



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 10, 2026 – 02:25 PM UTC

PDB ID : 4UN4 / pdb_00004un4
Title : Crystal structure of Cas9 bound to PAM-containing DNA target with mismatches at positions 1-2
Authors : Anders, C.; Niewoehner, O.; Duerst, A.; Jinek, M.
Deposited on : 2014-05-25
Resolution : 2.37 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:

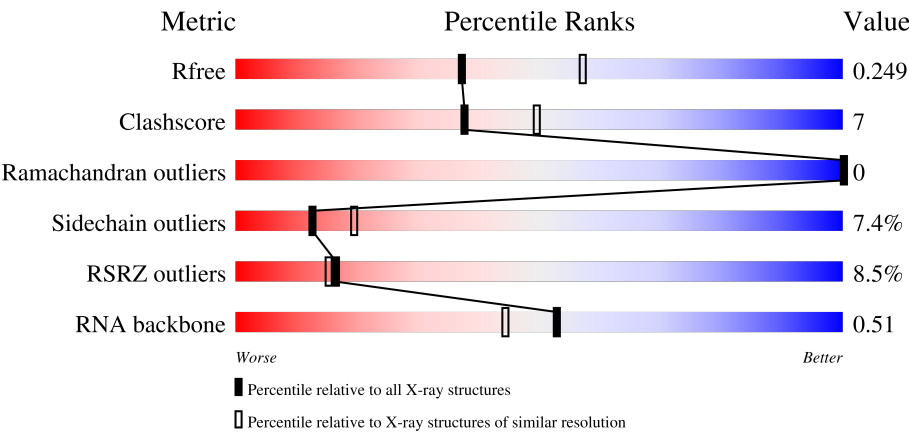
MolProbity	:	4-5-2 with Phenix2.0
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 2.37 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	7164 (2.40-2.36)
Clashscore	190562	7722 (2.40-2.36)
Ramachandran outliers	187476	7626 (2.40-2.36)
Sidechain outliers	187428	7627 (2.40-2.36)
RSRZ outliers	180081	7170 (2.40-2.36)
RNA backbone	3983	1016 (2.66-2.10)

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	83	5% 59%30%10%
2	B	1372	8% 75%18%5%
3	C	11	27% 55%45%
4	D	11	9% 82%9%9%

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Mol	Chain	Length	Quality of chain
5	E	17	 71% 29%

2 Entry composition

There are 7 unique types of molecules in this entry. The entry contains 13914 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 RNA chain called SGRNA.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	82	Total	C	N	O	P	0	0	1
			1733	778	318	556	81			

- Molecule 2 is a protein called CRISPR-ASSOCIATED ENDONUCLEASE CAS9/CSN1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	1310	Total	C	N	O	S	0	0	0
			10716	6832	1860	2002	22			

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	-3	GLY	-	expression tag	UNP Q99ZW2
B	-2	ALA	-	expression tag	UNP Q99ZW2
B	-1	ALA	-	expression tag	UNP Q99ZW2
B	0	SER	-	expression tag	UNP Q99ZW2
B	10	ALA	ASP	engineered mutation	UNP Q99ZW2
B	840	ALA	HIS	engineered mutation	UNP Q99ZW2

- Molecule 3 is a DNA chain called TARGET DNA STRAND PROXIMAL FRAGMENT.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	C	11	Total	C	N	O	P	0	0	0
			218	106	41	61	10			

- Molecule 4 is a DNA chain called NON-TARGET DNA STRAND.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
4	D	10	Total	C	N	O	P	0	0	0
			206	100	35	62	9			

- Molecule 5 is a DNA chain called TARGET DNA STRAND DISTAL FRAGMENT.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
5	E	17	Total	C	N	O	P	0	0	0
			346	169	59	102	16			

- Molecule 6 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	4	Total	Mg	0	0
			4	4		
6	B	4	Total	Mg	0	0
			4	4		

- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	204	Total	O	0	0
			204	204		
7	B	451	Total	O	0	0
			451	451		
7	C	7	Total	O	0	0
			7	7		
7	D	4	Total	O	0	0
			4	4		
7	E	21	Total	O	0	0
			21	21		

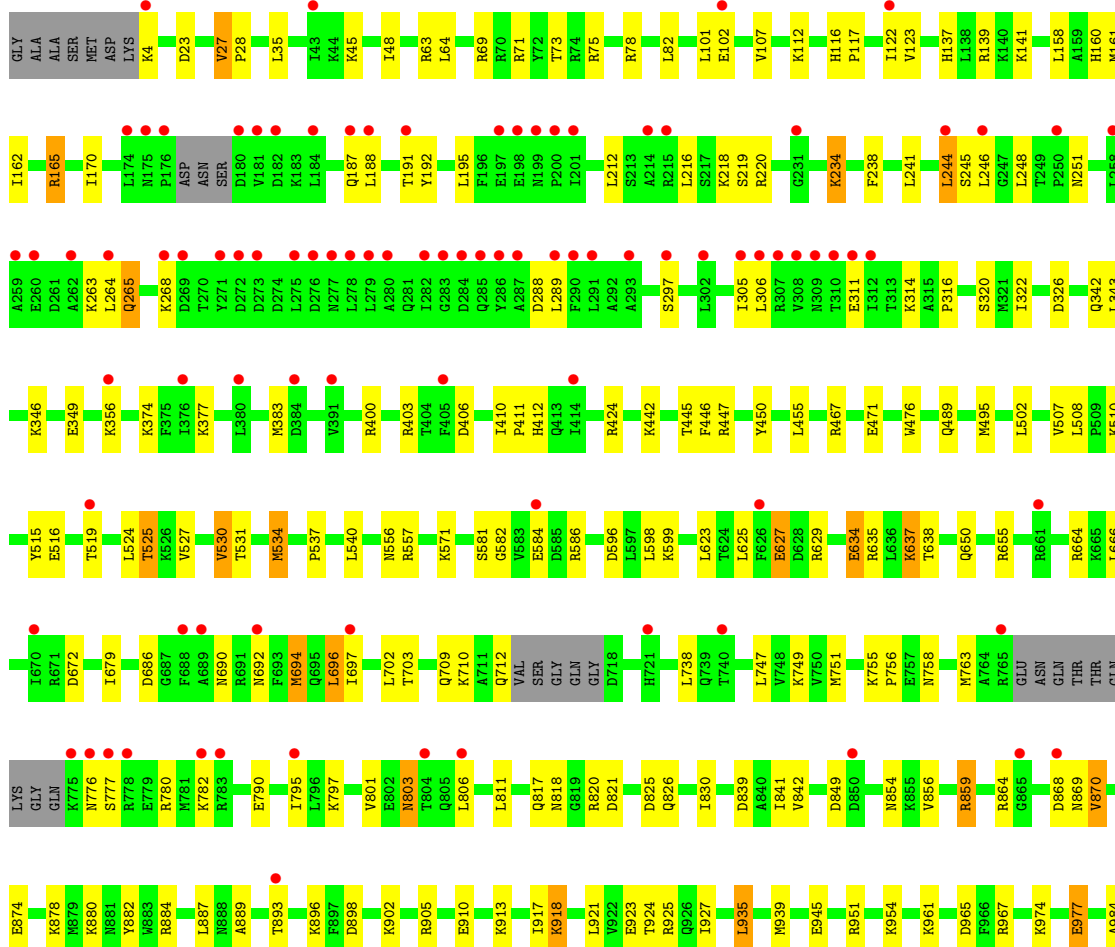
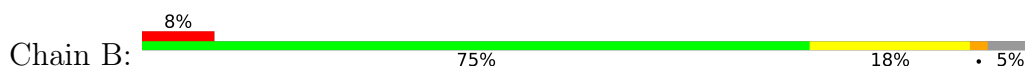
3 Residue-property plots [i](#)

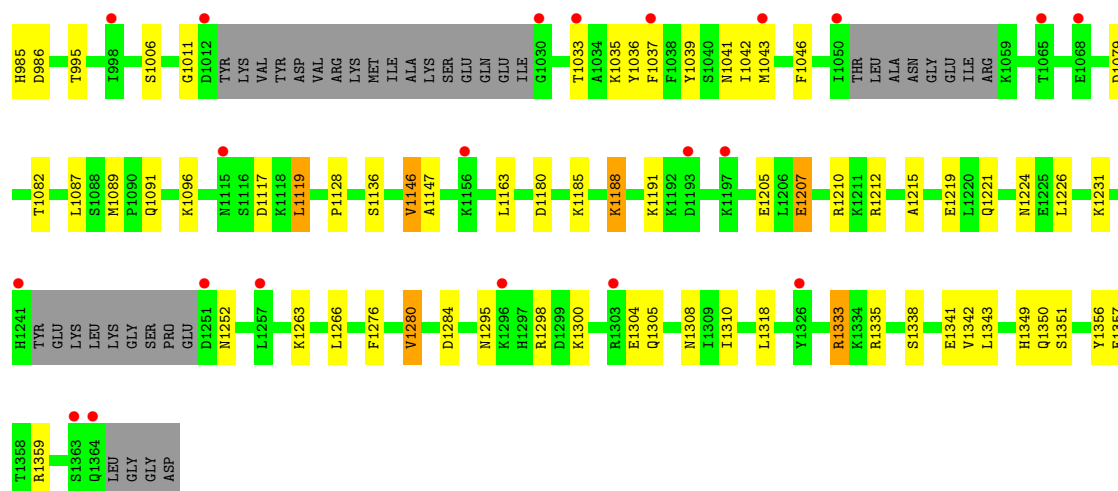
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. 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: SGRNA

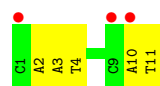


• Molecule 2: CRISPR-ASSOCIATED ENDONUCLEASE CAS9/CSN1

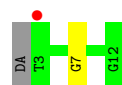
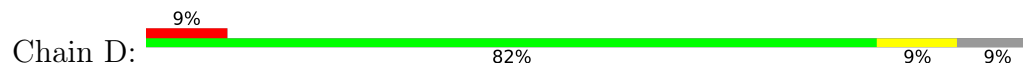




- Molecule 3: TARGET DNA STRAND PROXIMAL FRAGMENT



- Molecule 4: NON-TARGET DNA STRAND



- Molecule 5: TARGET DNA STRAND DISTAL FRAGMENT



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	177.78Å 66.82Å 186.83Å 90.00° 111.39° 90.00°	Depositor
Resolution (Å)	47.49 – 2.37 47.49 – 2.37	Depositor EDS
% Data completeness (in resolution range)	98.7 (47.49-2.37) 99.1 (47.49-2.37)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.22 (at 2.37Å)	Xtriage
Refinement program	PHENIX (PHENIX.REFINE)	Depositor
R, R_{free}	0.217 , 0.248 0.219 , 0.249	Depositor DCC
R_{free} test set	4128 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	42.1	Xtriage
Anisotropy	0.274	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 42.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	13914	wwPDB-VP
Average B, all atoms (Å ²)	42.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.09% 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: MG

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	0.14	0/1943	0.34	0/3026
2	B	0.29	0/10903	0.69	3/14646 (0.0%)
3	C	0.14	0/244	0.73	0/373
4	D	0.14	0/230	0.73	0/355
5	E	0.14	0/387	0.60	0/596
All	All	0.26	0/13707	0.65	3/18996 (0.0%)

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	502	LEU	CA-C-N	5.52	125.19	119.56
2	B	502	LEU	C-N-CA	5.52	125.19	119.56
2	B	1280	VAL	N-CA-C	5.09	115.64	111.62

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	1733	0	869	21	0
2	B	10716	0	10887	154	0
3	C	218	0	125	6	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	D	206	0	117	2	0
5	E	346	0	197	4	0
6	A	4	0	0	0	0
6	B	4	0	0	0	0
7	A	204	0	0	10	0
7	B	451	0	0	41	0
7	C	7	0	0	1	0
7	D	4	0	0	0	0
7	E	21	0	0	0	0
All	All	13914	0	12195	176	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 7.

All (176) 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)
2:B:1043:MET:O	7:B:3344:HOH:O	1.82	0.94
2:B:581:SER:O	7:B:3224:HOH:O	1.91	0.88
2:B:251:ASN:O	7:B:3115:HOH:O	1.97	0.82
1:A:33:G:N2	1:A:36:A:OP2	2.12	0.81
2:B:923:GLU:OE1	7:B:3284:HOH:O	2.00	0.79
2:B:818:ASN:ND2	7:B:3288:HOH:O	2.15	0.79
2:B:557:ARG:NH2	2:B:596:ASP:OD1	2.17	0.78
2:B:977:GLU:HG3	2:B:1310:ILE:HG23	1.67	0.77
2:B:825:ASP:N	7:B:3290:HOH:O	2.18	0.77
1:A:62:G:OP1	7:A:3159:HOH:O	2.02	0.76
2:B:349:GLU:HG3	2:B:356:LYS:HD3	1.69	0.74
2:B:78:ARG:NH1	2:B:162:ILE:O	2.20	0.73
2:B:141:LYS:NZ	7:B:3087:HOH:O	2.14	0.73
2:B:1212:ARG:NH1	7:B:3414:HOH:O	2.19	0.73
7:A:3164:HOH:O	2:B:69:ARG:NH2	2.21	0.72
2:B:1185:LYS:O	7:B:3400:HOH:O	2.07	0.72
2:B:905:ARG:NH1	7:B:3306:HOH:O	2.22	0.71
2:B:1011:GLY:O	7:B:3341:HOH:O	2.07	0.71
2:B:702:LEU:O	7:B:3268:HOH:O	2.07	0.71
1:A:27:G:H5'	1:A:28:A:H5''	1.73	0.70
2:B:170:ILE:O	7:B:3096:HOH:O	2.09	0.70
2:B:880:LYS:NZ	7:B:3302:HOH:O	2.26	0.69
7:B:3193:HOH:O	5:E:27:DA:OP1	2.11	0.68
3:C:11:DT:O4	7:C:3007:HOH:O	2.10	0.67

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:64:U:OP1	7:A:3165:HOH:O	2.12	0.66
2:B:1341:GLU:OE1	7:B:3412:HOH:O	2.14	0.66
2:B:1215:ALA:HB2	2:B:1221:GLN:HG3	1.78	0.65
2:B:910:GLU:HG2	2:B:1033:THR:HG22	1.79	0.65
2:B:841:ILE:O	2:B:864:ARG:NH2	2.29	0.64
2:B:489:GLN:HG3	2:B:625:LEU:HD21	1.78	0.64
2:B:1304:GLU:O	2:B:1308:ASN:ND2	2.29	0.63
2:B:442:LYS:HE3	2:B:476:TRP:HA	1.80	0.63
2:B:790:GLU:HG2	2:B:889:ALA:HA	1.80	0.63
1:A:5:C:OP1	2:B:515:TYR:OH	2.13	0.62
7:A:3040:HOH:O	2:B:495:MET:HE2	1.99	0.62
7:A:3048:HOH:O	2:B:447:ARG:NH2	2.32	0.62
2:B:758:ASN:OD1	2:B:954:LYS:NZ	2.33	0.61
1:A:59:U:OP1	2:B:467:ARG:NH2	2.35	0.60
2:B:244:LEU:HD11	2:B:264:LEU:HD11	1.83	0.60
2:B:629:ARG:HE	2:B:655:ARG:HD3	1.64	0.60
2:B:758:ASN:HD22	2:B:995:THR:HG22	1.66	0.60
2:B:1335:ARG:NH2	4:D:7:DG:O6	2.35	0.60
2:B:780:ARG:NH1	2:B:806:LEU:O	2.32	0.60
2:B:817:GLN:O	2:B:882:TYR:OH	2.19	0.59
2:B:859:ARG:NH1	7:B:3294:HOH:O	2.35	0.59
2:B:525:THR:HG21	7:B:3258:HOH:O	2.02	0.59
7:A:3033:HOH:O	2:B:63:ARG:NH1	2.34	0.59
1:A:27:G:N2	1:A:44:U:OP2	2.36	0.59
2:B:821:ASP:HB3	7:B:3290:HOH:O	2.02	0.59
2:B:869:ASN:OD1	2:B:870:VAL:N	2.36	0.58
2:B:849:ASP:HB3	2:B:854:ASN:HD22	1.68	0.58
2:B:1180:ASP:OD1	7:B:3397:HOH:O	2.17	0.58
2:B:967:ARG:NH1	2:B:986:ASP:OD1	2.37	0.57
3:C:2:DA:H2'	3:C:3:DA:C8	2.40	0.57
2:B:1212:ARG:NH2	2:B:1280:VAL:O	2.38	0.57
3:C:2:DA:H5''	3:C:2:DA:H8	1.70	0.57
2:B:306:LEU:O	2:B:320:SER:OG	2.20	0.57
2:B:1231:LYS:N	7:B:3429:HOH:O	2.19	0.57
2:B:1207:GLU:OE2	2:B:1210:ARG:NH1	2.38	0.56
2:B:45:LYS:NZ	2:B:1357:GLU:OE2	2.38	0.56
2:B:672:ASP:HA	2:B:703:THR:HG22	1.88	0.55
2:B:139:ARG:HH21	2:B:160:HIS:CE1	2.25	0.54
2:B:1295:ASN:OD1	2:B:1298:ARG:NH2	2.34	0.54
2:B:777:SER:HB3	2:B:803:ASN:HB2	1.90	0.53
2:B:1300:LYS:O	2:B:1305:GLN:NE2	2.37	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:81:G:N2	2:B:35:LEU:HG	2.23	0.53
2:B:158:LEU:HA	2:B:161:MET:HE3	1.90	0.53
2:B:192:TYR:OH	7:B:3107:HOH:O	2.14	0.53
2:B:679:ILE:HG23	2:B:696:LEU:HD23	1.90	0.53
2:B:826:GLN:OE1	7:B:3292:HOH:O	2.19	0.53
1:A:68:A:O2'	1:A:69:A:OP1	2.27	0.53
2:B:245:SER:HA	2:B:297:SER:HB3	1.90	0.53
2:B:902:LYS:HG3	2:B:905:ARG:HH12	1.74	0.53
1:A:27:G:H4'	1:A:28:A:OP2	2.08	0.53
2:B:1252:ASN:ND2	7:B:3432:HOH:O	2.42	0.52
2:B:692:ASN:HD21	5:E:26:DT:H2''	1.75	0.52
2:B:527:VAL:HA	2:B:582:GLY:HA3	1.92	0.52
2:B:755:LYS:NZ	7:B:3281:HOH:O	2.43	0.52
2:B:326:ASP:OD2	7:B:3127:HOH:O	2.19	0.51
2:B:634:GLU:HG2	2:B:637:LYS:HE3	1.91	0.51
2:B:530:VAL:HG22	2:B:537:PRO:HB3	1.93	0.51
2:B:212:LEU:HD12	2:B:246:LEU:HD21	1.93	0.51
2:B:516:GLU:HA	2:B:519:THR:HG22	1.92	0.51
2:B:1042:ILE:HG23	2:B:1043:MET:HG2	1.92	0.51
2:B:874:GLU:HG2	2:B:878:LYS:HE3	1.91	0.51
2:B:1351:SER:OG	2:B:1356:TYR:HB2	2.11	0.51
1:A:18:A:OP1	2:B:165:ARG:HD3	2.11	0.51
2:B:165:ARG:NH2	2:B:446:PHE:O	2.44	0.51
2:B:187:GLN:NE2	7:B:3104:HOH:O	2.41	0.51
2:B:238:PHE:HA	2:B:241:LEU:HD12	1.93	0.50
2:B:1205:GLU:OE1	2:B:1359:ARG:NH2	2.43	0.50
2:B:508:LEU:HD21	2:B:664:ARG:HB2	1.94	0.50
2:B:961:LYS:NZ	2:B:965:ASP:OD2	2.45	0.50
2:B:1224:ASN:HB2	2:B:1280:VAL:HG11	1.93	0.50
2:B:1046:PHE:HB2	7:B:3344:HOH:O	2.11	0.49
2:B:893:THR:HG23	2:B:896:LYS:H	1.78	0.49
2:B:450:TYR:OH	2:B:627:GLU:HG2	2.12	0.49
2:B:1163:LEU:HG	2:B:1343:LEU:HD21	1.94	0.49
5:E:16:DC:H2'	5:E:17:DA:C8	2.47	0.49
2:B:1146:VAL:HG13	2:B:1191:LYS:HB2	1.95	0.49
2:B:531:THR:H	2:B:534:MET:HG3	1.78	0.48
3:C:10:DA:H5''	3:C:11:DT:H5''	1.94	0.48
2:B:913:LYS:HB3	2:B:1036:TYR:CE2	2.49	0.48
2:B:489:GLN:NE2	7:B:3169:HOH:O	2.46	0.47
2:B:1035:LYS:HE2	2:B:1039:TYR:HE2	1.79	0.47
2:B:137:HIS:HA	2:B:322:ILE:HD11	1.97	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:1207:GLU:O	7:B:3407:HOH:O	2.20	0.46
2:B:1219:GLU:OE2	2:B:1335:ARG:HD2	2.15	0.46
1:A:1:A:H61	5:E:28:DT:H3	1.62	0.46
1:A:42:A:H2'	1:A:43:G:C8	2.51	0.46
2:B:967:ARG:CZ	2:B:974:LYS:HB2	2.46	0.46
3:C:2:DA:H5''	3:C:2:DA:C8	2.50	0.46
2:B:898:ASP:O	2:B:905:ARG:NH2	2.49	0.46
2:B:216:LEU:HD22	2:B:220:ARG:HG2	1.97	0.45
2:B:951:ARG:NH1	2:B:1011:GLY:HA3	2.31	0.45
2:B:288:ASP:OD2	7:B:3108:HOH:O	2.21	0.45
1:A:34:A:H5''	7:A:3093:HOH:O	2.16	0.45
2:B:248:LEU:O	2:B:265:GLN:NE2	2.50	0.45
2:B:803:ASN:OD1	2:B:803:ASN:N	2.34	0.45
2:B:165:ARG:O	2:B:412:HIS:HA	2.16	0.45
2:B:27:VAL:HA	2:B:28:PRO:HD3	1.87	0.45
2:B:635:ARG:NH1	7:B:3242:HOH:O	2.49	0.45
2:B:343:LEU:HD13	2:B:346:LYS:HD2	1.99	0.45
2:B:902:LYS:HG3	2:B:905:ARG:NH1	2.31	0.45
2:B:918:LYS:HE3	2:B:918:LYS:HB2	1.81	0.44
2:B:1350:GLN:NE2	7:B:3032:HOH:O	2.51	0.44
2:B:525:THR:HG22	2:B:690:ASN:HB3	2.00	0.44
2:B:1006:SER:O	7:B:3339:HOH:O	2.21	0.44
3:C:3:DA:H1'	3:C:4:DT:H5'	1.99	0.44
2:B:686:ASP:HA	7:B:3257:HOH:O	2.18	0.43
2:B:1119:LEU:HB3	2:B:1128:PRO:HB2	2.00	0.43
1:A:17:A:C8	2:B:71:ARG:HD3	2.53	0.43
1:A:43:G:OP1	7:A:3098:HOH:O	2.21	0.43
2:B:516:GLU:OE1	7:B:3183:HOH:O	2.20	0.43
2:B:584:GLU:O	2:B:584:GLU:HG3	2.18	0.43
2:B:218:LYS:H	2:B:218:LYS:HG2	1.62	0.43
2:B:48:ILE:HG12	2:B:984:ALA:HB1	2.00	0.43
2:B:1136:SER:HA	4:D:7:DG:O3'	2.19	0.43
2:B:244:LEU:HD23	2:B:244:LEU:HA	1.85	0.43
2:B:694:MET:HE2	2:B:694:MET:HA	2.00	0.42
2:B:1037:PHE:O	2:B:1041:ASN:ND2	2.50	0.42
2:B:1231:LYS:HG2	7:B:3429:HOH:O	2.19	0.42
1:A:70:C:H2'	1:A:71:U:C6	2.55	0.42
2:B:935:LEU:HD12	2:B:935:LEU:HA	1.88	0.42
2:B:571:LYS:HE3	2:B:571:LYS:HB2	1.76	0.42
2:B:584:GLU:O	2:B:586:ARG:N	2.52	0.42
2:B:234:LYS:HE3	2:B:234:LYS:HB3	1.90	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:69:A:H5'	2:B:1349:HIS:CE1	2.55	0.41
2:B:4:LYS:HE2	2:B:4:LYS:HB2	1.86	0.41
2:B:139:ARG:NH2	7:B:3086:HOH:O	2.53	0.41
7:A:3007:HOH:O	2:B:694:MET:HG2	2.21	0.41
1:A:3:A:H2'	1:A:4:A:C8	2.55	0.41
2:B:925:ARG:HG2	2:B:927:ILE:HG22	2.02	0.41
2:B:1333:ARG:NH1	7:B:3444:HOH:O	2.50	0.41
2:B:1079:ASP:O	2:B:1082:THR:OG1	2.27	0.41
1:A:20:A:OP1	2:B:403:ARG:HD2	2.20	0.41
2:B:116:HIS:HA	2:B:117:PRO:HD3	1.79	0.41
2:B:749:LYS:HE2	2:B:749:LYS:HB3	1.90	0.41
2:B:1147:ALA:HB1	2:B:1188:LYS:O	2.20	0.41
2:B:1226:LEU:HD13	2:B:1276:PHE:CG	2.55	0.41
2:B:985:HIS:CG	2:B:1087:LEU:HD22	2.55	0.41
2:B:1096:LYS:HE3	7:B:3421:HOH:O	2.21	0.41
2:B:191:THR:HG23	2:B:289:LEU:HD12	2.03	0.41
2:B:316:PRO:O	2:B:320:SER:OG	2.39	0.41
2:B:342:GLN:HB2	2:B:383:MET:HE3	2.02	0.41
2:B:219:SER:HB2	2:B:797:LYS:NZ	2.36	0.40
2:B:314:LYS:HE2	2:B:314:LYS:HB3	1.78	0.40
2:B:820:ARG:HD3	2:B:882:TYR:CE1	2.57	0.40
1:A:34:A:C8	7:A:3092:HOH:O	2.57	0.40
2:B:400:ARG:HH22	2:B:406:ASP:CG	2.29	0.40
2:B:556:ASN:ND2	7:B:3211:HOH:O	2.44	0.40
2:B:747:LEU:HD23	2:B:747:LEU:HA	1.94	0.40
2:B:839:ASP:OD2	2:B:864:ARG:NE	2.50	0.40
2:B:763:MET:HE2	2:B:763:MET:HB3	1.92	0.40
2:B:756:PRO:HD2	2:B:939:MET:HE2	2.03	0.40
2:B:410:ILE:HA	2:B:411:PRO:HD3	1.95	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	
2	B	1296/1372 (94%)	1252 (97%)	44 (3%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains ⓘ

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
2	B	1175/1226 (96%)	1088 (93%)	87 (7%)	13	19

All (87) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	B	23	ASP
2	B	27	VAL
2	B	64	LEU
2	B	73	THR
2	B	75	ARG
2	B	82	LEU
2	B	101	LEU
2	B	102	GLU
2	B	107	VAL
2	B	112	LYS
2	B	122	ILE
2	B	123	VAL
2	B	165	ARG
2	B	188	LEU
2	B	195	LEU
2	B	234	LYS
2	B	244	LEU
2	B	263	LYS
2	B	265	GLN
2	B	268	LYS
2	B	305	ILE
2	B	311	GLU
2	B	374	LYS

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Mol	Chain	Res	Type
2	B	377	LYS
2	B	424	ARG
2	B	445	THR
2	B	455	LEU
2	B	471	GLU
2	B	507	VAL
2	B	510	LYS
2	B	524	LEU
2	B	525	THR
2	B	530	VAL
2	B	534	MET
2	B	540	LEU
2	B	598	LEU
2	B	599	LYS
2	B	623	LEU
2	B	627	GLU
2	B	634	GLU
2	B	637	LYS
2	B	638	THR
2	B	650	GLN
2	B	666	LEU
2	B	694	MET
2	B	696	LEU
2	B	697	ILE
2	B	709	GLN
2	B	710	LYS
2	B	712	GLN
2	B	738	LEU
2	B	751	MET
2	B	776	ASN
2	B	782	LYS
2	B	795	ILE
2	B	801	VAL
2	B	803	ASN
2	B	811	LEU
2	B	830	ILE
2	B	842	VAL
2	B	856	VAL
2	B	859	ARG
2	B	868	ASP
2	B	870	VAL
2	B	884	ARG

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Mol	Chain	Res	Type
2	B	887	LEU
2	B	917	ILE
2	B	918	LYS
2	B	921	LEU
2	B	924	THR
2	B	935	LEU
2	B	945	GLU
2	B	977	GLU
2	B	1089	MET
2	B	1091	GLN
2	B	1117	ASP
2	B	1119	LEU
2	B	1146	VAL
2	B	1188	LYS
2	B	1207	GLU
2	B	1263	LYS
2	B	1266	LEU
2	B	1284	ASP
2	B	1318	LEU
2	B	1333	ARG
2	B	1338	SER
2	B	1342	VAL

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

Mol	Chain	Res	Type
2	B	14	ASN
2	B	46	ASN
2	B	295	ASN
2	B	412	HIS
2	B	459	ASN
2	B	501	ASN
2	B	930	HIS
2	B	980	ASN
2	B	983	HIS

5.3.3 RNA [i](#)

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
1	A	80/83 (96%)	16 (20%)	3 (3%)

All (16) RNA backbone outliers are listed below:

Mol	Chain	Res	Type
1	A	24	U
1	A	28	A
1	A	29	G
1	A	34	A
1	A	35	A
1	A	37	U
1	A	43	G
1	A	51	A
1	A	56	U
1	A	59	U
1	A	68	A
1	A	69	A
1	A	72	U
1	A	73	G
1	A	74	A
1	A	77	A

All (3) RNA pucker outliers are listed below:

Mol	Chain	Res	Type
1	A	27	G
1	A	42	A
1	A	68	A

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 8 ligands modelled in this entry, 8 are monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

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	82/83 (98%)	-0.38	4 (4%) 35 34	16, 32, 117, 164	0
2	B	1310/1372 (95%)	0.44	114 (8%) 16 15	13, 38, 77, 118	0
3	C	11/11 (100%)	0.89	3 (27%) 1 1	35, 48, 131, 137	0
4	D	10/11 (90%)	0.08	1 (10%) 12 11	28, 48, 98, 99	0
5	E	17/17 (100%)	-0.89	0 100 100	24, 28, 35, 36	0
All	All	1430/1494 (95%)	0.38	122 (8%) 16 15	13, 38, 79, 164	0

All (122) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	B	271	TYR	5.3
2	B	264	LEU	5.0
2	B	191	THR	4.6
2	B	775	LYS	4.5
2	B	356	LYS	4.4
2	B	688	PHE	4.2
3	C	10	DA	4.0
2	B	285	GLN	3.9
2	B	795	ILE	3.8
2	B	275	LEU	3.8
2	B	293	ALA	3.8
2	B	43	ILE	3.8
2	B	1363	SER	3.7
2	B	279	LEU	3.6
3	C	1	DC	3.6
2	B	286	TYR	3.5
2	B	1037	PHE	3.5
2	B	272	ASP	3.4
2	B	1251	ASP	3.4
2	B	278	LEU	3.3

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Mol	Chain	Res	Type	RSRZ
2	B	290	PHE	3.3
2	B	181	VAL	3.3
2	B	308	VAL	3.3
2	B	182	ASP	3.2
2	B	297	SER	3.2
2	B	176	PRO	3.2
2	B	198	GLU	3.1
2	B	1241	HIS	3.1
1	A	0	G	3.1
2	B	273	ASP	3.1
2	B	776	ASN	3.1
2	B	1326	TYR	3.0
2	B	721	HIS	3.0
2	B	1364	GLN	3.0
2	B	804	THR	3.0
4	D	3	DT	3.0
2	B	1050	ILE	2.9
2	B	850	ASP	2.9
2	B	215	ARG	2.9
2	B	306	LEU	2.9
2	B	201	ILE	2.9
2	B	283	GLY	2.9
2	B	305	ILE	2.8
2	B	740	THR	2.8
2	B	302	LEU	2.8
2	B	584	GLU	2.8
2	B	782	LYS	2.8
2	B	414	ILE	2.8
2	B	258	LEU	2.8
2	B	661	ARG	2.8
2	B	307	ARG	2.7
2	B	291	LEU	2.7
2	B	259	ALA	2.7
2	B	262	ALA	2.7
2	B	200	PRO	2.7
2	B	1303	ARG	2.7
2	B	184	LEU	2.7
2	B	4	LYS	2.7
2	B	175	ASN	2.7
2	B	312	ILE	2.7
2	B	1030	GLY	2.6
2	B	1296	LYS	2.6

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Mol	Chain	Res	Type	RSRZ
2	B	384	ASP	2.6
2	B	309	ASN	2.6
2	B	1257	LEU	2.5
2	B	893	THR	2.5
1	A	76	A	2.5
1	A	73	G	2.5
2	B	289	LEU	2.5
2	B	692	ASN	2.5
2	B	626	PHE	2.4
2	B	1197	LYS	2.4
2	B	1012	ASP	2.4
2	B	287	ALA	2.4
2	B	188	LEU	2.4
2	B	199	ASN	2.4
2	B	310	THR	2.4
2	B	519	THR	2.4
2	B	277	ASN	2.4
2	B	260	GLU	2.4
2	B	180	ASP	2.3
3	C	9	DC	2.3
2	B	268	LYS	2.3
2	B	214	ALA	2.3
2	B	102	GLU	2.3
2	B	1156	LYS	2.3
2	B	282	ILE	2.3
2	B	376	ILE	2.3
2	B	280	ALA	2.3
2	B	670	ILE	2.3
2	B	231	GLY	2.2
2	B	865	GLY	2.2
2	B	311	GLU	2.2
2	B	269	ASP	2.2
2	B	778	ARG	2.2
2	B	197	GLU	2.2
2	B	1068	GLU	2.2
2	B	405	PHE	2.2
2	B	783	ARG	2.2
2	B	276	ASP	2.2
2	B	868	ASP	2.2
2	B	1033	THR	2.2
2	B	174	LEU	2.1
2	B	244	LEU	2.1

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Mol	Chain	Res	Type	RSRZ
2	B	391	VAL	2.1
1	A	77	A	2.1
2	B	697	ILE	2.1
2	B	998	ILE	2.1
2	B	1115	ASN	2.1
2	B	1065	THR	2.1
2	B	250	PRO	2.1
2	B	689	ALA	2.0
2	B	1043	MET	2.0
2	B	284	ASP	2.0
2	B	1193	ASP	2.0
2	B	777	SER	2.0
2	B	187	GLN	2.0
2	B	246	LEU	2.0
2	B	380	LEU	2.0
2	B	806	LEU	2.0
2	B	122	ILE	2.0
2	B	765	ARG	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($\text{\AA}^2$)	Q<0.9
6	MG	B	2365	1/1	0.63	0.11	23,23,23,23	0
6	MG	B	2368	1/1	0.72	0.09	19,19,19,19	0
6	MG	B	2367	1/1	0.81	0.08	33,33,33,33	0
6	MG	A	1083	1/1	0.93	0.09	34,34,34,34	0
6	MG	A	1084	1/1	0.94	0.05	6,6,6,6	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
6	MG	B	2366	1/1	0.94	0.04	16,16,16,16	0
6	MG	A	1082	1/1	0.95	0.06	36,36,36,36	0
6	MG	A	1085	1/1	0.98	0.03	13,13,13,13	0

6.5 Other polymers [i](#)

There are no such residues in this entry.