



# Full wwPDB X-ray Structure Validation Report ⓘ

May 15, 2020 – 04:08 am BST

PDB ID : 2EW8  
Title : Crystal Structure of the (S)-Specific 1-Phenylethanol Dehydrogenase of the Denitrifying Bacterium Strain EbN1  
Authors : Hoeffken, H.W.  
Deposited on : 2005-11-02  
Resolution : 2.10 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](mailto: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.

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

MolProbity : 4.02b-467  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
Xtriage (Phenix) : **NOT EXECUTED**  
EDS : **NOT EXECUTED**  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.11

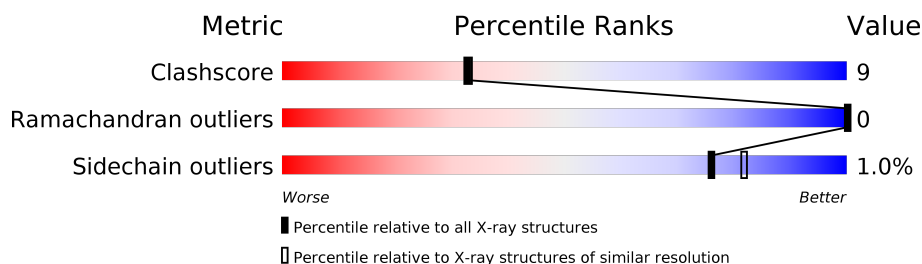
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 2.10 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	141614	5710 (2.10-2.10)
Ramachandran outliers	138981	5647 (2.10-2.10)
Sidechain outliers	138945	5648 (2.10-2.10)

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 on the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 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	249	
1	B	249	
1	C	249	
1	D	249	

## 2 Entry composition [i](#)

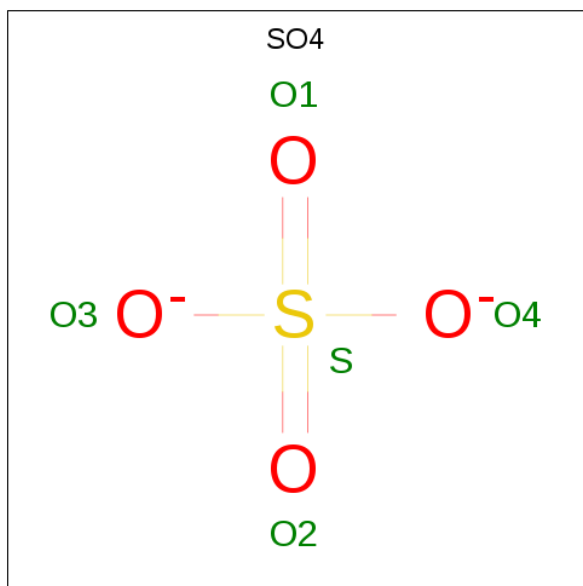
There are 3 unique types of molecules in this entry. The entry contains 7511 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 (S)-1-Phenylethanol dehydrogenase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	229	Total	C	N	O	S	0	0	0
			1728	1103	299	320	6			
1	B	228	Total	C	N	O	S	0	0	0
			1713	1092	297	319	5			
1	C	228	Total	C	N	O	S	0	0	0
			1720	1098	298	319	5			
1	D	229	Total	C	N	O	S	0	0	0
			1729	1102	300	321	6			

- Molecule 2 is SULFATE ION (three-letter code: SO4) (formula: O<sub>4</sub>S).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	B	1	Total	O	S	0	0
			5	4	1		
2	D	1	Total	O	S	0	0
			5	4	1		

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	155	Total 155	O 155	0	0
3	B	146	Total 146	O 146	0	0
3	C	149	Total 149	O 149	0	0
3	D	161	Total 161	O 161	0	0

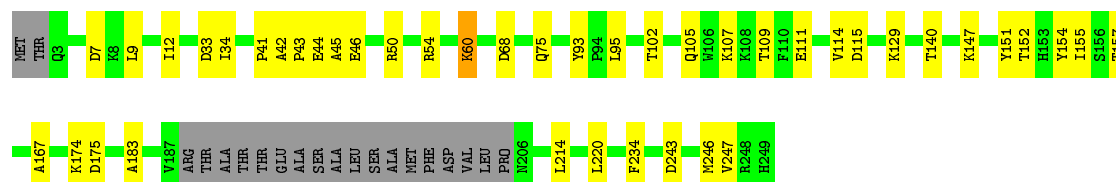
### 3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA 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.

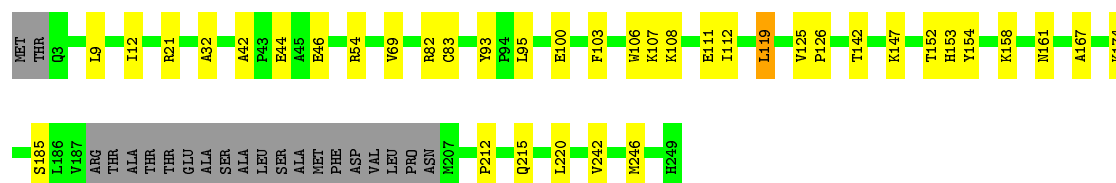
- Molecule 1: (S)-1-Phenylethanol dehydrogenase

Chain A: 



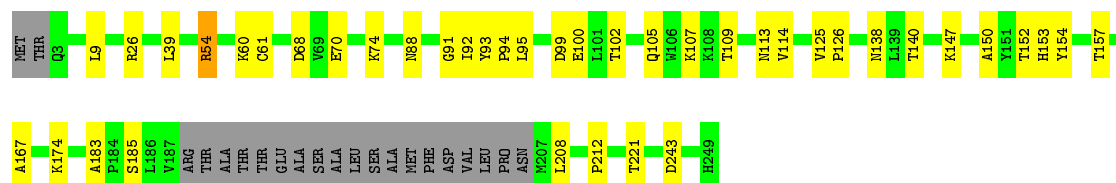
- Molecule 1: (S)-1-Phenylethanol dehydrogenase

Chain B: 




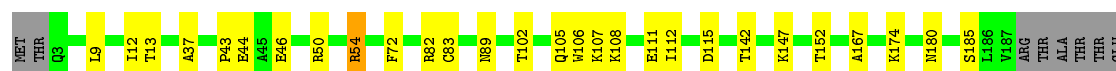
- Molecule 1: (S)-1-Phenylethanol dehydrogenase

Chain C: 



- Molecule 1: (S)-1-Phenylethanol dehydrogenase

Chain D: 



ALA	N206	Q209	P212	L218	T236	G237	Q238	H249
SER								
ALA								
LEU								
SER								
ALA								
MET								
PHE								
ASP								
VAL								
LEU								
PRO								

## 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, $\alpha$ , $\beta$ , $\gamma$	130.60 Å   110.70 Å   77.30 Å 90.00°   116.31°   90.00°	Depositor
Resolution (Å)	58.60 – 2.10	Depositor
% Data completeness (in resolution range)	7.6 (58.60-2.10)	Depositor
$R_{merge}$	0.06	Depositor
$R_{sym}$	0.08	Depositor
Refinement program	CNX	Depositor
R, $R_{free}$	0.171 , 0.209	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	7511	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	17.0	wwPDB-VP

## 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: SO4

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	0.27	0/1758	0.60	0/2383
1	B	0.28	0/1743	0.57	0/2365
1	C	0.27	0/1750	0.58	0/2373
1	D	0.28	0/1759	0.57	0/2384
All	All	0.27	0/7010	0.58	0/9505

There are no bond length outliers.

There are no bond angle outliers.

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	1728	0	1754	35	0
1	B	1713	0	1725	33	0
1	C	1720	0	1745	37	0
1	D	1729	0	1751	31	0
2	B	5	0	0	0	0
2	D	5	0	0	0	0
3	A	155	0	0	6	0
3	B	146	0	0	4	0
3	C	149	0	0	3	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	D	161	0	0	2	0
All	All	7511	0	6975	121	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 9.

All (121) 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:C:92:ILE:H	1:C:113:ASN:HD21	1.15	0.90
1:D:43:PRO:HG2	1:D:44:GLU:OE2	1.86	0.74
1:C:54:ARG:HG3	1:C:54:ARG:HH11	1.55	0.71
1:D:54:ARG:HA	1:D:54:ARG:HE	1.56	0.71
1:B:153:HIS:H	1:B:153:HIS:CD2	2.12	0.66
1:D:108:LYS:HE3	1:D:112:ILE:HD11	1.79	0.65
1:B:246:MET:HE2	3:B:770:HOH:O	1.96	0.65
1:A:174:LYS:HG2	1:B:212:PRO:HG3	1.78	0.64
1:C:54:ARG:NH1	1:C:54:ARG:HG3	2.11	0.64
1:B:107:LYS:O	1:B:111:GLU:HG3	1.99	0.62
1:C:107:LYS:HD2	3:C:367:HOH:O	1.99	0.61
3:A:380:HOH:O	1:D:107:LYS:HE2	2.01	0.61
1:C:99:ASP:OD1	1:C:100:GLU:HG3	2.00	0.60
1:C:88:ASN:HD22	1:C:138:ASN:ND2	2.00	0.59
1:D:107:LYS:O	1:D:111:GLU:HG3	2.02	0.58
1:B:100:GLU:HG2	3:B:789:HOH:O	2.03	0.58
1:C:208:LEU:HD22	1:C:208:LEU:N	2.18	0.58
1:B:32:ALA:O	1:B:54:ARG:HD3	2.04	0.57
1:B:93:TYR:HB3	1:B:154:TYR:CE2	2.42	0.55
1:A:214:LEU:HG	3:A:359:HOH:O	2.07	0.55
1:B:152:THR:HA	1:C:167:ALA:HB1	1.88	0.54
1:A:41:PRO:C	1:A:43:PRO:HD3	2.28	0.54
1:C:88:ASN:HB2	1:C:138:ASN:HD22	1.73	0.54
1:A:152:THR:HA	1:D:167:ALA:HB1	1.88	0.54
1:B:108:LYS:HE3	1:B:112:ILE:HD11	1.89	0.53
1:C:102:THR:H	1:C:105:GLN:HE21	1.57	0.53
1:A:129:LYS:HE2	1:A:175:ASP:OD1	2.09	0.53
1:C:109:THR:HG22	1:C:157:THR:HG21	1.90	0.53
1:C:88:ASN:HD22	1:C:138:ASN:HD21	1.57	0.53
1:C:147:LYS:O	1:C:147:LYS:HD3	2.09	0.52
1:C:61:CYS:SG	1:C:68:ASP:HB3	2.49	0.52
1:C:147:LYS:HD3	1:C:147:LYS:C	2.29	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:93:TYR:HB3	1:C:154:TYR:CE1	2.45	0.52
1:A:243:ASP:OD1	1:A:247:VAL:HG22	2.10	0.52
1:B:69:VAL:HG11	1:B:119:LEU:HB3	1.92	0.51
1:A:102:THR:OG1	1:A:105:GLN:HG3	2.11	0.51
1:C:153:HIS:CD2	1:C:153:HIS:H	2.28	0.51
1:D:212:PRO:HG2	3:D:825:HOH:O	2.11	0.51
1:B:42:ALA:O	1:B:46:GLU:HG3	2.11	0.51
1:A:42:ALA:HB1	1:A:45:ALA:HB3	1.93	0.51
1:A:152:THR:HA	1:D:167:ALA:CB	2.41	0.50
1:A:42:ALA:O	1:A:46:GLU:HG3	2.11	0.50
1:A:220:LEU:N	1:A:220:LEU:HD22	2.27	0.50
1:A:42:ALA:N	1:A:43:PRO:HD3	2.26	0.49
1:A:60:LYS:NZ	1:A:60:LYS:HB2	2.27	0.49
1:C:70:GLU:HG2	1:C:74:LYS:HE3	1.94	0.48
1:B:158:LYS:HE2	1:B:158:LYS:HA	1.96	0.48
1:B:106:TRP:HZ2	1:C:114:VAL:HG12	1.78	0.48
1:D:218:LEU:N	1:D:218:LEU:HD22	2.29	0.48
1:A:167:ALA:HB1	1:D:152:THR:HA	1.96	0.48
1:A:46:GLU:O	1:A:50:ARG:HG3	2.14	0.48
1:D:180:ASN:HD22	1:D:238:GLN:H	1.62	0.47
1:B:152:THR:HA	1:C:167:ALA:CB	2.44	0.47
1:B:147:LYS:HE3	1:D:209:GLN:O	2.14	0.46
1:C:102:THR:H	1:C:105:GLN:NE2	2.12	0.46
1:D:13:THR:O	1:D:89:ASN:HB3	2.15	0.46
1:B:153:HIS:H	1:B:153:HIS:HD2	1.60	0.46
1:B:9:LEU:C	1:B:9:LEU:HD13	2.36	0.46
1:D:82:ARG:HB2	3:D:861:HOH:O	2.15	0.46
1:A:246:MET:HE3	3:A:315:HOH:O	2.15	0.46
1:B:82:ARG:HG2	1:B:83:CYS:N	2.31	0.46
1:A:9:LEU:HD13	1:A:9:LEU:C	2.37	0.45
1:C:185:SER:OG	1:C:243:ASP:HB2	2.16	0.45
1:A:167:ALA:CB	1:D:152:THR:HA	2.46	0.45
1:D:37:ALA:HB2	1:D:72:PHE:CZ	2.52	0.45
1:A:140:THR:HG23	1:A:183:ALA:HB2	1.98	0.45
1:B:21:ARG:NH2	1:B:44:GLU:HB3	2.31	0.45
1:C:94:PRO:HG2	1:C:153:HIS:HE1	1.81	0.45
1:D:54:ARG:HA	1:D:54:ARG:NE	2.30	0.45
1:B:174:LYS:HB2	3:B:806:HOH:O	2.17	0.44
1:A:107:LYS:NZ	1:D:115:ASP:OD2	2.39	0.44
1:D:9:LEU:HD12	1:D:83:CYS:HA	1.99	0.44
1:B:153:HIS:N	1:B:153:HIS:CD2	2.83	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:102:THR:H	1:D:105:GLN:HE21	1.63	0.44
1:C:208:LEU:H	1:C:208:LEU:HD22	1.82	0.44
1:D:44:GLU:CD	1:D:44:GLU:H	2.20	0.44
1:C:39:LEU:O	1:C:60:LYS:HG3	2.17	0.44
1:B:167:ALA:HB1	1:C:152:THR:HA	2.00	0.44
1:D:142:THR:OG1	1:D:185:SER:HA	2.18	0.43
1:D:46:GLU:O	1:D:50:ARG:HG3	2.18	0.43
1:A:75:GLN:NE2	3:A:395:HOH:O	2.52	0.43
1:D:9:LEU:C	1:D:9:LEU:HD13	2.39	0.43
1:B:95:LEU:HD23	1:B:95:LEU:C	2.39	0.43
1:C:9:LEU:HD13	1:C:9:LEU:C	2.39	0.43
1:B:9:LEU:HD12	1:B:83:CYS:HA	2.00	0.43
1:B:125:VAL:N	1:B:126:PRO:CD	2.81	0.43
1:A:107:LYS:HD2	1:A:107:LYS:HA	1.84	0.43
1:C:125:VAL:N	1:C:126:PRO:CD	2.82	0.43
1:C:113:ASN:N	1:C:113:ASN:HD22	2.17	0.43
1:B:103:PHE:CZ	1:B:107:LYS:HD3	2.54	0.42
1:C:140:THR:HG23	1:C:183:ALA:HB2	2.02	0.42
1:A:174:LYS:HB2	3:A:398:HOH:O	2.19	0.42
1:A:33:ASP:O	1:A:34:ILE:HD13	2.19	0.42
1:D:218:LEU:HD22	1:D:218:LEU:H	1.84	0.42
1:A:109:THR:HG22	1:A:157:THR:HG21	2.02	0.42
1:A:95:LEU:HD23	1:A:151:TYR:CZ	2.54	0.42
1:C:92:ILE:N	1:C:113:ASN:HD21	1.98	0.42
1:A:111:GLU:HA	1:A:115:ASP:OD2	2.19	0.42
1:C:26:ARG:HG2	1:C:221:THR:HB	2.02	0.42
1:A:234:PHE:CE2	1:B:215:GLN:HB2	2.55	0.42
1:A:44:GLU:H	1:A:44:GLU:CD	2.23	0.42
1:B:142:THR:OG1	1:B:185:SER:HA	2.20	0.42
1:A:114:VAL:HG12	1:D:106:TRP:HZ2	1.83	0.42
1:A:93:TYR:HB3	1:A:154:TYR:CE1	2.55	0.41
1:B:158:LYS:HE2	1:B:161:ASN:ND2	2.35	0.41
1:C:174:LYS:HB2	3:C:365:HOH:O	2.20	0.41
1:A:12:ILE:N	1:A:12:ILE:HD12	2.35	0.41
1:C:174:LYS:NZ	3:C:332:HOH:O	2.54	0.41
1:D:12:ILE:HD12	1:D:12:ILE:N	2.36	0.41
1:C:91:GLY:HA2	1:C:113:ASN:ND2	2.35	0.41
1:C:95:LEU:HD13	1:C:150:ALA:HB1	2.03	0.41
1:A:54:ARG:HA	1:A:54:ARG:HD3	1.81	0.41
1:B:220:LEU:CD1	1:B:242:VAL:HB	2.50	0.41
1:B:147:LYS:C	1:B:147:LYS:HD3	2.41	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:212:PRO:HG3	1:D:174:LYS:HG2	2.03	0.40
1:A:155:ILE:HB	1:D:167:ALA:HB2	2.01	0.40
1:B:246:MET:HE1	3:B:781:HOH:O	2.21	0.40
1:D:111:GLU:O	1:D:115:ASP:HB2	2.21	0.40
1:D:180:ASN:HD21	1:D:236:THR:HA	1.87	0.40
1:A:7:ASP:HA	3:A:402:HOH:O	2.21	0.40
1:B:12:ILE:HD12	1:B:12:ILE:N	2.37	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	225/249 (90%)	219 (97%)	6 (3%)	0	100	100
1	B	224/249 (90%)	219 (98%)	5 (2%)	0	100	100
1	C	224/249 (90%)	218 (97%)	6 (3%)	0	100	100
1	D	225/249 (90%)	220 (98%)	5 (2%)	0	100	100
All	All	898/996 (90%)	876 (98%)	22 (2%)	0	100	100

There are no Ramachandran outliers to report.

### 5.3.2 Protein sidechains [i](#)

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	177/194 (91%)	174 (98%)	3 (2%)	60	67
1	B	174/194 (90%)	173 (99%)	1 (1%)	86	90
1	C	176/194 (91%)	175 (99%)	1 (1%)	86	90
1	D	177/194 (91%)	175 (99%)	2 (1%)	73	79
All	All	704/776 (91%)	697 (99%)	7 (1%)	76	82

All (7) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	60	LYS
1	A	68	ASP
1	A	147	LYS
1	B	119	LEU
1	C	54	ARG
1	D	54	ARG
1	D	147	LYS

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (19) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	65	GLN
1	A	75	GLN
1	A	238	GLN
1	B	17	ASN
1	B	153	HIS
1	B	161	ASN
1	C	3	GLN
1	C	75	GLN
1	C	105	GLN
1	C	113	ASN
1	C	131	ASN
1	C	138	ASN
1	C	153	HIS
1	C	161	ASN
1	D	3	GLN
1	D	75	GLN
1	D	88	ASN
1	D	105	GLN
1	D	180	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 carbohydrates in this entry.

## 5.6 Ligand geometry ⓘ

2 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	$\# Z  > 2$
2	SO4	D	701	-	4,4,4	0.20	0	6,6,6	0.08	0
2	SO4	B	702	-	4,4,4	0.25	0	6,6,6	0.08	0

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

## 5.7 Other polymers ⓘ

There are no such residues in this entry.

## 5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

## 6 Fit of model and data ⓘ

### 6.1 Protein, DNA and RNA chains ⓘ

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.