



Full wwPDB X-ray Structure Validation Report ⓘ

Aug 27, 2026 – 12:26 pm BST

PDB ID : 32JD / pdb_000032jd
Title : Structure of the pathogenic variant P157S of Human SHMT2 in a distorted tetrameric conformation
Authors : Giardina, G.; Boumis, G.; Di Matteo, A.; Breccia, S.
Deposited on : 2026-07-12
Resolution : 2.70 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	:	1.8.4, CSD as541be (2020)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.015 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.50

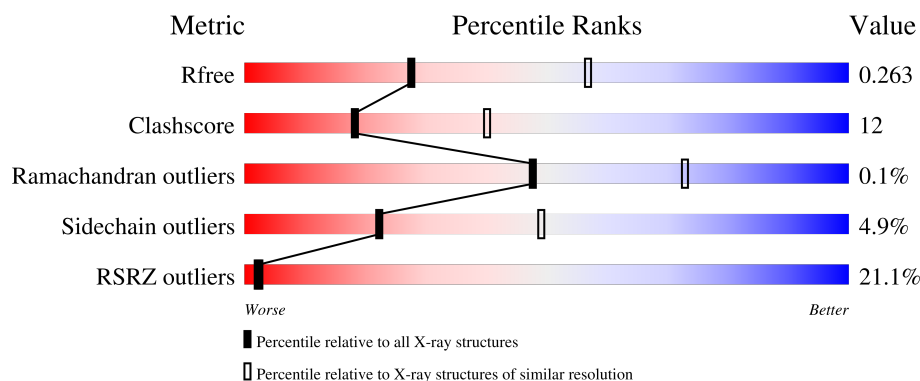
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.70 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	3538 (2.70-2.70)
Clashscore	190562	3843 (2.70-2.70)
Ramachandran outliers	187476	3778 (2.70-2.70)
Sidechain outliers	187428	3778 (2.70-2.70)
RSRZ outliers	180081	3538 (2.70-2.70)

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	486	5% 73% 16% 10%
1	B	486	32% 60% 26% 11%

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 6790 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.

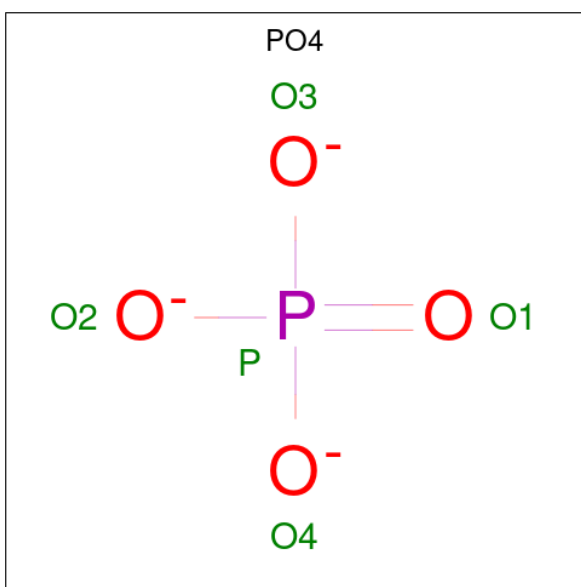
- Molecule 1 is a protein called Serine hydroxymethyltransferase, mitochondrial.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	436	Total	C	N	O	P	S	0	1	0
			3399	2146	598	639	1	15			
1	B	433	Total	C	N	O	P	S	0	0	0
			3351	2112	594	629	1	15			

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	19	GLY	-	expression tag	UNP P34897
A	20	SER	-	expression tag	UNP P34897
A	21	HIS	-	expression tag	UNP P34897
A	157	SER	PRO	variant	UNP P34897
B	19	GLY	-	expression tag	UNP P34897
B	20	SER	-	expression tag	UNP P34897
B	21	HIS	-	expression tag	UNP P34897
B	157	SER	PRO	variant	UNP P34897

- Molecule 2 is PHOSPHATE ION (CCD ID: PO4) (formula: O₄P).



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

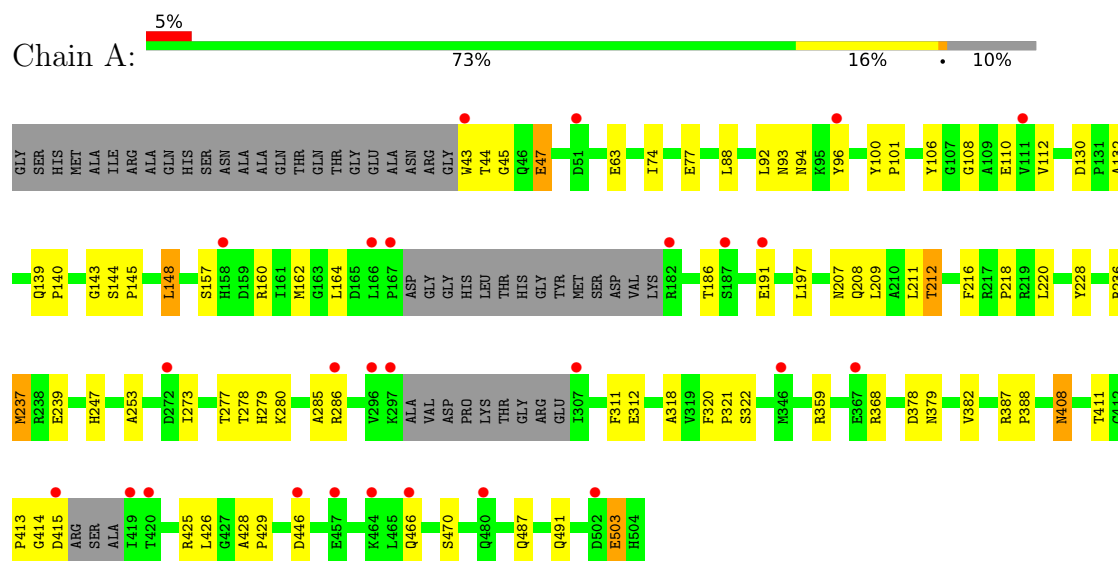
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	15	Total	O	0	0
			15	15		
3	B	15	Total	O	0	0
			15	15		

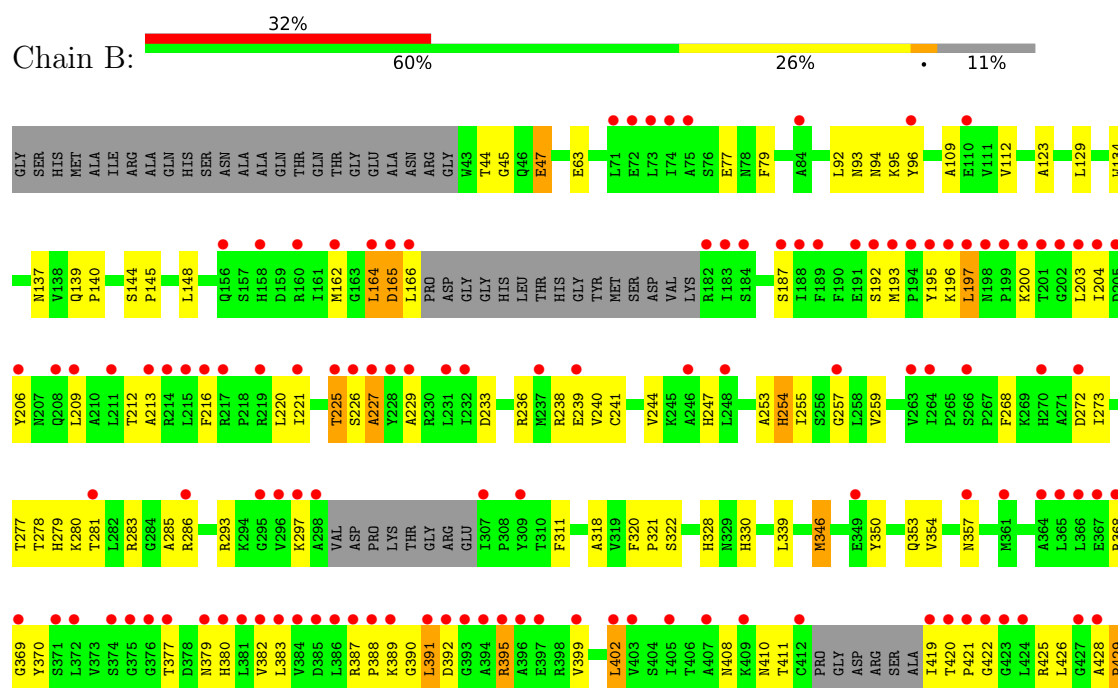
3 Residue-property plots [i](#)

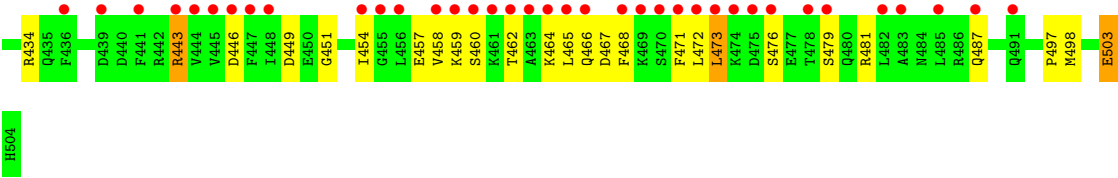
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. 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: Serine hydroxymethyltransferase, mitochondrial



- Molecule 1: Serine hydroxymethyltransferase, mitochondrial





4 Data and refinement statistics

Property	Value	Source
Space group	P 65 2 2	Depositor
Cell constants a, b, c, α , β , γ	162.13Å 162.13Å 207.38Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	140.41 – 2.70 140.41 – 2.70	Depositor EDS
% Data completeness (in resolution range)	100.0 (140.41-2.70) 100.0 (140.41-2.70)	Depositor EDS
R_{merge}	0.20	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.97 (at 2.69Å)	Xtriage
Refinement program	REFMAC 5.8.0419	Depositor
R, R_{free}	0.255 , 0.259 0.257 , 0.263	Depositor DCC
R_{free} test set	2297 reflections (5.14%)	wwPDB-VP
Wilson B-factor (Å ²)	59.3	Xtriage
Anisotropy	0.375	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.30 , 31.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.90	EDS
Total number of atoms	6790	wwPDB-VP
Average B, all atoms (Å ²)	69.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 1.97% 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: LLP, PO4

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	0.46	0/3439	0.87	1/4652 (0.0%)
1	B	0.47	0/3388	0.89	1/4586 (0.0%)
All	All	0.46	0/6827	0.88	2/9238 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	466	GLN	CB-CG-CD	-6.96	100.77	112.60
1	B	429	PRO	N-CA-C	-5.16	106.81	113.57

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	3399	0	3345	67	0
1	B	3351	0	3287	106	0
2	A	5	0	0	0	0
2	B	5	0	0	0	0
3	A	15	0	0	1	0
3	B	15	0	0	24	0
All	All	6790	0	6632	162	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 12.

All (162) 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:451:GLY:HA2	3:B:707:HOH:O	1.49	1.10
1:B:391:LEU:HD23	3:B:710:HOH:O	1.62	0.99
1:B:283:ARG:HH22	1:B:346:MET:HE1	1.44	0.81
1:A:279:HIS:O	3:A:701:HOH:O	1.98	0.81
1:B:197:LEU:H	1:B:197:LEU:HD12	1.45	0.80
1:B:226:SER:OG	1:B:425:ARG:NH1	2.17	0.78
1:A:368:ARG:NH1	1:A:446:ASP:OD1	2.16	0.78
1:A:88:LEU:HD23	1:B:93:ASN:HD21	1.53	0.74
1:A:162:MET:HE1	1:A:212:THR:CG2	2.18	0.74
1:B:204:ILE:HB	3:B:703:HOH:O	1.88	0.74
1:B:279:HIS:O	3:B:701:HOH:O	2.07	0.72
1:A:160:ARG:HB3	1:A:216:PHE:CE2	2.25	0.71
1:B:197:LEU:HB3	1:B:203:LEU:O	1.90	0.71
1:A:96:TYR:CZ	3:B:712:HOH:O	2.44	0.70
1:B:454:ILE:O	1:B:458:VAL:HG23	1.91	0.70
1:B:206:TYR:CZ	3:B:703:HOH:O	2.44	0.70
1:A:88:LEU:CD2	1:B:93:ASN:HD21	2.05	0.69
1:A:96:TYR:CE1	3:B:712:HOH:O	2.43	0.69
1:B:206:TYR:CE2	1:B:233:ASP:HB3	2.30	0.67
1:B:144:SER:HB2	1:B:145:PRO:HD3	1.76	0.66
1:A:428:ALA:H	1:A:429:PRO:HD3	1.61	0.65
1:A:96:TYR:CE2	3:B:712:HOH:O	2.50	0.65
1:B:206:TYR:CE1	3:B:703:HOH:O	2.50	0.64
1:B:204:ILE:CG2	3:B:703:HOH:O	2.46	0.63
1:A:96:TYR:CD1	3:B:712:HOH:O	2.51	0.63
1:A:318:ALA:O	1:A:322:SER:HB2	1.97	0.63
1:A:220:LEU:HD23	1:A:247:HIS:HB2	1.81	0.63
1:B:236:ARG:O	1:B:239:GLU:HB2	2.00	0.62
1:B:220:LEU:HD23	1:B:247:HIS:HB2	1.83	0.61
1:B:368:ARG:NH2	1:B:446:ASP:OD1	2.34	0.61
1:A:428:ALA:N	1:A:429:PRO:CD	2.65	0.60
1:B:226:SER:O	1:B:227:ALA:HB3	2.02	0.58
1:B:388:PRO:O	1:B:389:LYS:CB	2.50	0.58
1:B:428:ALA:C	3:B:709:HOH:O	2.47	0.58
1:A:96:TYR:CD2	3:B:712:HOH:O	2.56	0.57
1:B:253:ALA:HB3	1:B:280:LLP:O3	2.04	0.57
1:A:139:GLN:N	1:A:140:PRO:CD	2.67	0.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:286:ARG:NH1	3:B:702:HOH:O	2.34	0.57
1:B:227:ALA:O	1:B:383:LEU:HD11	2.04	0.57
1:A:411:THR:HG23	1:A:415:ASP:HB2	1.87	0.56
1:B:369:GLY:HA2	3:B:704:HOH:O	2.06	0.56
1:B:45:GLY:N	1:B:47:GLU:OE2	2.38	0.56
1:B:139:GLN:N	1:B:140:PRO:CD	2.69	0.56
1:B:353:GLN:HG3	1:B:357:ASN:HD21	1.71	0.55
1:B:387:ARG:HB2	1:B:388:PRO:HD3	1.88	0.55
1:B:419:ILE:O	1:B:420:THR:C	2.49	0.55
1:A:96:TYR:CG	3:B:712:HOH:O	2.60	0.55
1:B:468:PHE:HE1	1:B:472:LEU:HD11	1.72	0.55
1:B:209:LEU:HD12	1:B:240:VAL:HG21	1.86	0.55
1:B:410:ASN:O	1:B:421:PRO:HB2	2.06	0.55
1:A:74:ILE:HG12	1:A:408:ASN:HD21	1.72	0.55
1:B:392:ASP:HA	1:B:422:GLY:HA2	1.88	0.54
1:B:459:LYS:HD2	3:B:710:HOH:O	2.06	0.54
1:B:129:LEU:HD11	1:B:268:PHE:CE2	2.42	0.54
1:A:279:HIS:O	1:A:280:LLP:HB3	2.08	0.54
1:B:238:ARG:HH22	1:B:272:ASP:CG	2.16	0.54
1:B:187:SER:HA	1:B:192:SER:OG	2.07	0.53
1:B:458:VAL:O	1:B:462:THR:HG22	2.09	0.53
1:B:411:THR:HG22	1:B:421:PRO:HB3	1.90	0.53
1:B:428:ALA:N	1:B:429:PRO:HD3	2.23	0.53
1:B:468:PHE:CE1	1:B:472:LEU:HD11	2.44	0.53
1:A:428:ALA:H	1:A:429:PRO:CD	2.22	0.52
1:B:273:ILE:HD11	1:B:311:PHE:CD1	2.44	0.52
1:A:191:GLU:OE1	1:A:191:GLU:HA	2.08	0.52
1:B:462:THR:OG1	1:B:467:ASP:HB3	2.10	0.52
1:B:457:GLU:CD	1:B:481:ARG:HH12	2.18	0.52
1:B:164:LEU:HD13	1:B:225:THR:HG21	1.92	0.51
1:A:93:ASN:HD21	1:B:285:ALA:HA	1.76	0.51
1:A:197:LEU:HD23	1:A:413:PRO:HG3	1.91	0.51
1:A:236:ARG:O	1:A:239:GLU:HB2	2.10	0.51
1:A:162:MET:HE1	1:A:212:THR:HG21	1.91	0.51
1:A:108:GLY:HA2	1:A:110:GLU:OE2	2.11	0.51
1:A:160:ARG:HA	1:A:191:GLU:O	2.10	0.51
1:B:165:ASP:O	1:B:166:LEU:C	2.55	0.50
1:B:277:THR:HB	1:B:279:HIS:CE1	2.46	0.50
1:B:354:VAL:HG13	3:B:709:HOH:O	2.11	0.50
1:B:369:GLY:C	3:B:704:HOH:O	2.54	0.50
1:B:193:MET:HE2	1:B:212:THR:HG23	1.93	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:74:ILE:HG12	1:A:408:ASN:ND2	2.26	0.49
1:A:45:GLY:N	1:A:47:GLU:OE2	2.44	0.49
1:A:428:ALA:N	1:A:429:PRO:HD3	2.27	0.49
1:A:359:ARG:HH11	1:A:359:ARG:HG3	1.78	0.49
1:B:95:LYS:HG2	1:B:112:VAL:HG11	1.94	0.49
1:A:277:THR:HB	1:A:279:HIS:CE1	2.47	0.49
1:A:320:PHE:CD1	1:A:321:PRO:HA	2.48	0.49
1:B:465:LEU:O	1:B:468:PHE:HB3	2.12	0.49
1:B:238:ARG:NH2	1:B:272:ASP:CG	2.71	0.48
1:B:395:ARG:HB3	1:B:468:PHE:CE2	2.48	0.48
1:A:143:GLY:HA3	1:A:277:THR:HG22	1.96	0.48
1:A:106:TYR:OH	1:B:280:LLP:OP1	2.31	0.48
1:B:459:LYS:CD	3:B:710:HOH:O	2.61	0.48
1:B:379:ASN:HB3	1:B:380:HIS:H	1.40	0.47
1:B:283:ARG:NH2	1:B:346:MET:HE1	2.22	0.47
1:A:144:SER:HB2	1:A:145:PRO:HD3	1.97	0.47
1:B:328:HIS:HB3	1:B:330:HIS:CE1	2.49	0.47
1:B:123:ALA:HA	1:B:339:LEU:HD13	1.97	0.47
1:A:387:ARG:N	1:A:388:PRO:CD	2.77	0.47
1:B:109:ALA:HA	1:B:112:VAL:HG22	1.97	0.46
1:B:226:SER:HB2	1:B:254:HIS:CE1	2.50	0.46
1:B:454:ILE:HD12	3:B:707:HOH:O	2.15	0.46
1:B:318:ALA:O	1:B:322:SER:HB2	2.15	0.46
1:B:464:LYS:O	1:B:467:ASP:HB2	2.15	0.46
1:A:208:GLN:O	1:A:212:THR:HB	2.16	0.46
1:A:414:GLY:O	1:A:415:ASP:C	2.58	0.46
1:A:94:ASN:O	1:B:77:GLU:OE2	2.34	0.45
1:A:503:GLU:H	1:A:503:GLU:CD	2.23	0.45
1:B:350:TYR:O	1:B:354:VAL:HG23	2.16	0.45
1:B:134:TRP:CZ2	1:B:293:ARG:HD2	2.51	0.45
1:B:382:VAL:CG2	1:B:426:LEU:HB2	2.47	0.45
1:A:278:THR:OG1	1:A:285:ALA:O	2.34	0.45
1:A:359:ARG:NH2	1:A:378:ASP:OD1	2.50	0.45
1:A:408:ASN:OD1	1:A:425:ARG:NE	2.50	0.45
1:B:204:ILE:HG21	3:B:703:HOH:O	2.13	0.45
1:A:228:TYR:O	1:A:379:ASN:ND2	2.48	0.44
1:B:278:THR:OG1	1:B:285:ALA:O	2.32	0.44
1:B:388:PRO:C	1:B:390:GLY:H	2.23	0.44
1:B:443:ARG:O	1:B:443:ARG:HG3	2.16	0.44
1:A:286:ARG:HH11	1:B:96:TYR:HA	1.82	0.44
1:B:137:ASN:OD1	1:B:140:PRO:HD3	2.18	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:77:GLU:OE2	1:B:94:ASN:O	2.36	0.44
1:A:148:LEU:HD23	1:A:148:LEU:HA	1.85	0.44
1:B:79:PHE:CD2	1:B:498:MET:SD	3.11	0.44
1:B:257:GLY:HA3	1:B:281:THR:HB	2.00	0.44
1:A:207:ASN:O	1:A:211:LEU:HD13	2.19	0.43
1:A:487:GLN:NE2	1:A:491:GLN:OE1	2.47	0.43
1:A:43:TRP:HB2	1:B:346:MET:HG3	2.00	0.43
1:A:160:ARG:HB2	1:A:218:PRO:HA	2.00	0.43
1:B:476:SER:O	1:B:479:SER:HB3	2.19	0.43
1:A:311:PHE:O	1:A:312:GLU:C	2.61	0.43
1:B:369:GLY:CA	3:B:704:HOH:O	2.64	0.43
1:B:471:PHE:C	1:B:473:LEU:H	2.27	0.43
1:A:63:GLU:HG2	1:B:92:LEU:HD23	2.01	0.43
1:B:195:TYR:CB	1:B:209:LEU:HD23	2.49	0.43
1:A:139:GLN:N	1:A:140:PRO:HD3	2.31	0.43
1:B:503:GLU:H	1:B:503:GLU:CD	2.27	0.43
1:A:382:VAL:CG2	1:A:426:LEU:HB2	2.49	0.42
1:B:255:ILE:O	1:B:259:VAL:HG23	2.18	0.42
1:A:96:TYR:HA	1:B:286:ARG:HH22	1.85	0.42
1:B:320:PHE:CD1	1:B:321:PRO:HA	2.53	0.42
1:A:273:ILE:HD11	1:A:311:PHE:CG	2.54	0.42
1:B:368:ARG:NH1	1:B:449:ASP:OD2	2.40	0.42
1:A:100:TYR:HB3	1:A:101:PRO:HD2	2.00	0.42
1:A:237:MET:HE2	1:A:237:MET:HB3	1.98	0.42
1:A:382:VAL:HG22	1:A:426:LEU:HB2	2.01	0.42
1:B:391:LEU:HD23	1:B:391:LEU:HA	1.86	0.42
1:B:370:TYR:N	3:B:704:HOH:O	2.53	0.42
1:B:399:VAL:O	1:B:402:LEU:HB2	2.19	0.41
1:B:229:ALA:HB1	1:B:377:THR:HA	2.02	0.41
1:B:434:ARG:O	1:B:497:PRO:HD2	2.19	0.41
1:B:123:ALA:CA	1:B:339:LEU:HD13	2.50	0.41
1:B:221:ILE:HD12	1:B:241:CYS:SG	2.61	0.41
1:A:253:ALA:HB3	1:A:280:LLP:O3	2.19	0.41
1:B:254:HIS:HE1	1:B:280:LLP:OP3	2.04	0.41
1:A:139:GLN:H	1:A:140:PRO:HD3	1.86	0.41
1:A:130:ASP:OD1	1:A:132:ALA:N	2.43	0.41
1:B:193:MET:HB2	1:B:216:PHE:CZ	2.56	0.41
1:A:279:HIS:ND1	1:A:286:ARG:HA	2.35	0.40
1:B:162:MET:HA	1:B:193:MET:O	2.20	0.40
1:A:92:LEU:HD23	1:B:63:GLU:HG2	2.03	0.40
1:B:213:ALA:HB1	1:B:244:VAL:HG11	2.03	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:382:VAL:HG22	1:B:426:LEU:HB2	2.03	0.40
1:B:148:LEU:HA	1:B:148:LEU:HD23	1.85	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	428/486 (88%)	408 (95%)	20 (5%)	0	100	100
1	B	424/486 (87%)	397 (94%)	26 (6%)	1 (0%)	43	68
All	All	852/972 (88%)	805 (94%)	46 (5%)	1 (0%)	48	73

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	227	ALA

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	352/396 (89%)	339 (96%)	13 (4%)	30	59
1	B	344/396 (87%)	323 (94%)	21 (6%)	17	40
All	All	696/792 (88%)	662 (95%)	34 (5%)	22	49

All (34) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	44	THR
1	A	47	GLU
1	A	112	VAL
1	A	148	LEU
1	A	157	SER
1	A	164	LEU
1	A	186	THR
1	A	209	LEU
1	A	212	THR
1	A	237	MET
1	A	408	ASN
1	A	470	SER
1	A	503	GLU
1	B	44	THR
1	B	47	GLU
1	B	164	LEU
1	B	165	ASP
1	B	196	LYS
1	B	197	LEU
1	B	200	LYS
1	B	225	THR
1	B	254	HIS
1	B	297	LYS
1	B	346	MET
1	B	391	LEU
1	B	395	ARG
1	B	402	LEU
1	B	408	ASN
1	B	443	ARG
1	B	460	SER
1	B	466	GLN
1	B	473	LEU
1	B	487	GLN
1	B	503	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	93	ASN
1	B	93	ASN
1	B	254	HIS

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Mol	Chain	Res	Type
1	B	353	GLN
1	B	357	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

2 non-standard protein/DNA/RNA residues 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	$\# Z > 2$
1	LLP	A	280	1	23,24,25	0.53	0	25,32,34	0.93	0
1	LLP	B	280	1	23,24,25	0.50	0	25,32,34	0.71	0

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
1	LLP	A	280	1	-	7/16/17/19	0/1/1/1
1	LLP	B	280	1	-	1/16/17/19	0/1/1/1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (8) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	A	280	LLP	C5'-OP4-P-OP2

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Mol	Chain	Res	Type	Atoms
1	A	280	LLP	C5'-OP4-P-OP3
1	A	280	LLP	C-CA-CB-CG
1	A	280	LLP	O-C-CA-CB
1	B	280	LLP	O-C-CA-CB
1	A	280	LLP	C4-C4'-NZ-CE
1	A	280	LLP	C5'-OP4-P-OP1
1	A	280	LLP	C5-C5'-OP4-P

There are no ring outliers.

2 monomers are involved in 5 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	A	280	LLP	2	0
1	B	280	LLP	3	0

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

2 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	PO4	B	601	-	4,4,4	0.64	0	6,6,6	0.47	0
2	PO4	A	601	-	4,4,4	0.74	0	6,6,6	0.47	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

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

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	435/486 (89%)	0.50	26 (5%) 27 24	26, 57, 83, 111	1 (0%)
1	B	432/486 (88%)	1.62	157 (36%) 1 0	45, 75, 119, 150	0
All	All	867/972 (89%)	1.06	183 (21%) 2 2	26, 65, 106, 150	1 (0%)

All (183) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	412	CYS	7.2
1	B	392	ASP	6.1
1	B	307	ILE	5.7
1	B	465	LEU	5.6
1	B	298	ALA	5.4
1	A	158	HIS	5.4
1	B	183	ILE	5.4
1	B	419	ILE	5.0
1	B	471	PHE	5.0
1	B	166	LEU	4.9
1	A	419	ILE	4.9
1	B	197	LEU	4.8
1	B	206	TYR	4.8
1	A	307	ILE	4.4
1	B	164	LEU	4.3
1	B	428	ALA	4.3
1	B	420	THR	4.3
1	B	372	LEU	4.2
1	B	204	ILE	4.2
1	B	422	GLY	4.2
1	B	402	LEU	4.1
1	B	473	LEU	4.1
1	B	211	LEU	4.1
1	B	227	ALA	4.1

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Mol	Chain	Res	Type	RSRZ
1	B	379	ASN	4.0
1	A	296	VAL	3.9
1	A	182	ARG	3.9
1	B	208	GLN	3.9
1	B	165	ASP	3.9
1	B	219	ARG	3.8
1	B	482	LEU	3.8
1	B	468	PHE	3.8
1	B	203	LEU	3.8
1	B	472	LEU	3.7
1	B	391	LEU	3.6
1	A	272	ASP	3.6
1	B	464	LYS	3.6
1	B	469	LYS	3.6
1	B	399	VAL	3.6
1	B	403	VAL	3.6
1	B	474	LYS	3.6
1	B	182	ARG	3.6
1	B	383	LEU	3.6
1	B	202	GLY	3.5
1	B	192	SER	3.4
1	A	420	THR	3.3
1	B	266	SER	3.3
1	B	216	PHE	3.3
1	B	272	ASP	3.3
1	B	195	TYR	3.3
1	B	377	THR	3.3
1	B	396	ALA	3.3
1	B	444	VAL	3.3
1	A	51	ASP	3.3
1	B	381	LEU	3.2
1	B	200	LYS	3.2
1	B	463	ALA	3.2
1	B	184	SER	3.2
1	B	483	ALA	3.2
1	A	446	ASP	3.2
1	B	439	ASP	3.2
1	B	423	GLY	3.2
1	B	395	ARG	3.2
1	B	456	LEU	3.2
1	B	393	GLY	3.2
1	A	297	LYS	3.1

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Mol	Chain	Res	Type	RSRZ
1	B	110	GLU	3.1
1	B	296	VAL	3.1
1	B	375	GLY	3.1
1	B	461	LYS	3.1
1	B	388	PRO	3.1
1	B	386	LEU	3.1
1	B	194	PRO	3.1
1	B	491	GLN	3.0
1	B	478	THR	3.0
1	B	424	LEU	3.0
1	B	460	SER	3.0
1	B	228	TYR	3.0
1	B	421	PRO	3.0
1	B	246	ALA	2.9
1	B	297	LYS	2.9
1	B	458	VAL	2.9
1	B	196	LYS	2.9
1	B	215	LEU	2.9
1	B	231	LEU	2.9
1	B	470	SER	2.8
1	B	198	ASN	2.8
1	B	366	LEU	2.8
1	B	384	VAL	2.8
1	A	367	GLU	2.8
1	B	455	GLY	2.8
1	B	263	VAL	2.8
1	B	382	VAL	2.8
1	B	193	MET	2.8
1	B	209	LEU	2.8
1	B	369	GLY	2.8
1	B	427	GLY	2.8
1	B	407	ALA	2.8
1	B	462	THR	2.8
1	B	73	LEU	2.7
1	B	248	LEU	2.7
1	B	361	MET	2.7
1	B	72	GLU	2.7
1	B	446	ASP	2.7
1	B	187	SER	2.7
1	B	221	ILE	2.7
1	B	201	THR	2.7
1	B	205	ASP	2.7

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Mol	Chain	Res	Type	RSRZ
1	B	475	ASP	2.7
1	A	43	TRP	2.6
1	B	394	ALA	2.6
1	B	447	PHE	2.6
1	B	368	ARG	2.6
1	B	367	GLU	2.6
1	B	270	HIS	2.6
1	B	385	ASP	2.5
1	B	409	LYS	2.5
1	B	213	ALA	2.5
1	B	229	ALA	2.5
1	B	405	ILE	2.5
1	B	158	HIS	2.5
1	A	187	SER	2.5
1	B	387	ARG	2.5
1	B	436	PHE	2.5
1	B	476	SER	2.5
1	B	445	VAL	2.5
1	A	464	LYS	2.4
1	B	191	GLU	2.4
1	B	466	GLN	2.4
1	B	364	ALA	2.4
1	B	485	LEU	2.4
1	B	357	ASN	2.4
1	A	457	GLU	2.4
1	B	349	GLU	2.4
1	A	346	MET	2.4
1	B	389	LYS	2.4
1	B	454	ILE	2.3
1	B	226	SER	2.3
1	A	111	VAL	2.3
1	B	281	THR	2.3
1	B	239	GLU	2.3
1	B	160	ARG	2.3
1	B	189	PHE	2.3
1	B	225	THR	2.3
1	B	479	SER	2.3
1	B	75	ALA	2.3
1	A	191	GLU	2.3
1	A	167	PRO	2.3
1	B	286	ARG	2.3
1	B	459	LYS	2.2

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Mol	Chain	Res	Type	RSRZ
1	A	96	TYR	2.2
1	B	448	ILE	2.2
1	B	397	GLU	2.2
1	B	217	ARG	2.2
1	A	466	GLN	2.2
1	B	487	GLN	2.2
1	B	371	SER	2.2
1	B	309	TYR	2.2
1	A	166	LEU	2.2
1	A	415	ASP	2.2
1	B	71	LEU	2.2
1	B	295	GLY	2.2
1	B	214	ARG	2.2
1	B	199	PRO	2.2
1	B	365	LEU	2.2
1	B	376	GLY	2.1
1	A	502	ASP	2.1
1	B	380	HIS	2.1
1	B	156	GLN	2.1
1	B	374	SER	2.1
1	B	441	PHE	2.1
1	B	443	ARG	2.1
1	B	264	ILE	2.1
1	B	188	ILE	2.1
1	B	74	ILE	2.0
1	B	96	TYR	2.0
1	B	84	ALA	2.0
1	B	162	MET	2.0
1	B	237	MET	2.0
1	A	480	GLN	2.0
1	B	232	ILE	2.0
1	B	257	GLY	2.0
1	A	286	ARG	2.0

6.2 Non-standard residues in protein, DNA, RNA chains ⓘ

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
1	LLP	B	280	24/25	0.87	0.15	72,82,89,92	0
1	LLP	A	280	24/25	0.92	0.14	53,58,62,64	0

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
2	PO4	B	601	5/5	0.92	0.10	55,65,66,66	0
2	PO4	A	601	5/5	0.97	0.06	48,51,59,59	0

6.5 Other polymers [i](#)

There are no such residues in this entry.