



Full wwPDB X-ray Structure Validation Report ⓘ

Oct 15, 2025 – 01:57 pm BST

PDB ID : 9RUS / pdb_00009rus
Title : Structure of WRN in complex with ATPgS and Compound 3
Authors : Fletcher, C.T.; Rucktooa, P.
Deposited on : 2025-07-04
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 ⓘ](#)) were used in the production of this report:

MolProbity : 4-5-2 with Phenix2.0
Mogul : 1.8.4, CSD as541be (2020)
Xtriage (Phenix) : 2.0
EDS : 3.0
buster-report : 1.1.7 (2018)
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.46

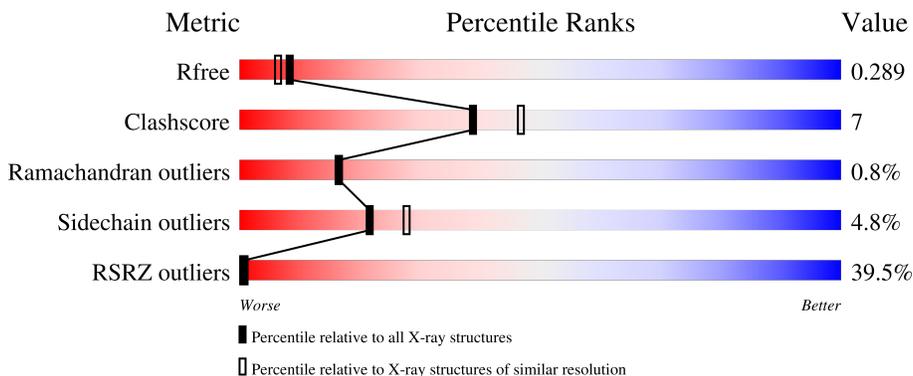
1 Overall quality at a glance

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}	164625	5791 (2.20-2.20)
Clashscore	180529	6634 (2.20-2.20)
Ramachandran outliers	177936	6560 (2.20-2.20)
Sidechain outliers	177891	6561 (2.20-2.20)
RSRZ outliers	164620	5791 (2.20-2.20)

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	427	
1	B	427	

2 Entry composition [i](#)

There are 9 unique types of molecules in this entry. The entry contains 7456 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.

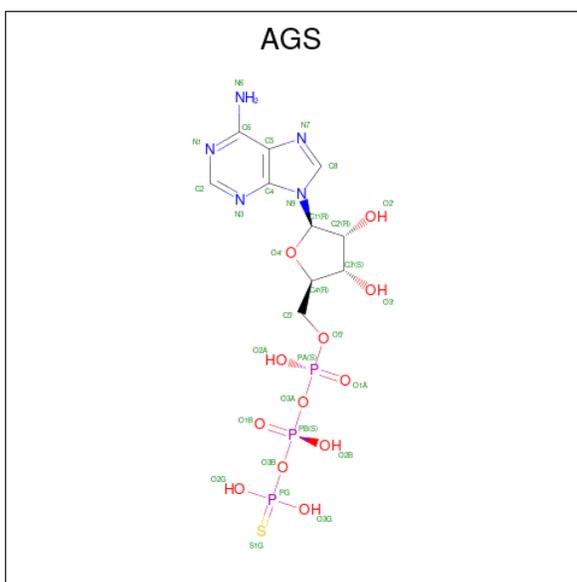
- Molecule 1 is a protein called Bifunctional 3'-5' exonuclease/ATP-dependent helicase WRN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	406	Total 3902	C 2468	N 681	O 719	S 34	0	102	0
1	B	400	Total 3197	C 2021	N 569	O 578	S 29	0	3	0

There are 4 discrepancies between the modelled and reference sequences:

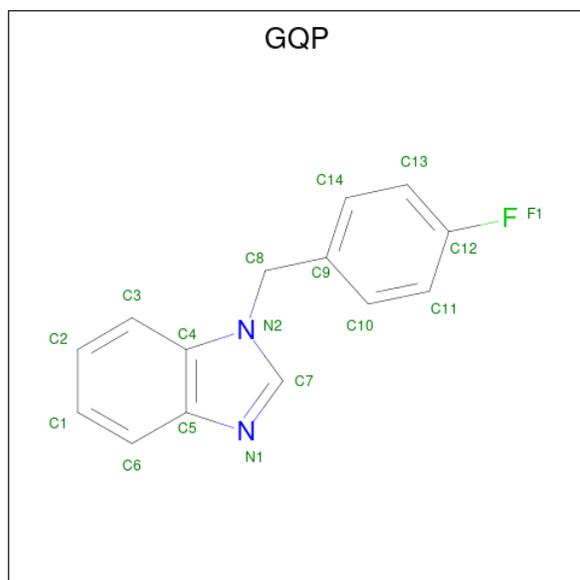
Chain	Residue	Modelled	Actual	Comment	Reference
A	515	GLY	-	expression tag	UNP Q14191
A	516	MET	-	expression tag	UNP Q14191
B	515	GLY	-	expression tag	UNP Q14191
B	516	MET	-	expression tag	UNP Q14191

- Molecule 2 is PHOSPHOTHIOPHOSPHORIC ACID-ADENYLATE ESTER (CCD ID: AGS) (formula: C₁₀H₁₆N₅O₁₂P₃S).



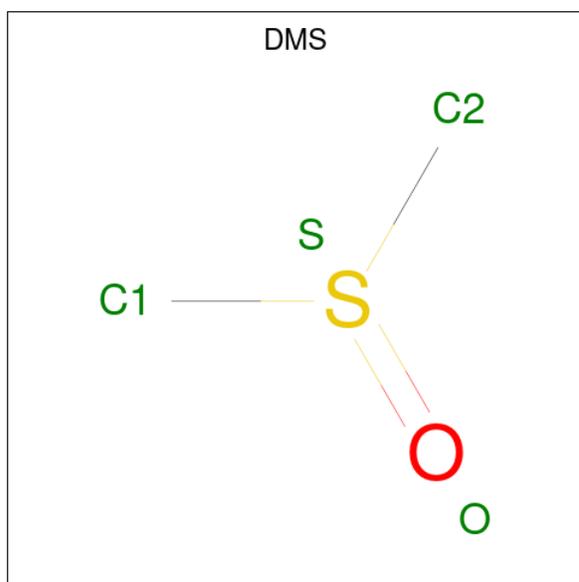
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	
			Total	C	N	O	P			S
2	A	1	31	10	5	12	3	1	0	1
2	B	1	31	10	5	12	3	1	0	1

- Molecule 3 is 1-[(4-fluorophenyl)methyl]benzimidazole (CCD ID: GQP) (formula: $C_{14}H_{11}FN_2$) (labeled as "Ligand of Interest" by depositor).



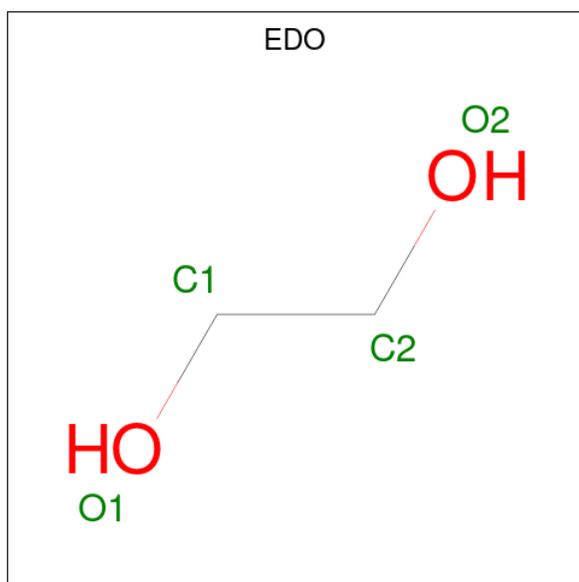
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	F	N		
3	A	1	34	28	2	4	0	1

- Molecule 4 is DIMETHYL SULFOXIDE (CCD ID: DMS) (formula: C_2H_6OS).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	
4	A	1	Total	C	O	S	0	0
			4	2	1	1		
4	A	1	Total	C	O	S	0	0
			4	2	1	1		
4	B	1	Total	C	O	S	0	0
			4	2	1	1		

- Molecule 5 is 1,2-ETHANEDIOL (CCD ID: EDO) (formula: $C_2H_6O_2$).



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

Continued on next page...

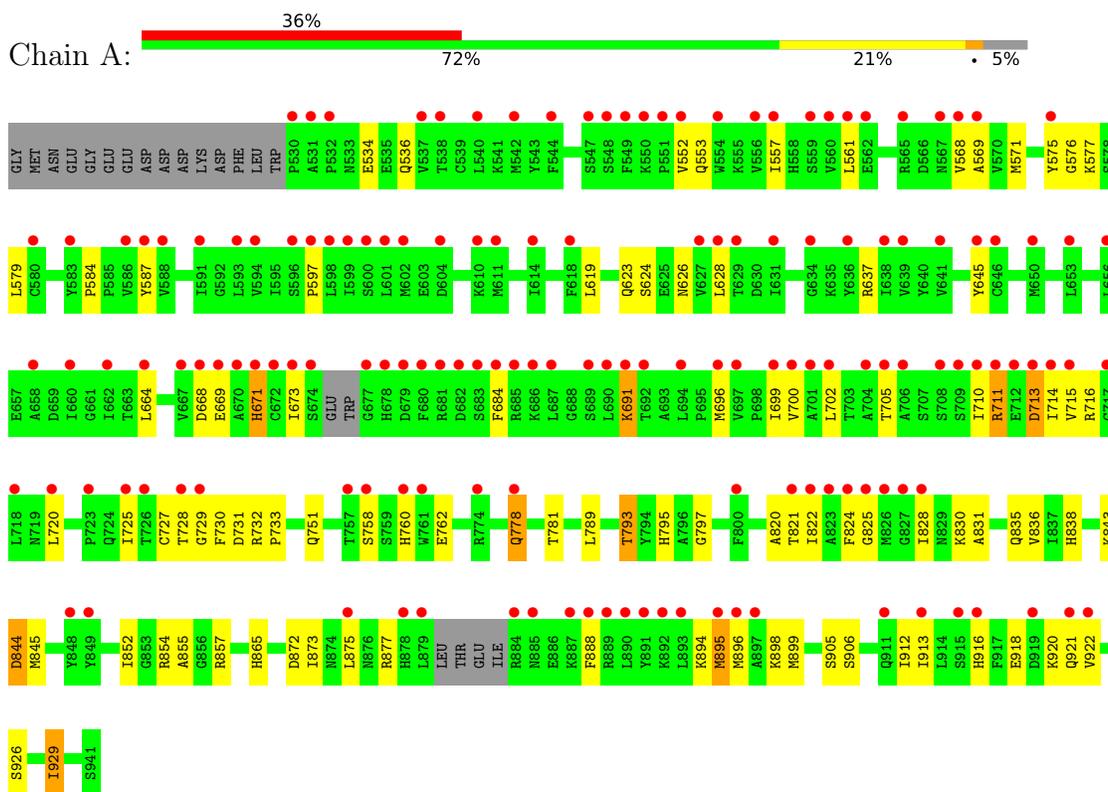
- Molecule 9 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
9	A	90	Total 90	O 90	0	0
9	B	90	Total 90	O 90	0	0

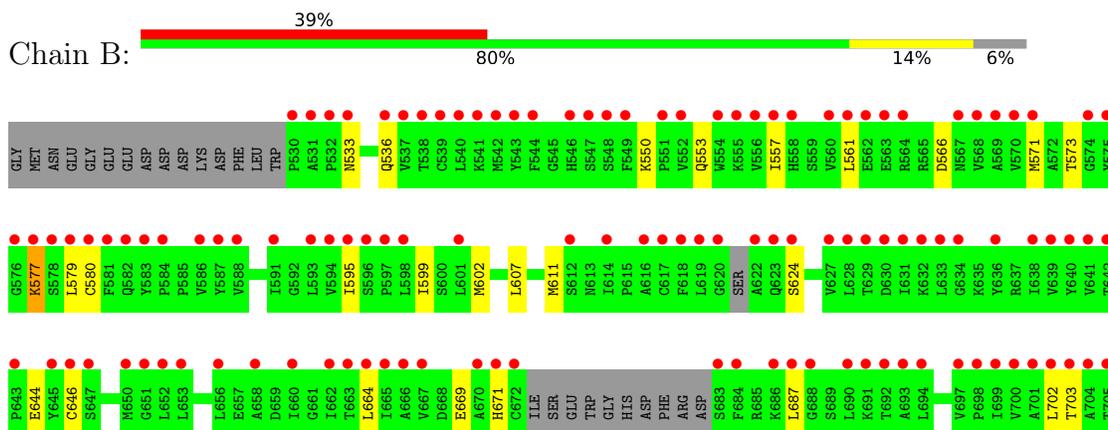
3 Residue-property plots [i](#)

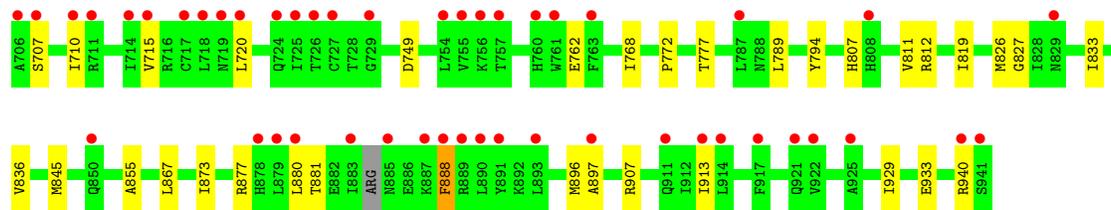
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. 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 3'-5' exonuclease/ATP-dependent helicase WRN



- Molecule 1: Bifunctional 3'-5' exonuclease/ATP-dependent helicase WRN





4 Data and refinement statistics

Property	Value	Source
Space group	P 41 21 2	Depositor
Cell constants a, b, c, α , β , γ	91.17Å 91.17Å 242.13Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	85.32 – 2.19 85.32 – 2.19	Depositor EDS
% Data completeness (in resolution range)	69.8 (85.32-2.19) 69.8 (85.32-2.19)	Depositor EDS
R_{merge}	0.12	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.88 (at 2.20Å)	Xtrriage
Refinement program	BUSTER 2.11.8	Depositor
R, R_{free}	0.267 , 0.298 0.257 , 0.289	Depositor DCC
R_{free} test set	1838 reflections (4.94%)	wwPDB-VP
Wilson B-factor (Å ²)	49.4	Xtrriage
Anisotropy	0.052	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 58.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.34$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.92	EDS
Total number of atoms	7456	wwPDB-VP
Average B, all atoms (Å ²)	63.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.76% 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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: EDO, ZN, DMS, ADP, GQP, AGS, MG

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	0.65	0/3976	0.99	9/5366 (0.2%)
1	B	0.71	0/3256	1.06	1/4386 (0.0%)
All	All	0.68	0/7232	1.02	10/9752 (0.1%)

There are no bond length outliers.

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	758	SER	CA-C-N	7.48	131.69	120.17
1	A	758	SER	C-N-CA	7.48	131.69	120.17
1	A	844	ASP	CA-CB-CG	7.10	119.70	112.60
1	B	888	PHE	CA-CB-CG	7.03	120.83	113.80
1	A	758	SER	N-CA-C	-6.71	102.94	112.13
1	A	713	ASP	CA-CB-CG	5.46	118.06	112.60
1	A	872	ASP	CA-CB-CG	5.36	117.96	112.60
1	A	905	SER	N-CA-C	5.28	117.11	110.24
1	A	645	TYR	CA-C-N	5.20	127.56	120.54
1	A	645	TYR	C-N-CA	5.20	127.56	120.54

There are no chirality outliers.

There are no planarity outliers.

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	A	3902	0	3913	68	0
1	B	3197	0	3242	31	0
2	A	31	0	12	3	0
2	B	31	0	12	4	0
3	A	34	0	0	0	0
4	A	8	0	12	0	0
4	B	4	0	6	0	0
5	A	8	0	12	2	0
5	B	4	0	6	0	0
6	A	27	0	12	3	0
6	B	27	0	12	0	0
7	A	1	0	0	0	0
7	B	1	0	0	0	0
8	A	1	0	0	0	0
9	A	90	0	0	1	0
9	B	90	0	0	0	0
All	All	7456	0	7239	98	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 7.

All (98) 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:711[A]:ARG:HE	1:A:725:ILE:HG21	1.38	0.88
1:A:568[B]:VAL:HG23	1:A:725:ILE:HG12	1.59	0.83
1:A:710[B]:ILE:HA	1:A:713:ASP:HB3	1.59	0.83
1:B:553:GLN:HE22	2:B:1001[A]:AGS:HN61	1.32	0.76
1:A:713:ASP:HA	1:A:716:ARG:HG2	1.67	0.76
1:A:571[B]:MET:HB3	1:A:577:LYS:HE3	1.71	0.72
1:A:831[B]:ALA:HA	1:A:857:ARG:HB2	1.72	0.71
1:A:795:HIS:HD2	1:A:797:GLY:H	1.39	0.70
1:A:673:ILE:HG13	1:A:684:PHE:HB3	1.72	0.70
1:A:713:ASP:HA	1:A:716:ARG:CG	2.21	0.70
1:B:577:LYS:HB2	2:B:1001[A]:AGS:O2B	1.93	0.68
1:A:857:ARG:NH1	2:A:1001[A]:AGS:O3G	2.29	0.65
1:A:577:LYS:NZ	6:A:1006[B]:ADP:O2B	2.28	0.63
1:A:821[B]:THR:HG22	1:A:822[B]:ILE:H	1.65	0.61
1:A:835:GLN:HE22	1:A:865:HIS:CD2	2.17	0.61
1:B:836:VAL:HG23	1:B:855:ALA:HB2	1.84	0.60
1:B:845:MET:HE1	1:B:913:ILE:HG12	1.83	0.59
1:A:835:GLN:HE22	1:A:865:HIS:HD2	1.50	0.59

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:895:MET:HE1	1:A:916[A]:HIS:HB3	1.86	0.58
1:A:727[A]:CYS:SG	1:A:730[A]:PHE:HZ	2.27	0.57
1:A:691:LYS:HG2	1:A:699[B]:ILE:HD12	1.86	0.57
1:B:550:LYS:H	1:B:553:GLN:HE21	1.51	0.57
1:B:762:GLU:HA	1:B:789:LEU:HD21	1.87	0.57
1:A:760:HIS:CE1	1:B:873:ILE:HD12	2.41	0.55
1:A:575[B]:TYR:O	6:A:1006[B]:ADP:O2B	2.24	0.55
1:A:569[A]:ALA:HB1	1:A:571[A]:MET:HE3	1.89	0.55
1:B:933:GLU:HA	1:B:940[B]:ARG:HG2	1.89	0.55
1:A:795:HIS:HD2	1:A:797:GLY:N	2.05	0.55
1:A:710[B]:ILE:O	1:A:714:ILE:HG13	2.07	0.55
1:A:733[B]:PRO:HB2	1:A:929:ILE:HD13	1.89	0.54
1:B:573:THR:HA	2:B:1001[A]:AGS:S1G	2.47	0.54
1:B:772:PRO:HB2	1:B:873:ILE:HD11	1.90	0.53
1:A:710[B]:ILE:CA	1:A:713:ASP:HB3	2.37	0.53
1:A:577:LYS:HG3	6:A:1006[B]:ADP:O2B	2.09	0.52
1:A:894:LYS:O	1:A:898:LYS:HG2	2.07	0.52
1:A:845[A]:MET:HE1	1:A:913[A]:ILE:HG12	1.92	0.52
1:B:566:ASP:HB3	1:B:720:LEU:HD13	1.91	0.52
1:A:838:HIS:HD2	5:A:1005:EDO:H21	1.75	0.51
1:A:710[B]:ILE:HA	1:A:713:ASP:CB	2.38	0.51
1:A:778:GLN:HE22	1:A:795:HIS:HE1	1.58	0.51
1:A:553:GLN:O	1:A:557:ILE:HG13	2.10	0.51
1:A:731[B]:ASP:O	1:A:732[B]:ARG:HB2	2.11	0.51
1:B:599:ILE:HA	1:B:602:MET:HE2	1.93	0.51
1:A:912:ILE:HG22	1:A:916[A]:HIS:NE2	2.27	0.50
1:A:673:ILE:CG1	1:A:684:PHE:HB3	2.39	0.50
1:B:715:VAL:HG13	1:B:720:LEU:HB2	1.93	0.50
1:B:533:ASN:ND2	1:B:536:GLN:HE21	2.11	0.49
1:A:877:ARG:HA	1:A:896:MET:HE1	1.95	0.49
1:A:828[B]:ILE:HD12	1:A:854:ARG:HD2	1.95	0.49
1:A:922[B]:VAL:CG2	1:A:926:SER:HB2	2.43	0.49
1:B:707:SER:HB2	1:B:710:ILE:HD12	1.95	0.49
1:A:854:ARG:NH1	2:A:1001[A]:AGS:O3G	2.46	0.49
1:B:607:LEU:O	1:B:611:MET:HG3	2.12	0.48
1:A:713:ASP:HA	1:A:716:ARG:CD	2.43	0.48
1:A:715:VAL:HG13	1:A:720:LEU:HB2	1.94	0.48
1:A:845[A]:MET:HE2	1:A:916[A]:HIS:CD2	2.48	0.48
1:B:812:ARG:HA	1:B:812:ARG:HE	1.78	0.47
1:A:711[A]:ARG:NE	1:A:725:ILE:HG21	2.20	0.46
1:A:597[A]:PRO:HD2	9:A:1114:HOH:O	2.15	0.46

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:571:MET:HE1	1:B:580:CYS:SG	2.55	0.46
1:A:552:VAL:HG12	1:A:571[A]:MET:HE2	1.96	0.46
1:A:705[B]:THR:HB	1:A:710[B]:ILE:HD11	1.97	0.46
1:A:669[A]:GLU:OE1	1:A:671[A]:HIS:HE1	1.99	0.46
1:B:749:ASP:HB3	1:B:867:LEU:HD13	1.98	0.46
1:A:857:ARG:HH12	2:A:1001[A]:AGS:PG	2.38	0.46
1:B:557:ILE:O	1:B:561:LEU:HB2	2.15	0.46
1:A:781:THR:HG21	1:A:793:THR:HG22	1.97	0.46
1:A:536:GLN:HG3	1:A:587:TYR:CZ	2.51	0.45
1:A:557:ILE:HG23	1:A:584:PRO:HG3	1.99	0.45
1:A:623:GLN:HE21	1:A:624:SER:H	1.63	0.45
1:A:711[A]:ARG:NE	1:A:725:ILE:HD13	2.32	0.45
1:A:728[A]:THR:HG22	1:A:729[A]:GLY:N	2.32	0.44
1:B:553:GLN:NE2	2:B:1001[A]:AGS:HN61	2.09	0.44
1:B:877:ARG:HH22	1:B:897:ALA:HB2	1.81	0.44
1:A:713:ASP:CA	1:A:716:ARG:HG2	2.44	0.44
1:A:561:LEU:HD13	1:A:584:PRO:HB3	2.00	0.43
1:B:768:ILE:HD11	1:B:833:ILE:HD13	1.99	0.43
1:B:794:TYR:CE1	1:B:827:GLY:HA3	2.53	0.43
1:A:727[A]:CYS:SG	1:A:730[A]:PHE:CZ	3.09	0.43
1:A:845[B]:MET:HG2	1:A:899:MET:SD	2.58	0.43
1:A:762:GLU:HA	1:A:789:LEU:HD21	2.00	0.43
1:B:807:HIS:NE2	1:B:811:VAL:HG21	2.34	0.43
1:A:836:VAL:HG23	1:A:855:ALA:HB2	2.02	0.42
1:A:898:LYS:HB3	1:A:916[A]:HIS:CE1	2.54	0.42
1:A:619:LEU:HD11	1:A:628:LEU:HD13	2.01	0.42
1:A:795:HIS:CD2	1:A:797:GLY:H	2.29	0.42
1:A:557:ILE:O	1:A:561:LEU:HB2	2.19	0.42
1:A:912:ILE:O	1:A:916[A]:HIS:CD2	2.73	0.42
1:B:595:ILE:HG21	1:B:687:LEU:HD21	2.01	0.42
1:B:777:THR:HG23	1:B:819:ILE:HG22	2.00	0.42
1:A:820:ALA:HB1	1:A:824[B]:PHE:HB2	2.02	0.42
1:B:807:HIS:HD2	1:B:826:MET:O	2.03	0.41
1:B:896:MET:HE3	1:B:896:MET:HB2	1.94	0.41
1:B:671:HIS:HD2	1:B:703:THR:OG1	2.04	0.41
1:A:668[B]:ASP:HA	1:A:702[B]:LEU:HB2	2.03	0.41
1:A:852:ILE:HD11	5:A:1007:EDO:H11	2.03	0.41
1:A:673:ILE:HG22	1:A:714:ILE:HG12	2.03	0.40
1:B:807:HIS:CD2	1:B:826:MET:O	2.74	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	492/427 (115%)	457 (93%)	25 (5%)	10 (2%)	6	4
1	B	395/427 (92%)	379 (96%)	16 (4%)	0	100	100
All	All	887/854 (104%)	836 (94%)	41 (5%)	10 (1%)	16	10

All (10) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	671[A]	HIS
1	A	576[A]	GLY
1	A	576[B]	GLY
1	A	830[A]	LYS
1	A	830[B]	LYS
1	A	843	LYS
1	A	920[A]	LYS
1	A	920[B]	LYS
1	A	825[A]	GLY
1	A	825[B]	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	432/377 (115%)	407 (94%)	25 (6%)	17	20
1	B	356/377 (94%)	342 (96%)	14 (4%)	27	37
All	All	788/754 (104%)	749 (95%)	39 (5%)	21	27

All (39) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	534	GLU
1	A	579	LEU
1	A	626	ASN
1	A	637	ARG
1	A	664	LEU
1	A	691	LYS
1	A	696	MET
1	A	700[A]	VAL
1	A	700[B]	VAL
1	A	711[A]	ARG
1	A	711[B]	ARG
1	A	751	GLN
1	A	778	GLN
1	A	793	THR
1	A	844	ASP
1	A	873	ILE
1	A	875	LEU
1	A	888	PHE
1	A	895	MET
1	A	906	SER
1	A	918[A]	GLU
1	A	918[B]	GLU
1	A	921[A]	GLN
1	A	921[B]	GLN
1	A	929	ILE
1	B	577	LYS
1	B	579	LEU
1	B	624	SER
1	B	644	GLU
1	B	646	CYS
1	B	664	LEU
1	B	669	GLU
1	B	702	LEU
1	B	880	LEU
1	B	881	THR
1	B	888	PHE
1	B	907[A]	ARG
1	B	907[B]	ARG
1	B	929	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (21) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	558	HIS
1	A	623	GLN
1	A	655	GLN
1	A	678[A]	HIS
1	A	751	GLN
1	A	760	HIS
1	A	778	GLN
1	A	795	HIS
1	A	835	GLN
1	A	874	ASN
1	A	876	ASN
1	A	885	ASN
1	A	904	HIS
1	B	533	ASN
1	B	536	GLN
1	B	553	GLN
1	B	671	HIS
1	B	778	GLN
1	B	807	HIS
1	B	850	GLN
1	B	904	HIS

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 15 ligands modelled in this entry, 3 are monoatomic - leaving 12 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
6	ADP	B	1003[B]	-	24,29,29	0.69	0	29,45,45	0.75	1 (3%)
4	DMS	A	1003	-	3,3,3	0.46	0	3,3,3	0.67	0
6	ADP	A	1006[B]	-	24,29,29	0.68	0	29,45,45	0.82	2 (6%)
5	EDO	A	1005	-	3,3,3	0.12	0	2,2,2	0.62	0
4	DMS	B	1004	-	3,3,3	0.70	0	3,3,3	0.46	0
5	EDO	A	1007	-	3,3,3	0.22	0	2,2,2	0.94	0
3	GQP	A	1002[C]	-	18,19,19	0.81	0	21,26,26	0.59	0
5	EDO	B	1002	-	3,3,3	0.17	0	2,2,2	0.72	0
4	DMS	A	1004	-	3,3,3	0.64	0	3,3,3	0.42	0
3	GQP	A	1002[B]	-	18,19,19	0.81	0	21,26,26	0.62	0
2	AGS	B	1001[A]	-	26,33,33	0.80	1 (3%)	26,52,52	0.83	1 (3%)
2	AGS	A	1001[A]	8	26,33,33	0.85	1 (3%)	26,52,52	0.86	1 (3%)

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
6	ADP	B	1003[B]	-	-	4/12/32/32	0/3/3/3
6	ADP	A	1006[B]	-	-	5/12/32/32	0/3/3/3
5	EDO	A	1005	-	-	1/1/1/1	-
5	EDO	A	1007	-	-	1/1/1/1	-
3	GQP	A	1002[C]	-	-	0/4/4/4	0/3/3/3
5	EDO	B	1002	-	-	1/1/1/1	-
3	GQP	A	1002[B]	-	-	2/4/4/4	0/3/3/3
2	AGS	B	1001[A]	-	-	1/17/38/38	0/3/3/3
2	AGS	A	1001[A]	8	-	4/17/38/38	0/3/3/3

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	1001[A]	AGS	PG-S1G	2.44	1.96	1.90
2	B	1001[A]	AGS	PG-S1G	2.16	1.95	1.90

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	A	1006[B]	ADP	C5-C6-N6	2.32	123.87	120.35
2	B	1001[A]	AGS	C5-C6-N6	2.29	123.83	120.35
6	B	1003[B]	ADP	C5-C6-N6	2.28	123.82	120.35
2	A	1001[A]	AGS	C5-C6-N6	2.20	123.70	120.35
6	A	1006[B]	ADP	PA-O3A-PB	2.16	140.24	132.83

There are no chirality outliers.

All (19) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	A	1006[B]	ADP	C5'-O5'-PA-O1A
6	A	1006[B]	ADP	O4'-C4'-C5'-O5'
5	A	1005	EDO	O1-C1-C2-O2
5	B	1002	EDO	O1-C1-C2-O2
6	A	1006[B]	ADP	C3'-C4'-C5'-O5'
3	A	1002[B]	GQP	N2-C8-C9-C10
3	A	1002[B]	GQP	N2-C8-C9-C14
2	A	1001[A]	AGS	PG-O3B-PB-O1B
6	B	1003[B]	ADP	O4'-C4'-C5'-O5'
6	A	1006[B]	ADP	PA-O3A-PB-O3B
6	A	1006[B]	ADP	C5'-O5'-PA-O3A
5	A	1007	EDO	O1-C1-C2-O2
6	B	1003[B]	ADP	PB-O3A-PA-O2A
2	B	1001[A]	AGS	O4'-C4'-C5'-O5'
2	A	1001[A]	AGS	O4'-C4'-C5'-O5'
2	A	1001[A]	AGS	PG-O3B-PB-O2B
6	B	1003[B]	ADP	PB-O3A-PA-O1A
2	A	1001[A]	AGS	C5'-O5'-PA-O1A
6	B	1003[B]	ADP	C5'-O5'-PA-O1A

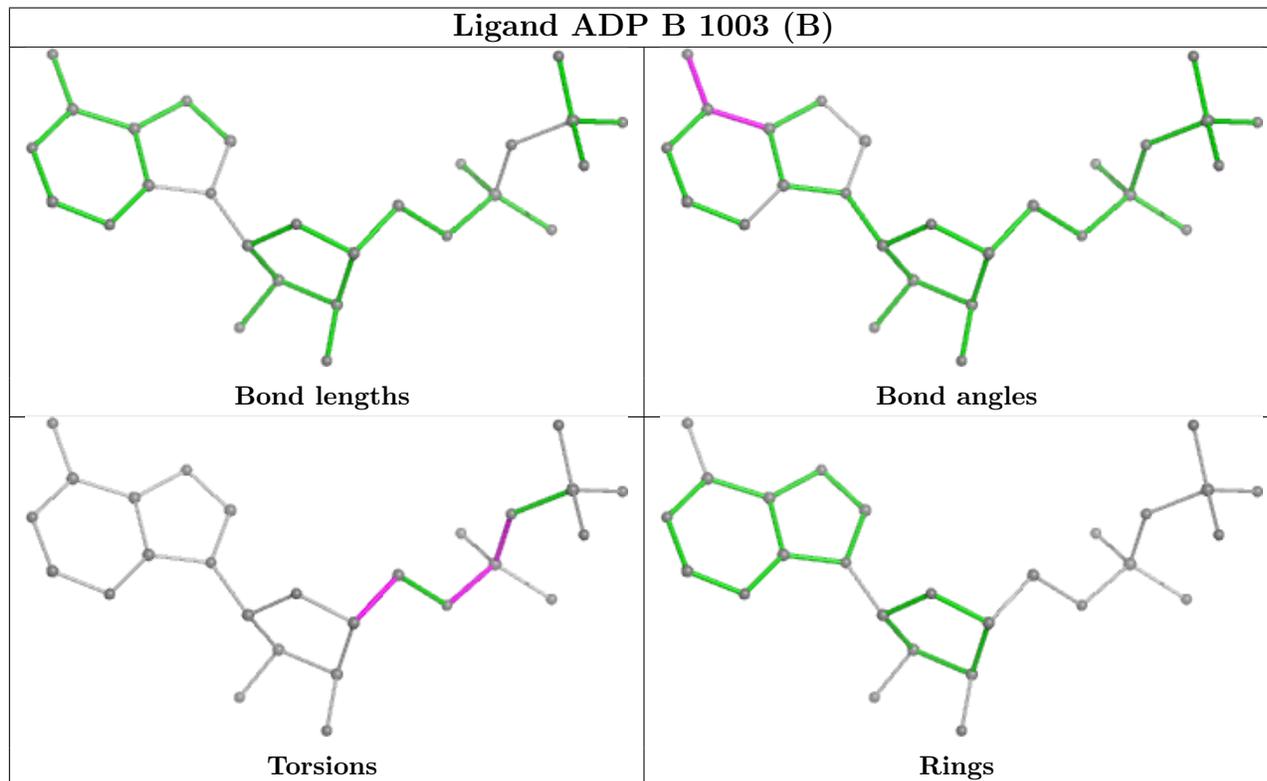
There are no ring outliers.

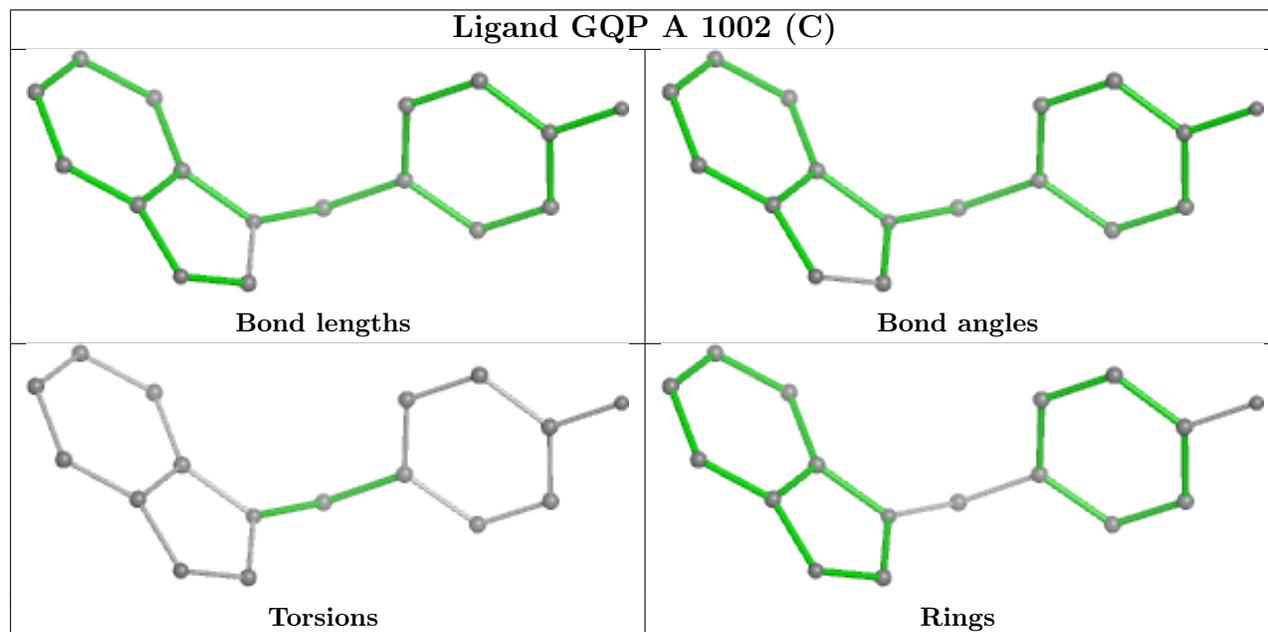
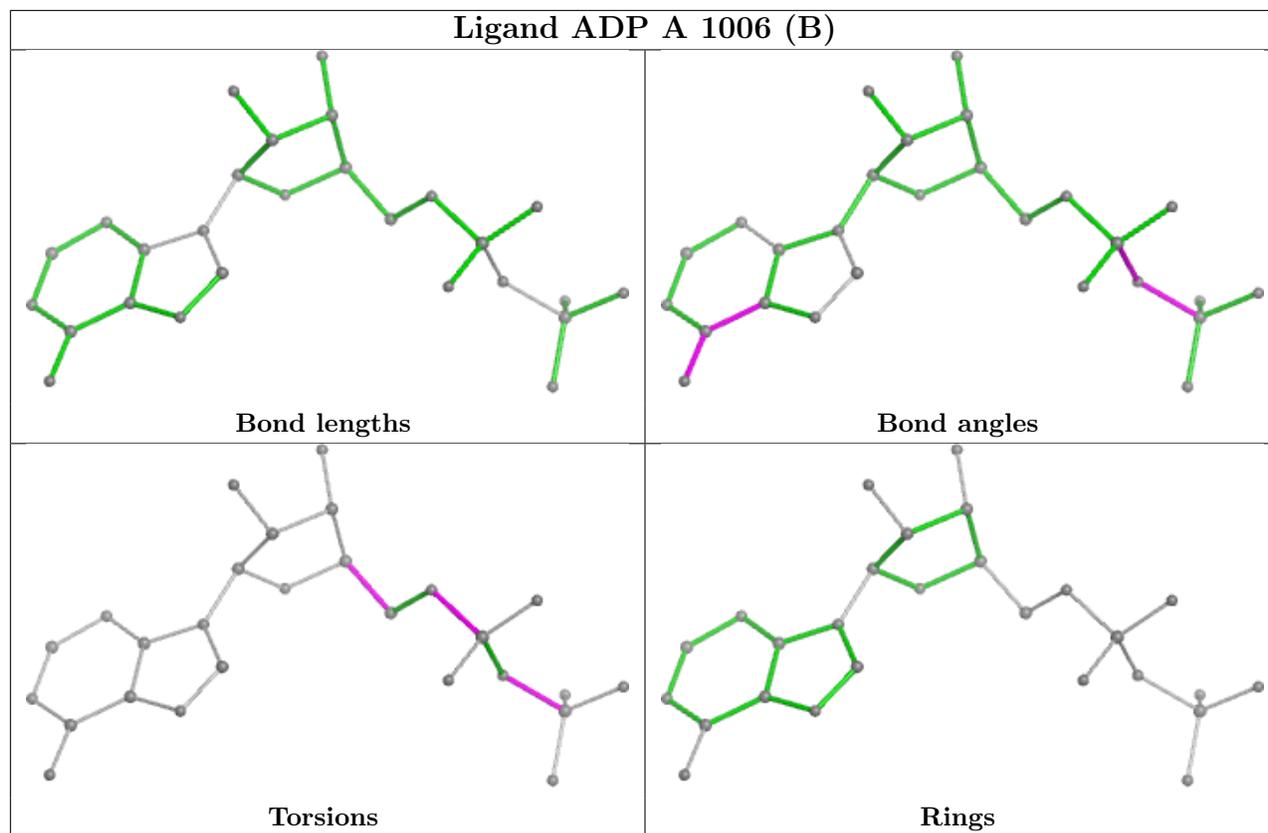
5 monomers are involved in 12 short contacts:

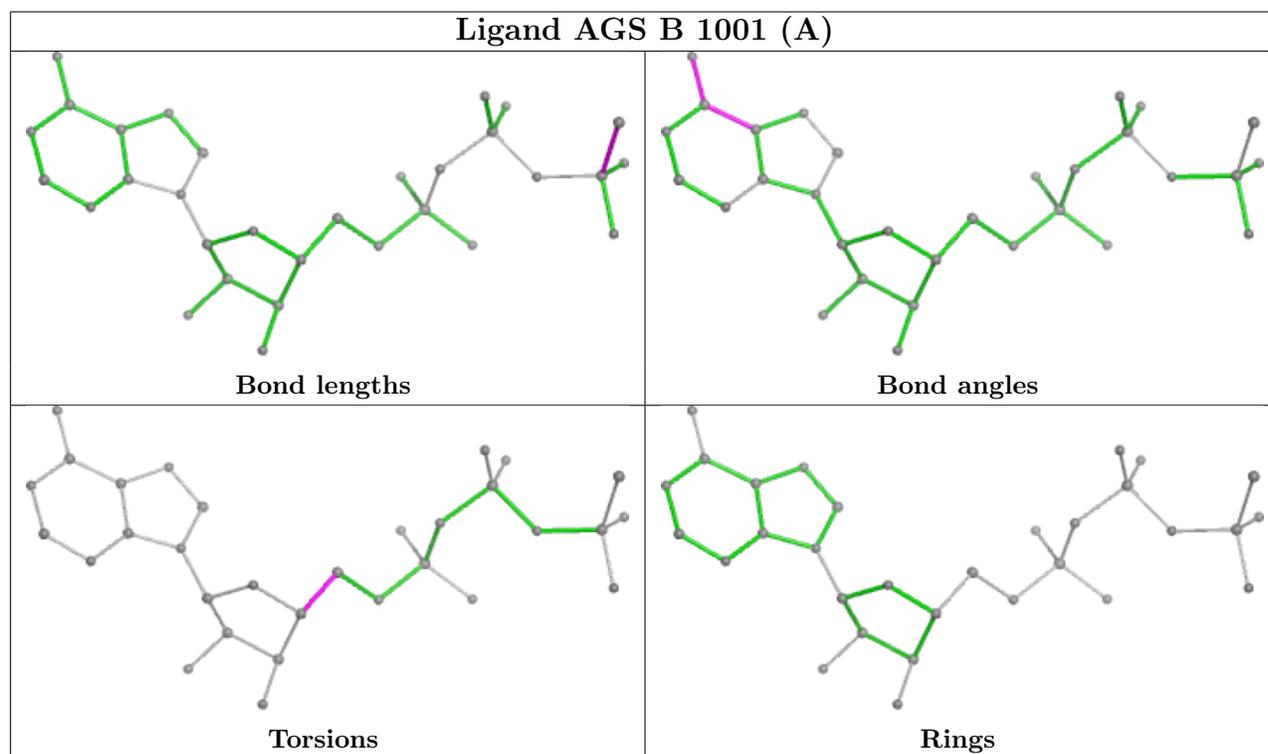
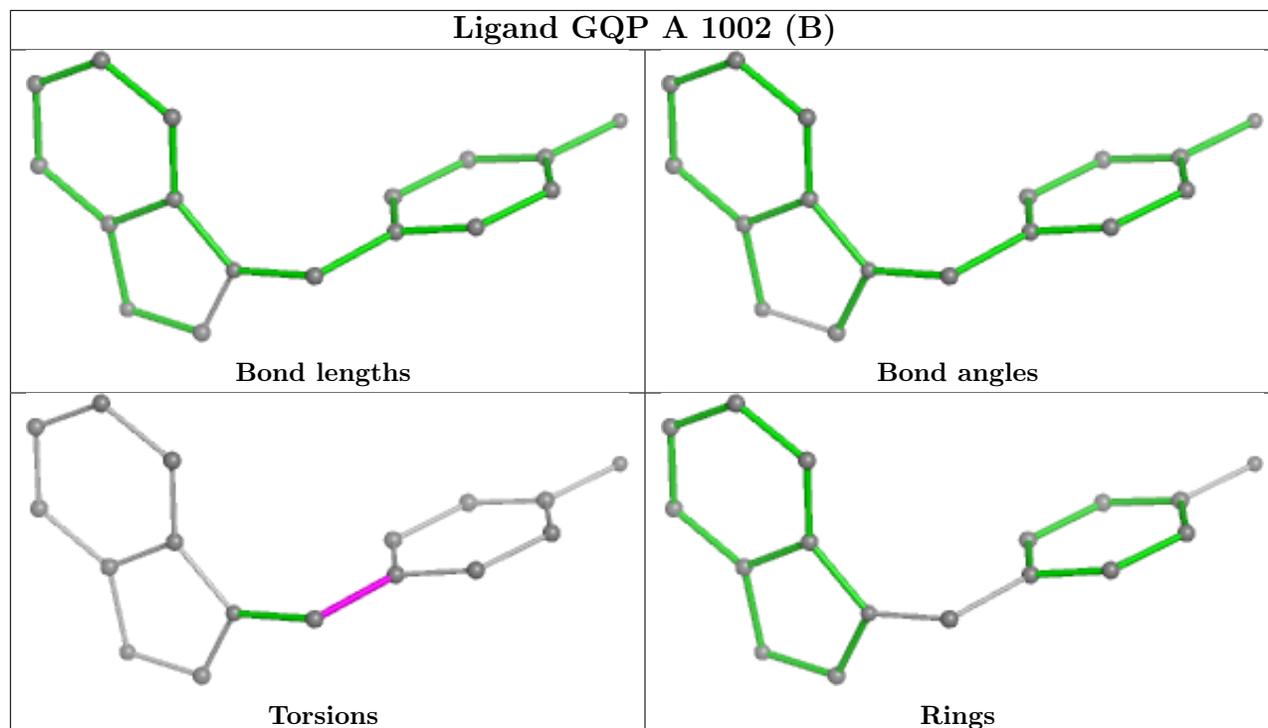
Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	A	1006[B]	ADP	3	0
5	A	1005	EDO	1	0
5	A	1007	EDO	1	0
2	B	1001[A]	AGS	4	0
2	A	1001[A]	AGS	3	0

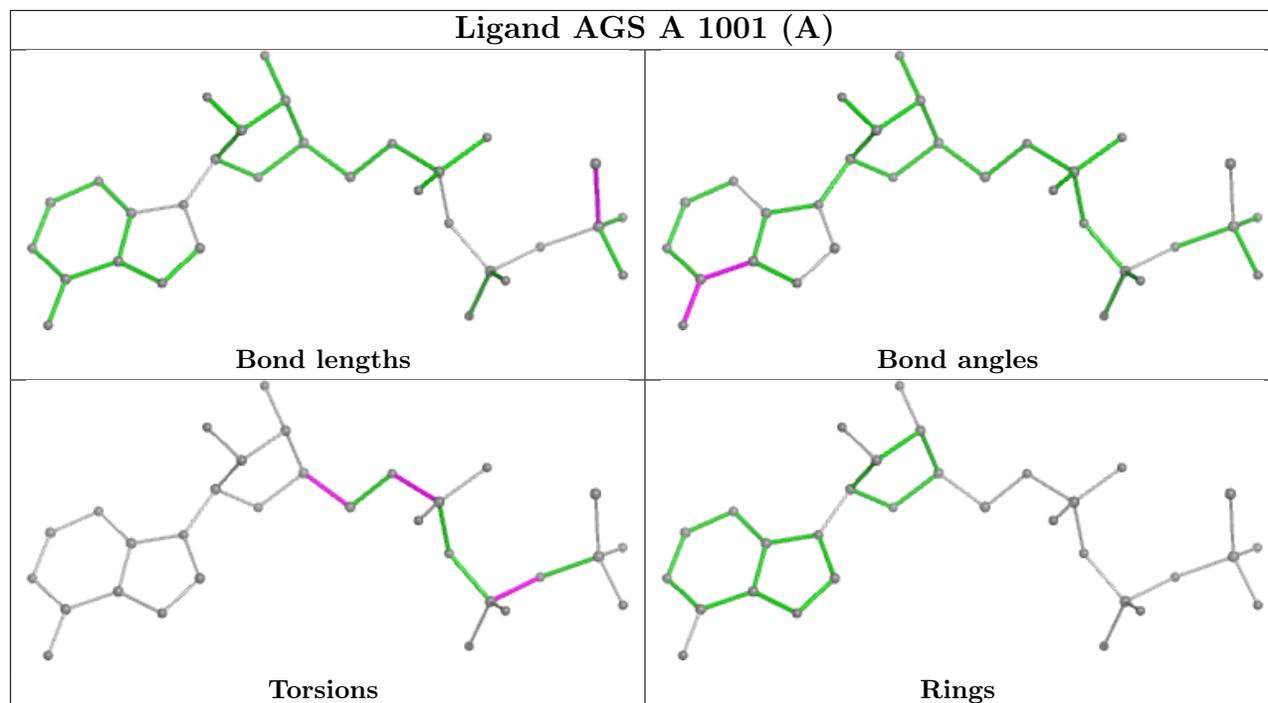
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In

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	406/427 (95%)	1.74	152 (37%) 1 1	14, 46, 92, 120	105 (25%)
1	B	400/427 (93%)	1.87	166 (41%) 1 0	20, 67, 115, 133	3 (0%)
All	All	806/854 (94%)	1.80	318 (39%) 1 0	14, 56, 109, 133	108 (13%)

All (318) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	677[A]	GLY	9.2
1	B	653	LEU	9.0
1	A	681[A]	ARG	8.2
1	B	560	VAL	7.5
1	A	680[A]	PHE	7.4
1	A	683[A]	SER	7.2
1	B	561	LEU	7.1
1	B	700	VAL	7.0
1	B	701	ALA	7.0
1	A	888	PHE	6.6
1	A	684	PHE	6.5
1	B	699	ILE	6.5
1	B	702	LEU	6.3
1	B	697	VAL	6.0
1	B	593	LEU	6.0
1	A	678[A]	HIS	5.8
1	B	628	LEU	5.7
1	A	601[A]	LEU	5.7
1	A	824[A]	PHE	5.7
1	B	883	ILE	5.6
1	B	638	ILE	5.6
1	A	687	LEU	5.6
1	B	718	LEU	5.6
1	A	822[A]	ILE	5.5

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	A	825[A]	GLY	5.4
1	B	698	PRO	5.2
1	A	682[A]	ASP	5.2
1	B	639	VAL	5.2
1	A	714	ILE	5.2
1	B	665	ILE	5.2
1	A	891	TYR	5.1
1	B	595	ILE	4.9
1	B	687	LEU	4.9
1	A	679[A]	ASP	4.9
1	A	673	ILE	4.8
1	B	631	ILE	4.8
1	B	715	VAL	4.8
1	B	714	ILE	4.7
1	A	674[A]	SER	4.7
1	A	893	LEU	4.7
1	B	588	VAL	4.7
1	A	879	LEU	4.7
1	A	702[A]	LEU	4.6
1	B	632	LYS	4.6
1	A	726[A]	THR	4.6
1	B	640	TYR	4.5
1	B	664	LEU	4.5
1	B	941	SER	4.4
1	B	684	PHE	4.4
1	B	888	PHE	4.4
1	B	704	ALA	4.4
1	A	890	LEU	4.3
1	B	530	PRO	4.3
1	B	670	ALA	4.3
1	B	725	ILE	4.3
1	B	663	THR	4.2
1	A	916[A]	HIS	4.2
1	B	662	ILE	4.2
1	B	710	ILE	4.2
1	A	597[A]	PRO	4.2
1	B	890	LEU	4.2
1	B	594	VAL	4.2
1	A	757	THR	4.1
1	A	668[A]	ASP	4.1
1	B	549	PHE	4.1
1	A	827[A]	GLY	4.1

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	A	568[A]	VAL	4.1
1	A	672[A]	CYS	4.1
1	A	575[A]	TYR	4.0
1	A	588	VAL	4.0
1	B	622	ALA	4.0
1	B	596	SER	4.0
1	A	710[A]	ILE	4.0
1	B	694	LEU	4.0
1	B	552	VAL	4.0
1	B	667	VAL	4.0
1	A	711[A]	ARG	4.0
1	B	671	HIS	4.0
1	A	875	LEU	4.0
1	A	826[A]	MET	3.9
1	A	823[A]	ALA	3.9
1	B	706	ALA	3.9
1	A	708[A]	SER	3.9
1	B	880	LEU	3.9
1	A	560	VAL	3.9
1	B	569	ALA	3.9
1	B	580	CYS	3.9
1	B	683	SER	3.8
1	B	705	THR	3.8
1	A	892	LYS	3.8
1	A	653	LEU	3.8
1	A	690	LEU	3.8
1	B	531	ALA	3.8
1	A	547	SER	3.8
1	A	656	LEU	3.7
1	A	549	PHE	3.7
1	B	567	ASN	3.7
1	B	879	LEU	3.7
1	A	667[A]	VAL	3.7
1	A	598[A]	LEU	3.7
1	B	656	LEU	3.7
1	B	563	GLU	3.7
1	B	666	ALA	3.7
1	B	690	LEU	3.6
1	B	568	VAL	3.6
1	A	670[A]	ALA	3.6
1	A	913[A]	ILE	3.6
1	B	564	ARG	3.6

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	B	627	VAL	3.6
1	A	761	TRP	3.5
1	A	728[A]	THR	3.5
1	A	530	PRO	3.5
1	B	646	CYS	3.5
1	A	537	VAL	3.4
1	A	720	LEU	3.4
1	A	922[A]	VAL	3.4
1	B	720	LEU	3.4
1	A	618	PHE	3.4
1	B	556	VAL	3.4
1	A	921[A]	GLN	3.4
1	B	557	ILE	3.4
1	B	619	LEU	3.3
1	A	600[A]	SER	3.3
1	A	758	SER	3.3
1	B	574	GLY	3.3
1	A	552	VAL	3.3
1	B	618	PHE	3.3
1	B	755	VAL	3.3
1	B	850	GLN	3.3
1	A	542	MET	3.3
1	B	651	GLY	3.3
1	A	556	VAL	3.3
1	A	593[A]	LEU	3.3
1	A	694	LEU	3.3
1	A	692	THR	3.3
1	B	633	LEU	3.3
1	A	699[A]	ILE	3.2
1	B	537	VAL	3.2
1	B	641	VAL	3.2
1	B	917	PHE	3.2
1	B	540	LEU	3.2
1	B	634	GLY	3.2
1	B	893	LEU	3.2
1	B	660	ILE	3.2
1	A	696	MET	3.2
1	A	760	HIS	3.2
1	A	591[A]	ILE	3.1
1	B	645	TYR	3.1
1	B	922	VAL	3.1
1	A	610	LYS	3.1

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	B	584	PRO	3.0
1	B	808	HIS	3.0
1	A	717	CYS	3.0
1	A	915[A]	SER	3.0
1	A	594[A]	VAL	3.0
1	B	558	HIS	3.0
1	A	540	LEU	3.0
1	A	664	LEU	3.0
1	A	631	ILE	2.9
1	A	895	MET	2.9
1	B	554	TRP	2.9
1	B	597	PRO	2.9
1	A	715	VAL	2.9
1	B	601	LEU	2.9
1	B	544	PHE	2.9
1	A	531	ALA	2.9
1	A	587	TYR	2.9
1	A	691	LYS	2.9
1	B	652	LEU	2.9
1	A	671[A]	HIS	2.9
1	B	581	PHE	2.9
1	A	569[A]	ALA	2.9
1	A	599[A]	ILE	2.9
1	B	885	ASN	2.9
1	B	543	TYR	2.9
1	A	704[A]	ALA	2.8
1	A	885	ASN	2.8
1	A	639	VAL	2.8
1	B	925	ALA	2.8
1	B	624	SER	2.8
1	A	638	ILE	2.8
1	B	555	LYS	2.8
1	A	821[A]	THR	2.8
1	A	685	ARG	2.8
1	A	544	PHE	2.8
1	B	913	ILE	2.8
1	A	723	PRO	2.8
1	A	718	LEU	2.8
1	B	571	MET	2.7
1	B	598	LEU	2.7
1	A	897	ALA	2.7
1	B	636	TYR	2.7

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	A	725	ILE	2.7
1	A	583	TYR	2.7
1	B	688	GLY	2.7
1	A	911	GLN	2.7
1	B	691	LYS	2.6
1	A	700[A]	VAL	2.6
1	B	703	THR	2.6
1	B	761	TRP	2.6
1	A	660	ILE	2.6
1	B	591	ILE	2.6
1	B	724	GLN	2.6
1	A	849[A]	TYR	2.6
1	B	693	ALA	2.6
1	A	705[A]	THR	2.6
1	B	692	THR	2.6
1	B	532	PRO	2.6
1	B	576	GLY	2.6
1	B	897	ALA	2.6
1	A	627	VAL	2.6
1	A	713	ASP	2.6
1	B	642	THR	2.6
1	A	611	MET	2.6
1	A	580	CYS	2.6
1	B	914	LEU	2.6
1	B	616	ALA	2.5
1	B	582	GLN	2.5
1	A	554	TRP	2.5
1	A	586	VAL	2.5
1	A	636	TYR	2.5
1	B	546	HIS	2.5
1	B	756	LYS	2.5
1	A	538	THR	2.5
1	B	575	TYR	2.5
1	A	551	PRO	2.5
1	B	614	ILE	2.5
1	B	921[A]	GLN	2.5
1	B	538	THR	2.5
1	B	829	ASN	2.5
1	B	583	TYR	2.4
1	B	878	HIS	2.4
1	B	647	SER	2.4
1	A	561	LEU	2.4

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	A	565	ARG	2.4
1	B	672	CYS	2.4
1	A	629	THR	2.4
1	A	559	SER	2.4
1	B	891	TYR	2.4
1	B	763	PHE	2.4
1	A	662	ILE	2.4
1	A	896	MET	2.4
1	A	919[A]	ASP	2.4
1	A	887	LYS	2.4
1	B	760	HIS	2.4
1	B	729	GLY	2.4
1	A	712[A]	GLU	2.4
1	A	567[A]	ASN	2.4
1	B	533	ASN	2.4
1	A	686	LYS	2.4
1	B	570	VAL	2.4
1	A	548	SER	2.4
1	B	707	SER	2.4
1	A	604[A]	ASP	2.4
1	A	634	GLY	2.4
1	A	729[A]	GLY	2.4
1	B	911	GLN	2.4
1	B	757	THR	2.3
1	B	587	TYR	2.3
1	B	541	LYS	2.3
1	B	577	LYS	2.3
1	B	629	THR	2.3
1	B	889	ARG	2.3
1	A	650	MET	2.3
1	B	623	GLN	2.3
1	A	557	ILE	2.3
1	A	889	ARG	2.3
1	B	658	ALA	2.3
1	A	646	CYS	2.3
1	B	539	CYS	2.3
1	A	532	PRO	2.3
1	A	689	SER	2.3
1	B	612	SER	2.3
1	B	586	VAL	2.3
1	A	828[A]	ILE	2.3
1	A	774	ARG	2.3

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	A	658	ALA	2.3
1	A	706[A]	ALA	2.3
1	B	536	GLN	2.3
1	B	578	SER	2.3
1	B	630	ASP	2.2
1	A	645	TYR	2.2
1	B	542	MET	2.2
1	A	701[A]	ALA	2.2
1	B	686	LYS	2.2
1	A	709[A]	SER	2.2
1	B	887	LYS	2.2
1	A	878	HIS	2.2
1	A	884	ARG	2.2
1	B	940[A]	ARG	2.2
1	A	778	GLN	2.2
1	B	562	GLU	2.2
1	B	726	THR	2.2
1	B	717	CYS	2.2
1	A	641	VAL	2.2
1	A	697[A]	VAL	2.2
1	B	650	MET	2.2
1	A	628	LEU	2.1
1	A	550	LYS	2.1
1	A	596[A]	SER	2.1
1	A	848[A]	TYR	2.1
1	B	643	PRO	2.1
1	A	669[A]	GLU	2.1
1	A	800[A]	PHE	2.1
1	B	727	CYS	2.1
1	B	711	ARG	2.1
1	B	579	LEU	2.1
1	B	754	LEU	2.1
1	B	547	SER	2.1
1	B	548	SER	2.1
1	B	620	GLY	2.1
1	A	562	GLU	2.0
1	B	551	PRO	2.0
1	B	719	ASN	2.0
1	B	617	CYS	2.0
1	B	787	LEU	2.0
1	A	614	ILE	2.0
1	A	602[A]	MET	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 oligosaccharides in this entry.

6.4 Ligands [i](#)

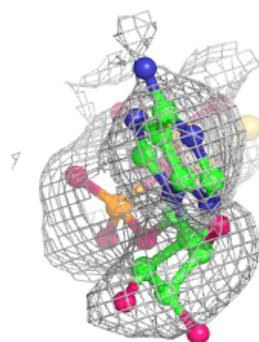
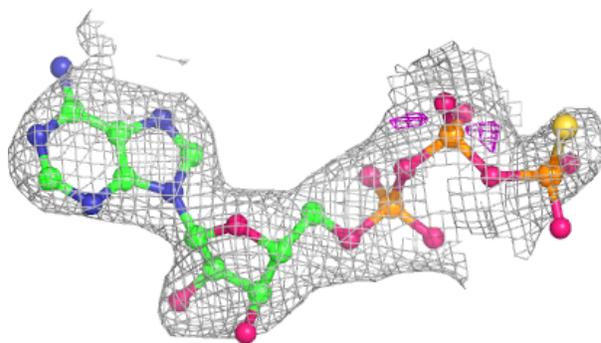
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
2	AGS	B	1001[A]	31/31	0.75	0.20	143,143,144,144	31
5	EDO	B	1002	4/4	0.76	0.32	48,48,49,49	0
2	AGS	A	1001[A]	31/31	0.78	0.16	62,65,66,66	31
3	GQP	A	1002[C]	17/17	0.83	0.29	26,27,28,28	17
3	GQP	A	1002[B]	17/17	0.83	0.29	44,45,45,45	17
8	MG	A	1009	1/1	0.83	0.15	59,59,59,59	0
4	DMS	B	1004	4/4	0.85	0.21	81,81,81,81	0
6	ADP	B	1003[B]	27/27	0.88	0.11	38,40,41,42	27
5	EDO	A	1005	4/4	0.89	0.18	49,49,50,51	0
4	DMS	A	1004	4/4	0.91	0.18	64,65,65,65	0
6	ADP	A	1006[B]	27/27	0.92	0.10	57,62,64,64	27
4	DMS	A	1003	4/4	0.94	0.13	90,90,90,90	0
5	EDO	A	1007	4/4	0.95	0.10	32,32,32,33	0
7	ZN	B	1005	1/1	0.99	0.04	37,37,37,37	0
7	ZN	A	1008	1/1	0.99	0.06	42,42,42,42	0

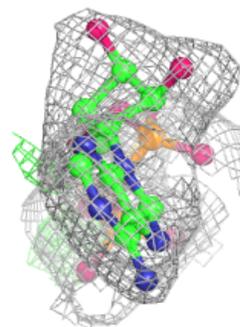
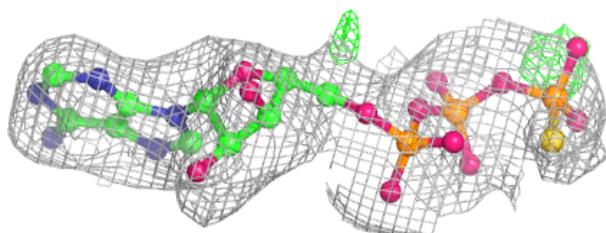
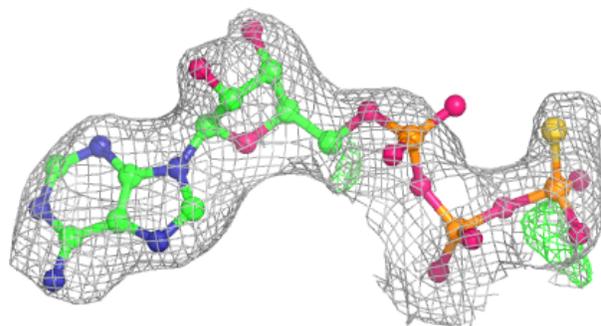
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around AGS B 1001 (A):

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

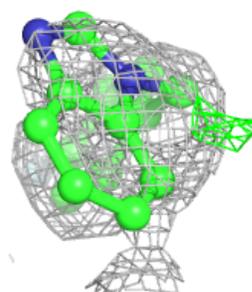
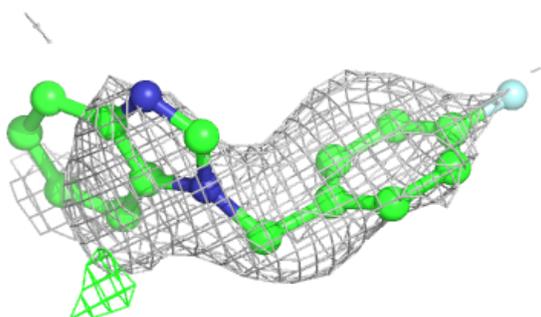
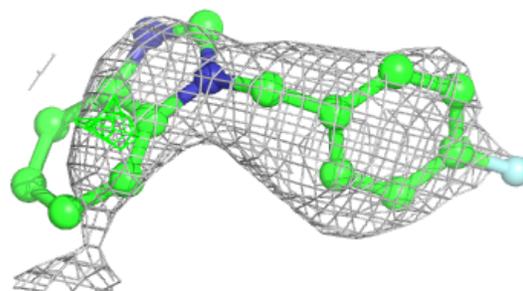
**Electron density around AGS A 1001 (A):**

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

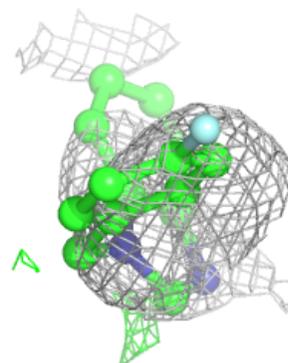
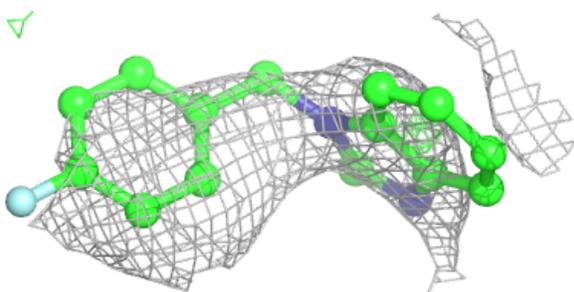
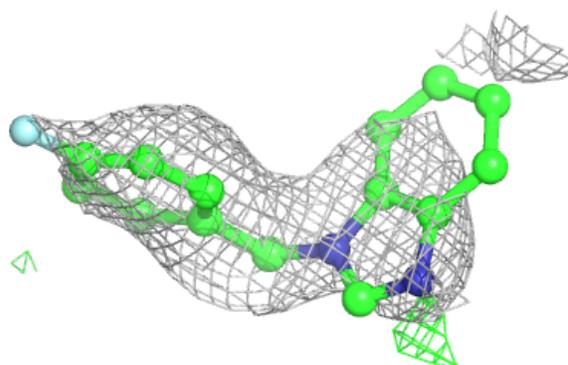


Electron density around GQP A 1002 (C):

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

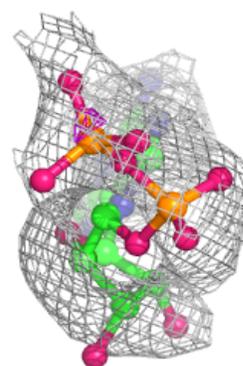
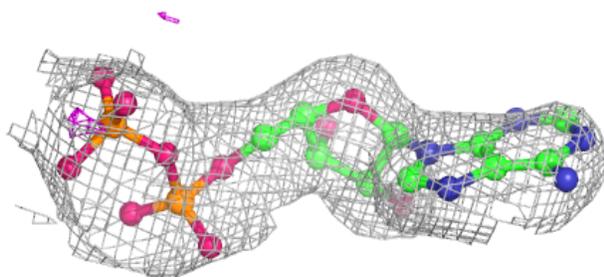
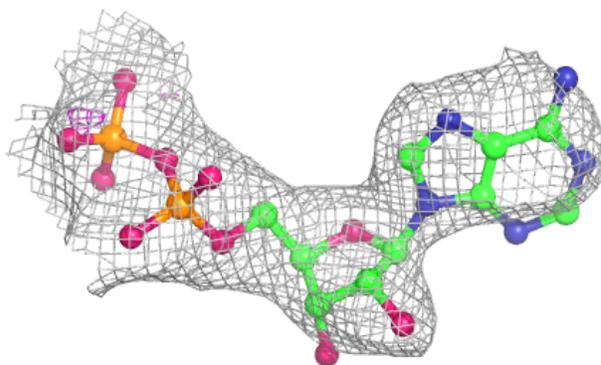
**Electron density around GQP A 1002 (B):**

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

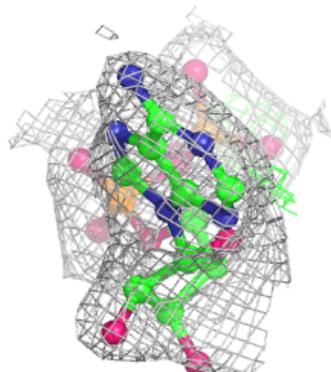
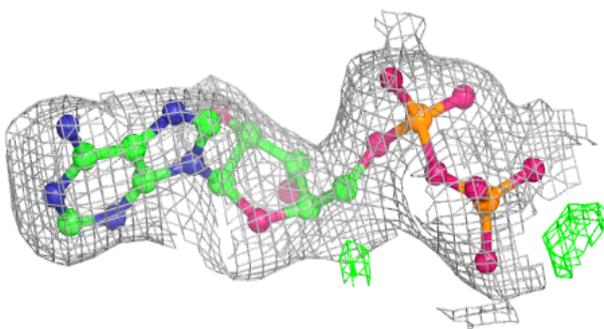
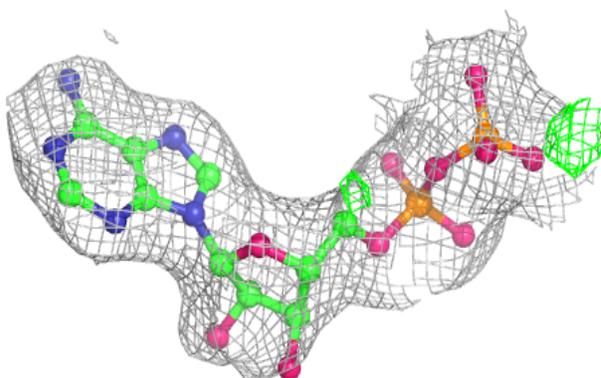


Electron density around ADP B 1003 (B):

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

**Electron density around ADP A 1006 (B):**

$2mF_o-DF_c$ (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.