



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 08:41 PM UTC

PDB ID : 2W2I / pdb_00002w2i
Title : Crystal structure of the human 2-oxoglutarate oxygenase LOC390245
Authors : Yue, W.W.; Ng, S.; Shafqat, N.; Ugochukwu, E.; McDonough, M.; Pike, A.C.W.; Filippakopoulos, P.; von Delft, F.; Arrowsmith, C.; Weigelt, J.; Edwards, A.; Bountra, C.; Schofield, C.; Oppermann, U.
Deposited on : 2008-10-31
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

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

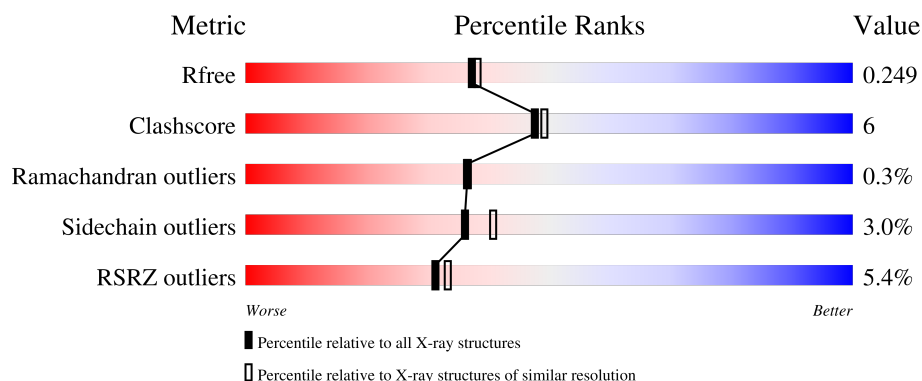
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.10 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))
R_{free}	180053	6658 (2.10-2.10)
Clashscore	190562	7164 (2.10-2.10)
Ramachandran outliers	187476	7099 (2.10-2.10)
Sidechain outliers	187428	7100 (2.10-2.10)
RSRZ outliers	180081	6662 (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 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	358	4% 73% 11% • 15%
1	B	358	2% 74% 11% • 15%
1	C	358	8% 77% 10% • 12%

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 7717 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 2-OXOGLUTARATE OXYGENASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	305	Total	C	N	O	S	0	1	0
			2396	1561	387	434	14			
1	B	306	Total	C	N	O	S	0	2	0
			2435	1583	399	440	13			
1	C	314	Total	C	N	O	S	0	2	0
			2476	1611	407	443	15			

There are 66 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-21	MET	-	expression tag	UNP B2RXH2
A	-20	HIS	-	expression tag	UNP B2RXH2
A	-19	HIS	-	expression tag	UNP B2RXH2
A	-18	HIS	-	expression tag	UNP B2RXH2
A	-17	HIS	-	expression tag	UNP B2RXH2
A	-16	HIS	-	expression tag	UNP B2RXH2
A	-15	HIS	-	expression tag	UNP B2RXH2
A	-14	SER	-	expression tag	UNP B2RXH2
A	-13	SER	-	expression tag	UNP B2RXH2
A	-12	GLY	-	expression tag	UNP B2RXH2
A	-11	VAL	-	expression tag	UNP B2RXH2
A	-10	ASP	-	expression tag	UNP B2RXH2
A	-9	LEU	-	expression tag	UNP B2RXH2
A	-8	GLY	-	expression tag	UNP B2RXH2
A	-7	THR	-	expression tag	UNP B2RXH2
A	-6	GLU	-	expression tag	UNP B2RXH2
A	-5	ASN	-	expression tag	UNP B2RXH2
A	-4	LEU	-	expression tag	UNP B2RXH2
A	-3	TYR	-	expression tag	UNP B2RXH2
A	-2	PHE	-	expression tag	UNP B2RXH2
A	-1	GLN	-	expression tag	UNP B2RXH2
A	0	SER	-	expression tag	UNP B2RXH2
B	-21	MET	-	expression tag	UNP B2RXH2

Continued on next page...

Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
B	-20	HIS	-	expression tag	UNP B2RXH2
B	-19	HIS	-	expression tag	UNP B2RXH2
B	-18	HIS	-	expression tag	UNP B2RXH2
B	-17	HIS	-	expression tag	UNP B2RXH2
B	-16	HIS	-	expression tag	UNP B2RXH2
B	-15	HIS	-	expression tag	UNP B2RXH2
B	-14	SER	-	expression tag	UNP B2RXH2
B	-13	SER	-	expression tag	UNP B2RXH2
B	-12	GLY	-	expression tag	UNP B2RXH2
B	-11	VAL	-	expression tag	UNP B2RXH2
B	-10	ASP	-	expression tag	UNP B2RXH2
B	-9	LEU	-	expression tag	UNP B2RXH2
B	-8	GLY	-	expression tag	UNP B2RXH2
B	-7	THR	-	expression tag	UNP B2RXH2
B	-6	GLU	-	expression tag	UNP B2RXH2
B	-5	ASN	-	expression tag	UNP B2RXH2
B	-4	LEU	-	expression tag	UNP B2RXH2
B	-3	TYR	-	expression tag	UNP B2RXH2
B	-2	PHE	-	expression tag	UNP B2RXH2
B	-1	GLN	-	expression tag	UNP B2RXH2
B	0	SER	-	expression tag	UNP B2RXH2
C	-21	MET	-	expression tag	UNP B2RXH2
C	-20	HIS	-	expression tag	UNP B2RXH2
C	-19	HIS	-	expression tag	UNP B2RXH2
C	-18	HIS	-	expression tag	UNP B2RXH2
C	-17	HIS	-	expression tag	UNP B2RXH2
C	-16	HIS	-	expression tag	UNP B2RXH2
C	-15	HIS	-	expression tag	UNP B2RXH2
C	-14	SER	-	expression tag	UNP B2RXH2
C	-13	SER	-	expression tag	UNP B2RXH2
C	-12	GLY	-	expression tag	UNP B2RXH2
C	-11	VAL	-	expression tag	UNP B2RXH2
C	-10	ASP	-	expression tag	UNP B2RXH2
C	-9	LEU	-	expression tag	UNP B2RXH2
C	-8	GLY	-	expression tag	UNP B2RXH2
C	-7	THR	-	expression tag	UNP B2RXH2
C	-6	GLU	-	expression tag	UNP B2RXH2
C	-5	ASN	-	expression tag	UNP B2RXH2
C	-4	LEU	-	expression tag	UNP B2RXH2
C	-3	TYR	-	expression tag	UNP B2RXH2
C	-2	PHE	-	expression tag	UNP B2RXH2
C	-1	GLN	-	expression tag	UNP B2RXH2

Continued on next page...

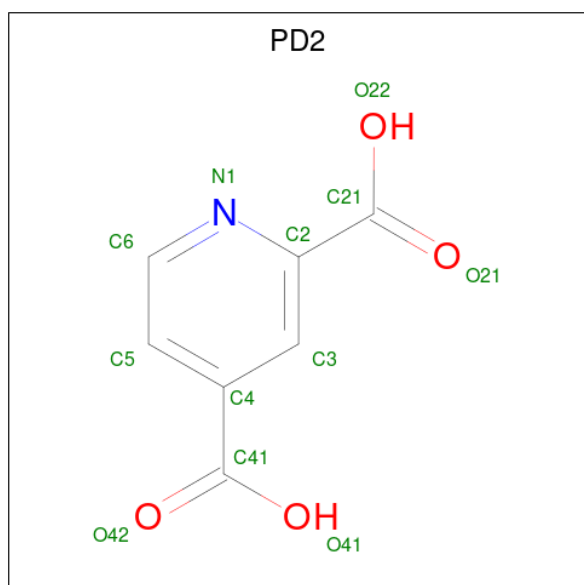
Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
C	0	SER	-	expression tag	UNP B2RXH2

- Molecule 2 is NICKEL (II) ION (CCD ID: NI) (formula: Ni).

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

- Molecule 3 is PYRIDINE-2,4-DICARBOXYLIC ACID (CCD ID: PD2) (formula: C₇H₅NO₄).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total C N O 12 7 1 4	0	0
3	B	1	Total C N O 12 7 1 4	0	0
3	C	1	Total C N O 12 7 1 4	0	0

- Molecule 4 is GLYCEROL (CCD ID: GOL) (formula: C₃H₈O₃).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	C	O	0	0
			6	3	3		
4	A	1	Total	C	O	0	0
			6	3	3		
4	B	1	Total	C	O	0	0
			6	3	3		
4	B	1	Total	C	O	0	0
			6	3	3		
4	B	1	Total	C	O	0	0
			6	3	3		

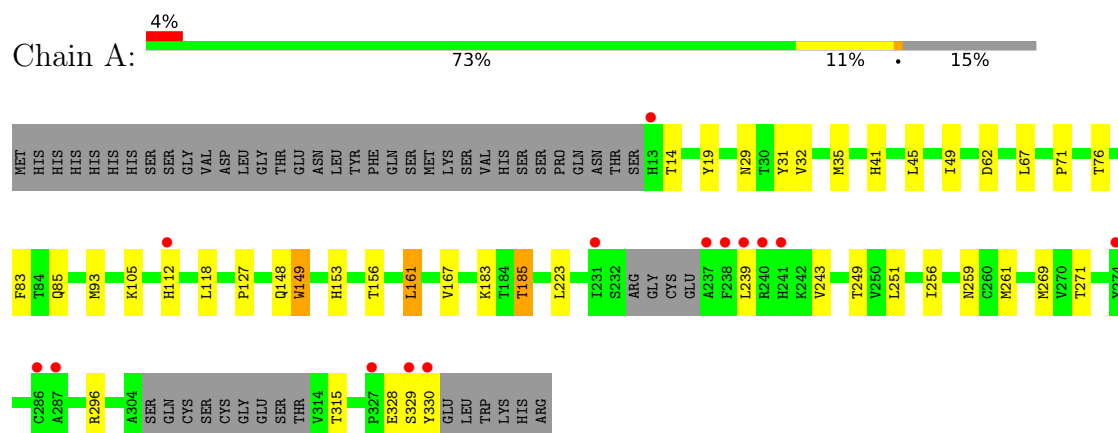
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	115	Total	O	0	0
			115	115		
5	B	122	Total	O	0	0
			122	122		
5	C	104	Total	O	0	0
			104	104		

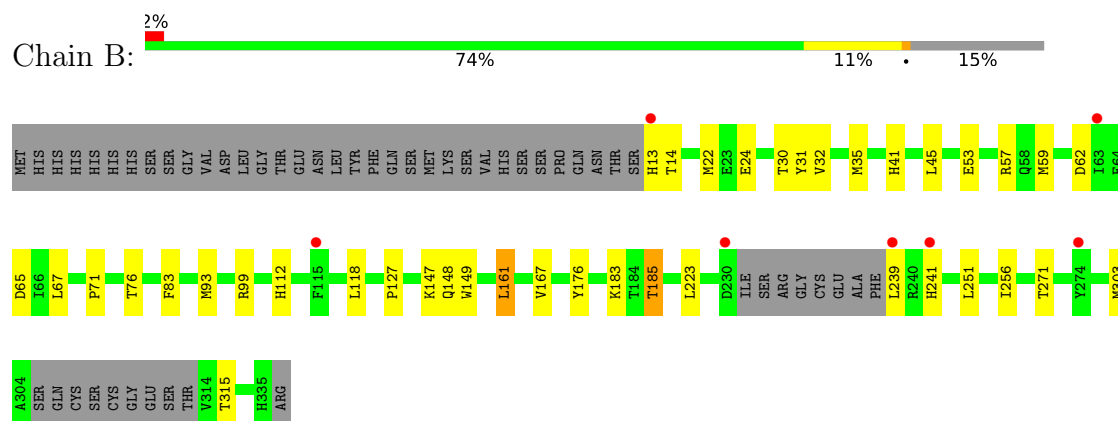
3 Residue-property plots [i](#)

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.

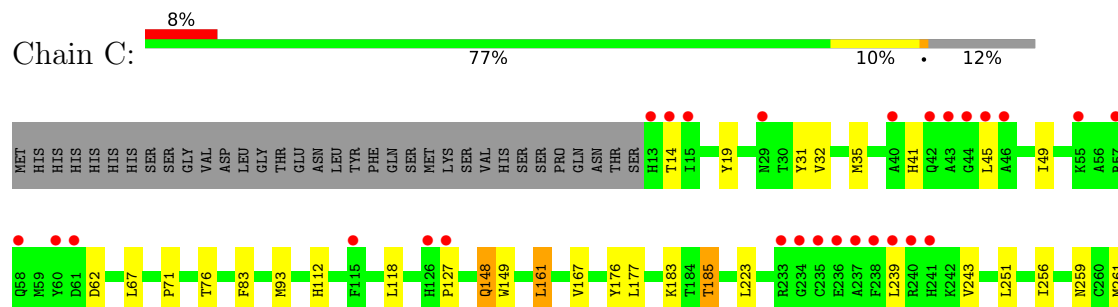
• Molecule 1: 2-OXOGLUTARATE OXYGENASE

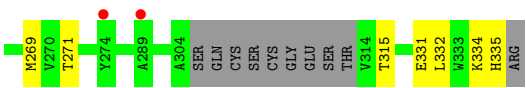


• Molecule 1: 2-OXOGLUTARATE OXYGENASE



• Molecule 1: 2-OXOGLUTARATE OXYGENASE





4 Data and refinement statistics

Property	Value	Source
Space group	I 2 2 2	Depositor
Cell constants a, b, c, α , β , γ	90.90Å 111.01Å 224.20Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	111.80 – 2.10 111.80 – 2.10	Depositor EDS
% Data completeness (in resolution range)	99.9 (111.80-2.10) 99.9 (111.80-2.10)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.14 (at 2.10Å)	Xtriage
Refinement program	REFMAC 5.5.0055	Depositor
R, R_{free}	0.210 , 0.236 0.234 , 0.249	Depositor DCC
R_{free} test set	3333 reflections (5.02%)	wwPDB-VP
Wilson B-factor (Å ²)	35.4	Xtriage
Anisotropy	0.647	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 48.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	7717	wwPDB-VP
Average B, all atoms (Å ²)	18.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.53% 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: GOL, NI, PD2

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	0.80	3/2478 (0.1%)	0.83	3/3379 (0.1%)
1	B	0.75	0/2522	0.83	1/3439 (0.0%)
1	C	0.73	0/2564	0.82	3/3494 (0.1%)
All	All	0.76	3/7564 (0.0%)	0.83	7/10312 (0.1%)

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	A	0	1
1	B	0	1
1	C	0	1
All	All	0	3

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	85	GLN	CD-NE2	-6.70	1.19	1.33
1	A	259	ASN	CG-ND2	-6.08	1.20	1.33
1	A	259	ASN	CG-OD1	-5.73	1.12	1.23

All (7) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	149	TRP	N-CA-C	-6.12	97.77	110.80
1	A	149	TRP	N-CA-C	-5.71	98.64	110.80
1	C	243	VAL	CB-CA-C	-5.62	105.14	110.65
1	B	149	TRP	N-CA-C	-5.44	99.21	110.80

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	243	VAL	CB-CA-C	-5.40	105.36	110.65
1	C	148	GLN	N-CA-C	-5.17	100.75	109.07
1	A	296	ARG	NE-CZ-NH2	5.14	123.82	119.20

There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	148	GLN	Peptide
1	B	148	GLN	Peptide
1	C	148	GLN	Peptide

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	2396	0	2208	30	0
1	B	2435	0	2254	30	0
1	C	2476	0	2302	24	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
2	C	1	0	0	0	0
3	A	12	0	3	0	0
3	B	12	0	3	0	0
3	C	12	0	3	0	0
4	A	12	0	16	3	0
4	B	18	0	24	1	0
5	A	115	0	0	0	0
5	B	122	0	0	2	0
5	C	104	0	0	1	0
All	All	7717	0	6813	79	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 (79) 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:32:VAL:HA	1:B:35:MET:HE3	1.40	1.04
1:A:32:VAL:HA	1:A:35:MET:HE3	1.47	0.96
1:C:32:VAL:HA	1:C:35:MET:HE3	1.48	0.95
1:C:161:LEU:HD22	1:C:167:VAL:HB	1.58	0.85
1:A:161:LEU:HD22	1:A:167:VAL:HB	1.63	0.79
1:B:161:LEU:HD22	1:B:167:VAL:HB	1.65	0.79
1:B:31:TYR:HD1	1:B:35:MET:HE2	1.48	0.78
1:A:31:TYR:HD1	1:A:35:MET:HE2	1.52	0.73
1:C:112:HIS:ND1	1:C:118:LEU:HD13	2.05	0.71
1:A:329:SER:O	1:A:330:TYR:O	2.10	0.70
1:C:31:TYR:HD1	1:C:35:MET:HE2	1.58	0.69
1:A:112:HIS:ND1	1:A:118:LEU:HD13	2.10	0.67
1:B:112:HIS:ND1	1:B:118:LEU:HD13	2.10	0.67
1:A:105:LYS:CE	1:B:30:THR:HG22	2.26	0.66
1:A:71:PRO:HG2	1:A:93:MET:HE3	1.78	0.66
1:A:112:HIS:CE1	1:A:118:LEU:HD22	2.31	0.66
1:B:31:TYR:CD1	1:B:35:MET:HE2	2.30	0.66
1:B:112:HIS:CE1	1:B:118:LEU:HD22	2.31	0.65
1:A:328:GLU:HG2	1:A:329:SER:OG	1.97	0.63
1:B:71:PRO:HG2	1:B:93:MET:HE3	1.80	0.63
1:A:31:TYR:CD1	1:A:35:MET:HE2	2.35	0.61
1:C:71:PRO:HG2	1:C:93:MET:HE3	1.82	0.61
1:C:223:LEU:CD2	1:C:256:ILE:HD12	2.32	0.60
1:B:223:LEU:CD2	1:B:256:ILE:HD12	2.32	0.59
1:B:22:MET:HE3	1:B:53:GLU:HB2	1.84	0.58
1:C:31:TYR:CD1	1:C:35:MET:HE2	2.39	0.57
1:A:223:LEU:CD2	1:A:256:ILE:HD12	2.35	0.57
1:B:223:LEU:HD23	1:B:256:ILE:HD12	1.88	0.56
1:B:22:MET:CE	1:B:53:GLU:HB2	2.39	0.53
1:C:239:LEU:HD12	1:C:239:LEU:N	2.23	0.53
1:C:112:HIS:CE1	1:C:118:LEU:HD22	2.44	0.53
1:C:223:LEU:HD23	1:C:256:ILE:HD12	1.91	0.53
1:B:41:HIS:H	1:B:41:HIS:CD2	2.27	0.52
1:A:153:HIS:O	4:A:1331:GOL:H31	2.10	0.52
1:C:261:MET:HG2	1:C:269:MET:HE1	1.91	0.52
1:A:105:LYS:CE	1:B:30:THR:CG2	2.88	0.51
1:A:223:LEU:HD23	1:A:256:ILE:HD12	1.91	0.51
1:C:45:LEU:HD13	1:C:271:THR:HG22	1.93	0.51
1:A:149:TRP:N	4:A:1331:GOL:O3	2.44	0.50
1:B:239:LEU:N	1:B:239:LEU:HD12	2.27	0.50
1:A:249:THR:HB	4:A:1332:GOL:H12	1.94	0.50
1:A:45:LEU:HD13	1:A:271:THR:HG22	1.94	0.49

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:41:HIS:CD2	1:A:41:HIS:H	2.29	0.49
1:C:62:ASP:N	1:C:62:ASP:OD1	2.44	0.49
1:B:99:ARG:NH1	5:B:2042:HOH:O	2.45	0.49
1:B:62:ASP:OD1	1:B:62:ASP:N	2.45	0.49
1:B:76:THR:CG2	1:B:83:PHE:HB3	2.43	0.48
1:B:112:HIS:ND1	1:B:118:LEU:HB2	2.28	0.48
1:B:32:VAL:CA	1:B:35:MET:HE3	2.29	0.48
1:A:105:LYS:HB3	1:B:24:GLU:HG2	1.96	0.47
1:A:62:ASP:N	1:A:62:ASP:OD1	2.46	0.47
1:C:223:LEU:HD22	1:C:256:ILE:HD12	1.95	0.47
1:A:183:LYS:O	1:A:185:THR:HG22	2.15	0.47
1:A:76:THR:CG2	1:A:83:PHE:HB3	2.45	0.47
1:C:334:LYS:O	1:C:335:HIS:CB	2.63	0.47
1:A:239:LEU:HD12	1:A:239:LEU:N	2.30	0.46
1:B:183:LYS:O	1:B:185:THR:HG22	2.14	0.46
1:C:41:HIS:H	1:C:41:HIS:CD2	2.33	0.46
1:B:303:MET:HE2	1:C:332:LEU:CD1	2.46	0.45
1:A:261:MET:HG2	1:A:269:MET:HE1	1.96	0.45
1:C:76:THR:CG2	1:C:83:PHE:HB3	2.46	0.45
1:A:29:ASN:OD1	1:A:156:THR:HG22	2.15	0.45
1:B:45:LEU:HD13	1:B:271:THR:HG22	1.97	0.45
1:B:303:MET:HE2	1:C:332:LEU:HD13	1.99	0.45
1:B:223:LEU:HD22	1:B:256:ILE:HD12	1.98	0.44
1:B:57:ARG:HD3	1:B:59:MET:O	2.18	0.44
1:A:112:HIS:ND1	1:A:118:LEU:HB2	2.32	0.44
1:A:223:LEU:HD22	1:A:256:ILE:HD12	2.00	0.43
1:C:183:LYS:O	1:C:185:THR:HG22	2.18	0.42
1:C:112:HIS:ND1	1:C:118:LEU:HB2	2.34	0.42
1:C:331:GLU:O	1:C:334:LYS:O	2.37	0.42
1:A:76:THR:HG23	1:A:83:PHE:HB3	2.01	0.42
1:B:147:LYS:O	4:B:1336:GOL:H32	2.20	0.42
1:B:65:ASP:HB2	5:B:2028:HOH:O	2.20	0.41
1:C:19:TYR:CE2	1:C:49:ILE:HD12	2.55	0.41
1:A:19:TYR:CE2	1:A:49:ILE:HD12	2.56	0.41
1:A:112:HIS:ND1	1:A:118:LEU:HD22	2.35	0.41
1:B:239:LEU:C	1:B:241:HIS:N	2.77	0.41
1:C:259:ASN:ND2	5:C:2075:HOH:O	2.53	0.41

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	300/358 (84%)	291 (97%)	8 (3%)	1 (0%)	36	36
1	B	302/358 (84%)	294 (97%)	7 (2%)	1 (0%)	36	36
1	C	312/358 (87%)	302 (97%)	9 (3%)	1 (0%)	36	36
All	All	914/1074 (85%)	887 (97%)	24 (3%)	3 (0%)	36	36

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	127	PRO
1	B	127	PRO
1	C	127	PRO

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	238/311 (76%)	232 (98%)	6 (2%)	42	48
1	B	245/311 (79%)	237 (97%)	8 (3%)	33	37
1	C	247/311 (79%)	239 (97%)	8 (3%)	34	38
All	All	730/933 (78%)	708 (97%)	22 (3%)	36	41

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

Mol	Chain	Res	Type
1	A	14	THR
1	A	67	LEU
1	A	161	LEU
1	A	185	THR
1	A	251	LEU
1	A	315	THR
1	B	13	HIS
1	B	14	THR
1	B	67	LEU
1	B	161	LEU
1	B	176	TYR
1	B	185	THR
1	B	251	LEU
1	B	315	THR
1	C	14	THR
1	C	67	LEU
1	C	161	LEU
1	C	176	TYR
1	C	177	LEU
1	C	185	THR
1	C	251	LEU
1	C	315	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (7) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	41	HIS
1	B	41	HIS
1	B	153	HIS
1	C	41	HIS
1	C	103	ASN
1	C	113	GLN
1	C	259	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 [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 11 ligands modelled in this entry, 3 are monoatomic - leaving 8 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	PD2	A	602	2	12,12,12	1.14	1 (8%)	16,16,16	2.55	4 (25%)
4	GOL	B	1338	-	5,5,5	0.43	0	5,5,5	0.22	0
4	GOL	A	1332	-	5,5,5	0.27	0	5,5,5	0.78	0
4	GOL	B	1337	-	5,5,5	0.38	0	5,5,5	0.18	0
4	GOL	B	1336	-	5,5,5	0.65	0	5,5,5	0.49	0
4	GOL	A	1331	-	5,5,5	0.61	0	5,5,5	1.01	0
3	PD2	C	502	2	12,12,12	1.28	2 (16%)	16,16,16	1.60	4 (25%)
3	PD2	B	402	2	12,12,12	1.06	0	16,16,16	1.78	5 (31%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	PD2	A	602	2	-	4/8/8/8	0/1/1/1
4	GOL	B	1338	-	-	4/4/4/4	-
4	GOL	A	1332	-	-	2/4/4/4	-
4	GOL	B	1337	-	-	2/4/4/4	-
4	GOL	B	1336	-	-	2/4/4/4	-
4	GOL	A	1331	-	-	2/4/4/4	-
3	PD2	C	502	2	-	7/8/8/8	0/1/1/1
3	PD2	B	402	2	-	4/8/8/8	0/1/1/1

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	502	PD2	C4-C41	2.39	1.54	1.49
3	A	602	PD2	O41-C41	-2.22	1.23	1.30
3	C	502	PD2	O41-C41	-2.05	1.24	1.30

All (13) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	602	PD2	C6-N1-C2	5.98	124.64	116.93
3	A	602	PD2	C4-C3-C2	-4.93	115.28	118.90
3	A	602	PD2	C5-C6-N1	-4.78	118.11	123.97
3	B	402	PD2	C6-N1-C2	3.77	121.79	116.93
3	C	502	PD2	C6-N1-C2	3.43	121.35	116.93
3	B	402	PD2	O21-C21-C2	-3.09	115.08	121.30
3	C	502	PD2	C3-C2-N1	-2.88	119.81	123.27
3	A	602	PD2	C3-C2-N1	-2.53	120.24	123.27
3	B	402	PD2	C5-C6-N1	-2.49	120.92	123.97
3	B	402	PD2	C3-C2-N1	-2.44	120.34	123.27
3	C	502	PD2	O21-C21-C2	-2.37	116.54	121.30
3	B	402	PD2	O22-C21-C2	2.10	119.71	114.71
3	C	502	PD2	O22-C21-C2	2.08	119.66	114.71

There are no chirality outliers.

All (27) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	1331	GOL	C1-C2-C3-O3
4	A	1332	GOL	O1-C1-C2-C3
4	B	1336	GOL	C1-C2-C3-O3
4	B	1337	GOL	C1-C2-C3-O3
4	B	1338	GOL	O1-C1-C2-C3
3	C	502	PD2	C5-C4-C41-O41
3	B	402	PD2	C5-C4-C41-O41
3	B	402	PD2	C3-C4-C41-O41
3	A	602	PD2	C5-C4-C41-O41
4	B	1338	GOL	O2-C2-C3-O3
3	C	502	PD2	C3-C4-C41-O41
3	B	402	PD2	C5-C4-C41-O42
3	B	402	PD2	C3-C4-C41-O42
3	A	602	PD2	C3-C4-C41-O41
3	C	502	PD2	C5-C4-C41-O42
4	B	1338	GOL	C1-C2-C3-O3

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms
4	A	1332	GOL	O1-C1-C2-O2
4	B	1336	GOL	O2-C2-C3-O3
4	B	1337	GOL	O2-C2-C3-O3
3	A	602	PD2	C5-C4-C41-O42
3	C	502	PD2	C3-C4-C41-O42
3	A	602	PD2	C3-C4-C41-O42
4	A	1331	GOL	O2-C2-C3-O3
3	C	502	PD2	C3-C2-C21-O22
4	B	1338	GOL	O1-C1-C2-O2
3	C	502	PD2	N1-C2-C21-O22
3	C	502	PD2	C3-C2-C21-O21

There are no ring outliers.

3 monomers are involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	1332	GOL	1	0
4	B	1336	GOL	1	0
4	A	1331	GOL	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, 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	305/358 (85%)	0.21	14 (4%) 37 39	2, 15, 40, 65	1 (0%)
1	B	306/358 (85%)	-0.08	7 (2%) 61 64	2, 15, 37, 61	2 (0%)
1	C	314/358 (87%)	0.41	29 (9%) 14 15	2, 15, 41, 75	2 (0%)
All	All	925/1074 (86%)	0.18	50 (5%) 31 33	2, 15, 40, 75	5 (0%)

All (50) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	45	LEU	4.9
1	C	239	LEU	4.8
1	B	239	LEU	4.4
1	A	13	HIS	3.8
1	A	274	TYR	3.7
1	C	13	HIS	3.7
1	C	57	ARG	3.5
1	C	15	ILE	3.4
1	A	237	ALA	3.4
1	C	127	PRO	3.2
1	C	40	ALA	3.2
1	B	274	TYR	3.1
1	A	239	LEU	3.1
1	C	58	GLN	3.0
1	C	43	ALA	3.0
1	C	235	CYS	2.9
1	C	44	GLY	2.8
1	C	236	GLU	2.7
1	C	61	ASP	2.7
1	C	55	LYS	2.7
1	C	237	ALA	2.7
1	B	115	PHE	2.7
1	B	230	ASP	2.7

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	C	115[A]	PHE	2.6
1	A	240	ARG	2.5
1	B	63	ILE	2.5
1	C	274	TYR	2.4
1	A	330	TYR	2.4
1	A	286	CYS	2.4
1	A	327	PRO	2.4
1	C	60	TYR	2.3
1	A	287	ALA	2.3
1	C	289	ALA	2.3
1	C	241	HIS	2.3
1	C	42	GLN	2.2
1	A	329	SER	2.2
1	C	233	ARG	2.2
1	C	46	ALA	2.2
1	C	14	THR	2.2
1	B	13	HIS	2.1
1	B	241	HIS	2.1
1	A	231	ILE	2.1
1	A	238	PHE	2.1
1	C	29	ASN	2.1
1	C	126	HIS	2.1
1	C	238	PHE	2.1
1	A	112	HIS	2.0
1	A	241	HIS	2.0
1	C	234	GLY	2.0
1	C	240	ARG	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($\text{\AA}^2$)	Q<0.9
4	GOL	A	1332	6/6	0.65	0.16	61,65,66,69	0
4	GOL	B	1337	6/6	0.74	0.15	55,66,69,78	0
4	GOL	B	1338	6/6	0.80	0.14	57,67,70,74	0
4	GOL	A	1331	6/6	0.82	0.12	40,48,57,58	0
4	GOL	B	1336	6/6	0.84	0.14	44,49,52,58	0
3	PD2	C	502	12/12	0.91	0.09	30,34,45,46	0
3	PD2	B	402	12/12	0.93	0.08	25,29,36,41	0
3	PD2	A	602	12/12	0.94	0.07	21,24,32,36	0
2	NI	A	601	1/1	0.97	0.04	26,26,26,26	0
2	NI	C	501	1/1	0.98	0.04	35,35,35,35	0
2	NI	B	401	1/1	0.99	0.02	30,30,30,30	0

6.5 Other polymers [i](#)

There are no such residues in this entry.