



Full wwPDB X-ray Structure Validation Report ⓘ

Jul 17, 2023 – 04:06 PM EDT

PDB ID : 8DQ5
Title : X-ray crystal structure of Flavobacterium johnsoniae dimanganese(II) class Id ribonucleotide reductase T191I variant
Authors : Rose, H.R.; Boal, A.K.
Deposited on : 2022-07-18
Resolution : 2.10 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
Xtriage (Phenix) : 1.13
EDS : 2.34
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) : 2.34

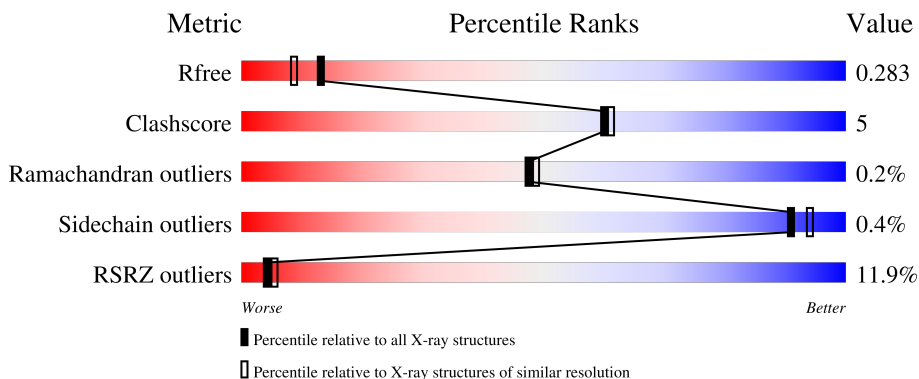
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.10 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	5197 (2.10-2.10)
Clashscore	141614	5710 (2.10-2.10)
Ramachandran outliers	138981	5647 (2.10-2.10)
Sidechain outliers	138945	5648 (2.10-2.10)
RSRZ outliers	127900	5083 (2.10-2.10)

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	343	
1	B	343	

2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 4698 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 Ribonucleoside-diphosphate reductase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	297	2453	1598	389	461	5	0	0	0
1	B	265	2183	1427	348	404	4	0	0	0

There are 40 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-18	GLY	-	expression tag	UNP A5FCJ5
A	-17	SER	-	expression tag	UNP A5FCJ5
A	-16	SER	-	expression tag	UNP A5FCJ5
A	-15	HIS	-	expression tag	UNP A5FCJ5
A	-14	HIS	-	expression tag	UNP A5FCJ5
A	-13	HIS	-	expression tag	UNP A5FCJ5
A	-12	HIS	-	expression tag	UNP A5FCJ5
A	-11	HIS	-	expression tag	UNP A5FCJ5
A	-10	HIS	-	expression tag	UNP A5FCJ5
A	-9	SER	-	expression tag	UNP A5FCJ5
A	-8	SER	-	expression tag	UNP A5FCJ5
A	-7	GLY	-	expression tag	UNP A5FCJ5
A	-6	LEU	-	expression tag	UNP A5FCJ5
A	-5	VAL	-	expression tag	UNP A5FCJ5
A	-4	PRO	-	expression tag	UNP A5FCJ5
A	-3	ARG	-	expression tag	UNP A5FCJ5
A	-2	GLY	-	expression tag	UNP A5FCJ5
A	-1	SER	-	expression tag	UNP A5FCJ5
A	0	HIS	-	expression tag	UNP A5FCJ5
A	191	ILE	THR	variant	UNP A5FCJ5
B	-18	GLY	-	expression tag	UNP A5FCJ5
B	-17	SER	-	expression tag	UNP A5FCJ5
B	-16	SER	-	expression tag	UNP A5FCJ5
B	-15	HIS	-	expression tag	UNP A5FCJ5
B	-14	HIS	-	expression tag	UNP A5FCJ5

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Chain	Residue	Modelled	Actual	Comment	Reference
B	-13	HIS	-	expression tag	UNP A5FCJ5
B	-12	HIS	-	expression tag	UNP A5FCJ5
B	-11	HIS	-	expression tag	UNP A5FCJ5
B	-10	HIS	-	expression tag	UNP A5FCJ5
B	-9	SER	-	expression tag	UNP A5FCJ5
B	-8	SER	-	expression tag	UNP A5FCJ5
B	-7	GLY	-	expression tag	UNP A5FCJ5
B	-6	LEU	-	expression tag	UNP A5FCJ5
B	-5	VAL	-	expression tag	UNP A5FCJ5
B	-4	PRO	-	expression tag	UNP A5FCJ5
B	-3	ARG	-	expression tag	UNP A5FCJ5
B	-2	GLY	-	expression tag	UNP A5FCJ5
B	-1	SER	-	expression tag	UNP A5FCJ5
B	0	HIS	-	expression tag	UNP A5FCJ5
B	191	ILE	THR	variant	UNP A5FCJ5

- Molecule 2 is MANGANESE (II) ION (three-letter code: MN) (formula: Mn) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	2	Total Mn 2 2	0	0
2	B	2	Total Mn 2 2	0	0

- Molecule 3 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total Mg 1 1	0	0

- Molecule 4 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	40	Total O 40 40	0	0
4	B	17	Total O 17 17	0	0

4 Data and refinement statistics i

Property	Value	Source
Space group	P 31	Depositor
Cell constants a, b, c, α , β , γ	53.77Å 53.77Å 221.29Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	46.57 – 2.10 46.57 – 2.10	Depositor EDS
% Data completeness (in resolution range)	86.2 (46.57-2.10) 86.2 (46.57-2.10)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.79 (at 2.10Å)	Xtrriage
Refinement program	PHENIX 1.17.1_3660	Depositor
R, R_{free}	0.246 , 0.282 0.247 , 0.283	Depositor DCC
R_{free} test set	1816 reflections (5.04%)	wwPDB-VP
Wilson B-factor (Å ²)	22.1	Xtrriage
Anisotropy	0.061	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 23.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.39$, $\langle L^2 \rangle = 0.21$	Xtrriage
Estimated twinning fraction	0.135 for -h,-k,l 0.168 for h,-h-k,-l 0.188 for -k,-h,-l	Xtrriage
F_o, F_c correlation	0.91	EDS
Total number of atoms	4698	wwPDB-VP
Average B, all atoms (Å ²)	30.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.65% 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: MN, MG

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z >5	RMSZ	# Z >5
1	A	0.24	0/2510	0.37	0/3396
1	B	0.25	0/2232	0.38	0/3013
All	All	0.24	0/4742	0.37	0/6409

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 [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	2453	0	2409	26	0
1	B	2183	0	2156	16	0
2	A	2	0	0	0	0
2	B	2	0	0	0	0
3	A	1	0	0	0	0
4	A	40	0	0	0	0
4	B	17	0	0	0	0
All	All	4698	0	4565	42	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 5.

All (42) 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:134:SER:HA	1:A:138:LYS:HE3	1.63	0.79
1:A:154:LEU:HD23	1:A:157:ILE:HD11	1.78	0.66
1:B:162:VAL:HG21	1:B:261:MET:HA	1.81	0.63
1:A:153:ILE:HD13	1:A:206:ILE:HD13	1.82	0.61
1:A:196:GLN:OE1	1:A:264:ARG:NH2	2.31	0.60
1:A:136:VAL:HG23	1:A:137:LEU:HG	1.82	0.60
1:A:149:MET:HE1	1:A:216:TYR:HB3	1.89	0.55
1:B:282:VAL:HA	1:B:285:TYR:CE2	2.44	0.53
1:A:162:VAL:HG22	1:A:261:MET:HG3	1.90	0.52
1:A:134:SER:CA	1:A:138:LYS:HE3	2.36	0.52
1:B:136:VAL:HG13	1:B:154:LEU:HD13	1.93	0.51
1:B:18:VAL:HG13	1:B:89:LEU:HB2	1.92	0.50
1:A:229:VAL:HG13	1:A:265:ILE:HD13	1.94	0.50
1:B:6:LYS:HA	1:B:82:PRO:HB2	1.94	0.50
1:A:133:LEU:HA	1:A:136:VAL:HG22	1.94	0.49
1:A:7:ARG:NH2	1:A:14:GLU:H	2.11	0.49
1:B:233:ILE:HD11	1:B:265:ILE:HD13	1.94	0.49
1:B:162:VAL:HA	1:B:165:PHE:HB2	1.95	0.48
1:A:260:PHE:CZ	1:A:264:ARG:HD2	2.48	0.48
1:B:125:VAL:HG12	1:B:239:ILE:HG12	1.97	0.47
1:A:226:ARG:NH2	1:A:276:VAL:O	2.47	0.47
1:A:7:ARG:HH22	1:A:85:GLU:CD	2.19	0.46
1:A:132:TYR:OH	1:A:228:THR:O	2.31	0.45
1:A:62:ALA:O	1:A:129:ARG:NH1	2.49	0.45
1:A:6:LYS:HA	1:A:82:PRO:HB2	1.99	0.44
1:A:139:ASP:OD2	1:A:147:LYS:HB3	2.17	0.44
1:A:260:PHE:CG	1:A:288:LEU:HD22	2.53	0.43
1:B:106:ARG:NH1	1:B:109:GLU:OE2	2.51	0.43
1:B:7:ARG:HH22	1:B:85:GLU:CD	2.22	0.43
1:A:132:TYR:O	1:A:136:VAL:HG13	2.19	0.43
1:A:31:VAL:HG23	1:A:34:GLU:HG3	2.01	0.43
1:B:258:VAL:HG12	1:B:262:LYS:HE3	2.00	0.43
1:A:18:VAL:HG13	1:A:89:LEU:HB2	2.00	0.42
1:B:28:ALA:O	1:B:30:TRP:HD1	2.02	0.42
1:B:153:ILE:H	1:B:153:ILE:HG13	1.64	0.42
1:B:202:GLY:O	1:B:206:ILE:HG12	2.20	0.42
1:A:13:PHE:CG	1:A:85:GLU:HG3	2.55	0.41
1:B:206:ILE:O	1:B:209:ILE:HB	2.20	0.41
1:A:121:LEU:O	1:A:127:ARG:HD3	2.20	0.41
1:A:175:THR:HG23	1:A:182:LYS:HG2	2.02	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:104:TYR:OH	1:A:191:ILE:HG21	2.20	0.41
1:B:260:PHE:CZ	1:B:264:ARG:HD2	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	293/343 (85%)	283 (97%)	9 (3%)	1 (0%)	41 41
1	B	257/343 (75%)	246 (96%)	11 (4%)	0	100 100
All	All	550/686 (80%)	529 (96%)	20 (4%)	1 (0%)	47 49

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	162	VAL

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	269/310 (87%)	268 (100%)	1 (0%)	91 94
1	B	238/310 (77%)	237 (100%)	1 (0%)	91 94
All	All	507/620 (82%)	505 (100%)	2 (0%)	91 94

All (2) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	135	ASN
1	B	40	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 5 ligands modelled in this entry, 5 are monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

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	297/343 (86%)	0.54	19 (6%) 19 24	5, 24, 46, 62	0
1	B	265/343 (77%)	1.07	48 (18%) 1 1	9, 34, 61, 71	0
All	All	562/686 (81%)	0.79	67 (11%) 4 5	5, 28, 57, 71	0

All (67) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	282	VAL	5.8
1	B	155	PHE	5.4
1	B	300	LEU	5.4
1	A	136	VAL	5.4
1	B	152	LEU	4.7
1	B	157	ILE	4.5
1	A	217	PHE	4.2
1	B	209	ILE	4.2
1	B	158	LEU	4.2
1	B	205	ILE	4.1
1	B	277	ILE	4.0
1	B	263	PHE	4.0
1	B	136	VAL	3.9
1	A	140	THR	3.9
1	A	296	PHE	3.9
1	B	4	PHE	3.8
1	A	149	MET	3.8
1	B	272	ILE	3.8
1	B	283	GLU	3.7
1	B	288	LEU	3.7
1	B	296	PHE	3.7
1	B	154	LEU	3.6
1	B	278	PHE	3.6
1	B	3	ILE	3.5

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Mol	Chain	Res	Type	RSRZ
1	B	280	VAL	3.4
1	B	206	ILE	3.2
1	A	152	LEU	3.0
1	B	268	SER	2.9
1	B	285	TYR	2.9
1	B	1	MET	2.9
1	B	80	HIS	2.9
1	B	159	ILE	2.9
1	B	207	ASN	2.9
1	B	297	ALA	2.8
1	B	291	PHE	2.7
1	A	233	ILE	2.7
1	B	162	VAL	2.7
1	B	135	ASN	2.7
1	A	133	LEU	2.7
1	B	137	LEU	2.7
1	A	146	ARG	2.6
1	B	286	LYS	2.6
1	A	161	ASN	2.6
1	B	299	SER	2.6
1	B	204	TYR	2.5
1	B	266	ASP	2.5
1	B	81	PHE	2.5
1	A	157	ILE	2.4
1	A	60	LEU	2.4
1	A	148	TYR	2.4
1	A	281	LYS	2.3
1	A	155	PHE	2.3
1	A	163	SER	2.3
1	B	269	LEU	2.3
1	B	210	ARG	2.2
1	A	118	GLU	2.2
1	B	133	LEU	2.2
1	B	21	PHE	2.1
1	B	271	GLN	2.1
1	B	279	ASP	2.1
1	A	285	TYR	2.1
1	B	233	ILE	2.1
1	B	151	SER	2.0
1	B	290	TRP	2.0
1	B	289	ALA	2.0
1	A	300	LEU	2.0

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Mol	Chain	Res	Type	RSRZ
1	B	8	VAL	2.0

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

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

6.3 Carbohydrates [i](#)

There are no monosaccharides in this entry.

6.4 Ligands [i](#)

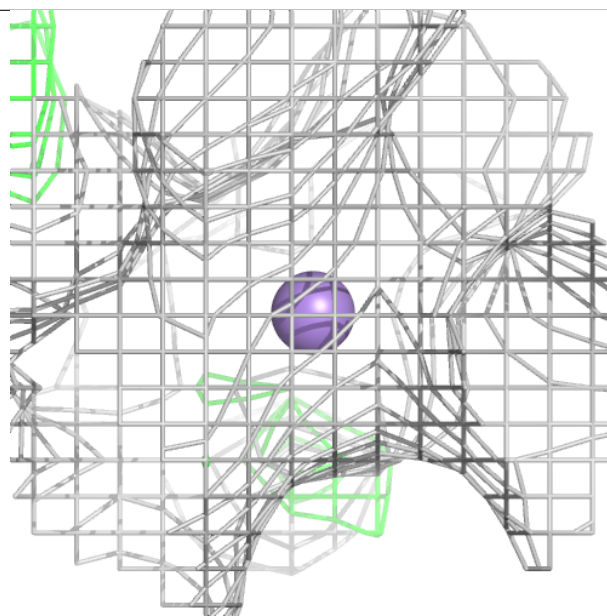
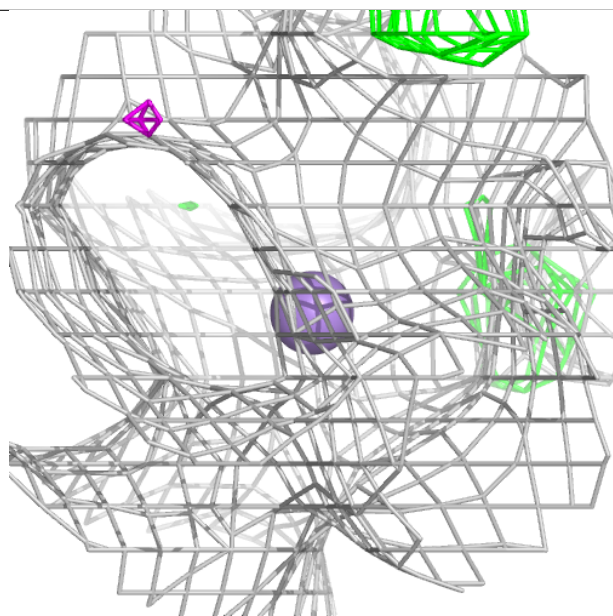
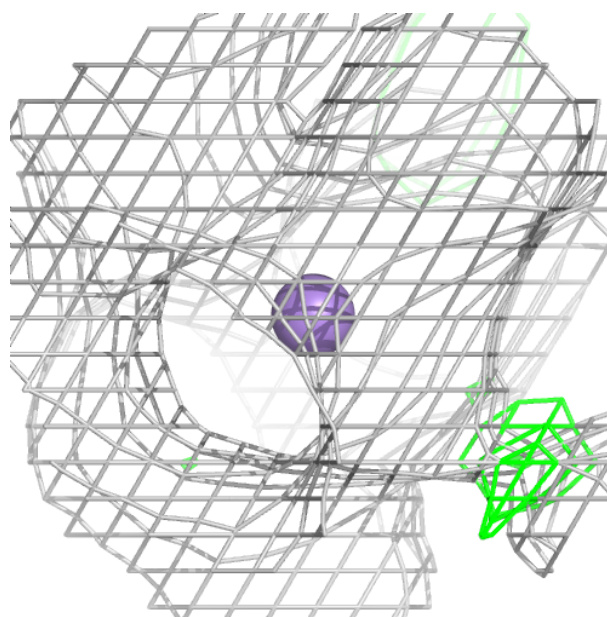
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
3	MG	A	403	1/1	0.73	0.17	37,37,37,37	0
2	MN	A	402	1/1	0.91	0.10	26,26,26,26	1
2	MN	B	402	1/1	0.95	0.06	38,38,38,38	1
2	MN	B	401	1/1	0.96	0.08	20,20,20,20	1
2	MN	A	401	1/1	0.97	0.11	14,14,14,14	1

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.

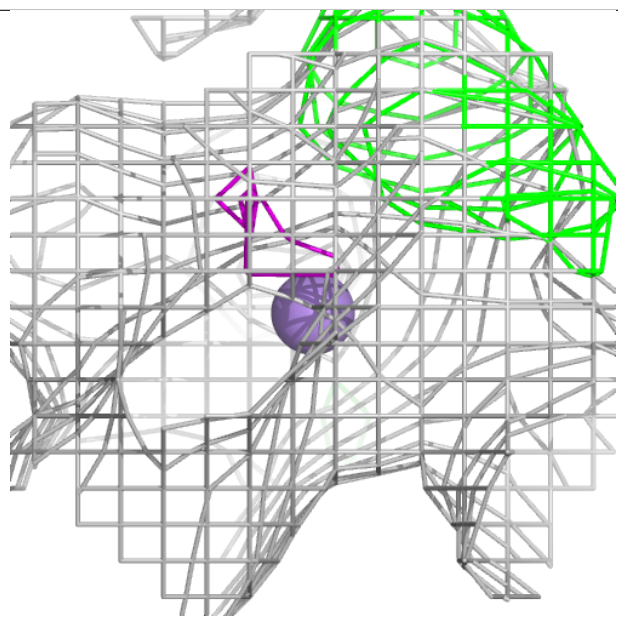
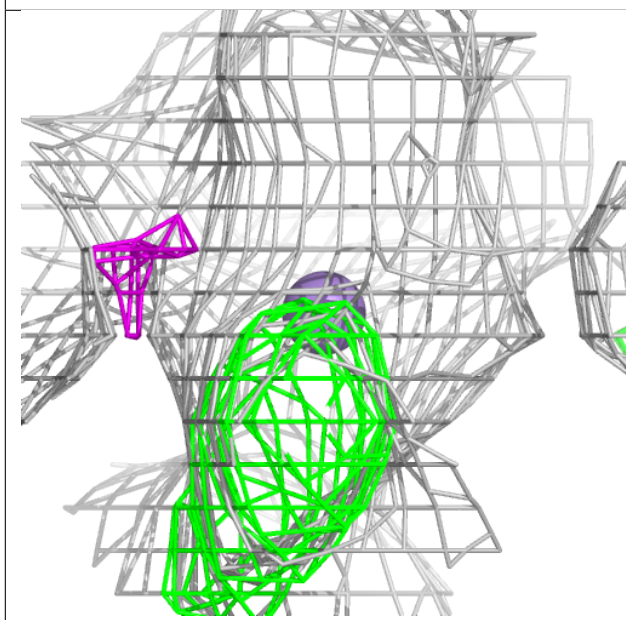
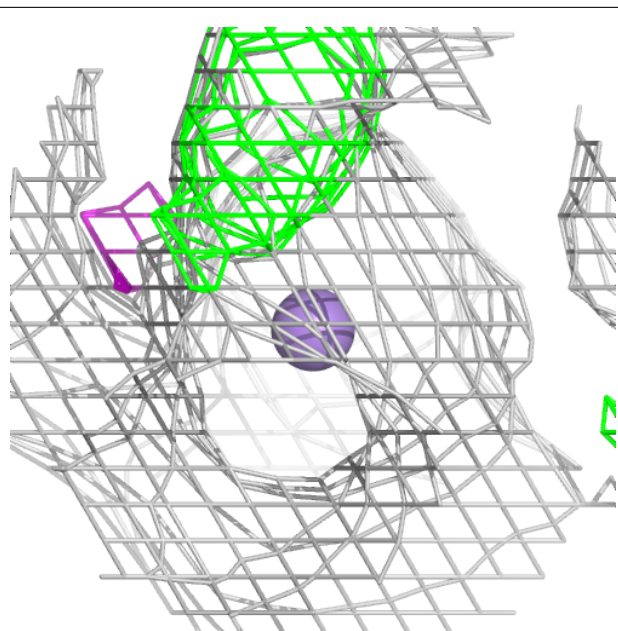
Electron density around MN A 402:

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



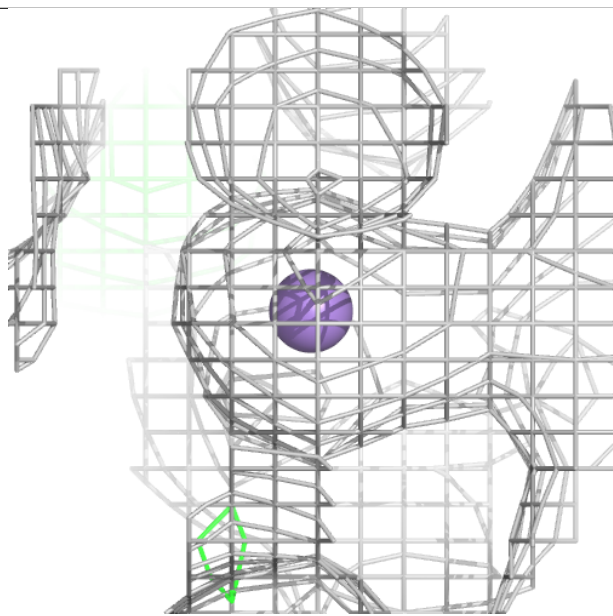
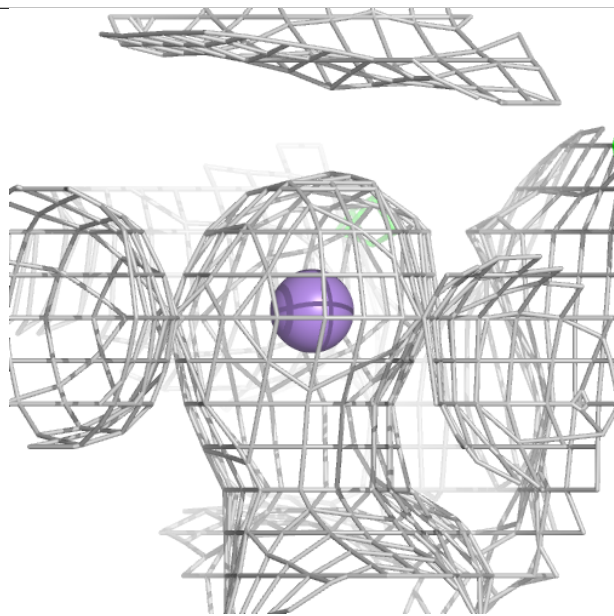
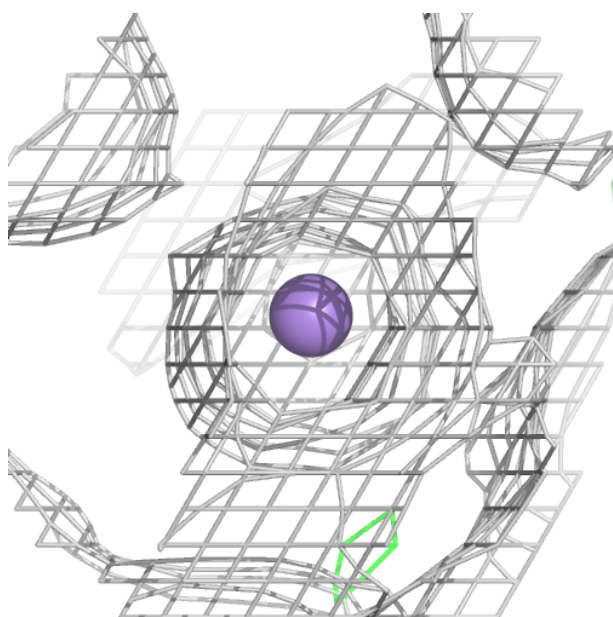
Electron density around MN B 402:

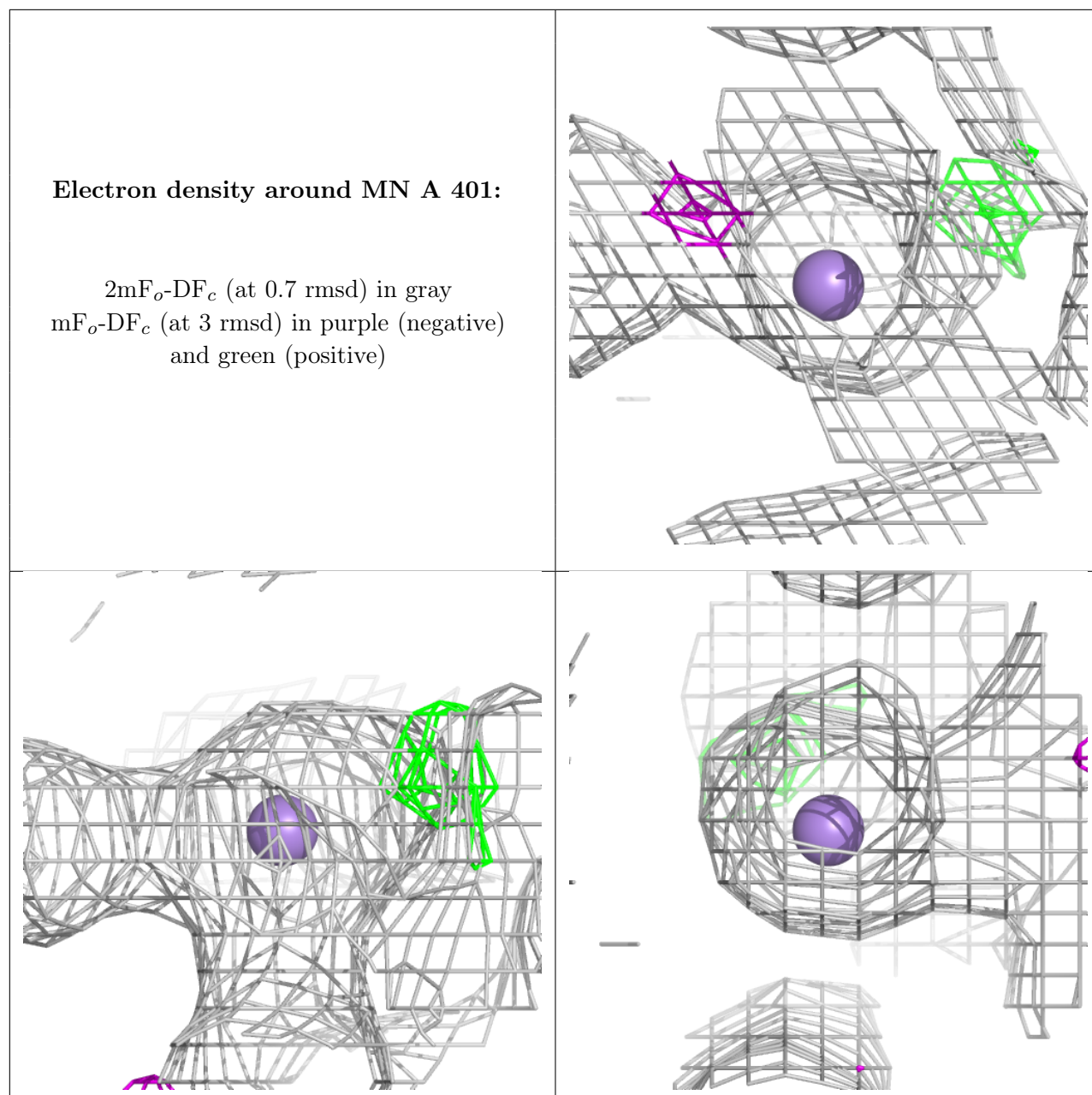
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around MN B 401:

$2mF_o-DF_c$ (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.