Full wwPDB X-ray Structure Validation Report ⓘ

Nov 15, 2023 – 10:58 PM JST

PDB ID	:	6K4Q
Title	:	Crystal structure of xCas9 in complex with sgRNA and DNA (CGG PAM)
Authors	:	Chen, W.; Zhang, H.; Zhang, Y.; Wang, Y.; Gan, J.; Ji, Q.
Deposited on	:	2019-05-26
Resolution	:	2.70 Å(reported)

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

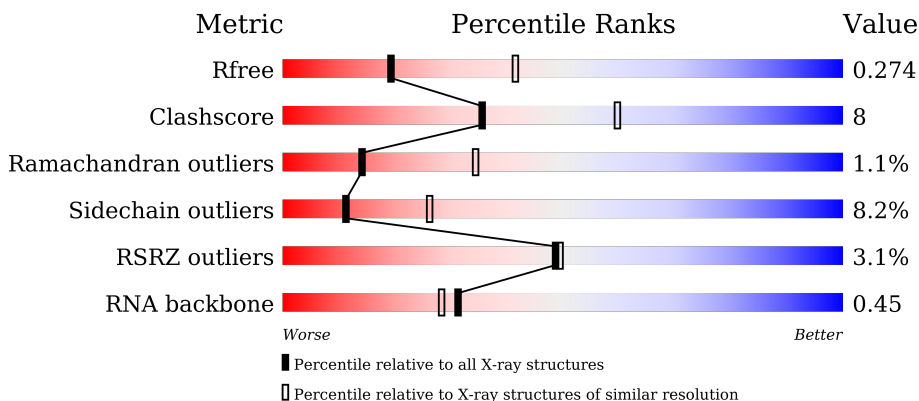|		
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.36
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36

1 Overall quality at a glance ⓘ

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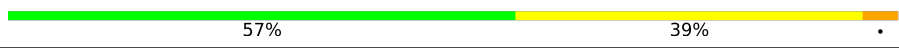*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.70 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	Percentile Ranks	Value
Rfree		0.274
Clashscore		8
Ramachandran outliers		1.1%
Sidechain outliers		8.2%
RSRZ outliers		3.1%
RNA backbone		0.45

Worse ← → *Better*

■ Percentile relative to all X-ray structures
▯ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R$_{free}$	130704	2808 (2.70-2.70)
Clashscore	141614	3122 (2.70-2.70)
Ramachandran outliers	138981	3069 (2.70-2.70)
Sidechain outliers	138945	3069 (2.70-2.70)
RSRZ outliers	127900	2737 (2.70-2.70)
RNA backbone	3102	1159 (3.00-2.40)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for >=3, 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions <=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	54% / 34% / 10% ·
2	C	28	57% / 39% ·
3	D	12	8% (upper) / 83% / 8% / 8%
4	B	1368	3% (upper) / 74% / 21% · ·

2 Entry composition ⓘ

There are 6 unique types of molecules in this entry. The entry contains 13209 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	81	Total 1732	C 778	N 318	O 555	P 81	0	0	0

- Molecule 2 is a DNA chain called DNA (28-MER).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	C	28	Total 568	C 276	N 96	O 169	P 27	0	0	0

- Molecule 3 is a DNA chain called DNA (5'-D(*AP*AP*AP*CP*GP*GP*TP*AP*TP*TP*G)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	D	11	Total 226	C 109	N 44	O 63	P 10	0	0	0

- Molecule 4 is a protein called CRISPR-associated endonuclease Cas9/Csn1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
4	B	1323	Total 10539	C 6725	N 1827	O 1968	S 19	0	0	0

There are 11 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	10	ALA	ASP	engineered mutation	UNP Q99ZW2
B	80	LEU	CYS	engineered mutation	UNP Q99ZW2
B	262	THR	ALA	engineered mutation	UNP Q99ZW2
B	324	LEU	ARG	engineered mutation	UNP Q99ZW2
B	409	ILE	SER	engineered mutation	UNP Q99ZW2
B	480	LYS	GLU	engineered mutation	UNP Q99ZW2
B	543	ASP	GLU	engineered mutation	UNP Q99ZW2

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Chain	Residue	Modelled	Actual	Comment	Reference
B	574	GLU	CYS	engineered mutation	UNP Q99ZW2
B	694	ILE	MET	engineered mutation	UNP Q99ZW2
B	840	ALA	HIS	engineered mutation	UNP Q99ZW2
B	1219	VAL	GLU	engineered mutation	UNP Q99ZW2

• Molecule 5 is PHOSPHATE ION (three-letter code: PO4) (formula: O_4P).
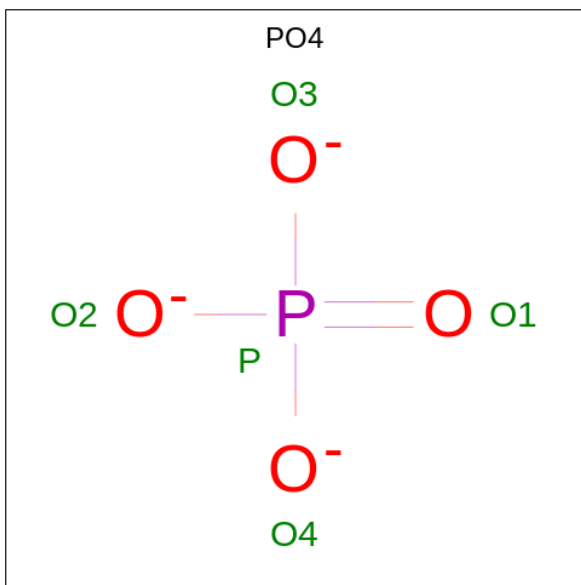
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total 5	O 4	P 1	0	0
5	A	1	Total 5	O 4	P 1	0	0
5	B	1	Total 5	O 4	P 1	0	0
5	B	1	Total 5	O 4	P 1	0	0
5	B	1	Total 5	O 4	P 1	0	0
5	B	1	Total 5	O 4	P 1	0	0
5	B	1	Total 5	O 4	P 1	0	0
5	B	1	Total 5	O 4	P 1	0	0
5	B	1	Total 5	O 4	P 1	0	0

• Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	22	Total 22	O 22	0	0
6	C	6	Total 6	O 6	0	0
6	D	1	Total 1	O 1	0	0
6	B	70	Total 70	O 70	0	0

3 Residue-property plots ⓘ

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.
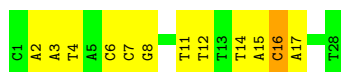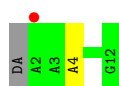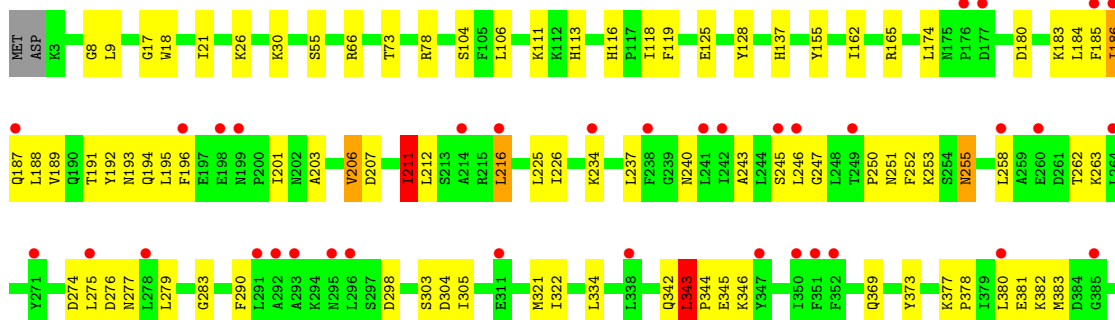
• Molecule 1: sgRNA
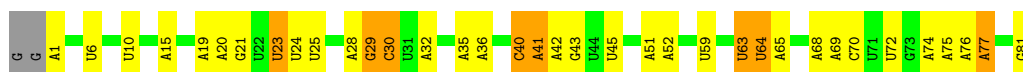
• Molecule 2: DNA (28-MER)

• Molecule 3: DNA (5'-D(*AP*AP*AP*CP*GP*GP*TP*AP*TP*TP*G)-3')

• Molecule 4: CRISPR-associated endonuclease Cas9/Csn1
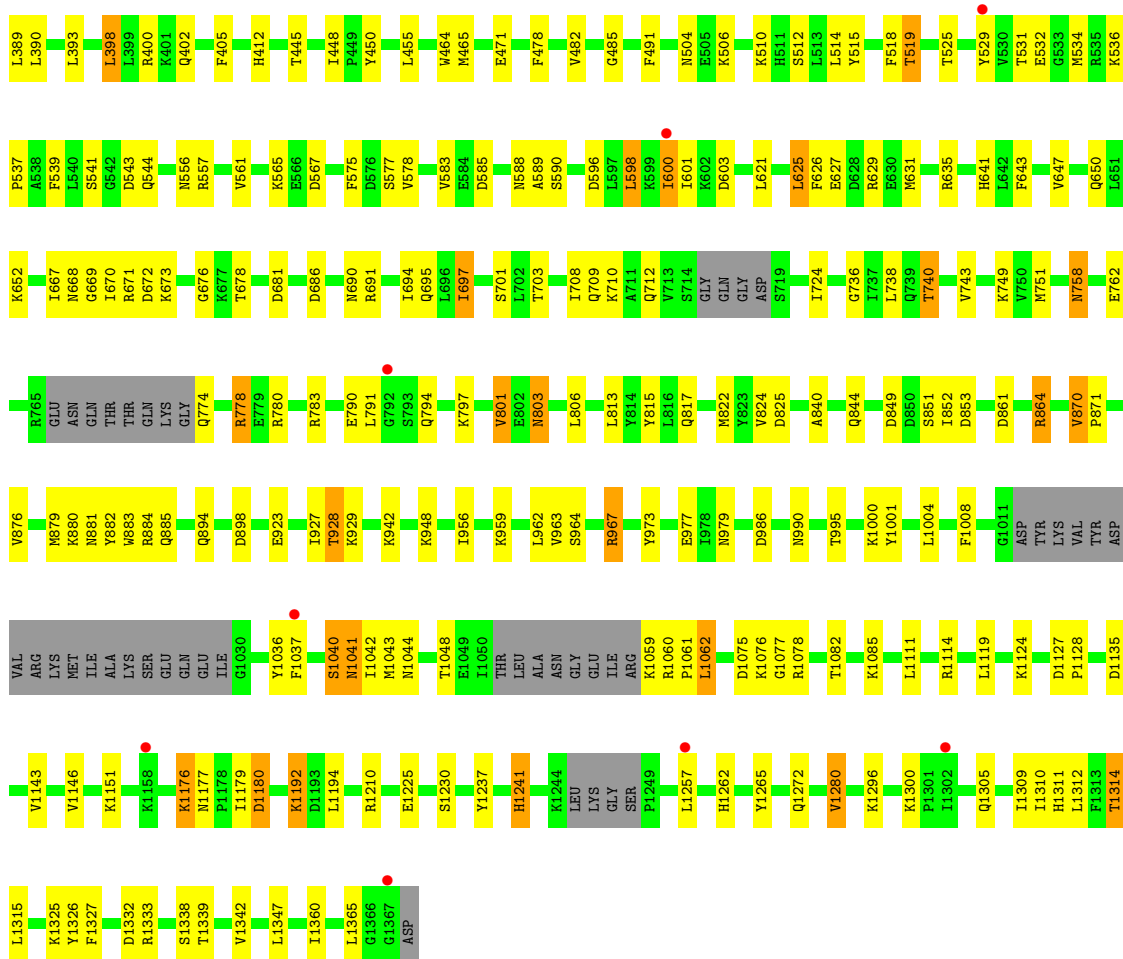
4 Data and refinement statistics ⓘ

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α, β, γ	177.84Å 69.67Å 189.51Å 90.00° 109.35° 90.00°	Depositor
Resolution (Å)	49.38 – 2.70 49.34 – 2.70	Depositor EDS
% Data completeness (in resolution range)	94.4 (49.38-2.70) 94.4 (49.34-2.70)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.51 (at 2.69Å)	Xtriage
Refinement program	REFMAC 5.8.0238	Depositor
R, R_{free}	0.203 , 0.275 0.209 , 0.274	Depositor DCC
R_{free} test set	2888 reflections (5.05%)	wwPDB-VP
Wilson B-factor (Å^2)	45.0	Xtriage
Anisotropy	0.039	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.32 , 42.0	EDS
L-test for twinning[2]	$< |L| > = 0.49, < L^2 > = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.93	EDS
Total number of atoms	13209	wwPDB-VP
Average B, all atoms (Å^2)	51.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.16% of the height of the origin peak. No significant pseudotranslation is detected.*

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[1]Intensities estimated from amplitudes.
[2]Theoretical values of $< |L| >$, $< L^2 >$ 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: PO4

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	1.02	14/1942 (0.7%)	0.95	0/3023
2	C	0.99	3/635 (0.5%)	1.00	0/978
3	D	0.67	0/254	0.85	0/391
4	B	0.78	0/10727	0.97	0/14459
All	All	0.83	17/13558 (0.1%)	0.97	0/18851

All (17) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	43	G	O3'-P	-8.74	1.50	1.61
1	A	21	G	O3'-P	-8.15	1.51	1.61
1	A	40	C	O3'-P	-7.62	1.52	1.61
2	C	15	DA	O3'-P	-7.56	1.52	1.61
1	A	24	U	O3'-P	-7.56	1.52	1.61
1	A	65	A	O3'-P	-7.32	1.52	1.61
1	A	20	A	O3'-P	-7.17	1.52	1.61
2	C	16	DC	O3'-P	-6.61	1.53	1.61
1	A	64	U	O3'-P	-6.61	1.53	1.61
1	A	41	A	O3'-P	-6.58	1.53	1.61
1	A	42	A	O3'-P	-6.31	1.53	1.61
1	A	19	A	O3'-P	-6.21	1.53	1.61
1	A	23	U	O3'-P	-6.18	1.53	1.61
1	A	69	A	O3'-P	-5.69	1.54	1.61
1	A	70	C	O3'-P	-5.44	1.54	1.61
1	A	72	U	O3'-P	5.18	1.67	1.61
2	C	14	DT	O3'-P	-5.10	1.55	1.61

There are no bond angle outliers.

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	1732	0	869	12	0
2	C	568	0	322	9	0
3	D	226	0	126	1	0
4	B	10539	0	10458	186	0
5	A	10	0	0	0	0
5	B	35	0	0	1	0
6	A	22	0	0	0	0
6	B	70	0	0	3	0
6	C	6	0	0	0	0
6	D	1	0	0	0	0
All	All	13209	0	11775	202	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 8.

All (202) 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)
4:B:212:LEU:CD2	4:B:246:LEU:HD21	1.71	1.18
4:B:813:LEU:O	4:B:817:GLN:HG3	1.47	1.13
4:B:212:LEU:HD23	4:B:246:LEU:HD21	1.42	0.98
4:B:211:ILE:HD11	4:B:225:LEU:HD12	1.50	0.93
4:B:212:LEU:HD22	4:B:246:LEU:HD21	1.50	0.92
4:B:116:HIS:HB3	4:B:125:GLU:HG3	1.55	0.88
4:B:211:ILE:HD12	4:B:225:LEU:HA	1.54	0.86
4:B:794:GLN:OE1	4:B:797:LYS:CB	2.25	0.84
4:B:541:SER:H	4:B:544:GLN:HE21	1.29	0.80
4:B:212:LEU:CD2	4:B:246:LEU:CD2	2.61	0.76
4:B:840:ALA:O	4:B:864:ARG:NH2	2.20	0.75
4:B:118:ILE:N	4:B:125:GLU:OE1	2.20	0.75
4:B:194:GLN:NE2	4:B:195:LEU:HD13	2.02	0.74
4:B:212:LEU:HD22	4:B:246:LEU:CD2	2.17	0.73
2:C:11:DT:C2'	2:C:12:DT:H5'	2.19	0.72
4:B:187:GLN:O	4:B:191:THR:HG23	1.89	0.71
4:B:1311:HIS:O	4:B:1314:THR:HG23	1.91	0.71

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:C:11:DT:H2"	2:C:12:DT:H5'	1.73	0.71
4:B:870:VAL:HG22	4:B:871:PRO:HD2	1.73	0.70
4:B:189:VAL:HG11	4:B:203:ALA:HB2	1.73	0.70
4:B:183:LYS:O	4:B:184:LEU:C	2.28	0.69
4:B:1179:ILE:HD11	4:B:1192:LYS:HG3	1.74	0.69
4:B:211:ILE:HD12	4:B:225:LEU:CA	2.22	0.69
4:B:342:GLN:OE1	4:B:383:MET:HB2	1.93	0.68
4:B:967:ARG:NH1	4:B:986:ASP:OD1	2.27	0.68
4:B:1042:ILE:HG23	4:B:1043:MET:HG2	1.75	0.67
4:B:803:ASN:H	4:B:803:ASN:HD22	1.40	0.66
4:B:678:THR:O	4:B:681:ASP:HB2	1.96	0.66
1:A:23:U:H6	1:A:23:U:O5'	1.78	0.66
4:B:1210:ARG:HA	4:B:1280:VAL:HG22	1.76	0.66
4:B:185:PHE:O	4:B:189:VAL:HG23	1.96	0.65
4:B:813:LEU:O	4:B:817:GLN:CG	2.36	0.63
4:B:525:THR:O	4:B:690:ASN:HB3	1.99	0.62
4:B:211:ILE:CG1	4:B:212:LEU:N	2.62	0.62
4:B:671:ARG:NH1	4:B:676:GLY:O	2.32	0.62
4:B:942:LYS:HB2	6:B:1539:HOH:O	1.98	0.62
4:B:211:ILE:HG13	4:B:212:LEU:N	2.15	0.62
4:B:211:ILE:HD11	4:B:225:LEU:CD1	2.28	0.61
4:B:369:GLN:OE1	4:B:400:ARG:NH1	2.33	0.61
4:B:226:ILE:HD13	4:B:234:LYS:HA	1.83	0.60
4:B:250:PRO:O	4:B:263:LYS:HA	2.02	0.59
4:B:557:ARG:NH2	4:B:596:ASP:OD1	2.36	0.59
1:A:76:A:H2'	1:A:77:A:O4'	2.02	0.58
4:B:183:LYS:O	4:B:186:ILE:N	2.36	0.58
4:B:817:GLN:O	4:B:882:TYR:OH	2.22	0.57
4:B:774:GLN:O	4:B:778:ARG:HB2	2.04	0.57
4:B:1237:TYR:O	4:B:1241:HIS:CD2	2.58	0.57
2:C:2:DA:H2'	2:C:3:DA:C8	2.40	0.57
4:B:1111:LEU:HD11	4:B:1135:ASP:HB2	1.87	0.56
4:B:531:THR:HG22	4:B:577:SER:O	2.06	0.56
4:B:923:GLU:HG2	4:B:928:THR:OG1	2.06	0.56
4:B:373:TYR:CE1	4:B:398:LEU:HB3	2.40	0.56
1:A:1:A:H5"	4:B:929:LYS:HE2	1.87	0.55
4:B:207:ASP:O	4:B:211:ILE:HG23	2.06	0.55
4:B:849:ASP:OD1	4:B:851:SER:HB3	2.07	0.55
4:B:880:LYS:C	4:B:882:TYR:N	2.57	0.55
4:B:673:LYS:HB2	4:B:703:THR:HG21	1.88	0.55
4:B:803:ASN:HD22	4:B:803:ASN:N	2.01	0.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:B:240:ASN:ND2	4:B:255:ASN:OD1	2.31	0.55
4:B:1114:ARG:HG2	4:B:1119:LEU:HD11	1.87	0.55
4:B:561:VAL:HG22	4:B:585:ASP:O	2.07	0.54
4:B:180:ASP:OD1	4:B:183:LYS:HD2	2.08	0.54
4:B:274:ASP:HA	4:B:277:ASN:ND2	2.23	0.54
4:B:880:LYS:O	4:B:883:TRP:N	2.40	0.54
4:B:194:GLN:HE21	4:B:195:LEU:HD13	1.73	0.54
4:B:118:ILE:HB	4:B:125:GLU:OE1	2.07	0.53
4:B:824:VAL:O	4:B:825:ASP:HB3	2.08	0.53
4:B:211:ILE:CG1	4:B:212:LEU:H	2.22	0.53
4:B:973:TYR:CD1	4:B:1237:TYR:CE2	2.97	0.53
4:B:1194:LEU:HD22	4:B:1365:LEU:HB3	1.91	0.53
4:B:334:LEU:HD23	4:B:389:LEU:HD21	1.90	0.53
4:B:1177:ASN:ND2	4:B:1180:ASP:OD1	2.42	0.53
4:B:345:GLU:HG2	4:B:346:LYS:HG2	1.91	0.52
4:B:801:VAL:HG11	4:B:815:TYR:CE2	2.44	0.52
1:A:45:U:H5'	4:B:402:GLN:HE21	1.74	0.52
4:B:113:HIS:ND1	5:B:1403:PO4:O2	2.42	0.51
4:B:973:TYR:CE1	4:B:1237:TYR:CE2	2.98	0.51
4:B:1312:LEU:HD21	4:B:1326:TYR:CD1	2.46	0.51
4:B:519:THR:HG22	4:B:589:ALA:HB1	1.93	0.51
4:B:686:ASP:OD2	4:B:691:ARG:HB2	2.10	0.51
1:A:6:U:O4'	4:B:588:ASN:HB3	2.11	0.51
4:B:1347:LEU:N	4:B:1360:ILE:O	2.43	0.51
4:B:626:PHE:CE2	4:B:635:ARG:HD3	2.47	0.50
4:B:672:ASP:HA	4:B:703:THR:OG1	2.11	0.50
4:B:531:THR:HG21	4:B:575:PHE:CG	2.47	0.50
1:A:29:G:H2'	1:A:30:C:O5'	2.11	0.50
4:B:377:LYS:HB3	4:B:378:PRO:HD3	1.94	0.50
4:B:165:ARG:O	4:B:412:HIS:HA	2.12	0.49
4:B:879:MET:O	4:B:882:TYR:N	2.44	0.49
4:B:180:ASP:O	4:B:184:LEU:N	2.37	0.49
4:B:758:ASN:ND2	4:B:995:THR:HG22	2.27	0.49
4:B:66:ARG:NH1	6:B:1501:HOH:O	2.37	0.49
4:B:1305:GLN:O	4:B:1309:ILE:HG12	2.12	0.49
4:B:393:LEU:HD23	4:B:393:LEU:O	2.13	0.48
4:B:861:ASP:O	4:B:864:ARG:HG2	2.13	0.48
4:B:8:GLY:O	4:B:18:TRP:HA	2.13	0.48
4:B:211:ILE:CD1	4:B:225:LEU:HA	2.35	0.48
4:B:226:ILE:HG21	4:B:234:LYS:HA	1.94	0.48
4:B:116:HIS:HB3	4:B:125:GLU:CG	2.37	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:C:2:DA:H4'	2:C:3:DA:OP1	2.14	0.48
4:B:536:LYS:HB3	4:B:537:PRO:HD2	1.96	0.47
4:B:600:ILE:HG22	4:B:650:GLN:HB3	1.95	0.47
2:C:16:DC:H2'	2:C:17:DA:C8	2.48	0.47
4:B:736:GLY:O	4:B:740:THR:HG23	2.14	0.47
4:B:879:MET:O	4:B:882:TYR:HB3	2.14	0.47
4:B:667:ILE:HG22	4:B:668:ASN:HB2	1.96	0.47
1:A:15:A:N3	4:B:450:TYR:HB2	2.30	0.47
4:B:600:ILE:CG2	4:B:650:GLN:HB3	2.45	0.46
4:B:697:ILE:HD12	4:B:708:ILE:CD1	2.45	0.46
4:B:963:VAL:HG21	4:B:990:ASN:ND2	2.30	0.46
4:B:9:LEU:HA	4:B:17:GLY:O	2.15	0.46
4:B:803:ASN:H	4:B:803:ASN:ND2	2.11	0.46
4:B:881:ASN:O	4:B:885:GLN:HG3	2.16	0.46
4:B:561:VAL:HG12	4:B:583:VAL:HG13	1.96	0.46
4:B:600:ILE:O	4:B:647:VAL:HG23	2.16	0.46
4:B:448:ILE:HG12	4:B:455:LEU:HD11	1.98	0.45
4:B:211:ILE:HG12	4:B:212:LEU:H	1.81	0.45
4:B:956:ILE:HA	4:B:1008:PHE:O	2.16	0.45
4:B:539:PHE:HB3	4:B:690:ASN:ND2	2.32	0.45
4:B:1041:ASN:O	4:B:1044:ASN:ND2	2.46	0.45
4:B:485:GLY:HA2	4:B:631:MET:CE	2.45	0.45
4:B:1312:LEU:O	4:B:1315:LEU:HB3	2.16	0.45
4:B:119:PHE:HE2	4:B:128:TYR:HB2	1.80	0.45
4:B:275:LEU:HD11	4:B:290:PHE:CD2	2.51	0.45
4:B:529:TYR:O	4:B:537:PRO:HA	2.17	0.45
4:B:1176:LYS:HE3	4:B:1177:ASN:HB2	1.99	0.45
4:B:1339:THR:O	4:B:1342:VAL:HG22	2.15	0.45
4:B:894:GLN:NE2	4:B:898:ASP:OD1	2.47	0.45
4:B:565:LYS:HG2	4:B:578:VAL:HG13	1.98	0.45
4:B:531:THR:HG21	4:B:575:PHE:CB	2.47	0.45
2:C:2:DA:H2''	2:C:3:DA:O5'	2.18	0.44
4:B:977:GLU:CG	4:B:1310:ILE:HG23	2.47	0.44
4:B:691:ARG:HA	4:B:695:GLN:OE1	2.17	0.44
4:B:979:ASN:HB2	4:B:1225:GLU:OE2	2.16	0.44
4:B:21:ILE:HA	4:B:26:LYS:O	2.16	0.44
4:B:381:GLU:C	4:B:383:MET:H	2.21	0.44
4:B:825:ASP:CG	4:B:825:ASP:O	2.56	0.44
4:B:192:TYR:CE1	4:B:201:ILE:HD11	2.53	0.44
4:B:817:GLN:NE2	4:B:822:MET:HB2	2.33	0.44
4:B:1262:HIS:O	4:B:1265:TYR:HB2	2.18	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:B:196:PHE:CE1	4:B:237:LEU:HD23	2.52	0.43
4:B:343:LEU:N	4:B:344:PRO:CD	2.81	0.43
4:B:514:LEU:HD21	4:B:668:ASN:HD22	1.83	0.43
2:C:3:DA:C2	2:C:4:DT:C2	3.07	0.43
4:B:1210:ARG:HG3	4:B:1280:VAL:HA	2.00	0.43
4:B:450:TYR:C	4:B:450:TYR:CD1	2.92	0.43
4:B:531:THR:HG21	4:B:575:PHE:CD2	2.53	0.43
1:A:74:A:H2'	1:A:75:A:O4'	2.18	0.43
2:C:8:DG:C6	3:D:4:DA:N6	2.87	0.43
4:B:450:TYR:OH	4:B:627:GLU:HG3	2.17	0.43
4:B:780:ARG:NH1	4:B:806:LEU:O	2.49	0.43
4:B:852:ILE:HD13	4:B:852:ILE:HA	1.88	0.43
4:B:601:ILE:O	4:B:601:ILE:HG13	2.18	0.43
4:B:192:TYR:CD1	4:B:201:ILE:HD12	2.54	0.43
4:B:1060:ARG:HB2	4:B:1061:PRO:CD	2.48	0.43
4:B:137:HIS:HA	4:B:322:ILE:HD11	2.00	0.43
1:A:25:U:H1'	4:B:104:SER:O	2.18	0.42
4:B:844:GLN:OE1	4:B:844:GLN:HA	2.19	0.42
4:B:880:LYS:C	4:B:882:TYR:H	2.22	0.42
4:B:192:TYR:CE1	4:B:201:ILE:CD1	3.02	0.42
4:B:405:PHE:N	6:B:1510:HOH:O	2.51	0.42
4:B:1036:TYR:O	4:B:1040:SER:OG	2.33	0.42
4:B:557:ARG:O	4:B:590:SER:HB2	2.20	0.42
4:B:708:ILE:O	4:B:712:GLN:HG2	2.20	0.42
4:B:736:GLY:O	4:B:740:THR:CG2	2.67	0.42
1:A:63:U:H4'	1:A:64:U:OP2	2.20	0.42
1:A:29:G:C2'	1:A:30:C:O5'	2.67	0.41
4:B:817:GLN:HE22	4:B:822:MET:HB2	1.85	0.41
4:B:1075:ASP:O	4:B:1077:GLY:N	2.53	0.41
4:B:849:ASP:OD1	4:B:851:SER:CB	2.68	0.41
4:B:1127:ASP:HA	4:B:1128:PRO:HD3	1.89	0.41
4:B:1176:LYS:CE	4:B:1177:ASN:HB2	2.51	0.41
4:B:203:ALA:O	4:B:206:VAL:HB	2.20	0.41
4:B:598:LEU:O	4:B:601:ILE:O	2.39	0.41
4:B:78:ARG:NH1	4:B:162:ILE:O	2.47	0.41
4:B:106:LEU:O	4:B:111:LYS:NZ	2.44	0.41
4:B:243:ALA:O	4:B:246:LEU:HB2	2.21	0.41
4:B:478:PHE:CE1	4:B:482:VAL:HG21	2.55	0.41
4:B:183:LYS:C	4:B:185:PHE:N	2.72	0.41
4:B:724:ILE:CD1	4:B:738:LEU:HA	2.49	0.41
4:B:1000:LYS:HG3	4:B:1001:TYR:CE1	2.55	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:40:C:H2'	1:A:41:A:O4'	2.21	0.41
4:B:30:LYS:HE3	4:B:751:MET:HE1	2.01	0.41
4:B:251:ASN:C	4:B:253:LYS:N	2.74	0.41
4:B:189:VAL:O	4:B:193:ASN:HB2	2.21	0.41
4:B:643:PHE:HB3	4:B:647:VAL:CG1	2.51	0.41
4:B:1314:THR:O	4:B:1315:LEU:C	2.58	0.41
4:B:155:TYR:CD2	4:B:155:TYR:C	2.95	0.41
4:B:515:TYR:O	4:B:518:PHE:HB3	2.21	0.41
4:B:724:ILE:HD13	4:B:738:LEU:HA	2.02	0.41
4:B:876:VAL:HA	4:B:883:TRP:CZ3	2.56	0.41
4:B:927:ILE:HG23	4:B:928:THR:N	2.35	0.41
4:B:464:TRP:CZ2	4:B:491:PHE:HD1	2.39	0.41
4:B:531:THR:HG21	4:B:575:PHE:HB3	2.03	0.41
4:B:621:LEU:O	4:B:625:LEU:HB2	2.21	0.41
4:B:694:ILE:HG12	4:B:694:ILE:O	2.21	0.41
4:B:380:LEU:HD21	4:B:389:LEU:HB3	2.03	0.40
4:B:724:ILE:HD12	4:B:738:LEU:HD13	2.02	0.40
4:B:1004:LEU:CD1	4:B:1042:ILE:HD11	2.51	0.40
2:C:6:DC:H2"	2:C:7:DC:O5'	2.21	0.40
4:B:191:THR:O	4:B:194:GLN:CG	2.69	0.40
4:B:279:LEU:O	4:B:283:GLY:N	2.48	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	
4	B	1311/1368 (96%)	1193 (91%)	104 (8%)	14 (1%)	14	34

All (14) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
4	B	252	PHE
4	B	471	GLU
4	B	652	LYS
4	B	1076	LYS
4	B	298	ASP
4	B	382	LYS
4	B	532	GLU
4	B	1062	LEU
4	B	1327	PHE
4	B	216	LEU
4	B	343	LEU
4	B	247	GLY
4	B	669	GLY
4	B	211	ILE

5.3.2 Protein sidechains (i)

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	
4	B	1114/1226 (91%)	1023 (92%)	91 (8%)	11	26

All (91) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
4	B	55	SER
4	B	73	THR
4	B	174	LEU
4	B	186	ILE
4	B	188	LEU
4	B	206	VAL
4	B	211	ILE
4	B	216	LEU
4	B	245	SER
4	B	255	ASN
4	B	258	LEU
4	B	262	THR
4	B	276	ASP

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Mol	Chain	Res	Type
4	B	303	SER
4	B	304	ASP
4	B	305	ILE
4	B	321	MET
4	B	343	LEU
4	B	390	LEU
4	B	398	LEU
4	B	445	THR
4	B	465	MET
4	B	504	ASN
4	B	506	LYS
4	B	510	LYS
4	B	512	SER
4	B	519	THR
4	B	534	MET
4	B	543	ASP
4	B	556	ASN
4	B	567	ASP
4	B	598	LEU
4	B	600	ILE
4	B	603	ASP
4	B	625	LEU
4	B	629	ARG
4	B	641	HIS
4	B	670	ILE
4	B	697	ILE
4	B	701	SER
4	B	709	GLN
4	B	710	LYS
4	B	740	THR
4	B	743	VAL
4	B	749	LYS
4	B	758	ASN
4	B	762	GLU
4	B	778	ARG
4	B	783	ARG
4	B	790	GLU
4	B	791	LEU
4	B	801	VAL
4	B	803	ASN
4	B	853	ASP
4	B	864	ARG

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Mol	Chain	Res	Type
4	B	870	VAL
4	B	884	ARG
4	B	928	THR
4	B	948	LYS
4	B	959	LYS
4	B	962	LEU
4	B	964	SER
4	B	967	ARG
4	B	1037	PHE
4	B	1040	SER
4	B	1041	ASN
4	B	1048	THR
4	B	1059	LYS
4	B	1062	LEU
4	B	1078	ARG
4	B	1082	THR
4	B	1085	LYS
4	B	1124	LYS
4	B	1143	VAL
4	B	1146	VAL
4	B	1151	LYS
4	B	1176	LYS
4	B	1180	ASP
4	B	1192	LYS
4	B	1230	SER
4	B	1241	HIS
4	B	1257	LEU
4	B	1272	GLN
4	B	1280	VAL
4	B	1296	LYS
4	B	1300	LYS
4	B	1314	THR
4	B	1325	LYS
4	B	1332	ASP
4	B	1333	ARG
4	B	1338	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (14) such sidechains are listed below:

Mol	Chain	Res	Type
4	B	83	GLN
4	B	194	GLN

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Mol	Chain	Res	Type
4	B	265	GLN
4	B	281	GLN
4	B	354	GLN
4	B	394	ASN
4	B	402	GLN
4	B	544	GLN
4	B	758	ASN
4	B	803	ASN
4	B	805	GLN
4	B	826	GLN
4	B	990	ASN
4	B	1286	ASN

5.3.3 RNA ⓘ

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
1	A	80/83 (96%)	14 (17%)	0

All (14) RNA backbone outliers are listed below:

Mol	Chain	Res	Type
1	A	10	U
1	A	28	A
1	A	29	G
1	A	30	C
1	A	32	A
1	A	35	A
1	A	36	A
1	A	51	A
1	A	52	A
1	A	59	U
1	A	63	U
1	A	68	A
1	A	77	A
1	A	81	G

There are no RNA pucker outliers to report.

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 monosaccharides in this entry.

5.6 Ligand geometry ⓘ

9 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	$\#|Z| > 2$
5	PO4	B	1407	-	4,4,4	0.64	0	6,6,6	0.39	0
5	PO4	B	1406	-	4,4,4	0.47	0	6,6,6	0.53	0
5	PO4	B	1405	-	4,4,4	0.57	0	6,6,6	0.49	0
5	PO4	A	102	-	4,4,4	0.47	0	6,6,6	0.52	0
5	PO4	B	1402	-	4,4,4	0.51	0	6,6,6	0.66	0
5	PO4	B	1401	-	4,4,4	0.64	0	6,6,6	0.47	0
5	PO4	A	101	-	4,4,4	0.62	0	6,6,6	0.52	0
5	PO4	B	1403	-	4,4,4	0.79	0	6,6,6	0.47	0
5	PO4	B	1404	-	4,4,4	0.79	0	6,6,6	0.42	0

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.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	B	1403	PO4	1	0

5.7 Other polymers (i)

There are no such residues in this entry.

5.8 Polymer linkage issues (i)

There are no chain breaks in this entry.

6 Fit of model and data ⓘ

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	81/83 (97%)	-0.62	0	100	100	22, 39, 93, 105	0
2	C	28/28 (100%)	-0.49	0	100	100	27, 45, 70, 75	0
3	D	11/12 (91%)	0.21	1 (9%)	9	7	35, 52, 113, 140	0
4	B	1323/1368 (96%)	0.11	44 (3%)	46	46	20, 49, 94, 115	0
All	All	1443/1491 (96%)	0.06	45 (3%)	49	49	20, 48, 95, 140	0

All (45) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
4	B	385	GLY	6.4
4	B	198	GLU	6.0
4	B	264	LEU	5.0
4	B	275	LEU	4.0
4	B	216	LEU	3.8
4	B	292	ALA	3.7
4	B	199	ASN	3.4
4	B	293	ALA	3.2
4	B	196	PHE	3.1
4	B	249	THR	3.1
4	B	238	PHE	3.0
4	B	186	ILE	3.0
4	B	1037	PHE	2.9
4	B	245	SER	2.9
4	B	291	LEU	2.9
4	B	258	LEU	2.9
4	B	1302	ILE	2.8
4	B	380	LEU	2.8
4	B	214	ALA	2.7
3	D	2	DA	2.7
4	B	338	LEU	2.7

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Mol	Chain	Res	Type	RSRZ
4	B	352	PHE	2.7
4	B	176	PRO	2.6
4	B	278	LEU	2.6
4	B	351	PHE	2.6
4	B	271	TYR	2.6
4	B	347	TYR	2.6
4	B	177	ASP	2.6
4	B	529	TYR	2.6
4	B	350	ILE	2.5
4	B	246	LEU	2.5
4	B	241	LEU	2.4
4	B	1367	GLY	2.4
4	B	187	GLN	2.4
4	B	296	LEU	2.4
4	B	242	ILE	2.2
4	B	185	PHE	2.2
4	B	600	ILE	2.2
4	B	1257	LEU	2.2
4	B	234	LYS	2.2
4	B	1158	LYS	2.1
4	B	792	GLY	2.1
4	B	311	GLU	2.1
4	B	260	GLU	2.0
4	B	295	ASN	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 monosaccharides 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(Å^2)	Q<0.9
5	PO4	B	1406	5/5	0.79	0.24	87,89,94,95	0
5	PO4	A	101	5/5	0.81	0.34	70,70,75,83	0
5	PO4	B	1404	5/5	0.85	0.24	51,54,67,70	0
5	PO4	B	1401	5/5	0.86	0.13	108,116,120,121	0
5	PO4	B	1405	5/5	0.87	0.24	93,98,101,102	0
5	PO4	A	102	5/5	0.93	0.21	70,75,81,82	0
5	PO4	B	1407	5/5	0.93	0.13	62,64,75,78	0
5	PO4	B	1403	5/5	0.95	0.15	60,70,74,75	0
5	PO4	B	1402	5/5	0.97	0.13	36,37,41,44	0

6.5 Other polymers ⓘ

There are no such residues in this entry.