



## Full wwPDB EM Validation Report ⓘ

Nov 5, 2024 – 10:36 AM JST

PDB ID : 8K9T  
EMDB ID : EMD-36997  
Title : Cryo-EM structure of the products-bound PGAP1(Bst1)-S327A from *Chaetomium thermophilum*  
Authors : Li, T.; Hong, J.; Qu, Q.; Li, D.  
Deposited on : 2023-08-01  
Resolution : 2.66 Å(reported)

This is a Full wwPDB EM 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/EMValidationReportHelp>  
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>.

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

EMDB validation analysis : **FAILED**  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
MolProbity : 4.02b-467  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)  
MapQ : **FAILED**  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.39

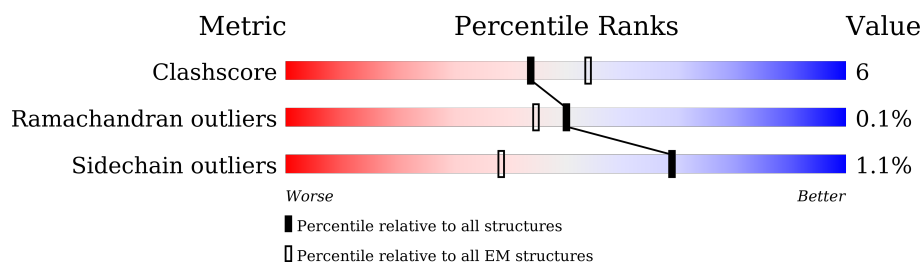
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*ELECTRON MICROSCOPY*

The reported resolution of this entry is 2.66 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)	EM structures (#Entries)
Clashscore	210492	15764
Ramachandran outliers	207382	16835
Sidechain outliers	206894	16415

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the 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  $\leq 5\%$ .

Mol	Chain	Length	Quality of chain
1	A	1447	
2	B	272	

## 2 Entry composition

There are 9 unique types of molecules in this entry. The entry contains 7747 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, 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 GPI inositol-deacylase,MCherry protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	961	7520	4882	1269	1336	33	0	0

There are 34 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-1	MET	-	initiating methionine	UNP G0S652
A	0	GLY	-	expression tag	UNP G0S652
A	1	SER	-	expression tag	UNP G0S652
A	327	ALA	SER	engineered mutation	UNP G0S652
A	1185	GLY	-	linker	UNP G0S652
A	1186	THR	-	linker	UNP G0S652
A	1187	LEU	-	linker	UNP G0S652
A	1188	GLU	-	linker	UNP G0S652
A	1189	VAL	-	linker	UNP G0S652
A	1190	LEU	-	linker	UNP G0S652
A	1191	PHE	-	linker	UNP G0S652
A	1192	GLN	-	linker	UNP G0S652
A	1193	GLY	-	linker	UNP G0S652
A	1194	PRO	-	linker	UNP G0S652
A	1195	LYS	-	linker	UNP G0S652
A	1196	LEU	-	linker	UNP G0S652
A	1197	GLU	-	linker	UNP G0S652
A	1198	PHE	-	linker	UNP G0S652
A	1345	SER	TRP	engineered mutation	UNP A0A366VY15
A	1363	VAL	ILE	engineered mutation	UNP A0A366VY15
A	1365	TYR	GLN	engineered mutation	UNP A0A366VY15
A	1399	ARG	ILE	engineered mutation	UNP A0A366VY15
A	1434	SER	-	expression tag	UNP A0A366VY15
A	1435	ALA	-	expression tag	UNP A0A366VY15
A	1436	HIS	-	expression tag	UNP A0A366VY15
A	1437	HIS	-	expression tag	UNP A0A366VY15
A	1438	HIS	-	expression tag	UNP A0A366VY15
A	1439	HIS	-	expression tag	UNP A0A366VY15

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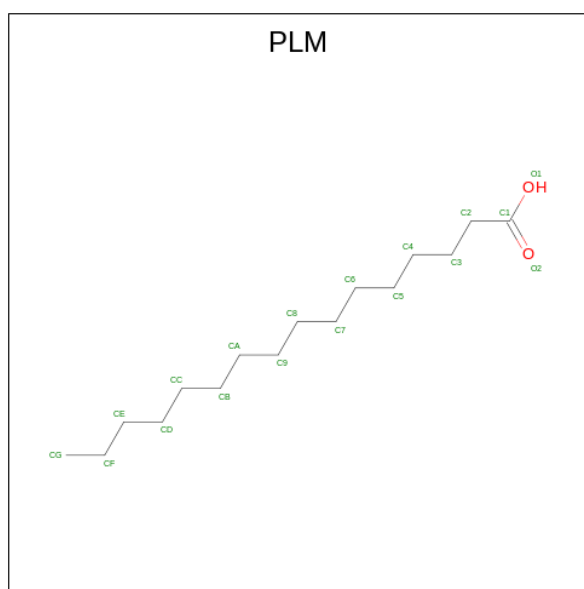
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Chain	Residue	Modelled	Actual	Comment	Reference
A	1440	HIS	-	expression tag	UNP A0A366VY15
A	1441	HIS	-	expression tag	UNP A0A366VY15
A	1442	HIS	-	expression tag	UNP A0A366VY15
A	1443	HIS	-	expression tag	UNP A0A366VY15
A	1444	HIS	-	expression tag	UNP A0A366VY15
A	1445	HIS	-	expression tag	UNP A0A366VY15

- Molecule 2 is a protein called Green fluorescent protein, Complement decay-accelerating factor.

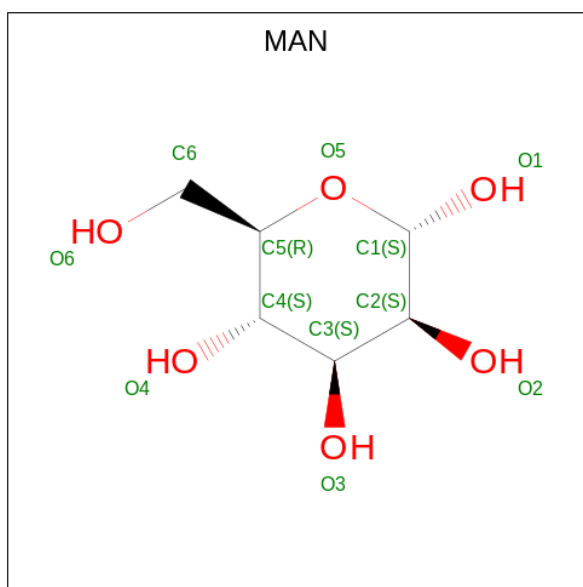
Mol	Chain	Residues	Atoms				AltConf	Trace
2	B	4	Total	C	N	O	0	0
			24	13	4	7		

- Molecule 3 is PALMITIC ACID (three-letter code: PLM) (formula:  $C_{16}H_{32}O_2$ ).



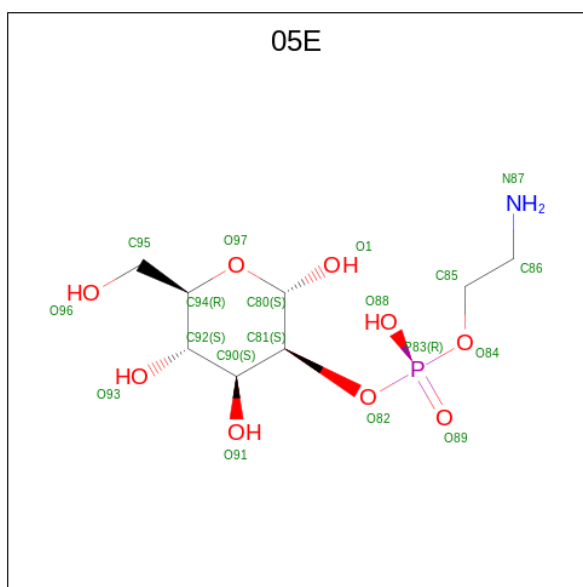
Mol	Chain	Residues	Atoms			AltConf
3	A	1	Total	C	O	0
			18	16	2	

- Molecule 4 is alpha-D-mannopyranose (three-letter code: MAN) (formula:  $C_6H_{12}O_6$ ) (labeled as "Ligand of Interest" by depositor).



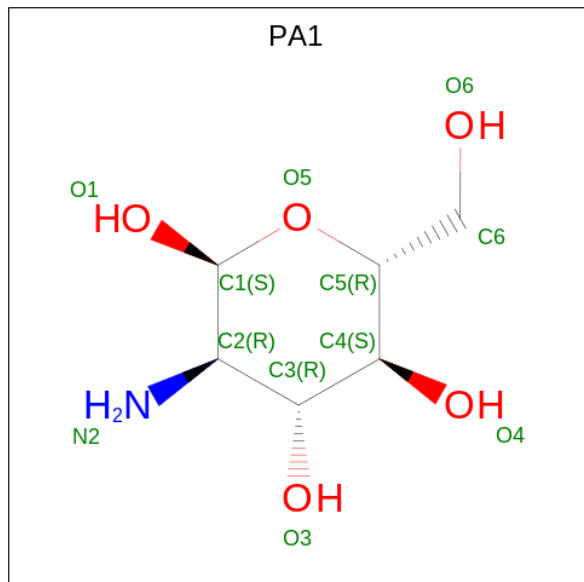
Mol	Chain	Residues	Atoms			AltConf
4	A	1	Total	C	O	0
			11	6	5	
4	A	1	Total	C	O	0
			11	6	5	

- Molecule 5 is 2-azanylethyl [(2 {S},3 {S},4 {S},5 {S},6 {R})-6-(hydroxymethyl)-2,4,5-tris(oxidanyl)oxan-3-yl] hydrogen phosphate (three-letter code: 05E) (formula: C<sub>8</sub>H<sub>18</sub>NO<sub>9</sub>P) (labeled as "Ligand of Interest" by depositor).



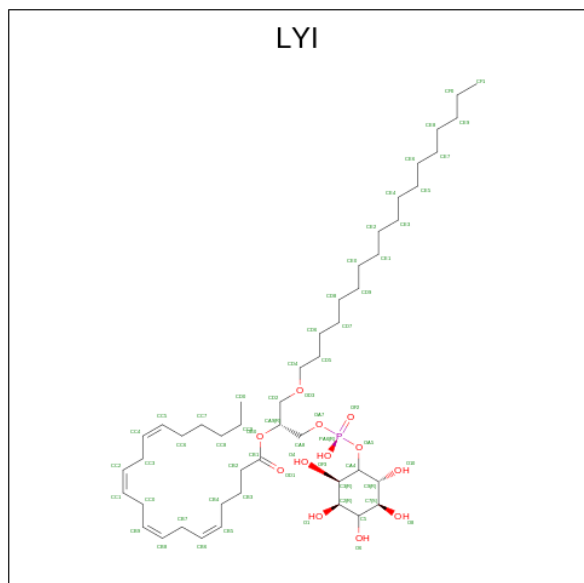
Mol	Chain	Residues	Atoms					AltConf
5	A	1	Total	C	N	O	P	0
			18	8	1	8	1	

- Molecule 6 is 2-amino-2-deoxy- $\alpha$ -D-glucopyranose (three-letter code: PA1) (formula:  $C_6H_{13}NO_5$ ) (labeled as "Ligand of Interest" by depositor).



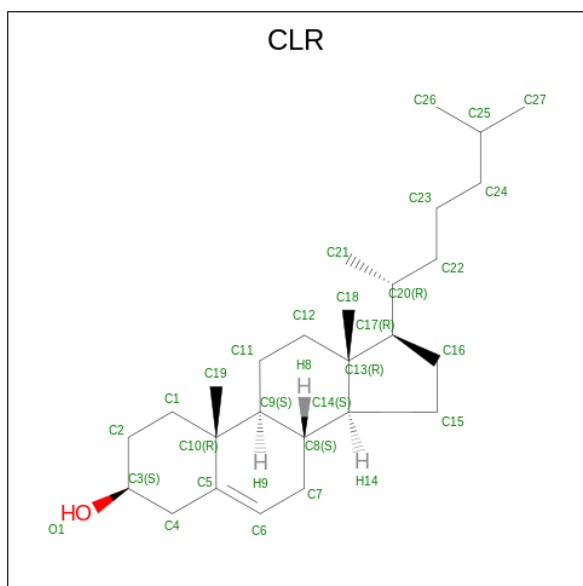
Mol	Chain	Residues	Atoms				AltConf
			Total	C	N	O	
6	A	1	11	6	1	4	0

- Molecule 7 is [(2 {R})-1-octadecoxy-3-[oxidanyl-[(2 {R},3 {R},5 {S},6 {R})-2,3,4,5,6-penta kis(oxidanyl)cyclohexyl]oxy-phosphoryl]oxy-propan-2-yl] (5 {Z},8 {Z},11 {Z},14 {Z})-icosa-5,8,11,14-tetraenoate (three-letter code: LYI) (formula:  $C_{47}H_{85}O_{12}P$ ) (labeled as "Ligand of Interest" by depositor).



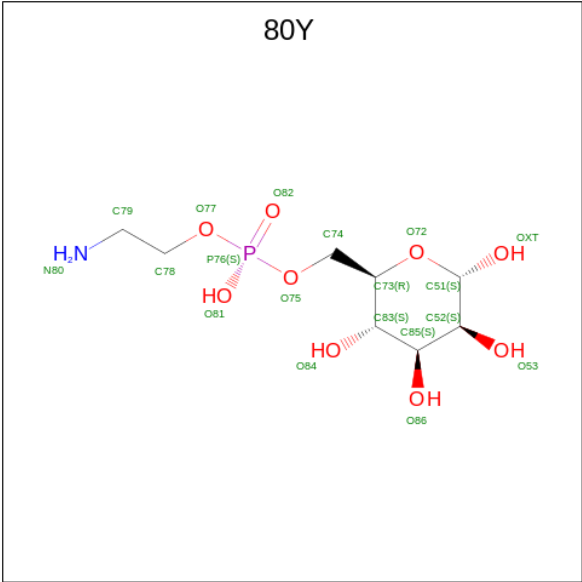
Mol	Chain	Residues	Atoms				AltConf
7	A	1	Total	C	O	P	0
			60	47	12	1	

- Molecule 8 is CHOLESTEROL (three-letter code: CLR) (formula:  $C_{27}H_{46}O$ ).



Mol	Chain	Residues	Atoms				AltConf
8	A	1	Total	C	O		0
			28	27	1		
8	A	1	Total	C	O		0
			28	27	1		

- Molecule 9 is 2-azanylethyl [(2R,3S,4S,5S,6S)-3,4,5,6-tetrakis(oxidanyl)oxan-2-yl]methyl hydrogen phosphate (three-letter code: 80Y) (formula:  $C_8H_{18}NO_9P$ ) (labeled as "Ligand of Interest" by depositor).

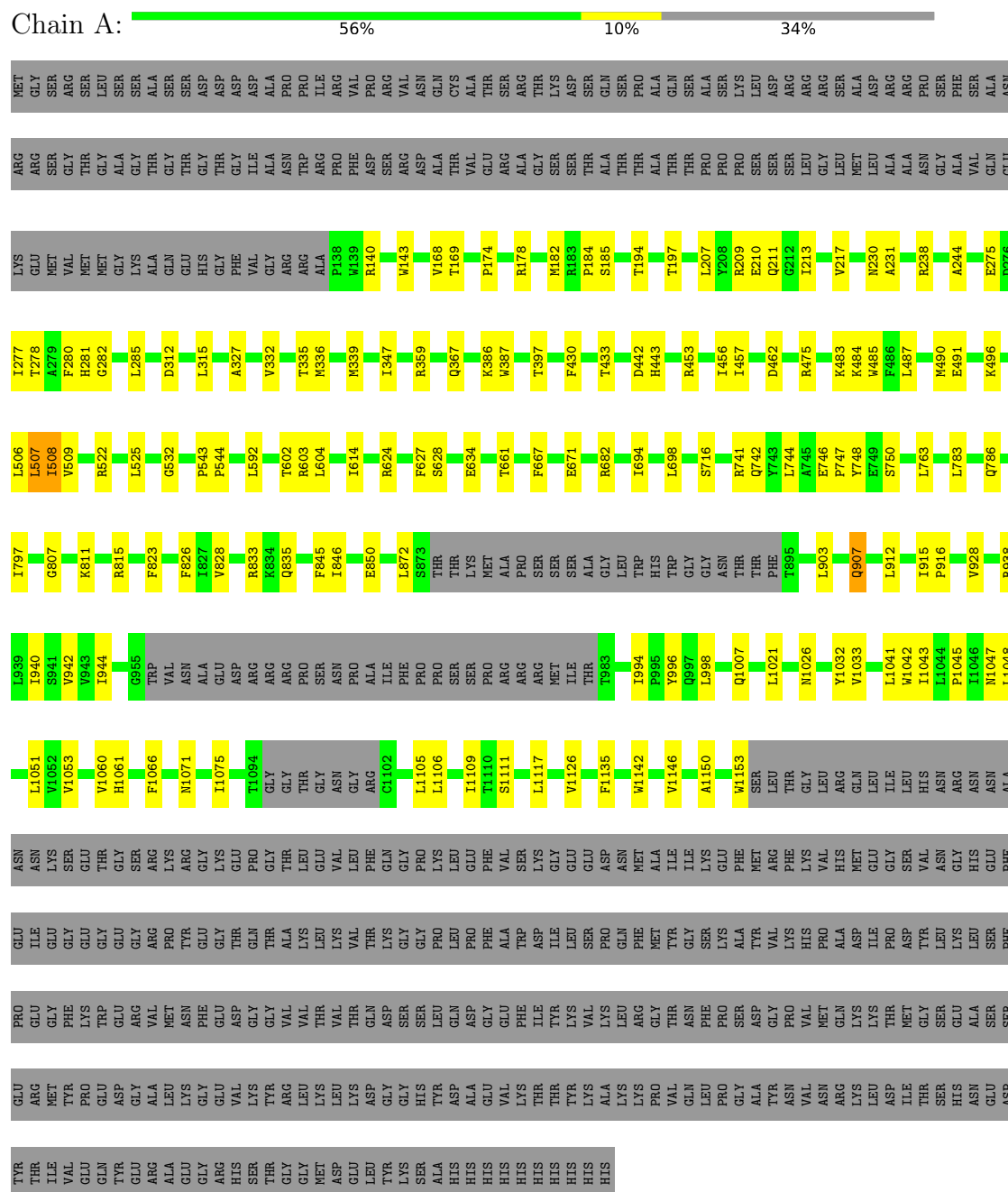


Mol	Chain	Residues	Atoms					AltConf
			Total	C	N	O	P	
9	B	1	18	8	1	8	1	0

### 3 Residue-property plots

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. 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. 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: GPI inositol-deacylase, MCherry protein



- Chain B:  99%

Chain B: . 99%

LYS	GLY	THR	PHE	ASP	GLY
GLY	THR	THR	TYR	ILE	GLY
GLY	TYR	TYR	ILE	THR	SER
GLY	ALA	ALA	ARG	PRO	GLY
GLY	LYS	LYS	PHE	ALA	SER
GLY	LYS	ASP	ASP	PHE	ALA
GLY	ASP	GLY	GLY	GLN	ALA
GLY	VAL	VAL	THR	TYR	VAL
GLY	ARG	ARG	ASN	GLY	ILE
GLY	LEU	LEU	PHE	ASN	LYS
SER	PRO	PRO	PRO	ARG	PRO
ALA	ASP	ALA	PRO	ALA	GLU
TRP	ALA	ASN	ASN	PHE	MET
SER	HIS	GLY	GLY	THR	LYS
HIS	GLU	PRO	PRO	LYS	ILE
PRO	VAL	VAL	VAL	TYR	LYS
GLN	ASP	ASP	MET	PRO	LEU
PHE	HIS	GLN	GLN	GLU	ARG
GLU	GLU	ARG	LYS	ASP	MET
LYS	ILE	LYS	ILE	ILE	GLU
GLY	GLU	GLU	THR	PRO	GLY
SER	SER	ILE	LEU	ASP	ALA
PRO	PRO	LEU	LEU	TYR	VAL
ASN	ASN	SER	TRP	PHE	GLY
GLY	LYS	HIS	GLU	GLN	ASN
SER	GLY	LYS	PRO	GLN	HIS
G1	G1	ASP	THR	PHE	LYS
T2	T2	TYR	GLU	PRO	PHE
T3	T3	ASN	LYS	GLU	VAL
S4	S4	LYS	THR	ILE	GLY
		VAL	VAL	SER	GLY
		ARG	GLU	TRP	ALA
		LEU	ASP	GLU	VAL
		TYR	ASP	GLU	GLY
		GLU	GLY	ARG	GLY
		HIS	VAL	SER	ILE
		ALA	VAL	SER	LYS
		ALA	GLY	THR	PRO
		ALA	LYS	THR	PRO
		ARG	ASP	GLU	TYR
		TYR	VAL	GLU	GLY
		SER	GLU	GLN	THR
		GLY	MET	GLY	LEU
		GLY	ALA	ILE	GLY
		GLY	LEU	CYS	ASP
		SER	LEU	ILE	LEU
		GLY	LEU	ALA	THR
		GLY	GLY	THR	GLU
		SER	GLY	ASP	GLY
		ALA	GLY	ILE	GLY
		TRP	HIS	THR	ALA
		SER	TYR	MET	PRO
		HIS	ARG	GLU	LEU
		GLN	CYS	GLY	PRO
		ASN	ASP	ASP	PHE
		PHE	PHE	CYS	SER
		GLU	LYS	THR	TYR

## 4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	353585	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ( $e^-/\text{\AA}^2$ )	50	Depositor
Minimum defocus (nm)	1200	Depositor
Maximum defocus (nm)	2500	Depositor
Magnification	Not provided	
Image detector	FEI FALCON IV (4k x 4k)	Depositor

## 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: 80Y, PA1, 05E, PLM, MAN, LYI, CLR

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	0.42	0/7722	0.52	0/10549
2	B	0.53	0/23	0.93	0/30
All	All	0.42	0/7745	0.52	0/10579

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

### 5.2 Too-close contacts [i](#)

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	7520	0	7512	93	0
2	B	24	0	24	3	0
3	A	18	0	31	1	0
4	A	22	0	19	1	0
5	A	18	0	0	0	0
6	A	11	0	10	1	0
7	A	60	0	0	0	0
8	A	56	0	92	10	0
9	B	18	0	0	0	0
All	All	7747	0	7688	97	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 6.

All (97) 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:1146:VAL:O	1:A:1150:ALA:HB3	1.76	0.83
1:A:143:TRP:HB3	8:A:1507:CLR:H12	1.61	0.80
1:A:506:LEU:HB3	1:A:592:LEU:CD2	2.21	0.71
1:A:1045:PRO:HD3	8:A:1508:CLR:H241	1.74	0.69
1:A:506:LEU:HB3	1:A:592:LEU:HD23	1.74	0.69
1:A:178:ARG:NH2	1:A:634:GLU:OE2	2.26	0.68
1:A:716:SER:OG	1:A:815:ARG:NH2	2.30	0.65
1:A:506:LEU:HA	1:A:604:LEU:O	1.98	0.63
2:B:1:GLY:O	2:B:2:THR:HB	1.98	0.63
1:A:741:ARG:NH1	1:A:786:GLN:OE1	2.32	0.62
1:A:182:MET:O	2:B:2:THR:HA	2.01	0.60
1:A:872:LEU:HD11	1:A:912:LEU:HD11	1.84	0.59
1:A:1041:LEU:HG	8:A:1508:CLR:H273	1.85	0.59
1:A:928:VAL:HG22	8:A:1507:CLR:H242	1.85	0.58
1:A:508:ILE:HA	1:A:602:THR:O	2.03	0.58
1:A:462:ASP:OD2	1:A:485:TRP:NE1	2.35	0.58
1:A:277:ILE:HD12	1:A:280:PHE:HB2	1.87	0.57
1:A:1048:LEU:HB2	8:A:1508:CLR:H183	1.87	0.56
1:A:312:ASP:HB2	1:A:315:LEU:HG	1.87	0.55
1:A:1117:LEU:HD13	1:A:1135:PHE:HD2	1.71	0.55
1:A:244:ALA:HB2	1:A:457:ILE:HD12	1.89	0.55
1:A:483:LYS:HG2	1:A:487:LEU:HD12	1.88	0.55
1:A:359:ARG:HH21	1:A:1126:VAL:HG12	1.72	0.55
1:A:184:PRO:O	1:A:211:GLN:NE2	2.38	0.54
1:A:238:ARG:NH1	2:B:4:SER:O	2.42	0.52
1:A:490:MET:HG3	1:A:614:ILE:HD13	1.89	0.52
1:A:1117:LEU:HD13	1:A:1135:PHE:CD2	2.44	0.52
1:A:1105:LEU:O	1:A:1109:ILE:HG13	2.10	0.52
1:A:433:THR:HB	1:A:750:SER:H	1.75	0.51
1:A:285:LEU:HD12	1:A:332:VAL:HG22	1.93	0.50
1:A:845:PHE:CE2	1:A:1032:TYR:HA	2.45	0.49
1:A:744:LEU:HD11	1:A:763:LEU:HD12	1.94	0.49
1:A:628:SER:HB3	1:A:634:GLU:HG3	1.95	0.49
1:A:1007:GLN:NE2	1:A:1033:VAL:HG13	2.27	0.49
1:A:327:ALA:HB2	1:A:443:HIS:NE2	2.27	0.49
1:A:682:ARG:HD2	1:A:694:ILE:HD11	1.95	0.49
1:A:174:PRO:HB2	1:A:627:PHE:HZ	1.78	0.48
1:A:1066:PHE:HB3	1:A:1071:ASN:OD1	2.13	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:140:ARG:NH1	1:A:850:GLU:HB2	2.29	0.48
1:A:168:VAL:HG23	1:A:169:THR:HG23	1.96	0.47
1:A:994:ILE:HD12	1:A:998:LEU:HD23	1.96	0.47
1:A:507:LEU:N	1:A:604:LEU:O	2.44	0.47
1:A:522:ARG:HG2	1:A:671:GLU:HB3	1.97	0.47
1:A:525:LEU:O	1:A:667:PHE:HA	2.15	0.47
1:A:217:VAL:O	1:A:217:VAL:HG13	2.16	0.46
1:A:281:HIS:ND1	1:A:1053:VAL:HG11	2.30	0.46
1:A:210:GLU:HG2	1:A:213:ILE:HD13	1.98	0.46
1:A:746:GLU:HB3	1:A:747:PRO:HD3	1.97	0.46
1:A:742:GLN:NE2	1:A:783:LEU:HD11	2.30	0.46
1:A:835:GLN:NE2	1:A:846:ILE:O	2.33	0.46
1:A:698:LEU:HB2	1:A:797:ILE:HG22	1.98	0.46
1:A:278:THR:CG2	1:A:285:LEU:HD13	2.46	0.46
1:A:397:THR:HG23	1:A:475:ARG:HG2	1.98	0.45
1:A:807:GLY:O	1:A:811:LYS:HG2	2.16	0.45
1:A:532:GLY:HA2	1:A:661:THR:O	2.15	0.45
1:A:280:PHE:CE1	8:A:1508:CLR:H42	2.52	0.45
1:A:996:TYR:HB2	1:A:1075:ILE:HB	1.99	0.45
1:A:624:ARG:HE	1:A:624:ARG:HB3	1.40	0.44
3:A:1501:PLM:H52	3:A:1501:PLM:H22	1.65	0.44
1:A:484:LYS:HD3	1:A:484:LYS:HA	1.78	0.44
1:A:543:PRO:HA	1:A:544:PRO:HD3	1.90	0.44
1:A:442:ASP:OD2	4:A:1502:MAN:O4	2.35	0.44
1:A:231:ALA:O	6:A:1505:PA1:N2	2.51	0.43
1:A:915:ILE:HB	1:A:916:PRO:HD3	1.99	0.43
1:A:1060:VAL:O	1:A:1061:HIS:HB2	2.19	0.43
1:A:143:TRP:CB	8:A:1507:CLR:H12	2.39	0.43
1:A:207:LEU:HD23	1:A:217:VAL:HG23	2.00	0.43
1:A:386:LYS:HD2	1:A:387:TRP:CZ3	2.53	0.43
1:A:1106:LEU:HD22	1:A:1142:TRP:HH2	1.84	0.43
1:A:1117:LEU:HB2	1:A:1135:PHE:HE2	1.83	0.43
1:A:940:ILE:O	1:A:944:ILE:HG12	2.18	0.43
1:A:453:ARG:HA	1:A:456:ILE:HG22	2.00	0.43
1:A:185:SER:HB3	1:A:209:ARG:O	2.18	0.43
1:A:430:PHE:O	1:A:433:THR:HG22	2.19	0.43
1:A:496:LYS:HA	1:A:496:LYS:HD3	1.81	0.43
1:A:359:ARG:HH11	1:A:359:ARG:HG3	1.84	0.42
1:A:994:ILE:HG23	1:A:998:LEU:HD23	2.01	0.42
1:A:335:THR:O	1:A:339:MET:HG2	2.19	0.42
8:A:1508:CLR:H211	8:A:1508:CLR:H231	1.66	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:282:GLY:HA3	1:A:367:GLN:HB3	2.00	0.42
8:A:1507:CLR:H162	8:A:1507:CLR:H221	1.69	0.42
1:A:828:VAL:HG21	1:A:1042:TRP:CD1	2.55	0.42
1:A:194:THR:HA	1:A:197:THR:O	2.20	0.41
1:A:998:LEU:N	1:A:1051:LEU:HD21	2.35	0.41
1:A:833:ARG:NH1	1:A:1111:SER:OG	2.53	0.41
1:A:912:LEU:HD23	1:A:912:LEU:HA	1.94	0.41
1:A:1021:LEU:HB2	1:A:1026:ASN:HD22	1.85	0.41
1:A:938:ARG:O	1:A:942:VAL:HG23	2.19	0.41
1:A:336:MET:HE2	1:A:347:ILE:HD11	2.03	0.41
1:A:1048:LEU:HD12	8:A:1508:CLR:H20	2.02	0.41
1:A:491:GLU:HG2	1:A:748:TYR:CE1	2.56	0.41
1:A:741:ARG:HB3	1:A:786:GLN:HB3	2.03	0.41
1:A:1048:LEU:HD23	1:A:1048:LEU:HA	1.83	0.40
1:A:603:ARG:O	1:A:604:LEU:HD23	2.21	0.40
1:A:907:GLN:HE21	1:A:907:GLN:HB2	1.76	0.40
1:A:1043:ILE:HG22	1:A:1047:ASN:ND2	2.36	0.40
1:A:823:PHE:O	1:A:826:PHE:HB3	2.22	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 PDB entries followed by that with respect to all EM entries.

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	953/1447 (66%)	934 (98%)	19 (2%)	0	100	100
2	B	2/272 (1%)	1 (50%)	0	1 (50%)	0	0
All	All	955/1719 (56%)	935 (98%)	19 (2%)	1 (0%)	50	67

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	2	THR

### 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 PDB entries followed by that with respect to all EM entries.

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	824/1248 (66%)	816 (99%)	8 (1%)	73	85
2	B	3/219 (1%)	2 (67%)	1 (33%)	0	0
All	All	827/1467 (56%)	818 (99%)	9 (1%)	69	84

All (9) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	230	ASN
1	A	275	GLU
1	A	507	LEU
1	A	508	ILE
1	A	509	VAL
1	A	903	LEU
1	A	907	GLN
1	A	1153	TRP
2	B	2	THR

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

Mol	Chain	Res	Type
1	A	907	GLN
1	A	1047	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 oligosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

9 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	$\# Z  > 2$
4	MAN	A	1503	5,9	11,11,12	0.54	0	15,15,17	1.23	3 (20%)
8	CLR	A	1507	-	31,31,31	0.22	0	48,48,48	0.36	0
4	MAN	A	1502	9	11,11,12	0.48	0	15,15,17	0.57	0
7	LYI	A	1506	6	60,60,60	0.42	0	69,71,71	0.55	1 (1%)
5	05E	A	1504	6,4	18,18,19	0.69	0	22,25,27	0.87	1 (4%)
8	CLR	A	1508	-	31,31,31	0.28	0	48,48,48	0.50	0
3	PLM	A	1501	-	17,17,17	0.60	0	17,17,17	0.51	0
6	PA1	A	1505	5,7	11,11,12	0.74	0	12,15,17	1.55	2 (16%)
9	80Y	B	101	2,4	18,18,19	0.66	0	24,25,27	0.90	1 (4%)

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	MAN	A	1503	5,9	-	2/2/19/22	0/1/1/1
8	CLR	A	1507	-	-	9/10/68/68	0/4/4/4
4	MAN	A	1502	9	-	0/2/19/22	0/1/1/1
7	LYI	A	1506	6	-	21/54/78/78	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
5	05E	A	1504	6,4	-	7/12/29/32	0/1/1/1
8	CLR	A	1508	-	-	7/10/68/68	0/4/4/4
3	PLM	A	1501	-	-	10/15/15/15	-
6	PA1	A	1505	5,7	-	2/2/19/22	0/1/1/1
9	80Y	B	101	2,4	-	5/11/28/31	0/1/1/1

There are no bond length outliers.

All (8) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	A	1505	PA1	C4-C3-C2	-3.55	105.37	111.37
6	A	1505	PA1	C1-O5-C5	3.55	117.00	112.19
9	B	101	80Y	O53-C52-C85	-2.97	104.19	110.14
7	A	1506	LYI	O10-C9-C7	-2.82	103.82	110.35
4	A	1503	MAN	O2-C2-C3	-2.77	104.59	110.14
5	A	1504	05E	C80-O97-C94	2.59	115.70	112.19
4	A	1503	MAN	O2-C2-C1	-2.48	104.07	109.15
4	A	1503	MAN	C2-C3-C4	-2.19	107.11	110.89

There are no chirality outliers.

All (63) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	A	1504	05E	C81-O82-P83-O88
5	A	1504	05E	C85-O84-P83-O88
5	A	1504	05E	C85-O84-P83-O89
9	B	101	80Y	C78-O77-P76-O75
9	B	101	80Y	C78-O77-P76-O81
9	B	101	80Y	C78-O77-P76-O82
6	A	1505	PA1	O5-C5-C6-O6
6	A	1505	PA1	C4-C5-C6-O6
8	A	1508	CLR	C21-C20-C22-C23
8	A	1507	CLR	C17-C20-C22-C23
3	A	1501	PLM	C2-C3-C4-C5
8	A	1507	CLR	C21-C20-C22-C23
8	A	1507	CLR	C22-C23-C24-C25
5	A	1504	05E	C85-O84-P83-O82
8	A	1507	CLR	C13-C17-C20-C22
7	A	1506	LYI	OD3-CD4-CD5-CD6
7	A	1506	LYI	CA4-OA5-PA6-OA7

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Mol	Chain	Res	Type	Atoms
8	A	1508	CLR	C13-C17-C20-C22
7	A	1506	LYI	CE3-CE4-CE5-CE6
7	A	1506	LYI	CE6-CE7-CE8-CE9
7	A	1506	LYI	CD5-CD6-CD7-CD8
7	A	1506	LYI	CE0-CE1-CE2-CE3
8	A	1508	CLR	C22-C23-C24-C25
5	A	1504	05E	O84-C85-C86-N87
9	B	101	80Y	O77-C78-C79-N80
3	A	1501	PLM	CB-CC-CD-CE
8	A	1507	CLR	C16-C17-C20-C21
7	A	1506	LYI	CE4-CE5-CE6-CE7
3	A	1501	PLM	C6-C7-C8-C9
8	A	1507	CLR	C13-C17-C20-C21
8	A	1508	CLR	C20-C22-C23-C24
8	A	1508	CLR	C16-C17-C20-C21
8	A	1507	CLR	C16-C17-C20-C22
4	A	1503	MAN	C4-C5-C6-O6
7	A	1506	LYI	CC6-CC7-CC8-CC9
8	A	1508	CLR	C13-C17-C20-C21
8	A	1508	CLR	C16-C17-C20-C22
5	A	1504	05E	C81-O82-P83-O84
7	A	1506	LYI	CD6-CD7-CD8-CD9
7	A	1506	LYI	CD9-CE0-CE1-CE2
3	A	1501	PLM	C3-C4-C5-C6
3	A	1501	PLM	C5-C6-C7-C8
5	A	1504	05E	C81-O82-P83-O89
4	A	1503	MAN	O5-C5-C6-O6
7	A	1506	LYI	CB6-CB7-CB8-CB9
7	A	1506	LYI	CB9-CC0-CC1-CC2
8	A	1507	CLR	C23-C24-C25-C27
7	A	1506	LYI	CD4-CD5-CD6-CD7
7	A	1506	LYI	CE1-CE2-CE3-CE4
7	A	1506	LYI	CD5-CD4-OD3-CD2
7	A	1506	LYI	CE7-CE8-CE9-CF0
7	A	1506	LYI	CE8-CE9-CF0-CF1
7	A	1506	LYI	CE5-CE6-CE7-CE8
9	B	101	80Y	C73-C74-O75-P76
8	A	1507	CLR	C23-C24-C25-C26
7	A	1506	LYI	CE2-CE3-CE4-CE5
3	A	1501	PLM	C8-C9-CA-CB
7	A	1506	LYI	CB5-CB6-CB7-CB8
7	A	1506	LYI	CB8-CB9-CC0-CC1

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Mol	Chain	Res	Type	Atoms
3	A	1501	PLM	C1-C2-C3-C4
3	A	1501	PLM	O1-C1-C2-C3
3	A	1501	PLM	O2-C1-C2-C3
3	A	1501	PLM	CD-CE-CF-CG

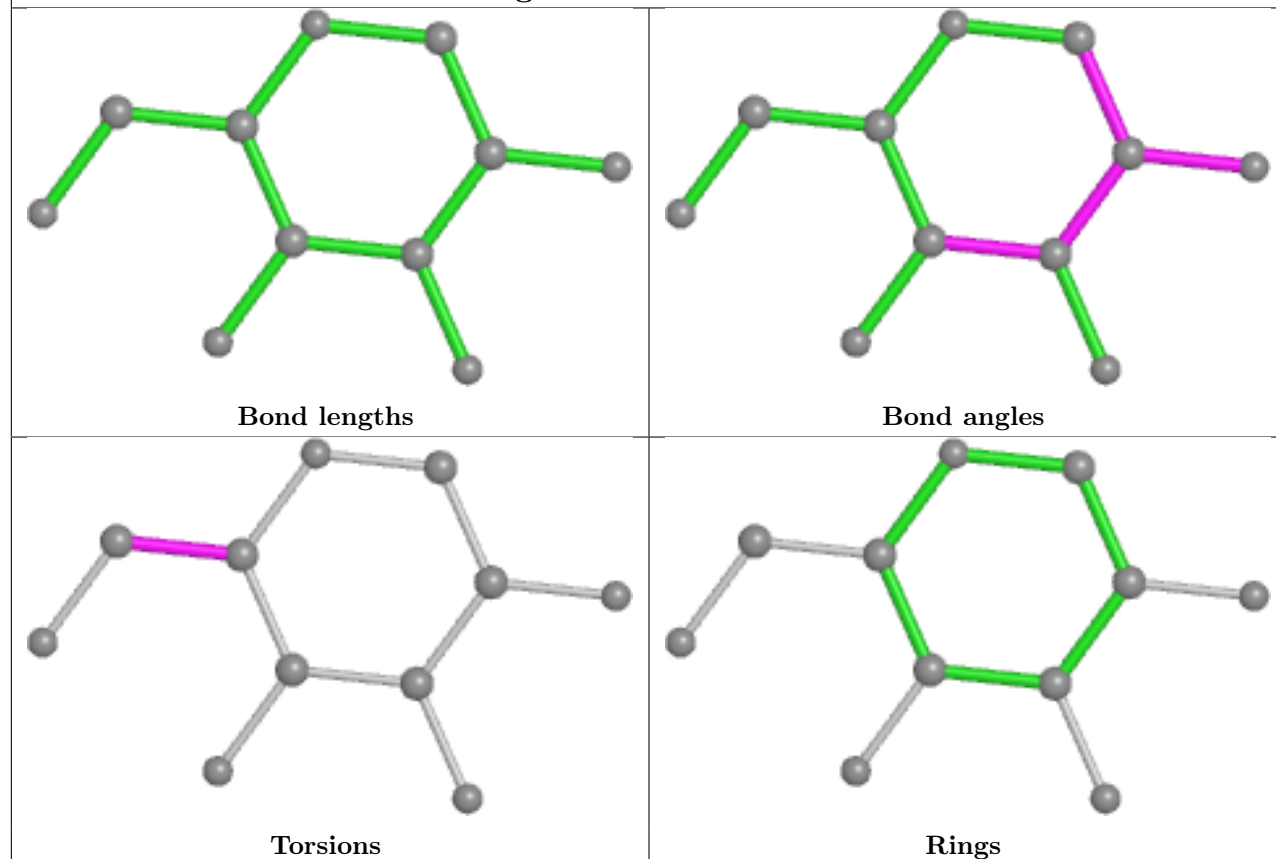
There are no ring outliers.

5 monomers are involved in 13 short contacts:

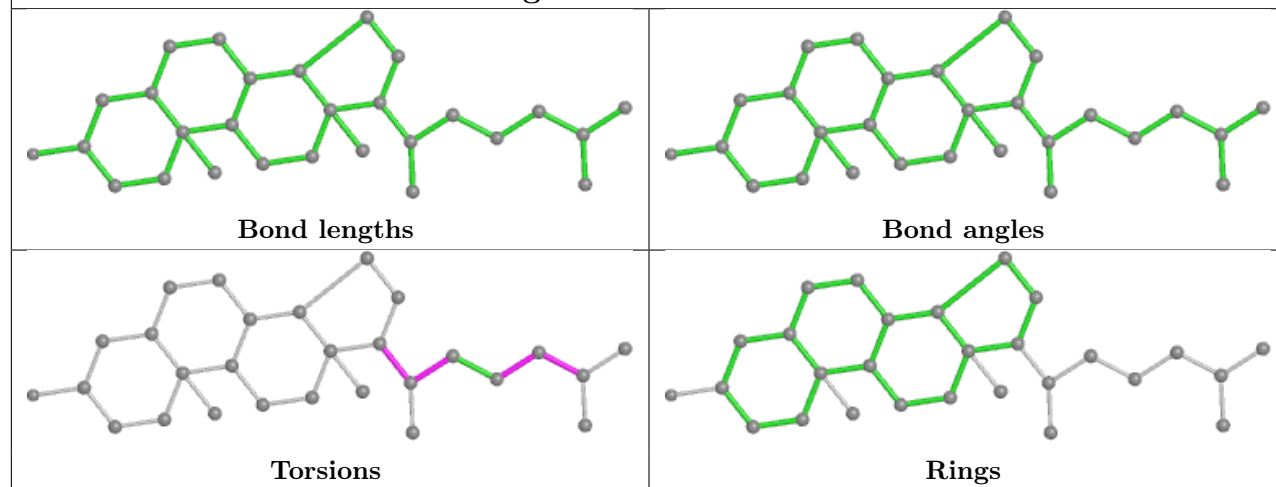
Mol	Chain	Res	Type	Clashes	Symm-Clashes
8	A	1507	CLR	4	0
4	A	1502	MAN	1	0
8	A	1508	CLR	6	0
3	A	1501	PLM	1	0
6	A	1505	PA1	1	0

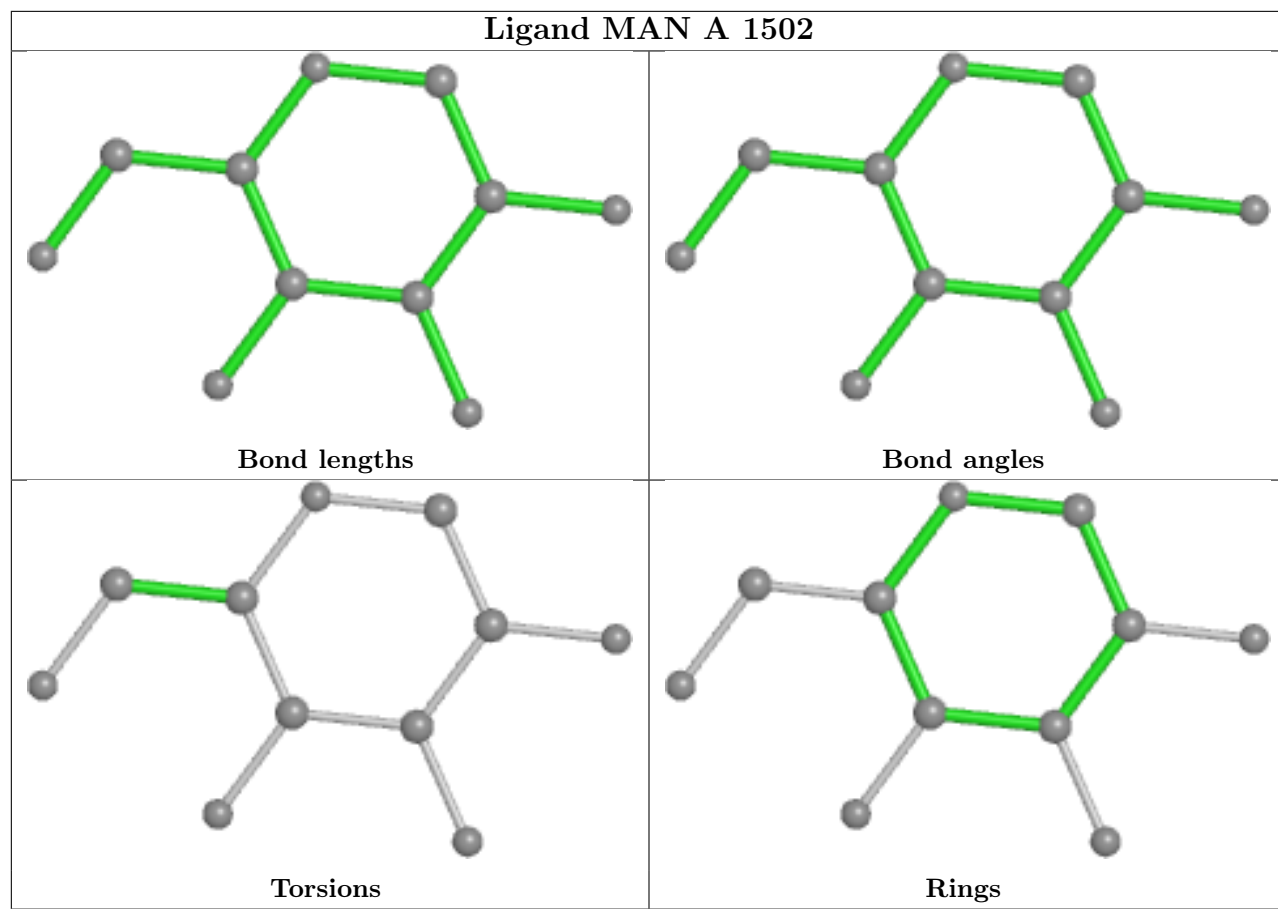
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. 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.

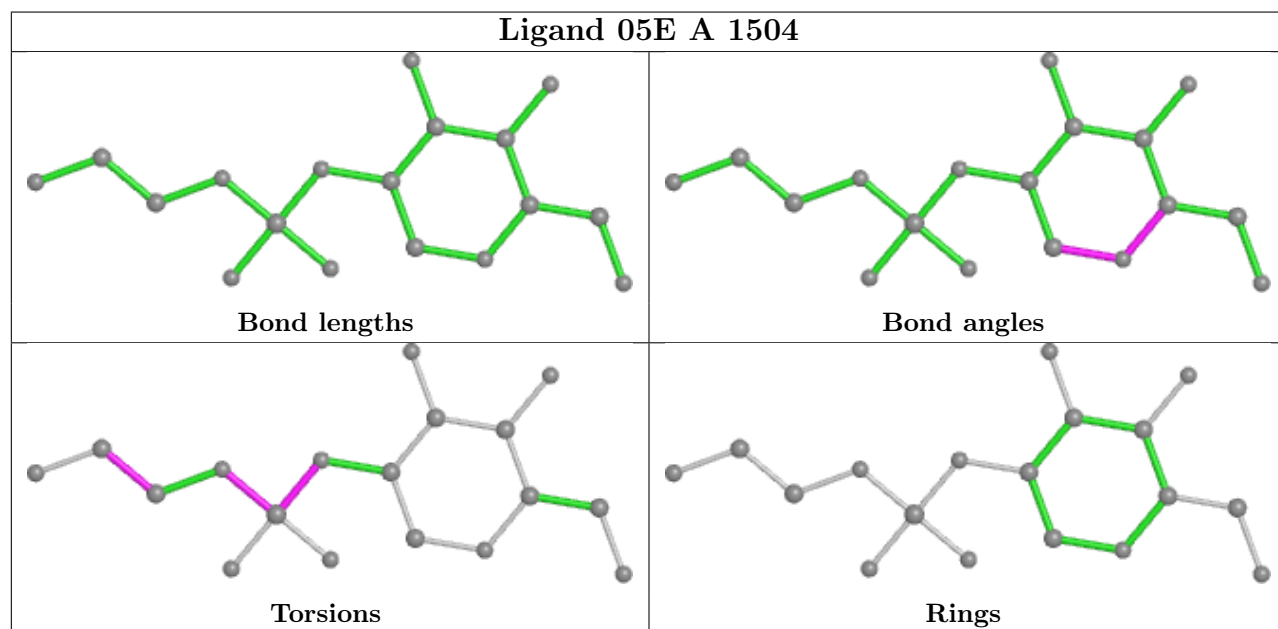
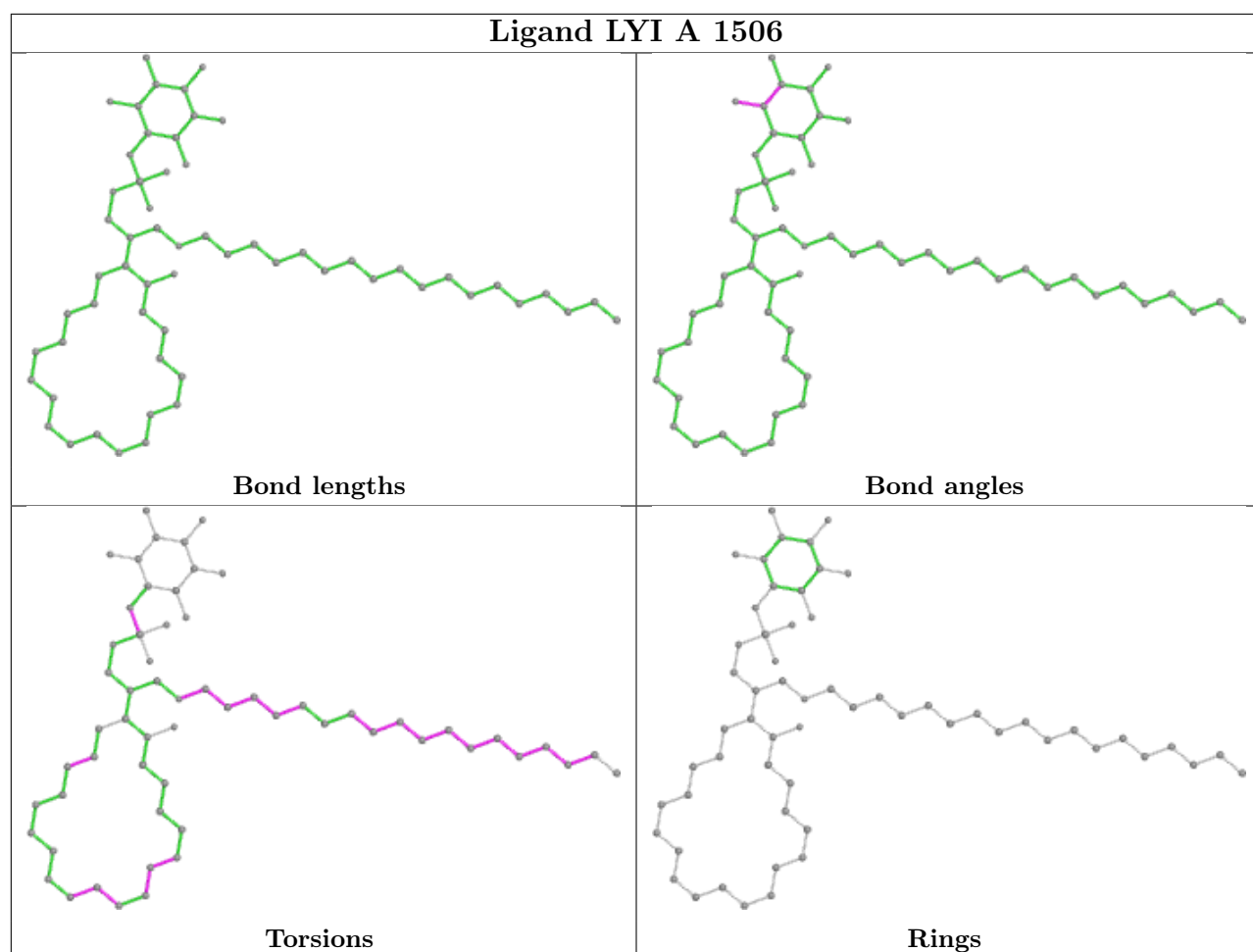
## Ligand MAN A 1503

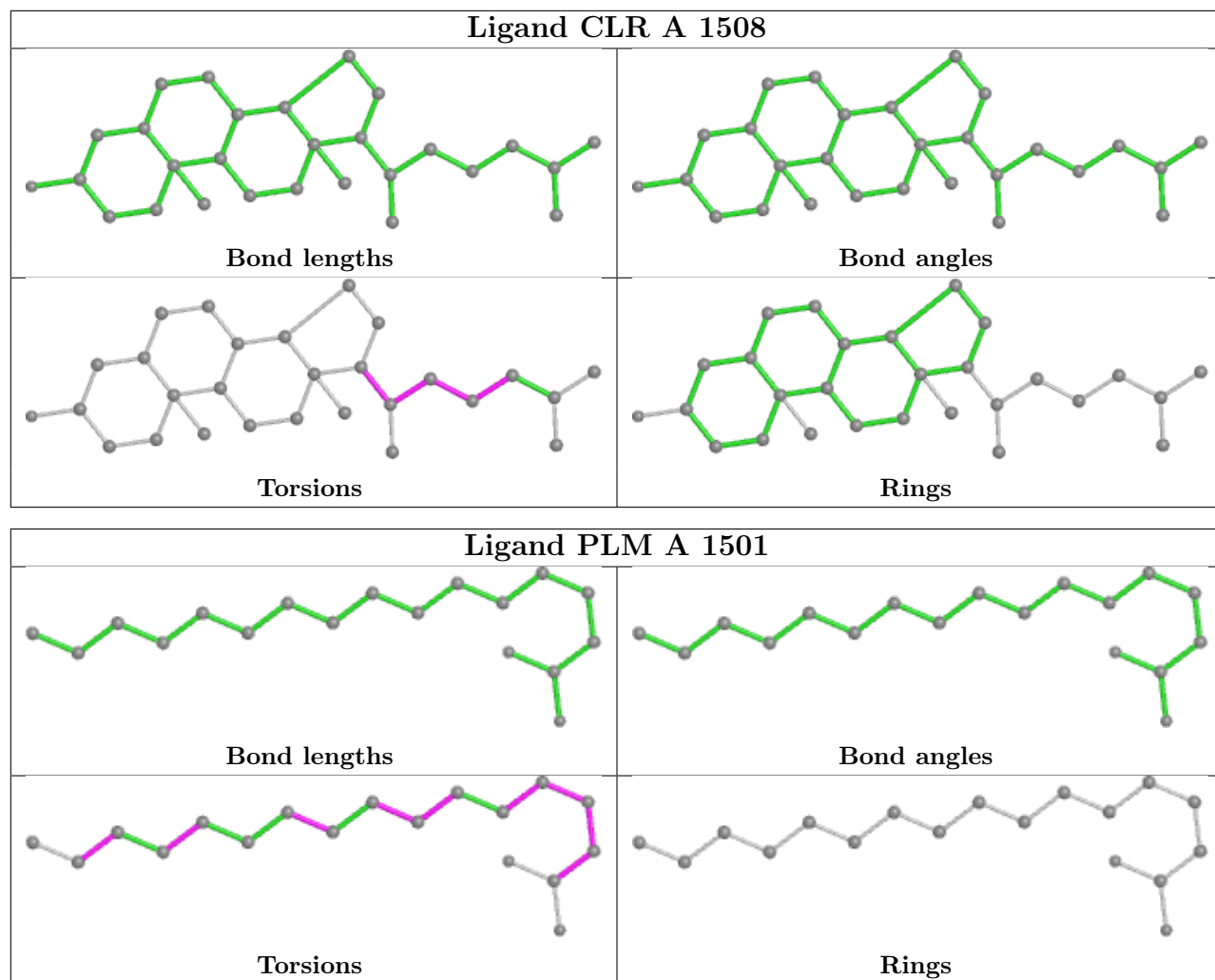


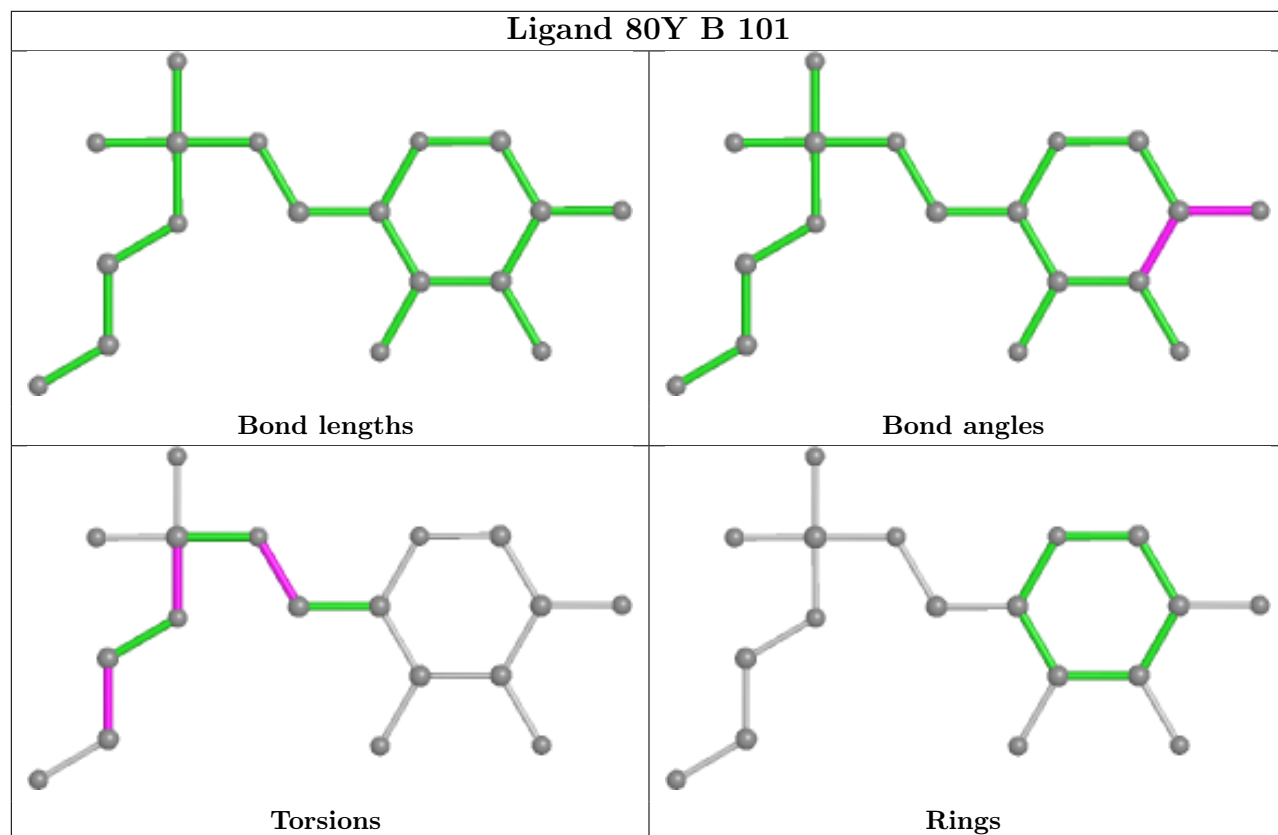
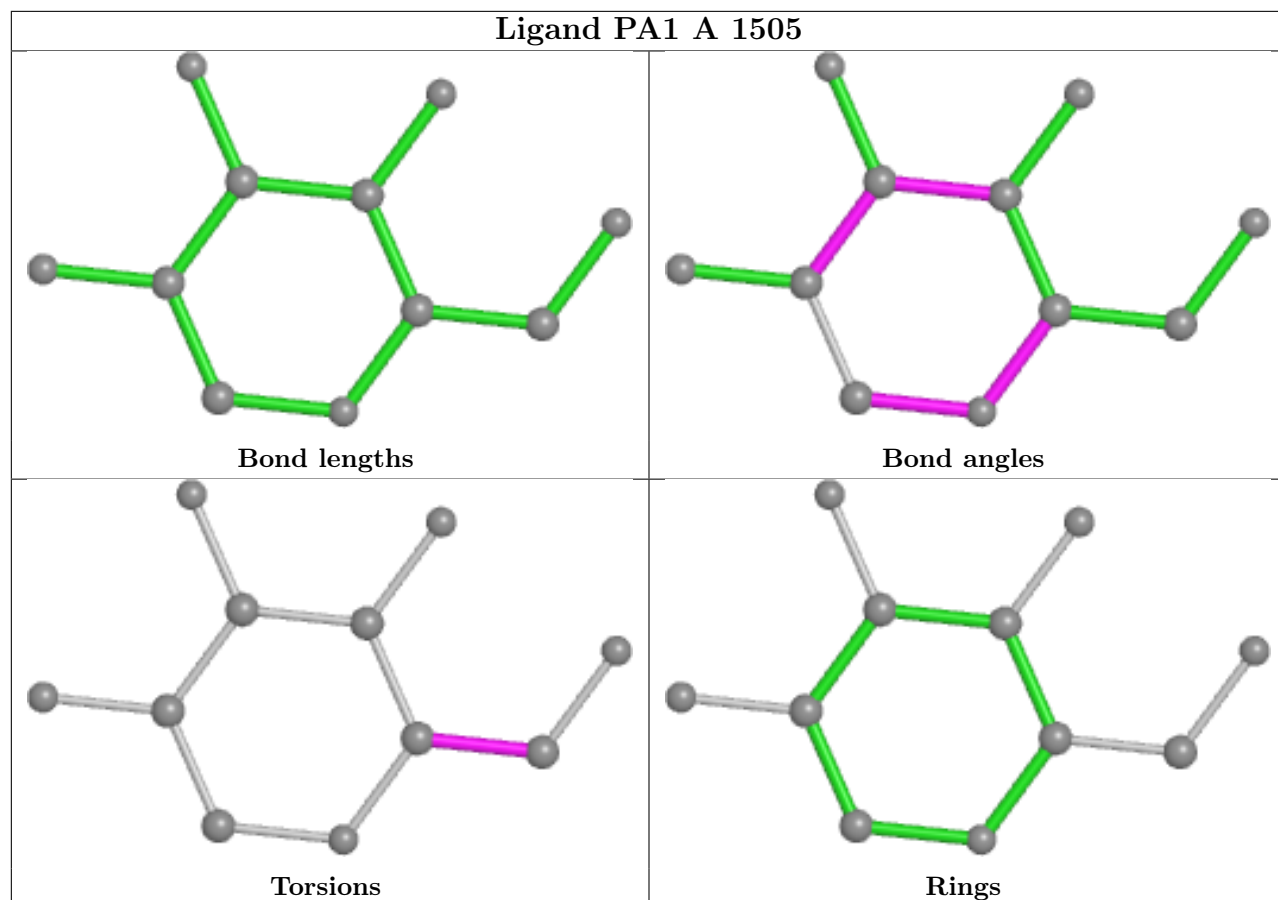
## Ligand CLR A 1507











## 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.