



Full wwPDB X-ray Structure Validation Report ⓘ

May 15, 2020 – 09:27 am BST

PDB ID : 4X4T
Title : Crystal structure of the *A.fulgidus* CCA-adding enzyme in complex with a G70A arginyl-tRNA minihelix ending in CCACCA
Authors : Kuhn, C.-D.; Joshua-Tor, L.
Deposited on : 2014-12-03
Resolution : 2.50 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 following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

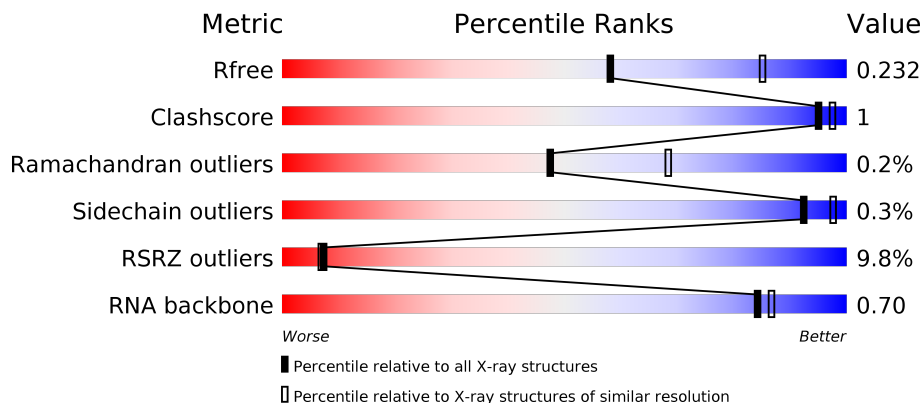
MolProbity : 4.02b-467
Mogul : 1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.11
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac : 5.8.0158
CCP4 : 7.0.044 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.11

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 2.50 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}	130704	4661 (2.50-2.50)
Clashscore	141614	5346 (2.50-2.50)
Ramachandran outliers	138981	5231 (2.50-2.50)
Sidechain outliers	138945	5233 (2.50-2.50)
RSRZ outliers	127900	4559 (2.50-2.50)
RNA backbone	3102	1008 (2.84-2.16)

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 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	457	
1	C	457	
1	E	457	
1	F	457	

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Mol	Chain	Length	Quality of chain
2	B	34	<p>35% 85% 15%</p>
2	D	34	<p>47% 68% 15% 6% 12%</p>
3	G	33	<p>6% 52% 9% 39%</p>
4	H	2	<p>100% 50%</p>
5	I	2	<p>100% 50%</p>

2 Entry composition [i](#)

There are 8 unique types of molecules in this entry. The entry contains 32835 atoms, of which 15704 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 CCA-adding enzyme.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace	
			Total	C	H	N	O				S
1	A	437	7270	2333	3641	632	651	13	0	0	0
1	C	437	7265	2333	3637	631	651	13	0	0	0
1	E	437	7270	2333	3641	632	651	13	0	0	0
1	F	437	7270	2333	3641	632	651	13	0	0	0

There are 80 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	438	SER	-	expression tag	UNP O28126
A	439	ASN	-	expression tag	UNP O28126
A	440	SER	-	expression tag	UNP O28126
A	441	SER	-	expression tag	UNP O28126
A	442	SER	-	expression tag	UNP O28126
A	443	VAL	-	expression tag	UNP O28126
A	444	ASP	-	expression tag	UNP O28126
A	445	LYS	-	expression tag	UNP O28126
A	446	LEU	-	expression tag	UNP O28126
A	447	ALA	-	expression tag	UNP O28126
A	448	ALA	-	expression tag	UNP O28126
A	449	ALA	-	expression tag	UNP O28126
A	450	LEU	-	expression tag	UNP O28126
A	451	GLU	-	expression tag	UNP O28126
A	452	HIS	-	expression tag	UNP O28126
A	453	HIS	-	expression tag	UNP O28126
A	454	HIS	-	expression tag	UNP O28126
A	455	HIS	-	expression tag	UNP O28126
A	456	HIS	-	expression tag	UNP O28126
A	457	HIS	-	expression tag	UNP O28126
C	438	SER	-	expression tag	UNP O28126

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Chain	Residue	Modelled	Actual	Comment	Reference
C	439	ASN	-	expression tag	UNP O28126
C	440	SER	-	expression tag	UNP O28126
C	441	SER	-	expression tag	UNP O28126
C	442	SER	-	expression tag	UNP O28126
C	443	VAL	-	expression tag	UNP O28126
C	444	ASP	-	expression tag	UNP O28126
C	445	LYS	-	expression tag	UNP O28126
C	446	LEU	-	expression tag	UNP O28126
C	447	ALA	-	expression tag	UNP O28126
C	448	ALA	-	expression tag	UNP O28126
C	449	ALA	-	expression tag	UNP O28126
C	450	LEU	-	expression tag	UNP O28126
C	451	GLU	-	expression tag	UNP O28126
C	452	HIS	-	expression tag	UNP O28126
C	453	HIS	-	expression tag	UNP O28126
C	454	HIS	-	expression tag	UNP O28126
C	455	HIS	-	expression tag	UNP O28126
C	456	HIS	-	expression tag	UNP O28126
C	457	HIS	-	expression tag	UNP O28126
E	438	SER	-	expression tag	UNP O28126
E	439	ASN	-	expression tag	UNP O28126
E	440	SER	-	expression tag	UNP O28126
E	441	SER	-	expression tag	UNP O28126
E	442	SER	-	expression tag	UNP O28126
E	443	VAL	-	expression tag	UNP O28126
E	444	ASP	-	expression tag	UNP O28126
E	445	LYS	-	expression tag	UNP O28126
E	446	LEU	-	expression tag	UNP O28126
E	447	ALA	-	expression tag	UNP O28126
E	448	ALA	-	expression tag	UNP O28126
E	449	ALA	-	expression tag	UNP O28126
E	450	LEU	-	expression tag	UNP O28126
E	451	GLU	-	expression tag	UNP O28126
E	452	HIS	-	expression tag	UNP O28126
E	453	HIS	-	expression tag	UNP O28126
E	454	HIS	-	expression tag	UNP O28126
E	455	HIS	-	expression tag	UNP O28126
E	456	HIS	-	expression tag	UNP O28126
E	457	HIS	-	expression tag	UNP O28126
F	438	SER	-	expression tag	UNP O28126
F	439	ASN	-	expression tag	UNP O28126
F	440	SER	-	expression tag	UNP O28126

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Chain	Residue	Modelled	Actual	Comment	Reference
F	441	SER	-	expression tag	UNP O28126
F	442	SER	-	expression tag	UNP O28126
F	443	VAL	-	expression tag	UNP O28126
F	444	ASP	-	expression tag	UNP O28126
F	445	LYS	-	expression tag	UNP O28126
F	446	LEU	-	expression tag	UNP O28126
F	447	ALA	-	expression tag	UNP O28126
F	448	ALA	-	expression tag	UNP O28126
F	449	ALA	-	expression tag	UNP O28126
F	450	LEU	-	expression tag	UNP O28126
F	451	GLU	-	expression tag	UNP O28126
F	452	HIS	-	expression tag	UNP O28126
F	453	HIS	-	expression tag	UNP O28126
F	454	HIS	-	expression tag	UNP O28126
F	455	HIS	-	expression tag	UNP O28126
F	456	HIS	-	expression tag	UNP O28126
F	457	HIS	-	expression tag	UNP O28126

- Molecule 2 is a RNA chain called G70A tRNA minihelix ending in CCACCA.

Mol	Chain	Residues	Atoms							ZeroOcc	AltConf	Trace
			Total	Br	C	H	N	O	P			
2	B	34	1083	3	322	355	129	240	34	0	6	0
2	D	30	968	2	284	325	114	213	30	0	0	0

- Molecule 3 is a RNA chain called G70A tRNA minihelix ending in CCACCA.

Mol	Chain	Residues	Atoms							ZeroOcc	AltConf	Trace
			Total	Br	C	H	N	O	P			
3	G	18	1159	1	342	385	143	252	36	0	18	0

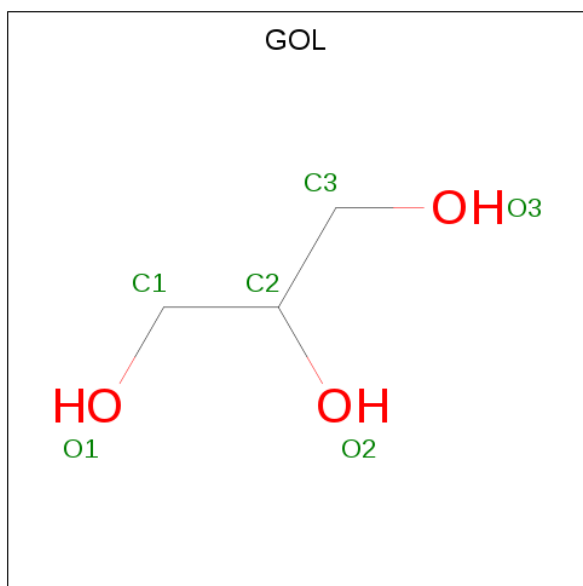
- Molecule 4 is a RNA chain called RNA (5'-D(P*CP*G)-3').

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	H	N	O	P			
4	H	2	66	19	23	8	14	2	0	0	0

- Molecule 5 is a RNA chain called RNA (5'-D(P*GP*G)-3').

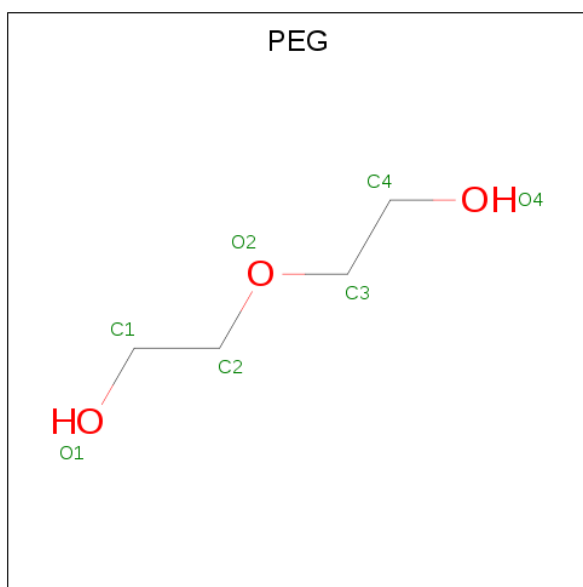
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace	
			Total	C	H	N	O				P
5	I	2	68	20	22	10	14	2	0	0	0

- Molecule 6 is GLYCEROL (three-letter code: GOL) (formula: $C_3H_8O_3$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	H	O		
6	A	1	14	3	8	3	0	0
6	A	1	14	3	8	3	0	0
6	A	1	14	3	8	3	0	0

- Molecule 7 is DI(HYDROXYETHYL)ETHER (three-letter code: PEG) (formula: $C_4H_{10}O_3$).



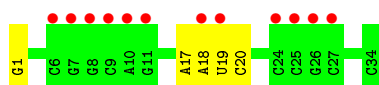
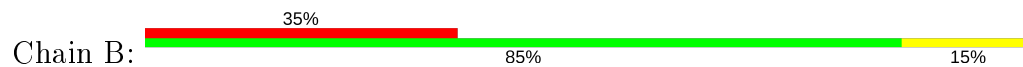
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
7	E	1	Total	C	H	O	0	0
			17	4	10	3		

- Molecule 8 is water.

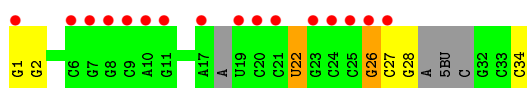
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
8	A	63	Total	O	0	0
			63	63		
8	B	2	Total	O	0	0
			2	2		
8	C	51	Total	O	0	0
			51	51		
8	E	133	Total	O	0	0
			133	133		
8	F	96	Total	O	0	0
			96	96		
8	G	12	Total	O	0	0
			12	12		

SER
VAL
ASP
LYS
LEU
ALA
ALA
LEU
GLU
HIS
HIS
HIS
HIS
HIS

- Molecule 2: G70A tRNA minihelix ending in CCACCA



- Molecule 2: G70A tRNA minihelix ending in CCACCA



- Molecule 3: G70A tRNA minihelix ending in CCACCA



- Molecule 4: RNA (5'-D(P*CP*G)-3')



- Molecule 5: RNA (5'-D(P*GP*G)-3')



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	115.42Å 83.96Å 135.32Å 90.00° 103.51° 90.00°	Depositor
Resolution (Å)	39.34 – 2.50 39.34 – 2.49	Depositor EDS
% Data completeness (in resolution range)	99.3 (39.34-2.50) 99.7 (39.34-2.49)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.62 (at 2.48Å)	Xtrriage
Refinement program	PHENIX (PHENIX.REFINE: 1.8.2_1309)	Depositor
R, R_{free}	0.186 , 0.229 0.189 , 0.232	Depositor DCC
R_{free} test set	4401 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	48.1	Xtrriage
Anisotropy	0.071	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.38 , 45.9	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	32835	wwPDB-VP
Average B, all atoms (Å ²)	75.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.64% 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: 5BU, PEG, GOL

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	0.23	0/3712	0.39	0/4987
1	C	0.23	0/3711	0.39	0/4985
1	E	0.24	0/3712	0.39	0/4987
1	F	0.23	0/3712	0.40	0/4987
2	B	0.42	1/741 (0.1%)	0.68	1/1150 (0.1%)
2	D	0.45	1/669 (0.1%)	0.72	1/1038 (0.1%)
3	G	0.15	0/834	0.67	0/1286
4	H	0.13	0/47	0.64	0/71
5	I	0.20	0/51	0.77	0/78
All	All	0.25	2/17189 (0.0%)	0.45	2/23569 (0.0%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	1	G	OP3-P	-10.60	1.48	1.61
2	D	1	G	OP3-P	-10.55	1.48	1.61

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	1	G	OP1-P-O3'	5.27	116.79	105.20
2	B	1	G	OP1-P-O3'	5.16	116.55	105.20

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	3629	3641	3633	8	0
1	C	3628	3637	3629	5	0
1	E	3629	3641	3633	7	0
1	F	3629	3641	3633	10	0
2	B	728	355	365	2	0
2	D	643	325	324	5	0
3	G	774	385	397	3	0
4	H	43	23	23	1	0
5	I	46	22	23	2	0
6	A	18	24	24	0	0
7	E	7	10	9	0	0
8	A	63	0	0	0	0
8	B	2	0	0	0	0
8	C	51	0	0	0	0
8	E	133	0	0	1	0
8	F	96	0	0	4	0
8	G	12	0	0	0	0
All	All	17131	15704	15693	36	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 1.

All (36) 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:19:U:H3	5:I:1:G:HO2'	1.27	0.76
1:F:299:ARG:NH1	1:F:399:THR:O	2.23	0.72
1:A:274:ARG:NH2	1:A:433:MET:O	2.24	0.71
2:B:17:A:O2'	2:B:19:U:OP2	2.11	0.68
1:A:358:PHE:O	1:A:363:ARG:NH2	2.26	0.67
1:E:299:ARG:NH1	1:E:399:THR:O	2.28	0.66
1:E:78:ARG:NH1	1:E:81:GLU:OE1	2.31	0.62
1:F:78:ARG:NH1	1:F:81:GLU:OE1	2.32	0.62
1:F:210:LYS:NZ	8:F:549:HOH:O	2.34	0.61
1:C:274:ARG:NH2	1:C:433:MET:O	2.35	0.60

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:F:291:ASP:OD2	3:G:8[A]:G:O2'	2.21	0.56
1:E:291:ASP:OD2	3:G:9[B]:C:O2'	2.23	0.56
1:F:50:ARG:NH2	8:F:509:HOH:O	2.40	0.55
1:A:373:ARG:NH1	5:I:2:G:O6	2.40	0.55
1:C:14:VAL:CG1	1:C:149:ARG:HB3	2.39	0.52
1:E:291:ASP:OD2	3:G:31[A]:C:O2'	2.27	0.52
1:C:291:ASP:OD2	2:D:34:C:O2'	2.27	0.52
1:A:69:GLU:N	1:A:69:GLU:OE1	2.43	0.51
1:F:387:GLU:OE2	1:F:390:ARG:NH1	2.45	0.50
1:C:373:ARG:NH2	4:H:2:G:O6	2.43	0.50
1:C:34:ARG:NH1	1:C:86:VAL:O	2.45	0.49
1:F:373:ARG:NH2	8:F:552:HOH:O	2.44	0.48
2:D:26:G:H2'	2:D:27:C:C6	2.48	0.48
1:A:14:VAL:CG1	1:A:149:ARG:HB3	2.43	0.48
2:D:22:5BU:C5'	2:D:22:5BU:H6	2.44	0.47
1:A:94:TYR:O	1:A:95:ALA:HB2	2.16	0.45
2:D:27:C:H2'	2:D:28:G:C8	2.52	0.45
1:F:14:VAL:HG13	1:F:54:LEU:HD22	1.99	0.45
2:D:22:5BU:H5''	2:D:22:5BU:H6	2.00	0.44
1:E:395:THR:HG23	1:E:396:HIS:ND1	2.33	0.44
1:A:96:GLU:O	1:A:97:HIS:ND1	2.51	0.43
1:A:154:PHE:O	1:A:158:ASN:ND2	2.48	0.43
1:F:50:ARG:NH1	1:F:176:GLU:OE2	2.52	0.42
1:F:390:ARG:NH2	8:F:547:HOH:O	2.49	0.42
1:E:130:THR:HB	1:E:131:PRO:HD3	2.03	0.41
1:E:50:ARG:NH2	8:E:724:HOH:O	2.52	0.41

There are no symmetry-related clashes.

5.3 Torsion angles [\(i\)](#)

5.3.1 Protein backbone [\(i\)](#)

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	435/457 (95%)	416 (96%)	18 (4%)	1 (0%)	47	68
1	C	435/457 (95%)	412 (95%)	22 (5%)	1 (0%)	47	68
1	E	435/457 (95%)	425 (98%)	10 (2%)	0	100	100
1	F	435/457 (95%)	425 (98%)	9 (2%)	1 (0%)	47	68
All	All	1740/1828 (95%)	1678 (96%)	59 (3%)	3 (0%)	47	68

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	95	ALA
1	C	96	GLU
1	F	2	LYS

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	
1	A	387/404 (96%)	386 (100%)	1 (0%)	92	97
1	C	386/404 (96%)	385 (100%)	1 (0%)	92	97
1	E	387/404 (96%)	386 (100%)	1 (0%)	92	97
1	F	387/404 (96%)	386 (100%)	1 (0%)	92	97
All	All	1547/1616 (96%)	1543 (100%)	4 (0%)	92	97

All (4) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	348	GLN
1	C	96	GLU
1	E	2	LYS
1	F	89	SER

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

5.3.3 RNA [i](#)

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
2	B	32/34 (94%)	2 (6%)	0
2	D	28/34 (82%)	3 (10%)	0
3	G	1/33 (3%)	0	0
4	H	1/2 (50%)	0	0
5	I	1/2 (50%)	1 (100%)	0
All	All	63/105 (60%)	6 (9%)	0

All (6) RNA backbone outliers are listed below:

Mol	Chain	Res	Type
2	B	18	A
2	B	20	C
2	D	2	G
2	D	22	5BU
2	D	26	G
5	I	2	G

There are no RNA pucker outliers to report.

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

6 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
2	5BU	B	30[B]	2	15,22,23	2.17	4 (26%)	17,32,35	2.84	1 (5%)
3	5BU	G	30[A]	3	15,22,23	2.20	4 (26%)	17,32,35	2.94	2 (11%)
2	5BU	B	13	2	15,22,23	2.18	4 (26%)	17,32,35	2.77	2 (11%)
2	5BU	D	22	2	15,22,23	2.16	4 (26%)	17,32,35	2.78	1 (5%)
2	5BU	B	22	2	15,22,23	2.17	4 (26%)	17,32,35	2.76	2 (11%)
2	5BU	D	13	2	15,22,23	2.18	4 (26%)	17,32,35	2.76	2 (11%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	5BU	B	30[B]	2	-	0/5/25/26	0/2/2/2
3	5BU	G	30[A]	3	-	0/5/25/26	0/2/2/2
2	5BU	B	13	2	-	0/5/25/26	0/2/2/2
2	5BU	D	22	2	-	2/5/25/26	0/2/2/2
2	5BU	B	22	2	-	0/5/25/26	0/2/2/2
2	5BU	D	13	2	-	0/5/25/26	0/2/2/2

All (24) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	13	5BU	C4-C5	5.44	1.45	1.38
2	B	13	5BU	C4-C5	5.43	1.45	1.38
2	B	30[B]	5BU	C4-C5	5.33	1.45	1.38
2	B	22	5BU	C4-C5	5.33	1.45	1.38
3	G	30[A]	5BU	C4-C5	5.30	1.45	1.38
2	D	22	5BU	C4-C5	5.26	1.45	1.38
3	G	30[A]	5BU	C4-N3	-4.55	1.25	1.33
2	B	30[B]	5BU	C4-N3	-4.47	1.25	1.33
2	B	22	5BU	C4-N3	-4.41	1.25	1.33
2	D	22	5BU	C4-N3	-4.41	1.25	1.33
2	D	13	5BU	C4-N3	-4.41	1.25	1.33
2	B	13	5BU	C4-N3	-4.36	1.25	1.33
3	G	30[A]	5BU	C6-C5	3.69	1.46	1.39
2	B	13	5BU	C6-C5	3.68	1.46	1.39
2	D	13	5BU	C6-C5	3.65	1.46	1.39
2	B	30[B]	5BU	C6-C5	3.65	1.46	1.39
2	B	22	5BU	C6-C5	3.62	1.46	1.39
2	D	22	5BU	C6-C5	3.59	1.46	1.39
3	G	30[A]	5BU	C2-N3	-2.71	1.32	1.38
2	B	22	5BU	C2-N3	-2.52	1.33	1.38
2	B	30[B]	5BU	C2-N3	-2.51	1.33	1.38
2	D	13	5BU	C2-N3	-2.51	1.33	1.38
2	B	13	5BU	C2-N3	-2.50	1.33	1.38
2	D	22	5BU	C2-N3	-2.47	1.33	1.38

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	G	30[A]	5BU	C4-N3-C2	11.47	124.83	115.14
2	B	30[B]	5BU	C4-N3-C2	11.18	124.58	115.14
2	D	22	5BU	C4-N3-C2	10.98	124.42	115.14
2	B	13	5BU	C4-N3-C2	10.80	124.26	115.14
2	D	13	5BU	C4-N3-C2	10.78	124.24	115.14
2	B	22	5BU	C4-N3-C2	10.74	124.21	115.14
3	G	30[A]	5BU	C6-N1-C1'	2.51	124.87	119.24
2	B	13	5BU	C6-N1-C1'	2.09	123.92	119.24
2	D	13	5BU	C6-N1-C1'	2.08	123.90	119.24
2	B	22	5BU	C6-N1-C1'	2.03	123.80	119.24

There are no chirality outliers.

All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	D	22	5BU	O4'-C4'-C5'-O5'
2	D	22	5BU	C3'-C4'-C5'-O5'

There are no ring outliers.

1 monomer is involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	D	22	5BU	2	0

5.5 Carbohydrates [i](#)

There are no carbohydrates in this entry.

5.6 Ligand geometry [i](#)

4 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
6	GOL	A	503	-	5,5,5	0.37	0	5,5,5	0.22	0
6	GOL	A	501	-	5,5,5	0.35	0	5,5,5	0.24	0
6	GOL	A	502	-	5,5,5	0.37	0	5,5,5	0.21	0
7	PEG	E	501	-	6,6,6	0.60	0	5,5,5	0.26	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
6	GOL	A	503	-	-	2/4/4/4	-
6	GOL	A	501	-	-	2/4/4/4	-
6	GOL	A	502	-	-	2/4/4/4	-
7	PEG	E	501	-	-	0/4/4/4	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (6) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	A	503	GOL	O1-C1-C2-C3
6	A	501	GOL	O1-C1-C2-C3
6	A	503	GOL	O1-C1-C2-O2
6	A	501	GOL	O1-C1-C2-O2
6	A	502	GOL	O1-C1-C2-O2
6	A	502	GOL	O1-C1-C2-C3

There are no ring outliers.

No monomer is involved in short contacts.

5.7 Other polymers [i](#)

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 i

6.1 Protein, DNA and RNA chains i

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	437/457 (95%)	0.66	48 (10%) 5 5	29, 58, 138, 161	0
1	C	437/457 (95%)	1.07	77 (17%) 1 1	32, 65, 153, 202	0
1	E	437/457 (95%)	0.19	7 (1%) 72 74	28, 47, 86, 131	0
1	F	437/457 (95%)	0.29	15 (3%) 45 48	34, 49, 87, 135	0
2	B	31/34 (91%)	1.99	12 (38%) 0 0	82, 128, 195, 200	5 (16%)
2	D	28/34 (82%)	2.84	16 (57%) 0 0	89, 143, 187, 199	0
3	G	18/33 (54%)	0.28	0 100 100	48, 60, 96, 96	2 (11%)
4	H	2/2 (100%)	2.72	2 (100%) 0 0	92, 92, 92, 116	0
5	I	2/2 (100%)	2.20	2 (100%) 0 0	99, 99, 99, 165	0
All	All	1829/1933 (94%)	0.61	179 (9%) 7 7	28, 54, 143, 202	7 (0%)

All (179) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	94	TYR	9.2
1	C	85	ALA	8.4
1	C	92	ILE	8.1
1	C	94	TYR	7.9
2	D	24	C	7.7
2	D	25	C	6.8
1	C	107	VAL	6.7
2	D	10	A	6.6
1	C	104	VAL	6.5
2	B	18	A	6.2
1	E	124	LYS	6.2
1	A	85	ALA	6.1
1	C	103	VAL	6.1
1	C	75	LEU	6.1
2	D	7	G	6.0

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Mol	Chain	Res	Type	RSRZ
1	C	115	TYR	6.0
1	C	87	LEU	6.0
2	D	26	G	5.9
2	D	9	C	5.7
2	B	9	C	5.6
1	C	109	VAL	5.6
1	C	88	ASP	5.5
2	B	8	G	5.5
1	C	122	ASN	5.4
1	C	37	GLU	5.3
1	A	87	LEU	5.3
1	C	68	GLU	5.2
1	C	71	SER	5.2
1	C	102	GLY	5.2
1	A	78	ARG	5.1
1	C	22	ARG	5.1
1	A	75	LEU	5.1
1	C	258	HIS	5.1
1	A	38	LEU	5.0
1	C	66	PHE	5.0
1	C	72	LYS	4.9
1	C	105	LYS	4.9
1	C	38	LEU	4.9
2	B	7	G	4.6
1	C	73	GLU	4.6
2	D	8	G	4.5
1	C	40	VAL	4.5
2	D	23	G	4.5
1	A	89	SER	4.4
1	C	98	PRO	4.3
1	C	89	SER	4.3
1	C	90	TYR	4.3
1	C	35	LEU	4.2
1	C	64	LEU	4.2
1	A	37	GLU	4.2
1	C	127	VAL	4.1
1	C	111	VAL	4.1
1	A	40	VAL	4.1
2	B	19	U	4.0
1	A	100	VAL	4.0
1	C	70	PHE	4.0
1	A	95	ALA	4.0

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Mol	Chain	Res	Type	RSRZ
1	C	260	LEU	3.9
1	C	93	ARG	3.9
1	F	76	ARG	3.9
2	B	10	A	3.8
1	A	105	LYS	3.8
2	B	25	C	3.8
1	A	39	GLY	3.8
1	C	26	GLU	3.8
2	D	27	C	3.7
2	B	26	G	3.7
1	C	60	ILE	3.7
2	D	20	C	3.7
1	C	33	ARG	3.6
1	F	94	TYR	3.6
1	C	30	GLU	3.6
1	E	123	ILE	3.5
1	A	35	LEU	3.5
1	C	117	LEU	3.5
1	A	109	VAL	3.5
1	C	81	GLU	3.5
2	B	6	C	3.4
1	E	1	MET	3.4
1	E	122	ASN	3.4
1	A	82	ILE	3.4
1	A	92	ILE	3.4
1	F	260	LEU	3.4
1	A	60	ILE	3.3
1	C	31	LEU	3.3
1	C	84	LYS	3.3
1	F	122	ASN	3.3
1	C	67	PRO	3.2
1	A	25	ARG	3.2
4	H	1	C	3.2
1	C	34	ARG	3.2
1	A	33	ARG	3.2
1	C	95	ALA	3.2
2	D	19	U	3.1
1	A	1	MET	3.1
1	C	39	GLY	3.1
2	D	11	G	3.1
1	C	58	LEU	3.1
1	C	100	VAL	3.1

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Mol	Chain	Res	Type	RSRZ
1	A	124	LYS	3.1
1	A	88	ASP	3.1
1	A	122	ASN	3.1
1	A	81	GLU	3.0
1	C	83	GLY	3.0
1	A	258	HIS	2.9
1	A	115	TYR	2.9
1	A	2	LYS	2.9
2	B	24	C	2.9
1	A	66	PHE	2.9
1	C	113	PRO	2.8
1	C	69	GLU	2.8
1	F	80	LEU	2.8
1	C	65	LEU	2.8
1	A	32	ARG	2.8
1	C	27	ALA	2.7
1	A	259	PRO	2.7
1	F	261	GLU	2.7
1	A	260	LEU	2.7
1	C	261	GLU	2.7
2	D	1	G	2.6
1	C	121	LYS	2.6
1	E	324	GLU	2.6
1	F	1	MET	2.6
1	A	107	VAL	2.6
2	B	11	G	2.6
1	A	96	GLU	2.6
1	C	41	GLU	2.6
2	D	6	C	2.6
1	C	267	LEU	2.6
1	F	121	LYS	2.5
1	C	91	GLU	2.5
1	C	1	MET	2.5
1	A	84	LYS	2.5
1	F	124	LYS	2.5
1	F	98	PRO	2.5
1	C	116	LYS	2.5
2	D	21	C	2.4
1	A	22	ARG	2.4
1	A	111	VAL	2.4
1	C	76	ARG	2.4
1	F	119	GLU	2.4

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Mol	Chain	Res	Type	RSRZ
1	C	53	TRP	2.4
1	A	76	ARG	2.3
1	A	123	ILE	2.3
1	C	120	PRO	2.3
1	C	78	ARG	2.3
1	C	54	LEU	2.3
1	A	70	PHE	2.3
5	I	1	G	2.2
1	A	36	ASP	2.2
1	C	124	LYS	2.2
1	F	118	LYS	2.2
1	C	21	VAL	2.2
4	H	2	G	2.2
1	A	80	LEU	2.2
1	C	106	GLY	2.2
1	C	80	LEU	2.2
1	C	29	GLU	2.2
2	B	27	C	2.2
1	A	65	LEU	2.2
1	A	83	GLY	2.2
1	C	86	VAL	2.2
5	I	2	G	2.1
1	C	251	LEU	2.1
1	C	36	ASP	2.1
1	A	26	GLU	2.1
2	D	17	A	2.1
1	F	92	ILE	2.1
1	E	118	LYS	2.1
1	A	91	GLU	2.1
1	A	118	LYS	2.1
1	E	2	LYS	2.1
1	C	123	ILE	2.1
1	C	48	TYR	2.0
1	C	77	GLU	2.0
1	F	96	GLU	2.0
1	A	121	LYS	2.0
1	C	118	LYS	2.0
1	F	72	LYS	2.0

6.2 Non-standard residues in protein, DNA, RNA chains [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(Å ²)	Q<0.9
2	5BU	D	22	21/22	0.73	0.28	151,160,190,197	0
2	5BU	B	22	21/22	0.74	0.21	134,145,171,184	0
2	5BU	B	13	21/22	0.83	0.16	109,129,151,160	0
2	5BU	D	13	21/22	0.88	0.19	121,145,166,180	0
2	5BU	B	30[B]	21/22	0.94	0.18	80,89,106,107	30
3	5BU	G	30[A]	21/22	0.96	0.16	41,44,56,108	30

6.3 Carbohydrates [i](#)

There are no carbohydrates 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(Å ²)	Q<0.9
6	GOL	A	501	6/6	0.70	0.20	80,96,105,106	0
6	GOL	A	502	6/6	0.74	0.33	59,71,75,75	0
7	PEG	E	501	7/7	0.79	0.30	75,95,118,119	0
6	GOL	A	503	6/6	0.91	0.21	70,84,92,95	0

6.5 Other polymers [i](#)

There are no such residues in this entry.