



Full wwPDB X-ray Structure Validation Report ⓘ

Nov 4, 2023 – 03:03 PM EDT

PDB ID : 7FQH
Title : Crystal Structure of human Legumain in complex with (2S)-N-[(3S)-5-amino-5-oxopent-1-yn-3-yl]-1-[1-[4-(cyclopropylmethoxy)phenyl]cyclopropanecarbonyl]pyrrolidine-2-carboxamide
Authors : Ehler, A.; Benz, J.; Bartels, B.; Hewings-David, S.; Rudolph, M.G.
Deposited on : 2022-10-05
Resolution : 2.18 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 : 2.36
buster-report : 1.1.7 (2018)
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac : 5.8.0158
CCP4 : 7.0.044 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.36

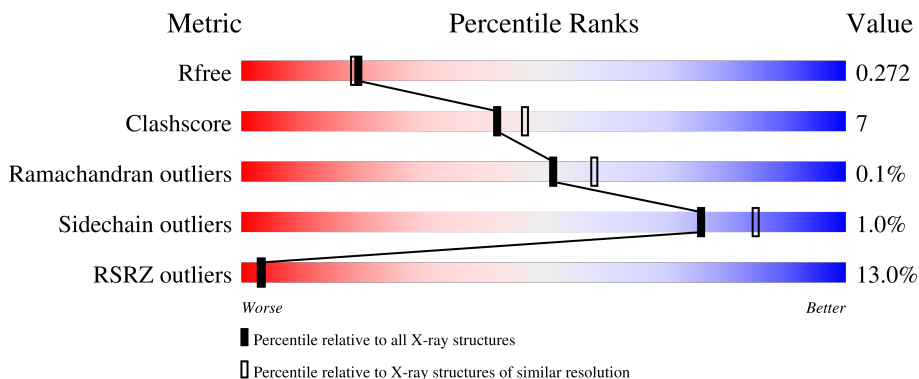
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.18 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	6864 (2.20-2.16)
Clashscore	141614	7689 (2.20-2.16)
Ramachandran outliers	138981	7564 (2.20-2.16)
Sidechain outliers	138945	7564 (2.20-2.16)
RSRZ outliers	127900	6738 (2.20-2.16)

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	444	
1	B	444	
1	D	444	

2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 6505 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 Legumain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	262	2112	1337	357	403	15	0	1	0
1	B	261	2094	1323	355	401	15	0	0	0
1	D	259	2082	1316	353	399	14	0	0	0

There are 90 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	0	MET	-	initiating methionine	UNP Q99538
A	1	LYS	-	expression tag	UNP Q99538
A	2	LEU	-	expression tag	UNP Q99538
A	3	CYS	-	expression tag	UNP Q99538
A	4	ILE	-	expression tag	UNP Q99538
A	5	LEU	-	expression tag	UNP Q99538
A	6	LEU	-	expression tag	UNP Q99538
A	7	ALA	-	expression tag	UNP Q99538
A	8	VAL	-	expression tag	UNP Q99538
A	9	VAL	-	expression tag	UNP Q99538
A	10	ALA	-	expression tag	UNP Q99538
A	11	PHE	-	expression tag	UNP Q99538
A	12	VAL	-	expression tag	UNP Q99538
A	13	GLY	-	expression tag	UNP Q99538
A	14	LEU	-	expression tag	UNP Q99538
A	15	SER	-	expression tag	UNP Q99538
A	16	LEU	-	expression tag	UNP Q99538
A	17	GLY	-	expression tag	UNP Q99538
A	147	SNN	ASP	conflict	UNP Q99538
A	272	GLN	ASN	conflict	UNP Q99538
A	434	VAL	-	expression tag	UNP Q99538
A	435	ASP	-	expression tag	UNP Q99538
A	436	HIS	-	expression tag	UNP Q99538

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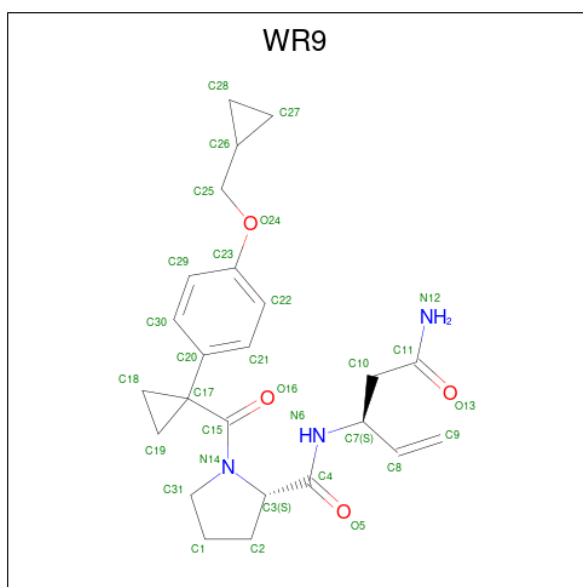
Chain	Residue	Modelled	Actual	Comment	Reference
A	437	HIS	-	expression tag	UNP Q99538
A	438	HIS	-	expression tag	UNP Q99538
A	439	HIS	-	expression tag	UNP Q99538
A	440	HIS	-	expression tag	UNP Q99538
A	441	HIS	-	expression tag	UNP Q99538
A	442	HIS	-	expression tag	UNP Q99538
A	443	HIS	-	expression tag	UNP Q99538
B	0	MET	-	initiating methionine	UNP Q99538
B	1	LYS	-	expression tag	UNP Q99538
B	2	LEU	-	expression tag	UNP Q99538
B	3	CYS	-	expression tag	UNP Q99538
B	4	ILE	-	expression tag	UNP Q99538
B	5	LEU	-	expression tag	UNP Q99538
B	6	LEU	-	expression tag	UNP Q99538
B	7	ALA	-	expression tag	UNP Q99538
B	8	VAL	-	expression tag	UNP Q99538
B	9	VAL	-	expression tag	UNP Q99538
B	10	ALA	-	expression tag	UNP Q99538
B	11	PHE	-	expression tag	UNP Q99538
B	12	VAL	-	expression tag	UNP Q99538
B	13	GLY	-	expression tag	UNP Q99538
B	14	LEU	-	expression tag	UNP Q99538
B	15	SER	-	expression tag	UNP Q99538
B	16	LEU	-	expression tag	UNP Q99538
B	17	GLY	-	expression tag	UNP Q99538
B	147	SNN	ASP	conflict	UNP Q99538
B	272	GLN	ASN	conflict	UNP Q99538
B	434	VAL	-	expression tag	UNP Q99538
B	435	ASP	-	expression tag	UNP Q99538
B	436	HIS	-	expression tag	UNP Q99538
B	437	HIS	-	expression tag	UNP Q99538
B	438	HIS	-	expression tag	UNP Q99538
B	439	HIS	-	expression tag	UNP Q99538
B	440	HIS	-	expression tag	UNP Q99538
B	441	HIS	-	expression tag	UNP Q99538
B	442	HIS	-	expression tag	UNP Q99538
B	443	HIS	-	expression tag	UNP Q99538
D	0	MET	-	initiating methionine	UNP Q99538
D	1	LYS	-	expression tag	UNP Q99538
D	2	LEU	-	expression tag	UNP Q99538
D	3	CYS	-	expression tag	UNP Q99538
D	4	ILE	-	expression tag	UNP Q99538

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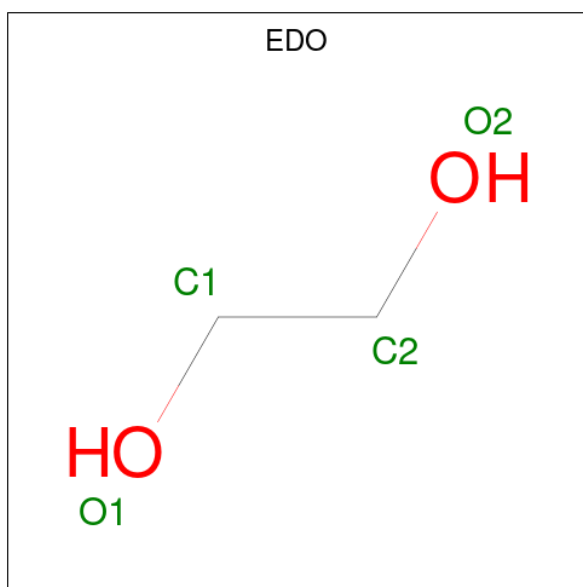
Chain	Residue	Modelled	Actual	Comment	Reference
D	5	LEU	-	expression tag	UNP Q99538
D	6	LEU	-	expression tag	UNP Q99538
D	7	ALA	-	expression tag	UNP Q99538
D	8	VAL	-	expression tag	UNP Q99538
D	9	VAL	-	expression tag	UNP Q99538
D	10	ALA	-	expression tag	UNP Q99538
D	11	PHE	-	expression tag	UNP Q99538
D	12	VAL	-	expression tag	UNP Q99538
D	13	GLY	-	expression tag	UNP Q99538
D	14	LEU	-	expression tag	UNP Q99538
D	15	SER	-	expression tag	UNP Q99538
D	16	LEU	-	expression tag	UNP Q99538
D	17	GLY	-	expression tag	UNP Q99538
D	147	SNN	ASP	conflict	UNP Q99538
D	272	GLN	ASN	conflict	UNP Q99538
D	434	VAL	-	expression tag	UNP Q99538
D	435	ASP	-	expression tag	UNP Q99538
D	436	HIS	-	expression tag	UNP Q99538
D	437	HIS	-	expression tag	UNP Q99538
D	438	HIS	-	expression tag	UNP Q99538
D	439	HIS	-	expression tag	UNP Q99538
D	440	HIS	-	expression tag	UNP Q99538
D	441	HIS	-	expression tag	UNP Q99538
D	442	HIS	-	expression tag	UNP Q99538
D	443	HIS	-	expression tag	UNP Q99538

- Molecule 2 is N-[(3S)-5-amino-5-oxopent-1-en-3-yl]-1-{1-[4-(cyclopropylmethoxy)phenyl]cyclopropane-1-carbonyl}-L-prolinamide (three-letter code: WR9) (formula: C₂₄H₃₁N₃O₄) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	C	N	O	0	0
			31	24	3	4		
2	B	1	Total	C	N	O	0	0
			31	24	3	4		
2	D	1	Total	C	N	O	0	0
			31	24	3	4		

- Molecule 3 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: C₂H₆O₂).



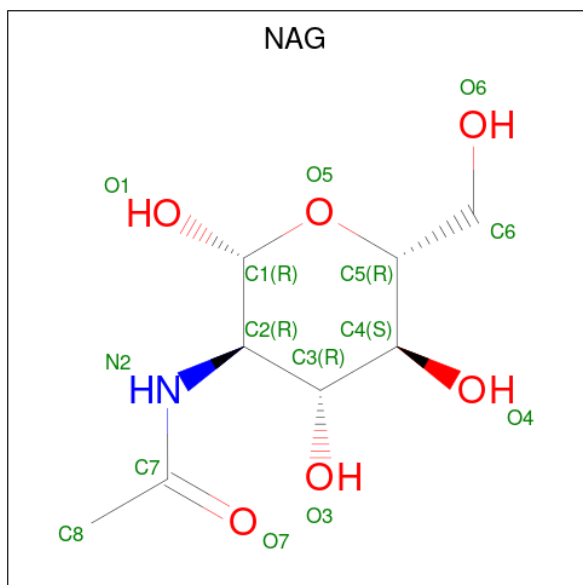
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			4	2	2		

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

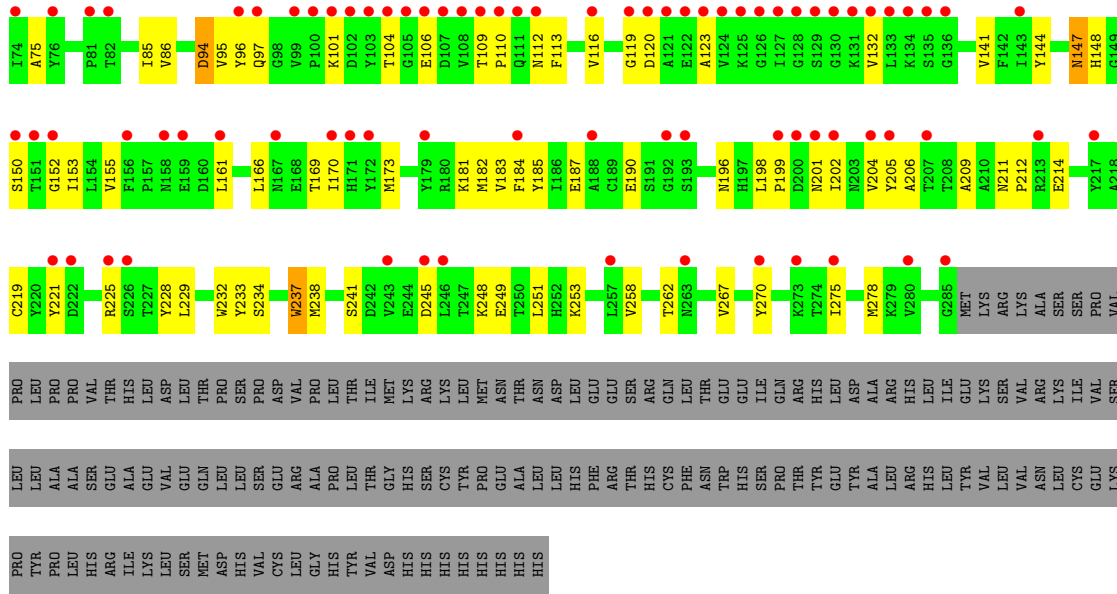
- Molecule 4 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula: $C_8H_{15}NO_6$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	A	1	Total	C	N	O	0	0
			14	8	1	5		
4	B	1	Total	C	N	O	0	0
			14	8	1	5		

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	43	Total	O	0	0
			43	43		
5	B	45	Total	O	0	0
			45	45		



4 Data and refinement statistics

Property	Value	Source
Space group	P 3 2 1	Depositor
Cell constants a, b, c, α , β , γ	117.80Å 117.80Å 102.81Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	51.46 – 2.18 51.41 – 2.18	Depositor EDS
% Data completeness (in resolution range)	65.1 (51.46-2.18) 65.1 (51.41-2.18)	Depositor EDS
R_{merge}	0.24	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.65 (at 2.18Å)	Xtrriage
Refinement program	REFMAC 5.8.0267	Depositor
R, R_{free}	0.223 , 0.272 0.225 , 0.272	Depositor DCC
R_{free} test set	1465 reflections (4.96%)	wwPDB-VP
Wilson B-factor (Å ²)	34.6	Xtrriage
Anisotropy	0.103	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.31 , 26.9	EDS
L-test for twinning ²	$\langle L \rangle = 0.51$, $\langle L^2 \rangle = 0.34$	Xtrriage
Estimated twinning fraction	0.017 for -h,-k,l	Xtrriage
F_o, F_c correlation	0.92	EDS
Total number of atoms	6505	wwPDB-VP
Average B, all atoms (Å ²)	41.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.11% 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: NAG, EDO, SNN, WR9

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	0.64	0/2165	0.80	0/2936
1	B	0.65	0/2143	0.79	0/2907
1	D	0.65	0/2131	0.70	0/2892
All	All	0.65	0/6439	0.76	0/8735

There are no bond length outliers.

There are no bond angle outliers.

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	2112	0	1993	8	0
1	B	2094	0	1971	11	0
1	D	2082	0	1960	66	0
2	A	31	0	0	0	0
2	B	31	0	0	0	0
2	D	31	0	0	0	0
3	A	4	0	6	0	0
3	B	4	0	6	0	0
4	A	14	0	13	1	0
4	B	14	0	13	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	A	43	0	0	0	0
5	B	45	0	0	1	0
All	All	6505	0	5962	85	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 (85) 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:245:ASP:OD2	1:D:248:LYS:HG2	1.61	1.00
1:D:67:VAL:HG11	1:D:116:VAL:HG11	1.47	0.94
1:D:28:LYS:HB3	1:D:65:GLN:OE1	1.88	0.72
1:D:55:ILE:O	1:D:59:ASN:ND2	2.22	0.71
1:D:86:VAL:O	1:D:95:VAL:HG22	1.90	0.71
1:D:245:ASP:OD2	1:D:248:LYS:CG	2.38	0.70
1:D:211:ASN:ND2	1:D:214:GLU:OE2	2.28	0.66
1:D:221:TYR:HB2	1:D:228:TYR:CE1	2.32	0.64
1:D:198:LEU:HD21	1:D:204:VAL:HG12	1.82	0.62
1:D:75:ALA:HB2	1:D:96:TYR:CE1	2.34	0.62
1:D:166:LEU:O	1:D:170:ILE:HG13	2.00	0.62
1:D:183:VAL:HA	1:D:205:TYR:O	2.02	0.59
1:D:152:GLY:O	1:D:153:ILE:HG13	2.04	0.58
1:D:116:VAL:HA	1:D:132:VAL:HG12	1.87	0.56
1:D:56:ILE:HG23	1:D:61:ILE:HD12	1.87	0.56
1:D:187:GLU:OE1	1:D:233:TYR:HB3	2.05	0.56
1:D:70:MET:O	1:D:104:THR:HA	2.06	0.56
1:D:190:GLU:HG2	1:D:212:PRO:O	2.06	0.56
1:D:182:MET:CE	1:D:204:VAL:HG22	2.38	0.53
1:D:52:ALA:O	1:D:56:ILE:HG12	2.09	0.53
1:D:37:SER:OG	1:D:42:ASN:HB3	2.09	0.53
1:A:199:PRO:HD3	4:A:503:NAG:O3	2.10	0.52
1:D:101:LYS:O	1:D:101:LYS:HG3	2.09	0.52
1:D:55:ILE:HD13	1:D:241:SER:HB2	1.91	0.52
1:B:183:VAL:HA	1:B:205:TYR:O	2.10	0.51
1:D:198:LEU:HD21	1:D:204:VAL:CG1	2.41	0.51
1:B:90:PRO:HD3	1:B:220:TYR:CG	2.45	0.51
1:D:190:GLU:CG	1:D:212:PRO:O	2.59	0.50
1:D:199:PRO:HD2	1:D:202:ILE:HD13	1.94	0.50
1:D:112:ASN:O	1:D:116:VAL:HG23	2.11	0.50
1:D:258:VAL:HG12	1:D:267:VAL:HG21	1.93	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:169:THR:O	1:D:173:MET:HG3	2.12	0.49
1:D:209:ALA:HA	1:D:233:TYR:CD2	2.48	0.49
1:D:211:ASN:ND2	1:D:214:GLU:CD	2.66	0.49
1:D:86:VAL:HB	1:D:96:TYR:HB2	1.95	0.49
1:D:249:GLU:HG3	1:D:253:LYS:HD3	1.95	0.48
1:A:198:LEU:HD21	1:A:204:VAL:HG12	1.95	0.48
1:B:89:ARG:HA	1:B:220:TYR:CD2	2.50	0.47
1:D:110:PRO:HB3	1:D:161:LEU:HB2	1.95	0.47
1:D:182:MET:HE2	1:D:204:VAL:HG22	1.95	0.47
1:D:97:GLN:HA	1:D:97:GLN:OE1	2.14	0.47
1:D:67:VAL:HG11	1:D:116:VAL:CG1	2.33	0.47
1:A:141:VAL:O	1:A:182:MET:HA	2.15	0.46
1:D:119:GLY:HA2	1:D:132:VAL:HB	1.97	0.46
1:D:56:ILE:HG22	1:D:61:ILE:HB	1.96	0.46
1:D:147:SNN:O5	1:D:148:HIS:HB2	2.15	0.46
1:B:118:ARG:HD3	5:B:620:HOH:O	2.16	0.46
1:D:199:PRO:HD2	1:D:202:ILE:CD1	2.46	0.46
1:D:225:ARG:HD3	1:D:229:LEU:HD21	1.98	0.45
1:D:234:SER:HB3	1:D:238:MET:HE2	1.98	0.45
1:D:147:SNN:O5	1:D:155:VAL:HB	2.15	0.45
1:B:70:MET:O	1:B:104:THR:HA	2.16	0.45
1:D:184:PHE:O	1:D:206:ALA:HA	2.16	0.45
1:D:46:GLN:HE22	1:D:71:TYR:HB3	1.81	0.45
1:D:101:LYS:HB2	1:D:104:THR:HG23	1.98	0.45
1:D:144:TYR:HA	1:D:185:TYR:O	2.17	0.45
1:B:184:PHE:O	1:B:206:ALA:HA	2.17	0.45
1:A:70:MET:O	1:A:104:THR:HA	2.17	0.44
1:B:140:HIS:CE1	1:B:282:GLN:HG3	2.53	0.44
1:D:219:CYS:HB3	1:D:232:TRP:CD1	2.53	0.44
1:A:210:ALA:HB1	1:A:214:GLU:HG3	1.99	0.43
1:D:201:ASN:OD1	1:D:201:ASN:N	2.50	0.43
1:D:150:SER:OG	1:D:153:ILE:HB	2.18	0.43
1:D:258:VAL:O	1:D:262:THR:OG1	2.28	0.43
1:D:237:TRP:CH2	1:D:238:MET:HG2	2.53	0.43
1:B:31:VAL:HA	1:B:142:PHE:O	2.19	0.42
1:B:40:TRP:O	1:B:43:TYR:HB2	2.19	0.42
1:D:196:ASN:HA	1:D:270:TYR:CD1	2.55	0.42
1:A:181:LYS:HD2	1:A:275:ILE:HG12	2.01	0.42
1:D:141:VAL:O	1:D:182:MET:HA	2.19	0.42
1:D:85:ILE:HG23	1:D:94:ASP:HB2	2.02	0.41
1:D:181:LYS:HG3	1:D:278:MET:CE	2.50	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:34:VAL:HG21	1:D:113:PHE:CD1	2.55	0.41
1:D:237:TRP:CE2	1:D:238:MET:HG3	2.54	0.41
1:D:106:GLU:HA	1:D:106:GLU:OE2	2.20	0.41
1:D:120:ASP:OD2	1:D:123:ALA:HB2	2.21	0.41
1:A:187:GLU:O	1:A:188:ALA:HB2	2.21	0.41
1:D:182:MET:HE3	1:D:204:VAL:HG22	2.03	0.41
1:D:251:LEU:HD12	1:D:275:ILE:O	2.21	0.41
1:B:56:ILE:HG23	1:B:61:ILE:HD12	2.03	0.40
1:D:198:LEU:HD12	1:D:198:LEU:HA	1.99	0.40
1:D:46:GLN:HE22	1:D:71:TYR:CB	2.33	0.40
1:D:75:ALA:CB	1:D:96:TYR:CE1	3.02	0.40
1:A:40:TRP:O	1:A:43:TYR:HB2	2.21	0.40
1:B:75:ALA:HB2	1:B:96:TYR:CD1	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	260/444 (59%)	250 (96%)	10 (4%)	0	100	100
1	B	258/444 (58%)	253 (98%)	5 (2%)	0	100	100
1	D	256/444 (58%)	237 (93%)	18 (7%)	1 (0%)	34	35
All	All	774/1332 (58%)	740 (96%)	33 (4%)	1 (0%)	51	58

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	D	94	ASP

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	229/396 (58%)	227 (99%)	2 (1%)	78	87
1	B	227/396 (57%)	225 (99%)	2 (1%)	78	87
1	D	226/396 (57%)	223 (99%)	3 (1%)	69	79
All	All	682/1188 (57%)	675 (99%)	7 (1%)	76	85

All (7) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	101	LYS
1	A	274	THR
1	B	146	THR
1	B	282	GLN
1	D	63	ASP
1	D	109	THR
1	D	237	TRP

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

Mol	Chain	Res	Type
1	D	59	ASN
1	D	88	ASN
1	D	211	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](#)

3 non-standard protein/DNA/RNA residues 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
1	SNN	B	147	1	5,6,8	1.07	0	3,6,11	3.76	3 (100%)
1	SNN	D	147	1	5,6,8	0.73	0	3,6,11	3.09	2 (66%)
1	SNN	A	147	1	5,6,8	1.09	0	3,6,11	3.37	3 (100%)

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
1	SNN	B	147	1	-	3/3/5/12	-
1	SNN	D	147	1	-	3/3/5/12	-
1	SNN	A	147	1	-	3/3/5/12	-

There are no bond length outliers.

All (8) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	147	SNN	C4-CA-C	-4.69	102.68	111.44
1	D	147	SNN	C4-CA-C	-4.42	103.19	111.44
1	A	147	SNN	C4-CA-C	-4.01	103.95	111.44
1	B	147	SNN	CA-C4-C5	-3.56	100.95	114.44
1	A	147	SNN	CA-C4-C5	-3.21	102.28	114.44
1	D	147	SNN	CA-C4-C5	-2.89	103.50	114.44
1	B	147	SNN	O5-C5-C4	-2.79	117.31	125.43
1	A	147	SNN	O5-C5-C4	-2.77	117.36	125.43

There are no chirality outliers.

All (9) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	A	147	SNN	O-C-CA-C4
1	A	147	SNN	C5-C4-CA-N

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Mol	Chain	Res	Type	Atoms
1	B	147	SNN	O-C-CA-C4
1	B	147	SNN	C5-C4-CA-N
1	D	147	SNN	O-C-CA-C4
1	D	147	SNN	C5-C4-CA-N
1	D	147	SNN	CA-C4-C5-O5
1	A	147	SNN	CA-C4-C5-O5
1	B	147	SNN	CA-C4-C5-O5

There are no ring outliers.

1 monomer is involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	D	147	SNN	2	0

5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

5.6 Ligand geometry [i](#)

7 ligands are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
3	EDO	B	503	-	3,3,3	0.11	0	2,2,2	0.12	0
2	WR9	A	501	1	32,34,34	0.22	0	43,49,49	0.22	0
4	NAG	B	502	1	14,14,15	0.45	0	17,19,21	0.73	0
4	NAG	A	503	1	14,14,15	0.70	0	17,19,21	0.87	0
3	EDO	A	502	-	3,3,3	0.17	0	2,2,2	0.33	0
2	WR9	D	501	1	32,34,34	0.21	0	43,49,49	0.44	0
2	WR9	B	501	1	32,34,34	0.23	0	43,49,49	0.27	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
3	EDO	B	503	-	-	0/1/1/1	-
2	WR9	A	501	1	-	4/35/51/51	0/4/4/4
4	NAG	B	502	1	-	2/6/23/26	0/1/1/1
4	NAG	A	503	1	-	2/6/23/26	0/1/1/1
3	EDO	A	502	-	-	0/1/1/1	-
2	WR9	D	501	1	-	8/35/51/51	0/4/4/4
2	WR9	B	501	1	-	4/35/51/51	0/4/4/4

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (20) torsion outliers are listed below:

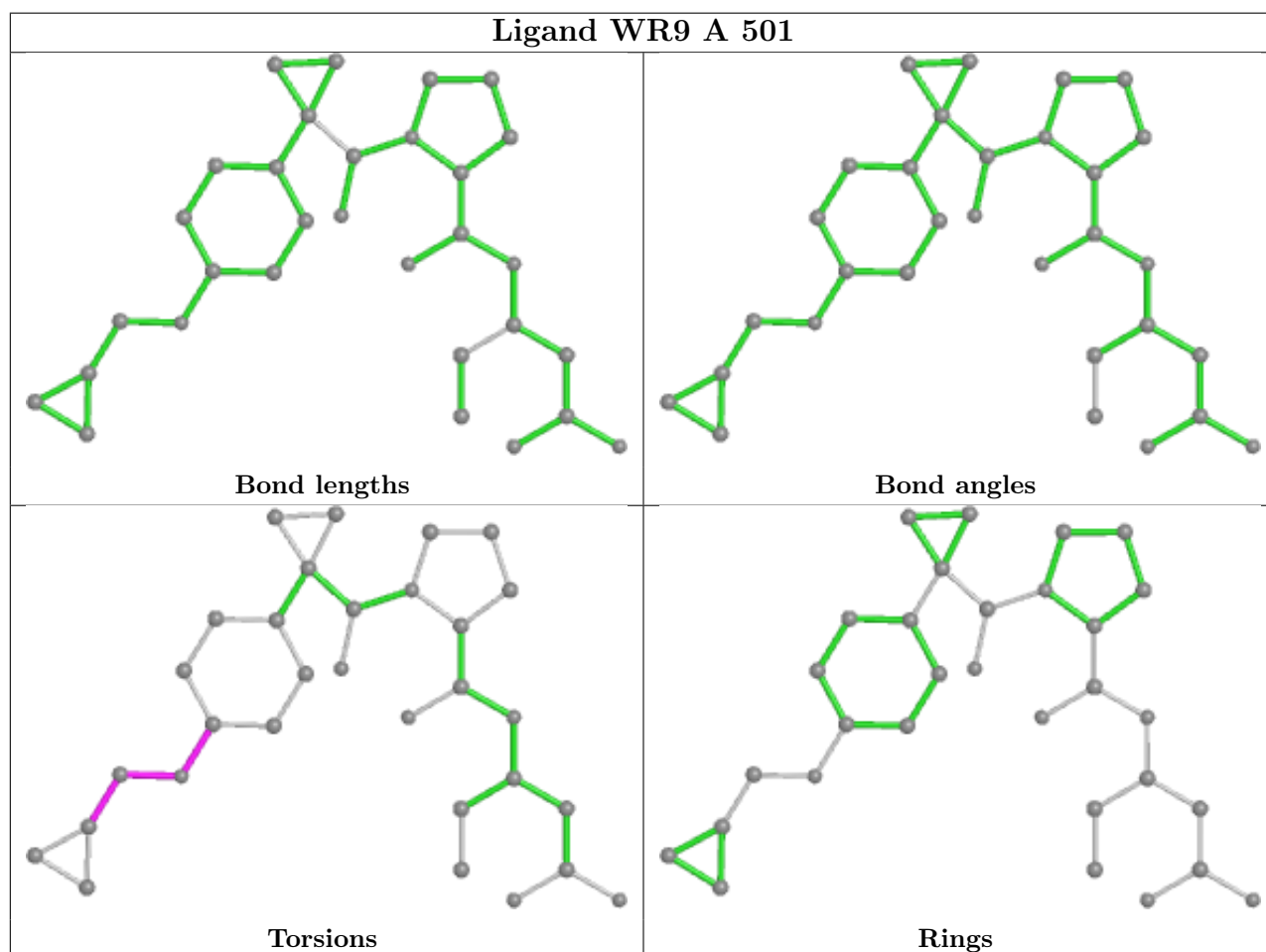
Mol	Chain	Res	Type	Atoms
2	A	501	WR9	O24-C25-C26-C27
2	A	501	WR9	C22-C23-O24-C25
2	A	501	WR9	C29-C23-O24-C25
2	B	501	WR9	C22-C23-O24-C25
2	B	501	WR9	C29-C23-O24-C25
2	D	501	WR9	C22-C23-O24-C25
2	D	501	WR9	C3-C4-N6-C7
2	D	501	WR9	C26-C25-O24-C23
2	D	501	WR9	O5-C4-N6-C7
2	D	501	WR9	C29-C23-O24-C25
4	B	502	NAG	O5-C5-C6-O6
2	A	501	WR9	C26-C25-O24-C23
4	B	502	NAG	C4-C5-C6-O6
4	A	503	NAG	C4-C5-C6-O6
2	D	501	WR9	C18-C17-C20-C21
2	D	501	WR9	C18-C17-C20-C30
2	D	501	WR9	C11-C10-C7-N6
2	B	501	WR9	O5-C4-N6-C7
4	A	503	NAG	O5-C5-C6-O6
2	B	501	WR9	C26-C25-O24-C23

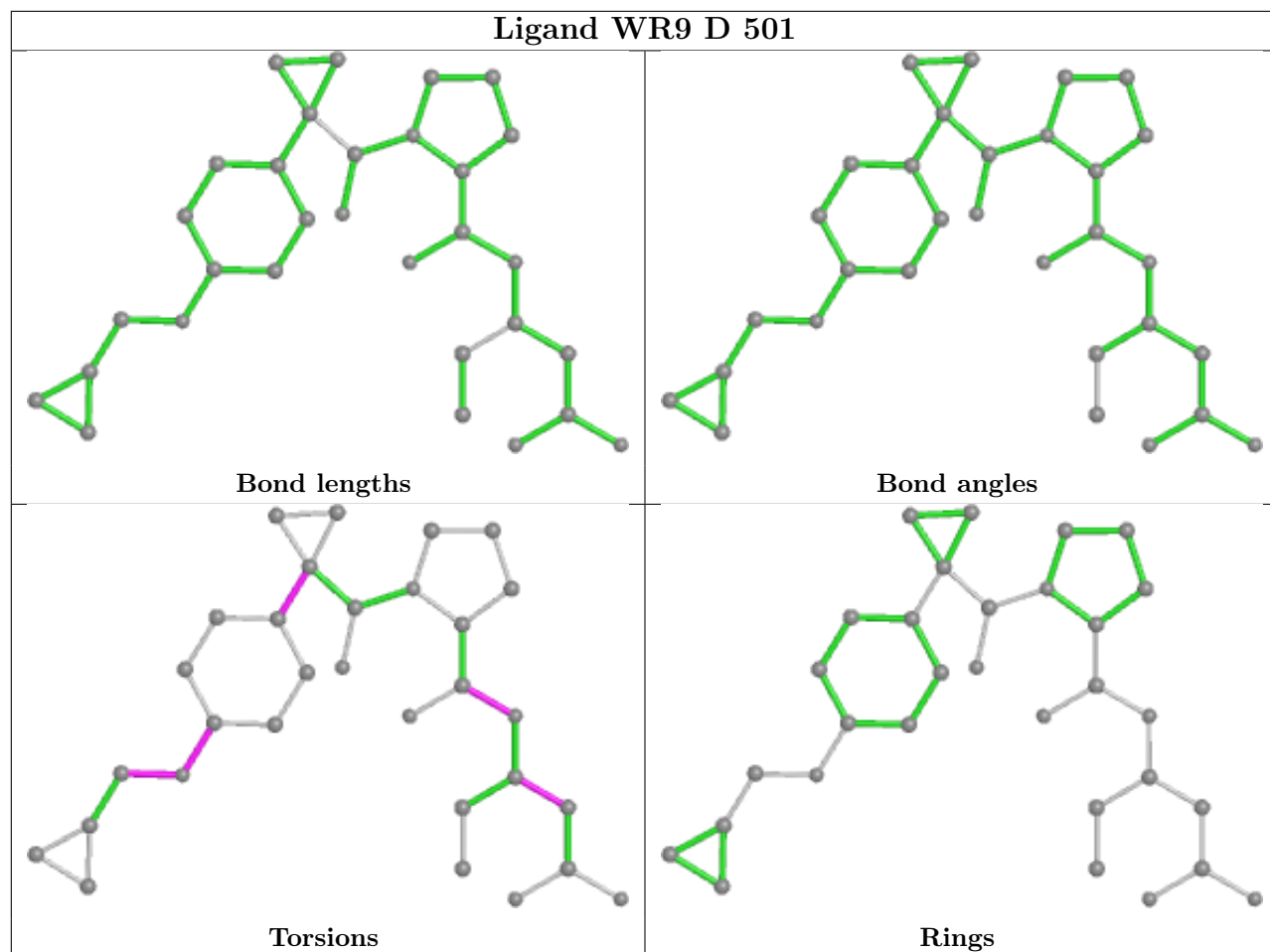
There are no ring outliers.

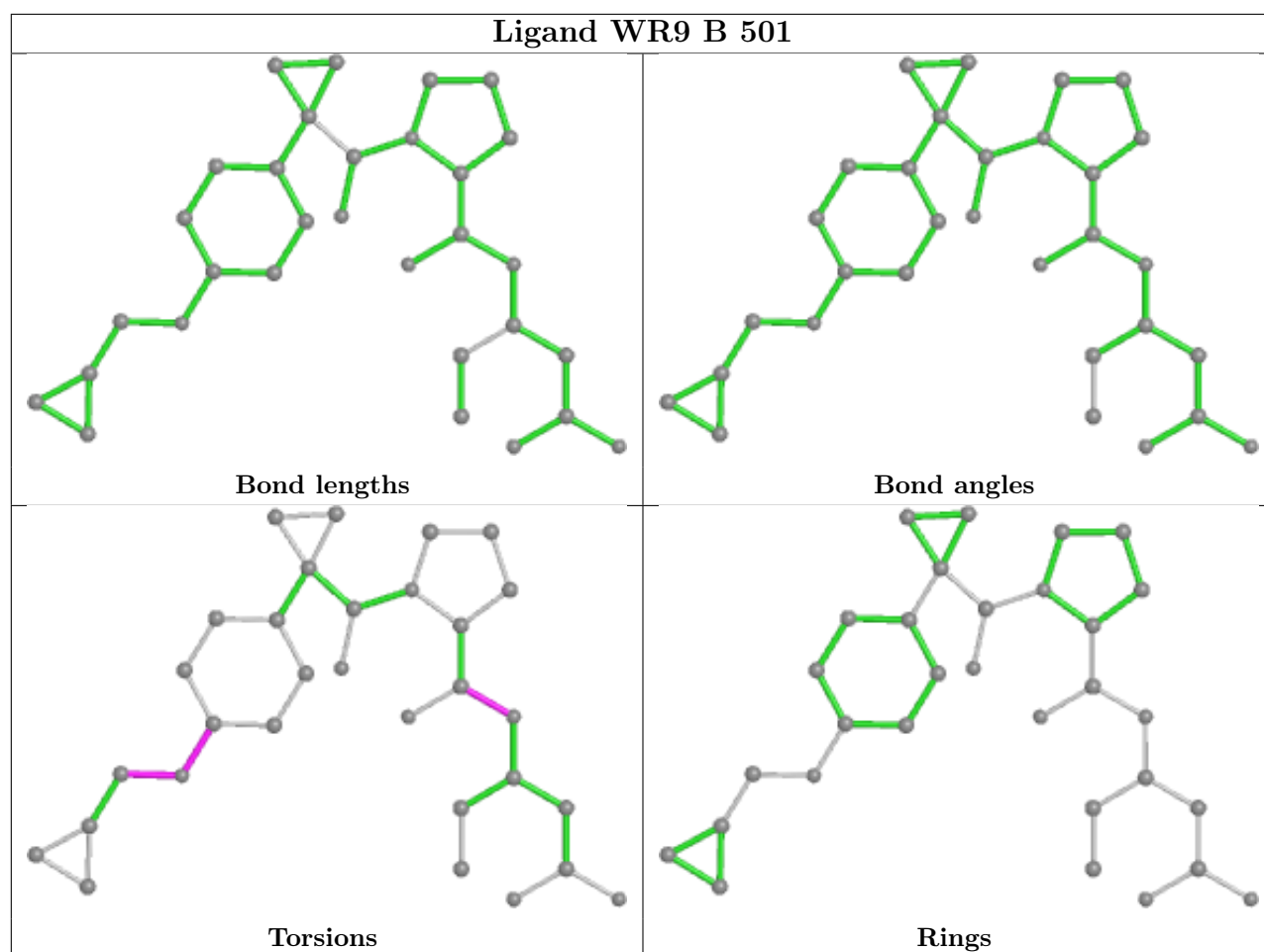
1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	503	NAG	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	261/444 (58%)	-0.10	4 (1%) 73 74	20, 36, 53, 72	0
1	B	260/444 (58%)	0.07	7 (2%) 54 55	22, 36, 58, 83	0
1	D	258/444 (58%)	1.98	90 (34%) 0 0	20, 47, 81, 124	258 (100%)
All	All	779/1332 (58%)	0.64	101 (12%) 3 3	20, 38, 71, 124	258 (33%)

All (101) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	124	VAL	14.6
1	D	133	LEU	8.1
1	D	152	GLY	7.9
1	D	193	SER	7.8
1	D	123	ALA	7.6
1	D	81	PRO	7.4
1	D	109	THR	6.7
1	D	151	THR	6.7
1	D	125	LYS	6.3
1	D	126	GLY	6.2
1	D	103	TYR	6.1
1	D	134	LYS	5.9
1	D	41	TYR	5.9
1	D	280	VAL	5.7
1	D	132	VAL	5.6
1	D	171	HIS	5.6
1	B	41	TYR	5.6
1	D	122	GLU	5.6
1	D	120	ASP	5.6
1	B	26	GLY	5.4
1	D	170	ILE	5.2
1	D	167	ASN	5.1
1	D	172	TYR	5.1

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Mol	Chain	Res	Type	RSRZ
1	D	156	PHE	5.0
1	D	108	VAL	5.0
1	D	225	ARG	4.8
1	D	111	GLN	4.7
1	D	101	LYS	4.7
1	D	82	THR	4.4
1	D	200	ASP	4.4
1	D	131	LYS	4.1
1	D	107	ASP	4.1
1	D	204	VAL	4.1
1	D	129	SER	4.0
1	D	106	GLU	4.0
1	D	179	TYR	3.9
1	D	71	TYR	3.8
1	D	158	ASN	3.8
1	D	110	PRO	3.6
1	D	135	SER	3.6
1	A	26	GLY	3.6
1	D	130	GLY	3.6
1	D	104	THR	3.5
1	D	127	ILE	3.5
1	D	105	GLY	3.5
1	D	205	TYR	3.4
1	B	223	GLU	3.3
1	D	159	GLU	3.2
1	D	201	ASN	3.2
1	D	128	GLY	3.2
1	D	29	HIS	3.1
1	D	202	ILE	3.1
1	D	263	ASN	3.1
1	D	76	TYR	3.0
1	D	121	ALA	3.0
1	A	91	ASN	3.0
1	B	78	GLU	3.0
1	D	74	ILE	2.9
1	D	112	ASN	2.8
1	B	39	GLY	2.8
1	D	161	LEU	2.8
1	D	246	LEU	2.8
1	D	275	ILE	2.8
1	D	217	TYR	2.8
1	D	222	ASP	2.7

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Mol	Chain	Res	Type	RSRZ
1	D	199	PRO	2.7
1	D	67	VAL	2.7
1	D	213	ARG	2.7
1	D	119	GLY	2.6
1	D	184	PHE	2.6
1	D	63	ASP	2.5
1	D	102	ASP	2.5
1	D	62	PRO	2.5
1	D	285	GLY	2.5
1	D	136	GLY	2.5
1	D	143	ILE	2.4
1	D	188	ALA	2.4
1	D	99	VAL	2.4
1	D	116	VAL	2.4
1	D	96	TYR	2.4
1	B	171	HIS	2.4
1	D	257	LEU	2.3
1	D	150	SER	2.3
1	D	100	PRO	2.3
1	D	192	GLY	2.3
1	D	35	ALA	2.3
1	D	207	THR	2.3
1	D	97	GLN	2.2
1	D	245	ASP	2.2
1	D	68	VAL	2.1
1	D	273	LYS	2.1
1	B	84	GLY	2.1
1	D	221	TYR	2.1
1	D	56	ILE	2.1
1	D	270	TYR	2.1
1	D	243	VAL	2.1
1	A	287	LYS	2.1
1	D	60	GLY	2.1
1	A	228	TYR	2.0
1	D	66	ILE	2.0
1	D	226	SER	2.0

6.2 Non-standard residues in protein, DNA, RNA chains [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(\AA^2)	Q<0.9
1	SNN	D	147	7/8	0.89	0.12	26,27,28,28	7
1	SNN	B	147	7/8	0.92	0.11	23,27,30,34	0
1	SNN	A	147	7/8	0.98	0.08	15,17,18,18	0

6.3 Carbohydrates [i](#)

There are no monosaccharides in this entry.

6.4 Ligands [i](#)

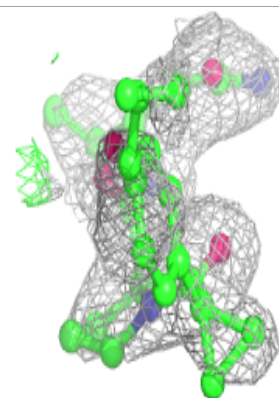
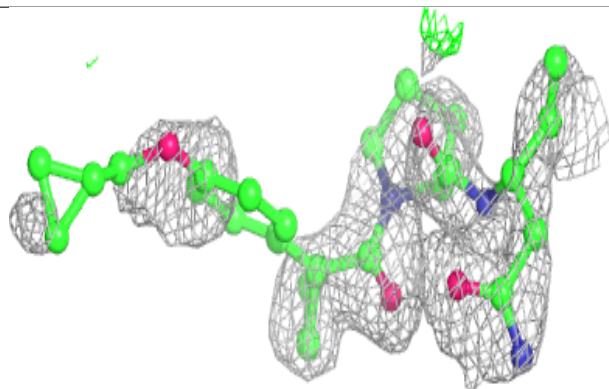
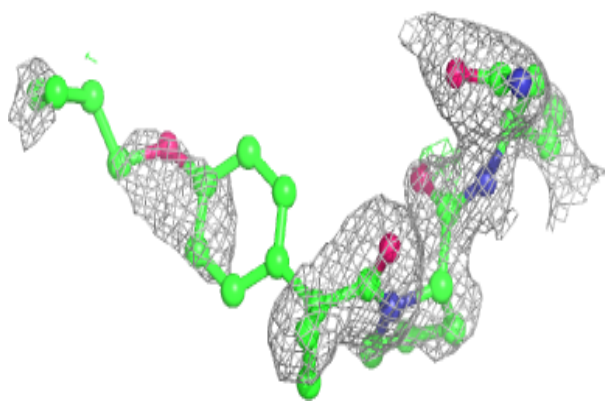
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
4	NAG	A	503	14/15	0.52	0.35	64,72,77,79	0
2	WR9	D	501	31/31	0.74	0.28	29,36,52,52	31
4	NAG	B	502	14/15	0.85	0.23	47,53,61,62	0
2	WR9	B	501	31/31	0.87	0.19	32,51,97,98	0
3	EDO	A	502	4/4	0.89	0.18	42,43,44,45	0
2	WR9	A	501	31/31	0.95	0.14	24,34,54,56	0
3	EDO	B	503	4/4	0.98	0.12	26,26,26,27	0

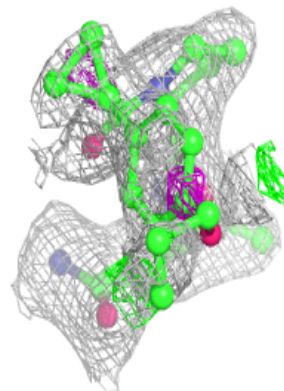
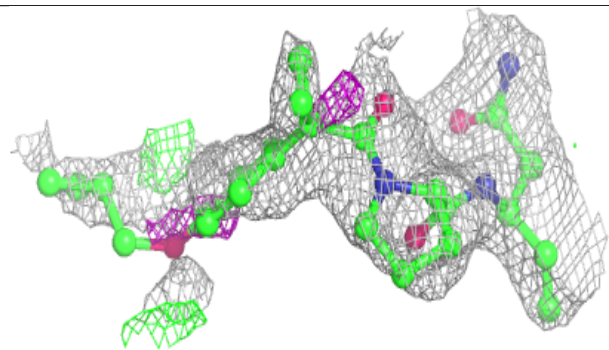
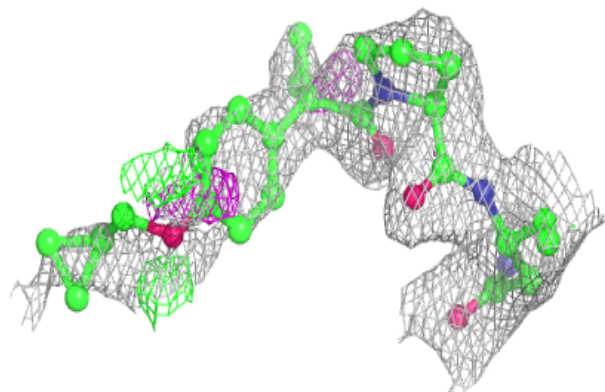
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

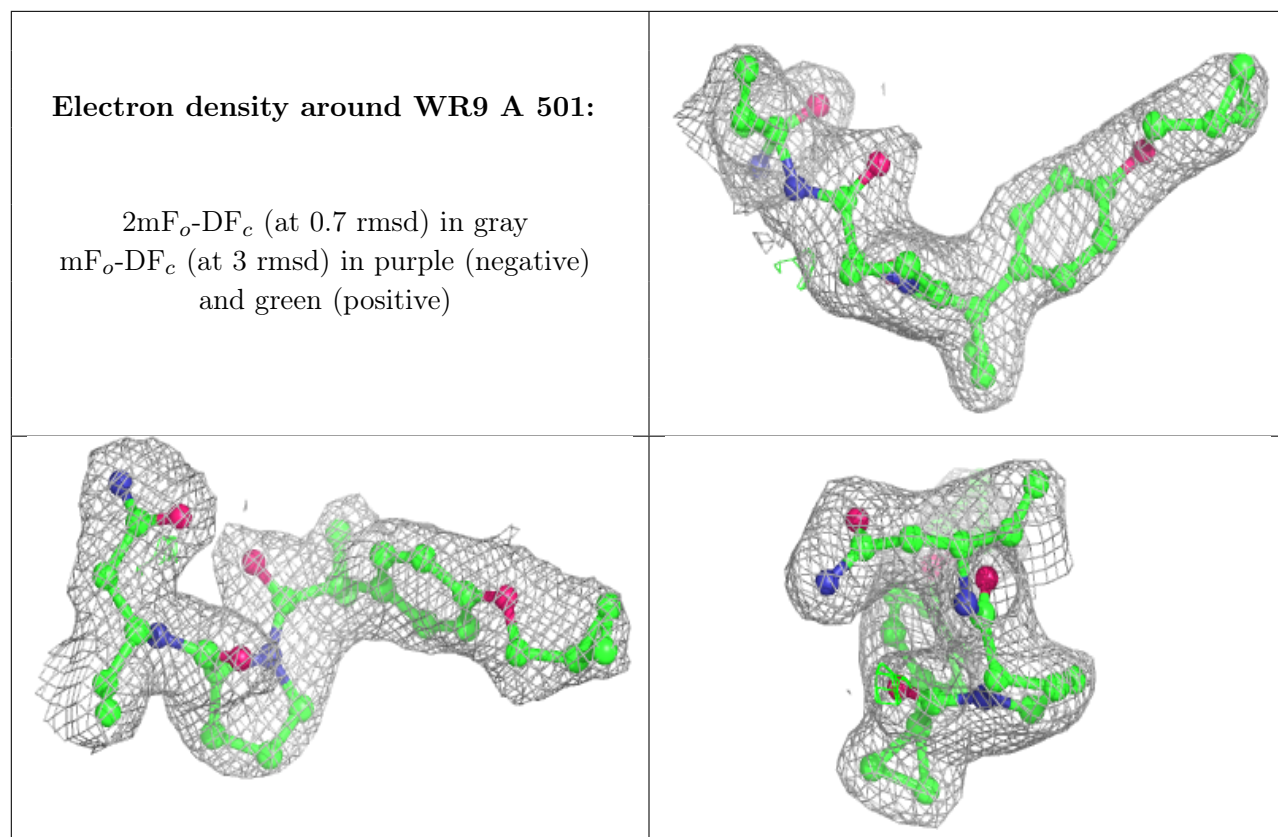
Electron density around WR9 D 501:

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

**Electron density around WR9 B 501:**

$2mF_o-DF_c$ (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.