



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 4, 2026 – 08:52 PM UTC

PDB ID : 1TAU / pdb_00001tau
Title : TAQ POLYMERASE (E.C.2.7.7.7)/DNA/B-OCTYLGLUCOSIDE COMPLEX
Authors : Eom, S.H.; Wang, J.; Steitz, T.A.
Deposited on : 1996-06-17
Resolution : 3.00 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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

MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

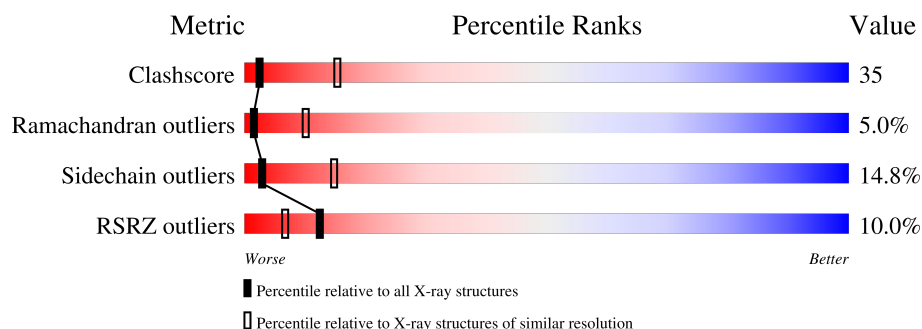
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.00 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))
Clashscore	190562	2977 (3.00-3.00)
Ramachandran outliers	187476	2877 (3.00-3.00)
Sidechain outliers	187428	2880 (3.00-3.00)
RSRZ outliers	180081	2671 (3.00-3.00)

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	T	8	88% 38% 62%
2	P	8	100% 88% 12%
3	A	832	8% 37% 46% 11% 5%

2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 8122 atoms, of which 1448 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 DNA chain called DNA (5'-D(*GP*CP*GP*AP*TP*CP*CP*G)-3').

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	T	8	Total	C	H	N	O	P	0	0	0
			181	77	20	31	46	7			

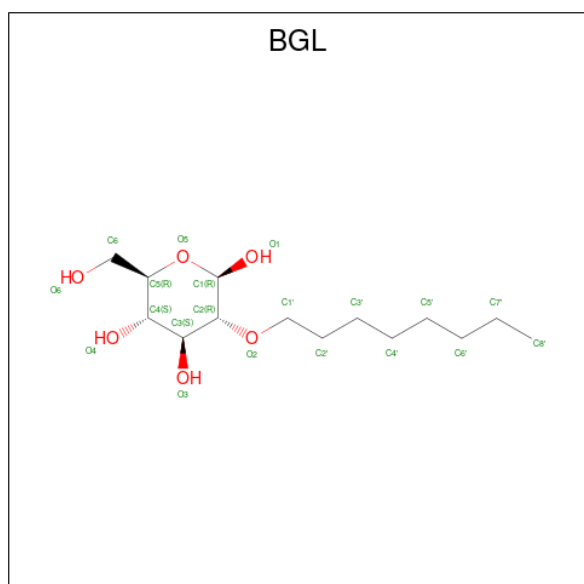
- Molecule 2 is a DNA chain called DNA (5'-D(*CP*GP*GP*AP*TP*CP*GP*C)-3').

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
2	P	8	Total	C	H	N	O	P	0	0	0
			181	77	20	31	46	7			

- Molecule 3 is a protein called PROTEIN (TAQ POLYMERASE).

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
3	A	793	Total	C	H	N	O	S	0	0	0
			7739	4039	1408	1125	1153	14			

- Molecule 4 is 2-O-octyl-beta-D-glucopyranose (CCD ID: BGL) (formula: C₁₄H₂₈O₆).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	C	O	0	0
			20	14	6		

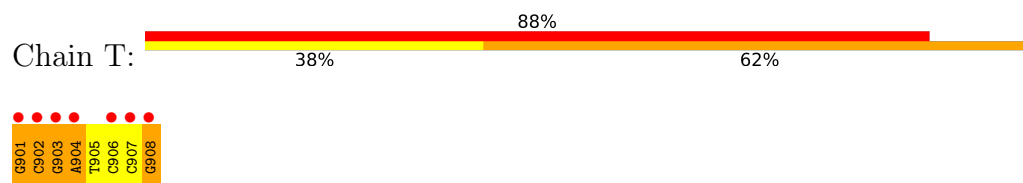
- Molecule 5 is ZINC ION (CCD ID: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	1	Total	Zn	0	0
			1	1		

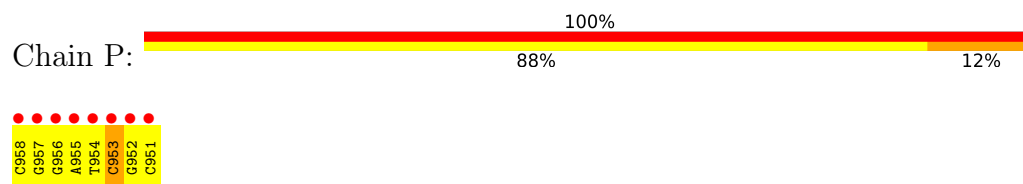
3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

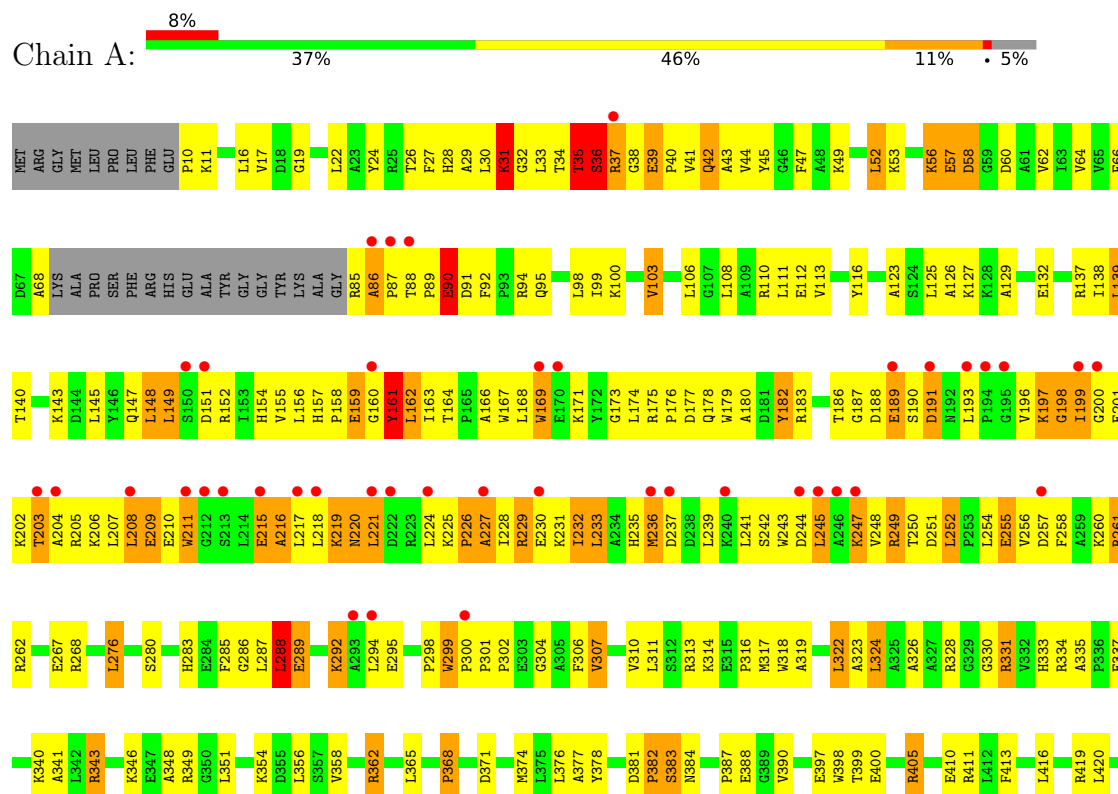
- Molecule 1: DNA (5'-D(*GP*CP*GP*AP*TP*CP*CP*G)-3')

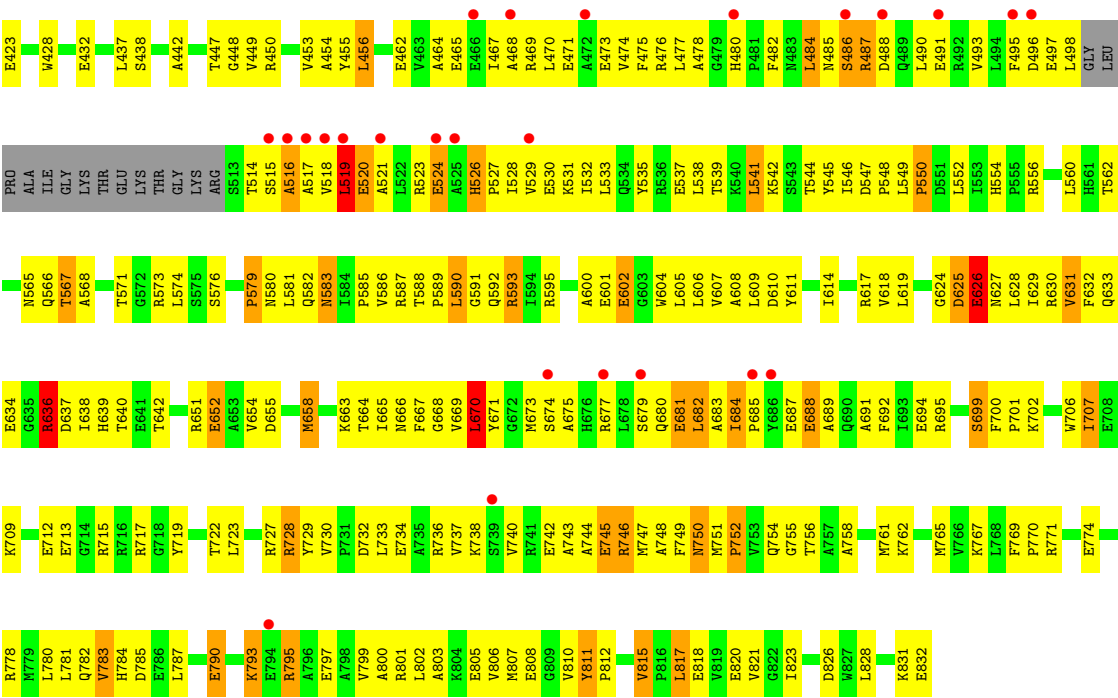


- Molecule 2: DNA (5'-D(*CP*GP*GP*AP*TP*CP*GP*C)-3')



- Molecule 3: PROTEIN (TAQ POLYMERASE)





4 Data and refinement statistics

Property	Value	Source
Space group	P 31 2 1	Depositor
Cell constants a, b, c, α , β , γ	107.60Å 107.60Å 170.01Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	8.00 – 3.00 8.00 – 3.00	Depositor EDS
% Data completeness (in resolution range)	(Not available) (8.00-3.00) 83.4 (8.00-3.00)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.11 (at 3.01Å)	Xtriage
Refinement program	X-PLOR	Depositor
R, R_{free}	0.244 , 0.305 0.265 , (Not available)	Depositor DCC
R_{free} test set	No test flags present.	wwPDB-VP
Wilson B-factor (Å ²)	49.6	Xtriage
Anisotropy	0.310	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 96.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	0.033 for -h,-k,l	Xtriage
F_o, F_c correlation	0.84	EDS
Total number of atoms	8122	wwPDB-VP
Average B, all atoms (Å ²)	36.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.56% 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

5.1 Standard geometry

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

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	T	0.49	0/180	1.27	5/276 (1.8%)
2	P	0.52	0/180	0.96	1/276 (0.4%)
3	A	0.62	1/6464 (0.0%)	1.08	42/8749 (0.5%)
All	All	0.61	1/6824 (0.0%)	1.09	48/9301 (0.5%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	684	ILE	CA-CB	6.23	1.58	1.53

All (48) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	151	ASP	N-CA-C	-9.39	96.58	110.48
3	A	688	GLU	N-CA-C	-8.85	102.50	113.20
3	A	795	ARG	N-CA-C	-8.81	101.60	111.82
3	A	191	ASP	N-CA-C	-8.24	97.27	109.62
3	A	383	SER	N-CA-C	-7.92	104.57	112.97
1	T	902	DC	C2'-C3'-O3'	-7.88	99.69	111.50
3	A	56	LYS	N-CA-C	-7.76	102.90	111.36
3	A	670	LEU	N-CA-C	7.46	120.36	111.33
3	A	255	GLU	N-CA-C	7.25	122.25	113.41
3	A	488	ASP	N-CA-C	6.99	119.75	111.71
3	A	568	ALA	N-CA-C	6.59	124.85	110.80
3	A	565	ASN	N-CA-C	6.46	118.94	108.41
1	T	903	DG	C2'-C3'-O3'	-6.45	101.83	111.50
1	T	904	DA	C2'-C3'-O3'	-6.38	101.93	111.50
3	A	520	GLU	N-CA-C	-6.36	104.42	111.36
3	A	236	MET	N-CA-C	-6.35	102.33	110.53
3	A	381	ASP	CA-C-N	6.32	127.74	119.84

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	381	ASP	C-N-CA	6.32	127.74	119.84
3	A	790	GLU	N-CA-C	-6.29	98.65	108.90
3	A	601	GLU	N-CA-C	6.28	120.00	108.58
3	A	210	GLU	N-CA-C	6.21	119.96	112.38
3	A	162	LEU	N-CA-C	-6.10	99.34	109.46
3	A	90	GLU	N-CA-C	6.09	117.59	111.07
3	A	546	ILE	N-CA-C	6.09	116.84	110.62
2	P	953	DC	C2'-C3'-O3'	-6.09	102.36	111.50
3	A	519	LEU	N-CA-C	-6.06	104.59	111.14
1	T	901	DG	C2'-C3'-O3'	-6.03	102.45	111.50
3	A	811	TYR	CA-C-N	6.02	126.33	119.83
3	A	811	TYR	C-N-CA	6.02	126.33	119.83
3	A	251	ASP	N-CA-C	5.89	119.23	112.57
3	A	31	LYS	N-CA-C	5.84	123.23	110.80
3	A	331	ARG	N-CA-C	-5.83	101.22	109.96
3	A	148	LEU	N-CA-C	-5.81	104.54	111.69
3	A	220	ASN	N-CA-C	5.74	123.03	110.80
3	A	35	THR	N-CA-C	-5.72	101.16	110.20
3	A	58	ASP	N-CA-C	5.59	122.71	110.80
3	A	166	ALA	N-CA-C	-5.55	105.14	111.14
1	T	908	DG	C4'-C3'-O3'	5.49	118.23	110.00
3	A	324	LEU	N-CA-C	-5.48	100.08	109.24
3	A	454	ALA	N-CA-C	-5.39	105.48	111.36
3	A	289	GLU	N-CA-C	-5.35	106.34	112.92
3	A	631	VAL	CB-CA-C	-5.26	105.23	111.97
3	A	636	ARG	N-CA-C	5.23	118.12	109.85
3	A	348	ALA	N-CA-C	-5.21	99.28	108.20
3	A	455	TYR	N-CA-C	-5.20	105.52	111.14
3	A	732	ASP	N-CA-C	5.17	119.22	113.01
3	A	707	ILE	CB-CA-C	-5.09	105.36	111.88
3	A	368	PRO	N-CA-C	5.06	116.88	110.70

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	T	161	20	91	36	0
2	P	161	20	91	57	0
3	A	6331	1408	6407	401	0
4	A	20	0	26	1	0
5	A	1	0	0	0	0
All	All	6674	1448	6615	461	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 35.

All (461) 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:P:954:DT:H2'	2:P:953:DC:C6	1.74	1.23
2:P:954:DT:H2'	2:P:953:DC:C5	1.77	1.20
1:T:905:DT:H4'	3:A:580:ASN:HB2	1.29	1.13
2:P:955:DA:H2''	2:P:954:DT:C7	1.78	1.12
1:T:906:DC:H4'	3:A:544:THR:HG23	1.19	1.10
1:T:902:DC:H2'	1:T:903:DG:C8	1.86	1.10
2:P:954:DT:H4'	3:A:537:GLU:OE2	1.54	1.07
3:A:780:LEU:HD11	3:A:790:GLU:HB2	1.38	1.05
2:P:955:DA:C2'	2:P:954:DT:H71	1.85	1.05
2:P:955:DA:H2''	2:P:954:DT:H71	1.36	1.04
2:P:955:DA:H2''	2:P:954:DT:C5	1.93	1.03
3:A:207:LEU:HB3	3:A:211:TRP:HE1	1.22	1.02
2:P:953:DC:H2''	2:P:952:DG:H5'	1.37	1.00
3:A:317:MET:HE1	3:A:362:ARG:HB3	1.41	1.00
3:A:317:MET:HE3	3:A:358:VAL:HG12	1.40	0.99
3:A:34:THR:HG22	3:A:40:PRO:HA	1.46	0.96
3:A:217:LEU:HG	3:A:218:LEU:HG	1.47	0.94
1:T:902:DC:H2'	1:T:903:DG:H8	1.27	0.92
3:A:728:ARG:HG2	3:A:751:MET:HG3	1.53	0.90
2:P:955:DA:C2'	2:P:954:DT:C7	2.45	0.90
2:P:954:DT:C2'	2:P:953:DC:C6	2.56	0.88
2:P:953:DC:H4'	3:A:585:PRO:HB3	1.59	0.84
2:P:952:DG:H2'	2:P:951:DC:C6	2.11	0.84
2:P:953:DC:H1'	3:A:583:ASN:ND2	1.92	0.84
1:T:908:DG:H21	2:P:958:DC:H41	1.23	0.84
2:P:953:DC:H2'	2:P:952:DG:H8	1.42	0.84
3:A:34:THR:HB	3:A:38:GLY:O	1.79	0.83
3:A:300:PRO:HA	3:A:301:PRO:N	1.93	0.83
2:P:953:DC:H1'	3:A:583:ASN:HD22	1.44	0.83

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:A:340:LYS:HD2	3:A:343:ARG:HD2	1.59	0.82
1:T:901:DG:O5'	3:A:677:ARG:HD2	1.80	0.82
3:A:137:ARG:HB3	3:A:156:LEU:HD13	1.60	0.82
2:P:955:DA:H5''	3:A:519:LEU:HG	1.60	0.81
3:A:207:LEU:HB3	3:A:211:TRP:NE1	1.94	0.81
3:A:302:PRO:HG3	3:A:331:ARG:NH2	1.95	0.81
2:P:953:DC:H2''	2:P:952:DG:C5'	2.11	0.81
3:A:89:PRO:HB2	3:A:92:PHE:HB2	1.63	0.80
3:A:640:THR:HG23	3:A:654:VAL:HG21	1.64	0.80
3:A:750:ASN:C	3:A:750:ASN:HD22	1.90	0.80
3:A:198:GLY:HA2	3:A:203:THR:HA	1.62	0.79
3:A:547:ASP:O	3:A:550:PRO:HD2	1.82	0.79
3:A:180:ALA:HA	3:A:245:LEU:HD12	1.66	0.78
2:P:958:DC:H2''	2:P:957:DG:C8	2.18	0.78
2:P:952:DG:H4'	3:A:784:HIS:CE1	2.20	0.77
3:A:292:LYS:HE2	3:A:292:LYS:HA	1.67	0.77
2:P:955:DA:H5''	3:A:519:LEU:CD2	2.15	0.77
2:P:951:DC:H5'	3:A:784:HIS:ND1	2.00	0.77
3:A:673:MET:HA	3:A:677:ARG:HH11	1.49	0.77
3:A:111:LEU:HD23	3:A:125:LEU:HD11	1.67	0.76
3:A:706:TRP:CZ3	3:A:749:PHE:HB2	2.21	0.76
1:T:906:DC:H4'	3:A:544:THR:CG2	2.10	0.75
3:A:202:LYS:HB2	3:A:207:LEU:HG	1.69	0.75
1:T:905:DT:H4'	3:A:580:ASN:CB	2.14	0.74
2:P:955:DA:H5''	3:A:519:LEU:CG	2.15	0.74
2:P:952:DG:O3'	3:A:784:HIS:CE1	2.41	0.74
3:A:634:GLU:OE1	3:A:636:ARG:HD2	1.87	0.73
1:T:905:DT:C4	1:T:906:DC:N4	2.56	0.73
3:A:695:ARG:HG2	4:A:1001:BGL:H3	1.70	0.73
3:A:182:TYR:CZ	3:A:208:LEU:HD13	2.24	0.73
1:T:906:DC:H1'	1:T:907:DC:O5'	1.90	0.72
3:A:324:LEU:HD23	3:A:341:ALA:HB3	1.72	0.71
3:A:808:GLU:HG3	3:A:817:LEU:O	1.91	0.71
3:A:607:VAL:HG12	3:A:609:LEU:HD11	1.70	0.71
1:T:904:DA:H2''	1:T:905:DT:C5'	2.21	0.71
2:P:953:DC:H2'	2:P:952:DG:C8	2.26	0.70
3:A:673:MET:HA	3:A:677:ARG:HD3	1.72	0.70
3:A:399:THR:O	3:A:405:ARG:HD2	1.90	0.70
3:A:684:ILE:HG23	3:A:685:PRO:HD3	1.73	0.70
3:A:651:ARG:O	3:A:654:VAL:HG22	1.91	0.70
1:T:908:DG:H21	2:P:958:DC:N4	1.90	0.69

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:A:140:THR:HG21	3:A:145:LEU:HD12	1.74	0.69
2:P:955:DA:H2''	2:P:954:DT:C6	2.27	0.69
1:T:902:DC:C2'	1:T:903:DG:H8	2.04	0.69
3:A:44:VAL:HG21	3:A:98:LEU:HD12	1.75	0.69
3:A:244:ASP:O	3:A:247:LYS:HB2	1.92	0.69
3:A:719:TYR:CD2	3:A:727:ARG:HG3	2.27	0.69
2:P:954:DT:C2'	2:P:953:DC:C5	2.69	0.69
3:A:464:ALA:O	3:A:467:ILE:HG12	1.91	0.68
3:A:487:ARG:O	3:A:491:GLU:HG3	1.94	0.68
3:A:761:MET:HE1	3:A:807:MET:HE3	1.73	0.68
2:P:958:DC:H2''	2:P:957:DG:H8	1.57	0.68
3:A:244:ASP:HA	3:A:247:LYS:HG3	1.75	0.68
3:A:68:ALA:HA	3:A:85:ARG:HH22	1.59	0.67
3:A:516:ALA:O	3:A:520:GLU:HG2	1.95	0.67
3:A:147:GLN:CD	3:A:248:VAL:HG21	2.19	0.67
3:A:157:HIS:HB3	3:A:160:GLY:O	1.95	0.67
1:T:904:DA:H2''	1:T:905:DT:H5'	1.76	0.66
3:A:738:LYS:O	3:A:742:GLU:HG2	1.95	0.66
2:P:955:DA:C5'	3:A:519:LEU:CD2	2.74	0.66
3:A:60:ASP:HB3	3:A:260:LYS:HG2	1.78	0.66
3:A:204:ALA:O	3:A:208:LEU:HG	1.96	0.66
3:A:10:PRO:HG3	3:A:152:ARG:HH12	1.61	0.65
2:P:952:DG:H4'	3:A:784:HIS:HE1	1.60	0.65
3:A:374:MET:HE1	3:A:387:PRO:HA	1.79	0.65
3:A:609:LEU:HG	3:A:821:VAL:HG12	1.78	0.65
3:A:202:LYS:HA	3:A:206:LYS:HB3	1.79	0.64
3:A:605:LEU:HD21	3:A:793:LYS:HD3	1.80	0.64
3:A:377:ALA:HB2	3:A:416:LEU:HD21	1.80	0.64
3:A:202:LYS:CB	3:A:207:LEU:HG	2.28	0.63
3:A:667:PHE:CZ	3:A:671:TYR:HE2	2.16	0.63
3:A:600:ALA:HB2	3:A:606:LEU:HG	1.79	0.63
1:T:907:DC:H2''	1:T:908:DG:C8	2.34	0.63
3:A:211:TRP:CD1	3:A:211:TRP:N	2.66	0.63
1:T:901:DG:H2'	1:T:902:DC:C6	2.33	0.63
3:A:302:PRO:HG3	3:A:331:ARG:HH22	1.63	0.63
3:A:665:ILE:HD11	3:A:692:PHE:HB3	1.80	0.63
3:A:388:GLU:HG3	3:A:398:TRP:CD1	2.34	0.62
3:A:127:LYS:HG3	3:A:250:THR:HB	1.82	0.62
1:T:902:DC:C2'	1:T:903:DG:C8	2.74	0.62
1:T:905:DT:H2''	1:T:906:DC:OP2	2.00	0.62
3:A:200:GLY:O	3:A:201:GLU:HG2	2.00	0.62

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:A:354:LYS:O	3:A:358:VAL:HG23	1.99	0.62
2:P:951:DC:O3'	3:A:573:ARG:NH2	2.33	0.61
1:T:908:DG:N2	2:P:958:DC:H41	1.96	0.61
2:P:953:DC:C6	2:P:953:DC:OP2	2.53	0.61
3:A:52:LEU:HD11	3:A:285:PHE:CE1	2.35	0.61
3:A:810:VAL:HG13	3:A:811:TYR:H	1.66	0.61
3:A:68:ALA:HB2	3:A:112:GLU:HB2	1.82	0.61
3:A:248:VAL:O	3:A:248:VAL:HG23	2.00	0.61
3:A:545:TYR:O	3:A:549:LEU:HD13	2.00	0.61
3:A:526:HIS:O	3:A:529:VAL:HG22	2.00	0.61
3:A:673:MET:HA	3:A:677:ARG:NH1	2.15	0.61
2:P:953:DC:C2	2:P:952:DG:C8	2.89	0.61
3:A:655:ASP:OD1	3:A:658:MET:HB2	2.00	0.61
1:T:904:DA:H2''	1:T:905:DT:O5'	2.00	0.60
3:A:24:TYR:HA	3:A:92:PHE:HE1	1.64	0.60
3:A:346:LYS:O	3:A:368:PRO:HD2	2.01	0.60
3:A:607:VAL:HG12	3:A:609:LEU:CD1	2.31	0.60
3:A:480:HIS:HE1	3:A:493:VAL:HG13	1.67	0.59
3:A:482:PHE:HE2	3:A:490:LEU:HD23	1.67	0.59
3:A:57:GLU:HB3	3:A:137:ARG:HH12	1.66	0.59
3:A:351:LEU:HD23	3:A:398:TRP:CZ3	2.37	0.59
3:A:149:LEU:HD11	3:A:163:ILE:O	2.03	0.59
3:A:85:ARG:N	3:A:88:THR:HG1	2.00	0.59
3:A:465:GLU:HG3	3:A:469:ARG:NH2	2.18	0.58
3:A:449:VAL:HG12	3:A:780:LEU:HD13	1.85	0.58
3:A:227:ALA:N	3:A:230:GLU:HB3	2.19	0.58
3:A:287:LEU:O	3:A:288:LEU:HD23	2.03	0.58
3:A:317:MET:HE3	3:A:358:VAL:CG1	2.25	0.58
3:A:541:LEU:HD23	3:A:590:LEU:HD12	1.84	0.58
3:A:230:GLU:O	3:A:233:LEU:HD12	2.03	0.58
1:T:906:DC:C4'	3:A:544:THR:HG23	2.12	0.58
3:A:154:HIS:CD2	3:A:164:THR:HG22	2.38	0.58
3:A:286:GLY:O	3:A:289:GLU:HG2	2.04	0.57
2:P:953:DC:O2	2:P:952:DG:C8	2.58	0.57
3:A:673:MET:HG3	3:A:677:ARG:NH1	2.19	0.57
3:A:631:VAL:HG11	3:A:638:ILE:HA	1.85	0.57
3:A:523:ARG:HA	3:A:529:VAL:HG21	1.87	0.57
3:A:163:ILE:HG23	3:A:167:TRP:CD1	2.39	0.57
3:A:595:ARG:NH2	3:A:828:LEU:HD12	2.20	0.57
1:T:907:DC:H1'	1:T:908:DG:H5'	1.86	0.56
3:A:149:LEU:HD21	3:A:163:ILE:HG22	1.86	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:T:906:DC:H2''	1:T:907:DC:OP2	2.05	0.56
1:T:907:DC:OP1	1:T:907:DC:H3'	2.04	0.56
3:A:797:GLU:O	3:A:801:ARG:HG3	2.04	0.56
3:A:358:VAL:HG22	3:A:442:ALA:HA	1.88	0.56
3:A:22:LEU:O	3:A:26:THR:HG23	2.06	0.56
3:A:103:VAL:HG11	3:A:110:ARG:HG3	1.87	0.56
3:A:224:LEU:HB3	3:A:229:ARG:HB2	1.88	0.56
3:A:769:PHE:HB3	3:A:770:PRO:HD3	1.87	0.56
3:A:95:GLN:O	3:A:99:ILE:HG12	2.06	0.56
3:A:802:LEU:O	3:A:806:VAL:HG23	2.06	0.56
3:A:471:GLU:O	3:A:474:VAL:HG22	2.07	0.56
3:A:211:TRP:N	3:A:211:TRP:HD1	2.04	0.55
3:A:688:GLU:O	3:A:691:ALA:HB3	2.05	0.55
3:A:310:VAL:HG21	3:A:400:GLU:O	2.06	0.55
3:A:484:LEU:HD23	3:A:485:ASN:H	1.71	0.55
3:A:586:VAL:HG12	3:A:587:ARG:HG3	1.89	0.55
3:A:196:VAL:HB	3:A:204:ALA:HB2	1.89	0.55
2:P:951:DC:H2'	3:A:754:GLN:NE2	2.21	0.55
3:A:10:PRO:HG3	3:A:152:ARG:NH1	2.21	0.55
3:A:35:THR:O	3:A:37:ARG:N	2.39	0.55
3:A:673:MET:HG3	3:A:677:ARG:HH11	1.72	0.55
3:A:709:LYS:O	3:A:712:GLU:HB3	2.07	0.55
3:A:179:TRP:CZ3	3:A:183:ARG:HG3	2.42	0.55
3:A:605:LEU:CD2	3:A:793:LYS:HA	2.36	0.55
3:A:116:TYR:CZ	3:A:252:LEU:HD12	2.41	0.55
3:A:217:LEU:CG	3:A:218:LEU:HG	2.29	0.54
3:A:227:ALA:H	3:A:230:GLU:HB3	1.73	0.54
3:A:475:PHE:CE1	3:A:482:PHE:O	2.61	0.54
3:A:30:LEU:HB2	3:A:42:GLN:HB2	1.88	0.54
3:A:474:VAL:HG12	3:A:531:LYS:HB2	1.89	0.54
3:A:317:MET:CE	3:A:362:ARG:HB3	2.26	0.54
3:A:722:THR:HG22	3:A:755:GLY:HA3	1.90	0.54
2:P:953:DC:C2'	2:P:952:DG:C5'	2.82	0.54
3:A:535:TYR:O	3:A:539:THR:HG23	2.08	0.54
3:A:723:LEU:HB3	3:A:756:THR:HG23	1.88	0.54
3:A:58:ASP:HB2	3:A:261:ARG:NH2	2.23	0.54
3:A:197:LYS:HD3	3:A:227:ALA:HB2	1.90	0.54
3:A:249:ARG:HG3	3:A:252:LEU:HD21	1.89	0.54
2:P:955:DA:C5'	3:A:519:LEU:HD21	2.38	0.53
3:A:53:LYS:HA	3:A:56:LYS:HD3	1.90	0.53
3:A:682:LEU:HB3	3:A:685:PRO:HD2	1.89	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:A:211:TRP:HD1	3:A:211:TRP:H	1.57	0.53
3:A:147:GLN:OE1	3:A:248:VAL:HG21	2.09	0.53
3:A:562:THR:HG23	3:A:579:PRO:HD2	1.89	0.53
3:A:179:TRP:CH2	3:A:183:ARG:HG3	2.44	0.53
3:A:298:PRO:O	3:A:333:HIS:HD2	1.92	0.53
3:A:465:GLU:HG3	3:A:469:ARG:CZ	2.38	0.53
3:A:149:LEU:HD13	3:A:155:VAL:HG23	1.91	0.53
3:A:211:TRP:CD1	3:A:211:TRP:H	2.25	0.53
3:A:595:ARG:HH21	3:A:828:LEU:HD12	1.74	0.53
1:T:907:DC:C5	1:T:908:DG:C6	2.97	0.53
3:A:24:TYR:HA	3:A:92:PHE:CE1	2.43	0.53
3:A:173:GLY:C	3:A:174:LEU:HD22	2.33	0.53
3:A:592:GLN:HE21	3:A:828:LEU:HD11	1.74	0.53
1:T:902:DC:H6	1:T:902:DC:OP2	1.92	0.52
2:P:955:DA:H2'	2:P:954:DT:C7	2.36	0.52
3:A:34:THR:HG22	3:A:40:PRO:CA	2.29	0.52
3:A:155:VAL:HB	3:A:163:ILE:HB	1.90	0.52
3:A:45:TYR:HE1	3:A:49:LYS:HD3	1.74	0.52
3:A:19:GLY:HA2	3:A:47:PHE:HE2	1.72	0.52
2:P:953:DC:C2'	2:P:952:DG:O5'	2.58	0.52
2:P:955:DA:C3'	2:P:954:DT:H71	2.40	0.52
3:A:243:TRP:HD1	3:A:244:ASP:N	2.07	0.52
3:A:306:PHE:HA	3:A:349:ARG:O	2.09	0.52
3:A:554:HIS:CE1	3:A:556:ARG:HB2	2.45	0.52
3:A:699:SER:C	3:A:701:PRO:HD3	2.35	0.52
3:A:317:MET:HE2	3:A:317:MET:HA	1.92	0.52
3:A:371:ASP:HB3	3:A:413:PHE:CE2	2.45	0.52
3:A:664:THR:HG21	3:A:682:LEU:HD22	1.92	0.52
3:A:149:LEU:CD2	3:A:163:ILE:HG22	2.40	0.51
3:A:482:PHE:CD2	3:A:493:VAL:HG21	2.45	0.51
3:A:40:PRO:HD2	3:A:94:ARG:NH1	2.25	0.51
3:A:183:ARG:NH1	3:A:188:ASP:HB2	2.25	0.51
3:A:580:ASN:OD1	3:A:582:GLN:HB2	2.10	0.51
3:A:609:LEU:HD21	3:A:803:ALA:HB3	1.91	0.51
2:P:958:DC:C2'	2:P:957:DG:C8	2.90	0.51
3:A:226:PRO:O	3:A:228:ILE:N	2.43	0.51
3:A:453:VAL:HA	3:A:456:LEU:HB2	1.93	0.51
3:A:307:VAL:HG21	3:A:356:LEU:HD22	1.92	0.51
3:A:183:ARG:HE	3:A:245:LEU:HD21	1.74	0.51
3:A:377:ALA:HB2	3:A:416:LEU:CD2	2.40	0.51
1:T:907:DC:H2''	1:T:908:DG:O5'	2.10	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:A:143:LYS:HE3	3:A:183:ARG:HH11	1.75	0.51
3:A:642:THR:HG23	3:A:700:PHE:HE2	1.76	0.51
3:A:36:SER:O	3:A:37:ARG:HG3	2.11	0.50
3:A:632:PHE:HB2	3:A:815:VAL:HG11	1.94	0.50
2:P:952:DG:OP1	3:A:586:VAL:HG23	2.11	0.50
3:A:22:LEU:HD11	3:A:139:LEU:HD22	1.93	0.50
3:A:164:THR:O	3:A:167:TRP:HB3	2.11	0.50
3:A:771:ARG:HA	3:A:774:GLU:CD	2.37	0.50
3:A:552:LEU:HB3	3:A:560:LEU:HD13	1.93	0.50
3:A:547:ASP:HB2	3:A:548:PRO:HD3	1.92	0.50
1:T:901:DG:N7	3:A:677:ARG:NH2	2.60	0.50
3:A:514:THR:O	3:A:519:LEU:N	2.44	0.50
3:A:322:LEU:O	3:A:323:ALA:HB3	2.11	0.50
3:A:699:SER:O	3:A:701:PRO:HD3	2.12	0.50
3:A:682:LEU:HB3	3:A:685:PRO:HG2	1.93	0.49
3:A:665:ILE:O	3:A:669:VAL:HG23	2.12	0.49
2:P:951:DC:H2'	3:A:754:GLN:HE22	1.77	0.49
3:A:215:GLU:O	3:A:216:ALA:HB3	2.11	0.49
3:A:528:ILE:O	3:A:532:ILE:HG23	2.13	0.49
3:A:585:PRO:O	3:A:591:GLY:HA3	2.12	0.49
3:A:682:LEU:HB3	3:A:685:PRO:CD	2.42	0.49
2:P:957:DG:H2''	2:P:956:DG:OP2	2.11	0.49
3:A:218:LEU:O	3:A:219:LYS:HB2	2.11	0.49
3:A:301:PRO:HG2	3:A:326:ALA:HB3	1.94	0.49
3:A:595:ARG:HH22	3:A:831:LYS:HA	1.78	0.49
3:A:639:HIS:CD2	3:A:663:LYS:HA	2.48	0.49
3:A:199:ILE:HD12	3:A:225:LYS:HE3	1.94	0.49
3:A:706:TRP:HE3	3:A:707:ILE:HD13	1.77	0.49
3:A:765:MET:HE3	3:A:787:LEU:HD11	1.94	0.49
3:A:199:ILE:HG13	3:A:226:PRO:O	2.12	0.49
3:A:68:ALA:HB3	3:A:113:VAL:O	2.13	0.48
3:A:164:THR:H	3:A:167:TRP:HB3	1.79	0.48
3:A:186:THR:OG1	3:A:208:LEU:HD21	2.13	0.48
3:A:742:GLU:O	3:A:745:GLU:HB2	2.12	0.48
2:P:953:DC:C5	2:P:953:DC:OP2	2.66	0.48
3:A:382:PRO:C	3:A:384:ASN:H	2.22	0.48
3:A:249:ARG:HE	3:A:252:LEU:HD11	1.78	0.48
3:A:605:LEU:HD23	3:A:793:LYS:HA	1.95	0.48
3:A:706:TRP:CE3	3:A:707:ILE:HD13	2.47	0.48
3:A:729:TYR:CD1	3:A:729:TYR:N	2.81	0.48
3:A:52:LEU:HD11	3:A:285:PHE:CD1	2.48	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:A:420:LEU:O	3:A:423:GLU:HB2	2.13	0.48
3:A:750:ASN:C	3:A:750:ASN:ND2	2.63	0.48
3:A:750:ASN:ND2	3:A:754:GLN:HG3	2.29	0.48
2:P:953:DC:OP2	2:P:953:DC:H6	1.95	0.48
3:A:123:ALA:HB1	3:A:148:LEU:HD21	1.96	0.48
3:A:465:GLU:O	3:A:468:ALA:HB3	2.13	0.48
3:A:595:ARG:NH2	3:A:828:LEU:HA	2.29	0.48
3:A:611:TYR:HB2	3:A:785:ASP:HB3	1.95	0.47
3:A:625:ASP:HB2	3:A:702:LYS:HB2	1.95	0.47
3:A:86:ALA:HB3	3:A:87:PRO:CD	2.44	0.47
3:A:149:LEU:O	3:A:176:PRO:HG2	2.13	0.47
3:A:625:ASP:OD2	3:A:700:PHE:HD1	1.97	0.47
3:A:795:ARG:O	3:A:799:VAL:HG23	2.14	0.47
3:A:810:VAL:HG13	3:A:811:TYR:N	2.29	0.47
3:A:169:TRP:O	3:A:173:GLY:HA2	2.14	0.47
3:A:437:LEU:HD22	3:A:762:LYS:HG2	1.97	0.47
3:A:625:ASP:O	3:A:627:ASN:N	2.47	0.47
3:A:632:PHE:HB2	3:A:815:VAL:CG1	2.45	0.47
3:A:86:ALA:HB3	3:A:87:PRO:HD3	1.96	0.47
3:A:41:VAL:O	3:A:41:VAL:HG22	2.15	0.47
3:A:239:LEU:C	3:A:241:LEU:H	2.23	0.47
3:A:287:LEU:C	3:A:288:LEU:HD23	2.40	0.47
3:A:295:GLU:CD	3:A:295:GLU:H	2.23	0.47
3:A:713:GLU:HB3	3:A:717:ARG:HH11	1.79	0.47
3:A:228:ILE:O	3:A:232:ILE:HG13	2.15	0.47
3:A:140:THR:O	3:A:158:PRO:HD3	2.14	0.46
3:A:187:GLY:O	3:A:191:ASP:HB3	2.16	0.46
1:T:903:DG:O6	2:P:954:DT:C4	2.68	0.46
3:A:26:THR:OG1	3:A:43:ALA:HA	2.15	0.46
1:T:902:DC:H2''	1:T:903:DG:O4'	2.15	0.46
2:P:951:DC:C2'	3:A:754:GLN:NE2	2.79	0.46
3:A:313:ARG:HD3	3:A:318:TRP:O	2.15	0.46
3:A:589:PRO:HB3	3:A:593:ARG:NH1	2.30	0.46
3:A:351:LEU:HD23	3:A:398:TRP:HZ3	1.80	0.46
3:A:611:TYR:HB3	3:A:614:ILE:HB	1.98	0.46
3:A:654:VAL:O	3:A:654:VAL:HG23	2.16	0.46
3:A:183:ARG:CZ	3:A:188:ASP:HB2	2.46	0.46
3:A:90:GLU:HG3	3:A:91:ASP:H	1.80	0.46
3:A:478:ALA:HA	3:A:497:GLU:OE2	2.15	0.46
3:A:216:ALA:HB2	3:A:221:LEU:HD12	1.96	0.46
3:A:604:TRP:HZ3	3:A:778:ARG:HG2	1.79	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:A:743:ALA:O	3:A:746:ARG:HB3	2.15	0.46
3:A:749:PHE:C	3:A:752:PRO:HD2	2.41	0.46
3:A:300:PRO:O	3:A:301:PRO:HA	2.16	0.46
3:A:112:GLU:O	3:A:112:GLU:HG3	2.16	0.45
3:A:607:VAL:CG1	3:A:609:LEU:HD11	2.44	0.45
3:A:639:HIS:CD2	3:A:666:ASN:HD22	2.34	0.45
3:A:62:VAL:HG11	3:A:108:LEU:HD22	1.98	0.45
3:A:157:HIS:CE1	3:A:159:GLU:HB2	2.51	0.45
3:A:306:PHE:O	3:A:326:ALA:HA	2.17	0.45
3:A:514:THR:HA	3:A:518:VAL:HB	1.97	0.45
3:A:737:VAL:O	3:A:740:VAL:HG12	2.16	0.45
3:A:137:ARG:HB3	3:A:156:LEU:CD1	2.39	0.45
3:A:207:LEU:HD13	3:A:211:TRP:CZ2	2.51	0.45
3:A:19:GLY:HA2	3:A:47:PHE:CE2	2.51	0.45
3:A:26:THR:HA	3:A:29:ALA:HB3	1.99	0.45
3:A:826:ASP:OD1	3:A:828:LEU:HB3	2.17	0.45
3:A:160:GLY:O	3:A:161:TYR:CD1	2.70	0.45
3:A:193:LEU:HD13	3:A:242:SER:OG	2.17	0.45
3:A:226:PRO:HA	3:A:230:GLU:HB2	1.99	0.45
3:A:410:GLU:HG3	3:A:411:ARG:N	2.32	0.45
3:A:497:GLU:O	3:A:498:LEU:HG	2.17	0.45
1:T:906:DC:H1'	1:T:907:DC:C5'	2.47	0.45
3:A:324:LEU:HD23	3:A:341:ALA:CB	2.42	0.44
3:A:482:PHE:HD1	3:A:482:PHE:H	1.65	0.44
3:A:607:VAL:HG13	3:A:823:ILE:HG12	1.99	0.44
3:A:202:LYS:HA	3:A:206:LYS:CB	2.44	0.44
3:A:605:LEU:CD2	3:A:793:LYS:HD3	2.47	0.44
2:P:951:DC:C6	2:P:951:DC:OP2	2.70	0.44
3:A:328:ARG:C	3:A:330:GLY:H	2.25	0.44
3:A:532:ILE:HG13	3:A:533:LEU:N	2.32	0.44
3:A:800:ALA:CB	3:A:823:ILE:HD11	2.47	0.44
3:A:16:LEU:HD12	3:A:138:ILE:HG12	1.99	0.44
3:A:229:ARG:NH1	3:A:233:LEU:HD11	2.33	0.44
3:A:673:MET:HE2	3:A:681:GLU:OE2	2.18	0.44
2:P:951:DC:OP2	2:P:951:DC:C5	2.71	0.44
3:A:28:HIS:HA	3:A:31:LYS:HE2	2.00	0.44
3:A:527:PRO:O	3:A:531:LYS:HG2	2.18	0.44
3:A:11:LYS:HD2	3:A:11:LYS:HA	1.83	0.44
3:A:90:GLU:HG3	3:A:91:ASP:N	2.33	0.44
1:T:905:DT:C4'	3:A:580:ASN:HD22	2.31	0.43
3:A:217:LEU:HD12	3:A:239:LEU:CD1	2.48	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:A:319:ALA:O	3:A:362:ARG:NH2	2.51	0.43
3:A:236:MET:O	3:A:237:ASP:HB2	2.19	0.43
3:A:382:PRO:HB2	3:A:728:ARG:NH2	2.34	0.43
3:A:627:ASN:O	3:A:630:ARG:HB3	2.18	0.43
3:A:751:MET:HB3	3:A:752:PRO:HD3	2.01	0.43
3:A:38:GLY:O	3:A:39:GLU:C	2.62	0.43
3:A:514:THR:O	3:A:515:SER:C	2.62	0.43
3:A:538:LEU:HD23	3:A:538:LEU:HA	1.83	0.43
3:A:140:THR:HG21	3:A:145:LEU:CD1	2.44	0.43
3:A:221:LEU:HD13	3:A:221:LEU:C	2.44	0.43
2:P:953:DC:H6	2:P:953:DC:P	2.41	0.43
3:A:16:LEU:HD11	3:A:126:ALA:CA	2.49	0.43
3:A:100:LYS:HB3	3:A:110:ARG:HD2	2.01	0.43
3:A:438:SER:HA	3:A:566:GLN:NE2	2.33	0.43
3:A:123:ALA:HA	3:A:148:LEU:HD11	1.99	0.43
3:A:473:GLU:O	3:A:476:ARG:HB3	2.19	0.43
3:A:17:VAL:HB	3:A:64:VAL:HG22	2.01	0.43
3:A:267:GLU:HG3	3:A:268:ARG:N	2.34	0.43
3:A:376:LEU:HD22	3:A:420:LEU:HD13	2.01	0.43
3:A:428:TRP:NE1	3:A:432:GLU:HG3	2.34	0.43
3:A:624:GLY:HA2	3:A:629:ILE:HD11	2.00	0.43
2:P:954:DT:H71	2:P:954:DT:OP2	2.19	0.43
3:A:209:GLU:CD	3:A:209:GLU:H	2.26	0.43
3:A:30:LEU:O	3:A:32:GLY:N	2.52	0.42
3:A:33:LEU:HB2	3:A:42:GLN:HB3	2.01	0.42
3:A:201:GLU:O	3:A:206:LYS:HE2	2.18	0.42
3:A:52:LEU:HD12	3:A:52:LEU:HA	1.77	0.42
3:A:137:ARG:HA	3:A:154:HIS:O	2.19	0.42
3:A:523:ARG:HH21	3:A:530:GLU:HG3	1.84	0.42
3:A:715:ARG:HB2	3:A:734:GLU:HG2	2.01	0.42
3:A:106:LEU:HD11	3:A:285:PHE:HE1	1.84	0.42
3:A:335:ALA:HB1	3:A:341:ALA:HB2	2.01	0.42
3:A:605:LEU:HD23	3:A:793:LYS:O	2.19	0.42
3:A:628:LEU:HD13	3:A:700:PHE:CE1	2.54	0.42
1:T:902:DC:C6	1:T:902:DC:OP2	2.72	0.42
3:A:811:TYR:HA	3:A:812:PRO:HD3	1.84	0.42
3:A:224:LEU:HG	3:A:225:LYS:N	2.34	0.42
3:A:351:LEU:HD11	3:A:374:MET:HE2	2.02	0.42
3:A:518:VAL:HG12	3:A:518:VAL:O	2.19	0.42
3:A:581:LEU:HB2	3:A:783:VAL:HG13	2.01	0.42
3:A:692:PHE:N	3:A:692:PHE:CD1	2.87	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:A:189:GLU:C	3:A:191:ASP:H	2.28	0.42
3:A:231:LYS:HD3	3:A:231:LYS:HA	1.86	0.42
3:A:378:TYR:CZ	3:A:567:THR:HA	2.54	0.42
3:A:465:GLU:O	3:A:469:ARG:HG3	2.19	0.42
3:A:670:LEU:H	3:A:670:LEU:HD22	1.84	0.42
3:A:311:LEU:HB3	3:A:319:ALA:HB1	2.00	0.42
3:A:43:ALA:HB3	3:A:95:GLN:OE1	2.20	0.42
3:A:468:ALA:O	3:A:469:ARG:C	2.62	0.42
3:A:758:ALA:O	3:A:762:LYS:HD3	2.20	0.42
3:A:299:TRP:HB3	3:A:300:PRO:HD3	2.02	0.42
1:T:907:DC:C2'	1:T:908:DG:C8	3.02	0.41
3:A:66:PHE:HZ	3:A:99:ILE:HG22	1.83	0.41
3:A:175:ARG:HB2	3:A:177:ASP:OD1	2.20	0.41
3:A:183:ARG:NE	3:A:245:LEU:HD21	2.35	0.41
3:A:450:ARG:HH12	3:A:602:GLU:HB2	1.85	0.41
3:A:571:THR:O	3:A:751:MET:HE2	2.20	0.41
3:A:668:GLY:O	3:A:669:VAL:C	2.63	0.41
3:A:692:PHE:N	3:A:692:PHE:HD1	2.18	0.41
3:A:486:SER:O	3:A:487:ARG:C	2.62	0.41
3:A:744:ALA:O	3:A:745:GLU:C	2.63	0.41
3:A:218:LEU:O	3:A:219:LYS:CB	2.68	0.41
3:A:447:THR:HG22	3:A:448:GLY:O	2.19	0.41
3:A:625:ASP:CB	3:A:702:LYS:HB2	2.49	0.41
3:A:198:GLY:HA2	3:A:203:THR:CA	2.42	0.41
3:A:682:LEU:HB3	3:A:685:PRO:CG	2.51	0.41
3:A:722:THR:CG2	3:A:755:GLY:HA3	2.49	0.41
3:A:733:LEU:HD23	3:A:733:LEU:HA	1.89	0.41
3:A:17:VAL:HB	3:A:64:VAL:HA	2.02	0.41
3:A:495:PHE:N	3:A:495:PHE:CD1	2.86	0.41
3:A:778:ARG:HG3	3:A:790:GLU:HB3	2.02	0.41
1:T:904:DA:C2'	1:T:905:DT:O5'	2.66	0.41
2:P:951:DC:H5'	3:A:784:HIS:CG	2.55	0.41
3:A:314:LYS:O	3:A:316:PRO:HD3	2.20	0.41
3:A:667:PHE:CE2	3:A:671:TYR:HE2	2.38	0.41
3:A:687:GLU:C	3:A:689:ALA:H	2.29	0.41
2:P:951:DC:C2'	3:A:754:GLN:HE22	2.33	0.41
3:A:295:GLU:CD	3:A:295:GLU:N	2.79	0.41
3:A:524:GLU:HG3	3:A:526:HIS:HB2	2.02	0.41
1:T:905:DT:C2	1:T:906:DC:C5	3.09	0.41
3:A:202:LYS:CA	3:A:206:LYS:HB3	2.49	0.41
3:A:225:LYS:HE3	3:A:225:LYS:HB3	1.87	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:A:276:LEU:N	3:A:276:LEU:HD23	2.36	0.41
3:A:684:ILE:CG2	3:A:685:PRO:HD3	2.47	0.41
3:A:767:LYS:O	3:A:770:PRO:HD2	2.21	0.41
3:A:574:LEU:HD12	3:A:782:GLN:HE21	1.86	0.41
3:A:518:VAL:HA	3:A:521:ALA:HB3	2.03	0.40
3:A:626:GLU:CD	3:A:626:GLU:H	2.28	0.40
3:A:652:GLU:H	3:A:652:GLU:CD	2.29	0.40
3:A:733:LEU:HD11	3:A:748:ALA:HB2	2.02	0.40
2:P:955:DA:H5"	3:A:519:LEU:HD23	2.00	0.40
3:A:45:TYR:CD1	3:A:45:TYR:C	3.00	0.40
3:A:610:ASP:HB2	3:A:832:GLU:C	2.46	0.40
3:A:299:TRP:HB3	3:A:300:PRO:CD	2.52	0.40
3:A:552:LEU:HB3	3:A:560:LEU:CD1	2.52	0.40
3:A:609:LEU:HD21	3:A:803:ALA:CB	2.51	0.40
3:A:27:PHE:HA	3:A:43:ALA:HB2	2.02	0.40
3:A:106:LEU:HD21	3:A:285:PHE:CD1	2.56	0.40
3:A:129:ALA:HB2	3:A:258:PHE:CE2	2.56	0.40
3:A:304:GLY:O	3:A:349:ARG:NH1	2.55	0.40
3:A:470:LEU:HD13	3:A:470:LEU:HA	1.93	0.40
3:A:608:ALA:C	3:A:609:LEU:HD12	2.47	0.40
3:A:143:LYS:HE3	3:A:183:ARG:NH1	2.37	0.40
3:A:609:LEU:HD12	3:A:609:LEU:N	2.36	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
3	A	785/832 (94%)	653 (83%)	93 (12%)	39 (5%)	1 10

All (39) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
3	A	31	LYS
3	A	37	ARG
3	A	86	ALA
3	A	161	TYR
3	A	220	ASN
3	A	221	LEU
3	A	496	ASP
3	A	517	ALA
3	A	626	GLU
3	A	674	SER
3	A	675	ALA
3	A	793	LYS
3	A	36	SER
3	A	190	SER
3	A	208	LEU
3	A	215	GLU
3	A	216	ALA
3	A	219	LYS
3	A	227	ALA
3	A	487	ARG
3	A	625	ASP
3	A	203	THR
3	A	486	SER
3	A	149	LEU
3	A	288	LEU
3	A	516	ALA
3	A	602	GLU
3	A	132	GLU
3	A	197	LYS
3	A	199	ILE
3	A	567	THR
3	A	637	ASP
3	A	683	ALA
3	A	39	GLU
3	A	299	TRP
3	A	256	VAL
3	A	198	GLY
3	A	226	PRO
3	A	382	PRO

5.3.2 Protein sidechains ⓘ

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
3	A	655/683 (96%)	558 (85%)	97 (15%)	3 15

All (97) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	A	35	THR
3	A	36	SER
3	A	42	GLN
3	A	52	LEU
3	A	57	GLU
3	A	90	GLU
3	A	103	VAL
3	A	139	LEU
3	A	159	GLU
3	A	161	TYR
3	A	162	LEU
3	A	168	LEU
3	A	169	TRP
3	A	171	LYS
3	A	178	GLN
3	A	182	TYR
3	A	189	GLU
3	A	205	ARG
3	A	209	GLU
3	A	211	TRP
3	A	229	ARG
3	A	232	ILE
3	A	233	LEU
3	A	235	HIS
3	A	245	LEU
3	A	247	LYS
3	A	249	ARG
3	A	252	LEU
3	A	254	LEU
3	A	255	GLU

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Mol	Chain	Res	Type
3	A	257	ASP
3	A	261	ARG
3	A	262	ARG
3	A	276	LEU
3	A	280	SER
3	A	283	HIS
3	A	288	LEU
3	A	292	LYS
3	A	294	LEU
3	A	307	VAL
3	A	322	LEU
3	A	334	ARG
3	A	337	GLU
3	A	343	ARG
3	A	362	ARG
3	A	365	LEU
3	A	383	SER
3	A	390	VAL
3	A	397	GLU
3	A	405	ARG
3	A	419	ARG
3	A	456	LEU
3	A	462	GLU
3	A	477	LEU
3	A	484	LEU
3	A	519	LEU
3	A	524	GLU
3	A	526	HIS
3	A	541	LEU
3	A	542	LYS
3	A	550	PRO
3	A	576	SER
3	A	579	PRO
3	A	583	ASN
3	A	588	THR
3	A	590	LEU
3	A	593	ARG
3	A	617	ARG
3	A	618	VAL
3	A	619	LEU
3	A	626	GLU
3	A	633	GLN

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Mol	Chain	Res	Type
3	A	636	ARG
3	A	652	GLU
3	A	658	MET
3	A	670	LEU
3	A	679	SER
3	A	680	GLN
3	A	681	GLU
3	A	682	LEU
3	A	694	GLU
3	A	699	SER
3	A	728	ARG
3	A	730	VAL
3	A	736	ARG
3	A	745	GLU
3	A	746	ARG
3	A	747	MET
3	A	750	ASN
3	A	752	PRO
3	A	781	LEU
3	A	783	VAL
3	A	805	GLU
3	A	815	VAL
3	A	817	LEU
3	A	818	GLU
3	A	820	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (13) such sidechains are listed below:

Mol	Chain	Res	Type
3	A	20	HIS
3	A	154	HIS
3	A	480	HIS
3	A	489	GLN
3	A	534	GLN
3	A	566	GLN
3	A	583	ASN
3	A	592	GLN
3	A	633	GLN
3	A	639	HIS
3	A	680	GLN
3	A	750	ASN
3	A	782	GLN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 2 ligands modelled in this entry, 1 is monoatomic - leaving 1 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	$\# Z > 2$
4	BGL	A	1001	-	20,20,20	1.14	3 (15%)	24,25,25	2.60	11 (45%)

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	BGL	A	1001	-	-	3/11/31/31	0/1/1/1

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	1001	BGL	O3-C3	-2.96	1.35	1.43
4	A	1001	BGL	O4-C4	-2.35	1.37	1.43
4	A	1001	BGL	C4-C3	2.27	1.58	1.52

All (11) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	1001	BGL	O2-C2-C3	5.75	121.41	109.83
4	A	1001	BGL	C1-O5-C5	-5.22	103.55	113.65
4	A	1001	BGL	C6-C5-C4	4.00	122.83	113.02
4	A	1001	BGL	O3-C3-C4	-3.96	101.05	110.38
4	A	1001	BGL	C4-C3-C2	3.75	118.20	109.68
4	A	1001	BGL	O1-C1-O5	-3.68	99.47	110.41
4	A	1001	BGL	O6-C6-C5	-2.65	102.29	111.33
4	A	1001	BGL	O1-C1-C2	2.55	120.96	109.70
4	A	1001	BGL	O5-C1-C2	-2.52	102.37	110.21
4	A	1001	BGL	C1'-O2-C2	2.38	119.31	114.02
4	A	1001	BGL	C3'-C2'-C1'	2.14	122.75	113.47

There are no chirality outliers.

All (3) torsion outliers are listed below:

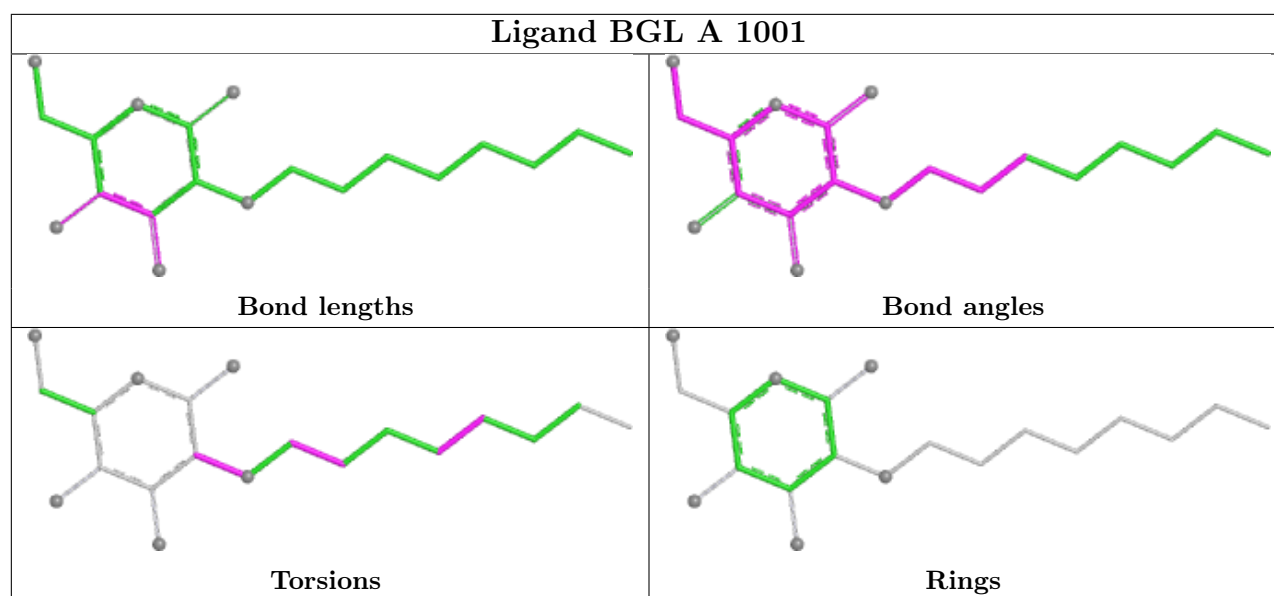
Mol	Chain	Res	Type	Atoms
4	A	1001	BGL	C3-C2-O2-C1'
4	A	1001	BGL	O2-C1'-C2'-C3'
4	A	1001	BGL	C3'-C4'-C5'-C6'

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	1001	BGL	1	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](#)

The following chains have linkage breaks:

Mol	Chain	Number of breaks
3	A	1

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	A	300:PRO	C	301:PRO	N	3.05

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	T	8/8 (100%)	2.70	7 (87%) 0 0	48, 52, 55, 57	0
2	P	8/8 (100%)	2.76	8 (100%) 0 0	49, 52, 56, 58	0
3	A	793/832 (95%)	0.32	66 (8%) 17 9	7, 30, 79, 100	0
All	All	809/848 (95%)	0.37	81 (10%) 12 7	7, 32, 79, 100	0

All (81) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
3	A	227	ALA	6.0
3	A	518	VAL	5.6
3	A	674	SER	5.3
3	A	88	THR	4.7
3	A	150	SER	4.5
3	A	203	THR	4.5
3	A	194	PRO	4.5
3	A	218	LEU	4.4
3	A	195	GLY	4.3
3	A	208	LEU	4.1
3	A	794	GLU	4.1
3	A	212	GLY	4.0
3	A	515	SER	3.9
3	A	204	ALA	3.9
1	T	907	DC	3.9
3	A	517	ALA	3.8
3	A	516	ALA	3.6
3	A	160	GLY	3.4
3	A	495	PHE	3.4
2	P	957	DG	3.4
3	A	151	ASP	3.3
3	A	294	LEU	3.2
1	T	901	DG	3.2

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Mol	Chain	Res	Type	RSRZ
3	A	169	TRP	3.2
3	A	199	ILE	3.2
3	A	200	GLY	3.1
3	A	230	GLU	3.1
3	A	529	VAL	3.1
3	A	496	ASP	3.1
3	A	685	PRO	3.1
2	P	954	DT	3.0
1	T	903	DG	3.0
3	A	221	LEU	3.0
2	P	958	DC	3.0
3	A	521	ALA	3.0
3	A	257	ASP	3.0
3	A	519	LEU	2.9
3	A	170	GLU	2.9
2	P	951	DC	2.9
3	A	222	ASP	2.8
3	A	468	ALA	2.8
3	A	472	ALA	2.8
3	A	244	ASP	2.8
3	A	215	GLU	2.8
3	A	236	MET	2.7
3	A	191	ASP	2.7
3	A	491	GLU	2.7
3	A	677	ARG	2.7
3	A	86	ALA	2.7
3	A	245	LEU	2.7
2	P	956	DG	2.6
3	A	466	GLU	2.6
3	A	524	GLU	2.6
3	A	189	GLU	2.5
3	A	240	LYS	2.5
2	P	953	DC	2.5
3	A	486	SER	2.5
3	A	246	ALA	2.5
3	A	213	SER	2.5
3	A	300	PRO	2.4
1	T	906	DC	2.4
1	T	902	DC	2.4
1	T	904	DA	2.4
2	P	955	DA	2.4
1	T	908	DG	2.3

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Mol	Chain	Res	Type	RSRZ
3	A	237	ASP	2.3
2	P	952	DG	2.3
3	A	211	TRP	2.3
3	A	87	PRO	2.3
3	A	247	LYS	2.2
3	A	686	TYR	2.2
3	A	217	LEU	2.2
3	A	480	HIS	2.2
3	A	525	ALA	2.1
3	A	488	ASP	2.1
3	A	224	LEU	2.1
3	A	679	SER	2.1
3	A	739	SER	2.1
3	A	193	LEU	2.1
3	A	293	ALA	2.1
3	A	37	ARG	2.0

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

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

6.3 Carbohydrates [i](#)

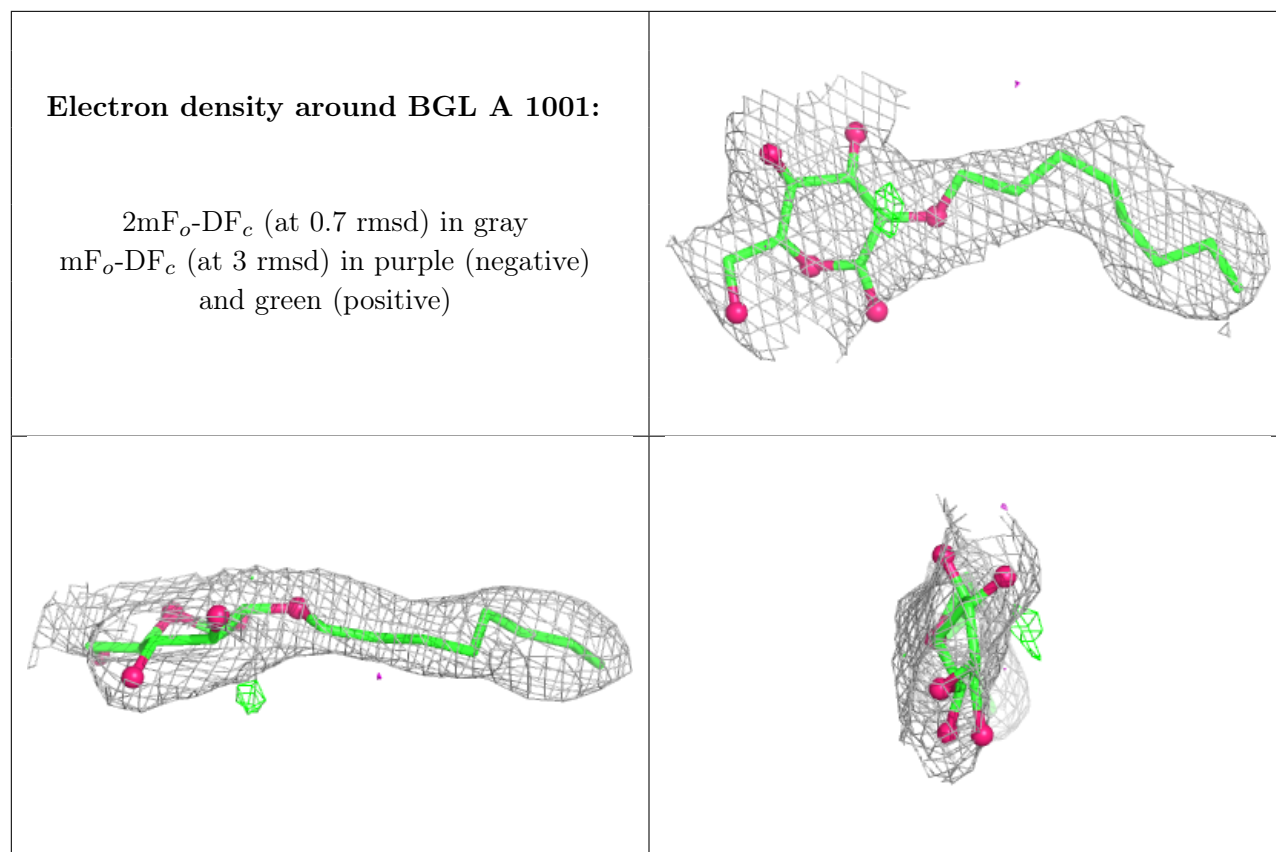
There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
4	BGL	A	1001	20/20	0.91	0.10	10,22,41,46	0
5	ZN	A	900	1/1	0.93	0.04	58,58,58,58	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.