



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 7, 2026 – 12:24 AM UTC

PDB ID : 8UGT / pdb_00008ugt
Title : E. eligens beta-glucuronidase bound to UNC10206581-G
Authors : Simpson, J.B.; Redinbo, M.R.
Deposited on : 2023-10-06
Resolution : 2.65 Å(reported)

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

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

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 : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 2.0
EDS : 3.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
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) : 2.49

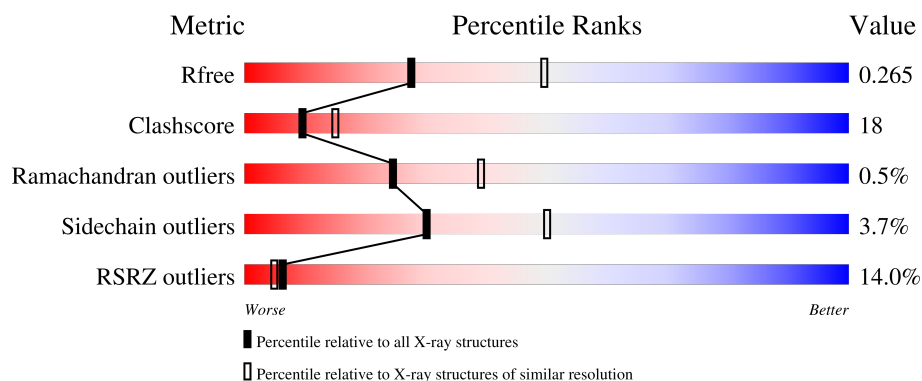
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.65 Å.

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



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	1110 (2.66-2.66)
Clashscore	190562	1141 (2.66-2.66)
Ramachandran outliers	187476	1126 (2.66-2.66)
Sidechain outliers	187428	1126 (2.66-2.66)
RSRZ outliers	180081	1110 (2.66-2.66)

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	614	13% 63% 29% 6%

2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 4718 atoms, of which 65 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.

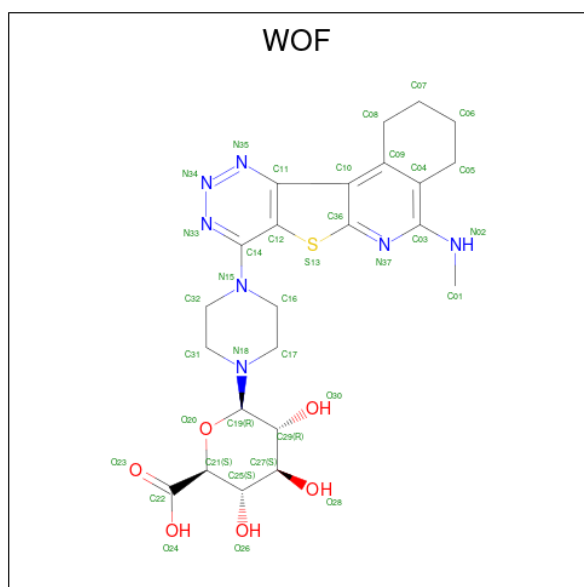
- Molecule 1 is a protein called Beta-glucuronidase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	580	Total	C	N	O	S	0	0	0
			4579	2920	757	881	21			

There are 4 discrepancies between the modelled and reference sequences:

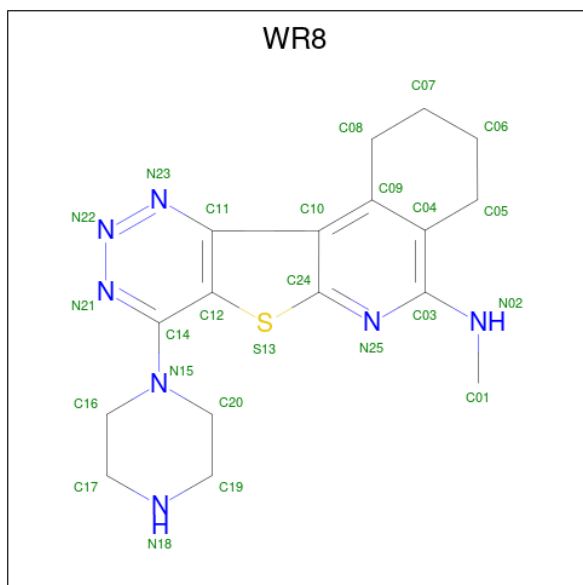
Chain	Residue	Modelled	Actual	Comment	Reference
A	-2	SER	-	expression tag	UNP A0A174ZZA3
A	-1	ASN	-	expression tag	UNP A0A174ZZA3
A	0	ALA	-	expression tag	UNP A0A174ZZA3
A	120	ASP	HIS	conflict	UNP A0A174ZZA3

- Molecule 2 is 8-(4-beta-D-glucopyranuronosylpiperazin-1-yl)-5-(methylamino)-1,2,3,4-tetrahydro[1,2,3]triazino[4',5':4,5]thieno[2,3-c]isoquinoline (CCD ID: WOF) (formula: C₂₃H₂₉N₇O₆S) (labeled as "Ligand of Interest" by depositor).



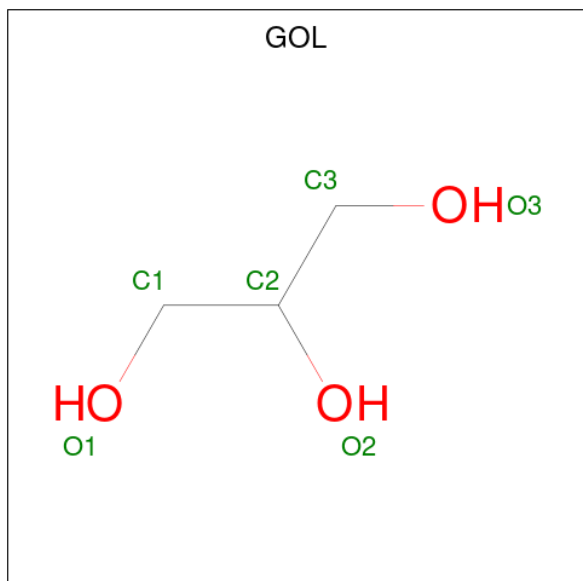
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	H	N	O	S	
			65	23	28	7	6	1	
								0	0

- Molecule 3 is N-methyl-8-(piperazin-1-yl)-1,2,3,4-tetrahydro[1,2,3]triazino[4',5':4,5]thien o[2,3-c]isoquinolin-5-amine (CCD ID: WR8) (formula: $C_{17}H_{21}N_7S$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total	C	H	N	S		
			46	17	21	7	1		
								0	0

- Molecule 4 is GLYCEROL (CCD ID: GOL) (formula: $C_3H_8O_3$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	A	1	Total	C	H	O	0	0
			14	3	8	3		
4	A	1	Total	C	H	O	0	0
			14	3	8	3		

- Molecule 1: Beta-glucuronidase



4 Data and refinement statistics

Property	Value	Source
Space group	P 64 2 2	Depositor
Cell constants a, b, c, α , β , γ	179.94Å 179.94Å 132.79Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	44.98 – 2.65 44.98 – 2.65	Depositor EDS
% Data completeness (in resolution range)	100.0 (44.98-2.65) 99.9 (44.98-2.65)	Depositor EDS
R_{merge}	0.04	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.49 (at 2.65Å)	Xtriage
Refinement program	PHENIX 1.19.2_4158	Depositor
R, R_{free}	0.239 , 0.267 0.239 , 0.265	Depositor DCC
R_{free} test set	2000 reflections (5.37%)	wwPDB-VP
Wilson B-factor (Å ²)	64.7	Xtriage
Anisotropy	0.311	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 55.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	4718	wwPDB-VP
Average B, all atoms (Å ²)	67.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.28% 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: WOF, GOL, WR8

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	0.53	0/4696	0.79	1/6385 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
1	A	533	TYR	CB-CA-C	5.39	115.17	109.83

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	4579	0	4288	158	0
2	A	37	28	0	1	0
3	A	25	21	0	1	0
4	A	12	16	16	2	0
All	All	4653	65	4304	159	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 18.

All (159) 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:210:SER:HB2	1:A:254:SER:HA	1.21	1.16
1:A:189:PRO:HG2	1:A:276:ASP:HB2	1.43	0.98
1:A:82:ARG:HB3	1:A:188:THR:HG22	1.49	0.93
1:A:82:ARG:HE	1:A:188:THR:HG21	1.40	0.85
1:A:98:LEU:HD11	1:A:126:ASN:HB3	1.60	0.81
1:A:72:ILE:HG22	1:A:126:ASN:HB2	1.62	0.80
1:A:522:VAL:HB	1:A:525:LEU:HD12	1.64	0.77
1:A:36:LYS:HE2	1:A:36:LYS:HA	1.68	0.76
1:A:443:LEU:HD12	1:A:447:LEU:HD13	1.66	0.76
1:A:82:ARG:HB3	1:A:188:THR:CG2	2.18	0.74
1:A:12:LEU:HD13	1:A:186:TYR:HB3	1.67	0.73
1:A:188:THR:HG23	1:A:189:PRO:O	1.89	0.72
1:A:443:LEU:CD1	1:A:447:LEU:HD13	2.20	0.72
1:A:85:LEU:HB2	1:A:117:LEU:HD11	1.70	0.72
1:A:280:LEU:HD22	1:A:281:PRO:HD2	1.74	0.69
1:A:98:LEU:HD12	1:A:99:ASN:N	2.09	0.68
1:A:448:ASP:OD2	1:A:452:ARG:HB2	1.93	0.68
1:A:72:ILE:HD11	1:A:185:ILE:HD11	1.75	0.68
1:A:210:SER:CB	1:A:254:SER:HA	2.14	0.66
1:A:308:LYS:O	1:A:342:SER:HB2	1.96	0.66
1:A:404:ILE:O	1:A:408:ILE:HG13	1.97	0.64
1:A:512:VAL:HG12	1:A:554:PHE:HD1	1.63	0.64
1:A:351:MET:HE1	1:A:361:VAL:HG11	1.79	0.63
1:A:82:ARG:NE	1:A:188:THR:HG21	2.14	0.63
1:A:484:TRP:CZ2	1:A:520:ASP:HB2	2.33	0.63
1:A:70:ARG:NH1	1:A:71:ASN:O	2.32	0.62
1:A:127:LEU:O	1:A:127:LEU:HD23	1.98	0.62
1:A:181:ARG:HB3	1:A:182:PRO:CD	2.29	0.62
1:A:532:MET:O	1:A:533:TYR:HB2	1.98	0.62
1:A:2:LEU:O	1:A:86:ARG:NH2	2.29	0.61
1:A:527:ASP:OD2	4:A:704:GOL:H11	2.01	0.61
1:A:447:LEU:O	1:A:449:PRO:HD3	2.01	0.61
1:A:512:VAL:O	1:A:555:VAL:HA	2.02	0.60
1:A:522:VAL:HB	1:A:525:LEU:CD1	2.32	0.59
1:A:76:GLU:C	1:A:78:VAL:H	2.11	0.59
1:A:98:LEU:HD12	1:A:99:ASN:H	1.67	0.59
1:A:70:ARG:HG2	1:A:71:ASN:N	2.17	0.59
1:A:257:ARG:N	1:A:267:TYR:OH	2.30	0.58
1:A:193:ILE:HG13	1:A:276:ASP:OD2	2.03	0.58
1:A:456:LEU:HD12	1:A:456:LEU:C	2.29	0.57
1:A:295:LEU:HA	1:A:299:LYS:O	2.05	0.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:82:ARG:CB	1:A:188:THR:HG22	2.27	0.57
1:A:1:MET:HE3	1:A:86:ARG:CZ	2.35	0.56
1:A:229:CYS:HB2	1:A:273:ALA:HB2	1.87	0.56
1:A:402:ASP:O	1:A:405:ARG:HG3	2.05	0.56
1:A:92:HIS:HB2	1:A:133:ASN:O	2.05	0.56
1:A:169:PRO:HB3	1:A:171:PHE:CZ	2.40	0.56
1:A:443:LEU:HD12	1:A:443:LEU:O	2.07	0.55
1:A:181:ARG:HB3	1:A:182:PRO:HD3	1.89	0.55
1:A:296:ILE:HD12	1:A:301:PHE:CG	2.42	0.55
1:A:272:THR:HG23	1:A:277:VAL:HB	1.88	0.54
1:A:258:LEU:HD22	1:A:284:VAL:HG12	1.90	0.54
1:A:0:ALA:HA	1:A:409:SER:OG	2.07	0.54
1:A:310:GLU:O	1:A:317:ARG:HA	2.08	0.53
1:A:531:VAL:HG23	1:A:534:THR:CG2	2.38	0.53
1:A:141:LEU:HD22	1:A:367:ALA:HA	1.91	0.53
1:A:259:TRP:O	1:A:260:GLN:HG2	2.09	0.53
1:A:288:ARG:O	1:A:295:LEU:HB2	2.08	0.53
1:A:96:ILE:N	1:A:96:ILE:HD12	2.23	0.52
1:A:364:GLU:OE2	1:A:424:ASN:HB2	2.10	0.52
1:A:36:LYS:HD3	1:A:37:PRO:HD2	1.92	0.52
1:A:81:GLN:HB3	1:A:188:THR:O	2.09	0.52
1:A:486:PHE:HB2	2:A:701:WOF:C01	2.40	0.52
1:A:22:LYS:HE3	1:A:39:LYS:O	2.10	0.52
1:A:37:PRO:HA	1:A:69:GLN:OE1	2.10	0.52
1:A:258:LEU:CD2	1:A:284:VAL:HG12	2.40	0.51
1:A:343:HIS:N	1:A:343:HIS:ND1	2.59	0.51
1:A:121:LEU:HD13	1:A:122:GLN:O	2.10	0.51
1:A:229:CYS:HB2	1:A:273:ALA:CB	2.41	0.51
1:A:84:VAL:HG11	1:A:186:TYR:CE2	2.46	0.51
1:A:341:THR:O	1:A:364:GLU:HB3	2.11	0.51
1:A:562:ASN:O	1:A:581:GLY:HA2	2.12	0.50
1:A:98:LEU:C	1:A:100:GLY:H	2.20	0.50
1:A:476:ILE:HG21	1:A:505:TRP:CE3	2.47	0.50
1:A:92:HIS:H	1:A:109:GLY:HA3	1.77	0.49
1:A:117:LEU:O	1:A:121:LEU:HB2	2.12	0.49
1:A:280:LEU:HD13	1:A:281:PRO:O	2.13	0.49
1:A:10:ARG:HB3	1:A:187:THR:O	2.13	0.49
1:A:6:LEU:HD13	1:A:6:LEU:HA	1.70	0.48
1:A:126:ASN:N	1:A:126:ASN:HD22	2.10	0.48
1:A:75:PRO:HB2	1:A:77:TYR:CE2	2.48	0.48
1:A:536:GLU:HG3	1:A:591:MET:HE1	1.95	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:84:VAL:HG11	1:A:186:TYR:CZ	2.48	0.48
1:A:1:MET:HE1	1:A:114:GLU:HG2	1.94	0.47
1:A:91:THR:HB	1:A:177:CYS:HA	1.95	0.47
1:A:521:THR:HG21	1:A:535:GLU:HA	1.96	0.47
1:A:76:GLU:C	1:A:78:VAL:N	2.72	0.47
1:A:92:HIS:H	1:A:109:GLY:CA	2.27	0.47
1:A:1:MET:HE3	1:A:86:ARG:NE	2.31	0.46
1:A:192:TYR:O	1:A:219:ILE:HG23	2.15	0.46
1:A:36:LYS:HA	1:A:36:LYS:CE	2.41	0.46
1:A:65:TRP:CH2	1:A:95:MET:HE2	2.51	0.45
1:A:121:LEU:HD22	1:A:126:ASN:OD1	2.15	0.45
1:A:212:VAL:HG23	1:A:251:PHE:O	2.16	0.45
1:A:90:VAL:CG1	1:A:132:VAL:HG22	2.46	0.45
1:A:328:ILE:HD12	1:A:353:LEU:HD23	1.99	0.45
1:A:401:LYS:HG3	1:A:440:LEU:CD2	2.46	0.45
1:A:206:LYS:O	1:A:209:PRO:HD3	2.15	0.45
1:A:531:VAL:HG21	4:A:704:GOL:H12	1.99	0.45
1:A:191:THR:HG22	1:A:221:GLY:C	2.42	0.45
1:A:484:TRP:HZ2	1:A:520:ASP:HB2	1.80	0.45
1:A:78:VAL:C	1:A:80:SER:N	2.75	0.45
1:A:192:TYR:O	1:A:219:ILE:HA	2.17	0.44
1:A:338:SER:HA	1:A:360:VAL:O	2.17	0.44
1:A:82:ARG:NE	1:A:192:TYR:CE2	2.85	0.44
1:A:169:PRO:HB3	1:A:171:PHE:CE2	2.53	0.44
1:A:217:VAL:HG12	1:A:218:GLU:N	2.32	0.44
1:A:340:ARG:HD2	1:A:364:GLU:OE1	2.17	0.44
1:A:448:ASP:OD2	1:A:452:ARG:N	2.40	0.44
1:A:3:TYR:CD2	1:A:352:ARG:CZ	3.01	0.43
1:A:259:TRP:CZ2	1:A:358:GLY:HA2	2.53	0.43
1:A:76:GLU:O	1:A:78:VAL:N	2.52	0.43
1:A:334:GLN:O	1:A:335:HIS:HB2	2.17	0.43
1:A:82:ARG:C	1:A:83:ILE:HD13	2.44	0.43
1:A:98:LEU:C	1:A:100:GLY:N	2.75	0.43
1:A:434:TYR:CZ	1:A:438:LYS:HD2	2.53	0.43
1:A:459:VAL:HG22	1:A:460:GLN:N	2.33	0.43
1:A:271:VAL:O	1:A:277:VAL:HA	2.19	0.43
1:A:499:ARG:O	1:A:503:SER:HB2	2.19	0.43
1:A:74:VAL:HG22	1:A:75:PRO:HD2	2.01	0.42
3:A:702:WR8:S13	3:A:702:WR8:C16	3.07	0.42
1:A:373:GLN:HG2	1:A:374:PHE:CD1	2.54	0.42
1:A:420:TRP:O	1:A:455:THR:HG22	2.19	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:9:SER:HB3	1:A:277:VAL:H	1.85	0.42
1:A:9:SER:CB	1:A:276:ASP:HA	2.49	0.42
1:A:246:GLY:C	1:A:248:GLU:H	2.27	0.42
1:A:340:ARG:O	1:A:342:SER:N	2.53	0.42
1:A:552:PHE:HB3	1:A:554:PHE:CE2	2.55	0.42
1:A:521:THR:OG1	1:A:538:GLN:HB2	2.20	0.42
1:A:76:GLU:O	1:A:79:LYS:HG2	2.20	0.42
1:A:561:TRP:HA	1:A:562:ASN:HA	1.66	0.42
1:A:28:GLY:O	1:A:31:GLU:O	2.38	0.42
1:A:106:HIS:ND1	1:A:113:PHE:HB3	2.34	0.42
1:A:231:VAL:HG22	1:A:271:VAL:HG12	2.01	0.42
1:A:47:PRO:O	1:A:48:ALA:HB2	2.19	0.41
1:A:23:LEU:HD23	1:A:66:VAL:HG12	2.02	0.41
1:A:191:THR:HA	1:A:220:LYS:O	2.19	0.41
1:A:75:PRO:O	1:A:76:GLU:C	2.64	0.41
1:A:486:PHE:CD1	1:A:486:PHE:C	2.97	0.41
1:A:107:LYS:HG2	1:A:399:HIS:CD2	2.55	0.41
1:A:317:ARG:HD3	1:A:344:TYR:CZ	2.55	0.41
1:A:82:ARG:CG	1:A:188:THR:HG22	2.50	0.41
1:A:341:THR:HA	1:A:346:TYR:CZ	2.56	0.41
1:A:472:LEU:HD23	1:A:472:LEU:N	2.35	0.41
1:A:37:PRO:O	1:A:39:LYS:HG3	2.21	0.41
1:A:457:VAL:HG13	1:A:515:THR:OG1	2.20	0.41
1:A:266:LEU:HD23	1:A:281:PRO:HB2	2.02	0.41
1:A:468:CYS:O	1:A:472:LEU:HG	2.20	0.41
1:A:65:TRP:CG	1:A:133:ASN:HD22	2.39	0.41
1:A:512:VAL:CG1	1:A:554:PHE:HD1	2.31	0.41
1:A:548:VAL:O	1:A:549:PHE:C	2.64	0.40
1:A:531:VAL:HG23	1:A:534:THR:HG21	2.01	0.40
1:A:9:SER:HB2	1:A:276:ASP:HA	2.03	0.40
1:A:31:GLU:H	1:A:31:GLU:HG3	1.74	0.40
1:A:306:TYR:CE1	1:A:331:MET:HG2	2.57	0.40
1:A:29:PHE:O	1:A:30:GLU:C	2.65	0.40
1:A:38:LEU:HG	1:A:69:GLN:CD	2.45	0.40
1:A:121:LEU:HD22	1:A:121:LEU:HA	1.90	0.40
1:A:305:GLY:HA3	1:A:338:SER:O	2.22	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	572/614 (93%)	525 (92%)	44 (8%)	3 (0%)	24	39

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	92	HIS
1	A	341	THR
1	A	77	TYR

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	484/533 (91%)	466 (96%)	18 (4%)	30	50

All (18) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	6	LEU
1	A	7	THR
1	A	8	GLN
1	A	9	SER
1	A	10	ARG
1	A	72	ILE
1	A	73	SER
1	A	74	VAL

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Mol	Chain	Res	Type
1	A	103	ILE
1	A	136	ILE
1	A	205	THR
1	A	251	PHE
1	A	271	VAL
1	A	272	THR
1	A	306	TYR
1	A	309	HIS
1	A	343	HIS
1	A	531	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (7) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	99	ASN
1	A	175	ASN
1	A	194	ASN
1	A	399	HIS
1	A	424	ASN
1	A	538	GLN
1	A	570	GLN

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](#)

4 ligands are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# $ Z > 2$	Counts	RMSZ	# $ Z > 2$
4	GOL	A	704	-	5,5,5	0.09	0	5,5,5	0.21	0
3	WR8	A	702	-	27,29,29	2.44	7 (25%)	25,42,42	2.73	5 (20%)
2	WOF	A	701	-	39,42,42	2.40	9 (23%)	40,63,63	2.40	9 (22%)
4	GOL	A	703	-	5,5,5	0.10	0	5,5,5	0.21	0

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	GOL	A	704	-	-	2/4/4/4	-
3	WR8	A	702	-	-	4/6/21/21	0/5/5/5
2	WOF	A	701	-	-	6/14/51/51	0/6/6/6
4	GOL	A	703	-	-	1/4/4/4	-

All (16) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	702	WR8	C03-N02	9.34	1.44	1.34
2	A	701	WOF	C03-N02	7.91	1.43	1.34
2	A	701	WOF	C17-N18	-6.18	1.35	1.47
2	A	701	WOF	C31-N18	-4.88	1.38	1.47
3	A	702	WR8	C20-N15	4.73	1.54	1.46
2	A	701	WOF	O20-C19	4.46	1.52	1.42
2	A	701	WOF	C14-N15	4.24	1.48	1.37
3	A	702	WR8	C16-C17	-3.40	1.43	1.51
2	A	701	WOF	C08-C09	3.10	1.56	1.51
3	A	702	WR8	C14-N15	2.74	1.44	1.37
3	A	702	WR8	C08-C09	2.54	1.55	1.51
3	A	702	WR8	C12-S13	-2.51	1.70	1.75
3	A	702	WR8	C09-C04	-2.47	1.36	1.40
2	A	701	WOF	C29-C27	-2.44	1.46	1.52

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	701	WOF	C21-C22	-2.41	1.48	1.53
2	A	701	WOF	C09-C04	-2.07	1.37	1.40

All (14) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	702	WR8	C12-S13-C24	9.63	101.01	90.40
2	A	701	WOF	C12-S13-C36	8.88	100.19	90.40
3	A	702	WR8	C11-C12-S13	-6.18	105.49	112.41
2	A	701	WOF	C11-C12-S13	-5.61	106.13	112.41
2	A	701	WOF	C01-N02-C03	-5.22	118.01	122.85
3	A	702	WR8	C10-C24-N25	-4.34	121.87	126.66
3	A	702	WR8	C01-N02-C03	-4.12	119.03	122.85
2	A	701	WOF	C31-C32-N15	3.94	119.07	110.78
2	A	701	WOF	C27-C29-C19	3.82	115.04	108.94
2	A	701	WOF	C10-C36-N37	-3.40	122.90	126.66
2	A	701	WOF	C17-C16-N15	3.14	117.39	110.78
3	A	702	WR8	C03-N25-C24	2.21	122.04	116.24
2	A	701	WOF	O20-C21-C25	2.20	113.82	109.48
2	A	701	WOF	C16-N15-C14	-2.17	111.55	118.92

There are no chirality outliers.

All (13) torsion outliers are listed below:

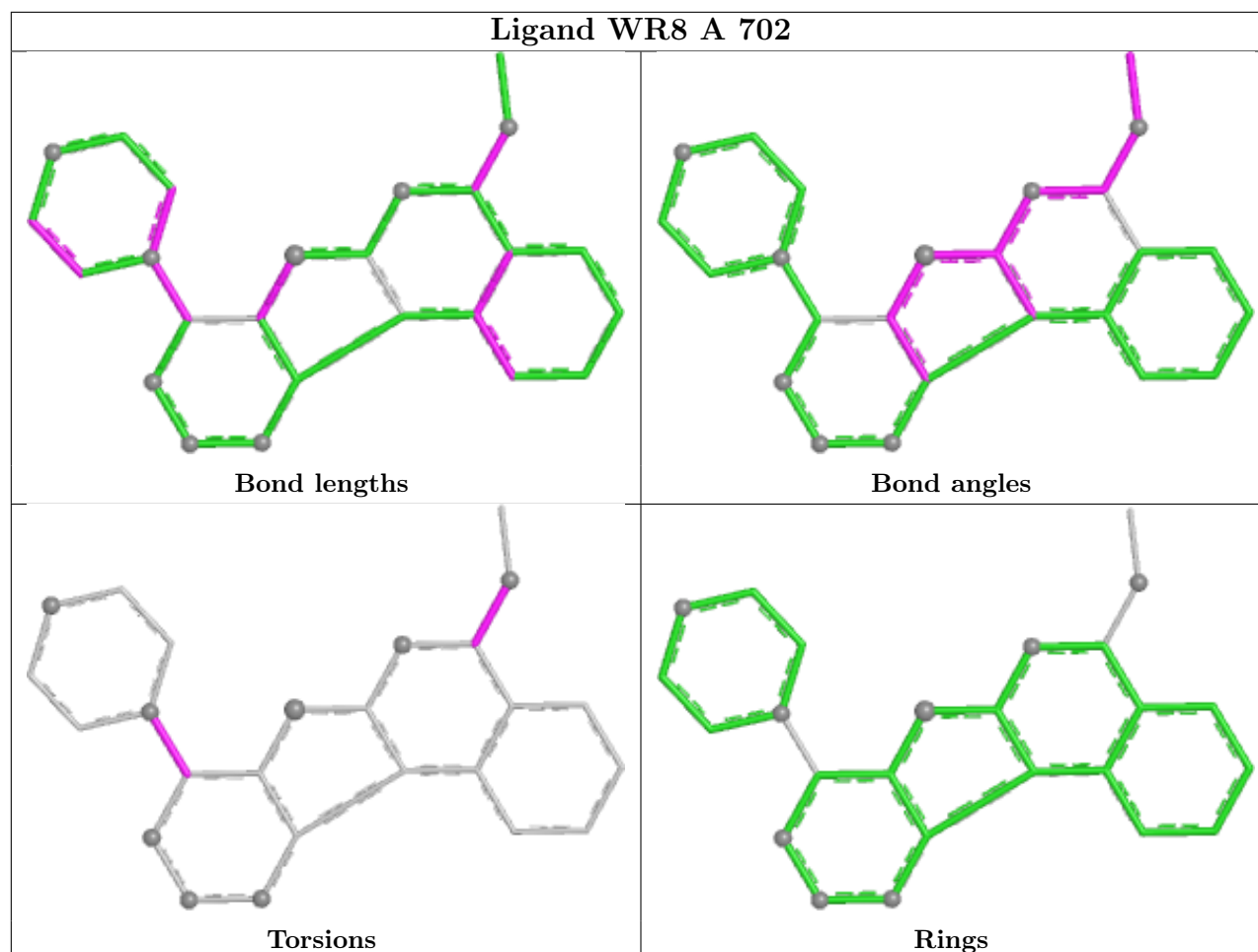
Mol	Chain	Res	Type	Atoms
2	A	701	WOF	C29-C19-N18-C17
2	A	701	WOF	C29-C19-N18-C31
2	A	701	WOF	O20-C19-N18-C31
2	A	701	WOF	C04-C03-N02-C01
2	A	701	WOF	N37-C03-N02-C01
3	A	702	WR8	C12-C14-N15-C20
3	A	702	WR8	N21-C14-N15-C20
3	A	702	WR8	C04-C03-N02-C01
3	A	702	WR8	N25-C03-N02-C01
4	A	704	GOL	O2-C2-C3-O3
4	A	703	GOL	O1-C1-C2-C3
4	A	704	GOL	C1-C2-C3-O3
2	A	701	WOF	O20-C19-N18-C17

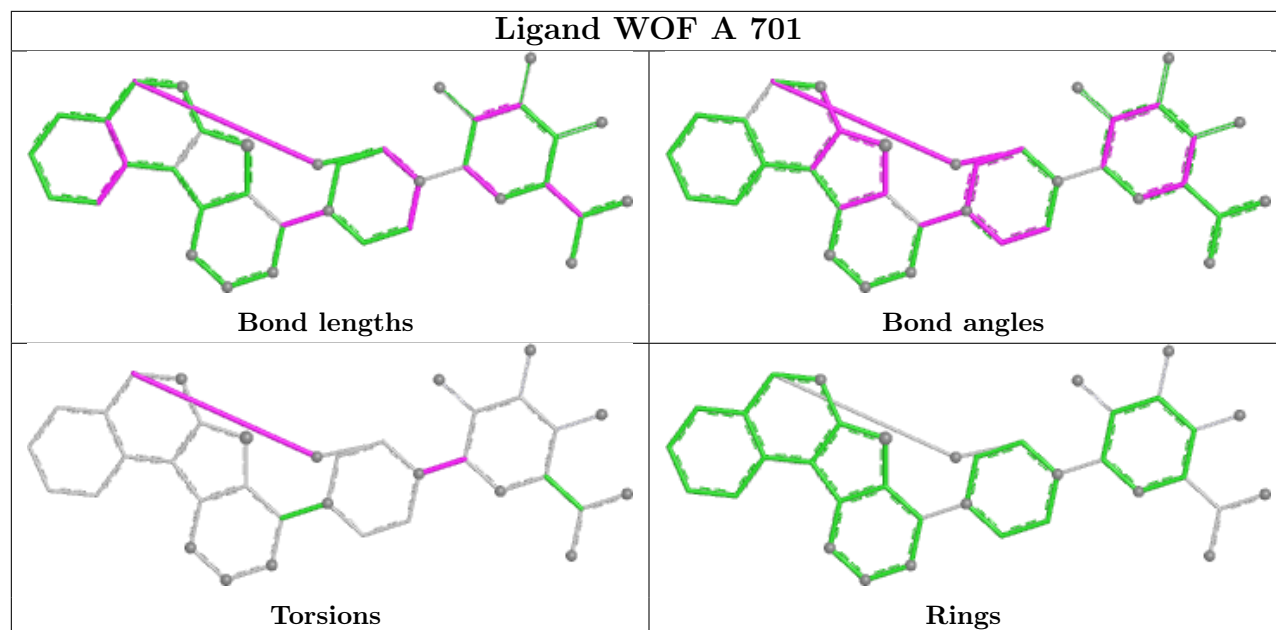
There are no ring outliers.

3 monomers are involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	704	GOL	2	0
3	A	702	WR8	1	0
2	A	701	WOF	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	580/614 (94%)	0.84	81 (13%) 6 5	30, 63, 106, 121	0

All (81) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	246	GLY	6.6
1	A	609	LYS	6.0
1	A	251	PHE	6.0
1	A	221	GLY	5.7
1	A	249	GLY	5.4
1	A	215	TYR	5.3
1	A	383	GLU	5.2
1	A	227	ILE	4.6
1	A	274	GLY	4.5
1	A	91	THR	4.3
1	A	250	THR	4.3
1	A	196	ILE	4.2
1	A	0	ALA	4.1
1	A	248	GLU	4.1
1	A	121	LEU	3.9
1	A	231	VAL	3.9
1	A	77	TYR	3.9
1	A	374	PHE	3.9
1	A	216	ASN	3.8
1	A	229	CYS	3.8
1	A	76	GLU	3.7
1	A	205	THR	3.6
1	A	203	ASP	3.6
1	A	252	GLU	3.5
1	A	102	LEU	3.5
1	A	206	LYS	3.4
1	A	191	THR	3.3

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Mol	Chain	Res	Type	RSRZ
1	A	243	GLU	3.3
1	A	204	PHE	3.3
1	A	78	VAL	3.3
1	A	83	ILE	3.2
1	A	6	LEU	3.1
1	A	342	SER	3.1
1	A	186	TYR	3.1
1	A	58	ASP	3.0
1	A	384	ARG	3.0
1	A	11	LEU	3.0
1	A	39	LYS	3.0
1	A	390	LYS	3.0
1	A	245	GLU	2.9
1	A	165	PRO	2.9
1	A	88	ALA	2.9
1	A	13	SER	2.8
1	A	247	SER	2.8
1	A	125	ASP	2.7
1	A	10	ARG	2.7
1	A	273	ALA	2.7
1	A	253	ILE	2.7
1	A	75	PRO	2.6
1	A	79	LYS	2.6
1	A	84	VAL	2.6
1	A	147	ALA	2.5
1	A	103	ILE	2.5
1	A	93	TYR	2.5
1	A	271	VAL	2.5
1	A	123	ASP	2.5
1	A	8	GLN	2.5
1	A	207	GLU	2.4
1	A	272	THR	2.4
1	A	99	ASN	2.4
1	A	230	LYS	2.4
1	A	115	VAL	2.4
1	A	97	TYR	2.3
1	A	233	LEU	2.3
1	A	185	ILE	2.3
1	A	9	SER	2.3
1	A	257	ARG	2.3
1	A	94	ALA	2.3
1	A	339	PHE	2.3

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Mol	Chain	Res	Type	RSRZ
1	A	36	LYS	2.2
1	A	122	GLN	2.2
1	A	219	ILE	2.2
1	A	127	LEU	2.2
1	A	85	LEU	2.1
1	A	74	VAL	2.1
1	A	244	THR	2.1
1	A	108	GLY	2.1
1	A	187	THR	2.1
1	A	602	ALA	2.0
1	A	275	GLN	2.0
1	A	116	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 oligosaccharides in this entry.

6.4 Ligands [i](#)

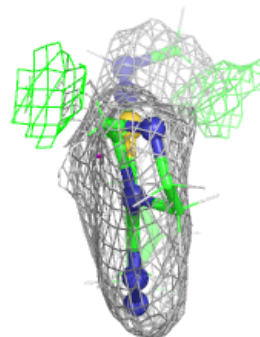
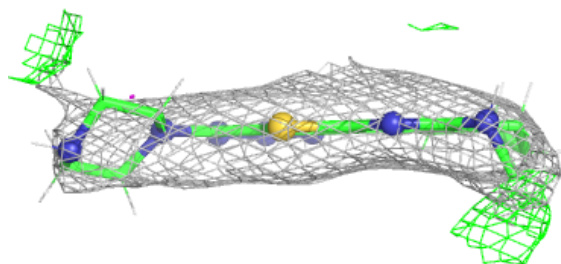
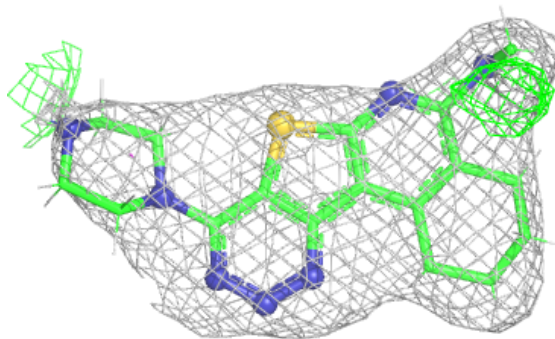
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
4	GOL	A	704	6/6	0.82	0.33	20,20,20,20	0
3	WR8	A	702	25/25	0.84	0.18	60,72,88,94	46
4	GOL	A	703	6/6	0.88	0.34	20,20,20,20	0
2	WOF	A	701	37/37	0.91	0.14	41,53,63,69	65

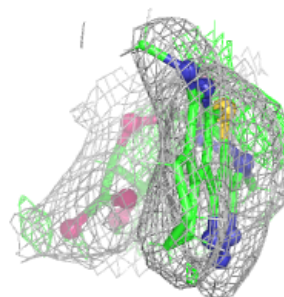
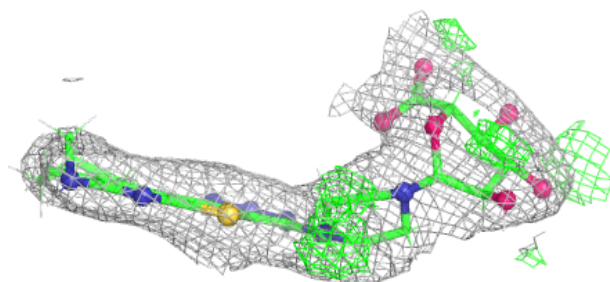
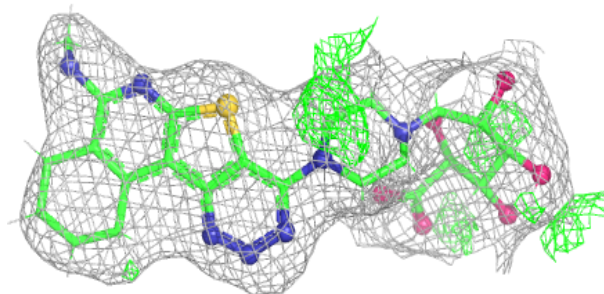
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around WR8 A 702:

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

**Electron density around WOF A 701:**

$2mF_o-DF_c$ (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.