



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 12, 2026 – 05:35 AM UTC

PDB ID : 3QHW / pdb_00003qhw
Title : Structure of a pCDK2/CyclinA transition-state mimic
Authors : Young, M.A.; Jacobsen, D.M.; Bao, Z.Q.
Deposited on : 2011-01-26
Resolution : 1.91 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
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
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

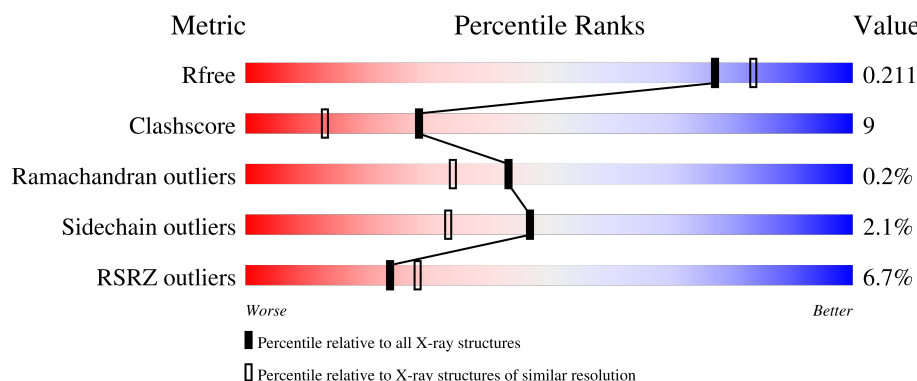
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.91 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	1188 (1.92-1.92)
Clashscore	190562	1209 (1.92-1.92)
Ramachandran outliers	187476	1195 (1.92-1.92)
Sidechain outliers	187428	1195 (1.92-1.92)
RSRZ outliers	180081	1188 (1.92-1.92)

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	298	7% 87% 12% .
1	C	298	7% 84% 15% .
2	B	261	4% 89% 10% .
2	D	261	4% 87% 11% .
3	J	10	40% 50% 50%

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Mol	Chain	Length	Quality of chain
3	K	10	50%60%30%10%
3	L	10	20%40%60%
3	M	10	30%40%60%

2 Entry composition

There are 9 unique types of molecules in this entry. The entry contains 10157 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 Cell division protein kinase 2.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	298	Total	C	N	O	P	S	0	0	0
			2396	1555	407	425	1	8			
1	C	298	Total	C	N	O	P	S	0	10	0
			2466	1600	419	438	1	8			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-1	GLY	-	expression tag	UNP P24941
A	0	HIS	-	expression tag	UNP P24941
C	-1	GLY	-	expression tag	UNP P24941
C	0	HIS	-	expression tag	UNP P24941

- Molecule 2 is a protein called Cyclin-A2.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
2	B	261	Total	C	N	O	S		0	0	0
			2099	1357	341	391	10				
2	D	261	Total	C	N	O	S		0	0	0
			2099	1357	341	391	10				

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	172	SER	-	expression tag	UNP P51943
D	172	SER	-	expression tag	UNP P51943

- Molecule 3 is a protein called CDK2 substrate peptide: PKTPKKAKKL.

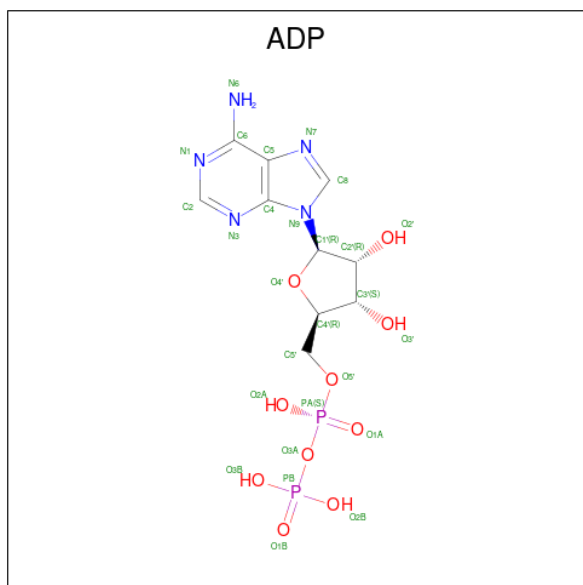
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	J	10	Total	C	N	O	0	0	0
			79	53	15	11			

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Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	K	10	Total	C	N	O	0	0	0
			79	53	15	11			
3	L	4	Total	C	N	O	0	0	0
			31	21	6	4			
3	M	4	Total	C	N	O	0	0	0
			31	21	6	4			

- Molecule 4 is ADENOSINE-5'-DIPHOSPHATE (CCD ID: ADP) (formula: $C_{10}H_{15}N_5O_{10}P_2$).

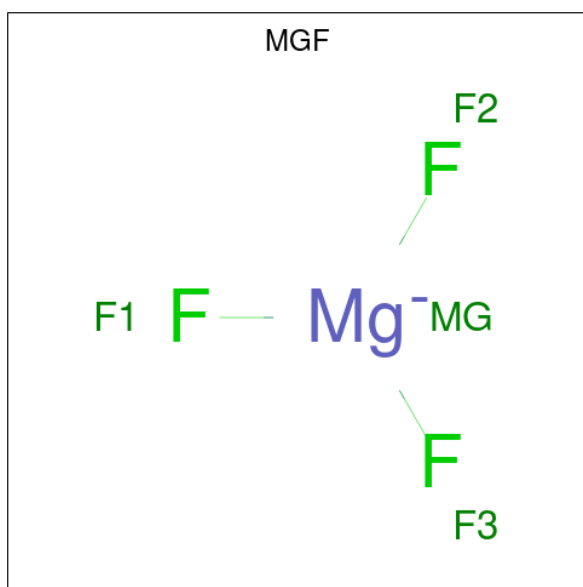


Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	A	1	Total	C	N	O	P	0	0
			27	10	5	10	2		
4	C	1	Total	C	N	O	P	0	0
			27	10	5	10	2		

- Molecule 5 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	2	Total	Mg	0	0
			2	2		
5	C	2	Total	Mg	0	0
			2	2		

- Molecule 6 is TRIFLUOROMAGNESATE (CCD ID: MGF) (formula: F_3Mg).

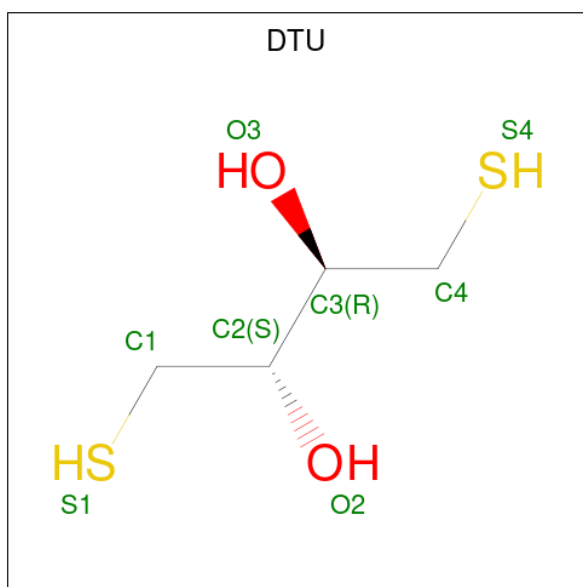


Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	A	1	Total	F	Mg	0	0
			4	3	1		
6	C	1	Total	F	Mg	0	0
			4	3	1		

- Molecule 7 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	1	Total	Cl	0	0
			1	1		
7	C	1	Total	Cl	0	0
			1	1		

- Molecule 8 is (2R,3S)-1,4-DIMERCAPTOBUTANE-2,3-DIOL (CCD ID: DTU) (formula: C₄H₁₀O₂S₂).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
8	B	1	Total	C	O	S	0	0
			8	4	2	2		
8	D	1	Total	C	O	S	0	0
			8	4	2	2		

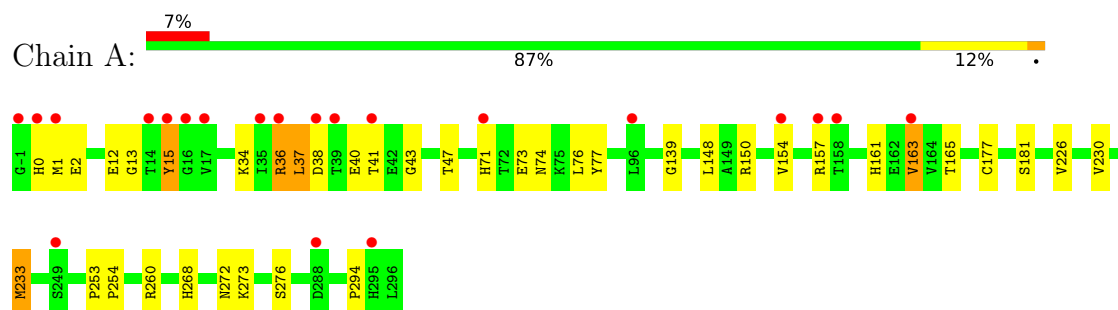
- Molecule 9 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
9	A	194	Total	O	0	0
			194	194		
9	B	216	Total	O	0	0
			216	216		
9	C	192	Total	O	0	0
			192	192		
9	D	180	Total	O	0	0
			180	180		
9	J	6	Total	O	0	0
			6	6		
9	K	2	Total	O	0	0
			2	2		
9	L	2	Total	O	0	0
			2	2		
9	M	1	Total	O	0	0
			1	1		

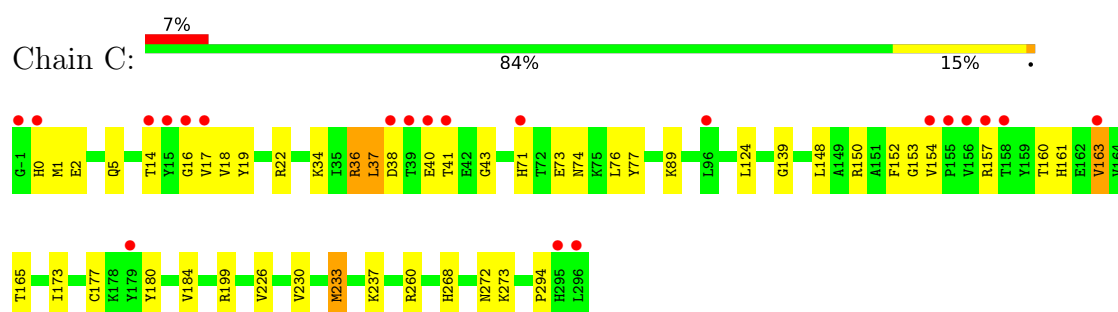
3 Residue-property plots [i](#)

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.

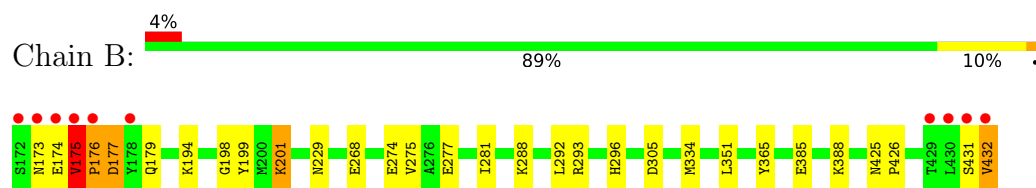
- Molecule 1: Cell division protein kinase 2



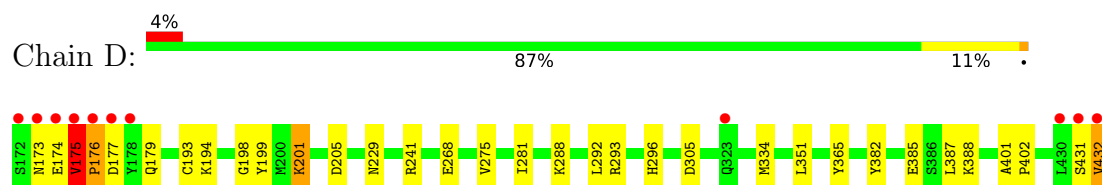
- Molecule 1: Cell division protein kinase 2



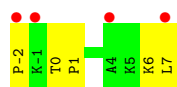
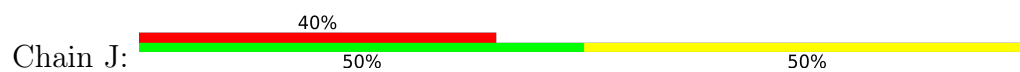
- Molecule 2: Cyclin-A2



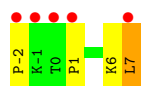
- Molecule 2: Cyclin-A2



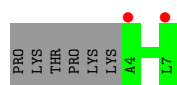
- Molecule 3: CDK2 substrate peptide: PKTPKKAKKL



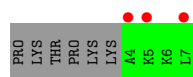
- Molecule 3: CDK2 substrate peptide: PKTPKKAKKL



- Molecule 3: CDK2 substrate peptide: PKTPKKAKKL



- Molecule 3: CDK2 substrate peptide: PKTPKKAKKL



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	71.03Å 163.45Å 73.39Å 90.00° 107.08° 90.00°	Depositor
Resolution (Å)	39.73 – 1.91 39.73 – 1.91	Depositor EDS
% Data completeness (in resolution range)	99.8 (39.73-1.91) 99.1 (39.73-1.91)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.14	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.78 (at 1.91Å)	Xtriage
Refinement program	PHENIX 1.7.1_743	Depositor
R, R_{free}	0.188 , 0.219 (Not available) , 0.211	Depositor DCC
R_{free} test set	2405 reflections (1.95%)	wwPDB-VP
Wilson B-factor (Å ²)	30.7	Xtriage
Anisotropy	0.450	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 55.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	0.018 for l,k,h	Xtriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	10157	wwPDB-VP
Average B, all atoms (Å ²)	43.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.72% 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: MG, CL, ADP, MGF, DTU, TPO

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	0.57	0/2447	0.82	1/3320 (0.0%)
1	C	0.56	0/2521	0.82	1/3420 (0.0%)
2	B	0.61	0/2149	0.81	3/2921 (0.1%)
2	D	0.58	0/2149	0.80	3/2921 (0.1%)
3	J	0.50	0/80	0.77	0/103
3	K	0.47	0/80	0.71	0/103
3	L	0.36	0/30	0.59	0/37
3	M	0.31	0/30	0.55	0/37
All	All	0.58	0/9486	0.81	8/12862 (0.1%)

There are no bond length outliers.

All (8) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	176	PRO	N-CA-C	7.60	124.10	113.53
1	A	15	TYR	N-CA-C	7.54	122.77	112.90
1	C	163	VAL	N-CA-C	6.50	122.87	109.34
2	D	176	PRO	N-CA-C	5.83	121.22	113.40
2	B	175	VAL	N-CA-C	5.82	121.46	108.88
2	D	205	ASP	N-CA-C	5.66	121.07	113.72
2	B	177	ASP	N-CA-C	5.29	117.05	111.28
2	D	175	VAL	N-CA-C	5.19	120.08	108.88

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	2396	0	2435	52	0
1	C	2466	0	2507	53	0
2	B	2099	0	2110	43	0
2	D	2099	0	2110	37	0
3	J	79	0	104	10	0
3	K	79	0	104	8	0
3	L	31	0	41	0	0
3	M	31	0	41	0	0
4	A	27	0	12	0	0
4	C	27	0	12	0	0
5	A	2	0	0	0	0
5	C	2	0	0	0	0
6	A	4	0	0	0	0
6	C	4	0	0	1	0
7	A	1	0	0	0	0
7	C	1	0	0	0	0
8	B	8	0	10	1	0
8	D	8	0	10	2	0
9	A	194	0	0	10	0
9	B	216	0	0	7	0
9	C	192	0	0	14	0
9	D	180	0	0	1	0
9	J	6	0	0	1	0
9	K	2	0	0	0	0
9	L	2	0	0	0	0
9	M	1	0	0	0	0
All	All	10157	0	9496	164	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 9.

All (164) 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:154:VAL:HG13	2:B:175:VAL:HG11	1.33	1.10

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:177:ASP:HB2	9:B:534:HOH:O	1.50	1.09
2:B:334:MET:HG2	9:B:711:HOH:O	1.53	1.05
1:A:40:GLU:HG2	1:A:43:GLY:O	1.56	1.04
2:D:175:VAL:O	2:D:175:VAL:HG22	1.60	1.00
2:B:175:VAL:HG23	9:B:775:HOH:O	1.61	1.00
1:A:34:LYS:HE2	1:A:77:TYR:HE1	1.30	0.97
1:C:41:THR:HG22	2:D:288:LYS:HE2	1.44	0.96
1:C:41:THR:HG22	2:D:288:LYS:CE	1.95	0.95
1:A:47:THR:HG22	9:A:388:HOH:O	1.67	0.94
1:C:272:ASN:OD1	2:D:174:GLU:HB3	1.67	0.94
1:A:163:VAL:O	3:J:1:PRO:HG2	1.66	0.94
1:C:5:GLN:HG2	9:C:390:HOH:O	1.66	0.94
1:A:41:THR:HG22	2:B:288:LYS:NZ	1.82	0.93
1:C:161:HIS:HD2	9:C:688:HOH:O	1.51	0.92
1:C:41:THR:HG22	2:D:288:LYS:NZ	1.87	0.88
1:C:34:LYS:HE2	1:C:77:TYR:HE1	1.36	0.88
2:B:388:LYS:HE2	2:B:432:VAL:HG13	1.57	0.87
1:A:34:LYS:HE2	1:A:77:TYR:CE1	2.09	0.86
1:C:34:LYS:HE2	1:C:77:TYR:CE1	2.12	0.84
3:K:6:LYS:O	3:K:7:LEU:HB2	1.75	0.83
1:A:177:CYS:SG	9:B:638:HOH:O	2.36	0.83
2:D:334:MET:HG2	9:D:694:HOH:O	1.78	0.82
1:A:41:THR:HG22	2:B:288:LYS:CE	2.10	0.81
1:A:154:VAL:CG1	2:B:175:VAL:HG11	2.10	0.81
2:D:388:LYS:HE2	2:D:432:VAL:HG13	1.63	0.79
2:D:175:VAL:O	2:D:175:VAL:CG2	2.30	0.78
2:B:175:VAL:H	2:B:176:PRO:HD3	1.46	0.78
1:C:41:THR:HG22	2:D:288:LYS:HZ1	1.49	0.78
1:A:163:VAL:O	3:J:1:PRO:CG	2.31	0.77
1:A:41:THR:CG2	2:B:288:LYS:NZ	2.49	0.76
2:D:229:ASN:HD22	2:D:334:MET:HE2	1.50	0.75
1:A:41:THR:HG22	2:B:288:LYS:HZ1	1.50	0.75
1:C:40:GLU:HG2	1:C:43:GLY:O	1.85	0.75
1:C:165:THR:HG21	3:K:-2:PRO:HB2	1.69	0.75
1:A:181:SER:HB3	9:B:532:HOH:O	1.87	0.75
2:B:229:ASN:HD22	2:B:334:MET:HE2	1.52	0.74
2:D:175:VAL:N	2:D:176:PRO:HD3	2.03	0.74
2:D:175:VAL:H	2:D:176:PRO:HD3	1.54	0.73
1:A:41:THR:HG22	2:B:288:LYS:HE2	1.69	0.73
1:A:165:THR:HG21	3:J:-2:PRO:HB2	1.70	0.72
2:B:201:LYS:HG2	9:B:765:HOH:O	1.89	0.72

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:41:THR:CG2	2:D:288:LYS:NZ	2.52	0.72
1:A:36:ARG:HD3	1:A:36:ARG:H	1.54	0.71
2:D:175:VAL:O	2:D:179:GLN:HB2	1.91	0.71
1:C:41:THR:CG2	2:D:288:LYS:HZ1	2.05	0.69
1:A:273:LYS:HE2	9:A:669:HOH:O	1.93	0.68
1:A:163:VAL:O	3:J:1:PRO:CD	2.42	0.68
1:A:2:GLU:H	1:A:2:GLU:CD	2.04	0.66
1:A:41:THR:HG23	9:A:393:HOH:O	1.93	0.66
2:B:175:VAL:N	2:B:176:PRO:CD	2.60	0.64
2:B:175:VAL:N	2:B:176:PRO:HD3	2.10	0.64
1:C:71:HIS:CE1	2:D:296:HIS:CD2	2.87	0.63
9:A:627:HOH:O	2:B:173:ASN:HB3	1.98	0.63
1:C:2:GLU:CD	1:C:2:GLU:H	2.06	0.63
1:C:157:ARG:NH2	2:D:268:GLU:OE2	2.32	0.63
1:A:41:THR:CG2	2:B:288:LYS:HZ1	2.12	0.62
1:A:71:HIS:CE1	2:B:296:HIS:CD2	2.87	0.62
2:B:175:VAL:HG12	2:B:179:GLN:HB2	1.81	0.61
2:B:175:VAL:HG12	2:B:175:VAL:O	2.00	0.61
1:C:22:ARG:HD3	9:C:390:HOH:O	1.99	0.61
1:C:163:VAL:O	3:K:1:PRO:CG	2.48	0.61
1:C:199:ARG:HG2	9:C:388:HOH:O	2.00	0.60
1:C:36[A]:ARG:HD3	1:C:36[A]:ARG:H	1.66	0.60
1:C:268:HIS:NE2	1:C:273:LYS:HE3	2.17	0.59
1:A:163:VAL:C	3:J:1:PRO:HG2	2.28	0.59
2:B:388:LYS:HE2	2:B:432:VAL:CG1	2.30	0.59
2:D:275:VAL:HG21	2:D:292:LEU:HD21	1.86	0.58
1:A:154:VAL:HG13	2:B:175:VAL:CG1	2.22	0.58
1:C:41:THR:CG2	2:D:288:LYS:HE2	2.29	0.57
2:D:305:ASP:HB3	8:D:4:DTU:H3	1.86	0.57
1:C:73:GLU:HG3	1:C:74:ASN:N	2.20	0.56
1:C:230:VAL:O	1:C:233:MET:HG3	2.05	0.56
1:A:73:GLU:HG3	1:A:74:ASN:N	2.21	0.56
1:A:230:VAL:O	1:A:233:MET:HG3	2.05	0.56
1:C:71:HIS:CD2	1:C:76:LEU:HD13	2.41	0.56
1:A:163:VAL:O	3:J:1:PRO:HD2	2.05	0.55
1:A:268:HIS:NE2	1:A:273:LYS:HE3	2.22	0.55
1:C:273:LYS:HE2	9:C:685:HOH:O	2.07	0.55
2:B:275:VAL:HG21	2:B:292:LEU:HD21	1.88	0.55
1:C:154:VAL:HG13	2:D:175:VAL:HG21	1.87	0.54
1:C:14[A]:THR:N	6:C:300:MGF:F2	2.26	0.54
1:C:260:ARG:HD3	9:C:538:HOH:O	2.08	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:163:VAL:O	3:K:1:PRO:HD2	2.08	0.54
2:B:175:VAL:O	2:B:179:GLN:HB2	2.08	0.54
3:K:6:LYS:O	3:K:7:LEU:CB	2.52	0.54
2:D:175:VAL:N	2:D:176:PRO:CD	2.72	0.53
1:A:1:MET:HE3	1:A:77:TYR:CD2	2.43	0.53
1:A:71:HIS:CD2	1:A:76:LEU:HD13	2.43	0.53
1:C:163:VAL:O	3:K:1:PRO:CD	2.57	0.52
2:D:385:GLU:O	2:D:388:LYS:HB2	2.10	0.52
1:A:36:ARG:HD3	1:A:36:ARG:N	2.22	0.51
1:C:161:HIS:CD2	9:C:688:HOH:O	2.38	0.51
1:C:1:MET:HE3	1:C:77:TYR:CD2	2.45	0.51
2:D:388:LYS:HE2	2:D:432:VAL:CG1	2.37	0.50
2:B:175:VAL:CG2	9:B:775:HOH:O	2.36	0.50
9:C:662:HOH:O	2:D:173:ASN:HB3	2.11	0.50
1:A:161:HIS:HE1	9:A:341:HOH:O	1.94	0.49
2:B:198:GLY:O	2:B:201:LYS:HG3	2.11	0.49
1:C:16[B]:GLY:HA3	1:C:34:LYS:O	2.12	0.49
1:C:17[B]:VAL:HG22	1:C:19:TYR:CE2	2.47	0.49
1:C:71:HIS:HD2	1:C:76:LEU:HD13	1.77	0.49
2:B:305:ASP:HB3	8:B:3:DTU:H3	1.95	0.48
1:C:153:GLY:HA3	9:C:420:HOH:O	2.13	0.48
1:C:0:HIS:HB3	1:C:2:GLU:OE2	2.12	0.48
1:C:177:CYS:SG	1:C:233:MET:HE1	2.54	0.48
1:A:71:HIS:HE1	2:B:296:HIS:CD2	2.30	0.48
2:B:175:VAL:H	2:B:176:PRO:CD	2.16	0.48
1:A:0:HIS:HB3	1:A:2:GLU:OE2	2.14	0.47
2:D:193:CYS:O	2:D:241:ARG:HD2	2.14	0.47
1:A:272:ASN:OD1	2:B:174:GLU:HB3	2.13	0.47
1:C:71:HIS:HE1	2:D:296:HIS:CD2	2.32	0.47
1:A:37:LEU:O	1:A:40:GLU:HB3	2.14	0.47
1:C:17[B]:VAL:HG21	1:C:19:TYR:CZ	2.50	0.47
9:C:345:HOH:O	3:K:-2:PRO:HG3	2.15	0.47
1:C:173:ILE:HD11	1:C:184:VAL:HG11	1.97	0.47
1:C:139:GLY:HA2	1:C:294:PRO:HD3	1.97	0.47
3:J:6:LYS:O	3:J:7:LEU:CB	2.63	0.47
1:A:260:ARG:HD3	9:A:787:HOH:O	2.15	0.46
2:B:194:LYS:HD3	2:B:351:LEU:HD23	1.96	0.46
2:D:365:TYR:OH	2:D:431:SER:HB3	2.14	0.46
1:A:41:THR:CG2	2:B:288:LYS:HZ3	2.26	0.46
1:A:12:GLU:HB3	9:A:389:HOH:O	2.15	0.46
1:C:38:ASP:HB3	1:C:74:ASN:OD1	2.15	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:D:194:LYS:HD3	2:D:351:LEU:HD23	1.98	0.46
1:A:157:ARG:NH2	2:B:268:GLU:OE2	2.48	0.46
2:B:274:GLU:HG2	2:B:277:GLU:HG3	1.97	0.46
1:C:89:LYS:NZ	9:C:546:HOH:O	2.48	0.46
1:C:17[B]:VAL:HG23	1:C:18[B]:VAL:N	2.30	0.45
2:D:175:VAL:HG22	2:D:179:GLN:HB2	1.99	0.45
2:D:199:TYR:C	2:D:199:TYR:CD1	2.94	0.45
1:A:15:TYR:CE1	1:A:47:THR:HG21	2.51	0.45
3:K:7:LEU:HD23	3:K:7:LEU:HA	1.83	0.45
3:J:6:LYS:O	3:J:7:LEU:HB3	2.17	0.45
1:C:161:HIS:HE1	9:C:357:HOH:O	2.01	0.44
1:A:13:GLY:N	9:A:389:HOH:O	2.43	0.44
1:C:37:LEU:O	1:C:40:GLU:O	2.36	0.43
1:A:139:GLY:HA2	1:A:294:PRO:HD3	2.00	0.43
2:D:382:TYR:HB3	2:D:387:LEU:CD1	2.49	0.43
2:B:365:TYR:OH	2:B:431:SER:HB3	2.17	0.43
1:C:180:TYR:CD1	1:C:180:TYR:C	2.97	0.43
2:B:388:LYS:CE	2:B:432:VAL:HG13	2.39	0.42
2:D:305:ASP:CB	8:D:4:DTU:H3	2.49	0.42
3:J:0:THR:HA	3:J:1:PRO:HD3	1.91	0.42
1:A:157:ARG:HB2	9:A:712:HOH:O	2.19	0.42
1:A:276:SER:OG	2:B:177:ASP:OD2	2.27	0.42
2:B:199:TYR:CD1	2:B:199:TYR:C	2.97	0.42
1:A:71:HIS:HD2	1:A:76:LEU:HD13	1.84	0.42
2:D:198:GLY:O	2:D:201:LYS:HG3	2.20	0.42
2:B:175:VAL:O	2:B:175:VAL:CG1	2.67	0.41
1:C:237:LYS:NZ	9:C:718:HOH:O	2.53	0.41
3:J:6:LYS:NZ	9:J:451:HOH:O	2.53	0.41
1:A:2:GLU:HG3	2:D:293:ARG:HH22	1.85	0.41
2:B:385:GLU:O	2:B:388:LYS:HB2	2.21	0.41
1:C:268:HIS:CD2	9:C:762:HOH:O	2.72	0.41
1:A:38:ASP:HB3	1:A:74:ASN:OD1	2.20	0.41
1:A:47:THR:HG23	9:A:396:HOH:O	2.20	0.41
1:A:253:PRO:HB2	1:A:254:PRO:HD3	2.01	0.41
2:B:293:ARG:HH22	1:C:2:GLU:HG3	1.85	0.41
1:A:37:LEU:O	1:A:40:GLU:O	2.39	0.41
1:C:124:LEU:HG	1:C:152:PHE:CD2	2.56	0.41
2:D:401:ALA:N	2:D:402:PRO:CD	2.84	0.41
2:B:425:ASN:HA	2:B:426:PRO:HD3	1.97	0.40
2:D:296:HIS:C	2:D:296:HIS:ND1	2.79	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	295/298 (99%)	291 (99%)	4 (1%)	0	100	100
1	C	305/298 (102%)	301 (99%)	4 (1%)	0	100	100
2	B	259/261 (99%)	258 (100%)	0	1 (0%)	30	19
2	D	259/261 (99%)	257 (99%)	1 (0%)	1 (0%)	30	19
3	J	8/10 (80%)	8 (100%)	0	0	100	100
3	K	8/10 (80%)	8 (100%)	0	0	100	100
3	L	2/10 (20%)	2 (100%)	0	0	100	100
3	M	2/10 (20%)	2 (100%)	0	0	100	100
All	All	1138/1158 (98%)	1127 (99%)	9 (1%)	2 (0%)	43	34

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	D	175	VAL
2	B	175	VAL

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	261/261 (100%)	254 (97%)	7 (3%)	39	24
1	C	268/261 (103%)	261 (97%)	7 (3%)	40	24
2	B	234/234 (100%)	231 (99%)	3 (1%)	61	53

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
2	D	234/234 (100%)	230 (98%)	4 (2%)	53	41
3	J	9/9 (100%)	9 (100%)	0	100	100
3	K	9/9 (100%)	8 (89%)	1 (11%)	6	0
3	L	3/9 (33%)	3 (100%)	0	100	100
3	M	3/9 (33%)	3 (100%)	0	100	100
All	All	1021/1026 (100%)	999 (98%)	22 (2%)	47	32

All (22) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	36	ARG
1	A	37	LEU
1	A	148	LEU
1	A	150	ARG
1	A	163	VAL
1	A	226	VAL
1	A	233	MET
2	B	201	LYS
2	B	281	ILE
2	B	432	VAL
1	C	36[A]	ARG
1	C	36[B]	ARG
1	C	37	LEU
1	C	148	LEU
1	C	150	ARG
1	C	226	VAL
1	C	233	MET
2	D	177	ASP
2	D	201	LYS
2	D	281	ILE
2	D	432	VAL
3	K	7	LEU

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

Mol	Chain	Res	Type
1	A	85	GLN
1	A	113	GLN
2	B	370	GLN

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Mol	Chain	Res	Type
1	C	85	GLN
2	D	370	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

2 non-standard protein/DNA/RNA residues are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
1	TPO	A	160	1	8,10,11	1.24	0	10,14,16	1.01	0
1	TPO	C	160	1	8,10,11	1.35	2 (25%)	10,14,16	1.04	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	TPO	A	160	1	-	1/9/11/13	-
1	TPO	C	160	1	-	1/9/11/13	-

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	160	TPO	O-C	2.11	1.28	1.20
1	C	160	TPO	P-OG1	-2.03	1.56	1.59

There are no bond angle outliers.

There are no chirality outliers.

All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	A	160	TPO	C-CA-CB-CG2
1	C	160	TPO	C-CA-CB-CG2

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 12 ligands modelled in this entry, 6 are monoatomic - leaving 6 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	$\# Z > 2$
8	DTU	D	4	2	7,7,7	0.92	0	4,8,8	1.79	1 (25%)
8	DTU	B	3	2	7,7,7	1.08	0	4,8,8	1.94	1 (25%)
4	ADP	C	297	5,6	28,29,29	1.51	4 (14%)	43,45,45	1.83	11 (25%)
6	MGF	A	300	4,3	0,3,3	-	-	-	-	-
4	ADP	A	297	5,6	28,29,29	1.50	4 (14%)	43,45,45	1.82	8 (18%)
6	MGF	C	300	4,3	0,3,3	-	-	-	-	-

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	ADP	A	297	5,6	-	1/16/32/32	0/3/3/3
8	DTU	B	3	2	-	3/8/8/8	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	ADP	C	297	5,6	-	1/16/32/32	0/3/3/3
8	DTU	D	4	2	-	3/8/8/8	-

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	C	297	ADP	C5-C4	4.82	1.47	1.39
4	A	297	ADP	C5-C4	4.65	1.47	1.39
4	A	297	ADP	PA-O3A	3.42	1.63	1.59
4	C	297	ADP	PA-O3A	3.22	1.63	1.59
4	A	297	ADP	C5-C6	2.88	1.49	1.41
4	C	297	ADP	C5-C6	2.85	1.48	1.41
4	C	297	ADP	C8-N7	2.64	1.36	1.31
4	A	297	ADP	C8-N7	2.52	1.36	1.31

All (21) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	C	297	ADP	C5-C4-N3	-5.62	118.98	126.72
4	A	297	ADP	C5-C4-N3	-5.46	119.20	126.72
4	A	297	ADP	N3-C4-N9	4.62	135.02	127.17
4	C	297	ADP	N3-C4-N9	4.60	134.99	127.17
4	C	297	ADP	C2-N3-C4	3.77	121.04	111.83
8	B	3	DTU	O2-C2-C3	-3.75	101.70	109.57
4	A	297	ADP	C2-N3-C4	3.66	120.78	111.83
4	A	297	ADP	N3-C2-N1	-3.47	123.33	128.58
4	A	297	ADP	C2'-C1'-N9	-3.29	105.14	113.30
4	C	297	ADP	N3-C2-N1	-3.28	123.61	128.58
4	C	297	ADP	O2A-PA-O3A	3.01	115.41	107.27
8	D	4	DTU	O2-C2-C3	-3.01	103.26	109.57
4	A	297	ADP	C4-N9-C8	2.93	108.82	105.74
4	C	297	ADP	C2'-C1'-N9	-2.86	106.20	113.30
4	C	297	ADP	C4-C5-N7	-2.85	107.33	110.58
4	C	297	ADP	C4-N9-C8	2.82	108.70	105.74
4	A	297	ADP	C4-C5-N7	-2.58	107.63	110.58
4	C	297	ADP	C6-C5-N7	2.11	136.15	132.09
4	A	297	ADP	O2A-PA-O3A	2.08	112.89	107.27
4	C	297	ADP	C5-N7-C8	2.06	106.69	103.45
4	C	297	ADP	O3B-PB-O2B	2.01	115.35	107.80

There are no chirality outliers.

All (8) torsion outliers are listed below:

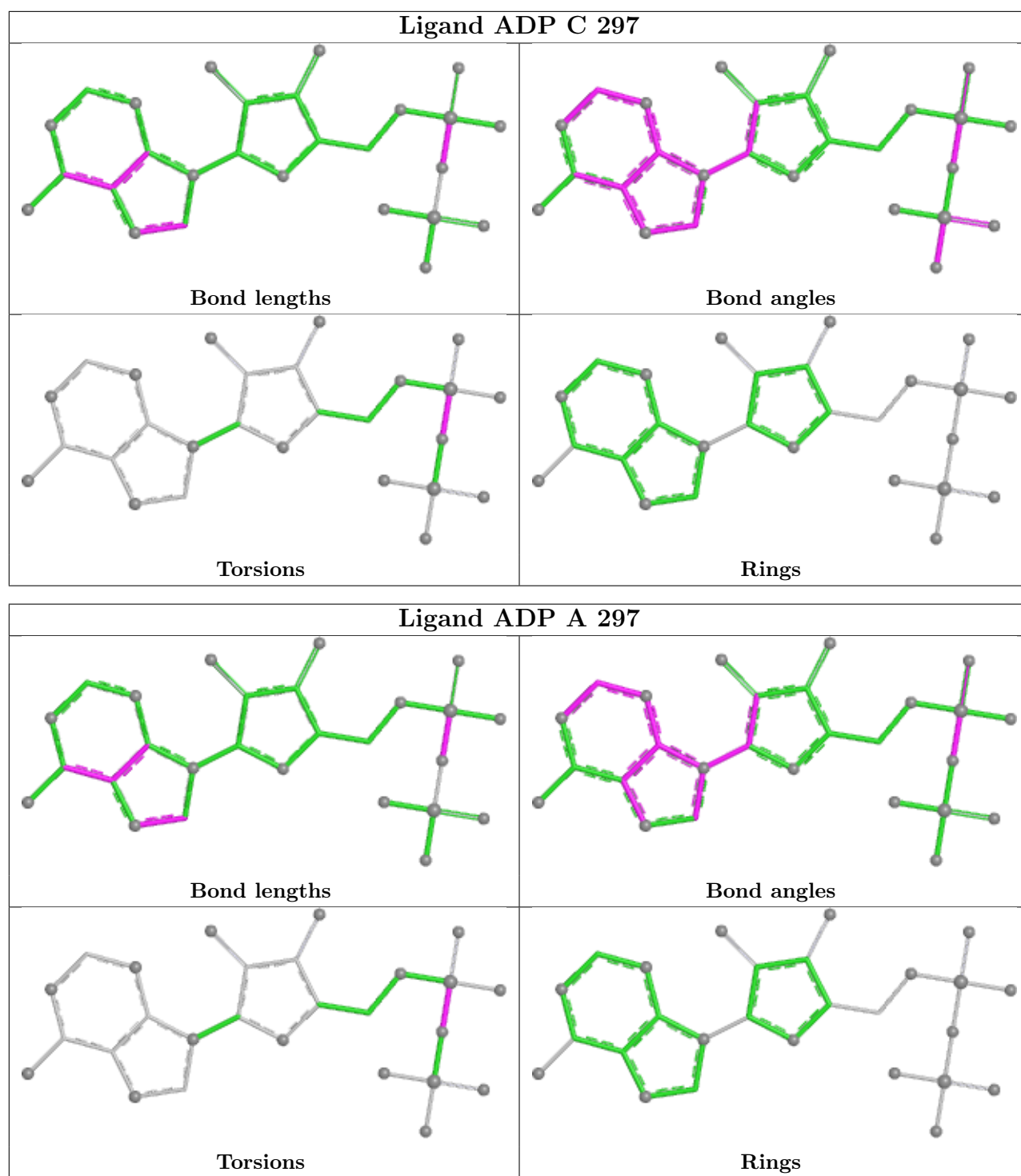
Mol	Chain	Res	Type	Atoms
8	B	3	DTU	C1-C2-C3-O3
8	B	3	DTU	O2-C2-C3-O3
8	B	3	DTU	O3-C3-C4-S4
8	D	4	DTU	C1-C2-C3-O3
8	D	4	DTU	O2-C2-C3-O3
8	D	4	DTU	O3-C3-C4-S4
4	C	297	ADP	PB-O3A-PA-O2A
4	A	297	ADP	PB-O3A-PA-O2A

There are no ring outliers.

3 monomers are involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
8	D	4	DTU	2	0
8	B	3	DTU	1	0
6	C	300	MGF	1	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.



5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

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

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	297/298 (99%)	0.16	21 (7%) 22 26	23, 36, 88, 136	0
1	C	297/298 (99%)	0.21	21 (7%) 22 26	20, 35, 73, 136	10 (3%)
2	B	261/261 (100%)	-0.07	10 (3%) 44 49	19, 34, 63, 146	0
2	D	261/261 (100%)	-0.10	11 (4%) 40 45	21, 36, 64, 146	0
3	J	10/10 (100%)	2.70	4 (40%) 1 0	52, 67, 89, 107	0
3	K	10/10 (100%)	2.86	5 (50%) 0 0	53, 67, 89, 107	0
3	L	4/10 (40%)	2.22	2 (50%) 0 0	49, 67, 69, 73	0
3	M	4/10 (40%)	2.53	3 (75%) 0 0	54, 67, 68, 73	0
All	All	1144/1158 (98%)	0.12	77 (6%) 24 28	19, 36, 79, 146	10 (0%)

All (77) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	16[A]	GLY	8.8
3	J	-2	PRO	8.4
2	D	175	VAL	7.9
3	K	-2	PRO	7.5
1	C	15[A]	TYR	7.5
1	C	14[A]	THR	6.4
1	A	-1	GLY	5.9
2	B	175	VAL	5.9
2	B	432	VAL	5.7
2	D	432	VAL	5.6
2	B	172	SER	5.5
3	J	7	LEU	5.1
3	K	7	LEU	5.0
1	A	17	VAL	4.9
1	C	163	VAL	4.8
2	D	174	GLU	4.7

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Mol	Chain	Res	Type	RSRZ
1	C	-1	GLY	4.7
2	B	174	GLU	4.5
1	A	0	HIS	4.3
1	C	0	HIS	4.3
2	B	173	ASN	4.0
3	L	4	ALA	4.0
1	A	39	THR	3.9
1	C	39	THR	3.9
1	A	163	VAL	3.8
2	D	178	TYR	3.8
2	B	176	PRO	3.7
1	C	96	LEU	3.6
3	M	4	ALA	3.5
3	M	7	LEU	3.4
1	A	16	GLY	3.3
1	A	96	LEU	3.1
1	C	179	TYR	3.1
2	D	173	ASN	3.0
2	B	178	TYR	2.9
2	D	172	SER	2.9
2	B	431	SER	2.9
1	C	38	ASP	2.9
1	A	14	THR	2.8
1	A	38	ASP	2.8
1	C	71	HIS	2.8
2	D	323	GLN	2.8
2	D	176	PRO	2.8
1	A	15	TYR	2.7
3	K	-1	LYS	2.6
1	C	296	LEU	2.6
3	J	-1	LYS	2.6
1	C	154	VAL	2.6
1	C	158	THR	2.5
1	A	154	VAL	2.4
2	D	431	SER	2.4
1	C	41	THR	2.4
1	A	288	ASP	2.4
1	C	40	GLU	2.4
1	A	158	THR	2.3
3	K	0	THR	2.3
1	C	155	PRO	2.3
1	C	157	ARG	2.3

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Mol	Chain	Res	Type	RSRZ
1	A	157	ARG	2.3
1	C	17[A]	VAL	2.3
1	C	156	VAL	2.3
1	A	41	THR	2.3
1	A	36	ARG	2.2
1	A	1	MET	2.2
3	M	5	LYS	2.2
3	L	7	LEU	2.2
1	A	71	HIS	2.2
1	A	295	HIS	2.2
1	C	295	HIS	2.2
3	J	4	ALA	2.2
2	D	430	LEU	2.1
3	K	1	PRO	2.1
2	B	430	LEU	2.1
1	A	35	ILE	2.0
2	B	429	THR	2.0
2	D	177	ASP	2.0
1	A	249	SER	2.0

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

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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
1	TPO	C	160	11/12	0.94	0.12	28,39,48,56	2
1	TPO	A	160	11/12	0.96	0.10	29,37,47,49	1

6.3 Carbohydrates ⓘ

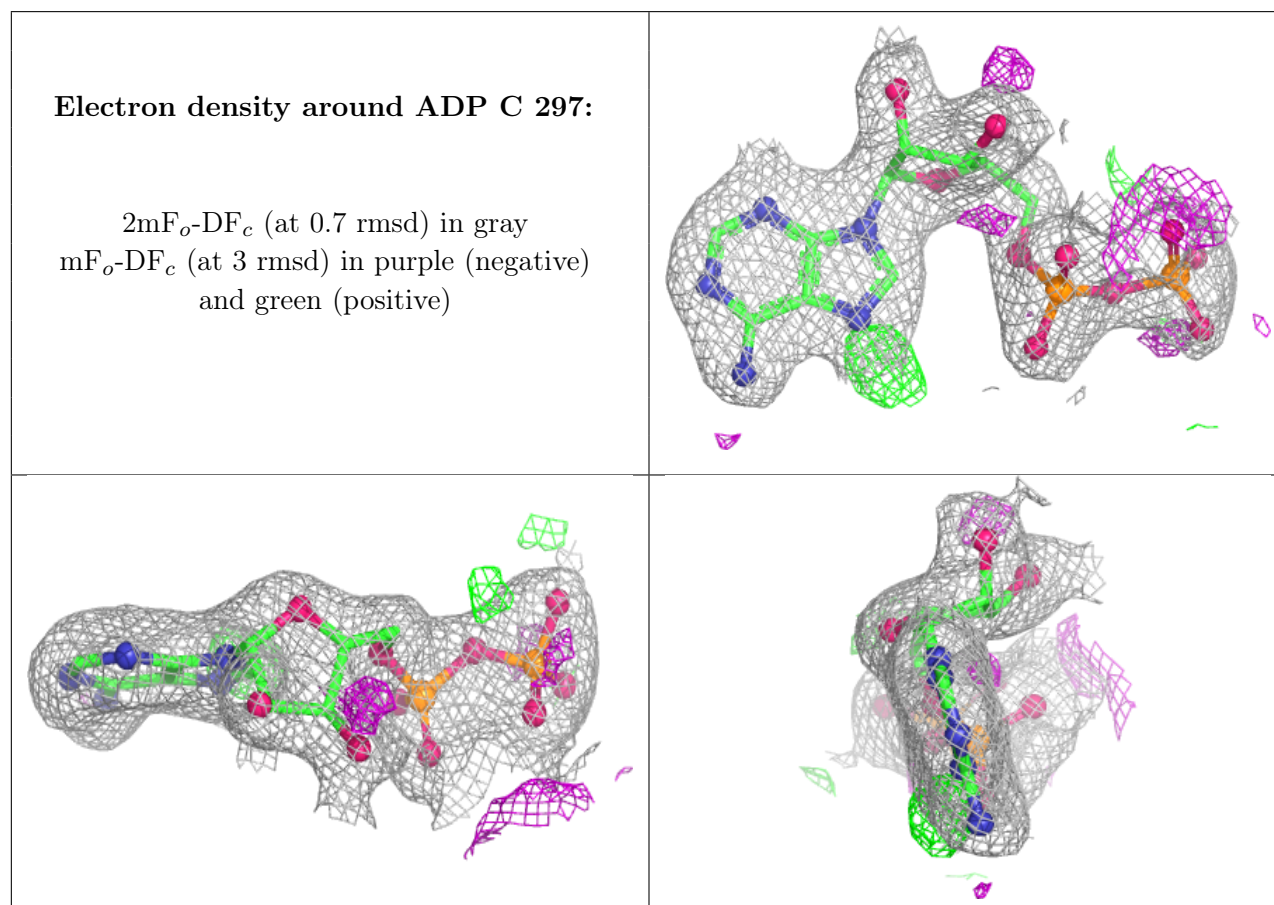
There are no oligosaccharides in this entry.

6.4 Ligands ⓘ

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.

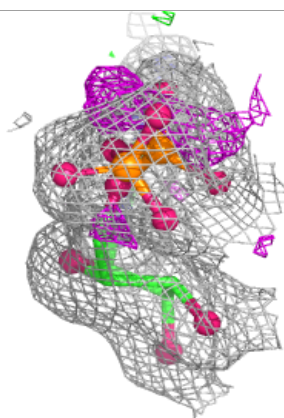
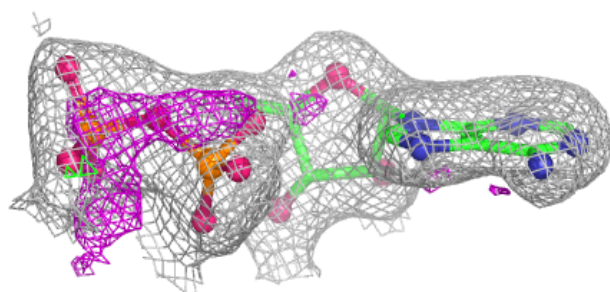
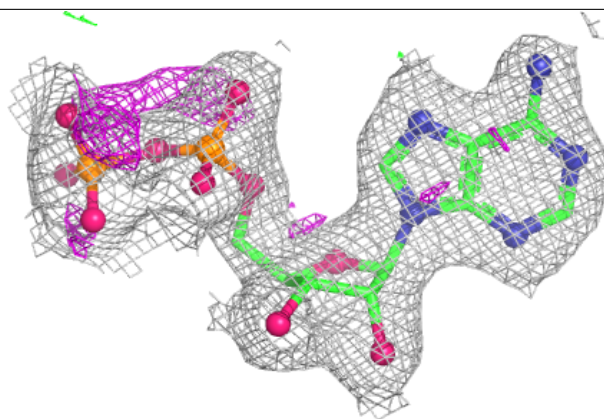
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
6	MGF	C	300	4/4	0.86	0.13	47,63,64,96	0
6	MGF	A	300	4/4	0.87	0.10	47,60,80,89	0
4	ADP	C	297	27/27	0.90	0.11	52,63,78,89	0
8	DTU	D	4	8/8	0.90	0.12	35,44,48,51	0
5	MG	C	299	1/1	0.93	0.12	62,62,62,62	1
8	DTU	B	3	8/8	0.93	0.09	32,38,42,42	0
5	MG	A	299	1/1	0.93	0.17	65,65,65,65	0
5	MG	C	298	1/1	0.94	0.11	44,44,44,44	0
4	ADP	A	297	27/27	0.94	0.09	48,53,67,81	0
7	CL	A	301	1/1	0.97	0.07	49,49,49,49	0
7	CL	C	301	1/1	0.97	0.11	47,47,47,47	0
5	MG	A	298	1/1	0.99	0.06	34,34,34,34	0

The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.



Electron density around ADP A 297:

$2mF_o - DF_c$ (at 0.7 rmsd) in gray
 $mF_o - DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)



6.5 Other polymers [i](#)

There are no such residues in this entry.