



Full wwPDB X-ray Structure Validation Report ⓘ

Dec 10, 2023 – 04:16 am GMT

PDB ID : 8QYU
Title : Beta-cardiac myosin S1 fragment in the pre-powerstroke state complexed to Omecamtiv mecarbil
Authors : Robert-Paganin, J.; Kikuti, C.; Auguin, D.; Rety, S.; David, A.; Houdusse, A.
Deposited on : 2023-10-26
Resolution : 1.96 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 : 1.8.4, 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

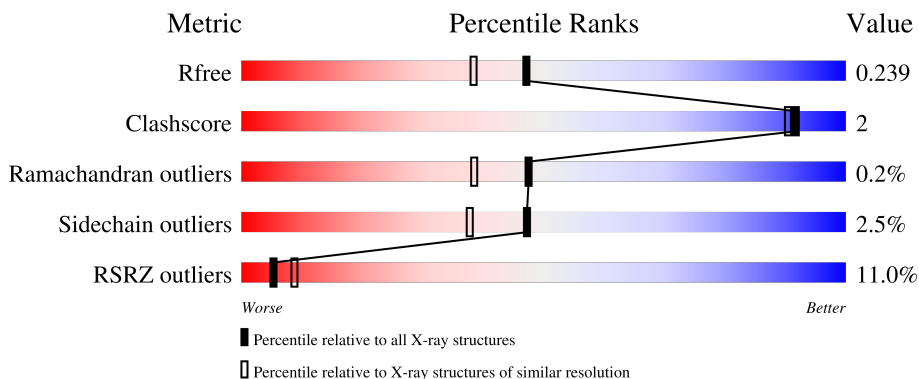
1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.96 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	2580 (1.96-1.96)
Clashscore	141614	2705 (1.96-1.96)
Ramachandran outliers	138981	2678 (1.96-1.96)
Sidechain outliers	138945	2678 (1.96-1.96)
RSRZ outliers	127900	2539 (1.96-1.96)

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	810	<div style="display: flex; align-items: center;"> <div style="width: 7%; height: 10px; background-color: red; margin-right: 5px;"></div> <div style="width: 89%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 5%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 5%; height: 10px; background-color: grey;"></div> </div> <p style="margin-left: 20px;">7% 89% 5% • 5%</p>
1	B	810	<div style="display: flex; align-items: center;"> <div style="width: 10%; height: 10px; background-color: red; margin-right: 5px;"></div> <div style="width: 88%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 5%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 7%; height: 10px; background-color: grey;"></div> </div> <p style="margin-left: 20px;">10% 88% 5% 7%</p>
2	G	199	<div style="display: flex; align-items: center;"> <div style="width: 25%; height: 10px; background-color: red; margin-right: 5px;"></div> <div style="width: 66%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 5%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 30%; height: 10px; background-color: grey;"></div> </div> <p style="margin-left: 20px;">25% 66% • 30%</p>
2	H	199	<div style="display: flex; align-items: center;"> <div style="width: 9%; height: 10px; background-color: red; margin-right: 5px;"></div> <div style="width: 73%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 5%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 22%; height: 10px; background-color: grey;"></div> </div> <p style="margin-left: 20px;">9% 73% 5% 22%</p>

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard

residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
4	VO4	B	902	-	-	X	-

2 Entry composition [i](#)

There are 11 unique types of molecules in this entry. The entry contains 15636 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.

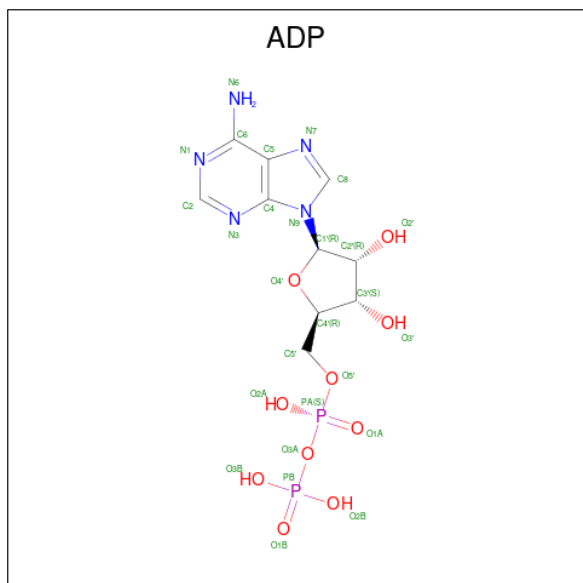
- Molecule 1 is a protein called Myosin-7.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	768	Total 6224	C 3976	N 1064	O 1151	S 33	0	2	0
1	B	756	Total 6127	C 3927	N 1039	O 1128	S 33	0	3	0

- Molecule 2 is a protein called Myosin light chain 3.

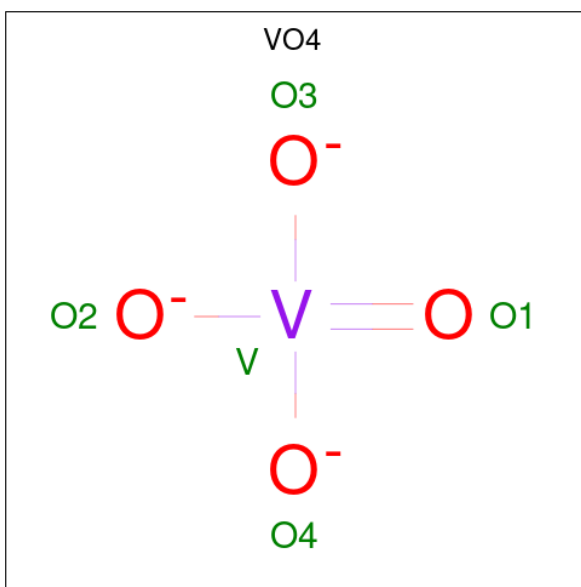
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	G	140	Total 1117	C 710	N 182	O 215	S 10	0	0	0
2	H	155	Total 1231	C 776	N 205	O 240	S 10	0	1	0

- Molecule 3 is ADENOSINE-5'-DIPHOSPHATE (three-letter code: ADP) (formula: $C_{10}H_{15}N_5O_{10}P_2$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	P		
3	A	1	27	10	5	10	2	0	0
3	B	1	27	10	5	10	2	0	0

- Molecule 4 is VANADATE ION (three-letter code: VO4) (formula: O₄V) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	O	V		
4	A	1	5	4	1	0	0
4	B	1	5	4	1	0	0

- Molecule 5 is MAGNESIUM ION (three-letter code: MG) (formula: Mg) (labeled as "Ligand of Interest" by depositor).

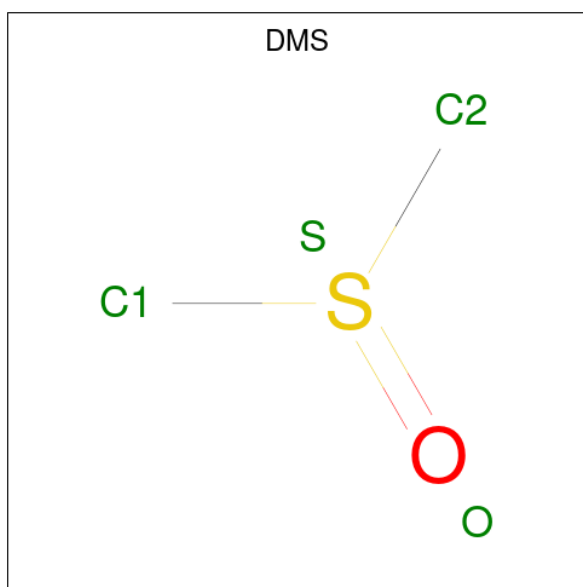
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Mg		
5	A	1	1	1	0	0
5	B	1	1	1	0	0

- Molecule 6 is FORMIC ACID (three-letter code: FMT) (formula: CH₂O₂).



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

- Molecule 7 is DIMETHYL SULFOXIDE (three-letter code: DMS) (formula: C₂H₆OS).



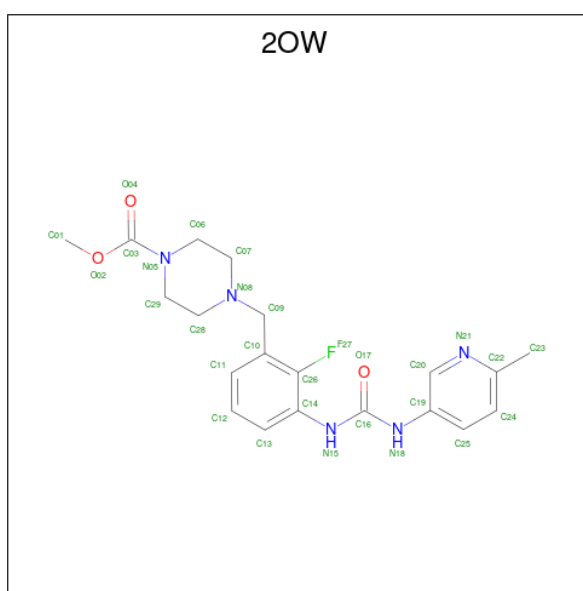
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
7	A	1	Total	C	O	S	0	0
			4	2	1	1		

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

- Molecule 8 is methyl 4-(2-fluoro-3-[(6-methylpyridin-3-yl)carbamoyl]amino)benzyl)piperazine-1-carboxylate (three-letter code: 2OW) (formula: C₂₀H₂₄FN₅O₃) (labeled as "Ligand of Interest" by depositor).



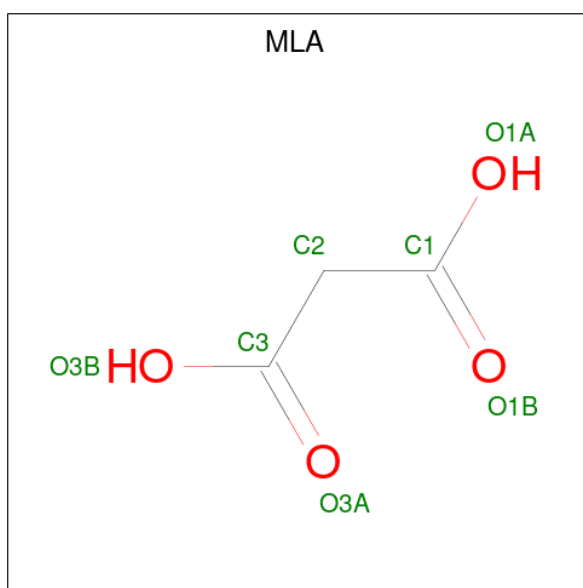
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	
8	A	1	Total	C	F	N	O	0	0
			29	20	1	5	3		
8	B	1	Total	C	F	N	O	0	0
			29	20	1	5	3		

- Molecule 9 is GLYCEROL (three-letter code: GOL) (formula: C₃H₈O₃).



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

- Molecule 10 is MALONIC ACID (three-letter code: MLA) (formula: $C_3H_4O_4$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
10	B	1	Total	C	O	0	0
			7	3	4		

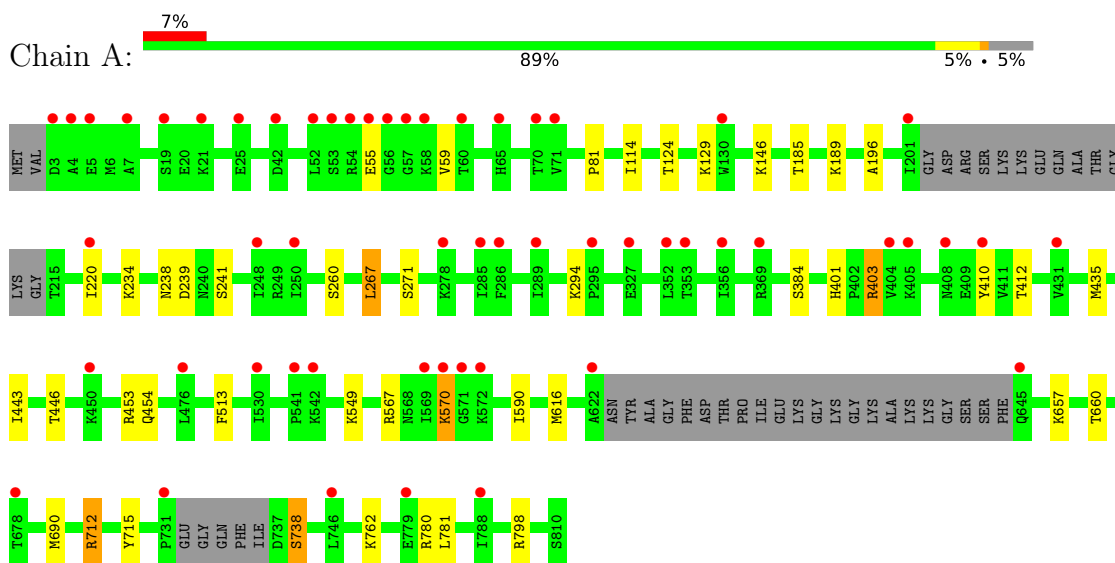
- Molecule 11 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
11	A	366	Total 366	O 366	0	0
11	B	324	Total 324	O 324	0	0
11	G	17	Total 17	O 17	0	0
11	H	62	Total 62	O 62	0	0

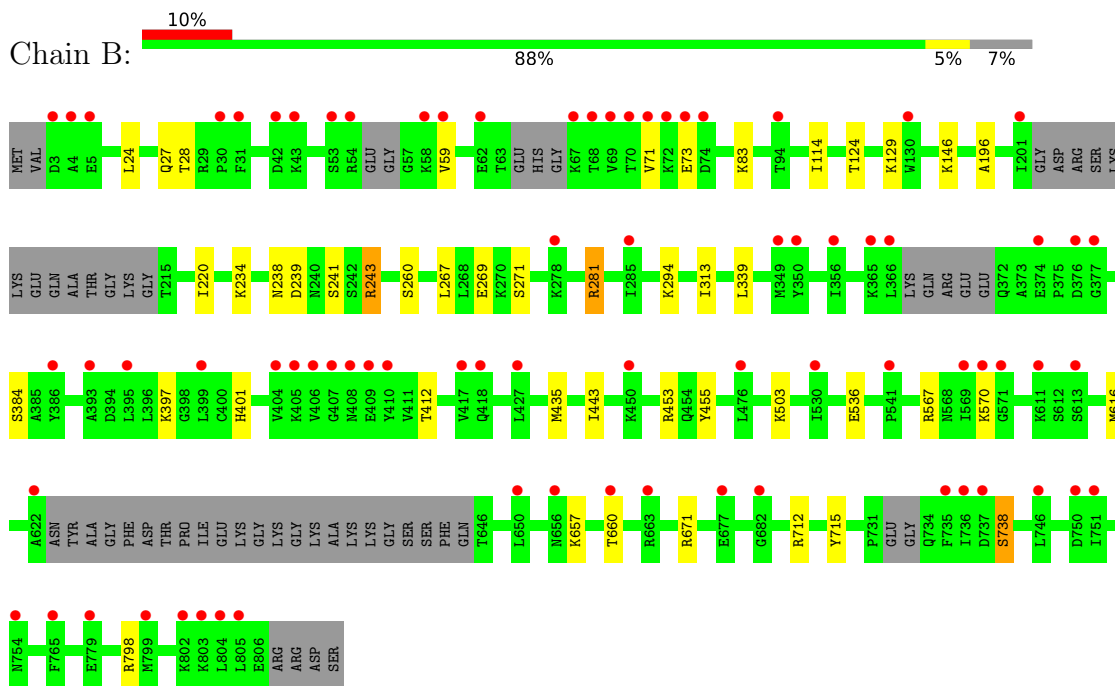
3 Residue-property plots [i](#)

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: Myosin-7



- Molecule 1: Myosin-7



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	98.00Å 122.50Å 187.46Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	22.63 – 1.96 22.58 – 1.96	Depositor EDS
% Data completeness (in resolution range)	57.2 (22.63-1.96) 57.4 (22.58-1.96)	Depositor EDS
R_{merge}	0.15	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.55 (at 1.96Å)	Xtrriage
Refinement program	BUSTER 2.10.2	Depositor
R, R_{free}	0.191 , 0.235 0.193 , 0.239	Depositor DCC
R_{free} test set	4645 reflections (5.02%)	wwPDB-VP
Wilson B-factor (Å ²)	29.1	Xtrriage
Anisotropy	0.170	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.38 , 64.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	15636	wwPDB-VP
Average B, all atoms (Å ²)	38.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.81% 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: ADP, MG, DMS, 2OW, FMT, VO4, GOL, MLA, M3L

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	0.51	0/6328	0.66	0/8525
1	B	0.52	0/6231	0.66	1/8394 (0.0%)
2	G	0.47	0/1134	0.65	0/1520
2	H	0.49	0/1253	0.67	0/1679
All	All	0.51	0/14946	0.66	1/20118 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	281	ARG	CB-CG-CD	-5.46	97.41	111.60

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	6224	0	6213	19	0
1	B	6127	0	6129	18	0
2	G	1117	0	1106	5	0
2	H	1231	0	1221	5	0
3	A	27	0	12	0	0
3	B	27	0	12	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	A	5	0	0	1	0
4	B	5	0	0	4	0
5	A	1	0	0	0	0
5	B	1	0	0	0	0
6	A	3	0	2	0	0
6	B	6	0	3	0	0
7	A	12	0	18	1	0
7	B	4	0	6	0	0
8	A	29	0	24	0	0
8	B	29	0	24	0	0
9	B	12	0	16	0	0
10	B	7	0	2	0	0
11	A	366	0	0	1	0
11	B	324	0	0	1	0
11	G	17	0	0	0	0
11	H	62	0	0	0	0
All	All	15636	0	14788	46	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 2.

All (46) 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)
2:G:55:ILE:HD12	2:G:119:LEU:HD21	1.68	0.76
2:H:55:ILE:HD12	2:H:119:LEU:HD21	1.68	0.75
2:H:75:ILE:HB	2:H:79:GLN:HG3	1.76	0.68
4:B:902:VO4:O4	4:B:902:VO4:V	1.54	0.65
4:A:902:VO4:V	4:A:902:VO4:O4	1.54	0.63
2:G:75:ILE:HB	2:G:79:GLN:HG3	1.81	0.62
4:B:902:VO4:V	4:B:902:VO4:O2	1.57	0.62
4:B:902:VO4:V	4:B:902:VO4:O3	1.59	0.59
1:A:196:ALA:HB2	1:A:220:ILE:HD11	1.86	0.58
1:B:281:ARG:HD3	11:B:1103:HOH:O	2.07	0.54
1:A:660:THR:HG21	1:B:660:THR:OG1	2.09	0.53
1:A:781:LEU:HD22	2:H:143:VAL:HG11	1.91	0.51
1:A:657:LYS:HG2	1:B:657:LYS:HG2	1.93	0.51
1:B:27:GLN:HG3	1:B:28:THR:HG23	1.94	0.50
1:B:798:ARG:HD3	2:G:85:ARG:O	2.10	0.50
1:A:454:GLN:HG2	1:B:536:GLU:OE2	2.12	0.49
1:B:24:LEU:HA	1:B:27:GLN:HG2	1.94	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:401:HIS:HB3	1:A:412:THR:HB	1.96	0.47
1:B:59:VAL:HG23	1:B:73:GLU:HG2	1.95	0.47
3:B:901:ADP:O1B	4:B:902:VO4:O3	2.33	0.47
1:A:513:PHE:H	7:A:905:DMS:H12	1.79	0.46
2:G:63:THR:HG22	2:G:73:MET:SD	2.55	0.46
1:B:114:ILE:O	1:B:124:THR:HA	2.16	0.46
1:A:435:MET:HG3	1:A:616:MET:HE2	1.97	0.46
1:A:715:TYR:HB3	1:A:738:SER:HB3	1.97	0.46
1:B:196:ALA:HB2	1:B:220:ILE:HD11	1.99	0.45
1:B:339:LEU:HD13	1:B:443:ILE:HG12	1.98	0.45
1:B:401:HIS:HB3	1:B:412:THR:HB	1.98	0.45
1:A:185:THR:HG22	1:A:189:LYS:HE2	1.99	0.44
1:B:715:TYR:HB3	1:B:738:SER:HB3	1.99	0.44
1:A:403:ARG:HB3	1:A:410:TYR:HB3	2.00	0.43
1:A:712:ARG:HG3	1:A:762:LYS:HD3	2.00	0.43
1:B:238:ASN:HB3	1:B:241:SER:HB2	1.99	0.43
1:A:443:ILE:O	1:A:446:THR:HG22	2.19	0.43
1:A:435:MET:HG3	1:A:616:MET:CE	2.49	0.42
1:B:234:LYS:HG2	1:B:239:ASP:HA	2.02	0.42
1:A:114:ILE:O	1:A:124:THR:HA	2.20	0.41
1:A:238:ASN:HB3	1:A:241:SER:HB2	2.01	0.41
2:H:75:ILE:HB	2:H:79:GLN:CG	2.49	0.41
1:A:81:PRO:HB2	11:A:1240:HOH:O	2.19	0.41
1:B:657:LYS:O	1:B:660:THR:HB	2.21	0.41
1:A:234:LYS:HG2	1:A:239:ASP:HA	2.02	0.41
1:B:435:MET:HG3	1:B:616:MET:CE	2.51	0.41
2:G:75:ILE:HB	2:G:79:GLN:CG	2.50	0.41
1:A:798:ARG:HD3	2:H:85:ARG:O	2.21	0.41
1:B:243:ARG:HD3	1:B:269:GLU:OE1	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	760/810 (94%)	739 (97%)	19 (2%)	2 (0%)	41	30
1	B	743/810 (92%)	726 (98%)	16 (2%)	1 (0%)	51	43
2	G	134/199 (67%)	132 (98%)	2 (2%)	0	100	100
2	H	152/199 (76%)	149 (98%)	3 (2%)	0	100	100
All	All	1789/2018 (89%)	1746 (98%)	40 (2%)	3 (0%)	47	38

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	570	LYS
1	B	267	LEU
1	A	267	LEU

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	669/698 (96%)	652 (98%)	17 (2%)	47	38
1	B	660/698 (95%)	642 (97%)	18 (3%)	44	34
2	G	122/165 (74%)	121 (99%)	1 (1%)	81	80
2	H	135/165 (82%)	132 (98%)	3 (2%)	52	44
All	All	1586/1726 (92%)	1547 (98%)	39 (2%)	47	38

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

Mol	Chain	Res	Type
1	A	55	GLU
1	A	59	VAL
1	A	146	LYS
1	A	260	SER
1	A	267	LEU
1	A	271	SER
1	A	294	LYS
1	A	384	SER

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Mol	Chain	Res	Type
1	A	403	ARG
1	A	453	ARG
1	A	567	ARG
1	A	570	LYS
1	A	590	ILE
1	A	690	MET
1	A	712	ARG
1	A	738	SER
1	A	780	ARG
1	B	71	VAL
1	B	83	LYS
1	B	146	LYS
1	B	243	ARG
1	B	260	SER
1	B	271	SER
1	B	294	LYS
1	B	313	ILE
1	B	384	SER
1	B	397	LYS
1	B	453	ARG
1	B	455	TYR
1	B	503	LYS
1	B	567	ARG
1	B	570	LYS
1	B	671	ARG
1	B	712	ARG
1	B	738	SER
2	G	110	SER
2	H	57	GLU
2	H	110	SER
2	H	131	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	661	ASN
1	B	288	GLN

5.3.3 RNA

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains

4 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	M3L	A	129	1	10,11,12	0.91	1 (10%)	9,14,16	0.62	0
1	M3L	A	549	1	10,11,12	1.07	1 (10%)	9,14,16	0.51	0
1	M3L	B	549	1	10,11,12	0.67	0	9,14,16	0.62	0
1	M3L	B	129	1	10,11,12	1.02	1 (10%)	9,14,16	0.69	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
1	M3L	A	129	1	-	0/9/10/12	-
1	M3L	A	549	1	-	1/9/10/12	-
1	M3L	B	549	1	-	1/9/10/12	-
1	M3L	B	129	1	-	0/9/10/12	-

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	549	M3L	CB-CA	3.19	1.57	1.53
1	B	129	M3L	CB-CA	2.95	1.57	1.53
1	A	129	M3L	CB-CA	2.68	1.57	1.53

There are no bond angle outliers.

There are no chirality outliers.

All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	B	549	M3L	CA-CB-CG-CD

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Mol	Chain	Res	Type	Atoms
1	A	549	M3L	CA-CB-CG-CD

There are no ring outliers.

No monomer is involved in short contacts.

5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 18 ligands modelled in this entry, 2 are monoatomic - leaving 16 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	FMT	A	904	-	2,2,2	1.17	0	1,1,1	1.19	0
4	VO4	B	902	5,3	1,4,4	1.16	0	-		
9	GOL	B	908	-	5,5,5	0.11	0	5,5,5	0.20	0
4	VO4	A	902	5,3	1,4,4	0.25	0	-		
6	FMT	B	905	-	2,2,2	1.09	0	1,1,1	1.18	0
3	ADP	A	901	5,4	24,29,29	0.61	0	29,45,45	0.74	1 (3%)
9	GOL	B	907	-	5,5,5	0.03	0	5,5,5	0.16	0
3	ADP	B	901	5,4	24,29,29	0.62	0	29,45,45	0.76	1 (3%)
7	DMS	A	907	-	3,3,3	0.56	0	3,3,3	0.47	0
8	2OW	A	908	-	31,31,31	0.31	0	41,42,42	0.63	0
7	DMS	A	906	-	3,3,3	0.40	0	3,3,3	0.76	0
7	DMS	B	906	-	3,3,3	0.32	0	3,3,3	0.82	0
10	MLA	B	909	-	6,6,6	1.21	0	7,7,7	1.47	2 (28%)
7	DMS	A	905	-	3,3,3	0.26	0	3,3,3	0.39	0
8	2OW	B	910	-	31,31,31	0.43	0	41,42,42	0.60	0
6	FMT	B	904	-	2,2,2	1.19	0	1,1,1	1.12	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
9	GOL	B	908	-	-	0/4/4/4	-
9	GOL	B	907	-	-	0/4/4/4	-
3	ADP	A	901	5,4	-	3/12/32/32	0/3/3/3
3	ADP	B	901	5,4	-	2/12/32/32	0/3/3/3
8	2OW	A	908	-	-	5/18/28/28	1/3/3/3
10	MLA	B	909	-	-	2/4/4/4	-
8	2OW	B	910	-	-	6/18/28/28	1/3/3/3

There are no bond length outliers.

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	901	ADP	C5-C6-N6	2.48	124.12	120.35
10	B	909	MLA	C3-C2-C1	-2.36	104.61	112.87
3	B	901	ADP	C5-C6-N6	2.29	123.83	120.35
10	B	909	MLA	O3B-C3-C2	2.18	121.50	114.54

There are no chirality outliers.

All (18) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	901	ADP	PA-O3A-PB-O2B
3	B	901	ADP	PA-O3A-PB-O3B
8	A	908	2OW	O04-C03-O02-C01
8	A	908	2OW	N05-C03-O02-C01
8	B	910	2OW	N05-C03-O02-C01
8	B	910	2OW	O04-C03-O02-C01
8	B	910	2OW	C26-C14-N15-C16
8	A	908	2OW	C10-C09-N08-C07
8	A	908	2OW	C10-C09-N08-C28
10	B	909	MLA	O1B-C1-C2-C3
8	B	910	2OW	C10-C09-N08-C07
10	B	909	MLA	O1A-C1-C2-C3
8	B	910	2OW	C10-C09-N08-C28
8	A	908	2OW	C26-C14-N15-C16
3	A	901	ADP	PA-O3A-PB-O1B
3	A	901	ADP	PA-O3A-PB-O3B

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Mol	Chain	Res	Type	Atoms
3	B	901	ADP	PA-O3A-PB-O2B
8	B	910	2OW	C13-C14-N15-C16

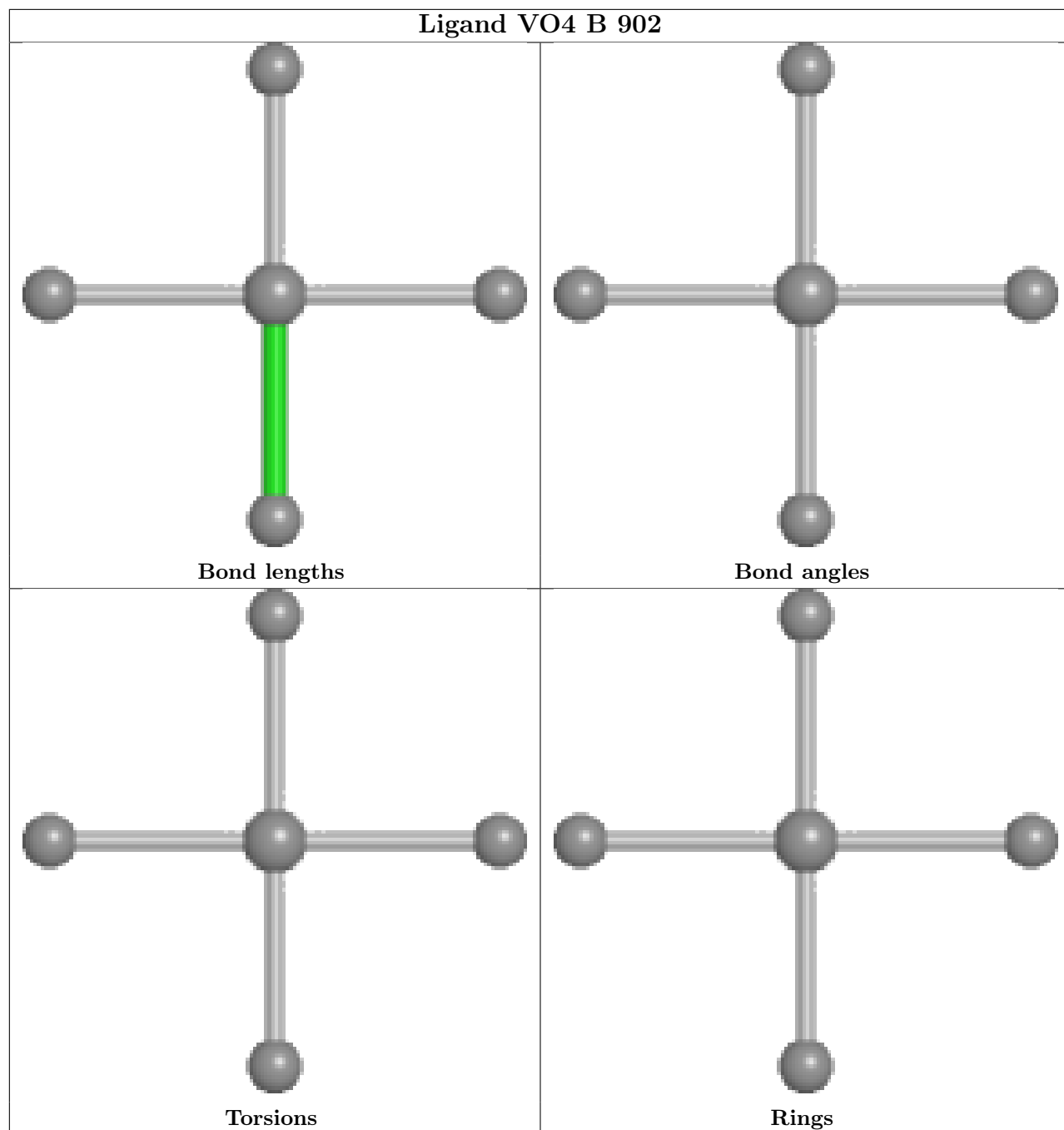
All (2) ring outliers are listed below:

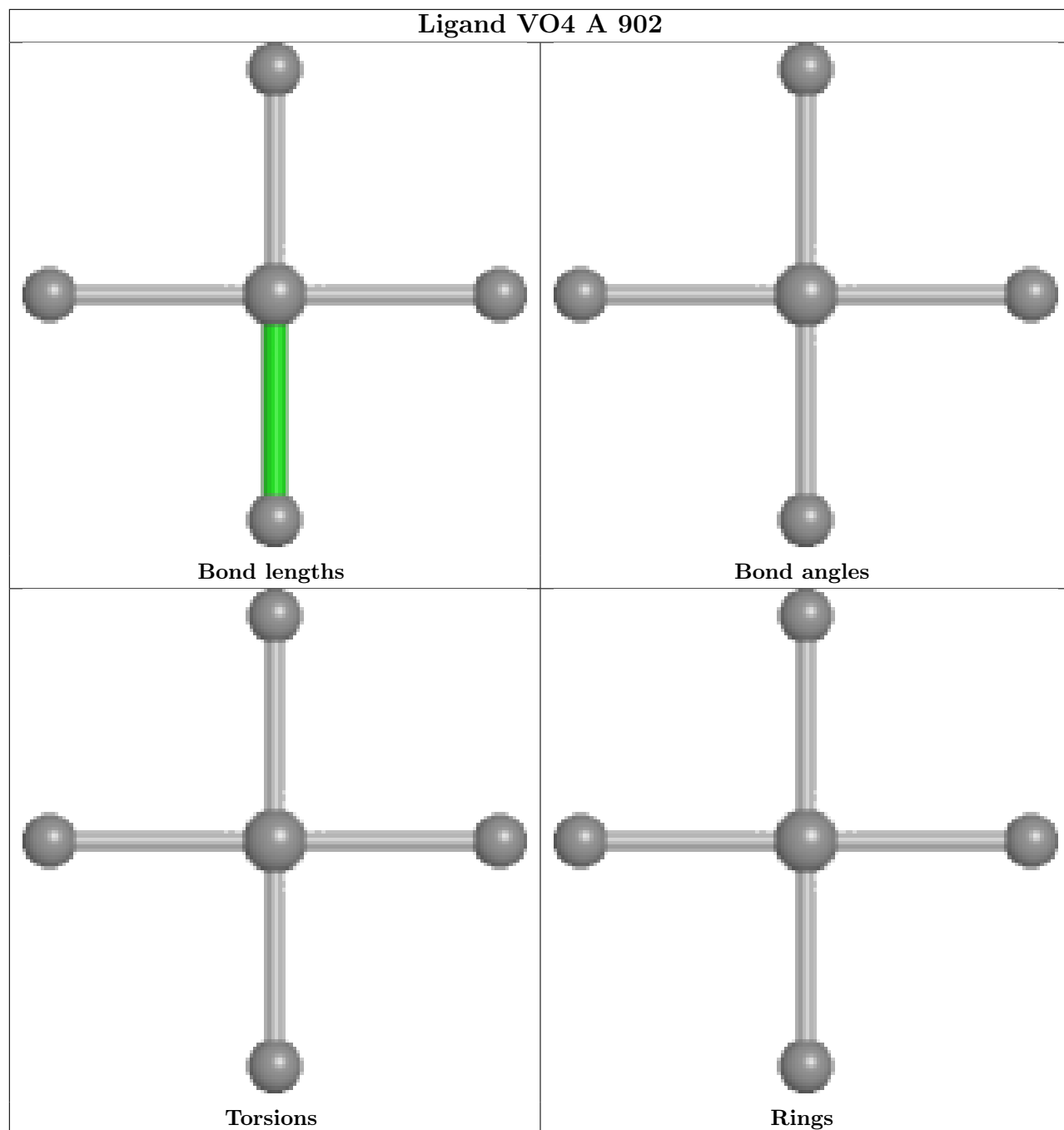
Mol	Chain	Res	Type	Atoms
8	B	910	2OW	C06-C07-C28-C29-N05-N08
8	A	908	2OW	C06-C07-C28-C29-N05-N08

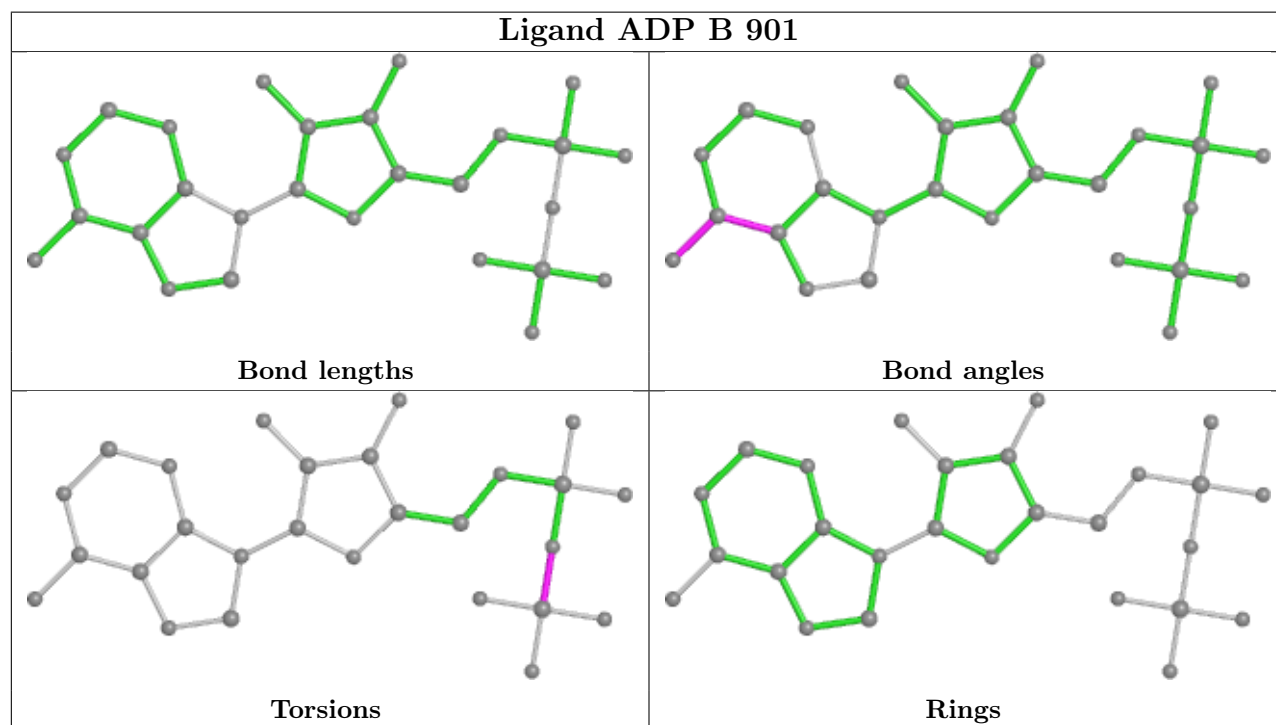
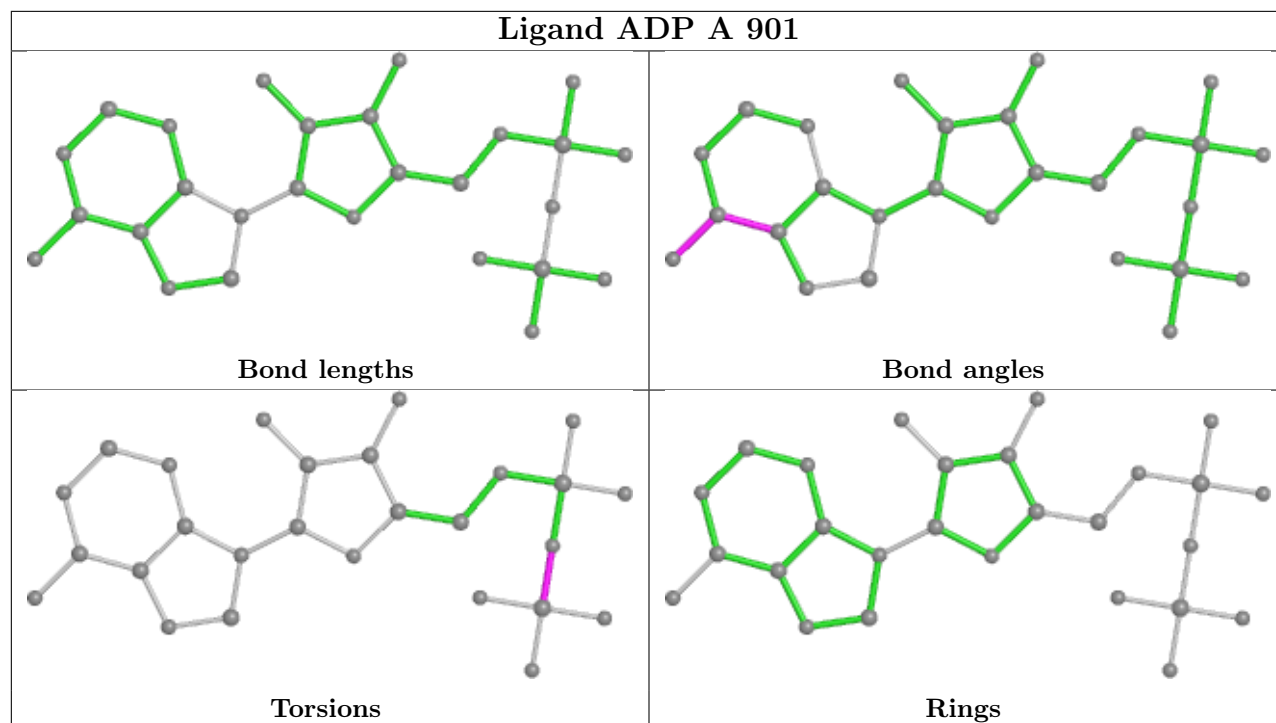
4 monomers are involved in 6 short contacts:

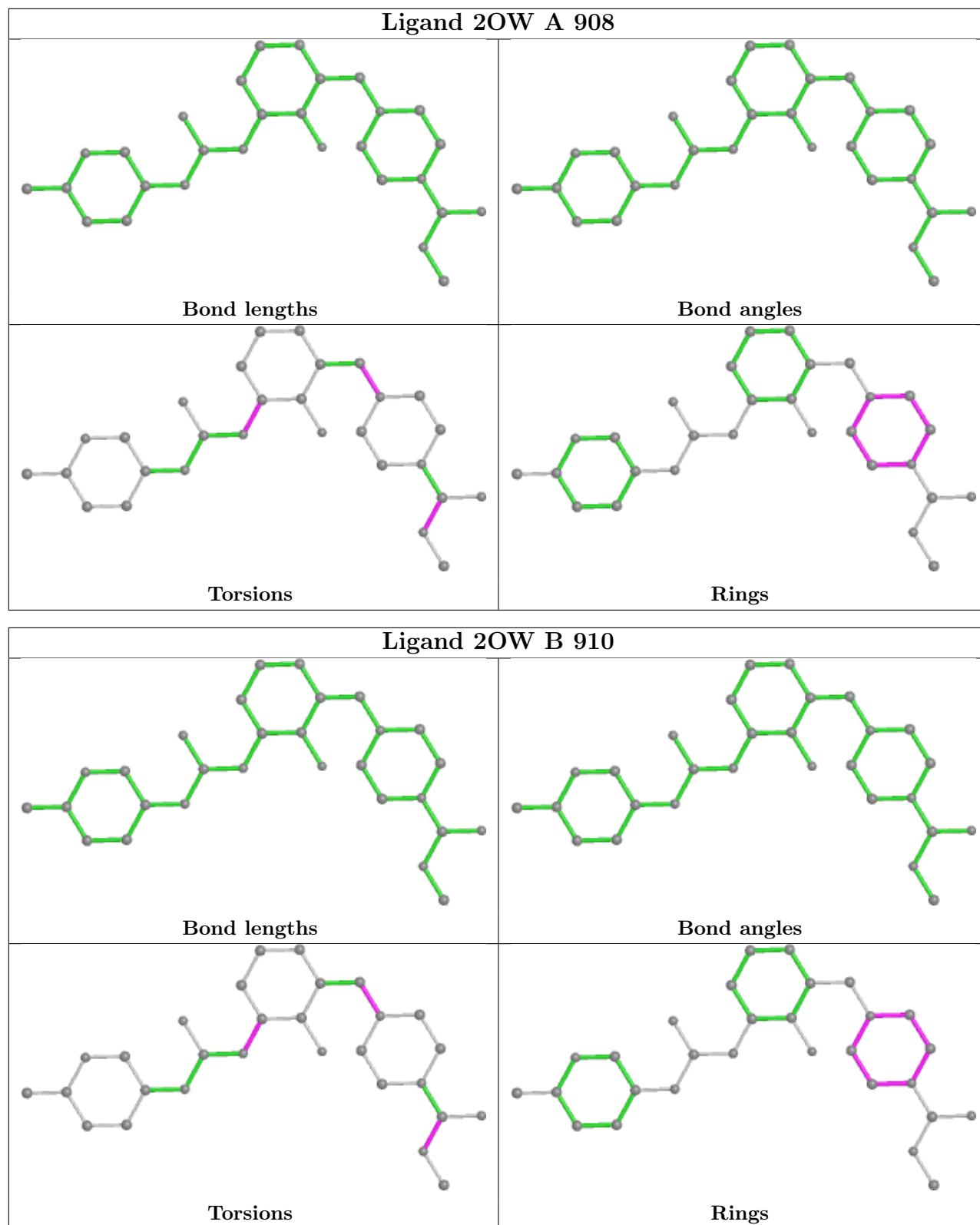
Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	B	902	VO4	4	0
4	A	902	VO4	1	0
3	B	901	ADP	1	0
7	A	905	DMS	1	0

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

There are no chain breaks in this entry.

6 Fit of model and data [i](#)

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

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

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	766/810 (94%)	0.46	55 (7%) 15 23	14, 31, 64, 99	1 (0%)
1	B	754/810 (93%)	0.62	77 (10%) 6 11	15, 33, 67, 112	0
2	G	140/199 (70%)	1.76	50 (35%) 0 0	39, 62, 94, 125	0
2	H	155/199 (77%)	0.89	18 (11%) 4 8	24, 40, 70, 92	0
All	All	1815/2018 (89%)	0.66	200 (11%) 5 9	14, 34, 72, 125	1 (0%)

All (200) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	H	45	LYS	7.9
2	G	186	CYS	7.7
1	B	735	PHE	7.4
1	A	569	ILE	7.4
1	B	408	ASN	6.7
1	B	410	TYR	6.5
1	B	407	GLY	6.5
2	G	52	PRO	6.5
2	G	153	MET	6.1
1	A	21	LYS	6.1
1	B	405	LYS	6.0
2	H	46	ILE	5.8
1	A	55	GLU	5.6
1	B	70	THR	5.5
1	A	410	TYR	5.5
1	B	42	ASP	5.5
1	A	56	GLY	5.3
1	B	622	ALA	5.2
1	B	366	LEU	5.2
1	A	571	GLY	5.1
2	H	44	SER	5.1

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Mol	Chain	Res	Type	RSRZ
2	G	50	PHE	5.0
2	G	110	SER	5.0
2	H	183	SER	4.9
1	A	570	LYS	4.8
1	B	736	ILE	4.8
1	B	68	THR	4.7
2	H	185	GLY	4.6
1	A	645	GLN	4.6
1	B	4	ALA	4.5
2	G	124	HIS	4.5
1	A	53	SER	4.5
1	B	418	GLN	4.4
2	G	67	ARG	4.4
1	B	804	LEU	4.3
1	B	417	VAL	4.2
1	B	409	GLU	4.2
2	H	184	ASN	4.2
1	B	5	GLU	4.1
1	B	406	VAL	4.1
2	G	178	ALA	4.1
2	G	99	VAL	4.1
1	B	399	LEU	4.1
1	A	542	LYS	4.1
2	G	49	GLU	4.0
2	G	51	THR	4.0
1	A	369	ARG	3.9
1	B	570	LYS	3.9
2	G	83	VAL	3.9
1	B	374	GLU	3.8
2	G	105	GLN	3.8
2	G	69	PRO	3.8
1	B	656	ASN	3.8
2	G	198	ALA	3.7
1	B	59	VAL	3.7
1	B	58	LYS	3.7
1	B	450	LYS	3.7
2	G	116	ASP	3.7
1	A	731	PRO	3.7
1	B	3	ASP	3.7
1	A	405	LYS	3.7
2	H	148	GLY	3.6
1	A	58	LYS	3.6

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Mol	Chain	Res	Type	RSRZ
1	A	7	ALA	3.5
1	B	43	LYS	3.5
2	G	84	LEU	3.5
2	G	171	ASP	3.5
1	B	377	GLY	3.5
1	B	31	PHE	3.5
1	A	42	ASP	3.5
1	A	3	ASP	3.4
1	B	72	LYS	3.4
1	B	476	LEU	3.4
2	G	127	LYS	3.4
1	A	54	ARG	3.4
1	B	799	MET	3.4
1	B	74	ASP	3.4
2	G	149	ASN	3.4
2	G	48	ILE	3.4
2	H	198	ALA	3.3
1	A	250	ILE	3.3
1	A	285	ILE	3.3
1	B	376	ASP	3.3
1	B	201	ILE	3.3
2	H	127	LYS	3.2
1	B	613	SER	3.2
1	A	19	SER	3.2
1	B	130[A]	TRP	3.2
1	A	408	ASN	3.2
2	G	104	LYS	3.1
1	A	541	PRO	3.1
1	A	57	GLY	3.1
1	A	70	THR	3.1
1	B	62	GLU	3.1
1	A	450	LYS	3.1
1	B	54	ARG	3.1
2	G	191	ALA	3.1
1	A	530	ILE	3.0
1	A	678	THR	3.0
2	H	49	GLU	3.0
2	G	102	LYS	3.0
2	G	133	THR	3.0
2	G	96	VAL	3.0
2	H	128	ASN	3.0
1	B	803	LYS	3.0

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Mol	Chain	Res	Type	RSRZ
1	B	73	GLU	3.0
1	A	71	VAL	3.0
1	B	53	SER	3.0
1	B	737	ASP	3.0
2	G	75	ILE	3.0
1	A	25	GLU	3.0
2	G	106	GLU	2.9
2	H	182	ASP	2.9
2	G	152	VAL	2.9
1	A	788	ILE	2.9
2	G	112	MET	2.8
1	A	220	ILE	2.8
2	H	153	MET	2.8
2	G	118	PHE	2.8
1	A	327	GLU	2.8
1	A	278	LYS	2.8
2	G	98	ARG	2.8
1	B	67	LYS	2.8
1	B	349	MET	2.8
1	A	4	ALA	2.7
2	G	70	LYS	2.7
1	B	751	ILE	2.7
1	A	201	ILE	2.7
1	A	295	PRO	2.7
1	B	663	ARG	2.7
2	H	47	LYS	2.7
2	H	51	THR	2.7
2	G	71	CYS	2.7
1	B	682	GLY	2.6
2	G	97	LEU	2.6
1	B	365	LYS	2.6
1	B	660	THR	2.6
1	B	650	LEU	2.6
2	G	170	GLU	2.6
1	B	571	GLY	2.6
1	A	65	HIS	2.6
2	G	147	GLU	2.6
1	A	622	ALA	2.5
2	G	195	HIS	2.5
1	B	427	LEU	2.5
2	G	68	THR	2.5
1	B	569	ILE	2.5

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Mol	Chain	Res	Type	RSRZ
1	A	60	THR	2.5
1	B	404	VAL	2.5
2	G	101	GLY	2.5
2	H	186	CYS	2.5
2	H	141	LEU	2.5
1	B	69	VAL	2.5
2	H	179	GLY	2.5
1	B	356	ILE	2.4
1	B	393	ALA	2.4
2	G	187	ILE	2.4
1	A	130[A]	TRP	2.4
1	B	746	LEU	2.4
1	A	289	ILE	2.4
1	B	802	LYS	2.4
1	A	779	GLU	2.4
1	B	805	LEU	2.4
1	B	677	GLU	2.3
1	A	746	LEU	2.3
1	B	611	LYS	2.3
2	G	56	GLU	2.3
1	B	541	PRO	2.3
2	G	80	CYS	2.3
2	G	151	THR	2.3
2	G	141	LEU	2.3
1	B	754	ASN	2.3
1	A	286	PHE	2.2
1	A	404	VAL	2.2
2	G	146	LYS	2.2
1	A	356	ILE	2.2
1	A	476	LEU	2.2
1	A	572	LYS	2.2
1	B	350	TYR	2.2
2	G	103	PRO	2.2
1	A	353	THR	2.2
1	B	94	THR	2.2
1	B	530	ILE	2.2
1	A	5	GLU	2.2
1	B	30	PRO	2.1
1	B	395	LEU	2.1
1	B	386	TYR	2.1
1	B	285	ILE	2.1
1	A	52	LEU	2.1

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Mol	Chain	Res	Type	RSRZ
1	A	352	LEU	2.1
2	G	155	ALA	2.1
1	B	278	LYS	2.1
1	A	431	VAL	2.1
1	A	248	ILE	2.1
1	B	765	PHE	2.1
1	B	71	VAL	2.1
1	B	750	ASP	2.1
1	B	779	GLU	2.0
2	G	175	LYS	2.0
2	G	63	THR	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(Å ²)	Q<0.9
1	M3L	A	549	12/13	0.93	0.14	22,36,51,52	0
1	M3L	B	549	12/13	0.94	0.24	20,26,39,45	0
1	M3L	A	129	12/13	0.96	0.11	21,29,33,33	0
1	M3L	B	129	12/13	0.97	0.12	19,28,32,36	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.

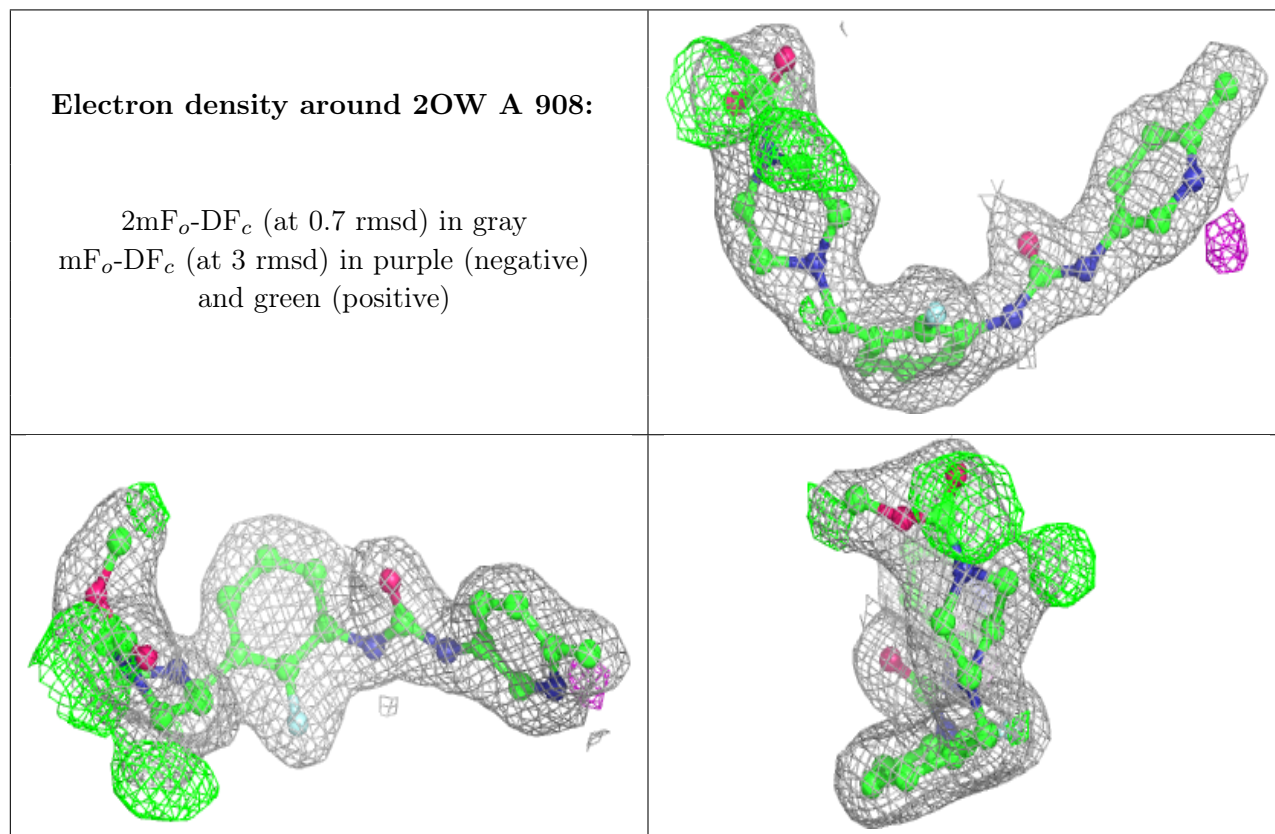
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
6	FMT	B	904	3/3	0.83	0.20	53,53,55,56	0
9	GOL	B	908	6/6	0.84	0.26	57,63,67,69	0
10	MLA	B	909	7/7	0.85	0.24	34,46,55,61	0

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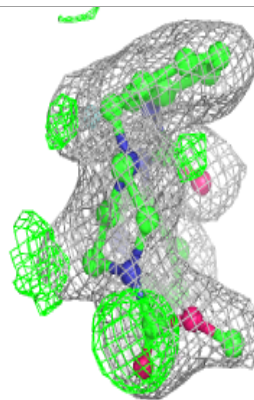
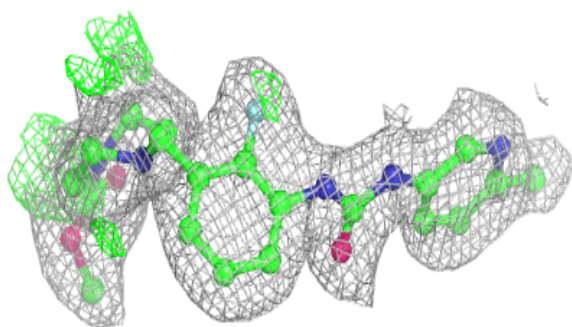
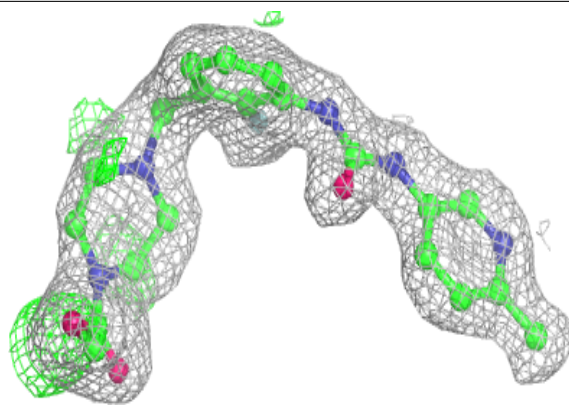
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
9	GOL	B	907	6/6	0.86	0.22	56,61,66,68	0
7	DMS	A	907	4/4	0.87	0.19	37,41,49,57	0
8	2OW	A	908	29/29	0.92	0.13	15,24,36,39	0
7	DMS	A	905	4/4	0.92	0.15	14,33,46,51	0
8	2OW	B	910	29/29	0.94	0.11	9,25,36,39	0
7	DMS	B	906	4/4	0.95	0.19	44,54,56,56	0
6	FMT	A	904	3/3	0.96	0.08	42,42,42,46	0
7	DMS	A	906	4/4	0.96	0.14	18,52,57,60	0
6	FMT	B	905	3/3	0.96	0.10	55,55,57,59	0
3	ADP	B	901	27/27	0.98	0.08	17,23,30,35	0
4	VO4	B	902	5/5	0.98	0.10	16,20,26,30	0
4	VO4	A	902	5/5	0.99	0.09	19,21,25,35	0
3	ADP	A	901	27/27	0.99	0.08	15,22,28,29	0
5	MG	A	903	1/1	0.99	0.07	22,22,22,22	0
5	MG	B	903	1/1	0.99	0.07	17,17,17,17	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.

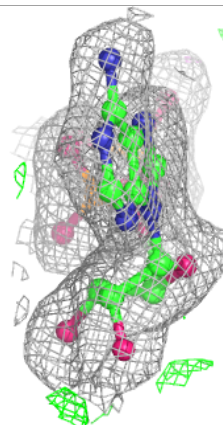
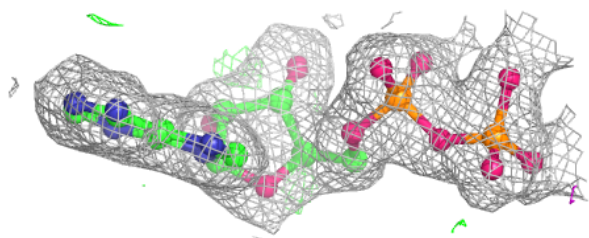
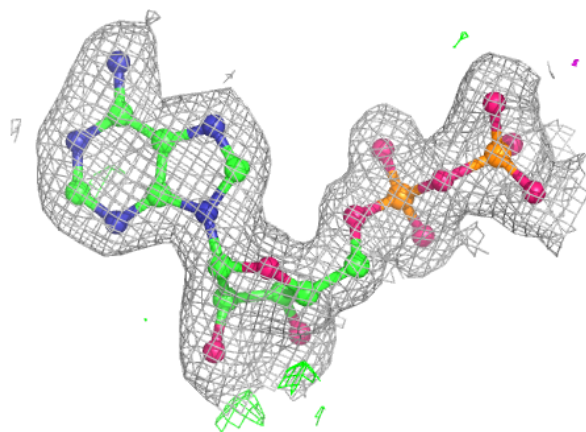


Electron density around 2OW B 910:

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

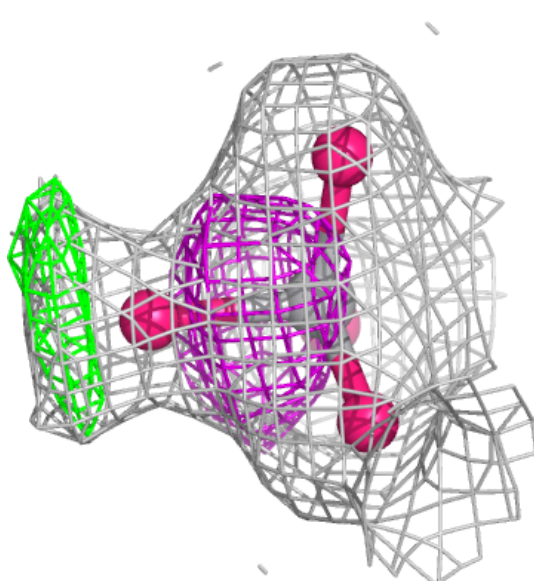
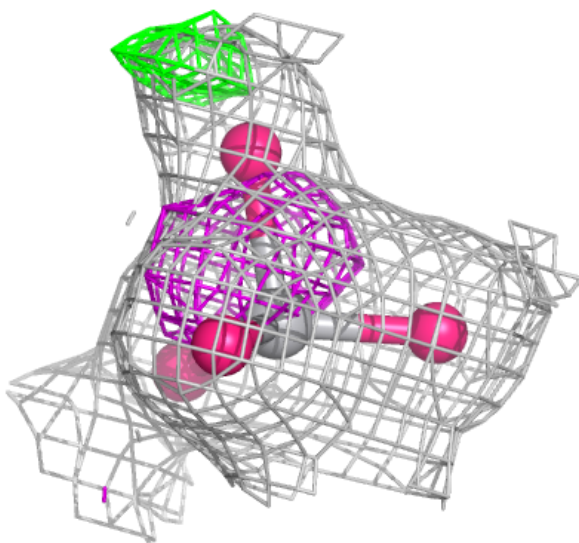
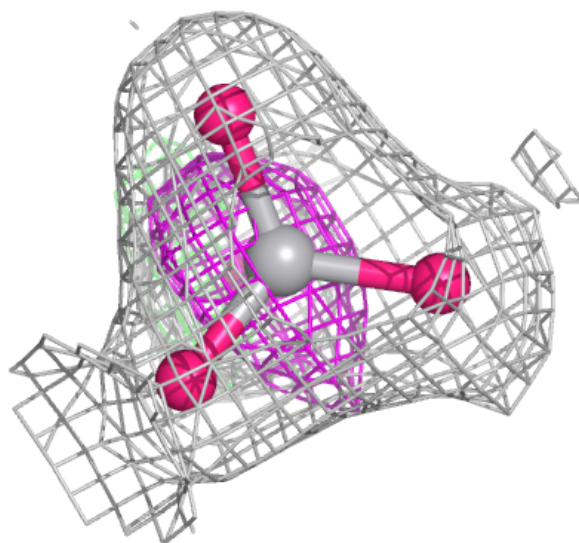
**Electron density around ADP B 901:**

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



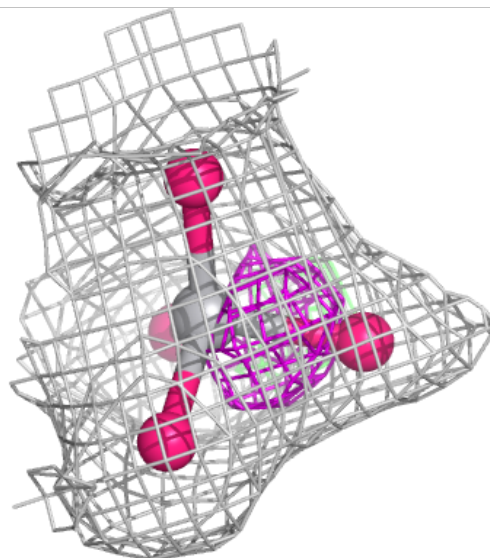
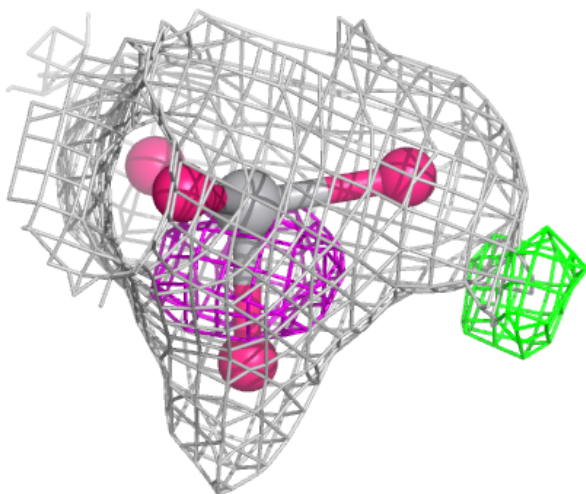
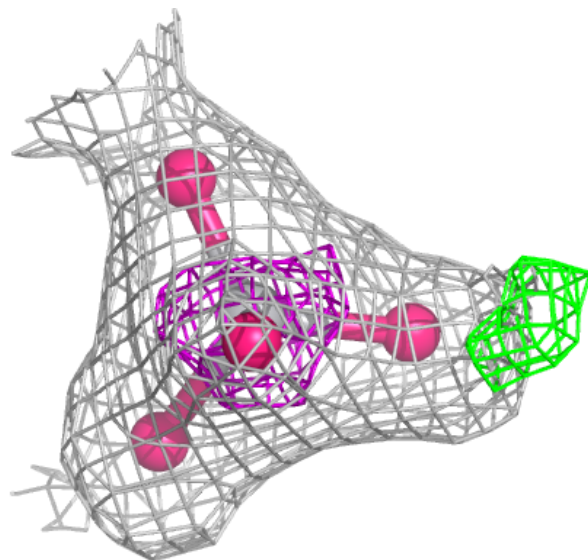
Electron density around VO4 B 902:

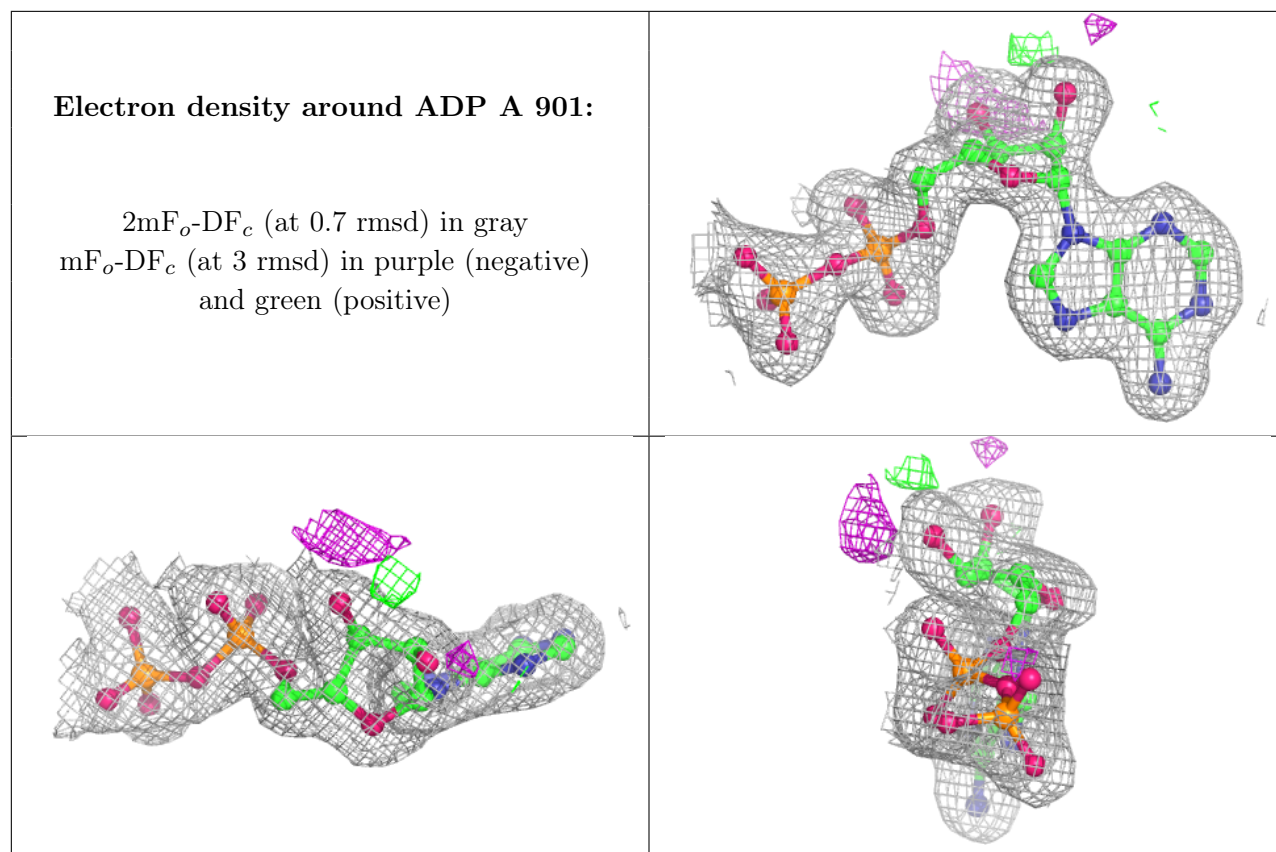
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around VO4 A 902:

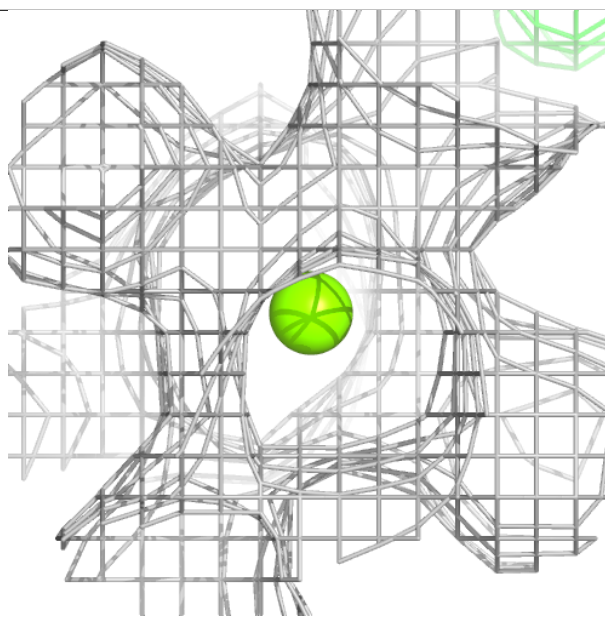
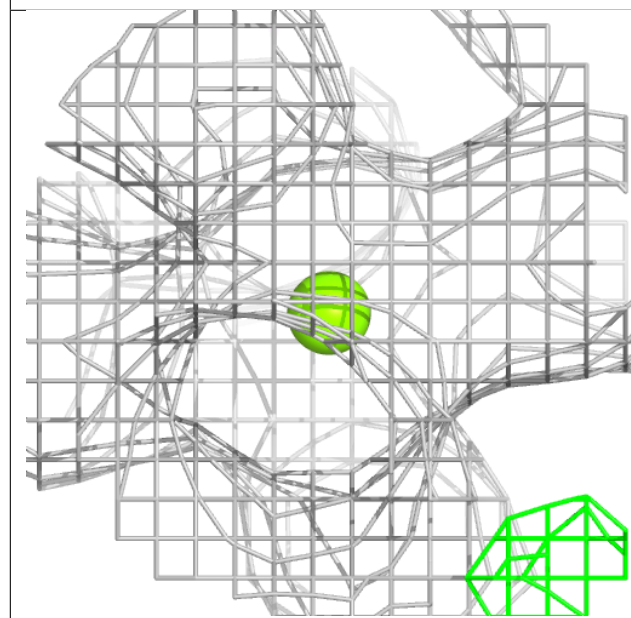
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

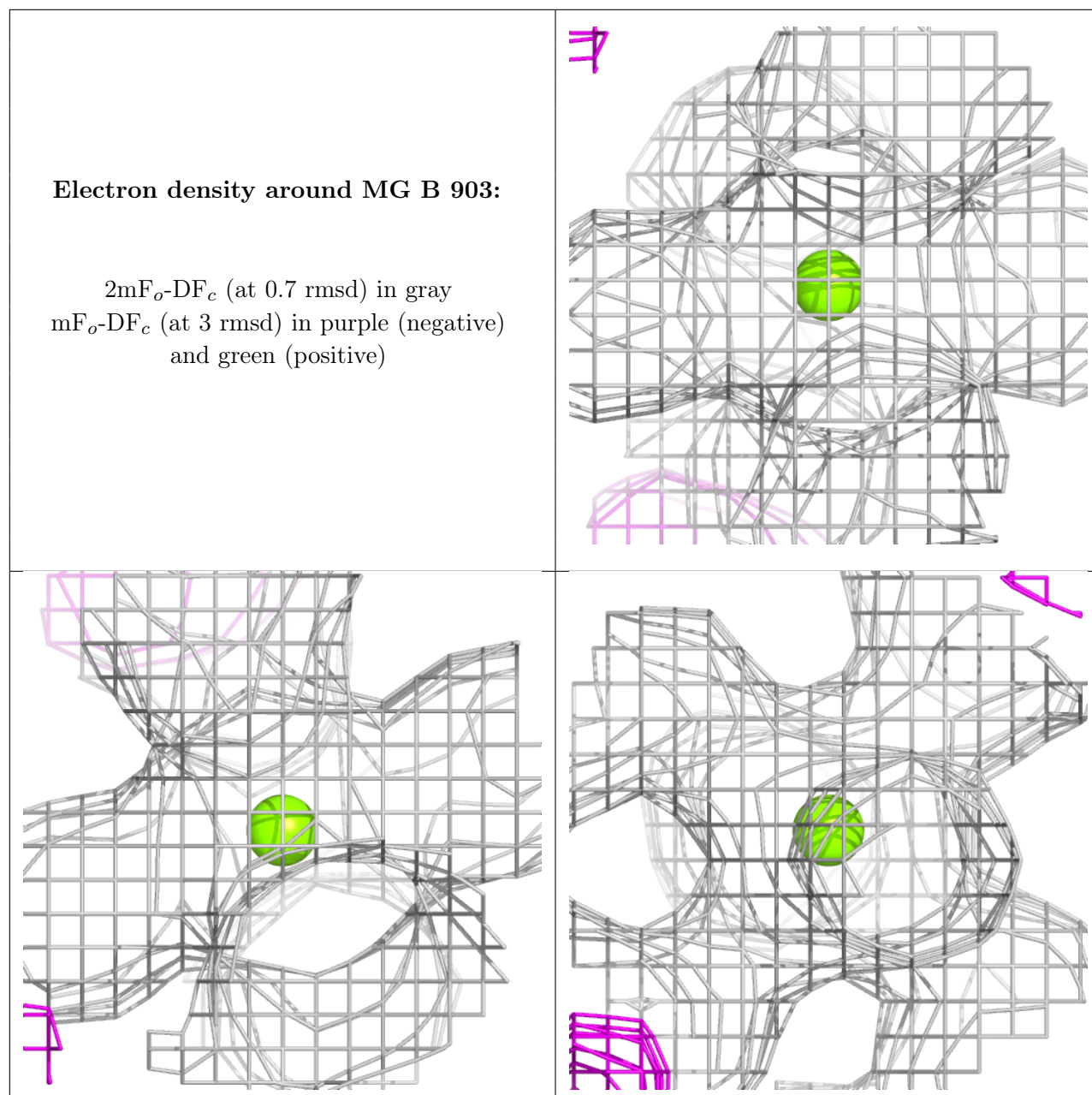




Electron density around MG A 903:

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





6.5 Other polymers ⓘ

There are no such residues in this entry.