



# Full wwPDB X-ray Structure Validation Report ⓘ

Jun 14, 2020 – 10:19 pm BST

PDB ID : 3DD2  
Title : Crystal structure of an RNA aptamer bound to human thrombin  
Authors : Long, S.B.; Sullenger, B.A.  
Deposited on : 2008-06-04  
Resolution : 1.90 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](mailto: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.

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

MolProbity : 4.02b-467  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 2.11  
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) : 2.11

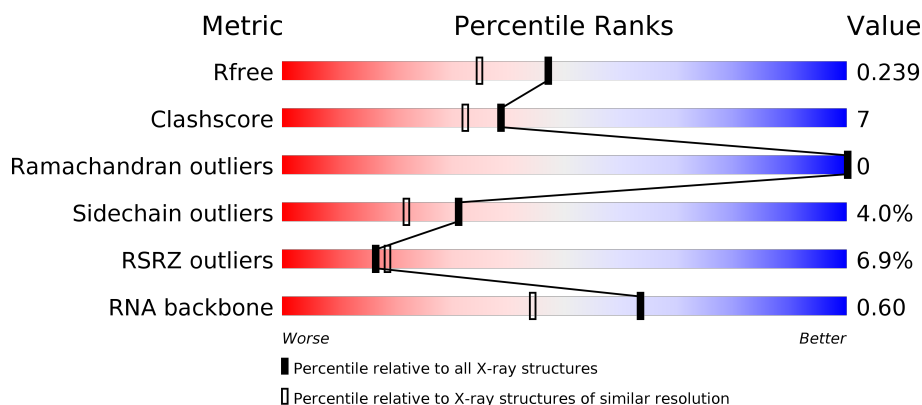
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.90 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	6207 (1.90-1.90)
Clashscore	141614	6847 (1.90-1.90)
Ramachandran outliers	138981	6760 (1.90-1.90)
Sidechain outliers	138945	6760 (1.90-1.90)
RSRZ outliers	127900	6082 (1.90-1.90)
RNA backbone	3102	1013 (2.42-1.38)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments on the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 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	L	30	<div> <div>17%</div> <div>70%</div> <div>30%</div> </div>
2	H	258	<div> <div>6%</div> <div>86%</div> <div>13%</div> </div>
3	B	26	<div> <div>69%</div> <div>31%</div> </div>

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
3	CFL	B	11	X	-	-	-
3	CFL	B	19	X	-	-	-
3	CFL	B	23	X	-	-	-
3	CFL	B	24	X	-	-	-
3	CFL	B	25	X	-	-	-
3	CFL	B	6	X	-	-	-

## 2 Entry composition [i](#)

There are 9 unique types of molecules in this entry. The entry contains 3214 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 Thrombin light chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	L	30	Total	C	N	O	S	0	0	0
			244	151	39	53	1			

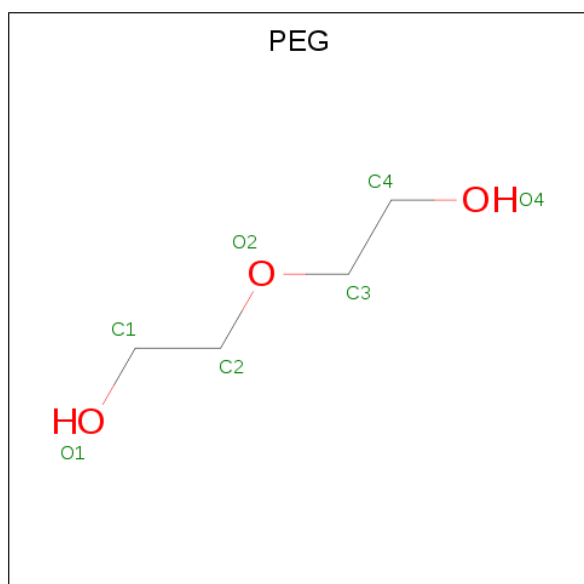
- Molecule 2 is a protein called Thrombin heavy chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	H	258	Total	C	N	O	S	0	0	0
			2084	1329	369	372	14			

- Molecule 3 is a RNA chain called RNA (26-MER).

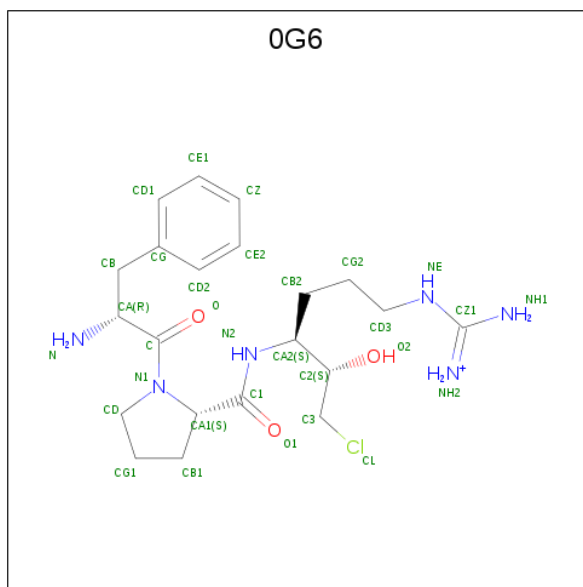
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	B	26	Total	C	F	N	O	P	0	0
			537	240	10	101	161	25		

- Molecule 4 is DI(HYDROXYETHYL)ETHER (three-letter code: PEG) (formula: C<sub>4</sub>H<sub>10</sub>O<sub>3</sub>).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	L	1	Total	C	O	0	0
			7	4	3		
4	B	1	Total	C	O	0	0
			7	4	3		
4	B	1	Total	C	O	0	0
			7	4	3		

- Molecule 5 is D-phenylalanyl-N-[(2S,3S)-6-{[amino(iminio)methyl]amino}-1-chloro-2-hydroxyhexan-3-yl]-L-prolinamide (three-letter code: 0G6) (formula:  $C_{21}H_{34}ClN_6O_3$ ).

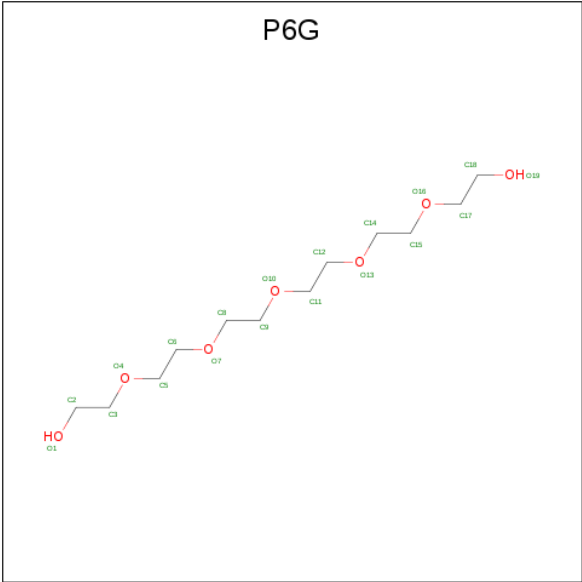


Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
5	H	1	Total	C	N	O	0	0
			30	21	6	3		

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

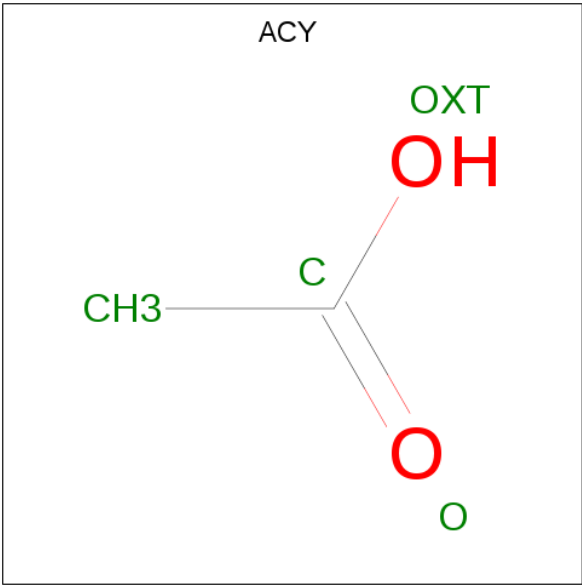
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	H	1	Total	Mg	0	0
			1	1		
6	B	1	Total	Mg	0	0
			1	1		

- Molecule 7 is HEXAETHYLENE GLYCOL (three-letter code: P6G) (formula:  $C_{12}H_{26}O_7$ ).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
7	H	1	Total	C	O	0	0
			19	12	7		

- Molecule 8 is ACETIC ACID (three-letter code: ACY) (formula: C<sub>2</sub>H<sub>4</sub>O<sub>2</sub>).



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

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

- Molecule 9 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
9	L	23	Total	O	0	0
			23	23		
9	H	186	Total	O	0	0
			186	186		
9	B	44	Total	O	0	0
			44	44		

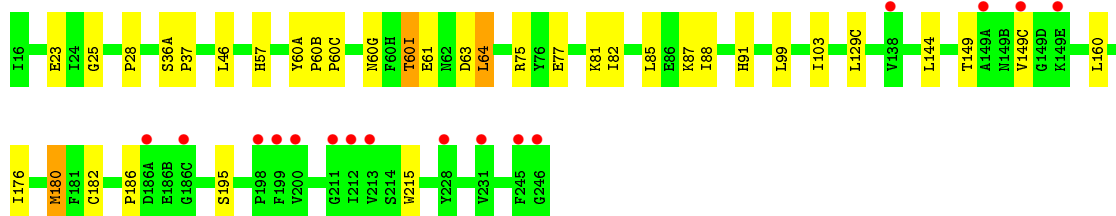
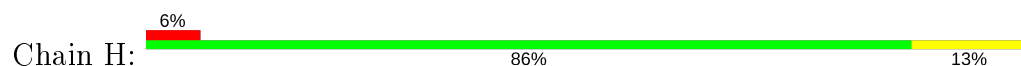
### 3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA 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: Thrombin light chain



- Molecule 2: Thrombin heavy chain



- Molecule 3: RNA (26-MER)





## 4 Data and refinement statistics

Property	Value	Source
Space group	P 2 <sub>1</sub> 2 <sub>1</sub> 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	83.77Å 134.02Å 44.03Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	30.35 – 1.90 30.35 – 1.90	Depositor EDS
% Data completeness (in resolution range)	89.0 (30.35-1.90) 89.1 (30.35-1.90)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.05	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.16 (at 1.91Å)	Xtriage
Refinement program	CNS 1.1	Depositor
R, $R_{free}$	0.204 , 0.254 0.194 , 0.239	Depositor DCC
$R_{free}$ test set	1764 reflections (4.96%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	25.1	Xtriage
Anisotropy	0.961	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.34 , 55.8	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	3214	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	38.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.24% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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: CFL, MG, 0G6, P6G, ACY, PEG, UFT

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	L	0.51	0/246	0.71	0/326
2	H	0.51	1/2139 (0.0%)	0.71	0/2891
3	B	0.45	0/381	0.66	0/596
All	All	0.50	1/2766 (0.0%)	0.70	0/3813

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
3	B	6	3

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	H	180	MET	SD-CE	-5.39	1.47	1.77

There are no bond angle outliers.

All (6) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
3	B	6	CFL	C2'
3	B	11	CFL	C2'
3	B	19	CFL	C2'
3	B	23	CFL	C2'
3	B	24	CFL	C2'
3	B	25	CFL	C2'

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
3	B	13	G	Sidechain
3	B	7	A	Sidechain
3	B	9	A	Sidechain

## 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	L	244	0	238	6	0
2	H	2084	0	2057	31	0
3	B	537	0	262	4	0
4	B	14	0	20	2	0
4	L	7	0	10	1	0
5	H	30	0	31	1	0
6	B	1	0	0	0	0
6	H	1	0	0	0	0
7	H	19	0	26	0	0
8	B	8	0	6	0	0
8	H	16	0	12	2	0
9	B	44	0	0	0	0
9	H	186	0	0	3	0
9	L	23	0	0	1	0
All	All	3214	0	2662	42	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 (42) 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:H:85:LEU:HD13	2:H:88:ILE:HD11	1.76	0.67
1:L:5:PRO:HA	1:L:9:LYS:HD2	1.80	0.63
2:H:61:GLU:HG2	2:H:87:LYS:HA	1.82	0.62
2:H:61:GLU:HG3	2:H:88:ILE:HD13	1.81	0.62
8:H:1006:ACY:H2	9:H:1062:HOH:O	1.99	0.62
2:H:61:GLU:CG	2:H:87:LYS:HA	2.32	0.60
2:H:64:LEU:CD1	2:H:85:LEU:HD12	2.33	0.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:L:14(A):LYS:HG2	2:H:23:GLU:OE2	2.06	0.56
2:H:81:LYS:HE2	2:H:82:ILE:O	2.07	0.55
2:H:25:GLY:O	2:H:28:PRO:HD3	2.07	0.54
2:H:60(I):THR:HG23	2:H:63:ASP:OD2	2.08	0.53
2:H:64:LEU:HD13	2:H:85:LEU:HD12	1.91	0.52
3:B:3:G:H21	4:B:103:PEG:H21	1.75	0.52
2:H:60(G):ASN:HD22	8:H:1007:ACY:H3	1.75	0.51
2:H:64:LEU:HD13	2:H:85:LEU:CD1	2.41	0.51
2:H:64:LEU:H	2:H:64:LEU:HD12	1.76	0.51
2:H:176:ILE:HG23	2:H:180:MET:HE2	1.93	0.50
2:H:149:THR:HB	2:H:149(C):VAL:HG22	1.94	0.49
2:H:149:THR:O	2:H:149(C):VAL:HG22	2.14	0.48
1:L:14(A):LYS:HG3	1:L:14(B):THR:HG23	1.95	0.47
2:H:176:ILE:HA	2:H:180:MET:CE	2.44	0.47
4:L:305:PEG:H32	3:B:14:A:C2	2.49	0.47
1:L:10:LYS:NZ	9:L:281:HOH:O	2.47	0.47
3:B:3:G:H21	4:B:103:PEG:H32	1.80	0.46
2:H:176:ILE:HG23	2:H:180:MET:CE	2.46	0.45
2:H:186:PRO:HD2	9:H:1185:HOH:O	2.17	0.45
2:H:64:LEU:HD12	2:H:64:LEU:N	2.32	0.45
2:H:75:ARG:NH2	2:H:77:GLU:HG2	2.32	0.45
2:H:99:LEU:HD12	2:H:215:TRP:HB3	2.00	0.44
2:H:176:ILE:HA	2:H:180:MET:HE1	2.00	0.44
2:H:85:LEU:CD1	2:H:88:ILE:HD11	2.48	0.43
2:H:75:ARG:HH11	2:H:75:ARG:HG2	1.84	0.42
1:L:14(A):LYS:HE3	9:H:1149:HOH:O	2.20	0.42
2:H:60(B):PRO:HB2	2:H:60(C):PRO:HD3	2.01	0.42
2:H:91:HIS:HB2	2:H:103:ILE:HG23	2.03	0.41
2:H:57:HIS:CE1	2:H:195:SER:OG	2.73	0.41
3:B:23:CFL:H2'	3:B:24:CFL:H6	2.01	0.41
1:L:1(A):ASP:N	1:L:1(A):ASP:OD1	2.51	0.41
2:H:75:ARG:NH1	2:H:75:ARG:HG2	2.37	0.40
2:H:36(A):SER:HA	2:H:37:PRO:C	2.42	0.40
2:H:60(A):TYR:CE2	2:H:60(C):PRO:HB2	2.56	0.40
5:H:1:0G6:CD1	5:H:1:0G6:HD3	2.52	0.40

There are no symmetry-related clashes.

## 5.3 Torsion angles

### 5.3.1 Protein backbone

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	L	28/30 (93%)	25 (89%)	3 (11%)	0	100	100
2	H	256/258 (99%)	247 (96%)	9 (4%)	0	100	100
All	All	284/288 (99%)	272 (96%)	12 (4%)	0	100	100

There are no Ramachandran outliers to report.

### 5.3.2 Protein sidechains

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	L	27/27 (100%)	24 (89%)	3 (11%)	6	2
2	H	224/224 (100%)	217 (97%)	7 (3%)	40	32
All	All	251/251 (100%)	241 (96%)	10 (4%)	31	22

All (10) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	L	3	LEU
1	L	6	LEU
1	L	14(G)	LEU
2	H	46	LEU
2	H	60(I)	THR
2	H	64	LEU
2	H	129(C)	LEU
2	H	144	LEU

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Mol	Chain	Res	Type
2	H	160	LEU
2	H	182	CYS

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
2	H	38	GLN
2	H	244	GLN

### 5.3.3 RNA ⓘ

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
3	B	20/26 (76%)	1 (5%)	0

All (1) RNA backbone outliers are listed below:

Mol	Chain	Res	Type
3	B	18	A

There are no RNA pucker outliers to report.

## 5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

10 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
3	UFT	B	17	3	14,21,22	1.34	2 (14%)	14,30,33	1.39	1 (7%)
3	UFT	B	21	3	14,21,22	1.09	1 (7%)	14,30,33	1.33	1 (7%)
3	CFL	B	23	3	15,21,22	0.84	0	17,30,33	1.18	1 (5%)
3	CFL	B	24	3	15,21,22	0.80	0	17,30,33	1.23	2 (11%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
3	CFL	B	11	3	15,21,22	0.87	0	17,30,33	1.10	1 (5%)
3	CFL	B	19	3	15,21,22	0.73	0	17,30,33	1.10	1 (5%)
3	UFT	B	20	3	14,21,22	1.21	2 (14%)	14,30,33	1.32	2 (14%)
3	CFL	B	25	3	15,21,22	0.84	0	17,30,33	1.21	2 (11%)
3	CFL	B	6	3	15,21,22	0.89	0	17,30,33	1.13	2 (11%)
3	UFT	B	12	3	14,21,22	1.08	1 (7%)	14,30,33	1.32	2 (14%)

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
3	UFT	B	17	3	-	0/5/25/26	0/2/2/2
3	UFT	B	21	3	-	0/5/25/26	0/2/2/2
3	CFL	B	23	3	1/1/5/5	0/5/25/26	0/2/2/2
3	CFL	B	24	3	1/1/5/5	0/5/25/26	0/2/2/2
3	CFL	B	11	3	1/1/5/5	0/5/25/26	0/2/2/2
3	CFL	B	19	3	1/1/5/5	0/5/25/26	0/2/2/2
3	UFT	B	20	3	-	0/5/25/26	0/2/2/2
3	CFL	B	25	3	1/1/5/5	0/5/25/26	0/2/2/2
3	CFL	B	6	3	1/1/5/5	0/5/25/26	0/2/2/2
3	UFT	B	12	3	-	0/5/25/26	0/2/2/2

All (6) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	17	UFT	C4-N3	3.50	1.39	1.33
3	B	20	UFT	C4-N3	3.08	1.38	1.33
3	B	12	UFT	C4-N3	2.76	1.37	1.33
3	B	17	UFT	C6-N1	2.61	1.39	1.35
3	B	21	UFT	C4-N3	2.58	1.37	1.33
3	B	20	UFT	C6-C5	-2.03	1.33	1.38

All (15) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	12	UFT	C5-C4-N3	-4.04	114.43	123.31
3	B	17	UFT	C5-C4-N3	-3.97	114.56	123.31
3	B	20	UFT	C5-C4-N3	-3.95	114.63	123.31
3	B	21	UFT	C5-C4-N3	-3.85	114.84	123.31

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	11	CFL	C2-N3-C4	3.70	120.09	116.34
3	B	25	CFL	C2-N3-C4	3.68	120.07	116.34
3	B	19	CFL	C2-N3-C4	3.60	119.99	116.34
3	B	23	CFL	C2-N3-C4	3.57	119.96	116.34
3	B	6	CFL	C2-N3-C4	3.48	119.86	116.34
3	B	24	CFL	C2-N3-C4	3.45	119.84	116.34
3	B	24	CFL	F-C2'-C3'	2.35	114.15	109.22
3	B	6	CFL	O4'-C1'-C2'	2.24	108.10	105.79
3	B	25	CFL	O4'-C1'-C2'	2.21	108.07	105.79
3	B	20	UFT	O4'-C1'-C2'	2.04	107.89	105.79
3	B	12	UFT	O4'-C1'-C2'	2.02	107.87	105.79

All (6) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
3	B	23	CFL	C2'
3	B	24	CFL	C2'
3	B	11	CFL	C2'
3	B	19	CFL	C2'
3	B	25	CFL	C2'
3	B	6	CFL	C2'

There are no torsion outliers.

There are no ring outliers.

2 monomers are involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	23	CFL	1	0
3	B	24	CFL	1	0

## 5.5 Carbohydrates [i](#)

There are no carbohydrates in this entry.

## 5.6 Ligand geometry [i](#)

Of 13 ligands modelled in this entry, 2 are monoatomic - leaving 11 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	PEG	B	104	-	6,6,6	1.05	1 (16%)	5,5,5	1.56	1 (20%)
8	ACY	H	1005	-	1,3,3	2.89	1 (100%)	0,3,3	0.00	-
4	PEG	L	305	-	6,6,6	1.19	1 (16%)	5,5,5	1.58	1 (20%)
8	ACY	H	1007	-	1,3,3	2.95	1 (100%)	0,3,3	0.00	-
5	0G6	H	1	2	30,31,32	0.55	0	37,41,42	0.53	0
4	PEG	B	103	-	6,6,6	1.14	1 (16%)	5,5,5	1.63	1 (20%)
8	ACY	H	1004	-	1,3,3	2.90	1 (100%)	0,3,3	0.00	-
8	ACY	B	152	-	1,3,3	2.82	1 (100%)	0,3,3	0.00	-
7	P6G	H	1003	-	18,18,18	1.97	5 (27%)	17,17,17	1.26	1 (5%)
8	ACY	B	151	-	1,3,3	2.88	1 (100%)	0,3,3	0.00	-
8	ACY	H	1006	-	1,3,3	2.48	1 (100%)	0,3,3	0.00	-

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	PEG	B	103	-	-	1/4/4/4	-
4	PEG	B	104	-	-	0/4/4/4	-
5	0G6	H	1	2	-	1/31/41/43	0/2/2/2
7	P6G	H	1003	-	-	4/16/16/16	-
4	PEG	L	305	-	-	1/4/4/4	-

All (14) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	H	1003	P6G	O10-C9	4.36	1.61	1.42
7	H	1003	P6G	O13-C12	3.73	1.58	1.42
7	H	1003	P6G	O16-C15	3.39	1.56	1.42
7	H	1003	P6G	O19-C18	3.37	1.59	1.42
8	H	1007	ACY	CH3-C	2.95	1.52	1.48
8	H	1004	ACY	CH3-C	2.90	1.52	1.48
8	H	1005	ACY	CH3-C	2.89	1.52	1.48

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
8	B	151	ACY	CH3-C	2.88	1.52	1.48
8	B	152	ACY	CH3-C	2.82	1.52	1.48
7	H	1003	P6G	O7-C6	2.73	1.53	1.42
8	H	1006	ACY	CH3-C	2.48	1.51	1.48
4	L	305	PEG	O4-C4	2.29	1.53	1.42
4	B	104	PEG	O4-C4	2.16	1.53	1.42
4	B	103	PEG	O4-C4	2.11	1.53	1.42

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
7	H	1003	P6G	O1-C2-C3	3.32	131.06	111.81
4	B	103	PEG	O2-C2-C1	2.72	122.00	110.07
4	L	305	PEG	O2-C2-C1	2.53	121.17	110.07
4	B	104	PEG	O2-C2-C1	2.32	120.28	110.07

There are no chirality outliers.

All (7) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	H	1	0G6	O2-C2-CA2-CB2
4	B	103	PEG	O1-C1-C2-O2
7	H	1003	P6G	O13-C14-C15-O16
4	L	305	PEG	O1-C1-C2-O2
7	H	1003	P6G	C11-C12-O13-C14
7	H	1003	P6G	O1-C2-C3-O4
7	H	1003	P6G	C2-C3-O4-C5

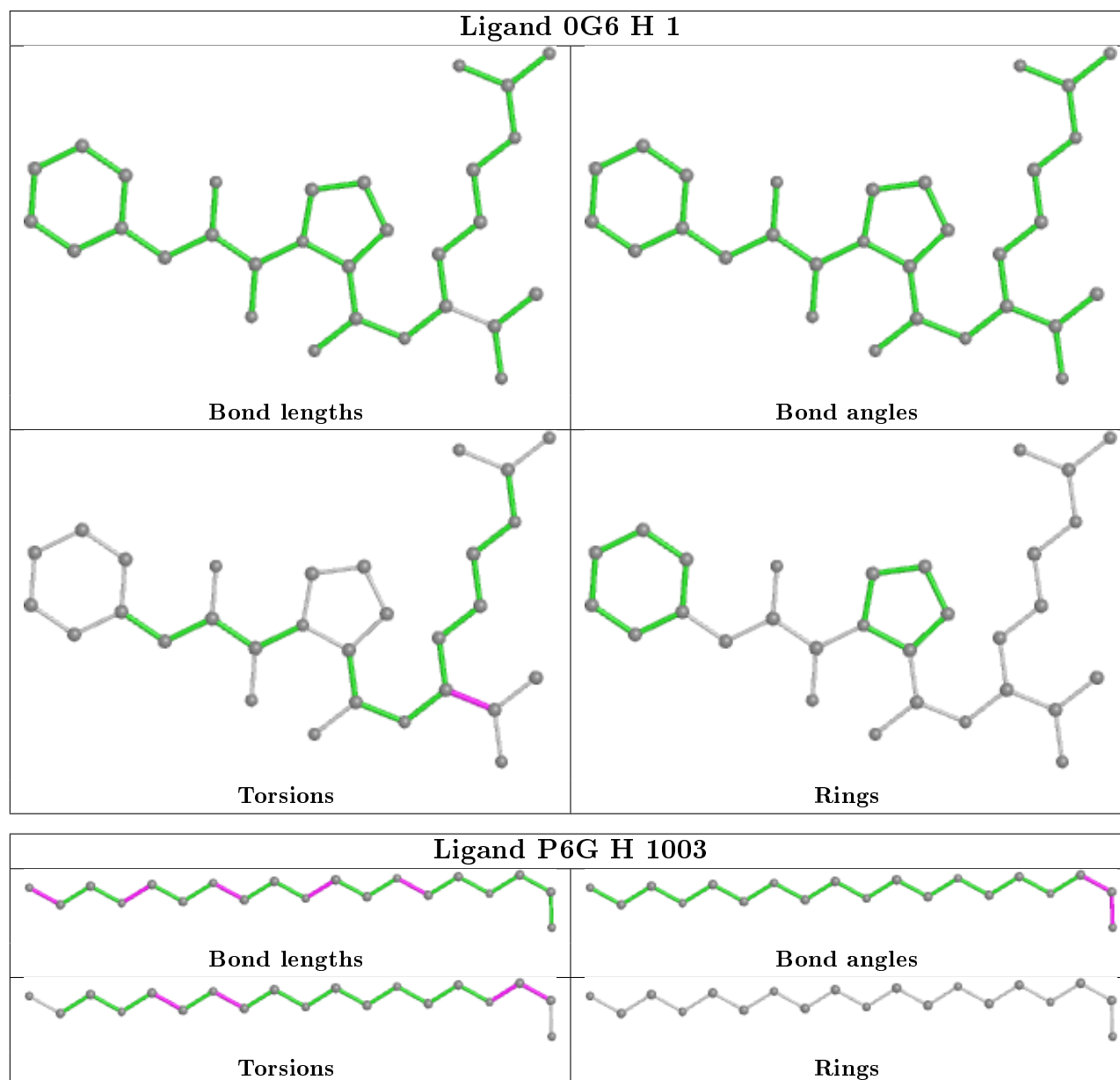
There are no ring outliers.

5 monomers are involved in 6 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	L	305	PEG	1	0
8	H	1007	ACY	1	0
5	H	1	0G6	1	0
4	B	103	PEG	2	0
8	H	1006	ACY	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 ⓘ

There are no such residues in this entry.

## 5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

## 6 Fit of model and data ⓘ

### 6.1 Protein, DNA and RNA chains ⓘ

In the following table, the column labelled ‘#RSRZ> 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	L	30/30 (100%)	0.42	5 (16%) 1 1	30, 40, 57, 58	0
2	H	258/258 (100%)	0.22	16 (6%) 20 23	20, 32, 51, 74	0
3	B	16/26 (61%)	-0.44	0 100 100	30, 39, 51, 64	0
All	All	304/314 (96%)	0.21	21 (6%) 16 19	20, 33, 52, 74	0

All (21) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	H	246	GLY	4.8
2	H	149(C)	VAL	3.8
2	H	245	PHE	3.8
1	L	14(L)	ASP	3.3
2	H	200	VAL	2.9
2	H	149(A)	ALA	2.8
2	H	199	PHE	2.7
2	H	212	ILE	2.6
2	H	213	VAL	2.5
2	H	186(C)	GLY	2.5
2	H	228	TYR	2.4
1	L	12	LEU	2.4
2	H	211	GLY	2.3
2	H	198	PRO	2.3
2	H	231	VAL	2.2
1	L	14(D)	ARG	2.2
1	L	1(D)	GLY	2.1
1	L	11	SER	2.1
2	H	138	VAL	2.1
2	H	186(A)	ASP	2.1
2	H	149(E)	LYS	2.0

## 6.2 Non-standard residues in protein, DNA, RNA chains ⓘ

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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
3	CFL	B	25	20/21	0.87	0.17	44,55,60,62	0
3	CFL	B	23	20/21	0.91	0.14	49,53,57,58	0
3	UFT	B	17	20/21	0.91	0.18	44,60,65,66	0
3	CFL	B	24	20/21	0.92	0.14	43,52,58,60	0
3	UFT	B	21	20/21	0.95	0.11	41,46,50,51	0
3	UFT	B	20	20/21	0.96	0.09	39,42,46,47	0
3	CFL	B	11	20/21	0.97	0.08	33,39,42,43	0
3	CFL	B	19	20/21	0.97	0.08	35,38,41,42	0
3	CFL	B	6	20/21	0.97	0.08	36,40,42,43	0
3	UFT	B	12	20/21	0.97	0.10	28,33,42,46	0

## 6.3 Carbohydrates ⓘ

There are no carbohydrates in this entry.

## 6.4 Ligands ⓘ

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> 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.

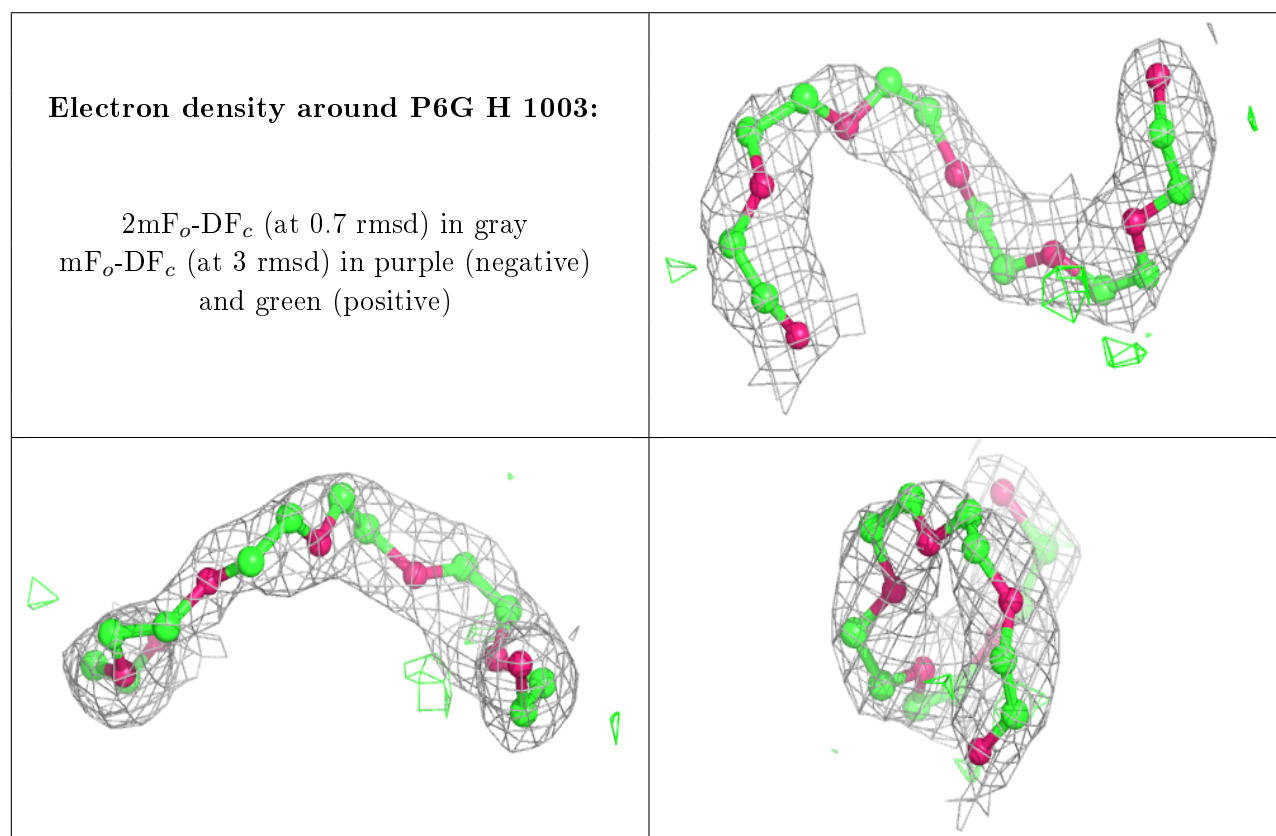
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
8	ACY	H	1005	4/4	0.48	0.32	89,89,90,90	0
4	PEG	L	305	7/7	0.56	0.18	59,60,67,69	0
4	PEG	B	104	7/7	0.64	0.23	78,79,82,83	0
8	ACY	B	152	4/4	0.76	0.26	74,74,75,75	0
8	ACY	H	1007	4/4	0.81	0.22	67,67,67,67	0
8	ACY	H	1006	4/4	0.85	0.16	63,63,64,65	0
4	PEG	B	103	7/7	0.86	0.18	62,63,63,64	0
8	ACY	H	1004	4/4	0.89	0.13	68,68,68,69	0
8	ACY	B	151	4/4	0.90	0.14	66,67,67,67	0
7	P6G	H	1003	19/19	0.92	0.15	46,60,69,70	0
5	0G6	H	1	30/31	0.95	0.10	23,27,31,33	0
6	MG	B	1000	1/1	0.97	0.03	33,33,33,33	0

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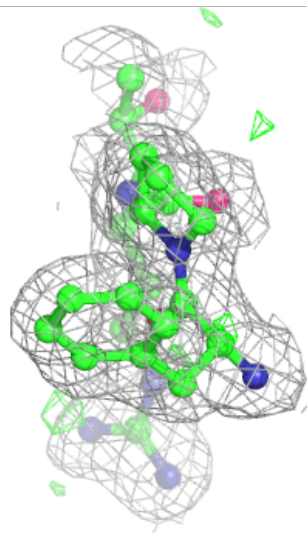
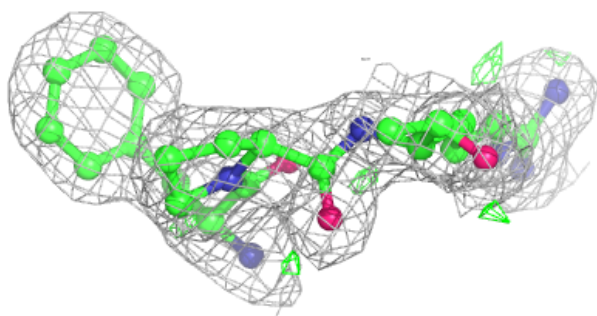
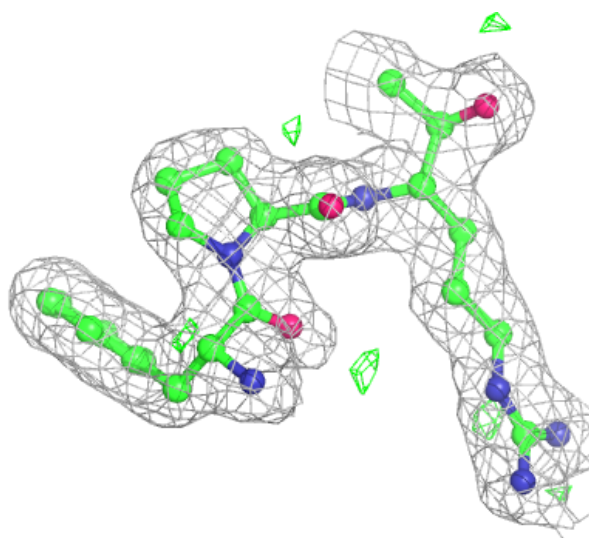
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
6	MG	H	1002	1/1	0.98	0.04	34,34,34,34	0

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.



**Electron density around 0G6 H 1:**

2mF<sub>o</sub>-DF<sub>c</sub> (at 0.7 rmsd) in gray  
mF<sub>o</sub>-DF<sub>c</sub> (at 3 rmsd) in purple (negative)  
and green (positive)



## 6.5 Other polymers [i](#)

There are no such residues in this entry.