14-Si Silicon

Silicon has three stable isotopes, but only two of them were investigated optically. Radioactive isotopes were not investigated. The listed radii are from muonic atoms and elastic electron scattering.

K X-ray measurements do not exist.

14.1.1 Optical measurements

14.1.1.1 Isotope shifts

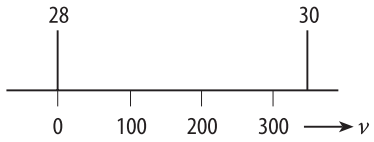
Stable isotopes: stable isotope ^{29}Si not investigated.
Radioactive isotopes: none
Total number of papers: 3

λ [nm]	Ref.	Measured isotope shifts $\delta\nu_{exp}$ [MHz]	
A		**28**	**30**
250.69	HH62[1])	0 ± 0	347.8 ± 6.0

[1]) ten more lines in the UV region are given in [HH62]

14.1.1.2 Isotope positions

The sequence for the stable isotopes for the transition Si I, $3s^2 3p^2\ ^3P_1 - 3s^2 3p4s\ ^3P_2$, wavelength λ **250.690 nm**, i.e. wavenumber σ = 39877.97 cm^{-1} is given in Fig. 1.



Frequency $\delta\nu^{A\text{-}28} = \nu(A) - \nu(28)$ [MHz]

Fig. 1. Optical isotope shift observed in the line λ 250.96 nm

14.1.3 Muonic atom data

14.1.3.1 Muonic 2p–1s transition energies, muonic Barrett radii, and model dependent RMS-radii

E_{exp}	Experimental muonic atom transition energies (center of gravity of 2p–1s); the error (given in parantheses) is the statistical one.
E_{theor}	Energy of the transition calculated using a two parameter Fermi distribution.
t	Skin thickness fixed at 2.30 fm.
c	Half-density radius fitted to reproduce the experimental transition energy.
NPol	Calculated nuclear polarization correction.
$< r^2 >^{1/2}_{model}$	RMS charge radius calculated from *t* and *c*, model dependent.
$R_{k\alpha}$	Model-independent Barrett equivalent radius; the parameters *k* and α are fitted to the corresponding transition; the first error is derived from the error of the experimental transition energy; the second error is estimated assuming as an upper limit a 30% error for the nuclear polarization corrections. For more details see Introduction Chapter 4.
C_z	Sensitivity factor $C_z = dR_{k\alpha} / dE$.

A	E_{exp} [keV]	E_{theo} [keV]	$Npol$ [keV]	c [fm]	$< r^2 >^{1/2}_{model}$ [fm]	α [1/fm]	k	C_z [10^{-3}fm/eV]	$R^{\mu}_{k\alpha}$ [fm]	Ref.
28	400.173(5)	400.173	0.055	3.1544(7)	3.123	0.0446	2.0621	–0.149	4.0112(7;25)	FHH92
29	400.375(45)	400.375	0.053	3.1482(86)	3.120	0.0446	2.0620	–0.149	4.0060(67;26)	FHH92
30	400.295(44)	400.295	0.051	3.1720(84)	3.134	0.0446	2.0622	–0.149	4.0250(66;26)	FHH92

14.1.3.2 Differences of Barrett-radii

The first error is derived from the error of the experimental transition energies. As an upper limit, the second error was estimated assuming a 10% error for the larger of the nuclear polarization corrections of the two isotopes. For more details see Introduction Chapter 4.

Isotope pair	$\Delta R^{\mu}_{k\alpha}$ [10^{-3} fm]
30 – 28	13.8 ± 6.0; ± 0.8
29 – 28	–5.2 ± 6.0; ± 0.8

14.1.4 Elastic electron scattering results

14.1.4.1 Root mean square nuclear charge radii $< r^2 >^{1/2}_e$

A	$< r^2 >^{1/2}_e$ [fm]	Ref.
28	3.106 ± 0.030	LYS74
	3.15 ±0.04	BJG77
	3.340 ± 0.018	Mi82
29	3.17 ± 0.05	BJG77
	3.079 ± 0.021	Mi82
30	3.176 ± 0.022	Mi82
	3.193 ± 0.013	WJL92

14.1.4.2 Changes of root mean square nuclear charge radii $\delta < r^2 >^{1/2}_e$

Isotope pair	$\delta < r^2 >^{1/2}_e$ [fm]	Ref.
30 – 28	0.03 ± 0.15	BJG77
29 – 28	–0.05 ± 0.25	BJG77

14.3 References for 14-Si

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