



Full wwPDB X-ray Structure Validation Report ⓘ

Oct 9, 2023 – 08:55 PM EDT

PDB ID : 7K98
Title : Preaminoacylation complex of *M. tuberculosis* PheRS with cognate precursor tRNA and 5'-O-(N-phenylalanyl)sulfamoyl-adenosine (F-AMS)
Authors : Michalska, K.; Chang, C.; Jedrzejczak, R.; Wower, J.; Baragana, B.; Forte, B.; Gilbert, I.H.; Joachimiak, A.; Center for Structural Genomics of Infectious Diseases (CSGID)
Deposited on : 2020-09-28
Resolution : 2.19 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](#) ①) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.8.5 (274361), CSD as541be (2020)
Xtrriage (Phenix) : 1.13
EDS : 2.35.1
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) : 2.35.1

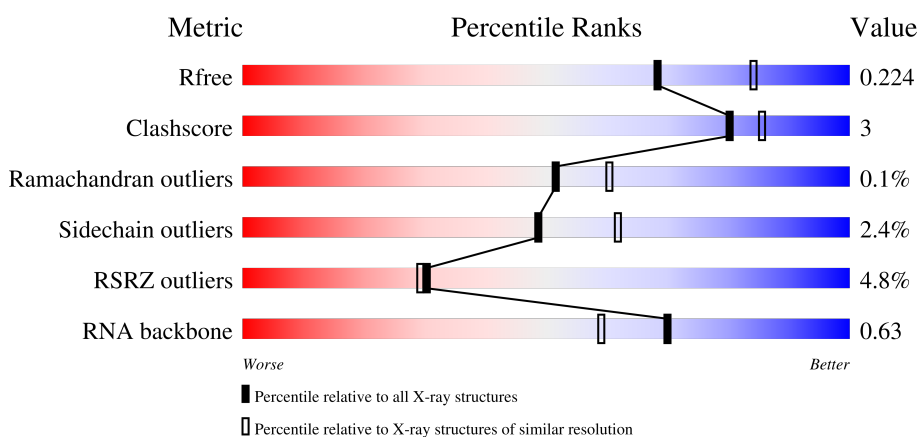
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

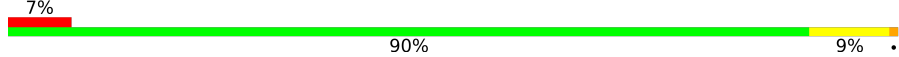

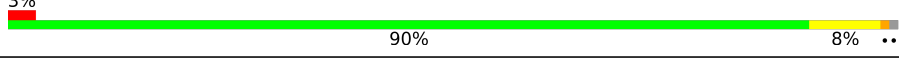
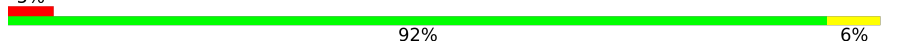
The reported resolution of this entry is 2.19 Å.

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.



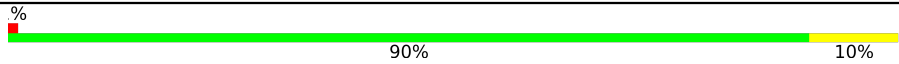

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	4898 (2.20-2.20)
Clashscore	141614	5594 (2.20-2.20)
Ramachandran outliers	138981	5503 (2.20-2.20)
Sidechain outliers	138945	5504 (2.20-2.20)
RSRZ outliers	127900	4800 (2.20-2.20)
RNA backbone	3102	1032 (2.60-1.80)

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	344	 7% 90% 9%
1	D	344	 8% 89% 10%
2	B	840	 3% 90% 8%
2	E	840	 5% 92% 6%

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Mol	Chain	Length	Quality of chain
3	C	77	 <p>%</p> <p>90% 10%</p>
3	F	77	 <p>86% 13%</p>

2 Entry composition [i](#)

There are 8 unique types of molecules in this entry. The entry contains 22017 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 Phenylalanine-tRNA ligase alpha subunit.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	343	2667	1678	485	494	10	0	2	0
1	D	343	2678	1684	489	495	10	0	3	0

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-2	SER	-	expression tag	UNP P9WFU3
A	-1	ASN	-	expression tag	UNP P9WFU3
A	0	ALA	-	expression tag	UNP P9WFU3
D	-2	SER	-	expression tag	UNP P9WFU3
D	-1	ASN	-	expression tag	UNP P9WFU3
D	0	ALA	-	expression tag	UNP P9WFU3

- Molecule 2 is a protein called Phenylalanine-tRNA ligase beta subunit.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	834	6281	3941	1146	1173	21	0	4	0
2	E	836	6359	3986	1166	1186	21	0	11	0

There are 18 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	-8	GLU	-	expression tag	UNP P9WFU1
B	-7	ASN	-	expression tag	UNP P9WFU1
B	-6	LEU	-	expression tag	UNP P9WFU1
B	-5	TYR	-	expression tag	UNP P9WFU1
B	-4	PHE	-	expression tag	UNP P9WFU1
B	-3	GLN	-	expression tag	UNP P9WFU1

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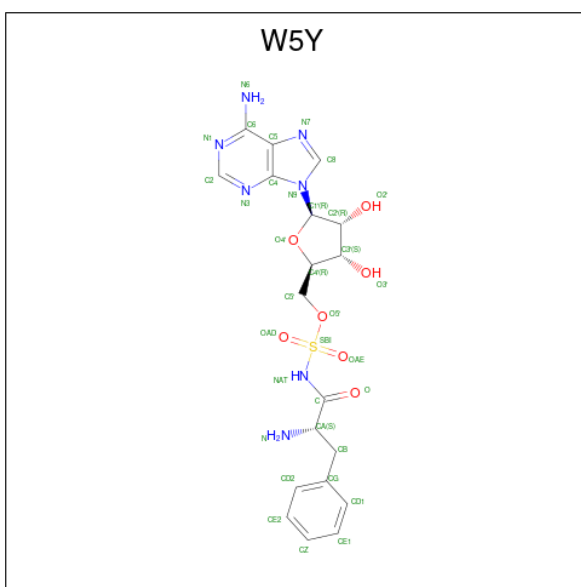
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Chain	Residue	Modelled	Actual	Comment	Reference
B	-2	SER	-	expression tag	UNP P9WFU1
B	-1	ASN	-	expression tag	UNP P9WFU1
B	0	ALA	-	expression tag	UNP P9WFU1
E	-8	GLU	-	expression tag	UNP P9WFU1
E	-7	ASN	-	expression tag	UNP P9WFU1
E	-6	LEU	-	expression tag	UNP P9WFU1
E	-5	TYR	-	expression tag	UNP P9WFU1
E	-4	PHE	-	expression tag	UNP P9WFU1
E	-3	GLN	-	expression tag	UNP P9WFU1
E	-2	SER	-	expression tag	UNP P9WFU1
E	-1	ASN	-	expression tag	UNP P9WFU1
E	0	ALA	-	expression tag	UNP P9WFU1

- Molecule 3 is a RNA chain called tRNA(Phe).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	P			
3	C	77	Total 1628	C 724	N 297	O 531	P 76	0	0	0
3	F	77	Total 1628	C 724	N 297	O 531	P 76	0	0	0

- Molecule 4 is 5'-O-(L-phenylalanylsulfamoyl)adenosine (three-letter code: W5Y) (formula: C₁₉H₂₃N₇O₇S) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	A	1	Total	C	N	O	S	0	0
			34	19	7	7	1		
4	D	1	Total	C	N	O	S	0	0
			34	19	7	7	1		

- Molecule 5 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	4	Total	Mg	0	0
			4	4		
5	B	1	Total	Mg	0	0
			1	1		
5	D	3	Total	Mg	0	0
			3	3		
5	C	2	Total	Mg	0	0
			2	2		
5	F	3	Total	Mg	0	0
			3	3		

- Molecule 6 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	B	1	Total	Cl	0	0
			1	1		
6	E	1	Total	Cl	0	0
			1	1		

- Molecule 7 is GLYCEROL (three-letter code: GOL) (formula: C₃H₈O₃).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	B	1	Total C O 6 3 3	0	0
7	E	1	Total C O 6 3 3	0	0
7	C	1	Total C O 6 3 3	0	0

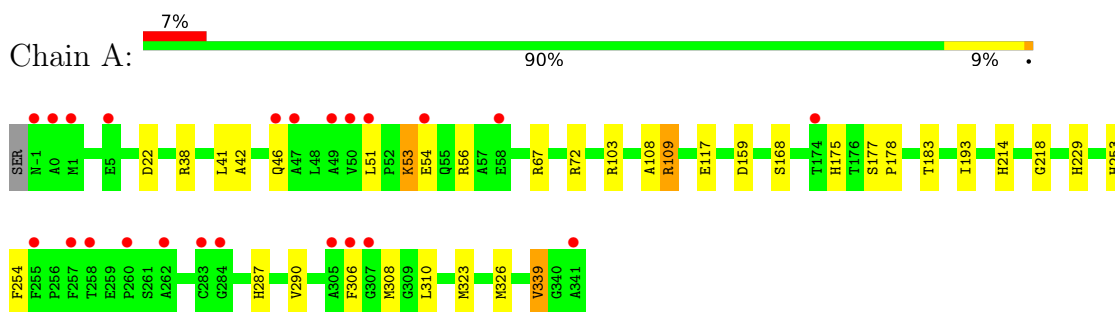
- Molecule 8 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
8	A	85	Total O 85 85	0	0
8	B	219	Total O 221 221	0	4
8	D	93	Total O 93 93	0	0
8	E	188	Total O 189 189	0	1
8	C	39	Total O 39 39	0	0
8	F	48	Total O 48 48	0	0

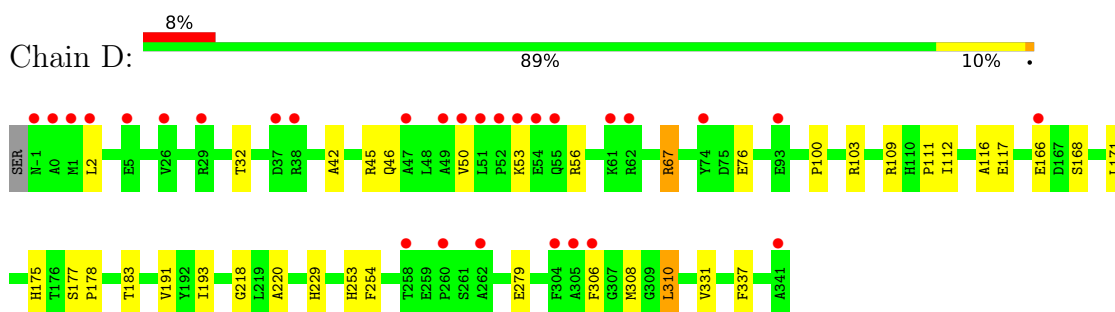
3 Residue-property plots [i](#)

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.

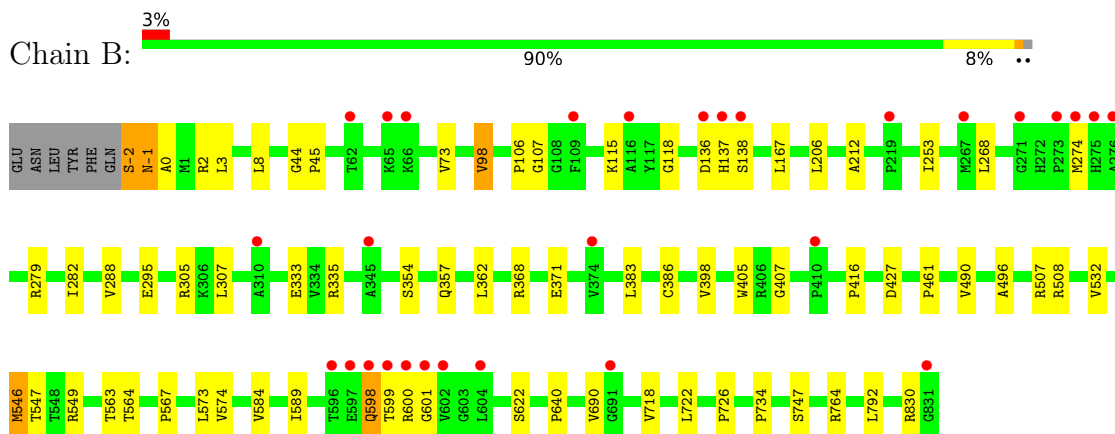
- Molecule 1: Phenylalanine-tRNA ligase alpha subunit



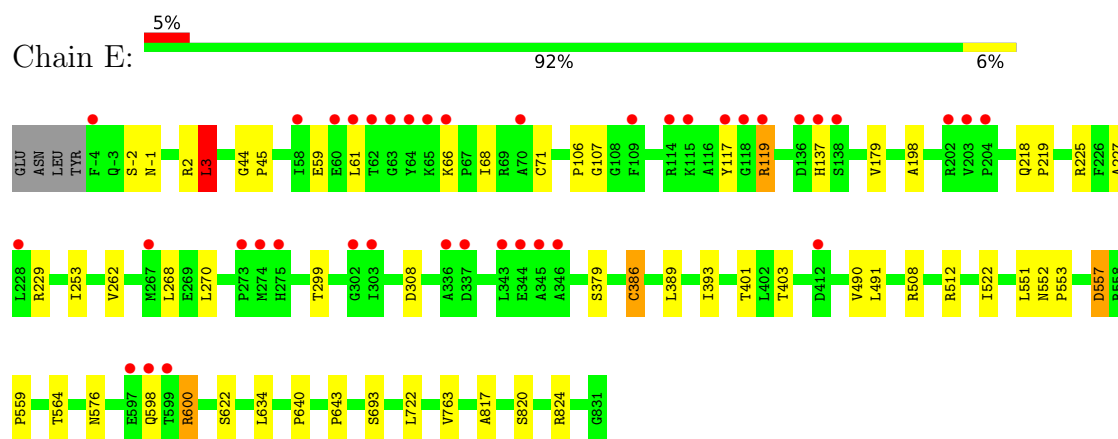
- Molecule 1: Phenylalanine-tRNA ligase alpha subunit



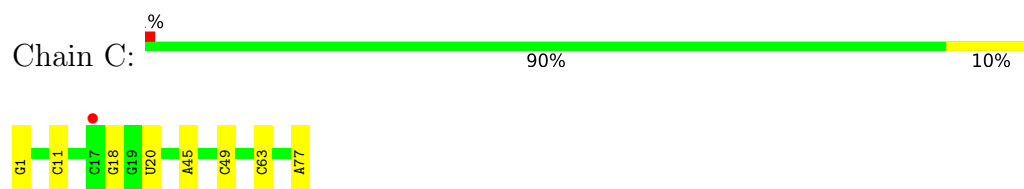
- Molecule 2: Phenylalanine-tRNA ligase beta subunit



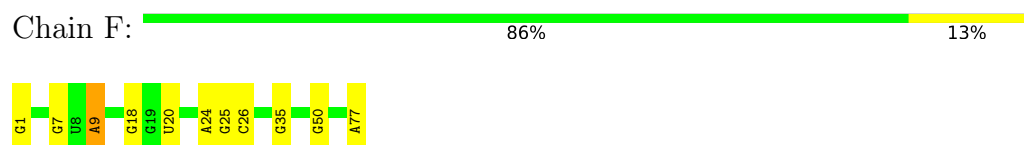
- Molecule 2: Phenylalanine-tRNA ligase beta subunit



- Molecule 3: tRNA(Phe)



- Molecule 3: tRNA(Phe)



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	147.42Å 65.30Å 193.48Å 90.00° 109.29° 90.00°	Depositor
Resolution (Å)	29.85 – 2.19 29.85 – 2.19	Depositor EDS
% Data completeness (in resolution range)	96.4 (29.85-2.19) 96.4 (29.85-2.19)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.94 (at 2.20Å)	Xtrriage
Refinement program	PHENIX 1.18rc1_3777	Depositor
R, R_{free}	0.177 , 0.224 0.177 , 0.224	Depositor DCC
R_{free} test set	3498 reflections (2.02%)	wwPDB-VP
Wilson B-factor (Å ²)	46.4	Xtrriage
Anisotropy	0.321	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.31 , 42.1	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	22017	wwPDB-VP
Average B, all atoms (Å ²)	61.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.73% 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: GOL, CL, MG, W5Y

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	0.39	0/2727	0.56	0/3708
1	D	0.39	0/2738	0.57	0/3722
2	B	0.39	1/6417 (0.0%)	0.58	0/8783
2	E	0.39	0/6496	0.58	1/8889 (0.0%)
3	C	0.54	1/1818 (0.1%)	1.02	3/2831 (0.1%)
3	F	0.53	1/1818 (0.1%)	0.98	1/2831 (0.0%)
All	All	0.42	3/22014 (0.0%)	0.67	5/30764 (0.0%)

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	F	1	G	OP3-P	-10.24	1.48	1.61
3	C	1	G	OP3-P	-10.24	1.48	1.61
2	B	386	CYS	CB-SG	-5.03	1.73	1.81

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	63	C	C6-N1-C2	-7.30	117.38	120.30
3	C	11	C	C6-N1-C2	-6.24	117.80	120.30
3	F	26	C	O5'-P-OP2	-5.16	101.06	105.70
3	C	11	C	N3-C4-C5	-5.11	119.86	121.90
2	E	3	LEU	CA-CB-CG	5.07	126.95	115.30

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	2667	0	2622	18	0
1	D	2678	0	2634	22	0
2	B	6281	0	6311	40	0
2	E	6359	0	6387	38	0
3	C	1628	0	827	2	0
3	F	1628	0	827	5	0
4	A	34	0	0	0	0
4	D	34	0	0	0	0
5	A	4	0	0	0	0
5	B	1	0	0	0	0
5	C	2	0	0	0	0
5	D	3	0	0	0	0
5	F	3	0	0	0	0
6	B	1	0	0	0	0
6	E	1	0	0	0	0
7	B	6	0	8	0	0
7	C	6	0	8	0	0
7	E	6	0	8	0	0
8	A	85	0	0	0	0
8	B	221	0	0	2	0
8	C	39	0	0	0	0
8	D	93	0	0	0	0
8	E	189	0	0	0	0
8	F	48	0	0	1	0
All	All	22017	0	19632	110	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 3.

All (110) 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:109[A]:ARG:NH2	1:A:117:GLU:OE1	2.07	0.87
1:D:46:GLN:HG2	3:C:20:U:H5''	1.62	0.80
1:A:46:GLN:HG2	3:F:20:U:H5''	1.63	0.79

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:166:GLU:HA	2:E:551:LEU:HD11	1.63	0.78
2:B:-1:ASN:OD1	2:B:2:ARG:NH1	2.22	0.71
2:B:764:ARG:NH2	8:B:1001:HOH:O	2.25	0.67
1:D:117:GLU:OE1	2:E:512[B]:ARG:NH1	2.30	0.64
2:B:3:LEU:HD11	2:B:8:LEU:HD13	1.81	0.62
2:E:-2:SER:HB2	2:E:2:ARG:NH2	2.15	0.61
2:B:599:THR:HA	2:B:622:SER:O	2.01	0.60
2:E:59:GLU:OE1	2:E:119:ARG:NH2	2.35	0.58
2:E:-2:SER:HB2	2:E:2:ARG:HH22	1.67	0.58
3:F:7:G:O2'	3:F:50:G:OP2	2.12	0.57
2:E:198[A]:ALA:HB2	2:E:270:LEU:HD22	1.87	0.56
2:E:-1:ASN:H	2:E:2:ARG:HH22	1.54	0.56
2:B:830:ARG:NH2	3:F:35:G:N7	2.50	0.54
2:E:225:ARG:HD3	2:E:379:SER:HB2	1.89	0.53
1:A:42:ALA:O	1:A:46:GLN:HG3	2.08	0.53
1:A:108:ALA:HA	1:A:339:VAL:HA	1.91	0.53
1:D:112:ILE:HG23	1:D:310:LEU:HD13	1.91	0.53
2:E:598:GLN:HG2	2:E:600:ARG:NH2	2.24	0.52
1:D:117:GLU:HG3	2:E:508:ARG:CZ	2.39	0.52
1:A:41:LEU:HD13	1:A:67:ARG:HA	1.90	0.52
1:A:229:HIS:HA	2:B:490:VAL:O	2.10	0.51
2:E:68:ILE:HG21	2:E:117:TYR:HD1	1.75	0.51
2:B:253:ILE:HD12	2:B:268:LEU:HD11	1.93	0.51
1:A:53:LYS:HA	1:A:56:ARG:HD2	1.92	0.51
2:E:508:ARG:O	2:E:512[A]:ARG:HG3	2.10	0.51
2:B:305:ARG:CZ	2:B:362:LEU:HD21	2.41	0.50
2:E:137:HIS:O	2:E:137:HIS:ND1	2.43	0.50
2:E:61:LEU:N	2:E:68:ILE:O	2.45	0.50
1:D:183:THR:HG21	1:D:193:ILE:HG12	1.94	0.50
1:D:177:SER:N	1:D:178:PRO:HD2	2.27	0.49
2:B:690:VAL:HG11	2:B:726:PRO:HD2	1.95	0.49
2:B:206:LEU:HD13	2:B:398:VAL:HG11	1.95	0.49
2:B:0:ALA:O	2:B:2:ARG:NH2	2.45	0.49
2:B:136:ASP:HB3	2:B:138:SER:H	1.77	0.49
2:B:-1:ASN:H	2:B:2:ARG:HH12	1.60	0.49
1:D:229:HIS:HA	2:E:490:VAL:O	2.13	0.48
2:B:115:LYS:HE3	2:B:118:GLY:HA2	1.95	0.48
2:E:262:VAL:HG12	2:E:386:CYS:SG	2.53	0.48
1:A:287:HIS:HB3	1:A:290:VAL:HG23	1.96	0.48
1:A:183:THR:HG21	1:A:193:ILE:HG12	1.95	0.48
3:F:24:A:H2'	3:F:25:G:C8	2.48	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:405:TRP:CH2	2:B:407:GLY:HA2	2.49	0.47
1:D:253:HIS:CD2	1:D:254:PHE:H	2.33	0.47
1:D:253:HIS:CG	1:D:254:PHE:H	2.31	0.47
2:B:507:ARG:HG2	2:B:589:ILE:HG21	1.97	0.47
2:E:722:LEU:HD23	2:E:722:LEU:HA	1.72	0.47
2:B:532:VAL:HG21	2:B:567:PRO:HB3	1.97	0.47
1:A:177:SER:N	1:A:178:PRO:HD2	2.30	0.47
1:D:32:THR:HG21	3:C:45:A:H5''	1.95	0.47
2:E:218:GLN:OE1	2:E:219:PRO:HD2	2.15	0.47
2:B:599:THR:O	2:B:600:ARG:NH1	2.49	0.46
2:B:368:ARG:HA	2:B:371:GLU:HG2	1.97	0.46
2:E:227:ALA:HA	2:E:403:THR:O	2.15	0.46
1:D:53:LYS:HA	1:D:56:ARG:NE	2.30	0.46
1:A:253:HIS:CG	1:A:254:PHE:H	2.33	0.46
2:B:547:THR:HG22	2:B:563:THR:HG23	1.98	0.46
2:E:557:ASP:OD1	2:E:557:ASP:N	2.42	0.46
1:A:22:ASP:OD1	1:A:22:ASP:N	2.41	0.46
2:B:496:ALA:HB3	2:E:491:LEU:HD13	1.99	0.45
2:B:274:MET:HE1	2:B:383:LEU:HA	1.99	0.45
2:B:333:GLU:O	2:B:335:ARG:HD2	2.17	0.45
1:A:323:MET:O	1:A:326:MET:HB3	2.16	0.45
2:B:106:PRO:HA	2:B:107:GLY:HA2	1.56	0.45
2:B:295:GLU:O	2:B:307:LEU:HB2	2.17	0.45
1:A:214:HIS:HB2	1:A:310:LEU:HB3	1.99	0.44
1:D:116:ALA:HB2	1:D:310:LEU:HD11	1.99	0.44
1:D:45:ARG:HH2	1:D:67:ARG:HD2	1.82	0.44
1:A:117:GLU:HG2	2:B:508:ARG:CZ	2.47	0.44
1:D:218:GLY:HA3	1:D:306:PHE:CZ	2.52	0.44
1:D:331:VAL:HG13	2:E:576:ASN:OD1	2.18	0.44
2:B:574:VAL:HG22	8:B:1170:HOH:O	2.17	0.43
2:E:44:GLY:HA3	2:E:45:PRO:HA	1.71	0.43
2:B:44:GLY:HA3	2:B:45:PRO:HA	1.75	0.43
1:D:103:ARG:O	2:E:640:PRO:HD2	2.18	0.43
2:E:553:PRO:HG3	2:E:559:PRO:HB3	2.00	0.43
2:E:598:GLN:O	2:E:622:SER:HA	2.18	0.43
1:A:218:GLY:HA3	1:A:306:PHE:CZ	2.53	0.43
1:D:100:PRO:HD2	2:E:643:PRO:HG3	1.99	0.43
1:D:42:ALA:O	1:D:46:GLN:HG3	2.18	0.43
1:D:109[A]:ARG:NH1	1:D:117:GLU:OE2	2.50	0.43
2:E:106:PRO:HA	2:E:107:GLY:HA2	1.48	0.43
2:B:0:ALA:HB1	2:B:167:LEU:O	2.19	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:E:253:ILE:HD12	2:E:268:LEU:HD11	2.01	0.42
2:B:73:VAL:HG11	2:B:98:VAL:HG11	2.00	0.42
2:E:61:LEU:HD21	2:E:119:ARG:NH2	2.34	0.42
2:B:-2:SER:HB3	2:B:368:ARG:HH22	1.84	0.42
2:E:229:ARG:HG3	2:E:401:THR:O	2.20	0.42
2:B:416:PRO:HD2	2:B:461:PRO:O	2.19	0.42
2:E:68:ILE:HG21	2:E:117:TYR:CD1	2.54	0.42
2:B:747:SER:HA	2:B:792:LEU:O	2.20	0.41
2:E:552:ASN:N	2:E:552:ASN:OD1	2.53	0.41
2:B:354:SER:HB2	2:B:371:GLU:HB2	2.03	0.41
2:B:722:LEU:HD23	2:B:722:LEU:HA	1.89	0.41
2:E:3:LEU:HD23	2:E:179:VAL:HG22	2.01	0.41
2:E:820:SER:O	2:E:824:ARG:HG3	2.21	0.41
2:B:598:GLN:H	2:B:598:GLN:HG2	1.50	0.41
1:D:111:PRO:HG3	1:D:337:PHE:CD2	2.55	0.41
2:B:279:ARG:HA	2:B:282:ILE:HD12	2.03	0.41
1:D:191:VAL:O	1:D:220:ALA:HA	2.20	0.41
2:E:66:LYS:HD3	2:E:66:LYS:HA	1.75	0.41
2:E:763:VAL:HG13	2:E:817:ALA:HB1	2.03	0.40
3:F:9:A:H2'	8:F:217:HOH:O	2.20	0.40
1:A:38:ARG:HE	1:A:38:ARG:HB3	1.75	0.40
2:E:389:LEU:O	2:E:393:ILE:HG13	2.22	0.40
1:A:103:ARG:O	2:B:640:PRO:HD2	2.21	0.40
2:B:573:LEU:HG	2:B:584:VAL:HG11	2.04	0.40
2:B:600:ARG:HB3	2:B:601:GLY:H	1.72	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	343/344 (100%)	336 (98%)	7 (2%)	0	100 100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	D	344/344 (100%)	333 (97%)	11 (3%)	0	100	100
2	B	836/840 (100%)	807 (96%)	27 (3%)	2 (0%)	47	55
2	E	845/840 (101%)	816 (97%)	29 (3%)	0	100	100
All	All	2368/2368 (100%)	2292 (97%)	74 (3%)	2 (0%)	51	60

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	212	ALA
2	B	546	MET

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	271/270 (100%)	260 (96%)	11 (4%)	30	39
1	D	272/270 (101%)	262 (96%)	10 (4%)	34	43
2	B	655/657 (100%)	642 (98%)	13 (2%)	55	69
2	E	663/657 (101%)	651 (98%)	12 (2%)	59	72
All	All	1861/1854 (100%)	1815 (98%)	46 (2%)	49	60

All (46) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	51	LEU
1	A	53	LYS
1	A	54	GLU
1	A	72	ARG
1	A	109[A]	ARG
1	A	109[B]	ARG
1	A	159	ASP
1	A	168	SER
1	A	175	HIS

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Mol	Chain	Res	Type
1	A	308	MET
1	A	339	VAL
2	B	-2	SER
2	B	-1	ASN
2	B	98	VAL
2	B	137	HIS
2	B	288	VAL
2	B	357	GLN
2	B	427	ASP
2	B	546	MET
2	B	549	ARG
2	B	564	THR
2	B	598	GLN
2	B	718	VAL
2	B	734	PRO
1	D	2	LEU
1	D	50	VAL
1	D	67	ARG
1	D	76	GLU
1	D	168	SER
1	D	171	LEU
1	D	175	HIS
1	D	279	GLU
1	D	308	MET
1	D	310	LEU
2	E	3	LEU
2	E	71	CYS
2	E	119	ARG
2	E	299	THR
2	E	308	ASP
2	E	386	CYS
2	E	522	ILE
2	E	557	ASP
2	E	564	THR
2	E	600	ARG
2	E	634	LEU
2	E	693	SER

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

5.3.3 RNA [i](#)

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
3	C	74/77 (96%)	3 (4%)	0
3	F	74/77 (96%)	3 (4%)	0
All	All	148/154 (96%)	6 (4%)	0

All (6) RNA backbone outliers are listed below:

Mol	Chain	Res	Type
3	C	18	G
3	C	49	C
3	C	77	A
3	F	9	A
3	F	18	G
3	F	77	A

There are no RNA pucker outliers to report.

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](#)

Of 20 ligands modelled in this entry, 15 are monoatomic - leaving 5 for Mogul analysis.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
7	GOL	C	103	-	5,5,5	0.88	0	5,5,5	1.00	0
7	GOL	E	902	-	5,5,5	0.97	0	5,5,5	0.86	0
7	GOL	B	903	-	5,5,5	0.80	0	5,5,5	1.07	0
4	W5Y	A	401	-	34,37,37	1.06	3 (8%)	38,54,54	1.64	7 (18%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
4	W5Y	D	401	-	34,37,37	1.25	5 (14%)	38,54,54	1.56	4 (10%)

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
7	GOL	C	103	-	-	0/4/4/4	-
7	GOL	E	902	-	-	4/4/4/4	-
7	GOL	B	903	-	-	4/4/4/4	-
4	W5Y	A	401	-	-	0/18/39/39	0/4/4/4
4	W5Y	D	401	-	-	1/18/39/39	0/4/4/4

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	D	401	W5Y	O5'-SBI	-3.46	1.52	1.59
4	A	401	W5Y	C-NAT	-2.62	1.32	1.37
4	D	401	W5Y	C-NAT	-2.44	1.32	1.37
4	D	401	W5Y	SBI-NAT	-2.43	1.55	1.59
4	A	401	W5Y	C5-C4	2.39	1.47	1.40
4	A	401	W5Y	O4'-C1'	2.39	1.44	1.41
4	D	401	W5Y	C5-C4	2.33	1.47	1.40
4	D	401	W5Y	O4'-C1'	2.19	1.44	1.41

All (11) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	401	W5Y	OAE-SBI-OAD	-6.31	110.93	120.76
4	D	401	W5Y	OAE-SBI-OAD	-6.08	111.28	120.76
4	A	401	W5Y	N3-C2-N1	-3.24	123.62	128.68
4	D	401	W5Y	N3-C2-N1	-3.17	123.72	128.68
4	D	401	W5Y	C4-C5-N7	-2.98	106.30	109.40
4	A	401	W5Y	C4-C5-N7	-2.81	106.47	109.40
4	A	401	W5Y	C-NAT-SBI	-2.50	120.56	124.61
4	D	401	W5Y	O5'-SBI-OAD	2.47	113.13	105.59
4	A	401	W5Y	C3'-C2'-C1'	2.26	104.38	100.98
4	A	401	W5Y	O5'-SBI-NAT	2.14	111.58	105.60
4	A	401	W5Y	C2-N1-C6	2.12	122.38	118.75

There are no chirality outliers.

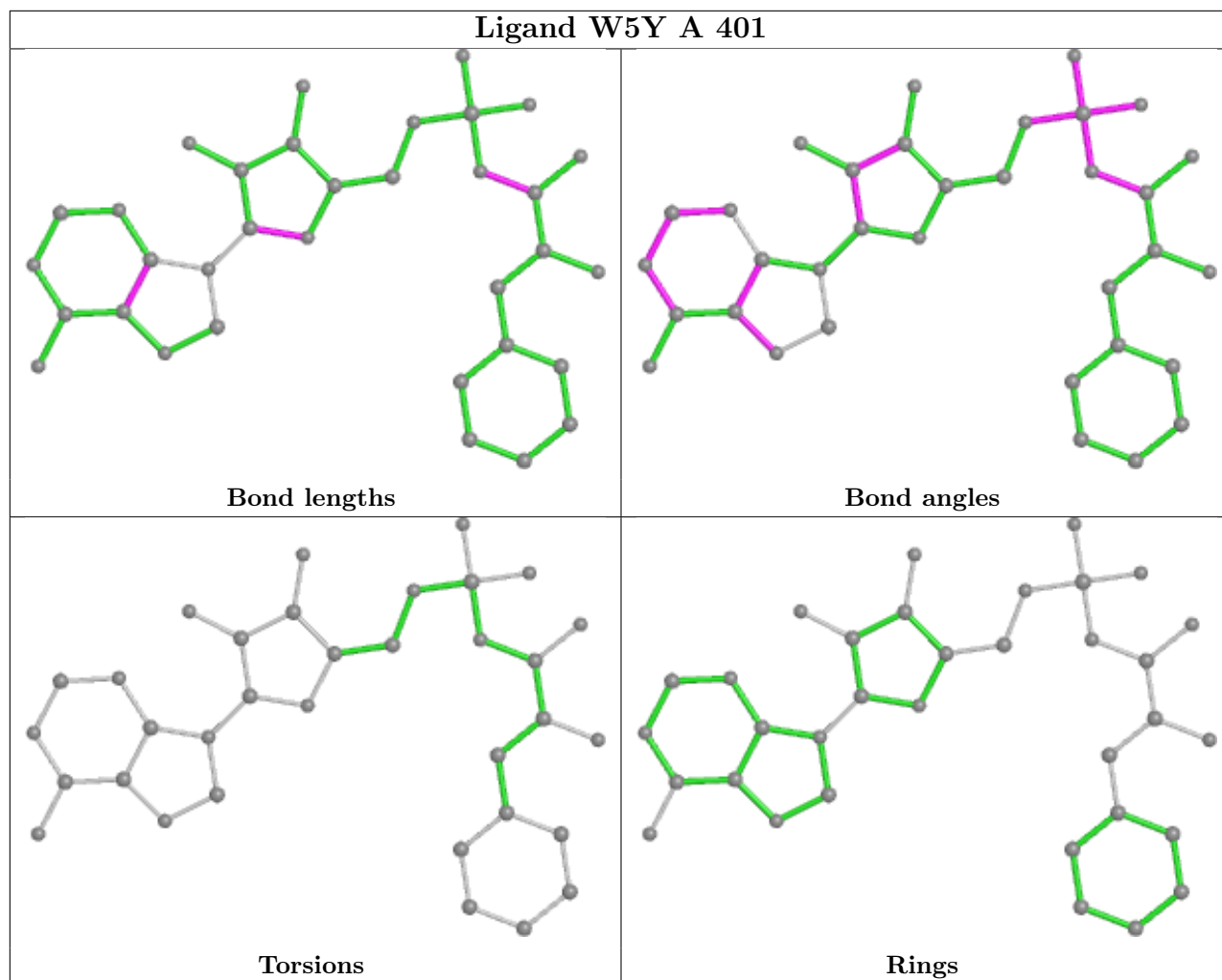
All (9) torsion outliers are listed below:

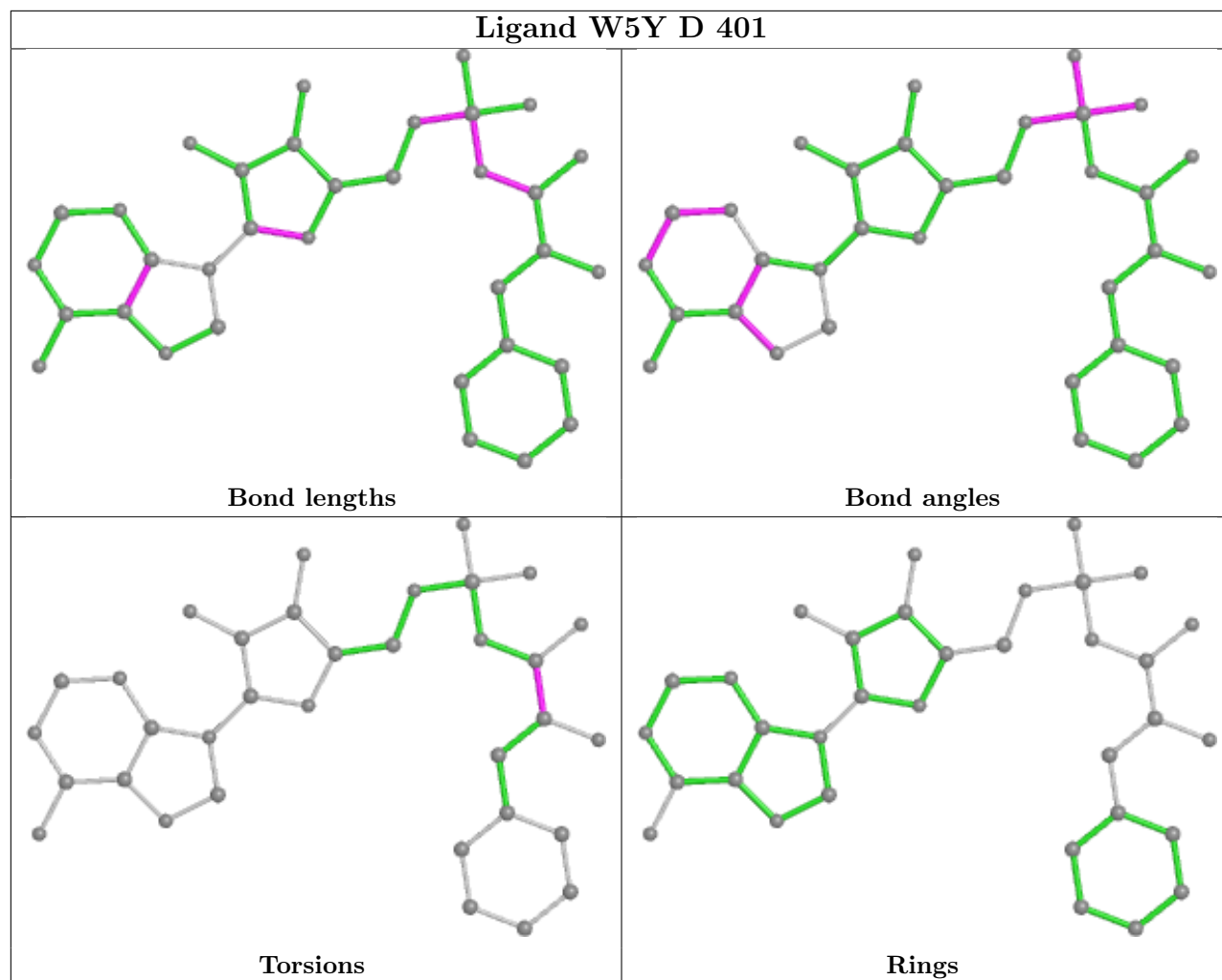
Mol	Chain	Res	Type	Atoms
7	E	902	GOL	O1-C1-C2-O2
7	E	902	GOL	O1-C1-C2-C3
7	E	902	GOL	C1-C2-C3-O3
7	B	903	GOL	O1-C1-C2-C3
7	B	903	GOL	C1-C2-C3-O3
7	B	903	GOL	O1-C1-C2-O2
7	B	903	GOL	O2-C2-C3-O3
7	E	902	GOL	O2-C2-C3-O3
4	D	401	W5Y	O-C-CA-CB

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 [i](#)

6.1 Protein, DNA and RNA chains [i](#)

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	343/344 (99%)	0.36	23 (6%) 17 16	35, 53, 103, 123	0
1	D	343/344 (99%)	0.42	29 (8%) 10 9	35, 50, 115, 166	0
2	B	834/840 (99%)	0.06	29 (3%) 44 42	34, 51, 87, 142	0
2	E	836/840 (99%)	0.07	39 (4%) 31 30	32, 53, 94, 145	0
3	C	77/77 (100%)	-0.57	1 (1%) 77 75	55, 84, 116, 152	0
3	F	77/77 (100%)	-0.51	0 100 100	50, 78, 104, 150	0
All	All	2510/2522 (99%)	0.12	121 (4%) 30 29	32, 53, 99, 166	0

All (121) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	50	VAL	7.9
1	D	341	ALA	7.5
2	B	597	GLU	6.8
1	A	50	VAL	5.6
2	E	-4	PHE	5.2
2	E	597	GLU	5.1
1	D	51	LEU	5.0
2	E	598	GLN	5.0
2	E	61	LEU	4.7
1	D	49	ALA	4.7
1	D	0	ALA	4.6
2	B	599	THR	4.6
1	D	54	GLU	4.4
2	E	203	VAL	4.3
2	E	345	ALA	4.2
1	A	341	ALA	4.1
2	B	831	GLY	4.1
1	A	283	CYS	4.1
1	D	26	VAL	4.0

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Mol	Chain	Res	Type	RSRZ
2	B	598	GLN	3.7
2	E	138	SER	3.6
2	B	62	THR	3.6
2	B	601	GLY	3.6
2	E	274	MET	3.6
2	E	346	ALA	3.5
2	E	66	LYS	3.5
1	A	1	MET	3.4
2	E	137	HIS	3.4
2	E	115	LYS	3.4
2	B	66	LYS	3.3
3	C	17	C	3.3
2	E	65	LYS	3.3
2	E	336	ALA	3.3
2	E	599	THR	3.3
1	D	52	PRO	3.2
2	E	64	TYR	3.2
1	D	2	LEU	3.2
2	B	602	VAL	3.2
1	D	1	MET	3.2
2	E	202[A]	ARG	3.2
2	E	62	THR	3.2
1	D	93	GLU	3.1
2	E	70	ALA	3.1
1	A	5	GLU	3.1
2	B	137	HIS	3.1
2	E	119	ARG	3.1
1	A	0	ALA	3.0
1	D	37	ASP	2.9
2	E	344	GLU	2.9
1	A	49	ALA	2.9
1	A	-1	ASN	2.8
2	B	310	ALA	2.8
1	A	51	LEU	2.8
2	E	136	ASP	2.8
1	A	258	THR	2.8
2	B	138	SER	2.8
2	E	58	ILE	2.8
2	E	412	ASP	2.7
1	D	55	GLN	2.7
1	D	-1	ASN	2.7
1	D	29	ARG	2.7

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Mol	Chain	Res	Type	RSRZ
2	E	273	PRO	2.7
1	A	307	GLY	2.6
2	B	596	THR	2.6
2	B	410	PRO	2.6
2	B	345	ALA	2.6
1	D	38	ARG	2.6
2	E	275	HIS	2.6
2	E	109	PHE	2.6
2	E	204	PRO	2.6
2	B	65	LYS	2.6
2	E	60	GLU	2.5
2	B	604	LEU	2.5
2	E	343	LEU	2.5
2	E	63	GLY	2.5
2	B	274	MET	2.5
2	B	271	GLY	2.5
1	D	47	ALA	2.5
1	D	5	GLU	2.5
1	A	174	THR	2.4
2	B	275	HIS	2.4
2	B	374	VAL	2.4
2	E	114	ARG	2.4
2	B	276	ALA	2.4
1	A	54	GLU	2.4
2	E	117	TYR	2.4
1	A	257	PHE	2.4
1	A	284	GLY	2.3
1	A	58	GLU	2.3
2	B	219	PRO	2.3
1	D	305	ALA	2.3
2	E	267	MET	2.3
1	D	258	THR	2.3
1	D	260	PRO	2.3
2	E	302	GLY	2.3
1	A	262	ALA	2.2
1	A	255	PHE	2.2
1	A	306	PHE	2.2
1	A	260	PRO	2.2
1	D	61	LYS	2.2
1	D	62	ARG	2.2
1	D	166	GLU	2.2
1	D	262	ALA	2.2

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Mol	Chain	Res	Type	RSRZ
1	D	304	PHE	2.2
2	B	136	ASP	2.2
2	B	116	ALA	2.2
2	E	228	LEU	2.2
1	D	74	TYR	2.2
1	D	53	LYS	2.1
2	E	337	ASP	2.1
1	A	47	ALA	2.1
2	B	691	GLY	2.1
1	D	306	PHE	2.1
1	A	305	ALA	2.1
2	B	267	MET	2.1
2	B	600	ARG	2.1
2	B	273	PRO	2.1
1	A	46	GLN	2.1
2	B	109	PHE	2.0
2	E	303	ILE	2.0
2	E	118	GLY	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, 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.

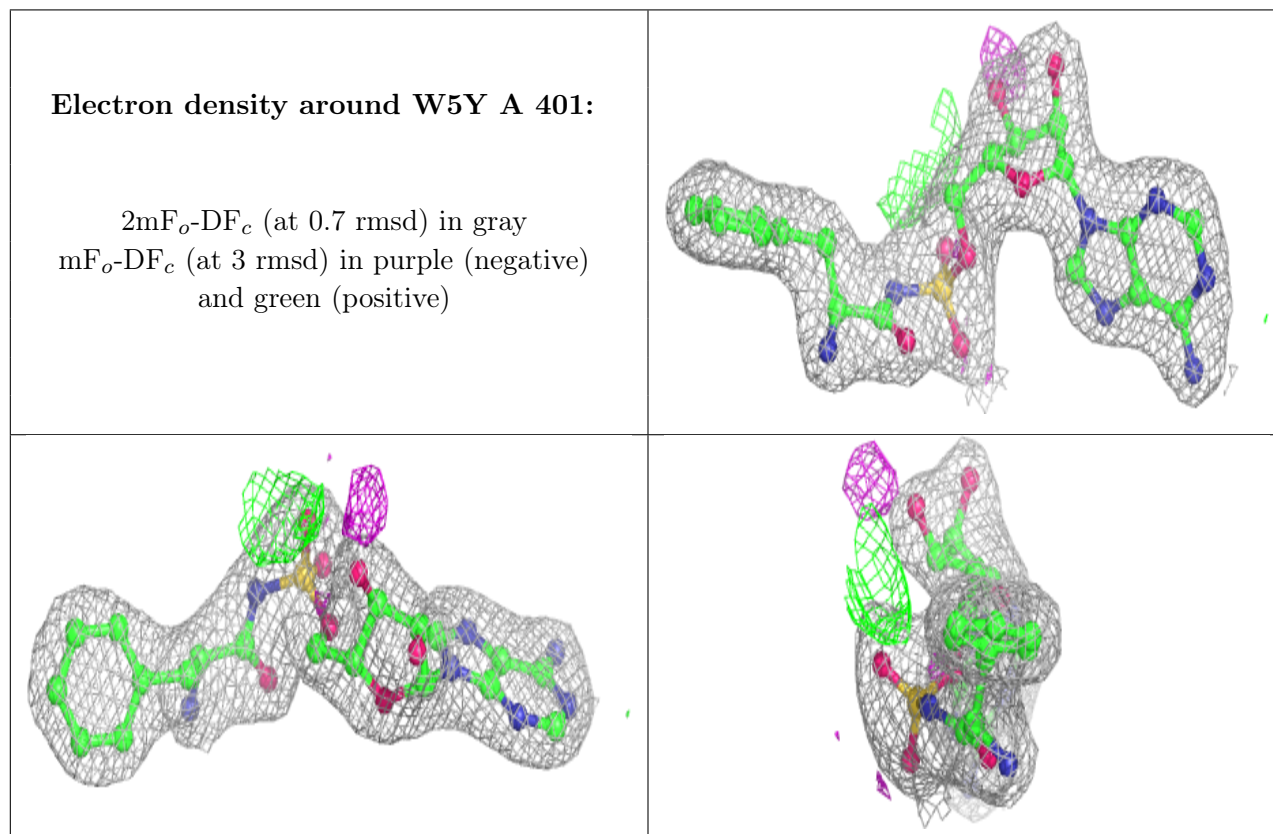
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
5	MG	A	405	1/1	0.65	0.13	69,69,69,69	0
5	MG	D	404	1/1	0.70	0.15	61,61,61,61	0
5	MG	F	103	1/1	0.83	0.05	93,93,93,93	0
7	GOL	B	903	6/6	0.86	0.12	65,73,78,84	0
7	GOL	E	902	6/6	0.88	0.17	73,82,88,91	0

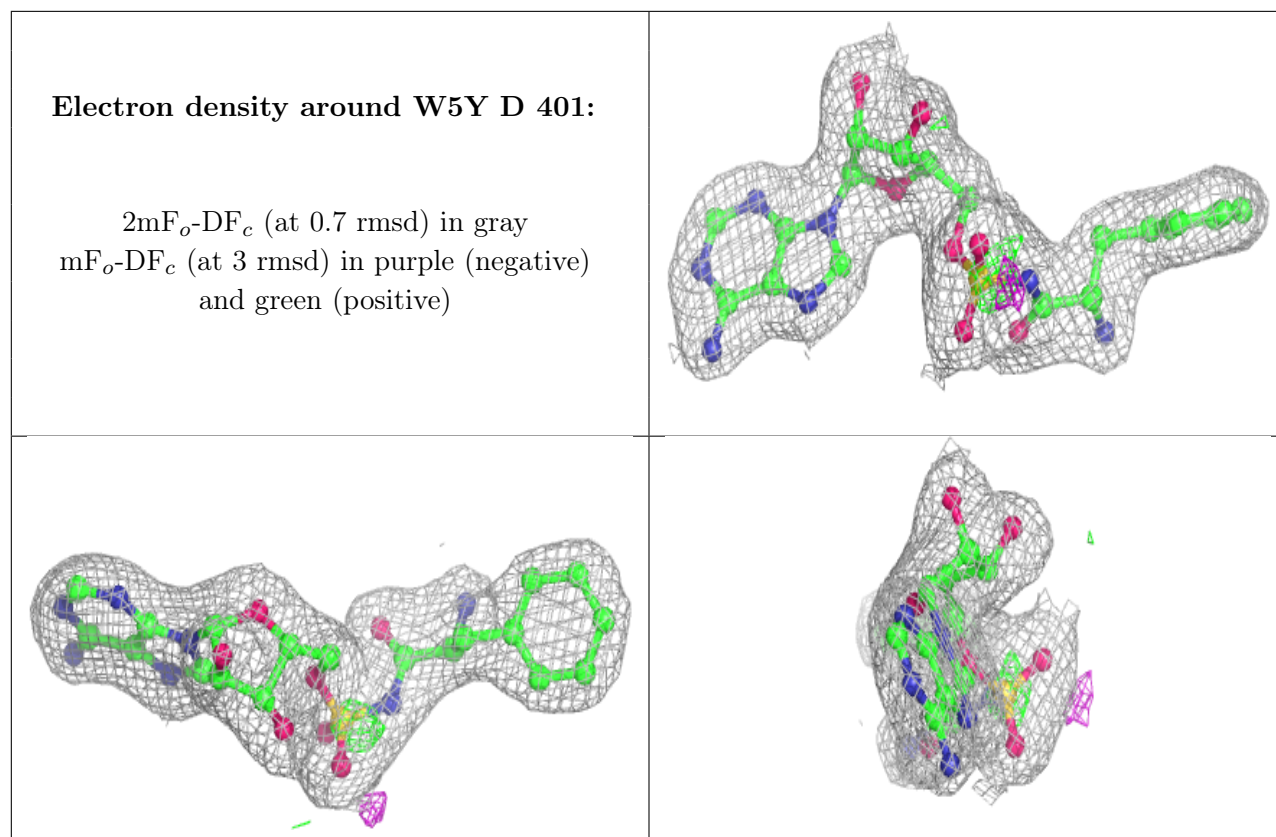
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
7	GOL	C	103	6/6	0.90	0.21	79,83,84,84	0
5	MG	C	101	1/1	0.92	0.13	65,65,65,65	0
5	MG	A	404	1/1	0.93	0.07	71,71,71,71	0
5	MG	C	102	1/1	0.93	0.18	64,64,64,64	0
5	MG	B	901	1/1	0.94	0.07	54,54,54,54	0
5	MG	F	101	1/1	0.96	0.11	67,67,67,67	0
5	MG	A	402	1/1	0.97	0.07	48,48,48,48	0
4	W5Y	A	401	34/34	0.97	0.18	31,40,45,47	0
6	CL	B	902	1/1	0.98	0.08	57,57,57,57	0
6	CL	E	901	1/1	0.98	0.05	51,51,51,51	0
5	MG	D	402	1/1	0.98	0.08	46,46,46,46	0
5	MG	F	102	1/1	0.98	0.06	74,74,74,74	0
4	W5Y	D	401	34/34	0.98	0.17	31,37,40,56	0
5	MG	D	403	1/1	0.99	0.14	41,41,41,41	0
5	MG	A	403	1/1	0.99	0.12	40,40,40,40	0

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





6.5 Other polymers [i](#)

There are no such residues in this entry.