



# Full wwPDB X-ray Structure Validation Report ⓘ

Oct 15, 2023 – 07:38 PM EDT

PDB ID : 8CXR  
Title : Crystal structure of MraY bound to a sphaerimicin analogue  
Authors : Mashalidis, E.H.; Lee, S.Y.  
Deposited on : 2022-05-22  
Resolution : 3.65 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.

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:

MolProbity : 4.02b-467  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 2.36  
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) : 2.36

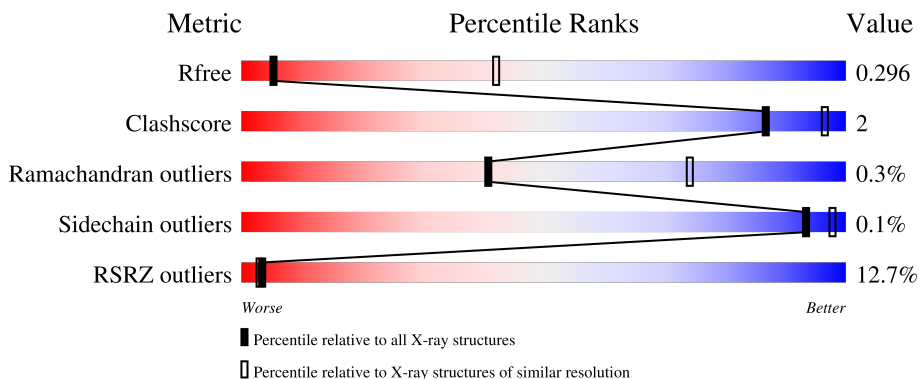
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 3.65 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.



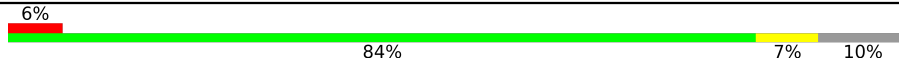
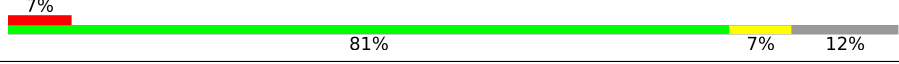
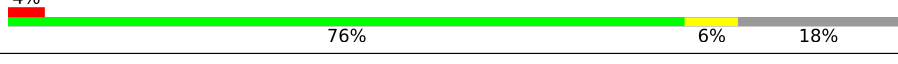
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
$R_{free}$	130704	1557 (3.82-3.50)
Clashscore	141614	1037 (3.80-3.52)
Ramachandran outliers	138981	1004 (3.80-3.52)
Sidechain outliers	138945	1002 (3.80-3.52)
RSRZ outliers	127900	1441 (3.82-3.50)

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  $\geq 3$ , 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	E	137	 23% 91% 8%
1	F	137	 32% 91% 8%
1	G	137	 23% 91% 8%
1	H	137	 30% 91% 9%
2	A	365	 4% 80% 6% 14%

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Mol	Chain	Length	Quality of chain
2	B	365	
2	C	365	
2	D	365	

## 2 Entry composition i

There are 3 unique types of molecules in this entry. The entry contains 26549 atoms, of which 13185 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 MraYAA nanobody.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace	
			Total	C	H	N	O				S
1	E	126	1805	584	871	161	185	4	0	0	0
1	G	126	1800	583	867	160	186	4	0	0	0
1	F	126	1810	585	873	161	187	4	0	0	0
1	H	124	1788	577	863	160	184	4	0	0	0

- Molecule 2 is a protein called Phospho-N-acetylmuramoyl-pentapeptide-transferase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace	
			Total	C	H	N	O				S
2	A	315	4828	1618	2431	363	408	8	0	0	0
2	C	320	4788	1613	2391	367	409	8	0	0	0
2	B	330	4933	1664	2465	379	418	7	0	0	0
2	D	300	4569	1529	2306	341	385	8	0	0	0

There are 24 discrepancies between the modelled and reference sequences:

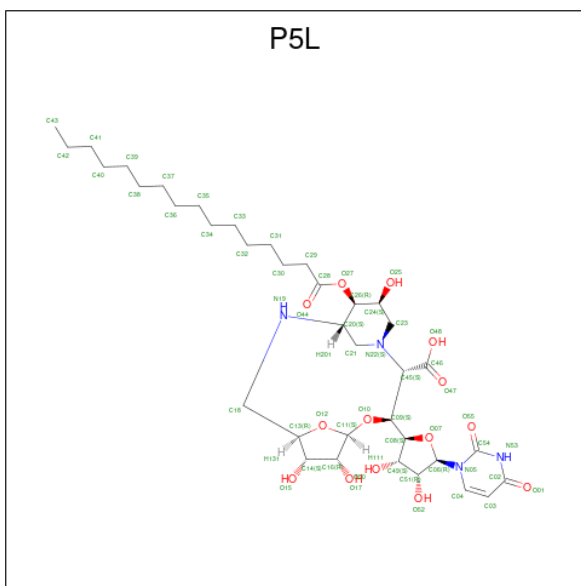
Chain	Residue	Modelled	Actual	Comment	Reference
A	-5	GLY	-	expression tag	UNP O66465
A	-4	PRO	-	expression tag	UNP O66465
A	-3	ALA	-	expression tag	UNP O66465
A	-2	VAL	-	expression tag	UNP O66465
A	-1	PRO	-	expression tag	UNP O66465
A	0	ARG	-	expression tag	UNP O66465
C	-5	GLY	-	expression tag	UNP O66465
C	-4	PRO	-	expression tag	UNP O66465

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Chain	Residue	Modelled	Actual	Comment	Reference
C	-3	ALA	-	expression tag	UNP O66465
C	-2	VAL	-	expression tag	UNP O66465
C	-1	PRO	-	expression tag	UNP O66465
C	0	ARG	-	expression tag	UNP O66465
B	-5	GLY	-	expression tag	UNP O66465
B	-4	PRO	-	expression tag	UNP O66465
B	-3	ALA	-	expression tag	UNP O66465
B	-2	VAL	-	expression tag	UNP O66465
B	-1	PRO	-	expression tag	UNP O66465
B	0	ARG	-	expression tag	UNP O66465
D	-5	GLY	-	expression tag	UNP O66465
D	-4	PRO	-	expression tag	UNP O66465
D	-3	ALA	-	expression tag	UNP O66465
D	-2	VAL	-	expression tag	UNP O66465
D	-1	PRO	-	expression tag	UNP O66465
D	0	ARG	-	expression tag	UNP O66465

- Molecule 3 is (1S,4R,5S,6R,7S,9S,10S,11S,13S,14R)-9-[(2S,3S,4R,5R)-5-(2,4-dioxo-3,4-dihydropyrimidin-1(2H)-yl)-3,4-dihydroxyoxolan-2-yl]-14-(hexadecanoyloxy)-5,6,13-trihydroxy-8,16-dioxo-2,11-diazatricyclo[9.3.1.1 4,7 ]hexadecane-10-carboxylic acid (three-letter code: P5L) (formula: C<sub>37</sub>H<sub>60</sub>N<sub>4</sub>O<sub>14</sub>) (labeled as "Ligand of Interest" by depositor).

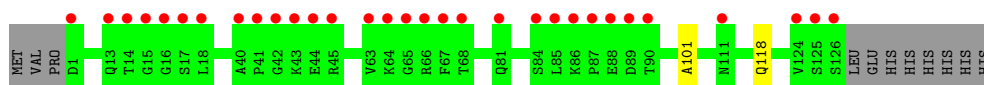


Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	
			Total	C	H	N			O
3	A	1	Total	C	H	N	O	0	0
			114	37	59	4	14		
3	C	1	Total	C	H	N	O	0	0
			114	37	59	4	14		

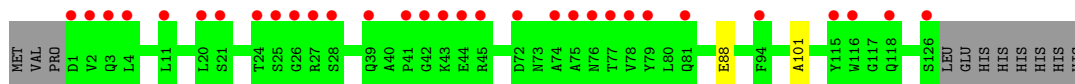
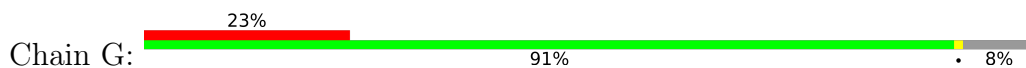
### 3 Residue-property plots [i](#)

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.

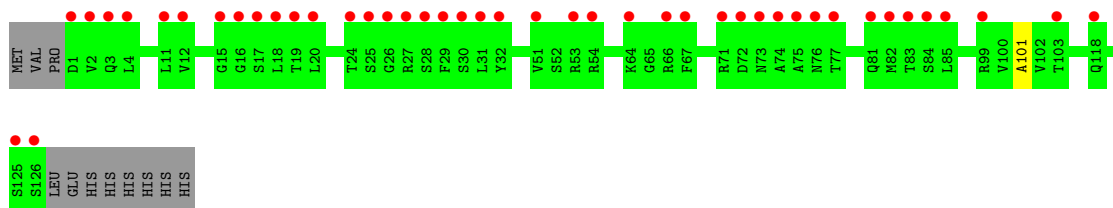
- Molecule 1: MraYAA nanobody



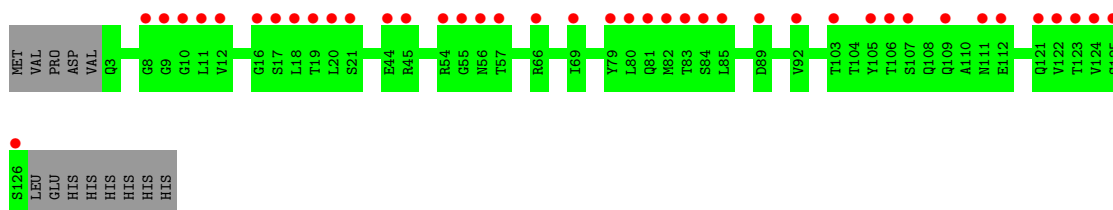
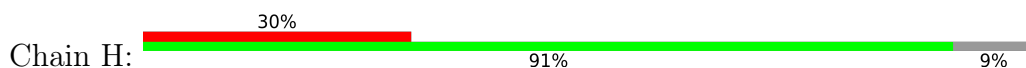
- Molecule 1: MraYAA nanobody



- Molecule 1: MraYAA nanobody

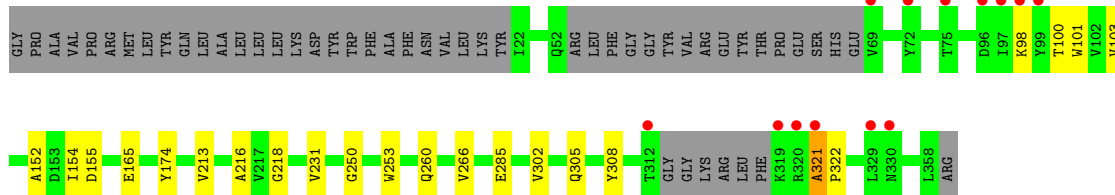


- Molecule 1: MraYAA nanobody



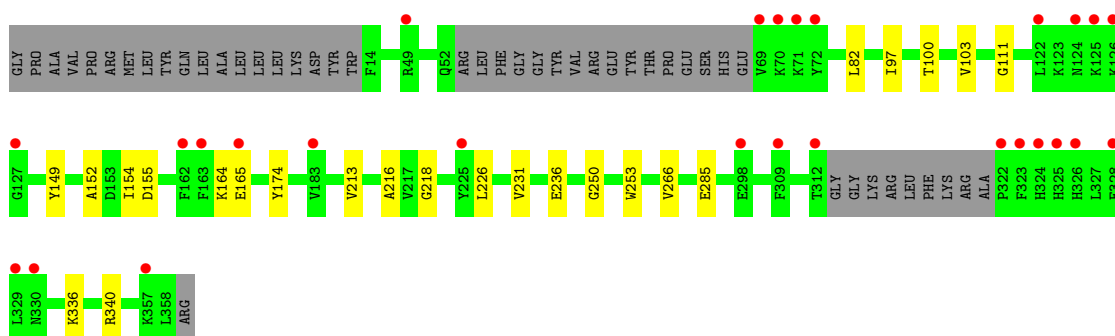
- Molecule 2: Phospho-N-acetylmuramoyl-pentapeptide-transferase

Chain A: 4% 80% 6% 14%



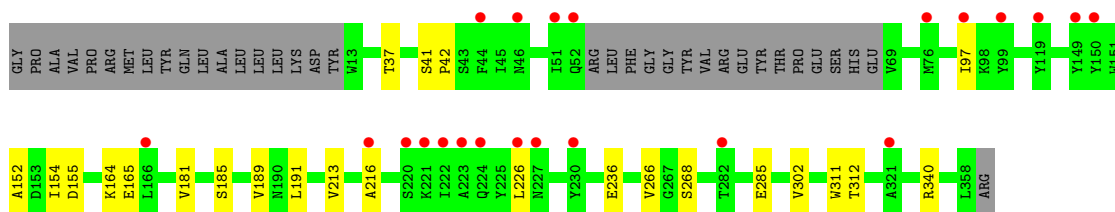
• Molecule 2: Phospho-N-acetylmuramoyl-pentapeptide-transferase

Chain C: 7% 81% 7% 12%



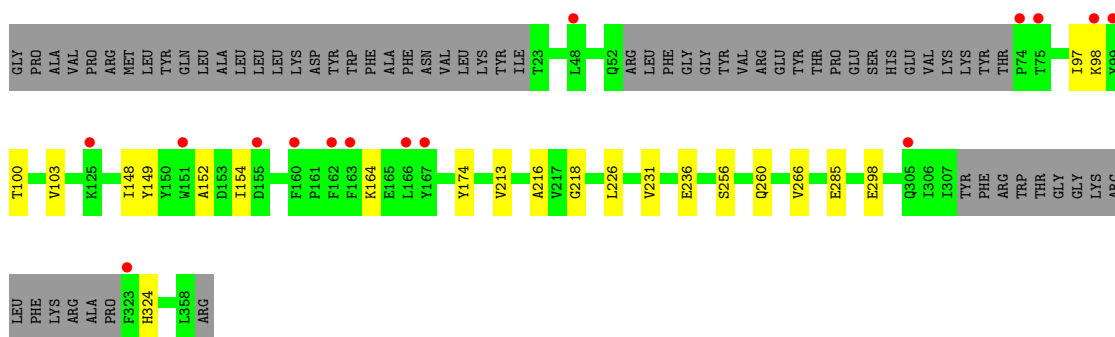
• Molecule 2: Phospho-N-acetylmuramoyl-pentapeptide-transferase

Chain B: 6% 84% 7% 10%



• Molecule 2: Phospho-N-acetylmuramoyl-pentapeptide-transferase

Chain D: 4% 76% 6% 18%



## 4 Data and refinement statistics i

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	93.88Å 127.70Å 130.15Å 90.00° 111.39° 90.00°	Depositor
Resolution (Å)	87.91 – 3.65 87.91 – 3.65	Depositor EDS
% Data completeness (in resolution range)	99.5 (87.91-3.65) 99.5 (87.91-3.65)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.28 (at 3.67Å)	Xtrriage
Refinement program	PHENIX (1.12_2829: ???)	Depositor
R, $R_{free}$	0.249 , 0.295 0.249 , 0.296	Depositor DCC
$R_{free}$ test set	1378 reflections (4.33%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	116.7	Xtrriage
Anisotropy	0.181	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.31 , 86.9	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.47$ , $\langle L^2 \rangle = 0.29$	Xtrriage
Estimated twinning fraction	0.034 for h,-k,-h-l	Xtrriage
$F_o, F_c$ correlation	0.82	EDS
Total number of atoms	26549	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	131.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.12% 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

### 5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: P5L

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	E	0.28	0/952	0.45	0/1294
1	F	0.26	0/955	0.46	0/1298
1	G	0.26	0/951	0.45	0/1293
1	H	0.26	0/943	0.45	0/1281
2	A	0.25	0/2458	0.40	0/3358
2	B	0.25	0/2532	0.40	0/3464
2	C	0.25	0/2457	0.39	0/3358
2	D	0.26	0/2319	0.39	0/3169
All	All	0.26	0/13567	0.41	0/18515

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
2	A	0	1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	A	321	ALA	Peptide

## 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	E	934	871	873	2	0
1	F	937	873	875	1	0
1	G	933	867	869	2	0
1	H	925	863	863	0	0
2	A	2397	2431	2431	12	0
2	B	2468	2465	2463	15	0
2	C	2397	2391	2391	15	0
2	D	2263	2306	2306	14	0
3	A	55	59	0	0	0
3	C	55	59	0	0	0
All	All	13364	13185	13071	55	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 2.

All (55) 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:G:101:ALA:O	2:C:155:ASP:N	2.28	0.66
1:F:101:ALA:O	2:B:155:ASP:N	2.29	0.66
1:E:101:ALA:O	2:A:155:ASP:N	2.30	0.65
2:D:298:GLU:OE1	2:D:324:HIS:ND1	2.33	0.62
2:C:285:GLU:N	2:C:285:GLU:OE1	2.33	0.61
2:A:174:TYR:OH	2:A:285:GLU:OE2	2.17	0.60
2:D:285:GLU:N	2:D:285:GLU:OE1	2.38	0.56
2:A:260:GLN:OE1	2:B:340:ARG:NH2	2.40	0.54
2:C:149:TYR:HH	2:C:174:TYR:HE1	1.56	0.53
2:C:340:ARG:NH2	2:D:260:GLN:OE1	2.43	0.52
1:G:88:GLU:OE1	1:G:88:GLU:N	2.39	0.52
2:C:336:LYS:NZ	2:D:256:SER:OG	2.42	0.51
2:B:164:LYS:NZ	2:B:226:LEU:O	2.44	0.51
2:D:213:VAL:O	2:D:216:ALA:N	2.44	0.50
2:C:165:GLU:OE1	2:C:165:GLU:N	2.42	0.50
2:D:152:ALA:O	2:D:154:ILE:N	2.45	0.50
2:D:164:LYS:NZ	2:D:226:LEU:O	2.45	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:213:VAL:O	2:B:216:ALA:N	2.45	0.49
2:B:165:GLU:OE1	2:B:165:GLU:N	2.42	0.48
1:E:118:GLN:OE1	1:E:118:GLN:N	2.40	0.48
2:C:152:ALA:O	2:C:154:ILE:N	2.47	0.48
2:A:165:GLU:OE1	2:A:165:GLU:N	2.42	0.46
2:C:213:VAL:O	2:C:216:ALA:N	2.48	0.46
2:A:213:VAL:O	2:A:216:ALA:N	2.50	0.45
2:D:174:TYR:OH	2:D:285:GLU:OE2	2.35	0.45
2:A:152:ALA:O	2:A:154:ILE:N	2.49	0.45
2:D:148:ILE:HG22	2:D:149:TYR:CE1	2.52	0.45
2:B:285:GLU:OE1	2:B:285:GLU:N	2.50	0.44
2:B:97:ILE:HG13	2:B:236:GLU:HG3	2.00	0.44
2:C:97:ILE:HG13	2:C:236:GLU:HG3	1.99	0.44
2:B:189:VAL:HG12	2:B:268:SER:HB2	2.00	0.43
2:A:302:VAL:HG22	2:A:321:ALA:O	2.19	0.43
2:D:149:TYR:CE1	2:D:174:TYR:HE2	2.37	0.43
2:B:152:ALA:O	2:B:154:ILE:N	2.51	0.43
2:A:100:THR:O	2:A:103:VAL:HG12	2.19	0.42
2:B:37:THR:O	2:B:41:SER:OG	2.24	0.42
2:D:218:GLY:HA2	2:D:231:VAL:O	2.19	0.42
2:D:97:ILE:O	2:D:98:LYS:HG2	2.20	0.42
2:D:97:ILE:HG13	2:D:236:GLU:HG3	2.02	0.42
2:B:311:TRP:CG	2:B:311:TRP:O	2.73	0.42
2:A:98:LYS:HA	2:A:101:TRP:HD1	1.85	0.41
2:A:305:GLN:CB	2:A:321:ALA:CB	2.97	0.41
2:C:218:GLY:HA2	2:C:231:VAL:O	2.20	0.41
2:C:174:TYR:OH	2:C:285:GLU:OE2	2.39	0.41
2:A:250:GLY:O	2:A:253:TRP:HB3	2.21	0.41
2:C:164:LYS:NZ	2:C:226:LEU:O	2.53	0.41
2:C:250:GLY:O	2:C:253:TRP:HB3	2.21	0.41
2:B:181:VAL:O	2:B:185:SER:N	2.49	0.41
2:C:100:THR:HA	2:C:103:VAL:HG12	2.03	0.41
2:B:41:SER:N	2:B:42:PRO:CD	2.84	0.41
2:A:218:GLY:HA2	2:A:231:VAL:O	2.21	0.41
2:B:189:VAL:HG11	2:B:268:SER:O	2.21	0.41
2:D:100:THR:O	2:D:103:VAL:HG12	2.21	0.40
2:C:82:LEU:HD21	2:C:111:GLY:HA3	2.04	0.40
2:B:191:LEU:HD11	2:B:302:VAL:HG21	2.03	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	E	124/137 (90%)	123 (99%)	1 (1%)	0	100	100
1	F	124/137 (90%)	123 (99%)	1 (1%)	0	100	100
1	G	124/137 (90%)	122 (98%)	2 (2%)	0	100	100
1	H	122/137 (89%)	121 (99%)	1 (1%)	0	100	100
2	A	309/365 (85%)	291 (94%)	16 (5%)	2 (1%)	25	62
2	B	326/365 (89%)	308 (94%)	16 (5%)	2 (1%)	25	62
2	C	314/365 (86%)	294 (94%)	19 (6%)	1 (0%)	41	74
2	D	294/365 (80%)	278 (95%)	15 (5%)	1 (0%)	41	74
All	All	1737/2008 (86%)	1660 (96%)	71 (4%)	6 (0%)	41	74

All (6) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	312	THR
2	A	322	PRO
2	C	266	VAL
2	B	266	VAL
2	D	266	VAL
2	A	266	VAL

### 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	E	92/110 (84%)	92 (100%)	0	100	100
1	F	93/110 (84%)	93 (100%)	0	100	100
1	G	92/110 (84%)	92 (100%)	0	100	100
1	H	92/110 (84%)	92 (100%)	0	100	100
2	A	247/309 (80%)	246 (100%)	1 (0%)	91	95
2	B	246/309 (80%)	246 (100%)	0	100	100
2	C	240/309 (78%)	240 (100%)	0	100	100
2	D	234/309 (76%)	234 (100%)	0	100	100
All	All	1336/1676 (80%)	1335 (100%)	1 (0%)	93	98

All (1) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	A	308	TYR

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

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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](#)

2 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
3	P5L	C	401	-	57,59,59	2.78	15 (26%)	69,82,82	1.57	13 (18%)
3	P5L	A	401	-	57,59,59	2.77	15 (26%)	69,82,82	1.56	13 (18%)

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	P5L	C	401	-	-	16/48/96/96	0/3/5/5
3	P5L	A	401	-	-	16/48/96/96	0/3/5/5

All (30) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	401	P5L	C51-C49	-9.29	1.27	1.53
3	A	401	P5L	C51-C49	-9.26	1.28	1.53
3	C	401	P5L	C54-N05	9.24	1.53	1.38
3	A	401	P5L	C54-N05	9.20	1.53	1.38
3	C	401	P5L	C54-N53	8.57	1.53	1.38
3	A	401	P5L	C54-N53	8.51	1.53	1.38
3	A	401	P5L	C49-C08	6.20	1.66	1.52
3	C	401	P5L	C49-C08	6.16	1.66	1.52
3	A	401	P5L	C06-N05	-5.07	1.33	1.47
3	C	401	P5L	C06-N05	-4.98	1.33	1.47
3	C	401	P5L	C04-C03	4.77	1.46	1.35
3	A	401	P5L	C04-C03	4.72	1.46	1.35
3	C	401	P5L	C02-N53	3.53	1.44	1.38
3	A	401	P5L	C02-N53	3.49	1.44	1.38
3	A	401	P5L	O27-C28	3.38	1.43	1.34
3	C	401	P5L	O27-C28	3.34	1.43	1.34
3	C	401	P5L	O52-C51	3.24	1.50	1.43
3	A	401	P5L	C23-N22	3.21	1.52	1.47
3	A	401	P5L	O52-C51	3.19	1.50	1.43
3	C	401	P5L	C23-N22	3.19	1.52	1.47
3	C	401	P5L	C45-N22	-3.15	1.44	1.47
3	A	401	P5L	C45-N22	-2.97	1.44	1.47
3	C	401	P5L	C16-C14	-2.86	1.45	1.53

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	401	P5L	C16-C14	-2.82	1.45	1.53
3	A	401	P5L	O01-C02	-2.50	1.19	1.24
3	C	401	P5L	O01-C02	-2.41	1.19	1.24
3	C	401	P5L	O55-C54	-2.31	1.18	1.23
3	A	401	P5L	O55-C54	-2.30	1.18	1.23
3	A	401	P5L	C23-C24	2.08	1.55	1.52
3	C	401	P5L	C23-C24	2.05	1.55	1.52

All (26) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	401	P5L	O48-C46-C45	4.99	120.52	111.85
3	C	401	P5L	O48-C46-C45	4.98	120.51	111.85
3	C	401	P5L	C18-N19-C20	-4.27	109.34	114.89
3	A	401	P5L	C23-N22-C21	-4.21	105.59	110.20
3	A	401	P5L	C02-N53-C54	-4.16	121.10	126.58
3	C	401	P5L	C23-N22-C21	-4.15	105.66	110.20
3	C	401	P5L	C02-N53-C54	-4.08	121.19	126.58
3	A	401	P5L	C18-N19-C20	-3.96	109.75	114.89
3	A	401	P5L	O27-C28-C29	3.80	119.69	111.50
3	C	401	P5L	O27-C28-C29	3.80	119.69	111.50
3	A	401	P5L	C03-C02-N53	3.02	119.36	114.84
3	C	401	P5L	C46-C45-N22	-3.02	110.13	112.14
3	A	401	P5L	O01-C02-C03	-2.93	120.01	125.16
3	C	401	P5L	C03-C02-N53	2.93	119.22	114.84
3	C	401	P5L	O01-C02-C03	-2.86	120.13	125.16
3	C	401	P5L	O47-C46-C45	-2.74	119.34	123.46
3	A	401	P5L	O47-C46-C45	-2.67	119.45	123.46
3	A	401	P5L	C46-C45-N22	-2.61	110.40	112.14
3	A	401	P5L	O27-C26-C24	2.48	112.34	107.99
3	C	401	P5L	O27-C26-C24	2.29	112.01	107.99
3	C	401	P5L	C23-C24-C26	2.26	115.44	111.53
3	A	401	P5L	C23-C24-C26	2.26	115.44	111.53
3	C	401	P5L	C49-C51-C06	2.26	105.71	101.43
3	C	401	P5L	O07-C06-N05	2.17	113.31	108.36
3	A	401	P5L	C49-C51-C06	2.15	105.52	101.43
3	A	401	P5L	O07-C06-N05	2.15	113.27	108.36

There are no chirality outliers.

All (32) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	401	P5L	C14-C13-C18-N19
3	A	401	P5L	O12-C13-C18-N19
3	A	401	P5L	C29-C28-O27-C26
3	A	401	P5L	O44-C28-O27-C26
3	A	401	P5L	C13-C18-N19-C20
3	C	401	P5L	C14-C13-C18-N19
3	C	401	P5L	O12-C13-C18-N19
3	C	401	P5L	C29-C28-O27-C26
3	C	401	P5L	O44-C28-O27-C26
3	C	401	P5L	C13-C18-N19-C20
3	A	401	P5L	C34-C35-C36-C37
3	C	401	P5L	C34-C35-C36-C37
3	A	401	P5L	C35-C36-C37-C38
3	C	401	P5L	C35-C36-C37-C38
3	C	401	P5L	C29-C30-C31-C32
3	A	401	P5L	C29-C30-C31-C32
3	A	401	P5L	C38-C39-C40-C41
3	C	401	P5L	C38-C39-C40-C41
3	C	401	P5L	C39-C40-C41-C42
3	A	401	P5L	C39-C40-C41-C42
3	A	401	P5L	C46-C45-N22-C21
3	C	401	P5L	C46-C45-N22-C21
3	C	401	P5L	C36-C37-C38-C39
3	A	401	P5L	C36-C37-C38-C39
3	C	401	P5L	C31-C32-C33-C34
3	A	401	P5L	C31-C32-C33-C34
3	C	401	P5L	C30-C31-C32-C33
3	A	401	P5L	C30-C31-C32-C33
3	C	401	P5L	C37-C38-C39-C40
3	A	401	P5L	C37-C38-C39-C40
3	A	401	P5L	C08-C09-C45-C46
3	C	401	P5L	C08-C09-C45-C46

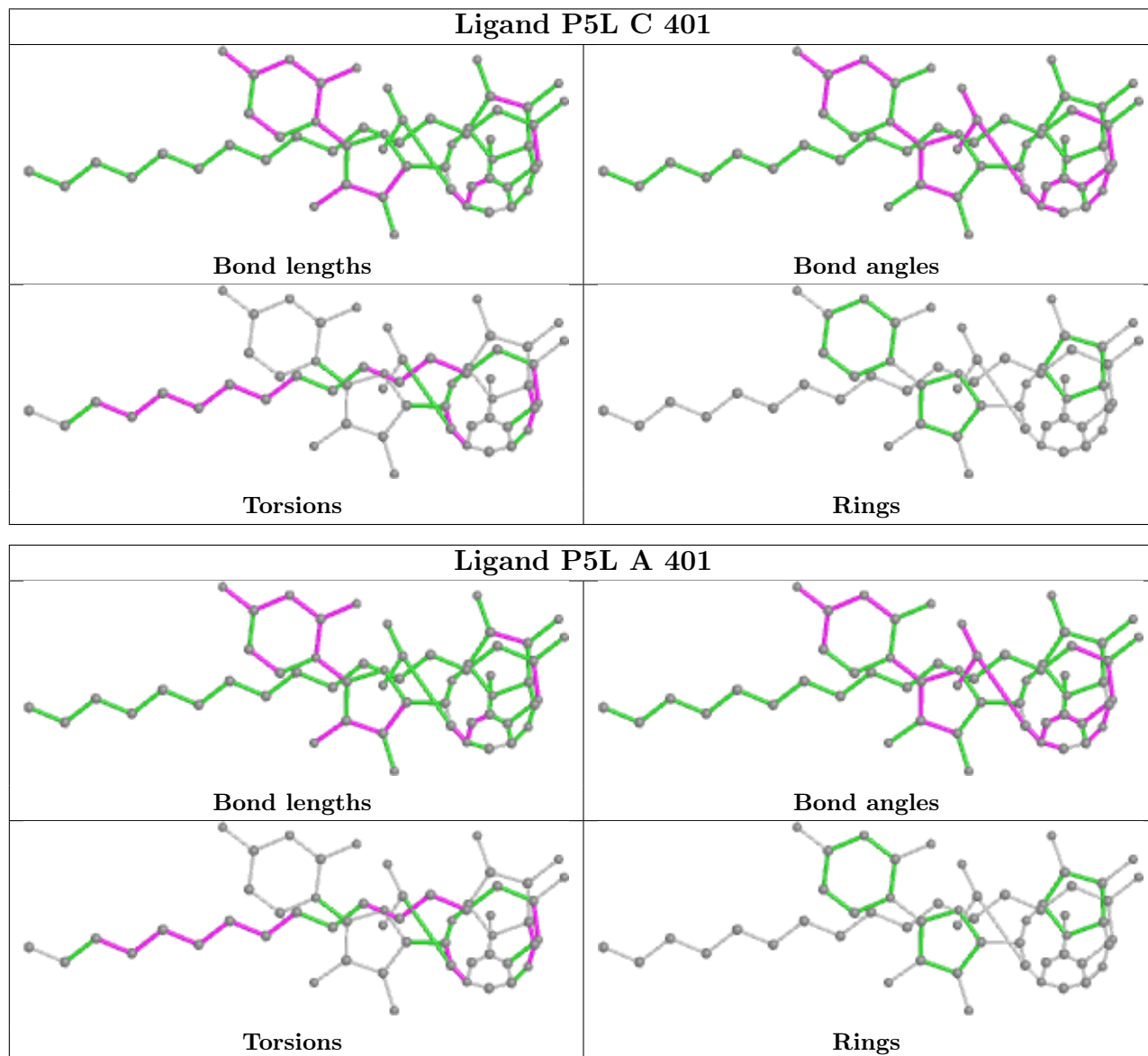
There are no ring outliers.

No monomer is involved in short contacts.

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for 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, 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	E	126/137 (91%)	1.04	31 (24%) 0 0	74, 104, 136, 157	0
1	F	126/137 (91%)	1.81	44 (34%) 0 0	87, 118, 153, 180	0
1	G	126/137 (91%)	1.19	31 (24%) 0 0	79, 102, 149, 173	0
1	H	124/137 (90%)	1.65	41 (33%) 0 0	99, 125, 159, 185	0
2	A	315/365 (86%)	0.23	13 (4%) 37 26	63, 96, 152, 179	0
2	B	330/365 (90%)	0.24	22 (6%) 17 11	71, 134, 188, 221	0
2	C	320/365 (87%)	0.38	27 (8%) 11 8	79, 119, 170, 201	0
2	D	300/365 (82%)	0.04	15 (5%) 28 20	85, 129, 173, 188	0
All	All	1767/2008 (87%)	0.57	224 (12%) 3 3	63, 117, 170, 221	0

All (224) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	F	1	ASP	10.3
1	G	1	ASP	9.6
1	F	2	VAL	9.1
2	C	126	LYS	8.9
1	H	125	SER	8.1
2	A	319	LYS	8.0
2	C	325	HIS	7.7
1	F	26	GLY	7.6
1	E	126	SER	7.4
2	C	72	TYR	7.3
1	F	25	SER	7.3
1	E	44	GLU	7.0
2	C	127	GLY	6.9
1	H	18	LEU	6.5
2	D	163	PHE	6.5
2	C	324	HIS	6.1

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
2	A	320	ARG	6.1
1	E	43	LYS	6.0
1	G	25	SER	6.0
1	H	17	SER	6.0
2	C	125	LYS	5.8
1	E	42	GLY	5.8
1	F	24	THR	5.8
1	F	17	SER	5.7
1	H	11	LEU	5.6
2	C	71	LYS	5.6
1	G	2	VAL	5.6
2	A	321	ALA	5.5
1	H	10	GLY	5.5
2	C	322	PRO	5.4
2	C	69	VAL	5.3
1	F	18	LEU	5.3
1	H	85	LEU	5.2
1	H	19	THR	5.2
1	H	81	GLN	5.2
1	G	45	ARG	5.1
1	G	26	GLY	5.1
2	C	124	ASN	5.1
1	F	28	SER	5.0
1	F	27	ARG	4.9
2	A	72	TYR	4.8
1	F	76	ASN	4.8
2	C	329	LEU	4.7
2	D	160	PHE	4.7
1	F	83	THR	4.7
2	D	162	PHE	4.7
1	E	125	SER	4.6
1	H	82	MET	4.6
1	H	55	GLY	4.5
1	H	103	THR	4.5
1	G	41	PRO	4.5
1	H	126	SER	4.5
1	G	39	GLN	4.5
2	D	74	PRO	4.4
2	C	165	GLU	4.4
1	E	65	GLY	4.4
1	G	42	GLY	4.4
1	H	54	ARG	4.4

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
1	F	82	MET	4.4
1	G	44	GLU	4.4
1	F	15	GLY	4.3
2	C	326	HIS	4.2
1	F	75	ALA	4.2
1	F	16	GLY	4.2
2	B	51	ILE	4.1
2	B	76	MET	4.1
1	H	45	ARG	4.1
2	C	70	LYS	4.1
1	G	4	LEU	4.1
2	C	330	ASN	4.0
1	E	87	PRO	4.0
1	H	123	THR	3.9
1	H	56	ASN	3.9
2	A	97	ILE	3.8
2	C	328	GLU	3.8
1	E	124	VAL	3.8
2	C	49	ARG	3.8
1	F	31	LEU	3.7
1	E	88	GLU	3.7
1	F	32	TYR	3.7
1	H	12	VAL	3.6
1	F	71	ARG	3.6
1	E	89	ASP	3.5
1	F	3	GLN	3.5
1	H	69	ILE	3.5
2	B	150	TYR	3.5
2	B	282	THR	3.5
1	E	41	PRO	3.5
2	C	163	PHE	3.4
1	F	4	LEU	3.4
2	D	99	TYR	3.4
1	G	76	ASN	3.4
1	H	111	ASN	3.4
1	G	79	TYR	3.4
1	E	81	GLN	3.4
2	C	357	LYS	3.4
1	G	24	THR	3.4
1	E	66	ARG	3.4
1	H	80	LEU	3.3
1	F	103	THR	3.3

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
2	C	162	PHE	3.3
1	H	84	SER	3.3
2	C	312	THR	3.3
1	H	124	VAL	3.3
1	F	66	ARG	3.3
2	D	323	PHE	3.3
1	H	92	VAL	3.2
1	G	74	ALA	3.2
2	B	52	GLN	3.2
1	E	85	LEU	3.2
2	B	226	LEU	3.2
1	H	79	TYR	3.2
1	E	16	GLY	3.2
1	E	45	ARG	3.1
2	B	321	ALA	3.1
2	D	155	ASP	3.1
1	E	64	LYS	3.1
1	G	43	LYS	3.1
2	C	225	TYR	3.1
1	E	111	ASN	3.1
1	F	73	ASN	3.1
1	G	75	ALA	3.1
1	E	90	THR	3.1
1	H	20	LEU	3.1
2	A	96	ASP	3.0
2	D	75	THR	3.0
1	H	112	GLU	3.0
2	C	122	LEU	3.0
2	A	99	TYR	2.9
1	G	27	ARG	2.9
1	G	3	GLN	2.9
1	F	29	PHE	2.9
2	B	220	SER	2.8
1	H	9	GLY	2.8
1	F	85	LEU	2.8
2	A	98	LYS	2.8
2	D	166	LEU	2.8
2	B	44	PHE	2.8
1	E	40	ALA	2.8
1	E	13	GLN	2.8
1	F	53	ARG	2.7
1	E	67	PHE	2.7

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
1	G	78	VAL	2.7
1	H	109	GLN	2.7
2	B	216	ALA	2.7
1	E	86	LYS	2.7
1	F	30	SER	2.7
1	F	19	THR	2.7
1	H	106	THR	2.6
1	H	8	GLY	2.6
1	G	72	ASP	2.6
1	F	81	GLN	2.6
1	F	84	SER	2.6
2	C	309	PHE	2.6
1	G	115	TYR	2.6
2	C	323	PHE	2.6
2	A	329	LEU	2.6
2	A	312	THR	2.6
1	G	21	SER	2.6
1	F	99	ARG	2.6
2	B	46	ASN	2.6
1	G	118	GLN	2.5
1	G	28	SER	2.5
1	G	77	THR	2.5
1	F	77	THR	2.5
1	E	15	GLY	2.5
1	H	57	THR	2.5
2	D	125	LYS	2.5
1	H	121	GLN	2.5
1	E	18	LEU	2.4
1	E	84	SER	2.4
2	D	151	TRP	2.4
1	F	54	ARG	2.4
1	H	16	GLY	2.4
1	F	11	LEU	2.4
1	H	66	ARG	2.4
2	A	330	ASN	2.4
1	E	1	ASP	2.4
1	G	116	TRP	2.4
2	A	69	VAL	2.4
2	B	224	GLN	2.4
2	C	183	VAL	2.4
2	B	223	ALA	2.3
1	H	105	TYR	2.3

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
2	B	221	LYS	2.3
1	F	74	ALA	2.3
1	F	125	SER	2.3
1	H	107	SER	2.3
1	H	122	VAL	2.3
1	H	44	GLU	2.3
1	F	67	PHE	2.3
2	B	166	LEU	2.3
1	F	20	LEU	2.3
1	F	64	LYS	2.3
1	F	72	ASP	2.3
2	A	75	THR	2.3
2	B	149	TYR	2.3
1	H	83	THR	2.3
1	F	118	GLN	2.2
1	E	14	THR	2.2
2	B	222	ILE	2.2
1	E	17	SER	2.2
1	F	51	VAL	2.2
2	B	99	TYR	2.2
2	D	305	GLN	2.2
1	G	11	LEU	2.2
2	D	48	LEU	2.2
1	G	20	LEU	2.2
2	D	167	TYR	2.2
2	B	119	TYR	2.1
1	H	89	ASP	2.1
2	B	97	ILE	2.1
1	E	68	THR	2.1
2	C	298	GLU	2.1
1	G	94	PHE	2.1
1	F	12	VAL	2.1
1	H	21	SER	2.1
2	B	230	TYR	2.1
1	F	126	SER	2.0
1	G	81	GLN	2.0
2	B	227	ASN	2.0
1	E	63	VAL	2.0
1	G	126	SER	2.0
2	D	98	LYS	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 [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, 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.

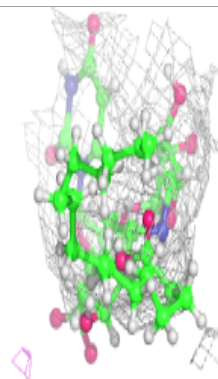
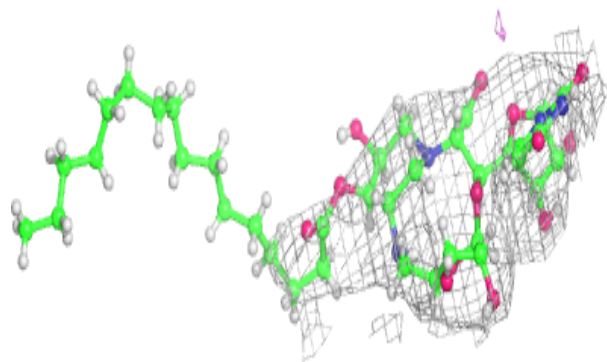
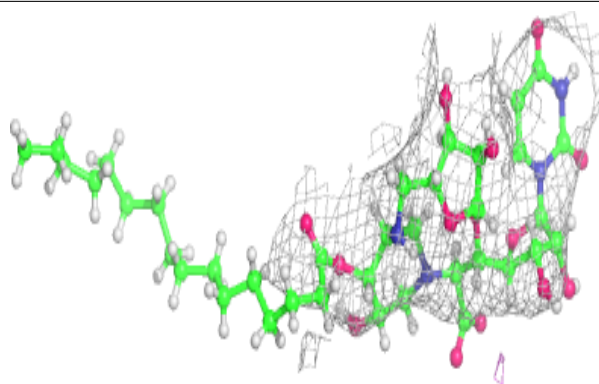
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
3	P5L	C	401	55/55	0.85	0.51	126,167,205,225	0
3	P5L	A	401	55/55	0.89	0.32	92,134,174,197	0

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.

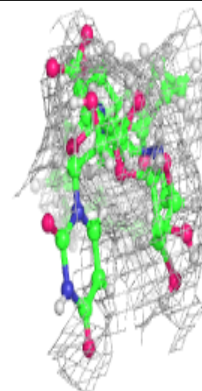
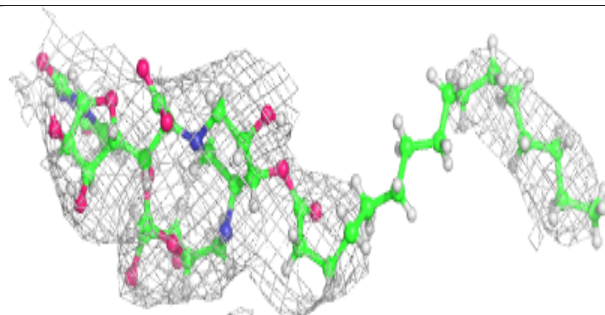
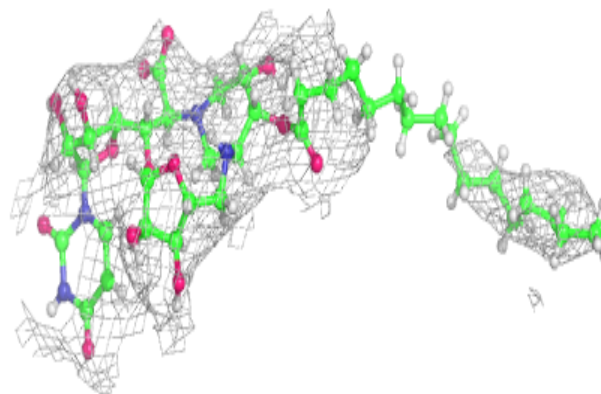


**Electron density around P5L C 401:**

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

**Electron density around P5L 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)



## 6.5 Other polymers [i](#)

There are no such residues in this entry.