



Full wwPDB X-ray Structure Validation Report ⓘ

Jun 17, 2024 – 10:30 PM EDT

PDB ID : 5UY8
Title : Crystal structure of AICARFT bound to an antifolate
Authors : Wang, J.; Wang, Y.; Fales, K.R.; Atwell, S.; Clawson, D.
Deposited on : 2017-02-23
Resolution : 2.39 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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

MolProbity : 4.02b-467
Mogul : 1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.37.1
buster-report : 1.1.7 (2018)
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac : 5.8.0158
CCP4 : 7.0.044 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.37.1

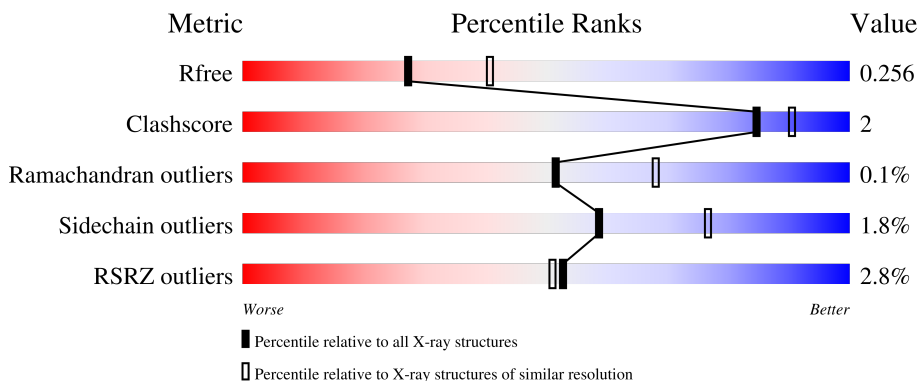
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

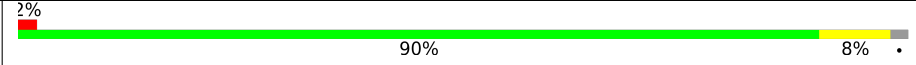
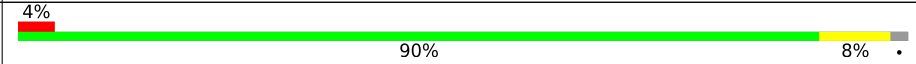
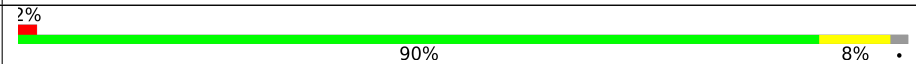
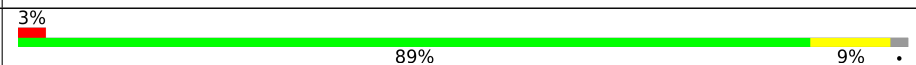
The reported resolution of this entry is 2.39 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	3907 (2.40-2.40)
Clashscore	141614	4398 (2.40-2.40)
Ramachandran outliers	138981	4318 (2.40-2.40)
Sidechain outliers	138945	4319 (2.40-2.40)
RSRZ outliers	127900	3811 (2.40-2.40)

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	601	 2% 90% 8%
1	B	601	 4% 90% 8%
1	C	601	 2% 90% 8%
1	D	601	 3% 89% 9%

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 18442 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 Bifunctional purine biosynthesis protein PURH.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	589	4500	2848	782	851	19	0	1	0
1	B	589	4501	2849	783	850	19	0	2	0
1	C	589	4484	2840	782	843	19	0	1	0
1	D	589	4468	2832	782	835	19	0	1	0

There are 40 discrepancies between the modelled and reference sequences:

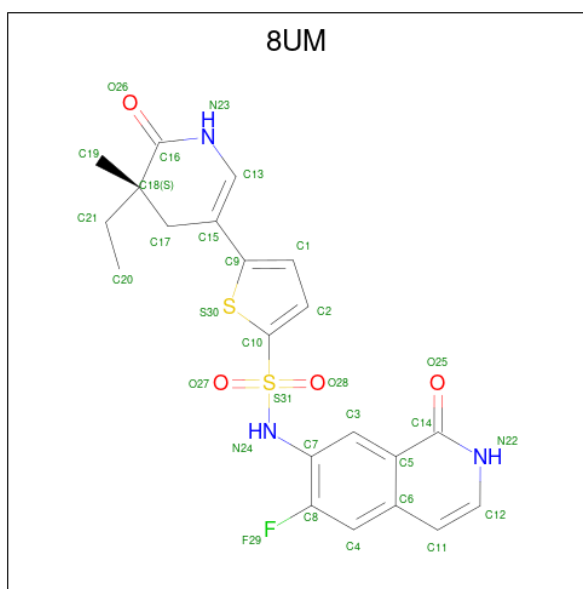
Chain	Residue	Modelled	Actual	Comment	Reference
A	-8	MET	-	expression tag	UNP P31939
A	-7	ALA	-	expression tag	UNP P31939
A	-6	HIS	-	expression tag	UNP P31939
A	-5	HIS	-	expression tag	UNP P31939
A	-4	HIS	-	expression tag	UNP P31939
A	-3	HIS	-	expression tag	UNP P31939
A	-2	HIS	-	expression tag	UNP P31939
A	-1	HIS	-	expression tag	UNP P31939
A	0	SER	-	expression tag	UNP P31939
A	1	LEU	-	expression tag	UNP P31939
B	-8	MET	-	expression tag	UNP P31939
B	-7	ALA	-	expression tag	UNP P31939
B	-6	HIS	-	expression tag	UNP P31939
B	-5	HIS	-	expression tag	UNP P31939
B	-4	HIS	-	expression tag	UNP P31939
B	-3	HIS	-	expression tag	UNP P31939
B	-2	HIS	-	expression tag	UNP P31939
B	-1	HIS	-	expression tag	UNP P31939
B	0	SER	-	expression tag	UNP P31939
B	1	LEU	-	expression tag	UNP P31939
C	-8	MET	-	expression tag	UNP P31939

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Chain	Residue	Modelled	Actual	Comment	Reference
C	-7	ALA	-	expression tag	UNP P31939
C	-6	HIS	-	expression tag	UNP P31939
C	-5	HIS	-	expression tag	UNP P31939
C	-4	HIS	-	expression tag	UNP P31939
C	-3	HIS	-	expression tag	UNP P31939
C	-2	HIS	-	expression tag	UNP P31939
C	-1	HIS	-	expression tag	UNP P31939
C	0	SER	-	expression tag	UNP P31939
C	1	LEU	-	expression tag	UNP P31939
D	-8	MET	-	expression tag	UNP P31939
D	-7	ALA	-	expression tag	UNP P31939
D	-6	HIS	-	expression tag	UNP P31939
D	-5	HIS	-	expression tag	UNP P31939
D	-4	HIS	-	expression tag	UNP P31939
D	-3	HIS	-	expression tag	UNP P31939
D	-2	HIS	-	expression tag	UNP P31939
D	-1	HIS	-	expression tag	UNP P31939
D	0	SER	-	expression tag	UNP P31939
D	1	LEU	-	expression tag	UNP P31939

- Molecule 2 is 5-[(5S)-5-ethyl-5-methyl-6-oxo-1,4,5,6-tetrahydropyridin-3-yl]-N-(6-fluoro-1-oxo-1,2-dihydroisoquinolin-7-yl)thiophene-2-sulfonamide (three-letter code: 8UM) (formula: C₂₁H₂₀FN₃O₄S₂).



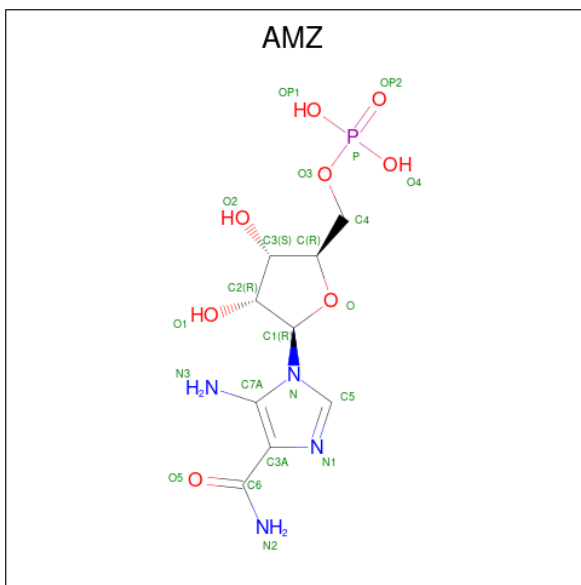
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	
			Total	C	F	N	O			S
2	A	1	31	21	1	3	4	2	0	0

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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	
			Total	C	F	N	O			S
2	B	1	Total	C	F	N	O	S	0	0
			31	21	1	3	4	2		
2	C	1	Total	C	F	N	O	S	0	0
			31	21	1	3	4	2		
2	D	1	Total	C	F	N	O	S	0	0
			31	21	1	3	4	2		

- Molecule 3 is AMINOIMIDAZOLE 4-CARBOXAMIDE RIBONUCLEOTIDE (three-letter code: AMZ) (formula: C₉H₁₅N₄O₈P).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	
			Total	C	N	O			P
3	A	1	Total	C	N	O	P	0	0
			22	9	4	8	1		
3	A	1	Total	C	N	O	P	0	0
			22	9	4	8	1		
3	B	1	Total	C	N	O	P	0	0
			22	9	4	8	1		
3	C	1	Total	C	N	O	P	0	0
			22	9	4	8	1		
3	C	1	Total	C	N	O	P	0	0
			22	9	4	8	1		
3	D	1	Total	C	N	O	P	0	0
			22	9	4	8	1		
3	D	1	Total	C	N	O	P	0	0
			22	9	4	8	1		

- Molecule 4 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total Mg 1 1	0	0
4	B	1	Total Mg 1 1	0	0
4	C	1	Total Mg 1 1	0	0
4	D	1	Total Mg 1 1	0	0

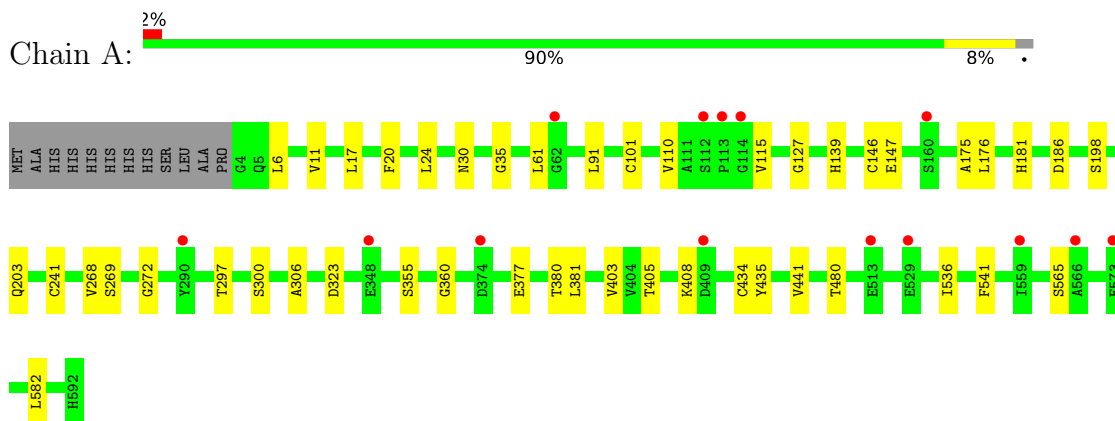
- Molecule 5 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	50	Total O 50 50	0	0
5	B	61	Total O 61 61	0	0
5	C	46	Total O 46 46	0	0
5	D	50	Total O 50 50	0	0

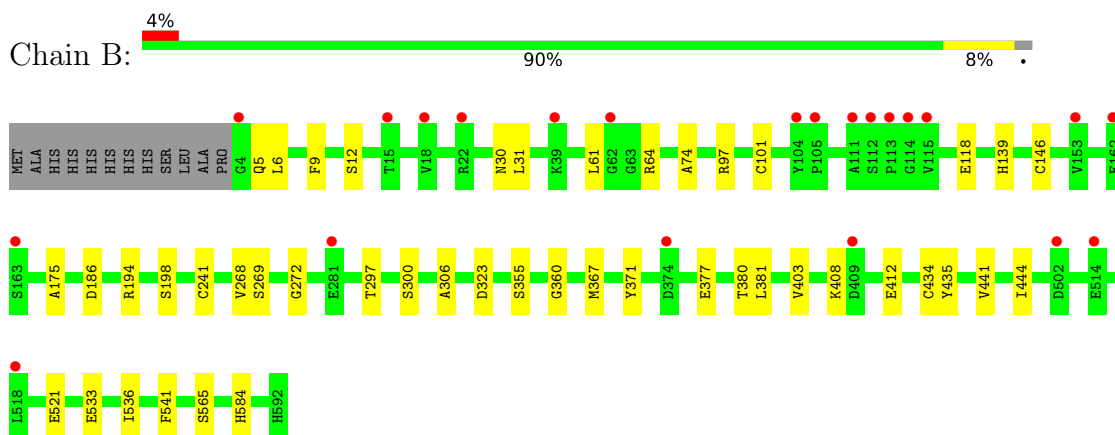
3 Residue-property plots [i](#)

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.

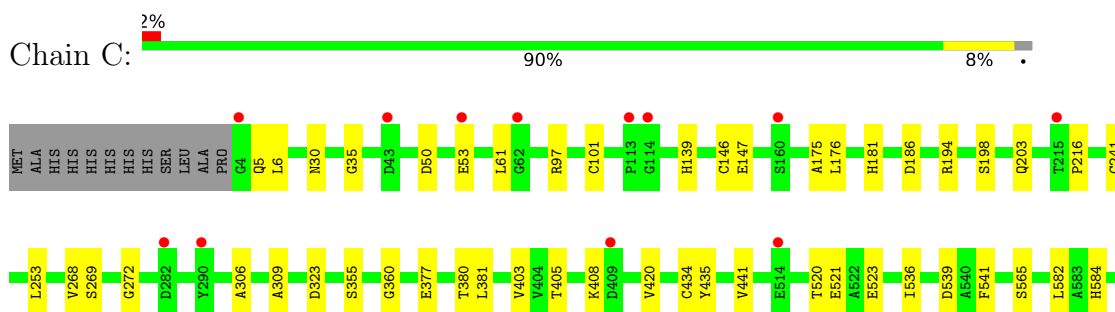
- Molecule 1: Bifunctional purine biosynthesis protein PURH



- Molecule 1: Bifunctional purine biosynthesis protein PURH

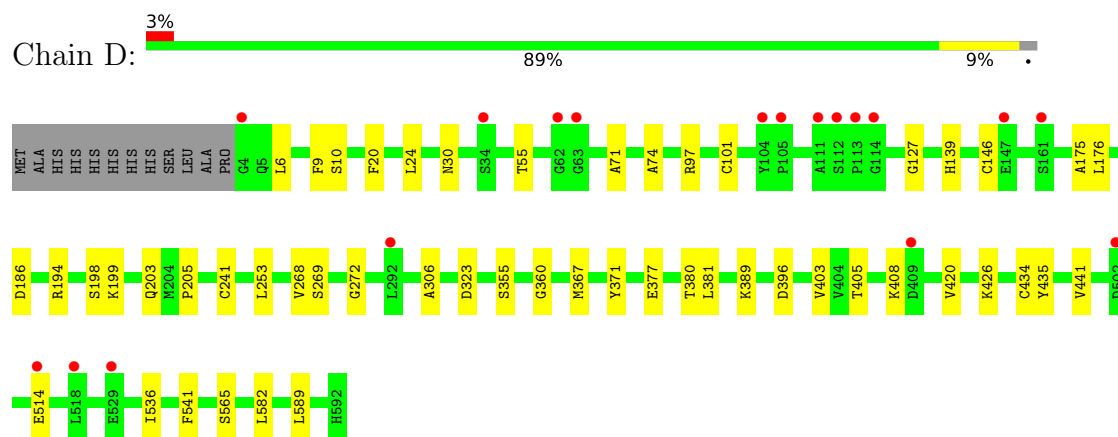


- Molecule 1: Bifunctional purine biosynthesis protein PURH



H592

- Molecule 1: Bifunctional purine biosynthesis protein PURH



4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α , β , γ	61.58Å 104.23Å 105.47Å 113.16° 99.39° 95.50°	Depositor
Resolution (Å)	19.98 – 2.39 19.98 – 2.39	Depositor EDS
% Data completeness (in resolution range)	96.2 (19.98-2.39) 96.2 (19.98-2.39)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.41 (at 2.38Å)	Xtrriage
Refinement program	BUSTER 2.11.5	Depositor
R, R_{free}	0.205 , 0.245 0.213 , 0.256	Depositor DCC
R_{free} test set	4478 reflections (5.03%)	wwPDB-VP
Wilson B-factor (Å ²)	21.6	Xtrriage
Anisotropy	0.417	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 48.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	0.012 for -h,-l,-k	Xtrriage
F_o, F_c correlation	0.92	EDS
Total number of atoms	18442	wwPDB-VP
Average B, all atoms (Å ²)	26.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 11.75% 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: 8UM, MG, AMZ

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	0.50	0/4586	0.66	0/6223
1	B	0.50	0/4591	0.66	0/6231
1	C	0.49	0/4570	0.66	1/6203 (0.0%)
1	D	0.51	0/4554	0.65	0/6182
All	All	0.50	0/18301	0.66	1/24839 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	539	ASP	CA-CB-CG	5.18	124.80	113.40

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	4500	0	4517	24	0
1	B	4501	0	4511	21	0
1	C	4484	0	4501	24	0
1	D	4468	0	4482	28	0
2	A	31	0	0	0	0
2	B	31	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	C	31	0	0	0	0
2	D	31	0	0	0	0
3	A	44	0	26	2	0
3	B	22	0	13	0	0
3	C	44	0	26	1	0
3	D	44	0	26	2	0
4	A	1	0	0	0	0
4	B	1	0	0	0	0
4	C	1	0	0	0	0
4	D	1	0	0	0	0
5	A	50	0	0	0	0
5	B	61	0	0	0	0
5	C	46	0	0	1	0
5	D	50	0	0	0	0
All	All	18442	0	18102	84	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 (84) 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:D:101:CYS:O	1:D:146:CYS:HA	1.85	0.77
1:B:101:CYS:O	1:B:146:CYS:HA	1.87	0.74
1:B:541:PHE:CD1	1:B:565:SER:HB2	2.28	0.69
1:A:541:PHE:CD1	1:A:565:SER:HB2	2.30	0.67
1:D:541:PHE:CD1	1:D:565:SER:HB2	2.29	0.66
1:A:147:GLU:HG3	1:A:181:HIS:HE1	1.60	0.66
1:C:541:PHE:CD1	1:C:565:SER:HB2	2.31	0.66
3:C:603:AMZ:H9	3:C:603:AMZ:H12	1.51	0.57
1:A:101:CYS:O	1:A:146:CYS:HA	2.04	0.56
1:C:309:ALA:HB2	5:C:720:HOH:O	2.05	0.55
1:C:403:VAL:HG11	1:C:408:LYS:HA	1.88	0.54
1:A:403:VAL:HG11	1:A:408:LYS:HA	1.90	0.54
1:D:403:VAL:HG11	1:D:408:LYS:HA	1.91	0.53
1:A:380:THR:HB	1:B:377:GLU:HB2	1.91	0.53
3:A:603:AMZ:H12	3:A:603:AMZ:H9	1.57	0.52
1:B:403:VAL:HG11	1:B:408:LYS:HA	1.92	0.51
1:C:101:CYS:O	1:C:146:CYS:HA	2.11	0.51
1:C:381:LEU:CD2	1:D:241:CYS:HA	2.40	0.51
1:A:176:LEU:HD11	1:B:194:ARG:HG3	1.93	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:355:SER:O	1:C:360:GLY:HA2	2.12	0.50
1:A:241:CYS:HA	1:B:381:LEU:CD2	2.42	0.49
1:A:381:LEU:CD2	1:B:241:CYS:HA	2.43	0.49
1:B:355:SER:O	1:B:360:GLY:HA2	2.13	0.49
1:D:355:SER:O	1:D:360:GLY:HA2	2.13	0.48
1:A:434:CYS:SG	1:A:441:VAL:HG22	2.53	0.48
1:C:435:TYR:HA	1:C:536:ILE:HG22	1.95	0.48
1:A:355:SER:O	1:A:360:GLY:HA2	2.12	0.48
1:D:10:SER:OG	3:D:603:AMZ:H13	2.14	0.48
1:D:435:TYR:HA	1:D:536:ILE:HG22	1.96	0.48
1:A:147:GLU:HG3	1:A:181:HIS:CE1	2.46	0.47
1:A:61:LEU:HD11	1:B:74:ALA:HA	1.97	0.47
1:A:435:TYR:HA	1:A:536:ILE:HG22	1.97	0.47
1:C:380:THR:HB	1:D:377:GLU:HB2	1.96	0.47
1:A:110:VAL:HA	1:A:115:VAL:HG11	1.97	0.46
1:A:272:GLY:HA3	1:A:306:ALA:O	2.16	0.46
1:D:272:GLY:HA3	1:D:306:ALA:O	2.16	0.46
1:B:139:HIS:HB3	1:B:175:ALA:HB2	1.96	0.46
1:D:199:LYS:HE3	1:D:205:PRO:HG2	1.96	0.46
1:D:139:HIS:HB3	1:D:175:ALA:HB2	1.97	0.46
1:A:139:HIS:HB3	1:A:175:ALA:HB2	1.98	0.45
1:B:435:TYR:HA	1:B:536:ILE:HG22	1.97	0.45
1:C:520:THR:OG1	1:C:523:GLU:HG3	2.17	0.45
1:D:434:CYS:SG	1:D:441:VAL:HG22	2.56	0.45
1:A:480:THR:HG21	1:D:97:ARG:HH11	1.81	0.45
1:C:139:HIS:HB3	1:C:175:ALA:HB2	1.99	0.45
1:D:55:THR:HG22	1:D:71:ALA:HB3	1.98	0.45
1:D:20:PHE:CE1	1:D:24:LEU:HD11	2.52	0.45
1:D:253:LEU:HD21	1:D:420:VAL:HA	1.99	0.45
1:C:241:CYS:HA	1:D:381:LEU:CD2	2.47	0.44
1:B:434:CYS:SG	1:B:441:VAL:HG22	2.56	0.44
1:A:20:PHE:O	1:A:24:LEU:HG	2.18	0.44
1:A:11:VAL:HG21	1:A:17:LEU:HD13	1.98	0.44
1:A:127:GLY:HA3	3:A:603:AMZ:C6	2.47	0.44
1:B:272:GLY:HA3	1:B:306:ALA:O	2.17	0.43
1:B:61:LEU:O	1:B:64:ARG:HD3	2.17	0.43
1:A:405:THR:HG23	1:A:582:LEU:HB3	2.00	0.43
1:C:405:THR:HG23	1:C:582:LEU:HB3	2.01	0.43
1:C:434:CYS:SG	1:C:441:VAL:HG22	2.58	0.43
1:C:147:GLU:HG3	1:C:181:HIS:HE1	1.84	0.43
1:C:272:GLY:HA3	1:C:306:ALA:O	2.19	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:377:GLU:HB2	1:D:380:THR:HB	2.01	0.43
1:C:176:LEU:HD11	1:D:194:ARG:HG3	2.01	0.42
1:C:194:ARG:HG3	1:D:176:LEU:HD11	2.00	0.42
1:D:6:LEU:HD23	1:D:30:ASN:HB2	2.02	0.42
1:C:50:ASP:HB2	1:C:53:GLU:HG3	2.01	0.42
1:B:367:MET:HE3	1:B:371:TYR:HB3	2.02	0.42
1:C:253:LEU:HD21	1:C:420:VAL:HA	2.02	0.41
1:B:6:LEU:HD23	1:B:30:ASN:HB2	2.01	0.41
1:A:377:GLU:HB2	1:B:380:THR:HB	2.01	0.41
1:D:405:THR:HG23	1:D:582:LEU:HB3	2.02	0.41
1:C:6:LEU:HD23	1:C:30:ASN:HB2	2.01	0.41
1:D:367:MET:HE3	1:D:371:TYR:HB3	2.01	0.41
1:A:6:LEU:HD23	1:A:30:ASN:HB2	2.03	0.41
1:C:5:GLN:OE1	1:C:97:ARG:HD3	2.21	0.41
1:B:434:CYS:HB2	1:B:444:ILE:HD13	2.03	0.41
1:D:9:PHE:HZ	1:D:24:LEU:HD12	1.85	0.41
1:C:61:LEU:HD11	1:D:74:ALA:HA	2.03	0.41
1:B:5:GLN:OE1	1:B:97:ARG:HD3	2.22	0.40
1:D:127:GLY:HA3	3:D:603:AMZ:C6	2.51	0.40
1:A:297:THR:H	1:A:300:SER:HG	1.68	0.40
1:B:297:THR:H	1:B:300:SER:HG	1.69	0.40
1:C:216:PRO:HD2	1:D:389:LYS:HE2	2.04	0.40
1:D:426:LYS:HG3	1:D:589:LEU:HD22	2.03	0.40
1:B:9:PHE:CE1	1:B:31:LEU:HD22	2.56	0.40

There are no symmetry-related clashes.

5.3 Torsion angles [\(i\)](#)

5.3.1 Protein backbone [\(i\)](#)

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
1	A	588/601 (98%)	575 (98%)	12 (2%)	1 (0%)	47 62

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	B	589/601 (98%)	578 (98%)	11 (2%)	0	100	100
1	C	588/601 (98%)	573 (97%)	14 (2%)	1 (0%)	47	62
1	D	588/601 (98%)	577 (98%)	11 (2%)	0	100	100
All	All	2353/2404 (98%)	2303 (98%)	48 (2%)	2 (0%)	51	68

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	35	GLY
1	A	35	GLY

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	478/496 (96%)	471 (98%)	7 (2%)	65	80
1	B	477/496 (96%)	466 (98%)	11 (2%)	50	70
1	C	474/496 (96%)	466 (98%)	8 (2%)	60	78
1	D	469/496 (95%)	461 (98%)	8 (2%)	60	78
All	All	1898/1984 (96%)	1864 (98%)	34 (2%)	59	76

All (34) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	91	LEU
1	A	186	ASP
1	A	198	SER
1	A	203	GLN
1	A	268	VAL
1	A	269	SER
1	A	323	ASP
1	B	12	SER
1	B	118	GLU

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Mol	Chain	Res	Type
1	B	186	ASP
1	B	198	SER
1	B	268	VAL
1	B	269	SER
1	B	323	ASP
1	B	412	GLU
1	B	521	GLU
1	B	533	GLU
1	B	584	HIS
1	C	186	ASP
1	C	198	SER
1	C	203	GLN
1	C	268	VAL
1	C	269	SER
1	C	323	ASP
1	C	521	GLU
1	C	584	HIS
1	D	186	ASP
1	D	198	SER
1	D	203	GLN
1	D	268	VAL
1	D	269	SER
1	D	323	ASP
1	D	396	ASP
1	D	514	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	196	GLN
1	C	376	ASN
1	D	376	ASN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 15 ligands modelled in this entry, 4 are monoatomic - leaving 11 for Mogul analysis.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	8UM	B	601	-	31,34,34	1.37	3 (9%)	36,52,52	1.57	9 (25%)
3	AMZ	D	603	-	18,23,23	0.72	0	22,35,35	1.55	3 (13%)
3	AMZ	A	603	-	18,23,23	0.61	0	22,35,35	1.62	5 (22%)
3	AMZ	D	602	-	18,23,23	0.85	1 (5%)	22,35,35	1.22	2 (9%)
3	AMZ	C	603	-	18,23,23	0.60	0	22,35,35	1.45	3 (13%)
2	8UM	D	601	-	31,34,34	1.43	3 (9%)	36,52,52	1.87	13 (36%)
2	8UM	A	601	-	31,34,34	1.47	4 (12%)	36,52,52	1.67	9 (25%)
2	8UM	C	601	-	31,34,34	1.52	5 (16%)	36,52,52	1.82	9 (25%)
3	AMZ	C	602	-	18,23,23	0.73	0	22,35,35	1.11	1 (4%)
3	AMZ	A	602	-	18,23,23	0.78	0	22,35,35	1.21	2 (9%)
3	AMZ	B	602	-	18,23,23	0.78	0	22,35,35	1.20	2 (9%)

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	8UM	B	601	-	-	0/8/34/34	0/4/4/4
3	AMZ	D	603	-	-	3/6/30/30	0/2/2/2
3	AMZ	A	603	-	-	0/6/30/30	0/2/2/2
3	AMZ	D	602	-	-	0/6/30/30	0/2/2/2
3	AMZ	C	603	-	-	0/6/30/30	0/2/2/2
2	8UM	D	601	-	-	1/8/34/34	0/4/4/4

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	8UM	A	601	-	-	1/8/34/34	0/4/4/4
2	8UM	C	601	-	-	0/8/34/34	0/4/4/4
3	AMZ	C	602	-	-	0/6/30/30	0/2/2/2
3	AMZ	A	602	-	-	0/6/30/30	0/2/2/2
3	AMZ	B	602	-	-	0/6/30/30	0/2/2/2

All (16) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	601	8UM	S31-N24	5.26	1.72	1.63
2	D	601	8UM	S31-N24	4.78	1.71	1.63
2	C	601	8UM	S31-N24	4.54	1.71	1.63
2	C	601	8UM	C18-C16	4.44	1.56	1.52
2	B	601	8UM	S31-N24	4.33	1.70	1.63
2	D	601	8UM	C18-C16	4.22	1.56	1.52
2	A	601	8UM	C18-C16	3.94	1.55	1.52
2	B	601	8UM	C18-C16	3.56	1.55	1.52
2	C	601	8UM	O28-S31	2.79	1.46	1.43
2	C	601	8UM	C9-C15	-2.77	1.44	1.48
2	B	601	8UM	C9-C15	-2.70	1.44	1.48
2	D	601	8UM	C9-C15	-2.58	1.44	1.48
2	A	601	8UM	C9-C15	-2.30	1.45	1.48
3	D	602	AMZ	O-C1	2.25	1.44	1.41
2	A	601	8UM	O27-S31	2.20	1.46	1.43
2	C	601	8UM	C17-C15	2.06	1.53	1.51

All (58) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	601	8UM	C3-C7-C8	4.85	122.21	117.75
2	A	601	8UM	O27-S31-C10	-3.97	101.12	107.66
3	D	603	AMZ	C3A-C6-N2	3.95	121.99	115.75
2	D	601	8UM	C18-C17-C15	3.83	119.94	111.98
3	D	603	AMZ	C5-N1-C3A	3.53	109.71	102.99
2	C	601	8UM	C4-C8-C7	-3.52	120.15	123.50
3	A	603	AMZ	O-C1-C2	-3.52	101.79	106.93
3	C	603	AMZ	C5-N1-C3A	3.42	109.50	102.99
2	D	601	8UM	C4-C8-C7	-3.40	120.27	123.50
2	C	601	8UM	C20-C21-C18	-3.35	109.10	114.92
2	D	601	8UM	C3-C7-C8	3.33	120.81	117.75
2	D	601	8UM	C19-C18-C21	-3.19	103.84	109.99
2	C	601	8UM	C18-C16-N23	3.18	118.99	117.03

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	603	AMZ	C3A-C6-N2	3.15	120.72	115.75
2	B	601	8UM	C20-C21-C18	-3.12	109.50	114.92
2	B	601	8UM	C18-C17-C15	3.09	118.39	111.98
3	A	603	AMZ	C3A-C6-N2	3.07	120.60	115.75
2	A	601	8UM	O26-C16-C18	-3.01	120.57	123.36
2	B	601	8UM	C3-C7-C8	3.01	120.52	117.75
2	D	601	8UM	O27-S31-N24	2.95	114.12	106.73
3	A	602	AMZ	C5-N1-C3A	2.92	108.55	102.99
2	A	601	8UM	C18-C17-C15	2.84	117.88	111.98
2	B	601	8UM	O25-C14-N22	2.84	123.78	120.32
3	A	603	AMZ	C5-N1-C3A	2.82	108.36	102.99
3	C	603	AMZ	O-C1-C2	-2.80	102.83	106.93
3	C	602	AMZ	C5-N1-C3A	2.76	108.24	102.99
3	D	602	AMZ	C5-N1-C3A	2.75	108.23	102.99
2	C	601	8UM	O28-S31-O27	-2.72	116.20	119.55
2	D	601	8UM	O26-C16-C18	-2.71	120.85	123.36
2	A	601	8UM	C5-C14-N22	2.68	116.58	114.31
3	B	602	AMZ	C5-N1-C3A	2.67	108.08	102.99
2	D	601	8UM	C18-C16-N23	2.64	118.66	117.03
2	C	601	8UM	C18-C17-C15	2.60	117.38	111.98
2	D	601	8UM	C10-S31-N24	-2.55	104.29	107.27
2	A	601	8UM	C3-C7-C8	2.53	120.08	117.75
2	A	601	8UM	C4-C8-C7	-2.43	121.18	123.50
3	A	603	AMZ	OP1-P-O3	-2.42	100.30	106.73
2	D	601	8UM	C20-C21-C18	-2.40	110.75	114.92
2	A	601	8UM	C20-C21-C18	-2.40	110.76	114.92
2	B	601	8UM	C4-C8-C7	-2.38	121.24	123.50
2	C	601	8UM	C19-C18-C21	-2.33	105.50	109.99
3	D	603	AMZ	C3-C2-C1	2.33	104.48	100.98
2	D	601	8UM	C6-C11-C12	-2.33	117.89	120.91
2	A	601	8UM	C19-C18-C21	-2.30	105.56	109.99
2	B	601	8UM	O27-S31-C10	-2.21	104.02	107.66
2	C	601	8UM	O27-S31-N24	2.18	112.19	106.73
3	D	602	AMZ	O4-P-O3	-2.17	100.95	106.73
3	B	602	AMZ	C3A-C6-N2	2.08	119.04	115.75
2	B	601	8UM	C6-C11-C12	-2.08	118.21	120.91
2	D	601	8UM	O25-C14-N22	2.08	122.85	120.32
2	C	601	8UM	O26-C16-C18	-2.08	121.44	123.36
2	B	601	8UM	C5-C14-N22	2.05	116.05	114.31
2	D	601	8UM	C19-C18-C16	2.05	110.33	108.95
3	A	602	AMZ	O-C1-C2	2.03	109.90	106.93
2	B	601	8UM	O27-S31-N24	2.03	111.81	106.73

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	603	AMZ	O4-P-OP1	2.03	115.38	107.64
2	D	601	8UM	O27-S31-C10	-2.03	104.32	107.66
2	A	601	8UM	O27-S31-N24	2.03	111.80	106.73

There are no chirality outliers.

All (5) torsion outliers are listed below:

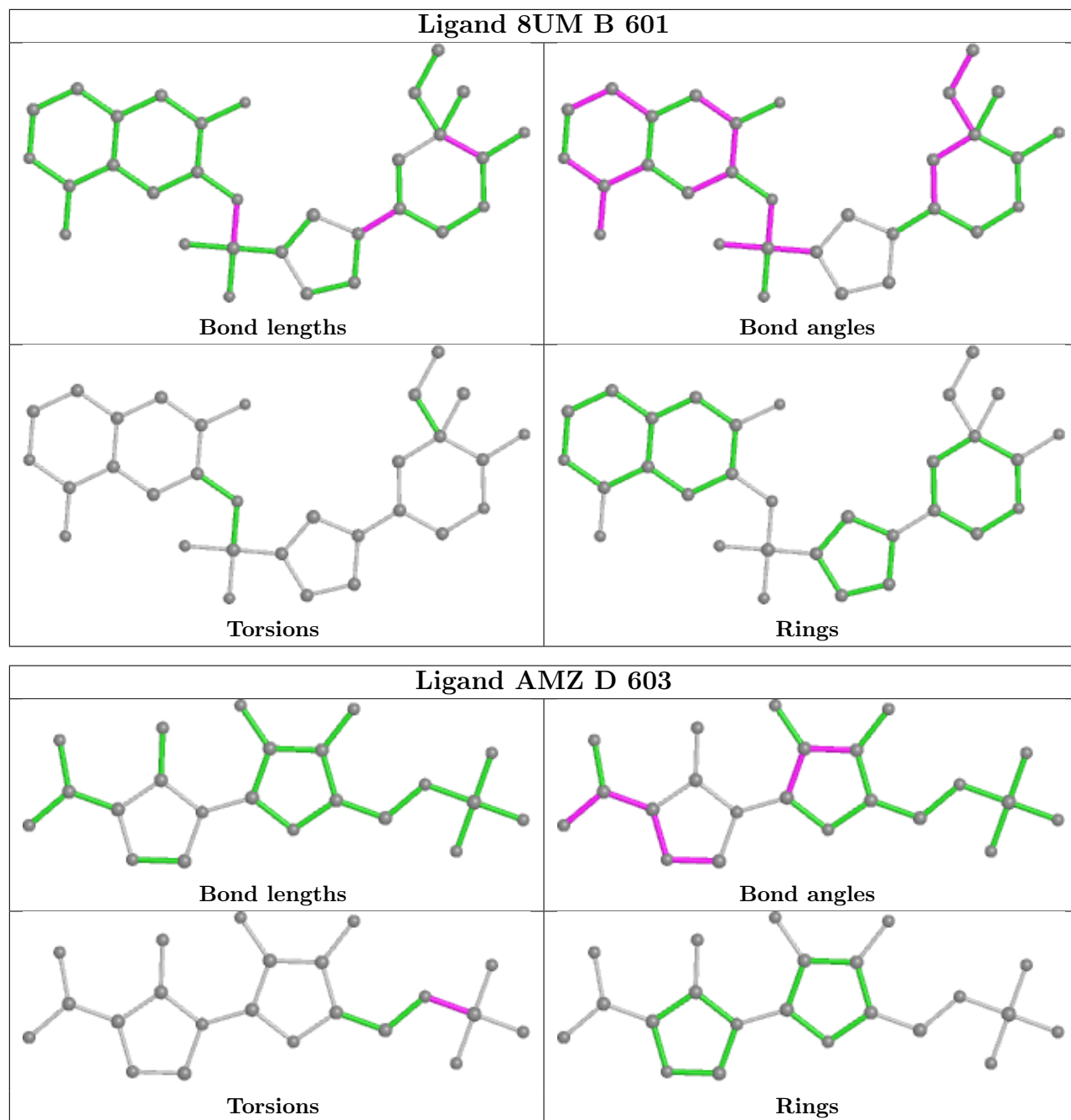
Mol	Chain	Res	Type	Atoms
3	D	603	AMZ	C4-O3-P-OP1
3	D	603	AMZ	C4-O3-P-OP2
3	D	603	AMZ	C4-O3-P-O4
2	D	601	8UM	C7-N24-S31-O27
2	A	601	8UM	C7-N24-S31-O27

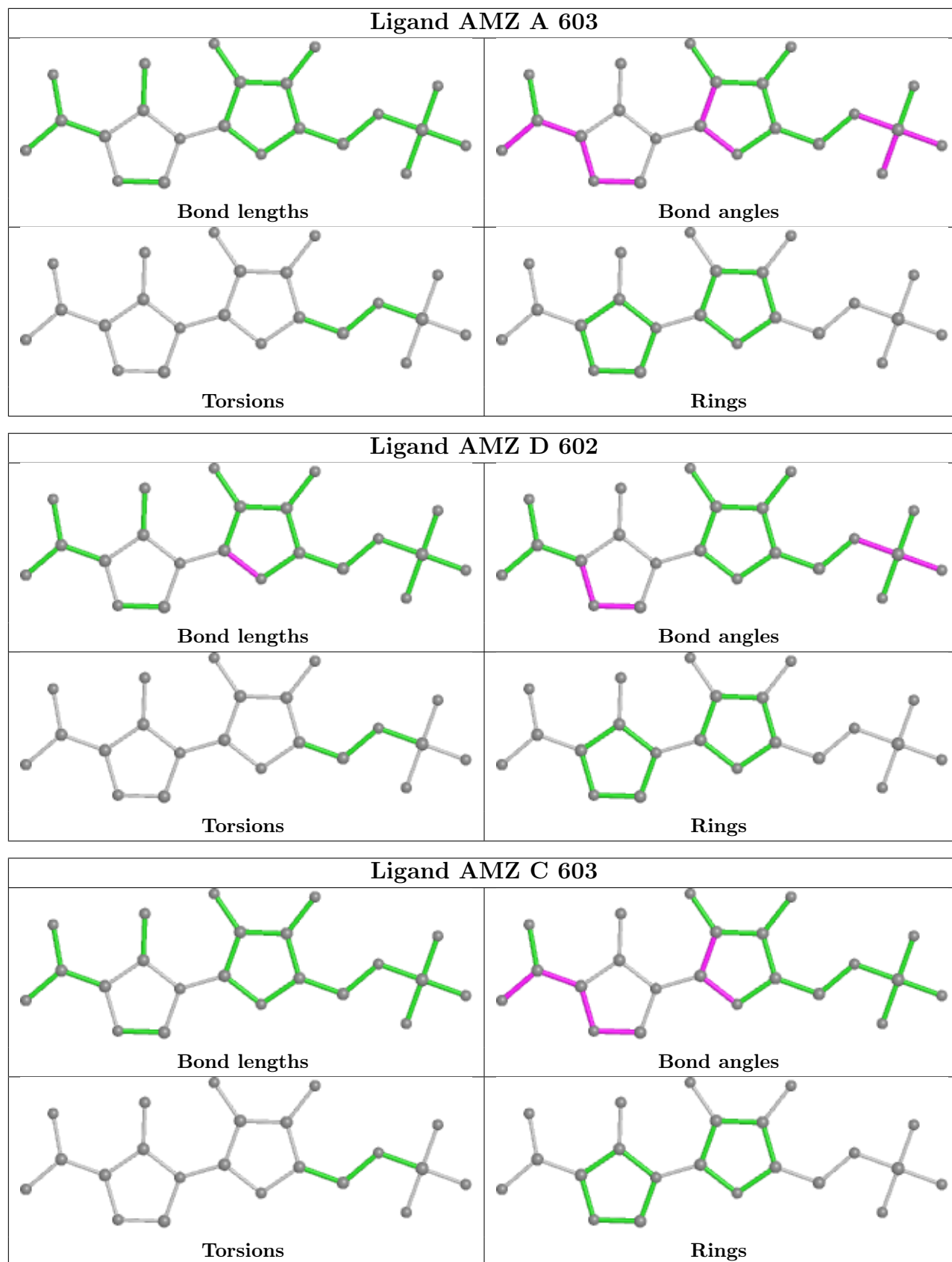
There are no ring outliers.

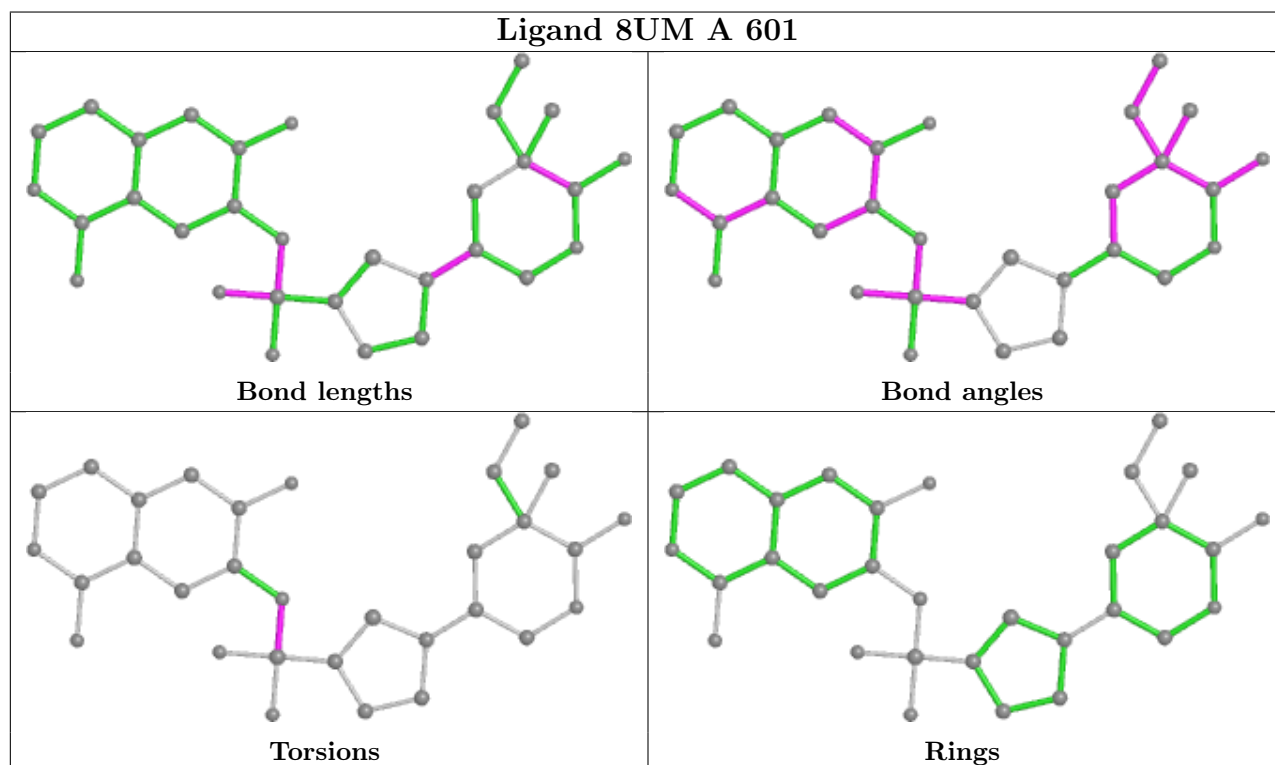
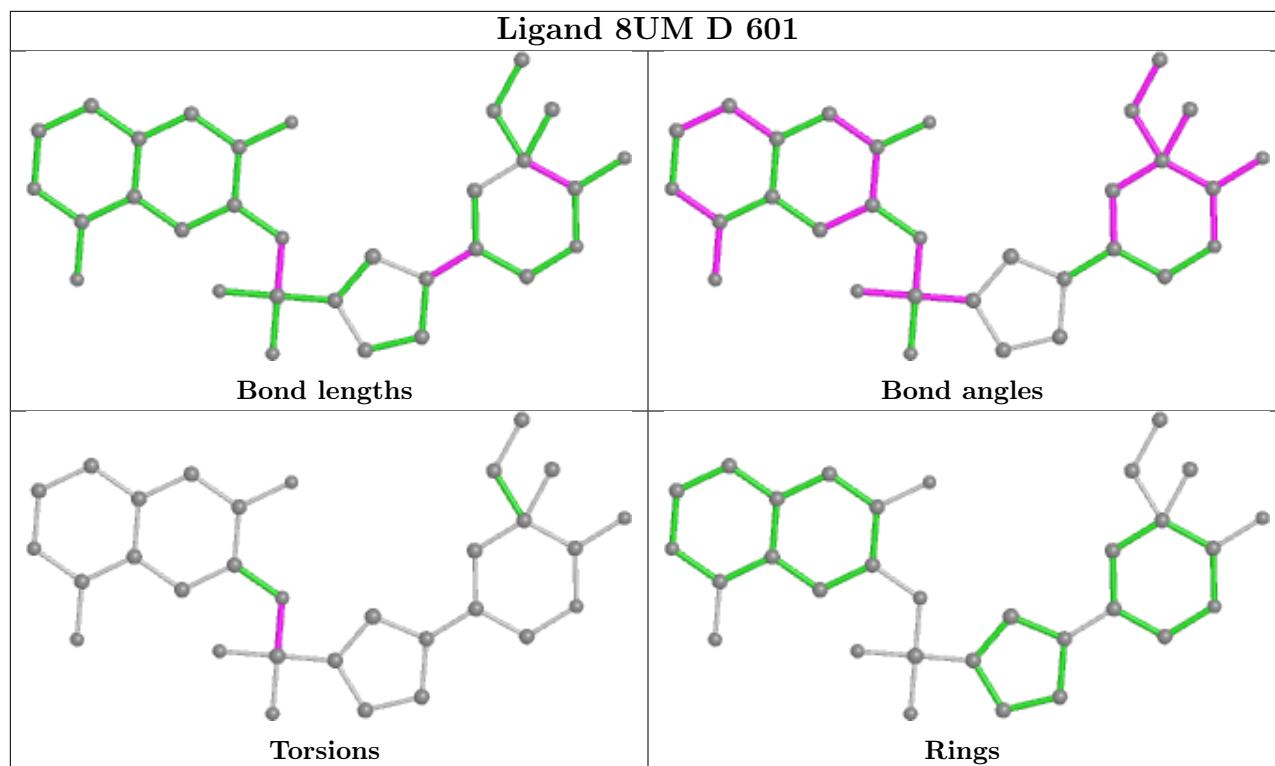
3 monomers are involved in 5 short contacts:

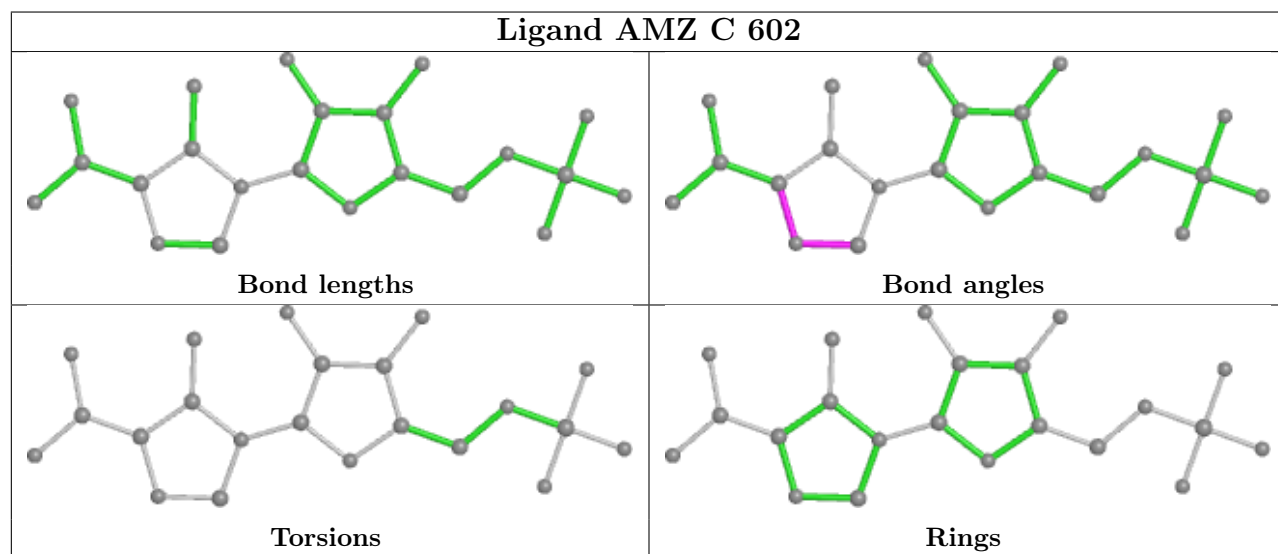
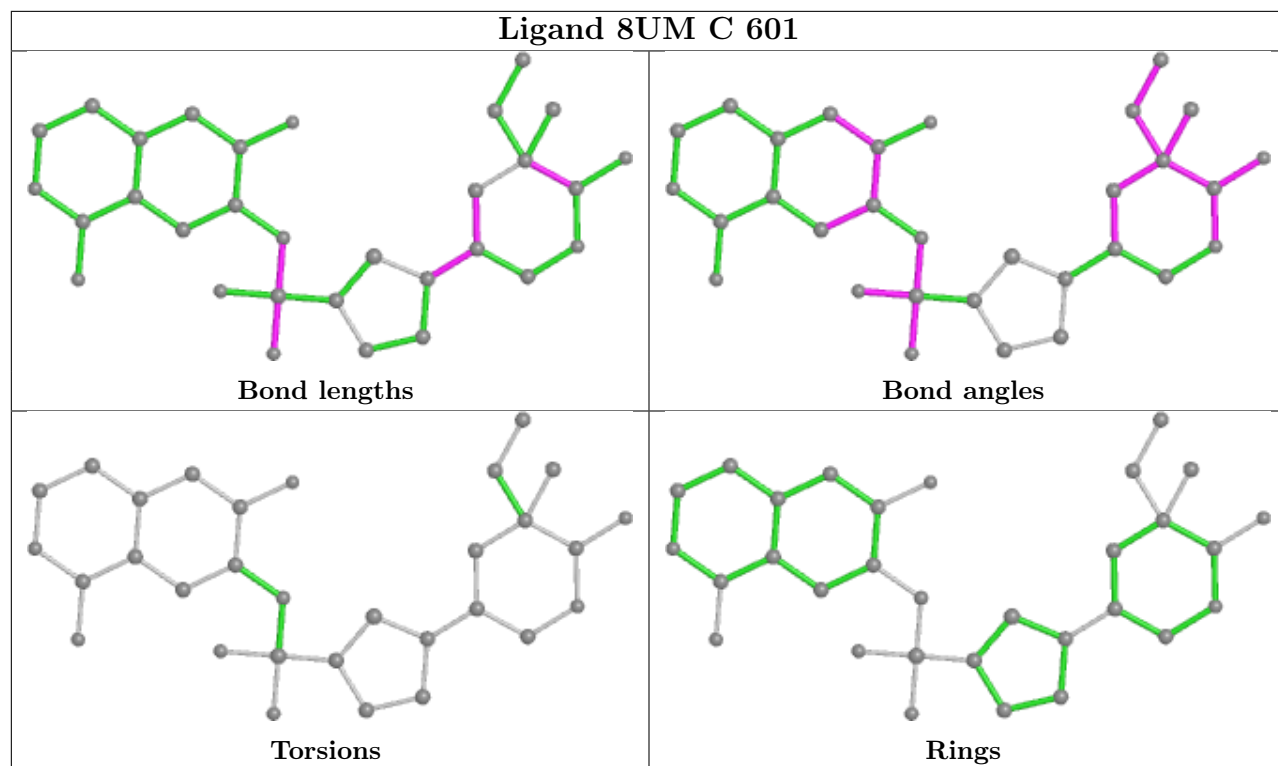
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	D	603	AMZ	2	0
3	A	603	AMZ	2	0
3	C	603	AMZ	1	0

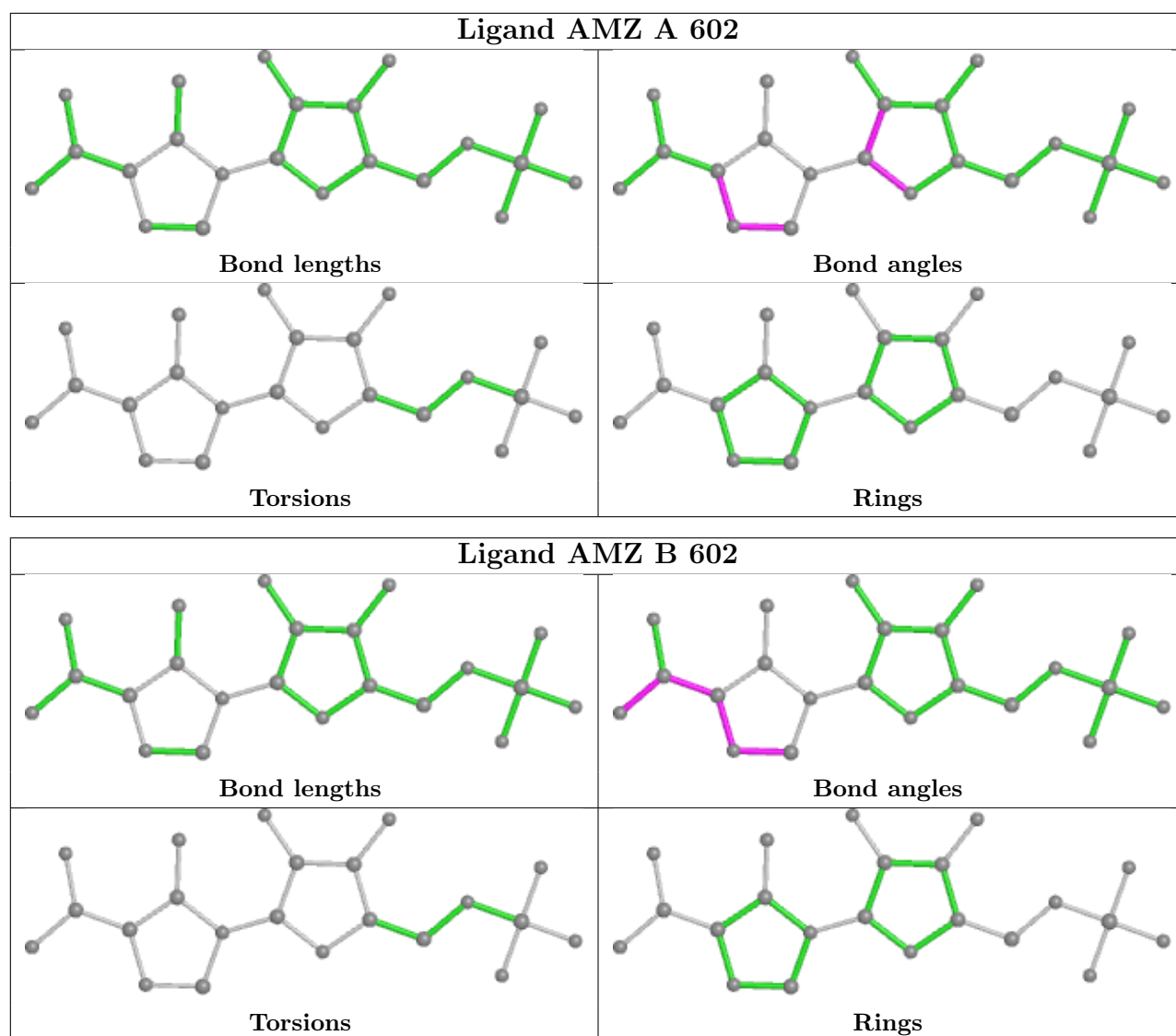
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.











5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q < 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	589/601 (98%)	0.12	14 (2%) 59 57	9, 23, 44, 54	0
1	B	589/601 (98%)	0.26	22 (3%) 41 41	9, 24, 44, 64	0
1	C	589/601 (98%)	0.15	12 (2%) 65 63	7, 23, 44, 61	0
1	D	589/601 (98%)	0.22	18 (3%) 49 47	9, 25, 46, 61	0
All	All	2356/2404 (98%)	0.19	66 (2%) 53 51	7, 24, 45, 64	0

All (66) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	114	GLY	7.3
1	B	114	GLY	5.0
1	D	105	PRO	5.0
1	A	409	ASP	4.8
1	A	113	PRO	4.7
1	B	153	VAL	4.6
1	B	162	GLU	4.5
1	C	114	GLY	4.0
1	A	290	TYR	3.9
1	C	113	PRO	3.9
1	D	113	PRO	3.9
1	B	113	PRO	3.5
1	B	111	ALA	3.5
1	A	62	GLY	3.5
1	C	4	GLY	3.4
1	D	104	TYR	3.4
1	D	62	GLY	3.4
1	B	112	SER	3.2
1	A	114	GLY	3.2
1	B	502	ASP	3.1
1	B	281	GLU	3.1

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Mol	Chain	Res	Type	RSRZ
1	C	409	ASP	3.1
1	B	62	GLY	3.1
1	D	292	LEU	3.0
1	D	63	GLY	3.0
1	B	39	LYS	3.0
1	A	529	GLU	3.0
1	C	62	GLY	2.9
1	A	160	SER	2.9
1	D	112	SER	2.9
1	C	160	SER	2.8
1	A	348	GLU	2.7
1	D	409	ASP	2.7
1	D	502	ASP	2.7
1	D	161	SER	2.7
1	B	514	GLU	2.7
1	B	409	ASP	2.6
1	A	513	GLU	2.6
1	B	105	PRO	2.5
1	B	115	VAL	2.5
1	D	34	SER	2.5
1	C	43	ASP	2.5
1	B	104	TYR	2.5
1	A	374	ASP	2.4
1	B	4	GLY	2.4
1	D	514	GLU	2.4
1	B	163	SER	2.4
1	D	518	LEU	2.3
1	B	18	VAL	2.3
1	C	290	TYR	2.3
1	D	4	GLY	2.3
1	A	112	SER	2.3
1	A	559	ILE	2.3
1	C	215	THR	2.2
1	A	573	GLU	2.2
1	B	15	THR	2.2
1	D	529	GLU	2.2
1	B	374	ASP	2.2
1	B	518	LEU	2.1
1	B	22	ARG	2.1
1	A	566	ALA	2.1
1	C	282	ASP	2.1
1	D	111	ALA	2.1

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Mol	Chain	Res	Type	RSRZ
1	C	53	GLU	2.0
1	D	147	GLU	2.0
1	C	514	GLU	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](#)

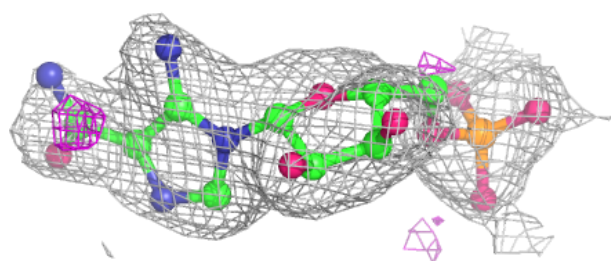
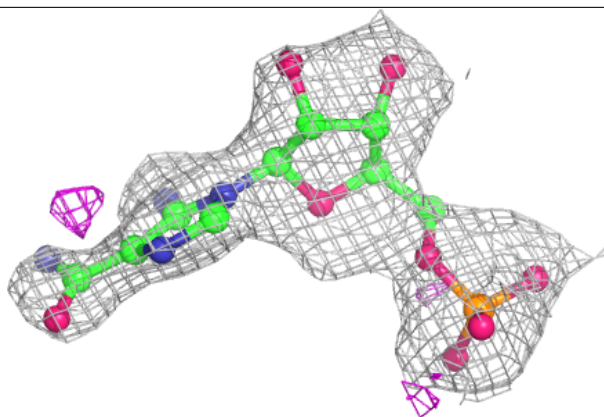
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
3	AMZ	D	603	22/22	0.88	0.19	44,49,62,63	0
2	8UM	C	601	31/31	0.94	0.14	10,16,29,32	0
3	AMZ	A	603	22/22	0.95	0.12	10,18,29,34	0
4	MG	C	604	1/1	0.95	0.05	18,18,18,18	0
2	8UM	B	601	31/31	0.96	0.12	5,17,29,30	0
2	8UM	A	601	31/31	0.96	0.11	4,14,25,29	0
4	MG	A	604	1/1	0.96	0.08	20,20,20,20	0
2	8UM	D	601	31/31	0.96	0.12	3,14,22,28	0
3	AMZ	A	602	22/22	0.97	0.11	4,20,24,25	0
3	AMZ	B	602	22/22	0.97	0.10	12,19,22,24	0
3	AMZ	C	603	22/22	0.97	0.10	22,26,29,31	0
3	AMZ	D	602	22/22	0.98	0.09	3,17,21,25	0
4	MG	B	603	1/1	0.98	0.07	16,16,16,16	0
3	AMZ	C	602	22/22	0.98	0.10	15,20,23,26	0
4	MG	D	604	1/1	0.98	0.07	24,24,24,24	0

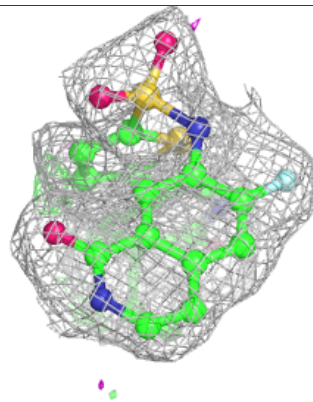
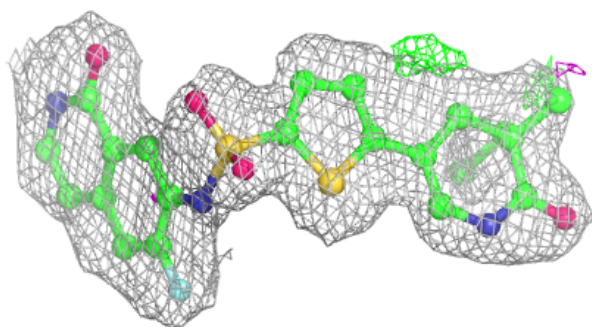
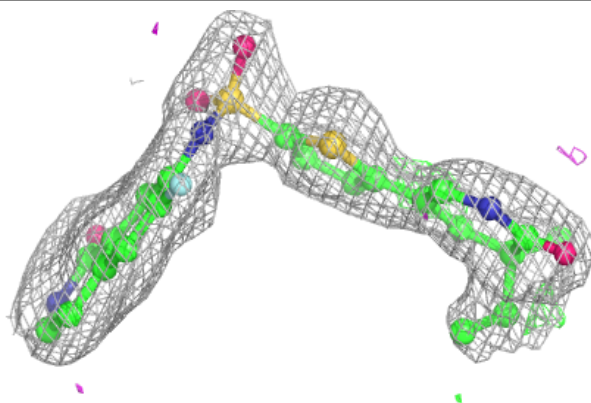
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around AMZ D 603:

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

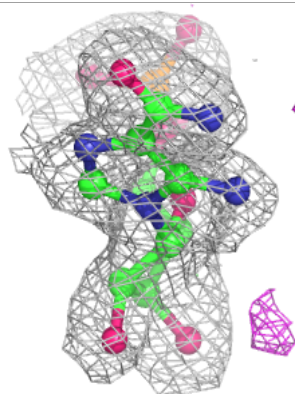
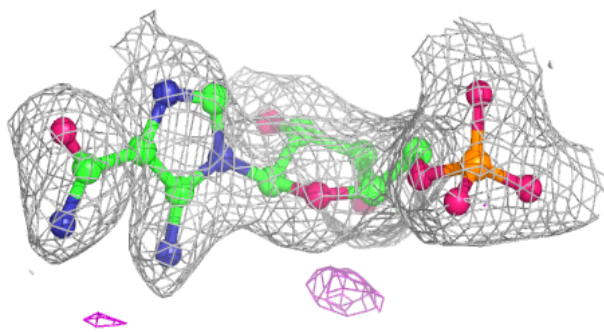
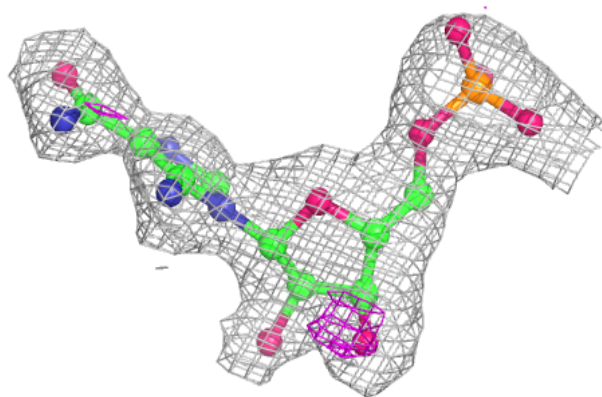
**Electron density around 8UM C 601:**

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

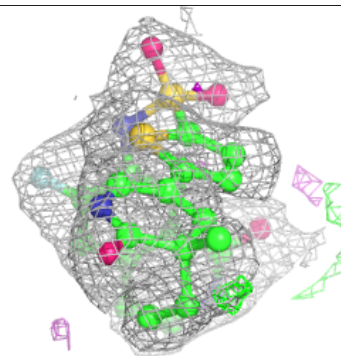
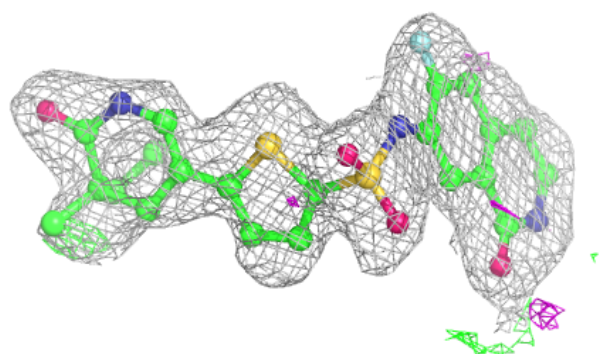
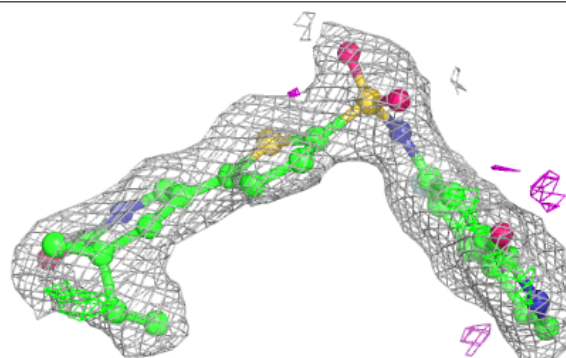


Electron density around AMZ A 603:

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

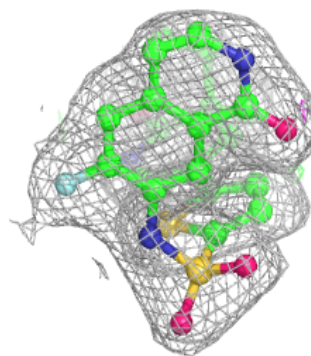
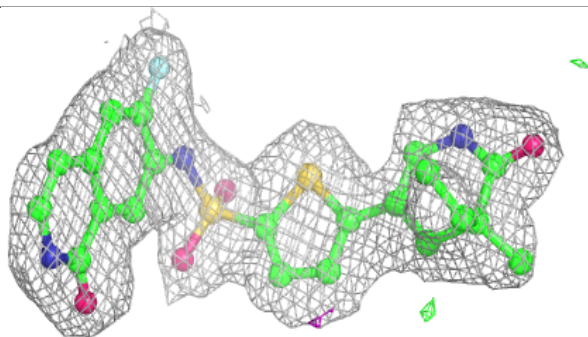
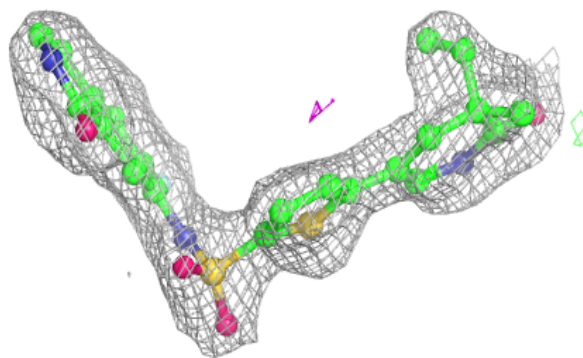
**Electron density around 8UM B 601:**

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

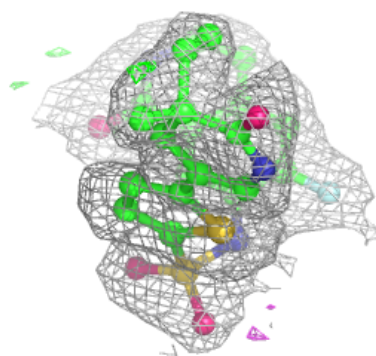
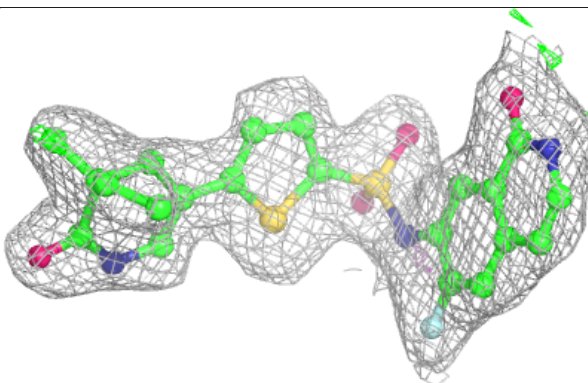
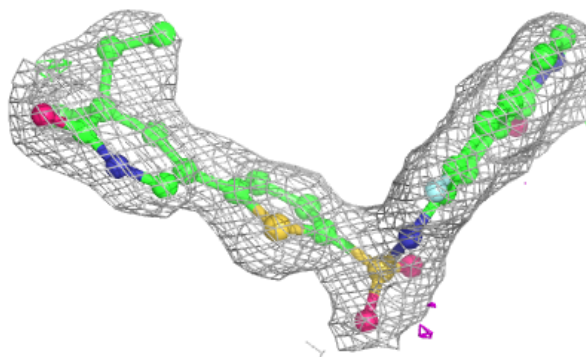


Electron density around 8UM A 601:

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

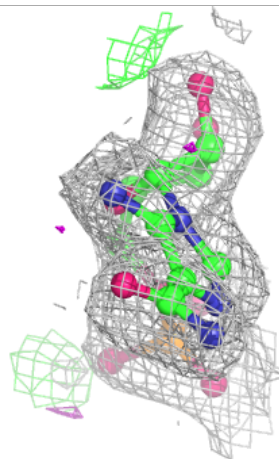
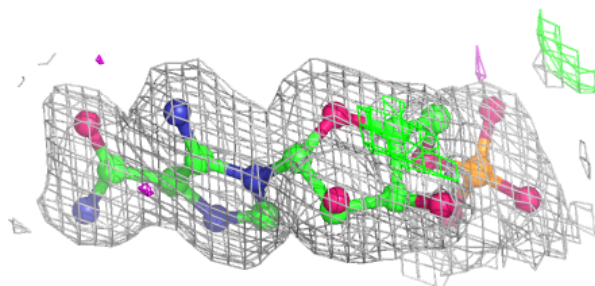
**Electron density around 8UM D 601:**

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



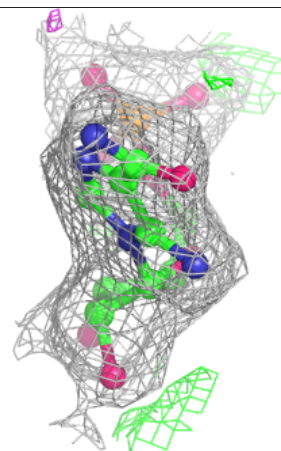
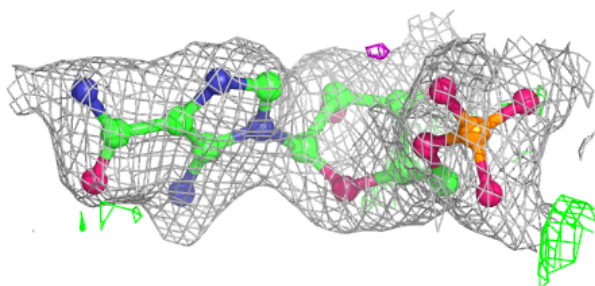
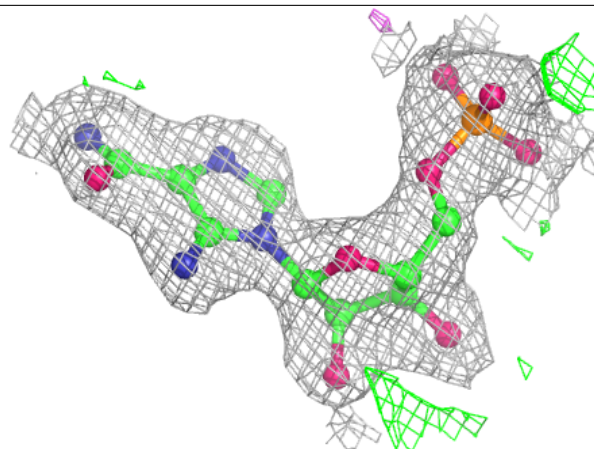
Electron density around AMZ A 602:

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

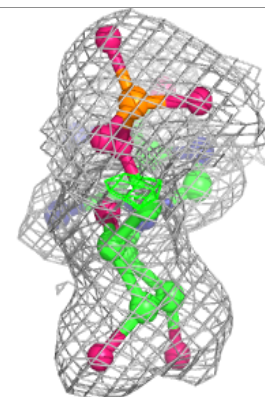
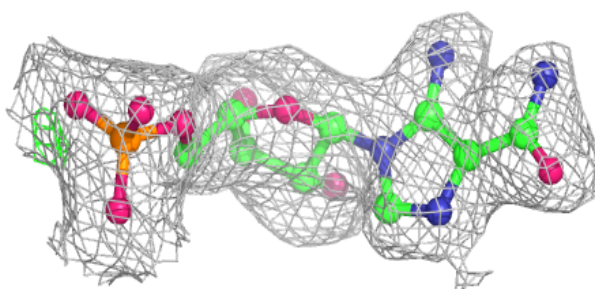
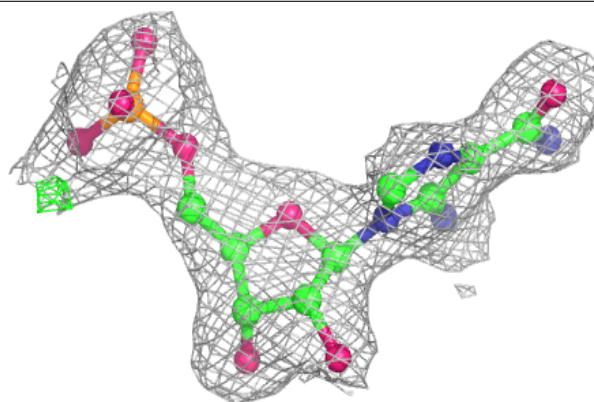


Electron density around AMZ B 602:

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

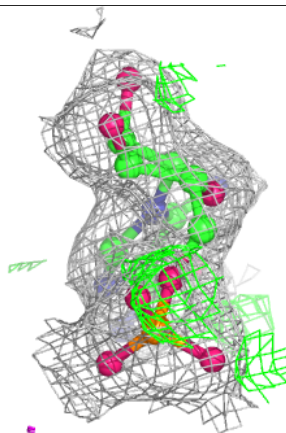
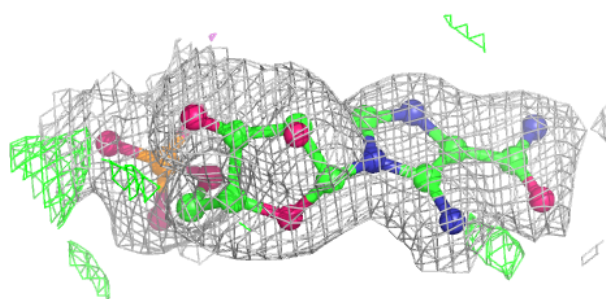
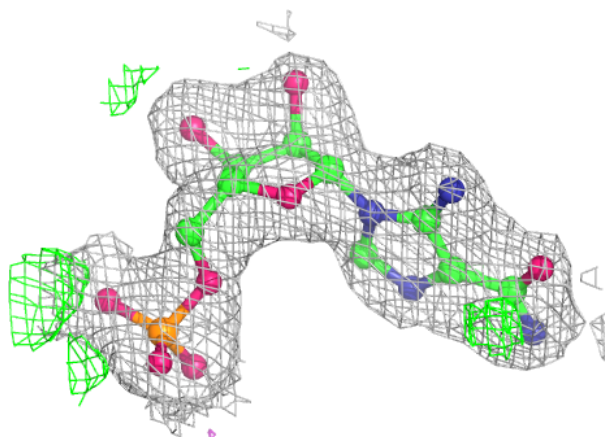
**Electron density around AMZ C 603:**

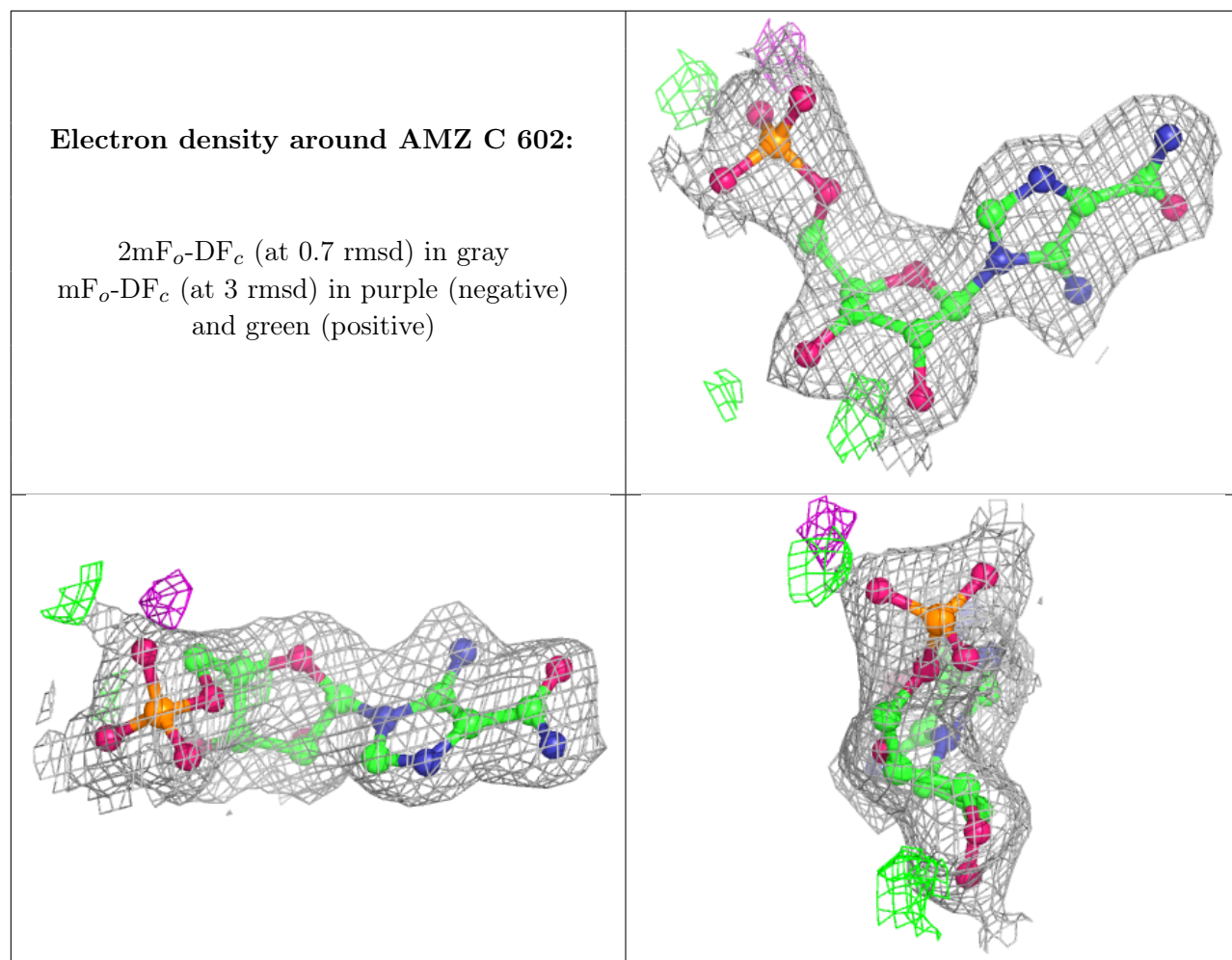
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around AMZ D 602:

$2mF_o-DF_c$ (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.