



Full wwPDB X-ray Structure Validation Report ⓘ

Aug 22, 2020 – 09:53 AM BST

PDB ID : 4HGV
Title : Crystal structure of a fumarate hydratase
Authors : Eswaramoorthy, S.; Evans, B.; Foti, R.; Gizzi, A.; Hillerich, B.; Kar, A.; Lafleur, J.; Seidel, R.; Villigas, G.; Zencheck, W.; Almo, S.C.; Swaminathan, S.; New York Structural Genomics Research Consortium (NYSGRC)
Deposited on : 2012-10-08
Resolution : 2.09 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 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) : 1.13
EDS : 2.13.1
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac : 5.8.0158
CCP4 : 7.0.044 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.13.1

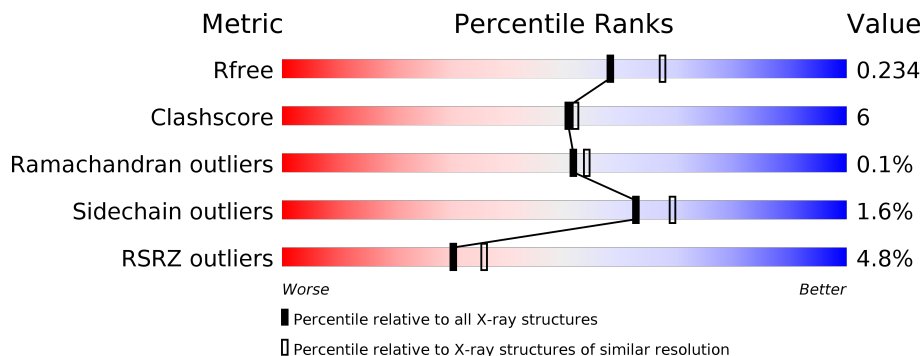
1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.09 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}	130704	5197 (2.10-2.10)
Clashscore	141614	5710 (2.10-2.10)
Ramachandran outliers	138981	5647 (2.10-2.10)
Sidechain outliers	138945	5648 (2.10-2.10)
RSRZ outliers	127900	5083 (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 ≥ 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	495	<div style="display: flex; align-items: center;"> <div style="width: 5%; height: 10px; background-color: red; margin-right: 5px;"></div> <div style="width: 80%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 12%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 8%; height: 10px; background-color: grey; margin-right: 5px;"></div> </div> <p style="margin-top: 5px;">5% 80% 12% • 8%</p>
1	B	495	<div style="display: flex; align-items: center;"> <div style="width: 2%; height: 10px; background-color: red; margin-right: 5px;"></div> <div style="width: 82%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 9%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 8%; height: 10px; background-color: grey; margin-right: 5px;"></div> </div> <p style="margin-top: 5px;">2% 82% 9% • 8%</p>
1	C	495	<div style="display: flex; align-items: center;"> <div style="width: 3%; height: 10px; background-color: red; margin-right: 5px;"></div> <div style="width: 74%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 9%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 17%; height: 10px; background-color: grey; margin-right: 5px;"></div> </div> <p style="margin-top: 5px;">3% 74% 9% 17%</p>
1	D	495	<div style="display: flex; align-items: center;"> <div style="width: 7%; height: 10px; background-color: red; margin-right: 5px;"></div> <div style="width: 79%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 12%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 8%; height: 10px; background-color: grey; margin-right: 5px;"></div> </div> <p style="margin-top: 5px;">7% 79% 12% 8%</p>

2 Entry composition [i](#)

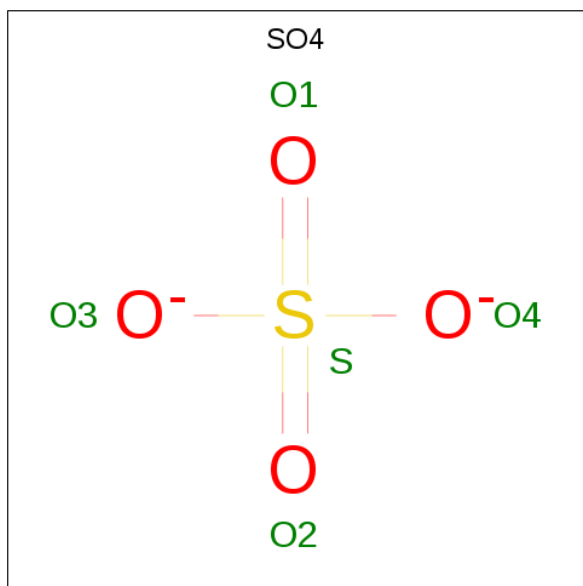
There are 3 unique types of molecules in this entry. The entry contains 13548 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 Fumarate hydratase class II.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	N	O	S	Se			
1	A	456	Total 3388	C 2124	N 596	O 653	S 5	Se 10	0	0	0
1	B	453	Total 3388	C 2128	N 595	O 650	S 5	Se 10	0	0	0
1	C	411	Total 3060	C 1923	N 536	O 586	S 5	Se 10	0	0	0
1	D	454	Total 3381	C 2121	N 593	O 651	S 5	Se 11	0	0	0

- Molecule 2 is SULFATE ION (three-letter code: SO4) (formula: O₄S).



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

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

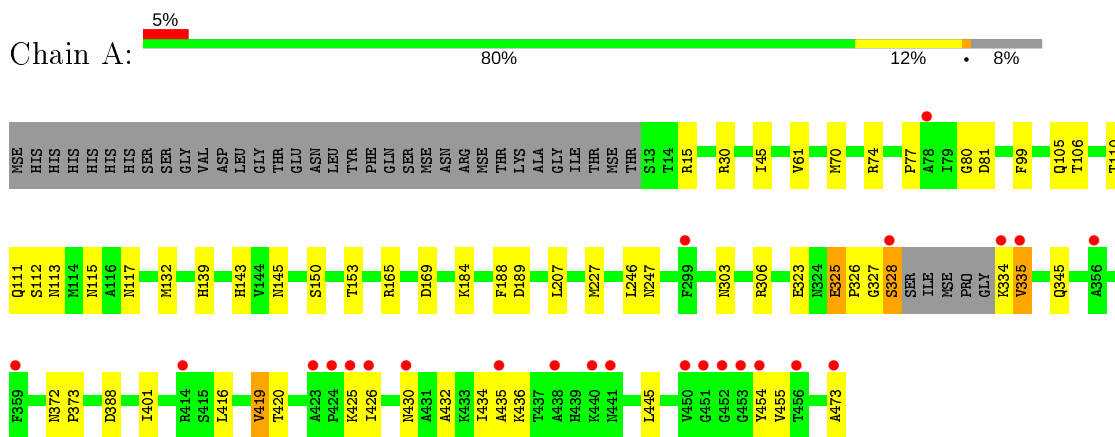
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	77	Total	O	0	0
			77	77		
3	B	82	Total	O	0	0
			82	82		
3	C	77	Total	O	0	0
			77	77		
3	D	80	Total	O	0	0
			80	80		

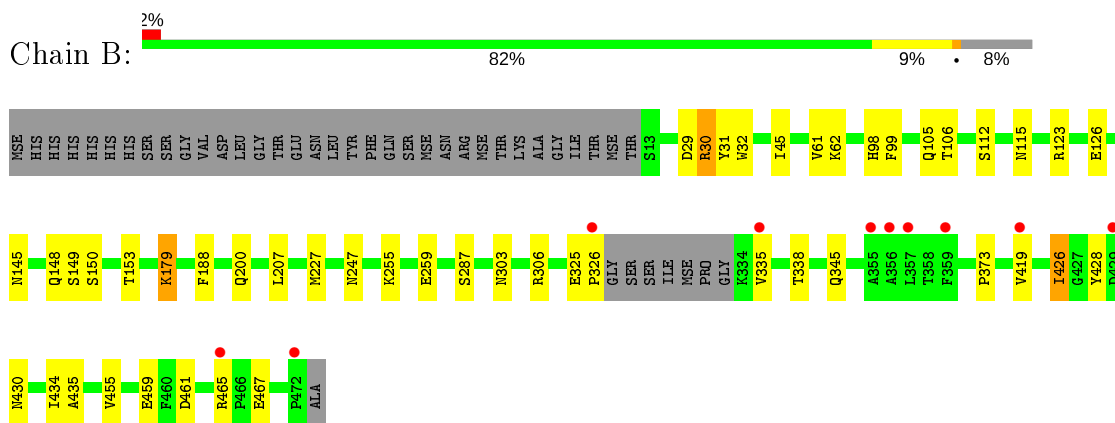
3 Residue-property plots [i](#)

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.

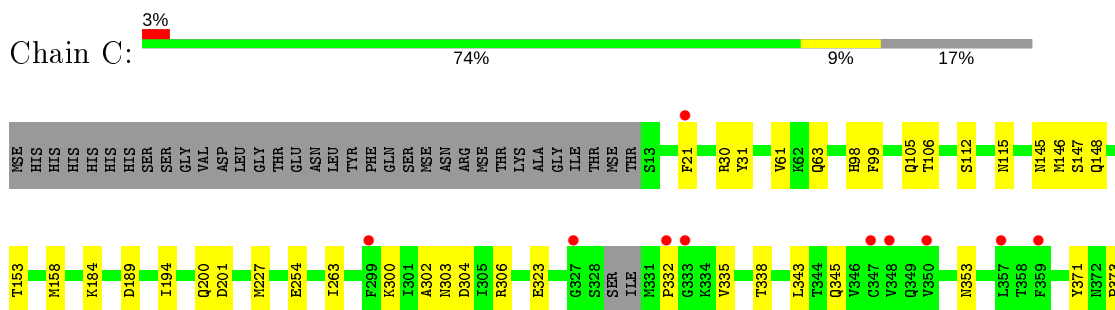
- Molecule 1: Fumarate hydratase class II

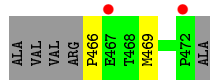
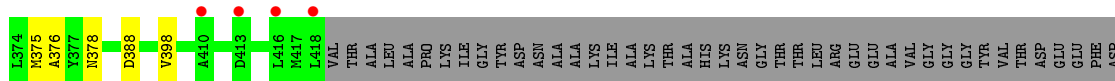


- Molecule 1: Fumarate hydratase class II

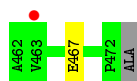
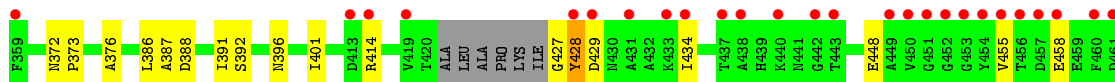
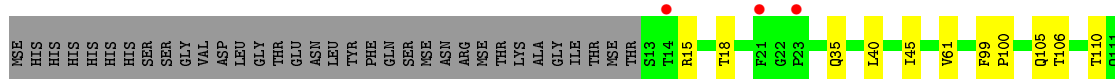
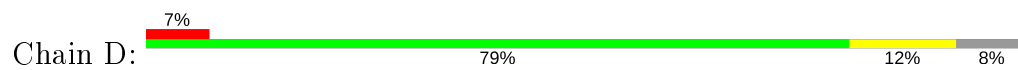


- Molecule 1: Fumarate hydratase class II





● Molecule 1: Fumarate hydratase class II



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	72.16Å 159.97Å 162.04Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	44.76 – 2.09 44.76 – 2.09	Depositor EDS
% Data completeness (in resolution range)	99.0 (44.76-2.09) 99.1 (44.76-2.09)	Depositor EDS
R_{merge}	0.14	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	4.08 (at 2.10Å)	Xtrriage
Refinement program	REFMAC 5.5.0110	Depositor
R, R_{free}	0.197 , 0.234 0.198 , 0.234	Depositor DCC
R_{free} test set	5509 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	22.7	Xtrriage
Anisotropy	0.737	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 40.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.34$	Xtrriage
Estimated twinning fraction	0.003 for -h,l,k	Xtrriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	13548	wwPDB-VP
Average B, all atoms (Å ²)	25.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.49% of the height of the origin peak. No significant pseudotranslation is detected.*

¹ Intensities estimated from amplitudes.

² 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 [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	0.50	0/3439	0.58	0/4653
1	B	0.50	0/3440	0.57	0/4652
1	C	0.52	0/3107	0.57	0/4199
1	D	0.52	0/3432	0.57	0/4640
All	All	0.51	0/13418	0.57	0/18144

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	3388	0	3352	54	0
1	B	3388	0	3368	43	0
1	C	3060	0	3031	38	0
1	D	3381	0	3341	44	0
2	C	5	0	0	0	0
2	D	10	0	0	0	0
3	A	77	0	0	0	0
3	B	82	0	0	2	0
3	C	77	0	0	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	D	80	0	0	1	0
All	All	13548	0	13092	150	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 6.

All (150) 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:70:MSE:HE3	1:A:80:GLY:HA3	1.26	1.12
1:A:70:MSE:HE2	1:A:77:PRO:HA	1.17	1.09
1:A:70:MSE:CE	1:A:77:PRO:HA	1.95	0.95
1:A:70:MSE:HE3	1:A:80:GLY:CA	1.98	0.93
1:C:466:PRO:HA	1:C:469:MSE:HE3	1.50	0.92
1:A:70:MSE:HE2	1:A:77:PRO:CA	2.02	0.89
1:B:303:ASN:HD22	1:B:306:ARG:HH21	1.21	0.85
1:A:325:GLU:HG2	3:D:620:HOH:O	1.76	0.84
1:D:312:PRO:HG3	1:D:333:GLY:HA3	1.61	0.82
1:B:455:VAL:HG22	1:B:459:GLU:HB2	1.61	0.81
1:D:330:ILE:HD12	1:D:331:MSE:HG2	1.61	0.81
1:A:303:ASN:HD22	1:A:306:ARG:HH21	1.32	0.76
1:D:303:ASN:HD22	1:D:306:ARG:HH21	1.35	0.74
1:C:254:GLU:HG2	3:C:641:HOH:O	1.88	0.73
1:B:373:PRO:HD2	1:C:345:GLN:HE22	1.56	0.70
1:C:303:ASN:HD22	1:C:306:ARG:HH21	1.36	0.70
1:A:139:HIS:H	1:A:143:HIS:CD2	2.11	0.68
1:A:70:MSE:CE	1:A:80:GLY:HA3	2.15	0.68
1:D:145:ASN:O	1:D:148:GLN:HG2	1.93	0.68
1:A:105:GLN:HE22	1:A:112:SER:H	1.42	0.68
1:B:419:VAL:HG11	1:B:435:ALA:HB2	1.77	0.67
1:A:139:HIS:H	1:A:143:HIS:HD2	1.41	0.67
1:A:345:GLN:HE22	1:D:373:PRO:HD2	1.59	0.66
1:B:345:GLN:HE22	1:C:373:PRO:HD2	1.61	0.64
1:C:31:TYR:H	1:C:98:HIS:CD2	2.16	0.64
1:B:99:PHE:HA	1:B:115:ASN:HD21	1.61	0.63
1:D:61:VAL:HG11	1:D:153:THR:HG23	1.80	0.63
1:D:35:GLN:NE2	1:D:114:MSE:HG3	2.13	0.63
1:B:105:GLN:HE22	1:B:112:SER:H	1.47	0.62
1:B:29:ASP:HB3	1:B:30:ARG:HD3	1.80	0.62
1:A:70:MSE:HE1	1:A:81:ASP:N	2.14	0.62
1:B:338:THR:CG2	1:C:106:THR:HG22	2.30	0.62

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:194:ILE:HD11	1:C:201:ASP:HB3	1.81	0.60
1:B:303:ASN:ND2	1:B:306:ARG:HH21	1.95	0.60
1:A:426:ILE:HG22	1:A:430:ASN:HB2	1.83	0.60
1:A:70:MSE:HE1	1:A:81:ASP:H	1.68	0.59
1:B:106:THR:HG22	1:C:338:THR:HB	1.84	0.59
1:A:70:MSE:CE	1:A:80:GLY:CA	2.77	0.59
1:B:150:SER:HB2	3:B:511:HOH:O	2.02	0.59
1:B:338:THR:HB	1:C:106:THR:HG22	1.86	0.58
1:A:373:PRO:HD2	1:D:345:GLN:HE22	1.67	0.58
1:D:99:PHE:HA	1:D:115:ASN:HD21	1.69	0.57
1:B:326:PRO:HA	1:C:21:PHE:CD1	2.40	0.57
1:B:428:TYR:CE1	1:D:330:ILE:HG12	2.40	0.56
1:B:31:TYR:H	1:B:98:HIS:CD2	2.23	0.56
1:D:303:ASN:ND2	1:D:306:ARG:HE	2.04	0.56
1:A:61:VAL:HG11	1:A:153:THR:HG23	1.88	0.55
1:C:105:GLN:HE22	1:C:112:SER:H	1.52	0.55
1:B:145:ASN:O	1:B:148:GLN:HG2	2.07	0.55
1:B:461:ASP:O	1:B:465:ARG:HD3	2.07	0.55
1:D:105:GLN:HE22	1:D:112:SER:H	1.54	0.55
1:C:145:ASN:O	1:C:148:GLN:HG2	2.07	0.53
1:A:345:GLN:NE2	1:D:373:PRO:HD2	2.23	0.53
1:C:371:TYR:O	1:C:375:MSE:HG3	2.09	0.53
1:D:106:THR:HG21	1:D:110:THR:HB	1.92	0.52
1:A:416:LEU:O	1:A:419:VAL:HG22	2.09	0.52
1:C:31:TYR:H	1:C:98:HIS:HD2	1.55	0.51
1:C:466:PRO:CA	1:C:469:MSE:HE3	2.33	0.51
1:D:220:SER:O	1:D:224:ARG:HG3	2.10	0.51
1:D:303:ASN:ND2	1:D:306:ARG:HH21	2.05	0.51
1:B:373:PRO:HD2	1:C:345:GLN:NE2	2.24	0.51
1:A:419:VAL:HG13	1:A:445:LEU:HD22	1.92	0.51
1:A:434:ILE:HD11	1:A:454:TYR:CD1	2.45	0.51
1:B:61:VAL:HG11	1:B:153:THR:HG23	1.91	0.51
1:B:123:ARG:NH1	1:B:126:GLU:OE1	2.43	0.51
1:A:113:ASN:HD21	1:A:145:ASN:HD21	1.59	0.50
1:C:227:MSE:HG2	1:D:227:MSE:SE	2.62	0.50
1:A:45:ILE:HA	1:D:388:ASP:HB3	1.92	0.50
1:B:179:LYS:HD3	3:B:551:HOH:O	2.12	0.50
1:A:106:THR:HG22	1:D:338:THR:HB	1.93	0.49
1:A:110:THR:HA	1:A:150:SER:HB2	1.95	0.48
1:A:426:ILE:HD13	1:A:454:TYR:HB3	1.95	0.48
1:B:31:TYR:H	1:B:98:HIS:HD2	1.61	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:432:ALA:O	1:A:436:LYS:HG3	2.14	0.48
1:B:338:THR:CB	1:C:106:THR:HG22	2.43	0.47
1:C:99:PHE:HA	1:C:115:ASN:HD21	1.80	0.47
1:B:200:GLN:NE2	1:D:335:VAL:H	2.11	0.47
1:B:45:ILE:HA	1:C:388:ASP:HB3	1.97	0.47
1:A:388:ASP:HB3	1:D:45:ILE:HA	1.96	0.47
1:B:62:LYS:HZ3	1:B:148:GLN:NE2	2.13	0.47
1:C:184:LYS:HE3	1:C:398:VAL:O	2.15	0.47
1:A:165:ARG:HD3	1:A:169:ASP:OD2	2.15	0.46
1:A:326:PRO:HA	1:A:327:GLY:HA3	1.70	0.46
1:B:426:ILE:HG23	1:B:430:ASN:HB2	1.97	0.46
1:B:335:VAL:H	1:D:200:GLN:NE2	2.13	0.46
1:A:99:PHE:HA	1:A:115:ASN:HD21	1.80	0.46
1:D:387:ALA:O	1:D:391:ILE:HG12	2.15	0.46
1:A:328:SER:HB2	1:A:334:LYS:CB	2.46	0.46
1:B:30:ARG:HG3	1:B:32:TRP:CH2	2.50	0.46
1:C:303:ASN:ND2	1:C:306:ARG:HH21	2.08	0.46
1:C:158:MSE:HG2	1:C:376:ALA:HB2	1.98	0.46
1:D:427:GLY:O	1:D:428:TYR:CB	2.64	0.46
1:A:184:LYS:HE3	1:A:401:ILE:O	2.16	0.46
1:D:434:ILE:HG23	1:D:448:GLU:HB2	1.98	0.46
1:A:227:MSE:HG2	1:B:227:MSE:SE	2.66	0.45
1:B:345:GLN:NE2	1:C:373:PRO:HD2	2.27	0.45
1:C:63:GLN:HE21	1:C:263:ILE:CD1	2.30	0.45
1:D:188:PHE:HB3	1:D:207:LEU:HB3	1.98	0.45
1:A:246:LEU:O	1:A:247:ASN:HB2	2.15	0.45
1:D:427:GLY:O	1:D:428:TYR:HB3	2.16	0.45
1:B:455:VAL:HG22	1:B:459:GLU:CB	2.41	0.45
1:C:61:VAL:HG11	1:C:153:THR:HG23	1.98	0.45
1:B:188:PHE:HB3	1:B:207:LEU:HB3	1.98	0.44
1:B:30:ARG:HD2	1:B:30:ARG:HA	1.68	0.44
1:D:184:LYS:HE3	1:D:401:ILE:O	2.17	0.44
1:D:414:ARG:O	1:D:414:ARG:HG3	2.17	0.44
1:A:372:ASN:HB2	1:A:373:PRO:HD3	1.98	0.44
1:D:151:ASN:O	1:D:278:LEU:HD22	2.18	0.44
1:B:255:LYS:HE3	1:B:259:GLU:OE2	2.17	0.44
1:A:303:ASN:ND2	1:A:306:ARG:HH21	2.07	0.44
1:A:335:VAL:H	1:C:200:GLN:NE2	2.15	0.44
1:D:113:ASN:HD21	1:D:145:ASN:HD21	1.65	0.44
1:A:335:VAL:H	1:C:200:GLN:HE21	1.66	0.43
1:C:30:ARG:HD3	1:C:30:ARG:HA	1.75	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:303:ASN:ND2	1:B:306:ARG:HE	2.17	0.43
1:B:426:ILE:HG23	1:B:430:ASN:CB	2.49	0.43
1:D:158:MSE:HG2	1:D:376:ALA:HB2	1.99	0.43
1:A:188:PHE:HB3	1:A:207:LEU:HB3	2.00	0.43
1:B:338:THR:HG22	1:C:106:THR:HG22	2.00	0.43
1:D:372:ASN:HB2	1:D:373:PRO:HD3	1.99	0.42
1:D:392:SER:O	1:D:396:ASN:HB2	2.19	0.42
1:C:146:MSE:O	1:C:147:SER:HB2	2.19	0.42
1:A:430:ASN:O	1:A:434:ILE:HG12	2.19	0.42
1:A:426:ILE:HG22	1:A:426:ILE:O	2.18	0.42
1:B:303:ASN:HD22	1:B:306:ARG:NH2	2.01	0.42
1:B:430:ASN:O	1:B:434:ILE:HG12	2.20	0.42
1:B:467:GLU:H	1:B:467:GLU:CD	2.21	0.42
1:A:106:THR:HG21	1:A:111:GLN:OE1	2.20	0.42
1:C:227:MSE:SE	1:D:227:MSE:HG2	2.69	0.42
1:D:428:TYR:CG	1:D:429:ASP:N	2.88	0.42
1:A:30:ARG:HD3	1:A:30:ARG:HA	1.86	0.41
1:A:473:ALA:HB3	1:B:247:ASN:H	1.86	0.41
1:D:330:ILE:H	1:D:330:ILE:HG13	1.69	0.41
1:C:323:GLU:HG3	1:C:335:VAL:HG13	2.03	0.41
1:A:117:ASN:HD21	1:A:145:ASN:ND2	2.18	0.41
1:A:419:VAL:HG13	1:A:445:LEU:CD2	2.49	0.41
1:A:323:GLU:HG2	1:A:335:VAL:HG22	2.02	0.41
1:A:373:PRO:HD2	1:D:345:GLN:NE2	2.33	0.41
1:D:40:LEU:HD21	1:D:100:PRO:HB2	2.03	0.41
1:D:15:ARG:HD2	1:D:132:MSE:O	2.20	0.41
1:A:15:ARG:HD2	1:A:132:MSE:O	2.20	0.41
1:A:426:ILE:HG22	1:A:430:ASN:CB	2.49	0.41
1:D:312:PRO:HG3	1:D:333:GLY:CA	2.42	0.41
1:C:302:ALA:HB2	1:C:343:LEU:HD23	2.01	0.41
1:C:353:ASN:CG	1:C:378:ASN:HD22	2.24	0.41
1:A:435:ALA:CB	1:C:332:PRO:HG2	2.51	0.41
1:D:291:ILE:HG23	1:D:386:LEU:HD12	2.03	0.41
1:D:303:ASN:HD22	1:D:306:ARG:NH2	2.10	0.40
1:A:106:THR:HG22	1:D:338:THR:CG2	2.52	0.40
1:C:300:LYS:NZ	1:C:304:ASP:OD2	2.50	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	452/495 (91%)	437 (97%)	14 (3%)	1 (0%)	47	49
1	B	449/495 (91%)	440 (98%)	9 (2%)	0	100	100
1	C	405/495 (82%)	393 (97%)	12 (3%)	0	100	100
1	D	450/495 (91%)	437 (97%)	12 (3%)	1 (0%)	47	49
All	All	1756/1980 (89%)	1707 (97%)	47 (3%)	2 (0%)	51	54

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	D	428	TYR
1	A	335	VAL

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	350/372 (94%)	342 (98%)	8 (2%)	50	55
1	B	352/372 (95%)	346 (98%)	6 (2%)	60	67
1	C	319/372 (86%)	318 (100%)	1 (0%)	92	95
1	D	350/372 (94%)	343 (98%)	7 (2%)	55	60
All	All	1371/1488 (92%)	1349 (98%)	22 (2%)	62	69

All (22) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	74	ARG
1	A	189	ASP
1	A	325	GLU
1	A	328	SER
1	A	419	VAL
1	A	420	THR
1	A	425	LYS
1	A	455	VAL
1	B	30	ARG
1	B	149	SER
1	B	179	LYS
1	B	287	SER
1	B	325	GLU
1	B	426	ILE
1	C	189	ASP
1	D	18	THR
1	D	223	LYS
1	D	255	LYS
1	D	328	SER
1	D	455	VAL
1	D	458	GLU
1	D	467	GLU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (60) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	63	GLN
1	A	69	ASN
1	A	105	GLN
1	A	115	ASN
1	A	143	HIS
1	A	145	ASN
1	A	148	GLN
1	A	200	GLN
1	A	292	ASN
1	A	303	ASN
1	A	339	GLN
1	A	345	GLN
1	A	349	GLN
1	A	378	ASN
1	A	396	ASN
1	B	63	GLN
1	B	98	HIS

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Mol	Chain	Res	Type
1	B	105	GLN
1	B	115	ASN
1	B	145	ASN
1	B	148	GLN
1	B	200	GLN
1	B	292	ASN
1	B	303	ASN
1	B	339	GLN
1	B	345	GLN
1	B	349	GLN
1	B	378	ASN
1	B	396	ASN
1	C	63	GLN
1	C	69	ASN
1	C	98	HIS
1	C	105	GLN
1	C	115	ASN
1	C	145	ASN
1	C	148	GLN
1	C	247	ASN
1	C	292	ASN
1	C	303	ASN
1	C	339	GLN
1	C	345	GLN
1	C	349	GLN
1	C	378	ASN
1	C	396	ASN
1	D	35	GLN
1	D	63	GLN
1	D	69	ASN
1	D	105	GLN
1	D	115	ASN
1	D	145	ASN
1	D	148	GLN
1	D	200	GLN
1	D	247	ASN
1	D	292	ASN
1	D	303	ASN
1	D	339	GLN
1	D	345	GLN
1	D	349	GLN
1	D	378	ASN

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Mol	Chain	Res	Type
1	D	396	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 monosaccharides in this entry.

5.6 Ligand geometry [i](#)

3 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	502	-	4,4,4	0.13	0	6,6,6	0.08	0
2	SO4	D	501	-	4,4,4	0.14	0	6,6,6	0.12	0
2	SO4	C	501	-	4,4,4	0.18	0	6,6,6	0.26	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 [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	446/495 (90%)	0.12	24 (5%) 25 31	12, 24, 51, 62	0
1	B	443/495 (89%)	-0.13	10 (2%) 60 65	12, 23, 44, 50	0
1	C	400/495 (80%)	-0.01	16 (4%) 38 44	11, 22, 40, 63	0
1	D	443/495 (89%)	0.15	33 (7%) 14 18	11, 23, 59, 73	0
All	All	1732/1980 (87%)	0.03	83 (4%) 30 36	11, 23, 49, 73	0

All (83) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	428	TYR	7.8
1	D	450	VAL	5.7
1	D	453	GLY	5.4
1	D	456	THR	4.7
1	D	458	GLU	4.6
1	C	418	LEU	4.6
1	D	419	VAL	4.6
1	A	78	ALA	4.4
1	C	472	PRO	4.3
1	A	451	GLY	4.3
1	A	335	VAL	4.2
1	D	455	VAL	4.2
1	B	472	PRO	4.1
1	D	463	VAL	4.0
1	D	460	PHE	3.8
1	D	440	LYS	3.8
1	A	473	ALA	3.6
1	C	359	PHE	3.5
1	C	416	LEU	3.5
1	C	413	ASP	3.4
1	D	457	ASP	3.4

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Mol	Chain	Res	Type	RSRZ
1	D	443	THR	3.3
1	D	359	PHE	3.3
1	B	326	PRO	3.3
1	A	454	TYR	3.2
1	C	21	PHE	3.1
1	A	426	ILE	3.1
1	A	440	LYS	3.1
1	A	430	ASN	3.0
1	A	450	VAL	3.0
1	B	335	VAL	2.9
1	B	359	PHE	2.9
1	A	452	GLY	2.9
1	D	414	ARG	2.9
1	D	433	LYS	2.9
1	B	429	ASP	2.8
1	D	449	ALA	2.8
1	A	424	PRO	2.7
1	B	356	ALA	2.7
1	D	454	TYR	2.7
1	D	442	GLY	2.7
1	B	419	VAL	2.6
1	C	327	GLY	2.6
1	A	328	SER	2.6
1	C	333	GLY	2.6
1	D	434	ILE	2.6
1	A	453	GLY	2.6
1	C	350	VAL	2.5
1	D	438	ALA	2.5
1	D	461	ASP	2.5
1	A	425	LYS	2.5
1	A	423	ALA	2.5
1	D	437	THR	2.4
1	A	359	PHE	2.4
1	C	348	VAL	2.4
1	A	438	ALA	2.4
1	D	358	THR	2.3
1	D	413	ASP	2.3
1	A	334	LYS	2.3
1	C	299	PHE	2.2
1	A	356	ALA	2.2
1	C	467	GLU	2.2
1	A	441	ASN	2.2

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Mol	Chain	Res	Type	RSRZ
1	D	429	ASP	2.2
1	A	435	ALA	2.2
1	C	332	PRO	2.2
1	B	465	ARG	2.2
1	D	431	ALA	2.2
1	B	357	LEU	2.2
1	A	299	PHE	2.2
1	D	451	GLY	2.2
1	D	452	GLY	2.1
1	D	348	VAL	2.1
1	A	414	ARG	2.1
1	C	357	LEU	2.1
1	C	347	CYS	2.1
1	D	333	GLY	2.1
1	D	14	THR	2.1
1	C	410	ALA	2.1
1	D	23	PRO	2.0
1	B	355	ALA	2.0
1	D	21	PHE	2.0
1	A	456	THR	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 monosaccharides 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
2	SO4	D	501	5/5	0.88	0.21	71,71,71,71	0
2	SO4	C	501	5/5	0.88	0.18	65,65,66,66	0
2	SO4	D	502	5/5	0.91	0.17	83,84,84,84	0

6.5 Other polymers

There are no such residues in this entry.