



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 03:18 PM UTC

PDB ID : 2IOB / pdb_00002iob
Title : E. coli Bifunctional glutathionylspermidine synthetase/amidase Apo protein
Authors : Pai, C.H.; Chiang, B.Y.; Ko, T.P.; Chou, C.C.; Chong, C.M.; Yen, F.J.;
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Deposited on : 2006-10-10
Resolution : 2.20 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
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

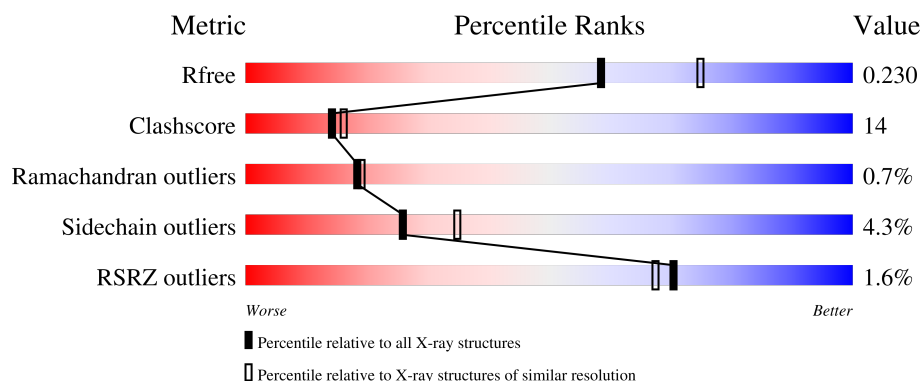
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.20 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	6164 (2.20-2.20)
Clashscore	190562	6851 (2.20-2.20)
Ramachandran outliers	187476	6768 (2.20-2.20)
Sidechain outliers	187428	6769 (2.20-2.20)
RSRZ outliers	180081	6166 (2.20-2.20)

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	619	2% 66% 22% 8%
1	B	619	2% 66% 24% 6%

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 10550 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 Bifunctional glutathionylspermidine synthetase/amidase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	571	Total	C	N	O	S	0	0	0
			4623	2964	787	854	18			
1	B	582	Total	C	N	O	S	0	0	0
			4703	3014	799	872	18			

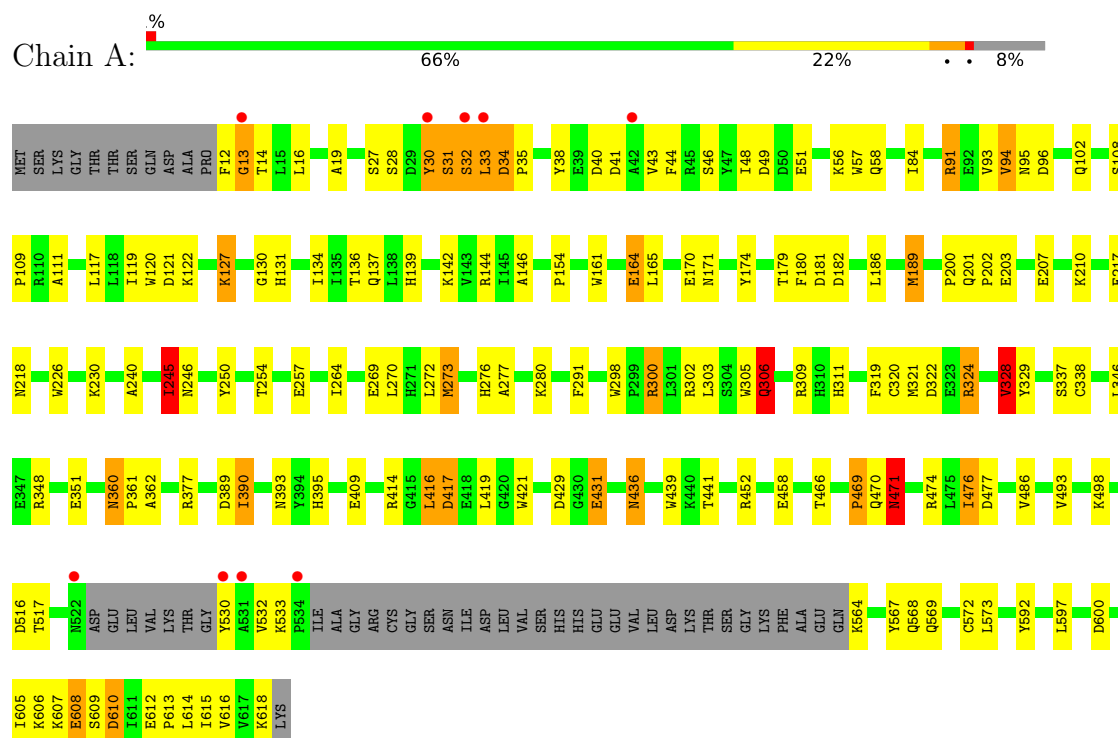
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	596	Total	O	0	0
			596	596		
2	B	628	Total	O	0	0
			628	628		

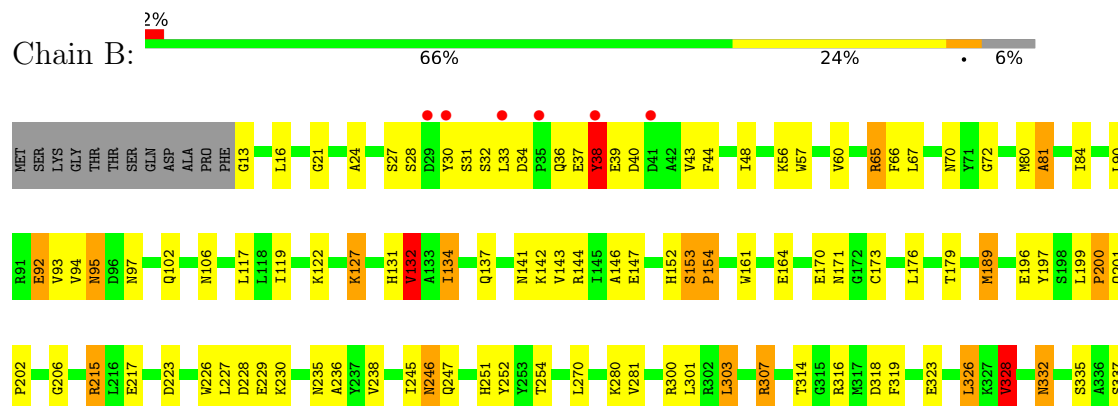
3 Residue-property plots [i](#)

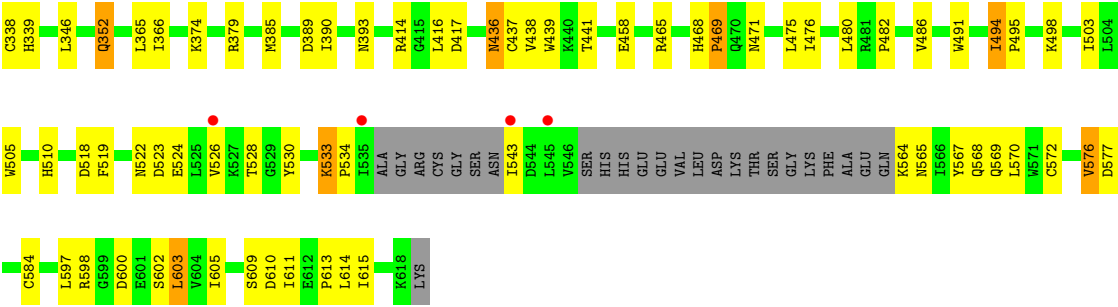
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

- Molecule 1: Bifunctional glutathionylspermidine synthetase/amidase



- Molecule 1: Bifunctional glutathionylspermidine synthetase/amidase





4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	149.27Å 92.96Å 108.30Å 90.00° 109.37° 90.00°	Depositor
Resolution (Å)	50.00 – 2.20 50.00 – 2.20	Depositor EDS
% Data completeness (in resolution range)	(Not available) (50.00-2.20) 94.9 (50.00-2.20)	Depositor EDS
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.32 (at 2.20Å)	Xtriage
Refinement program	XTALVIEW	Depositor
R, R_{free}	0.175 , 0.236 0.172 , 0.230	Depositor DCC
R_{free} test set	3431 reflections (5.09%)	wwPDB-VP
Wilson B-factor (Å ²)	29.8	Xtriage
Anisotropy	0.472	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 63.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	10550	wwPDB-VP
Average B, all atoms (Å ²)	38.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.76% 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

5.1 Standard geometry

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	1.05	6/4744 (0.1%)	1.22	28/6445 (0.4%)
1	B	1.06	6/4823 (0.1%)	1.19	31/6553 (0.5%)
All	All	1.06	12/9567 (0.1%)	1.21	59/12998 (0.5%)

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	B	0	1

All (12) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	189	MET	SD-CE	-14.95	1.42	1.79
1	A	189	MET	SD-CE	-9.18	1.56	1.79
1	B	494	ILE	CA-CB	8.65	1.59	1.54
1	A	273	MET	SD-CE	-7.22	1.61	1.79
1	A	321	MET	SD-CE	-7.00	1.62	1.79
1	B	80	MET	SD-CE	6.81	1.96	1.79
1	B	238	VAL	CA-CB	6.50	1.62	1.54
1	B	385	MET	SD-CE	5.87	1.94	1.79
1	A	306	GLN	CB-CG	-5.40	1.36	1.52
1	B	106	ASN	CA-C	5.35	1.59	1.52
1	A	277	ALA	CA-C	5.15	1.59	1.52
1	A	471	ASN	CA-C	5.05	1.59	1.53

All (59) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	93	VAL	N-CA-C	10.11	120.12	110.42
1	A	417	ASP	N-CA-C	9.76	121.92	111.28

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	328	VAL	CB-CA-C	-9.44	97.94	111.34
1	B	417	ASP	N-CA-C	9.28	121.40	111.28
1	B	93	VAL	N-CA-C	9.17	119.22	110.42
1	A	40	ASP	N-CA-C	8.20	121.33	111.82
1	B	576	VAL	CA-C-N	-8.19	111.08	122.87
1	B	576	VAL	C-N-CA	-8.19	111.08	122.87
1	B	523	ASP	N-CA-C	-8.15	103.47	113.50
1	A	390	ILE	N-CA-C	7.96	118.74	110.62
1	B	390	ILE	N-CA-C	7.70	119.39	110.62
1	A	130	GLY	N-CA-C	-7.38	99.55	112.53
1	B	328	VAL	CB-CA-C	-7.30	100.97	111.34
1	B	441	THR	N-CA-C	-7.03	104.73	113.38
1	A	441	THR	N-CA-C	-6.99	104.90	113.50
1	B	365	LEU	N-CA-C	6.94	119.49	111.02
1	B	439	TRP	N-CA-C	-6.77	97.87	108.90
1	A	486	VAL	N-CA-C	6.72	118.72	108.71
1	B	486	VAL	N-CA-C	6.54	118.46	108.71
1	B	611	ILE	N-CA-C	-6.54	100.32	109.21
1	A	33	LEU	N-CA-C	6.36	116.63	108.24
1	A	217	GLU	N-CA-C	-6.27	100.12	109.15
1	B	200	PRO	N-CA-C	-6.22	101.29	111.68
1	A	94	VAL	N-CA-C	6.20	116.87	110.36
1	A	466	THR	N-CA-C	-6.18	103.90	112.30
1	A	109	PRO	N-CA-C	-6.17	106.15	113.86
1	B	610	ASP	N-CA-C	6.07	119.06	110.50
1	B	90	LEU	N-CA-C	-5.96	100.19	109.72
1	B	65	ARG	NE-CZ-NH2	-5.88	113.91	119.20
1	B	533	LYS	CA-C-N	5.77	125.53	119.76
1	B	533	LYS	C-N-CA	5.77	125.53	119.76
1	B	132	VAL	CB-CA-C	-5.76	100.75	110.71
1	A	108	SER	N-CA-C	5.71	118.58	110.24
1	A	58	GLN	N-CA-C	5.67	117.84	110.53
1	A	439	TRP	N-CA-C	-5.66	99.29	108.52
1	B	227	LEU	N-CA-C	-5.60	101.05	109.95
1	A	245	ILE	N-CA-C	-5.58	97.74	109.34
1	B	236	ALA	N-CA-C	-5.56	105.22	111.28
1	A	164	GLU	N-CA-C	-5.50	100.73	109.59
1	B	438	VAL	N-CA-C	5.45	116.33	108.48
1	B	223	ASP	N-CA-C	5.44	119.18	112.54
1	A	180	PHE	N-CA-C	-5.40	101.77	110.14
1	B	217	GLU	N-CA-C	-5.36	101.91	109.96
1	B	48	ILE	N-CA-C	-5.35	98.78	107.28

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	298	TRP	CA-C-N	-5.30	113.17	119.05
1	A	298	TRP	C-N-CA	-5.30	113.17	119.05
1	A	19	ALA	N-CA-C	-5.29	104.04	110.13
1	B	92	GLU	N-CA-C	-5.29	101.16	109.25
1	B	524	GLU	N-CA-C	-5.26	105.46	111.14
1	A	127	LYS	N-CA-C	5.25	121.97	110.80
1	B	134	ILE	CB-CA-C	-5.17	103.12	110.83
1	A	409	GLU	N-CA-C	-5.16	102.42	110.42
1	A	250	TYR	N-CA-C	-5.10	107.06	113.28
1	A	300	ARG	NE-CZ-NH1	-5.09	116.41	121.50
1	A	200	PRO	N-CA-C	-5.09	103.20	111.19
1	B	81	ALA	N-CA-C	5.05	117.44	111.33
1	A	610	ASP	N-CA-C	5.05	117.76	110.28
1	B	146	ALA	N-CA-C	-5.02	101.57	109.50
1	B	179	THR	N-CA-C	-5.01	106.94	113.16

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	B	567	TYR	Sidechain

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	4623	0	4486	141	0
1	B	4703	0	4576	123	0
2	A	596	0	0	13	0
2	B	628	0	0	25	0
All	All	10550	0	9062	261	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 14.

All (261) 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:A:84:ILE:HG22	1:A:189:MET:HE1	1.20	1.11
1:B:84:ILE:HG22	1:B:189:MET:HE1	1.28	1.11
1:A:269:GLU:HG2	1:A:273:MET:HE2	1.22	1.09
1:B:24:ALA:O	1:B:65:ARG:NH2	2.00	0.94
1:A:269:GLU:HG2	1:A:273:MET:CE	1.99	0.92
1:A:28:SER:HG	1:A:30:TYR:HE1	1.08	0.91
1:B:534:PRO:HA	1:B:565:ASN:ND2	1.86	0.89
1:A:516:ASP:H	1:A:569:GLN:HE21	0.90	0.88
1:B:316:ARG:HD3	1:B:584:CYS:HB3	1.58	0.83
1:B:533:LYS:HG2	1:B:543:ILE:HD12	1.63	0.80
1:A:33:LEU:HG	1:A:34:ASP:H	1.48	0.79
1:A:416:LEU:HD23	1:A:419:LEU:HD12	1.64	0.78
1:A:516:ASP:H	1:A:569:GLN:NE2	1.76	0.78
1:A:280:LYS:HE2	2:A:841:HOH:O	1.83	0.78
1:A:322:ASP:OD2	1:A:324:ARG:NH1	2.18	0.77
1:B:142:LYS:HE3	1:B:164:GLU:HG2	1.65	0.77
1:B:229:GLU:O	1:B:235:ASN:HB2	1.84	0.77
1:B:84:ILE:HG22	1:B:189:MET:CE	2.14	0.75
1:A:516:ASP:N	1:A:569:GLN:HE21	1.75	0.75
1:B:28:SER:H	1:B:152:HIS:HE1	1.33	0.74
1:B:40:ASP:O	1:B:43:VAL:HG22	1.90	0.71
1:B:303:LEU:HD13	1:B:307:ARG:NH1	2.05	0.71
1:A:139:HIS:ND1	1:A:144:ARG:NH2	2.38	0.71
1:B:543:ILE:HG12	2:B:900:HOH:O	1.92	0.69
1:A:41:ASP:HB3	1:A:43:VAL:HG22	1.74	0.68
1:B:332:ASN:HD21	1:B:335:SER:H	1.41	0.68
1:B:141:ASN:HB3	2:B:662:HOH:O	1.94	0.68
1:B:144:ARG:HD3	1:B:161:TRP:CD1	2.29	0.67
1:B:13:GLY:N	2:B:940:HOH:O	2.26	0.67
1:A:311:HIS:HE2	1:A:377:ARG:NH2	1.91	0.67
1:A:170:GLU:HG2	1:A:171:ASN:ND2	2.10	0.66
1:A:84:ILE:CG2	1:A:189:MET:HE1	2.13	0.66
1:A:119:ILE:CG1	1:A:189:MET:HE2	2.26	0.66
1:A:606:LYS:NZ	1:A:607:LYS:HZ1	1.94	0.65
1:B:576:VAL:O	2:B:1069:HOH:O	2.13	0.65
1:A:606:LYS:CD	1:A:607:LYS:H	2.09	0.65
1:A:144:ARG:HD2	1:A:161:TRP:CD1	2.31	0.65
1:A:306:GLN:NE2	2:A:1036:HOH:O	2.29	0.65
1:A:119:ILE:HG13	1:A:189:MET:HE2	1.79	0.65
1:A:393:ASN:HD21	1:A:414:ARG:HE	1.45	0.64
1:A:606:LYS:NZ	1:A:607:LYS:NZ	2.45	0.64
1:A:171:ASN:HA	2:A:837:HOH:O	1.97	0.64

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:534:PRO:HA	1:B:565:ASN:HD22	1.62	0.64
1:B:534:PRO:HD2	1:B:543:ILE:HD13	1.79	0.64
1:A:121:ASP:OD1	1:A:122:LYS:N	2.28	0.63
1:A:322:ASP:OD1	1:A:324:ARG:HG3	1.99	0.63
1:A:564:LYS:HE3	2:A:1137:HOH:O	1.98	0.63
1:A:181:ASP:HB2	2:A:939:HOH:O	1.98	0.63
1:A:329:TYR:HE1	1:A:573:LEU:HD21	1.63	0.63
1:B:28:SER:H	1:B:152:HIS:CE1	2.15	0.62
1:B:95:ASN:ND2	2:B:864:HOH:O	2.32	0.61
1:A:606:LYS:HD2	1:A:607:LYS:H	1.65	0.61
1:B:300:ARG:NH1	2:B:1181:HOH:O	2.34	0.61
1:B:498:LYS:HE3	1:B:534:PRO:O	2.00	0.60
1:B:494:ILE:HB	1:B:495:PRO:HD3	1.84	0.60
1:A:12:PHE:CG	1:A:13:GLY:N	2.62	0.60
1:A:303:LEU:HD21	1:B:72:GLY:HA3	1.83	0.60
1:A:28:SER:OG	1:A:30:TYR:HE1	1.80	0.59
1:B:119:ILE:CD1	1:B:132:VAL:HG13	2.32	0.59
1:B:436:ASN:C	1:B:436:ASN:HD22	2.10	0.59
1:A:269:GLU:CG	1:A:273:MET:HE2	2.15	0.59
1:B:366:ILE:HG12	2:B:1143:HOH:O	2.03	0.59
1:A:240:ALA:HB2	1:A:390:ILE:HG22	1.84	0.58
1:B:122:LYS:HB2	1:B:127:LYS:O	2.02	0.58
1:A:606:LYS:HZ2	1:A:607:LYS:NZ	2.01	0.58
1:A:431:GLU:HG2	2:A:1103:HOH:O	2.03	0.58
1:B:21:GLY:HA3	1:B:70:ASN:HD21	1.68	0.58
1:A:416:LEU:HD23	1:A:419:LEU:CD1	2.33	0.58
1:B:465:ARG:HD3	2:B:1016:HOH:O	2.03	0.58
1:B:605:ILE:HG23	1:B:609:SER:OG	2.03	0.58
1:B:34:ASP:OD2	1:B:36:GLN:HB3	2.03	0.57
1:B:246:ASN:H	1:B:246:ASN:HD22	1.52	0.57
1:A:31:SER:O	1:A:33:LEU:N	2.38	0.57
1:B:389:ASP:OD2	1:B:389:ASP:C	2.46	0.56
1:B:206:GLY:O	1:B:323:GLU:HA	2.05	0.56
1:A:121:ASP:HB2	1:A:186:LEU:HG	1.88	0.56
1:A:416:LEU:HD13	2:A:976:HOH:O	2.05	0.56
1:B:31:SER:C	1:B:33:LEU:H	2.14	0.56
1:B:81:ALA:HB1	1:B:132:VAL:HG22	1.87	0.55
1:A:84:ILE:HG22	1:A:189:MET:CE	2.14	0.55
1:A:469:PRO:CB	1:A:470:GLN:HE22	2.19	0.55
1:A:38:TYR:HA	1:A:44:PHE:CD1	2.42	0.55
1:B:572:CYS:HB3	1:B:603:LEU:HD21	1.88	0.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:603:LEU:HD22	2:B:790:HOH:O	2.07	0.55
1:A:207:GLU:OE2	1:A:210:LYS:HE2	2.06	0.54
1:A:270:LEU:HA	1:A:273:MET:HE3	1.89	0.54
1:B:173:CYS:HB2	2:B:742:HOH:O	2.07	0.54
1:A:38:TYR:HA	1:A:44:PHE:CE1	2.43	0.54
1:A:474:ARG:HB2	1:A:477:ASP:OD2	2.07	0.54
1:B:251:HIS:HE1	1:B:577:ASP:OD2	1.90	0.54
1:B:498:LYS:HG2	2:B:764:HOH:O	2.06	0.54
1:B:600:ASP:OD1	1:B:602:SER:HB3	2.08	0.54
1:B:171:ASN:HD22	1:B:171:ASN:C	2.15	0.54
1:B:228:ASP:OD1	1:B:228:ASP:C	2.50	0.53
1:B:92:GLU:HG2	2:B:864:HOH:O	2.07	0.53
1:B:27:SER:HB2	1:B:152:HIS:ND1	2.23	0.53
1:B:66:PHE:CE2	1:B:134:ILE:HG21	2.43	0.53
1:A:517:THR:HG23	1:A:568:GLN:HB2	1.90	0.53
1:B:316:ARG:HD2	1:B:318:ASP:OD1	2.07	0.53
1:B:131:HIS:HE1	1:B:147:GLU:OE1	1.92	0.53
1:B:143:VAL:HG21	1:B:176:LEU:HD21	1.91	0.53
1:A:320:CYS:HB2	1:A:329:TYR:CZ	2.44	0.52
1:B:131:HIS:HD2	2:B:879:HOH:O	1.92	0.52
1:B:228:ASP:OD1	1:B:230:LYS:N	2.35	0.52
1:B:337:SER:O	1:B:338:CYS:HB2	2.08	0.52
1:B:522:ASN:O	1:B:526:VAL:HG23	2.09	0.52
1:B:568:GLN:HG2	2:B:1117:HOH:O	2.10	0.52
1:B:280:LYS:HD3	1:B:503:ILE:HG23	1.90	0.52
1:B:60:VAL:HG12	2:B:685:HOH:O	2.09	0.52
1:B:332:ASN:C	1:B:332:ASN:HD22	2.18	0.52
1:B:30:TYR:O	1:B:33:LEU:HB2	2.09	0.52
1:A:469:PRO:CB	1:A:470:GLN:NE2	2.73	0.51
1:A:139:HIS:CG	1:A:144:ARG:HH21	2.27	0.51
1:A:245:ILE:HG23	1:A:246:ASN:N	2.25	0.51
1:A:96:ASP:O	1:A:276:HIS:CE1	2.63	0.51
1:A:606:LYS:O	1:A:609:SER:HB2	2.10	0.51
1:B:352:GLN:NE2	1:B:352:GLN:HA	2.26	0.51
1:A:56:LYS:HD3	1:A:57:TRP:CZ2	2.45	0.51
1:B:56:LYS:NZ	2:B:682:HOH:O	2.44	0.51
1:B:171:ASN:O	1:B:171:ASN:ND2	2.44	0.50
1:B:300:ARG:NH2	1:B:482:PRO:HG3	2.27	0.50
1:A:30:TYR:O	1:A:31:SER:C	2.53	0.50
1:B:119:ILE:HD13	1:B:132:VAL:HG13	1.93	0.50
1:B:122:LYS:NZ	2:B:886:HOH:O	2.43	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:393:ASN:OD1	1:B:414:ARG:NH1	2.45	0.50
1:A:324:ARG:CG	1:A:324:ARG:HH11	2.25	0.50
1:A:498:LYS:HD3	1:A:533:LYS:HD3	1.94	0.50
1:A:606:LYS:HZ1	1:A:607:LYS:HZ1	1.60	0.50
1:A:96:ASP:O	1:A:276:HIS:HE1	1.94	0.49
1:A:322:ASP:CG	1:A:324:ARG:NH1	2.70	0.49
1:A:361:PRO:HD3	1:A:616:VAL:HG23	1.94	0.49
1:B:245:ILE:HG23	1:B:246:ASN:N	2.27	0.49
1:A:91:ARG:HD3	1:A:272:LEU:HD21	1.94	0.49
1:A:305:TRP:CH2	1:A:309:ARG:HD3	2.47	0.49
1:A:56:LYS:HB3	1:A:57:TRP:CE2	2.46	0.49
1:A:51:GLU:OE1	1:A:91:ARG:NH2	2.46	0.49
1:A:476:ILE:HG13	1:A:476:ILE:O	2.12	0.49
1:A:142:LYS:HB3	1:A:164:GLU:HG2	1.95	0.49
1:B:352:GLN:HE21	1:B:352:GLN:CA	2.25	0.49
1:A:254:THR:HA	1:A:615:ILE:O	2.13	0.48
1:A:30:TYR:O	1:A:32:SER:N	2.46	0.48
1:A:532:VAL:HG22	1:A:567:TYR:CD2	2.48	0.48
1:B:314:THR:OG1	1:B:339:HIS:HE1	1.95	0.48
1:A:30:TYR:CD1	1:A:30:TYR:N	2.79	0.48
1:B:246:ASN:HD22	1:B:246:ASN:N	2.09	0.48
1:A:324:ARG:HG3	1:A:324:ARG:HH11	1.78	0.48
1:A:16:LEU:HD21	1:A:27:SER:HB3	1.96	0.48
1:B:303:LEU:HD13	1:B:307:ARG:HH11	1.76	0.48
1:A:337:SER:O	1:A:338:CYS:HB2	2.14	0.48
1:A:469:PRO:HB3	1:A:470:GLN:HE22	1.78	0.48
1:B:215:ARG:NH1	2:B:632:HOH:O	2.34	0.48
1:A:117:LEU:HD23	1:A:134:ILE:CD1	2.44	0.48
1:A:436:ASN:HD22	1:A:436:ASN:C	2.21	0.48
1:A:240:ALA:CB	1:A:390:ILE:HG22	2.44	0.47
1:B:597:LEU:HG	1:B:614:LEU:HD22	1.95	0.47
1:A:56:LYS:HB3	1:A:57:TRP:CD2	2.49	0.47
1:A:137:GLN:NE2	1:B:458:GLU:OE2	2.46	0.47
1:A:319:PHE:CE2	1:A:328:VAL:HG13	2.49	0.47
1:B:37:GLU:C	1:B:39:GLU:H	2.21	0.47
1:B:56:LYS:HB3	1:B:57:TRP:CD2	2.49	0.47
1:B:94:VAL:HG23	2:B:923:HOH:O	2.14	0.47
1:B:319:PHE:CD2	1:B:326:LEU:HD22	2.49	0.47
1:B:505:TRP:CH2	1:B:510:HIS:HA	2.50	0.47
1:A:33:LEU:HD12	2:A:1148:HOH:O	2.15	0.47
1:B:543:ILE:CG1	2:B:900:HOH:O	2.58	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:303:LEU:HD23	1:B:303:LEU:HA	1.73	0.46
1:A:458:GLU:O	1:B:137:GLN:HA	2.16	0.46
1:A:324:ARG:NH1	1:A:324:ARG:HG3	2.30	0.46
1:A:530:TYR:CG	1:A:530:TYR:O	2.67	0.46
1:B:153:SER:O	1:B:154:PRO:C	2.58	0.46
1:B:323:GLU:HG2	2:B:668:HOH:O	2.15	0.46
1:A:597:LEU:HG	1:A:614:LEU:HD22	1.98	0.46
1:A:606:LYS:CG	1:A:607:LYS:N	2.78	0.46
1:A:56:LYS:HA	1:A:57:TRP:HA	1.74	0.46
1:A:102:GLN:O	1:A:189:MET:HA	2.15	0.46
1:A:393:ASN:ND2	1:A:414:ARG:HE	2.09	0.46
1:A:469:PRO:HD3	2:B:931:HOH:O	2.14	0.46
1:A:144:ARG:HD3	1:A:161:TRP:CE2	2.51	0.46
1:B:95:ASN:ND2	1:B:97:ASN:OD1	2.48	0.46
1:A:218:ASN:C	1:A:218:ASN:OD1	2.59	0.45
1:A:395:HIS:HE1	2:A:894:HOH:O	1.98	0.45
1:A:94:VAL:HG23	2:A:1006:HOH:O	2.16	0.45
1:B:196:GLU:HG2	1:B:197:TYR:CD1	2.51	0.45
1:B:352:GLN:NE2	1:B:352:GLN:CA	2.79	0.45
1:A:12:PHE:O	1:A:14:THR:N	2.50	0.45
1:A:360:ASN:ND2	1:A:362:ALA:H	2.14	0.45
1:B:530:TYR:HA	1:B:570:LEU:HG	1.99	0.45
1:B:38:TYR:CD2	1:B:44:PHE:CE2	3.05	0.45
1:B:170:GLU:O	1:B:171:ASN:HB3	2.16	0.45
1:A:532:VAL:HG22	1:A:567:TYR:HD2	1.82	0.45
1:B:270:LEU:HD13	1:B:328:VAL:CG2	2.47	0.45
1:B:584:CYS:SG	1:B:598:ARG:HD3	2.56	0.45
1:A:111:ALA:HB2	1:A:174:TYR:CE1	2.52	0.45
1:B:518:ASP:OD1	1:B:519:PHE:N	2.50	0.45
1:B:603:LEU:CD2	2:B:790:HOH:O	2.65	0.45
1:B:92:GLU:CG	2:B:864:HOH:O	2.64	0.44
1:A:605:ILE:HG23	1:A:609:SER:CB	2.47	0.44
1:B:16:LEU:HD21	1:B:27:SER:HB3	1.99	0.44
1:B:533:LYS:HG2	1:B:543:ILE:CD1	2.40	0.44
1:B:416:LEU:HD21	1:B:475:LEU:HA	1.99	0.44
1:B:67:LEU:HD11	1:B:117:LEU:HD21	1.99	0.44
1:A:165:LEU:CD2	1:A:179:THR:HG23	2.48	0.44
1:B:119:ILE:HG13	1:B:189:MET:HE2	1.99	0.44
1:B:252:TYR:HB2	1:B:613:PRO:HB2	2.00	0.44
1:B:468:HIS:CG	1:B:469:PRO:HD2	2.53	0.44
1:A:28:SER:HB2	1:A:57:TRP:O	2.18	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:91:ARG:CD	1:A:272:LEU:HD21	2.48	0.44
1:A:348:ARG:NE	1:A:348:ARG:HA	2.33	0.44
1:A:421:TRP:HE3	1:A:471:ASN:ND2	2.16	0.44
1:A:120:TRP:HB2	1:A:131:HIS:HB3	2.00	0.44
1:A:142:LYS:HB3	1:A:164:GLU:CG	2.48	0.44
1:A:33:LEU:HG	1:A:34:ASP:N	2.26	0.43
1:A:452:ARG:NH1	2:A:858:HOH:O	2.50	0.43
1:A:136:THR:HG21	1:A:146:ALA:HB2	2.01	0.43
1:B:199:LEU:HA	1:B:200:PRO:HD3	1.87	0.43
1:B:226:TRP:HB2	1:B:352:GLN:HG2	1.98	0.43
1:A:257:GLU:CD	1:A:618:LYS:HG2	2.43	0.43
1:B:301:LEU:CD1	1:B:491:TRP:HA	2.49	0.43
1:A:324:ARG:NH2	1:A:572:CYS:O	2.49	0.43
1:A:417:ASP:HB2	2:A:1183:HOH:O	2.18	0.43
1:A:600:ASP:HB2	1:A:605:ILE:HD13	2.01	0.43
1:A:226:TRP:H	1:A:226:TRP:CD1	2.37	0.43
1:B:254:THR:HA	1:B:615:ILE:O	2.19	0.43
1:B:564:LYS:HD2	1:B:564:LYS:HA	1.81	0.43
1:A:95:ASN:HB2	2:A:871:HOH:O	2.17	0.43
1:A:117:LEU:HD23	1:A:134:ILE:HD13	2.00	0.43
1:B:31:SER:O	1:B:33:LEU:N	2.52	0.43
1:A:606:LYS:HG3	1:A:608:GLU:H	1.84	0.42
1:B:436:ASN:HD22	1:B:437:CYS:N	2.17	0.42
1:A:102:GLN:HE21	1:A:102:GLN:HA	1.84	0.42
1:B:252:TYR:CB	1:B:613:PRO:HB2	2.49	0.42
1:A:46:SER:HB2	1:A:56:LYS:HG2	2.02	0.42
1:A:469:PRO:HB2	1:A:470:GLN:NE2	2.33	0.42
1:B:56:LYS:HB3	1:B:57:TRP:CE2	2.55	0.42
1:B:102:GLN:O	1:B:189:MET:HA	2.19	0.42
1:B:301:LEU:HD11	1:B:491:TRP:HA	2.02	0.42
1:A:142:LYS:HG3	1:A:164:GLU:OE1	2.19	0.42
1:A:182:ASP:OD1	1:A:182:ASP:N	2.50	0.42
1:A:48:ILE:O	1:A:49:ASP:HB2	2.20	0.41
1:B:300:ARG:HH22	1:B:482:PRO:HG3	1.85	0.41
1:A:393:ASN:HD21	1:A:414:ARG:HH21	1.68	0.41
1:A:498:LYS:CE	1:A:533:LYS:HD3	2.50	0.41
1:B:528:THR:HG21	1:B:569:GLN:HB2	2.02	0.41
1:A:429:ASP:OD2	1:A:429:ASP:C	2.64	0.41
1:A:606:LYS:HG3	1:A:607:LYS:N	2.35	0.41
1:A:230:LYS:HE3	1:A:230:LYS:HB2	1.72	0.41
1:A:329:TYR:HE1	1:A:573:LEU:CD2	2.30	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:393:ASN:HD22	1:A:393:ASN:HA	1.65	0.41
1:B:281:VAL:HG22	1:B:503:ILE:HD13	2.01	0.41
1:B:476:ILE:O	1:B:476:ILE:HG13	2.20	0.41
1:A:291:PHE:CD1	1:A:291:PHE:N	2.89	0.41
1:A:245:ILE:CG2	1:A:246:ASN:N	2.84	0.40
1:A:264:ILE:HG12	1:A:592:TYR:CD2	2.57	0.40
1:B:201:GLN:HA	1:B:202:PRO:HD3	2.00	0.40
1:A:165:LEU:HD23	1:A:179:THR:HG23	2.03	0.40
1:A:612:GLU:O	1:A:613:PRO:C	2.63	0.40
1:A:346:LEU:HD22	1:A:613:PRO:HA	2.02	0.40
1:B:316:ARG:HD3	1:B:584:CYS:CB	2.39	0.40
1:B:374:LYS:CE	2:B:1158:HOH:O	2.70	0.40
1:A:201:GLN:HA	1:A:202:PRO:HD3	1.84	0.40
1:B:346:LEU:HD23	1:B:346:LEU:HA	1.78	0.40

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

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	565/619 (91%)	539 (95%)	21 (4%)	5 (1%)	14	14
1	B	576/619 (93%)	548 (95%)	25 (4%)	3 (0%)	24	27
All	All	1141/1238 (92%)	1087 (95%)	46 (4%)	8 (1%)	18	19

All (8) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	13	GLY
1	A	31	SER
1	A	32	SER
1	A	127	LYS

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Mol	Chain	Res	Type
1	B	127	LYS
1	B	32	SER
1	A	35	PRO
1	B	38	TYR

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	490/530 (92%)	467 (95%)	23 (5%)	23	31
1	B	500/530 (94%)	480 (96%)	20 (4%)	28	38
All	All	990/1060 (93%)	947 (96%)	43 (4%)	26	35

All (43) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	30	TYR
1	A	34	ASP
1	A	91	ARG
1	A	154	PRO
1	A	203	GLU
1	A	245	ILE
1	A	300	ARG
1	A	302	ARG
1	A	306	GLN
1	A	324	ARG
1	A	328	VAL
1	A	351	GLU
1	A	360	ASN
1	A	389	ASP
1	A	416	LEU
1	A	431	GLU
1	A	436	ASN
1	A	469	PRO
1	A	471	ASN

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Mol	Chain	Res	Type
1	A	476	ILE
1	A	493	VAL
1	A	608	GLU
1	A	610	ASP
1	B	38	TYR
1	B	95	ASN
1	B	132	VAL
1	B	153	SER
1	B	154	PRO
1	B	215	ARG
1	B	246	ASN
1	B	247	GLN
1	B	303	LEU
1	B	307	ARG
1	B	326	LEU
1	B	328	VAL
1	B	332	ASN
1	B	352	GLN
1	B	379	ARG
1	B	436	ASN
1	B	469	PRO
1	B	471	ASN
1	B	480	LEU
1	B	603	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (41) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	58	GLN
1	A	97	ASN
1	A	102	GLN
1	A	141	ASN
1	A	149	ASN
1	A	171	ASN
1	A	201	GLN
1	A	306	GLN
1	A	310	HIS
1	A	360	ASN
1	A	386	GLN
1	A	393	ASN
1	A	395	HIS
1	A	401	GLN

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Mol	Chain	Res	Type
1	A	405	GLN
1	A	436	ASN
1	A	470	GLN
1	A	471	ASN
1	A	522	ASN
1	A	568	GLN
1	A	569	GLN
1	B	55	HIS
1	B	70	ASN
1	B	95	ASN
1	B	131	HIS
1	B	152	HIS
1	B	160	GLN
1	B	171	ASN
1	B	201	GLN
1	B	246	ASN
1	B	261	GLN
1	B	332	ASN
1	B	339	HIS
1	B	352	GLN
1	B	367	ASN
1	B	386	GLN
1	B	401	GLN
1	B	405	GLN
1	B	436	ASN
1	B	471	ASN
1	B	565	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 [i](#)

6.1 Protein, DNA and RNA chains [i](#)

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	571/619 (92%)	-0.33	9 (1%) 70 67	18, 33, 69, 106	0
1	B	582/619 (94%)	-0.39	10 (1%) 69 66	17, 32, 67, 104	0
All	All	1153/1238 (93%)	-0.36	19 (1%) 70 67	17, 33, 68, 106	0

All (19) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	38	TYR	5.6
1	A	531	ALA	4.4
1	A	530	TYR	4.1
1	A	534	PRO	3.6
1	B	30	TYR	3.0
1	B	33	LEU	2.9
1	B	526	VAL	2.8
1	B	545	LEU	2.7
1	A	30	TYR	2.7
1	B	29	ASP	2.5
1	A	522	ASN	2.5
1	B	543	ILE	2.4
1	A	33	LEU	2.4
1	A	32	SER	2.3
1	B	535	ILE	2.3
1	A	42	ALA	2.2
1	B	41	ASP	2.2
1	A	13	GLY	2.1
1	B	35	PRO	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.