



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 03:33 PM UTC

PDB ID : 4UOX / pdb_00004uox
Title : Crystal structure of YgjG in complex with Pyridoxal-5'-phosphate and putrescine
Authors : Jeong, J.H.; Kim, Y.G.
Deposited on : 2014-06-11
Resolution : 2.08 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

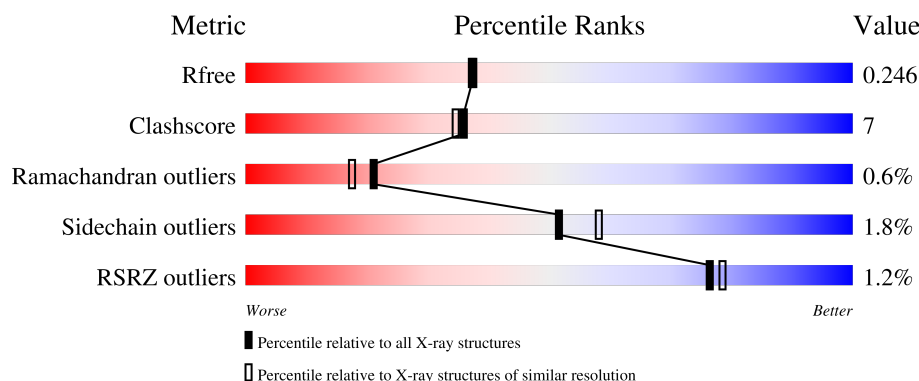
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.08 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	8172 (2.10-2.06)
Clashscore	190562	8714 (2.10-2.06)
Ramachandran outliers	187476	8641 (2.10-2.06)
Sidechain outliers	187428	8642 (2.10-2.06)
RSRZ outliers	180081	8177 (2.10-2.06)

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	467	3% 77% 19% ..
1	B	467	81% 15% ..
1	C	467	% 82% 15% .
1	D	467	% 84% 13% ..

2 Entry composition

There are 7 unique types of molecules in this entry. The entry contains 14395 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 PUTRESCINE AMINOTRANSFERASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	453	Total	C	N	O	S	0	0	0
			3436	2184	590	640	22			
1	B	452	Total	C	N	O	S	0	0	0
			3430	2181	589	638	22			
1	C	456	Total	C	N	O	S	0	0	0
			3463	2201	596	644	22			
1	D	452	Total	C	N	O	S	0	0	0
			3430	2181	589	638	22			

There are 32 discrepancies between the modelled and reference sequences:

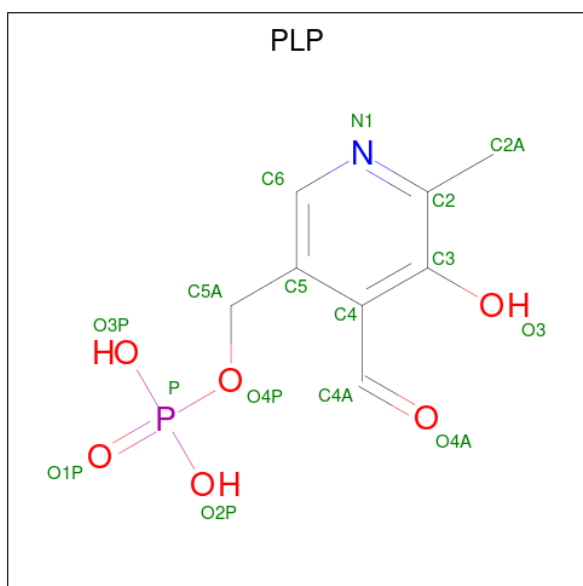
Chain	Residue	Modelled	Actual	Comment	Reference
A	460	LEU	-	expression tag	UNP P42588
A	461	GLU	-	expression tag	UNP P42588
A	462	HIS	-	expression tag	UNP P42588
A	463	HIS	-	expression tag	UNP P42588
A	464	HIS	-	expression tag	UNP P42588
A	465	HIS	-	expression tag	UNP P42588
A	466	HIS	-	expression tag	UNP P42588
A	467	HIS	-	expression tag	UNP P42588
B	460	LEU	-	expression tag	UNP P42588
B	461	GLU	-	expression tag	UNP P42588
B	462	HIS	-	expression tag	UNP P42588
B	463	HIS	-	expression tag	UNP P42588
B	464	HIS	-	expression tag	UNP P42588
B	465	HIS	-	expression tag	UNP P42588
B	466	HIS	-	expression tag	UNP P42588
B	467	HIS	-	expression tag	UNP P42588
C	460	LEU	-	expression tag	UNP P42588
C	461	GLU	-	expression tag	UNP P42588
C	462	HIS	-	expression tag	UNP P42588
C	463	HIS	-	expression tag	UNP P42588
C	464	HIS	-	expression tag	UNP P42588

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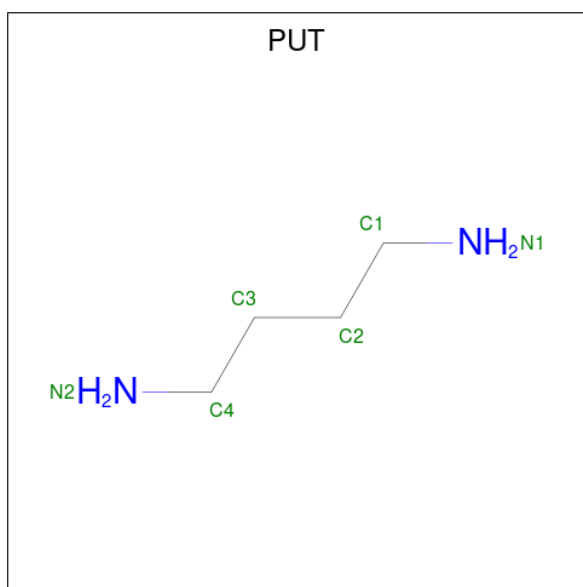
Chain	Residue	Modelled	Actual	Comment	Reference
C	465	HIS	-	expression tag	UNP P42588
C	466	HIS	-	expression tag	UNP P42588
C	467	HIS	-	expression tag	UNP P42588
D	460	LEU	-	expression tag	UNP P42588
D	461	GLU	-	expression tag	UNP P42588
D	462	HIS	-	expression tag	UNP P42588
D	463	HIS	-	expression tag	UNP P42588
D	464	HIS	-	expression tag	UNP P42588
D	465	HIS	-	expression tag	UNP P42588
D	466	HIS	-	expression tag	UNP P42588
D	467	HIS	-	expression tag	UNP P42588

- Molecule 2 is PYRIDOXAL-5'-PHOSPHATE (CCD ID: PLP) (formula: $C_8H_{10}NO_6P$).



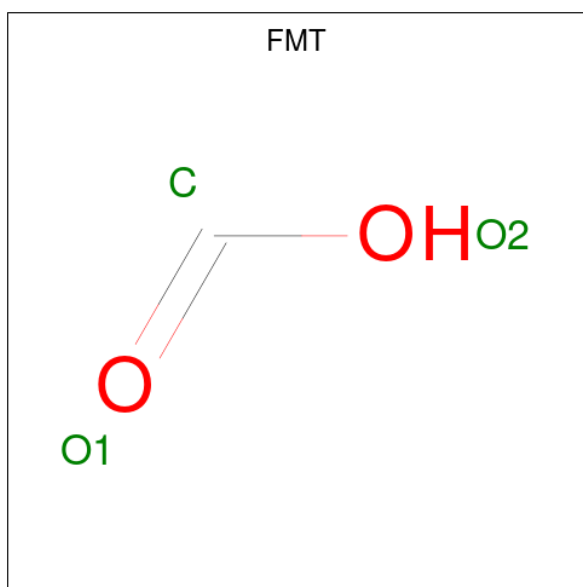
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	N	O	P	0	0
			15	8	1	5	1		
2	B	1	Total	C	N	O	P	0	0
			15	8	1	5	1		
2	C	1	Total	C	N	O	P	0	0
			16	8	1	6	1		
2	D	1	Total	C	N	O	P	0	0
			16	8	1	6	1		

- Molecule 3 is 1,4-DIAMINOBUTANE (CCD ID: PUT) (formula: $C_4H_{12}N_2$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	N	0	0
			6	4	2		
3	B	1	Total	C	N	0	0
			6	4	2		
3	C	1	Total	C	N	0	0
			6	4	2		

- Molecule 4 is FORMIC ACID (CCD ID: FMT) (formula: CH₂O₂).



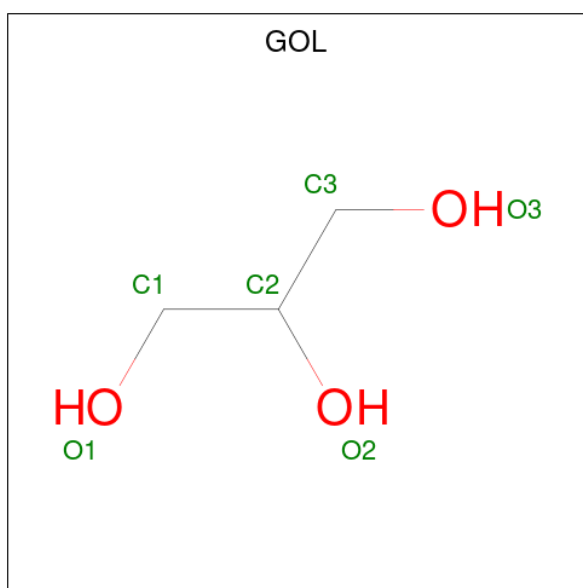
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	C	O	0	0
			3	1	2		

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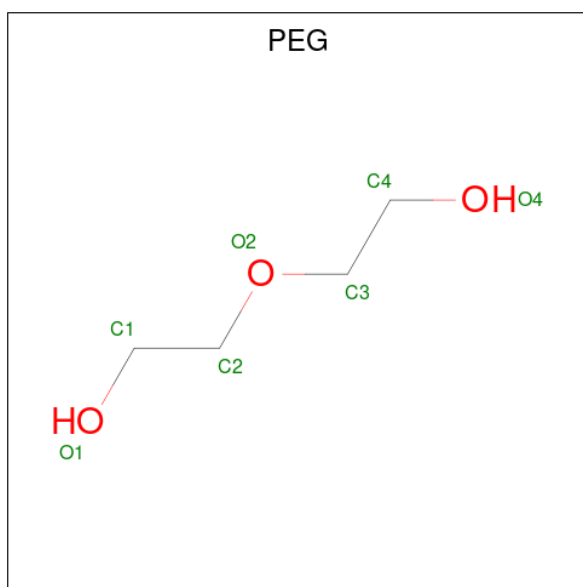
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	C	O	0	0
			3	1	2		
4	C	1	Total	C	O	0	0
			3	1	2		
4	C	1	Total	C	O	0	0
			3	1	2		
4	D	1	Total	C	O	0	0
			3	1	2		
4	D	1	Total	C	O	0	0
			3	1	2		

- Molecule 5 is GLYCEROL (CCD ID: GOL) (formula: $C_3H_8O_3$).



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

- Molecule 6 is DI(HYDROXYETHYL)ETHER (CCD ID: PEG) (formula: $C_4H_{10}O_3$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	C	1	Total	C	O	0	0
			7	4	3		

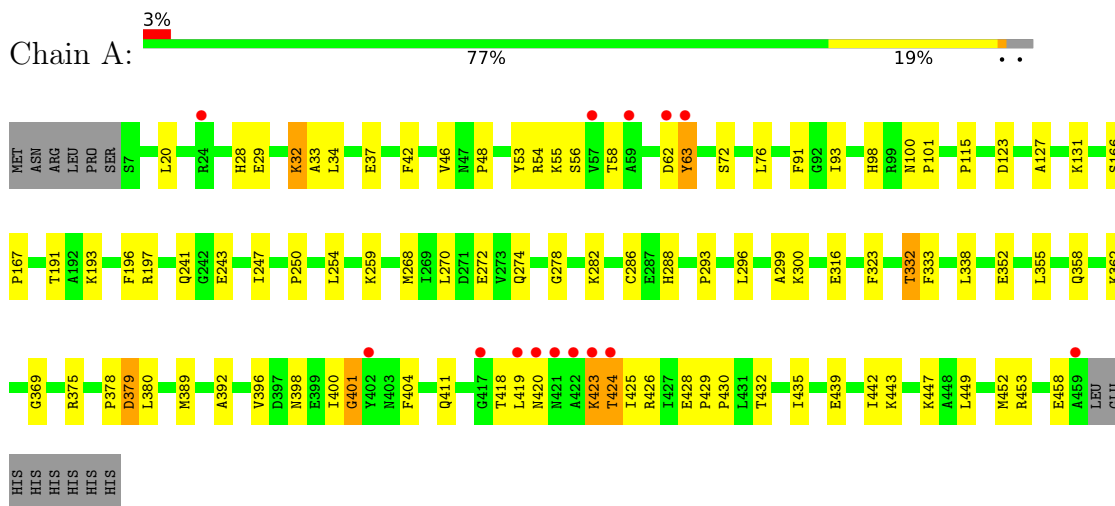
- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	146	Total	O	0	0
			146	146		
7	B	137	Total	O	0	0
			137	137		
7	C	106	Total	O	0	0
			106	106		
7	D	124	Total	O	0	0
			124	124		

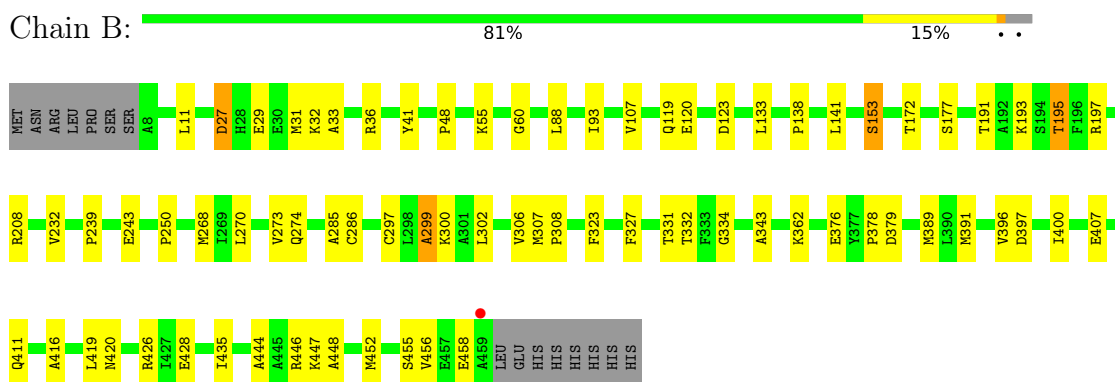
3 Residue-property plots [i](#)

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.

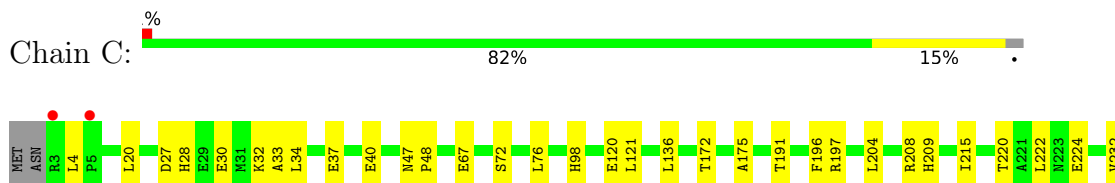
• Molecule 1: PUTRESCINE AMINOTRANSFERASE

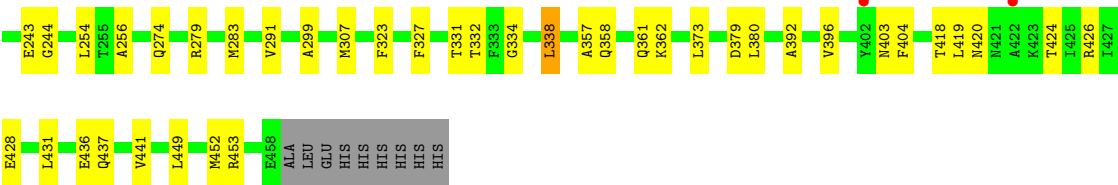


• Molecule 1: PUTRESCINE AMINOTRANSFERASE

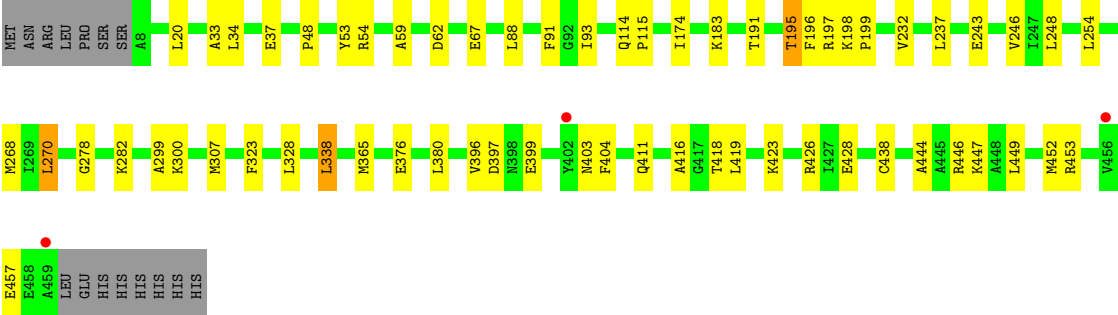
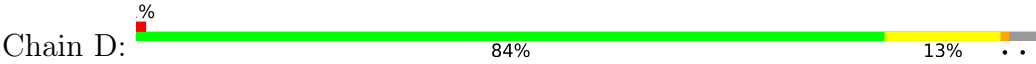


• Molecule 1: PUTRESCINE AMINOTRANSFERASE





● Molecule 1: PUTRESCINE AMINOTRANSFERASE



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	121.12Å 129.52Å 131.27Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	36.26 – 2.08 36.26 – 2.08	Depositor EDS
% Data completeness (in resolution range)	88.9 (36.26-2.08) 88.9 (36.26-2.08)	Depositor EDS
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.44 (at 2.08Å)	Xtriage
Refinement program	PHENIX (PHENIX.REFINE)	Depositor
R, R_{free}	0.188 , 0.245 0.193 , 0.246	Depositor DCC
R_{free} test set	5528 reflections (5.05%)	wwPDB-VP
Wilson B-factor (Å ²)	21.1	Xtriage
Anisotropy	0.150	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 36.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	0.016 for -h,l,k	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	14395	wwPDB-VP
Average B, all atoms (Å ²)	26.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.45% 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: PUT, GOL, PLP, FMT, PEG

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	0.54	0/3500	0.88	5/4736 (0.1%)
1	B	0.54	0/3494	0.84	1/4728 (0.0%)
1	C	0.49	0/3527	0.85	4/4771 (0.1%)
1	D	0.50	0/3494	0.85	0/4728
All	All	0.52	0/14015	0.85	10/18963 (0.1%)

There are no bond length outliers.

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	4	LEU	CA-C-N	5.91	125.92	119.89
1	C	4	LEU	C-N-CA	5.91	125.92	119.89
1	A	355	LEU	CA-C-N	-5.90	112.42	118.85
1	A	355	LEU	C-N-CA	-5.90	112.42	118.85
1	A	424	THR	N-CA-C	-5.80	99.44	108.90
1	A	401	GLY	N-CA-C	5.74	119.44	112.49
1	A	250	PRO	O-C-N	5.59	123.78	121.15
1	B	250	PRO	O-C-N	5.44	123.81	121.31
1	C	204	LEU	CA-C-N	-5.18	114.90	120.03
1	C	204	LEU	C-N-CA	-5.18	114.90	120.03

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	3436	0	3469	81	0
1	B	3430	0	3464	55	0
1	C	3463	0	3499	49	0
1	D	3430	0	3464	44	0
2	A	15	0	7	0	0
2	B	15	0	7	0	0
2	C	16	0	8	1	0
2	D	16	0	8	1	0
3	A	6	0	10	0	0
3	B	6	0	10	1	0
3	C	6	0	12	1	0
4	A	6	0	2	1	0
4	C	6	0	2	1	0
4	D	6	0	2	0	0
5	A	6	0	8	0	0
5	B	6	0	8	2	0
5	D	6	0	8	3	0
6	C	7	0	10	0	0
7	A	146	0	0	4	0
7	B	137	0	0	2	0
7	C	106	0	0	1	0
7	D	124	0	0	1	0
All	All	14395	0	13998	204	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 7.

All (204) 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:193:LYS:HD2	1:A:420:ASN:HA	1.59	0.84
1:A:404:PHE:HD1	1:A:452:MET:HE1	1.47	0.78
1:D:449:LEU:HA	1:D:452:MET:HE3	1.68	0.75
1:D:198:LYS:HD3	5:D:1461:GOL:H11	1.69	0.74
1:A:401:GLY:HA3	1:A:423:LYS:HG2	1.71	0.71
1:B:27:ASP:OD1	1:B:29:GLU:N	2.20	0.69
1:D:195:THR:HA	5:D:1461:GOL:H12	1.75	0.69
1:D:418:THR:HA	1:D:426:ARG:HH21	1.56	0.68
1:A:449:LEU:HA	1:A:452:MET:HE3	1.77	0.67

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:33:ALA:O	1:A:37:GLU:HG2	1.94	0.67
1:A:191:THR:O	1:A:197:ARG:HD2	1.96	0.66
1:C:449:LEU:HA	1:C:452:MET:HE3	1.78	0.64
1:C:418:THR:HA	1:C:426:ARG:HH21	1.63	0.63
1:B:376:GLU:OE1	1:B:446:ARG:NH1	2.26	0.62
1:D:307:MET:HE2	1:D:307:MET:HA	1.80	0.62
1:A:423:LYS:HZ1	1:A:425:ILE:CG1	2.13	0.61
1:C:307:MET:HE1	1:D:338:LEU:HD12	1.83	0.61
1:A:379:ASP:OD2	1:A:453:ARG:NE	2.29	0.61
1:A:423:LYS:HE3	1:A:425:ILE:HG12	1.81	0.61
1:A:274:GLN:HE22	1:A:426:ARG:NH1	2.00	0.60
1:C:307:MET:SD	1:D:307:MET:HE1	2.41	0.60
1:D:33:ALA:O	1:D:37:GLU:HG2	2.01	0.60
1:A:439:GLU:O	1:A:443:LYS:HG3	2.01	0.59
1:B:455:SER:HA	1:B:458:GLU:HG2	1.84	0.59
1:C:67:GLU:OE2	1:D:114:GLN:NE2	2.36	0.58
1:C:358:GLN:HB3	1:C:362:LYS:HE3	1.84	0.58
1:A:91:PHE:O	1:A:300:LYS:HE2	2.03	0.58
1:B:411:GLN:HE22	1:B:447:LYS:HB2	1.69	0.57
1:C:33:ALA:O	1:C:37:GLU:HG2	2.04	0.57
1:C:307:MET:HA	1:C:307:MET:HE2	1.86	0.57
1:D:404:PHE:HD1	1:D:452:MET:HE1	1.69	0.57
1:C:244:GLY:HA2	1:C:420:ASN:HB2	1.87	0.56
1:A:243:GLU:CD	1:A:426:ARG:HH22	2.14	0.56
1:C:338:LEU:HD12	1:D:307:MET:CE	2.36	0.56
1:A:404:PHE:CD1	1:A:452:MET:HE1	2.35	0.56
1:C:121:LEU:HD22	1:D:67:GLU:HB3	1.86	0.56
1:B:191:THR:O	1:B:197:ARG:HD2	2.06	0.56
1:C:307:MET:CE	1:D:338:LEU:HD12	2.35	0.56
1:C:338:LEU:HD12	1:D:307:MET:HE3	1.88	0.56
1:C:327:PHE:O	1:D:183:LYS:NZ	2.39	0.56
1:D:243:GLU:HB3	1:D:419:LEU:HB2	1.88	0.56
1:C:196:PHE:HZ	1:C:419:LEU:HD22	1.71	0.55
1:A:423:LYS:HZ1	1:A:425:ILE:HG12	1.72	0.55
1:C:254:LEU:HB3	1:C:291:VAL:HG21	1.89	0.55
1:A:401:GLY:HA3	1:A:423:LYS:HE2	1.90	0.54
1:D:199:PRO:HD3	5:D:1461:GOL:H2	1.88	0.54
1:A:332:THR:CG2	1:B:93:ILE:HD11	2.38	0.54
1:C:357:ALA:O	1:C:361:GLN:HG3	2.07	0.54
1:A:323:PHE:CE1	1:B:48:PRO:HD2	2.43	0.54
1:A:352:GLU:HG2	1:B:11:LEU:HD11	1.90	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:423:LYS:CE	1:A:425:ILE:HG12	2.38	0.53
1:D:376:GLU:OE1	1:D:446:ARG:NH1	2.34	0.53
1:B:389:MET:HA	1:B:391:MET:HE2	1.91	0.53
1:C:222:LEU:HD12	1:C:232:VAL:HG21	1.90	0.53
1:D:243:GLU:OE1	1:D:426:ARG:NH2	2.40	0.53
1:D:399:GLU:O	1:D:403:ASN:ND2	2.31	0.53
1:A:401:GLY:C	1:A:423:LYS:HZ3	2.12	0.53
1:A:37:GLU:HG3	7:A:2004:HOH:O	2.10	0.52
1:A:76:LEU:HD21	1:A:98:HIS:CE1	2.44	0.52
1:B:33:ALA:HA	1:B:36:ARG:HE	1.74	0.52
1:D:20:LEU:HD11	1:D:34:LEU:HD22	1.92	0.52
1:D:365:MET:HE1	1:D:438:CYS:HB3	1.90	0.52
1:A:72:SER:OG	7:A:2019:HOH:O	2.16	0.52
1:B:448:ALA:O	1:B:452:MET:HE3	2.10	0.52
1:D:411:GLN:NE2	1:D:444:ALA:O	2.42	0.52
1:A:423:LYS:NZ	1:A:425:ILE:HD11	2.25	0.52
1:A:48:PRO:HD2	1:B:323:PHE:CE1	2.45	0.52
1:D:196:PHE:HZ	1:D:419:LEU:HD22	1.75	0.52
1:A:28:HIS:O	1:A:32:LYS:HG3	2.09	0.52
1:C:404:PHE:HD1	1:C:452:MET:HE1	1.75	0.51
1:A:401:GLY:HA3	1:A:423:LYS:CG	2.40	0.51
1:C:243:GLU:CD	1:C:426:ARG:HH22	2.17	0.51
1:A:55:LYS:HA	1:A:63:TYR:HB2	1.92	0.51
1:C:40:GLU:OE1	7:C:2014:HOH:O	2.19	0.51
1:A:418:THR:HG22	1:A:426:ARG:CZ	2.41	0.51
1:B:397:ASP:HB2	1:B:400:ILE:HG13	1.92	0.51
1:A:131:LYS:HG3	1:B:41:TYR:CZ	2.45	0.50
1:A:358:GLN:HB3	1:A:362:LYS:HE3	1.94	0.50
1:A:423:LYS:HZ2	1:A:425:ILE:HD11	1.75	0.50
1:A:127:ALA:HB1	1:B:41:TYR:HB2	1.94	0.50
1:A:392:ALA:HB1	1:A:424:THR:HG22	1.93	0.50
1:B:419:LEU:HD11	3:B:801:PUT:H22	1.94	0.50
1:A:369:GLY:HA3	1:A:442:ILE:HD13	1.93	0.49
1:C:332:THR:HB	2:D:800:PLP:O2P	2.13	0.49
1:D:37:GLU:HG3	7:D:2001:HOH:O	2.11	0.49
1:A:115:PRO:HA	1:A:338:LEU:HG	1.95	0.49
1:A:379:ASP:HB2	1:A:453:ARG:HH21	1.78	0.49
1:C:373:LEU:HD22	1:C:449:LEU:HD12	1.94	0.49
1:B:88:LEU:HD13	1:B:416:ALA:HB3	1.95	0.48
1:D:88:LEU:HD13	1:D:416:ALA:HB3	1.95	0.48
1:A:332:THR:HG23	1:B:93:ILE:HD11	1.95	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:398:ASN:HA	1:A:423:LYS:HB3	1.95	0.48
1:A:53:TYR:CD2	1:B:327:PHE:HZ	2.32	0.48
1:A:58:THR:HB	1:A:62:ASP:HB2	1.94	0.48
1:B:407:GLU:O	1:B:411:GLN:HG3	2.14	0.48
1:C:274:GLN:NE2	1:C:428:GLU:OE2	2.43	0.48
1:B:33:ALA:O	1:B:36:ARG:HG2	2.14	0.47
1:C:380:LEU:O	1:C:396:VAL:HG23	2.14	0.47
1:C:243:GLU:OE1	1:C:426:ARG:NH2	2.42	0.47
1:A:93:ILE:HD11	1:B:332:THR:CG2	2.44	0.47
1:A:401:GLY:CA	1:A:423:LYS:HE2	2.43	0.47
1:B:55:LYS:O	7:B:2012:HOH:O	2.20	0.47
1:B:307:MET:HA	1:B:307:MET:HE2	1.97	0.47
1:B:33:ALA:HA	1:B:36:ARG:NE	2.29	0.47
1:B:426:ARG:HD3	1:B:428:GLU:OE1	2.15	0.47
1:D:268:MET:HE2	1:D:270:LEU:HD11	1.95	0.46
1:A:423:LYS:NZ	1:A:425:ILE:HG12	2.29	0.46
1:B:270:LEU:CD2	1:B:286:CYS:HB3	2.45	0.46
1:D:397:ASP:HA	1:D:423:LYS:HD2	1.98	0.46
1:A:91:PHE:HE2	1:B:119:GLN:HB2	1.81	0.46
1:B:362:LYS:NZ	5:B:1460:GOL:H2	2.30	0.46
1:C:215:ILE:HG12	1:C:256:ALA:HB1	1.98	0.46
1:A:375:ARG:O	1:A:378:PRO:HD3	2.16	0.46
1:A:389:MET:CE	1:A:429:PRO:HG2	2.46	0.46
1:A:411:GLN:CD	1:A:447:LYS:HD2	2.40	0.45
1:C:175:ALA:O	1:C:209:HIS:HA	2.15	0.45
1:A:259:LYS:HA	1:A:259:LYS:HD3	1.75	0.45
1:B:362:LYS:HZ1	5:B:1460:GOL:H2	1.82	0.45
1:A:426:ARG:HD3	1:A:428:GLU:OE1	2.16	0.45
1:A:54:ARG:HD3	1:B:120:GLU:O	2.17	0.45
4:C:1459:FMT:O1	4:C:1460:FMT:H	2.17	0.45
1:B:302:LEU:O	1:B:343:ALA:HA	2.16	0.45
1:A:278:GLY:HA2	1:A:282:LYS:O	2.17	0.45
1:C:279:ARG:HA	1:C:431:LEU:HD21	1.97	0.45
1:D:426:ARG:HD3	1:D:428:GLU:OE1	2.16	0.45
1:A:131:LYS:HG3	1:B:41:TYR:CE2	2.52	0.45
1:A:272:GLU:HG3	1:A:296:LEU:HD11	1.99	0.45
1:D:328:LEU:HD12	1:D:328:LEU:HA	1.85	0.44
1:B:396:VAL:HB	1:B:400:ILE:HD12	1.99	0.44
1:D:59:ALA:O	1:D:62:ASP:HB2	2.17	0.44
1:A:316:GLU:OE2	4:A:1460:FMT:H	2.17	0.44
1:C:379:ASP:HB2	1:C:453:ARG:HH21	1.83	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:91:PHE:HD1	1:D:426:ARG:CZ	2.30	0.44
1:A:243:GLU:OE1	1:A:426:ARG:NH2	2.49	0.44
1:C:437:GLN:O	1:C:441:VAL:HG23	2.18	0.43
1:C:28:HIS:O	1:C:32:LYS:HG2	2.19	0.43
1:B:376:GLU:C	1:B:378:PRO:HD3	2.43	0.43
1:A:166:SER:HB3	1:A:167:PRO:HD3	2.00	0.43
1:D:174:ILE:HD13	1:D:232:VAL:HG22	1.99	0.43
1:A:270:LEU:HD12	1:A:270:LEU:HA	1.83	0.43
1:B:239:PRO:HG2	1:B:285:ALA:HB3	1.99	0.43
1:C:392:ALA:HB1	1:C:424:THR:HG23	2.00	0.43
1:B:123:ASP:OD1	1:B:123:ASP:N	2.50	0.43
1:C:191:THR:O	1:C:197:ARG:HD2	2.19	0.43
1:C:120:GLU:O	1:D:54:ARG:HD3	2.18	0.43
1:A:48:PRO:HD2	1:B:323:PHE:CD1	2.54	0.43
1:C:196:PHE:CZ	1:C:419:LEU:HD22	2.51	0.43
1:A:379:ASP:OD1	7:A:2138:HOH:O	2.20	0.42
1:A:389:MET:HE3	1:A:429:PRO:HG2	2.01	0.42
1:A:243:GLU:HG2	7:A:2102:HOH:O	2.18	0.42
1:A:268:MET:HE2	1:A:270:LEU:HD13	2.01	0.42
1:B:31:MET:HE3	1:B:31:MET:HB3	1.90	0.42
1:B:138:PRO:HD2	1:B:141:LEU:HD12	2.01	0.42
1:A:396:VAL:HB	1:A:400:ILE:HD12	2.00	0.42
1:A:196:PHE:HZ	1:A:419:LEU:HD22	1.84	0.42
1:D:191:THR:O	1:D:197:ARG:HD2	2.19	0.42
1:D:278:GLY:HA2	1:D:282:LYS:O	2.20	0.42
1:D:453:ARG:O	1:D:457:GLU:HB3	2.20	0.42
1:A:91:PHE:HD1	1:A:426:ARG:NE	2.17	0.42
1:B:133:LEU:HD23	1:B:133:LEU:HA	1.85	0.42
1:B:273:VAL:HG13	1:B:299:ALA:HB3	2.01	0.42
1:C:48:PRO:HD2	1:D:323:PHE:CE1	2.54	0.42
1:D:416:ALA:O	1:D:426:ARG:HG2	2.19	0.42
1:B:107:VAL:HG21	1:B:306:VAL:HG11	2.02	0.42
1:C:20:LEU:HD11	1:C:34:LEU:HD22	2.02	0.42
1:A:270:LEU:HD23	1:A:286:CYS:HB3	2.01	0.42
1:B:153:SER:OG	1:B:297:CYS:HB3	2.19	0.42
1:C:220:THR:O	1:C:224:GLU:HG2	2.20	0.41
1:A:241:GLN:HB2	1:A:247:ILE:HB	2.01	0.41
1:A:380:LEU:C	1:A:396:VAL:HG23	2.45	0.41
1:A:333:PHE:CB	1:B:308:PRO:HB3	2.50	0.41
1:C:172:THR:HB	1:C:232:VAL:HA	2.02	0.41
1:A:423:LYS:NZ	1:A:425:ILE:CG1	2.82	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:411:GLN:NE2	1:B:444:ALA:O	2.53	0.41
1:C:76:LEU:HD21	1:C:98:HIS:CE1	2.55	0.41
1:D:411:GLN:OE1	1:D:447:LYS:HD2	2.21	0.41
1:A:20:LEU:HD11	1:A:34:LEU:HD13	2.01	0.41
1:A:423:LYS:O	1:A:423:LYS:HG3	2.20	0.41
1:B:379:ASP:OD1	1:B:379:ASP:N	2.40	0.41
1:C:331:THR:HG23	1:C:334:GLY:HA3	2.03	0.41
2:C:800:PLP:O4A	3:C:801:PUT:N2	2.53	0.41
1:A:282:LYS:HG2	1:A:288:HIS:CE1	2.56	0.41
1:B:195:THR:HG21	7:B:2056:HOH:O	2.20	0.41
1:B:274:GLN:HE22	1:B:426:ARG:NH1	2.18	0.41
1:B:331:THR:HG23	1:B:334:GLY:H	1.85	0.41
1:A:123:ASP:OD1	1:A:123:ASP:N	2.52	0.41
1:C:27:ASP:HB2	1:C:30:GLU:OE1	2.21	0.41
1:B:172:THR:HB	1:B:232:VAL:HA	2.03	0.41
1:D:380:LEU:O	1:D:396:VAL:HG23	2.21	0.41
1:A:29:GLU:HA	1:A:29:GLU:OE1	2.21	0.41
1:C:327:PHE:HZ	1:D:53:TYR:CD2	2.39	0.40
1:B:243:GLU:HB3	1:B:419:LEU:HB2	2.03	0.40
1:C:136:LEU:HD11	1:C:283:MET:HE3	2.03	0.40
1:C:323:PHE:CE1	1:D:48:PRO:HD2	2.57	0.40
1:C:332:THR:CG2	1:D:93:ILE:HD11	2.51	0.40
1:A:42:PHE:HA	1:A:46:VAL:HB	2.03	0.40
1:A:430:PRO:C	1:A:432:THR:H	2.29	0.40
1:B:193:LYS:HD2	1:B:420:ASN:HA	2.03	0.40
1:C:274:GLN:HE22	1:C:426:ARG:NH1	2.19	0.40
1:B:452:MET:HE3	1:B:452:MET:HB2	1.48	0.40
1:A:100:ASN:HA	1:A:101:PRO:HD2	1.88	0.40
1:A:270:LEU:HB2	1:A:293:PRO:HB3	2.04	0.40
1:B:268:MET:HE2	1:B:270:LEU:HD13	2.04	0.40
1:C:47:ASN:HA	1:C:48:PRO:HD2	1.95	0.40

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	451/467 (97%)	423 (94%)	25 (6%)	3 (1%)	18	14
1	B	450/467 (96%)	430 (96%)	17 (4%)	3 (1%)	18	14
1	C	453/467 (97%)	429 (95%)	23 (5%)	1 (0%)	43	44
1	D	450/467 (96%)	433 (96%)	13 (3%)	4 (1%)	14	10
All	All	1804/1868 (97%)	1715 (95%)	78 (4%)	11 (1%)	21	17

All (11) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	60	GLY
1	A	423	LYS
1	B	299	ALA
1	A	299	ALA
1	A	379	ASP
1	B	300	LYS
1	D	299	ALA
1	D	300	LYS
1	C	299	ALA
1	D	246	VAL
1	D	115	PRO

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	360/374 (96%)	353 (98%)	7 (2%)	50	56
1	B	359/374 (96%)	351 (98%)	8 (2%)	45	51
1	C	364/374 (97%)	359 (99%)	5 (1%)	59	66
1	D	359/374 (96%)	353 (98%)	6 (2%)	53	60
All	All	1442/1496 (96%)	1416 (98%)	26 (2%)	51	58

All (26) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	32	LYS
1	A	56	SER
1	A	63	TYR
1	A	254	LEU
1	A	332	THR
1	A	435	ILE
1	A	458	GLU
1	B	27	ASP
1	B	32	LYS
1	B	153	SER
1	B	177	SER
1	B	195	THR
1	B	208	ARG
1	B	435	ILE
1	B	456	VAL
1	C	72	SER
1	C	208	ARG
1	C	338	LEU
1	C	403	ASN
1	C	436	GLU
1	D	195	THR
1	D	237	LEU
1	D	248	LEU
1	D	254	LEU
1	D	270	LEU
1	D	338	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (19) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	74	ASN
1	A	100	ASN
1	A	223	ASN
1	A	288	HIS
1	A	353	GLN
1	A	354	ASN
1	A	421	ASN
1	B	74	ASN
1	B	100	ASN
1	C	28	HIS
1	C	100	ASN

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Mol	Chain	Res	Type
1	C	109	ASN
1	D	35	ASN
1	D	74	ASN
1	D	100	ASN
1	D	109	ASN
1	D	223	ASN
1	D	348	ASN
1	D	358	GLN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

17 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	PLP	B	800	3	15,15,16	3.54	3 (20%)	21,22,23	1.40	2 (9%)
2	PLP	D	800	-	16,16,16	2.95	3 (18%)	20,23,23	1.57	3 (15%)
5	GOL	D	1461	-	5,5,5	0.34	0	5,5,5	0.40	0
2	PLP	C	800	-	16,16,16	2.99	3 (18%)	20,23,23	1.82	3 (15%)
3	PUT	B	801	2	5,5,5	0.22	0	4,4,4	0.46	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
4	FMT	A	1460	-	2,2,2	0.74	0	1,1,1	0.29	0
4	FMT	D	1460	-	2,2,2	0.68	0	1,1,1	0.10	0
5	GOL	A	1462	-	5,5,5	0.35	0	5,5,5	0.20	0
6	PEG	C	1461	-	6,6,6	0.65	0	5,5,5	0.29	0
3	PUT	A	801	2	5,5,5	0.21	0	4,4,4	0.53	0
4	FMT	D	1462	-	2,2,2	0.64	0	1,1,1	0.16	0
5	GOL	B	1460	-	5,5,5	0.29	0	5,5,5	0.82	0
2	PLP	A	800	3	15,15,16	3.53	4 (26%)	21,22,23	1.47	4 (19%)
4	FMT	C	1460	-	2,2,2	0.72	0	1,1,1	0.26	0
4	FMT	C	1459	-	2,2,2	0.70	0	1,1,1	0.27	0
3	PUT	C	801	-	5,5,5	0.22	0	4,4,4	0.50	0
4	FMT	A	1461	-	2,2,2	0.63	0	1,1,1	0.17	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
2	PLP	B	800	3	-	2/6/6/8	0/1/1/1
2	PLP	D	800	-	-	2/8/8/8	0/1/1/1
5	GOL	D	1461	-	-	2/4/4/4	-
2	PLP	C	800	-	-	4/8/8/8	0/1/1/1
3	PUT	B	801	2	-	1/3/3/3	-
5	GOL	A	1462	-	-	0/4/4/4	-
6	PEG	C	1461	-	-	3/4/4/4	-
3	PUT	A	801	2	-	2/3/3/3	-
2	PLP	A	800	3	-	0/6/6/8	0/1/1/1
3	PUT	C	801	-	-	1/3/3/3	-
5	GOL	B	1460	-	-	2/4/4/4	-

All (13) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	800	PLP	C3-C2	9.03	1.50	1.41
2	B	800	PLP	C3-C2	8.79	1.50	1.41
2	D	800	PLP	C3-C2	8.59	1.49	1.41
2	B	800	PLP	C5-C4	8.52	1.50	1.40
2	C	800	PLP	C3-C2	8.28	1.49	1.41
2	A	800	PLP	C5-C4	8.11	1.49	1.40

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	800	PLP	C4-C5	6.02	1.50	1.42
2	D	800	PLP	C4-C5	5.69	1.49	1.42
2	C	800	PLP	C4-C3	5.21	1.49	1.41
2	A	800	PLP	C3-C4	5.12	1.49	1.40
2	B	800	PLP	C3-C4	4.99	1.49	1.40
2	D	800	PLP	C4-C3	4.79	1.49	1.41
2	A	800	PLP	C2-N1	2.35	1.38	1.33

All (12) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	800	PLP	C4-C3-C2	-5.32	117.15	120.14
2	D	800	PLP	C4-C3-C2	-4.32	117.71	120.14
2	A	800	PLP	C2A-C2-C3	-2.75	117.58	120.80
2	A	800	PLP	C6-C5-C4	2.49	120.13	118.10
2	D	800	PLP	C3-C4-C5	-2.42	116.34	118.28
2	C	800	PLP	C6-N1-C2	2.33	123.42	119.20
2	B	800	PLP	C6-N1-C2	2.33	123.42	119.20
2	C	800	PLP	O4P-C5A-C5	2.31	113.68	109.36
2	D	800	PLP	C6-N1-C2	2.23	123.25	119.20
2	A	800	PLP	C4-C3-C2	-2.20	116.60	119.89
2	A	800	PLP	C2A-C2-N1	2.03	121.46	117.64
2	B	800	PLP	C6-C5-C4	2.02	119.75	118.10

There are no chirality outliers.

All (19) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	C	800	PLP	C4-C5-C5A-O4P
2	C	800	PLP	C5A-O4P-P-O2P
5	D	1461	GOL	C1-C2-C3-O3
5	B	1460	GOL	O1-C1-C2-C3
5	D	1461	GOL	O2-C2-C3-O3
5	B	1460	GOL	O1-C1-C2-O2
6	C	1461	PEG	O1-C1-C2-O2
2	C	800	PLP	C3-C4-C4A-O4A
6	C	1461	PEG	C1-C2-O2-C3
3	A	801	PUT	C1-C2-C3-C4
2	B	800	PLP	C4-C5-C5A-O4P
2	D	800	PLP	C5A-O4P-P-O1P
3	A	801	PUT	C2-C3-C4-N2
2	B	800	PLP	C6-C5-C5A-O4P

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Mol	Chain	Res	Type	Atoms
2	C	800	PLP	C6-C5-C5A-O4P
3	B	801	PUT	C2-C3-C4-N2
3	C	801	PUT	C1-C2-C3-C4
2	D	800	PLP	C3-C4-C4A-O4A
6	C	1461	PEG	O2-C3-C4-O4

There are no ring outliers.

9 monomers are involved in 10 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	D	800	PLP	1	0
5	D	1461	GOL	3	0
2	C	800	PLP	1	0
3	B	801	PUT	1	0
4	A	1460	FMT	1	0
5	B	1460	GOL	2	0
4	C	1460	FMT	1	0
4	C	1459	FMT	1	0
3	C	801	PUT	1	0

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

The following chains have linkage breaks:

Mol	Chain	Number of breaks
1	C	1

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	C	457:GLU	C	458:GLU	N	2.96

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	453/467 (97%)	-0.20	14 (3%) 51 53	12, 24, 52, 74	0
1	B	452/467 (96%)	-0.47	1 (0%) 91 92	11, 21, 42, 70	0
1	C	456/467 (97%)	-0.28	4 (0%) 81 83	12, 26, 48, 74	0
1	D	452/467 (96%)	-0.37	3 (0%) 84 86	11, 23, 46, 72	0
All	All	1813/1868 (97%)	-0.33	22 (1%) 76 78	11, 24, 46, 74	0

All (22) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	63	TYR	6.1
1	A	422	ALA	5.3
1	A	421	ASN	4.4
1	A	420	ASN	4.1
1	A	423	LYS	3.8
1	D	459	ALA	3.4
1	A	402	TYR	3.4
1	C	402	TYR	3.2
1	A	419	LEU	2.9
1	A	417	GLY	2.8
1	A	57	VAL	2.7
1	A	59	ALA	2.6
1	B	459	ALA	2.6
1	A	62	ASP	2.6
1	D	402	TYR	2.6
1	C	5	PRO	2.5
1	A	459	ALA	2.4
1	C	3	ARG	2.4
1	A	24	ARG	2.3
1	A	424	THR	2.3
1	C	422	ALA	2.3
1	D	456	VAL	2.1

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
3	PUT	C	801	6/6	0.72	0.17	36,41,44,45	0
3	PUT	B	801	6/6	0.76	0.18	37,42,46,49	0
4	FMT	A	1461	3/3	0.78	0.12	35,35,41,45	0
3	PUT	A	801	6/6	0.80	0.16	29,37,42,46	0
6	PEG	C	1461	7/7	0.83	0.13	32,34,39,40	0
5	GOL	A	1462	6/6	0.85	0.14	42,45,47,53	0
4	FMT	A	1460	3/3	0.86	0.11	33,33,33,37	0
2	PLP	C	800	16/16	0.86	0.11	18,31,44,47	0
2	PLP	A	800	15/16	0.87	0.10	20,25,34,49	0
5	GOL	D	1461	6/6	0.89	0.21	29,36,37,46	0
2	PLP	B	800	15/16	0.89	0.10	19,24,37,40	0
2	PLP	D	800	16/16	0.92	0.09	21,27,36,39	0
4	FMT	D	1460	3/3	0.94	0.10	28,28,35,38	0
4	FMT	C	1459	3/3	0.94	0.06	35,35,35,37	0
4	FMT	D	1462	3/3	0.95	0.08	28,28,31,34	0
5	GOL	B	1460	6/6	0.95	0.09	19,23,25,26	0
4	FMT	C	1460	3/3	0.97	0.06	21,21,24,28	0

6.5 Other polymers [i](#)

There are no such residues in this entry.