



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 10, 2026 – 01:16 AM UTC

PDB ID : 2P82 / pdb_00002p82
Title : Cysteine protease ATG4A
Authors : Walker, J.R.; Davis, T.; Mujib, S.; Butler-Cole, C.; Finerty Jr., P.J.; Weigelt, J.; Sundstrom, M.; Arrowsmith, C.H.; Edwards, A.M.; Bochkarev, A.; Dhe-Paganon, S.; Structural Genomics Consortium (SGC)
Deposited on : 2007-03-21
Resolution : 2.10 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

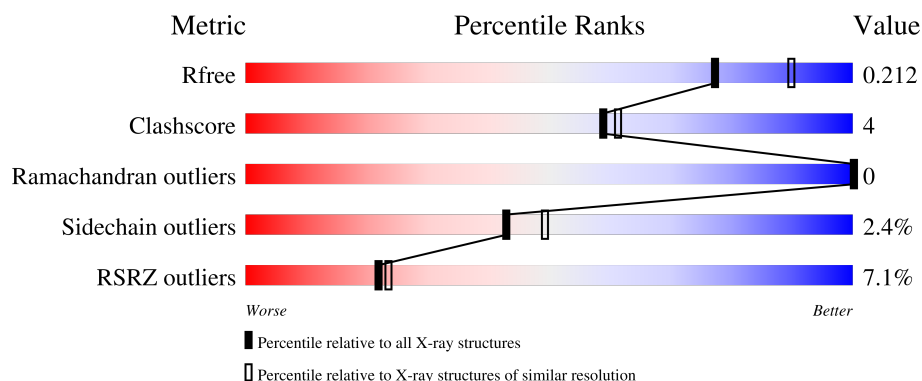
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.10 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	6658 (2.10-2.10)
Clashscore	190562	7164 (2.10-2.10)
Ramachandran outliers	187476	7099 (2.10-2.10)
Sidechain outliers	187428	7100 (2.10-2.10)
RSRZ outliers	180081	6662 (2.10-2.10)

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	355	<div> <div>5%</div> <div> <div></div> <div>77%</div> <div>9%</div> <div>•</div> <div>12%</div> </div> </div>
1	B	355	<div> <div>9%</div> <div> <div></div> <div>76%</div> <div>12%</div> <div></div> <div>12%</div> </div> </div>
1	C	355	<div> <div>7%</div> <div> <div></div> <div>80%</div> <div>6%</div> <div>•</div> <div>14%</div> </div> </div>
1	D	355	<div> <div>4%</div> <div> <div></div> <div>74%</div> <div>10%</div> <div></div> <div>15%</div> </div> </div>

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 10944 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 Cysteine protease ATG4A.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	312	Total	C	N	O	S	0	3	0
			2529	1625	428	452	24			
1	B	312	Total	C	N	O	S	0	3	0
			2524	1618	427	457	22			
1	C	307	Total	C	N	O	S	0	3	0
			2492	1600	423	448	21			
1	D	301	Total	C	N	O	S	0	3	0
			2437	1568	412	435	22			

There are 72 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	5	MET	-	cloning artifact	UNP Q8WYN0
A	6	HIS	-	cloning artifact	UNP Q8WYN0
A	7	HIS	-	cloning artifact	UNP Q8WYN0
A	8	HIS	-	cloning artifact	UNP Q8WYN0
A	9	HIS	-	cloning artifact	UNP Q8WYN0
A	10	HIS	-	cloning artifact	UNP Q8WYN0
A	11	HIS	-	cloning artifact	UNP Q8WYN0
A	12	SER	-	cloning artifact	UNP Q8WYN0
A	13	SER	-	cloning artifact	UNP Q8WYN0
A	14	GLY	-	cloning artifact	UNP Q8WYN0
A	15	ARG	-	cloning artifact	UNP Q8WYN0
A	16	GLU	-	cloning artifact	UNP Q8WYN0
A	17	ASN	-	cloning artifact	UNP Q8WYN0
A	18	LEU	-	cloning artifact	UNP Q8WYN0
A	19	TYR	-	cloning artifact	UNP Q8WYN0
A	20	PHE	-	cloning artifact	UNP Q8WYN0
A	21	GLN	-	cloning artifact	UNP Q8WYN0
A	22	GLY	-	cloning artifact	UNP Q8WYN0
B	5	MET	-	cloning artifact	UNP Q8WYN0
B	6	HIS	-	cloning artifact	UNP Q8WYN0
B	7	HIS	-	cloning artifact	UNP Q8WYN0

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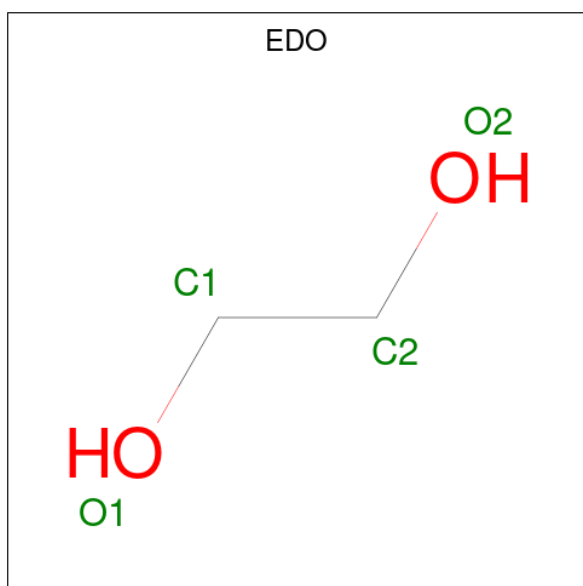
Chain	Residue	Modelled	Actual	Comment	Reference
B	8	HIS	-	cloning artifact	UNP Q8WYN0
B	9	HIS	-	cloning artifact	UNP Q8WYN0
B	10	HIS	-	cloning artifact	UNP Q8WYN0
B	11	HIS	-	cloning artifact	UNP Q8WYN0
B	12	SER	-	cloning artifact	UNP Q8WYN0
B	13	SER	-	cloning artifact	UNP Q8WYN0
B	14	GLY	-	cloning artifact	UNP Q8WYN0
B	15	ARG	-	cloning artifact	UNP Q8WYN0
B	16	GLU	-	cloning artifact	UNP Q8WYN0
B	17	ASN	-	cloning artifact	UNP Q8WYN0
B	18	LEU	-	cloning artifact	UNP Q8WYN0
B	19	TYR	-	cloning artifact	UNP Q8WYN0
B	20	PHE	-	cloning artifact	UNP Q8WYN0
B	21	GLN	-	cloning artifact	UNP Q8WYN0
B	22	GLY	-	cloning artifact	UNP Q8WYN0
C	5	MET	-	cloning artifact	UNP Q8WYN0
C	6	HIS	-	cloning artifact	UNP Q8WYN0
C	7	HIS	-	cloning artifact	UNP Q8WYN0
C	8	HIS	-	cloning artifact	UNP Q8WYN0
C	9	HIS	-	cloning artifact	UNP Q8WYN0
C	10	HIS	-	cloning artifact	UNP Q8WYN0
C	11	HIS	-	cloning artifact	UNP Q8WYN0
C	12	SER	-	cloning artifact	UNP Q8WYN0
C	13	SER	-	cloning artifact	UNP Q8WYN0
C	14	GLY	-	cloning artifact	UNP Q8WYN0
C	15	ARG	-	cloning artifact	UNP Q8WYN0
C	16	GLU	-	cloning artifact	UNP Q8WYN0
C	17	ASN	-	cloning artifact	UNP Q8WYN0
C	18	LEU	-	cloning artifact	UNP Q8WYN0
C	19	TYR	-	cloning artifact	UNP Q8WYN0
C	20	PHE	-	cloning artifact	UNP Q8WYN0
C	21	GLN	-	cloning artifact	UNP Q8WYN0
C	22	GLY	-	cloning artifact	UNP Q8WYN0
D	5	MET	-	cloning artifact	UNP Q8WYN0
D	6	HIS	-	cloning artifact	UNP Q8WYN0
D	7	HIS	-	cloning artifact	UNP Q8WYN0
D	8	HIS	-	cloning artifact	UNP Q8WYN0
D	9	HIS	-	cloning artifact	UNP Q8WYN0
D	10	HIS	-	cloning artifact	UNP Q8WYN0
D	11	HIS	-	cloning artifact	UNP Q8WYN0
D	12	SER	-	cloning artifact	UNP Q8WYN0
D	13	SER	-	cloning artifact	UNP Q8WYN0

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Chain	Residue	Modelled	Actual	Comment	Reference
D	14	GLY	-	cloning artifact	UNP Q8WYN0
D	15	ARG	-	cloning artifact	UNP Q8WYN0
D	16	GLU	-	cloning artifact	UNP Q8WYN0
D	17	ASN	-	cloning artifact	UNP Q8WYN0
D	18	LEU	-	cloning artifact	UNP Q8WYN0
D	19	TYR	-	cloning artifact	UNP Q8WYN0
D	20	PHE	-	cloning artifact	UNP Q8WYN0
D	21	GLN	-	cloning artifact	UNP Q8WYN0
D	22	GLY	-	cloning artifact	UNP Q8WYN0

- Molecule 2 is 1,2-ETHANEDIOL (CCD ID: EDO) (formula: C₂H₆O₂).



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

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

- Molecule 3 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	D	1	Total Cl 1 1	0	0

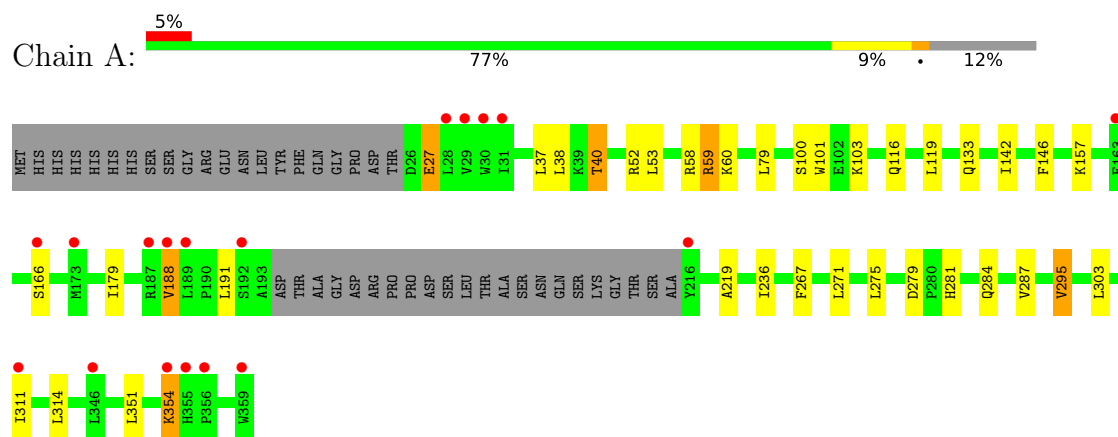
- Molecule 4 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	248	Total O 264 264	0	16
4	B	194	Total O 203 203	0	9
4	C	214	Total O 224 224	0	10
4	D	202	Total O 210 210	0	8

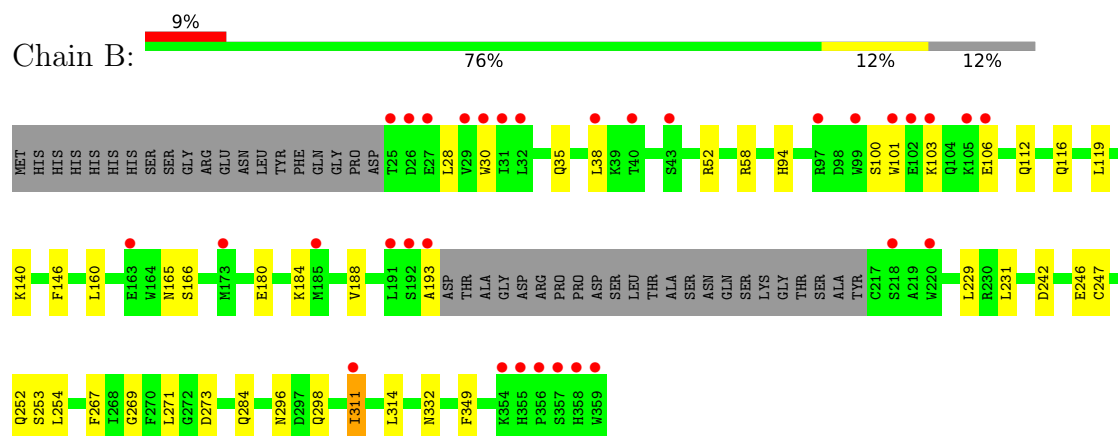
3 Residue-property plots [i](#)

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.

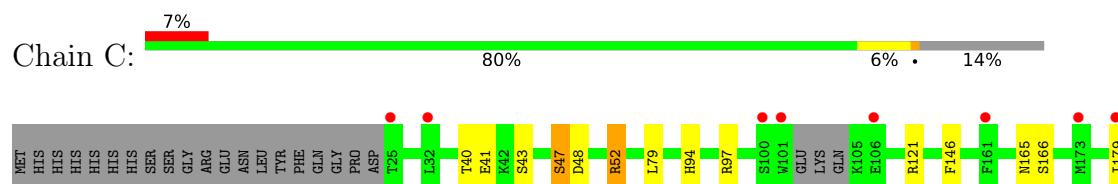
• Molecule 1: Cysteine protease ATG4A

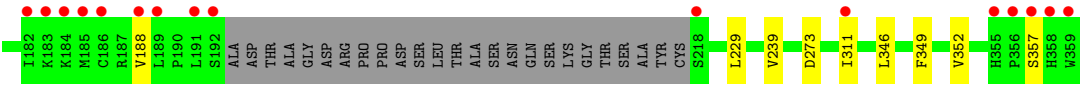


• Molecule 1: Cysteine protease ATG4A

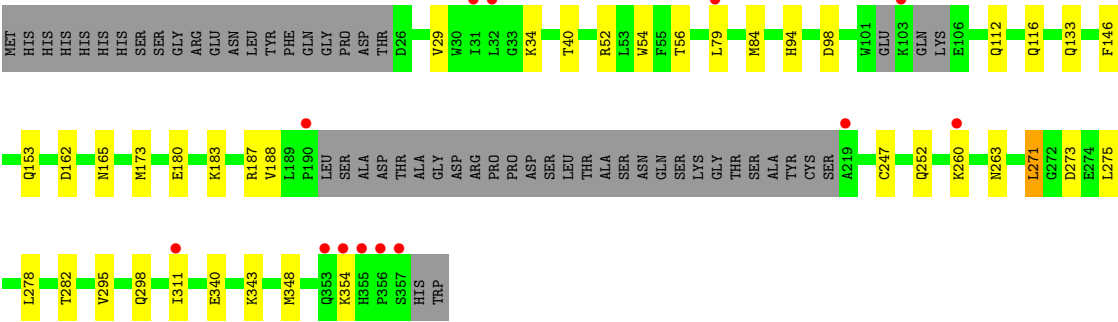
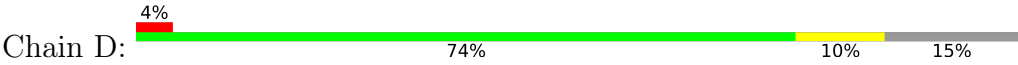


• Molecule 1: Cysteine protease ATG4A





● Molecule 1: Cysteine protease ATG4A



4 Data and refinement statistics

Property	Value	Source
Space group	P 31 2 1	Depositor
Cell constants a, b, c, α , β , γ	94.41Å 94.41Å 337.34Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	38.69 – 2.10 38.69 – 2.10	Depositor EDS
% Data completeness (in resolution range)	95.2 (38.69-2.10) 95.2 (38.69-2.10)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.06	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.13 (at 2.10Å)	Xtriage
Refinement program	REFMAC 5.2.0019	Depositor
R, R_{free}	0.175 , 0.213 0.175 , 0.212	Depositor DCC
R_{free} test set	4967 reflections (4.83%)	wwPDB-VP
Wilson B-factor (Å ²)	35.7	Xtriage
Anisotropy	0.031	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 54.9	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	0.021 for -h,-k,l	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	10944	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 5.94% 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: EDO, 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	0.69	3/2593 (0.1%)	0.77	2/3505 (0.1%)
1	B	0.56	1/2586 (0.0%)	0.76	0/3496
1	C	0.59	1/2555 (0.0%)	0.77	0/3451
1	D	0.53	0/2494	0.78	0/3367
All	All	0.60	5/10228 (0.0%)	0.77	2/13819 (0.0%)

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	354	LYS	CG-CD	15.54	1.99	1.52
1	B	193	ALA	C-O	9.37	1.42	1.23
1	A	27	GLU	CD-OE1	7.79	1.40	1.25
1	A	27	GLU	CD-OE2	7.27	1.39	1.25
1	C	357	SER	CB-OG	6.43	1.55	1.42

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	354	LYS	CG-CD-CE	-8.27	92.27	111.30
1	A	354	LYS	CB-CG-CD	-6.00	97.49	111.30

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	2529	0	2487	27	0
1	B	2524	0	2484	22	0
1	C	2492	0	2464	10	0
1	D	2437	0	2419	28	0
2	A	16	0	24	0	0
2	B	12	0	18	1	0
2	C	16	0	24	2	0
2	D	16	0	24	2	0
3	D	1	0	0	0	0
4	A	264	0	0	1	0
4	B	203	0	0	2	0
4	C	224	0	0	1	0
4	D	210	0	0	2	0
All	All	10944	0	9944	87	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 4.

All (87) 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:354:LYS:CD	1:A:354:LYS:CG	1.99	1.39
1:A:179:ILE:HD11	1:A:351:LEU:HD11	1.51	0.90
1:A:354:LYS:CG	1:A:354:LYS:CE	2.57	0.82
1:D:260[B]:LYS:HG2	1:D:263:ASN:HB2	1.63	0.79
1:A:179:ILE:CD1	1:A:351:LEU:HD11	2.15	0.77
1:B:252:GLN:HE22	1:B:332[B]:ASN:HD22	1.32	0.75
1:A:236:ILE:HD11	1:A:314:LEU:HD23	1.68	0.73
1:D:84:MET:CE	1:D:278:LEU:HD13	2.19	0.73
1:D:84:MET:HE1	1:D:278:LEU:HD13	1.73	0.70
1:A:354:LYS:CD	1:A:354:LYS:CB	2.70	0.70
1:D:54:TRP:HA	1:D:84:MET:HE3	1.72	0.69
1:D:153:GLN:NE2	1:D:173[A]:MET:HE1	2.13	0.63
1:D:84:MET:HE1	1:D:278:LEU:CB	2.30	0.60
1:D:84:MET:HE1	1:D:278:LEU:CD1	2.32	0.59
1:D:84:MET:HE1	1:D:278:LEU:HB3	1.83	0.59
1:C:94:HIS:NE2	1:C:165:ASN:ND2	2.50	0.58
1:A:275:LEU:HG	1:A:311:ILE:HG12	1.86	0.57
1:C:97:ARG:HD3	2:C:360:EDO:H12	1.86	0.57
1:A:188:VAL:HG13	1:A:219:ALA:HB3	1.86	0.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:296:ASN:ND2	1:B:298:GLN:OE1	2.34	0.57
1:C:239:VAL:HG21	1:C:346:LEU:HD12	1.88	0.55
1:D:34:LYS:HE3	1:D:98:ASP:OD1	2.07	0.55
1:D:247:CYS:SG	1:D:348:MET:HE1	2.45	0.55
1:D:84:MET:CE	1:D:278:LEU:CD1	2.85	0.54
1:B:267:PHE:CZ	1:B:314:LEU:HD13	2.42	0.54
1:A:133:GLN:HG3	4:A:525:HOH:O	2.07	0.54
1:A:287:VAL:HG12	1:A:295:VAL:HG22	1.90	0.53
1:D:273:ASP:O	1:D:311:ILE:HG13	2.08	0.53
1:B:100:SER:HB3	1:B:103:LYS:HE2	1.90	0.53
1:D:79:LEU:HD21	1:D:146:PHE:CZ	2.44	0.52
1:D:180:GLU:HG2	1:D:354:LYS:HA	1.91	0.52
1:D:153:GLN:HE22	1:D:173[A]:MET:HE1	1.75	0.52
1:A:38:LEU:HD22	1:A:271:LEU:HD21	1.92	0.51
1:A:267:PHE:CZ	1:A:314:LEU:CD1	2.93	0.51
1:D:29:VAL:HG22	1:D:271:LEU:HG	1.91	0.51
1:B:38:LEU:HD22	1:B:271:LEU:HD11	1.94	0.50
1:D:94:HIS:NE2	1:D:165:ASN:ND2	2.60	0.50
1:A:236:ILE:CD1	1:A:314:LEU:HD23	2.40	0.49
1:D:112:GLN:HG3	1:D:116:GLN:NE2	2.27	0.49
1:D:133:GLN:HG3	4:D:433:HOH:O	2.12	0.48
1:D:183:LYS:HB3	1:D:187:ARG:HD2	1.95	0.48
1:D:340:GLU:HA	1:D:343:LYS:HE3	1.94	0.48
1:A:27:GLU:HB2	1:A:271:LEU:HD11	1.95	0.48
1:C:48:ASP:O	1:C:52:ARG:HD2	2.13	0.47
1:D:56:THR:HB	1:D:282:THR:O	2.14	0.47
1:A:100:SER:HB3	1:A:103:LYS:HE2	1.97	0.47
1:B:140:LYS:HG2	1:B:146:PHE:CD2	2.49	0.47
1:B:58:ARG:HA	1:B:284:GLN:O	2.14	0.47
1:A:157:LYS:HD2	1:B:160:LEU:HD11	1.97	0.47
1:B:296:ASN:HB2	4:B:543:HOH:O	2.15	0.46
1:C:179:ILE:HG12	1:C:352:VAL:O	2.14	0.46
1:A:37:LEU:HB2	1:A:40:THR:HG23	1.96	0.46
1:B:229:LEU:HD21	1:B:349:PHE:HB3	1.96	0.46
1:B:332[A]:ASN:ND2	4:B:553:HOH:O	2.47	0.46
1:B:254:LEU:HD23	2:B:360:EDO:C2	2.46	0.46
1:C:273:ASP:O	1:C:311:ILE:HG13	2.15	0.46
1:D:275:LEU:HG	1:D:311:ILE:HG12	1.98	0.45
1:A:116:GLN:HA	1:A:119:LEU:HG	1.99	0.45
1:A:58:ARG:HA	1:A:284:GLN:O	2.17	0.45
1:C:79:LEU:HD21	1:C:146:PHE:CZ	2.52	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:133:GLN:NE2	1:A:142:ILE:HD11	2.32	0.45
1:A:279:ASP:OD1	1:A:281[B]:HIS:HD2	2.00	0.44
1:D:252:GLN:HG3	2:D:361:EDO:H11	1.99	0.44
1:B:112:GLN:HG3	1:B:116:GLN:NE2	2.33	0.44
1:D:112:GLN:HB2	4:D:564:HOH:O	2.18	0.44
1:A:59:ARG:NH2	1:A:60:LYS:HE2	2.32	0.44
1:D:112:GLN:OE1	1:D:295:VAL:HG12	2.18	0.43
1:C:229:LEU:HD21	1:C:349:PHE:HB3	2.00	0.43
1:A:37:LEU:CB	1:A:40:THR:HG23	2.47	0.43
1:D:162:ASP:OD2	1:D:165:ASN:HB2	2.18	0.43
1:A:267:PHE:CZ	1:A:314:LEU:HD13	2.53	0.42
1:B:242:ASP:O	1:B:246:GLU:HG2	2.19	0.42
1:A:79:LEU:HD21	1:A:146:PHE:CZ	2.55	0.41
1:B:28:LEU:HD11	1:B:35:GLN:HB2	2.01	0.41
1:B:112:GLN:HG3	1:B:116:GLN:HE21	1.84	0.41
2:C:361:EDO:C2	4:C:462:HOH:O	2.69	0.41
1:A:354:LYS:CG	1:A:354:LYS:NZ	2.83	0.41
1:B:273:ASP:O	1:B:311:ILE:HG13	2.20	0.41
1:C:43:SER:O	1:C:47:SER:HB3	2.21	0.41
1:C:40:THR:HG22	1:C:41:GLU:HG3	2.02	0.41
1:B:94:HIS:NE2	1:B:165:ASN:ND2	2.69	0.41
1:B:30:TRP:O	1:B:269:GLY:HA3	2.20	0.41
1:B:247:CYS:O	1:B:253:SER:HB2	2.20	0.40
1:A:53:LEU:HD23	1:A:53:LEU:HA	1.94	0.40
1:B:180:GLU:O	1:B:184:LYS:HG3	2.22	0.40
1:B:116:GLN:HA	1:B:119:LEU:HG	2.04	0.40
1:D:252:GLN:HG3	2:D:361:EDO:C1	2.52	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	311/355 (88%)	308 (99%)	3 (1%)	0	100	100
1	B	311/355 (88%)	306 (98%)	5 (2%)	0	100	100
1	C	304/355 (86%)	300 (99%)	4 (1%)	0	100	100
1	D	297/355 (84%)	291 (98%)	6 (2%)	0	100	100
All	All	1223/1420 (86%)	1205 (98%)	18 (2%)	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	276/313 (88%)	267 (97%)	9 (3%)	33	37
1	B	277/313 (88%)	270 (98%)	7 (2%)	42	48
1	C	274/313 (88%)	269 (98%)	5 (2%)	51	60
1	D	267/313 (85%)	262 (98%)	5 (2%)	50	58
All	All	1094/1252 (87%)	1068 (98%)	26 (2%)	43	49

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

Mol	Chain	Res	Type
1	A	40	THR
1	A	52	ARG
1	A	59	ARG
1	A	101	TRP
1	A	166	SER
1	A	188	VAL
1	A	191	LEU
1	A	295	VAL
1	A	303	LEU
1	B	52	ARG
1	B	101	TRP
1	B	106	GLU
1	B	166	SER

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Mol	Chain	Res	Type
1	B	188	VAL
1	B	231	LEU
1	B	311	ILE
1	C	47	SER
1	C	52	ARG
1	C	121	ARG
1	C	166	SER
1	C	188	VAL
1	D	40	THR
1	D	52	ARG
1	D	188	VAL
1	D	271	LEU
1	D	298	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (21) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	104	GLN
1	A	133	GLN
1	A	175	ASN
1	A	345	ASN
1	B	104	GLN
1	B	116	GLN
1	B	149	ASN
1	B	165	ASN
1	B	175	ASN
1	B	284	GLN
1	B	353	GLN
1	C	165	ASN
1	C	284	GLN
1	C	298	GLN
1	C	353	GLN
1	D	116	GLN
1	D	133	GLN
1	D	149	ASN
1	D	153	GLN
1	D	165	ASN
1	D	284	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](#)

Of 16 ligands modelled in this entry, 1 is monoatomic - leaving 15 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	$\# Z > 2$
2	EDO	D	360	-	3,3,3	0.37	0	2,2,2	0.44	0
2	EDO	C	361	-	3,3,3	0.38	0	2,2,2	0.47	0
2	EDO	B	361	-	3,3,3	0.46	0	2,2,2	0.43	0
2	EDO	D	4	-	3,3,3	0.38	0	2,2,2	0.62	0
2	EDO	A	2	-	3,3,3	0.41	0	2,2,2	0.55	0
2	EDO	C	360	-	3,3,3	0.51	0	2,2,2	0.30	0
2	EDO	A	362	-	3,3,3	0.52	0	2,2,2	0.25	0
2	EDO	C	363	-	3,3,3	0.59	0	2,2,2	0.25	0
2	EDO	C	362	-	3,3,3	0.32	0	2,2,2	0.72	0
2	EDO	B	360	-	3,3,3	0.29	0	2,2,2	0.55	0
2	EDO	D	362	-	3,3,3	0.46	0	2,2,2	0.33	0
2	EDO	D	361	-	3,3,3	0.38	0	2,2,2	0.49	0
2	EDO	A	360	-	3,3,3	0.43	0	2,2,2	0.49	0
2	EDO	A	361	-	3,3,3	0.38	0	2,2,2	0.58	0
2	EDO	B	3	-	3,3,3	0.44	0	2,2,2	0.54	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	EDO	D	360	-	-	0/1/1/1	-
2	EDO	C	361	-	-	0/1/1/1	-
2	EDO	B	361	-	-	1/1/1/1	-
2	EDO	D	4	-	-	0/1/1/1	-
2	EDO	A	2	-	-	0/1/1/1	-
2	EDO	C	360	-	-	0/1/1/1	-
2	EDO	A	362	-	-	0/1/1/1	-
2	EDO	C	363	-	-	1/1/1/1	-
2	EDO	C	362	-	-	0/1/1/1	-
2	EDO	B	360	-	-	0/1/1/1	-
2	EDO	D	362	-	-	1/1/1/1	-
2	EDO	D	361	-	-	0/1/1/1	-
2	EDO	A	360	-	-	1/1/1/1	-
2	EDO	A	361	-	-	1/1/1/1	-
2	EDO	B	3	-	-	0/1/1/1	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (5) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	C	363	EDO	O1-C1-C2-O2
2	B	361	EDO	O1-C1-C2-O2
2	D	362	EDO	O1-C1-C2-O2
2	A	361	EDO	O1-C1-C2-O2
2	A	360	EDO	O1-C1-C2-O2

There are no ring outliers.

4 monomers are involved in 5 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	C	361	EDO	1	0
2	C	360	EDO	1	0
2	B	360	EDO	1	0
2	D	361	EDO	2	0

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

In the following table, the column labelled ‘#RSRZ> 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q< 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2			OWAB(Å ²)	Q<0.9
1	A	312/355 (87%)	0.20	18 (5%)	29	30	16, 35, 51, 62	3 (0%)
1	B	312/355 (87%)	0.46	32 (10%)	12	12	19, 38, 62, 75	3 (0%)
1	C	307/355 (86%)	0.24	24 (7%)	19	20	18, 34, 50, 67	3 (0%)
1	D	301/355 (84%)	0.30	13 (4%)	40	41	17, 36, 53, 61	3 (0%)
All	All	1232/1420 (86%)	0.30	87 (7%)	22	23	16, 36, 55, 75	12 (0%)

All (87) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	31	ILE	7.5
1	A	31	ILE	7.3
1	B	354	LYS	6.8
1	D	353	GLN	6.7
1	C	186	CYS	6.1
1	C	359	TRP	6.1
1	B	359	TRP	5.9
1	C	357	SER	5.8
1	D	354	LYS	5.7
1	C	185	MET	5.5
1	A	354	LYS	5.4
1	A	30	TRP	5.3
1	B	30	TRP	4.9
1	B	356	PRO	4.8
1	C	355	HIS	4.8
1	D	357	SER	4.5
1	B	101	TRP	4.4
1	A	28	LEU	4.3
1	A	355	HIS	4.3
1	B	355	HIS	4.3
1	C	358	HIS	4.3

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Mol	Chain	Res	Type	RSRZ
1	B	99	TRP	4.1
1	A	188	VAL	3.8
1	D	355	HIS	3.8
1	C	356	PRO	3.8
1	B	25	THR	3.7
1	C	311	ILE	3.6
1	C	189	LEU	3.6
1	A	359	TRP	3.5
1	C	191	LEU	3.5
1	A	216	TYR	3.5
1	A	29	VAL	3.4
1	C	184	LYS	3.4
1	B	32	LEU	3.4
1	D	356	PRO	3.2
1	D	32	LEU	3.1
1	B	358	HIS	3.1
1	B	29	VAL	3.0
1	B	102	GLU	2.9
1	D	311	ILE	2.9
1	B	193	ALA	2.8
1	A	189	LEU	2.8
1	A	311	ILE	2.8
1	A	187	ARG	2.7
1	B	97	ARG	2.7
1	B	357	SER	2.7
1	B	191	LEU	2.6
1	C	188	VAL	2.6
1	B	26	ASP	2.6
1	C	192	SER	2.6
1	C	218	SER	2.6
1	C	101	TRP	2.5
1	A	166	SER	2.5
1	B	103	LYS	2.4
1	C	183	LYS	2.4
1	A	192	SER	2.4
1	C	173	MET	2.4
1	D	219	ALA	2.4
1	B	185	MET	2.4
1	A	356	PRO	2.4
1	B	220	TRP	2.4
1	B	38	LEU	2.3
1	C	161	PHE	2.3

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Mol	Chain	Res	Type	RSRZ
1	B	163	GLU	2.3
1	B	173	MET	2.3
1	D	103	LYS	2.3
1	B	27	GLU	2.2
1	B	106	GLU	2.2
1	B	218	SER	2.2
1	B	40	THR	2.2
1	B	105	LYS	2.2
1	A	346	LEU	2.2
1	B	192	SER	2.2
1	D	260[A]	LYS	2.2
1	A	173[A]	MET	2.2
1	C	106	GLU	2.2
1	B	43[A]	SER	2.2
1	D	31	ILE	2.1
1	C	32	LEU	2.1
1	A	163	GLU	2.1
1	C	182	ILE	2.1
1	C	100	SER	2.1
1	D	79	LEU	2.1
1	D	190	PRO	2.1
1	C	25	THR	2.0
1	B	311	ILE	2.0
1	C	179	ILE	2.0

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

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

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
2	EDO	C	362	4/4	0.86	0.19	57,57,58,59	0
2	EDO	D	361	4/4	0.86	0.27	51,56,57,59	0
2	EDO	C	363	4/4	0.87	0.19	50,54,55,55	0
2	EDO	A	2	4/4	0.88	0.16	67,69,70,72	0
2	EDO	C	361	4/4	0.90	0.15	48,56,56,58	0
2	EDO	A	360	4/4	0.91	0.17	40,40,41,42	0
2	EDO	D	4	4/4	0.91	0.17	53,55,56,59	0
2	EDO	B	3	4/4	0.91	0.14	55,59,60,62	0
2	EDO	B	361	4/4	0.92	0.13	54,58,60,63	0
2	EDO	A	362	4/4	0.92	0.17	53,53,55,57	0
2	EDO	A	361	4/4	0.94	0.11	39,40,42,44	0
2	EDO	D	362	4/4	0.94	0.13	54,60,61,64	0
2	EDO	D	360	4/4	0.95	0.17	41,44,46,46	0
2	EDO	C	360	4/4	0.96	0.15	40,44,45,45	0
2	EDO	B	360	4/4	0.96	0.12	46,49,49,50	0
3	CL	D	1	1/1	0.96	0.27	67,67,67,67	1

6.5 Other polymers [i](#)

There are no such residues in this entry.