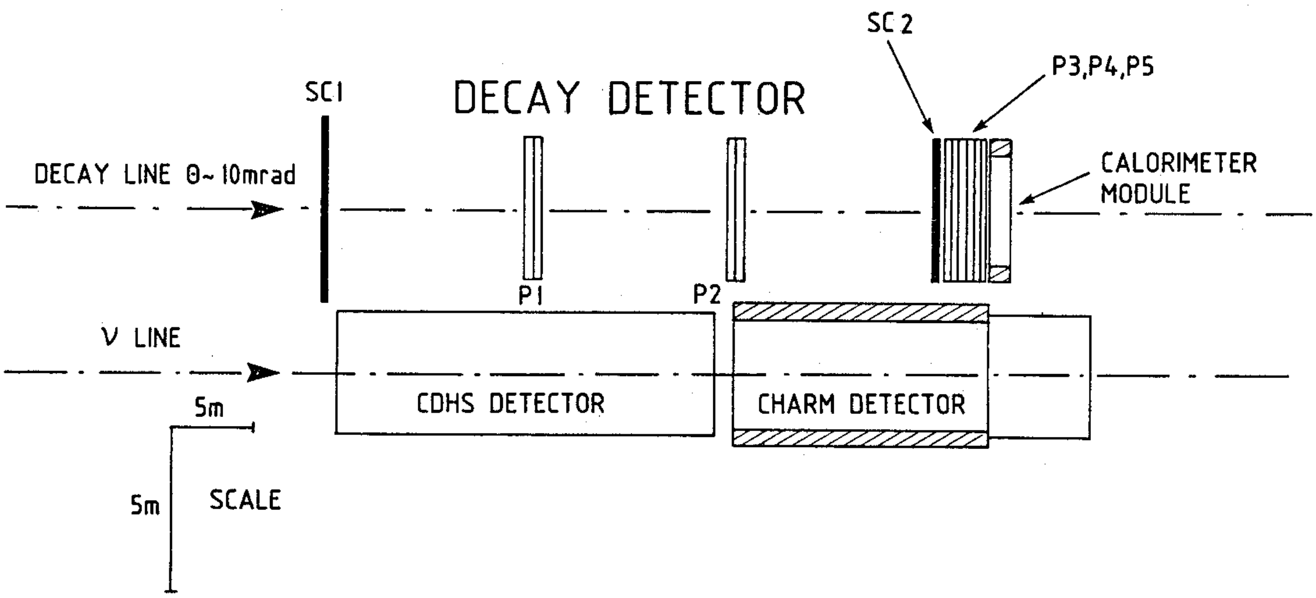
- **CHARM beam dump experiment at SPS CERN**
- **General mixing** $\nu_l = \sum_i U_{li}\nu_i$

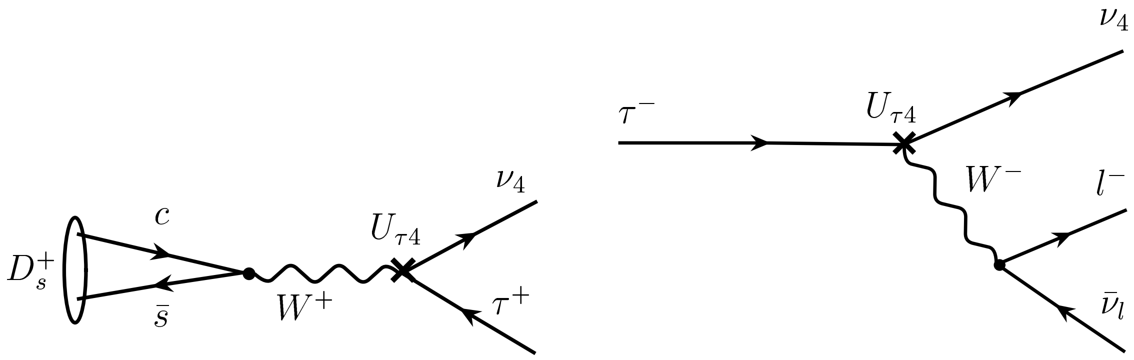
  $(l = e,\ \mu,\ \tau,\ ..;\ i = 1, 2, 3, 4,\ ..)$
- **Production by** $D_s \to \nu_4 + \tau$ **and** $\tau \to \nu_4 + \ldots.$
- **Search for** $\nu_4 \to \nu_\tau + e^+ + e^-$ **events**
- **Limits on** $|U_{\tau 4}|^2$ **of** ν_τ **for** m_{ν_4} **=10-290 MeV/c**^{2}

CHARM decay detector

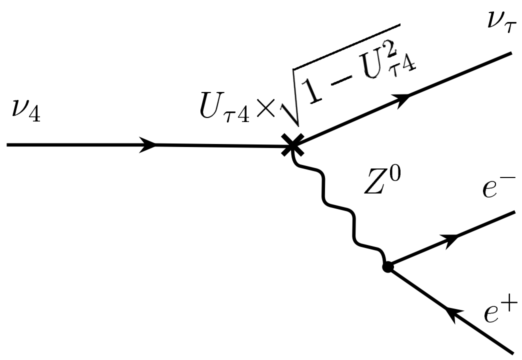


- **400 GeV proton beam on Cu target**
- **Integrated flux $N_p = 2 \times 10^{18}$ protons**
- **Decay detector at L=400 m from the beam dump**
- **Decay length 35 m, cross-section 2.5x2.5 m selected**
- **7185 events selected with energy cut $E_{el} > 2$ GeV**
- **No candidates to electrons.**

Production and decay of ν_4



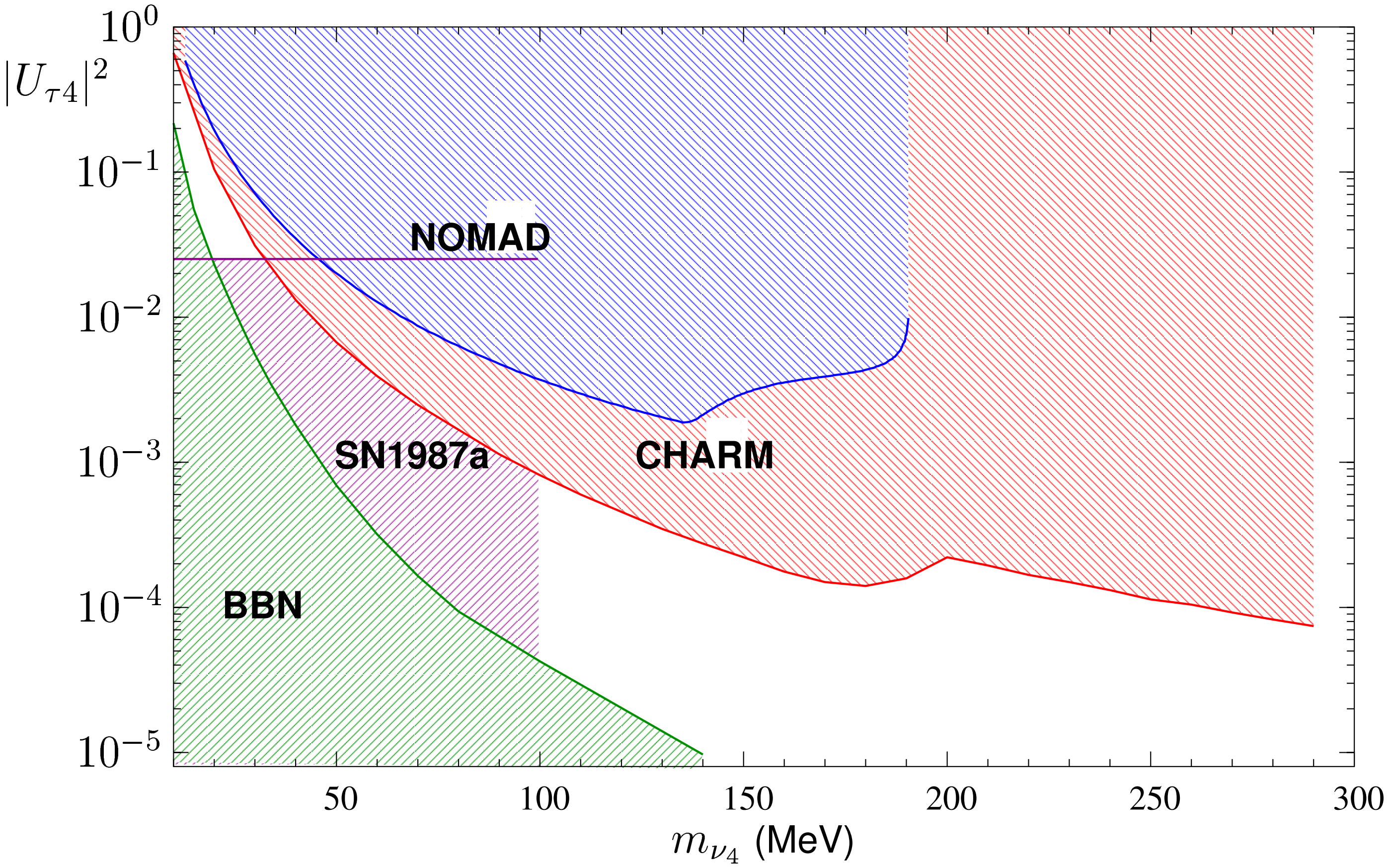
Production



Decay

- ν_4 **mostly isosinglet under Standard SU(2)**$_L$
- ν_4 **couples essentially via mixing with** ν_τ
- $|U_{e4}|^2 \, , \, |U_{\mu 4}|^2 << |U_{\tau 4}|^2$

Limits on the $|U_{\tau 4}|^2$



Conclusion:

$|U_{\tau 4}|^2 < 2 \times 10^{-4}$ **for** $m_{\nu_4} > 160$ **MeV/c^2**