



# Full wwPDB X-ray Structure Validation Report ⓘ

Mar 8, 2026 – 03:39 PM UTC

PDB ID : 3E2W / pdb\_00003e2w  
Title : H. influenzae beta-carbonic anhydrase, variant Y181F with 1M bicarbonate  
Authors : Rowlett, R.S.; Lee, J.  
Deposited on : 2008-08-06  
Resolution : 2.30 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.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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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

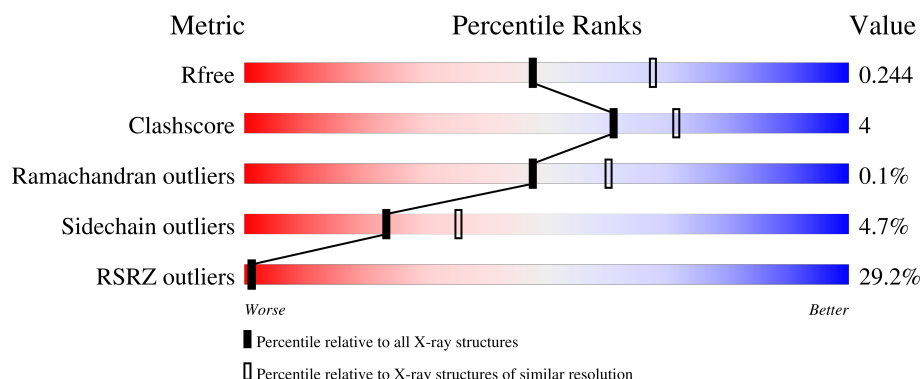
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 2.30 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	6319 (2.30-2.30)
Clashscore	190562	6919 (2.30-2.30)
Ramachandran outliers	187476	6854 (2.30-2.30)
Sidechain outliers	187428	6854 (2.30-2.30)
RSRZ outliers	180081	6325 (2.30-2.30)

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  $\geq 3$ , 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  $\leq 5\%$ . 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	229	<div> <div>23%</div> <div> <div>82%</div> <div>9%</div> <div>9%</div> </div> </div>
1	B	229	<div> <div>33%</div> <div> <div>74%</div> <div>11%</div> <div>•</div> <div>12%</div> </div> </div>
1	C	229	<div> <div>25%</div> <div> <div>83%</div> <div>5%</div> <div>11%</div> </div> </div>
1	D	229	<div> <div>23%</div> <div> <div>79%</div> <div>10%</div> <div>•</div> <div>11%</div> </div> </div>
1	E	229	<div> <div>40%</div> <div> <div>78%</div> <div>10%</div> <div>12%</div> </div> </div>

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Mol	Chain	Length	Quality of chain
1	F	229	

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	SO4	A	233	-	-	X	-
3	SO4	E	232	-	-	X	-

## 2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 10077 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 Carbonic anhydrase 2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	208	Total	C	N	O	S	0	0	0
			1670	1059	298	304	9			
1	B	201	Total	C	N	O	S	0	0	0
			1609	1024	288	289	8			
1	C	203	Total	C	N	O	S	0	0	0
			1626	1035	292	290	9			
1	D	204	Total	C	N	O	S	0	0	0
			1636	1039	294	294	9			
1	E	202	Total	C	N	O	S	0	0	0
			1617	1029	290	289	9			
1	F	199	Total	C	N	O	S	0	0	0
			1592	1014	286	283	9			

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	181	PHE	TYR	engineered mutation	UNP P45148
B	181	PHE	TYR	engineered mutation	UNP P45148
C	181	PHE	TYR	engineered mutation	UNP P45148
D	181	PHE	TYR	engineered mutation	UNP P45148
E	181	PHE	TYR	engineered mutation	UNP P45148
F	181	PHE	TYR	engineered mutation	UNP P45148

- Molecule 2 is ZINC ION (CCD ID: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total	Zn	0	0
			1	1		
2	B	1	Total	Zn	0	0
			1	1		
2	C	1	Total	Zn	0	0
			1	1		

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	D	1	Total	Zn	0	0
			1	1		
2	E	1	Total	Zn	0	0
			1	1		
2	F	1	Total	Zn	0	0
			1	1		

- Molecule 3 is SULFATE ION (CCD ID: SO4) (formula: O<sub>4</sub>S).



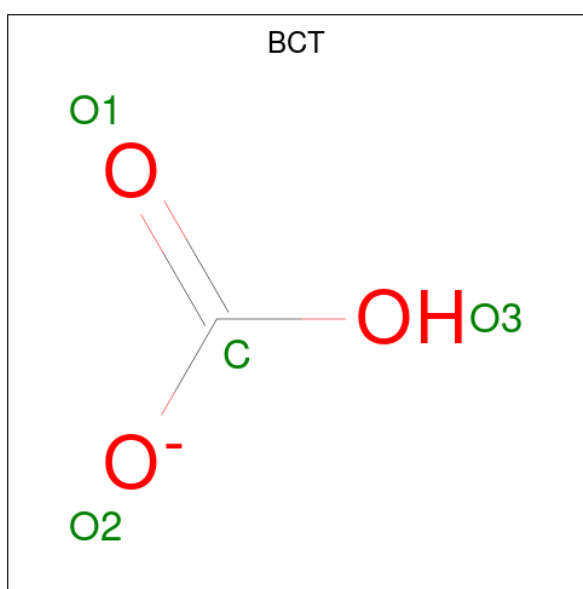
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	O	S	0	0
			5	4	1		
3	A	1	Total	O	S	0	0
			5	4	1		
3	A	1	Total	O	S	0	0
			5	4	1		
3	B	1	Total	O	S	0	0
			5	4	1		
3	C	1	Total	O	S	0	0
			5	4	1		
3	D	1	Total	O	S	0	0
			5	4	1		
3	D	1	Total	O	S	0	0
			5	4	1		
3	D	1	Total	O	S	0	0
			5	4	1		

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	E	1	Total	O	S	0	0
			5	4	1		
3	E	1	Total	O	S	0	0
			5	4	1		
3	F	1	Total	O	S	0	0
			5	4	1		
3	F	1	Total	O	S	0	0
			5	4	1		

- Molecule 4 is BICARBONATE ION (CCD ID: BCT) (formula:  $\text{CHO}_3$ ).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	F	1	Total	C	O	0	0
			4	1	3		

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	56	Total	O	0	0
			56	56		
5	B	33	Total	O	0	0
			33	33		
5	C	37	Total	O	0	0
			37	37		
5	D	51	Total	O	0	0
			51	51		

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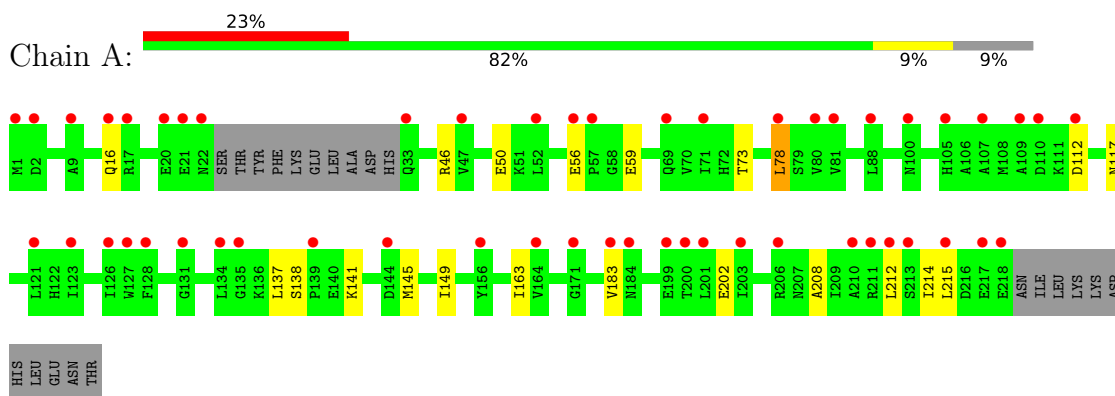
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	E	40	Total	O	0	0
			40	40		
5	F	40	Total	O	0	0
			40	40		

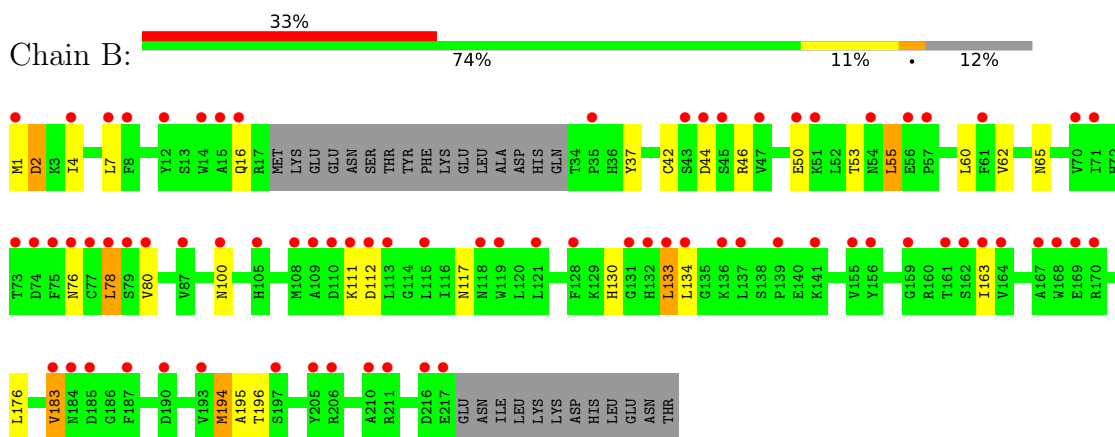
### 3 Residue-property plots

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.

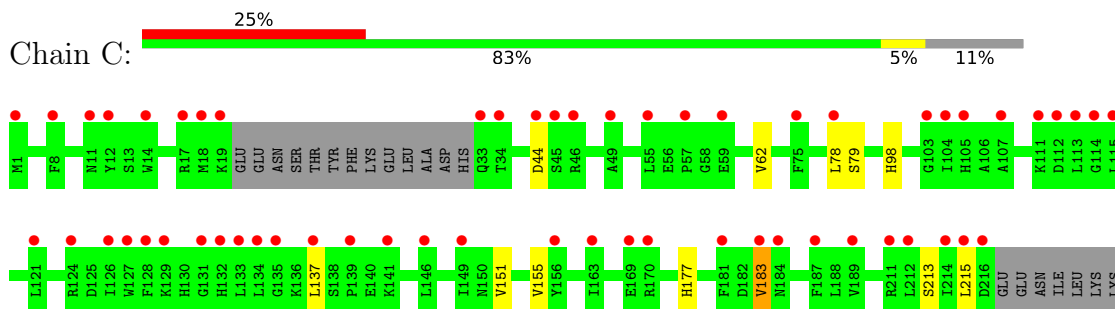
#### • Molecule 1: Carbonic anhydrase 2



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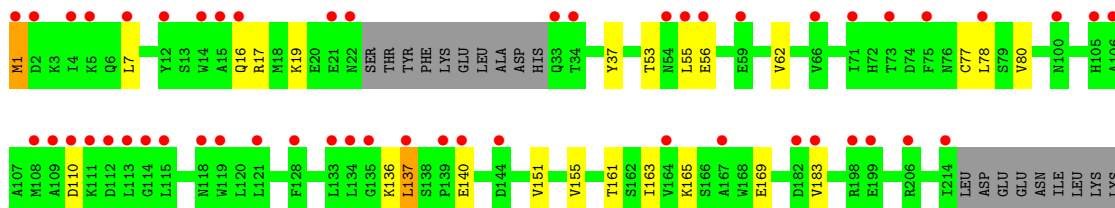




ASP  
HIS  
LEU  
GLU  
ASN  
THR

• Molecule 1: Carbonic anhydrase 2

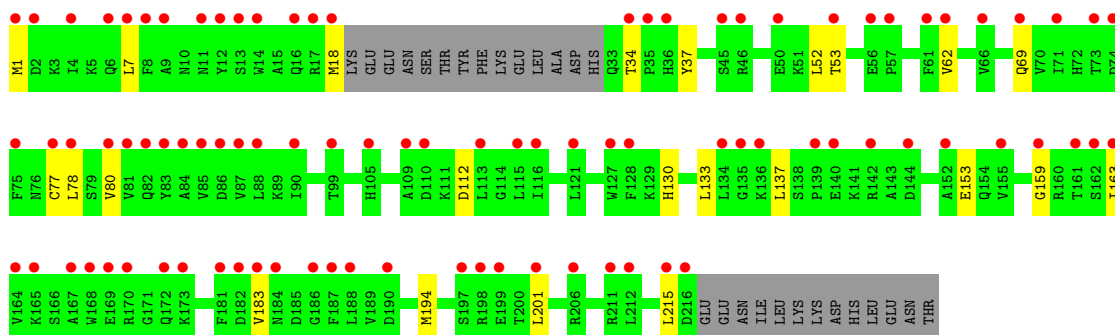
Chain D: 23% 79% 10% 11%



ASP  
HIS  
LEU  
GLU  
ASN  
THR

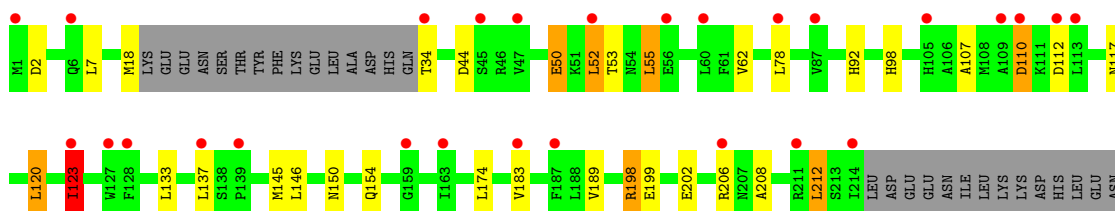
• Molecule 1: Carbonic anhydrase 2

Chain E: 40% 78% 10% 12%



• Molecule 1: Carbonic anhydrase 2

Chain F: 12% 72% 11% 13%



THR

## 4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	250.14Å 145.22Å 53.50Å 90.00° 93.78° 90.00°	Depositor
Resolution (Å)	26.20 – 2.30 26.20 – 2.30	Depositor EDS
% Data completeness (in resolution range)	91.5 (26.20-2.30) 91.4 (26.20-2.30)	Depositor EDS
$R_{merge}$	0.06	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.28 (at 2.29Å)	Xtriage
Refinement program	REFMAC 5.2	Depositor
R, $R_{free}$	0.205 , 0.242 0.210 , 0.244	Depositor DCC
$R_{free}$ test set	3911 reflections (4.61%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	38.7	Xtriage
Anisotropy	0.460	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.34 , 80.3	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.34$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.91	EDS
Total number of atoms	10077	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	67.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.18% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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: BCT, SO4, ZN

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	0.86	1/1705 (0.1%)	0.94	1/2307 (0.0%)
1	B	0.83	0/1644	0.95	2/2227 (0.1%)
1	C	0.86	0/1661	0.94	2/2248 (0.1%)
1	D	0.90	0/1671	0.95	1/2261 (0.0%)
1	E	0.85	0/1652	0.92	2/2237 (0.1%)
1	F	0.88	1/1627 (0.1%)	0.95	1/2203 (0.0%)
All	All	0.87	2/9960 (0.0%)	0.94	9/13483 (0.1%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	F	123	ILE	CA-CB	6.34	1.62	1.54
1	A	73	THR	CA-C	5.01	1.59	1.53

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	44	ASP	CB-CA-C	-9.29	96.23	110.90
1	D	62	VAL	N-CA-C	7.93	119.21	108.11
1	C	62	VAL	N-CA-C	7.26	118.27	108.11
1	E	62	VAL	N-CA-C	6.49	117.20	108.11
1	F	62	VAL	N-CA-C	6.19	116.78	108.11
1	A	202	GLU	N-CA-C	5.76	117.36	111.14
1	B	62	VAL	N-CA-C	5.17	115.36	108.11
1	C	79	SER	N-CA-C	5.17	116.60	111.07
1	E	69	GLN	N-CA-C	5.08	118.34	110.17

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	1670	0	1654	9	0
1	B	1609	0	1600	21	0
1	C	1626	0	1624	7	0
1	D	1636	0	1627	13	0
1	E	1617	0	1611	11	0
1	F	1592	0	1588	25	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
2	C	1	0	0	0	0
2	D	1	0	0	0	0
2	E	1	0	0	0	0
2	F	1	0	0	0	0
3	A	15	0	0	2	0
3	B	5	0	0	1	0
3	C	5	0	0	1	0
3	D	15	0	0	0	0
3	E	10	0	0	2	0
3	F	10	0	0	0	0
4	F	4	0	0	1	0
5	A	56	0	0	1	0
5	B	33	0	0	2	0
5	C	37	0	0	0	0
5	D	51	0	0	0	0
5	E	40	0	0	0	0
5	F	40	0	0	0	0
All	All	10077	0	9704	82	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 4.

All (82) 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:B:133:LEU:HD22	1:B:134:LEU:HD12	1.49	0.94
1:F:208:ALA:O	1:F:212:LEU:HD23	1.72	0.89

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:80:VAL:HG21	5:B:263:HOH:O	1.80	0.80
1:D:1:MET:HE3	1:F:92:HIS:HE1	1.48	0.79
1:A:50:GLU:OE1	5:A:268:HOH:O	2.07	0.72
1:A:112:ASP:HA	1:A:117:ASN:HD21	1.57	0.69
1:D:137:LEU:N	1:D:137:LEU:HD13	2.11	0.66
1:A:137:LEU:HD13	1:A:215:LEU:HD22	1.77	0.66
1:A:208:ALA:O	1:A:212:LEU:HD23	1.97	0.65
1:B:1:MET:O	1:B:4:ILE:N	2.29	0.64
1:F:110:ASP:OD2	1:F:110:ASP:N	2.32	0.62
1:F:50:GLU:OE1	4:F:231:BCT:O3	2.18	0.62
1:C:183:VAL:HG13	3:C:231:SO4:O3	2.00	0.61
1:B:78:LEU:HD13	1:B:163:ILE:HD12	1.83	0.60
1:E:137:LEU:HD21	1:E:215:LEU:HD22	1.82	0.60
1:C:213:SER:O	1:C:215:LEU:HD22	2.01	0.60
1:D:77:CYS:O	1:D:80:VAL:HG12	2.02	0.59
1:A:112:ASP:HA	1:A:117:ASN:ND2	2.19	0.57
1:A:183:VAL:HG11	3:A:233:SO4:O4	2.05	0.57
1:B:133:LEU:C	1:B:133:LEU:HD23	2.29	0.56
1:A:78:LEU:HD23	1:A:163:ILE:HD12	1.86	0.56
1:F:133:LEU:C	1:F:133:LEU:HD23	2.31	0.55
1:F:183:VAL:HG22	1:F:183:VAL:O	2.05	0.54
1:F:112:ASP:HA	1:F:117:ASN:ND2	2.22	0.54
1:B:194:MET:HE2	1:B:195:ALA:N	2.23	0.54
1:F:18:MET:HA	1:F:18:MET:HE2	1.90	0.53
1:D:7:LEU:HD21	1:F:55:LEU:HD21	1.91	0.52
1:B:76:ASN:O	1:B:80:VAL:HG23	2.09	0.52
1:B:80:VAL:CG2	5:B:263:HOH:O	2.45	0.52
1:C:137:LEU:HD21	1:C:215:LEU:HD12	1.92	0.52
1:F:112:ASP:HA	1:F:117:ASN:HD21	1.74	0.52
1:E:78:LEU:CD2	1:E:163:ILE:HD12	2.40	0.51
1:A:183:VAL:CG1	3:A:233:SO4:O2	2.59	0.51
1:F:198:ARG:NH1	1:F:202:GLU:HG2	2.25	0.51
1:D:53:THR:HG22	1:F:7:LEU:HD21	1.93	0.51
1:C:151:VAL:O	1:C:155:VAL:HG23	2.11	0.51
1:F:137:LEU:HD11	1:F:145:MET:HG2	1.93	0.50
1:B:194:MET:HE1	1:B:196:THR:HG23	1.94	0.50
1:F:52:LEU:HD22	1:F:53:THR:HG23	1.94	0.49
1:E:52:LEU:HD12	1:E:53:THR:HG23	1.95	0.49
1:C:177:HIS:HE1	1:E:1:MET:HE1	1.77	0.48
1:B:183:VAL:CG1	3:B:231:SO4:O4	2.62	0.48
1:B:112:ASP:HA	1:B:117:ASN:ND2	2.28	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:133:LEU:C	1:E:133:LEU:HD23	2.39	0.47
1:B:112:ASP:HA	1:B:117:ASN:HD21	1.79	0.47
1:B:50:GLU:HG3	1:B:60:LEU:HD12	1.96	0.47
1:C:137:LEU:HD21	1:C:215:LEU:CD1	2.45	0.46
1:F:53:THR:OG1	1:F:55:LEU:HD22	2.15	0.46
1:B:37:TYR:HB2	1:B:60:LEU:HD23	1.97	0.46
1:B:133:LEU:C	1:B:133:LEU:CD2	2.89	0.46
1:F:150:ASN:O	1:F:154:GLN:HG2	2.16	0.46
1:D:151:VAL:O	1:D:155:VAL:HG23	2.16	0.46
1:B:130:HIS:O	1:B:134:LEU:HD13	2.16	0.45
1:D:78:LEU:CD1	1:D:163:ILE:HD12	2.47	0.45
1:E:130:HIS:HE1	1:E:153:GLU:OE2	2.00	0.45
1:E:183:VAL:HG11	3:E:232:SO4:O2	2.17	0.45
1:F:123:ILE:HD11	1:F:146:LEU:HD21	1.99	0.45
1:F:212:LEU:CD2	1:F:212:LEU:N	2.79	0.44
1:F:107:ALA:HB2	1:F:120:LEU:HG	1.99	0.43
1:F:198:ARG:O	1:F:198:ARG:HD2	2.17	0.43
1:D:56:GLU:N	1:D:56:GLU:OE1	2.51	0.43
1:F:52:LEU:CD2	1:F:53:THR:HG23	2.49	0.43
1:B:78:LEU:HD13	1:B:163:ILE:CD1	2.47	0.43
1:F:212:LEU:N	1:F:212:LEU:HD22	2.33	0.43
1:A:145:MET:HG3	1:A:149:ILE:HD12	2.01	0.43
1:E:159:GLY:HA3	1:E:201:LEU:HD22	2.01	0.43
1:B:53:THR:OG1	1:B:55:LEU:HD23	2.17	0.42
1:B:194:MET:HE2	1:B:195:ALA:H	1.84	0.42
1:D:17:ARG:C	1:D:19:LYS:H	2.27	0.42
1:E:77:CYS:O	1:E:80:VAL:HG12	2.19	0.42
1:D:136:LYS:HB2	1:D:137:LEU:HD13	2.01	0.42
1:E:130:HIS:CE1	1:E:153:GLU:OE2	2.72	0.42
1:D:78:LEU:HD12	1:D:163:ILE:HD12	2.01	0.42
1:F:199:GLU:OE1	1:F:199:GLU:N	2.47	0.42
1:B:1:MET:O	1:B:2:ASP:C	2.63	0.41
1:D:161:THR:O	1:D:165:LYS:HG3	2.20	0.41
1:E:183:VAL:CG1	3:E:232:SO4:O2	2.69	0.41
1:D:136:LYS:C	1:D:137:LEU:HD13	2.46	0.41
1:F:123:ILE:CD1	1:F:146:LEU:HD21	2.51	0.41
1:F:44:ASP:OD2	1:F:98:HIS:CE1	2.73	0.40
1:C:44:ASP:HB2	1:C:98:HIS:CE1	2.56	0.40
1:B:42:CYS:HA	1:B:65:ASN:O	2.22	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	204/229 (89%)	198 (97%)	6 (3%)	0	100	100
1	B	197/229 (86%)	189 (96%)	7 (4%)	1 (0%)	24	31
1	C	199/229 (87%)	194 (98%)	5 (2%)	0	100	100
1	D	200/229 (87%)	194 (97%)	6 (3%)	0	100	100
1	E	198/229 (86%)	194 (98%)	4 (2%)	0	100	100
1	F	195/229 (85%)	192 (98%)	3 (2%)	0	100	100
All	All	1193/1374 (87%)	1161 (97%)	31 (3%)	1 (0%)	48	60

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	2	ASP

### 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	181/201 (90%)	173 (96%)	8 (4%)	25	38
1	B	174/201 (87%)	163 (94%)	11 (6%)	16	23
1	C	176/201 (88%)	174 (99%)	2 (1%)	65	81
1	D	177/201 (88%)	168 (95%)	9 (5%)	21	32
1	E	175/201 (87%)	169 (97%)	6 (3%)	32	49
1	F	172/201 (86%)	158 (92%)	14 (8%)	11	14

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
All	All	1055/1206 (88%)	1005 (95%)	50 (5%)	23	35

All (50) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	16	GLN
1	A	46	ARG
1	A	56	GLU
1	A	59	GLU
1	A	78	LEU
1	A	138	SER
1	A	141	LYS
1	A	214	ILE
1	B	7	LEU
1	B	16	GLN
1	B	46	ARG
1	B	55	LEU
1	B	78	LEU
1	B	100	ASN
1	B	111	LYS
1	B	133	LEU
1	B	176	LEU
1	B	183	VAL
1	B	194	MET
1	C	78	LEU
1	C	183	VAL
1	D	1	MET
1	D	16	GLN
1	D	37	TYR
1	D	55	LEU
1	D	110	ASP
1	D	137	LEU
1	D	140	GLU
1	D	169	GLU
1	D	183	VAL
1	E	7	LEU
1	E	18	MET
1	E	34	THR
1	E	37	TYR
1	E	112	ASP
1	E	194	MET
1	F	2	ASP

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Mol	Chain	Res	Type
1	F	34	THR
1	F	50	GLU
1	F	52	LEU
1	F	55	LEU
1	F	78	LEU
1	F	110	ASP
1	F	120	LEU
1	F	123	ILE
1	F	174	LEU
1	F	189	VAL
1	F	198	ARG
1	F	206	ARG
1	F	212	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (25) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	16	GLN
1	A	117	ASN
1	A	132	HIS
1	B	6	GLN
1	B	117	ASN
1	B	154	GLN
1	C	6	GLN
1	C	10	ASN
1	C	54	ASN
1	C	105	HIS
1	C	177	HIS
1	C	184	ASN
1	D	100	ASN
1	D	105	HIS
1	D	132	HIS
1	E	16	GLN
1	E	36	HIS
1	E	100	ASN
1	E	130	HIS
1	E	184	ASN
1	E	191	GLN
1	F	6	GLN
1	F	92	HIS
1	F	117	ASN
1	F	130	HIS

### 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](#)

Of 19 ligands modelled in this entry, 6 are monoatomic - leaving 13 for Mogul analysis.

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	F	232	-	4,4,4	0.21	0	6,6,6	0.15	0
4	BCT	F	231	-	3,3,3	0.52	0	2,3,3	0.12	0
3	SO4	B	231	-	4,4,4	0.23	0	6,6,6	0.12	0
3	SO4	C	231	-	4,4,4	0.23	0	6,6,6	0.18	0
3	SO4	A	232	-	4,4,4	0.23	0	6,6,6	0.26	0
3	SO4	A	233	-	4,4,4	0.23	0	6,6,6	0.22	0
3	SO4	D	231	-	4,4,4	0.24	0	6,6,6	0.10	0
3	SO4	E	231	-	4,4,4	0.29	0	6,6,6	0.29	0
3	SO4	D	232	-	4,4,4	0.23	0	6,6,6	0.21	0
3	SO4	D	233	-	4,4,4	0.26	0	6,6,6	0.16	0
3	SO4	A	231	-	4,4,4	0.25	0	6,6,6	0.20	0
3	SO4	F	233	-	4,4,4	0.23	0	6,6,6	0.20	0
3	SO4	E	232	-	4,4,4	0.23	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.

5 monomers are involved in 7 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	F	231	BCT	1	0
3	B	231	SO4	1	0
3	C	231	SO4	1	0
3	A	233	SO4	2	0
3	E	232	SO4	2	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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	208/229 (90%)	1.53	52 (25%) 2 2	56, 65, 75, 83	0
1	B	201/229 (87%)	1.86	75 (37%) 1 1	60, 66, 79, 83	0
1	C	203/229 (88%)	1.57	58 (28%) 1 1	61, 67, 77, 80	0
1	D	204/229 (89%)	1.50	52 (25%) 1 2	59, 66, 76, 82	0
1	E	202/229 (88%)	1.90	91 (45%) 0 0	59, 66, 75, 82	0
1	F	199/229 (86%)	1.27	27 (13%) 7 7	51, 66, 76, 80	0
All	All	1217/1374 (88%)	1.60	355 (29%) 1 1	51, 66, 77, 83	0

All (355) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	183	VAL	5.7
1	E	183	VAL	5.3
1	B	217	GLU	5.2
1	B	169	GLU	4.9
1	E	12	TYR	4.2
1	E	110	ASP	4.1
1	D	12	TYR	4.1
1	D	139	PRO	4.0
1	D	22	ASN	4.0
1	F	45	SER	4.0
1	E	140	GLU	3.9
1	B	187	PHE	3.9
1	C	183	VAL	3.9
1	D	183	VAL	3.9
1	D	1	MET	3.9
1	A	128	PHE	3.9
1	B	71	ILE	3.9
1	E	18	MET	3.9
1	D	7	LEU	3.8

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Mol	Chain	Res	Type	RSRZ
1	D	137	LEU	3.8
1	C	128	PHE	3.8
1	B	1	MET	3.7
1	D	21	GLU	3.7
1	B	15	ALA	3.7
1	A	218	GLU	3.6
1	C	131	GLY	3.6
1	E	168	TRP	3.6
1	E	167	ALA	3.6
1	A	215	LEU	3.5
1	E	45	SER	3.5
1	C	1	MET	3.5
1	E	14	TRP	3.5
1	E	128	PHE	3.5
1	F	187	PHE	3.5
1	A	2	ASP	3.4
1	D	110	ASP	3.4
1	B	78	LEU	3.4
1	B	168	TRP	3.4
1	B	111	LYS	3.4
1	B	8	PHE	3.4
1	B	136	LYS	3.4
1	C	169	GLU	3.3
1	E	34	THR	3.3
1	F	128	PHE	3.3
1	B	12	TYR	3.3
1	B	184	ASN	3.3
1	B	193	VAL	3.3
1	E	85	VAL	3.3
1	E	1	MET	3.3
1	E	75	PHE	3.2
1	A	184	ASN	3.2
1	A	1	MET	3.2
1	A	110	ASP	3.2
1	D	113	LEU	3.2
1	C	34	THR	3.2
1	B	45	SER	3.1
1	D	56	GLU	3.1
1	F	123	ILE	3.1
1	E	162	SER	3.1
1	B	100	ASN	3.1
1	E	78	LEU	3.1

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Mol	Chain	Res	Type	RSRZ
1	E	90	ILE	3.1
1	F	112	ASP	3.1
1	B	205	TYR	3.1
1	D	112	ASP	3.1
1	C	215	LEU	3.1
1	A	56	GLU	3.0
1	A	213	SER	3.0
1	A	210	ALA	3.0
1	E	81	VAL	3.0
1	D	73	THR	3.0
1	B	87	VAL	3.0
1	B	113	LEU	3.0
1	E	190	ASP	3.0
1	E	7	LEU	3.0
1	B	73	THR	3.0
1	E	135	GLY	3.0
1	B	128	PHE	2.9
1	B	115	LEU	2.9
1	E	73	THR	2.9
1	A	20	GLU	2.9
1	B	75	PHE	2.9
1	C	133	LEU	2.9
1	E	88	LEU	2.9
1	D	199	GLU	2.9
1	F	1	MET	2.9
1	E	83	TYR	2.9
1	D	128	PHE	2.9
1	E	80	VAL	2.9
1	E	56	GLU	2.9
1	E	71	ILE	2.9
1	A	112	ASP	2.9
1	E	11	ASN	2.9
1	C	19	LYS	2.8
1	A	183	VAL	2.8
1	B	47	VAL	2.8
1	D	140	GLU	2.8
1	D	135	GLY	2.8
1	E	198	ARG	2.8
1	C	181	PHE	2.8
1	D	108	MET	2.8
1	A	109	ALA	2.8
1	C	214	ILE	2.8

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Mol	Chain	Res	Type	RSRZ
1	D	4	ILE	2.8
1	D	214	ILE	2.8
1	F	105	HIS	2.8
1	B	112	ASP	2.8
1	D	144	ASP	2.8
1	B	56	GLU	2.8
1	D	115	LEU	2.8
1	E	134	LEU	2.8
1	E	187	PHE	2.8
1	E	4	ILE	2.7
1	E	172	GLN	2.7
1	B	121	LEU	2.7
1	C	134	LEU	2.7
1	F	52	LEU	2.7
1	B	79	SER	2.7
1	A	127	TRP	2.7
1	D	66	VAL	2.7
1	F	139	PRO	2.7
1	A	17	ARG	2.7
1	B	119	TRP	2.7
1	C	121	LEU	2.7
1	E	113	LEU	2.7
1	A	199	GLU	2.7
1	E	139	PRO	2.7
1	F	211	ARG	2.7
1	A	52	LEU	2.7
1	C	137	LEU	2.7
1	D	33	GLN	2.6
1	E	6	GLN	2.6
1	A	100	ASN	2.6
1	D	118	ASN	2.6
1	D	114	GLY	2.6
1	B	206	ARG	2.6
1	E	163	ILE	2.6
1	B	133	LEU	2.6
1	E	188	LEU	2.6
1	C	49	ALA	2.6
1	E	9	ALA	2.6
1	B	110	ASP	2.6
1	B	185	ASP	2.6
1	C	12	TYR	2.6
1	E	164	VAL	2.6

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Mol	Chain	Res	Type	RSRZ
1	C	57	PRO	2.6
1	A	212	LEU	2.6
1	B	141	LYS	2.6
1	D	109	ALA	2.6
1	C	44	ASP	2.6
1	D	100	ASN	2.6
1	A	57	PRO	2.6
1	C	135	GLY	2.6
1	E	161	THR	2.6
1	A	78	LEU	2.6
1	C	212	LEU	2.6
1	D	198	ARG	2.6
1	B	14	TRP	2.6
1	C	216	ASP	2.6
1	E	184	ASN	2.6
1	E	216	ASP	2.6
1	F	34	THR	2.6
1	A	203	ILE	2.6
1	E	13	SER	2.6
1	A	88	LEU	2.5
1	D	55	LEU	2.5
1	E	169	GLU	2.5
1	A	107	ALA	2.5
1	B	77	CYS	2.5
1	D	167	ALA	2.5
1	F	127	TRP	2.5
1	B	156	TYR	2.5
1	D	121	LEU	2.5
1	E	115	LEU	2.5
1	B	216	ASP	2.5
1	C	112	ASP	2.5
1	E	186	GLY	2.5
1	C	127	TRP	2.5
1	E	197	SER	2.5
1	B	50	GLU	2.5
1	E	199	GLU	2.5
1	F	206	ARG	2.5
1	A	144	ASP	2.5
1	B	51	LYS	2.5
1	D	2	ASP	2.5
1	B	161	THR	2.5
1	A	206	ARG	2.5

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Mol	Chain	Res	Type	RSRZ
1	E	127	TRP	2.5
1	B	7	LEU	2.5
1	A	9	ALA	2.5
1	B	159	GLY	2.5
1	A	47	VAL	2.4
1	A	71	ILE	2.4
1	A	135	GLY	2.4
1	E	170	ARG	2.4
1	F	159	GLY	2.4
1	C	75	PHE	2.4
1	E	8	PHE	2.4
1	F	137	LEU	2.4
1	B	44	ASP	2.4
1	E	182	ASP	2.4
1	D	59	GLU	2.4
1	B	109	ALA	2.4
1	E	109	ALA	2.4
1	D	75	PHE	2.4
1	A	69	GLN	2.4
1	D	106	ALA	2.4
1	D	71	ILE	2.4
1	F	47	VAL	2.4
1	E	121	LEU	2.4
1	E	212	LEU	2.4
1	C	170	ARG	2.4
1	E	17	ARG	2.4
1	B	76	ASN	2.3
1	E	74	ASP	2.3
1	E	144	ASP	2.3
1	B	210	ALA	2.3
1	F	87	VAL	2.3
1	A	105	HIS	2.3
1	C	46	ARG	2.3
1	E	105	HIS	2.3
1	B	16	GLN	2.3
1	E	215	LEU	2.3
1	E	2	ASP	2.3
1	C	14	TRP	2.3
1	E	136	LYS	2.3
1	E	173	LYS	2.3
1	C	104	ILE	2.3
1	C	105	HIS	2.3

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Mol	Chain	Res	Type	RSRZ
1	D	105	HIS	2.3
1	D	16	GLN	2.3
1	E	82	GLN	2.3
1	F	113	LEU	2.3
1	E	35	PRO	2.3
1	E	57	PRO	2.3
1	C	124	ARG	2.3
1	A	16	GLN	2.3
1	A	21	GLU	2.3
1	C	187	PHE	2.3
1	B	137	LEU	2.3
1	E	201	LEU	2.3
1	B	118	ASN	2.3
1	C	184	ASN	2.3
1	A	211	ARG	2.3
1	B	167	ALA	2.3
1	E	206	ARG	2.3
1	B	132	HIS	2.3
1	C	45	SER	2.3
1	B	4	ILE	2.3
1	F	214	ILE	2.3
1	A	164	VAL	2.3
1	C	115	LEU	2.2
1	F	78	LEU	2.2
1	F	183	VAL	2.3
1	D	14	TRP	2.2
1	D	111	LYS	2.2
1	A	121	LEU	2.2
1	B	70	VAL	2.2
1	B	164	VAL	2.2
1	B	57	PRO	2.2
1	E	211	ARG	2.2
1	B	197	SER	2.2
1	B	61	PHE	2.2
1	C	211	ARG	2.2
1	D	54	ASN	2.2
1	F	110	ASP	2.2
1	C	18	MET	2.2
1	E	53	THR	2.2
1	D	133	LEU	2.2
1	B	80	VAL	2.2
1	B	108	MET	2.2

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Mol	Chain	Res	Type	RSRZ
1	C	11	ASN	2.2
1	B	35	PRO	2.2
1	C	111	LYS	2.2
1	C	129	LYS	2.2
1	C	103	GLY	2.2
1	C	132	HIS	2.2
1	E	36	HIS	2.2
1	F	6	GLN	2.2
1	E	84	ALA	2.2
1	E	99	THR	2.2
1	A	126	ILE	2.1
1	A	201	LEU	2.1
1	C	113	LEU	2.1
1	D	78	LEU	2.1
1	B	54	ASN	2.1
1	E	87	VAL	2.1
1	A	33	GLN	2.1
1	E	69	GLN	2.1
1	B	162	SER	2.1
1	C	17	ARG	2.1
1	E	46	ARG	2.1
1	C	149	ILE	2.1
1	C	163	ILE	2.1
1	E	50	GLU	2.1
1	E	86	ASP	2.1
1	A	81	VAL	2.1
1	D	119	TRP	2.1
1	A	171	GLY	2.1
1	E	159	GLY	2.1
1	D	34	THR	2.1
1	D	15	ALA	2.1
1	E	152	ALA	2.1
1	C	141	LYS	2.1
1	E	165	LYS	2.1
1	F	56	GLU	2.1
1	A	156	TYR	2.1
1	B	74	ASP	2.1
1	C	126	ILE	2.1
1	F	163	ILE	2.1
1	A	80	VAL	2.1
1	A	139	PRO	2.1
1	E	62	VAL	2.1

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Mol	Chain	Res	Type	RSRZ
1	E	155	VAL	2.1
1	E	181	PHE	2.1
1	D	206	ARG	2.1
1	A	200	THR	2.1
1	C	107	ALA	2.1
1	D	5	LYS	2.1
1	F	109	ALA	2.1
1	C	59	GLU	2.1
1	D	134	LEU	2.1
1	E	16	GLN	2.1
1	F	60	LEU	2.1
1	A	123	ILE	2.1
1	B	163	ILE	2.1
1	B	190	ASP	2.1
1	B	139	PRO	2.1
1	C	156	TYR	2.1
1	C	189	VAL	2.1
1	E	66	VAL	2.1
1	B	131	GLY	2.1
1	C	8	PHE	2.1
1	E	61	PHE	2.1
1	B	170	ARG	2.1
1	E	142	ARG	2.1
1	B	43	SER	2.0
1	B	105	HIS	2.0
1	A	134	LEU	2.0
1	C	78	LEU	2.0
1	D	182	ASP	2.0
1	E	116	ILE	2.0
1	B	155	VAL	2.0
1	B	211	ARG	2.0
1	D	164	VAL	2.0
1	A	131	GLY	2.0
1	C	114	GLY	2.0
1	A	217	GLU	2.0
1	C	33	GLN	2.0
1	E	77	CYS	2.0
1	A	22	ASN	2.0
1	B	134	LEU	2.0
1	C	55	LEU	2.0
1	C	146	LEU	2.0
1	C	139	PRO	2.0

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

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

## 6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

## 6.4 Ligands [i](#)

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, 95<sup>th</sup> 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	E	231	5/5	0.71	0.22	110,111,112,112	0
3	SO4	A	232	5/5	0.73	0.20	110,111,112,112	0
3	SO4	A	231	5/5	0.74	0.19	120,120,121,121	0
3	SO4	D	232	5/5	0.77	0.18	127,127,127,127	0
3	SO4	D	231	5/5	0.77	0.18	113,113,113,114	0
3	SO4	B	231	5/5	0.79	0.32	95,95,95,95	5
3	SO4	F	233	5/5	0.80	0.35	96,96,96,96	5
3	SO4	F	232	5/5	0.82	0.16	98,99,99,101	0
3	SO4	C	231	5/5	0.85	0.30	95,95,96,96	5
3	SO4	E	232	5/5	0.86	0.21	74,75,75,75	5
3	SO4	D	233	5/5	0.91	0.19	52,53,54,55	5
3	SO4	A	233	5/5	0.93	0.18	53,55,56,58	5
4	BCT	F	231	4/4	0.96	0.15	61,62,62,62	0
2	ZN	C	230	1/1	0.98	0.10	66,66,66,66	0
2	ZN	D	230	1/1	0.98	0.14	66,66,66,66	0
2	ZN	E	230	1/1	0.98	0.12	64,64,64,64	0
2	ZN	B	230	1/1	0.98	0.12	65,65,65,65	0
2	ZN	F	230	1/1	0.99	0.09	68,68,68,68	0
2	ZN	A	230	1/1	0.99	0.13	67,67,67,67	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.