



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 10, 2026 – 01:30 AM UTC

PDB ID : 1DTZ / pdb_00001dtz
Title : STRUCTURE OF CAMEL APO-LACTOFERRIN DEMONSTRATES ITS DUAL ROLE IN SEQUESTERING AND TRANSPORTING FERRIC IONS SIMULTANEOUSLY: CRYSTAL STRUCTURE OF CAMEL APO-LACTOFERRIN AT 2.6Å RESOLUTION.
Authors : Khan, J.A.; Kumar, P.; Paramasivam, M.; Srinivasan, A.; Yadav, R.S.; Sahani, M.S.; Singh, T.P.
Deposited on : 2000-01-13
Resolution : 2.65 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) : **NOT EXECUTED**
EDS : **NOT EXECUTED**
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

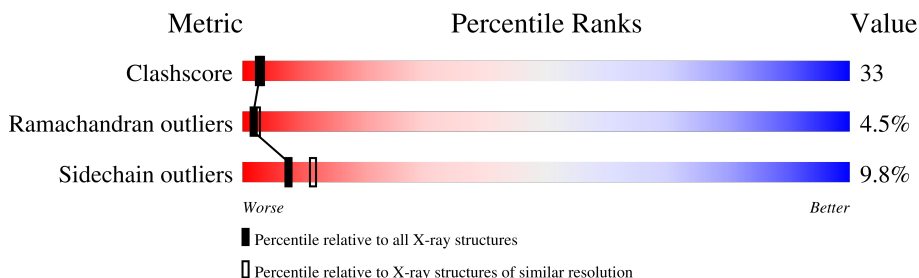
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.65 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))
Clashscore	190562	1141 (2.66-2.66)
Ramachandran outliers	187476	1126 (2.66-2.66)
Sidechain outliers	187428	1126 (2.66-2.66)

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 $\leq 5\%$.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	689	

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 5511 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 APO LACTOFERRIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	689	Total	C	N	O	S	15	0	0
			5284	3318	934	994	38			

There are 11 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	17	LYS	SER	conflict	UNP Q9TUM0
A	87	GLN	ASN	conflict	UNP Q9TUM0
A	242	PHE	SER	conflict	UNP Q9TUM0
A	312	LYS	SER	conflict	UNP Q9TUM0
A	477	ASP	ASN	conflict	UNP Q9TUM0
A	513	LEU	ASN	conflict	UNP Q9TUM0
A	523	LEU	TYR	conflict	UNP Q9TUM0
A	556	GLY	ASN	conflict	UNP Q9TUM0
A	608	ARG	GLU	conflict	UNP Q9TUM0
A	623	GLU	GLN	conflict	UNP Q9TUM0
A	658	ASP	GLU	conflict	UNP Q9TUM0

- Molecule 2 is water.

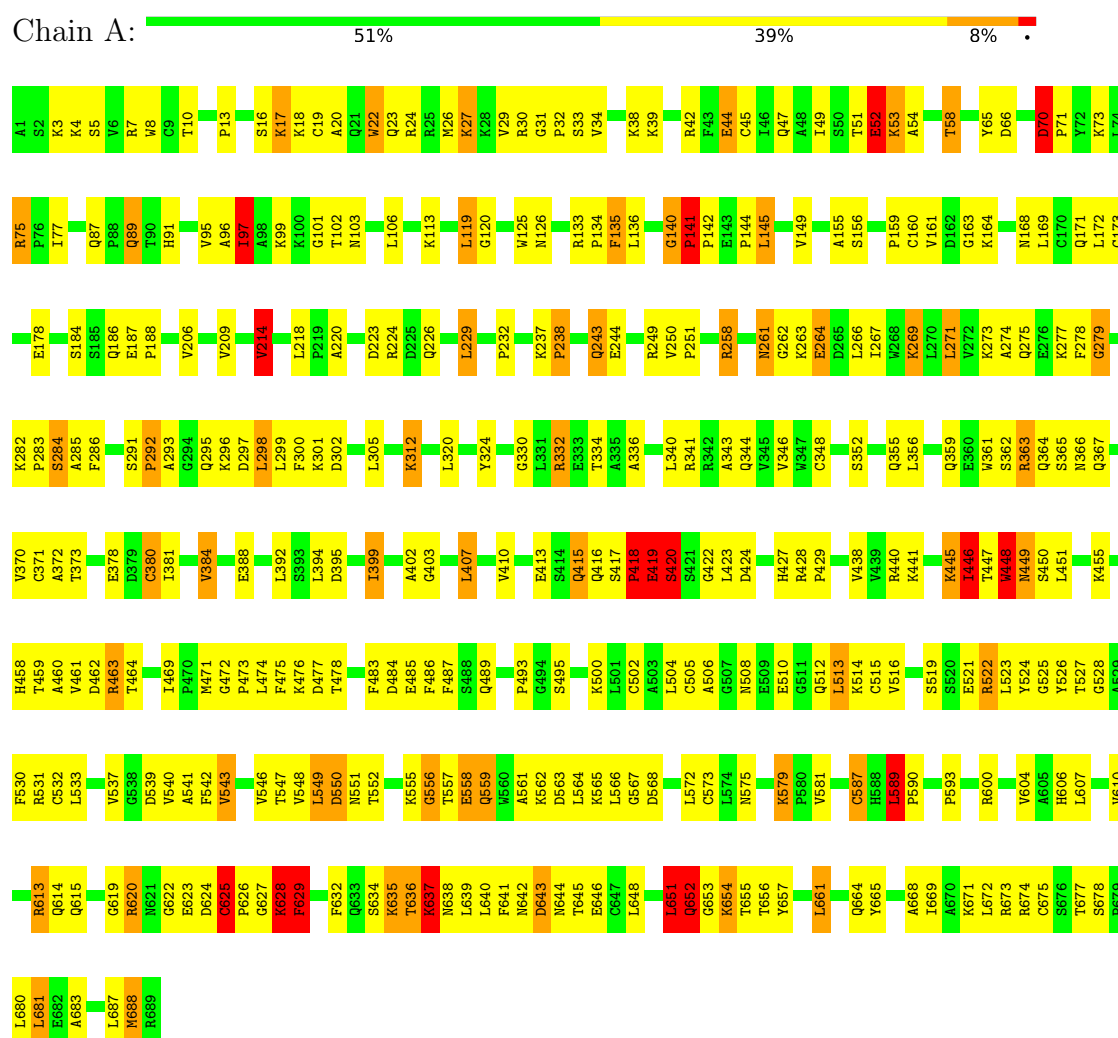
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	227	Total	O	0	0
			227	227		

3 Residue-property plots

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. 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. 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.

Note EDS was not executed.

• Molecule 1: APO LACTOFERRIN



4 Data and refinement statistics

Xtriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	175.84Å 80.92Å 56.35Å 90.00° 92.35° 90.00°	Depositor
Resolution (Å)	11.94 – 2.65	Depositor
% Data completeness (in resolution range)	98.0 (11.94-2.65)	Depositor
R_{merge}	0.11	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	CNS 0.9	Depositor
R, R_{free}	0.198 , 0.266	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	5511	wwPDB-VP
Average B, all atoms (Å ²)	52.0	wwPDB-VP

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	0.90	10/5392 (0.2%)	1.65	51/7293 (0.7%)

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	1	8

All (10) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	652	GLN	C-N	-26.26	0.95	1.33
1	A	628	LYS	C-N	-25.88	0.98	1.33
1	A	651	LEU	C-N	-24.67	0.99	1.33
1	A	420	SER	C-N	16.66	1.50	1.33
1	A	448	TRP	C-N	-16.59	1.03	1.33
1	A	418	PRO	C-N	-12.53	1.15	1.33
1	A	449	ASN	CA-CB	10.89	1.75	1.54
1	A	449	ASN	C-N	-9.95	1.21	1.33
1	A	419	GLU	C-N	-9.69	1.18	1.33
1	A	420	SER	C-O	6.43	1.33	1.23

All (51) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	652	GLN	O-C-N	-40.71	68.45	122.59
1	A	651	LEU	O-C-N	-38.97	70.75	122.59
1	A	628	LYS	CA-C-N	37.24	173.33	120.82
1	A	628	LYS	C-N-CA	37.24	173.33	120.82
1	A	419	GLU	CB-CG-CD	26.49	157.63	112.60
1	A	628	LYS	O-C-N	-23.20	91.73	122.59

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	419	GLU	O-C-N	-22.91	92.41	122.42
1	A	448	TRP	O-C-N	-20.96	94.71	122.59
1	A	652	GLN	CA-C-N	20.57	161.73	121.41
1	A	652	GLN	C-N-CA	20.57	161.73	121.41
1	A	418	PRO	N-CA-C	19.24	152.11	112.47
1	A	448	TRP	CA-C-N	19.10	162.11	122.58
1	A	448	TRP	C-N-CA	19.10	162.11	122.58
1	A	419	GLU	CA-C-N	17.68	157.40	123.09
1	A	419	GLU	C-N-CA	17.68	157.40	123.09
1	A	629	PHE	CB-CG-CD1	-14.41	96.20	120.70
1	A	629	PHE	CB-CG-CD2	13.78	144.12	120.70
1	A	419	GLU	CA-CB-CG	-12.28	89.54	114.10
1	A	420	SER	CA-C-O	-10.98	107.74	121.46
1	A	652	GLN	CB-CG-CD	9.09	128.05	112.60
1	A	140	GLY	CA-C-N	8.94	129.59	120.38
1	A	140	GLY	C-N-CA	8.94	129.59	120.38
1	A	141	PRO	N-CA-C	8.04	120.50	110.70
1	A	371	CYS	N-CA-C	7.72	121.99	109.40
1	A	214	VAL	CB-CA-C	-7.34	102.23	112.14
1	A	31	GLY	N-CA-C	-7.27	103.43	112.23
1	A	675	CYS	N-CA-C	-7.25	104.41	113.55
1	A	449	ASN	O-C-N	-7.22	112.42	122.10
1	A	419	GLU	CA-C-O	-7.17	110.97	119.15
1	A	70	ASP	N-CA-C	7.16	125.64	109.81
1	A	567	GLY	N-CA-C	-6.93	106.72	115.31
1	A	677	THR	N-CA-C	6.55	119.25	110.35
1	A	625	CYS	CA-C-N	-6.34	112.65	119.24
1	A	625	CYS	C-N-CA	-6.34	112.65	119.24
1	A	44	GLU	N-CA-C	-5.79	104.88	111.07
1	A	136	LEU	N-CA-C	5.78	120.47	112.90
1	A	70	ASP	CA-C-N	-5.71	112.70	119.84
1	A	70	ASP	C-N-CA	-5.71	112.70	119.84
1	A	418	PRO	CB-CA-C	-5.71	102.15	111.56
1	A	293	ALA	N-CA-C	5.69	117.16	111.07
1	A	399	ILE	N-CA-C	-5.51	105.00	110.62
1	A	163	GLY	N-CA-C	5.48	118.86	112.50
1	A	97	ILE	CB-CA-C	-5.46	103.74	111.38
1	A	285	ALA	N-CA-C	-5.43	106.15	112.89
1	A	372	ALA	N-CA-C	-5.34	101.17	109.72
1	A	604	VAL	N-CA-C	5.33	115.77	110.23
1	A	417	SER	CA-C-N	5.25	126.41	119.84
1	A	417	SER	C-N-CA	5.25	126.41	119.84

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	683	ALA	N-CA-C	-5.11	105.62	111.14
1	A	169	LEU	N-CA-C	-5.08	106.59	112.89
1	A	651	LEU	N-CA-C	5.03	121.52	110.80

All (1) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
1	A	418	PRO	CA

All (8) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	419	GLU	Peptide
1	A	420	SER	Mainchain
1	A	448	TRP	Peptide,Mainchain
1	A	628	LYS	Peptide
1	A	651	LEU	Peptide,Mainchain
1	A	652	GLN	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	5284	0	5231	351	0
2	A	227	0	0	14	0
All	All	5511	0	5231	351	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 33.

All (351) 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:449:ASN:CB	1:A:449:ASN:CA	1.75	1.63
1:A:312:LYS:H	1:A:312:LYS:HE3	1.08	1.18
1:A:429:PRO:CB	1:A:652:GLN:HE22	1.61	1.12

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:429:PRO:HB3	1:A:652:GLN:HE22	1.06	1.10
1:A:615:GLN:NE2	1:A:648:LEU:H	1.59	1.01
1:A:418:PRO:HB2	1:A:419:GLU:OE1	1.69	0.93
1:A:429:PRO:HB3	1:A:652:GLN:NE2	1.84	0.92
1:A:589:LEU:HB3	1:A:590:PRO:HD2	1.51	0.92
1:A:312:LYS:H	1:A:312:LYS:CE	1.83	0.91
1:A:500:LYS:H	1:A:500:LYS:HD3	1.36	0.91
1:A:484:ASP:HB2	1:A:500:LYS:HE2	1.53	0.90
1:A:559:GLN:H	1:A:559:GLN:HE21	1.19	0.89
1:A:459:THR:HG23	1:A:525:GLY:HA2	1.55	0.89
1:A:556:GLY:HA3	1:A:561:ALA:HB1	1.54	0.88
1:A:469:ILE:O	1:A:473:PRO:HD2	1.74	0.88
1:A:615:GLN:HE22	1:A:648:LEU:N	1.72	0.87
1:A:557:THR:H	1:A:561:ALA:HB3	1.38	0.86
1:A:429:PRO:HG3	1:A:652:GLN:NE2	1.91	0.86
1:A:463:ARG:HH11	1:A:463:ARG:HB3	1.41	0.84
1:A:615:GLN:HE22	1:A:648:LEU:H	0.90	0.84
1:A:429:PRO:CG	1:A:652:GLN:HE22	1.89	0.84
1:A:429:PRO:CB	1:A:652:GLN:NE2	2.39	0.82
1:A:429:PRO:CG	1:A:652:GLN:NE2	2.44	0.81
1:A:678:SER:HB3	1:A:681:LEU:HB2	1.65	0.78
1:A:269:LYS:HE2	1:A:269:LYS:HA	1.65	0.78
1:A:522:ARG:HD3	1:A:531:ARG:HH12	1.49	0.78
1:A:486:PHE:O	1:A:487:PHE:HB2	1.84	0.78
1:A:629:PHE:CD2	1:A:629:PHE:O	2.37	0.77
1:A:508:ASN:HB3	1:A:512:GLN:HB2	1.66	0.77
1:A:589:LEU:HB3	1:A:590:PRO:CD	2.14	0.77
1:A:423:LEU:HD23	1:A:423:LEU:H	1.47	0.77
1:A:506:ALA:HB2	1:A:523:LEU:HD13	1.64	0.77
1:A:17:LYS:HD3	1:A:18:LYS:N	2.00	0.76
1:A:460:ALA:HB3	1:A:463:ARG:HG3	1.68	0.76
1:A:258:ARG:HG3	1:A:262:GLY:HA2	1.67	0.76
1:A:312:LYS:HE3	1:A:312:LYS:N	1.94	0.76
1:A:445:LYS:HE2	1:A:445:LYS:HA	1.66	0.76
1:A:23:GLN:HA	1:A:34:VAL:HG13	1.66	0.75
1:A:642:ASN:HB3	1:A:645:THR:HG23	1.68	0.75
1:A:416:GLN:HA	1:A:646:GLU:HB2	1.69	0.74
1:A:506:ALA:HB3	1:A:522:ARG:HB2	1.69	0.74
1:A:32:PRO:HD3	1:A:273:LYS:HD2	1.69	0.74
1:A:410:VAL:HG21	1:A:607:LEU:HD23	1.69	0.74
1:A:340:LEU:O	1:A:344:GLN:HG2	1.87	0.74

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:505:CYS:O	1:A:514:LYS:HE2	1.89	0.73
1:A:471:MET:HE3	1:A:483:PHE:HB3	1.70	0.73
1:A:473:PRO:HD3	1:A:668:ALA:HB2	1.70	0.73
1:A:548:VAL:HG11	1:A:581:VAL:HG21	1.69	0.73
1:A:75:ARG:HH11	1:A:75:ARG:HB2	1.55	0.72
1:A:352:SER:O	1:A:356:LEU:HG	1.90	0.72
1:A:380:CYS:O	1:A:384:VAL:HG12	1.90	0.71
1:A:672:LEU:HB2	2:A:761:HOH:O	1.90	0.70
1:A:687:LEU:C	1:A:688:MET:HE3	2.16	0.70
1:A:559:GLN:H	1:A:559:GLN:NE2	1.89	0.70
1:A:296:LYS:HA	1:A:296:LYS:HE2	1.73	0.70
1:A:113:LYS:HB3	1:A:172:LEU:HD11	1.73	0.69
1:A:427:HIS:O	1:A:429:PRO:HD3	1.93	0.69
1:A:653:GLY:O	1:A:655:THR:HG23	1.92	0.68
1:A:65:TYR:HB2	1:A:320:LEU:HD11	1.73	0.68
1:A:22:TRP:HH2	1:A:274:ALA:CB	2.06	0.68
1:A:30:ARG:HA	1:A:30:ARG:NE	2.09	0.68
1:A:23:GLN:HA	1:A:34:VAL:CG1	2.24	0.67
1:A:214:VAL:HG23	2:A:789:HOH:O	1.93	0.67
1:A:305:LEU:HD12	1:A:305:LEU:O	1.94	0.67
1:A:449:ASN:CB	1:A:449:ASN:N	2.56	0.67
1:A:590:PRO:HB3	1:A:664:GLN:HB2	1.76	0.67
1:A:119:LEU:HD23	1:A:120:GLY:N	2.10	0.66
1:A:343:ALA:O	1:A:606:HIS:NE2	2.25	0.66
1:A:355:GLN:O	1:A:359:GLN:HG3	1.96	0.65
1:A:3:LYS:HG2	1:A:4:LYS:N	2.09	0.65
1:A:243:GLN:HB2	2:A:762:HOH:O	1.95	0.65
1:A:557:THR:H	1:A:561:ALA:CB	2.09	0.65
1:A:168:ASN:HA	1:A:171:GLN:HB2	1.77	0.65
1:A:184:SER:OG	1:A:186:GLN:HG2	1.97	0.64
1:A:355:GLN:NE2	1:A:373:THR:HG21	2.13	0.64
1:A:634:SER:C	1:A:636:THR:H	2.05	0.64
1:A:546:VAL:O	1:A:550:ASP:HB3	1.98	0.64
1:A:558:GLU:O	1:A:562:LYS:HG2	1.98	0.64
1:A:459:THR:HG23	1:A:525:GLY:CA	2.26	0.63
1:A:384:VAL:O	1:A:600:ARG:NH1	2.32	0.63
1:A:448:TRP:HB2	1:A:572:LEU:HG	1.81	0.63
1:A:471:MET:CE	1:A:483:PHE:HB3	2.29	0.63
1:A:440:ARG:HB3	1:A:440:ARG:NH2	2.13	0.62
1:A:613:ARG:HE	1:A:613:ARG:HA	1.65	0.62
1:A:651:LEU:HG	1:A:654:LYS:HG3	1.82	0.61

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:395:ASP:O	1:A:399:ILE:HG13	2.00	0.61
1:A:446:ILE:HG23	1:A:446:ILE:O	1.99	0.61
1:A:634:SER:O	1:A:636:THR:N	2.26	0.61
1:A:295:GLN:O	1:A:296:LYS:HE3	2.00	0.61
1:A:449:ASN:CA	1:A:449:ASN:CG	2.69	0.61
1:A:70:ASP:OD1	1:A:73:LYS:NZ	2.33	0.60
1:A:173:CYS:HB3	1:A:187:GLU:OE2	2.01	0.60
1:A:133:ARG:HB3	1:A:134:PRO:HD3	1.82	0.60
1:A:610:VAL:O	1:A:614:GLN:HG2	2.02	0.60
1:A:3:LYS:HG2	1:A:4:LYS:H	1.66	0.60
1:A:484:ASP:HB2	1:A:500:LYS:CE	2.30	0.60
1:A:455:LYS:NZ	1:A:489:GLN:HE21	2.00	0.59
1:A:564:LEU:O	1:A:564:LEU:HD12	2.01	0.59
1:A:381:ILE:O	1:A:384:VAL:HG13	2.02	0.59
1:A:532:CYS:O	1:A:537:VAL:HB	2.02	0.59
1:A:489:GLN:HB3	1:A:504:LEU:HG	1.85	0.59
1:A:23:GLN:HG3	1:A:34:VAL:O	2.03	0.59
1:A:402:ALA:O	1:A:407:LEU:HB2	2.02	0.59
1:A:461:VAL:HG23	1:A:493:PRO:O	2.02	0.59
1:A:418:PRO:C	1:A:419:GLU:OE1	2.47	0.58
1:A:22:TRP:O	1:A:26:MET:HG2	2.03	0.58
1:A:22:TRP:HH2	1:A:274:ALA:HB2	1.68	0.58
1:A:95:VAL:CG1	1:A:229:LEU:HG	2.34	0.58
1:A:418:PRO:CB	1:A:419:GLU:OE1	2.49	0.58
1:A:295:GLN:HA	2:A:786:HOH:O	2.02	0.58
1:A:500:LYS:H	1:A:500:LYS:CD	2.12	0.58
1:A:552:THR:HG22	1:A:564:LEU:HD13	1.86	0.58
1:A:634:SER:C	1:A:636:THR:N	2.62	0.58
1:A:145:LEU:HD22	1:A:149:VAL:HG23	1.85	0.57
1:A:522:ARG:HD3	1:A:531:ARG:NH1	2.17	0.57
1:A:95:VAL:HG12	1:A:96:ALA:N	2.20	0.57
1:A:416:GLN:HB3	1:A:644:ASN:O	2.05	0.57
1:A:651:LEU:O	1:A:654:LYS:HG2	2.04	0.57
1:A:559:GLN:HE21	1:A:559:GLN:N	1.97	0.56
1:A:10:THR:HG21	1:A:16:SER:HA	1.85	0.56
1:A:469:ILE:CG2	1:A:590:PRO:HD2	2.35	0.56
1:A:557:THR:HG22	1:A:558:GLU:HG3	1.86	0.56
1:A:125:TRP:HD1	1:A:126:ASN:ND2	2.03	0.56
1:A:566:LEU:C	1:A:568:ASP:H	2.14	0.56
1:A:469:ILE:HD13	1:A:590:PRO:HG2	1.88	0.56
1:A:629:PHE:O	1:A:629:PHE:CG	2.58	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:106:LEU:HD12	1:A:232:PRO:HA	1.88	0.56
1:A:380:CYS:HB3	1:A:392:LEU:HD22	1.88	0.56
1:A:557:THR:HG22	1:A:558:GLU:N	2.19	0.56
1:A:263:LYS:HE2	1:A:266:LEU:HD23	1.88	0.56
1:A:634:SER:CB	1:A:639:LEU:H	2.19	0.56
1:A:22:TRP:CH2	1:A:274:ALA:CB	2.88	0.55
1:A:156:SER:HA	1:A:172:LEU:HD12	1.88	0.55
1:A:186:GLN:NE2	1:A:186:GLN:HA	2.22	0.55
1:A:413:GLU:HB3	1:A:645:THR:HG21	1.89	0.55
1:A:363:ARG:NH2	1:A:367:GLN:HE22	2.05	0.55
1:A:469:ILE:HG23	1:A:590:PRO:HD2	1.87	0.55
1:A:65:TYR:HB2	1:A:320:LEU:CD1	2.37	0.55
1:A:364:GLN:HE21	1:A:364:GLN:HA	1.72	0.54
1:A:359:GLN:O	1:A:362:SER:HB3	2.07	0.54
1:A:324:TYR:HB2	2:A:705:HOH:O	2.07	0.54
1:A:549:LEU:HD12	1:A:549:LEU:O	2.08	0.54
1:A:678:SER:CB	1:A:681:LEU:HB2	2.35	0.54
1:A:263:LYS:O	1:A:267:ILE:HG13	2.08	0.54
1:A:410:VAL:HG21	1:A:607:LEU:CD2	2.38	0.54
1:A:135:PHE:CD1	1:A:135:PHE:N	2.77	0.53
1:A:220:ALA:HB3	1:A:223:ASP:OD2	2.08	0.53
1:A:140:GLY:C	1:A:142:PRO:HD2	2.34	0.53
1:A:34:VAL:HG13	1:A:34:VAL:O	2.08	0.53
1:A:590:PRO:HB3	1:A:664:GLN:CB	2.38	0.53
1:A:506:ALA:O	1:A:514:LYS:HG3	2.09	0.53
1:A:526:TYR:HA	1:A:543:VAL:CG1	2.39	0.53
1:A:23:GLN:O	1:A:26:MET:HB2	2.09	0.53
1:A:471:MET:O	1:A:475:PHE:HB2	2.07	0.53
1:A:546:VAL:O	1:A:550:ASP:CB	2.56	0.53
1:A:363:ARG:NH2	1:A:367:GLN:NE2	2.57	0.53
1:A:346:VAL:HG22	1:A:370:VAL:HG23	1.91	0.53
1:A:530:PHE:CE2	1:A:548:VAL:HA	2.43	0.52
1:A:378:GLU:HG2	1:A:680:LEU:HD22	1.91	0.52
1:A:218:LEU:O	1:A:224:ARG:HD3	2.09	0.52
1:A:556:GLY:HA3	1:A:561:ALA:CB	2.34	0.52
1:A:622:GLY:C	1:A:624:ASP:H	2.17	0.52
1:A:519:SER:C	1:A:521:GLU:H	2.16	0.52
1:A:472:GLY:HA2	2:A:760:HOH:O	2.09	0.52
1:A:101:GLY:C	1:A:102:THR:O	2.51	0.52
1:A:671:LYS:O	1:A:674:ARG:HG2	2.08	0.52
1:A:58:THR:HG23	2:A:690:HOH:O	2.10	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:271:LEU:O	1:A:275:GLN:HG3	2.10	0.51
1:A:672:LEU:HD22	2:A:761:HOH:O	2.09	0.51
1:A:24:ARG:O	1:A:27:LYS:HG2	2.10	0.51
1:A:579:LYS:HE2	1:A:587:CYS:HB2	1.92	0.51
1:A:415:GLN:HE21	1:A:415:GLN:HA	1.75	0.51
1:A:223:ASP:O	1:A:226:GLN:HG2	2.10	0.51
1:A:440:ARG:HB3	1:A:440:ARG:HH21	1.73	0.51
1:A:620:ARG:NH2	1:A:645:THR:O	2.43	0.51
1:A:42:ARG:O	1:A:45:CYS:HB2	2.10	0.51
1:A:678:SER:O	1:A:681:LEU:N	2.43	0.51
1:A:366:ASN:O	1:A:367:GLN:HB2	2.11	0.51
1:A:381:ILE:HA	1:A:384:VAL:CG1	2.40	0.51
1:A:495:SER:HB2	1:A:502:CYS:SG	2.51	0.51
1:A:524:TYR:N	1:A:528:GLY:HA3	2.25	0.51
1:A:269:LYS:HA	1:A:269:LYS:CE	2.37	0.50
1:A:558:GLU:O	1:A:562:LYS:HE3	2.10	0.50
1:A:523:LEU:C	1:A:528:GLY:HA3	2.37	0.50
1:A:7:ARG:NH1	1:A:52:GLU:O	2.44	0.50
1:A:95:VAL:HG11	1:A:229:LEU:HG	1.91	0.50
1:A:392:LEU:HD23	1:A:394:LEU:HD21	1.92	0.50
1:A:422:GLY:O	1:A:428:ARG:NH2	2.44	0.50
1:A:449:ASN:CB	1:A:449:ASN:C	2.75	0.50
1:A:361:TRP:HB2	1:A:629:PHE:CZ	2.46	0.50
1:A:548:VAL:HG12	1:A:566:LEU:HD12	1.94	0.50
1:A:423:LEU:H	1:A:423:LEU:CD2	2.20	0.50
1:A:446:ILE:HG13	1:A:539:ASP:HB3	1.92	0.50
1:A:469:ILE:O	1:A:473:PRO:CD	2.56	0.50
1:A:415:GLN:HA	1:A:415:GLN:NE2	2.27	0.49
1:A:471:MET:HB3	1:A:483:PHE:CD2	2.47	0.49
1:A:549:LEU:HD23	1:A:566:LEU:HD21	1.94	0.49
1:A:626:PRO:HG2	1:A:627:GLY:H	1.78	0.49
1:A:22:TRP:HA	1:A:286:PHE:CZ	2.48	0.49
1:A:639:LEU:C	1:A:641:PHE:H	2.21	0.49
1:A:49:ILE:HA	1:A:54:ALA:O	2.13	0.49
1:A:461:VAL:HG12	1:A:462:ASP:OD1	2.12	0.49
1:A:184:SER:C	1:A:186:GLN:H	2.20	0.49
1:A:415:GLN:HE21	1:A:415:GLN:CA	2.25	0.49
1:A:424:ASP:O	1:A:428:ARG:HG3	2.13	0.49
1:A:17:LYS:O	1:A:20:ALA:HB3	2.13	0.48
1:A:526:TYR:O	1:A:547:THR:HG21	2.13	0.48
1:A:473:PRO:HD3	1:A:668:ALA:CB	2.40	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:526:TYR:HA	1:A:543:VAL:HG12	1.94	0.48
1:A:656:THR:HG22	1:A:657:TYR:H	1.78	0.48
1:A:625:CYS:O	1:A:626:PRO:C	2.50	0.48
1:A:521:GLU:O	1:A:524:TYR:HB3	2.14	0.48
1:A:624:ASP:O	1:A:628:LYS:N	2.46	0.48
1:A:593:PRO:HG2	1:A:661:LEU:HD12	1.96	0.48
1:A:445:LYS:HG3	1:A:445:LYS:O	2.14	0.48
1:A:463:ARG:HB3	1:A:463:ARG:NH1	2.20	0.47
1:A:22:TRP:HA	1:A:286:PHE:CE2	2.49	0.47
1:A:279:GLY:C	1:A:282:LYS:HD3	2.39	0.47
1:A:297:ASP:H	1:A:302:ASP:CG	2.22	0.47
1:A:178:GLU:OE2	1:A:178:GLU:N	2.39	0.47
1:A:445:LYS:HZ3	1:A:445:LYS:C	2.23	0.47
1:A:341:ARG:HG3	2:A:728:HOH:O	2.13	0.47
1:A:506:ALA:CB	1:A:523:LEU:HD13	2.38	0.47
1:A:70:ASP:CG	1:A:70:ASP:O	2.57	0.47
1:A:186:GLN:HA	1:A:186:GLN:HE21	1.79	0.47
1:A:378:GLU:HG2	1:A:680:LEU:CD2	2.44	0.47
1:A:438:VAL:HG13	1:A:533:LEU:CD2	2.45	0.47
1:A:461:VAL:O	1:A:462:ASP:HB2	2.15	0.47
1:A:581:VAL:HG12	1:A:581:VAL:O	2.15	0.47
1:A:634:SER:HB2	1:A:639:LEU:HB2	1.98	0.46
1:A:27:LYS:HA	1:A:30:ARG:NH1	2.31	0.46
1:A:365:SER:O	1:A:366:ASN:HB2	2.14	0.46
1:A:413:GLU:OE1	1:A:645:THR:HG21	2.15	0.46
1:A:469:ILE:CD1	1:A:590:PRO:HG2	2.45	0.46
1:A:510:GLU:OE2	1:A:522:ARG:HD2	2.15	0.46
1:A:262:GLY:O	1:A:263:LYS:CB	2.63	0.46
1:A:97:ILE:HD11	1:A:209:VAL:HG21	1.97	0.46
1:A:58:THR:HG21	1:A:299:LEU:O	2.16	0.46
1:A:533:LEU:HD12	1:A:533:LEU:O	2.16	0.46
1:A:566:LEU:C	1:A:568:ASP:N	2.73	0.46
1:A:5:SER:HB3	1:A:33:SER:OG	2.15	0.46
1:A:301:LYS:HG2	2:A:727:HOH:O	2.16	0.46
1:A:455:LYS:HZ2	1:A:489:GLN:HE21	1.64	0.46
1:A:364:GLN:HA	1:A:364:GLN:NE2	2.30	0.46
1:A:515:CYS:O	1:A:516:VAL:C	2.59	0.46
1:A:261:ASN:HD22	1:A:261:ASN:HA	1.58	0.46
1:A:364:GLN:HG3	1:A:629:PHE:HB3	1.97	0.46
1:A:440:ARG:CZ	1:A:440:ARG:CB	2.94	0.46
1:A:133:ARG:N	1:A:134:PRO:CD	2.79	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:635:LYS:O	1:A:637:LYS:HD2	2.15	0.45
1:A:229:LEU:HB2	1:A:237:LYS:O	2.16	0.45
1:A:264:GLU:O	1:A:267:ILE:N	2.49	0.45
1:A:5:SER:O	1:A:263:LYS:NZ	2.39	0.45
1:A:446:ILE:O	1:A:446:ILE:CG2	2.64	0.45
1:A:283:PRO:O	1:A:284:SER:C	2.59	0.45
1:A:16:SER:OG	1:A:38:LYS:HG2	2.17	0.45
1:A:269:LYS:HE2	1:A:269:LYS:CA	2.43	0.45
1:A:651:LEU:O	1:A:654:LYS:HE2	2.17	0.45
1:A:651:LEU:HD23	1:A:654:LYS:O	2.17	0.45
1:A:555:LYS:O	1:A:555:LYS:HG2	2.17	0.45
1:A:91:HIS:ND1	1:A:91:HIS:C	2.75	0.45
1:A:119:LEU:HD12	1:A:161:VAL:HG22	1.98	0.45
1:A:334:THR:C	1:A:336:ALA:N	2.72	0.45
1:A:346:VAL:HG22	1:A:370:VAL:CG2	2.47	0.45
1:A:392:LEU:HD11	2:A:819:HOH:O	2.16	0.45
1:A:89:GLN:HA	2:A:827:HOH:O	2.17	0.45
1:A:4:LYS:HD2	1:A:4:LYS:C	2.43	0.44
1:A:446:ILE:C	1:A:446:ILE:HD13	2.42	0.44
1:A:298:LEU:O	1:A:300:PHE:N	2.45	0.44
1:A:87:GLN:HG3	1:A:87:GLN:O	2.18	0.44
1:A:438:VAL:HG22	1:A:533:LEU:HD21	2.00	0.44
1:A:665:TYR:O	1:A:669:ILE:HD13	2.17	0.44
1:A:249:ARG:NH1	2:A:818:HOH:O	2.49	0.44
1:A:512:GLN:O	1:A:513:LEU:C	2.60	0.44
1:A:44:GLU:HA	1:A:47:GLN:HE21	1.82	0.44
1:A:263:LYS:CE	1:A:266:LEU:HD23	2.47	0.44
1:A:4:LYS:HD2	1:A:4:LYS:O	2.18	0.44
1:A:613:ARG:HA	1:A:613:ARG:NE	2.30	0.44
1:A:334:THR:C	1:A:336:ALA:H	2.25	0.44
1:A:66:ASP:OD1	1:A:332:ARG:NH2	2.51	0.43
1:A:133:ARG:NH1	1:A:330:GLY:O	2.50	0.43
1:A:291:SER:HB3	1:A:292:PRO:HD2	2.00	0.43
1:A:184:SER:C	1:A:186:GLN:N	2.73	0.43
1:A:471:MET:HE3	1:A:483:PHE:HD2	1.84	0.43
1:A:615:GLN:O	1:A:619:GLY:HA3	2.19	0.43
1:A:22:TRP:CH2	1:A:274:ALA:HB1	2.52	0.43
1:A:632:PHE:CD2	1:A:645:THR:OG1	2.71	0.43
1:A:13:PRO:HA	1:A:38:LYS:HZ3	1.83	0.43
1:A:159:PRO:O	1:A:160:CYS:CB	2.66	0.43
1:A:448:TRP:CH2	1:A:474:LEU:HD13	2.54	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:263:LYS:HG2	1:A:266:LEU:HD23	2.00	0.43
1:A:346:VAL:HA	1:A:370:VAL:HG23	2.00	0.43
1:A:348:CYS:O	1:A:392:LEU:HD13	2.19	0.43
1:A:632:PHE:HD2	1:A:645:THR:OG1	2.02	0.43
1:A:638:ASN:ND2	1:A:643:ASP:H	2.16	0.43
1:A:251:PRO:HB3	2:A:836:HOH:O	2.18	0.43
1:A:410:VAL:HG11	1:A:607:LEU:CD2	2.49	0.43
1:A:549:LEU:HB3	1:A:566:LEU:HD13	2.00	0.43
1:A:423:LEU:HD23	1:A:423:LEU:N	2.26	0.43
1:A:39:LYS:HD2	1:A:44:GLU:HB3	2.00	0.42
1:A:226:GLN:HE21	1:A:226:GLN:HA	1.83	0.42
1:A:441:LYS:HE3	1:A:441:LYS:HB2	1.83	0.42
1:A:29:VAL:HB	1:A:277:LYS:HZ3	1.84	0.42
1:A:18:LYS:O	1:A:22:TRP:HB2	2.19	0.42
1:A:113:LYS:HA	1:A:155:ALA:O	2.19	0.42
1:A:525:GLY:C	1:A:527:THR:N	2.77	0.42
1:A:17:LYS:HD3	1:A:17:LYS:C	2.45	0.42
1:A:3:LYS:CG	1:A:4:LYS:N	2.81	0.42
1:A:296:LYS:HA	1:A:296:LYS:CE	2.47	0.42
1:A:575:ASN:OD1	1:A:575:ASN:O	2.37	0.42
1:A:229:LEU:HD22	1:A:238:PRO:O	2.20	0.42
1:A:526:TYR:HB3	1:A:547:THR:OG1	2.20	0.42
1:A:561:ALA:C	1:A:562:LYS:HE2	2.45	0.42
1:A:410:VAL:HG11	1:A:607:LEU:HD23	2.01	0.42
1:A:447:THR:HG22	1:A:450:SER:OG	2.19	0.42
1:A:448:TRP:HA	1:A:451:LEU:HG	2.02	0.42
1:A:519:SER:C	1:A:521:GLU:N	2.78	0.42
1:A:361:TRP:CD1	1:A:361:TRP:O	2.73	0.42
1:A:102:THR:O	1:A:103:ASN:ND2	2.53	0.41
1:A:403:GLY:HA3	1:A:657:TYR:CG	2.55	0.41
1:A:459:THR:HG21	1:A:463:ARG:NH2	2.35	0.41
1:A:549:LEU:HB3	1:A:566:LEU:CD1	2.50	0.41
1:A:559:GLN:NE2	1:A:559:GLN:N	2.63	0.41
1:A:638:ASN:HD22	1:A:643:ASP:H	1.68	0.41
1:A:119:LEU:C	1:A:119:LEU:CD2	2.93	0.41
1:A:521:GLU:O	1:A:522:ARG:C	2.63	0.41
1:A:51:THR:OG1	1:A:53:LYS:HD3	2.20	0.41
1:A:565:LYS:HB2	1:A:568:ASP:HB2	2.02	0.41
1:A:19:CYS:HA	1:A:22:TRP:HB3	2.02	0.41
1:A:278:PHE:HB3	1:A:286:PHE:O	2.21	0.41
1:A:459:THR:HG21	1:A:463:ARG:NH1	2.36	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:540:VAL:HG22	1:A:541:ALA:N	2.36	0.41
1:A:8:TRP:HZ2	1:A:58:THR:HG22	1.84	0.41
1:A:58:THR:CG2	1:A:299:LEU:O	2.68	0.41
1:A:95:VAL:CG1	1:A:96:ALA:N	2.83	0.41
1:A:99:LYS:HE2	1:A:99:LYS:HB3	1.86	0.41
1:A:144:PRO:O	1:A:145:LEU:C	2.64	0.41
1:A:159:PRO:C	1:A:160:CYS:SG	3.03	0.41
1:A:312:LYS:CE	1:A:312:LYS:N	2.66	0.41
1:A:440:ARG:NH2	1:A:440:ARG:CB	2.83	0.41
1:A:263:LYS:HE2	1:A:266:LEU:CD2	2.50	0.41
1:A:458:HIS:CE1	1:A:542:PHE:CE1	3.09	0.41
1:A:75:ARG:HH11	1:A:75:ARG:CB	2.28	0.41
1:A:54:ALA:O	1:A:258:ARG:NH2	2.54	0.40
1:A:642:ASN:HB3	1:A:645:THR:CG2	2.47	0.40
1:A:187:GLU:OE1	1:A:188:PRO:HD2	2.22	0.40
1:A:295:GLN:O	1:A:296:LYS:HG2	2.21	0.40
1:A:473:PRO:HA	1:A:476:LYS:HG2	2.03	0.40
1:A:549:LEU:HB3	1:A:566:LEU:HD22	2.03	0.40
1:A:639:LEU:O	1:A:640:LEU:HB2	2.20	0.40
1:A:620:ARG:HH21	1:A:645:THR:C	2.29	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	687/689 (100%)	578 (84%)	78 (11%)	31 (4%)	2 2

All (31) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	141	PRO

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Mol	Chain	Res	Type
1	A	418	PRO
1	A	446	ILE
1	A	550	ASP
1	A	587	CYS
1	A	589	LEU
1	A	637	LYS
1	A	651	LEU
1	A	652	GLN
1	A	52	GLU
1	A	279	GLY
1	A	284	SER
1	A	448	TRP
1	A	464	THR
1	A	522	ARG
1	A	556	GLY
1	A	563	ASP
1	A	513	LEU
1	A	551	ASN
1	A	558	GLU
1	A	623	GLU
1	A	654	LYS
1	A	70	ASP
1	A	264	GLU
1	A	636	THR
1	A	643	ASP
1	A	71	PRO
1	A	238	PRO
1	A	635	LYS
1	A	543	VAL
1	A	292	PRO

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	570/570 (100%)	514 (90%)	56 (10%)	7 11

All (56) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	17	LYS
1	A	22	TRP
1	A	27	LYS
1	A	52	GLU
1	A	53	LYS
1	A	58	THR
1	A	75	ARG
1	A	77	ILE
1	A	89	GLN
1	A	97	ILE
1	A	119	LEU
1	A	135	PHE
1	A	141	PRO
1	A	145	LEU
1	A	164	LYS
1	A	206	VAL
1	A	214	VAL
1	A	229	LEU
1	A	243	GLN
1	A	244	GLU
1	A	250	VAL
1	A	258	ARG
1	A	261	ASN
1	A	269	LYS
1	A	271	LEU
1	A	298	LEU
1	A	312	LYS
1	A	332	ARG
1	A	363	ARG
1	A	380	CYS
1	A	384	VAL
1	A	388	GLU
1	A	407	LEU
1	A	415	GLN
1	A	419	GLU
1	A	420	SER
1	A	445	LYS
1	A	446	ILE
1	A	463	ARG
1	A	477	ASP
1	A	478	THR
1	A	485	GLU

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Mol	Chain	Res	Type
1	A	549	LEU
1	A	559	GLN
1	A	573	CYS
1	A	579	LYS
1	A	589	LEU
1	A	613	ARG
1	A	620	ARG
1	A	625	CYS
1	A	629	PHE
1	A	637	LYS
1	A	661	LEU
1	A	673	ARG
1	A	681	LEU
1	A	688	MET

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (28) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	21	GLN
1	A	23	GLN
1	A	47	GLN
1	A	89	GLN
1	A	103	ASN
1	A	105	GLN
1	A	108	GLN
1	A	126	ASN
1	A	146	GLN
1	A	186	GLN
1	A	226	GLN
1	A	234	ASN
1	A	261	ASN
1	A	355	GLN
1	A	364	GLN
1	A	367	GLN
1	A	415	GLN
1	A	416	GLN
1	A	449	ASN
1	A	489	GLN
1	A	512	GLN
1	A	551	ASN
1	A	559	GLN
1	A	575	ASN

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Mol	Chain	Res	Type
1	A	615	GLN
1	A	638	ASN
1	A	642	ASN
1	A	652	GLN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

There are no ligands in this entry.

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

The following chains have linkage breaks:

Mol	Chain	Number of breaks
1	A	6

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	A	419:GLU	C	420:SER	N	1.18
1	A	418:PRO	C	419:GLU	N	1.15
1	A	448:TRP	C	449:ASN	N	1.03

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Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	A	651:LEU	C	652:GLN	N	0.99
1	A	628:LYS	C	629:PHE	N	0.98
1	A	652:GLN	C	653:GLY	N	0.95

6 Fit of model and data

6.1 Protein, DNA and RNA chains

EDS was not executed - this section is therefore empty.

6.2 Non-standard residues in protein, DNA, RNA chains

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates

EDS was not executed - this section is therefore empty.

6.4 Ligands

EDS was not executed - this section is therefore empty.

6.5 Other polymers

EDS was not executed - this section is therefore empty.