

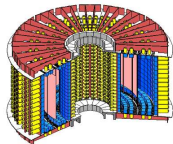
Search for neutrinoless double beta decay with NEMO3 using ^{150}Nd

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Rencontres de Moriond 2008

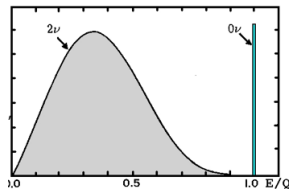
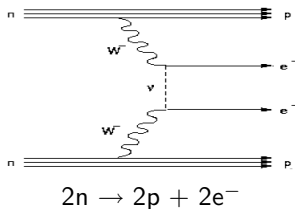
March 4, 2008

NEMO Collaboration



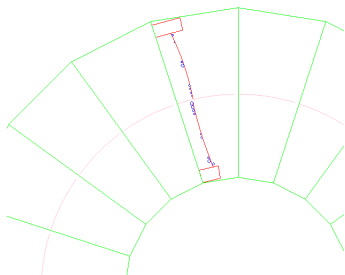
Aim of the NEMO-3 experiment :

Search for evidence of lepton number violation
in $\beta\beta 0\nu$ decay of ^{150}Nd (^{100}Mo , ^{82}Se ...)



Would you like to see some *golden events*?

⇒ *golden events* from ^{150}Nd Strip



$$\delta_{TOF} \approx 0$$

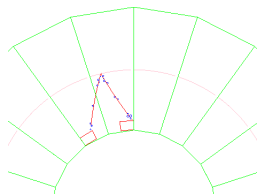
$$E_1 = 1611\text{keV}$$

$$E_2 = 1620\text{keV}$$

$$E_{tot} = E_1 + E_2 = 3231\text{keV} \approx Q_{\beta\beta}$$

A nice $\Delta L=2$ candidate event!

⇒ *golden events* from ^{150}Nd Strip



Look! Another one...

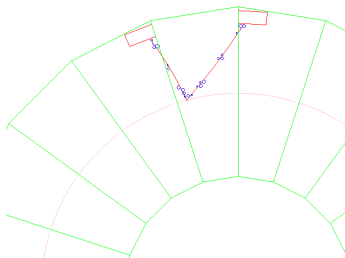
$$\delta_{TOF} \approx 0$$

$$E_1 = 1590\text{keV}$$

$$E_2 = 1464\text{keV}$$

$$E_{tot} = E_1 + E_2 = 3054\text{keV} \approx Q_{\beta\beta}$$

⇒ *golden events* from ^{150}Nd Strip



Yet another one

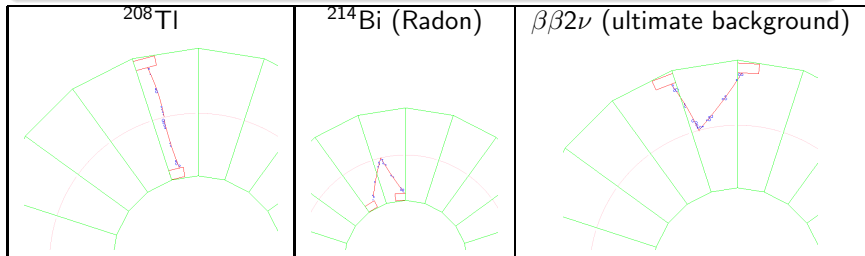
$$\delta_{TOF} \approx 0$$

$$E_1 = 1233\text{keV}$$

$$E_2 = 1989\text{keV}$$

$$E_{tot} = E_1 + E_2 = 3222\text{keV} \approx Q_{\beta\beta}$$

These *golden events* are simulated from possible background contribution



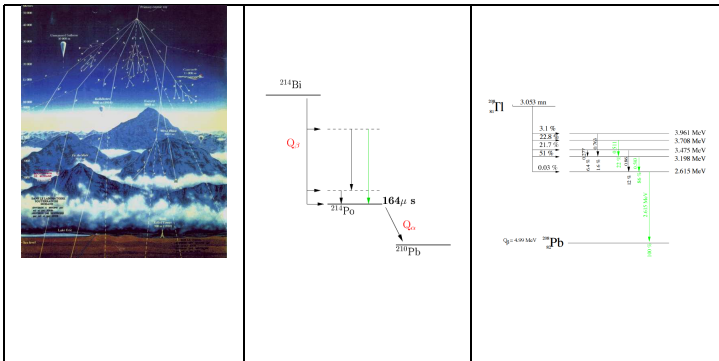
This highlights the crucial importance of the extreme radio-purity one needs to reach acceptable sensitivity in such experiment¹

($T_{1/2} 0\nu = 10^{24}$ years)

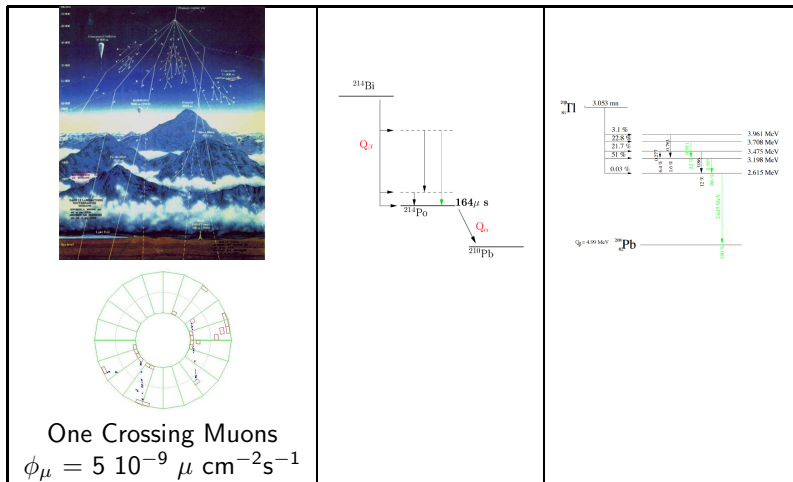
⇒ particle physics at 1 MeV and 1 mBq

¹Technical design and performance of the NEMO-3 detector NIM A 536 (2005)
79-122

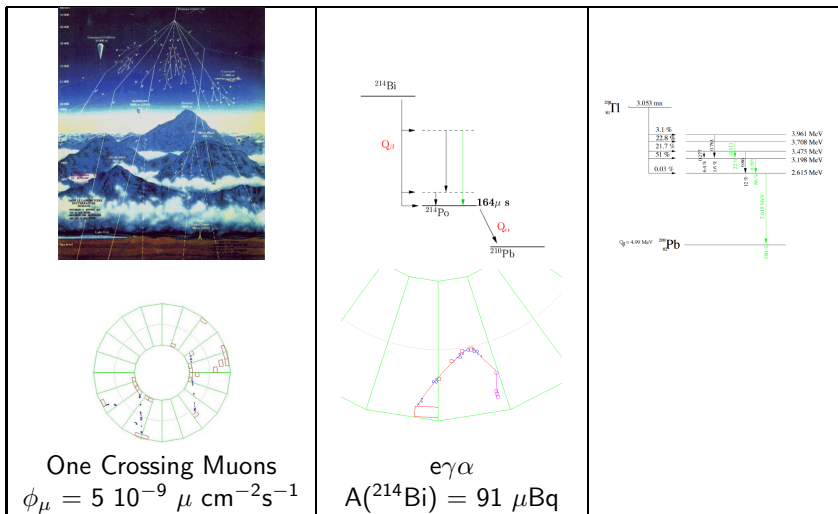
NEMO-3 is able to measure its own background using dedicated channels



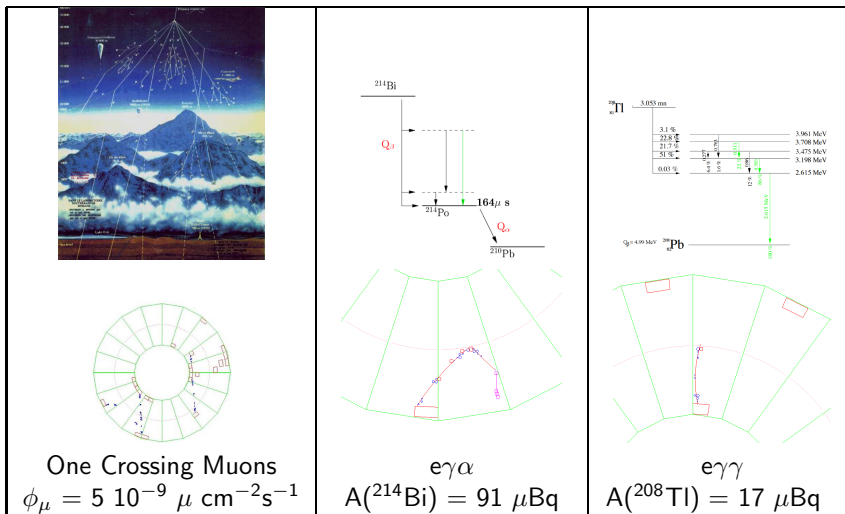
NEMO-3 is able to measure its own background using dedicated channels



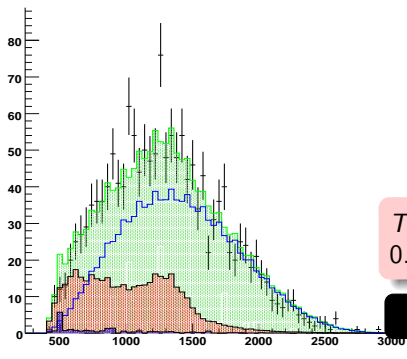
NEMO-3 is able to measure its own background using dedicated channels



NEMO-3 is able to measure its own background using dedicated channels



internal 2e channel from ^{150}Nd source foil



duration : 10 560 hours

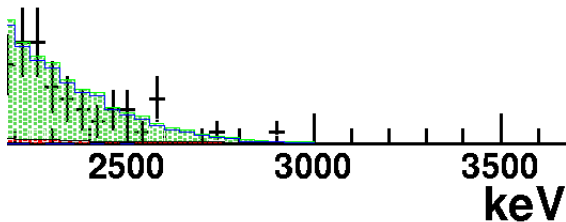
events : 980 events

S/B = 3.4

$\beta\beta$ events : 756 events

$T_{1/2}(2\nu) = (9.75 \pm 0.35 \text{ (stat.)} \pm 0.85 \text{ (syst.)}) 10^{18} \text{ years}$

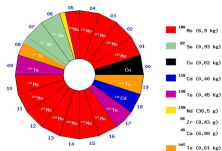
?



0 event observed during 10 560 hours

$$T_{1/2}(0\nu) > 8.0 \cdot 10^{21} \text{ years (90\% CL)}$$

- Same method used for all isotopes in NEMO-3 (^{100}Mo , ^{82}Se , ^{130}Te ...)



- No evidence for $\Delta L=2$ using ^{150}Nd data

This work

^{150}Nd :

$$T_{1/2}(2\nu) = (9.75 \pm 0.35 \text{ (stat.)} \pm 0.85 \text{ (syst.)}) 10^{18} \text{ years}$$

$$T_{1/2}(0\nu) > 8.0 10^{21} \text{ years (90\% CL)}$$