



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 14, 2026 – 07:43 PM UTC

PDB ID : 4D97 / pdb_00004d97
Title : Salmonella typhimurium D-Cysteine desulphydrase with D-ser bound at active site
Authors : Bharath, S.R.; Shveta, B.; Rajesh, K.H.; Savithri, H.S.; Murthy, M.R.N.
Deposited on : 2012-01-11
Resolution : 1.77 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

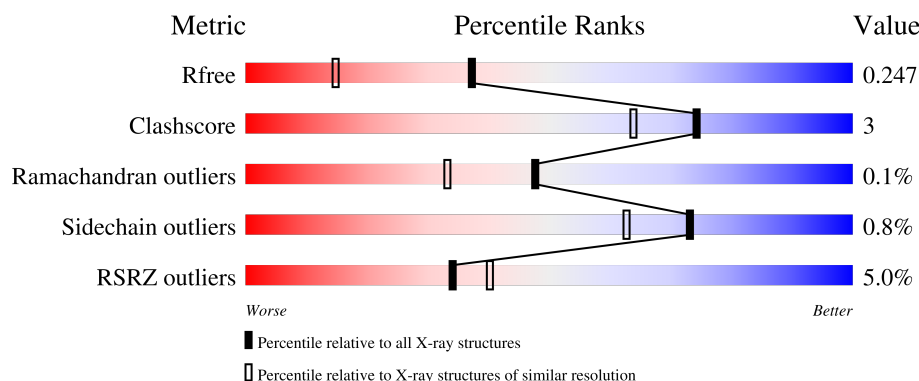
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.77 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	1365 (1.78-1.78)
Clashscore	190562	1395 (1.78-1.78)
Ramachandran outliers	187476	1382 (1.78-1.78)
Sidechain outliers	187428	1382 (1.78-1.78)
RSRZ outliers	180081	1365 (1.78-1.78)

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	346	2% 90% 5% 5%
1	B	346	5% 88% 5% 6%
1	C	346	9% 88% 5% 7%
1	D	346	3% 87% 7% 5%

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard

residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
3	DSN	B	401	-	-	X	-
3	DSN	D	402	-	-	X	-

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 10536 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 D-cysteine desulfhydrase.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	328	Total	C	N	O	P	S	0	3	0
			2473	1576	416	471	1	9			
1	B	324	Total	C	N	O	P	S	0	3	0
			2438	1552	411	465	1	9			
1	C	322	Total	C	N	O	P	S	0	3	0
			2414	1537	409	458	1	9			
1	D	328	Total	C	N	O	P	S	0	4	0
			2466	1577	411	468	1	9			

There are 72 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-13	MET	-	expression tag	UNP Q8ZNT7
A	-12	ARG	-	expression tag	UNP Q8ZNT7
A	-11	GLY	-	expression tag	UNP Q8ZNT7
A	-10	SER	-	expression tag	UNP Q8ZNT7
A	-9	HIS	-	expression tag	UNP Q8ZNT7
A	-8	HIS	-	expression tag	UNP Q8ZNT7
A	-7	HIS	-	expression tag	UNP Q8ZNT7
A	-6	HIS	-	expression tag	UNP Q8ZNT7
A	-5	HIS	-	expression tag	UNP Q8ZNT7
A	-4	HIS	-	expression tag	UNP Q8ZNT7
A	-3	GLY	-	expression tag	UNP Q8ZNT7
A	-2	MET	-	expression tag	UNP Q8ZNT7
A	-1	ALA	-	expression tag	UNP Q8ZNT7
A	0	SER	-	expression tag	UNP Q8ZNT7
A	329	THR	-	expression tag	UNP Q8ZNT7
A	330	TYR	-	expression tag	UNP Q8ZNT7
A	331	PRO	-	expression tag	UNP Q8ZNT7
A	332	GLU	-	expression tag	UNP Q8ZNT7
B	-13	MET	-	expression tag	UNP Q8ZNT7
B	-12	ARG	-	expression tag	UNP Q8ZNT7
B	-11	GLY	-	expression tag	UNP Q8ZNT7

Continued on next page...

Continued from previous page...

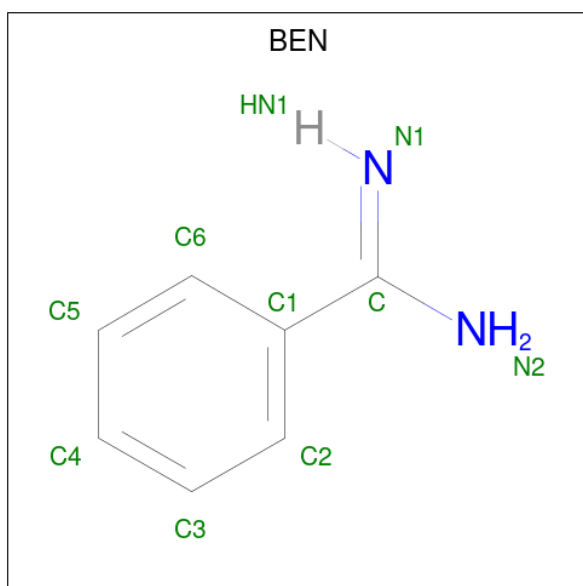
Chain	Residue	Modelled	Actual	Comment	Reference
B	-10	SER	-	expression tag	UNP Q8ZNT7
B	-9	HIS	-	expression tag	UNP Q8ZNT7
B	-8	HIS	-	expression tag	UNP Q8ZNT7
B	-7	HIS	-	expression tag	UNP Q8ZNT7
B	-6	HIS	-	expression tag	UNP Q8ZNT7
B	-5	HIS	-	expression tag	UNP Q8ZNT7
B	-4	HIS	-	expression tag	UNP Q8ZNT7
B	-3	GLY	-	expression tag	UNP Q8ZNT7
B	-2	MET	-	expression tag	UNP Q8ZNT7
B	-1	ALA	-	expression tag	UNP Q8ZNT7
B	0	SER	-	expression tag	UNP Q8ZNT7
B	329	THR	-	expression tag	UNP Q8ZNT7
B	330	TYR	-	expression tag	UNP Q8ZNT7
B	331	PRO	-	expression tag	UNP Q8ZNT7
B	332	GLU	-	expression tag	UNP Q8ZNT7
C	-13	MET	-	expression tag	UNP Q8ZNT7
C	-12	ARG	-	expression tag	UNP Q8ZNT7
C	-11	GLY	-	expression tag	UNP Q8ZNT7
C	-10	SER	-	expression tag	UNP Q8ZNT7
C	-9	HIS	-	expression tag	UNP Q8ZNT7
C	-8	HIS	-	expression tag	UNP Q8ZNT7
C	-7	HIS	-	expression tag	UNP Q8ZNT7
C	-6	HIS	-	expression tag	UNP Q8ZNT7
C	-5	HIS	-	expression tag	UNP Q8ZNT7
C	-4	HIS	-	expression tag	UNP Q8ZNT7
C	-3	GLY	-	expression tag	UNP Q8ZNT7
C	-2	MET	-	expression tag	UNP Q8ZNT7
C	-1	ALA	-	expression tag	UNP Q8ZNT7
C	0	SER	-	expression tag	UNP Q8ZNT7
C	329	THR	-	expression tag	UNP Q8ZNT7
C	330	TYR	-	expression tag	UNP Q8ZNT7
C	331	PRO	-	expression tag	UNP Q8ZNT7
C	332	GLU	-	expression tag	UNP Q8ZNT7
D	-13	MET	-	expression tag	UNP Q8ZNT7
D	-12	ARG	-	expression tag	UNP Q8ZNT7
D	-11	GLY	-	expression tag	UNP Q8ZNT7
D	-10	SER	-	expression tag	UNP Q8ZNT7
D	-9	HIS	-	expression tag	UNP Q8ZNT7
D	-8	HIS	-	expression tag	UNP Q8ZNT7
D	-7	HIS	-	expression tag	UNP Q8ZNT7
D	-6	HIS	-	expression tag	UNP Q8ZNT7
D	-5	HIS	-	expression tag	UNP Q8ZNT7

Continued on next page...

Continued from previous page...

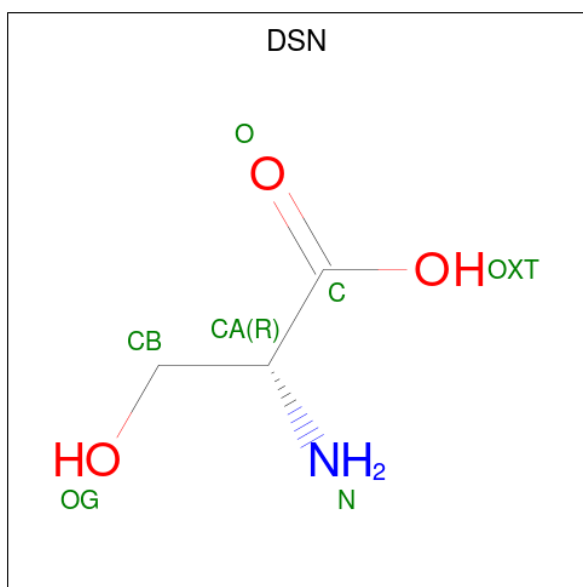
Chain	Residue	Modelled	Actual	Comment	Reference
D	-4	HIS	-	expression tag	UNP Q8ZNT7
D	-3	GLY	-	expression tag	UNP Q8ZNT7
D	-2	MET	-	expression tag	UNP Q8ZNT7
D	-1	ALA	-	expression tag	UNP Q8ZNT7
D	0	SER	-	expression tag	UNP Q8ZNT7
D	329	THR	-	expression tag	UNP Q8ZNT7
D	330	TYR	-	expression tag	UNP Q8ZNT7
D	331	PRO	-	expression tag	UNP Q8ZNT7
D	332	GLU	-	expression tag	UNP Q8ZNT7

- Molecule 2 is BENZAMIDINE (CCD ID: BEN) (formula: $C_7H_8N_2$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	C	N	0	0
			9	7	2		
2	C	1	Total	C	N	0	0
			9	7	2		
2	D	1	Total	C	N	0	0
			9	7	2		

- Molecule 3 is D-SERINE (CCD ID: DSN) (formula: $C_3H_7NO_3$).

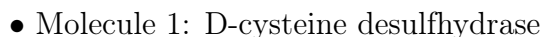
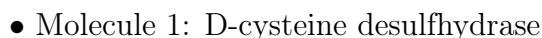
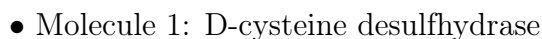


Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	N	O	0	0
			7	3	1	3		
3	B	1	Total	C	N	O	0	0
			7	3	1	3		
3	C	1	Total	C	N	O	0	0
			7	3	1	3		
3	D	1	Total	C	N	O	0	0
			7	3	1	3		

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	210	Total	O	0	0
			210	210		
4	B	151	Total	O	0	0
			151	151		
4	C	129	Total	O	0	0
			129	129		
4	D	200	Total	O	0	0
			200	200		

- Molecule 1: D-cysteine desulfhydrase





4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	66.44Å 165.29Å 68.71Å 90.00° 118.71° 90.00°	Depositor
Resolution (Å)	29.13 – 1.77 29.13 – 1.77	Depositor EDS
% Data completeness (in resolution range)	98.5 (29.13-1.77) 98.5 (29.13-1.77)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.40 (at 1.77Å)	Xtriage
Refinement program	REFMAC 5.6.0117	Depositor
R, R_{free}	0.216 , 0.248 0.215 , 0.247	Depositor DCC
R_{free} test set	6294 reflections (5.02%)	wwPDB-VP
Wilson B-factor (Å ²)	23.0	Xtriage
Anisotropy	0.111	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 29.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.34$	Xtriage
Estimated twinning fraction	0.000 for -h-l,k,h 0.000 for l,k,-h-l 0.017 for h,-k,-h-l 0.018 for -h-l,-k,l 0.019 for l,-k,h	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	10536	wwPDB-VP
Average B, all atoms (Å ²)	25.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.81% 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](#)

Bond lengths and bond angles in the following residue types are not validated in this section: LLP, BEN, DSN

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	0.60	0/2501	0.77	0/3408
1	B	0.60	0/2464	0.79	2/3356 (0.1%)
1	C	0.55	0/2438	0.80	0/3321
1	D	0.59	0/2497	0.77	0/3404
All	All	0.59	0/9900	0.78	2/13489 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	308	GLY	CA-C-N	5.17	125.18	119.90
1	B	308	GLY	C-N-CA	5.17	125.18	119.90

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

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	2473	0	2476	15	0
1	B	2438	0	2431	16	0
1	C	2414	0	2420	15	0
1	D	2466	0	2467	17	0
2	A	9	0	7	0	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	C	9	0	7	1	0
2	D	9	0	7	0	0
3	A	7	0	6	3	0
3	B	7	0	6	4	0
3	C	7	0	6	1	0
3	D	7	0	6	4	0
4	A	210	0	0	3	0
4	B	151	0	0	1	0
4	C	129	0	0	1	0
4	D	200	0	0	1	0
All	All	10536	0	9839	60	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 3.

All (60) 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:78:SER:OG	3:A:402:DSN:HB2	1.71	0.90
1:A:107:ALA:HB2	1:A:328[B]:VAL:HG23	1.55	0.88
1:A:42:VAL:O	1:A:42:VAL:HG23	1.91	0.70
3:D:402:DSN:N	4:D:634:HOH:O	2.25	0.69
1:D:52[B]:LEU:HG	1:D:83:GLN:HE21	1.62	0.63
1:D:78:SER:OG	3:D:402:DSN:N	2.33	0.61
1:B:42:VAL:HG12	1:B:42:VAL:O	2.01	0.61
1:D:7:THR:O	1:D:8:ARG:CB	2.49	0.61
1:B:314:HIS:HD2	1:B:316:GLY:H	1.49	0.61
1:B:105:THR:OG1	1:B:328[A]:VAL:HG12	2.00	0.60
1:D:314:HIS:HD2	1:D:316:GLY:H	1.51	0.58
1:C:314:HIS:HD2	1:C:316:GLY:H	1.50	0.57
1:B:328[A]:VAL:HG11	1:D:145:ARG:HH12	1.69	0.57
1:C:105:THR:OG1	1:C:328[A]:VAL:HG12	2.06	0.55
1:B:314:HIS:CD2	1:B:316:GLY:H	2.26	0.54
1:A:145:ARG:HH12	1:C:328[A]:VAL:HG21	1.72	0.53
3:B:401:DSN:HB2	4:B:651:HOH:O	2.06	0.53
1:C:112:THR:OG1	1:D:325:HIS:HE1	1.92	0.52
1:D:26:ARG:HD3	1:D:278:LEU:O	2.09	0.52
1:A:325:HIS:HD2	4:A:673:HOH:O	1.92	0.51
1:D:261:TYR:OH	3:D:402:DSN:HB3	2.10	0.51
1:B:287:TYR:OH	3:B:401:DSN:HA	2.12	0.50
1:A:259:PRO:HG2	1:A:263:VAL:HG11	1.94	0.48

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:39[A]:ARG:NH1	4:C:620:HOH:O	2.45	0.48
1:D:259:PRO:HG2	1:D:263:VAL:HG11	1.96	0.48
1:B:237:ALA:O	1:B:241:GLN:HG2	2.14	0.47
1:C:314:HIS:CD2	1:C:316:GLY:H	2.31	0.47
1:D:105:THR:OG1	1:D:328[A]:VAL:HG12	2.15	0.47
1:C:132:LEU:HA	1:C:138:GLN:HE22	1.79	0.47
1:D:72:THR:OG1	1:D:80:HIS:HE1	1.98	0.47
1:C:300:SER:OG	2:C:401:BEN:H6	2.15	0.46
1:C:105:THR:CB	1:C:328[A]:VAL:HG12	2.45	0.46
1:B:71:ILE:HG12	1:B:96:VAL:HB	1.98	0.45
1:D:80:HIS:HB3	3:D:402:DSN:H	1.80	0.45
1:A:132:LEU:HA	1:A:138:GLN:HE22	1.81	0.45
1:A:42:VAL:O	1:A:42:VAL:CG2	2.59	0.45
1:A:78:SER:HG	3:A:402:DSN:HB2	1.73	0.45
1:A:134:ASP:H	1:A:138:GLN:HE21	1.65	0.44
1:A:325:HIS:HE1	1:B:112:THR:OG1	1.98	0.44
1:B:132:LEU:HA	1:B:138:GLN:HE22	1.83	0.43
3:A:402:DSN:HB3	4:A:710:HOH:O	2.18	0.43
1:D:314:HIS:CD2	1:D:316:GLY:H	2.34	0.42
1:B:105:THR:CB	1:B:328[A]:VAL:HG12	2.50	0.42
1:B:42:VAL:O	1:B:42:VAL:CG1	2.67	0.42
1:D:132:LEU:HA	1:D:138:GLN:HE22	1.85	0.42
1:B:51:LLP:HE3	3:B:401:DSN:H	1.84	0.42
1:C:71:ILE:HG12	1:C:96:VAL:HB	2.01	0.42
1:B:208:HIS:HE1	1:B:245:THR:O	2.02	0.42
1:D:298:GLY:HA2	1:D:303:ARG:HB2	2.02	0.42
1:A:15:ILE:HG23	1:A:43:THR:HG22	2.02	0.41
1:C:26:ARG:HD3	1:C:278:LEU:O	2.20	0.41
1:A:149:GLN:NE2	1:C:328[A]:VAL:HG13	2.35	0.41
1:B:328[A]:VAL:HG13	1:D:149:GLN:NE2	2.36	0.41
1:C:105:THR:HB	1:C:328[A]:VAL:HG12	2.03	0.41
1:D:15:ILE:HG23	1:D:43:THR:HG22	2.03	0.41
4:A:634:HOH:O	1:C:327:HIS:HD2	2.05	0.40
1:B:78:SER:OG	3:B:401:DSN:HB3	2.21	0.40
1:A:134:ASP:H	1:A:138:GLN:NE2	2.19	0.40
1:A:257:PHE:HA	1:A:290:LYS:HD3	2.02	0.40
1:C:287:TYR:OH	3:C:402:DSN:HA	2.21	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	327/346 (94%)	318 (97%)	9 (3%)	0	100	100
1	B	321/346 (93%)	314 (98%)	7 (2%)	0	100	100
1	C	321/346 (93%)	310 (97%)	11 (3%)	0	100	100
1	D	328/346 (95%)	320 (98%)	7 (2%)	1 (0%)	36	22
All	All	1297/1384 (94%)	1262 (97%)	34 (3%)	1 (0%)	48	33

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	D	8	ARG

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	254/270 (94%)	254 (100%)	0	100	100
1	B	250/270 (93%)	247 (99%)	3 (1%)	63	49
1	C	246/270 (91%)	244 (99%)	2 (1%)	73	63
1	D	251/270 (93%)	248 (99%)	3 (1%)	63	49
All	All	1001/1080 (93%)	993 (99%)	8 (1%)	73	63

All (8) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	7	THR
1	B	12	LEU
1	B	241	GLN
1	C	12	LEU
1	C	70	LEU
1	D	43	THR
1	D	241	GLN
1	D	303	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (24) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	5	HIS
1	A	125	GLN
1	A	138	GLN
1	A	149	GLN
1	A	305	ASN
1	A	325	HIS
1	B	125	GLN
1	B	138	GLN
1	B	208	HIS
1	B	314	HIS
1	C	80	HIS
1	C	125	GLN
1	C	138	GLN
1	C	314	HIS
1	D	5	HIS
1	D	80	HIS
1	D	83	GLN
1	D	125	GLN
1	D	138	GLN
1	D	149	GLN
1	D	241	GLN
1	D	301	GLN
1	D	314	HIS
1	D	325	HIS

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

4 non-standard protein/DNA/RNA residues 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$
1	LLP	C	51	1	23,24,25	0.77	0	25,32,34	1.12	1 (4%)
1	LLP	B	51	1	23,24,25	0.80	0	25,32,34	1.11	0
1	LLP	A	51	1	23,24,25	0.76	0	25,32,34	1.03	0
1	LLP	D	51	1	23,24,25	0.73	0	25,32,34	1.06	0

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
1	LLP	C	51	1	-	3/16/17/19	0/1/1/1
1	LLP	B	51	1	-	3/16/17/19	0/1/1/1
1	LLP	A	51	1	-	2/16/17/19	0/1/1/1
1	LLP	D	51	1	-	3/16/17/19	0/1/1/1

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	51	LLP	C5-C6-N1	-2.16	120.31	123.83

There are no chirality outliers.

All (11) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	A	51	LLP	C4-C4'-NZ-CE
1	D	51	LLP	C4-C4'-NZ-CE
1	B	51	LLP	C4-C4'-NZ-CE

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms
1	C	51	LLP	C4-C4'-NZ-CE
1	B	51	LLP	C3-C4-C4'-NZ
1	C	51	LLP	C3-C4-C4'-NZ
1	D	51	LLP	CE-CD-CG-CB
1	A	51	LLP	C3-C4-C4'-NZ
1	D	51	LLP	C3-C4-C4'-NZ
1	B	51	LLP	C5-C4-C4'-NZ
1	C	51	LLP	C5-C4-C4'-NZ

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	B	51	LLP	1	0

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

7 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	DSN	C	402	-	4,6,6	1.18	1 (25%)	2,7,7	2.44	1 (50%)
2	BEN	A	401	-	9,9,9	1.44	2 (22%)	7,11,11	1.09	0
3	DSN	A	402	-	4,6,6	1.32	1 (25%)	2,7,7	2.22	1 (50%)
3	DSN	B	401	-	4,6,6	1.26	1 (25%)	2,7,7	2.26	1 (50%)
2	BEN	D	401	-	9,9,9	1.33	1 (11%)	7,11,11	0.94	0
2	BEN	C	401	-	9,9,9	1.35	1 (11%)	7,11,11	0.64	0
3	DSN	D	402	-	4,6,6	1.32	1 (25%)	2,7,7	1.93	1 (50%)

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
3	DSN	C	402	-	-	4/6/6/6	-
2	BEN	A	401	-	-	0/4/4/4	0/1/1/1
3	DSN	A	402	-	-	4/6/6/6	-
3	DSN	B	401	-	-	2/6/6/6	-
2	BEN	D	401	-	-	0/4/4/4	0/1/1/1
2	BEN	C	401	-	-	0/4/4/4	0/1/1/1
3	DSN	D	402	-	-	3/6/6/6	-

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	401	BEN	C-N2	-2.88	1.26	1.33
2	C	401	BEN	C-N2	-2.88	1.26	1.33
2	D	401	BEN	C-N2	-2.80	1.26	1.33
3	D	402	DSN	OXT-C	-2.59	1.22	1.30
3	A	402	DSN	OXT-C	-2.54	1.22	1.30
3	B	401	DSN	OXT-C	-2.43	1.22	1.30
3	C	402	DSN	OXT-C	-2.31	1.23	1.30
2	A	401	BEN	C1-C	2.07	1.51	1.47

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	402	DSN	OXT-C-O	-3.38	116.41	124.08
3	B	401	DSN	OXT-C-O	-3.14	116.94	124.08
3	A	402	DSN	OXT-C-O	-3.11	117.02	124.08
3	D	402	DSN	OXT-C-O	-2.60	118.19	124.08

There are no chirality outliers.

All (13) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	402	DSN	C-CA-CB-OG
3	B	401	DSN	N-CA-CB-OG
3	C	402	DSN	O-C-CA-N
3	C	402	DSN	N-CA-CB-OG
3	C	402	DSN	C-CA-CB-OG

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms
3	D	402	DSN	OXT-C-CA-N
3	C	402	DSN	OXT-C-CA-N
3	B	401	DSN	C-CA-CB-OG
3	D	402	DSN	O-C-CA-N
3	A	402	DSN	N-CA-CB-OG
3	A	402	DSN	O-C-CA-N
3	A	402	DSN	OXT-C-CA-N
3	D	402	DSN	C-CA-CB-OG

There are no ring outliers.

5 monomers are involved in 13 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	C	402	DSN	1	0
3	A	402	DSN	3	0
3	B	401	DSN	4	0
2	C	401	BEN	1	0
3	D	402	DSN	4	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	327/346 (94%)	0.13	8 (2%) 59 68	13, 20, 35, 45	3 (0%)
1	B	323/346 (93%)	0.55	17 (5%) 32 38	13, 26, 43, 62	3 (0%)
1	C	321/346 (92%)	0.85	30 (9%) 14 16	13, 28, 45, 52	3 (0%)
1	D	327/346 (94%)	0.13	10 (3%) 51 59	11, 20, 35, 44	4 (1%)
All	All	1298/1384 (93%)	0.41	65 (5%) 34 40	11, 24, 41, 62	13 (1%)

All (65) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	184	VAL	5.1
1	B	3	LEU	4.3
1	B	305	ASN	4.3
1	D	328[A]	VAL	4.3
1	C	328[A]	VAL	4.2
1	B	328[A]	VAL	4.0
1	D	8	ARG	3.9
1	A	7	THR	3.6
1	C	7	THR	3.5
1	D	16	GLY	3.5
1	B	4	HIS	3.4
1	C	184	VAL	3.4
1	D	7	THR	3.2
1	A	328[A]	VAL	3.2
1	D	42	VAL	3.2
1	D	185	GLY	3.1
1	C	305	ASN	3.0
1	C	146	ILE	3.0
1	B	249	ASP	2.9
1	A	184	VAL	2.8
1	D	184	VAL	2.8

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	C	8	ARG	2.8
1	C	133	THR	2.8
1	C	16	GLY	2.8
1	A	305	ASN	2.8
1	D	307	ASP	2.8
1	B	148	ALA	2.7
1	C	213	VAL	2.7
1	C	208	HIS	2.7
1	C	225	ALA	2.7
1	C	211	PRO	2.7
1	C	185	GLY	2.6
1	B	6	LEU	2.6
1	B	307	ASP	2.6
1	C	143	ALA	2.6
1	C	232	ILE	2.6
1	D	1	MET	2.6
1	C	141	THR	2.6
1	C	212	ASP	2.6
1	A	1	MET	2.5
1	B	181	GLU	2.4
1	C	231	VAL	2.4
1	A	4	HIS	2.4
1	C	15	ILE	2.3
1	B	145	ARG	2.3
1	A	307	ASP	2.3
1	C	148	ALA	2.3
1	C	308	GLY	2.3
1	B	245	THR	2.2
1	D	15	ILE	2.2
1	B	42	VAL	2.2
1	C	137	ALA	2.2
1	C	135	PRO	2.2
1	C	42	VAL	2.2
1	C	142	LEU	2.2
1	C	209	LEU	2.2
1	B	146	ILE	2.2
1	B	185	GLY	2.1
1	C	206	LEU	2.1
1	C	245	THR	2.1
1	C	229	PRO	2.1
1	B	7	THR	2.1
1	C	131	ALA	2.0

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	A	183	VAL	2.0
1	B	5	HIS	2.0

6.2 Non-standard residues in protein, DNA, RNA chains [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(Å ²)	Q<0.9
1	LLP	B	51	24/25	0.92	0.09	21,23,25,26	0
1	LLP	C	51	24/25	0.92	0.09	23,24,28,29	0
1	LLP	A	51	24/25	0.96	0.07	17,18,20,20	0
1	LLP	D	51	24/25	0.96	0.06	16,18,19,19	0

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(Å ²)	Q<0.9
3	DSN	C	402	7/7	0.72	0.20	36,38,40,40	0
3	DSN	A	402	7/7	0.73	0.19	28,28,30,31	0
3	DSN	B	401	7/7	0.75	0.16	33,34,35,36	0
3	DSN	D	402	7/7	0.83	0.16	27,28,28,28	0
2	BEN	C	401	9/9	0.89	0.10	35,36,36,37	0
2	BEN	A	401	9/9	0.94	0.07	16,16,17,17	0
2	BEN	D	401	9/9	0.96	0.05	15,15,16,16	0

6.5 Other polymers [i](#)

There are no such residues in this entry.