



Full wwPDB X-ray Structure Validation Report ⓘ

Jun 25, 2024 – 02:20 AM EDT

PDB ID : 6F9G
Title : Ligand binding domain of *P. putida* KT2440 polyamine chemoreceptors McpU in complex putrescine.
Authors : Gavira, J.A.; Conejero-Muriel, M.T.; Ortega, A.; Martin-Mora, D.; Corral-Lugo, A.; Morel, B.; Krell, T.
Deposited on : 2017-12-14
Resolution : 2.39 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)
Xtriage (Phenix) : 1.13
EDS : 2.37.1
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) : 2.37.1

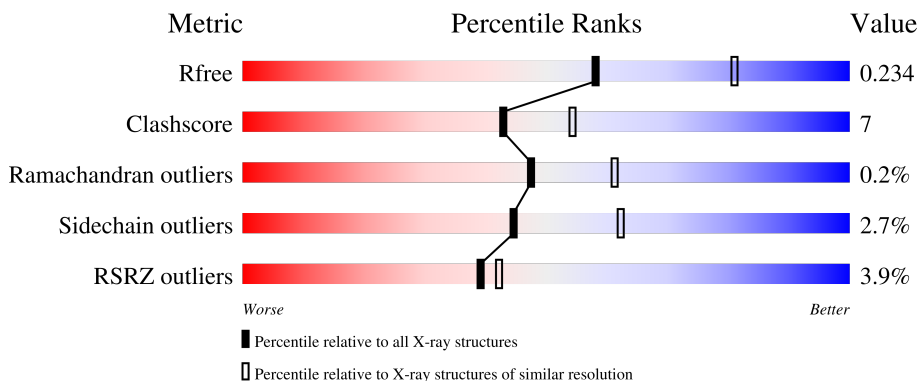
1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.39 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.



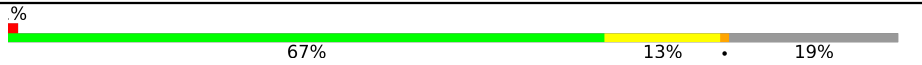
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	5509 (2.40-2.36)
Clashscore	141614	6082 (2.40-2.36)
Ramachandran outliers	138981	5973 (2.40-2.36)
Sidechain outliers	138945	5975 (2.40-2.36)
RSRZ outliers	127900	5397 (2.40-2.36)

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	321	 3% 64% 17% 19%
1	B	321	 7% 67% 14% 19%
1	C	321	 2% 67% 13% 19%
1	D	321	 3% 67% 14% 18%

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Mol	Chain	Length	Quality of chain
1	E	321	 <p>A horizontal bar chart representing the quality of chain. The bar is divided into three segments: a green segment on the left labeled '67%', a yellow segment in the middle labeled '13%', and a grey segment on the right labeled '19%'. A small red square is at the beginning of the bar, and a small black dot is at the end of the grey segment. A '%' symbol is positioned above the start of the bar.</p>

2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 11034 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 Methyl-accepting chemotaxis protein McpU.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	261	2121	1313	388	409	11	0	16	0
1	B	261	2131	1318	389	413	11	0	18	0
1	C	260	2144	1329	393	411	11	0	19	0
1	D	262	2150	1328	402	410	10	0	16	0
1	E	261	2124	1320	385	408	11	0	17	0

There are 95 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	14	MET	-	initiating methionine	UNP Q88NI1
A	15	GLY	-	expression tag	UNP Q88NI1
A	16	SER	-	expression tag	UNP Q88NI1
A	17	SER	-	expression tag	UNP Q88NI1
A	18	HIS	-	expression tag	UNP Q88NI1
A	19	HIS	-	expression tag	UNP Q88NI1
A	20	HIS	-	expression tag	UNP Q88NI1
A	21	HIS	-	expression tag	UNP Q88NI1
A	22	HIS	-	expression tag	UNP Q88NI1
A	23	HIS	-	expression tag	UNP Q88NI1
A	24	SER	-	expression tag	UNP Q88NI1
A	25	SER	-	expression tag	UNP Q88NI1
A	26	GLY	-	expression tag	UNP Q88NI1
A	27	LEU	-	expression tag	UNP Q88NI1
A	28	VAL	-	expression tag	UNP Q88NI1
A	29	PRO	-	expression tag	UNP Q88NI1
A	30	ARG	-	expression tag	UNP Q88NI1
A	31	GLY	-	expression tag	UNP Q88NI1
A	32	SER	-	expression tag	UNP Q88NI1

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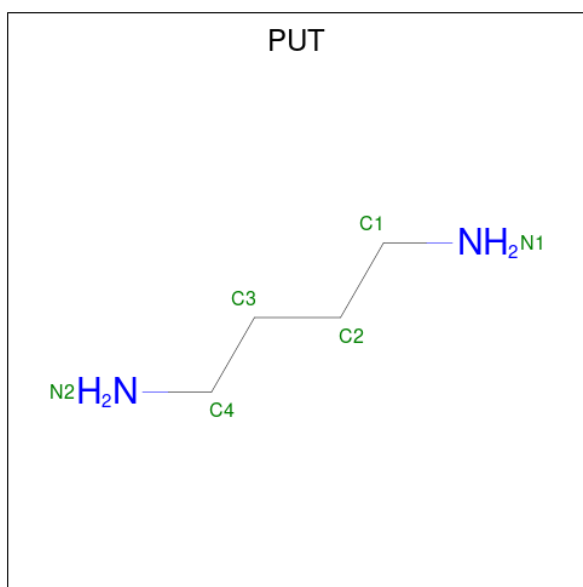
Chain	Residue	Modelled	Actual	Comment	Reference
B	14	MET	-	initiating methionine	UNP Q88NI1
B	15	GLY	-	expression tag	UNP Q88NI1
B	16	SER	-	expression tag	UNP Q88NI1
B	17	SER	-	expression tag	UNP Q88NI1
B	18	HIS	-	expression tag	UNP Q88NI1
B	19	HIS	-	expression tag	UNP Q88NI1
B	20	HIS	-	expression tag	UNP Q88NI1
B	21	HIS	-	expression tag	UNP Q88NI1
B	22	HIS	-	expression tag	UNP Q88NI1
B	23	HIS	-	expression tag	UNP Q88NI1
B	24	SER	-	expression tag	UNP Q88NI1
B	25	SER	-	expression tag	UNP Q88NI1
B	26	GLY	-	expression tag	UNP Q88NI1
B	27	LEU	-	expression tag	UNP Q88NI1
B	28	VAL	-	expression tag	UNP Q88NI1
B	29	PRO	-	expression tag	UNP Q88NI1
B	30	ARG	-	expression tag	UNP Q88NI1
B	31	GLY	-	expression tag	UNP Q88NI1
B	32	SER	-	expression tag	UNP Q88NI1
C	14	MET	-	initiating methionine	UNP Q88NI1
C	15	GLY	-	expression tag	UNP Q88NI1
C	16	SER	-	expression tag	UNP Q88NI1
C	17	SER	-	expression tag	UNP Q88NI1
C	18	HIS	-	expression tag	UNP Q88NI1
C	19	HIS	-	expression tag	UNP Q88NI1
C	20	HIS	-	expression tag	UNP Q88NI1
C	21	HIS	-	expression tag	UNP Q88NI1
C	22	HIS	-	expression tag	UNP Q88NI1
C	23	HIS	-	expression tag	UNP Q88NI1
C	24	SER	-	expression tag	UNP Q88NI1
C	25	SER	-	expression tag	UNP Q88NI1
C	26	GLY	-	expression tag	UNP Q88NI1
C	27	LEU	-	expression tag	UNP Q88NI1
C	28	VAL	-	expression tag	UNP Q88NI1
C	29	PRO	-	expression tag	UNP Q88NI1
C	30	ARG	-	expression tag	UNP Q88NI1
C	31	GLY	-	expression tag	UNP Q88NI1
C	32	SER	-	expression tag	UNP Q88NI1
D	14	MET	-	initiating methionine	UNP Q88NI1
D	15	GLY	-	expression tag	UNP Q88NI1
D	16	SER	-	expression tag	UNP Q88NI1
D	17	SER	-	expression tag	UNP Q88NI1

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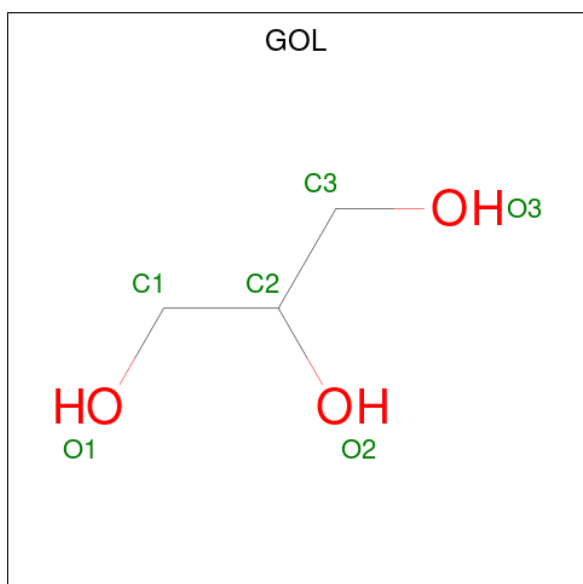
Chain	Residue	Modelled	Actual	Comment	Reference
D	18	HIS	-	expression tag	UNP Q88NI1
D	19	HIS	-	expression tag	UNP Q88NI1
D	20	HIS	-	expression tag	UNP Q88NI1
D	21	HIS	-	expression tag	UNP Q88NI1
D	22	HIS	-	expression tag	UNP Q88NI1
D	23	HIS	-	expression tag	UNP Q88NI1
D	24	SER	-	expression tag	UNP Q88NI1
D	25	SER	-	expression tag	UNP Q88NI1
D	26	GLY	-	expression tag	UNP Q88NI1
D	27	LEU	-	expression tag	UNP Q88NI1
D	28	VAL	-	expression tag	UNP Q88NI1
D	29	PRO	-	expression tag	UNP Q88NI1
D	30	ARG	-	expression tag	UNP Q88NI1
D	31	GLY	-	expression tag	UNP Q88NI1
D	32	SER	-	expression tag	UNP Q88NI1
E	14	MET	-	initiating methionine	UNP Q88NI1
E	15	GLY	-	expression tag	UNP Q88NI1
E	16	SER	-	expression tag	UNP Q88NI1
E	17	SER	-	expression tag	UNP Q88NI1
E	18	HIS	-	expression tag	UNP Q88NI1
E	19	HIS	-	expression tag	UNP Q88NI1
E	20	HIS	-	expression tag	UNP Q88NI1
E	21	HIS	-	expression tag	UNP Q88NI1
E	22	HIS	-	expression tag	UNP Q88NI1
E	23	HIS	-	expression tag	UNP Q88NI1
E	24	SER	-	expression tag	UNP Q88NI1
E	25	SER	-	expression tag	UNP Q88NI1
E	26	GLY	-	expression tag	UNP Q88NI1
E	27	LEU	-	expression tag	UNP Q88NI1
E	28	VAL	-	expression tag	UNP Q88NI1
E	29	PRO	-	expression tag	UNP Q88NI1
E	30	ARG	-	expression tag	UNP Q88NI1
E	31	GLY	-	expression tag	UNP Q88NI1
E	32	SER	-	expression tag	UNP Q88NI1

- Molecule 2 is 1,4-DIAMINOBUTANE (three-letter code: PUT) (formula: C₄H₁₂N₂) (labeled as "Ligand of Interest" by depositor).



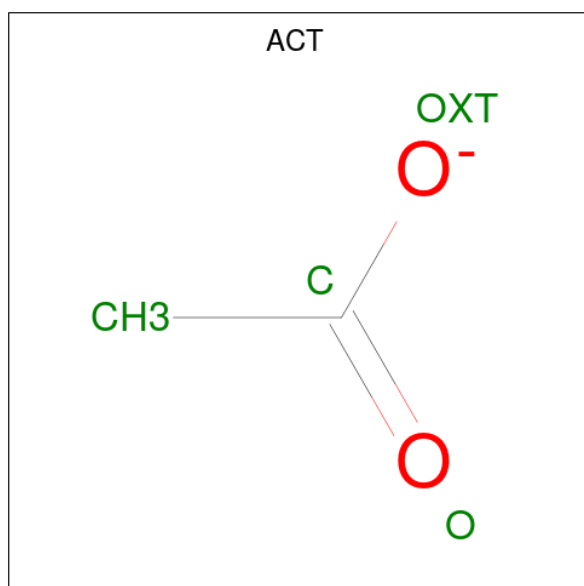
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	1	Total C N 6 4 2	0	0
2	B	1	Total C N 6 4 2	0	0
2	C	1	Total C N 6 4 2	0	0
2	D	1	Total C N 6 4 2	0	0
2	E	1	Total C N 6 4 2	0	0

- Molecule 3 is GLYCEROL (three-letter code: GOL) (formula: C₃H₈O₃).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			6	3	3		
3	D	1	Total	C	O	0	0
			6	3	3		
3	D	1	Total	C	O	0	0
			6	3	3		
3	E	1	Total	C	O	0	0
			6	3	3		
3	E	1	Total	C	O	0	0
			6	3	3		

- Molecule 4 is ACETATE ION (three-letter code: ACT) (formula: C₂H₃O₂).



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

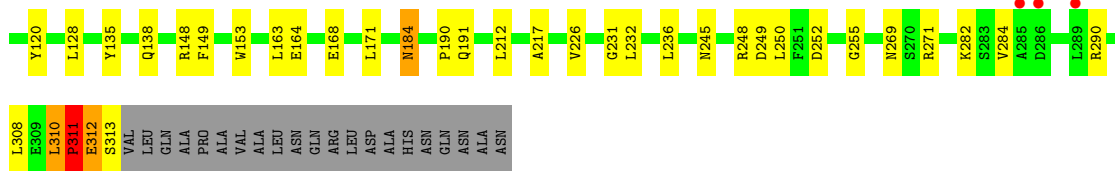
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	58	Total	O	0	0
			58	58		
5	B	56	Total	O	0	0
			56	56		
5	C	69	Total	O	0	0
			69	69		

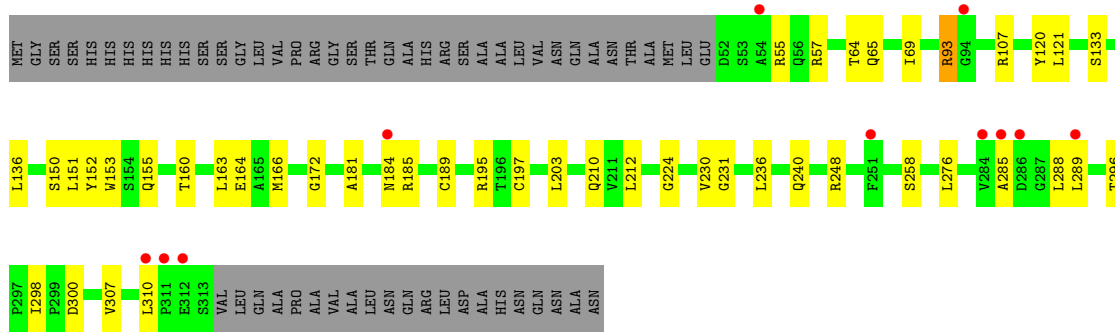
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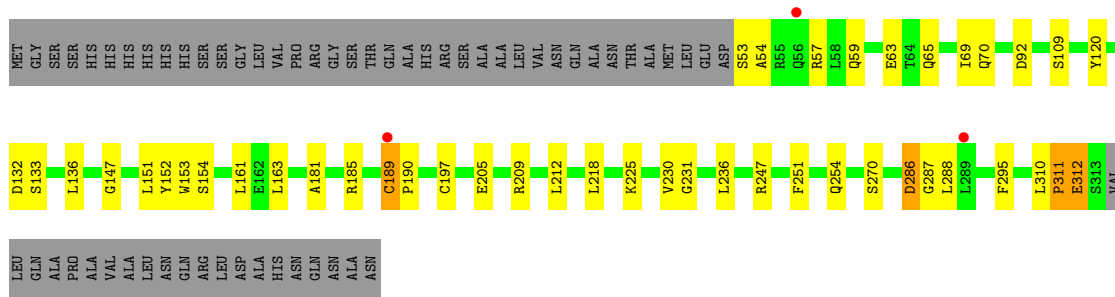
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	D	54	Total	O	0	0
			54	54		
5	E	59	Total	O	0	0
			59	59		



• Molecule 1: Methyl-accepting chemotaxis protein McpU



• Molecule 1: Methyl-accepting chemotaxis protein McpU



4 Data and refinement statistics

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, α , β , γ	133.98Å 164.52Å 123.61Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	79.53 – 2.39 82.26 – 2.39	Depositor EDS
% Data completeness (in resolution range)	96.2 (79.53-2.39) 96.3 (82.26-2.39)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.88 (at 2.40Å)	Xtrriage
Refinement program	PHENIX (1.12_2829: ???)	Depositor
R, R_{free}	0.195 , 0.234 0.194 , 0.234	Depositor DCC
R_{free} test set	2510 reflections (4.78%)	wwPDB-VP
Wilson B-factor (Å ²)	37.6	Xtrriage
Anisotropy	0.594	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 48.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	11034	wwPDB-VP
Average B, all atoms (Å ²)	49.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.95% 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: PUT, ACT, GOL

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z >5	RMSZ	# Z >5
1	A	0.32	0/2166	0.45	0/2935
1	B	0.24	0/2182	0.44	0/2956
1	C	0.31	0/2192	0.64	8/2967 (0.3%)
1	D	0.25	0/2186	0.44	0/2958
1	E	0.28	0/2176	0.46	0/2949
All	All	0.28	0/10902	0.49	8/14765 (0.1%)

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
1	C	0	3

There are no bond length outliers.

All (8) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	56	GLN	O-C-N	-17.49	94.72	122.70
1	C	56	GLN	CA-C-N	5.98	130.35	117.20
1	C	69	ILE	CG1-CB-CG2	-5.84	98.54	111.40
1	C	313	SER	N-CA-CB	5.37	118.55	110.50
1	C	312	GLU	C-N-CA	5.36	135.11	121.70
1	C	56	GLN	N-CA-CB	-5.16	101.31	110.60
1	C	311	PRO	N-CA-C	5.14	125.47	112.10
1	C	55	ARG	C-N-CA	5.02	134.25	121.70

There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	C	56	GLN	Mainchain
1	C	57[B]	ARG	Mainchain

5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2121	0	2089	35	0
1	B	2131	0	2093	34	0
1	C	2144	0	2114	28	0
1	D	2150	0	2118	28	0
1	E	2124	0	2096	27	0
2	A	6	0	12	1	0
2	B	6	0	12	0	0
2	C	6	0	12	1	0
2	D	6	0	12	0	0
2	E	6	0	12	0	0
3	A	6	0	8	0	0
3	D	12	0	16	0	0
3	E	12	0	16	0	0
4	C	4	0	3	0	0
4	D	4	0	3	0	0
5	A	58	0	0	2	0
5	B	56	0	0	0	0
5	C	69	0	0	2	0
5	D	54	0	0	1	0
5	E	59	0	0	2	0
All	All	11034	0	10616	146	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 (146) 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:224:GLY:HA3	1:D:224:GLY:HA3	1.71	0.71
1:B:288:LEU:HD22	1:B:311:PRO:HA	1.73	0.69

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:121:LEU:HD13	1:D:230:VAL:HG12	1.75	0.69
1:B:196:THR:HG22	1:B:298:ILE:HD13	1.77	0.67
1:D:258:SER:HB2	1:D:307:VAL:HB	1.78	0.65
1:B:257:VAL:HG22	1:B:308:LEU:HD22	1.81	0.63
1:D:195[B]:ARG:NH1	1:D:300:ASP:O	2.33	0.62
1:A:120:TYR:CZ	1:A:231:GLY:HA3	2.35	0.61
1:A:195:ARG:NH2	1:A:300:ASP:O	2.34	0.61
1:C:120:TYR:CZ	1:C:231:GLY:HA3	2.37	0.60
5:C:502:HOH:O	1:D:93[A]:ARG:NH2	2.35	0.59
1:D:181:ALA:HB1	1:D:185[B]:ARG:HG3	1.85	0.58
1:B:120:TYR:CZ	1:B:231:GLY:HA3	2.39	0.58
1:E:310:LEU:HD12	1:E:311:PRO:HD2	1.85	0.58
1:C:190:PRO:HG3	1:C:217:ALA:HB1	1.86	0.58
1:E:286[A]:ASP:N	1:E:286[A]:ASP:OD1	2.35	0.57
1:E:185[A]:ARG:NH1	5:E:505:HOH:O	2.36	0.57
1:A:258:SER:OG	1:A:269:ASN:OD1	2.23	0.56
1:B:310:LEU:HD12	1:B:311:PRO:HD2	1.88	0.56
1:E:120:TYR:CZ	1:E:231:GLY:HA3	2.40	0.56
1:B:247:ARG:NH2	1:B:270:SER:O	2.39	0.56
1:A:125:PRO:HD3	1:A:148:ARG:NH2	2.21	0.56
1:D:120:TYR:CZ	1:D:231:GLY:HA3	2.41	0.55
1:E:181:ALA:HB1	1:E:185[B]:ARG:HD3	1.88	0.55
1:B:251:PHE:O	1:B:254[A]:GLN:NE2	2.42	0.53
1:D:212:LEU:HG	1:D:236:LEU:HD22	1.89	0.53
1:A:310:LEU:HD12	1:A:311:PRO:HD2	1.89	0.53
1:D:151:LEU:HD11	1:D:153:TRP:CD1	2.43	0.53
1:E:59:GLN:NE2	5:E:502:HOH:O	2.29	0.53
1:E:212:LEU:HG	1:E:236:LEU:HD22	1.89	0.53
1:B:196:THR:HG22	1:B:298:ILE:CD1	2.38	0.53
1:A:179:ASN:ND2	5:A:504:HOH:O	2.37	0.52
1:C:245:ASN:OD1	1:C:248[A]:ARG:NH2	2.42	0.52
1:C:148:ARG:NH2	1:C:168:GLU:OE2	2.43	0.52
1:A:288:LEU:HD23	1:A:309:GLU:HB3	1.92	0.51
1:B:310:LEU:HG	1:B:311:PRO:N	2.25	0.51
1:A:68[A]:ARG:NH1	1:B:249[A]:ASP:OD2	2.44	0.51
1:C:284:VAL:HG22	1:C:290[B]:ARG:HH11	1.76	0.51
1:B:258[B]:SER:OG	1:B:269:ASN:OD1	2.29	0.51
1:B:63[A]:GLU:HG2	1:B:293:HIS:CE1	2.45	0.51
1:D:203:LEU:HD11	1:D:210[B]:GLN:HB2	1.92	0.51
1:A:172:GLY:HA2	1:A:184[A]:ASN:HD21	1.76	0.51
1:D:172:GLY:HA2	1:D:184[B]:ASN:HD21	1.76	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:203:LEU:HD21	1:A:210[B]:GLN:HB3	1.92	0.51
1:A:283:SER:OG	1:A:284:VAL:N	2.44	0.51
1:B:120:TYR:HB3	1:B:152:TYR:HD1	1.74	0.51
1:A:203:LEU:HD21	1:A:210[A]:GLN:HB3	1.92	0.50
1:A:221:LEU:HD23	1:A:224:GLY:HA2	1.94	0.50
1:B:197[B]:CYS:SG	1:B:199:LEU:HG	2.51	0.50
1:C:271[A]:ARG:NH2	5:C:507:HOH:O	2.44	0.49
1:E:189[A]:CYS:HB3	1:E:197:CYS:SG	2.52	0.49
1:A:94:GLY:O	1:B:93:ARG:NH2	2.42	0.49
1:B:111:ALA:HB2	1:B:161:LEU:HD11	1.94	0.49
1:A:121:LEU:HD13	1:A:230:VAL:HG22	1.94	0.48
1:B:272:ASP:OD2	1:B:274:SER:OG	2.26	0.48
1:B:107:ARG:CZ	1:B:161:LEU:HD12	2.43	0.48
1:D:55[B]:ARG:HE	1:D:289:LEU:HD11	1.79	0.48
1:C:171:LEU:O	1:C:184[A]:ASN:ND2	2.37	0.48
1:C:191[A]:GLN:HA	1:C:226:VAL:HG11	1.96	0.48
1:A:71[B]:ARG:NH1	1:B:115:ASP:OD2	2.32	0.48
1:C:91:LYS:HG3	1:C:128:LEU:HD12	1.96	0.48
1:E:153:TRP:CH2	1:E:163:LEU:HB2	2.49	0.48
1:B:310:LEU:HG	1:B:311:PRO:CD	2.44	0.47
1:C:284:VAL:HG22	1:C:290[B]:ARG:NH1	2.28	0.47
1:D:163:LEU:HD12	1:D:164:GLU:N	2.29	0.47
1:D:153:TRP:CH2	1:D:163:LEU:HB2	2.48	0.47
1:E:53:SER:OG	1:E:54:ALA:N	2.47	0.47
1:E:218:LEU:HB2	1:E:230:VAL:HG13	1.95	0.47
1:C:191[B]:GLN:HA	1:C:226:VAL:HG11	1.96	0.47
1:B:198:MET:HB2	1:B:298:ILE:HG12	1.97	0.47
1:A:154:SER:O	1:A:161:LEU:HA	2.15	0.47
1:C:56:GLN:HG2	1:C:56:GLN:O	2.15	0.47
1:E:151:LEU:HD21	1:E:153:TRP:HD1	1.79	0.47
1:C:212:LEU:HG	1:C:236:LEU:HD22	1.97	0.47
1:C:250:LEU:HD22	1:C:308:LEU:HG	1.96	0.47
1:E:251:PHE:O	1:E:254:GLN:NE2	2.38	0.46
1:B:66:ALA:HB1	1:B:295:PHE:HB3	1.97	0.46
1:B:153:TRP:CE2	1:B:163:LEU:HD13	2.50	0.46
1:A:151:LEU:HD12	1:A:152:TYR:N	2.31	0.46
1:E:120:TYR:HB3	1:E:152:TYR:CD1	2.51	0.46
1:C:99:ARG:HD3	1:C:149:PHE:HD2	1.80	0.46
1:B:190:PRO:HG3	1:B:217:ALA:HB1	1.98	0.46
1:B:310:LEU:HG	1:B:311:PRO:HD2	1.97	0.46
1:B:179:ASN:ND2	1:B:202:TYR:HB3	2.31	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:133:SER:HA	1:E:136:LEU:HD11	1.98	0.46
1:E:120:TYR:HB3	1:E:152:TYR:HD1	1.81	0.45
1:A:58:LEU:HD13	1:A:310:LEU:HD23	1.98	0.45
1:A:99:ARG:NH2	1:A:132:ASP:OD1	2.43	0.45
1:A:220:LEU:HD11	1:A:230:VAL:HG23	1.98	0.45
1:A:191:GLN:NE2	5:A:509:HOH:O	2.43	0.45
1:D:189[B]:CYS:HB3	1:D:197:CYS:SG	2.57	0.45
1:A:189[B]:CYS:HB3	1:A:197:CYS:SG	2.57	0.45
1:A:251:PHE:O	1:A:254:GLN:NE2	2.43	0.45
1:B:206:VAL:O	1:B:209:ARG:HG3	2.17	0.45
1:B:247:ARG:O	1:B:253:GLY:HA2	2.16	0.45
1:D:120:TYR:HB3	1:D:152:TYR:HD1	1.82	0.45
1:D:285:ALA:HB3	1:D:288:LEU:HD12	1.98	0.45
1:E:247:ARG:NH1	1:E:270:SER:O	2.50	0.45
1:B:153:TRP:CZ2	1:B:163:LEU:HD13	2.52	0.44
1:A:124:GLN:HA	1:A:148:ARG:HH21	1.81	0.44
1:C:153:TRP:CZ2	1:C:163:LEU:HD12	2.52	0.44
1:C:163:LEU:HD23	1:C:164:GLU:N	2.32	0.44
1:C:248[A]:ARG:NH1	1:D:64:THR:OG1	2.51	0.44
1:E:65:GLN:O	1:E:69:ILE:HG12	2.17	0.44
1:D:296:THR:HG22	1:D:298:ILE:O	2.17	0.44
1:A:107:ARG:HB2	1:A:153:TRP:CE2	2.53	0.44
1:C:250:LEU:HD23	1:C:255:GLY:HA3	2.00	0.44
1:C:249:ASP:OD1	1:D:64:THR:HG21	2.18	0.43
1:A:132:ASP:O	1:A:147:GLY:HA3	2.18	0.43
1:A:282:LYS:HD2	1:A:282:LYS:H	1.84	0.43
1:A:65:GLN:O	1:A:69:ILE:HG12	2.19	0.43
1:A:68[A]:ARG:HH12	1:B:249[A]:ASP:CG	2.21	0.43
1:D:155:GLN:HA	1:D:160:THR:O	2.19	0.43
1:B:189:CYS:SG	1:B:197[B]:CYS:HB2	2.58	0.43
1:A:97[A]:ASP:N	1:A:97[A]:ASP:OD1	2.51	0.43
1:B:289:LEU:O	1:B:309:GLU:HA	2.18	0.43
1:D:133:SER:HA	1:D:136:LEU:HD11	2.01	0.43
1:A:194:ALA:HB1	1:A:221:LEU:HD21	2.00	0.42
1:B:61:HIS:O	1:B:65:GLN:HG2	2.19	0.42
1:B:310:LEU:CD1	1:B:311:PRO:HD2	2.47	0.42
1:C:135:TYR:HA	1:C:138:GLN:HG3	2.00	0.42
1:D:150:SER:OG	1:D:166:MET:HB2	2.19	0.42
1:E:288:LEU:HA	1:E:311:PRO:HA	2.00	0.42
1:C:60:ALA:HB1	1:D:248[B]:ARG:HH12	1.84	0.42
1:E:205:GLU:HA	1:E:209:ARG:O	2.20	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:65:GLN:O	1:D:69:ILE:HG12	2.20	0.42
1:D:240:GLN:HB2	1:D:276:LEU:HD11	2.00	0.42
1:A:287:GLY:O	1:A:311:PRO:HA	2.20	0.41
1:E:189[B]:CYS:HB3	1:E:190:PRO:HD3	2.02	0.41
1:D:107:ARG:NH1	5:D:505:HOH:O	2.46	0.41
1:E:287:GLY:O	1:E:311:PRO:O	2.38	0.41
1:E:57[A]:ARG:HD3	1:E:57[A]:ARG:HA	1.67	0.41
1:E:70:GLN:HB2	1:E:295:PHE:HB2	2.02	0.41
1:C:116:VAL:HG11	1:C:232:LEU:HD22	2.03	0.41
2:A:401:PUT:H42	2:A:401:PUT:H12	1.92	0.41
2:C:401:PUT:H12	2:C:401:PUT:H42	1.87	0.41
1:E:154:SER:O	1:E:161:LEU:HA	2.21	0.41
1:A:199:LEU:HD13	1:A:215:SER:HB2	2.01	0.41
1:E:132:ASP:O	1:E:147:GLY:HA3	2.21	0.40
1:E:312:GLU:O	1:E:312:GLU:HG2	2.17	0.40
1:C:310:LEU:HA	1:C:311:PRO:HD3	1.86	0.40
1:C:171:LEU:C	1:C:184[A]:ASN:HD21	2.19	0.40
1:D:55[B]:ARG:HH21	1:D:289:LEU:HD12	1.87	0.40
1:C:107:ARG:HB2	1:C:153:TRP:CE2	2.56	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	275/321 (86%)	269 (98%)	6 (2%)	0	100	100
1	B	277/321 (86%)	268 (97%)	9 (3%)	0	100	100
1	C	277/321 (86%)	271 (98%)	5 (2%)	1 (0%)	34	46
1	D	276/321 (86%)	271 (98%)	5 (2%)	0	100	100
1	E	276/321 (86%)	272 (99%)	3 (1%)	1 (0%)	34	46

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
All	All	1381/1605 (86%)	1351 (98%)	28 (2%)	2 (0%)	47 67

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	311	PRO
1	E	311	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	227/258 (88%)	215 (95%)	12 (5%)	22 34
1	B	229/258 (89%)	224 (98%)	5 (2%)	52 69
1	C	229/258 (89%)	220 (96%)	9 (4%)	32 48
1	D	228/258 (88%)	223 (98%)	5 (2%)	52 69
1	E	228/258 (88%)	217 (95%)	11 (5%)	25 39
All	All	1141/1290 (88%)	1099 (96%)	42 (4%)	44 50

All (42) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	97[A]	ASP
1	A	97[B]	ASP
1	A	148	ARG
1	A	185[A]	ARG
1	A	185[B]	ARG
1	A	199	LEU
1	A	248	ARG
1	A	252	ASP
1	A	273	ASP
1	A	286[A]	ASP
1	A	286[B]	ASP
1	A	289	LEU

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Mol	Chain	Res	Type
1	B	195[A]	ARG
1	B	195[B]	ARG
1	B	199	LEU
1	B	254[A]	GLN
1	B	254[B]	GLN
1	C	67[A]	LEU
1	C	67[B]	LEU
1	C	184[A]	ASN
1	C	184[B]	ASN
1	C	252	ASP
1	C	282[A]	LYS
1	C	282[B]	LYS
1	C	310	LEU
1	C	312	GLU
1	D	57[A]	ARG
1	D	57[B]	ARG
1	D	93[A]	ARG
1	D	93[B]	ARG
1	D	310	LEU
1	E	63[A]	GLU
1	E	63[B]	GLU
1	E	92	ASP
1	E	109	SER
1	E	189[A]	CYS
1	E	189[B]	CYS
1	E	225[A]	LYS
1	E	225[B]	LYS
1	E	286[A]	ASP
1	E	286[B]	ASP
1	E	312	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	88	GLN
1	C	105	GLN
1	C	210	GLN
1	E	155	GLN
1	E	269	ASN

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 monosaccharides in this entry.

5.6 Ligand geometry [i](#)

12 ligands are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
2	PUT	E	401	-	5,5,5	0.25	0	4,4,4	0.54	0
2	PUT	B	401	-	5,5,5	0.24	0	4,4,4	0.61	0
3	GOL	D	403	-	5,5,5	0.91	0	5,5,5	0.99	0
3	GOL	E	402	-	5,5,5	0.90	0	5,5,5	1.01	0
3	GOL	E	403	-	5,5,5	0.92	0	5,5,5	1.00	0
2	PUT	C	401	-	5,5,5	0.25	0	4,4,4	0.53	0
2	PUT	A	401	-	5,5,5	0.26	0	4,4,4	0.51	0
2	PUT	D	401	-	5,5,5	0.25	0	4,4,4	0.50	0
3	GOL	A	402	-	5,5,5	0.88	0	5,5,5	1.00	0
4	ACT	D	402	-	3,3,3	0.78	0	3,3,3	0.73	0
4	ACT	C	402	-	3,3,3	0.77	0	3,3,3	0.73	0
3	GOL	D	404	-	5,5,5	0.90	0	5,5,5	1.01	0

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	PUT	E	401	-	-	0/3/3/3	-
2	PUT	B	401	-	-	0/3/3/3	-
3	GOL	D	403	-	-	2/4/4/4	-
3	GOL	E	402	-	-	0/4/4/4	-
3	GOL	E	403	-	-	2/4/4/4	-
2	PUT	C	401	-	-	0/3/3/3	-
2	PUT	A	401	-	-	0/3/3/3	-
2	PUT	D	401	-	-	0/3/3/3	-
3	GOL	A	402	-	-	2/4/4/4	-
3	GOL	D	404	-	-	2/4/4/4	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (8) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	402	GOL	O1-C1-C2-C3
3	E	403	GOL	O2-C2-C3-O3
3	D	403	GOL	O1-C1-C2-C3
3	E	403	GOL	C1-C2-C3-O3
3	A	402	GOL	O1-C1-C2-O2
3	D	403	GOL	O1-C1-C2-O2
3	D	404	GOL	C1-C2-C3-O3
3	D	404	GOL	O2-C2-C3-O3

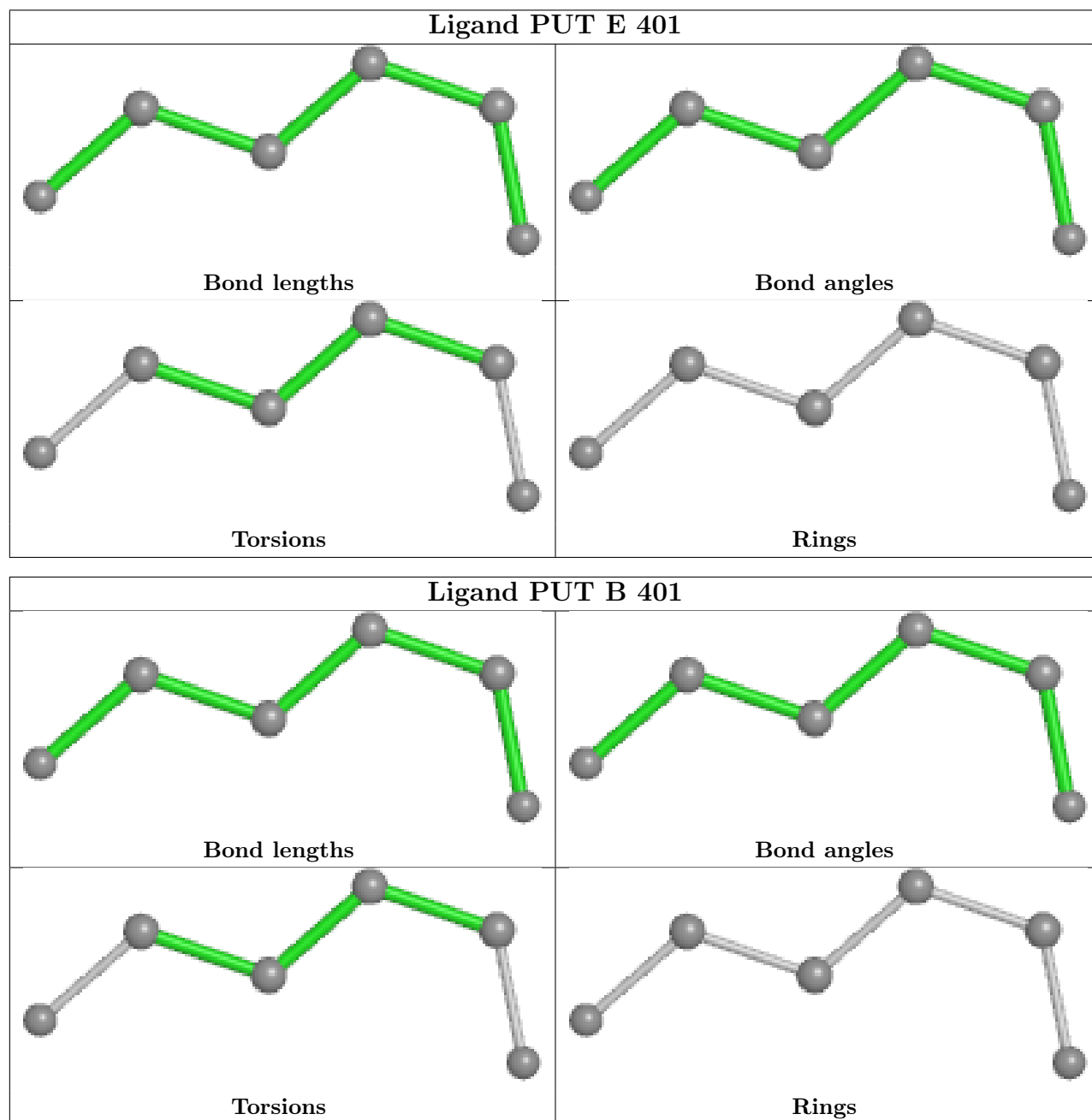
There are no ring outliers.

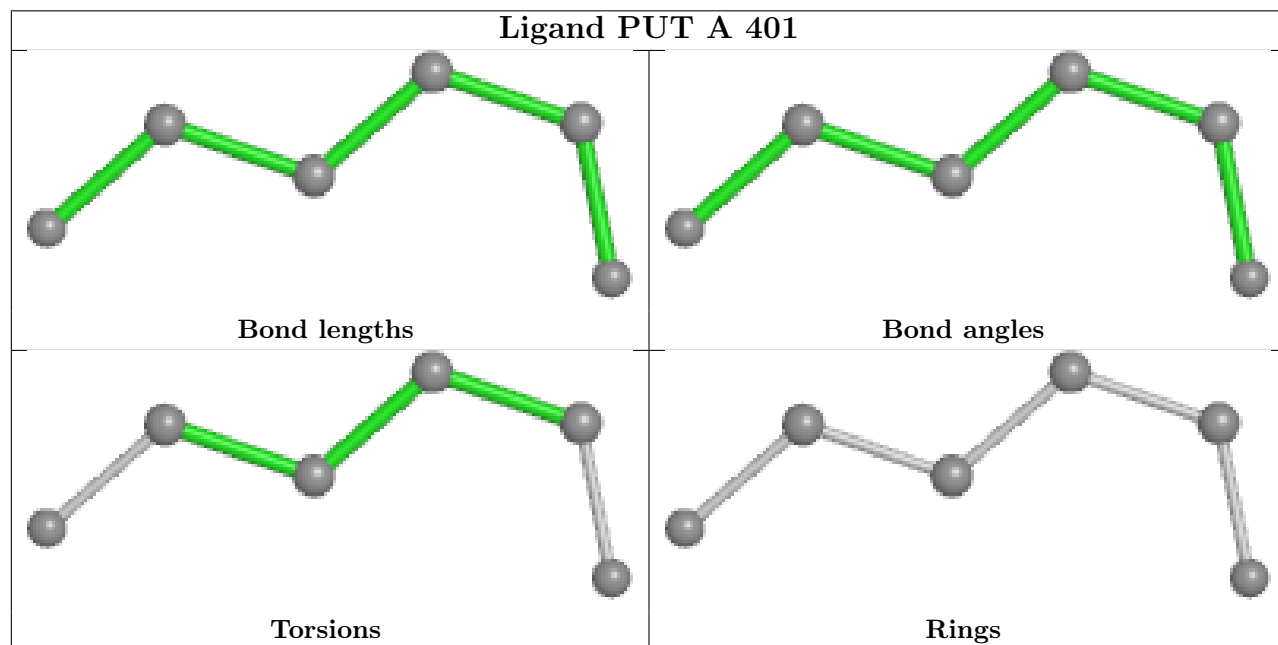
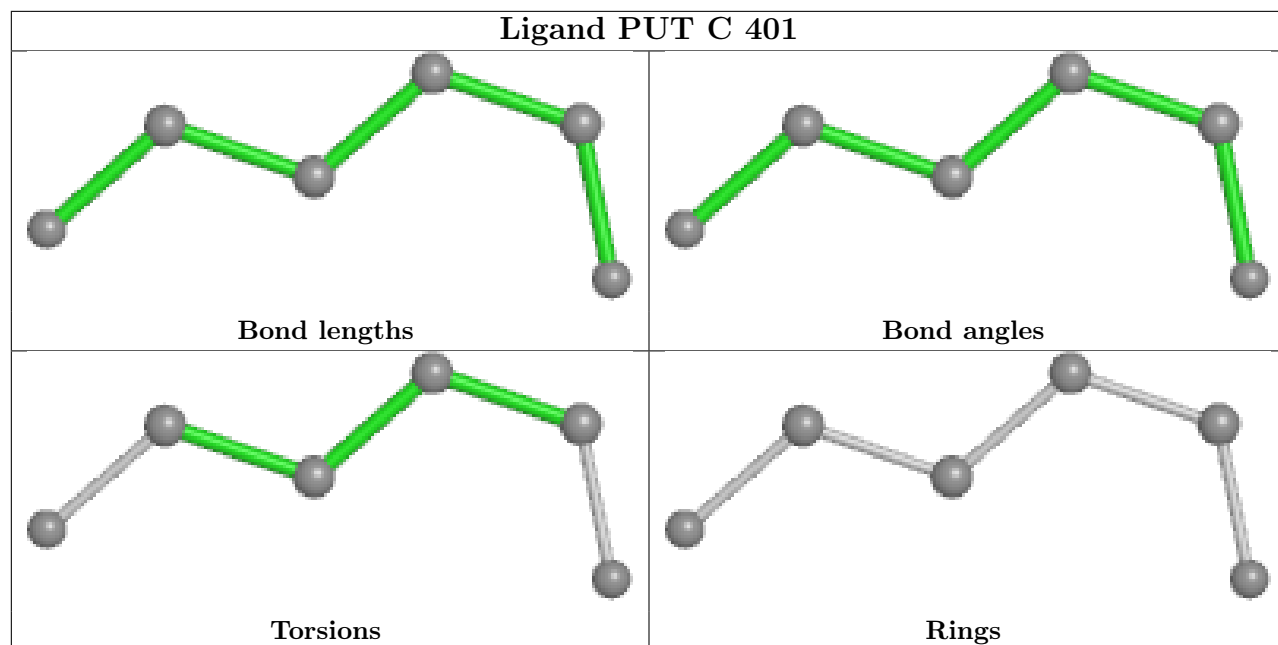
2 monomers are involved in 2 short contacts:

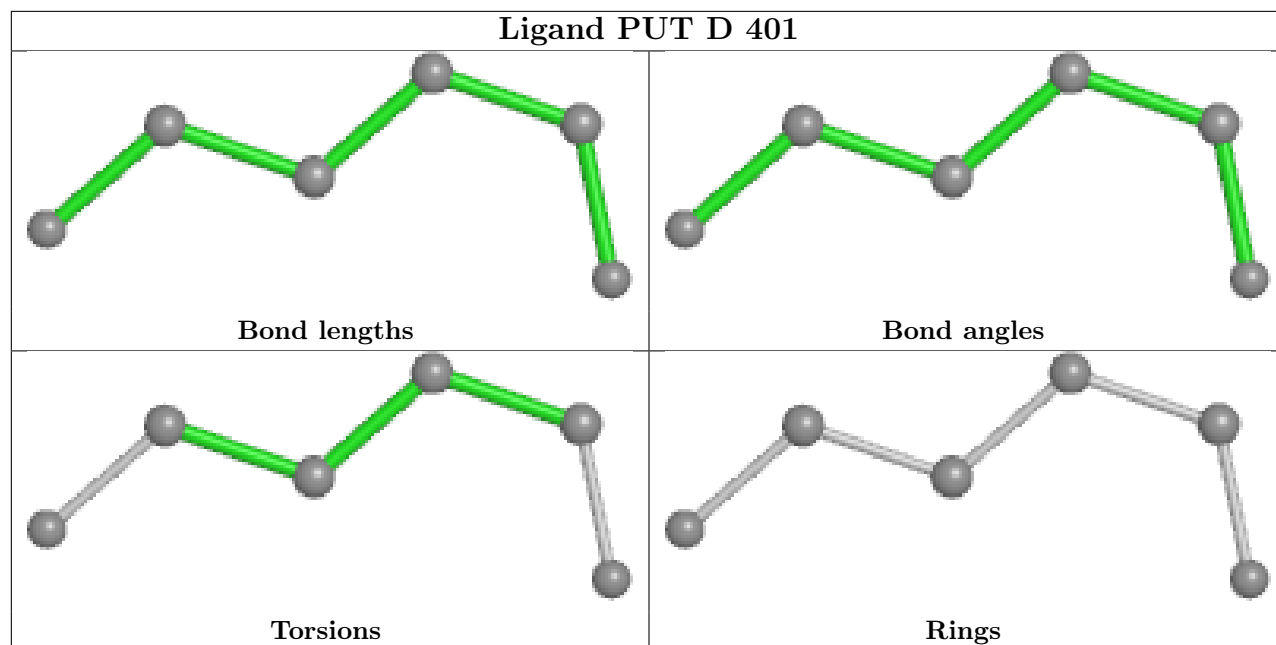
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	C	401	PUT	1	0
2	A	401	PUT	1	0

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](#)

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	261/321 (81%)	0.40	11 (4%) 36 39	23, 44, 96, 118	0
1	B	261/321 (81%)	0.50	21 (8%) 12 13	24, 43, 98, 137	0
1	C	260/321 (80%)	0.27	5 (1%) 66 68	25, 41, 78, 125	0
1	D	262/321 (81%)	0.35	11 (4%) 36 39	25, 46, 87, 122	0
1	E	261/321 (81%)	0.34	3 (1%) 80 81	24, 46, 78, 122	0
All	All	1305/1605 (81%)	0.37	51 (3%) 39 42	23, 44, 90, 137	0

All (51) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	311	PRO	6.5
1	A	289	LEU	6.2
1	B	285	ALA	6.1
1	B	289	LEU	4.4
1	A	288	LEU	4.4
1	A	310	LEU	4.4
1	B	251	PHE	4.3
1	B	54	ALA	4.3
1	A	57[A]	ARG	4.2
1	B	55[A]	ARG	4.2
1	A	251	PHE	4.1
1	D	312	GLU	4.1
1	D	54	ALA	3.8
1	D	251	PHE	3.7
1	D	289	LEU	3.7
1	B	286	ASP	3.6
1	A	311	PRO	3.6
1	B	282	LYS	3.4
1	B	284	VAL	3.3
1	B	312	GLU	3.2

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Mol	Chain	Res	Type	RSRZ
1	C	285	ALA	3.1
1	B	281[A]	ASP	3.0
1	C	289	LEU	3.0
1	B	287	GLY	3.0
1	A	286[A]	ASP	2.9
1	E	289	LEU	2.9
1	D	285	ALA	2.7
1	B	250	LEU	2.7
1	B	310	LEU	2.7
1	A	285	ALA	2.7
1	B	57[A]	ARG	2.6
1	D	311	PRO	2.6
1	C	286	ASP	2.5
1	A	312[A]	GLU	2.5
1	D	310	LEU	2.4
1	D	286	ASP	2.4
1	B	197[A]	CYS	2.2
1	C	54	ALA	2.2
1	D	184[A]	ASN	2.2
1	A	55	ARG	2.2
1	E	56	GLN	2.2
1	A	287	GLY	2.2
1	B	246	GLY	2.2
1	B	313	SER	2.1
1	D	284	VAL	2.1
1	D	94	GLY	2.1
1	C	97[A]	ASP	2.1
1	B	249[A]	ASP	2.0
1	E	189[A]	CYS	2.0
1	B	288	LEU	2.0
1	B	254[A]	GLN	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](#)

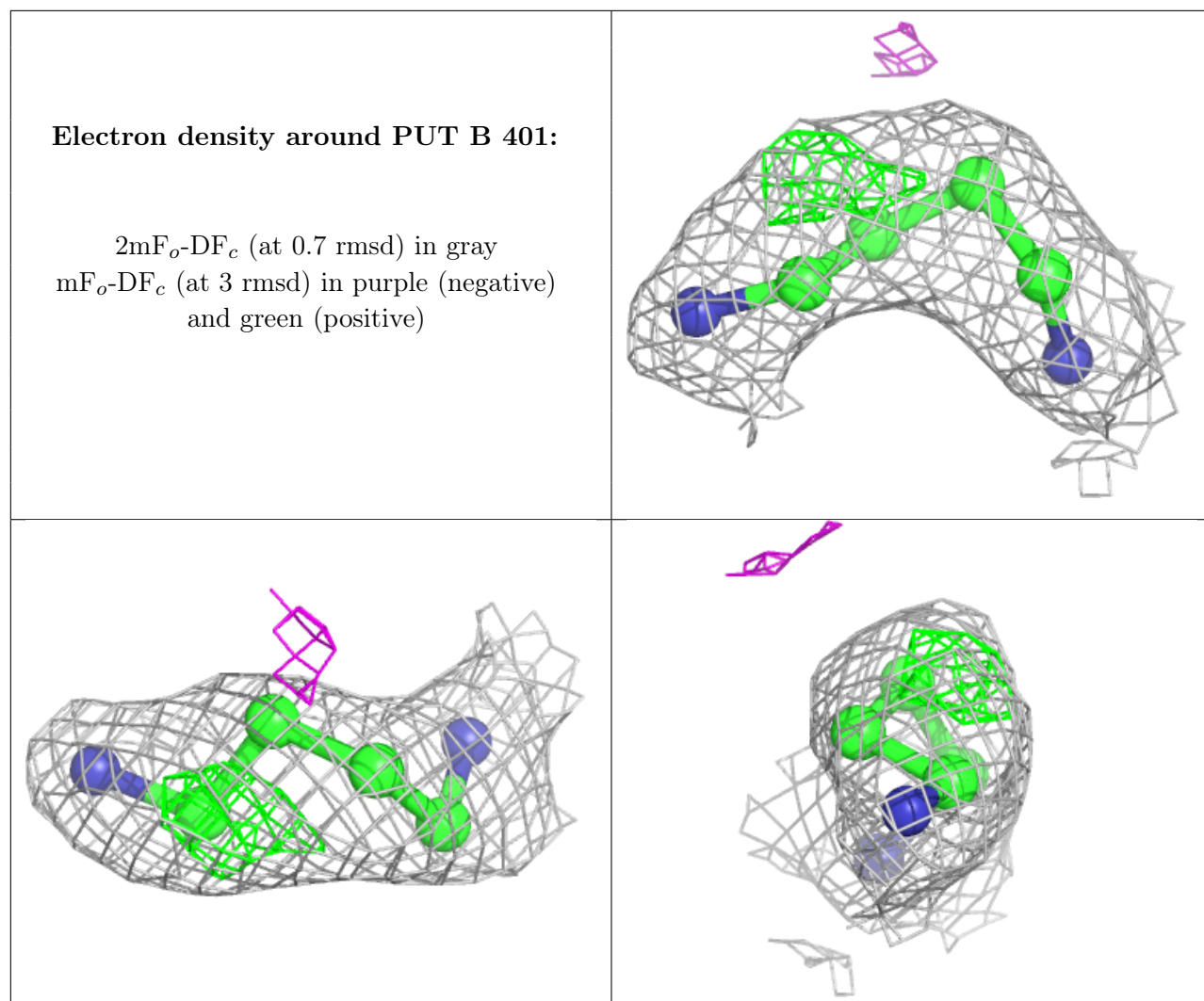
There are no monosaccharides in this entry.

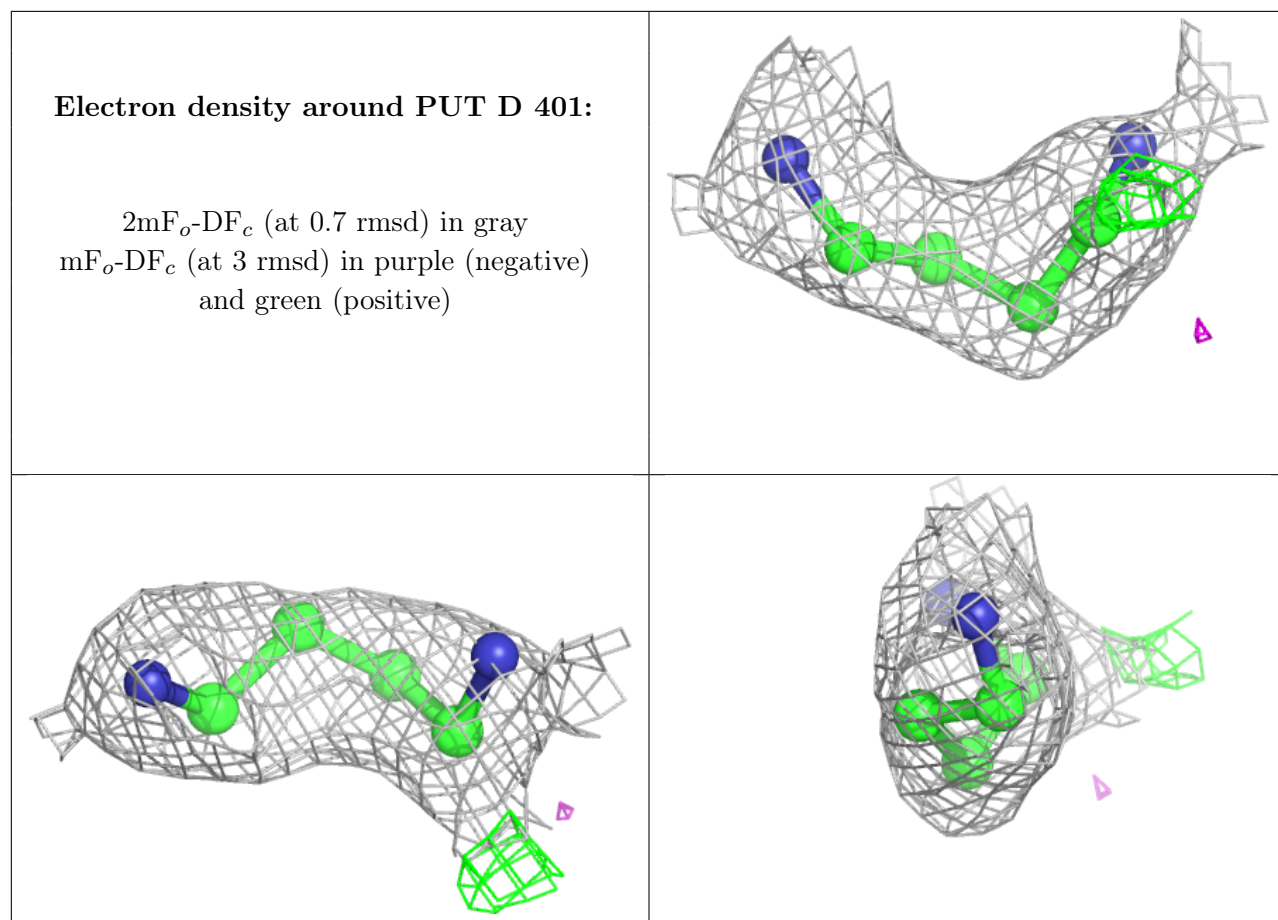
6.4 Ligands

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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
4	ACT	C	402	4/4	0.70	0.22	81,84,85,86	0
3	GOL	E	403	6/6	0.82	0.18	59,69,69,72	0
3	GOL	D	404	6/6	0.85	0.16	71,74,74,75	0
3	GOL	E	402	6/6	0.86	0.19	63,67,69,69	0
3	GOL	A	402	6/6	0.87	0.17	55,58,60,67	0
2	PUT	B	401	6/6	0.88	0.22	38,39,46,48	0
3	GOL	D	403	6/6	0.88	0.17	65,68,69,71	0
4	ACT	D	402	4/4	0.89	0.13	55,56,59,61	0
2	PUT	D	401	6/6	0.93	0.24	36,41,44,49	0
2	PUT	A	401	6/6	0.93	0.23	37,43,47,48	0
2	PUT	E	401	6/6	0.95	0.19	36,38,42,43	0
2	PUT	C	401	6/6	0.96	0.18	29,32,38,43	0

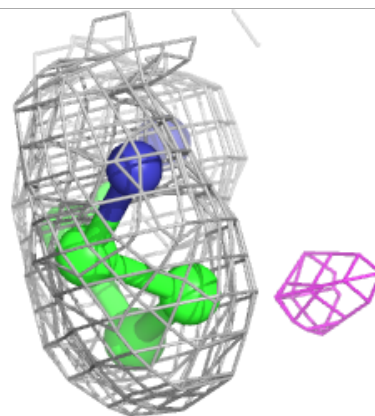
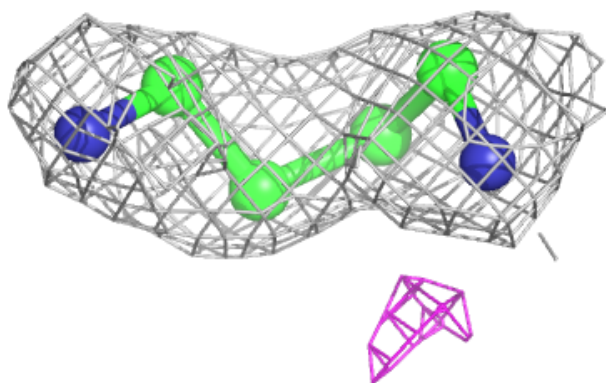
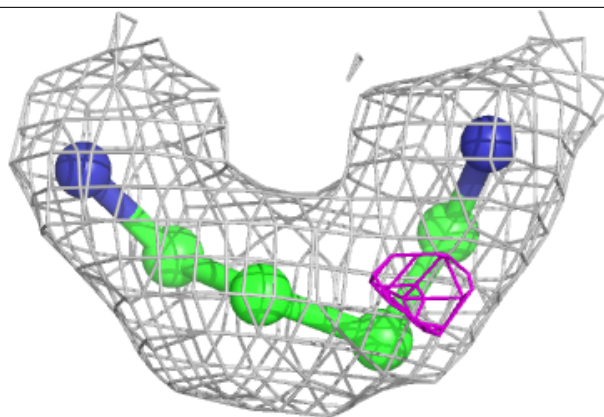
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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





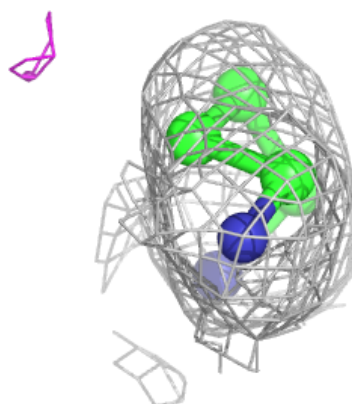
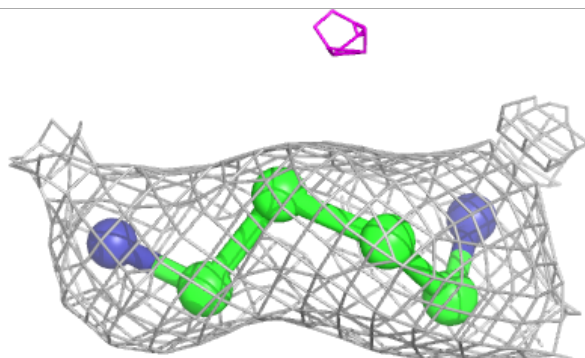
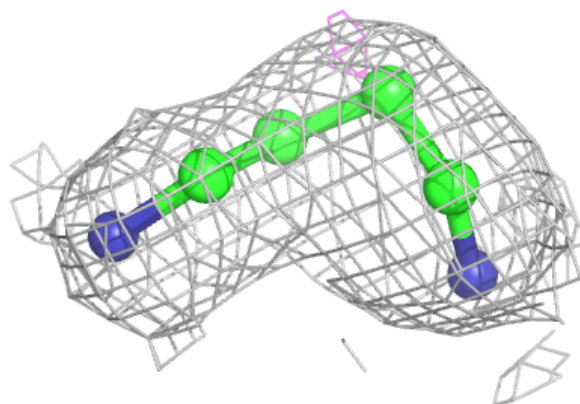
Electron density around PUT A 401:

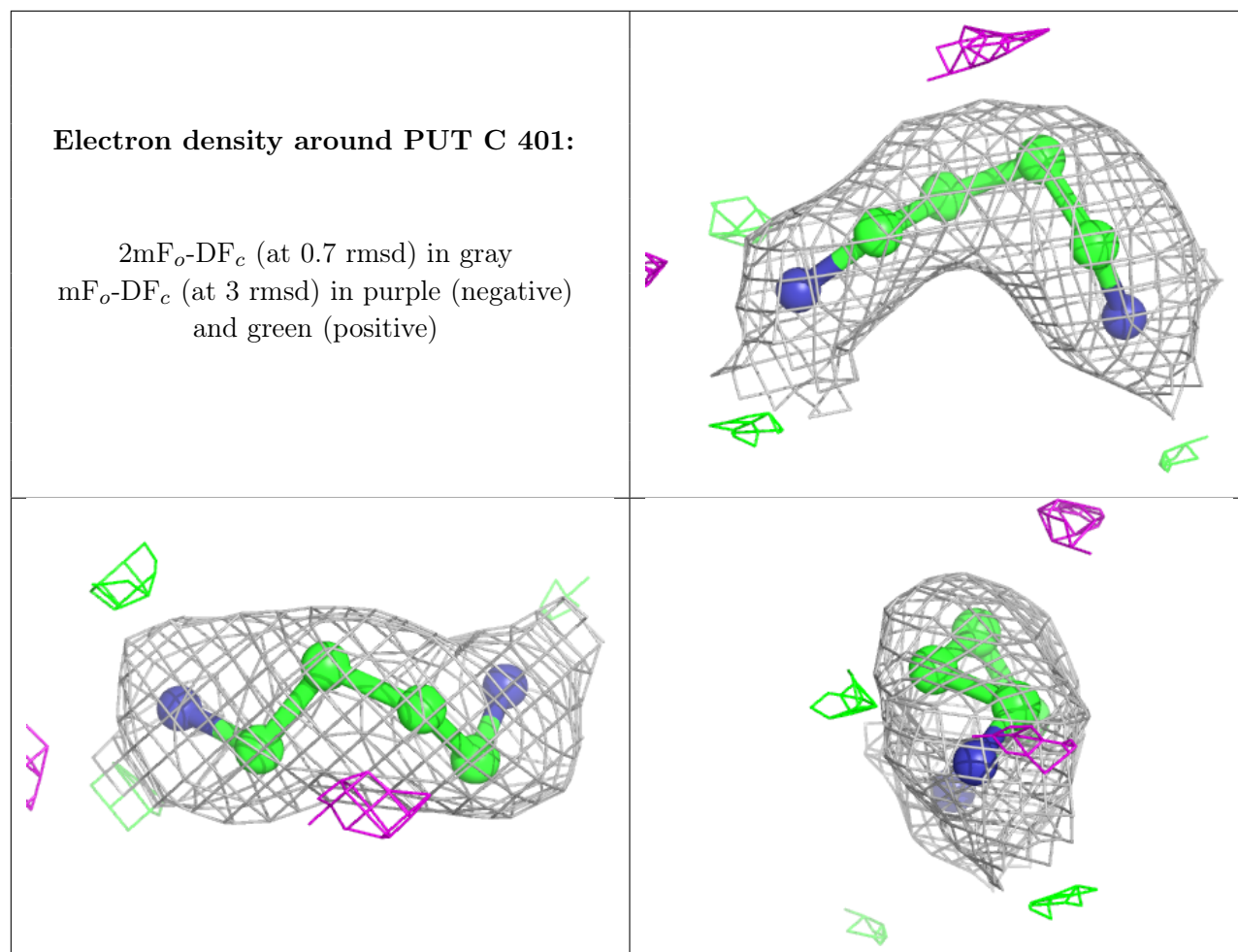
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around PUT E 401:

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





6.5 Other polymers [i](#)

There are no such residues in this entry.