



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 01:55 PM UTC

PDB ID : 4W8I / pdb_00004w8i
Title : Crystal structure of LpSPL/Lpp2128, Legionella pneumophila sphingosine-1 phosphate lyase
Authors : Stogios, P.J.; Daniels, C.; Skarina, T.; Cuff, M.; Di Leo, R.; Savchenko, A.; Joachimiak, A.; Midwest Center for Structural Genomics (MCSG)
Deposited on : 2014-08-24
Resolution : 2.85 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 2.0
EDS : 3.0
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

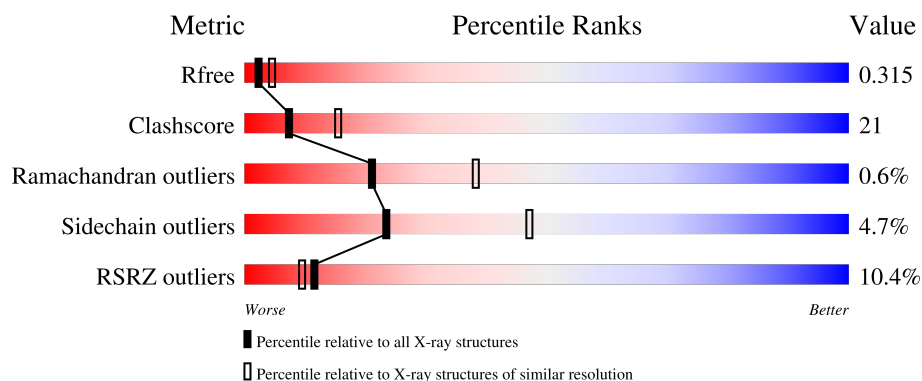
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.85 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	1407 (2.88-2.84)
Clashscore	190562	1446 (2.88-2.84)
Ramachandran outliers	187476	1406 (2.88-2.84)
Sidechain outliers	187428	1407 (2.88-2.84)
RSRZ outliers	180081	1408 (2.88-2.84)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	551	5% 43% 22% .. 34%
1	B	551	8% 39% 21% . 36%

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 5515 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called Probable sphingosine-1-phosphate lyase.

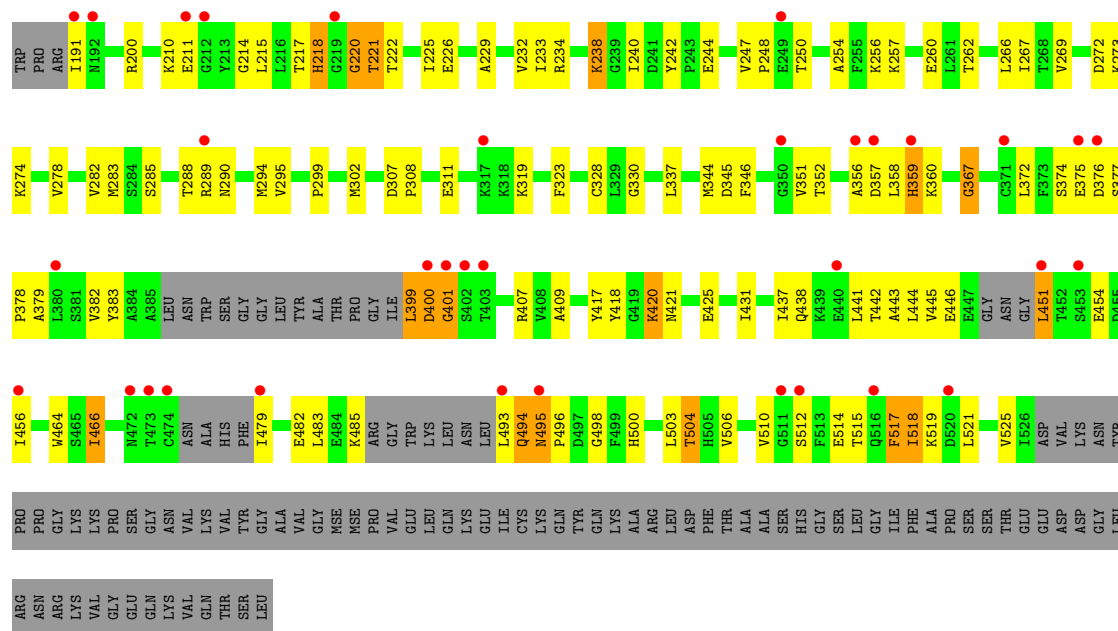
Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	363	Total	C	N	O	S	Se	0	0	0
			2784	1780	463	528	7	6			
1	B	354	Total	C	N	O	S	Se	0	0	0
			2715	1729	449	523	8	6			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	55	GLY	-	expression tag	UNP Q5X3A8
B	55	GLY	-	expression tag	UNP Q5X3A8

- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	12	Total	O	0	0
			12	12		
2	B	4	Total	O	0	0
			4	4		



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	57.78Å 118.25Å 57.79Å 90.00° 114.38° 90.00°	Depositor
Resolution (Å)	19.71 – 2.85 19.71 – 2.85	Depositor EDS
% Data completeness (in resolution range)	89.8 (19.71-2.85) 89.1 (19.71-2.85)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.07	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.44 (at 2.47Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.9_1692)	Depositor
R, R_{free}	0.262 , 0.316 0.266 , 0.315	Depositor DCC
R_{free} test set	1280 reflections (4.90%)	wwPDB-VP
Wilson B-factor (Å ²)	36.0	Xtriage
Anisotropy	0.630	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.31 , 60.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	0.047 for l,-k,h	Xtriage
F_o, F_c correlation	0.87	EDS
Total number of atoms	5515	wwPDB-VP
Average B, all atoms (Å ²)	65.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.44% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality [i](#)

5.1 Standard geometry [i](#)

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z >5	RMSZ	# Z >5
1	A	0.50	0/2833	0.99	10/3831 (0.3%)
1	B	0.53	0/2760	1.00	12/3727 (0.3%)
All	All	0.52	0/5593	1.00	22/7558 (0.3%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	2
1	B	0	2
All	All	0	4

There are no bond length outliers.

All (22) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	238	LYS	N-CA-C	10.34	122.63	111.36
1	B	482	GLU	N-CA-C	-8.58	102.94	113.41
1	B	359	HIS	N-CA-C	7.93	119.56	111.07
1	B	495	ASN	CA-C-N	-6.86	111.87	120.79
1	B	495	ASN	C-N-CA	-6.86	111.87	120.79
1	A	302	MSE	N-CA-C	6.36	118.21	111.28
1	B	496	PRO	N-CA-C	-5.73	101.22	110.74
1	A	449	ASN	N-CA-C	5.61	121.65	113.40
1	B	358	LEU	N-CA-C	5.53	117.30	111.28
1	B	170	LEU	N-CA-C	-5.49	105.30	111.28
1	A	114	LEU	N-CA-C	-5.48	103.15	110.55
1	B	221	THR	CA-C-N	5.46	127.59	120.28
1	B	221	THR	C-N-CA	5.46	127.59	120.28
1	A	495	ASN	CA-C-N	-5.31	113.21	119.84

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	495	ASN	C-N-CA	-5.31	113.21	119.84
1	B	307	ASP	CA-C-N	-5.24	113.29	119.84
1	B	307	ASP	C-N-CA	-5.24	113.29	119.84
1	B	400	ASP	N-CA-C	-5.23	99.66	110.80
1	A	493	LEU	N-CA-C	5.20	117.44	109.07
1	A	399	LEU	N-CA-C	5.19	116.63	111.07
1	A	115	SER	CA-C-N	-5.01	113.77	119.28
1	A	115	SER	C-N-CA	-5.01	113.77	119.28

There are no chirality outliers.

All (4) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	399	LEU	Peptide
1	A	449	ASN	Peptide
1	B	220	GLY	Peptide
1	B	454	GLU	Mainchain

5.2 Too-close contacts ⓘ

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2784	0	2773	104	0
1	B	2715	0	2684	134	0
2	A	12	0	0	1	0
2	B	4	0	0	0	0
All	All	5515	0	5457	225	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 21.

All (225) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:359:HIS:CD2	1:B:360:LYS:HG3	1.56	1.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:383:TYR:CE1	1:B:399:LEU:HD13	1.73	1.22
1:B:383:TYR:HE1	1:B:399:LEU:HD13	1.11	0.97
1:B:359:HIS:CD2	1:B:360:LYS:CG	2.51	0.90
1:B:383:TYR:CE1	1:B:399:LEU:CD1	2.54	0.89
1:B:359:HIS:NE2	1:B:360:LYS:HG3	1.88	0.86
1:B:359:HIS:HD2	1:B:360:LYS:HG3	1.40	0.86
1:B:383:TYR:CD1	1:B:399:LEU:HD13	2.11	0.84
1:B:493:LEU:HB3	1:B:498:GLY:O	1.75	0.84
1:B:221:THR:O	1:B:225:ILE:HD13	1.79	0.83
1:B:357:ASP:HB3	1:B:359:HIS:CE1	2.15	0.82
1:B:466:ILE:HD13	1:B:500:HIS:CE1	2.16	0.81
1:A:295:VAL:HG22	1:A:324:HIS:HB3	1.63	0.80
1:B:383:TYR:HE1	1:B:399:LEU:CD1	1.92	0.80
1:B:256:LYS:HG2	1:B:266:LEU:HD23	1.66	0.78
1:A:495:ASN:HB3	1:A:496:PRO:HD3	1.66	0.77
1:B:256:LYS:HG2	1:B:266:LEU:CD2	2.16	0.75
1:B:302:MSE:HB2	1:B:493:LEU:HD11	1.67	0.75
1:A:495:ASN:HB3	1:A:496:PRO:CD	2.17	0.75
1:A:367:GLY:O	1:A:407:ARG:NH2	2.20	0.74
1:A:483:LEU:HD11	1:A:490:LEU:HD22	1.69	0.74
1:A:494:GLN:HA	1:A:494:GLN:OE1	1.87	0.74
1:B:220:GLY:O	1:B:222:THR:N	2.19	0.74
1:A:443:ALA:O	1:A:444:LEU:HG	1.88	0.74
1:B:232:VAL:HG21	1:B:262:THR:HB	1.70	0.73
1:A:524:ALA:O	1:A:528:VAL:HG23	1.89	0.73
1:B:162:ILE:HD12	1:B:162:ILE:O	1.90	0.70
1:B:200:ARG:HD2	1:B:210:LYS:HE2	1.75	0.68
1:A:446:GLU:HG3	1:A:447:GLU:H	1.57	0.68
1:A:194:MSE:HE3	1:A:412:TYR:CB	2.22	0.68
1:B:375:GLU:OE1	1:B:375:GLU:N	2.26	0.68
1:B:220:GLY:N	1:B:357:ASP:OD1	2.27	0.68
1:A:194:MSE:HE1	1:A:409:ALA:HA	1.76	0.67
1:B:344:MSE:HE1	1:B:464:TRP:HZ2	1.58	0.66
1:B:383:TYR:CD1	1:B:399:LEU:CD1	2.76	0.66
1:A:194:MSE:SE	1:B:123:PHE:CE1	2.99	0.65
1:A:328:CYS:HA	1:A:356:ALA:HA	1.79	0.65
1:A:163:HIS:HB2	1:A:168:THR:HG23	1.79	0.65
1:A:448:GLY:O	1:A:450:GLY:HA2	1.97	0.65
1:A:495:ASN:CB	1:A:496:PRO:CD	2.74	0.65
1:A:225:ILE:HG22	1:A:258:ALA:HB2	1.79	0.64
1:A:220:GLY:N	1:A:357:ASP:OD1	2.29	0.64

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:200:ARG:HD2	1:B:107:GLU:HA	1.78	0.64
1:B:242:TYR:O	1:B:290:ASN:ND2	2.30	0.64
1:A:194:MSE:HE3	1:A:412:TYR:CG	2.33	0.63
1:B:225:ILE:HD12	1:B:225:ILE:N	2.13	0.63
1:B:256:LYS:O	1:B:260:GLU:HG3	1.98	0.63
1:A:221:THR:HG22	1:A:254:ALA:HB2	1.80	0.63
1:A:444:LEU:C	1:A:446:GLU:H	2.06	0.63
1:A:383:TYR:CE1	1:A:399:LEU:HG	2.33	0.62
1:A:504:THR:H	1:A:507:HIS:CD2	2.18	0.62
1:B:493:LEU:HB3	1:B:498:GLY:C	2.24	0.62
1:B:221:THR:O	1:B:225:ILE:CD1	2.46	0.62
1:B:367:GLY:O	1:B:407:ARG:NH2	2.33	0.62
1:A:173:GLU:OE2	1:B:172:LYS:NZ	2.33	0.61
1:A:192:ASN:OD1	1:A:193:ALA:N	2.28	0.61
1:B:221:THR:HG22	1:B:254:ALA:HB2	1.82	0.61
1:A:444:LEU:HD12	1:A:518:ILE:HG21	1.82	0.61
1:A:180:LEU:HD13	1:B:163:HIS:ND1	2.17	0.60
1:B:504:THR:HG22	1:B:506:VAL:HG12	1.82	0.60
1:B:211:GLU:N	1:B:211:GLU:OE1	2.35	0.59
1:A:197:GLU:OE2	1:A:200:ARG:NH2	2.36	0.59
1:A:421:ASN:ND2	1:B:111:GLU:O	2.31	0.59
1:B:299:PRO:HD2	1:B:330:GLY:HA3	1.84	0.59
1:A:433:LEU:HD11	1:A:513:PHE:HB3	1.84	0.58
1:A:284:SER:OG	1:A:319:LYS:NZ	2.36	0.58
1:B:466:ILE:HD13	1:B:500:HIS:ND1	2.18	0.58
1:A:398:ILE:O	1:B:257:LYS:NZ	2.35	0.57
1:A:504:THR:H	1:A:507:HIS:HD2	1.52	0.57
1:A:300:SER:OG	1:A:303:ASN:OD1	2.23	0.57
1:A:424:GLN:O	1:A:428:LYS:HG3	2.05	0.57
1:B:308:PRO:HB2	1:B:311:GLU:OE1	2.04	0.56
1:A:521:LEU:O	1:A:525:VAL:HG23	2.06	0.56
1:B:504:THR:HG22	1:B:506:VAL:H	1.69	0.56
1:B:328:CYS:O	1:B:357:ASP:HB2	2.06	0.56
1:A:444:LEU:HD12	1:A:518:ILE:CG2	2.36	0.55
1:B:302:MSE:HB2	1:B:493:LEU:CD1	2.35	0.55
1:A:386:LEU:HD12	1:A:399:LEU:CD2	2.37	0.55
1:B:344:MSE:HE1	1:B:464:TRP:CZ2	2.40	0.55
1:B:451:LEU:HD21	1:B:525:VAL:HG21	1.89	0.54
1:B:517:PHE:C	1:B:517:PHE:CD2	2.85	0.54
1:A:446:GLU:HG3	1:A:447:GLU:N	2.22	0.54
1:B:357:ASP:HB3	1:B:359:HIS:ND1	2.21	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:226:GLU:OE1	1:B:383:TYR:OH	2.26	0.54
1:B:493:LEU:CB	1:B:498:GLY:O	2.53	0.54
1:A:241:ASP:OD1	1:A:242:TYR:N	2.41	0.53
1:B:225:ILE:N	1:B:225:ILE:CD1	2.71	0.53
1:B:437:ILE:HD12	1:B:503:LEU:HD11	1.90	0.53
1:A:280:PRO:HG3	1:A:312:LEU:HD12	1.90	0.53
1:A:428:LYS:O	1:A:432:ARG:HG3	2.08	0.53
1:B:116:PRO:HB2	1:B:132:PHE:HB3	1.91	0.53
1:A:220:GLY:O	1:A:223:SER:N	2.43	0.52
1:A:449:ASN:N	1:A:450:GLY:HA3	2.25	0.52
1:B:165:LYS:HE3	1:B:169:GLU:OE1	2.10	0.52
1:B:250:THR:HA	1:B:302:MSE:SE	2.59	0.52
1:A:194:MSE:HE2	1:A:408:VAL:HG12	1.91	0.52
1:A:443:ALA:O	1:A:444:LEU:CG	2.55	0.52
1:A:210:LYS:NZ	1:A:211:GLU:OE2	2.43	0.52
1:B:512:SER:O	1:B:512:SER:OG	2.24	0.52
1:A:449:ASN:N	1:A:450:GLY:CA	2.73	0.52
1:A:162:ILE:HG22	1:A:163:HIS:O	2.10	0.51
1:A:443:ALA:C	1:A:444:LEU:HG	2.36	0.51
1:B:323:PHE:CD2	1:B:351:VAL:HG22	2.45	0.51
1:B:283:MSE:SE	1:B:294:MSE:HE3	2.61	0.51
1:A:443:ALA:O	1:A:444:LEU:CD2	2.59	0.51
1:B:220:GLY:O	1:B:221:THR:C	2.52	0.51
1:A:324:HIS:HD1	1:A:353:SER:HG	1.59	0.51
1:A:386:LEU:HD12	1:A:399:LEU:HD21	1.94	0.50
1:A:452:THR:OG1	1:A:453:SER:N	2.45	0.50
1:B:229:ALA:O	1:B:233:ILE:HG12	2.12	0.50
1:B:421:ASN:O	1:B:425:GLU:HG3	2.12	0.50
1:B:234:ARG:O	1:B:238:LYS:N	2.38	0.50
1:B:282:VAL:O	1:B:285:SER:OG	2.28	0.50
1:B:278:VAL:HG21	1:B:283:MSE:HE3	1.94	0.50
1:A:440:GLU:HB3	1:A:518:ILE:HD12	1.93	0.49
1:B:218:HIS:HB2	1:B:222:THR:HG21	1.94	0.49
1:B:443:ALA:O	1:B:444:LEU:C	2.52	0.49
1:B:256:LYS:CG	1:B:266:LEU:CD2	2.90	0.49
1:B:166:GLU:OE2	1:B:417:TYR:OH	2.24	0.49
1:B:218:HIS:ND1	1:B:218:HIS:N	2.59	0.49
1:B:256:LYS:HA	1:B:266:LEU:HD22	1.95	0.49
1:B:220:GLY:C	1:B:222:THR:N	2.69	0.49
1:B:352:THR:O	1:B:374:SER:N	2.41	0.48
1:B:248:PRO:HA	1:B:269:VAL:O	2.13	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:233:ILE:HG21	1:B:382:VAL:HG13	1.95	0.48
1:B:359:HIS:CG	1:B:360:LYS:N	2.82	0.48
1:B:479:ILE:O	1:B:483:LEU:HB2	2.14	0.47
1:A:231:TYR:O	1:A:234:ARG:NH1	2.46	0.47
1:B:506:VAL:O	1:B:510:VAL:HG23	2.13	0.47
1:B:514:GLU:HG2	1:B:515:THR:N	2.29	0.47
1:B:214:GLY:HA3	1:B:372:LEU:HD23	1.96	0.47
1:A:194:MSE:O	1:A:197:GLU:HB2	2.15	0.47
1:A:427:ALA:O	1:A:431:ILE:HG12	2.14	0.47
1:A:475:ASN:HB3	1:A:478:PHE:HD2	1.79	0.47
1:B:217:THR:HG21	1:B:226:GLU:HG3	1.97	0.47
1:A:253:ALA:O	1:A:257:LYS:HG2	2.15	0.47
1:A:322:PRO:HG3	1:A:378:PRO:HG2	1.97	0.47
1:A:440:GLU:O	1:A:444:LEU:HG	2.15	0.47
1:A:226:GLU:OE2	1:A:383:TYR:OH	2.28	0.47
1:A:443:ALA:O	1:A:444:LEU:HD23	2.16	0.46
1:B:485:LYS:HD2	1:B:485:LYS:N	2.31	0.46
1:A:202:CYS:O	1:A:206:PHE:HD2	1.99	0.46
1:A:454:GLU:HG3	1:A:472:ASN:HB2	1.96	0.46
1:A:492:LEU:HD12	1:A:492:LEU:H	1.80	0.46
1:A:173:GLU:CD	1:B:128:GLU:HG2	2.41	0.45
1:B:218:HIS:N	1:B:218:HIS:HD1	2.14	0.45
1:A:116:PRO:O	1:A:117:GLN:C	2.56	0.45
1:A:456:ILE:HD13	1:A:521:LEU:HD21	1.98	0.45
1:B:247:VAL:HG12	1:B:295:VAL:HB	1.97	0.45
1:B:466:ILE:CD1	1:B:500:HIS:CE1	2.96	0.45
1:A:231:TYR:O	1:A:234:ARG:HG3	2.17	0.45
1:A:448:GLY:HA3	1:A:449:ASN:OD1	2.16	0.45
1:A:437:ILE:HA	1:A:514:GLU:HB2	1.99	0.45
1:A:216:LEU:HA	1:A:216:LEU:HD12	1.81	0.45
1:A:420:LYS:HD2	1:B:111:GLU:HA	1.98	0.45
1:B:169:GLU:HG3	1:B:170:LEU:N	2.30	0.45
1:A:210:LYS:O	2:A:701:HOH:O	2.21	0.45
1:A:274:LYS:HA	1:A:459:TYR:CE1	2.52	0.45
1:B:127:VAL:N	1:B:128:GLU:HG3	2.32	0.45
1:B:504:THR:CG2	1:B:506:VAL:HG12	2.47	0.44
1:B:220:GLY:C	1:B:222:THR:H	2.25	0.44
1:A:444:LEU:CD1	1:A:518:ILE:CG2	2.95	0.44
1:B:443:ALA:O	1:B:445:VAL:N	2.51	0.44
1:A:218:HIS:HD2	1:A:222:THR:HG21	1.82	0.44
1:A:448:GLY:C	1:A:450:GLY:CA	2.90	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:377:SER:C	1:B:379:ALA:H	2.25	0.44
1:B:494:GLN:HB3	1:B:495:ASN:H	1.59	0.44
1:A:172:LYS:NZ	1:B:173:GLU:HG3	2.33	0.44
1:A:215:LEU:O	1:A:370:VAL:HA	2.18	0.43
1:A:295:VAL:HG13	1:A:324:HIS:O	2.18	0.43
1:A:474:CYS:SG	1:A:529:LYS:HG2	2.59	0.43
1:B:127:VAL:H	1:B:128:GLU:HG3	1.83	0.43
1:A:194:MSE:HE3	1:A:412:TYR:HB3	1.99	0.43
1:B:328:CYS:HA	1:B:356:ALA:HA	1.99	0.43
1:B:515:THR:OG1	1:B:519:LYS:HD3	2.19	0.43
1:B:517:PHE:O	1:B:521:LEU:N	2.52	0.43
1:A:112:GLU:CD	1:B:421:ASN:HD21	2.27	0.43
1:B:443:ALA:O	1:B:446:GLU:N	2.52	0.43
1:A:218:HIS:CD2	1:B:218:HIS:HD2	2.37	0.43
1:B:493:LEU:HD12	1:B:494:GLN:H	1.83	0.43
1:B:233:ILE:HB	1:B:382:VAL:HG21	2.00	0.43
1:B:323:PHE:CE2	1:B:351:VAL:HG22	2.54	0.43
1:B:517:PHE:CE2	1:B:518:ILE:HD12	2.54	0.43
1:B:220:GLY:HA2	1:B:357:ASP:OD2	2.19	0.42
1:B:272:ASP:OD1	1:B:274:LYS:NZ	2.35	0.42
1:A:220:GLY:O	1:A:221:THR:C	2.60	0.42
1:A:445:VAL:HA	1:A:451:LEU:O	2.18	0.42
1:B:345:ASP:HB2	1:B:346:PHE:H	1.69	0.42
1:A:257:LYS:HE3	1:A:257:LYS:HB3	1.79	0.42
1:B:244:GLU:HB3	1:B:267:ILE:HG12	2.00	0.42
1:A:232:VAL:HG13	1:A:243:PRO:HG2	2.01	0.42
1:A:244:GLU:OE1	1:A:288:THR:OG1	2.34	0.42
1:A:301:PHE:CZ	1:A:500:HIS:CE1	3.07	0.42
1:B:238:LYS:HE2	1:B:289:ARG:HH12	1.84	0.42
1:B:374:SER:HB3	1:B:376:ASP:OD1	2.20	0.42
1:B:444:LEU:C	1:B:446:GLU:H	2.26	0.42
1:A:437:ILE:O	1:A:518:ILE:HD11	2.18	0.42
1:B:288:THR:HG23	1:B:290:ASN:H	1.85	0.42
1:B:400:ASP:CG	1:B:401:GLY:H	2.28	0.42
1:B:456:ILE:HD12	1:B:521:LEU:HD21	2.00	0.42
1:B:200:ARG:HB2	1:B:210:LYS:NZ	2.35	0.42
1:B:337:LEU:HD13	1:B:431:ILE:HD11	2.02	0.42
1:B:163:HIS:NE2	1:B:418:TYR:OH	2.53	0.41
1:A:307:ASP:O	1:A:309:ILE:N	2.53	0.41
1:A:399:LEU:HA	1:B:257:LYS:CE	2.51	0.41
1:A:444:LEU:C	1:A:446:GLU:N	2.75	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:218:HIS:NE2	1:B:401:GLY:HA2	2.35	0.41
1:B:233:ILE:HG22	1:B:382:VAL:HG22	2.02	0.41
1:B:165:LYS:O	1:B:169:GLU:HG2	2.21	0.41
1:B:274:LYS:N	1:B:274:LYS:HD3	2.36	0.41
1:B:438:GLN:O	1:B:442:THR:HG23	2.20	0.41
1:B:483:LEU:HD11	1:B:521:LEU:HA	2.01	0.41
1:A:265:ILE:HD12	1:A:265:ILE:N	2.35	0.41
1:B:323:PHE:O	1:B:323:PHE:CG	2.74	0.41
1:A:215:LEU:CD2	1:A:398:ILE:HD13	2.51	0.41
1:B:162:ILE:HD12	1:B:162:ILE:C	2.45	0.41
1:B:234:ARG:HD2	1:B:378:PRO:HB2	2.02	0.41
1:A:302:MSE:HB3	1:A:302:MSE:HE2	1.76	0.41
1:B:357:ASP:HB3	1:B:359:HIS:HE1	1.80	0.41
1:B:420:LYS:HB3	1:B:420:LYS:HE3	1.42	0.40
1:B:174:VAL:CG2	1:B:409:ALA:HB1	2.51	0.40
1:B:357:ASP:CB	1:B:359:HIS:CE1	2.93	0.40
1:A:221:THR:O	1:A:225:ILE:HG12	2.21	0.40
1:A:399:LEU:HA	1:B:257:LYS:HE3	2.03	0.40
1:A:272:ASP:HB3	1:A:275:THR:HB	2.04	0.40

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	351/551 (64%)	323 (92%)	27 (8%)	1 (0%)	36	54
1	B	338/551 (61%)	295 (87%)	40 (12%)	3 (1%)	14	28
All	All	689/1102 (62%)	618 (90%)	67 (10%)	4 (1%)	21	38

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	495	ASN
1	B	494	GLN
1	B	401	GLY
1	B	367	GLY

5.3.2 Protein sidechains ⓘ

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	299/448 (67%)	288 (96%)	11 (4%)	30	55
1	B	294/448 (66%)	277 (94%)	17 (6%)	18	38
All	All	593/896 (66%)	565 (95%)	28 (5%)	23	47

All (28) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	109	ILE
1	A	112	GLU
1	A	165	LYS
1	A	238	LYS
1	A	252	HIS
1	A	268	THR
1	A	321	VAL
1	A	368	THR
1	A	458	VAL
1	A	494	GLN
1	A	506	VAL
1	B	112	GLU
1	B	173	GLU
1	B	191	ILE
1	B	215	LEU
1	B	218	HIS
1	B	238	LYS
1	B	240	ILE
1	B	273	LYS
1	B	319	LYS

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Mol	Chain	Res	Type
1	B	399	LEU
1	B	420	LYS
1	B	441	LEU
1	B	451	LEU
1	B	466	ILE
1	B	504	THR
1	B	517	PHE
1	B	518	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	204	ASN
1	A	218	HIS
1	A	314	GLN
1	A	359	HIS
1	A	491	ASN
1	B	421	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

There are no ligands in this entry.

5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q < 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ > 2		OWAB(Å ²)	Q < 0.9
1	A	357/551 (64%)	0.62	28 (7%)	19 14	30, 52, 110, 149	0
1	B	348/551 (63%)	0.85	45 (12%)	7 5	35, 60, 135, 172	0
All	All	705/1102 (63%)	0.73	73 (10%)	11 9	30, 57, 127, 172	0

All (73) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	400	ASP	5.3
1	A	111	GLU	4.9
1	B	357	ASP	4.6
1	B	131	HIS	4.5
1	B	169	GLU	4.4
1	B	289	ARG	4.2
1	B	472	ASN	4.2
1	B	495	ASN	3.8
1	B	402	SER	3.8
1	B	132	PHE	3.7
1	B	133	ASP	3.6
1	A	482	GLU	3.5
1	B	375	GLU	3.4
1	A	197	GLU	3.4
1	B	107	GLU	3.4
1	B	317	LYS	3.3
1	B	474	CYS	3.1
1	A	117	GLN	3.1
1	B	516	GLN	3.1
1	B	473	THR	3.1
1	A	290	ASN	3.0
1	B	520	ASP	3.0
1	A	125	VAL	3.0
1	B	212	GLY	2.9

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Mol	Chain	Res	Type	RSRZ
1	A	124	ASP	2.9
1	B	479	ILE	2.9
1	B	249	GLU	2.8
1	A	483	LEU	2.8
1	A	445	VAL	2.7
1	B	512	SER	2.7
1	A	192	ASN	2.7
1	B	211	GLU	2.7
1	A	317	LYS	2.6
1	B	127	VAL	2.6
1	B	192	ASN	2.6
1	B	376	ASP	2.6
1	B	401	GLY	2.6
1	B	359	HIS	2.5
1	A	451	LEU	2.5
1	A	495	ASN	2.5
1	A	485	LYS	2.5
1	B	371	CYS	2.5
1	A	118	ASP	2.5
1	A	180	LEU	2.5
1	B	191	ILE	2.4
1	A	211	GLU	2.4
1	B	350	GLY	2.4
1	B	511	GLY	2.4
1	A	401	GLY	2.4
1	B	130	CYS	2.4
1	A	286	TYR	2.4
1	A	285	SER	2.3
1	B	403	THR	2.3
1	B	453	SER	2.3
1	B	380	LEU	2.3
1	A	376	ASP	2.2
1	A	528	VAL	2.2
1	B	129	LYS	2.2
1	B	440	GLU	2.2
1	B	126	ASP	2.2
1	B	451	LEU	2.1
1	A	158	ALA	2.1
1	A	527	ASP	2.1
1	A	234	ARG	2.1
1	B	356	ALA	2.1
1	B	219	GLY	2.1

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Mol	Chain	Res	Type	RSRZ
1	B	179	ALA	2.1
1	B	160	TYR	2.1
1	A	440	GLU	2.0
1	B	493	LEU	2.0
1	A	276	GLY	2.0
1	B	456	ILE	2.0
1	A	481	ASP	2.0

6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

There are no ligands in this entry.

6.5 Other polymers [i](#)

There are no such residues in this entry.