



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 07:44 AM UTC

PDB ID : 4RQX / pdb_00004rqx
Title : Crystal structure of human peroxiredoxin 4(THIOREDOXIN PEROXIDASE) with MESNA
Authors : Badger, J.; Sridhar, V.; Logan, C.; Hausheer, F.H.; Nienaber, V.L.
Deposited on : 2014-11-05
Resolution : 2.26 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

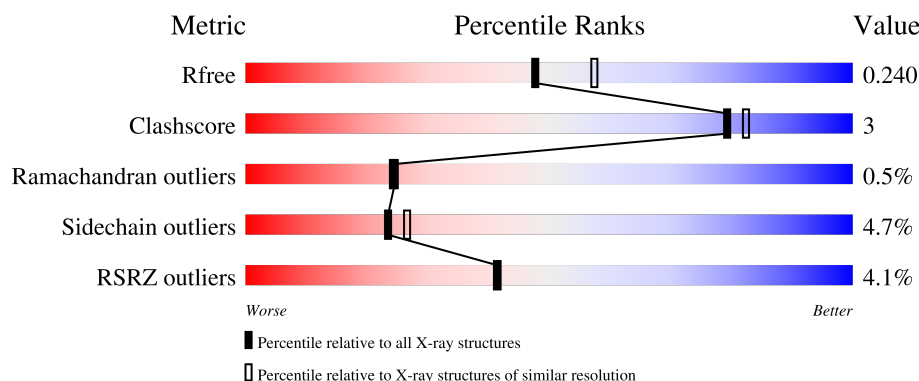
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.26 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	1898 (2.26-2.26)
Clashscore	190562	2005 (2.26-2.26)
Ramachandran outliers	187476	1965 (2.26-2.26)
Sidechain outliers	187428	1966 (2.26-2.26)
RSRZ outliers	180081	1898 (2.26-2.26)

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	226	3% 69% 27%
1	B	226	4% 65% 8% 27%
1	C	226	3% 67% 6% 27%
1	D	226	3% 68% 27%
1	E	226	3% 64% 9% 27%

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	COM	A	301	-	X	-	-
2	COM	B	301[A]	-	X	-	-
2	COM	B	301[B]	-	X	-	-
2	COM	C	301	-	X	-	-
2	COM	D	301[A]	-	X	-	-
2	COM	D	301[B]	-	X	-	-
2	COM	E	301[A]	-	X	-	-

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 6836 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 Peroxiredoxin-4.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	166	Total	C	N	O	S	0	1	0
			1313	848	215	248	2			
1	B	166	Total	C	N	O	S	0	0	0
			1319	853	217	247	2			
1	C	166	Total	C	N	O	S	0	1	0
			1317	853	215	247	2			
1	D	166	Total	C	N	O	S	0	2	0
			1316	850	216	248	2			
1	E	166	Total	C	N	O	S	0	2	0
			1324	854	217	251	2			

There are 165 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	46	MET	-	expression tag	UNP Q13162
A	47	GLY	-	expression tag	UNP Q13162
A	48	SER	-	expression tag	UNP Q13162
A	49	SER	-	expression tag	UNP Q13162
A	50	HIS	-	expression tag	UNP Q13162
A	51	HIS	-	expression tag	UNP Q13162
A	52	HIS	-	expression tag	UNP Q13162
A	53	HIS	-	expression tag	UNP Q13162
A	54	HIS	-	expression tag	UNP Q13162
A	55	HIS	-	expression tag	UNP Q13162
A	56	SER	-	expression tag	UNP Q13162
A	57	SER	-	expression tag	UNP Q13162
A	58	GLY	-	expression tag	UNP Q13162
A	59	LEU	-	expression tag	UNP Q13162
A	60	VAL	-	expression tag	UNP Q13162
A	61	PRO	-	expression tag	UNP Q13162
A	62	ARG	-	expression tag	UNP Q13162
A	63	GLY	-	expression tag	UNP Q13162
A	64	SER	-	expression tag	UNP Q13162

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Chain	Residue	Modelled	Actual	Comment	Reference
A	65	HIS	-	expression tag	UNP Q13162
A	66	MET	-	expression tag	UNP Q13162
A	67	THR	-	expression tag	UNP Q13162
A	68	THR	-	expression tag	UNP Q13162
A	69	GLU	-	expression tag	UNP Q13162
A	70	ASN	-	expression tag	UNP Q13162
A	71	LEU	-	expression tag	UNP Q13162
A	72	TYR	-	expression tag	UNP Q13162
A	73	PHE	-	expression tag	UNP Q13162
A	74	GLN	-	expression tag	UNP Q13162
A	75	GLY	-	expression tag	UNP Q13162
A	76	ALA	-	expression tag	UNP Q13162
A	77	GLY	-	expression tag	UNP Q13162
A	78	THR	-	expression tag	UNP Q13162
B	46	MET	-	expression tag	UNP Q13162
B	47	GLY	-	expression tag	UNP Q13162
B	48	SER	-	expression tag	UNP Q13162
B	49	SER	-	expression tag	UNP Q13162
B	50	HIS	-	expression tag	UNP Q13162
B	51	HIS	-	expression tag	UNP Q13162
B	52	HIS	-	expression tag	UNP Q13162
B	53	HIS	-	expression tag	UNP Q13162
B	54	HIS	-	expression tag	UNP Q13162
B	55	HIS	-	expression tag	UNP Q13162
B	56	SER	-	expression tag	UNP Q13162
B	57	SER	-	expression tag	UNP Q13162
B	58	GLY	-	expression tag	UNP Q13162
B	59	LEU	-	expression tag	UNP Q13162
B	60	VAL	-	expression tag	UNP Q13162
B	61	PRO	-	expression tag	UNP Q13162
B	62	ARG	-	expression tag	UNP Q13162
B	63	GLY	-	expression tag	UNP Q13162
B	64	SER	-	expression tag	UNP Q13162
B	65	HIS	-	expression tag	UNP Q13162
B	66	MET	-	expression tag	UNP Q13162
B	67	THR	-	expression tag	UNP Q13162
B	68	THR	-	expression tag	UNP Q13162
B	69	GLU	-	expression tag	UNP Q13162
B	70	ASN	-	expression tag	UNP Q13162
B	71	LEU	-	expression tag	UNP Q13162
B	72	TYR	-	expression tag	UNP Q13162
B	73	PHE	-	expression tag	UNP Q13162

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Chain	Residue	Modelled	Actual	Comment	Reference
B	74	GLN	-	expression tag	UNP Q13162
B	75	GLY	-	expression tag	UNP Q13162
B	76	ALA	-	expression tag	UNP Q13162
B	77	GLY	-	expression tag	UNP Q13162
B	78	THR	-	expression tag	UNP Q13162
C	46	MET	-	expression tag	UNP Q13162
C	47	GLY	-	expression tag	UNP Q13162
C	48	SER	-	expression tag	UNP Q13162
C	49	SER	-	expression tag	UNP Q13162
C	50	HIS	-	expression tag	UNP Q13162
C	51	HIS	-	expression tag	UNP Q13162
C	52	HIS	-	expression tag	UNP Q13162
C	53	HIS	-	expression tag	UNP Q13162
C	54	HIS	-	expression tag	UNP Q13162
C	55	HIS	-	expression tag	UNP Q13162
C	56	SER	-	expression tag	UNP Q13162
C	57	SER	-	expression tag	UNP Q13162
C	58	GLY	-	expression tag	UNP Q13162
C	59	LEU	-	expression tag	UNP Q13162
C	60	VAL	-	expression tag	UNP Q13162
C	61	PRO	-	expression tag	UNP Q13162
C	62	ARG	-	expression tag	UNP Q13162
C	63	GLY	-	expression tag	UNP Q13162
C	64	SER	-	expression tag	UNP Q13162
C	65	HIS	-	expression tag	UNP Q13162
C	66	MET	-	expression tag	UNP Q13162
C	67	THR	-	expression tag	UNP Q13162
C	68	THR	-	expression tag	UNP Q13162
C	69	GLU	-	expression tag	UNP Q13162
C	70	ASN	-	expression tag	UNP Q13162
C	71	LEU	-	expression tag	UNP Q13162
C	72	TYR	-	expression tag	UNP Q13162
C	73	PHE	-	expression tag	UNP Q13162
C	74	GLN	-	expression tag	UNP Q13162
C	75	GLY	-	expression tag	UNP Q13162
C	76	ALA	-	expression tag	UNP Q13162
C	77	GLY	-	expression tag	UNP Q13162
C	78	THR	-	expression tag	UNP Q13162
D	46	MET	-	expression tag	UNP Q13162
D	47	GLY	-	expression tag	UNP Q13162
D	48	SER	-	expression tag	UNP Q13162
D	49	SER	-	expression tag	UNP Q13162

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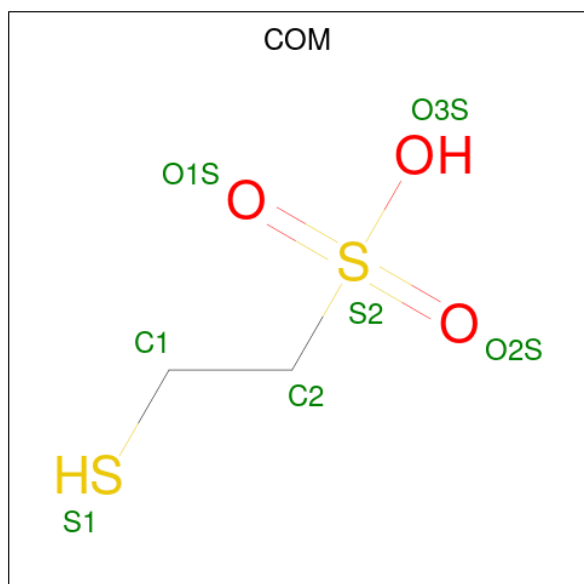
Chain	Residue	Modelled	Actual	Comment	Reference
D	50	HIS	-	expression tag	UNP Q13162
D	51	HIS	-	expression tag	UNP Q13162
D	52	HIS	-	expression tag	UNP Q13162
D	53	HIS	-	expression tag	UNP Q13162
D	54	HIS	-	expression tag	UNP Q13162
D	55	HIS	-	expression tag	UNP Q13162
D	56	SER	-	expression tag	UNP Q13162
D	57	SER	-	expression tag	UNP Q13162
D	58	GLY	-	expression tag	UNP Q13162
D	59	LEU	-	expression tag	UNP Q13162
D	60	VAL	-	expression tag	UNP Q13162
D	61	PRO	-	expression tag	UNP Q13162
D	62	ARG	-	expression tag	UNP Q13162
D	63	GLY	-	expression tag	UNP Q13162
D	64	SER	-	expression tag	UNP Q13162
D	65	HIS	-	expression tag	UNP Q13162
D	66	MET	-	expression tag	UNP Q13162
D	67	THR	-	expression tag	UNP Q13162
D	68	THR	-	expression tag	UNP Q13162
D	69	GLU	-	expression tag	UNP Q13162
D	70	ASN	-	expression tag	UNP Q13162
D	71	LEU	-	expression tag	UNP Q13162
D	72	TYR	-	expression tag	UNP Q13162
D	73	PHE	-	expression tag	UNP Q13162
D	74	GLN	-	expression tag	UNP Q13162
D	75	GLY	-	expression tag	UNP Q13162
D	76	ALA	-	expression tag	UNP Q13162
D	77	GLY	-	expression tag	UNP Q13162
D	78	THR	-	expression tag	UNP Q13162
E	46	MET	-	expression tag	UNP Q13162
E	47	GLY	-	expression tag	UNP Q13162
E	48	SER	-	expression tag	UNP Q13162
E	49	SER	-	expression tag	UNP Q13162
E	50	HIS	-	expression tag	UNP Q13162
E	51	HIS	-	expression tag	UNP Q13162
E	52	HIS	-	expression tag	UNP Q13162
E	53	HIS	-	expression tag	UNP Q13162
E	54	HIS	-	expression tag	UNP Q13162
E	55	HIS	-	expression tag	UNP Q13162
E	56	SER	-	expression tag	UNP Q13162
E	57	SER	-	expression tag	UNP Q13162
E	58	GLY	-	expression tag	UNP Q13162

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Chain	Residue	Modelled	Actual	Comment	Reference
E	59	LEU	-	expression tag	UNP Q13162
E	60	VAL	-	expression tag	UNP Q13162
E	61	PRO	-	expression tag	UNP Q13162
E	62	ARG	-	expression tag	UNP Q13162
E	63	GLY	-	expression tag	UNP Q13162
E	64	SER	-	expression tag	UNP Q13162
E	65	HIS	-	expression tag	UNP Q13162
E	66	MET	-	expression tag	UNP Q13162
E	67	THR	-	expression tag	UNP Q13162
E	68	THR	-	expression tag	UNP Q13162
E	69	GLU	-	expression tag	UNP Q13162
E	70	ASN	-	expression tag	UNP Q13162
E	71	LEU	-	expression tag	UNP Q13162
E	72	TYR	-	expression tag	UNP Q13162
E	73	PHE	-	expression tag	UNP Q13162
E	74	GLN	-	expression tag	UNP Q13162
E	75	GLY	-	expression tag	UNP Q13162
E	76	ALA	-	expression tag	UNP Q13162
E	77	GLY	-	expression tag	UNP Q13162
E	78	THR	-	expression tag	UNP Q13162

- Molecule 2 is 1-THIOETHANESULFONIC ACID (CCD ID: COM) (formula: C₂H₆O₃S₂).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	C	O	S	
			7	2	3	2	
							0
							0

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Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	B	1	Total	C	O	S	0	1
			14	4	6	4		
2	C	1	Total	C	O	S	0	0
			7	2	3	2		
2	D	1	Total	C	O	S	0	1
			14	4	6	4		
2	E	1	Total	C	O	S	0	1
			14	4	6	4		

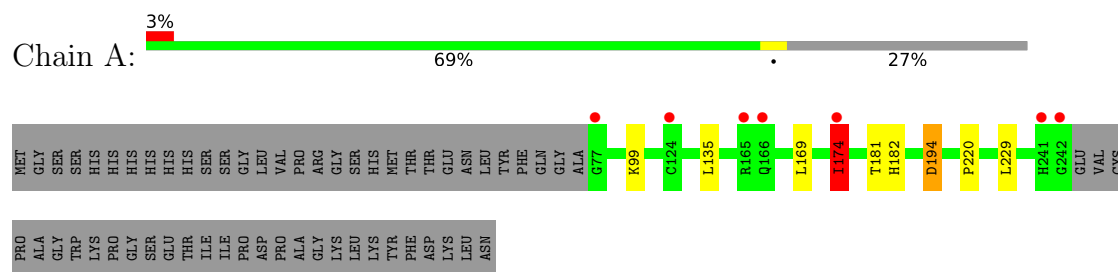
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	43	Total	O	0	0
			43	43		
3	B	43	Total	O	0	0
			43	43		
3	C	25	Total	O	0	0
			25	25		
3	D	33	Total	O	0	0
			33	33		
3	E	47	Total	O	0	0
			47	47		

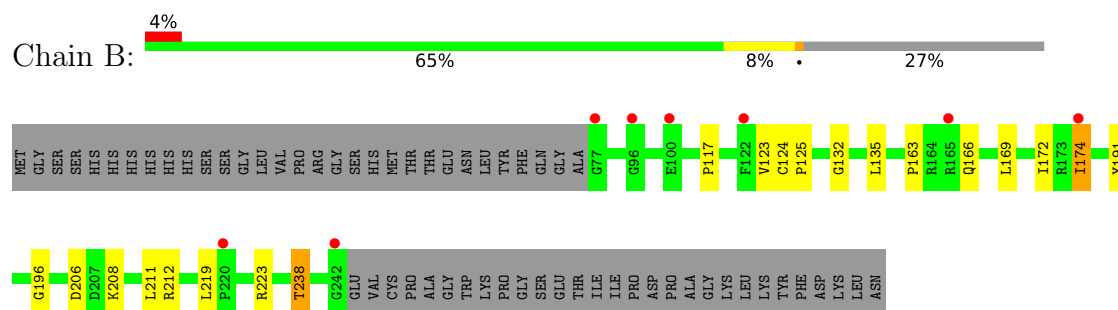
3 Residue-property plots [i](#)

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.

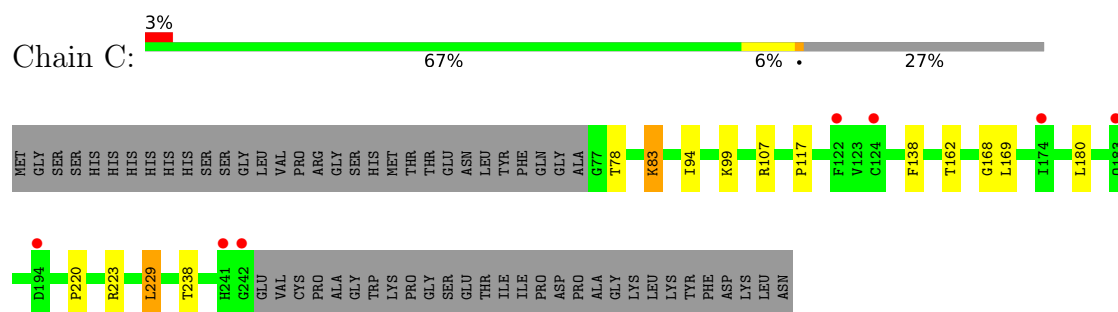
• Molecule 1: Peroxiredoxin-4



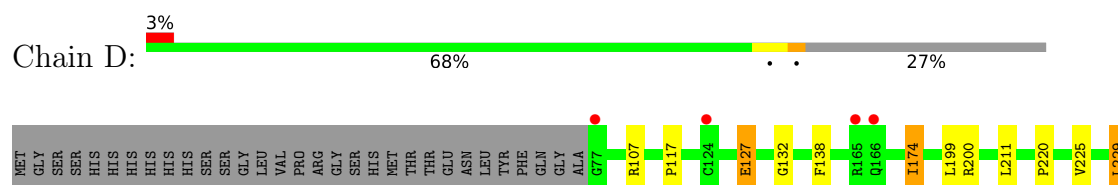
• Molecule 1: Peroxiredoxin-4

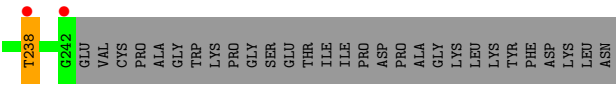


• Molecule 1: Peroxiredoxin-4

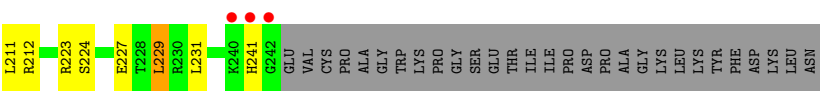
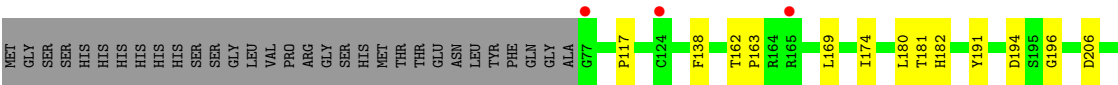


• Molecule 1: Peroxiredoxin-4





● Molecule 1: Peroxiredoxin-4



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	108.00Å 139.68Å 96.19Å 90.00° 103.17° 90.00°	Depositor
Resolution (Å)	33.06 – 2.26 33.06 – 2.26	Depositor EDS
% Data completeness (in resolution range)	(Not available) (33.06-2.26) 95.9 (33.06-2.26)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.51 (at 2.27Å)	Xtriage
Refinement program	REFMAC 5.5.0072	Depositor
R, R_{free}	0.208 , 0.250 0.202 , 0.240	Depositor DCC
R_{free} test set	3168 reflections (5.07%)	wwPDB-VP
Wilson B-factor (Å ²)	48.0	Xtriage
Anisotropy	0.552	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 32.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.51$, $\langle L^2 \rangle = 0.34$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	6836	wwPDB-VP
Average B, all atoms (Å ²)	52.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.68% 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 [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: COM

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	0.83	0/1351	0.93	1/1840 (0.1%)
1	B	0.73	0/1352	0.96	3/1839 (0.2%)
1	C	0.64	0/1356	0.83	0/1847
1	D	0.70	0/1359	0.88	0/1851
1	E	0.79	0/1367	0.93	0/1860
All	All	0.74	0/6785	0.91	4/9237 (0.0%)

There are no bond length outliers.

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	174	ILE	CB-CA-C	8.28	118.16	110.13
1	B	219	LEU	CA-C-N	-8.19	112.47	120.83
1	B	219	LEU	C-N-CA	-8.19	112.47	120.83
1	B	219	LEU	N-CA-C	5.35	120.20	113.25

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	1313	0	1262	4	0
1	B	1319	0	1281	11	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	C	1317	0	1264	8	0
1	D	1316	0	1263	9	0
1	E	1324	0	1279	8	0
2	A	7	0	5	0	0
2	B	14	0	10	2	0
2	C	7	0	5	0	0
2	D	14	0	10	0	0
2	E	14	0	10	0	0
3	A	43	0	0	0	0
3	B	43	0	0	0	0
3	C	25	0	0	0	0
3	D	33	0	0	0	0
3	E	47	0	0	2	0
All	All	6836	0	6389	35	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 3.

All (35) 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:132:GLY:HA2	1:B:174:ILE:HD13	1.75	0.69
1:A:135:LEU:HD13	1:A:174:ILE:HD11	1.76	0.68
1:C:238:THR:HG21	1:D:220:PRO:CB	2.32	0.60
1:E:224:SER:HB3	1:E:227:GLU:HB3	1.83	0.59
1:B:124:CYS:H	2:B:301[B]:COM:H12	1.68	0.59
1:D:138:PHE:CE2	1:D:229:LEU:HD13	2.39	0.57
1:D:132:GLY:HA2	1:D:174:ILE:HD12	1.87	0.57
1:B:132:GLY:HA2	1:B:174:ILE:CD1	2.35	0.55
1:B:163:PRO:HD2	1:B:166:GLN:NE2	2.22	0.54
1:A:181:THR:O	1:A:182:HIS:HB2	2.09	0.52
1:E:223:ARG:HD3	3:E:440:HOH:O	2.08	0.52
1:A:220:PRO:HG2	1:B:238:THR:HG21	1.94	0.49
1:E:138:PHE:CE2	1:E:229:LEU:HD13	2.50	0.47
1:B:124:CYS:H	2:B:301[B]:COM:C1	2.27	0.47
1:E:206:ASP:OD2	1:E:212:ARG:HD3	2.15	0.47
1:C:94:ILE:HD12	1:C:99:LYS:HB2	1.97	0.46
1:E:231:LEU:HD11	3:E:406:HOH:O	2.16	0.45
1:B:163:PRO:HD2	1:B:166:GLN:HE21	1.80	0.45
1:B:135:LEU:HD13	1:B:174:ILE:HD11	2.00	0.44
1:C:138:PHE:CE2	1:C:229:LEU:HD13	2.52	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:191:TYR:OH	1:E:196:GLY:HA2	2.17	0.44
1:B:125:PRO:HG2	1:B:169:LEU:HD23	2.00	0.44
1:B:191:TYR:OH	1:B:196:GLY:HA2	2.17	0.43
1:C:238:THR:HG21	1:D:220:PRO:HB2	1.99	0.43
1:D:225:VAL:HG12	1:D:229:LEU:HD22	2.01	0.43
1:D:127:GLU:OE1	1:D:200:ARG:NH1	2.50	0.43
1:D:138:PHE:CZ	1:D:229:LEU:HD13	2.54	0.43
1:C:162:THR:HB	1:C:168:GLY:HA3	2.02	0.42
1:C:220:PRO:HG2	1:D:238:THR:HG21	2.03	0.41
1:E:181:THR:O	1:E:182:HIS:HB2	2.19	0.41
1:B:206:ASP:OD2	1:B:212:ARG:HD3	2.20	0.41
1:C:238:THR:HG21	1:D:220:PRO:CG	2.51	0.41
1:E:162:THR:HA	1:E:163:PRO:HD3	1.94	0.40
1:C:83:LYS:HA	1:C:83:LYS:HD2	1.87	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	165/226 (73%)	161 (98%)	4 (2%)	0	100	100
1	B	164/226 (73%)	157 (96%)	6 (4%)	1 (1%)	21	21
1	C	165/226 (73%)	161 (98%)	3 (2%)	1 (1%)	21	21
1	D	166/226 (74%)	160 (96%)	5 (3%)	1 (1%)	21	21
1	E	166/226 (74%)	163 (98%)	2 (1%)	1 (1%)	21	21
All	All	826/1130 (73%)	802 (97%)	20 (2%)	4 (0%)	24	24

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	D	117	PRO
1	E	117	PRO
1	B	117	PRO
1	C	117	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	140/195 (72%)	134 (96%)	6 (4%)	26	31
1	B	141/195 (72%)	134 (95%)	7 (5%)	22	24
1	C	140/195 (72%)	133 (95%)	7 (5%)	22	24
1	D	140/195 (72%)	133 (95%)	7 (5%)	22	24
1	E	143/195 (73%)	135 (94%)	8 (6%)	19	20
All	All	704/975 (72%)	669 (95%)	35 (5%)	23	24

All (35) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	99	LYS
1	A	169	LEU
1	A	174	ILE
1	A	194[A]	ASP
1	A	194[B]	ASP
1	A	229	LEU
1	B	123	VAL
1	B	172	ILE
1	B	174	ILE
1	B	208	LYS
1	B	211	LEU
1	B	223	ARG
1	B	238	THR
1	C	78	THR
1	C	83	LYS
1	C	107	ARG

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Mol	Chain	Res	Type
1	C	169	LEU
1	C	180	LEU
1	C	223	ARG
1	C	229	LEU
1	D	107	ARG
1	D	127	GLU
1	D	174	ILE
1	D	199	LEU
1	D	211	LEU
1	D	229	LEU
1	D	238	THR
1	E	169	LEU
1	E	174	ILE
1	E	180	LEU
1	E	194[A]	ASP
1	E	194[B]	ASP
1	E	211	LEU
1	E	229	LEU
1	E	241	HIS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (8) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	182	HIS
1	B	166	GLN
1	B	182	HIS
1	C	166	GLN
1	C	182	HIS
1	D	166	GLN
1	D	182	HIS
1	E	182	HIS

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](#)

8 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	COM	C	301	1	6,6,6	3.17	2 (33%)	8,8,8	3.34	5 (62%)
2	COM	A	301	1	6,6,6	3.31	2 (33%)	8,8,8	3.10	4 (50%)
2	COM	B	301[A]	1	6,6,6	3.25	2 (33%)	8,8,8	3.14	5 (62%)
2	COM	B	301[B]	1	6,6,6	3.36	2 (33%)	8,8,8	3.21	6 (75%)
2	COM	E	301[A]	1	6,6,6	3.22	2 (33%)	8,8,8	3.21	5 (62%)
2	COM	E	301[B]	1	6,6,6	3.19	2 (33%)	8,8,8	3.25	5 (62%)
2	COM	D	301[A]	1	6,6,6	3.39	2 (33%)	8,8,8	3.09	5 (62%)
2	COM	D	301[B]	1	6,6,6	3.10	2 (33%)	8,8,8	3.29	5 (62%)

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
2	COM	C	301	1	-	1/4/4/4	-
2	COM	A	301	1	-	2/4/4/4	-
2	COM	B	301[A]	1	-	4/4/4/4	-
2	COM	B	301[B]	1	-	4/4/4/4	-
2	COM	E	301[A]	1	-	3/4/4/4	-
2	COM	E	301[B]	1	-	0/4/4/4	-
2	COM	D	301[A]	1	-	4/4/4/4	-
2	COM	D	301[B]	1	-	3/4/4/4	-

All (16) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	301	COM	O3S-S2	6.36	1.71	1.47
2	B	301[A]	COM	O3S-S2	6.36	1.71	1.47
2	D	301[A]	COM	O3S-S2	6.36	1.71	1.47
2	B	301[B]	COM	O3S-S2	6.35	1.71	1.47
2	D	301[B]	COM	O3S-S2	6.26	1.70	1.47
2	E	301[A]	COM	O3S-S2	6.24	1.70	1.47
2	E	301[B]	COM	O3S-S2	6.23	1.70	1.47
2	C	301	COM	O3S-S2	6.21	1.70	1.47
2	D	301[A]	COM	C2-S2	-5.30	1.70	1.77
2	B	301[B]	COM	C2-S2	-5.18	1.70	1.77
2	A	301	COM	C2-S2	-4.95	1.70	1.77
2	B	301[A]	COM	C2-S2	-4.74	1.70	1.77
2	E	301[A]	COM	C2-S2	-4.74	1.70	1.77
2	E	301[B]	COM	C2-S2	-4.63	1.71	1.77
2	C	301	COM	C2-S2	-4.59	1.71	1.77
2	D	301[B]	COM	C2-S2	-4.15	1.71	1.77

All (40) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	301[B]	COM	O1S-S2-C2	5.57	115.15	106.73
2	C	301	COM	O1S-S2-C2	5.40	114.89	106.73
2	E	301[B]	COM	O1S-S2-C2	5.27	114.69	106.73
2	E	301[A]	COM	O1S-S2-C2	5.12	114.46	106.73
2	D	301[A]	COM	O1S-S2-C2	4.98	114.25	106.73
2	B	301[A]	COM	O1S-S2-C2	4.74	113.90	106.73
2	B	301[B]	COM	O1S-S2-C2	4.67	113.78	106.73
2	A	301	COM	O2S-S2-C2	4.58	113.65	106.73
2	B	301[A]	COM	O3S-S2-O2S	-4.39	100.43	111.40
2	C	301	COM	O3S-S2-O2S	-4.33	100.58	111.40
2	E	301[B]	COM	O2S-S2-C2	4.30	113.23	106.73
2	B	301[B]	COM	O2S-S2-C2	4.27	113.17	106.73
2	D	301[A]	COM	O3S-S2-O2S	-4.26	100.75	111.40
2	E	301[A]	COM	O3S-S2-O1S	-4.25	100.76	111.40
2	C	301	COM	O3S-S2-O1S	-4.21	100.87	111.40
2	E	301[B]	COM	O3S-S2-O1S	-4.18	100.94	111.40
2	D	301[B]	COM	O3S-S2-O1S	-4.16	101.00	111.40
2	A	301	COM	O1S-S2-C2	4.10	112.93	106.73
2	D	301[B]	COM	O2S-S2-C2	4.10	112.93	106.73
2	A	301	COM	O3S-S2-O2S	-4.08	101.20	111.40
2	D	301[B]	COM	O3S-S2-O2S	-4.00	101.39	111.40
2	B	301[B]	COM	O3S-S2-O2S	-3.98	101.44	111.40

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	301	COM	O2S-S2-C2	3.90	112.62	106.73
2	B	301[A]	COM	O2S-S2-C2	3.89	112.61	106.73
2	E	301[B]	COM	O3S-S2-O2S	-3.88	101.70	111.40
2	E	301[A]	COM	O3S-S2-O2S	-3.82	101.85	111.40
2	E	301[A]	COM	O2S-S2-C2	3.80	112.47	106.73
2	B	301[B]	COM	O3S-S2-O1S	-3.79	101.91	111.40
2	B	301[A]	COM	O3S-S2-O1S	-3.76	102.00	111.40
2	D	301[A]	COM	O3S-S2-O1S	-3.68	102.20	111.40
2	A	301	COM	O3S-S2-O1S	-3.64	102.29	111.40
2	D	301[A]	COM	O2S-S2-C2	3.08	111.38	106.73
2	E	301[A]	COM	O3S-S2-C2	2.64	111.17	106.00
2	C	301	COM	O3S-S2-C2	2.53	110.95	106.00
2	D	301[A]	COM	O3S-S2-C2	2.51	110.91	106.00
2	B	301[A]	COM	O3S-S2-C2	2.48	110.85	106.00
2	B	301[B]	COM	C2-C1-S1	-2.40	107.01	113.10
2	B	301[B]	COM	O3S-S2-C2	2.29	110.48	106.00
2	D	301[B]	COM	O3S-S2-C2	2.23	110.36	106.00
2	E	301[B]	COM	O3S-S2-C2	2.16	110.23	106.00

There are no chirality outliers.

All (21) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	301	COM	C1-C2-S2-O1S
2	B	301[A]	COM	S1-C1-C2-S2
2	B	301[A]	COM	C1-C2-S2-O1S
2	B	301[A]	COM	C1-C2-S2-O2S
2	B	301[B]	COM	S1-C1-C2-S2
2	B	301[B]	COM	C1-C2-S2-O1S
2	B	301[B]	COM	C1-C2-S2-O2S
2	B	301[B]	COM	C1-C2-S2-O3S
2	D	301[A]	COM	S1-C1-C2-S2
2	D	301[A]	COM	C1-C2-S2-O1S
2	D	301[A]	COM	C1-C2-S2-O2S
2	D	301[A]	COM	C1-C2-S2-O3S
2	D	301[B]	COM	S1-C1-C2-S2
2	D	301[B]	COM	C1-C2-S2-O2S
2	E	301[A]	COM	C1-C2-S2-O1S
2	B	301[A]	COM	C1-C2-S2-O3S
2	E	301[A]	COM	C1-C2-S2-O3S
2	A	301	COM	S1-C1-C2-S2
2	C	301	COM	S1-C1-C2-S2

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Mol	Chain	Res	Type	Atoms
2	E	301[A]	COM	C1-C2-S2-O2S
2	D	301[B]	COM	C1-C2-S2-O3S

There are no ring outliers.

1 monomer is involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	301[B]	COM	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	166/226 (73%)	0.28	7 (4%)	40	40	34, 46, 66, 80	1 (0%)
1	B	166/226 (73%)	0.30	8 (4%)	35	35	35, 49, 69, 86	0
1	C	166/226 (73%)	0.40	7 (4%)	40	40	42, 55, 78, 96	1 (0%)
1	D	166/226 (73%)	0.26	6 (3%)	46	46	31, 49, 69, 91	2 (1%)
1	E	166/226 (73%)	0.29	6 (3%)	46	46	36, 49, 72, 88	2 (1%)
All	All	830/1130 (73%)	0.30	34 (4%)	41	41	31, 50, 73, 96	6 (0%)

All (34) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	166	GLN	5.5
1	A	242	GLY	3.6
1	A	124	CYS	3.4
1	D	242	GLY	3.3
1	A	165	ARG	3.2
1	E	242	GLY	3.2
1	D	165	ARG	3.1
1	B	242	GLY	3.0
1	C	242	GLY	2.9
1	C	241	HIS	2.9
1	E	240	LYS	2.8
1	B	165	ARG	2.7
1	E	77	GLY	2.7
1	C	183	GLN	2.6
1	E	165	ARG	2.6
1	B	122	PHE	2.6
1	B	96	GLY	2.6
1	E	241	HIS	2.6
1	C	124	CYS	2.5
1	D	77	GLY	2.5

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Mol	Chain	Res	Type	RSRZ
1	A	77	GLY	2.5
1	D	166	GLN	2.5
1	B	77	GLY	2.4
1	D	124	CYS	2.4
1	E	124	CYS	2.4
1	C	122[A]	PHE	2.4
1	A	174	ILE	2.3
1	C	174	ILE	2.3
1	D	238	THR	2.3
1	B	220	PRO	2.2
1	A	241	HIS	2.2
1	B	100	GLU	2.1
1	C	194	ASP	2.0
1	B	174	ILE	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
2	COM	D	301[A]	7/7	0.50	0.31	78,79,79,80	7
2	COM	D	301[B]	7/7	0.50	0.31	80,84,85,85	7
2	COM	A	301	7/7	0.64	0.30	77,82,83,84	7
2	COM	C	301	7/7	0.66	0.27	87,91,92,92	7
2	COM	E	301[A]	7/7	0.66	0.27	86,87,87,88	7
2	COM	E	301[B]	7/7	0.66	0.27	86,88,89,90	7
2	COM	B	301[B]	7/7	0.72	0.23	74,77,78,79	7
2	COM	B	301[A]	7/7	0.72	0.23	74,78,79,80	7

6.5 Other polymers [i](#)

There are no such residues in this entry.