



Full wwPDB X-ray Structure Validation Report

Feb 26, 2014 – 05:33 PM GMT

PDB ID : 3MJR
Title : Human dCK complex with Acyclic Nucleoside
Authors : Hazra, S.; Lavie, A.
Deposited on : 2010-04-13
Resolution : 2.10 Å(reported)

This is a full wwPDB validation report for a publicly released PDB entry.
We welcome your comments at validation@mail.wwpdb.org
A user guide is available at <http://wwpdb.org/ValidationPDFNotes.html>

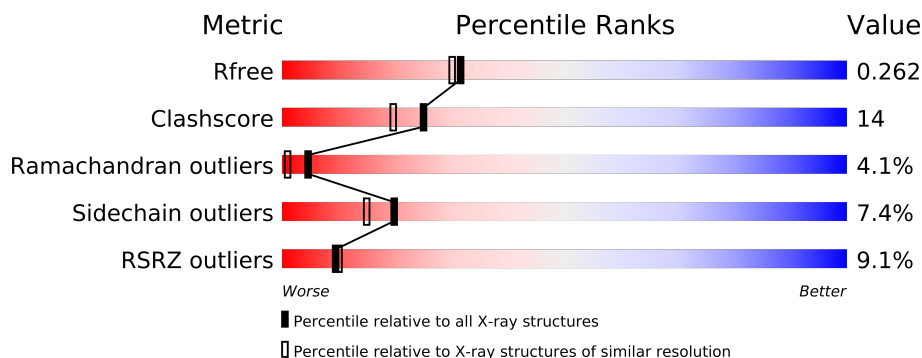
The following versions of software and data (see [references](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.15 2013
Xtriage (Phenix) : dev-1323
EDS : stable22639
Percentile statistics : 21963
Refmac : 5.8.0049
CCP4 : 6.3.0 (Settle)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et. al. (1996)
Validation Pipeline (wwPDB-VP) : stable22683

1 Overall quality at a glance

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}	66092	3012 (2.10-2.10)
Clashscore	79885	3649 (2.10-2.10)
Ramachandran outliers	78287	3610 (2.10-2.10)
Sidechain outliers	78261	3611 (2.10-2.10)
RSRZ outliers	66119	3013 (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 on the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density.

Mol	Chain	Length	Quality of chain
1	A	279	
1	B	279	
1	C	279	
1	D	279	

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 7428 atoms, of which 0 are hydrogen and 0 are deuterium.

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 Deoxycytidine kinase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	230	Total	C	N	O	S	0	0	0
			1866	1196	310	354	6			
1	B	226	Total	C	N	O	S	0	0	0
			1815	1161	303	345	6			
1	C	222	Total	C	N	O	S	0	0	0
			1757	1119	295	338	5			
1	D	221	Total	C	N	O	S	0	0	0
			1777	1140	294	338	5			

There are 92 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-18	MET	-	EXPRESSION TAG	UNP P27707
A	-17	GLY	-	EXPRESSION TAG	UNP P27707
A	-16	SER	-	EXPRESSION TAG	UNP P27707
A	-15	SER	-	EXPRESSION TAG	UNP P27707
A	-14	HIS	-	EXPRESSION TAG	UNP P27707
A	-13	HIS	-	EXPRESSION TAG	UNP P27707
A	-12	HIS	-	EXPRESSION TAG	UNP P27707
A	-11	HIS	-	EXPRESSION TAG	UNP P27707
A	-10	HIS	-	EXPRESSION TAG	UNP P27707
A	-9	HIS	-	EXPRESSION TAG	UNP P27707
A	-8	SER	-	EXPRESSION TAG	UNP P27707
A	-7	GLY	-	EXPRESSION TAG	UNP P27707
A	-6	LEU	-	EXPRESSION TAG	UNP P27707
A	-5	VAL	-	EXPRESSION TAG	UNP P27707
A	-4	PRO	-	EXPRESSION TAG	UNP P27707
A	-3	ARG	-	EXPRESSION TAG	UNP P27707
A	-2	GLY	-	EXPRESSION TAG	UNP P27707
A	-1	SER	-	EXPRESSION TAG	UNP P27707
A	0	HIS	-	EXPRESSION TAG	UNP P27707
A	9	SER	CYS	CONFLICT	UNP P27707
A	45	SER	CYS	CONFLICT	UNP P27707

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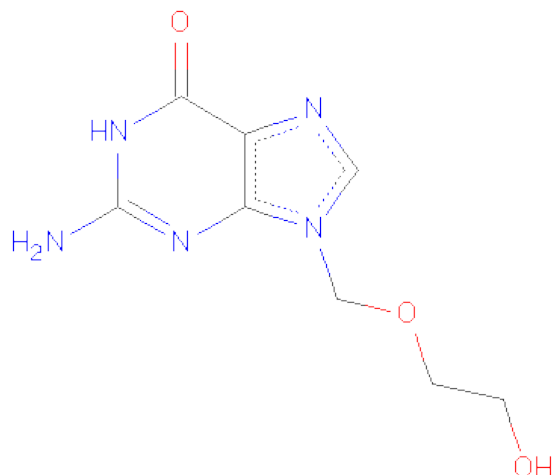
Chain	Residue	Modelled	Actual	Comment	Reference
A	59	SER	CYS	CONFLICT	UNP P27707
A	146	SER	CYS	CONFLICT	UNP P27707
B	-18	MET	-	EXPRESSION TAG	UNP P27707
B	-17	GLY	-	EXPRESSION TAG	UNP P27707
B	-16	SER	-	EXPRESSION TAG	UNP P27707
B	-15	SER	-	EXPRESSION TAG	UNP P27707
B	-14	HIS	-	EXPRESSION TAG	UNP P27707
B	-13	HIS	-	EXPRESSION TAG	UNP P27707
B	-12	HIS	-	EXPRESSION TAG	UNP P27707
B	-11	HIS	-	EXPRESSION TAG	UNP P27707
B	-10	HIS	-	EXPRESSION TAG	UNP P27707
B	-9	HIS	-	EXPRESSION TAG	UNP P27707
B	-8	SER	-	EXPRESSION TAG	UNP P27707
B	-7	GLY	-	EXPRESSION TAG	UNP P27707
B	-6	LEU	-	EXPRESSION TAG	UNP P27707
B	-5	VAL	-	EXPRESSION TAG	UNP P27707
B	-4	PRO	-	EXPRESSION TAG	UNP P27707
B	-3	ARG	-	EXPRESSION TAG	UNP P27707
B	-2	GLY	-	EXPRESSION TAG	UNP P27707
B	-1	SER	-	EXPRESSION TAG	UNP P27707
B	0	HIS	-	EXPRESSION TAG	UNP P27707
B	9	SER	CYS	CONFLICT	UNP P27707
B	45	SER	CYS	CONFLICT	UNP P27707
B	59	SER	CYS	CONFLICT	UNP P27707
B	146	SER	CYS	CONFLICT	UNP P27707
C	-18	MET	-	EXPRESSION TAG	UNP P27707
C	-17	GLY	-	EXPRESSION TAG	UNP P27707
C	-16	SER	-	EXPRESSION TAG	UNP P27707
C	-15	SER	-	EXPRESSION TAG	UNP P27707
C	-14	HIS	-	EXPRESSION TAG	UNP P27707
C	-13	HIS	-	EXPRESSION TAG	UNP P27707
C	-12	HIS	-	EXPRESSION TAG	UNP P27707
C	-11	HIS	-	EXPRESSION TAG	UNP P27707
C	-10	HIS	-	EXPRESSION TAG	UNP P27707
C	-9	HIS	-	EXPRESSION TAG	UNP P27707
C	-8	SER	-	EXPRESSION TAG	UNP P27707
C	-7	GLY	-	EXPRESSION TAG	UNP P27707
C	-6	LEU	-	EXPRESSION TAG	UNP P27707
C	-5	VAL	-	EXPRESSION TAG	UNP P27707
C	-4	PRO	-	EXPRESSION TAG	UNP P27707
C	-3	ARG	-	EXPRESSION TAG	UNP P27707
C	-2	GLY	-	EXPRESSION TAG	UNP P27707

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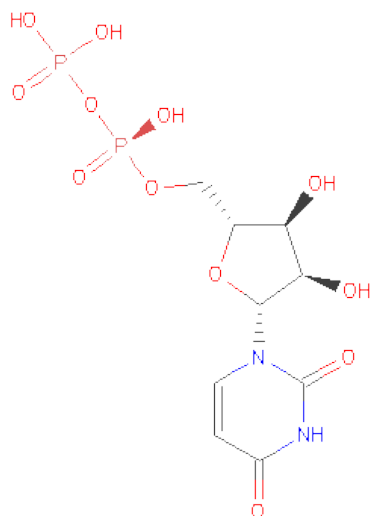
Chain	Residue	Modelled	Actual	Comment	Reference
C	-1	SER	-	EXPRESSION TAG	UNP P27707
C	0	HIS	-	EXPRESSION TAG	UNP P27707
C	9	SER	CYS	CONFLICT	UNP P27707
C	45	SER	CYS	CONFLICT	UNP P27707
C	59	SER	CYS	CONFLICT	UNP P27707
C	146	SER	CYS	CONFLICT	UNP P27707
D	-18	MET	-	EXPRESSION TAG	UNP P27707
D	-17	GLY	-	EXPRESSION TAG	UNP P27707
D	-16	SER	-	EXPRESSION TAG	UNP P27707
D	-15	SER	-	EXPRESSION TAG	UNP P27707
D	-14	HIS	-	EXPRESSION TAG	UNP P27707
D	-13	HIS	-	EXPRESSION TAG	UNP P27707
D	-12	HIS	-	EXPRESSION TAG	UNP P27707
D	-11	HIS	-	EXPRESSION TAG	UNP P27707
D	-10	HIS	-	EXPRESSION TAG	UNP P27707
D	-9	HIS	-	EXPRESSION TAG	UNP P27707
D	-8	SER	-	EXPRESSION TAG	UNP P27707
D	-7	GLY	-	EXPRESSION TAG	UNP P27707
D	-6	LEU	-	EXPRESSION TAG	UNP P27707
D	-5	VAL	-	EXPRESSION TAG	UNP P27707
D	-4	PRO	-	EXPRESSION TAG	UNP P27707
D	-3	ARG	-	EXPRESSION TAG	UNP P27707
D	-2	GLY	-	EXPRESSION TAG	UNP P27707
D	-1	SER	-	EXPRESSION TAG	UNP P27707
D	0	HIS	-	EXPRESSION TAG	UNP P27707
D	9	SER	CYS	CONFLICT	UNP P27707
D	45	SER	CYS	CONFLICT	UNP P27707
D	59	SER	CYS	CONFLICT	UNP P27707
D	146	SER	CYS	CONFLICT	UNP P27707

- Molecule 2 is 9-HYROXYETHOXYMETHYLGUANINE (three-letter code: AC2) (formula: $C_8H_{11}N_5O_3$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	C	N	O	0	0
			16	8	5	3		
2	B	1	Total	C	N	O	0	0
			16	8	5	3		
2	D	1	Total	C	N	O	0	0
			16	8	5	3		

- Molecule 3 is URIDINE-5'-DIPHOSPHATE (three-letter code: UDP) (formula: $C_9H_{14}N_2O_{12}P_2$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total	C	N	O	P	0	0
			25	9	2	12	2		

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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	B	1	Total	C	N	O	P	0	0
			25	9	2	12	2		
3	C	1	Total	C	N	O	P	0	0
			25	9	2	12	2		
3	D	1	Total	C	N	O	P	0	0
			25	9	2	12	2		

- Molecule 4 is water.

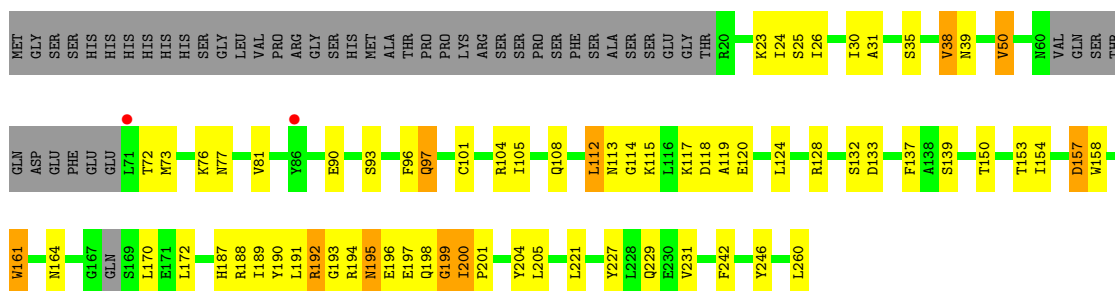
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	22	Total	O	0	0
			22	22		
4	B	32	Total	O	0	0
			32	32		
4	C	7	Total	O	0	0
			7	7		
4	D	4	Total	O	0	0
			4	4		

3 Residue-property plots

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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.

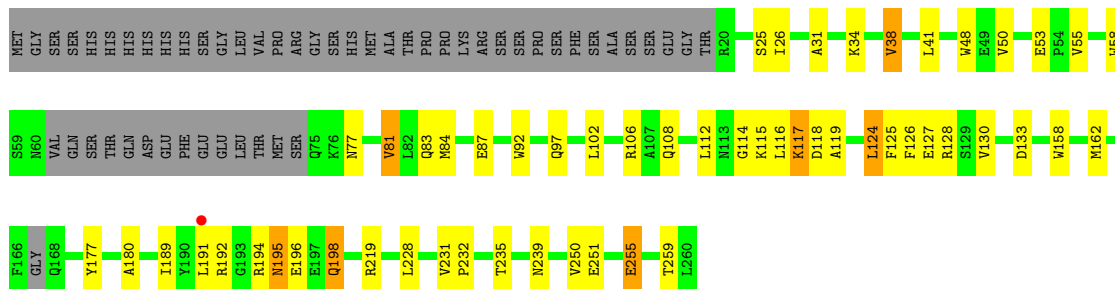
• Molecule 1: Deoxycytidine kinase

Chain A: 



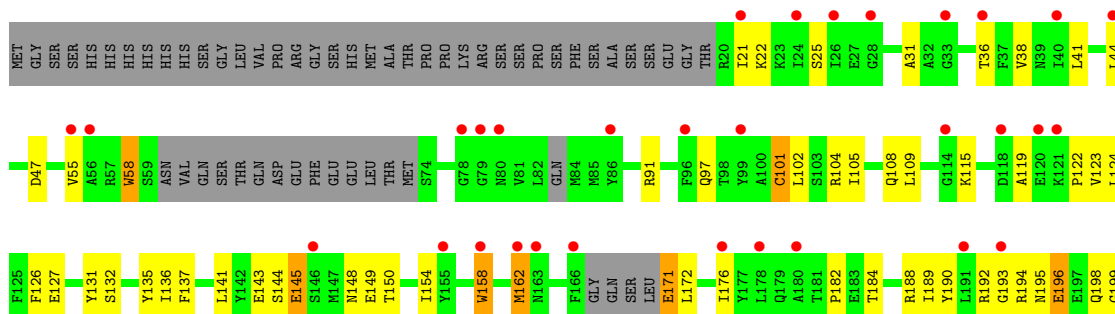
• Molecule 1: Deoxycytidine kinase

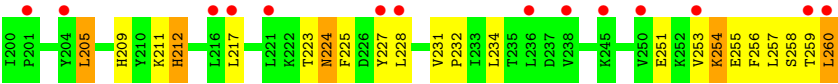
Chain B: 



• Molecule 1: Deoxycytidine kinase

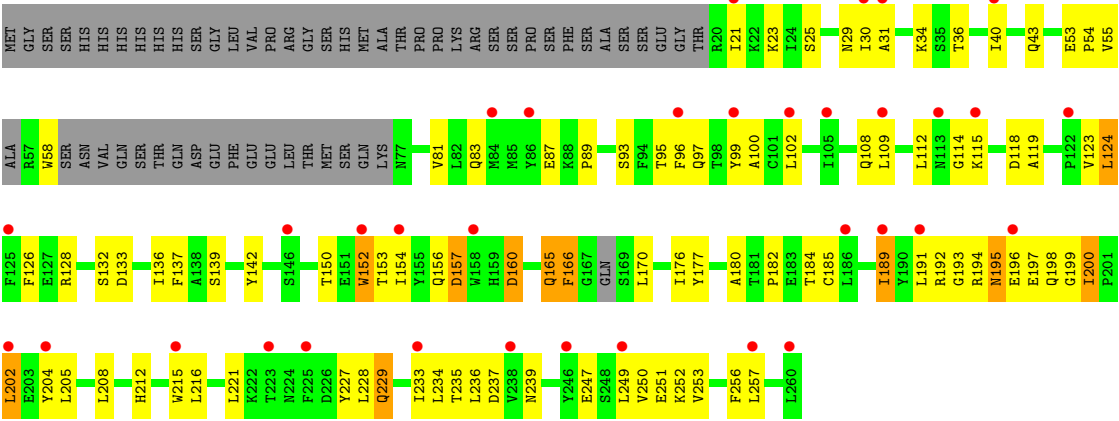
Chain C: 





● Molecule 1: Deoxycytidine kinase

Chain D:



4 Data and refinement statistics

Property	Value	Source
Space group	P 41	Depositor
Cell constants a, b, c, α , β , γ	97.31Å 97.31Å 121.50Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	30.00 – 2.10 29.65 – 2.10	Depositor EDS
% Data completeness (in resolution range)	89.8 (30.00-2.10) 97.6 (29.65-2.10)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.33 (at 2.10Å)	Xtriage
Refinement program	REFMAC5.2	Depositor
R, R_{free}	0.258 , 0.312 0.263 , 0.262	Depositor DCC
R_{free} test set	6501 reflections (11.22%)	DCC
Wilson B-factor (Å ²)	34.9	Xtriage
Anisotropy	0.127	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 29.2	EDS
Estimated twinning fraction	0.470 for h,-k,-l	Xtriage
L-test for twinning	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Outliers	0 of 65014 reflections	Xtriage
F_o, F_c correlation	0.91	EDS
Total number of atoms	7428	wwPDB-VP
Average B, all atoms (Å ²)	43.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 58.21 % of the origin peak, indicating pseudo translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo translational symmetry is equal to 2.1139e-05. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

¹Intensities estimated from amplitudes.

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: AC2, UDP

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	0.46	0/1910	0.62	0/2590
1	B	0.46	0/1857	0.63	0/2520
1	C	0.37	0/1796	0.56	1/2437 (0.0%)
1	D	0.38	0/1816	0.58	0/2462
All	All	0.42	0/7379	0.60	1/10009 (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	C	260	LEU	CA-CB-CG	5.03	126.86	115.30

There are no chirality outliers.

There are no planarity outliers.

5.2 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 hydrogens added by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, and the number in parentheses is this value normalized per 1000 atoms of the molecule in the chain. The Symm-Clashes column gives symmetry related clashes, in the same way as for the Clashes column.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	1866	0	1765	51	0
1	B	1815	0	1688	35	0
1	C	1757	0	1606	41	0
1	D	1777	0	1670	72	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	A	16	0	11	9	0
2	B	16	0	11	2	0
2	D	16	0	10	3	0
3	A	25	0	11	2	0
3	B	25	0	11	0	0
3	C	25	0	11	0	0
3	D	25	0	11	1	0
4	A	22	0	0	2	0
4	B	32	0	0	4	0
4	C	7	0	0	3	0
4	D	4	0	0	0	0
All	All	7428	0	6805	195	0

Clashscore is defined as the number of clashes calculated for the entry per 1000 atoms (including hydrogens) of the entry. The overall clashscore for this entry is 14.

All (195) close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:93:SER:O	1:A:96:PHE:O	1.58	1.22
1:B:53:GLU:OE1	2:B:401:AC2:N2	1.71	1.21
1:A:200:ILE:HB	1:A:201:PRO:HD3	1.38	1.01
1:D:180:ALA:HA	1:D:239:ASN:HD21	1.27	0.95
1:A:38:VAL:HG22	1:A:50:VAL:HG22	1.51	0.93
1:D:198:GLN:HG3	1:D:199:GLY:H	1.38	0.89
1:B:108:GLN:OE1	4:B:293:HOH:O	1.96	0.83
1:D:133:ASP:OD1	2:D:601:AC2:O6	1.96	0.83
1:C:97:GLN:O	1:C:101:CYS:HB2	1.81	0.81
1:A:38:VAL:HG22	1:A:50:VAL:CG2	2.12	0.80
1:A:190:TYR:HA	1:A:194:ARG:HE	1.50	0.76
1:A:189:ILE:HG21	1:A:199:GLY:HA3	1.68	0.76
1:B:117:LYS:HA	1:B:119:ALA:N	2.02	0.75
1:A:200:ILE:HB	1:A:201:PRO:CD	2.18	0.72
1:D:165:GLN:HB3	1:D:166:PHE:CB	2.20	0.71
1:A:227:TYR:O	1:A:231:VAL:HG23	1.90	0.71
1:D:249:LEU:O	1:D:253:VAL:HG23	1.90	0.71
1:D:132:SER:O	1:D:136:ILE:HB	1.91	0.70
1:A:97:GLN:N	4:A:283:HOH:O	2.04	0.70
1:D:182:PRO:HB2	1:D:202:LEU:CD2	2.22	0.70
1:D:23:LYS:HG2	1:D:126:PHE:HE1	1.54	0.69
1:B:102:LEU:O	1:B:106:ARG:HG3	1.92	0.69
1:D:199:GLY:O	1:D:200:ILE:HB	1.94	0.67
1:B:158:TRP:CE2	1:B:162:MET:HG3	2.31	0.66

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:C:38:VAL:HA	1:C:41:LEU:HD12	1.78	0.66
1:D:247:GLU:HA	1:D:250:VAL:HG12	1.77	0.66
1:D:31:ALA:HB3	1:D:189:ILE:HG12	1.78	0.65
1:B:251:GLU:OE2	4:B:269:HOH:O	2.14	0.65
1:A:96:PHE:O	1:A:97:GLN:HB2	1.96	0.65
1:A:38:VAL:CG2	1:A:50:VAL:HG22	2.24	0.64
1:B:31:ALA:HB3	1:B:189:ILE:HG13	1.78	0.64
1:A:204:TYR:OH	2:A:301:AC2:H3'1	1.97	0.64
1:D:97:GLN:NE2	2:D:601:AC2:N7	2.45	0.64
1:D:132:SER:O	1:D:137:PHE:HD1	1.81	0.64
1:A:101:CYS:O	1:A:105:ILE:HG13	1.99	0.63
1:D:180:ALA:HA	1:D:239:ASN:ND2	2.07	0.63
1:A:96:PHE:HA	4:A:283:HOH:O	1.99	0.63
1:A:77:ASN:O	1:A:81:VAL:HG22	1.99	0.62
1:B:84:MET:HB3	1:B:92:TRP:CD1	2.34	0.62
1:C:256:PHE:HD1	4:C:262:HOH:O	1.82	0.62
1:C:21:ILE:HG22	1:C:22:LYS:H	1.65	0.61
1:D:29:ASN:HD21	1:D:205:LEU:HB3	1.64	0.61
1:D:177:TYR:HE1	1:D:212:HIS:HB3	1.66	0.61
1:C:195:ASN:O	1:C:196:GLU:HB2	2.01	0.61
1:D:53:GLU:O	1:D:55:VAL:N	2.33	0.61
1:D:192:ARG:HB2	3:D:261:UDP:H4'	1.84	0.60
1:B:77:ASN:O	1:B:81:VAL:HG22	2.02	0.60
1:D:182:PRO:HB2	1:D:202:LEU:HD21	1.83	0.59
1:A:204:TYR:OH	2:A:301:AC2:C3'	2.50	0.59
1:B:117:LYS:HA	1:B:119:ALA:H	1.66	0.59
1:C:253:VAL:HA	4:C:262:HOH:O	2.03	0.58
1:C:198:GLN:HG3	1:C:199:GLY:H	1.68	0.58
1:B:124:LEU:HD13	1:B:126:PHE:HE2	1.69	0.57
1:B:31:ALA:CB	1:B:189:ILE:HG13	2.34	0.57
1:D:185:CYS:O	1:D:189:ILE:HG13	2.05	0.57
1:A:25:SER:HB2	1:A:172:LEU:HD13	1.87	0.57
1:C:158:TRP:HB3	1:D:102:LEU:HD21	1.87	0.56
1:A:195:ASN:C	1:A:197:GLU:H	2.09	0.56
1:D:31:ALA:CB	1:D:189:ILE:HG12	2.35	0.56
1:C:192:ARG:HG2	1:C:193:GLY:H	1.71	0.56
1:A:96:PHE:O	1:A:97:GLN:CB	2.54	0.56
1:C:171:GLU:HA	1:C:227:TYR:OH	2.06	0.55
1:A:117:LYS:HA	1:A:118:ASP:C	2.27	0.55
1:D:177:TYR:CE1	1:D:212:HIS:HB3	2.42	0.55
1:B:130:VAL:HA	1:B:133:ASP:HB2	1.88	0.55
1:A:150:THR:O	1:A:154:ILE:HG13	2.07	0.55

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:D:139:SER:HA	1:D:152:TRP:HZ2	1.72	0.55
1:A:128:ARG:HH11	2:A:301:AC2:HN22	1.54	0.55
1:D:176:ILE:HD13	1:D:253:VAL:HG22	1.88	0.54
1:D:21:ILE:CG2	1:D:124:LEU:HB2	2.38	0.54
1:D:23:LYS:HG2	1:D:126:PHE:CE1	2.41	0.54
1:D:137:PHE:CD2	2:D:601:AC2:C5	2.91	0.54
1:A:153:THR:CG2	1:B:77:ASN:HD21	2.20	0.54
1:B:25:SER:HA	1:B:126:PHE:O	2.08	0.54
1:D:55:VAL:HA	1:D:58:TRP:HA	1.88	0.54
1:B:41:LEU:O	1:B:48:TRP:HE3	1.91	0.54
1:D:198:GLN:CG	1:D:199:GLY:H	2.10	0.53
1:C:176:ILE:HG12	1:C:234:LEU:HB3	1.90	0.53
1:D:198:GLN:HG3	1:D:199:GLY:N	2.15	0.53
1:A:35:SER:O	1:A:39:ASN:ND2	2.42	0.52
1:D:123:VAL:HG21	1:D:257:LEU:HD21	1.91	0.52
1:D:184:THR:HG21	1:D:239:ASN:HA	1.91	0.52
1:C:251:GLU:HA	1:C:254:LYS:HE3	1.91	0.52
1:B:50:VAL:HG22	1:B:125:PHE:HB2	1.92	0.52
1:D:83:GLN:O	1:D:87:GLU:HG2	2.10	0.52
1:A:190:TYR:HA	1:A:194:ARG:NE	2.23	0.51
1:C:154:ILE:HG12	1:D:99:TYR:CD1	2.44	0.51
1:B:177:TYR:CD2	1:B:235:THR:HG23	2.45	0.51
1:D:177:TYR:HD2	1:D:235:THR:HG23	1.76	0.51
1:D:252:LYS:O	1:D:256:PHE:HB3	2.10	0.51
1:C:144:SER:O	1:C:145:GLU:HB2	2.10	0.51
1:D:95:THR:O	1:D:96:PHE:HB3	2.10	0.51
1:A:204:TYR:HH	2:A:301:AC2:C3'	2.23	0.51
1:B:195:ASN:O	1:B:196:GLU:HB3	2.11	0.50
1:A:73:MET:HA	1:A:76:LYS:HB3	1.93	0.50
1:C:132:SER:HA	1:C:136:ILE:HD12	1.92	0.50
1:C:102:LEU:HA	1:C:105:ILE:HD12	1.93	0.50
1:C:136:ILE:HD13	1:C:212:HIS:CE1	2.47	0.50
1:C:184:THR:HB	1:C:188:ARG:NH1	2.27	0.50
1:B:97:GLN:OE1	2:B:401:AC2:N7	2.45	0.49
1:D:157:ASP:HA	1:D:160:ASP:HB2	1.93	0.49
1:B:158:TRP:NE1	1:B:162:MET:CG	2.75	0.49
1:D:152:TRP:HE3	1:D:156:GLN:HG3	1.77	0.49
1:D:234:LEU:HD13	1:D:256:PHE:HB2	1.93	0.49
1:D:96:PHE:O	1:D:100:ALA:HB2	2.11	0.49
1:B:180:ALA:HA	1:B:239:ASN:OD1	2.13	0.49
1:B:116:LEU:O	1:B:117:LYS:CB	2.60	0.49
1:B:38:VAL:HG11	1:B:127:GLU:OE1	2.12	0.49

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:D:34:LYS:HE3	1:D:128:ARG:HE	1.77	0.49
1:C:158:TRP:CD1	1:C:162:MET:HG3	2.47	0.49
1:D:108:GLN:O	1:D:112:LEU:HB2	2.13	0.49
1:C:135:TYR:OH	1:C:224:ASN:ND2	2.46	0.49
1:A:128:ARG:NH1	2:A:301:AC2:N2	2.57	0.48
1:A:189:ILE:HD12	1:A:205:LEU:HD11	1.95	0.48
1:A:192:ARG:HD3	3:A:261:UDP:H5'1	1.96	0.48
1:D:36:THR:O	1:D:40:ILE:HG13	2.13	0.48
1:D:89:PRO:O	1:D:93:SER:HB2	2.14	0.48
1:A:137:PHE:HE2	2:A:301:AC2:HO'3	1.59	0.48
1:C:31:ALA:HB3	1:C:189:ILE:HG13	1.95	0.48
1:D:195:ASN:H	1:D:198:GLN:H	1.62	0.47
1:D:198:GLN:CG	1:D:199:GLY:N	2.75	0.47
1:B:83:GLN:O	1:B:87:GLU:HG2	2.12	0.47
1:D:227:TYR:C	1:D:229:GLN:H	2.18	0.47
1:B:250:VAL:HG23	4:B:269:HOH:O	2.15	0.47
1:D:215:TRP:HA	1:D:221:LEU:HB3	1.97	0.47
1:A:192:ARG:HA	3:A:261:UDP:O3'	2.15	0.46
1:A:23:LYS:HE2	1:A:112:LEU:HD11	1.97	0.46
1:B:26:ILE:HG22	1:B:34:LYS:HG2	1.96	0.46
1:A:128:ARG:NH1	2:A:301:AC2:HN22	2.14	0.46
1:D:182:PRO:HB2	1:D:202:LEU:HD23	1.98	0.46
1:C:119:ALA:HB3	1:C:122:PRO:HG3	1.98	0.46
1:A:117:LYS:HA	1:A:118:ASP:O	2.16	0.46
1:A:31:ALA:HB1	1:A:188:ARG:HB3	1.98	0.46
1:D:205:LEU:HA	1:D:208:LEU:HD12	1.98	0.45
1:D:194:ARG:HB3	1:D:198:GLN:HA	1.98	0.45
1:D:236:LEU:HD13	1:D:249:LEU:HD22	1.99	0.45
1:D:109:LEU:HG	1:D:170:LEU:HD21	1.98	0.45
1:C:131:TYR:HE1	1:C:172:LEU:HG	1.80	0.45
1:D:165:GLN:CB	1:D:166:PHE:CB	2.91	0.45
1:C:190:TYR:HA	1:C:194:ARG:HE	1.80	0.45
1:A:108:GLN:HB3	1:A:170:LEU:HD22	1.99	0.45
1:D:142:TYR:HB2	1:D:152:TRP:HE1	1.81	0.45
1:B:55:VAL:O	1:B:58:TRP:HB2	2.17	0.45
1:A:101:CYS:HB3	1:A:158:TRP:HH2	1.81	0.45
1:A:153:THR:HG21	1:B:77:ASN:HD21	1.81	0.45
1:B:219:ARG:NH2	1:B:228:LEU:O	2.50	0.45
1:C:223:THR:C	1:C:225:PHE:H	2.20	0.45
1:A:97:GLN:NE2	2:A:301:AC2:N7	2.64	0.45
1:A:101:CYS:HB3	1:A:158:TRP:CH2	2.52	0.44
1:D:234:LEU:HB2	1:D:256:PHE:CD2	2.51	0.44

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:C:225:PHE:HB2	1:C:228:LEU:HD12	1.99	0.44
1:D:152:TRP:CE3	1:D:156:GLN:HG3	2.53	0.44
1:D:216:LEU:HB3	1:D:233:ILE:HG21	1.99	0.44
1:B:128:ARG:HD3	4:B:275:HOH:O	2.16	0.44
1:D:139:SER:HA	1:D:152:TRP:CZ2	2.52	0.44
1:D:239:ASN:HD22	1:D:239:ASN:H	1.65	0.44
1:B:231:VAL:HA	1:B:232:PRO:HD3	1.80	0.44
1:D:237:ASP:OD1	1:D:239:ASN:ND2	2.51	0.43
1:D:133:ASP:HA	1:D:137:PHE:HB2	1.99	0.43
1:C:21:ILE:HG23	1:C:122:PRO:HB2	2.00	0.43
1:C:182:PRO:HD3	1:C:209:HIS:CE1	2.53	0.43
1:C:25:SER:HA	1:C:126:PHE:HB2	2.00	0.43
1:D:195:ASN:N	1:D:198:GLN:H	2.16	0.43
1:C:182:PRO:HG3	1:C:209:HIS:ND1	2.33	0.43
1:A:24:ILE:HD11	1:A:260:LEU:HD13	2.01	0.43
1:D:153:THR:HA	1:D:156:GLN:HB2	2.00	0.43
1:C:31:ALA:CB	1:C:189:ILE:HG13	2.49	0.42
1:D:176:ILE:HG12	1:D:234:LEU:HD23	2.01	0.42
1:D:21:ILE:HG21	1:D:124:LEU:HB2	2.01	0.42
1:A:24:ILE:HD11	1:A:260:LEU:CD1	2.50	0.42
1:D:150:THR:O	1:D:154:ILE:N	2.40	0.42
1:A:189:ILE:HG21	1:A:199:GLY:CA	2.43	0.42
1:C:104:ARG:O	1:C:108:GLN:HG3	2.20	0.42
1:A:242:PHE:O	1:A:246:TYR:HB3	2.18	0.42
1:C:123:VAL:HG13	4:C:263:HOH:O	2.19	0.42
1:B:255:GLU:O	1:B:259:THR:HG23	2.19	0.42
1:D:25:SER:HA	1:D:126:PHE:O	2.20	0.42
1:A:104:ARG:NE	1:A:133:ASP:OD2	2.44	0.42
1:B:158:TRP:CZ2	1:B:162:MET:HG3	2.54	0.41
1:A:30:ILE:HD11	2:A:301:AC2:O3'	2.19	0.41
1:A:194:ARG:HH11	1:A:198:GLN:NE2	2.19	0.41
1:C:211:LYS:H	1:C:211:LYS:HG3	1.69	0.41
1:C:231:VAL:HA	1:C:232:PRO:HD3	1.87	0.41
1:C:182:PRO:HB3	1:C:205:LEU:HD22	2.02	0.41
1:C:143:GLU:OE1	1:C:211:LYS:HE2	2.20	0.41
1:C:91:ARG:O	1:C:91:ARG:HG3	2.20	0.41
1:C:137:PHE:O	1:C:141:LEU:HG	2.21	0.41
1:A:187:HIS:O	1:A:191:LEU:HG	2.21	0.41
1:D:139:SER:CA	1:D:152:TRP:HZ2	2.32	0.40
1:A:157:ASP:O	1:A:161:TRP:HB3	2.20	0.40
1:B:158:TRP:CE2	1:B:162:MET:CG	3.03	0.40
1:D:247:GLU:O	1:D:251:GLU:HG2	2.20	0.40

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:C:55:VAL:HA	1:C:58:TRP:HB2	2.03	0.40
1:C:256:PHE:O	1:C:258:SER:N	2.54	0.40
1:A:112:LEU:C	1:A:114:GLY:H	2.25	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	224/279 (80%)	201 (90%)	11 (5%)	12 (5%)	3	0
1	B	220/279 (79%)	188 (86%)	24 (11%)	8 (4%)	5	1
1	C	214/279 (77%)	173 (81%)	36 (17%)	5 (2%)	10	3
1	D	213/279 (76%)	179 (84%)	23 (11%)	11 (5%)	3	0
All	All	871/1116 (78%)	741 (85%)	94 (11%)	36 (4%)	4	1

All (36) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	97	GLN
1	A	119	ALA
1	A	200	ILE
1	B	115	LYS
1	B	117	LYS
1	B	194	ARG
1	C	196	GLU
1	D	54	PRO
1	D	119	ALA
1	D	166	PHE
1	D	200	ILE
1	A	112	LEU
1	A	192	ARG
1	A	193	GLY
1	A	195	ASN

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Mol	Chain	Res	Type
1	C	127	GLU
1	C	145	GLU
1	C	257	LEU
1	A	199	GLY
1	D	118	ASP
1	D	195	ASN
1	D	228	LEU
1	A	72	THR
1	A	113	ASN
1	B	118	ASP
1	B	192	ARG
1	B	195	ASN
1	B	198	GLN
1	C	224	ASN
1	D	193	GLY
1	A	115	LYS
1	D	115	LYS
1	D	197	GLU
1	A	196	GLU
1	D	114	GLY
1	B	114	GLY

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	197/255 (77%)	184 (93%)	13 (7%)	24	19
1	B	187/255 (73%)	180 (96%)	7 (4%)	45	45
1	C	177/255 (69%)	156 (88%)	21 (12%)	8	4
1	D	185/255 (72%)	171 (92%)	14 (8%)	19	14
All	All	746/1020 (73%)	691 (93%)	55 (7%)	20	15

All (55) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	26	ILE

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Mol	Chain	Res	Type
1	A	38	VAL
1	A	50	VAL
1	A	90	GLU
1	A	120	GLU
1	A	124	LEU
1	A	132	SER
1	A	139	SER
1	A	157	ASP
1	A	161	TRP
1	A	164	ASN
1	A	221	LEU
1	A	229	GLN
1	B	38	VAL
1	B	81	VAL
1	B	112	LEU
1	B	124	LEU
1	B	191	LEU
1	B	198	GLN
1	B	255	GLU
1	C	36	THR
1	C	44	LEU
1	C	47	ASP
1	C	58	TRP
1	C	101	CYS
1	C	109	LEU
1	C	115	LYS
1	C	124	LEU
1	C	148	ASN
1	C	149	GLU
1	C	150	THR
1	C	158	TRP
1	C	162	MET
1	C	171	GLU
1	C	205	LEU
1	C	212	HIS
1	C	217	LEU
1	C	254	LYS
1	C	255	GLU
1	C	259	THR
1	C	260	LEU
1	D	30	ILE
1	D	43	GLN

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Mol	Chain	Res	Type
1	D	81	VAL
1	D	124	LEU
1	D	152	TRP
1	D	157	ASP
1	D	160	ASP
1	D	165	GLN
1	D	189	ILE
1	D	191	LEU
1	D	196	GLU
1	D	202	LEU
1	D	204	TYR
1	D	229	GLN

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (15) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	39	ASN
1	A	165	GLN
1	A	195	ASN
1	A	224	ASN
1	B	77	ASN
1	B	97	GLN
1	B	218	HIS
1	B	229	GLN
1	C	39	ASN
1	C	148	ASN
1	C	209	HIS
1	C	224	ASN
1	C	229	GLN
1	D	113	ASN
1	D	165	GLN

5.3.3 RNA ⓘ

There are no RNA chains in this entry.

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

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

5.5 Carbohydrates ⓘ

There are no carbohydrates in this entry.

5.6 Ligand geometry ⓘ

7 ligands are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# $ Z > 2$	Counts	RMSZ	# $ Z > 2$
3	UDP	A	261	-	26,26,26	0.98	1 (3%)	36,40,40	1.42	3 (8%)
2	AC2	A	301	-	17,17,17	1.89	2 (11%)	20,23,23	2.36	6 (30%)
3	UDP	B	261	-	26,26,26	1.04	2 (7%)	36,40,40	1.29	4 (11%)
2	AC2	B	401	-	17,17,17	1.86	2 (11%)	20,23,23	2.07	5 (25%)
3	UDP	C	501	-	26,26,26	0.98	1 (3%)	36,40,40	1.42	4 (11%)
3	UDP	D	261	-	26,26,26	0.96	1 (3%)	36,40,40	1.54	4 (11%)
2	AC2	D	601	-	17,17,17	1.88	2 (11%)	20,23,23	2.53	8 (40%)

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	UDP	A	261	-	-	0/14/32/32	0/2/2/2
2	AC2	A	301	-	-	0/4/5/5	0/0/2/2
3	UDP	B	261	-	-	0/14/32/32	0/2/2/2
2	AC2	B	401	-	-	0/4/5/5	0/0/2/2
3	UDP	C	501	-	-	0/14/32/32	0/2/2/2
3	UDP	D	261	-	-	0/14/32/32	0/2/2/2
2	AC2	D	601	-	-	0/4/5/5	0/0/2/2

All (11) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	301	AC2	O6-C6	6.16	1.36	1.24
2	D	601	AC2	O6-C6	5.96	1.36	1.24
2	B	401	AC2	O6-C6	5.87	1.36	1.24
2	B	401	AC2	C4-N9	-2.69	1.33	1.37
2	D	601	AC2	C4-N9	-2.39	1.34	1.37
2	A	301	AC2	C4-N9	-2.35	1.34	1.37
3	B	261	UDP	C6-C5	2.28	1.39	1.36
3	A	261	UDP	C6-C5	2.23	1.39	1.36
3	C	501	UDP	C6-C5	2.19	1.39	1.36
3	B	261	UDP	PB-O2B	-2.01	1.47	1.54
3	D	261	UDP	C6-C5	2.00	1.39	1.36

All (34) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	601	AC2	C6-C5-N7	-6.96	133.20	134.14
2	A	301	AC2	C6-C5-N7	-5.72	133.37	134.14
3	C	501	UDP	N3-C2-N1	4.75	119.94	115.97
3	D	261	UDP	C2-N1-C1'	4.75	121.19	118.21
2	B	401	AC2	C5-C4-N3	-4.73	119.08	125.94
3	A	261	UDP	N3-C2-N1	4.70	119.89	115.97
3	B	261	UDP	N3-C2-N1	4.57	119.79	115.97
3	D	261	UDP	N3-C2-N1	4.57	119.79	115.97
2	A	301	AC2	C5-C4-N3	-4.55	119.35	125.94
2	D	601	AC2	C5-C4-N3	-4.49	119.44	125.94
2	D	601	AC2	N3-C4-N9	4.16	133.41	127.09
3	A	261	UDP	C2-N1-C1'	4.15	120.81	118.21
2	A	301	AC2	N3-C4-N9	3.83	132.91	127.09
2	B	401	AC2	C4-C5-N7	-3.69	106.36	109.52
2	B	401	AC2	C2-N3-C4	3.65	120.22	115.09
2	D	601	AC2	C2-N3-C4	3.62	120.17	115.09
3	C	501	UDP	PA-O3A-PB	-3.59	121.14	131.68
2	A	301	AC2	C2-N3-C4	3.46	119.95	115.09
2	B	401	AC2	N3-C4-N9	3.43	132.30	127.09
3	D	261	UDP	C3'-C2'-C1'	3.30	106.07	100.91
3	A	261	UDP	PA-O3A-PB	-3.28	122.07	131.68
2	B	401	AC2	C1'-N9-C4	3.26	126.26	123.78
2	A	301	AC2	C1'-N9-C4	3.20	126.21	123.78
2	A	301	AC2	C4-C5-N7	-2.93	107.01	109.52
3	C	501	UDP	C2-N1-C1'	2.90	120.02	118.21
2	D	601	AC2	C1'-N9-C4	2.59	125.75	123.78
3	B	261	UDP	O4'-C1'-N1	2.54	113.42	108.06
3	C	501	UDP	C3'-C2'-C1'	2.49	104.81	100.91

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	601	AC2	C4-C5-N7	-2.38	107.49	109.52
3	B	261	UDP	C5-C4-N3	2.32	121.07	116.70
2	D	601	AC2	C8-N9-C4	2.23	108.89	106.93
3	B	261	UDP	O2A-PA-O3A	2.22	115.66	105.14
3	D	261	UDP	C4'-O4'-C1'	2.19	112.12	109.75
2	D	601	AC2	N7-C8-N9	-2.04	108.58	114.36

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

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	230/279 (82%)	0.29	2 (0%) 81 85	21, 32, 43, 49	0
1	B	226/279 (81%)	0.28	1 (0%) 90 92	21, 32, 43, 47	0
1	C	222/279 (79%)	1.14	45 (20%) 1 1	44, 55, 63, 65	0
1	D	221/279 (79%)	1.00	34 (15%) 3 3	45, 54, 59, 62	0
All	All	899/1116 (80%)	0.67	82 (9%) 9 10	21, 45, 60, 65	0

All (82) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	191	LEU	8.1
1	C	96	PHE	7.0
1	C	238	VAL	5.7
1	C	180	ALA	5.6
1	D	158	TRP	5.5
1	D	21	ILE	5.0
1	D	154	ILE	4.6
1	C	163	ASN	4.4
1	D	30	ILE	4.3
1	C	86	TYR	4.2
1	C	176	ILE	4.0
1	C	228	LEU	3.9
1	D	249	LEU	3.8
1	D	260	LEU	3.8
1	D	196	GLU	3.8
1	D	40	ILE	3.7
1	C	193	GLY	3.6
1	C	33	GLY	3.5
1	D	84	MET	3.5
1	C	78	GLY	3.4
1	D	31	ALA	3.4

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Mol	Chain	Res	Type	RSRZ
1	C	221	LEU	3.3
1	D	257	LEU	3.3
1	C	236	LEU	3.2
1	C	56	ALA	3.1
1	C	216	LEU	3.1
1	D	223	THR	3.0
1	C	114	GLY	3.0
1	C	250	VAL	3.0
1	C	253	VAL	3.0
1	D	109	LEU	3.0
1	C	36	THR	2.9
1	C	178	LEU	2.9
1	C	204	TYR	2.9
1	C	158	TRP	2.8
1	D	152	TRP	2.7
1	D	202	LEU	2.7
1	C	26	ILE	2.7
1	C	259	THR	2.7
1	D	186	LEU	2.7
1	C	201	PRO	2.6
1	D	215	TRP	2.6
1	D	225	PHE	2.6
1	C	217	LEU	2.6
1	C	21	ILE	2.6
1	C	260	LEU	2.6
1	C	28	GLY	2.5
1	D	115	LYS	2.5
1	D	189	ILE	2.5
1	C	227	TYR	2.5
1	C	162	MET	2.5
1	D	191	LEU	2.4
1	D	86	TYR	2.4
1	D	113	ASN	2.4
1	C	44	LEU	2.3
1	C	245	LYS	2.3
1	D	125	PHE	2.3
1	C	55	VAL	2.3
1	D	146	SER	2.3
1	A	71	LEU	2.3
1	C	99	TYR	2.2
1	C	118	ASP	2.2
1	C	79	GLY	2.2

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Mol	Chain	Res	Type	RSRZ
1	D	238	VAL	2.2
1	D	204	TYR	2.2
1	C	166	PHE	2.2
1	C	24	ILE	2.1
1	C	146	SER	2.1
1	C	40	ILE	2.1
1	D	99	TYR	2.1
1	C	120	GLU	2.1
1	D	105	ILE	2.1
1	C	155	TYR	2.1
1	D	122	PRO	2.1
1	C	80	ASN	2.1
1	D	233	ILE	2.0
1	A	86	TYR	2.0
1	D	96	PHE	2.0
1	C	121	LYS	2.0
1	D	246	TYR	2.0
1	B	191	LEU	2.0
1	D	102	LEU	2.0

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

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

6.3 Carbohydrates ⓘ

There are no carbohydrates 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. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains. 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	RSR	LLDF	B-factors(Å ²)	Q<0.9
2	AC2	A	301	16/16	0.20	1.59	61,62,65,65	0
2	AC2	D	601	16/16	0.18	0.04	53,54,56,56	0

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Mol	Type	Chain	Res	Atoms	RSR	LLDF	B-factors(\AA^2)	Q<0.9
3	UDP	B	261	25/25	0.13	-0.28	21,31,33,34	0
3	UDP	C	501	25/25	0.16	-0.65	53,59,61,61	0
3	UDP	A	261	25/25	0.12	-0.74	29,37,38,39	0
3	UDP	D	261	25/25	0.13	-0.94	45,51,59,59	0
2	AC2	B	401	16/16	0.13	-1.24	41,44,46,46	0

6.5 Other polymers ⓘ

There are no such residues in this entry.