



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 10, 2026 – 07:57 AM UTC

PDB ID : 1E5S / pdb_00001e5s
Title : Proline 3-hydroxylase (type II) - Iron form
Authors : Clifton, I.J.; Hsueh, L.C.; Baldwin, J.E.; Schofield, C.J.; Harlos, K.
Deposited on : 2000-07-28
Resolution : 2.40 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

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

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

MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

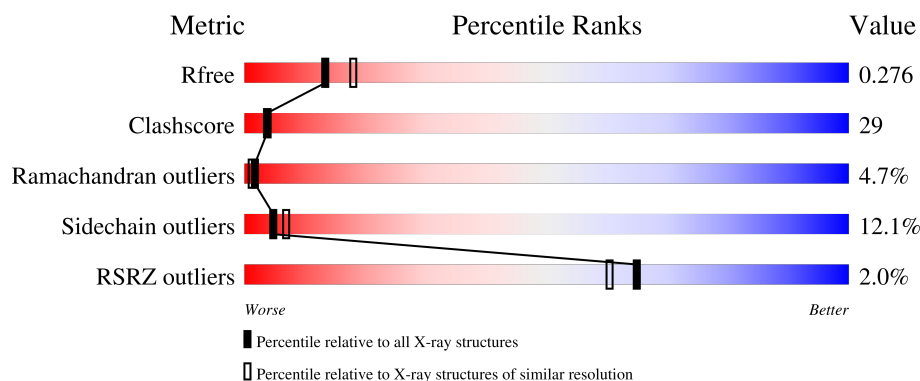
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.40 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	4912 (2.40-2.40)
Clashscore	190562	5391 (2.40-2.40)
Ramachandran outliers	187476	5320 (2.40-2.40)
Sidechain outliers	187428	5321 (2.40-2.40)
RSRZ outliers	180081	4916 (2.40-2.40)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	290	3% 43% 32% 12% 10%
1	B	290	% 39% 38% 7% 16%

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
2	SO4	A	400	-	-	X	-

2 Entry composition [i](#)

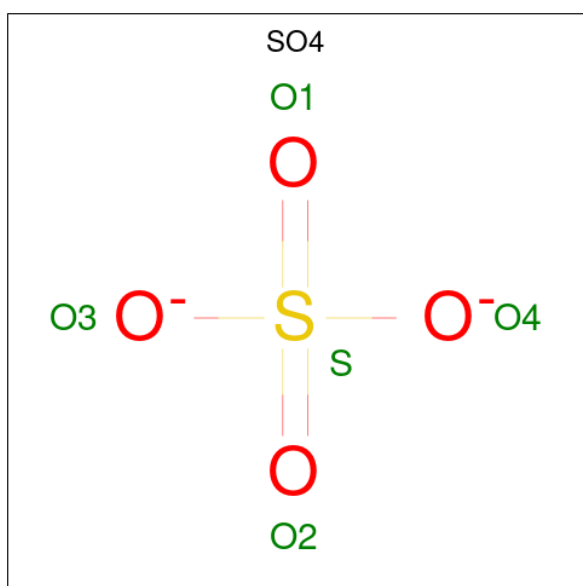
There are 4 unique types of molecules in this entry. The entry contains 4298 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 PROLINE OXIDASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	260	Total	C	N	O	S	0	0	0
			2110	1357	363	384	6			
1	B	243	Total	C	N	O	S	0	0	0
			1965	1262	343	354	6			

- Molecule 2 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



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

- Molecule 3 is FE (II) ION (CCD ID: FE2) (formula: Fe).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	1	Total	Fe	0	0
			1	1		

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	B	1	Total 1	Fe 1	0	0

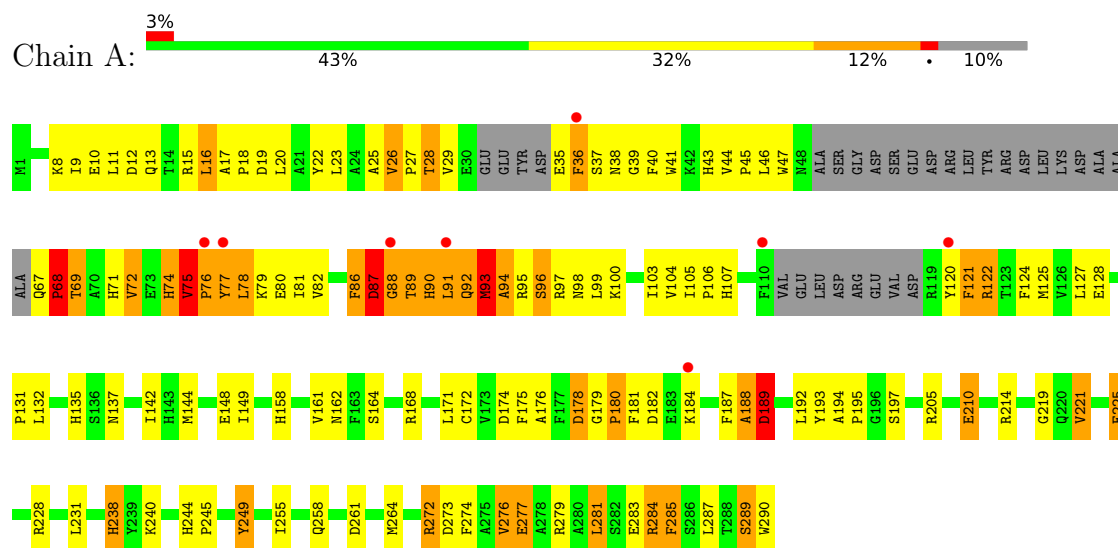
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	115	Total 115	O 115	0	0
4	B	101	Total 101	O 101	0	0

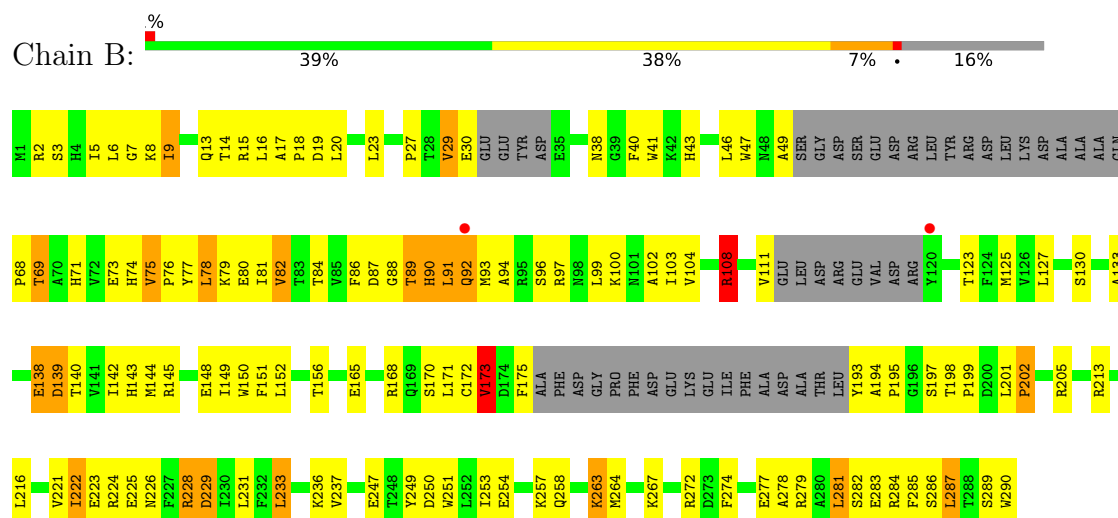
3 Residue-property plots

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: PROLINE OXIDASE



• Molecule 1: PROLINE OXIDASE



4 Data and refinement statistics

Property	Value	Source
Space group	P 31 2 1	Depositor
Cell constants a, b, c, α , β , γ	72.78Å 72.78Å 224.90Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	23.82 – 2.40 23.82 – 2.40	Depositor EDS
% Data completeness (in resolution range)	93.8 (23.82-2.40) 93.7 (23.82-2.40)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.24 (at 2.41Å)	Xtriage
Refinement program	CNS 1.0	Depositor
R, R_{free}	0.216 , 0.271 0.219 , 0.276	Depositor DCC
R_{free} test set	1311 reflections (4.87%)	wwPDB-VP
Wilson B-factor (Å ²)	48.9	Xtriage
Anisotropy	0.315	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 64.9	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	0.039 for -h,-k,l	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	4298	wwPDB-VP
Average B, all atoms (Å ²)	57.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.35% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: FE2, 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	1.10	4/2167 (0.2%)	1.40	29/2941 (1.0%)
1	B	1.04	3/2015 (0.1%)	1.29	22/2732 (0.8%)
All	All	1.07	7/4182 (0.2%)	1.35	51/5673 (0.9%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	B	0	1

All (7) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	221	VAL	CA-CB	6.65	1.63	1.54
1	B	237	VAL	CA-C	6.64	1.60	1.52
1	A	221	VAL	CA-CB	6.51	1.62	1.54
1	A	107	HIS	ND1-CE1	6.50	1.39	1.32
1	A	264	MET	SD-CE	-5.41	1.66	1.79
1	A	238	HIS	C-O	-5.20	1.17	1.24
1	B	173	VAL	CA-CB	5.20	1.60	1.54

All (51) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	75	VAL	CA-C-N	11.81	134.60	119.84
1	A	75	VAL	C-N-CA	11.81	134.60	119.84
1	A	36	PHE	N-CA-C	-9.77	99.16	112.94
1	A	179	GLY	CA-C-N	8.76	130.79	119.84

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	179	GLY	C-N-CA	8.76	130.79	119.84
1	A	88	GLY	N-CA-C	-8.53	100.75	112.18
1	B	283	GLU	N-CA-C	-7.80	103.49	113.16
1	A	181	PHE	N-CA-C	7.25	119.08	108.86
1	B	75	VAL	CA-C-N	7.09	128.70	119.84
1	B	75	VAL	C-N-CA	7.09	128.70	119.84
1	B	108	ARG	N-CA-C	-7.00	97.99	109.40
1	A	78	LEU	N-CA-C	-6.92	103.82	111.36
1	A	219	GLY	N-CA-C	-6.90	105.81	114.16
1	A	96	SER	N-CA-C	-6.83	101.33	110.55
1	A	194	ALA	CA-C-N	6.72	128.24	119.84
1	A	194	ALA	C-N-CA	6.72	128.24	119.84
1	A	107	HIS	CB-CG-CD2	-6.61	122.61	131.20
1	B	205	ARG	CA-C-N	6.42	126.18	119.76
1	B	205	ARG	C-N-CA	6.42	126.18	119.76
1	A	189	ASP	N-CA-C	-6.38	97.21	110.80
1	B	138	GLU	CA-C-N	-6.34	113.16	122.86
1	B	138	GLU	C-N-CA	-6.34	113.16	122.86
1	A	221	VAL	N-CA-C	6.29	119.83	113.47
1	B	130	SER	N-CA-C	-6.25	95.79	109.11
1	A	90	HIS	N-CA-C	6.16	119.59	108.69
1	A	107	HIS	CB-CG-ND1	5.93	131.59	122.70
1	B	223	GLU	N-CA-C	-5.92	100.07	109.07
1	B	233	LEU	CA-CB-CG	5.84	136.75	116.30
1	A	255	ILE	N-CA-C	-5.82	104.69	110.62
1	A	87	ASP	N-CA-C	5.73	123.00	110.80
1	A	178	ASP	N-CA-C	-5.67	98.72	110.80
1	B	130	SER	CA-C-N	5.65	125.49	119.28
1	B	130	SER	C-N-CA	5.65	125.49	119.28
1	B	78	LEU	N-CA-C	-5.63	105.14	111.28
1	B	263	LYS	N-CA-C	-5.48	105.46	111.82
1	A	105	ILE	CA-C-N	5.43	125.36	119.76
1	A	105	ILE	C-N-CA	5.43	125.36	119.76
1	A	188	ALA	N-CA-C	-5.43	96.44	107.41
1	B	27	PRO	N-CA-C	-5.41	102.65	111.68
1	A	249	TYR	N-CA-C	5.35	118.02	111.82
1	B	285	PHE	N-CA-C	5.20	117.75	109.96
1	A	92	GLN	N-CA-C	5.18	119.76	112.72
1	B	194	ALA	CA-C-N	5.16	126.28	119.84
1	B	194	ALA	C-N-CA	5.16	126.28	119.84
1	A	86	PHE	N-CA-C	5.15	117.30	109.63
1	B	9	ILE	CA-C-N	-5.12	114.96	122.19

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	9	ILE	C-N-CA	-5.12	114.96	122.19
1	A	131	PRO	N-CA-C	5.12	120.65	113.53
1	A	171	LEU	N-CA-C	-5.05	101.46	109.59
1	A	179	GLY	N-CA-C	-5.05	102.05	112.34
1	B	104	VAL	N-CA-C	-5.02	100.55	108.23

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	B	249	TYR	Sidechain

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	2110	0	2040	133	0
1	B	1965	0	1915	99	0
2	A	5	0	0	2	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0
4	A	115	0	0	5	0
4	B	101	0	0	8	0
All	All	4298	0	3955	232	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 29.

All (232) 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:35:GLU:HG2	1:A:36:PHE:H	1.19	1.06
1:A:69:THR:HG23	1:A:71:HIS:H	1.22	1.01
1:A:98:ASN:HD21	1:A:168:ARG:H	1.14	0.93
1:A:97:ARG:HD3	1:A:172:CYS:SG	2.12	0.90

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:47:TRP:HB2	1:A:94:ALA:HB3	1.58	0.84
1:B:228:ARG:HG2	1:B:287:LEU:HD23	1.57	0.84
1:A:96:SER:O	1:A:97:ARG:HG3	1.78	0.82
1:A:86:PHE:O	1:A:87:ASP:HB2	1.77	0.82
1:A:16:LEU:HB2	1:A:77:TYR:CE2	2.15	0.82
1:A:16:LEU:HB2	1:A:77:TYR:CD2	2.15	0.82
1:B:97:ARG:HD3	1:B:168:ARG:HH22	1.45	0.81
1:B:88:GLY:HA2	1:B:91:LEU:HB2	1.62	0.80
1:B:46:LEU:O	1:B:69:THR:HG23	1.83	0.78
1:A:22:TYR:HB2	1:A:75:VAL:HG21	1.69	0.75
1:A:290:TRP:CD1	1:A:290:TRP:N	2.54	0.75
1:B:5:ILE:HG22	1:B:7:GLY:H	1.52	0.75
1:B:286:SER:OG	1:B:289:SER:HB3	1.87	0.74
1:A:35:GLU:HG2	1:A:36:PHE:N	1.98	0.73
1:B:49:ALA:HB2	1:B:92:GLN:O	1.89	0.73
1:B:123:THR:HA	1:B:150:TRP:O	1.91	0.70
1:B:97:ARG:NE	4:B:2020:HOH:O	2.24	0.69
1:A:11:LEU:HB2	4:A:2007:HOH:O	1.92	0.69
1:A:122:ARG:HD2	4:A:2034:HOH:O	1.92	0.69
1:A:210:GLU:CG	1:A:214:ARG:HH12	2.06	0.68
1:A:92:GLN:O	1:A:93:MET:HG2	1.93	0.68
1:B:8:LYS:HG3	1:B:9:ILE:N	2.07	0.68
1:A:76:PRO:O	1:A:78:LEU:N	2.27	0.67
1:A:92:GLN:O	1:A:93:MET:CG	2.43	0.67
1:A:69:THR:CG2	1:A:71:HIS:H	2.06	0.66
1:A:193:TYR:CD2	1:A:195:PRO:HD3	2.30	0.66
1:A:290:TRP:CD1	1:A:290:TRP:H	2.14	0.66
1:B:47:TRP:CZ3	1:B:82:VAL:HG21	2.31	0.65
1:B:103:ILE:HD13	1:B:236:LYS:HG3	1.78	0.65
1:A:8:LYS:HE3	1:A:148:GLU:HG2	1.79	0.65
1:B:74:HIS:C	1:B:76:PRO:HD3	2.21	0.64
1:B:224:ARG:NH2	1:B:263:LYS:HD2	2.12	0.64
1:A:27:PRO:O	1:A:28:THR:O	2.16	0.64
1:B:224:ARG:HH22	1:B:263:LYS:HD2	1.62	0.63
1:A:285:PHE:CD1	1:A:285:PHE:C	2.76	0.63
1:A:205:ARG:HH21	1:A:240:LYS:HE3	1.64	0.63
1:A:187:PHE:HB3	1:A:189:ASP:O	2.00	0.62
1:A:91:LEU:HD12	1:A:91:LEU:O	1.99	0.62
1:A:210:GLU:HG2	1:A:214:ARG:NH1	2.14	0.62
1:A:68:PRO:HB3	1:A:72:VAL:HG21	1.82	0.61
1:A:86:PHE:CD2	1:A:175:PHE:HZ	2.18	0.61

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:277:GLU:HB3	1:A:279:ARG:HG3	1.81	0.61
1:A:210:GLU:HG2	1:A:214:ARG:HH12	1.66	0.61
1:A:283:GLU:O	1:A:284:ARG:CB	2.49	0.61
1:B:43:HIS:HA	1:B:96:SER:O	1.99	0.61
1:A:98:ASN:ND2	1:A:168:ARG:H	1.92	0.61
1:A:18:PRO:O	1:A:75:VAL:HG11	2.01	0.61
1:B:6:LEU:HB2	1:B:149:ILE:O	2.02	0.60
1:A:91:LEU:HD12	1:A:91:LEU:C	2.25	0.60
1:B:138:GLU:CG	1:B:156:THR:HB	2.31	0.60
1:A:19:ASP:OD2	1:A:76:PRO:O	2.20	0.60
1:A:276:VAL:HG23	1:A:276:VAL:O	2.01	0.60
1:B:6:LEU:HB2	1:B:149:ILE:HG22	1.82	0.60
1:B:267:LYS:HE3	1:B:286:SER:O	2.01	0.60
1:A:8:LYS:HG2	1:A:8:LYS:O	2.01	0.60
1:B:138:GLU:HG2	1:B:156:THR:HB	1.85	0.59
1:B:173:VAL:HG23	1:B:175:PHE:HE1	1.67	0.59
1:A:193:TYR:CE2	1:A:195:PRO:HD3	2.37	0.58
1:A:72:VAL:CG1	1:A:79:LYS:HG3	2.34	0.58
1:B:108:ARG:NH1	1:B:156:THR:HA	2.18	0.58
1:B:108:ARG:HH12	1:B:156:THR:HA	1.68	0.58
1:A:16:LEU:HB2	1:A:77:TYR:HE2	1.69	0.58
1:A:16:LEU:HB2	1:A:77:TYR:HD2	1.69	0.57
1:A:12:ASP:CG	1:A:15:ARG:HB2	2.31	0.56
1:B:173:VAL:HG23	1:B:175:PHE:CE1	2.39	0.56
1:B:250:ASP:OD1	1:B:272:ARG:NH2	2.29	0.56
1:B:274:PHE:CD2	1:B:281:LEU:HD22	2.41	0.56
1:B:277:GLU:HB2	1:B:279:ARG:HG2	1.87	0.56
1:A:44:VAL:O	1:A:46:LEU:HD13	2.06	0.56
1:A:261:ASP:C	1:A:261:ASP:OD1	2.49	0.56
1:B:213:ARG:NE	4:B:2067:HOH:O	2.29	0.55
1:B:224:ARG:HH12	1:B:263:LYS:CD	2.20	0.55
1:A:38:ASN:HD21	1:A:103:ILE:H	1.55	0.54
1:A:132:LEU:HD12	1:A:164:SER:HB3	1.90	0.54
1:A:94:ALA:HA	1:A:172:CYS:O	2.07	0.54
1:A:273:ASP:O	1:A:277:GLU:HB3	2.06	0.54
1:A:86:PHE:CD2	1:A:175:PHE:CZ	2.95	0.54
1:A:97:ARG:NH2	2:A:400:SO4:O2	2.40	0.54
1:B:144:MET:CE	1:B:152:LEU:HD21	2.38	0.53
1:A:93:MET:O	1:A:94:ALA:HB2	2.09	0.53
1:A:210:GLU:HB3	4:A:2070:HOH:O	2.07	0.53
1:A:43:HIS:CE1	1:A:97:ARG:HG2	2.44	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:274:PHE:HB2	1:A:281:LEU:HD13	1.91	0.52
1:A:210:GLU:CG	1:A:214:ARG:NH1	2.70	0.52
1:A:228:ARG:HG3	1:A:287:LEU:HD13	1.90	0.52
1:B:88:GLY:C	1:B:90:HIS:H	2.17	0.52
1:B:97:ARG:CD	4:B:2020:HOH:O	2.57	0.52
1:B:99:LEU:HG	1:B:102:ALA:HB3	1.91	0.52
1:A:12:ASP:OD2	1:A:15:ARG:HG3	2.09	0.52
1:A:184:LYS:HE2	1:A:193:TYR:CE2	2.44	0.52
1:A:193:TYR:CE2	1:A:195:PRO:HG3	2.46	0.51
1:B:125:MET:HE2	1:B:171:LEU:HD23	1.92	0.51
1:B:145:ARG:NH1	1:B:148:GLU:OE2	2.44	0.51
1:A:9:ILE:HD11	1:A:11:LEU:HD21	1.92	0.51
1:B:89:THR:O	1:B:90:HIS:CB	2.59	0.51
1:B:224:ARG:NH1	1:B:263:LYS:CD	2.74	0.51
1:A:277:GLU:HA	1:A:277:GLU:OE1	2.11	0.51
1:A:36:PHE:CE1	1:A:287:LEU:HD11	2.46	0.50
1:A:88:GLY:O	1:A:90:HIS:N	2.44	0.50
1:B:97:ARG:HD3	4:B:2020:HOH:O	2.10	0.50
1:A:91:LEU:HD12	1:A:93:MET:H	1.75	0.50
1:B:224:ARG:NH1	1:B:263:LYS:HD3	2.26	0.50
1:A:26:VAL:HG12	1:A:28:THR:HG23	1.93	0.50
1:A:277:GLU:C	1:A:279:ARG:H	2.18	0.50
1:A:258:GLN:NE2	4:A:2099:HOH:O	2.34	0.50
1:A:16:LEU:HD21	1:A:20:LEU:HD21	1.94	0.50
1:A:106:PRO:HA	1:A:158:HIS:O	2.12	0.49
1:A:188:ALA:O	1:A:189:ASP:CB	2.60	0.49
1:B:222:ILE:HG12	1:B:264:MET:SD	2.52	0.49
1:B:108:ARG:HH11	1:B:108:ARG:CB	2.24	0.49
1:A:46:LEU:HB3	1:A:47:TRP:CE3	2.48	0.49
1:A:19:ASP:OD1	1:A:75:VAL:HG12	2.13	0.49
1:A:71:HIS:O	1:A:72:VAL:C	2.56	0.49
1:A:91:LEU:CD1	1:A:93:MET:O	2.61	0.49
1:B:3:SER:HB3	1:B:151:PHE:O	2.13	0.48
1:B:173:VAL:CG2	1:B:175:PHE:HE1	2.25	0.48
1:A:28:THR:HG21	1:A:43:HIS:O	2.13	0.48
1:A:93:MET:HE3	1:A:174:ASP:OD2	2.13	0.48
1:A:67:GLN:O	1:A:68:PRO:O	2.32	0.48
1:B:272:ARG:HD3	4:B:2094:HOH:O	2.13	0.48
1:A:120:TYR:O	1:A:121:PHE:O	2.32	0.48
1:B:47:TRP:CZ3	1:B:82:VAL:CG2	2.97	0.48
1:B:47:TRP:HD1	1:B:68:PRO:HD3	1.78	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:95:ARG:HH21	1:A:122:ARG:HH22	1.62	0.48
1:A:17:ALA:N	1:A:18:PRO:HD2	2.29	0.48
1:A:205:ARG:NH2	1:A:240:LYS:HE3	2.29	0.48
1:B:47:TRP:O	1:B:93:MET:HB2	2.14	0.47
1:A:9:ILE:HG22	1:A:192:LEU:HD12	1.96	0.47
1:B:5:ILE:HD11	1:B:199:PRO:HB3	1.97	0.47
1:B:6:LEU:N	1:B:149:ILE:O	2.43	0.47
1:B:80:GLU:O	1:B:84:THR:HG23	2.14	0.47
1:A:35:GLU:CG	1:A:36:PHE:H	2.03	0.47
1:A:37:SER:HB3	1:A:41:TRP:CZ3	2.49	0.47
1:B:92:GLN:O	1:B:93:MET:HB3	2.12	0.47
1:A:71:HIS:O	1:A:74:HIS:N	2.48	0.47
1:B:139:ASP:HA	4:B:2040:HOH:O	2.14	0.47
1:B:253:ILE:O	1:B:257:LYS:HG3	2.15	0.47
1:A:121:PHE:O	1:A:122:ARG:HB2	2.15	0.47
1:B:49:ALA:CB	1:B:92:GLN:O	2.60	0.47
1:B:87:ASP:C	1:B:87:ASP:OD1	2.56	0.47
1:B:193:TYR:CD1	1:B:193:TYR:C	2.92	0.47
1:A:122:ARG:HD3	4:A:2035:HOH:O	2.15	0.46
1:B:75:VAL:HG23	1:B:75:VAL:O	2.15	0.46
1:A:86:PHE:O	1:A:188:ALA:CB	2.63	0.46
1:B:40:PHE:HB3	1:B:100:LYS:HB2	1.98	0.46
1:A:40:PHE:CD1	1:A:100:LYS:HD3	2.51	0.46
1:B:284:ARG:CB	4:B:2099:HOH:O	2.62	0.46
1:B:247:GLU:HG2	1:B:251:TRP:NE1	2.31	0.46
1:B:277:GLU:O	1:B:278:ALA:HB3	2.15	0.46
1:A:98:ASN:ND2	1:A:99:LEU:H	2.13	0.46
1:B:193:TYR:CE1	1:B:195:PRO:HD3	2.51	0.46
1:B:69:THR:C	1:B:71:HIS:N	2.74	0.46
1:A:25:ALA:O	1:A:26:VAL:C	2.59	0.45
1:B:254:GLU:O	1:B:258:GLN:HG3	2.17	0.45
1:A:9:ILE:HD11	1:A:11:LEU:CD2	2.47	0.45
1:A:86:PHE:O	1:A:87:ASP:CB	2.56	0.45
1:A:244:HIS:ND1	1:A:245:PRO:HD2	2.31	0.45
1:A:10:GLU:OE1	1:A:10:GLU:HA	2.17	0.45
1:A:168:ARG:NH1	2:A:400:SO4:O3	2.46	0.45
1:A:98:ASN:HD21	1:A:168:ARG:N	1.97	0.45
1:B:16:LEU:O	1:B:20:LEU:HG	2.16	0.45
1:B:75:VAL:N	1:B:76:PRO:HD3	2.32	0.45
1:A:225:GLU:CD	1:A:225:GLU:H	2.25	0.45
1:B:77:TYR:CZ	1:B:81:ILE:HD11	2.52	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:47:TRP:CE3	1:B:82:VAL:HG21	2.52	0.45
1:A:16:LEU:HD13	1:A:16:LEU:C	2.42	0.45
1:A:162:ASN:ND2	1:A:164:SER:H	2.15	0.44
1:B:94:ALA:HA	1:B:172:CYS:O	2.17	0.44
1:A:23:LEU:HD22	1:A:96:SER:OG	2.18	0.44
1:A:124:PHE:CD1	1:A:144:MET:SD	3.10	0.44
1:B:47:TRP:HA	1:B:68:PRO:N	2.32	0.44
1:B:274:PHE:CD2	1:B:281:LEU:CD2	3.01	0.44
1:B:17:ALA:N	1:B:18:PRO:HD2	2.32	0.44
1:B:133:ALA:O	1:B:143:HIS:HD2	2.00	0.44
1:A:98:ASN:HD22	1:A:99:LEU:H	1.66	0.44
1:B:144:MET:HE2	1:B:152:LEU:HD21	1.99	0.43
1:B:201:LEU:O	1:B:202:PRO:C	2.60	0.43
1:A:86:PHE:O	1:A:188:ALA:HB2	2.18	0.43
1:A:8:LYS:HE3	1:A:148:GLU:CG	2.47	0.43
1:B:16:LEU:HG	1:B:20:LEU:HG	2.00	0.43
1:A:88:GLY:C	1:A:90:HIS:N	2.77	0.43
1:A:162:ASN:C	1:A:162:ASN:HD22	2.26	0.43
1:B:29:VAL:HG12	1:B:30:GLU:N	2.33	0.43
1:B:38:ASN:ND2	4:B:2009:HOH:O	2.48	0.43
1:A:69:THR:C	1:A:71:HIS:N	2.76	0.43
1:A:277:GLU:C	1:A:279:ARG:N	2.73	0.43
1:B:8:LYS:HA	1:B:148:GLU:HA	2.00	0.43
1:A:47:TRP:HB2	1:A:94:ALA:CB	2.40	0.42
1:B:86:PHE:CZ	1:B:149:ILE:HD13	2.54	0.42
1:A:12:ASP:O	1:A:16:LEU:HB3	2.19	0.42
1:A:89:THR:O	1:A:89:THR:HG22	2.18	0.42
1:A:125:MET:HE2	1:A:149:ILE:HG12	2.01	0.42
1:A:161:VAL:HG22	1:A:162:ASN:N	2.34	0.42
1:B:41:TRP:CD1	1:B:41:TRP:N	2.86	0.42
1:B:96:SER:HA	1:B:170:SER:O	2.19	0.42
1:B:228:ARG:CG	1:B:287:LEU:HD23	2.41	0.42
1:A:45:PRO:HA	1:A:95:ARG:HB3	2.01	0.42
1:A:135:HIS:HB2	1:A:142:ILE:HG12	2.02	0.42
1:B:267:LYS:HD2	1:B:290:TRP:CH2	2.55	0.42
1:A:26:VAL:CG1	1:A:28:THR:HG23	2.50	0.42
1:B:145:ARG:HB2	1:B:148:GLU:OE2	2.20	0.42
1:B:229:ASP:OD1	1:B:229:ASP:N	2.53	0.42
1:A:238:HIS:CD2	1:A:245:PRO:HB3	2.55	0.42
1:A:187:PHE:CD2	1:A:192:LEU:HB2	2.55	0.41
1:B:108:ARG:NH1	1:B:108:ARG:HB3	2.35	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:224:ARG:HH12	1:B:263:LYS:HD3	1.84	0.41
1:A:36:PHE:CD1	1:A:287:LEU:HD11	2.55	0.41
1:A:182:ASP:OD1	1:A:182:ASP:C	2.63	0.41
1:A:193:TYR:CE2	1:A:195:PRO:CD	3.03	0.41
1:A:249:TYR:HB3	1:A:272:ARG:HG3	2.02	0.41
1:B:226:ASN:OD1	1:B:226:ASN:C	2.62	0.41
1:B:286:SER:OG	1:B:289:SER:CB	2.64	0.41
1:A:80:GLU:O	1:A:81:ILE:C	2.64	0.41
1:A:273:ASP:O	1:A:277:GLU:CB	2.68	0.41
1:A:22:TYR:CB	1:A:75:VAL:HG21	2.46	0.41
1:A:90:HIS:HB3	1:A:176:ALA:HB3	2.02	0.41
1:B:5:ILE:HG22	1:B:6:LEU:N	2.36	0.41
1:B:79:LYS:O	1:B:79:LYS:HG2	2.20	0.41
1:B:97:ARG:HD3	1:B:168:ARG:NH2	2.25	0.41
1:B:142:ILE:HG22	1:B:143:HIS:N	2.36	0.41
1:A:238:HIS:CG	1:A:245:PRO:HB3	2.56	0.41
1:B:23:LEU:HD11	1:B:78:LEU:CD1	2.52	0.41
1:A:74:HIS:C	1:A:75:VAL:HG23	2.47	0.40
1:B:69:THR:O	1:B:71:HIS:N	2.54	0.40
1:B:173:VAL:CG2	1:B:173:VAL:O	2.69	0.40
1:A:43:HIS:HD2	1:A:95:ARG:NH1	2.20	0.40
1:A:97:ARG:CD	1:A:172:CYS:SG	2.97	0.40
1:B:19:ASP:O	1:B:20:LEU:C	2.65	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	252/290 (87%)	211 (84%)	23 (9%)	18 (7%)	1	0
1	B	233/290 (80%)	214 (92%)	14 (6%)	5 (2%)	5	7

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
All	All	485/580 (84%)	425 (88%)	37 (8%)	23 (5%)	2 1

All (23) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	28	THR
1	A	68	PRO
1	A	76	PRO
1	A	77	TYR
1	A	87	ASP
1	A	121	PHE
1	A	178	ASP
1	A	180	PRO
1	A	189	ASP
1	B	13	GLN
1	B	29	VAL
1	B	90	HIS
1	A	39	GLY
1	A	72	VAL
1	A	94	ALA
1	A	122	ARG
1	A	284	ARG
1	A	89	THR
1	A	93	MET
1	A	289	SER
1	B	89	THR
1	B	202	PRO
1	A	29	VAL

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	226/256 (88%)	200 (88%)	26 (12%)	5 8
1	B	211/256 (82%)	184 (87%)	27 (13%)	4 6

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
All	All	437/512 (85%)	384 (88%)	53 (12%)	5 7

All (53) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	13	GLN
1	A	16	LEU
1	A	26	VAL
1	A	68	PRO
1	A	69	THR
1	A	74	HIS
1	A	75	VAL
1	A	82	VAL
1	A	91	LEU
1	A	93	MET
1	A	104	VAL
1	A	127	LEU
1	A	128	GLU
1	A	137	ASN
1	A	180	PRO
1	A	197	SER
1	A	210	GLU
1	A	221	VAL
1	A	225	GLU
1	A	231	LEU
1	A	272	ARG
1	A	276	VAL
1	A	277	GLU
1	A	281	LEU
1	A	285	PHE
1	A	289	SER
1	B	2	ARG
1	B	14	THR
1	B	15	ARG
1	B	69	THR
1	B	73	GLU
1	B	82	VAL
1	B	91	LEU
1	B	92	GLN
1	B	108	ARG
1	B	111	VAL
1	B	127	LEU

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Mol	Chain	Res	Type
1	B	139	ASP
1	B	140	THR
1	B	165	GLU
1	B	173	VAL
1	B	197	SER
1	B	198	THR
1	B	216	LEU
1	B	222	ILE
1	B	225	GLU
1	B	228	ARG
1	B	229	ASP
1	B	231	LEU
1	B	233	LEU
1	B	281	LEU
1	B	282	SER
1	B	287	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (14) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	38	ASN
1	A	48	ASN
1	A	98	ASN
1	A	135	HIS
1	A	137	ASN
1	A	162	ASN
1	A	211	HIS
1	B	38	ASN
1	B	48	ASN
1	B	137	ASN
1	B	143	HIS
1	B	220	GLN
1	B	258	GLN
1	B	270	GLN

5.3.3 RNA ⓘ

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 3 ligands modelled in this entry, 2 are monoatomic - leaving 1 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	$\# Z > 2$
2	SO4	A	400	-	4,4,4	0.73	0	6,6,6	0.32	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.

1 monomer is involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	400	SO4	2	0

5.7 Other polymers [i](#)

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 [i](#)

6.1 Protein, DNA and RNA chains [i](#)

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	260/290 (89%)	0.13	8 (3%) 51 47	29, 51, 98, 114	0
1	B	243/290 (83%)	0.10	2 (0%) 82 80	33, 54, 91, 104	0
All	All	503/580 (86%)	0.12	10 (1%) 65 60	29, 53, 95, 114	0

All (10) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	110	PHE	3.2
1	A	88	GLY	3.1
1	B	120	TYR	2.9
1	A	76	PRO	2.8
1	A	91	LEU	2.8
1	A	120	TYR	2.3
1	A	184	LYS	2.3
1	A	36	PHE	2.3
1	B	92	GLN	2.2
1	A	77	TYR	2.0

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

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

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
3	FE2	A	800	1/1	0.92	0.07	62,62,62,62	0
3	FE2	B	801	1/1	0.95	0.07	60,60,60,60	0
2	SO4	A	400	5/5	0.96	0.12	69,70,73,74	0

6.5 Other polymers [i](#)

There are no such residues in this entry.