



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 10, 2026 – 03:49 AM UTC

PDB ID : 6CTY / pdb_00006cty
Title : Crystal structure of dihydroorotase pyrC from Yersinia pestis in complex with zinc and malate at 2.4 Å resolution
Authors : Lipowska, J.; Shabalin, I.G.; Winsor, J.; Woinska, M.; Cooper, D.R.; Kwon, K.; Shuvalova, L.; Anderson, W.F.; Minor, W.; Center for Structural Genomics of Infectious Diseases (CSGID)
Deposited on : 2018-03-23
Resolution : 2.41 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

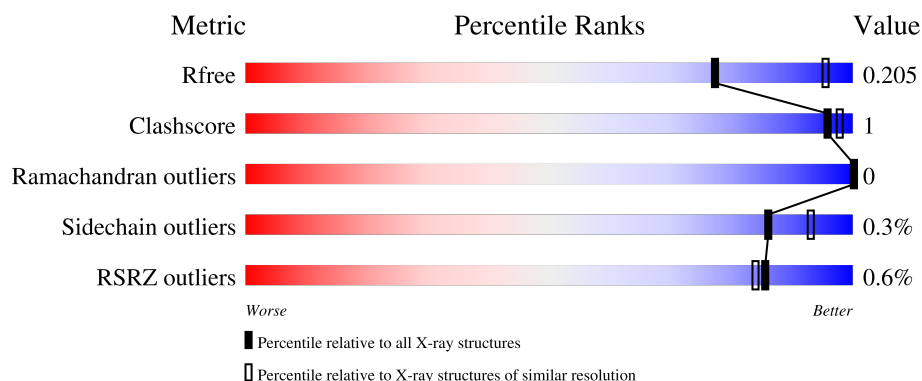
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

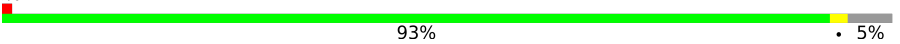
The reported resolution of this entry is 2.41 Å.

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	6062 (2.44-2.40)
Clashscore	190562	6562 (2.44-2.40)
Ramachandran outliers	187476	6481 (2.44-2.40)
Sidechain outliers	187428	6482 (2.44-2.40)
RSRZ outliers	180081	6066 (2.44-2.40)

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	372	 89% 7%
1	B	372	 88% 8%
1	C	372	 93% 5%
1	D	372	 90% 8%

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
1	E	372	2% 89% 8%
1	F	372	% 89% 8%

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 17234 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 Dihydroorotase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	345	Total	C	N	O	S	0	2	0
			2699	1725	471	491	12			
1	B	343	Total	C	N	O	S	0	0	0
			2668	1708	459	489	12			
1	C	353	Total	C	N	O	S	0	0	0
			2738	1752	471	502	13			
1	D	343	Total	C	N	O	S	0	2	0
			2681	1716	463	490	12			
1	E	341	Total	C	N	O	S	0	1	0
			2658	1703	460	483	12			
1	F	344	Total	C	N	O	S	0	0	0
			2669	1708	460	489	12			

There are 144 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-23	MET	-	expression tag	UNP Q8ZFU4
A	-22	HIS	-	expression tag	UNP Q8ZFU4
A	-21	HIS	-	expression tag	UNP Q8ZFU4
A	-20	HIS	-	expression tag	UNP Q8ZFU4
A	-19	HIS	-	expression tag	UNP Q8ZFU4
A	-18	HIS	-	expression tag	UNP Q8ZFU4
A	-17	HIS	-	expression tag	UNP Q8ZFU4
A	-16	SER	-	expression tag	UNP Q8ZFU4
A	-15	SER	-	expression tag	UNP Q8ZFU4
A	-14	GLY	-	expression tag	UNP Q8ZFU4
A	-13	VAL	-	expression tag	UNP Q8ZFU4
A	-12	ASP	-	expression tag	UNP Q8ZFU4
A	-11	LEU	-	expression tag	UNP Q8ZFU4
A	-10	GLY	-	expression tag	UNP Q8ZFU4
A	-9	THR	-	expression tag	UNP Q8ZFU4
A	-8	GLU	-	expression tag	UNP Q8ZFU4
A	-7	ASN	-	expression tag	UNP Q8ZFU4

Continued on next page...

Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
A	-6	LEU	-	expression tag	UNP Q8ZFU4
A	-5	TYR	-	expression tag	UNP Q8ZFU4
A	-4	PHE	-	expression tag	UNP Q8ZFU4
A	-3	GLN	-	expression tag	UNP Q8ZFU4
A	-2	SER	-	expression tag	UNP Q8ZFU4
A	-1	ASN	-	expression tag	UNP Q8ZFU4
A	0	ALA	-	expression tag	UNP Q8ZFU4
B	-23	MET	-	expression tag	UNP Q8ZFU4
B	-22	HIS	-	expression tag	UNP Q8ZFU4
B	-21	HIS	-	expression tag	UNP Q8ZFU4
B	-20	HIS	-	expression tag	UNP Q8ZFU4
B	-19	HIS	-	expression tag	UNP Q8ZFU4
B	-18	HIS	-	expression tag	UNP Q8ZFU4
B	-17	HIS	-	expression tag	UNP Q8ZFU4
B	-16	SER	-	expression tag	UNP Q8ZFU4
B	-15	SER	-	expression tag	UNP Q8ZFU4
B	-14	GLY	-	expression tag	UNP Q8ZFU4
B	-13	VAL	-	expression tag	UNP Q8ZFU4
B	-12	ASP	-	expression tag	UNP Q8ZFU4
B	-11	LEU	-	expression tag	UNP Q8ZFU4
B	-10	GLY	-	expression tag	UNP Q8ZFU4
B	-9	THR	-	expression tag	UNP Q8ZFU4
B	-8	GLU	-	expression tag	UNP Q8ZFU4
B	-7	ASN	-	expression tag	UNP Q8ZFU4
B	-6	LEU	-	expression tag	UNP Q8ZFU4
B	-5	TYR	-	expression tag	UNP Q8ZFU4
B	-4	PHE	-	expression tag	UNP Q8ZFU4
B	-3	GLN	-	expression tag	UNP Q8ZFU4
B	-2	SER	-	expression tag	UNP Q8ZFU4
B	-1	ASN	-	expression tag	UNP Q8ZFU4
B	0	ALA	-	expression tag	UNP Q8ZFU4
C	-23	MET	-	expression tag	UNP Q8ZFU4
C	-22	HIS	-	expression tag	UNP Q8ZFU4
C	-21	HIS	-	expression tag	UNP Q8ZFU4
C	-20	HIS	-	expression tag	UNP Q8ZFU4
C	-19	HIS	-	expression tag	UNP Q8ZFU4
C	-18	HIS	-	expression tag	UNP Q8ZFU4
C	-17	HIS	-	expression tag	UNP Q8ZFU4
C	-16	SER	-	expression tag	UNP Q8ZFU4
C	-15	SER	-	expression tag	UNP Q8ZFU4
C	-14	GLY	-	expression tag	UNP Q8ZFU4
C	-13	VAL	-	expression tag	UNP Q8ZFU4

Continued on next page...

Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
C	-12	ASP	-	expression tag	UNP Q8ZFU4
C	-11	LEU	-	expression tag	UNP Q8ZFU4
C	-10	GLY	-	expression tag	UNP Q8ZFU4
C	-9	THR	-	expression tag	UNP Q8ZFU4
C	-8	GLU	-	expression tag	UNP Q8ZFU4
C	-7	ASN	-	expression tag	UNP Q8ZFU4
C	-6	LEU	-	expression tag	UNP Q8ZFU4
C	-5	TYR	-	expression tag	UNP Q8ZFU4
C	-4	PHE	-	expression tag	UNP Q8ZFU4
C	-3	GLN	-	expression tag	UNP Q8ZFU4
C	-2	SER	-	expression tag	UNP Q8ZFU4
C	-1	ASN	-	expression tag	UNP Q8ZFU4
C	0	ALA	-	expression tag	UNP Q8ZFU4
D	-23	MET	-	expression tag	UNP Q8ZFU4
D	-22	HIS	-	expression tag	UNP Q8ZFU4
D	-21	HIS	-	expression tag	UNP Q8ZFU4
D	-20	HIS	-	expression tag	UNP Q8ZFU4
D	-19	HIS	-	expression tag	UNP Q8ZFU4
D	-18	HIS	-	expression tag	UNP Q8ZFU4
D	-17	HIS	-	expression tag	UNP Q8ZFU4
D	-16	SER	-	expression tag	UNP Q8ZFU4
D	-15	SER	-	expression tag	UNP Q8ZFU4
D	-14	GLY	-	expression tag	UNP Q8ZFU4
D	-13	VAL	-	expression tag	UNP Q8ZFU4
D	-12	ASP	-	expression tag	UNP Q8ZFU4
D	-11	LEU	-	expression tag	UNP Q8ZFU4
D	-10	GLY	-	expression tag	UNP Q8ZFU4
D	-9	THR	-	expression tag	UNP Q8ZFU4
D	-8	GLU	-	expression tag	UNP Q8ZFU4
D	-7	ASN	-	expression tag	UNP Q8ZFU4
D	-6	LEU	-	expression tag	UNP Q8ZFU4
D	-5	TYR	-	expression tag	UNP Q8ZFU4
D	-4	PHE	-	expression tag	UNP Q8ZFU4
D	-3	GLN	-	expression tag	UNP Q8ZFU4
D	-2	SER	-	expression tag	UNP Q8ZFU4
D	-1	ASN	-	expression tag	UNP Q8ZFU4
D	0	ALA	-	expression tag	UNP Q8ZFU4
E	-23	MET	-	expression tag	UNP Q8ZFU4
E	-22	HIS	-	expression tag	UNP Q8ZFU4
E	-21	HIS	-	expression tag	UNP Q8ZFU4
E	-20	HIS	-	expression tag	UNP Q8ZFU4
E	-19	HIS	-	expression tag	UNP Q8ZFU4

Continued on next page...

Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
E	-18	HIS	-	expression tag	UNP Q8ZFU4
E	-17	HIS	-	expression tag	UNP Q8ZFU4
E	-16	SER	-	expression tag	UNP Q8ZFU4
E	-15	SER	-	expression tag	UNP Q8ZFU4
E	-14	GLY	-	expression tag	UNP Q8ZFU4
E	-13	VAL	-	expression tag	UNP Q8ZFU4
E	-12	ASP	-	expression tag	UNP Q8ZFU4
E	-11	LEU	-	expression tag	UNP Q8ZFU4
E	-10	GLY	-	expression tag	UNP Q8ZFU4
E	-9	THR	-	expression tag	UNP Q8ZFU4
E	-8	GLU	-	expression tag	UNP Q8ZFU4
E	-7	ASN	-	expression tag	UNP Q8ZFU4
E	-6	LEU	-	expression tag	UNP Q8ZFU4
E	-5	TYR	-	expression tag	UNP Q8ZFU4
E	-4	PHE	-	expression tag	UNP Q8ZFU4
E	-3	GLN	-	expression tag	UNP Q8ZFU4
E	-2	SER	-	expression tag	UNP Q8ZFU4
E	-1	ASN	-	expression tag	UNP Q8ZFU4
E	0	ALA	-	expression tag	UNP Q8ZFU4
F	-23	MET	-	expression tag	UNP Q8ZFU4
F	-22	HIS	-	expression tag	UNP Q8ZFU4
F	-21	HIS	-	expression tag	UNP Q8ZFU4
F	-20	HIS	-	expression tag	UNP Q8ZFU4
F	-19	HIS	-	expression tag	UNP Q8ZFU4
F	-18	HIS	-	expression tag	UNP Q8ZFU4
F	-17	HIS	-	expression tag	UNP Q8ZFU4
F	-16	SER	-	expression tag	UNP Q8ZFU4
F	-15	SER	-	expression tag	UNP Q8ZFU4
F	-14	GLY	-	expression tag	UNP Q8ZFU4
F	-13	VAL	-	expression tag	UNP Q8ZFU4
F	-12	ASP	-	expression tag	UNP Q8ZFU4
F	-11	LEU	-	expression tag	UNP Q8ZFU4
F	-10	GLY	-	expression tag	UNP Q8ZFU4
F	-9	THR	-	expression tag	UNP Q8ZFU4
F	-8	GLU	-	expression tag	UNP Q8ZFU4
F	-7	ASN	-	expression tag	UNP Q8ZFU4
F	-6	LEU	-	expression tag	UNP Q8ZFU4
F	-5	TYR	-	expression tag	UNP Q8ZFU4
F	-4	PHE	-	expression tag	UNP Q8ZFU4
F	-3	GLN	-	expression tag	UNP Q8ZFU4
F	-2	SER	-	expression tag	UNP Q8ZFU4
F	-1	ASN	-	expression tag	UNP Q8ZFU4

Continued on next page...

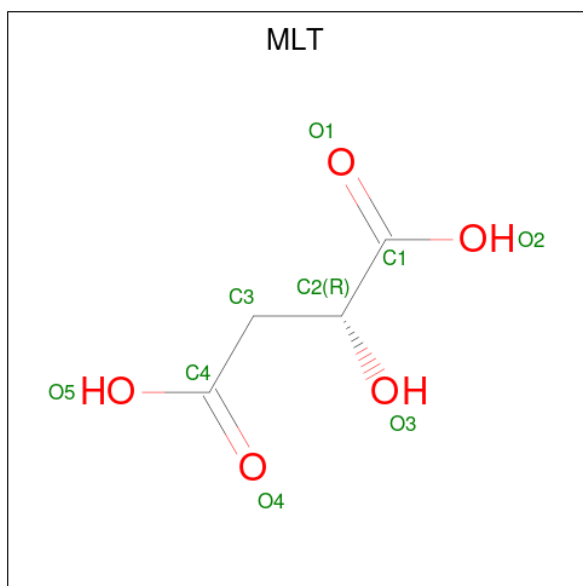
Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
F	0	ALA	-	expression tag	UNP Q8ZFU4

- Molecule 2 is ZINC ION (CCD ID: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	2	Total	Zn	0	0
			2	2		
2	B	2	Total	Zn	0	0
			2	2		
2	C	2	Total	Zn	0	0
			2	2		
2	D	2	Total	Zn	0	0
			2	2		
2	E	2	Total	Zn	0	0
			2	2		
2	F	2	Total	Zn	0	0
			2	2		

- Molecule 3 is D-MALATE (CCD ID: MLT) (formula: C₄H₆O₅).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			9	4	5		
3	B	1	Total	C	O	0	0
			9	4	5		
3	C	1	Total	C	O	0	0
			9	4	5		

Continued on next page...

Continued from previous page...

Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	D	1	Total	C	O	0	0
			9	4	5		
3	F	1	Total	C	O	0	0
			9	4	5		

- Molecule 4 is water.

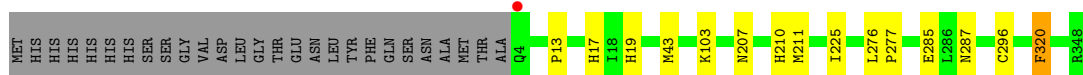
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	175	Total	O	0	0
			175	175		
4	B	151	Total	O	0	0
			151	151		
4	C	140	Total	O	0	0
			140	140		
4	D	205	Total	O	0	0
			205	205		
4	E	194	Total	O	0	0
			194	194		
4	F	199	Total	O	0	0
			199	199		

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.

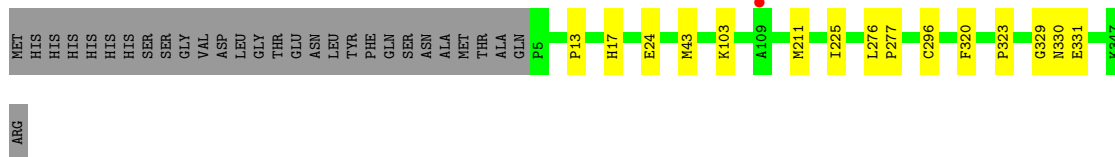
- Molecule 1: Dihydroorotase

Chain A: 

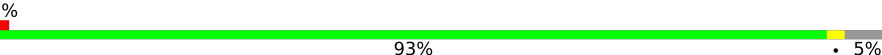


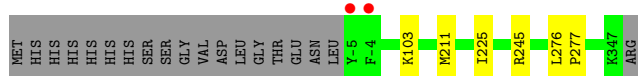
- Molecule 1: Dihydroorotase

Chain B: 



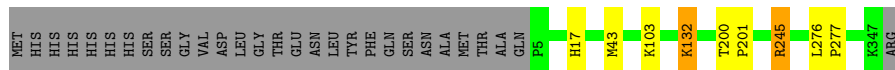
- Molecule 1: Dihydroorotase

Chain C: 



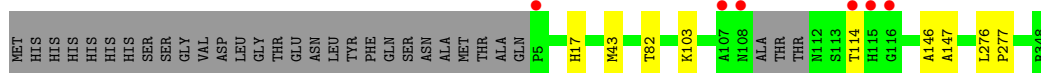
- Molecule 1: Dihydroorotase

Chain D: 

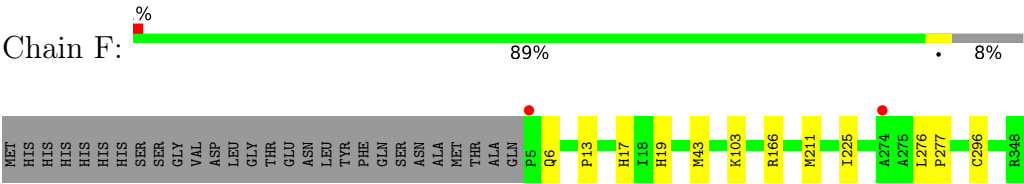


- Molecule 1: Dihydroorotase

Chain E: 



● Molecule 1: Dihydroorotase



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	95.84Å 112.20Å 208.26Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	50.01 – 2.41 50.01 – 2.41	Depositor EDS
% Data completeness (in resolution range)	88.8 (50.01-2.41) 89.0 (50.01-2.41)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	0.09	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.42 (at 2.39Å)	Xtriage
Refinement program	REFMAC 5.8.0158	Depositor
R, R_{free}	0.159 , 0.198 0.165 , 0.205	Depositor DCC
R_{free} test set	3921 reflections (4.47%)	wwPDB-VP
Wilson B-factor (Å ²)	36.8	Xtriage
Anisotropy	0.122	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 41.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	17234	wwPDB-VP
Average B, all atoms (Å ²)	44.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.47% 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: ZN, CSX, MLT, KCX

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	0.53	0/2742	0.74	1/3736 (0.0%)
1	B	0.52	0/2708	0.73	0/3691
1	C	0.49	0/2780	0.73	0/3791
1	D	0.49	0/2727	0.71	0/3717
1	E	0.54	0/2700	0.74	0/3675
1	F	0.49	0/2709	0.72	0/3692
All	All	0.51	0/16366	0.73	1/22302 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	320	PHE	CB-CA-C	5.28	117.72	110.34

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	2699	0	2662	14	0
1	B	2668	0	2628	15	0
1	C	2738	0	2687	2	0
1	D	2681	0	2647	5	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	E	2658	0	2622	5	0
1	F	2669	0	2624	6	0
2	A	2	0	0	0	0
2	B	2	0	0	0	0
2	C	2	0	0	0	0
2	D	2	0	0	0	0
2	E	2	0	0	0	0
2	F	2	0	0	0	0
3	A	9	0	4	1	0
3	B	9	0	4	0	0
3	C	9	0	4	0	0
3	D	9	0	4	0	0
3	F	9	0	4	1	0
4	A	175	0	0	0	0
4	B	151	0	0	0	0
4	C	140	0	0	0	0
4	D	205	0	0	1	0
4	E	194	0	0	0	0
4	F	199	0	0	1	0
All	All	17234	0	15890	36	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 1.

All (36) 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:210:HIS:CE1	1:B:329:GLY:O	2.34	0.80
1:A:210:HIS:CD2	1:B:330:ASN:HA	2.28	0.69
1:A:285:GLU:HA	1:B:323:PRO:HB3	1.74	0.68
1:B:24:GLU:HB2	1:E:147:ALA:O	2.01	0.61
1:A:210:HIS:NE2	1:B:330:ASN:HA	2.23	0.53
1:A:210:HIS:NE2	1:B:329:GLY:O	2.42	0.52
1:A:285:GLU:HA	1:B:323:PRO:CB	2.40	0.52
1:E:82:THR:HG21	1:E:114:THR:O	2.11	0.50
1:A:207:ASN:HD21	1:B:329:GLY:HA2	1.80	0.46
1:D:132:LYS:HB2	1:D:132:LYS:HE2	1.78	0.46
1:E:17:HIS:CE1	1:E:43:MET:HE3	2.51	0.46
1:D:276:LEU:HB3	1:D:277:PRO:HD3	1.99	0.45
1:E:276:LEU:HB3	1:E:277:PRO:HD3	1.99	0.44
1:A:276:LEU:HB3	1:A:277:PRO:HD3	2.00	0.44

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:276:LEU:HB3	1:B:277:PRO:HD3	2.00	0.44
1:A:13:PRO:HB3	1:A:296:CYS:HB3	1.99	0.43
1:F:13:PRO:HB3	1:F:296:CYS:HB3	2.00	0.43
1:C:276:LEU:HB3	1:C:277:PRO:HD3	2.01	0.43
1:A:285:GLU:HA	1:B:323:PRO:HG3	2.01	0.43
1:B:13:PRO:HB3	1:B:296:CYS:HB3	1.99	0.42
1:F:276:LEU:HB3	1:F:277:PRO:HD3	2.00	0.42
1:B:17:HIS:CE1	1:B:43:MET:HE3	2.55	0.42
1:A:19:HIS:NE2	3:A:403:MLT:H32	2.34	0.42
1:B:331:GLU:CD	1:E:146:ALA:HB2	2.44	0.42
1:F:19:HIS:NE2	3:F:403:MLT:H32	2.35	0.42
1:C:211:MET:HE1	1:C:225:ILE:HD11	2.01	0.42
1:A:211:MET:HE1	1:A:225:ILE:HD11	2.02	0.42
1:A:287:ASN:OD1	1:B:320:PHE:CE1	2.73	0.41
1:F:211:MET:HE1	1:F:225:ILE:HD11	2.01	0.41
1:D:245:ARG:HD2	4:D:646:HOH:O	2.20	0.41
1:B:211:MET:HE1	1:B:225:ILE:HD11	2.03	0.41
1:D:17:HIS:CE1	1:D:43:MET:HE3	2.56	0.41
1:A:17:HIS:CE1	1:A:43:MET:HE3	2.57	0.40
1:F:17:HIS:CE1	1:F:43:MET:HE3	2.57	0.40
1:D:200:THR:HB	1:D:201:PRO:HD2	2.03	0.40
1:F:166:ARG:NH1	4:F:509:HOH:O	2.49	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	342/372 (92%)	332 (97%)	10 (3%)	0	100	100
1	B	338/372 (91%)	328 (97%)	10 (3%)	0	100	100
1	C	348/372 (94%)	337 (97%)	11 (3%)	0	100	100

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	D	340/372 (91%)	330 (97%)	10 (3%)	0	100	100
1	E	335/372 (90%)	326 (97%)	9 (3%)	0	100	100
1	F	339/372 (91%)	329 (97%)	10 (3%)	0	100	100
All	All	2042/2232 (92%)	1982 (97%)	60 (3%)	0	100	100

There are no Ramachandran outliers to report.

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	282/309 (91%)	281 (100%)	1 (0%)	84	92
1	B	280/309 (91%)	280 (100%)	0	100	100
1	C	286/309 (93%)	285 (100%)	1 (0%)	86	93
1	D	282/309 (91%)	280 (99%)	2 (1%)	76	87
1	E	278/309 (90%)	278 (100%)	0	100	100
1	F	279/309 (90%)	278 (100%)	1 (0%)	84	92
All	All	1687/1854 (91%)	1682 (100%)	5 (0%)	86	93

All (5) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	320	PHE
1	C	245	ARG
1	D	132	LYS
1	D	245	ARG
1	F	6	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (9) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	96	GLN
1	B	96	GLN
1	D	96	GLN
1	D	299	ASN
1	E	96	GLN
1	E	112	ASN
1	E	233	GLN
1	F	96	GLN
1	F	299	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

18 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	KCX	E	103	2,1	10,11,12	2.77	1 (10%)	6,12,14	0.72	0
1	CSX	D	266	1	3,6,7	0.70	0	1,6,8	0.71	0
1	CSX	F	264	1	3,6,7	0.70	0	1,6,8	0.90	0
1	CSX	E	264	1	3,6,7	0.46	0	1,6,8	0.95	0
1	CSX	E	266	1	3,6,7	0.67	0	1,6,8	0.72	0
1	CSX	B	266	1	3,6,7	0.73	0	1,6,8	1.01	0
1	CSX	A	266	1	3,6,7	0.65	0	1,6,8	0.83	0
1	CSX	C	264	1	3,6,7	0.43	0	1,6,8	0.89	0
1	CSX	B	264	1	3,6,7	0.47	0	1,6,8	0.92	0
1	KCX	A	103	2,1	10,11,12	2.29	1 (10%)	6,12,14	0.65	0
1	KCX	F	103	2,1	10,11,12	0.53	0	6,12,14	1.12	1 (16%)
1	KCX	D	103	2,1	10,11,12	0.48	0	6,12,14	1.30	1 (16%)
1	CSX	D	264	1	3,6,7	0.57	0	1,6,8	0.76	0
1	CSX	A	264	1	3,6,7	0.59	0	1,6,8	1.07	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
1	CSX	C	266	1	3,6,7	0.64	0	1,6,8	0.37	0
1	KCX	C	103	2,1	10,11,12	1.91	1 (10%)	6,12,14	2.05	1 (16%)
1	KCX	B	103	2,1	10,11,12	0.64	0	6,12,14	1.07	1 (16%)
1	CSX	F	266	1	3,6,7	0.65	0	1,6,8	0.56	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	KCX	E	103	2,1	-	0/9/10/12	-
1	CSX	D	266	1	-	0/2/5/7	-
1	CSX	F	264	1	-	0/2/5/7	-
1	CSX	E	264	1	-	0/2/5/7	-
1	CSX	E	266	1	-	0/2/5/7	-
1	CSX	B	266	1	-	0/2/5/7	-
1	CSX	A	266	1	-	0/2/5/7	-
1	CSX	C	264	1	-	0/2/5/7	-
1	CSX	B	264	1	-	0/2/5/7	-
1	KCX	A	103	2,1	-	0/9/10/12	-
1	KCX	F	103	2,1	-	0/9/10/12	-
1	KCX	D	103	2,1	-	0/9/10/12	-
1	CSX	D	264	1	-	0/2/5/7	-
1	CSX	A	264	1	-	0/2/5/7	-
1	CSX	C	266	1	-	0/2/5/7	-
1	KCX	C	103	2,1	-	0/9/10/12	-
1	KCX	B	103	2,1	-	0/9/10/12	-
1	CSX	F	266	1	-	0/2/5/7	-

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	E	103	KCX	OQ1-CX	8.45	1.37	1.21
1	A	103	KCX	OQ1-CX	6.88	1.34	1.21
1	C	103	KCX	OQ1-CX	5.64	1.32	1.21

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	103	KCX	OQ1-CX-NZ	-4.85	117.56	124.92
1	D	103	KCX	OQ1-CX-NZ	-2.95	120.44	124.92

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	F	103	KCX	OQ1-CX-NZ	-2.45	121.19	124.92
1	B	103	KCX	OQ1-CX-NZ	-2.38	121.30	124.92

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 17 ligands modelled in this entry, 12 are monoatomic - leaving 5 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	MLT	F	403	2	8,8,8	1.17	0	10,10,10	1.53	2 (20%)
3	MLT	C	403	2	8,8,8	0.98	0	10,10,10	1.48	1 (10%)
3	MLT	B	403	2	8,8,8	1.01	0	10,10,10	1.39	1 (10%)
3	MLT	A	403	2	8,8,8	1.13	0	10,10,10	1.42	1 (10%)
3	MLT	D	403	2	8,8,8	1.18	0	10,10,10	1.52	2 (20%)

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	MLT	F	403	2	-	8/8/8/8	-

Continued on next page...

Continued from previous page...

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	MLT	C	403	2	-	4/8/8/8	-
3	MLT	B	403	2	-	2/8/8/8	-
3	MLT	A	403	2	-	1/8/8/8	-
3	MLT	D	403	2	-	2/8/8/8	-

There are no bond length outliers.

All (7) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	F	403	MLT	O2-C1-C2	3.39	119.92	112.74
3	D	403	MLT	O2-C1-C2	3.19	119.48	112.74
3	A	403	MLT	O2-C1-C2	3.06	119.21	112.74
3	C	403	MLT	O2-C1-C2	2.86	118.78	112.74
3	B	403	MLT	O2-C1-C2	2.75	118.55	112.74
3	F	403	MLT	O1-C1-C2	-2.26	118.09	122.60
3	D	403	MLT	C2-C3-C4	2.12	117.62	112.08

There are no chirality outliers.

All (17) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	C	403	MLT	O2-C1-C2-C3
3	B	403	MLT	O3-C2-C3-C4
3	F	403	MLT	O3-C2-C3-C4
3	B	403	MLT	C1-C2-C3-C4
3	F	403	MLT	C1-C2-C3-C4
3	C	403	MLT	O1-C1-C2-C3
3	F	403	MLT	O1-C1-C2-C3
3	F	403	MLT	O2-C1-C2-C3
3	D	403	MLT	C2-C3-C4-O4
3	F	403	MLT	C2-C3-C4-O5
3	D	403	MLT	C2-C3-C4-O5
3	F	403	MLT	C2-C3-C4-O4
3	A	403	MLT	C1-C2-C3-C4
3	C	403	MLT	O1-C1-C2-O3
3	C	403	MLT	O2-C1-C2-O3
3	F	403	MLT	O2-C1-C2-O3
3	F	403	MLT	O1-C1-C2-O3

There are no ring outliers.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	F	403	MLT	1	0
3	A	403	MLT	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 [i](#)

6.1 Protein, DNA and RNA chains [i](#)

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	342/372 (91%)	-0.38	1 (0%) 90 88	26, 40, 66, 101	2 (0%)
1	B	340/372 (91%)	-0.29	1 (0%) 90 88	24, 42, 76, 106	0
1	C	350/372 (94%)	-0.21	2 (0%) 85 84	29, 50, 78, 104	0
1	D	340/372 (91%)	-0.49	0 100 100	22, 37, 64, 102	2 (0%)
1	E	338/372 (90%)	-0.28	6 (1%) 67 64	25, 40, 80, 122	1 (0%)
1	F	341/372 (91%)	-0.52	2 (0%) 85 84	23, 34, 64, 119	0
All	All	2051/2232 (91%)	-0.36	12 (0%) 85 84	22, 40, 74, 122	5 (0%)

All (12) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	E	107	ALA	3.9
1	C	-5	TYR	3.7
1	E	108	ASN	3.2
1	B	109	ALA	3.2
1	E	5	PRO	3.2
1	C	-4	PHE	3.0
1	E	114	THR	2.8
1	F	274	ALA	2.7
1	E	116	GLY	2.6
1	F	5	PRO	2.5
1	A	4	GLN	2.5
1	E	115	HIS	2.2

6.2 Non-standard residues in protein, DNA, RNA chains [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
1	KCX	E	103	12/13	0.90	0.11	35,42,81,95	0
1	KCX	B	103	12/13	0.91	0.12	39,47,62,68	0
1	KCX	A	103	12/13	0.92	0.09	30,32,37,40	0
1	CSX	C	266	7/8	0.93	0.07	36,38,50,52	0
1	CSX	A	266	7/8	0.93	0.07	28,33,40,42	0
1	KCX	C	103	12/13	0.94	0.08	34,40,46,47	0
1	CSX	E	266	7/8	0.94	0.07	30,31,38,45	0
1	CSX	E	264	7/8	0.95	0.06	34,37,52,55	0
1	CSX	C	264	7/8	0.95	0.06	36,38,47,55	0
1	CSX	B	264	7/8	0.96	0.06	29,31,41,50	0
1	KCX	D	103	12/13	0.96	0.07	27,29,42,43	0
1	CSX	D	264	7/8	0.96	0.05	36,37,46,49	0
1	KCX	F	103	12/13	0.96	0.06	24,28,42,46	0
1	CSX	F	266	7/8	0.96	0.05	27,29,36,39	0
1	CSX	D	266	7/8	0.97	0.05	32,32,43,43	0
1	CSX	B	266	7/8	0.97	0.06	28,29,38,41	0
1	CSX	A	264	7/8	0.97	0.06	32,37,40,42	0
1	CSX	F	264	7/8	0.98	0.04	29,30,35,38	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
3	MLT	A	403	9/9	0.93	0.10	30,39,45,48	0
3	MLT	B	403	9/9	0.95	0.07	43,59,87,109	0
3	MLT	D	403	9/9	0.95	0.08	32,41,50,60	0
3	MLT	C	403	9/9	0.96	0.06	41,48,59,59	0
2	ZN	E	402	1/1	0.96	0.11	133,133,133,133	0
3	MLT	F	403	9/9	0.96	0.07	34,43,48,48	0
2	ZN	B	401	1/1	0.98	0.12	72,72,72,72	0
2	ZN	E	401	1/1	0.98	0.15	74,74,74,74	0
2	ZN	F	402	1/1	0.99	0.06	48,48,48,48	0

Continued on next page...

Continued from previous page...

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	ZN	C	401	1/1	0.99	0.05	49,49,49,49	0
2	ZN	F	401	1/1	1.00	0.04	39,39,39,39	0
2	ZN	A	402	1/1	1.00	0.07	46,46,46,46	0
2	ZN	C	402	1/1	1.00	0.06	60,60,60,60	0
2	ZN	D	401	1/1	1.00	0.06	48,48,48,48	0
2	ZN	D	402	1/1	1.00	0.04	42,42,42,42	0
2	ZN	A	401	1/1	1.00	0.06	45,45,45,45	0
2	ZN	B	402	1/1	1.00	0.09	55,55,55,55	0

6.5 Other polymers [i](#)

There are no such residues in this entry.