

KTA1

Slides to lecture on 23.10.2013

Wiederholung: Nuklidkarte

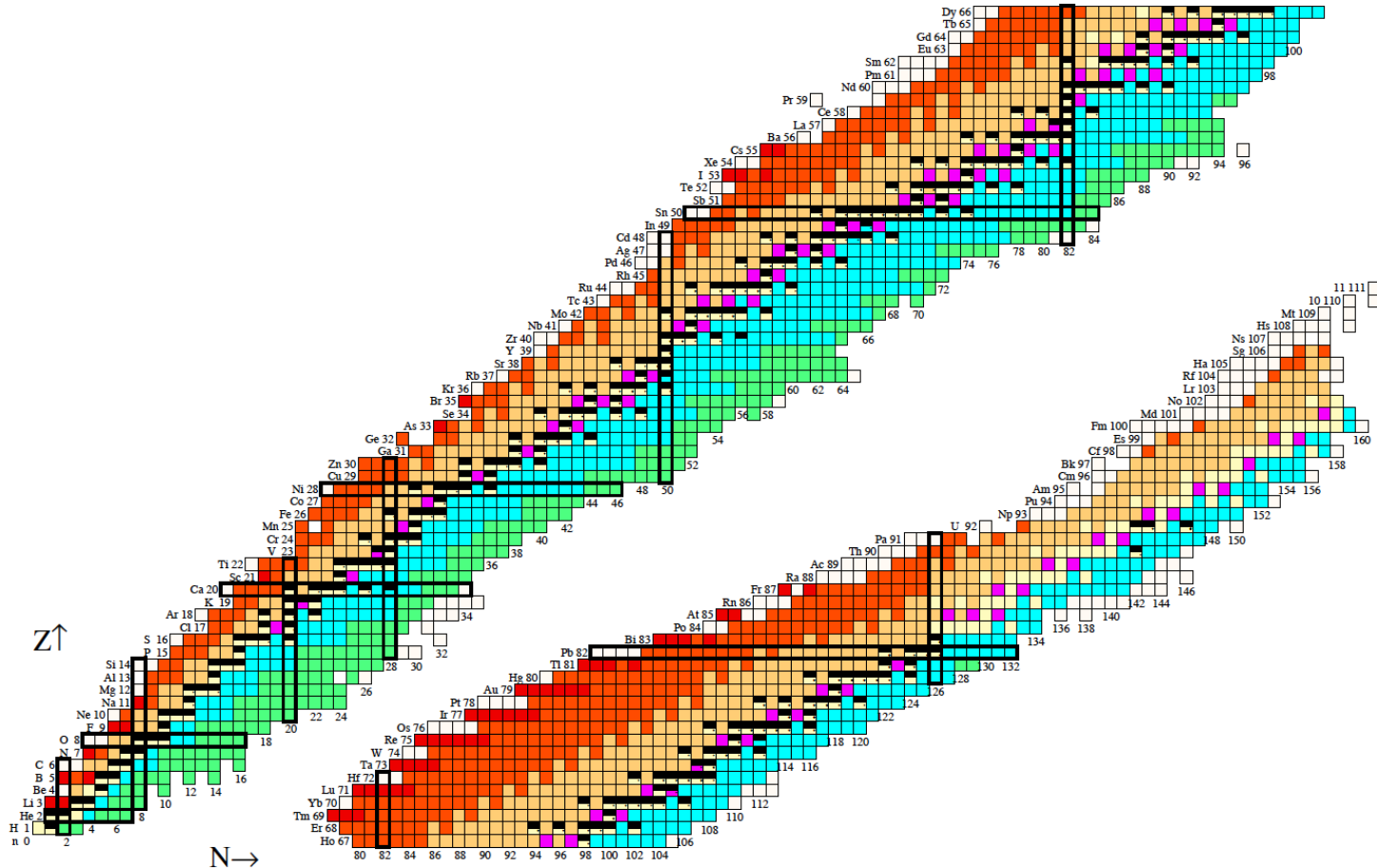
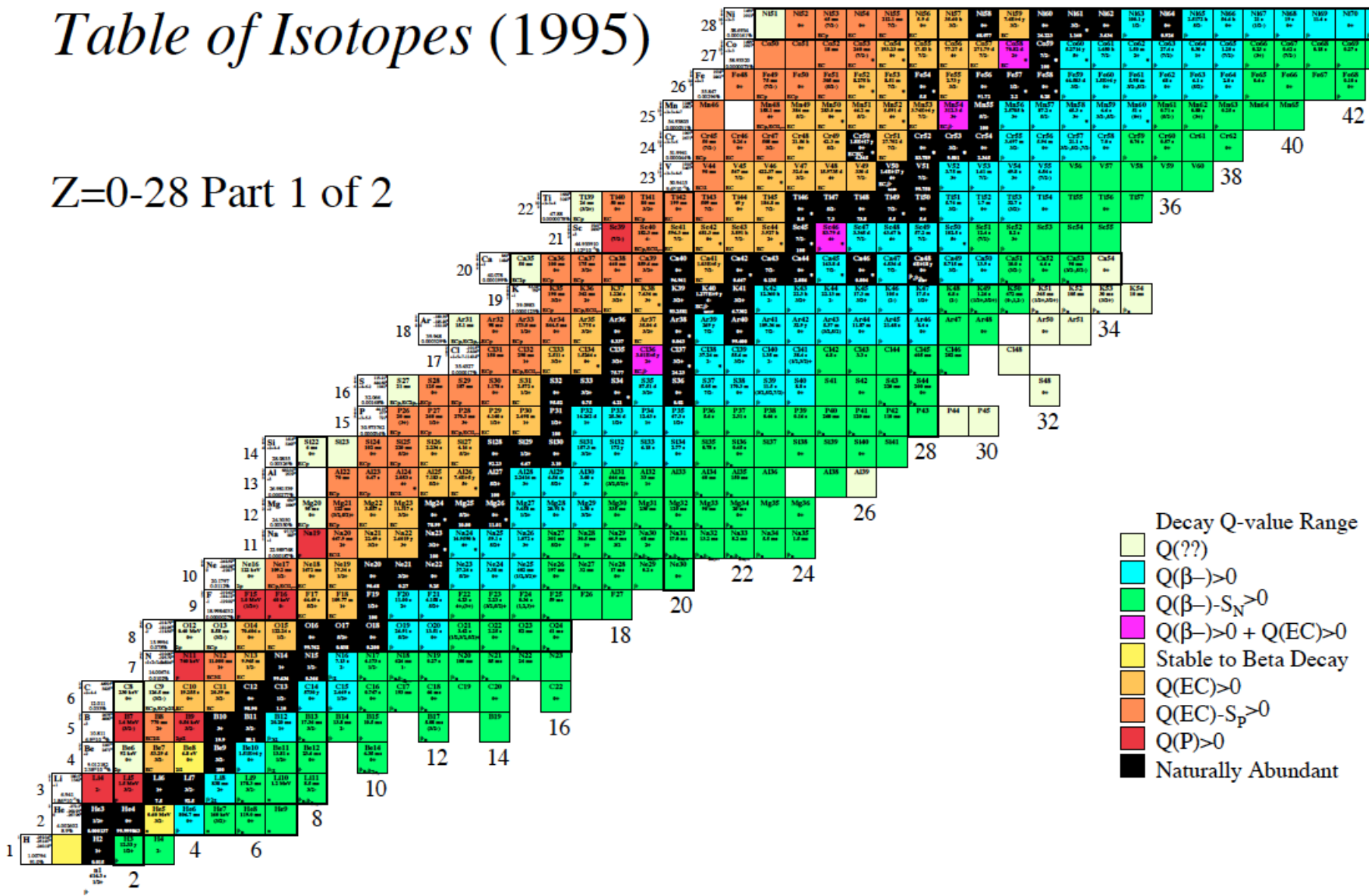


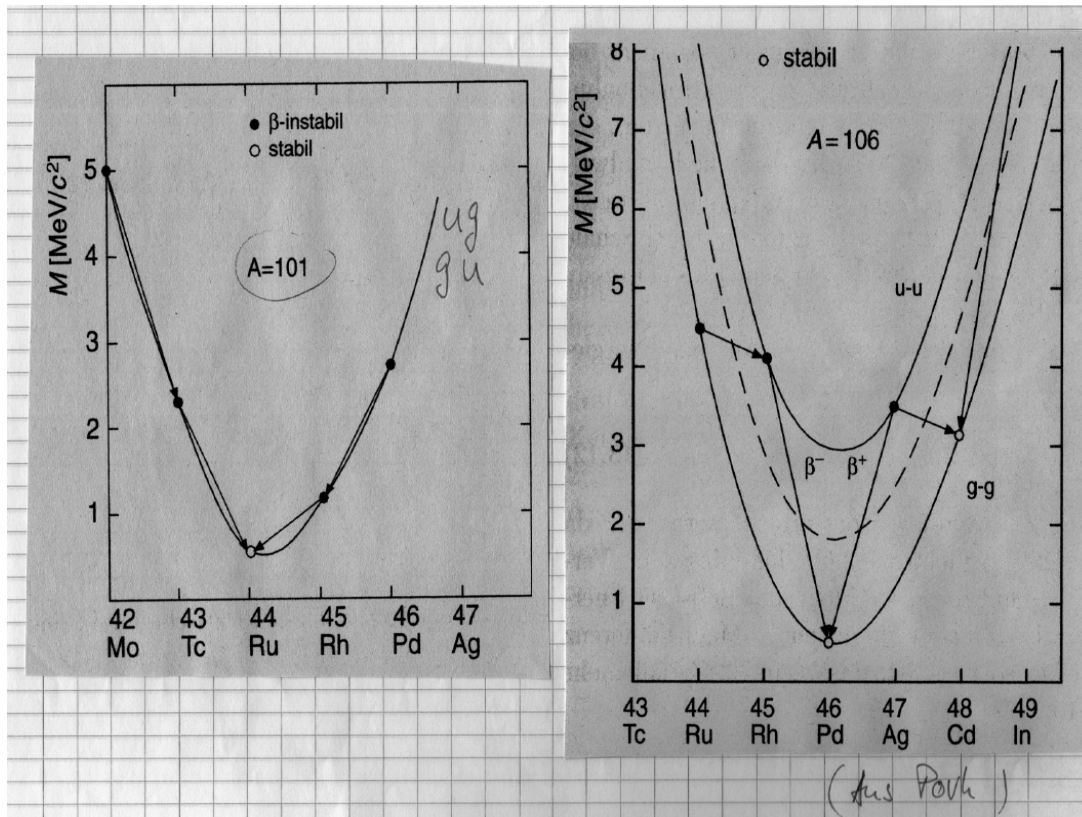
Table of Isotopes (1995)

Z=0-28 Part 1 of 2



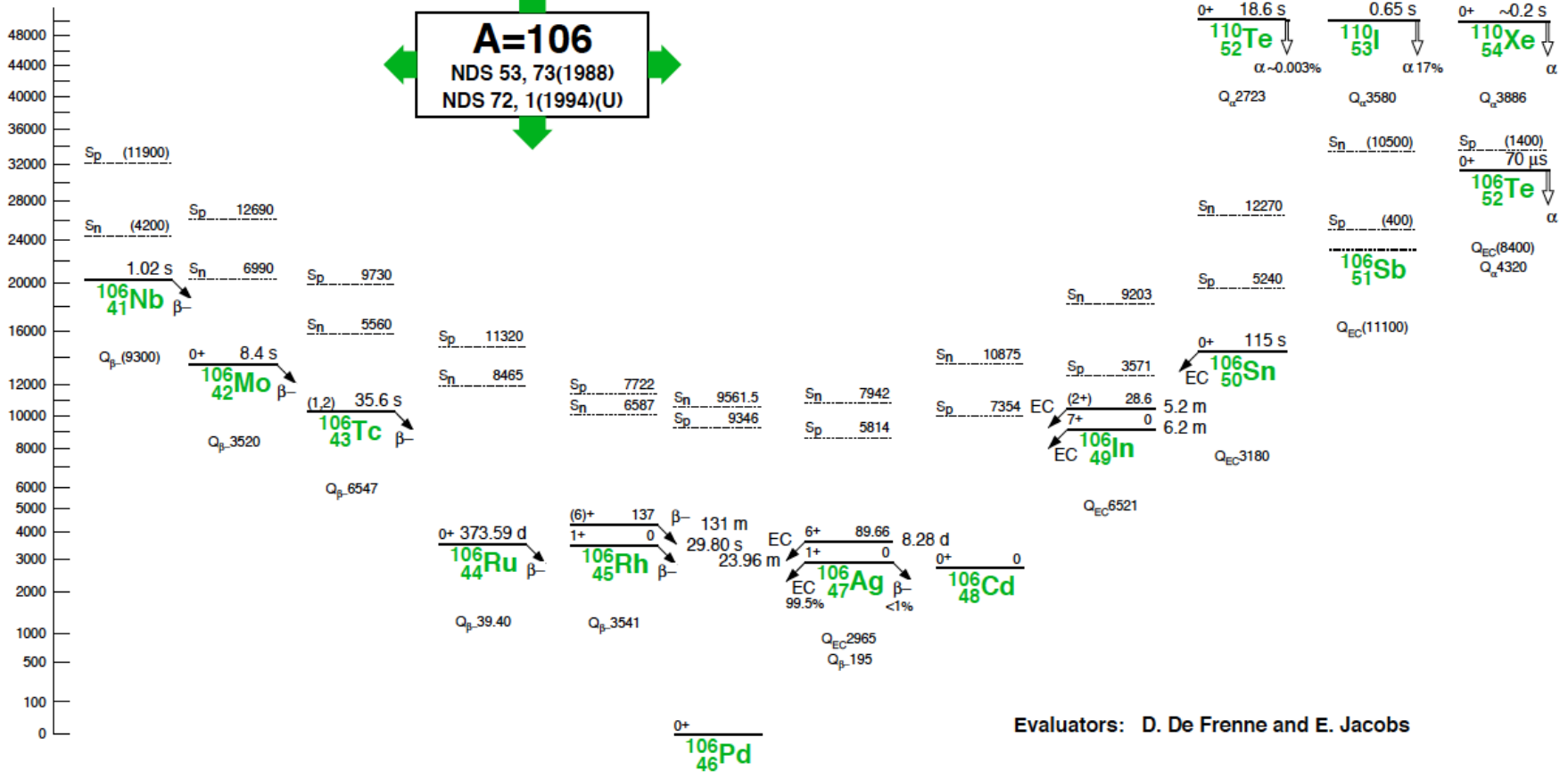
- Decay Q-value Range
- Q(??)
 - $Q(\beta^-) > 0$
 - $Q(\beta^-) - S_N > 0$
 - $Q(\beta^-) > 0 + Q(EC) > 0$
 - Stable to Beta Decay
 - $Q(EC) > 0$
 - $Q(EC) - S_p > 0$
 - $Q(P) > 0$
 - Naturally Abundant

Wiederholung: Bei Beta-Zerfall bleibt A konstant („Mutter“ und „Tochter“ Kerne sind Isobare); Weizäckersche Massenformel ist quadratisch in Z (siehe Übungsaufgabe)



(Bilder der Nuklidkarte:
Elemente: C, K, Cu, U, ...)

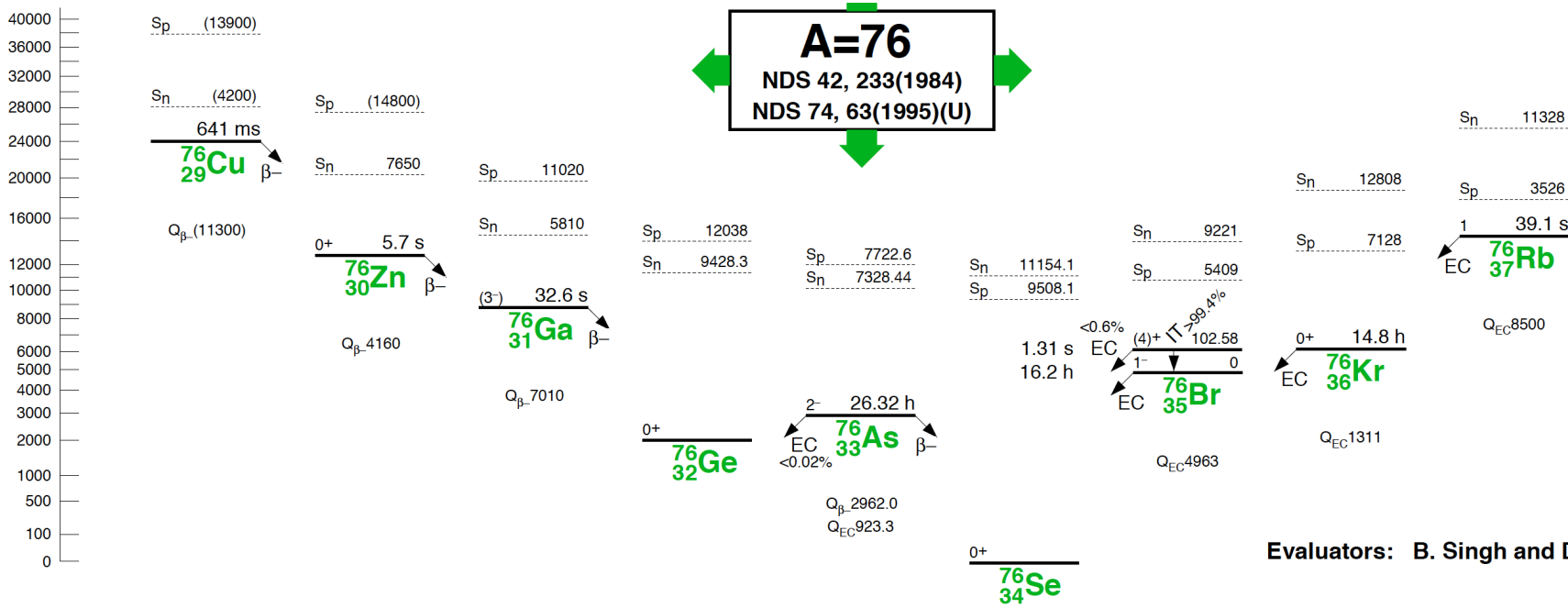
A=106
 NDS 53, 73(1988)
 NDS 72, 1(1994)(U)



Evaluators: D. De Frenne and E. Jacobs

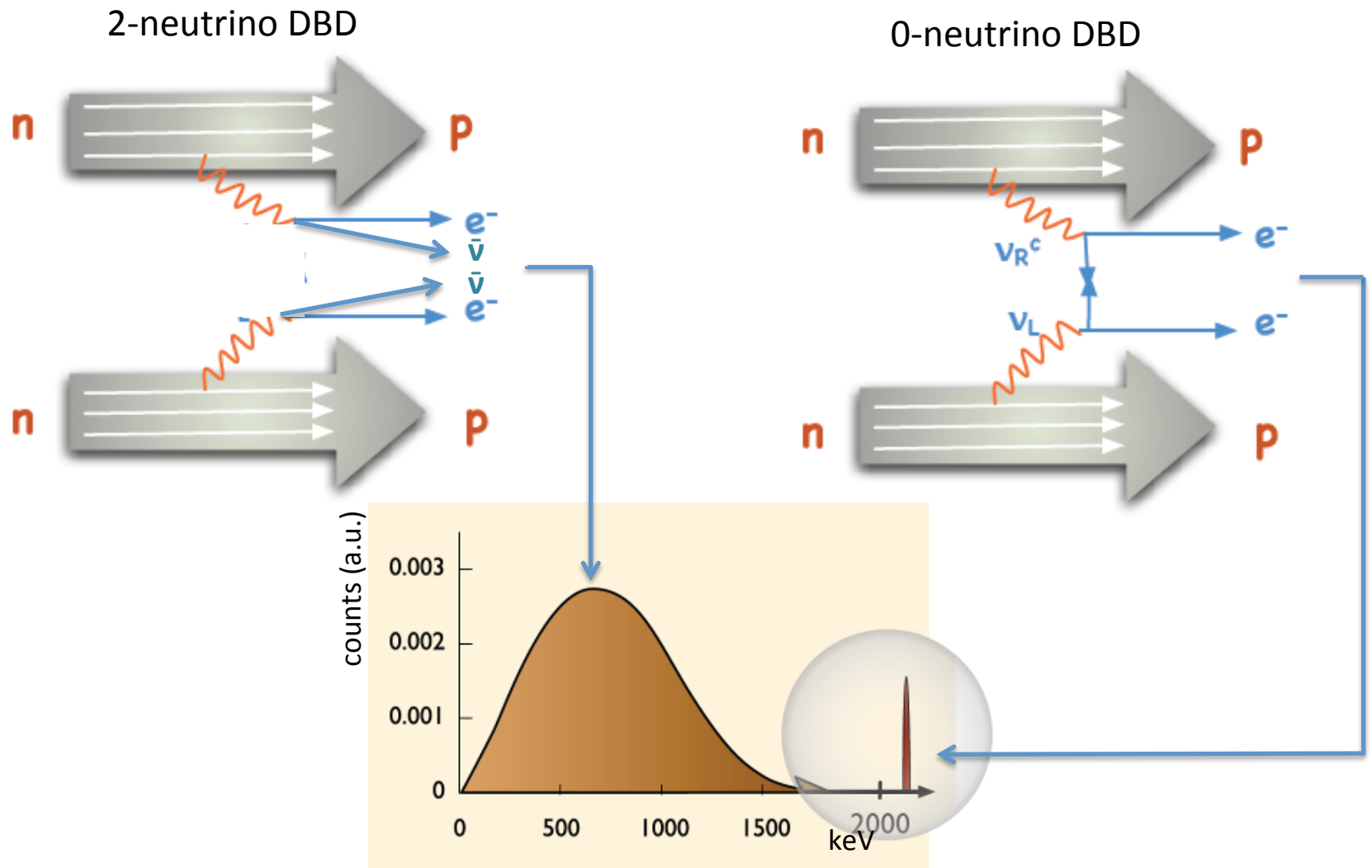
Double-beta decay of Ge-76

	Se74 0+ 0.89 *	Se75 119.779 d 5/2+ EC	Se76 0+ 9.36 *	Se77 1/2- 7.63 *	Se78 0+ 23.78	Se79 6.5E+4 y 7/2+ * β-
	As73 80.30 d 3/2- EC	As74 17.77 d 2- EC,β-	As75 3/2- 100 *	As76 26.32 h 2- EC,β-	As77 38.83 h 3/2- * β-	As78 90.7 m 2- β-
	Ge72 0+ 27.66 *	Ge73 9/2+ * 7.73	Ge74 0+ 35.94	Ge75 82.78 m 1/2- * β-	Ge76 0+ 7.44	Ge77 11.30 h 7/2+ * β-
	Ga71 3/2- * 39.892	Ga72 14.10 h 3- * β-	Ga73 4.86 h 3/2- * β-	Ga74 8.12 m (3-) * β-	Ga75 126 s 3/2- β-	Ga76 32.6 s (3-) β-

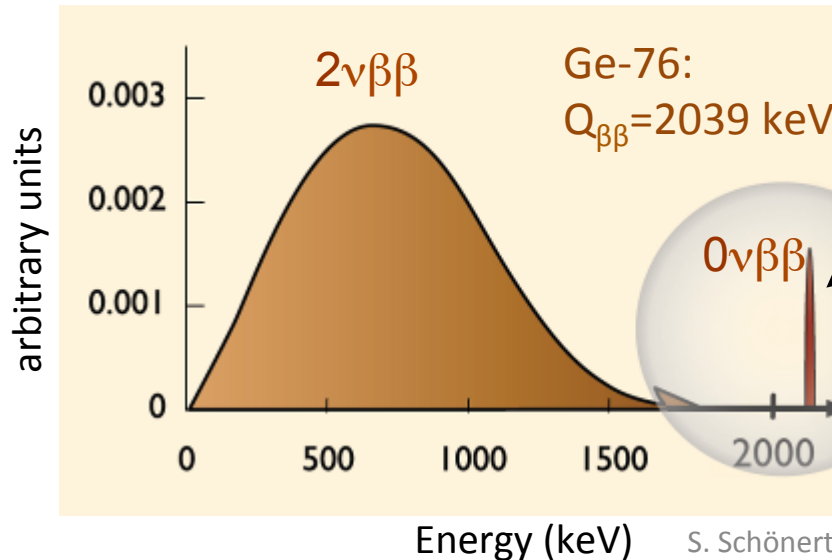
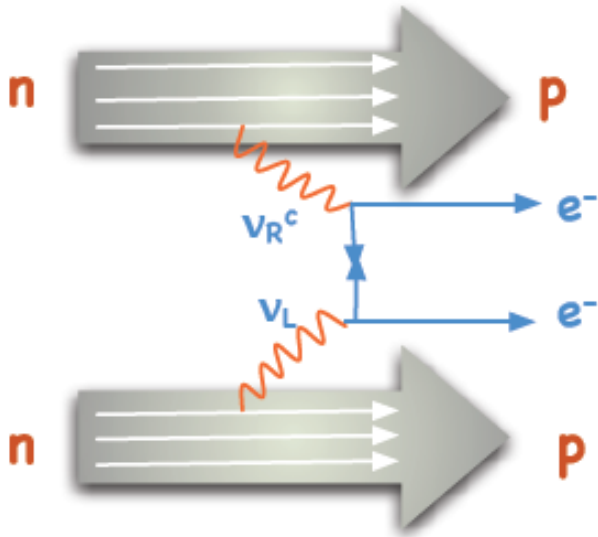


Evaluators: B. Singh and D.A. Viggars

$2\nu\beta\beta$ vs. $0\nu\beta\beta$ decay



2-electron spectra

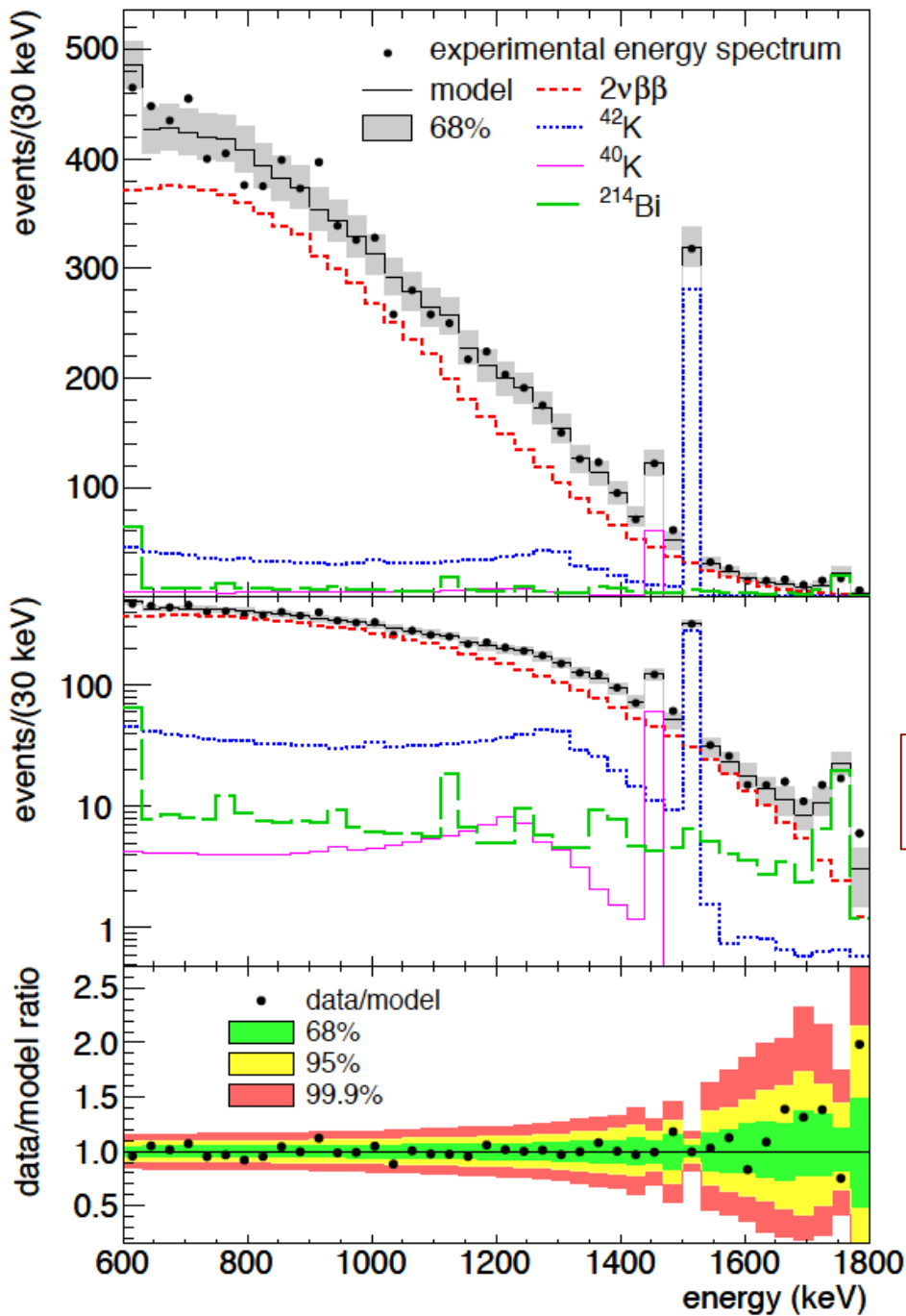


Experimental signatures:

- peak at $Q_{\beta\beta} = m(A,Z) - m(A,Z+2) - 2m_e$
- two electrons from vertex

Discovery would imply:

- lepton number violation $\Delta L = 2$
- ν 's have Majorana character
- mass scale & hierarchy
- physics beyond the standard model



$$T_{1/2}^{2\nu} = (1.84_{-0.08}^{+0.09}) \cdot 10^{21} \text{ yr},$$

Radioaktive Zerfallsketten

