



Full wwPDB X-ray Structure Validation Report ⓘ

Sep 24, 2023 – 09:07 AM EDT

PDB ID : 5TXO
Title : STRUCTURE OF Q151M complex (A62V, V75I, F77L, F116Y, Q151M) mutant HIV-1 REVERSE TRANSCRIPTASE (RT) TERNARY COMPLEX WITH A DOUBLE STRANDED DNA AND AN INCOMING DATP
Authors : Das, K.; Martinez, S.M.; Arnold, E.
Deposited on : 2016-11-17
Resolution : 2.55 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 : 4.02b-467
Mogul : 1.8.5 (274361), CSD as541be (2020)
Xtrriage (Phenix) : 1.13
EDS : 2.35.1
buster-report : 1.1.7 (2018)
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) : 2.35.1

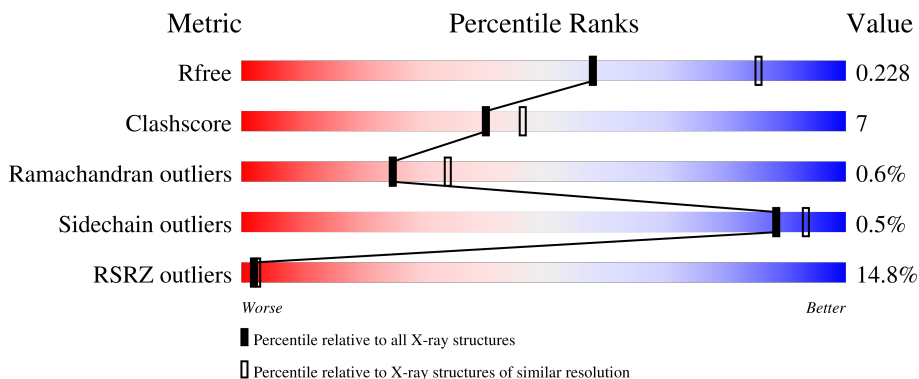
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.55 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	1284 (2.56-2.52)
Clashscore	141614	1332 (2.56-2.52)
Ramachandran outliers	138981	1315 (2.56-2.52)
Sidechain outliers	138945	1315 (2.56-2.52)
RSRZ outliers	127900	1272 (2.56-2.52)

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	556	 16% 81% 19%
1	C	556	 17% 76% 23% .
2	B	428	 10% 84% 12% .
2	D	428	 13% 79% 17% .

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Mol	Chain	Length	Quality of chain
3	E	27	
3	T	27	
4	F	21	
4	P	21	
5	G	2	
5	H	2	

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
9	SO4	B	503	-	-	-	X

2 Entry composition i

There are 10 unique types of molecules in this entry. The entry contains 17928 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called HIV-1 REVERSE TRANSCRIPTASE P66 SUBUNIT.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	556	4516	2923	751	833	9	0	0	0
1	C	556	4516	2923	751	833	9	0	0	0

There are 20 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-1	MET	-	initiating methionine	UNP P03366
A	0	VAL	-	expression tag	UNP P03366
A	62	VAL	ALA	engineered mutation	UNP P03366
A	75	ILE	VAL	engineered mutation	UNP P03366
A	77	LEU	PHE	engineered mutation	UNP P03366
A	116	TYR	PHE	engineered mutation	UNP P03366
A	151	MET	GLN	engineered mutation	UNP P03366
A	258	CYS	GLN	engineered mutation	UNP P03366
A	280	SER	CYS	engineered mutation	UNP P03366
A	498	ASN	ASP	engineered mutation	UNP P03366
C	-1	MET	-	initiating methionine	UNP P03366
C	0	VAL	-	expression tag	UNP P03366
C	62	VAL	ALA	engineered mutation	UNP P03366
C	75	ILE	VAL	engineered mutation	UNP P03366
C	77	LEU	PHE	engineered mutation	UNP P03366
C	116	TYR	PHE	engineered mutation	UNP P03366
C	151	MET	GLN	engineered mutation	UNP P03366
C	258	CYS	GLN	engineered mutation	UNP P03366
C	280	SER	CYS	engineered mutation	UNP P03366
C	498	ASN	ASP	engineered mutation	UNP P03366

- Molecule 2 is a protein called HIV-1 REVERSE TRANSCRIPTASE P51 SUBUNIT.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	412	3400	2212	563	619	6	0	0	0
2	D	412	3397	2210	563	619	5	0	0	0

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	280	SER	CYS	engineered mutation	UNP P03366
D	280	SER	CYS	engineered mutation	UNP P03366

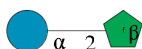
- Molecule 3 is a DNA chain called DNA (5'-D(*TP*GP*GP*TP*CP*GP*GP*CP*GP*CP*CP*GP*AP*AP*CP*AP*GP*GP*GP*AP*CP*TP*G)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	P			
3	T	24	494	233	97	141	23	0	0	0
3	E	24	494	233	97	141	23	0	0	0

- Molecule 4 is a DNA chain called DNA (5'-D(*CP*AP*GP*TP*CP*CP*CP*TP*GP*TP*TP*CP*GP*GP*(MRG)P*CP*GP*CP*CP*G)-3').

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	N	O	P	S			
4	P	20	407	195	72	120	19	1	0	0	0
4	F	20	407	195	72	120	19	1	0	0	0

- Molecule 5 is an oligosaccharide called beta-D-fructofuranose-(2-1)-alpha-D-glucopyranose.

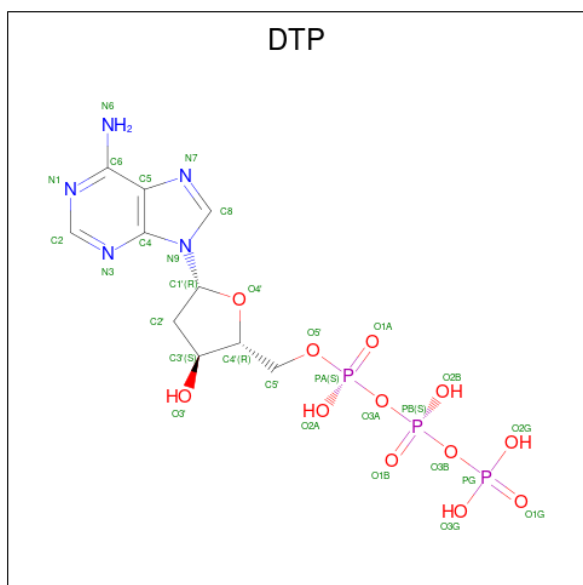


Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	Trace
			Total	C	O			
5	G	2	23	12	11	0	0	0
5	H	2	23	12	11	0	0	0

- Molecule 6 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

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

- Molecule 7 is 2'-DEOXYADENOSINE 5'-TRIPHOSPHATE (three-letter code: DTP) (formula: $C_{10}H_{16}N_5O_{12}P_3$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	A	1	Total C N O P 30 10 5 12 3	0	0
7	C	1	Total C N O P 30 10 5 12 3	0	0

- Molecule 8 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: $C_2H_6O_2$).



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

- Molecule 9 is SULFATE ION (three-letter code: SO4) (formula: O₄S).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
9	B	1	Total	O	S	0	0
			5	4	1		
9	D	1	Total	O	S	0	0
			5	4	1		

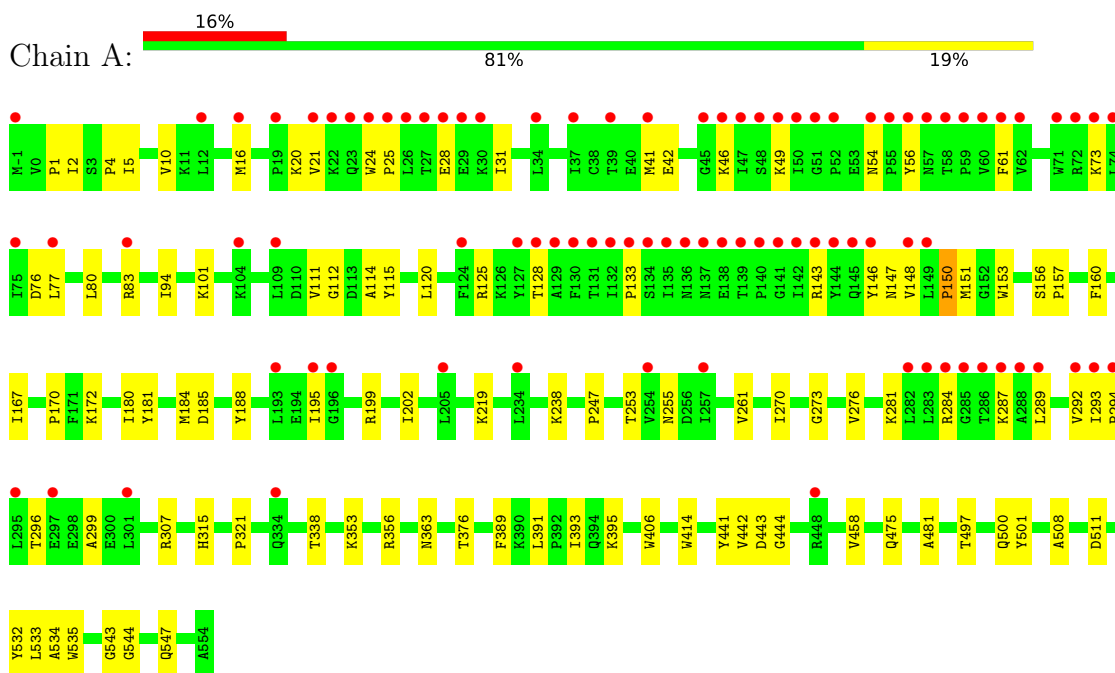
- Molecule 10 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
10	A	45	Total O 45 45	0	0
10	B	37	Total O 37 37	0	0
10	T	3	Total O 3 3	0	0
10	P	1	Total O 1 1	0	0
10	C	51	Total O 51 51	0	0
10	D	27	Total O 27 27	0	0
10	E	2	Total O 2 2	0	0
10	F	3	Total O 3 3	0	0

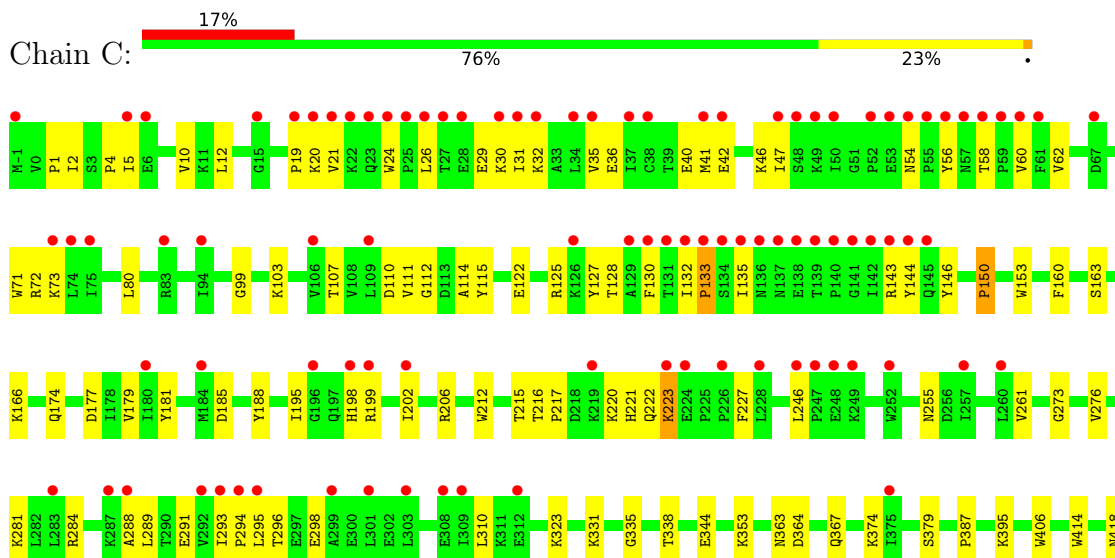
3 Residue-property plots

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: HIV-1 REVERSE TRANSCRIPTASE P66 SUBUNIT

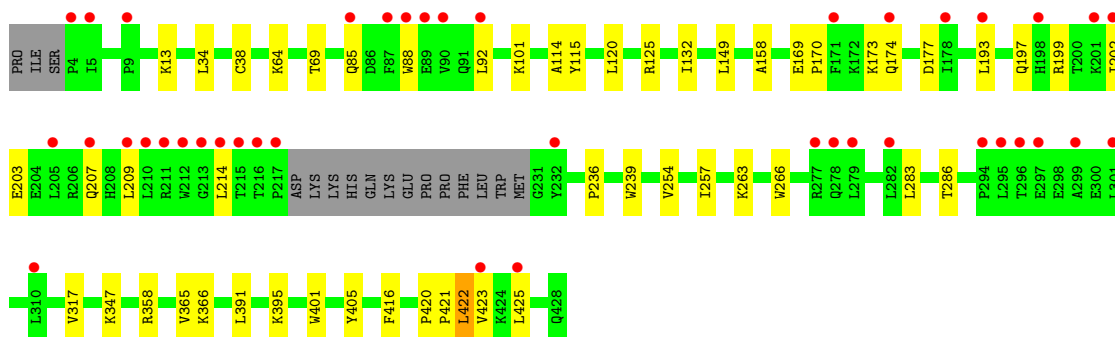
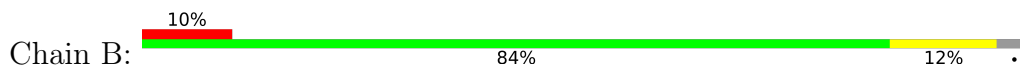


• Molecule 1: HIV-1 REVERSE TRANSCRIPTASE P66 SUBUNIT

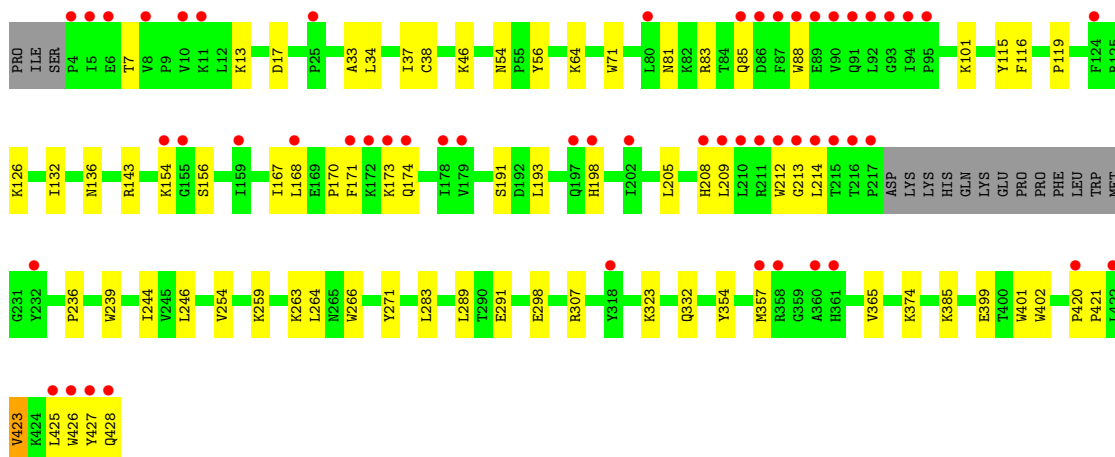
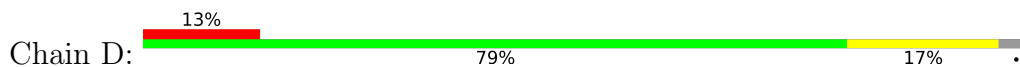




● Molecule 2: HIV-1 REVERSE TRANSCRIPTASE P51 SUBUNIT



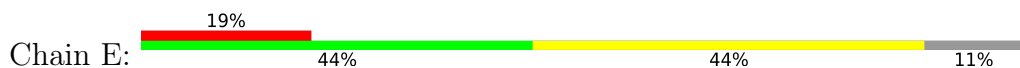
● Molecule 2: HIV-1 REVERSE TRANSCRIPTASE P51 SUBUNIT



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

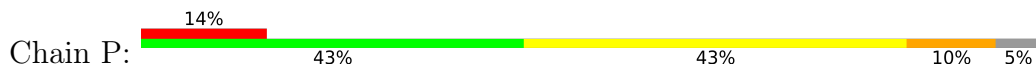


● Molecule 3: DNA (5'-D(*TP*GP*GP*TP*CP*GP*GP*CP*GP*CP*CP*CP*GP*AP*AP*CP*AP*GP*GP*GP*AP*CP*TP*G)-3')

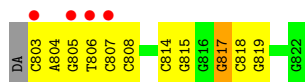




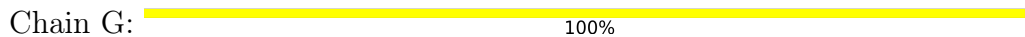
- Molecule 4: DNA (5'-D(*CP*AP*GP*TP*CP*CP*CP*TP*GP*TP*TP*CP*GP*GP*(MRG)P*CP*GP*CP*CP*G)-3')



- Molecule 4: DNA (5'-D(*CP*AP*GP*TP*CP*CP*CP*TP*GP*TP*TP*CP*GP*GP*(MRG)P*CP*GP*CP*CP*G)-3')



- Molecule 5: beta-D-fructofuranose-(2-1)-alpha-D-glucopyranose



GLC1
FRU2

- Molecule 5: beta-D-fructofuranose-(2-1)-alpha-D-glucopyranose



GLC1
FRU2

4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	89.99Å 132.93Å 139.12Å 90.00° 97.38° 90.00°	Depositor
Resolution (Å)	45.99 – 2.55 48.00 – 2.55	Depositor EDS
% Data completeness (in resolution range)	98.8 (45.99-2.55) 98.8 (48.00-2.55)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.01 (at 2.54Å)	Xtrriage
Refinement program	PHENIX (1.10_2155: ???)	Depositor
R, R_{free}	0.191 , 0.228 0.192 , 0.228	Depositor DCC
R_{free} test set	3140 reflections (2.99%)	wwPDB-VP
Wilson B-factor (Å ²)	58.6	Xtrriage
Anisotropy	0.292	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 75.1	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	17928	wwPDB-VP
Average B, all atoms (Å ²)	96.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.65% 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: GLC, MRG, SO4, FRU, DTP, MG, EDO

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	0.28	0/4633	0.46	0/6296
1	C	0.32	0/4633	0.58	3/6296 (0.0%)
2	B	0.30	1/3497 (0.0%)	0.51	0/4751
2	D	0.29	0/3494	0.48	0/4748
3	E	0.57	0/555	0.87	0/856
3	T	0.53	0/555	0.85	1/856 (0.1%)
4	F	0.62	0/424	0.91	0/649
4	P	0.71	1/424 (0.2%)	0.97	1/649 (0.2%)
All	All	0.34	2/18215 (0.0%)	0.57	5/25101 (0.0%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	P	804	DA	C4'-O4'	8.39	1.53	1.45
2	B	391	LEU	C-N	5.12	1.44	1.34

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	295	LEU	CA-CB-CG	7.59	132.76	115.30
4	P	804	DA	O4'-C4'-C3'	-7.12	101.65	104.50
1	C	132	ILE	C-N-CD	-6.05	107.29	120.60
3	T	709	DC	O4'-C4'-C3'	-5.55	102.28	104.50
1	C	223	LYS	CA-CB-CG	-5.13	102.11	113.40

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	4516	0	4581	64	0
1	C	4516	0	4581	79	0
2	B	3400	0	3433	31	0
2	D	3397	0	3426	49	0
3	E	494	0	269	9	0
3	T	494	0	269	7	0
4	F	407	0	229	11	0
4	P	407	0	229	8	0
5	G	23	0	21	0	0
5	H	23	0	21	0	0
6	A	2	0	0	0	0
6	C	2	0	0	0	0
7	A	30	0	12	2	0
7	C	30	0	12	2	0
8	B	4	0	6	0	0
8	D	4	0	6	2	0
9	B	5	0	0	0	0
9	D	5	0	0	0	0
10	A	45	0	0	1	0
10	B	37	0	0	0	0
10	C	51	0	0	0	0
10	D	27	0	0	3	0
10	E	2	0	0	0	0
10	F	3	0	0	0	0
10	P	1	0	0	0	0
10	T	3	0	0	0	0
All	All	17928	0	17095	248	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 (248) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:296:THR:HG23	1:A:299:ALA:H	1.51	0.76

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:13:LYS:HD2	2:B:85:GLN:HB3	1.69	0.74
1:C:163:SER:HA	1:C:166:LYS:HE2	1.70	0.73
1:A:128:THR:HG21	1:A:146:TYR:HB2	1.71	0.73
2:D:263:LYS:HE3	2:D:425:LEU:HA	1.71	0.71
1:C:261:VAL:HG13	1:C:276:VAL:HG11	1.73	0.70
1:C:323:LYS:NZ	1:C:344:GLU:OE2	2.24	0.69
1:C:54:ASN:HB3	1:C:143:ARG:HH12	1.57	0.69
3:E:722:DA:H2''	3:E:723:DC:H5''	1.74	0.69
2:D:298:GLU:OE1	10:D:601:HOH:O	2.10	0.68
1:A:253:THR:HA	1:A:292:VAL:HA	1.78	0.65
2:D:259:LYS:NZ	10:D:604:HOH:O	2.29	0.65
1:A:261:VAL:HG13	1:A:276:VAL:HG11	1.77	0.65
2:D:56:TYR:HE2	2:D:126:LYS:HE2	1.63	0.64
2:B:114:ALA:HB2	2:B:214:LEU:HD22	1.79	0.64
3:T:713:DC:H2''	3:T:714:DG:H5'	1.81	0.62
2:D:246:LEU:HD11	2:D:264:LEU:HD21	1.81	0.62
2:D:254:VAL:HG13	2:D:283:LEU:HD22	1.81	0.62
2:B:209:LEU:HD22	2:B:214:LEU:HD23	1.82	0.61
1:C:114:ALA:HB1	1:C:160:PHE:CZ	2.35	0.61
1:A:543:GLY:O	1:A:547:GLN:NE2	2.34	0.61
2:D:354:TYR:CE1	2:D:374:LYS:HD2	2.35	0.61
1:C:222:GLN:O	1:C:227:PHE:HE1	1.84	0.61
2:D:266:TRP:CE3	2:D:425:LEU:HG	2.36	0.60
1:C:19:PRO:HG3	1:C:80:LEU:HB2	1.84	0.60
1:C:122:GLU:HA	1:C:125:ARG:HD2	1.84	0.60
2:B:120:LEU:HD23	2:B:125:ARG:HG2	1.83	0.59
2:B:199:ARG:HA	2:B:202:ILE:HD12	1.83	0.59
1:C:276:VAL:HG23	1:C:353:LYS:HE2	1.83	0.59
1:A:41:MET:HE1	1:A:73:LYS:HD3	1.84	0.59
2:B:358:ARG:NH2	2:B:405:TYR:O	2.36	0.59
1:C:62:VAL:HG12	1:C:71:TRP:HE3	1.67	0.58
1:C:246:LEU:HD11	1:C:310:LEU:HD22	1.85	0.58
1:C:47:ILE:HD12	1:C:146:TYR:HA	1.83	0.58
1:A:56:TYR:O	1:A:143:ARG:NH2	2.38	0.57
2:B:203:GLU:O	2:B:207:GLN:HG2	2.04	0.57
1:A:114:ALA:HB1	1:A:160:PHE:CZ	2.40	0.57
1:C:107:THR:OG1	1:C:198:HIS:NE2	2.33	0.57
2:D:307:ARG:HH22	8:D:503:EDO:H12	1.69	0.57
4:F:804:DA:H2'	4:F:805:DG:C8	2.39	0.57
1:A:120:LEU:H	1:A:148:VAL:HA	1.69	0.57
1:A:389:PHE:HB3	1:A:391:LEU:HD13	1.87	0.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:543:GLY:O	1:C:547:GLN:NE2	2.37	0.57
4:P:806:DT:H2'	4:P:807:DC:C6	2.39	0.57
1:C:448:ARG:O	1:C:451:LYS:NZ	2.38	0.57
2:D:332:GLN:CD	2:D:427:TYR:HB2	2.24	0.57
1:A:112:GLY:HA2	7:A:603:DTP:O2G	2.06	0.56
2:D:213:GLY:O	2:D:214:LEU:HD23	2.05	0.56
2:D:323:LYS:O	2:D:385:LYS:NZ	2.39	0.56
2:D:64:LYS:HE3	2:D:71:TRP:CE2	2.41	0.56
3:E:720:DG:H2''	3:E:721:DG:C8	2.41	0.55
1:C:29:GLU:HG3	1:C:30:LYS:N	2.21	0.55
1:C:36:GLU:O	1:C:40:GLU:HG2	2.06	0.55
1:C:273:GLY:HA2	1:C:338:THR:HG21	1.89	0.55
2:B:365:VAL:HG11	2:B:401:TRP:HB2	1.88	0.55
1:C:110:ASP:HB3	1:C:220:LYS:HB3	1.88	0.55
1:C:195:ILE:HD11	1:C:199:ARG:HH21	1.72	0.55
2:B:266:TRP:CD1	2:B:425:LEU:HD22	2.41	0.55
1:A:16:MET:HG2	1:A:83:ARG:HD3	1.89	0.54
2:D:13:LYS:HD2	2:D:85:GLN:HB3	1.89	0.54
1:C:199:ARG:NH1	1:C:223:LYS:HD2	2.23	0.53
4:F:814:DC:H2''	4:F:815:DG:C8	2.43	0.53
2:B:92:LEU:HB3	2:B:158:ALA:HB1	1.90	0.53
1:C:32:LYS:HD2	1:C:135:ILE:HD12	1.90	0.53
1:C:111:VAL:HB	1:C:185:ASP:HB2	1.90	0.53
2:D:421:PRO:HB2	2:D:423:VAL:HG23	1.91	0.53
1:A:111:VAL:HB	1:A:185:ASP:HB2	1.89	0.53
3:E:702:DT:H3'	3:E:703:DG:H8	1.74	0.53
2:D:209:LEU:HD22	2:D:214:LEU:HD12	1.89	0.53
1:A:167:ILE:O	1:A:170:PRO:HD2	2.08	0.52
1:A:195:ILE:HD11	1:A:199:ARG:HE	1.74	0.52
3:T:713:DC:H2'	3:T:714:DG:C8	2.44	0.52
1:C:353:LYS:O	1:C:374:LYS:NZ	2.42	0.52
2:B:38:CYS:SG	2:B:132:ILE:HD11	2.50	0.52
1:A:406:TRP:CE2	2:B:420:PRO:HB3	2.44	0.52
4:F:818:DC:H2'	4:F:819:DG:C8	2.45	0.52
3:E:716:DA:H2''	3:E:717:DC:OP2	2.09	0.51
1:A:391:LEU:HB3	1:A:393:ILE:HG22	1.93	0.51
3:T:724:DT:H3	4:P:804:DA:H61	1.57	0.51
1:C:473:THR:O	1:C:477:THR:HG23	2.10	0.51
2:B:169:GLU:O	2:B:173:LYS:HG2	2.11	0.51
1:C:199:ARG:HH11	1:C:223:LYS:HD2	1.74	0.51
1:C:418:ASN:O	1:C:420:PRO:HD3	2.11	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:F:817:MRG:H2'	4:F:818:DC:C6	2.46	0.51
4:F:806:DT:H2'	4:F:807:DC:C6	2.46	0.51
1:C:114:ALA:HB1	1:C:160:PHE:CE1	2.46	0.50
1:A:458:VAL:HG12	2:B:286:THR:HG21	1.93	0.50
4:P:810:DT:H2''	4:P:811:DG:H5'	1.92	0.50
1:C:56:TYR:O	1:C:143:ARG:NH2	2.45	0.50
2:D:167:ILE:HD13	2:D:214:LEU:HD11	1.94	0.50
2:D:54:ASN:HB3	2:D:143:ARG:HH21	1.76	0.50
1:A:20:LYS:O	1:A:21:VAL:HG23	2.12	0.50
1:A:238:LYS:HD2	1:A:315:HIS:CG	2.47	0.50
2:D:85:GLN:HA	2:D:88:TRP:CE2	2.46	0.50
2:D:170:PRO:HB2	2:D:208:HIS:CE1	2.47	0.50
1:A:24:TRP:HE3	1:A:25:PRO:HD2	1.76	0.50
1:A:77:LEU:HD13	1:A:80:LEU:HD23	1.93	0.50
2:B:101:LYS:O	2:B:236:PRO:HB2	2.12	0.50
1:C:221:HIS:CE1	1:C:223:LYS:HG3	2.47	0.50
2:D:17:ASP:O	2:D:83:ARG:HD3	2.11	0.50
2:D:81:ASN:HB3	2:D:154:LYS:HD2	1.93	0.49
2:D:168:LEU:O	2:D:171:PHE:N	2.41	0.49
4:F:818:DC:H2'	4:F:819:DG:H8	1.78	0.49
1:C:181:TYR:HB2	1:C:188:TYR:HB3	1.92	0.49
2:B:170:PRO:O	2:B:174:GLN:HG3	2.12	0.49
1:A:281:LYS:O	1:A:284:ARG:HG2	2.13	0.49
1:C:31:ILE:HD13	1:C:133:PRO:HB2	1.95	0.49
1:C:5:ILE:HG21	1:C:212:TRP:HD1	1.77	0.49
1:A:125:ARG:O	1:A:128:THR:OG1	2.25	0.48
1:A:247:PRO:O	1:A:307:ARG:NH2	2.46	0.48
2:B:64:LYS:HD3	2:B:69:THR:HA	1.96	0.48
1:C:12:LEU:HD11	1:C:127:TYR:CZ	2.48	0.48
1:A:443:ASP:OD1	1:A:444:GLY:N	2.43	0.48
1:A:181:TYR:HB2	1:A:188:TYR:HB3	1.94	0.48
1:A:114:ALA:HB1	1:A:160:PHE:CE2	2.47	0.48
4:F:805:DG:H4'	4:F:806:DT:OP1	2.14	0.48
1:A:172:LYS:HE2	1:A:180:ILE:HB	1.96	0.48
3:E:702:DT:H3'	3:E:703:DG:C8	2.49	0.48
3:T:721:DG:H5'	3:T:721:DG:C8	2.49	0.48
2:D:236:PRO:HA	2:D:239:TRP:CE2	2.49	0.48
1:C:62:VAL:HG13	1:C:72:ARG:O	2.14	0.47
1:C:288:ALA:HB3	1:C:291:GLU:HB2	1.97	0.47
2:D:33:ALA:O	2:D:37:ILE:HG12	2.13	0.47
2:D:167:ILE:HG23	2:D:212:TRP:CG	2.49	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:442:VAL:HB	1:A:481:ALA:HB1	1.95	0.47
2:D:307:ARG:HH12	8:D:503:EDO:H12	1.80	0.47
1:C:60:VAL:HG21	1:C:130:PHE:CD1	2.49	0.47
1:A:115:TYR:HE1	1:A:184:MET:HE2	1.79	0.47
2:B:257:ILE:HB	2:B:283:LEU:HD21	1.97	0.47
3:T:721:DG:H2''	3:T:722:DA:C8	2.50	0.47
1:C:406:TRP:CZ2	2:D:420:PRO:HG3	2.50	0.47
2:B:193:LEU:HD13	2:B:197:GLN:HB3	1.97	0.47
4:P:807:DC:H4'	4:P:808:DC:OP1	2.15	0.47
1:C:47:ILE:HG12	1:C:144:TYR:HB3	1.95	0.47
1:C:103:LYS:HE3	1:C:179:VAL:HG21	1.97	0.47
1:C:216:THR:O	1:C:216:THR:OG1	2.29	0.47
2:B:254:VAL:HG13	2:B:283:LEU:HD22	1.97	0.46
1:C:128:THR:HG21	1:C:146:TYR:HB2	1.96	0.46
4:F:803:DC:H2'	4:F:804:DA:C8	2.50	0.46
4:F:807:DC:H2''	4:F:808:DC:H5''	1.97	0.46
1:A:475:GLN:HB3	1:A:501:TYR:CE2	2.50	0.46
1:C:125:ARG:O	1:C:128:THR:OG1	2.32	0.46
3:E:709:DC:H2'	3:E:710:DG:H8	1.81	0.46
1:C:20:LYS:O	1:C:21:VAL:HG23	2.16	0.46
2:D:38:CYS:SG	2:D:132:ILE:HD11	2.56	0.46
2:D:191:SER:OG	2:D:198:HIS:ND1	2.33	0.46
3:T:721:DG:H5'	3:T:721:DG:H8	1.80	0.46
1:C:10:VAL:HG21	1:C:153:TRP:HH2	1.80	0.46
1:A:276:VAL:HG23	1:A:353:LYS:HE2	1.98	0.46
1:C:441:TYR:CG	1:C:544:GLY:HA3	2.51	0.46
1:A:10:VAL:HG11	1:A:153:TRP:CZ2	2.51	0.46
1:A:61:PHE:HE2	1:A:76:ASP:HB2	1.81	0.46
2:D:173:LYS:HD2	2:D:173:LYS:HA	1.74	0.46
1:C:73:LYS:HZ1	1:C:130:PHE:HZ	1.62	0.45
4:F:807:DC:H4'	4:F:808:DC:OP1	2.15	0.45
1:A:376:THR:HG21	2:B:401:TRP:CH2	2.52	0.45
1:C:31:ILE:O	1:C:35:VAL:HG23	2.17	0.45
1:C:335:GLY:HA2	1:C:367:GLN:HE22	1.81	0.45
1:C:24:TRP:HB2	1:C:26:LEU:HG	1.98	0.45
1:C:281:LYS:O	1:C:284:ARG:HG2	2.17	0.45
2:B:263:LYS:HA	2:B:423:VAL:HG21	1.99	0.45
2:B:317:VAL:HG12	2:B:347:LYS:HB3	1.99	0.45
2:B:358:ARG:HG3	2:B:366:LYS:HD3	1.98	0.45
4:P:817:MRG:H2'	4:P:818:DC:C6	2.52	0.45
1:C:293:ILE:HG13	1:C:294:PRO:HD2	2.00	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:D:191:SER:HB2	2:D:193:LEU:HG	1.99	0.44
1:C:112:GLY:HA2	7:C:601:DTP:O2G	2.16	0.44
1:C:255:ASN:HB2	1:C:289:LEU:HG	2.00	0.44
1:A:287:LYS:H	1:A:287:LYS:HG2	1.55	0.44
1:A:363:ASN:HA	1:A:511:ASP:OD1	2.18	0.44
1:C:42:GLU:OE2	1:C:144:TYR:OH	2.30	0.44
1:C:12:LEU:HD11	1:C:127:TYR:CE2	2.53	0.43
1:C:395:LYS:HD2	1:C:414:TRP:CH2	2.53	0.43
2:D:115:TYR:CD2	2:D:156:SER:HB3	2.52	0.43
1:A:255:ASN:HB2	1:A:289:LEU:HG	2.01	0.43
1:A:532:TYR:CE2	1:A:534:ALA:HB2	2.54	0.43
1:C:146:TYR:CD1	1:C:150:PRO:HB3	2.53	0.43
1:A:441:TYR:CG	1:A:544:GLY:HA3	2.53	0.43
1:C:442:VAL:HG12	1:C:457:TYR:HB3	2.01	0.43
4:P:807:DC:H2''	4:P:808:DC:H5''	1.99	0.43
1:A:94:ILE:HD11	3:T:708:DG:H21	1.83	0.43
1:C:99:GLY:HA3	2:D:136:ASN:ND2	2.33	0.43
1:C:379:SER:CB	1:C:387:PRO:HD3	2.48	0.43
1:A:54:ASN:HB3	1:A:143:ARG:HH12	1.84	0.43
2:B:236:PRO:HA	2:B:239:TRP:CD2	2.52	0.43
1:C:452:LEU:HD23	1:C:470:THR:HA	2.01	0.43
1:A:156:SER:HB2	1:A:157:PRO:HD3	2.01	0.43
2:B:115:TYR:O	2:B:149:LEU:HB2	2.18	0.43
1:A:219:LYS:H	1:A:219:LYS:HG3	1.48	0.43
2:D:170:PRO:O	2:D:174:GLN:HG3	2.18	0.43
2:D:365:VAL:HG11	2:D:401:TRP:HB2	2.00	0.43
4:F:805:DG:H2''	4:F:806:DT:O5'	2.18	0.43
1:C:406:TRP:CD2	2:D:420:PRO:HB3	2.54	0.43
2:B:395:LYS:HG3	2:B:416:PHE:CE2	2.54	0.42
2:D:399:GLU:HA	2:D:402:TRP:HD1	1.84	0.42
2:D:423:VAL:HG11	2:D:426:TRP:CD1	2.53	0.42
1:C:296:THR:HG22	1:C:298:GLU:H	1.83	0.42
2:D:101:LYS:O	2:D:236:PRO:HB2	2.19	0.42
1:C:395:LYS:NZ	1:C:414:TRP:O	2.52	0.42
3:E:713:DC:H2'	3:E:714:DG:C8	2.55	0.42
1:C:363:ASN:HA	1:C:511:ASP:OD1	2.19	0.42
2:D:427:TYR:O	2:D:428:GLN:HB2	2.19	0.42
1:C:202:ILE:O	1:C:206:ARG:HG3	2.19	0.42
1:A:273:GLY:HA2	1:A:338:THR:HG21	2.02	0.42
1:A:356:ARG:HD3	10:A:715:HOH:O	2.19	0.42
1:A:46:LYS:O	1:A:147:ASN:HB2	2.20	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:41:MET:HG2	1:C:46:LYS:HB2	2.01	0.42
2:D:34:LEU:HD23	2:D:34:LEU:HA	1.83	0.42
2:D:291:GLU:OE1	10:D:602:HOH:O	2.21	0.42
1:A:42:GLU:OE1	1:A:49:LYS:HE3	2.20	0.42
1:A:202:ILE:HA	1:A:202:ILE:HD13	1.84	0.42
1:A:293:ILE:HG13	1:A:294:PRO:HD2	2.00	0.41
1:C:331:LYS:HE3	1:C:364:ASP:OD2	2.20	0.41
1:C:550:LYS:HE2	1:C:550:LYS:HB3	1.92	0.41
3:E:709:DC:H2'	3:E:710:DG:C8	2.54	0.41
1:A:146:TYR:CD1	1:A:150:PRO:HB3	2.55	0.41
4:P:813:DT:H2''	4:P:814:DC:C6	2.56	0.41
4:P:818:DC:H2'	4:P:819:DG:C8	2.55	0.41
1:C:516:GLU:O	1:C:520:GLN:HG3	2.20	0.41
1:A:115:TYR:CD2	1:A:151:MET:HG2	2.56	0.41
1:C:115:TYR:CD2	7:C:601:DTP:H2'1	2.55	0.41
2:D:64:LYS:HE3	2:D:71:TRP:CZ2	2.56	0.41
1:A:270:ILE:HD12	1:A:270:ILE:HA	1.93	0.41
1:A:497:THR:O	1:A:535:TRP:HA	2.20	0.41
1:C:221:HIS:HE1	1:C:223:LYS:HG3	1.86	0.41
2:B:85:GLN:HA	2:B:88:TRP:CE2	2.56	0.41
2:B:177:ASP:OD1	2:B:177:ASP:N	2.37	0.41
1:C:174:GLN:OE1	1:C:174:GLN:HA	2.21	0.41
1:C:497:THR:O	1:C:535:TRP:HA	2.20	0.41
1:A:115:TYR:CD2	7:A:603:DTP:H2'1	2.55	0.41
1:A:120:LEU:N	1:A:148:VAL:HA	2.34	0.41
2:B:34:LEU:HD23	2:B:34:LEU:HA	1.85	0.41
2:D:7:THR:HG22	2:D:119:PRO:HG2	2.02	0.41
3:E:721:DG:H2''	3:E:722:DA:C8	2.56	0.41
1:A:28:GLU:HA	1:A:31:ILE:HD12	2.03	0.40
1:A:500:GLN:HB3	2:B:422:LEU:HD21	2.03	0.40
1:C:494:ASN:HB3	2:D:289:LEU:HD12	2.03	0.40
2:D:46:LYS:HE2	2:D:116:PHE:HB3	2.03	0.40
2:D:244:ILE:HD12	2:D:271:TYR:HE2	1.86	0.40
1:A:395:LYS:HD2	1:A:414:TRP:CH2	2.57	0.40
1:A:101:LYS:HE2	1:A:321:PRO:HG3	2.03	0.40
1:A:406:TRP:HH2	1:A:508:ALA:HB2	1.86	0.40
1:A:533:LEU:HD23	1:A:533:LEU:HA	1.92	0.40
1:C:222:GLN:O	1:C:227:PHE:CE1	2.70	0.40
2:D:171:PHE:CZ	2:D:205:LEU:HB2	2.56	0.40
1:A:406:TRP:CH2	1:A:508:ALA:HB2	2.55	0.40
1:C:215:THR:O	1:C:217:PRO:HD3	2.21	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:427:TYR:CE1	1:C:525:LEU:HD13	2.57	0.40

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	554/556 (100%)	535 (97%)	15 (3%)	4 (1%)	22	30
1	C	554/556 (100%)	536 (97%)	14 (2%)	4 (1%)	22	30
2	B	408/428 (95%)	396 (97%)	11 (3%)	1 (0%)	47	60
2	D	408/428 (95%)	391 (96%)	15 (4%)	2 (0%)	29	40
All	All	1924/1968 (98%)	1858 (97%)	55 (3%)	11 (1%)	25	34

All (11) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	4	PRO
1	C	4	PRO
2	D	357	MET
1	A	1	PRO
2	D	423	VAL
1	A	150	PRO
1	C	1	PRO
1	C	150	PRO
1	A	133	PRO
2	B	421	PRO
1	C	133	PRO

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	496/498 (100%)	494 (100%)	2 (0%)	91	95
1	C	496/498 (100%)	491 (99%)	5 (1%)	76	84
2	B	374/390 (96%)	373 (100%)	1 (0%)	92	96
2	D	373/390 (96%)	373 (100%)	0	100	100
All	All	1739/1776 (98%)	1731 (100%)	8 (0%)	88	93

All (8) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	2	ILE
1	A	5	ILE
2	B	422	LEU
1	C	2	ILE
1	C	58	THR
1	C	177	ASP
1	C	474	ASN
1	C	553	SER

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

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond

length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
4	MRG	P	817	4,3	21,28,29	2.47	8 (38%)	19,39,42	1.57	5 (26%)
4	MRG	F	817	4,3,1	21,28,29	2.41	8 (38%)	19,39,42	1.57	5 (26%)

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	MRG	P	817	4,3	-	3/8/26/27	0/3/3/3
4	MRG	F	817	4,3,1	-	1/8/26/27	0/3/3/3

All (16) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	P	817	MRG	C2-N2	7.02	1.49	1.34
4	F	817	MRG	C2-N2	6.68	1.48	1.34
4	F	817	MRG	C2-N1	4.21	1.43	1.36
4	P	817	MRG	C2-N1	4.19	1.43	1.36
4	P	817	MRG	C2'-C3'	-3.31	1.44	1.52
4	F	817	MRG	C2'-C3'	-3.29	1.44	1.52
4	P	817	MRG	C4-N3	3.29	1.45	1.37
4	F	817	MRG	C4-N3	3.21	1.45	1.37
4	F	817	MRG	C6-N1	2.86	1.42	1.37
4	P	817	MRG	O3'-C3'	-2.82	1.37	1.43
4	P	817	MRG	C6-N1	2.77	1.42	1.37
4	F	817	MRG	O4'-C4'	-2.64	1.39	1.45
4	P	817	MRG	O4'-C4'	-2.62	1.39	1.45
4	F	817	MRG	O3'-C3'	-2.61	1.37	1.43
4	F	817	MRG	O5'-C5'	-2.41	1.38	1.44
4	P	817	MRG	O5'-C5'	-2.37	1.39	1.44

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	F	817	MRG	C5-C6-N1	3.43	120.01	113.95
4	P	817	MRG	C5-C6-N1	3.38	119.91	113.95
4	P	817	MRG	C22-C21-N2	2.98	120.73	112.21

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	F	817	MRG	O5'-C5'-C4'	2.81	118.54	108.99
4	P	817	MRG	O5'-C5'-C4'	2.73	118.27	108.99
4	F	817	MRG	C8-N7-C5	2.70	108.14	102.99
4	P	817	MRG	C8-N7-C5	2.55	107.86	102.99
4	P	817	MRG	O6-C6-C5	-2.21	120.06	124.37
4	F	817	MRG	O6-C6-C5	-2.16	120.15	124.37
4	F	817	MRG	C21-N2-C2	-2.07	119.53	123.41

There are no chirality outliers.

All (4) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	P	817	MRG	C22-C21-N2-C2
4	P	817	MRG	N2-C21-C22-C23
4	P	817	MRG	C21-C22-C23-S24
4	F	817	MRG	N2-C21-C22-C23

There are no ring outliers.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	P	817	MRG	1	0
4	F	817	MRG	1	0

5.5 Carbohydrates i

4 monosaccharides 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	GLC	G	1	5	11,11,12	1.19	2 (18%)	15,15,17	1.60	2 (13%)
5	FRU	G	2	5	11,12,12	2.62	4 (36%)	10,18,18	5.25	5 (50%)
5	GLC	H	1	5	11,11,12	0.90	0	15,15,17	1.60	3 (20%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
5	FRU	H	2	5	11,12,12	2.31	4 (36%)	10,18,18	5.27	4 (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
5	GLC	G	1	5	-	0/2/19/22	0/1/1/1
5	FRU	G	2	5	-	4/5/24/24	0/1/1/1
5	GLC	H	1	5	-	1/2/19/22	0/1/1/1
5	FRU	H	2	5	-	3/5/24/24	0/1/1/1

All (10) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	G	2	FRU	O5-C2	5.97	1.52	1.43
5	H	2	FRU	O3-C3	4.52	1.51	1.42
5	H	2	FRU	O5-C2	4.48	1.50	1.43
5	G	2	FRU	O3-C3	3.88	1.50	1.42
5	G	2	FRU	O2-C2	3.39	1.46	1.40
5	G	1	GLC	O5-C5	2.66	1.48	1.43
5	H	2	FRU	O5-C5	-2.43	1.38	1.43
5	G	1	GLC	O5-C1	2.43	1.47	1.43
5	H	2	FRU	C4-C5	2.32	1.58	1.53
5	G	2	FRU	C4-C5	2.32	1.58	1.53

All (14) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	H	2	FRU	O2-C2-O5	-14.35	81.80	109.50
5	G	2	FRU	O2-C2-O5	-13.86	82.75	109.50
5	G	2	FRU	O5-C5-C4	-7.64	86.48	105.49
5	H	2	FRU	O5-C5-C4	-7.13	87.77	105.49
5	G	1	GLC	O5-C5-C6	4.69	114.56	107.20
5	H	1	GLC	O5-C5-C6	-3.84	101.18	107.20
5	H	2	FRU	O3-C3-C4	3.54	125.55	113.32
5	G	2	FRU	O3-C3-C4	3.49	125.39	113.32
5	H	1	GLC	C6-C5-C4	-2.69	106.70	113.00
5	G	2	FRU	O1-C1-C2	2.39	116.94	111.86
5	G	2	FRU	C6-C5-C4	-2.18	109.82	115.09

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	G	1	GLC	C1-C2-C3	2.16	112.33	109.67
5	H	2	FRU	C6-C5-C4	-2.12	109.98	115.09
5	H	1	GLC	C3-C4-C5	-2.03	106.61	110.24

There are no chirality outliers.

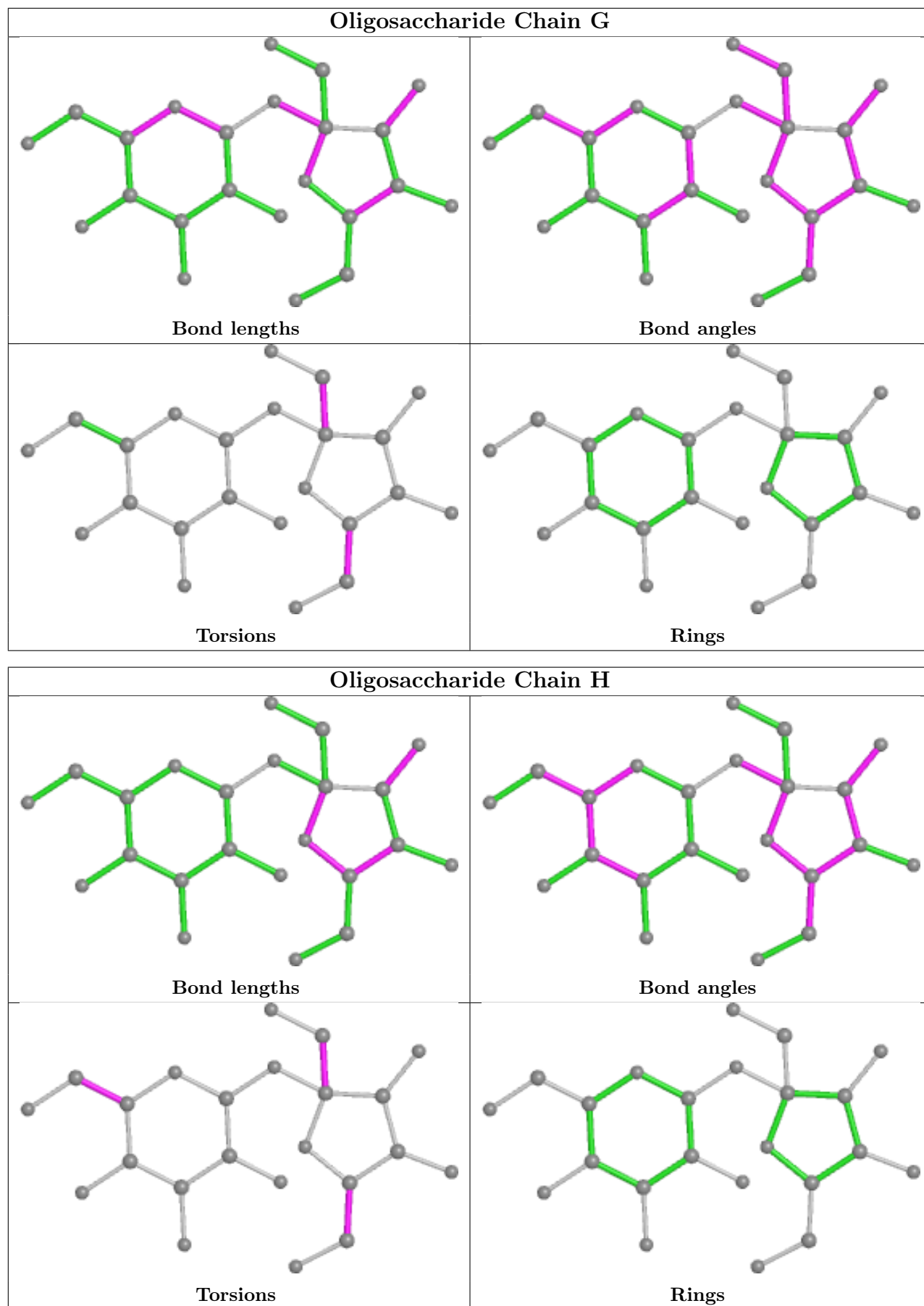
All (8) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	H	1	GLC	O5-C5-C6-O6
5	G	2	FRU	O1-C1-C2-O2
5	H	2	FRU	O1-C1-C2-O2
5	G	2	FRU	O5-C5-C6-O6
5	H	2	FRU	O5-C5-C6-O6
5	G	2	FRU	O1-C1-C2-O5
5	G	2	FRU	O1-C1-C2-C3
5	H	2	FRU	O1-C1-C2-C3

There are no ring outliers.

No monomer is involved in short contacts.

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for oligosaccharide.



5.6 Ligand geometry

Of 10 ligands modelled in this entry, 4 are monoatomic - leaving 6 for Mogul analysis.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
7	DTP	A	603	6	26,32,32	1.46	6 (23%)	30,50,50	1.46	5 (16%)
9	SO4	B	503	-	4,4,4	0.14	0	6,6,6	0.05	0
8	EDO	D	503	-	3,3,3	0.43	0	2,2,2	0.25	0
8	EDO	B	502	-	3,3,3	0.50	0	2,2,2	0.33	0
9	SO4	D	502	-	4,4,4	0.14	0	6,6,6	0.05	0
7	DTP	C	601	6	26,32,32	1.46	6 (23%)	30,50,50	1.44	5 (16%)

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
8	EDO	B	502	-	-	0/1/1/1	-
7	DTP	A	603	6	-	2/18/34/34	0/3/3/3
8	EDO	D	503	-	-	1/1/1/1	-
7	DTP	C	601	6	-	2/18/34/34	0/3/3/3

All (12) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	C	601	DTP	C6-N6	3.60	1.47	1.34
7	A	603	DTP	C6-N6	3.50	1.46	1.34
7	A	603	DTP	C5'-C4'	-2.99	1.42	1.51
7	C	601	DTP	C5'-C4'	-2.96	1.42	1.51
7	A	603	DTP	C2'-C3'	-2.50	1.46	1.52
7	A	603	DTP	O5'-C5'	-2.48	1.35	1.44
7	C	601	DTP	C2'-C3'	-2.47	1.46	1.52
7	C	601	DTP	O5'-C5'	-2.45	1.35	1.44
7	C	601	DTP	O3'-C3'	-2.28	1.38	1.43

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	A	603	DTP	O3'-C3'	-2.24	1.38	1.43
7	C	601	DTP	C3'-C4'	-2.13	1.47	1.53
7	A	603	DTP	C3'-C4'	-2.10	1.47	1.53

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
7	A	603	DTP	N3-C2-N1	-4.38	121.83	128.68
7	C	601	DTP	N3-C2-N1	-4.37	121.85	128.68
7	C	601	DTP	PB-O3B-PG	-3.62	120.40	132.83
7	A	603	DTP	PB-O3B-PG	-3.43	121.05	132.83
7	C	601	DTP	PA-O3A-PB	-2.76	123.34	132.83
7	C	601	DTP	O5'-C5'-C4'	2.71	118.31	108.99
7	A	603	DTP	O5'-C5'-C4'	2.59	117.91	108.99
7	A	603	DTP	PA-O3A-PB	-2.56	124.03	132.83
7	A	603	DTP	C4-C5-N7	-2.26	107.05	109.40
7	C	601	DTP	C4-C5-N7	-2.01	107.30	109.40

There are no chirality outliers.

All (5) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
7	C	601	DTP	PA-O3A-PB-O2B
8	D	503	EDO	O1-C1-C2-O2
7	A	603	DTP	PA-O3A-PB-O2B
7	C	601	DTP	O4'-C4'-C5'-O5'
7	A	603	DTP	PA-O3A-PB-O1B

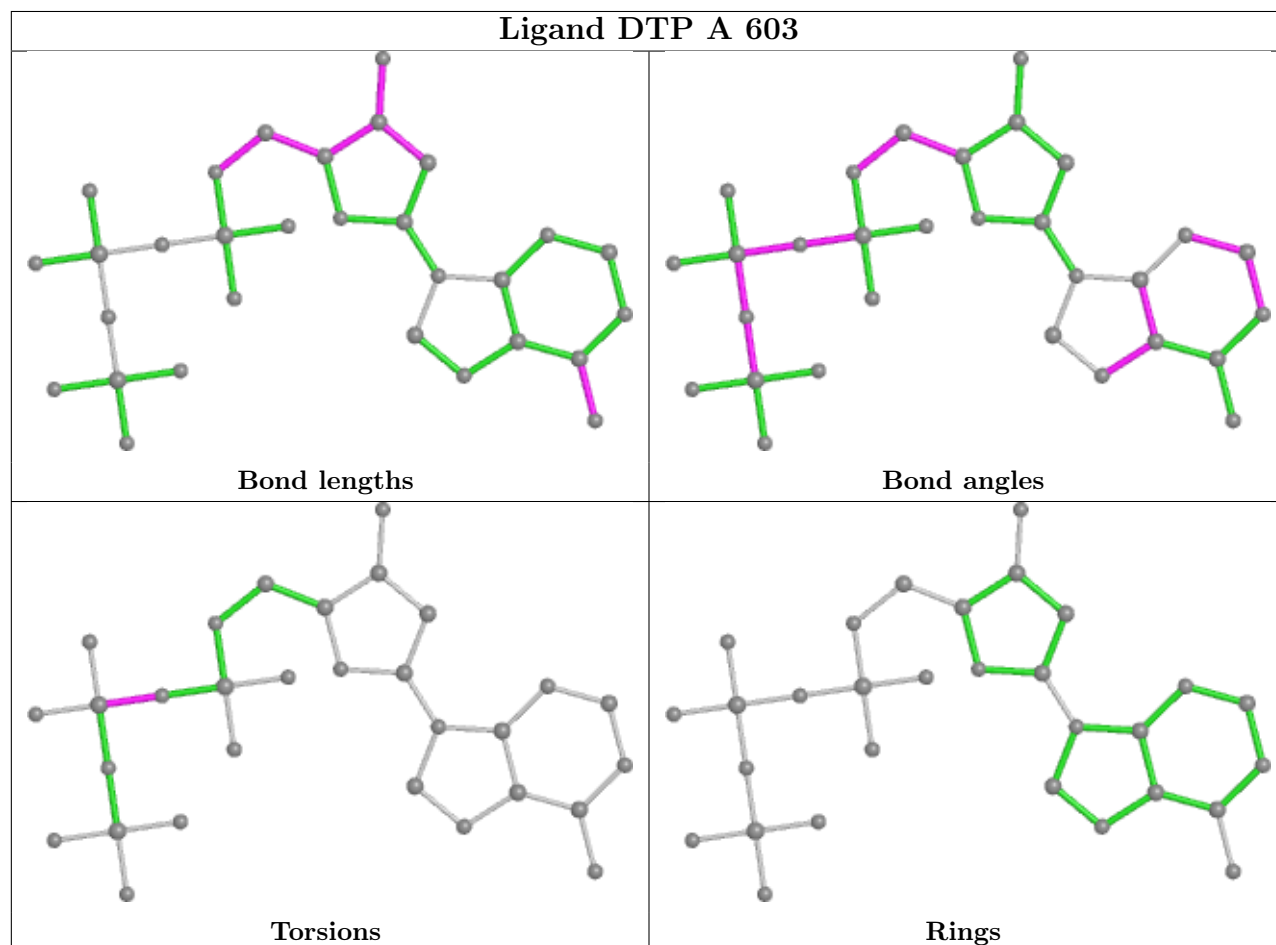
There are no ring outliers.

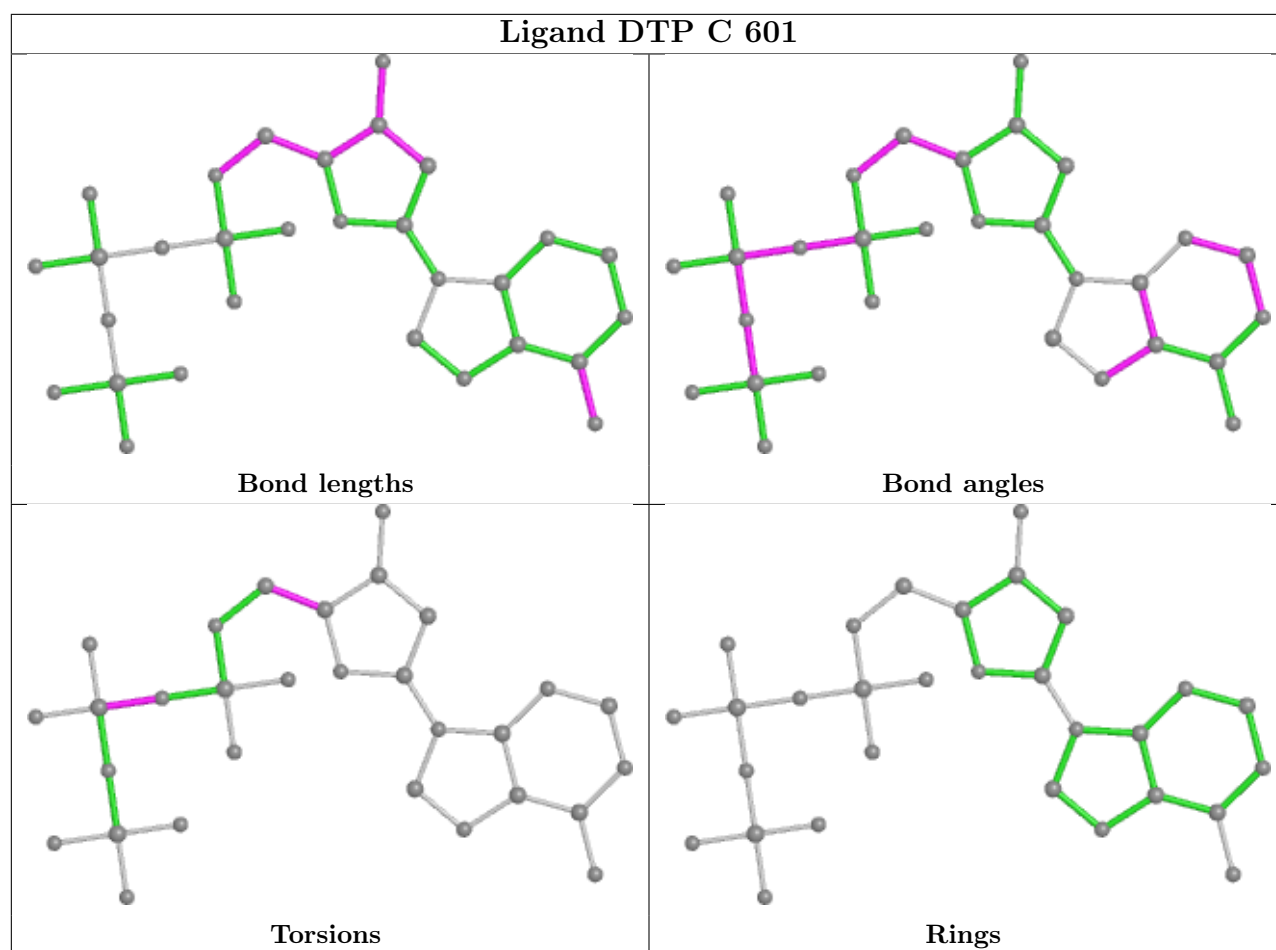
3 monomers are involved in 6 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
7	A	603	DTP	2	0
8	D	503	EDO	2	0
7	C	601	DTP	2	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier.

Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.





5.7 Other polymers [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	556/556 (100%)	0.97	90 (16%) 1 2	38, 89, 181, 228	0
1	C	556/556 (100%)	1.08	96 (17%) 1 1	40, 96, 172, 244	0
2	B	412/428 (96%)	0.68	41 (9%) 7 9	37, 74, 137, 215	0
2	D	412/428 (96%)	0.89	55 (13%) 3 4	45, 87, 162, 206	0
3	E	24/27 (88%)	1.33	5 (20%) 1 0	84, 121, 230, 245	0
3	T	24/27 (88%)	1.08	5 (20%) 1 0	80, 110, 232, 267	0
4	F	19/21 (90%)	0.73	4 (21%) 1 0	65, 100, 194, 217	0
4	P	19/21 (90%)	0.56	3 (15%) 2 2	72, 99, 170, 215	0
All	All	2022/2064 (97%)	0.92	299 (14%) 2 2	37, 86, 171, 267	0

All (299) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	B	214	LEU	20.3
2	D	214	LEU	13.2
1	A	135	ILE	12.5
3	T	702	DT	10.8
1	C	142	ILE	9.5
2	D	360	ALA	9.2
2	B	4	PRO	9.2
2	D	88	TRP	9.1
1	A	142	ILE	9.0
2	D	92	LEU	8.7
1	C	133	PRO	8.4
1	C	26	LEU	8.0
1	A	133	PRO	7.9
1	C	252	TRP	7.9
2	B	215	THR	7.8
1	C	144	TYR	7.6

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Mol	Chain	Res	Type	RSRZ
1	C	24	TRP	7.5
2	D	4	PRO	7.5
1	A	141	GLY	7.4
1	C	132	ILE	7.4
1	A	131	THR	7.3
1	A	26	LEU	7.3
1	A	73	LYS	7.2
1	A	132	ILE	7.2
1	A	144	TYR	7.1
1	A	24	TRP	6.9
1	A	130	PHE	6.9
1	C	34	LEU	6.9
1	A	140	PRO	6.8
1	C	22	LYS	6.7
1	C	131	THR	6.7
2	D	212	TRP	6.5
2	D	215	THR	6.5
1	A	57	ASN	6.5
2	D	90	VAL	6.5
2	B	5	ILE	6.5
1	C	135	ILE	6.4
1	A	30	LYS	6.4
1	C	21	VAL	6.2
2	D	89	GLU	6.2
1	C	134	SER	6.1
1	C	74	LEU	6.1
1	A	60	VAL	6.1
1	C	61	PHE	6.1
1	A	129	ALA	6.0
1	C	141	GLY	5.9
2	B	90	VAL	5.9
1	C	54	ASN	5.8
1	C	19	PRO	5.8
2	D	209	LEU	5.7
2	D	94	ILE	5.7
2	B	89	GLU	5.6
1	A	61	PHE	5.6
2	D	213	GLY	5.6
1	A	134	SER	5.6
1	A	75	ILE	5.5
1	A	52	PRO	5.5
2	B	88	TRP	5.4

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Mol	Chain	Res	Type	RSRZ
3	E	725	DG	5.4
2	B	212	TRP	5.4
2	D	85	GLN	5.4
1	C	25	PRO	5.3
1	A	285	GLY	5.2
1	A	58	THR	5.2
1	C	31	ILE	5.2
1	C	130	PHE	5.2
2	D	168	LEU	5.2
1	A	138	GLU	5.1
1	C	299	ALA	5.1
1	C	27	THR	5.1
1	C	49	LYS	5.1
1	A	109	LEU	5.1
1	A	288	ALA	5.0
1	A	56	TYR	5.0
2	B	301	LEU	5.0
1	A	193	LEU	4.9
1	A	50	ILE	4.9
1	A	143	ARG	4.9
1	C	35	VAL	4.9
2	D	361	HIS	4.8
3	E	702	DT	4.7
1	A	139	THR	4.7
1	C	32	LYS	4.7
1	C	246	LEU	4.7
1	A	74	LEU	4.6
1	C	448	ARG	4.5
1	C	52	PRO	4.5
1	A	137	ASN	4.4
1	A	136	ASN	4.3
1	A	21	VAL	4.3
1	C	28	GLU	4.3
2	B	205	LEU	4.3
1	C	23	GLN	4.3
2	D	216	THR	4.3
4	P	803	DC	4.3
1	C	138	GLU	4.3
1	A	59	PRO	4.3
1	C	292	VAL	4.3
1	C	47	ILE	4.2
1	A	286	THR	4.2

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Mol	Chain	Res	Type	RSRZ
1	C	139	THR	4.2
2	B	92	LEU	4.2
2	B	171	PHE	4.2
2	D	124	PHE	4.2
2	B	213	GLY	4.2
1	A	54	ASN	4.2
2	D	232	TYR	4.2
1	C	293	ILE	4.1
1	A	289	LEU	4.1
2	B	209	LEU	4.1
1	C	288	ALA	4.0
1	C	20	LYS	4.0
1	C	301	LEU	4.0
2	D	358	ARG	4.0
1	A	34	LEU	3.9
1	A	25	PRO	3.9
2	B	232	TYR	3.9
3	T	725	DG	3.8
1	A	29	GLU	3.8
3	T	703	DG	3.8
4	F	805	DG	3.8
1	A	294	PRO	3.8
1	C	294	PRO	3.7
1	A	284	ARG	3.7
1	C	295	LEU	3.7
1	A	293	ILE	3.7
2	D	87	PHE	3.6
1	A	37	ILE	3.6
3	E	703	DG	3.6
1	C	137	ASN	3.6
2	D	159	ILE	3.6
1	C	37	ILE	3.6
2	B	9	PRO	3.5
1	C	129	ALA	3.5
1	A	22	LYS	3.5
1	C	30	LYS	3.5
1	A	71	TRP	3.4
1	C	223	LYS	3.4
2	D	217	PRO	3.4
2	D	211	ARG	3.4
1	C	57	ASN	3.3
1	A	282	LEU	3.3

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Mol	Chain	Res	Type	RSRZ
2	B	202	ILE	3.3
2	D	5	ILE	3.3
1	C	202	ILE	3.3
1	A	448	ARG	3.3
1	A	19	PRO	3.3
1	C	283	LEU	3.3
2	D	154	LYS	3.3
1	C	143	ARG	3.3
1	C	136	ASN	3.2
1	C	55	PRO	3.2
1	C	303	LEU	3.2
2	D	178	ILE	3.2
2	B	174	GLN	3.2
2	D	179	VAL	3.2
1	C	109	LEU	3.2
1	C	145	GLN	3.2
1	A	149	LEU	3.2
2	D	428	GLN	3.1
2	B	217	PRO	3.1
1	A	127	TYR	3.1
1	A	196	GLY	3.1
2	D	173	LYS	3.1
1	C	-1	MET	3.1
1	C	219	LYS	3.1
2	B	216	THR	3.1
2	B	299	ALA	3.1
1	A	295	LEU	3.1
1	A	62	VAL	3.1
1	A	148	VAL	3.1
1	C	50	ILE	3.0
1	A	47	ILE	3.0
1	C	56	TYR	3.0
1	C	38	CYS	3.0
1	C	75	ILE	3.0
2	B	423	VAL	3.0
2	D	155	GLY	3.0
2	D	202	ILE	3.0
1	A	48	SER	3.0
2	D	95	PRO	3.0
2	D	357	MET	2.9
2	D	198	HIS	2.9
1	C	140	PRO	2.9

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Mol	Chain	Res	Type	RSRZ
1	A	27	THR	2.9
4	F	806	DT	2.9
2	B	211	ARG	2.9
1	C	67	ASP	2.9
1	C	247	PRO	2.9
1	A	292	VAL	2.9
2	D	171	PHE	2.9
1	C	260	LEU	2.9
1	A	55	PRO	2.8
2	B	193	LEU	2.8
2	D	197	GLN	2.8
2	B	279	LEU	2.8
1	C	287	LYS	2.8
1	A	23	GLN	2.8
1	A	145	GLN	2.8
1	A	287	LYS	2.8
2	D	172	LYS	2.8
2	D	210	LEU	2.8
1	A	254	VAL	2.8
1	C	73	LYS	2.8
1	C	312	GLU	2.7
1	A	46	LYS	2.7
1	A	146	TYR	2.7
2	B	277	ARG	2.7
2	D	86	ASP	2.7
1	C	58	THR	2.7
1	C	308	GLU	2.7
1	A	12	LEU	2.7
2	B	295	LEU	2.6
1	C	48	SER	2.6
1	A	41	MET	2.6
3	T	724	DT	2.6
2	D	10	VAL	2.6
3	E	723	DC	2.6
1	C	15	GLY	2.6
2	D	318	TYR	2.6
2	D	420	PRO	2.5
2	B	87	PHE	2.5
1	A	195	ILE	2.5
2	B	85	GLN	2.5
2	D	426	TRP	2.5
1	A	301	LEU	2.5

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Mol	Chain	Res	Type	RSRZ
3	T	704	DG	2.5
1	A	257	ILE	2.5
1	C	106	VAL	2.5
1	A	39	THR	2.5
1	A	128	THR	2.5
2	B	297	GLU	2.5
2	D	6	GLU	2.5
2	D	80	LEU	2.4
1	A	28	GLU	2.4
1	C	257	ILE	2.4
1	A	104	LYS	2.4
1	A	51	GLY	2.4
1	C	5	ILE	2.4
1	C	226	PRO	2.3
2	B	178	ILE	2.3
2	D	425	LEU	2.3
2	B	198	HIS	2.3
2	D	174	GLN	2.3
1	C	249	LYS	2.3
1	A	283	LEU	2.3
1	C	228	LEU	2.3
4	P	804	DA	2.3
1	A	45	GLY	2.3
1	A	234	LEU	2.3
2	B	425	LEU	2.3
1	A	72	ARG	2.3
2	D	93	GLY	2.3
2	D	208	HIS	2.3
1	C	6	GLU	2.3
1	C	42	GLU	2.3
1	A	83	ARG	2.2
1	C	41	MET	2.2
4	P	805	DG	2.2
1	C	198	HIS	2.2
1	C	83	ARG	2.2
2	D	91	GLN	2.2
1	A	-1	MET	2.2
1	C	94	ILE	2.2
1	C	126	LYS	2.2
1	C	196	GLY	2.2
3	E	724	DT	2.2
1	C	199	ARG	2.2

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Mol	Chain	Res	Type	RSRZ
4	F	807	DC	2.2
1	C	224	GLU	2.2
2	B	210	LEU	2.2
4	F	803	DC	2.1
1	C	60	VAL	2.1
2	D	8	VAL	2.1
1	C	59	PRO	2.1
1	A	205	LEU	2.1
2	D	422	LEU	2.1
1	C	184	MET	2.1
2	B	278	GLN	2.1
2	B	294	PRO	2.1
1	A	124	PHE	2.1
2	B	282	LEU	2.1
1	C	180	ILE	2.1
1	A	77	LEU	2.1
2	B	310	LEU	2.1
1	C	53	GLU	2.1
2	D	11	LYS	2.1
2	D	25	PRO	2.0
1	A	297	GLU	2.0
1	C	248	GLU	2.0
1	C	309	ILE	2.0
2	B	296	THR	2.0
1	C	375	ILE	2.0
2	B	201	LYS	2.0
1	A	16	MET	2.0
2	B	207	GLN	2.0
2	D	427	TYR	2.0
1	A	49	LYS	2.0
1	A	334	GLN	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
4	MRG	F	817	26/27	0.90	0.18	117,133,165,172	0
4	MRG	P	817	26/27	0.91	0.18	92,114,144,154	0

6.3 Carbohydrates

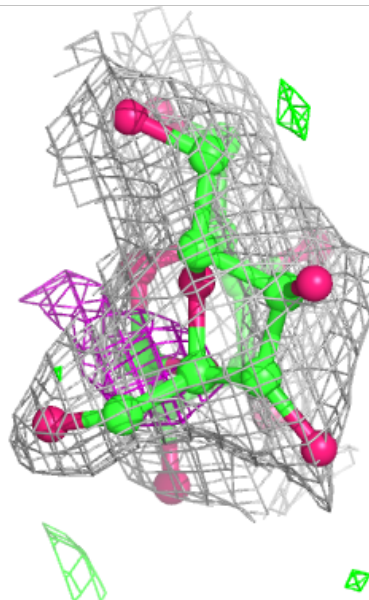
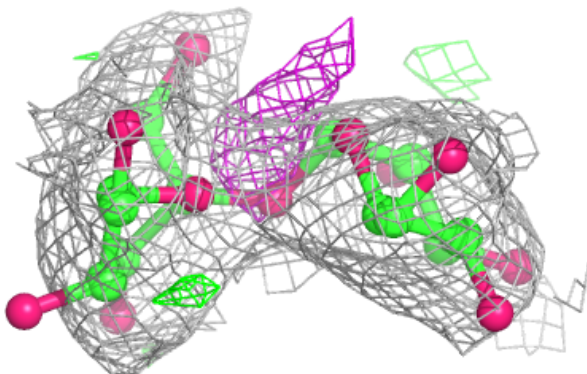
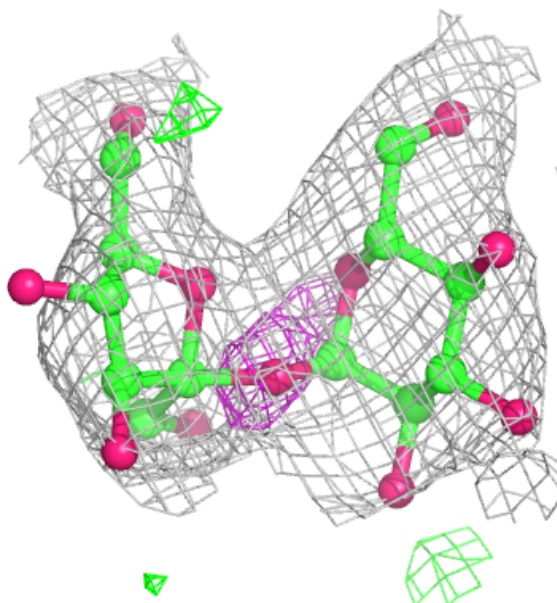
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

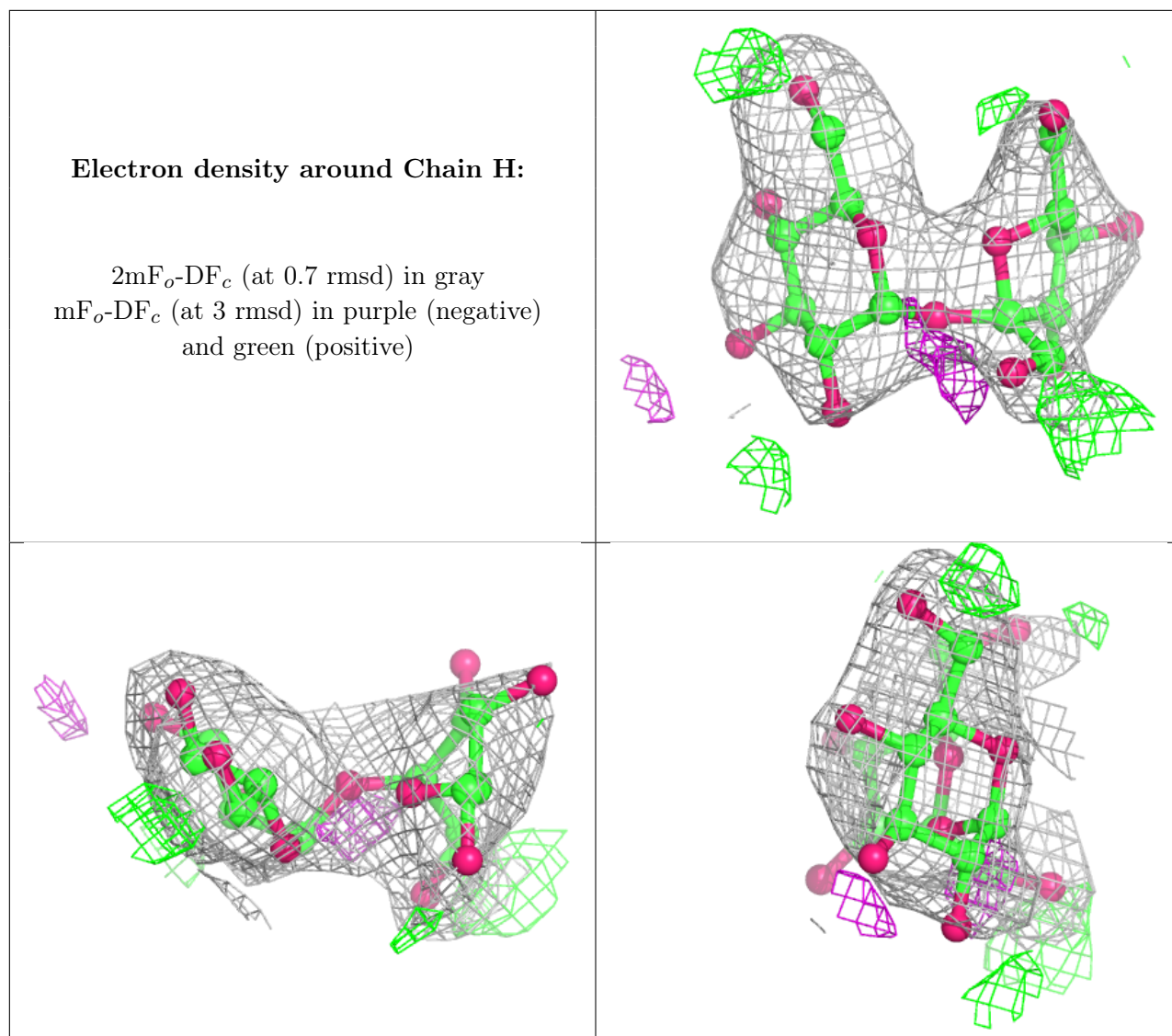
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
5	FRU	H	2	12/12	0.82	0.25	108,130,142,150	0
5	FRU	G	2	12/12	0.83	0.24	81,123,127,130	0
5	GLC	H	1	11/12	0.87	0.23	84,115,131,134	0
5	GLC	G	1	11/12	0.91	0.19	66,101,110,117	0

The following is a graphical depiction of the model fit to experimental electron density for oligosaccharide. Each fit is shown from different orientation to approximate a three-dimensional view.

Electron density around Chain G:

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





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.

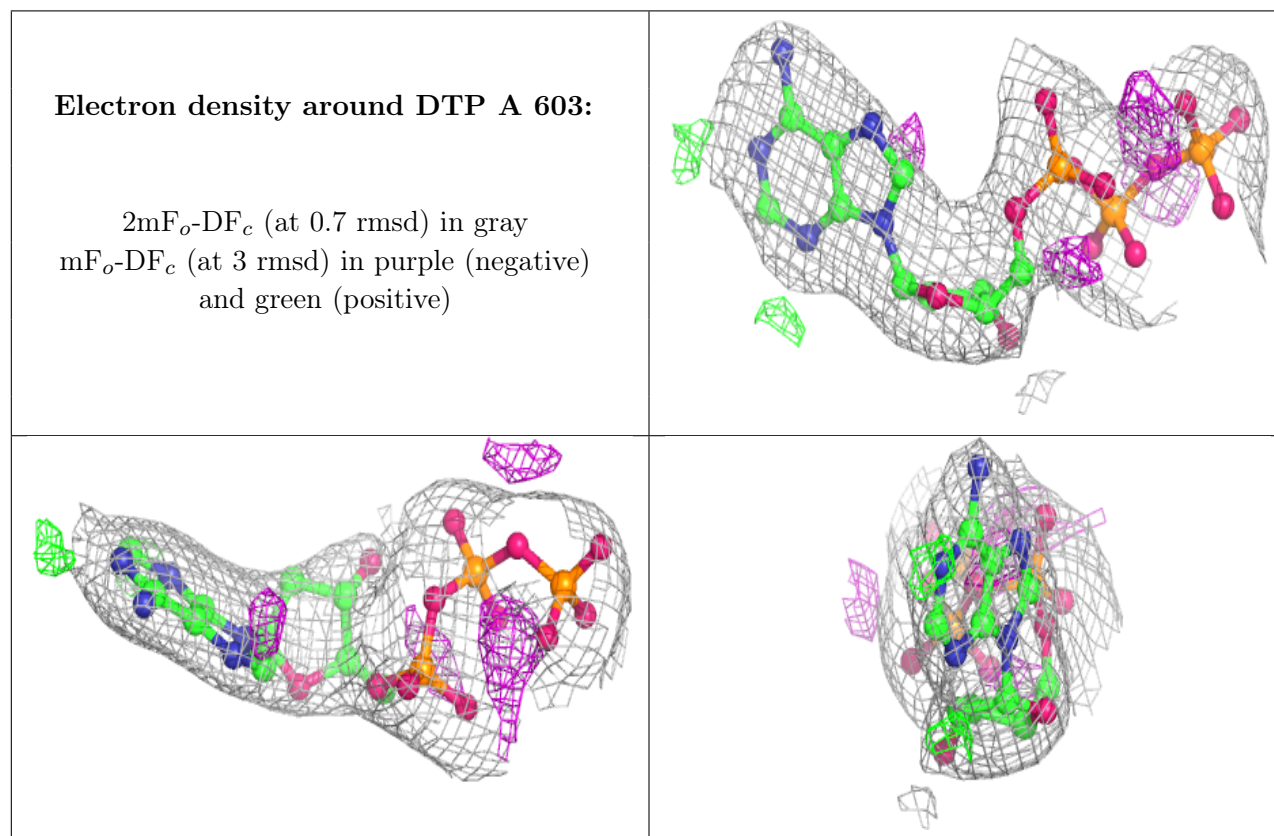
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
9	SO4	B	503	5/5	0.67	0.84	263,263,267,280	0
9	SO4	D	502	5/5	0.83	0.26	145,146,150,153	0
6	MG	A	601	1/1	0.84	0.05	129,129,129,129	0
6	MG	C	602	1/1	0.90	0.09	116,116,116,116	0
6	MG	A	602	1/1	0.93	0.09	143,143,143,143	0
8	EDO	D	503	4/4	0.93	0.34	68,75,80,80	0
6	MG	C	603	1/1	0.94	0.12	105,105,105,105	0

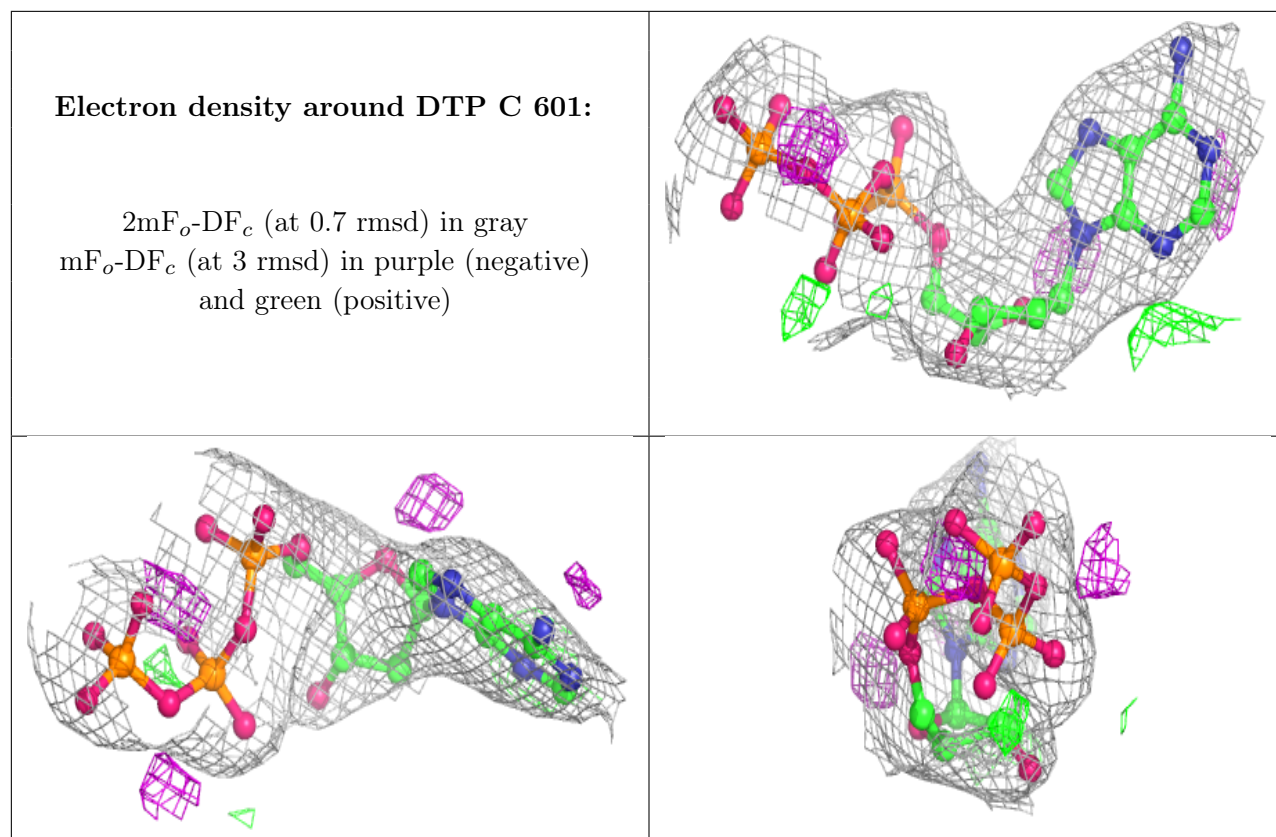
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
7	DTP	A	603	30/30	0.94	0.13	66,111,146,146	0
7	DTP	C	601	30/30	0.94	0.17	83,98,143,148	0
8	EDO	B	502	4/4	0.95	0.19	60,68,70,77	0

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





6.5 Other polymers [i](#)

There are no such residues in this entry.