Order of magnitude lifetime measurements in ^{66}Ni

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Lifetimes of 0^+ states in ^{66}Ni

^{66}Ni - lifetimes with RDDS

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Multifaceted Quadruplet of Low-Lying Spin-Zero States in ^{66}Ni: Emergence of Shape Isomerism in Light Nuclei

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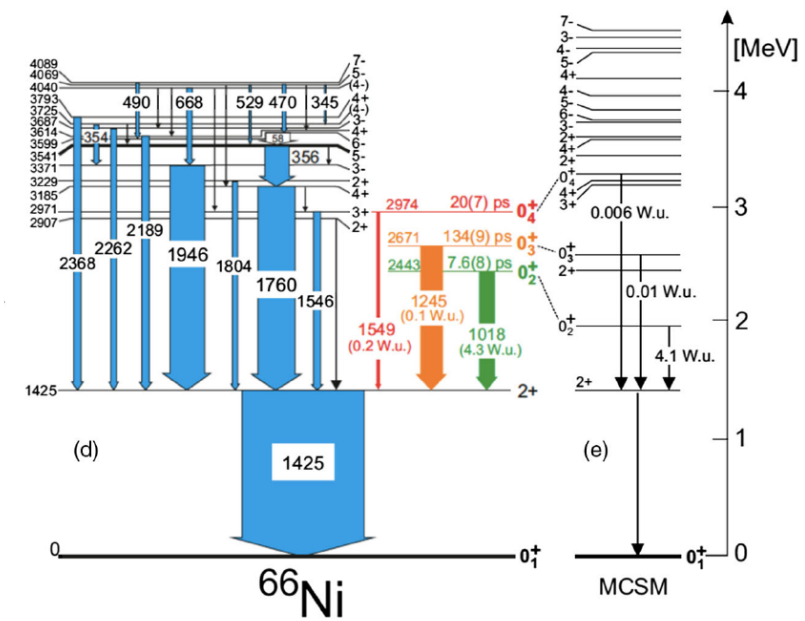
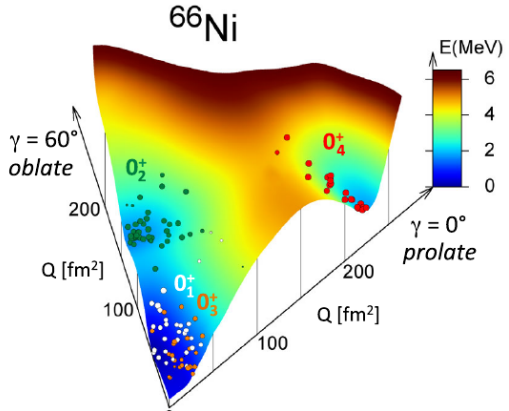
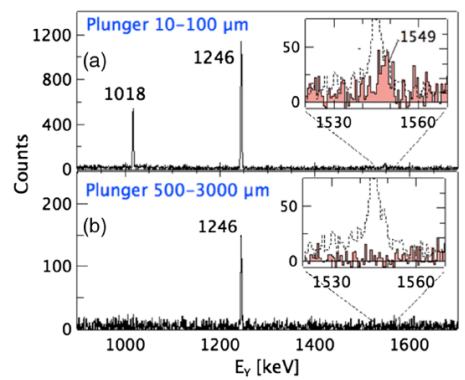
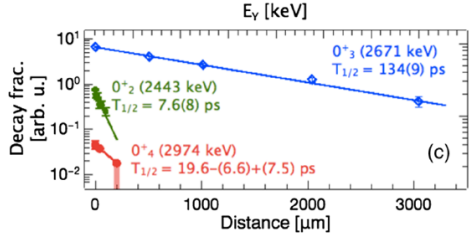
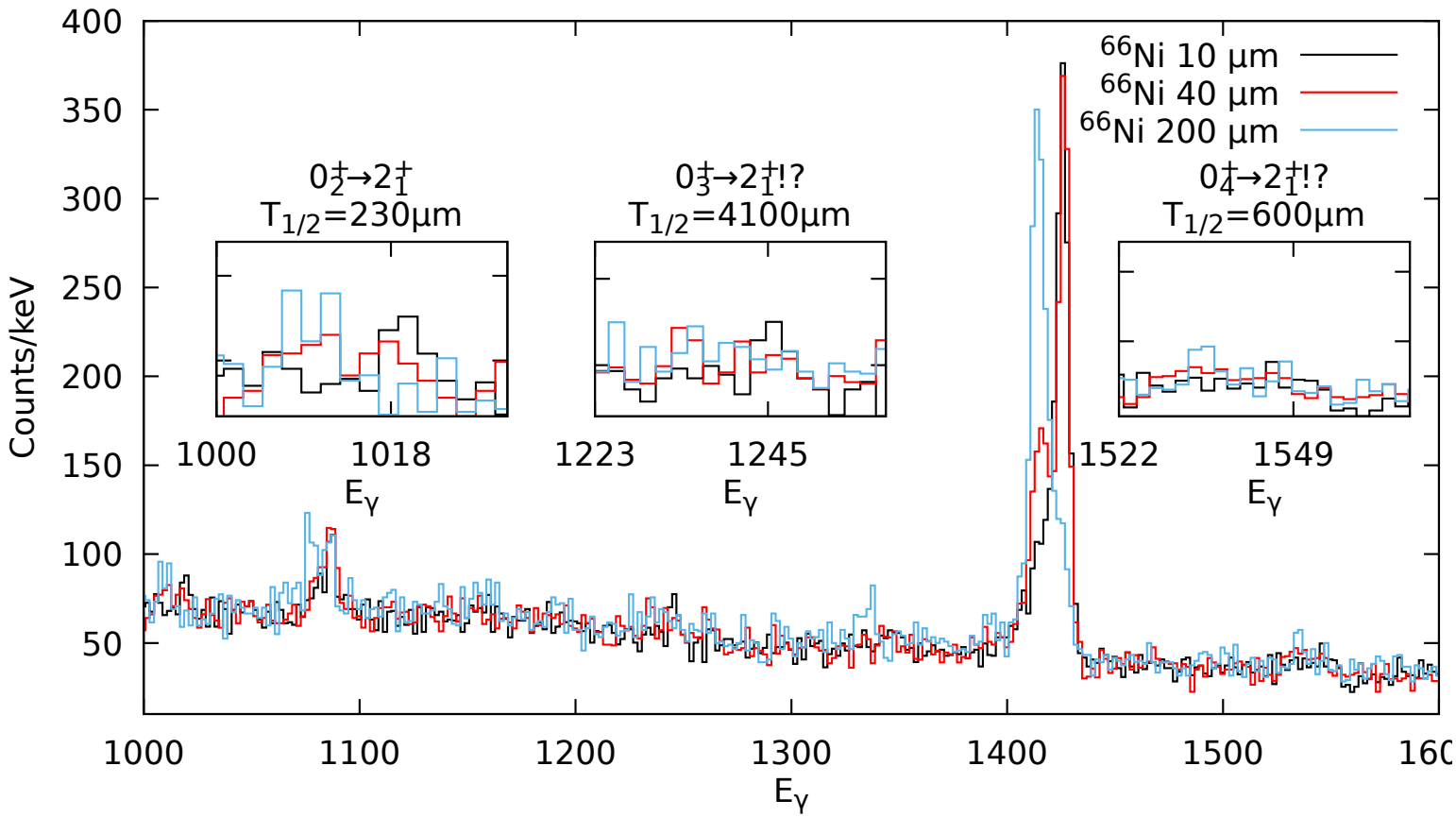








Experimental tensions with AGATA+VAMOS+OUPS data



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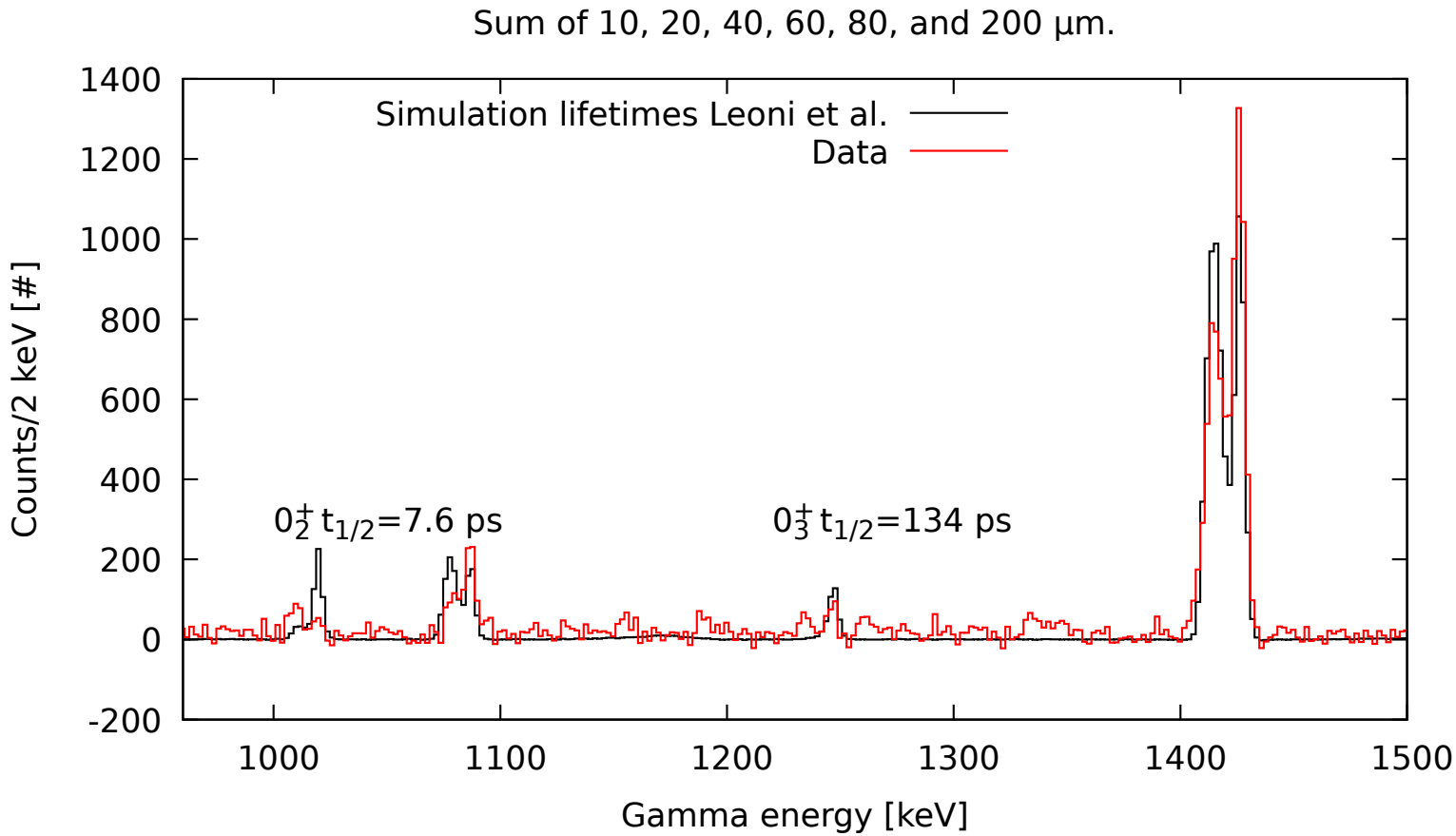

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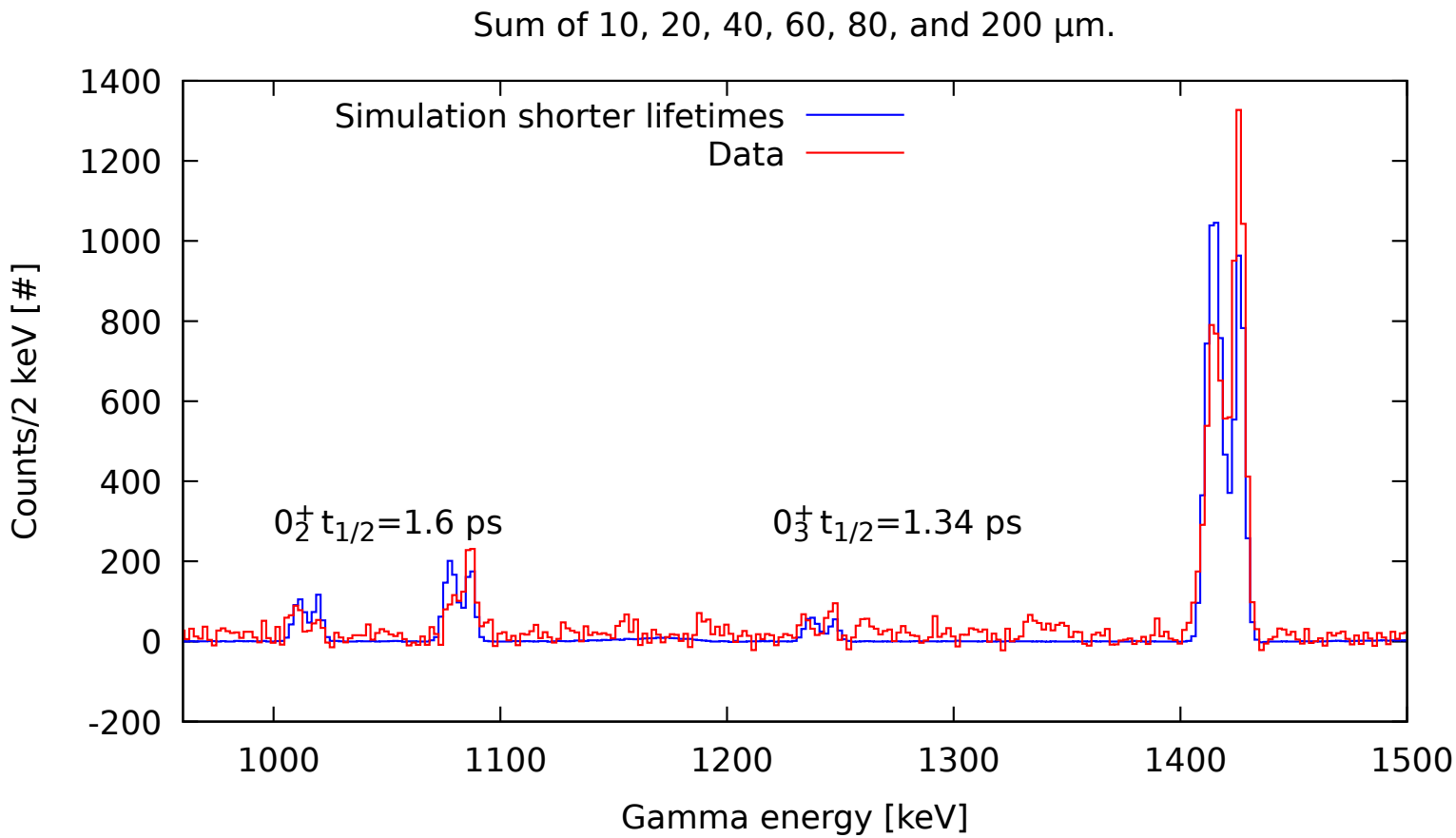

But the AGATA+VAMOS+OUPS data is not very good is it...?

- The statistics are low, indeed, too low to get a life time with RDDS.
- Lifetimes differ with a factor of 10, maybe check this with a "simple experiment" without plunger, find a way to go forward...
- Especially if we can control the population of states in ^{66}Ni, could that be found with a bit of determination...

Hm... what about "DSAM like" after (d,p) with AGATA+VAMOS+GRIT?

Impact of (possible) shorter lifetimes

- 0_2^+ factor 5-10, MCSM no longer perfect.
- 0_3^+ factor 50-100, gives similar B(E2) for the first two excited 0^+ states, in disagreement with MCSM.
- Is the results for the 0_4^+ (shape isomer) still valid?
- Reminder that "a plunger" does not make an experiment without errors

The lifetimes might also be correct :-)

Inspiration

Nuclear Physics **A366** (1981) 68–90

SPECTROSCOPY OF ^{62}Ni WITH THE ^{61}Ni($\vec{d}$, p) REACTION

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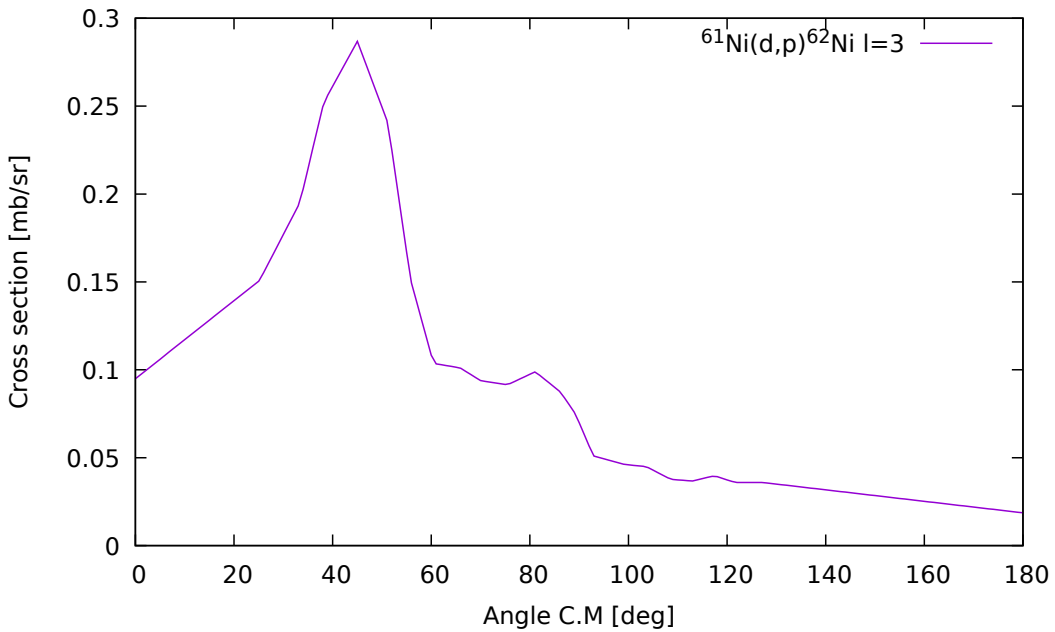
Abstract: Differential cross sections, vector and tensor analysing powers have been measured for the ^{61}Ni(d, p) reaction at a deuteron energy of 12.3 MeV. Most of the 30 transitions observed below 8.5 MeV excitation are dominated by a single j-value, which was determined from behaviour of the analysing power data. For a number of transitions it was possible to make unambiguous j-assignment relying on the established j-dependence of the T_{22} tensor analysing power. The deduced spectroscopic factors indicate that the full strength of neutron transfer to the $(2p, 1f_{5/2})$ and $1g_{9/2}$ orbits was found and seven $\frac{5}{2}^+$ transitions were located above 5.3 MeV. The separated strengths of the $\frac{3}{2}^-$, $\frac{1}{2}^-$ and $\frac{5}{2}^-$ transitions are compared with shell-model calculations for the low-lying states of ^{62}Ni.

E

NUCLEAR REACTIONS ^{61}Ni(d, p), $E = 12.3$ MeV; measured $\sigma(\theta)$, iT_{11}, T_{20}, $T_{22}(\theta)$. ^{62}Ni deduced levels, L, j, π, $(2J_t+1)S_j$. Enriched target.

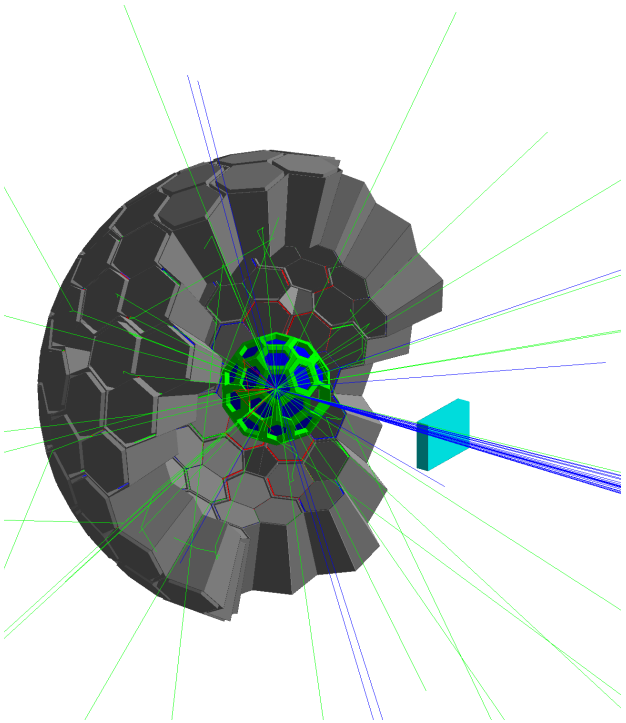
AGATA+VAMOS+GRIT (ISIS) simulations

- ^{65}Ni(d,p)^{66}Ni
- ^{65}Ni@468 MeV
- 1 mg/cm^2 CD_2
- 2 mg/cm^2 Mg backing
- Proton detection with ISIS (lack of GRIT in AGATA G4 sim).



- Ang dist from ^{61}Ni(d,p)^{62}Ni

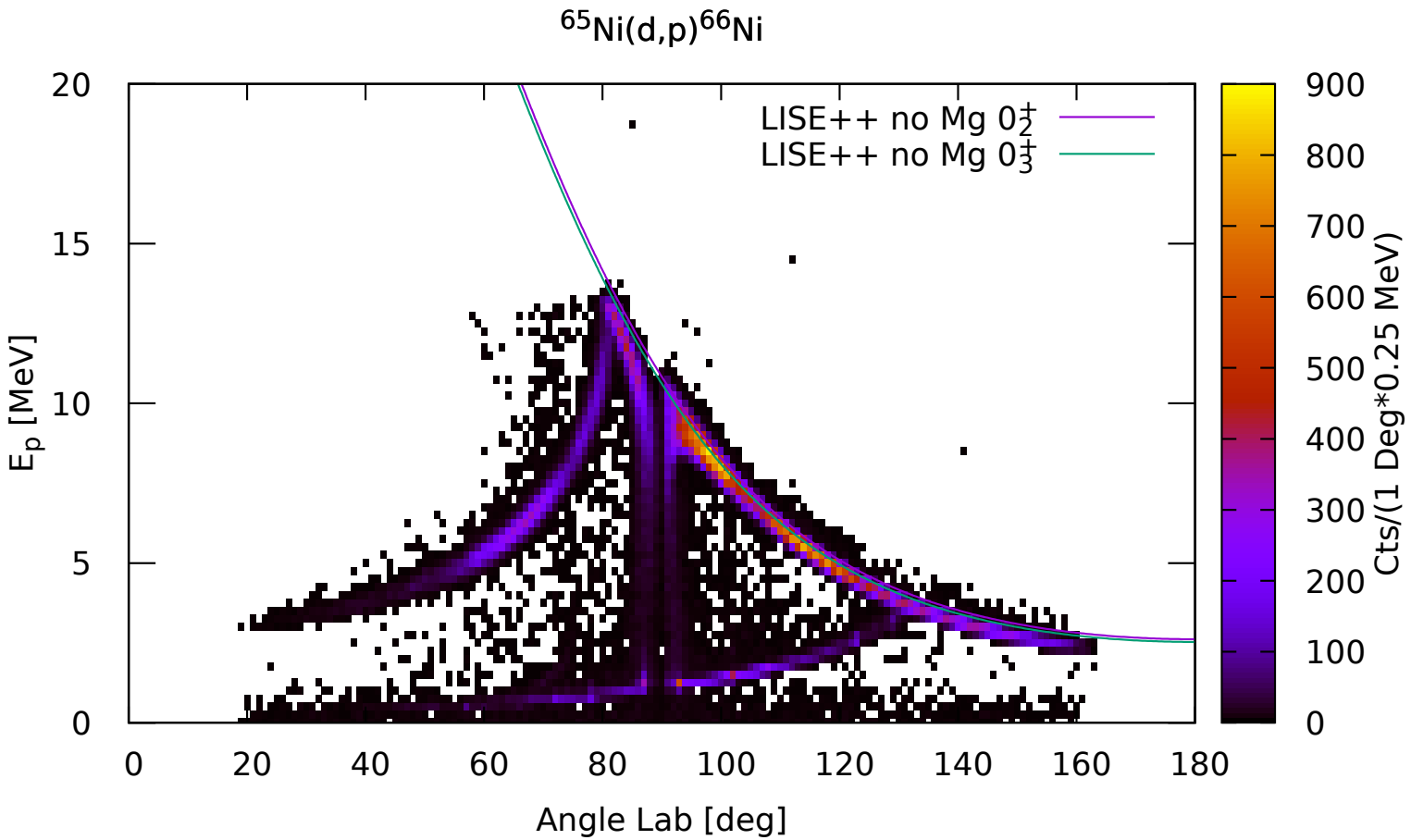
AGATA+VAMOS+GRIT (ISIS) simulations



- 10^6 events simulated
- $\sim 10^4$ triple coincidences/0^+

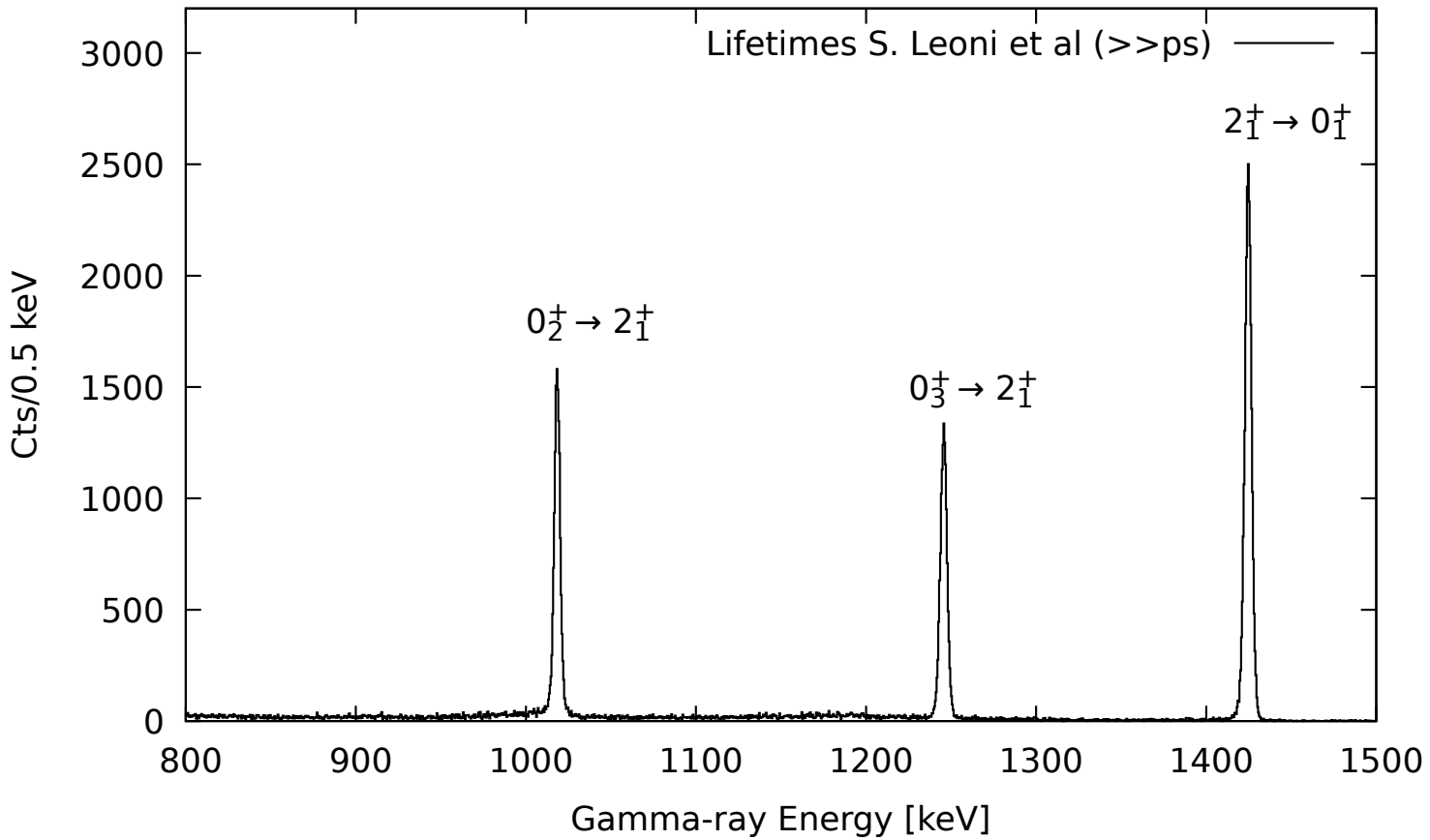
- Simulation of 2π AGATA with G4 code, with options "-Gen -SN -seed -a 1 4"
- VAMOS included by entrance detector
- Tracked by OFT, adding ancillaries and VAMOS to tracked_energies output
- Sorted demanding triple coincidence
- Doppler Corrected with ^{66}Ni from "VAMOS"(acceptance from code by M. Rejmund)

AGATA+VAMOS+GRIT (ISIS) simulations

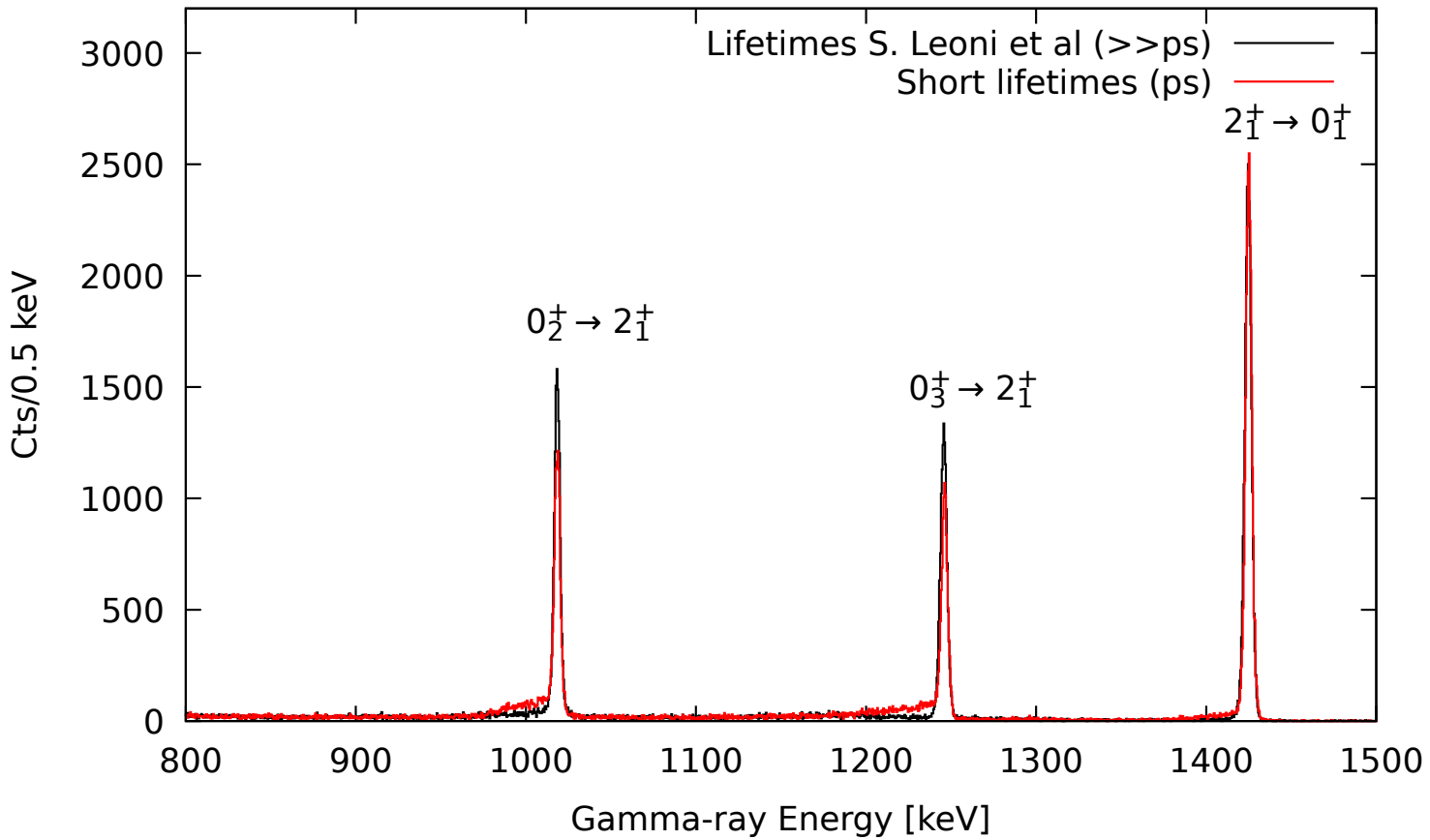


Total energy in ISIS

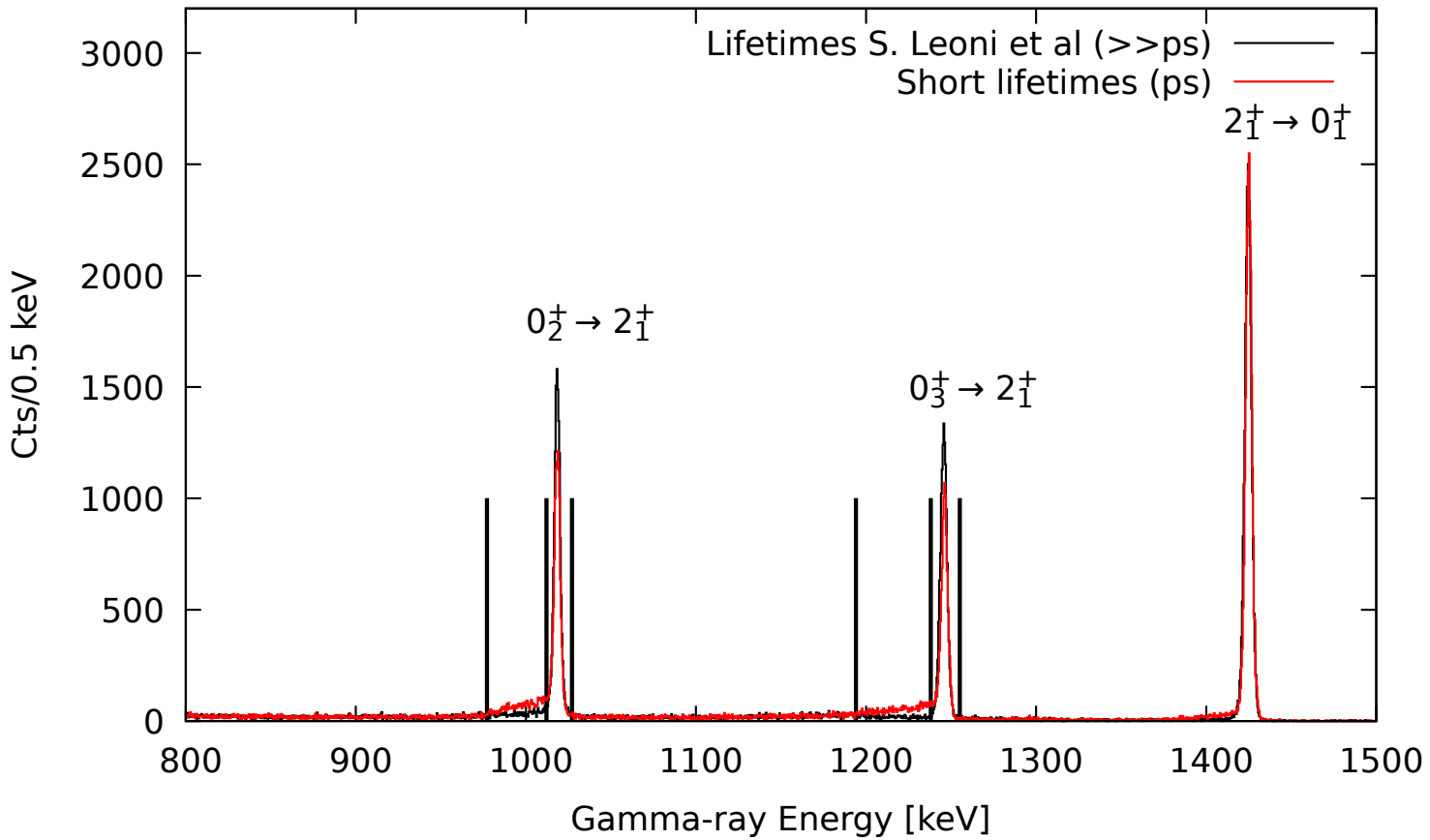
AGATA+VAMOS+GRIT (ISIS) simulations



AGATA+VAMOS+GRIT (ISIS) simulations

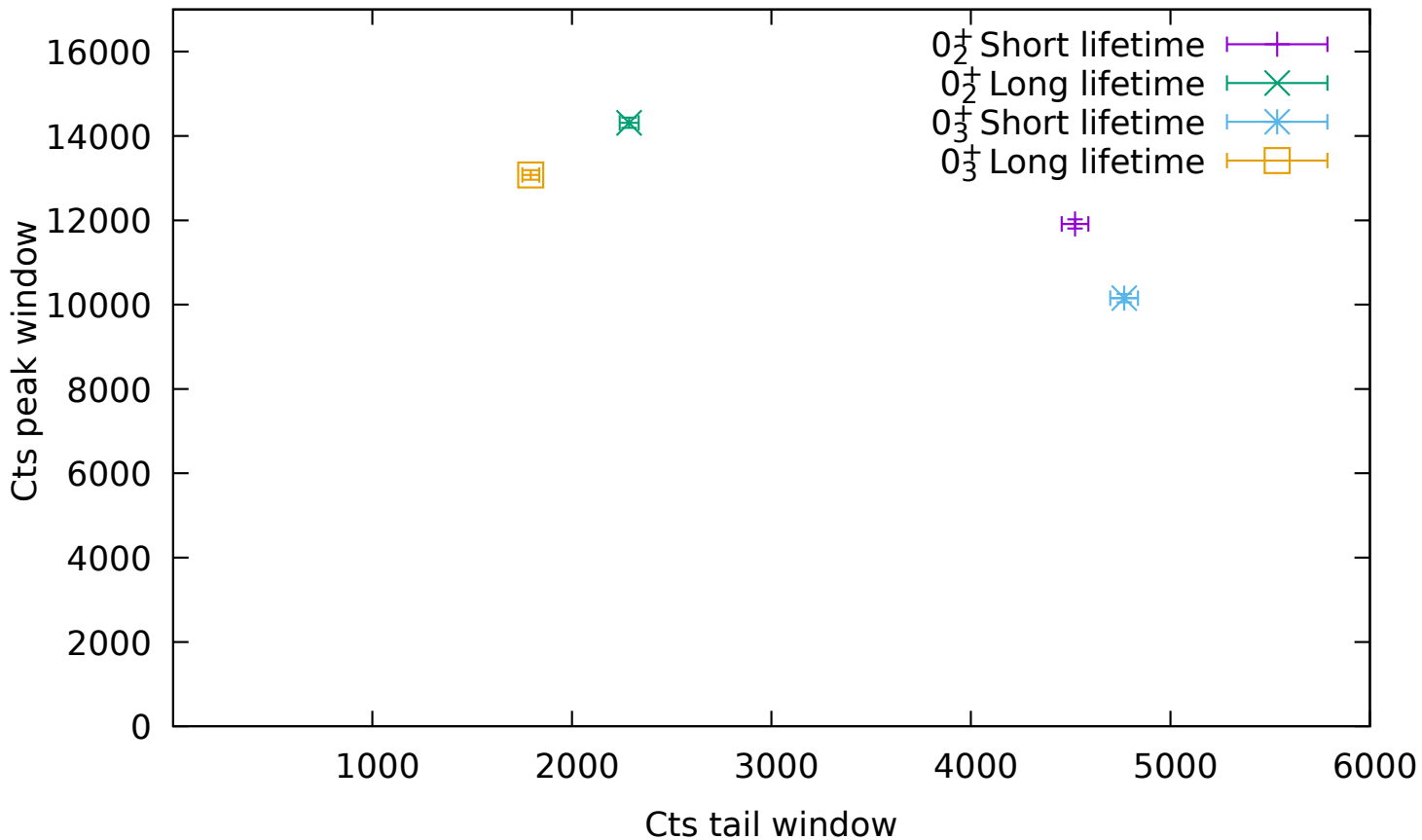


AGATA+VAMOS+GRIT (ISIS) simulations



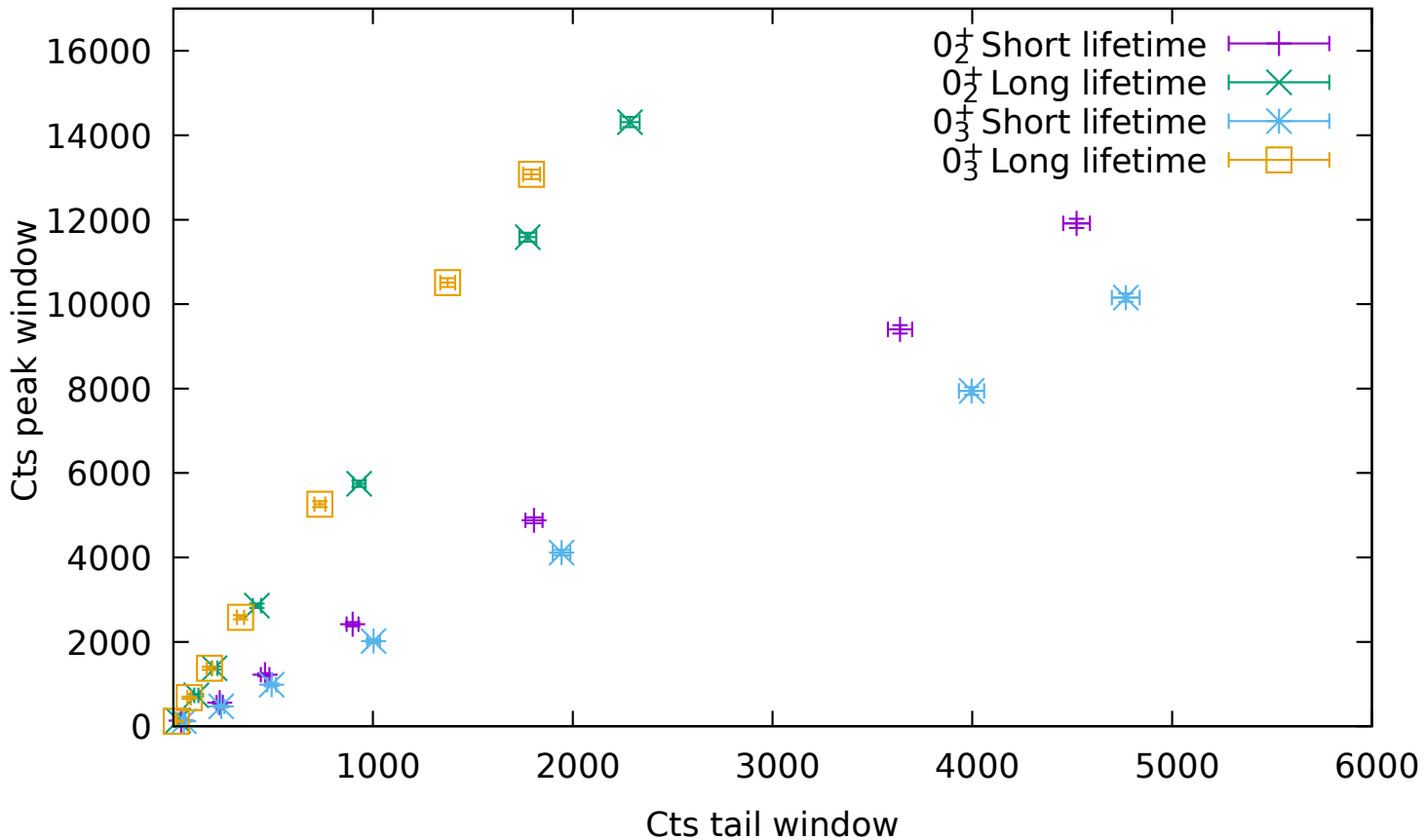
Integrate in two different windows per transition

AGATA+VAMOS+GRIT (ISIS) simulations



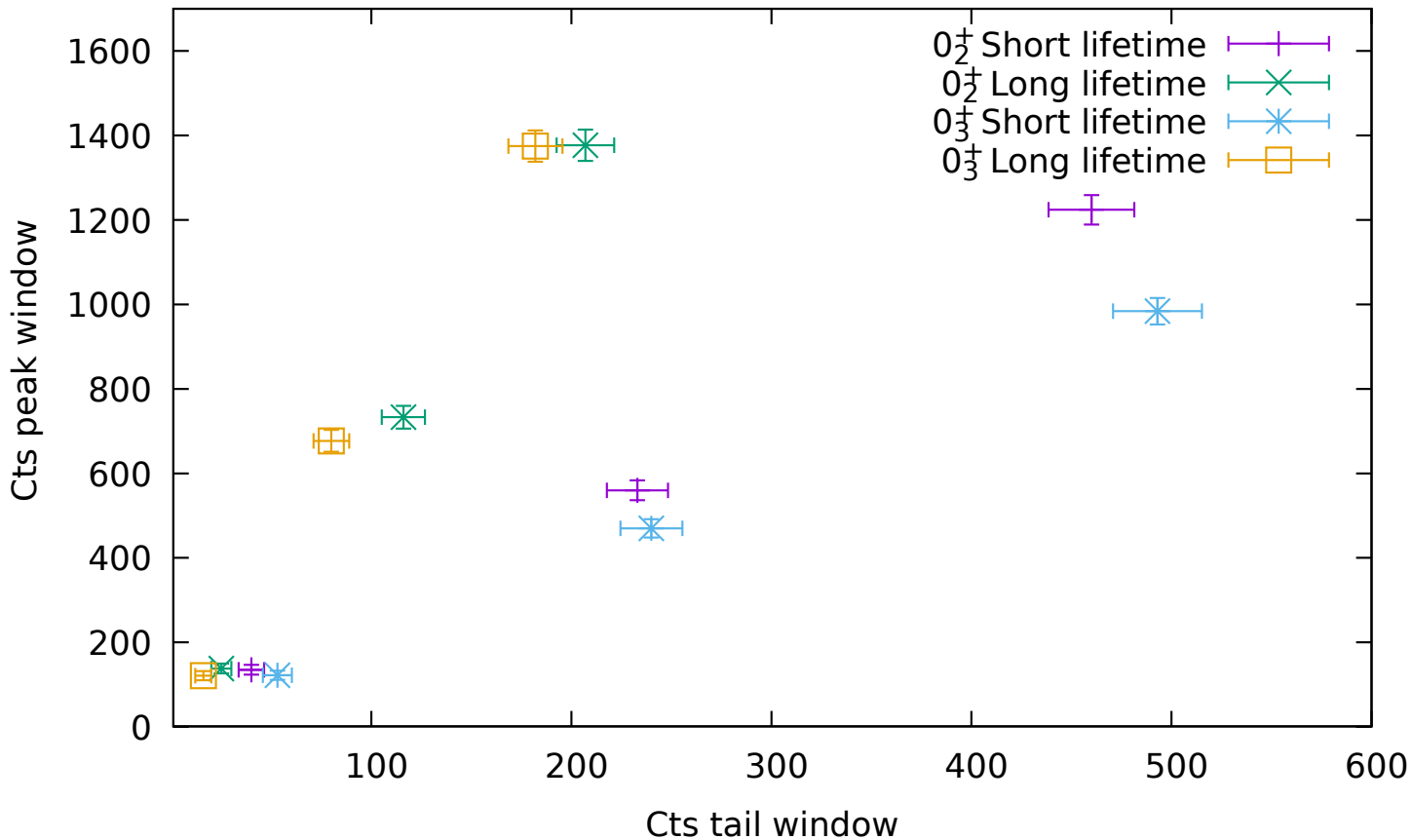
Clear discrimination power at high statistics

AGATA+VAMOS+GRIT (ISIS) simulations



How about with less statistics?

AGATA+VAMOS+GRIT (ISIS) simulations



Seems ok to about 100 cts in peak

Needed Beam Intensity

- Aim for $> 10^2$ cts total in a peak
- This corresponds to 10^4 reactions
- Cross section something like 0.5 mb
- 7×10^{19} d/cm^2 target
- Gives 3×10^9 ions on target

21 UT's need an average beam intensity of 4×10^3 ^{65}Ni pps.

That is it folks

Thank you!