



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 27, 2026 – 10:18 PM UTC

PDB ID : 4QDH / pdb_00004qdh
Title : Crystal Structure of the C-terminal Domain of Mouse TLR9
Authors : Collins, B.C.; Wilson, I.A.
Deposited on : 2014-05-13
Resolution : 2.40 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

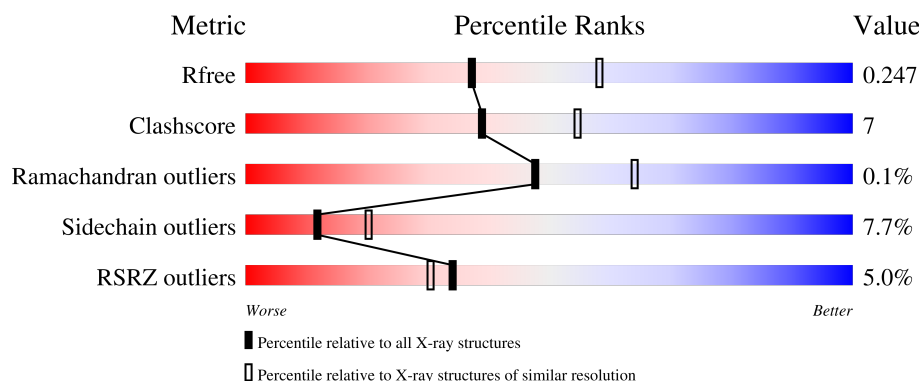
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.40 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	4912 (2.40-2.40)
Clashscore	190562	5391 (2.40-2.40)
Ramachandran outliers	187476	5320 (2.40-2.40)
Sidechain outliers	187428	5321 (2.40-2.40)
RSRZ outliers	180081	4916 (2.40-2.40)

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	438	5% 71% 18% •• 8%
1	B	438	5% 72% 15% • 10%

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 6532 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 Variable lymphocyte receptor B, Toll-like receptor 9 chimera.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	402	Total	C	N	O	S	0	0	0
			3155	2001	553	587	14			
1	B	393	Total	C	N	O	S	0	0	0
			3077	1950	537	577	13			

There are 56 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-6	ALA	-	expression tag	UNP Q4G1L2
A	-5	ASP	-	expression tag	UNP Q4G1L2
A	-4	PRO	-	expression tag	UNP Q4G1L2
A	-3	GLY	-	expression tag	UNP Q4G1L2
A	408	ALA	-	expression tag	UNP Q4G1L2
A	409	SER	-	expression tag	UNP Q4G1L2
A	410	LEU	-	expression tag	UNP Q4G1L2
A	411	VAL	-	expression tag	UNP Q4G1L2
A	412	PRO	-	expression tag	UNP Q4G1L2
A	413	ARG	-	expression tag	UNP Q4G1L2
A	414	GLY	-	expression tag	UNP Q4G1L2
A	415	SER	-	expression tag	UNP Q4G1L2
A	416	TRP	-	expression tag	UNP Q4G1L2
A	417	SER	-	expression tag	UNP Q4G1L2
A	418	HIS	-	expression tag	UNP Q4G1L2
A	419	PRO	-	expression tag	UNP Q4G1L2
A	420	GLN	-	expression tag	UNP Q4G1L2
A	421	PHE	-	expression tag	UNP Q4G1L2
A	422	GLU	-	expression tag	UNP Q4G1L2
A	423	LYS	-	expression tag	UNP Q4G1L2
A	424	GLY	-	expression tag	UNP Q4G1L2
A	425	SER	-	expression tag	UNP Q4G1L2
A	426	HIS	-	expression tag	UNP Q4G1L2
A	427	HIS	-	expression tag	UNP Q4G1L2
A	428	HIS	-	expression tag	UNP Q4G1L2

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Chain	Residue	Modelled	Actual	Comment	Reference
A	429	HIS	-	expression tag	UNP Q4G1L2
A	430	HIS	-	expression tag	UNP Q4G1L2
A	431	HIS	-	expression tag	UNP Q4G1L2
B	-6	ALA	-	expression tag	UNP Q4G1L2
B	-5	ASP	-	expression tag	UNP Q4G1L2
B	-4	PRO	-	expression tag	UNP Q4G1L2
B	-3	GLY	-	expression tag	UNP Q4G1L2
B	408	ALA	-	expression tag	UNP Q4G1L2
B	409	SER	-	expression tag	UNP Q4G1L2
B	410	LEU	-	expression tag	UNP Q4G1L2
B	411	VAL	-	expression tag	UNP Q4G1L2
B	412	PRO	-	expression tag	UNP Q4G1L2
B	413	ARG	-	expression tag	UNP Q4G1L2
B	414	GLY	-	expression tag	UNP Q4G1L2
B	415	SER	-	expression tag	UNP Q4G1L2
B	416	TRP	-	expression tag	UNP Q4G1L2
B	417	SER	-	expression tag	UNP Q4G1L2
B	418	HIS	-	expression tag	UNP Q4G1L2
B	419	PRO	-	expression tag	UNP Q4G1L2
B	420	GLN	-	expression tag	UNP Q4G1L2
B	421	PHE	-	expression tag	UNP Q4G1L2
B	422	GLU	-	expression tag	UNP Q4G1L2
B	423	LYS	-	expression tag	UNP Q4G1L2
B	424	GLY	-	expression tag	UNP Q4G1L2
B	425	SER	-	expression tag	UNP Q4G1L2
B	426	HIS	-	expression tag	UNP Q4G1L2
B	427	HIS	-	expression tag	UNP Q4G1L2
B	428	HIS	-	expression tag	UNP Q4G1L2
B	429	HIS	-	expression tag	UNP Q4G1L2
B	430	HIS	-	expression tag	UNP Q4G1L2
B	431	HIS	-	expression tag	UNP Q4G1L2

- Molecule 2 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: $C_8H_{15}NO_6$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	C	N	O	0	0
			14	8	1	5		
2	A	1	Total	C	N	O	0	0
			14	8	1	5		
2	A	1	Total	C	N	O	0	0
			14	8	1	5		
2	A	1	Total	C	N	O	0	0
			14	8	1	5		
2	A	1	Total	C	N	O	0	0
			14	8	1	5		
2	B	1	Total	C	N	O	0	0
			14	8	1	5		
2	B	1	Total	C	N	O	0	0
			14	8	1	5		
2	B	1	Total	C	N	O	0	0
			14	8	1	5		
2	B	1	Total	C	N	O	0	0
			14	8	1	5		

- Molecule 3 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	O	S	0	0
			5	4	1		
3	A	1	Total	O	S	0	0
			5	4	1		
3	A	1	Total	O	S	0	0
			5	4	1		
3	A	1	Total	O	S	0	0
			5	4	1		
3	B	1	Total	O	S	0	0
			5	4	1		
3	B	1	Total	O	S	0	0
			5	4	1		
3	B	1	Total	O	S	0	0
			5	4	1		

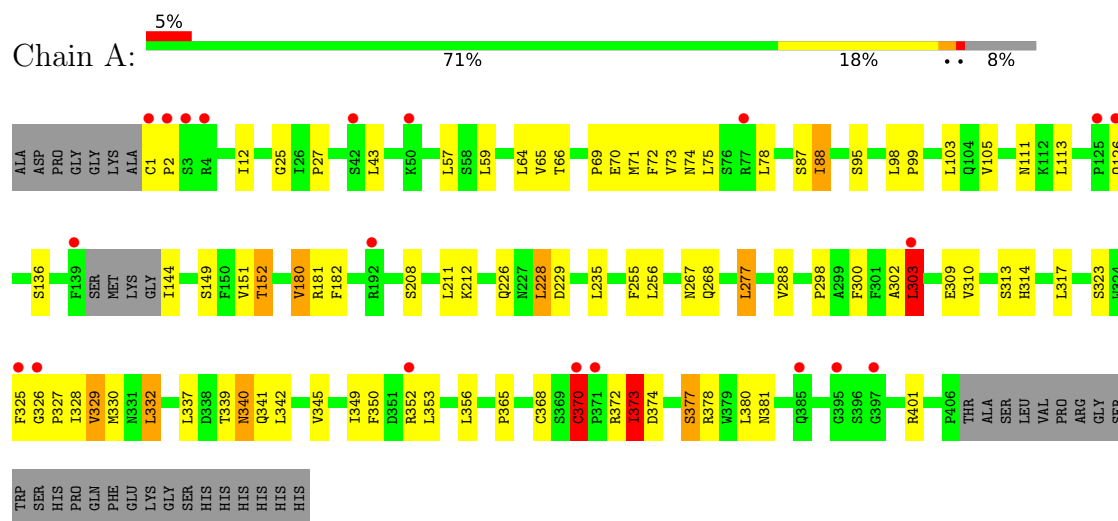
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	57	Total	O	0	0
			57	57		
4	B	63	Total	O	0	0
			63	63		

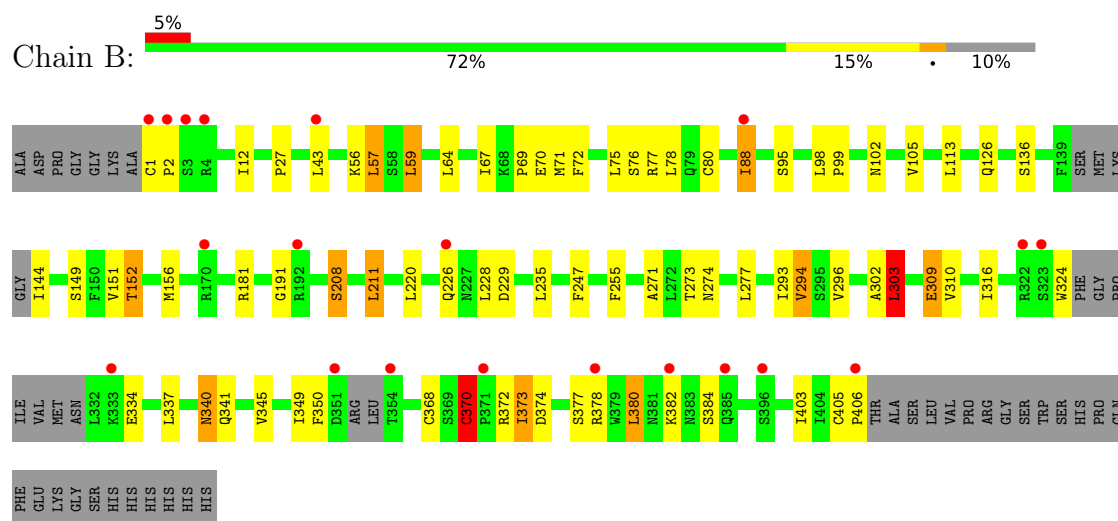
3 Residue-property plots

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 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: Variable lymphocyte receptor B, Toll-like receptor 9 chimera



- Molecule 1: Variable lymphocyte receptor B, Toll-like receptor 9 chimera



4 Data and refinement statistics

Property	Value	Source
Space group	P 31 2 1	Depositor
Cell constants a, b, c, α , β , γ	106.03Å 106.03Å 221.55Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	47.82 – 2.40 47.82 – 2.40	Depositor EDS
% Data completeness (in resolution range)	99.6 (47.82-2.40) 99.6 (47.82-2.40)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.13	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.86 (at 2.39Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.8.1_1168)	Depositor
R, R_{free}	0.214 , 0.247 0.217 , 0.247	Depositor DCC
R_{free} test set	2888 reflections (5.04%)	wwPDB-VP
Wilson B-factor (Å ²)	37.7	Xtriage
Anisotropy	0.423	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 39.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	0.027 for -h,-k,l	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	6532	wwPDB-VP
Average B, all atoms (Å ²)	40.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.88% 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

Bond lengths and bond angles in the following residue types are not validated in this section: SO4, NAG

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	0.58	0/3222	1.05	11/4371 (0.3%)
1	B	0.54	0/3140	0.93	7/4258 (0.2%)
All	All	0.56	0/6362	0.99	18/8629 (0.2%)

There are no bond length outliers.

All (18) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	326	GLY	CA-C-N	16.43	140.38	119.84
1	A	326	GLY	C-N-CA	16.43	140.38	119.84
1	A	136	SER	N-CA-C	-9.48	97.75	110.55
1	A	370	CYS	CA-C-N	-8.26	109.51	119.84
1	A	370	CYS	C-N-CA	-8.26	109.51	119.84
1	A	208	SER	N-CA-C	7.96	120.73	111.02
1	A	340	ASN	N-CA-C	7.87	125.80	114.16
1	B	136	SER	N-CA-C	-7.72	100.33	110.53
1	B	340	ASN	N-CA-C	7.06	124.61	114.16
1	B	208	SER	N-CA-C	7.04	119.61	111.02
1	B	370	CYS	CA-C-N	-6.42	111.81	119.84
1	B	370	CYS	C-N-CA	-6.42	111.81	119.84
1	A	303	LEU	CA-CB-CG	6.33	138.45	116.30
1	B	303	LEU	N-CA-CB	-6.02	107.31	114.17
1	A	370	CYS	N-CA-C	5.63	122.24	109.81
1	A	180	VAL	N-CA-CB	5.61	117.21	110.31
1	A	373	ILE	CB-CA-C	-5.40	102.44	111.29
1	B	370	CYS	N-CA-C	5.11	121.11	109.81

There are no chirality outliers.

There are no planarity outliers.

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	3155	0	3170	47	0
1	B	3077	0	3079	40	0
2	A	70	0	65	0	0
2	B	70	0	65	1	0
3	A	20	0	0	0	0
3	B	20	0	0	0	0
4	A	57	0	0	2	0
4	B	63	0	0	2	0
All	All	6532	0	6379	87	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 7.

All (87) 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:368:CYS:HA	1:A:373:ILE:HG12	1.46	0.97
1:B:368:CYS:HA	1:B:373:ILE:HG12	1.55	0.89
1:A:88:ILE:HG13	1:A:113:LEU:HD21	1.59	0.85
1:A:401:ARG:NH1	4:A:605:HOH:O	2.14	0.81
1:B:43:LEU:HD12	1:B:71:MET:HE3	1.72	0.71
1:A:69:PRO:HG3	1:A:95:SER:O	1.91	0.71
1:B:88:ILE:HG13	1:B:113:LEU:HD21	1.71	0.71
1:A:298:PRO:HB3	1:A:323:SER:HB2	1.73	0.70
1:B:76:SER:O	1:B:102:ASN:ND2	2.22	0.70
1:B:43:LEU:HB2	1:B:71:MET:HG2	1.74	0.69
1:A:43:LEU:HD12	1:A:71:MET:HE3	1.78	0.66
1:A:65:VAL:HG12	1:A:66:THR:HG23	1.77	0.66
1:A:353:LEU:HD23	1:A:356:LEU:HD22	1.76	0.66
1:A:87:SER:HA	1:A:111:ASN:HA	1.77	0.65
1:B:69:PRO:HG3	1:B:95:SER:O	1.98	0.63
1:B:126:GLN:HA	1:B:156:MET:HG3	1.79	0.63
1:B:373:ILE:HD13	1:B:403:ILE:HG21	1.81	0.62
1:A:373:ILE:O	1:A:377:SER:OG	2.18	0.61
1:B:64:LEU:O	1:B:88:ILE:HG22	2.01	0.61

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:373:ILE:O	1:B:377:SER:OG	2.12	0.60
1:A:12:ILE:HD11	1:A:27:PRO:HG2	1.85	0.59
1:B:152:THR:HG21	4:B:648:HOH:O	2.03	0.58
1:A:64:LEU:O	1:A:88:ILE:HG22	2.05	0.57
1:A:126:GLN:H	1:A:126:GLN:CD	2.12	0.57
1:A:72:PHE:HB2	1:A:99:PRO:HG2	1.88	0.56
1:B:56:LYS:HG2	1:B:80:CYS:HB3	1.88	0.54
1:B:208:SER:O	4:B:627:HOH:O	2.18	0.54
1:B:294:VAL:HG23	1:B:316:ILE:HG13	1.90	0.53
1:A:370:CYS:C	1:A:372:ARG:H	2.16	0.53
1:B:12:ILE:HD11	1:B:27:PRO:HG2	1.90	0.53
1:B:273:THR:OG1	1:B:274:ASN:N	2.42	0.52
1:B:296:VAL:HB	1:B:324:TRP:CE2	2.44	0.52
1:A:103:LEU:O	1:A:126:GLN:NE2	2.42	0.52
1:B:181:ARG:HD2	1:B:211:LEU:HD22	1.92	0.51
1:A:302:ALA:O	1:A:303:LEU:HB3	2.10	0.50
1:B:374:ASP:OD2	1:B:378:ARG:NH1	2.44	0.50
1:B:349:ILE:HG23	1:B:350:PHE:CD2	2.48	0.49
1:A:340:ASN:O	1:A:341:GLN:HB2	2.13	0.49
1:A:370:CYS:O	1:A:372:ARG:N	2.45	0.49
1:B:302:ALA:O	1:B:303:LEU:HB3	2.13	0.49
1:B:191:GLY:HA2	1:B:220:LEU:HD23	1.94	0.48
1:A:103:LEU:O	1:A:126:GLN:HG2	2.14	0.47
1:A:103:LEU:N	1:A:126:GLN:HE21	2.13	0.47
1:A:313:SER:OG	1:A:314:HIS:ND1	2.43	0.47
1:A:314:HIS:CD2	1:A:339:THR:HG21	2.50	0.47
1:B:340:ASN:O	1:B:341:GLN:HB2	2.14	0.47
1:A:73:VAL:O	1:A:74:ASN:HB2	2.15	0.46
1:A:374:ASP:OD2	1:A:378:ARG:NH1	2.48	0.46
1:B:229:ASP:HA	1:B:255:PHE:HB3	1.97	0.46
1:A:302:ALA:HA	1:A:328:ILE:HG12	1.96	0.46
1:A:229:ASP:HA	1:A:255:PHE:HB3	1.97	0.46
1:A:317:LEU:HD23	1:A:317:LEU:HA	1.78	0.46
1:B:370:CYS:C	1:B:372:ARG:H	2.24	0.46
1:A:149:SER:O	1:A:152:THR:HG23	2.16	0.45
1:A:330:MET:SD	1:A:352:ARG:NE	2.89	0.45
1:A:330:MET:O	1:A:353:LEU:HA	2.17	0.45
1:B:57:LEU:HB2	1:B:78:LEU:HD11	1.99	0.45
1:B:405:CYS:HA	1:B:406:PRO:HD3	1.85	0.44
1:B:67:ILE:HD11	1:B:88:ILE:HD12	2.00	0.44
1:A:182:PHE:HD1	1:A:212:LYS:HB2	1.83	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:126:GLN:OE1	1:A:126:GLN:N	2.30	0.43
1:B:296:VAL:HB	1:B:324:TRP:NE1	2.34	0.43
1:A:368:CYS:CA	1:A:373:ILE:HG12	2.33	0.43
1:B:72:PHE:HB2	1:B:99:PRO:HG2	2.00	0.43
1:A:181:ARG:HA	1:A:181:ARG:HD3	1.84	0.43
1:A:329:VAL:HA	1:A:332:LEU:HD22	2.01	0.42
1:A:342:LEU:O	1:A:365:PRO:HD2	2.19	0.42
1:A:370:CYS:C	1:A:372:ARG:N	2.76	0.42
1:A:2:PRO:HG3	1:A:25:GLY:O	2.20	0.42
1:A:228:LEU:HG	1:A:256:LEU:HD11	2.00	0.42
1:B:1:CYS:HA	1:B:2:PRO:HD3	1.90	0.42
1:A:152:THR:HG22	4:A:648:HOH:O	2.19	0.42
1:B:380:LEU:HD12	1:B:380:LEU:HA	1.88	0.42
1:A:349:ILE:HG23	1:A:350:PHE:CD2	2.55	0.41
1:B:126:GLN:H	1:B:126:GLN:CD	2.26	0.41
1:A:277:LEU:HD13	1:A:300:PHE:CZ	2.55	0.41
1:B:149:SER:O	1:B:152:THR:HG23	2.19	0.41
1:B:271:ALA:HA	1:B:293:ILE:HG23	2.02	0.41
1:B:247:PHE:CE2	2:B:504:NAG:H82	2.55	0.41
1:A:325:PHE:HB3	1:A:349:ILE:HD11	2.02	0.41
1:B:43:LEU:HD11	1:B:59:LEU:HD21	2.02	0.41
1:A:329:VAL:O	1:A:332:LEU:HD22	2.21	0.40
1:A:1:CYS:HA	1:A:2:PRO:HD3	1.85	0.40
1:B:77:ARG:O	1:B:77:ARG:HG3	2.22	0.40
1:B:309:GLU:HB3	1:B:334:GLU:HB2	2.03	0.40
1:B:373:ILE:H	1:B:373:ILE:HG13	1.61	0.40
1:A:267:ASN:HB3	1:A:268:GLN:H	1.75	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	398/438 (91%)	372 (94%)	25 (6%)	1 (0%)	36	50
1	B	385/438 (88%)	359 (93%)	26 (7%)	0	100	100
All	All	783/876 (89%)	731 (93%)	51 (6%)	1 (0%)	48	64

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	327	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	369/397 (93%)	339 (92%)	30 (8%)	11	18
1	B	360/397 (91%)	334 (93%)	26 (7%)	13	23
All	All	729/794 (92%)	673 (92%)	56 (8%)	12	20

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

Mol	Chain	Res	Type
1	A	57	LEU
1	A	59	LEU
1	A	70	GLU
1	A	75	LEU
1	A	78	LEU
1	A	88	ILE
1	A	98	LEU
1	A	105	VAL
1	A	144	ILE
1	A	151	VAL
1	A	152	THR
1	A	180	VAL
1	A	211	LEU
1	A	226	GLN
1	A	228	LEU

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Mol	Chain	Res	Type
1	A	235	LEU
1	A	277	LEU
1	A	288	VAL
1	A	303	LEU
1	A	309	GLU
1	A	310	VAL
1	A	329	VAL
1	A	332	LEU
1	A	337	LEU
1	A	345	VAL
1	A	370	CYS
1	A	373	ILE
1	A	377	SER
1	A	380	LEU
1	A	381	ASN
1	B	57	LEU
1	B	59	LEU
1	B	70	GLU
1	B	75	LEU
1	B	88	ILE
1	B	98	LEU
1	B	105	VAL
1	B	144	ILE
1	B	151	VAL
1	B	152	THR
1	B	211	LEU
1	B	226	GLN
1	B	228	LEU
1	B	235	LEU
1	B	277	LEU
1	B	294	VAL
1	B	303	LEU
1	B	309	GLU
1	B	310	VAL
1	B	337	LEU
1	B	345	VAL
1	B	370	CYS
1	B	373	ILE
1	B	380	LEU
1	B	382	LYS
1	B	384	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (13)

such sidechains are listed below:

Mol	Chain	Res	Type
1	A	85	HIS
1	A	176	ASN
1	A	217	GLN
1	A	219	ASN
1	A	381	ASN
1	A	388	GLN
1	B	41	GLN
1	B	53	GLN
1	B	85	HIS
1	B	128	GLN
1	B	176	ASN
1	B	217	GLN
1	B	219	ASN

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](#)

18 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. 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 $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	SO4	A	507	-	4,4,4	0.26	0	6,6,6	0.21	0
2	NAG	A	501	1	14,14,15	0.62	0	17,19,21	1.21	2 (11%)
3	SO4	B	509	-	4,4,4	0.24	0	6,6,6	0.13	0
3	SO4	A	506	-	4,4,4	0.26	0	6,6,6	0.35	0
2	NAG	A	502	1	14,14,15	0.56	0	17,19,21	1.02	1 (5%)
2	NAG	A	505	1	14,14,15	0.62	1 (7%)	17,19,21	2.19	4 (23%)
2	NAG	B	504	1	14,14,15	0.49	0	17,19,21	1.84	3 (17%)
2	NAG	B	505	1	14,14,15	0.55	0	17,19,21	1.19	2 (11%)
2	NAG	B	501	1	14,14,15	0.57	0	17,19,21	1.09	1 (5%)
3	SO4	B	508	-	4,4,4	0.28	0	6,6,6	0.13	0
3	SO4	B	507	-	4,4,4	0.30	0	6,6,6	0.48	0
3	SO4	A	508	-	4,4,4	0.24	0	6,6,6	0.14	0
3	SO4	B	506	-	4,4,4	0.28	0	6,6,6	0.12	0
3	SO4	A	509	-	4,4,4	0.24	0	6,6,6	0.11	0
2	NAG	B	503	1	14,14,15	0.45	0	17,19,21	1.75	2 (11%)
2	NAG	A	503	1	14,14,15	0.59	0	17,19,21	0.89	1 (5%)
2	NAG	A	504	1	14,14,15	0.43	0	17,19,21	1.77	1 (5%)
2	NAG	B	502	1	14,14,15	0.51	0	17,19,21	1.36	2 (11%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	NAG	A	501	1	-	2/6/23/26	0/1/1/1
2	NAG	A	502	1	-	0/6/23/26	0/1/1/1
2	NAG	A	505	1	-	1/6/23/26	0/1/1/1
2	NAG	B	504	1	-	0/6/23/26	0/1/1/1
2	NAG	B	505	1	-	2/6/23/26	0/1/1/1
2	NAG	B	501	1	-	2/6/23/26	0/1/1/1
2	NAG	B	503	1	-	0/6/23/26	0/1/1/1
2	NAG	A	503	1	-	0/6/23/26	0/1/1/1
2	NAG	A	504	1	-	0/6/23/26	0/1/1/1
2	NAG	B	502	1	-	2/6/23/26	0/1/1/1

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	505	NAG	C1-C2	2.01	1.55	1.52

All (19) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	505	NAG	C1-O5-C5	6.37	120.73	112.19
2	B	503	NAG	C1-O5-C5	6.15	120.43	112.19
2	A	504	NAG	C1-O5-C5	5.82	119.99	112.19
2	B	504	NAG	C1-O5-C5	5.63	119.73	112.19
2	B	502	NAG	C2-N2-C7	-4.31	117.12	122.90
2	A	502	NAG	O5-C1-C2	-3.54	105.82	111.29
2	A	505	NAG	C6-C5-C4	-3.35	104.80	113.02
2	A	505	NAG	C3-C4-C5	3.31	116.23	110.23
2	B	501	NAG	C1-O5-C5	3.26	116.56	112.19
2	B	505	NAG	C2-N2-C7	-2.81	119.13	122.90
2	A	505	NAG	C4-C3-C2	2.81	115.13	111.02
2	B	504	NAG	C4-C3-C2	-2.81	106.91	111.02
2	A	503	NAG	C1-O5-C5	2.70	115.80	112.19
2	B	503	NAG	C2-N2-C7	-2.65	119.35	122.90
2	A	501	NAG	O5-C1-C2	-2.52	107.39	111.29
2	B	502	NAG	O5-C1-C2	-2.41	107.56	111.29
2	A	501	NAG	C1-O5-C5	2.20	115.14	112.19
2	B	505	NAG	C1-O5-C5	2.17	115.10	112.19
2	B	504	NAG	C1-C2-N2	2.14	113.80	110.43

There are no chirality outliers.

All (9) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	B	501	NAG	C8-C7-N2-C2
2	B	501	NAG	O7-C7-N2-C2
2	B	505	NAG	O5-C5-C6-O6
2	B	505	NAG	C4-C5-C6-O6
2	A	501	NAG	C8-C7-N2-C2
2	A	501	NAG	O7-C7-N2-C2
2	B	502	NAG	C4-C5-C6-O6
2	B	502	NAG	O5-C5-C6-O6
2	A	505	NAG	O5-C5-C6-O6

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	504	NAG	1	0

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

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	402/438 (91%)	-0.02	20 (4%) 34 30	18, 33, 70, 111	0
1	B	393/438 (89%)	0.19	20 (5%) 33 30	18, 40, 78, 120	0
All	All	795/876 (90%)	0.08	40 (5%) 34 30	18, 35, 74, 120	0

All (40) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	406	PRO	5.8
1	A	3	SER	4.6
1	B	354	THR	4.6
1	B	3	SER	4.4
1	B	4	ARG	3.9
1	B	1	CYS	3.8
1	A	1	CYS	3.7
1	B	385	GLN	3.5
1	B	371	PRO	3.4
1	A	139	PHE	3.4
1	A	303	LEU	3.2
1	A	326	GLY	3.1
1	A	352	ARG	3.1
1	B	322	ARG	3.0
1	A	325	PHE	3.0
1	A	371	PRO	3.0
1	A	126	GLN	3.0
1	B	192	ARG	2.9
1	A	50	LYS	2.8
1	A	4	ARG	2.8
1	A	2	PRO	2.8
1	B	382	LYS	2.7
1	B	226	GLN	2.6
1	B	2	PRO	2.6

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Mol	Chain	Res	Type	RSRZ
1	A	192	ARG	2.6
1	A	125	PRO	2.5
1	A	395	GLY	2.5
1	B	88	ILE	2.5
1	B	396	SER	2.5
1	A	397	GLY	2.5
1	A	42	SER	2.5
1	B	170	ARG	2.4
1	A	370	CYS	2.4
1	A	385	GLN	2.4
1	B	351	ASP	2.3
1	B	323	SER	2.2
1	A	77	ARG	2.1
1	B	378	ARG	2.1
1	B	333	LYS	2.0
1	B	43	LEU	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](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
3	SO4	B	506	5/5	0.52	0.20	107,108,110,111	0
2	NAG	A	504	14/15	0.62	0.17	70,80,89,90	0
2	NAG	B	504	14/15	0.74	0.15	57,72,80,82	0
2	NAG	B	505	14/15	0.81	0.15	52,63,70,70	0
3	SO4	A	509	5/5	0.82	0.19	115,115,116,118	0
3	SO4	A	508	5/5	0.83	0.15	88,92,94,95	0
3	SO4	B	509	5/5	0.84	0.15	89,92,94,97	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	NAG	A	503	14/15	0.85	0.12	58,70,75,76	0
2	NAG	B	503	14/15	0.86	0.13	62,70,77,78	0
2	NAG	B	501	14/15	0.88	0.10	39,55,62,63	0
2	NAG	A	501	14/15	0.89	0.09	27,44,49,51	0
2	NAG	B	502	14/15	0.89	0.10	37,47,56,56	0
2	NAG	A	505	14/15	0.89	0.13	42,53,64,68	0
2	NAG	A	502	14/15	0.90	0.11	35,43,45,50	0
3	SO4	A	506	5/5	0.90	0.13	63,68,70,70	0
3	SO4	B	508	5/5	0.91	0.21	75,77,82,82	0
3	SO4	A	507	5/5	0.95	0.11	46,46,49,57	0
3	SO4	B	507	5/5	0.97	0.07	35,41,45,48	0

6.5 Other polymers [i](#)

There are no such residues in this entry.