Supporting Information for:

Determination of stable isotope ratios using Nuclear Reaction Analysis coupled with a particle-gamma coincidence method

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This supporting information provides the figures and tables to support the results presented in the main text.

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Table S.1: Predicted reaction cross-sections of an 11.75 MeV proton beam with the copper stable isotopes using PACE4 code [1].

Target	Compound nucleus	Reaction products	Predicted cross-sections (b)
^{63}Cu	^{64}Zn	^{63}Zn + n + γ	0.385
		^{63}Cu + p + γ	0.372
		^{60}Ni + α + γ	0.229
^{65}Cu	^{66}Zn	^{65}Zn + n + γ	0.751
		^{65}Cu + p + γ	0.121
		^{62}Ni + α + γ	0.136

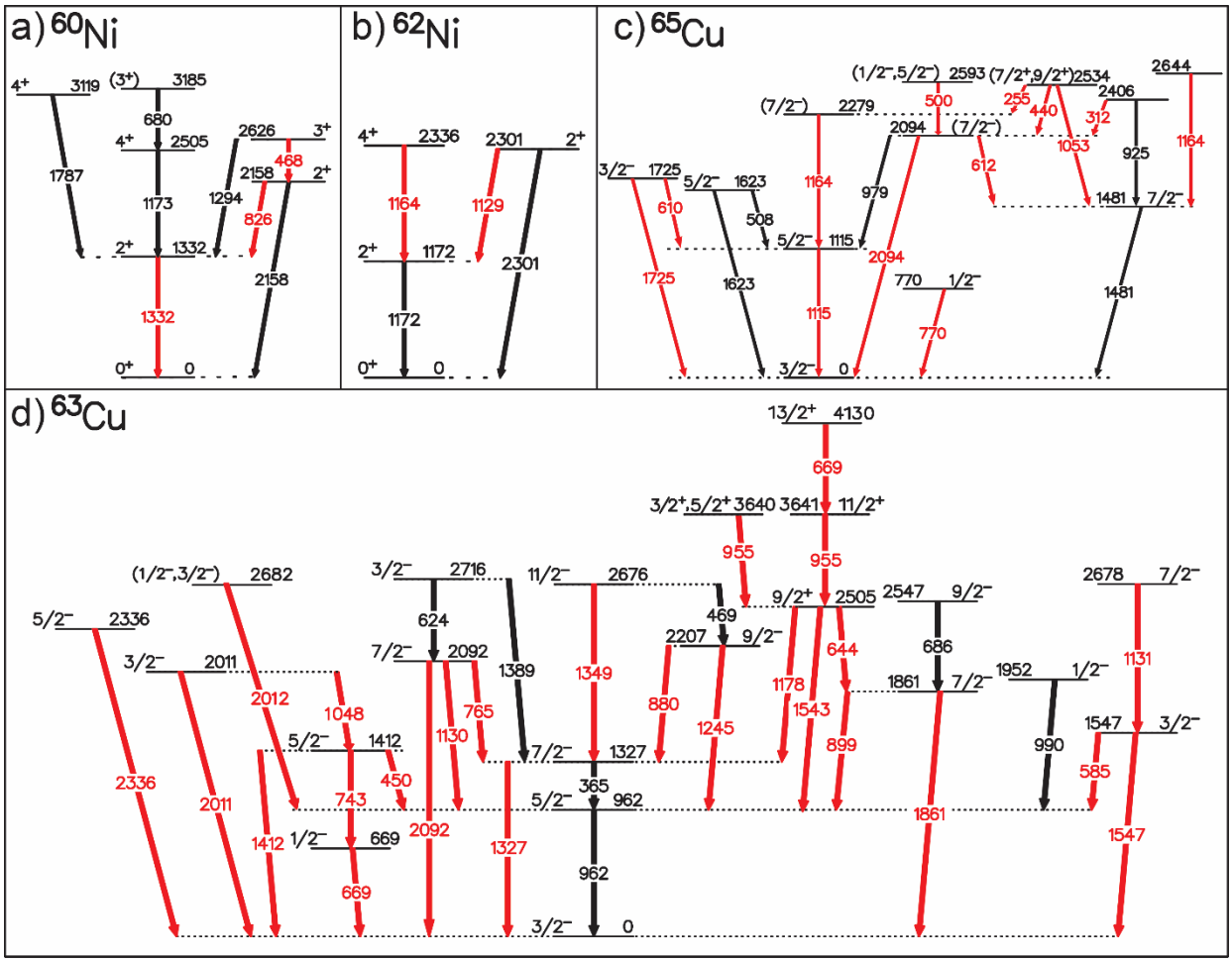

Figure S.1: Reduced level schemes of the nuclei populated in this work (a) ^{60}Ni, b) ^{62}Ni, c) ^{65}Cu, and d) ^{63}Cu. The level schemes show only the gamma-rays de-populating the excited states observed in the experiments. The transitions used to calculate the isotope ratios are shown in red. Adapted from references [2-5]. The energies of the excited states and gamma-rays are in keV.

Table S.2: Gamma-ray energies (in keV) used from ^{63,65}Cu and ^{60,62}Ni to obtain the ^{63,65}Cu reaction cross-sections with ^{nat}Cu and ^{65}Cu targets and to determine the ^{63,65}Cu isotopic ratio in the ^{mixed}Cu target. The *"Coincidence Spectrum"* column indicates the coincidence spectrum from which the gamma-ray was observed, while the *"$E_{\gamma ref}$"* column indicates the reference energy values, taken from references [2-5]. The errors are the standard counting statistics uncertainties and correspond to one sigma (k = 1).

Nucleus	Coincidence Spectrum	$E_{\gamma ref}$ (keV)
^{63}Cu	γ-proton	449.93 (5)
		584.82 (15)
		645.4 (3)
		669.62(5) + 668.5 (2)
		742.25 (10)
		765.7 (5)
		881.0 (1)
		899.0 (4)
		955.0 (17) + 956.1 (5)
		1048.8 (5)
		1130.7 (3) + 1131.0 (1)
		1178.9 (3)
		1245.2 (2)
		1327.03 (8)
		1350.1 (4)
		1412.08 (5)
		1543.0 (1)
		1547.04 (6)
		1861.3 (3)
		2011.4 (5) +2012.0 (1)
		2092.6 (5)
		2336.5 (3)
^{65}Cu	γ-proton	255.0 (13)
		312.4 (6)
		439.7 (7)
		499.7 (21)
		609.5 (1)
		612.7 (8)
		770.6 (2)
		1052.0 (4)
		1115.546 (4)
		1162.6 (11) + 1163.7 (11)
		1724.92 (6)
		2094.3 (2)
^{60}Ni	γ-alpha	467.3 (2)
		826.06 (3)
		1332.501 (5)
^{62}Ni	γ-alpha	1128.82 14
		1163.50 (12)

References

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