



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 02:26 PM UTC

PDB ID : 3CSW / pdb_00003csw
Title : Crystal structure of a putative branched-chain amino acid aminotransferase (TM0831) from *Thermotoga maritima* at 2.15 Å resolution
Authors : Joint Center for Structural Genomics (JCSG)
Deposited on : 2008-04-10
Resolution : 2.15 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

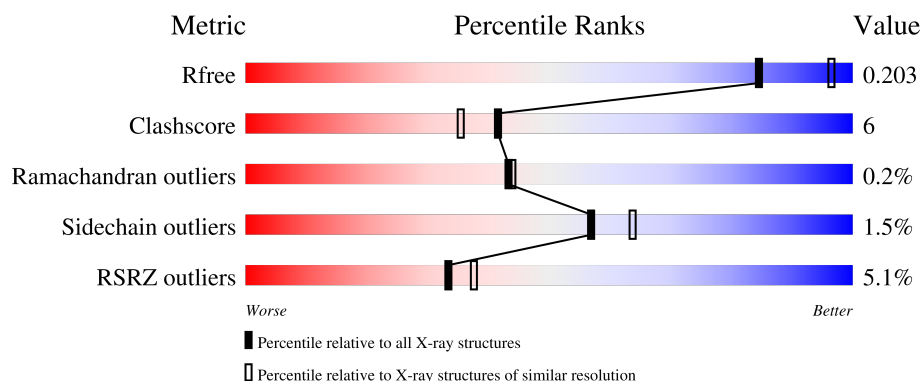
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.15 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	2057 (2.16-2.16)
Clashscore	190562	2159 (2.16-2.16)
Ramachandran outliers	187476	2134 (2.16-2.16)
Sidechain outliers	187428	2133 (2.16-2.16)
RSRZ outliers	180081	2059 (2.16-2.16)

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	285	6% 84% 12% .
1	B	285	2% 87% 9% .
1	C	285	7% 85% 11% ..
1	D	285	5% 86% 9% .

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
3	UNL	A	301	-	-	X	-
3	UNL	C	301	-	-	X	-
3	UNL	D	275	-	-	X	-
5	MPD	A	303	-	-	X	-

2 Entry composition

There are 7 unique types of molecules in this entry. The entry contains 9636 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 Putative branched-chain-amino-acid aminotransferase.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	274	Total	C	N	O	S	Se	0	7	0
			2222	1449	360	409	2	2			
1	B	274	Total	C	N	O	S	Se	0	8	0
			2246	1465	366	411	2	2			
1	C	275	Total	C	N	O	S	Se	0	6	0
			2216	1444	362	406	2	2			
1	D	274	Total	C	N	O	S	Se	0	3	0
			2186	1422	357	403	2	2			

There are 52 discrepancies between the modelled and reference sequences:

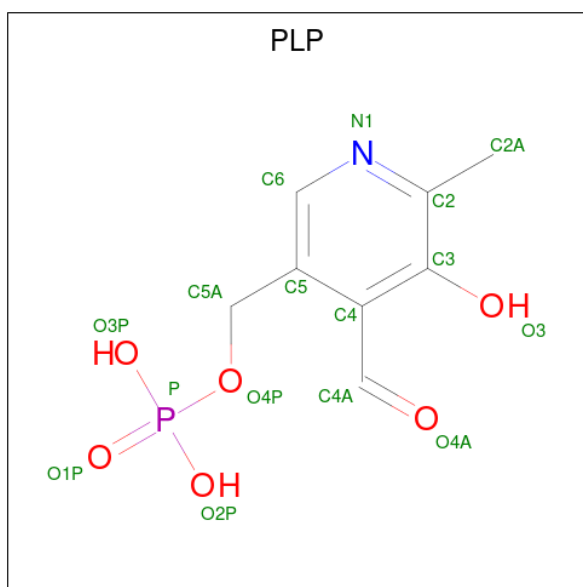
Chain	Residue	Modelled	Actual	Comment	Reference
A	-11	MSE	-	expression tag	UNP P74921
A	-10	GLY	-	expression tag	UNP P74921
A	-9	SER	-	expression tag	UNP P74921
A	-8	ASP	-	expression tag	UNP P74921
A	-7	LYS	-	expression tag	UNP P74921
A	-6	ILE	-	expression tag	UNP P74921
A	-5	HIS	-	expression tag	UNP P74921
A	-4	HIS	-	expression tag	UNP P74921
A	-3	HIS	-	expression tag	UNP P74921
A	-2	HIS	-	expression tag	UNP P74921
A	-1	HIS	-	expression tag	UNP P74921
A	0	HIS	-	expression tag	UNP P74921
A	1	VAL	-	SEE REMARK 999	UNP P74921
B	-11	MSE	-	expression tag	UNP P74921
B	-10	GLY	-	expression tag	UNP P74921
B	-9	SER	-	expression tag	UNP P74921
B	-8	ASP	-	expression tag	UNP P74921
B	-7	LYS	-	expression tag	UNP P74921
B	-6	ILE	-	expression tag	UNP P74921
B	-5	HIS	-	expression tag	UNP P74921
B	-4	HIS	-	expression tag	UNP P74921

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Chain	Residue	Modelled	Actual	Comment	Reference
B	-3	HIS	-	expression tag	UNP P74921
B	-2	HIS	-	expression tag	UNP P74921
B	-1	HIS	-	expression tag	UNP P74921
B	0	HIS	-	expression tag	UNP P74921
B	1	VAL	-	SEE REMARK 999	UNP P74921
C	-11	MSE	-	expression tag	UNP P74921
C	-10	GLY	-	expression tag	UNP P74921
C	-9	SER	-	expression tag	UNP P74921
C	-8	ASP	-	expression tag	UNP P74921
C	-7	LYS	-	expression tag	UNP P74921
C	-6	ILE	-	expression tag	UNP P74921
C	-5	HIS	-	expression tag	UNP P74921
C	-4	HIS	-	expression tag	UNP P74921
C	-3	HIS	-	expression tag	UNP P74921
C	-2	HIS	-	expression tag	UNP P74921
C	-1	HIS	-	expression tag	UNP P74921
C	0	HIS	-	expression tag	UNP P74921
C	1	VAL	-	SEE REMARK 999	UNP P74921
D	-11	MSE	-	expression tag	UNP P74921
D	-10	GLY	-	expression tag	UNP P74921
D	-9	SER	-	expression tag	UNP P74921
D	-8	ASP	-	expression tag	UNP P74921
D	-7	LYS	-	expression tag	UNP P74921
D	-6	ILE	-	expression tag	UNP P74921
D	-5	HIS	-	expression tag	UNP P74921
D	-4	HIS	-	expression tag	UNP P74921
D	-3	HIS	-	expression tag	UNP P74921
D	-2	HIS	-	expression tag	UNP P74921
D	-1	HIS	-	expression tag	UNP P74921
D	0	HIS	-	expression tag	UNP P74921
D	1	VAL	-	SEE REMARK 999	UNP P74921

- Molecule 2 is PYRIDOXAL-5'-PHOSPHATE (CCD ID: PLP) (formula: C₈H₁₀NO₆P).

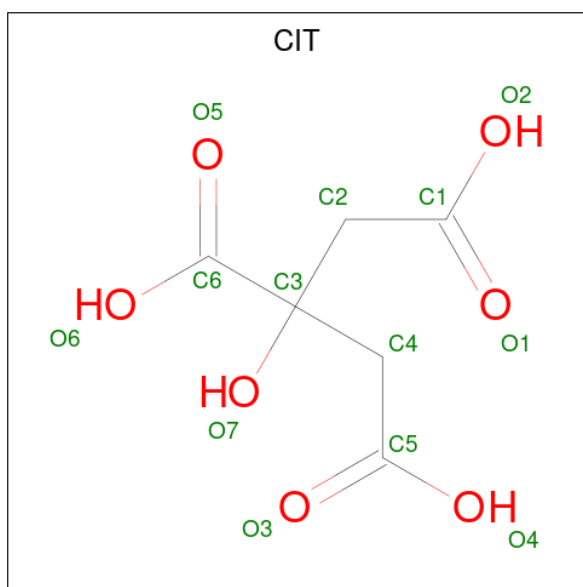


Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	N	O	P	0	0
			16	8	1	6	1		
2	C	1	Total	C	N	O	P	0	0
			16	8	1	6	1		

- Molecule 3 is UNKNOWN LIGAND (CCD ID: UNL) (formula:).

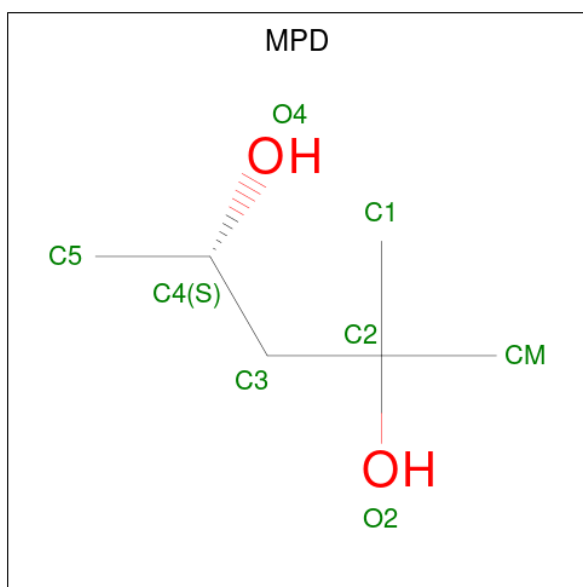
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	1	Total	O	0	0
			4	4		
3	B	1	Total	O	0	0
			2	2		
3	C	1	Total	O	0	0
			4	4		
3	D	1	Total	O	0	0
			6	6		

- Molecule 4 is CITRIC ACID (CCD ID: CIT) (formula: C₆H₈O₇).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	C	O	0	0
			13	6	7		
4	B	1	Total	C	O	0	0
			13	6	7		
4	D	1	Total	C	O	0	0
			13	6	7		

- Molecule 5 is (4S)-2-METHYL-2,4-PENTANEDIOL (CCD ID: MPD) (formula: C₆H₁₄O₂).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total	C	O	0	0
			8	6	2		

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

- Molecule 6 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	B	2	Total	Cl	0	0
			2	2		
6	C	1	Total	Cl	0	0
			1	1		
6	D	1	Total	Cl	0	0
			1	1		

- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	150	Total	O	0	0
			150	150		
7	B	139	Total	O	0	0
			139	139		
7	C	178	Total	O	0	0
			178	178		
7	D	154	Total	O	0	0
			154	154		

- Molecule 1: Putative branched-chain-amino-acid aminotransferase



E164	I191	S229	A230	P234	M256	L264	I273
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4 Data and refinement statistics

Property	Value	Source
Space group	I 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	107.71Å 129.76Å 298.69Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	29.75 – 2.15 29.75 – 2.15	Depositor EDS
% Data completeness (in resolution range)	98.6 (29.75-2.15) 98.6 (29.75-2.15)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.88 (at 2.16Å)	Xtriage
Refinement program	REFMAC 5.2.0019, PHENIX	Depositor
R, R_{free}	0.167 , 0.200 0.171 , 0.203	Depositor DCC
R_{free} test set	5612 reflections (4.95%)	wwPDB-VP
Wilson B-factor (Å ²)	35.9	Xtriage
Anisotropy	0.222	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 52.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	9636	wwPDB-VP
Average B, all atoms (Å ²)	39.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.05% 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: PLP, MPD, UNL, CIT, CL

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	0.75	0/2293	0.87	3/3114 (0.1%)
1	B	0.75	0/2314	0.87	1/3138 (0.0%)
1	C	0.87	1/2284 (0.0%)	0.91	4/3101 (0.1%)
1	D	0.83	1/2251 (0.0%)	0.91	4/3057 (0.1%)
All	All	0.80	2/9142 (0.0%)	0.89	12/12410 (0.1%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	D	256	MSE	SE-CE	-8.10	1.71	1.95
1	C	256	MSE	SE-CE	-5.37	1.79	1.95

All (12) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	91	PHE	CA-C-N	6.36	127.78	119.84
1	C	91	PHE	C-N-CA	6.36	127.78	119.84
1	C	0	HIS	N-CA-C	-6.29	103.70	112.25
1	B	8	LYS	N-CA-C	5.52	117.46	109.07
1	A	91	PHE	CA-C-N	5.50	125.78	119.83
1	A	91	PHE	C-N-CA	5.50	125.78	119.83
1	D	8	LYS	N-CA-C	5.32	117.16	109.07
1	D	17	LEU	N-CA-C	5.21	117.11	109.24
1	D	149[A]	ASP	N-CA-C	-5.20	102.41	109.54
1	D	149[B]	ASP	N-CA-C	-5.20	102.41	109.54
1	A	31	TYR	N-CA-C	5.10	116.83	109.07
1	C	91	PHE	N-CA-C	5.05	116.96	110.39

There are no chirality outliers.

There are no planarity outliers.

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	2222	0	2229	27	1
1	B	2246	0	2267	16	0
1	C	2216	0	2213	32	0
1	D	2186	0	2153	18	0
2	A	16	0	8	1	0
2	C	16	0	8	4	0
3	A	4	0	0	6	0
3	B	2	0	0	1	0
3	C	4	0	0	3	0
3	D	6	0	0	7	0
4	A	13	0	5	0	0
4	B	13	0	5	0	0
4	D	13	0	5	0	0
5	A	16	0	28	7	0
5	B	14	0	23	3	0
5	C	16	0	28	4	0
5	D	8	0	14	0	0
6	B	2	0	0	0	0
6	C	1	0	0	0	0
6	D	1	0	0	0	0
7	A	150	0	0	0	0
7	B	139	0	0	0	0
7	C	178	0	0	0	0
7	D	154	0	0	0	0
All	All	9636	0	8986	116	1

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 (116) 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)
5:A:303:MPD:H11	5:A:303:MPD:H52	1.08	1.06
3:C:301:UNL:O2	3:C:301:UNL:O3	1.77	1.03
5:A:303:MPD:H11	5:A:303:MPD:C5	1.92	0.99

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:D:275:UNL:O1	3:D:275:UNL:O4	1.81	0.98
1:A:33[B]:THR:HG21	3:A:301:UNL:O3	1.66	0.95
5:A:303:MPD:H52	5:A:303:MPD:C1	1.97	0.94
1:D:60:LEU:HD22	1:D:92:PRO:O	1.70	0.92
3:A:301:UNL:O1	3:A:301:UNL:O2	1.88	0.91
5:C:302:MPD:H52	5:C:302:MPD:H12	1.57	0.86
1:B:114[B]:GLU:OE2	1:B:236[B]:ARG:NH1	2.13	0.81
3:C:301:UNL:O3	3:C:301:UNL:O4	2.06	0.73
3:D:275:UNL:O2	3:D:275:UNL:O6	2.08	0.72
1:C:50[B]:ARG:HG3	1:C:53[B]:ARG:HH12	1.53	0.71
1:D:3:ILE:HG23	1:D:12:ALA:HB2	1.74	0.69
1:C:17:LEU:HD12	1:C:21:LEU:HD22	1.74	0.69
1:A:106:ILE:HD11	1:A:230:ALA:HB2	1.76	0.68
1:D:106:ILE:HD11	1:D:230:ALA:HB2	1.78	0.66
3:D:275:UNL:O6	3:D:275:UNL:O5	2.14	0.66
1:C:33[A]:THR:HG22	1:C:87:LYS:HG2	1.78	0.65
3:D:275:UNL:O1	3:D:275:UNL:O2	2.15	0.64
1:A:17:LEU:HD12	1:A:21:LEU:HD22	1.80	0.64
1:C:70:THR:O	1:C:74:LYS:HG3	1.98	0.64
1:C:50[B]:ARG:HG3	1:C:53[B]:ARG:NH1	2.13	0.63
5:C:303:MPD:O4	5:C:303:MPD:H11	1.97	0.63
1:B:47:HIS:CE1	1:B:191[B]:ILE:HD12	2.34	0.63
1:C:50[B]:ARG:CG	1:C:53[B]:ARG:NH1	2.63	0.62
1:C:133:LYS:NZ	2:C:300:PLP:H4A	2.13	0.62
3:A:301:UNL:O3	3:A:301:UNL:O1	2.18	0.61
1:C:50[B]:ARG:CG	1:C:53[B]:ARG:HH12	2.14	0.60
1:C:50[B]:ARG:HD2	1:C:191:ILE:HD11	1.83	0.60
1:D:47:HIS:CE1	1:D:191:ILE:HD12	2.37	0.60
1:C:56:ASP:C	1:C:58:PHE:H	2.10	0.60
1:C:17:LEU:HD12	1:C:21:LEU:CD2	2.32	0.59
3:A:301:UNL:O3	3:A:301:UNL:O4	2.21	0.59
3:C:301:UNL:O2	3:C:301:UNL:O4	2.20	0.59
1:D:106:ILE:HD12	1:D:107:PRO:HD2	1.83	0.59
1:A:33[B]:THR:CG2	3:A:301:UNL:O3	2.47	0.59
3:D:275:UNL:O6	3:D:275:UNL:O3	2.21	0.58
1:B:45:TYR:O	1:B:49:THR:HG23	2.03	0.58
1:B:5:TRP:CH2	1:B:96:GLU:HG2	2.39	0.57
1:D:104:LEU:HD11	1:D:229:SER:HB2	1.87	0.57
1:B:114[B]:GLU:CD	1:B:236[B]:ARG:NH1	2.63	0.56
1:D:17:LEU:HD13	1:D:22:PHE:HB2	1.86	0.56
1:D:60:LEU:CD2	1:D:92:PRO:O	2.51	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:133:LYS:HZ1	2:C:300:PLP:H4A	1.71	0.55
1:A:184:ASP:O	5:A:303:MPD:H51	2.07	0.55
1:C:30[B]:VAL:HG23	1:C:90:LEU:HB3	1.87	0.55
1:C:131:ALA:HA	1:C:188:LEU:HD12	1.88	0.54
1:B:47:HIS:ND1	1:B:191[B]:ILE:HD12	2.22	0.54
1:A:106:ILE:HD11	1:A:230:ALA:CB	2.37	0.54
1:A:30[B]:VAL:HG23	1:A:90:LEU:HB3	1.91	0.53
1:C:111:THR:O	1:C:111:THR:CG2	2.55	0.53
1:C:17:LEU:HD21	1:D:17:LEU:HD11	1.91	0.53
5:B:278:MPD:O2	5:B:278:MPD:H52	2.09	0.52
1:C:1:VAL:HG12	1:C:12:ALA:HB2	1.91	0.52
1:A:17:LEU:HD12	1:A:21:LEU:CD2	2.39	0.52
1:C:100:VAL:HG21	1:D:19:PHE:HZ	1.75	0.52
1:C:133:LYS:NZ	2:C:300:PLP:C4A	2.73	0.52
1:A:64:LEU:HD22	1:A:68:GLU:CB	2.41	0.51
5:A:303:MPD:H53	5:A:303:MPD:HM2	1.92	0.51
3:B:276:UNL:O1	3:B:276:UNL:O2	2.29	0.50
5:C:303:MPD:O4	5:C:303:MPD:C1	2.60	0.50
1:B:50:ARG:NH1	1:B:191[A]:ILE:HD13	2.27	0.49
1:A:66:PHE:O	1:A:70:THR:HG23	2.13	0.49
1:C:30[B]:VAL:CG2	1:C:90:LEU:HD23	2.44	0.48
1:C:50[B]:ARG:HG2	1:C:53[B]:ARG:NH1	2.29	0.48
1:A:133:LYS:NZ	2:A:300:PLP:H4A	2.28	0.47
1:A:106:ILE:HD12	1:A:107:PRO:HD2	1.96	0.47
1:A:30[A]:VAL:HG12	1:A:51:LEU:HD12	1.97	0.47
1:A:109:LEU:HD13	1:A:233:VAL:HG13	1.97	0.47
1:A:47:HIS:CE1	1:A:191:ILE:HD12	2.50	0.47
1:C:133:LYS:HZ1	2:C:300:PLP:C4A	2.29	0.46
1:A:56:ASP:C	1:A:58:PHE:H	2.22	0.46
1:A:9:PHE:C	1:A:10:ARG:HG3	2.41	0.46
5:C:302:MPD:H12	5:C:302:MPD:C5	2.37	0.46
1:B:59:ASN:HA	5:B:278:MPD:H13	1.97	0.46
1:B:114[B]:GLU:OE2	1:B:236[B]:ARG:CZ	2.63	0.46
1:C:30[B]:VAL:HG21	1:C:90:LEU:HD23	1.99	0.45
1:A:64:LEU:HD22	1:A:68:GLU:HB2	1.99	0.45
1:B:133:LYS:HG2	1:B:188:LEU:HD22	1.98	0.45
1:A:50[B]:ARG:HD2	1:A:191:ILE:HD11	1.99	0.45
1:A:64:LEU:HD22	1:A:68:GLU:HB3	1.99	0.44
1:C:56:ASP:C	1:C:58:PHE:N	2.72	0.44
1:D:45:TYR:O	1:D:49:THR:HG23	2.17	0.44
1:C:30[A]:VAL:HG13	1:C:54:SER:HB3	2.00	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:111:THR:O	1:C:111:THR:HG22	2.17	0.44
1:A:107:PRO:HG2	1:A:109:LEU:HD21	2.00	0.44
1:A:30[B]:VAL:CG2	1:A:90:LEU:HB3	2.47	0.44
1:C:30[B]:VAL:CG2	1:C:90:LEU:HB3	2.47	0.44
5:A:303:MPD:C5	5:A:303:MPD:C1	2.67	0.44
1:B:106:ILE:O	1:B:106:ILE:HG23	2.17	0.43
1:D:229:SER:OG	3:D:275:UNL:O4	2.33	0.43
1:C:91:PHE:HA	1:C:92:PRO:HD3	1.93	0.43
1:C:198:LYS:NZ	1:C:268:GLU:OE2	2.51	0.43
1:D:37:TYR:CG	1:D:264:LEU:HD21	2.54	0.42
1:C:107:PRO:HG2	1:C:109:LEU:HD21	2.00	0.42
1:D:17:LEU:CD1	1:D:22:PHE:HB2	2.50	0.42
1:B:52:LYS:HB2	1:B:62[A]:LEU:HD11	2.02	0.42
1:B:234:PRO:HG3	1:B:256:MSE:SE	2.70	0.42
1:A:56:ASP:C	1:A:58:PHE:N	2.77	0.42
1:A:24:LYS:HG3	1:A:92:PRO:HG2	2.01	0.41
1:A:45:TYR:O	1:A:49:THR:HG23	2.20	0.41
1:A:70:THR:O	1:A:74:LYS:HG3	2.19	0.41
3:D:275:UNL:O4	3:D:275:UNL:O6	2.39	0.41
1:D:119:ASN:HB2	1:D:146:GLU:OE2	2.20	0.41
3:A:301:UNL:O2	3:A:301:UNL:O4	2.38	0.41
1:B:3:ILE:HG23	1:B:12:ALA:HB2	2.03	0.41
5:A:304:MPD:HM3	5:A:304:MPD:H4	1.94	0.41
1:D:74:LYS:NZ	1:D:273:ILE:O	2.54	0.41
1:A:149:ASP:HB3	1:C:9:PHE:CD2	2.56	0.41
1:B:60:LEU:HD22	1:B:92:PRO:HA	2.02	0.40
1:D:3:ILE:CG2	1:D:12:ALA:HB2	2.48	0.40
5:B:278:MPD:O2	5:B:278:MPD:C5	2.69	0.40
1:B:60:LEU:HD11	1:B:95:GLY:HA2	2.02	0.40
1:C:133:LYS:HG3	1:C:188:LEU:HD11	2.04	0.40
1:D:234:PRO:HG3	1:D:256:MSE:SE	2.72	0.40

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:267:GLU:OE1	1:A:267:GLU:OE1[7_555]	2.09	0.11

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	279/285 (98%)	266 (95%)	12 (4%)	1 (0%)	30	26
1	B	280/285 (98%)	270 (96%)	10 (4%)	0	100	100
1	C	279/285 (98%)	267 (96%)	11 (4%)	1 (0%)	30	26
1	D	275/285 (96%)	262 (95%)	13 (5%)	0	100	100
All	All	1113/1140 (98%)	1065 (96%)	46 (4%)	2 (0%)	43	44

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	57	PHE
1	A	57	PHE

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	245/252 (97%)	242 (99%)	3 (1%)	63	70
1	B	248/252 (98%)	245 (99%)	3 (1%)	63	70
1	C	241/252 (96%)	234 (97%)	7 (3%)	37	39
1	D	237/252 (94%)	234 (99%)	3 (1%)	61	68
All	All	971/1008 (96%)	955 (98%)	16 (2%)	57	61

All (16) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	50[A]	ARG
1	A	50[B]	ARG
1	A	62	LEU
1	B	111	THR
1	B	164	GLU
1	B	194	GLU
1	C	3	ILE
1	C	15	ILE
1	C	50[A]	ARG
1	C	50[B]	ARG
1	C	96	GLU
1	C	111	THR
1	C	188	LEU
1	D	13	ASP
1	D	17	LEU
1	D	164	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	258	ASN
1	B	105	ASN
1	B	258	ASN
1	D	27	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

Of 20 ligands modelled in this entry, 4 are unknown and 4 are monoatomic - leaving 12 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
4	CIT	B	277	-	12,12,12	1.44	1 (8%)	17,17,17	1.79	2 (11%)
2	PLP	C	300	-	16,16,16	1.69	4 (25%)	20,23,23	1.17	1 (5%)
5	MPD	A	304	-	7,7,7	0.49	0	9,10,10	0.25	0
5	MPD	A	303	-	7,7,7	0.36	0	9,10,10	0.74	0
5	MPD	D	277	-	7,7,7	0.34	0	9,10,10	0.94	0
4	CIT	D	276	-	12,12,12	1.05	0	17,17,17	1.55	4 (23%)
5	MPD	C	302	-	7,7,7	0.37	0	9,10,10	0.43	0
5	MPD	B	278	-	7,7,7	0.49	0	9,10,10	0.83	0
5	MPD	B	279	-	5,5,7	0.36	0	4,7,10	0.49	0
5	MPD	C	303	-	7,7,7	0.33	0	9,10,10	0.47	0
4	CIT	A	302	-	12,12,12	1.16	1 (8%)	17,17,17	1.45	2 (11%)
2	PLP	A	300	-	16,16,16	1.29	2 (12%)	20,23,23	1.04	1 (5%)

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
4	CIT	B	277	-	-	0/16/16/16	-
2	PLP	C	300	-	-	2/8/8/8	0/1/1/1
5	MPD	A	304	-	-	2/5/5/5	-
5	MPD	A	303	-	-	4/5/5/5	-
5	MPD	D	277	-	-	4/5/5/5	-
4	CIT	D	276	-	-	1/16/16/16	-
5	MPD	C	302	-	-	1/5/5/5	-
5	MPD	B	278	-	-	0/5/5/5	-
5	MPD	B	279	-	-	1/3/3/5	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
5	MPD	C	303	-	-	1/5/5/5	-
4	CIT	A	302	-	-	0/16/16/16	-
2	PLP	A	300	-	-	2/8/8/8	0/1/1/1

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	300	PLP	C2-N1	3.30	1.39	1.33
2	A	300	PLP	C2-N1	3.20	1.39	1.33
4	B	277	CIT	C3-C6	2.95	1.56	1.53
2	C	300	PLP	C3-C2	2.90	1.44	1.41
2	C	300	PLP	C6-N1	2.72	1.40	1.34
2	C	300	PLP	C4-C4A	2.56	1.52	1.46
4	A	302	CIT	O2-C1	-2.31	1.23	1.30
2	A	300	PLP	C6-N1	2.03	1.38	1.34

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	B	277	CIT	O6-C6-C3	5.45	123.59	113.14
4	A	302	CIT	O6-C6-C3	3.87	120.56	113.14
4	D	276	CIT	O6-C6-C3	3.53	119.92	113.14
4	B	277	CIT	O6-C6-O5	-2.79	114.94	123.86
4	D	276	CIT	O1-C1-C2	-2.63	115.50	122.95
4	D	276	CIT	C4-C3-C2	-2.24	103.58	109.31
2	C	300	PLP	O3-C3-C2	2.21	122.16	117.58
4	A	302	CIT	O2-C1-O1	-2.20	117.67	123.33
2	A	300	PLP	O4A-C4A-C4	-2.01	120.04	124.80
4	D	276	CIT	O6-C6-O5	-2.01	117.44	123.86

There are no chirality outliers.

All (18) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	300	PLP	C3-C4-C4A-O4A
2	C	300	PLP	C3-C4-C4A-O4A
5	A	303	MPD	C2-C3-C4-O4
5	A	303	MPD	C2-C3-C4-C5
5	D	277	MPD	O2-C2-C3-C4
5	D	277	MPD	CM-C2-C3-C4
5	D	277	MPD	C2-C3-C4-C5

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Mol	Chain	Res	Type	Atoms
2	C	300	PLP	C5-C4-C4A-O4A
2	A	300	PLP	C5-C4-C4A-O4A
5	A	304	MPD	O2-C2-C3-C4
5	C	303	MPD	O2-C2-C3-C4
5	A	304	MPD	C2-C3-C4-C5
5	C	302	MPD	C2-C3-C4-C5
5	A	303	MPD	O2-C2-C3-C4
5	A	303	MPD	CM-C2-C3-C4
5	D	277	MPD	C1-C2-C3-C4
5	B	279	MPD	O2-C2-C3-C4
4	D	276	CIT	O1-C1-C2-C3

There are no ring outliers.

7 monomers are involved in 19 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	C	300	PLP	4	0
5	A	304	MPD	1	0
5	A	303	MPD	6	0
5	C	302	MPD	2	0
5	B	278	MPD	3	0
5	C	303	MPD	2	0
2	A	300	PLP	1	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	272/285 (95%)	0.53	16 (5%) 28 32	17, 34, 70, 84	7 (2%)
1	B	272/285 (95%)	0.14	5 (1%) 67 71	18, 37, 59, 78	8 (2%)
1	C	273/285 (95%)	0.05	20 (7%) 21 24	17, 34, 71, 85	6 (2%)
1	D	272/285 (95%)	0.16	14 (5%) 33 37	19, 37, 60, 78	3 (1%)
All	All	1089/1140 (95%)	0.22	55 (5%) 33 37	17, 35, 67, 85	24 (2%)

All (55) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	12	ALA	5.2
1	A	0	HIS	5.1
1	C	13	ASP	4.8
1	C	61	PRO	4.7
1	A	106	ILE	4.5
1	D	21	LEU	4.2
1	A	60	LEU	4.2
1	C	60	LEU	4.1
1	B	106	ILE	3.8
1	C	15	ILE	3.8
1	D	15	ILE	3.8
1	C	0	HIS	3.7
1	C	-1	HIS	3.4
1	D	5	TRP	3.4
1	C	92	PRO	3.4
1	A	61	PRO	3.2
1	C	109	LEU	3.2
1	C	12	ALA	3.1
1	C	149	ASP	3.1
1	C	62	LEU	3.0
1	A	57	PHE	3.0

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Mol	Chain	Res	Type	RSRZ
1	C	110	GLU	3.0
1	C	58	PHE	2.9
1	C	111	THR	2.8
1	D	63	SER	2.7
1	C	57	PHE	2.7
1	A	105	ASN	2.7
1	C	93	ASP	2.7
1	A	92	PRO	2.7
1	A	13	ASP	2.7
1	C	11	ARG	2.7
1	C	14	GLU	2.6
1	B	12	ALA	2.6
1	A	78	ASP	2.6
1	A	15	ILE	2.6
1	D	111	THR	2.6
1	D	16	SER	2.5
1	D	106	ILE	2.5
1	D	17	LEU	2.5
1	D	19	PHE	2.5
1	D	20	SER	2.4
1	D	0	HIS	2.4
1	A	64	LEU	2.3
1	A	158	LEU	2.3
1	D	105	ASN	2.3
1	B	13	ASP	2.3
1	D	92	PRO	2.2
1	A	245	GLU	2.2
1	D	18	ASP	2.1
1	A	82	GLN	2.1
1	C	107	PRO	2.1
1	B	273	ILE	2.1
1	A	111	THR	2.0
1	C	17	LEU	2.0
1	B	107	PRO	2.0

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

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
5	MPD	A	304	8/8	0.85	0.19	54,72,76,77	0
3	UNL	C	301	4/-	0.87	0.14	33,44,62,71	0
5	MPD	C	302	8/8	0.87	0.19	61,68,68,72	0
5	MPD	D	277	8/8	0.88	0.18	38,55,79,82	0
6	CL	B	275	1/1	0.88	0.20	70,70,70,70	0
5	MPD	C	303	8/8	0.90	0.15	39,50,57,61	0
4	CIT	B	277	13/13	0.90	0.12	30,53,61,64	0
5	MPD	A	303	8/8	0.90	0.14	49,53,59,61	0
6	CL	C	274	1/1	0.90	0.16	84,84,84,84	0
5	MPD	B	279	6/8	0.91	0.15	37,48,55,56	0
3	UNL	A	301	4/-	0.92	0.10	31,53,61,70	0
3	UNL	B	276	2/-	0.93	0.11	34,34,34,63	0
4	CIT	D	276	13/13	0.93	0.09	31,48,59,59	0
5	MPD	B	278	8/8	0.93	0.12	48,54,61,65	0
4	CIT	A	302	13/13	0.94	0.08	33,36,42,45	0
2	PLP	C	300	16/16	0.94	0.11	34,42,53,65	0
3	UNL	D	275	6/-	0.95	0.09	36,52,66,71	0
2	PLP	A	300	16/16	0.96	0.09	35,42,53,64	0
6	CL	D	274	1/1	0.96	0.14	48,48,48,48	0
6	CL	B	274	1/1	0.98	0.10	57,57,57,57	0

6.5 Other polymers [i](#)

There are no such residues in this entry.