



Full wwPDB X-ray Structure Validation Report ⓘ

Sep 8, 2025 – 02:10 pm BST

PDB ID : 9GPH / pdb_00009gph
Title : Teth514_1788 1,2-beta-oligomannan phosphorylase in complex with mannose (-1) and phosphate
Authors : Cioci, G.; Durand, J.; Veronese-Potocki, G.; Ladeveze, S.
Deposited on : 2024-09-07
Resolution : 1.70 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 : **FAILED**
Mogul : 1.8.4, CSD as541be (2020)
Xtriage (Phenix) : 2.0rc1
EDS : 3.0
buster-report : 1.1.7 (2018)
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4 : 9.0.006 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.45.1

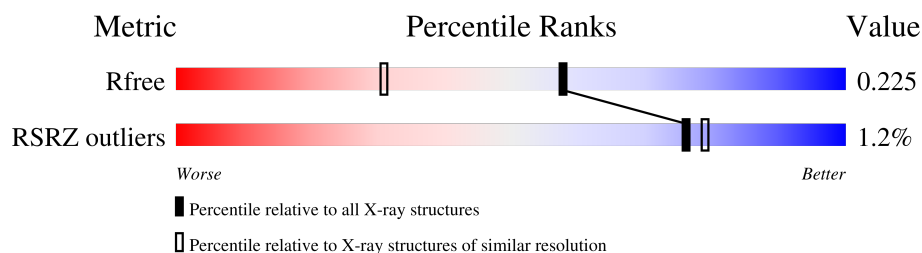
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.70 Å.

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



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	164625	5161 (1.70-1.70)
RSRZ outliers	164620	5159 (1.70-1.70)

MolProbity failed to run properly - the sequence quality summary graphics cannot be shown.

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 10665 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 1,2-beta-oligomannan phosphorylase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	302	Total	C	N	O	S	0	1	0
			2460	1587	418	445	10			
1	B	296	Total	C	N	O	S	0	0	0
			2392	1547	399	437	9			
1	C	302	Total	C	N	O	S	0	0	0
			2456	1585	418	444	9			
1	D	302	Total	C	N	O	S	0	0	0
			2452	1582	417	444	9			

There are 32 discrepancies between the modelled and reference sequences:

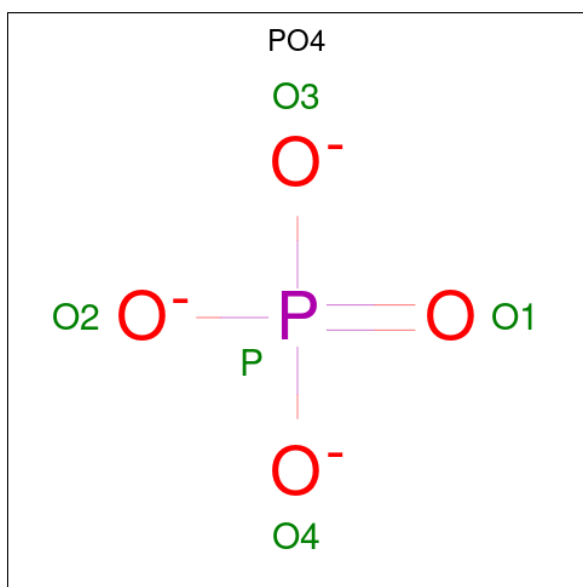
Chain	Residue	Modelled	Actual	Comment	Reference
A	1	MET	-	initiating methionine	UNP B0K2C2
A	2	GLY	-	expression tag	UNP B0K2C2
A	298	HIS	-	expression tag	UNP B0K2C2
A	299	HIS	-	expression tag	UNP B0K2C2
A	300	HIS	-	expression tag	UNP B0K2C2
A	301	HIS	-	expression tag	UNP B0K2C2
A	302	HIS	-	expression tag	UNP B0K2C2
A	303	HIS	-	expression tag	UNP B0K2C2
B	1	MET	-	initiating methionine	UNP B0K2C2
B	2	GLY	-	expression tag	UNP B0K2C2
B	298	HIS	-	expression tag	UNP B0K2C2
B	299	HIS	-	expression tag	UNP B0K2C2
B	300	HIS	-	expression tag	UNP B0K2C2
B	301	HIS	-	expression tag	UNP B0K2C2
B	302	HIS	-	expression tag	UNP B0K2C2
B	303	HIS	-	expression tag	UNP B0K2C2
C	1	MET	-	initiating methionine	UNP B0K2C2
C	2	GLY	-	expression tag	UNP B0K2C2
C	298	HIS	-	expression tag	UNP B0K2C2
C	299	HIS	-	expression tag	UNP B0K2C2
C	300	HIS	-	expression tag	UNP B0K2C2

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Chain	Residue	Modelled	Actual	Comment	Reference
C	301	HIS	-	expression tag	UNP B0K2C2
C	302	HIS	-	expression tag	UNP B0K2C2
C	303	HIS	-	expression tag	UNP B0K2C2
D	1	MET	-	initiating methionine	UNP B0K2C2
D	2	GLY	-	expression tag	UNP B0K2C2
D	298	HIS	-	expression tag	UNP B0K2C2
D	299	HIS	-	expression tag	UNP B0K2C2
D	300	HIS	-	expression tag	UNP B0K2C2
D	301	HIS	-	expression tag	UNP B0K2C2
D	302	HIS	-	expression tag	UNP B0K2C2
D	303	HIS	-	expression tag	UNP B0K2C2

- Molecule 2 is PHOSPHATE ION (CCD ID: PO4) (formula: O_4P) (labeled as "Ligand of Interest" by depositor).



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

- Molecule 3 is alpha-D-mannopyranose (CCD ID: MAN) (formula: $C_6H_{12}O_6$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			12	6	6		
3	B	1	Total	C	O	0	0
			12	6	6		
3	C	1	Total	C	O	0	0
			12	6	6		
3	D	1	Total	C	O	0	0
			12	6	6		

- Molecule 4 is 1,2-ETHANEDIOL (CCD ID: EDO) (formula: $C_2H_6O_2$).



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

- Molecule 5 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	212	Total O 212 212	0	0
5	B	167	Total O 167 167	0	0
5	C	221	Total O 221 221	0	0
5	D	209	Total O 209 209	0	0

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3 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	67.39Å 67.57Å 299.54Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	50.01 – 1.70 50.01 – 1.70	Depositor EDS
% Data completeness (in resolution range)	99.3 (50.01-1.70) 99.3 (50.01-1.70)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.48 (at 1.70Å)	Xtriage
Refinement program	REFMAC 5.8.0425	Depositor
R, R_{free}	0.192 , 0.216 0.203 , 0.225	Depositor DCC
R_{free} test set	7453 reflections (4.92%)	wwPDB-VP
Wilson B-factor (Å ²)	21.5	Xtriage
Anisotropy	0.048	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 26.1	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.34$	Xtriage
Estimated twinning fraction	0.018 for k,h,-l	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	10665	wwPDB-VP
Average B, all atoms (Å ²)	25.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.89% 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.

4 Model quality [i](#)

4.1 Standard geometry [i](#)

MolProbity failed to run properly - this section is therefore empty.

4.2 Too-close contacts [i](#)

MolProbity failed to run properly - this section is therefore empty.

4.3 Torsion angles [i](#)

4.3.1 Protein backbone [i](#)

MolProbity failed to run properly - this section is therefore empty.

4.3.2 Protein sidechains [i](#)

MolProbity failed to run properly - this section is therefore empty.

4.3.3 RNA [i](#)

MolProbity failed to run properly - this section is therefore empty.

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

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

4.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

4.6 Ligand geometry [i](#)

15 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	MAN	C	402	-	12,12,12	0.84	1 (8%)	17,17,17	1.11	2 (11%)
4	EDO	C	404	-	3,3,3	0.25	0	2,2,2	0.37	0
4	EDO	B	405	-	3,3,3	0.39	0	2,2,2	0.54	0
3	MAN	D	402	-	12,12,12	0.99	1 (8%)	17,17,17	1.23	2 (11%)
4	EDO	D	403	-	3,3,3	0.33	0	2,2,2	0.39	0
2	PO4	C	401	-	4,4,4	0.81	0	6,6,6	0.45	0
2	PO4	D	401	-	4,4,4	1.20	1 (25%)	6,6,6	0.57	0
2	PO4	B	401	-	4,4,4	0.45	0	6,6,6	0.60	0
2	PO4	A	401	-	4,4,4	1.23	1 (25%)	6,6,6	0.73	0
3	MAN	B	402	-	12,12,12	0.75	0	17,17,17	1.26	3 (17%)
4	EDO	C	403	-	3,3,3	0.39	0	2,2,2	0.44	0
3	MAN	A	402	-	12,12,12	0.92	1 (8%)	17,17,17	1.25	1 (5%)
4	EDO	B	403	-	3,3,3	0.19	0	2,2,2	0.39	0
4	EDO	B	404	-	3,3,3	0.39	0	2,2,2	0.56	0
4	EDO	A	403	-	3,3,3	0.28	0	2,2,2	0.34	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	MAN	C	402	-	-	0/2/22/22	0/1/1/1
4	EDO	C	404	-	-	1/1/1/1	-
4	EDO	B	405	-	-	0/1/1/1	-
3	MAN	D	402	-	-	0/2/22/22	0/1/1/1
4	EDO	D	403	-	-	0/1/1/1	-
3	MAN	B	402	-	-	0/2/22/22	0/1/1/1
4	EDO	C	403	-	-	0/1/1/1	-
3	MAN	A	402	-	-	0/2/22/22	0/1/1/1
4	EDO	B	403	-	-	0/1/1/1	-
4	EDO	B	404	-	-	1/1/1/1	-
4	EDO	A	403	-	-	0/1/1/1	-

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	D	402	MAN	O1-C1	-2.45	1.31	1.39
3	A	402	MAN	O1-C1	-2.32	1.32	1.39
2	D	401	PO4	P-O3	-2.19	1.48	1.54
2	A	401	PO4	P-O1	2.14	1.55	1.50
3	C	402	MAN	O1-C1	-2.03	1.33	1.39

All (8) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	402	MAN	C1-C2-C3	-3.42	103.22	110.31
3	D	402	MAN	O1-C1-C2	3.04	117.58	109.03
3	B	402	MAN	C1-C2-C3	-2.80	104.50	110.31
3	C	402	MAN	C1-C2-C3	-2.75	104.60	110.31
3	D	402	MAN	C1-C2-C3	-2.68	104.76	110.31
3	C	402	MAN	O1-C1-C2	2.51	116.10	109.03
3	B	402	MAN	O1-C1-O5	2.47	117.78	110.38
3	B	402	MAN	O2-C2-C3	2.33	115.73	110.35

There are no chirality outliers.

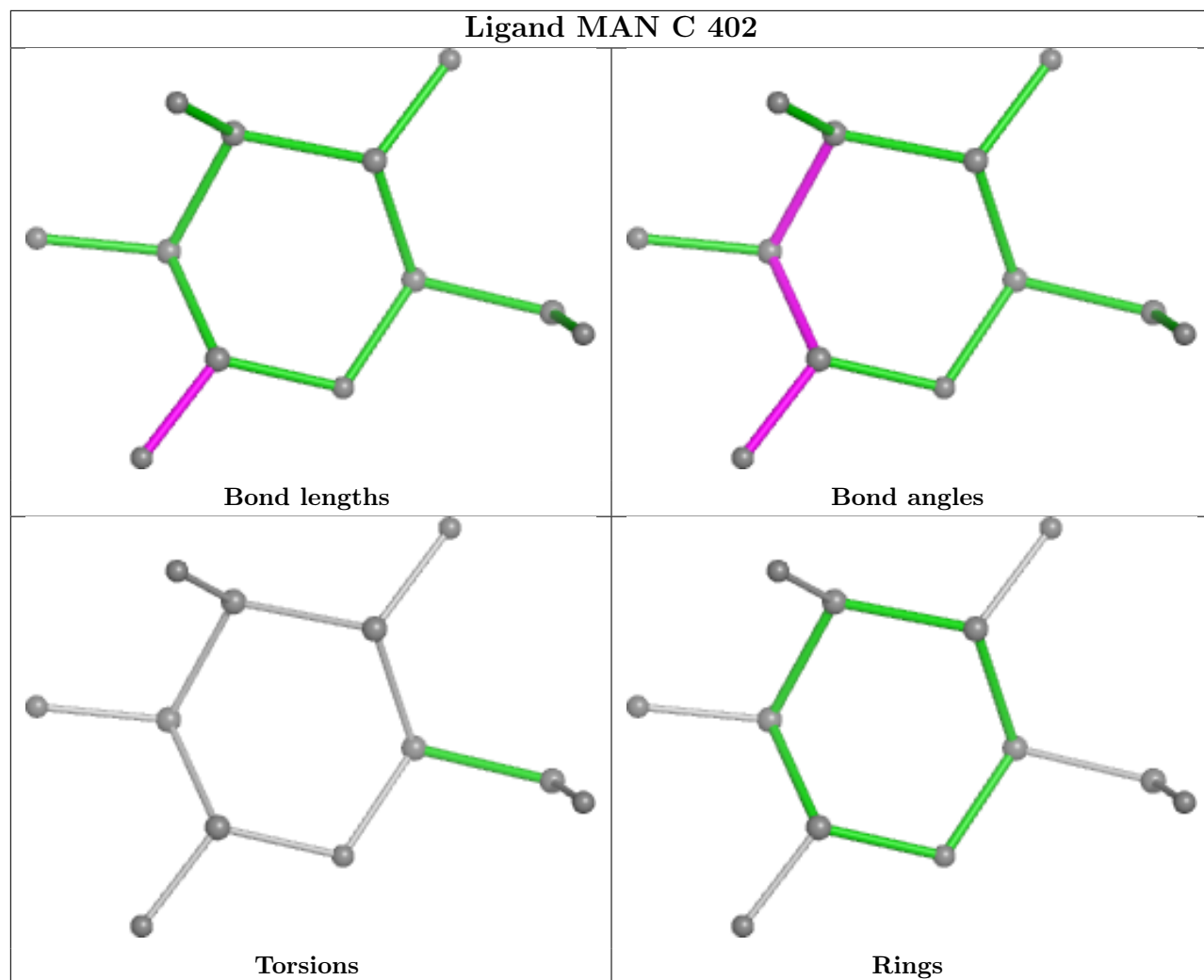
All (2) torsion outliers are listed below:

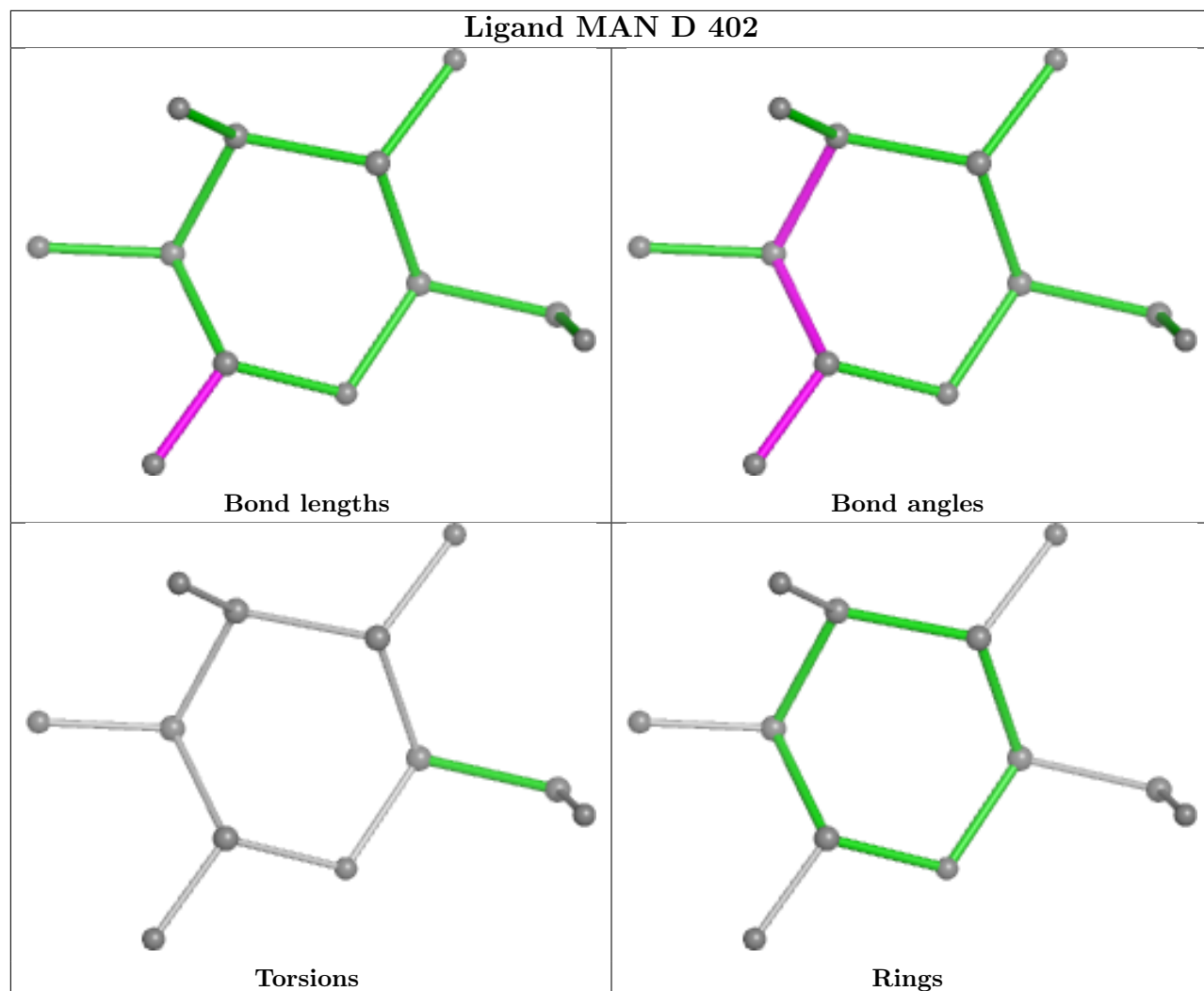
Mol	Chain	Res	Type	Atoms
4	B	404	EDO	O1-C1-C2-O2
4	C	404	EDO	O1-C1-C2-O2

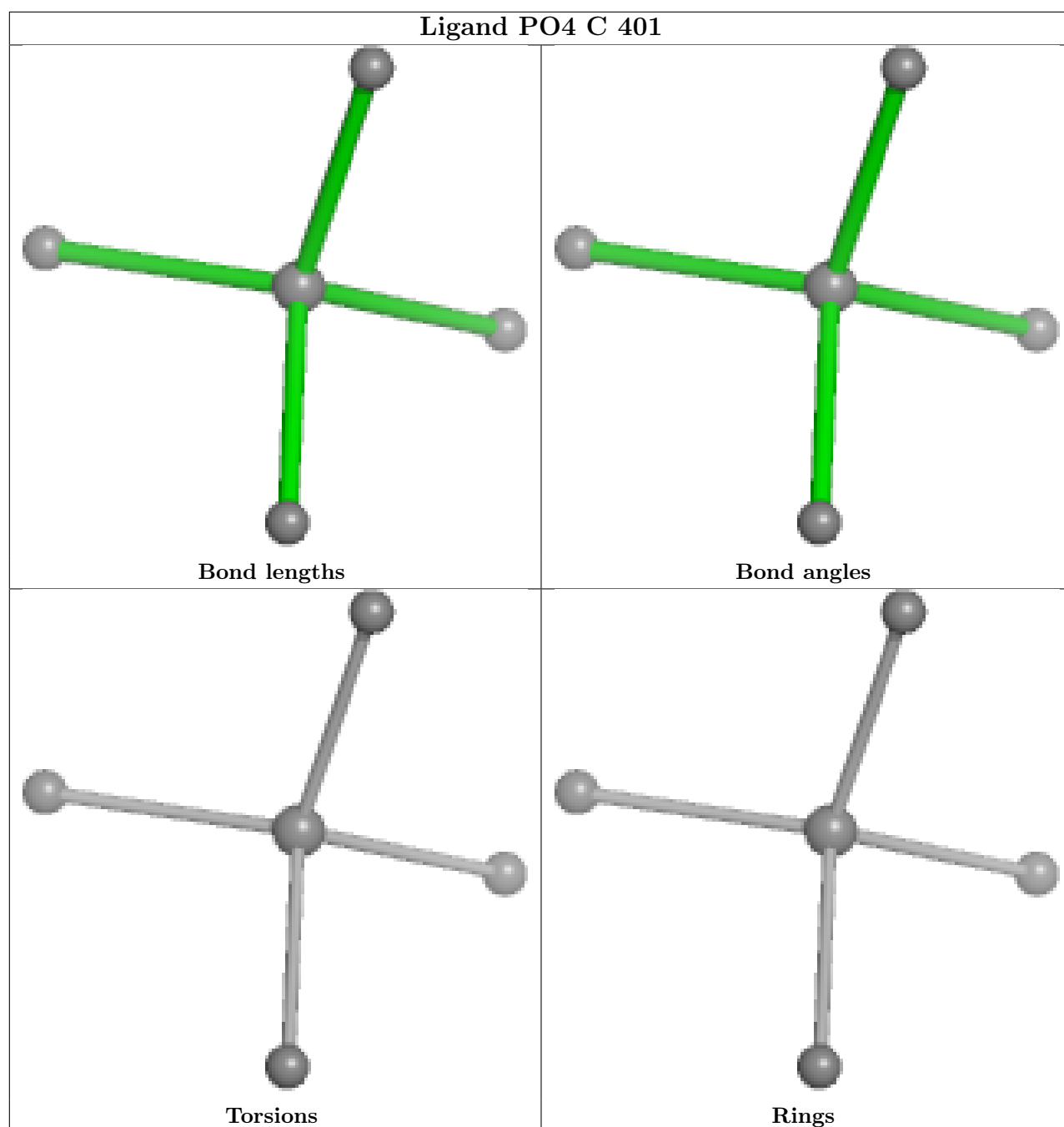
There are no ring outliers.

No monomer is involved in short contacts.

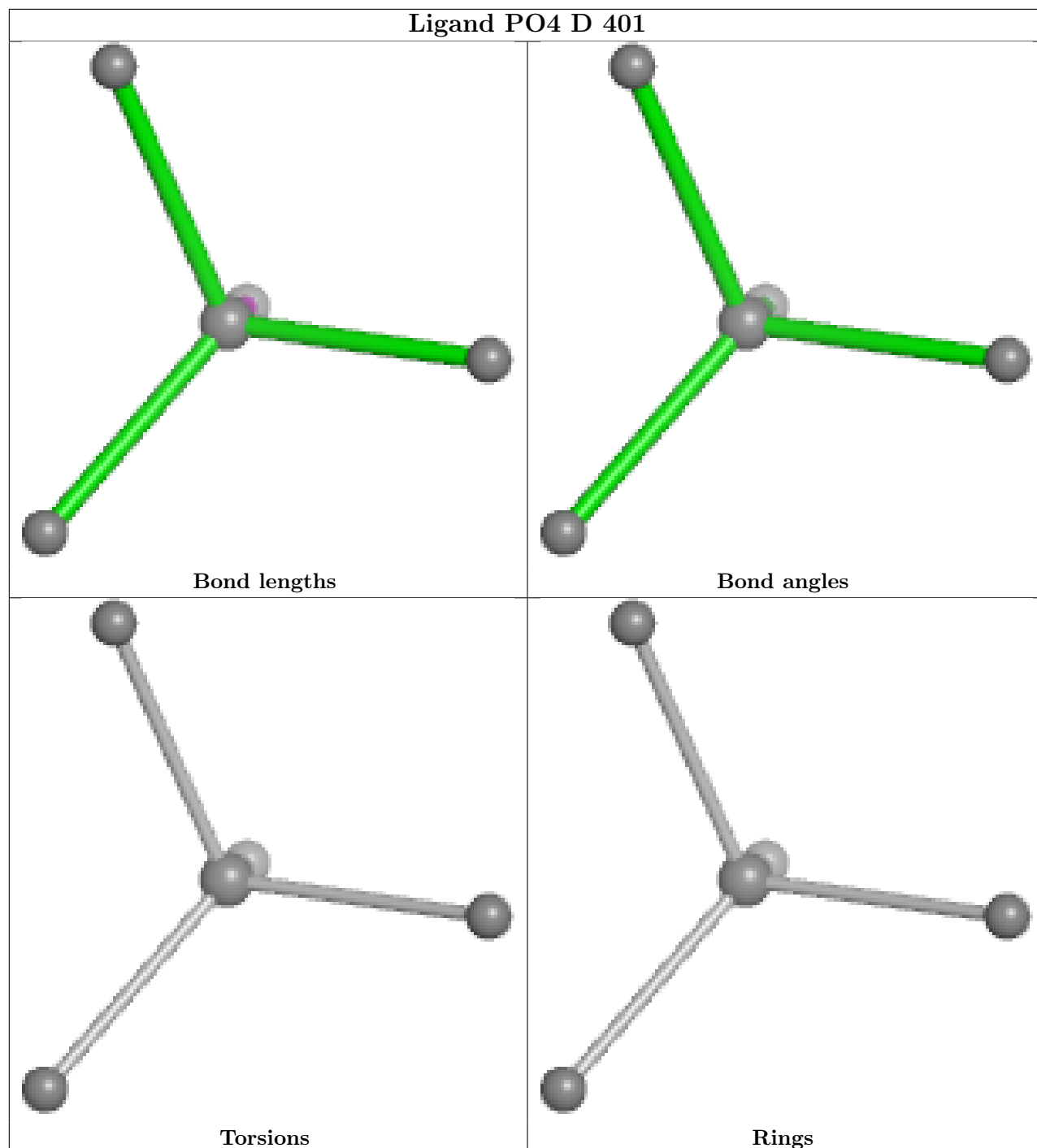
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. 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.



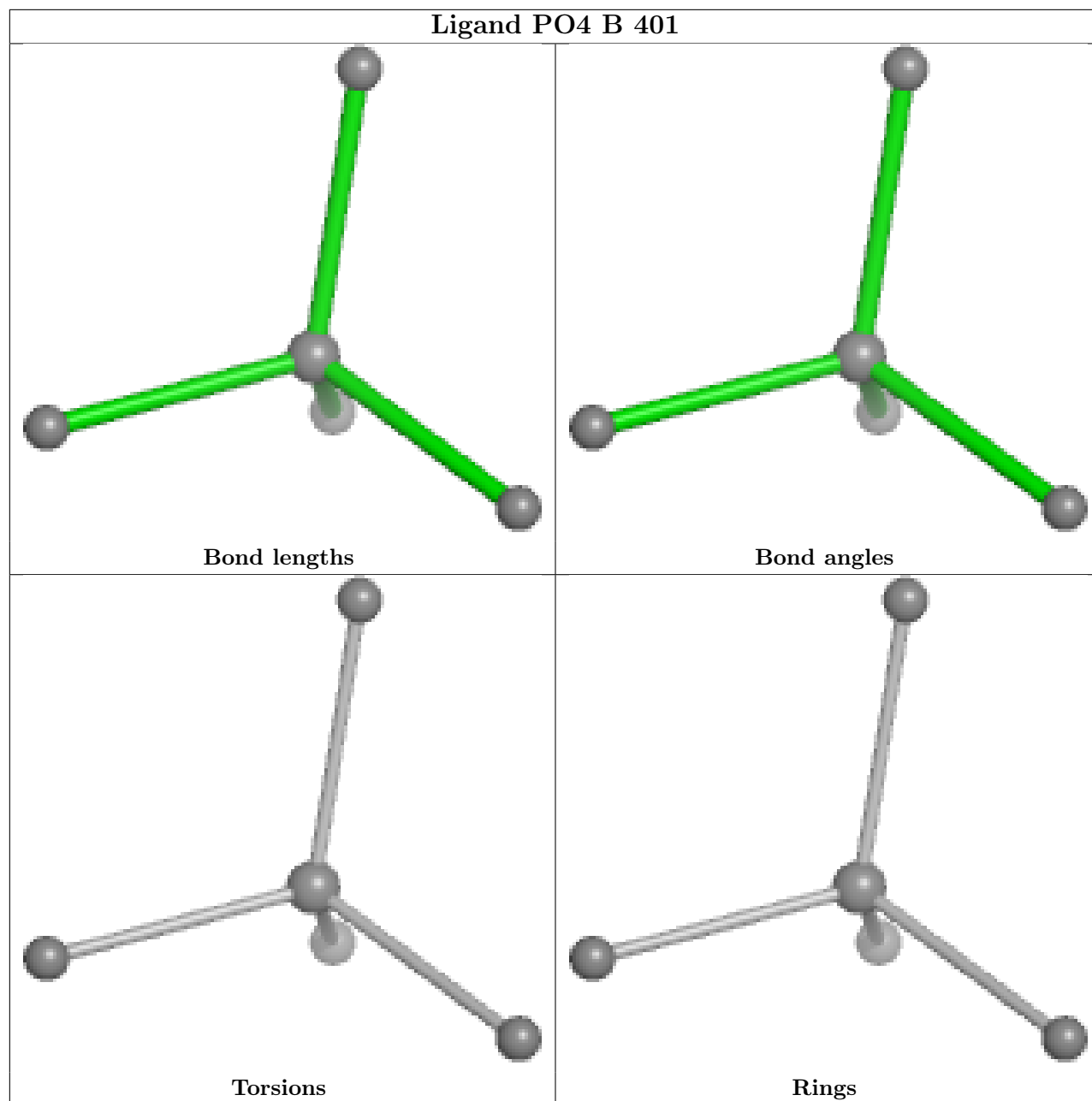


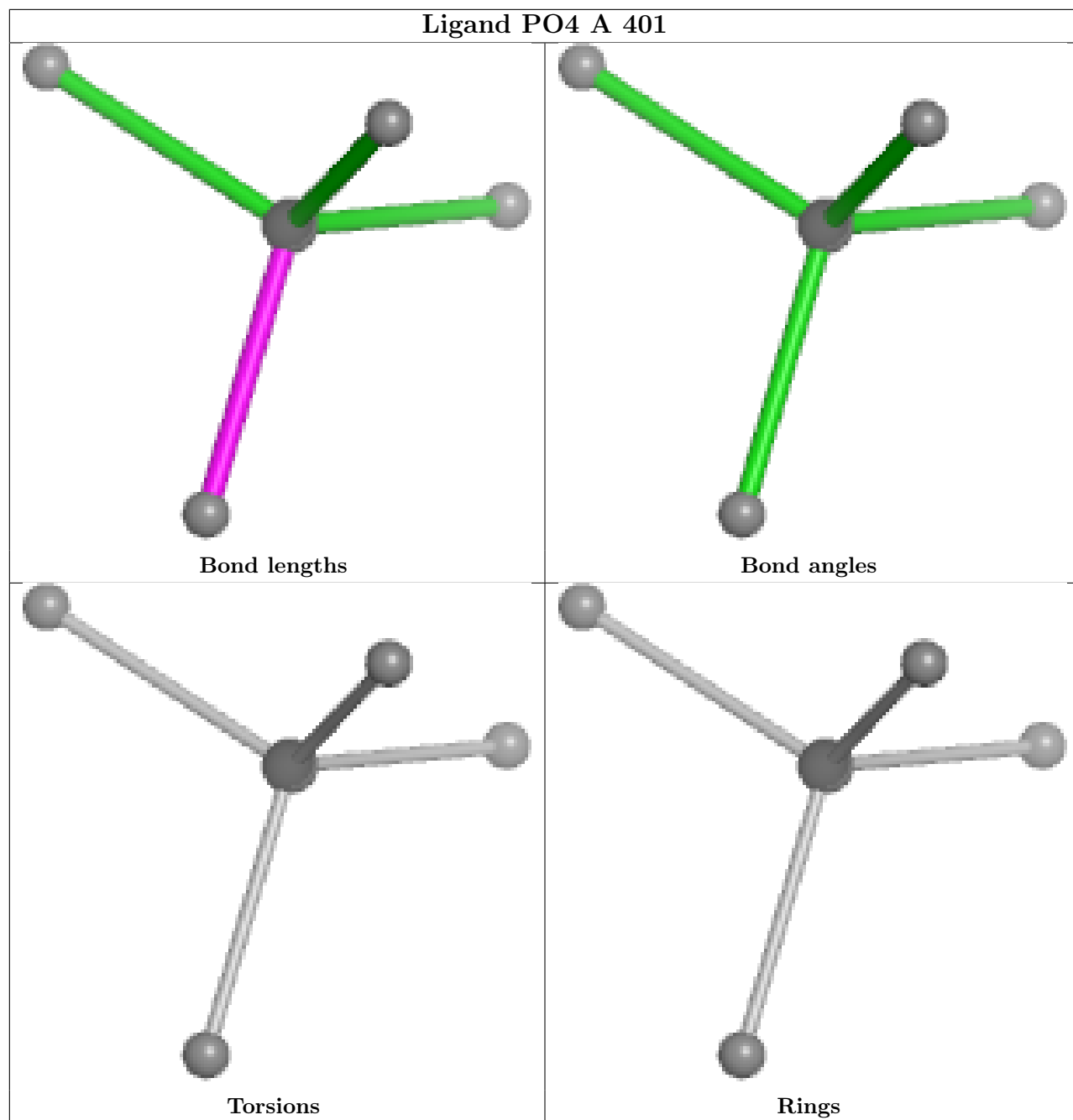


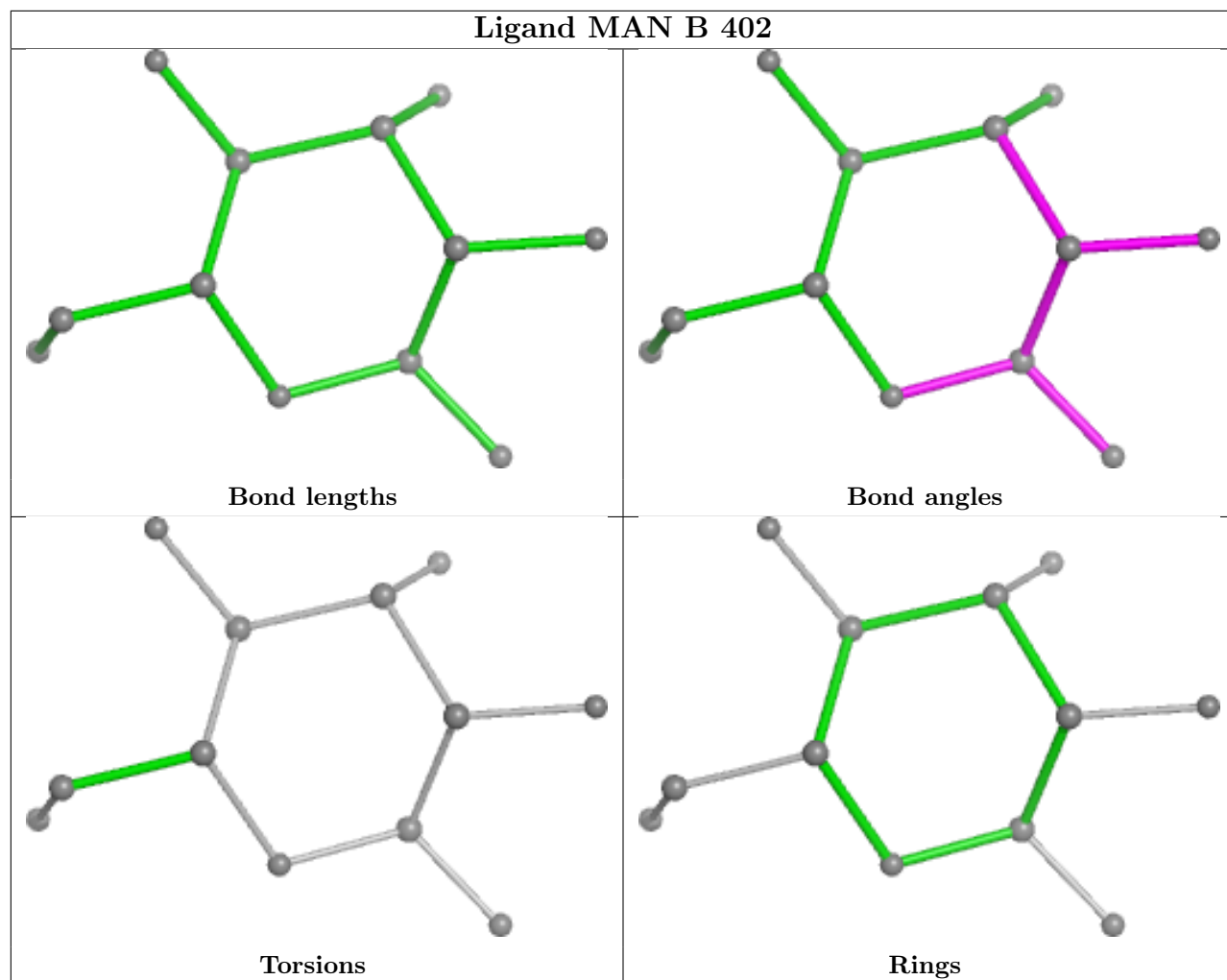
Ligand PO4 D 401

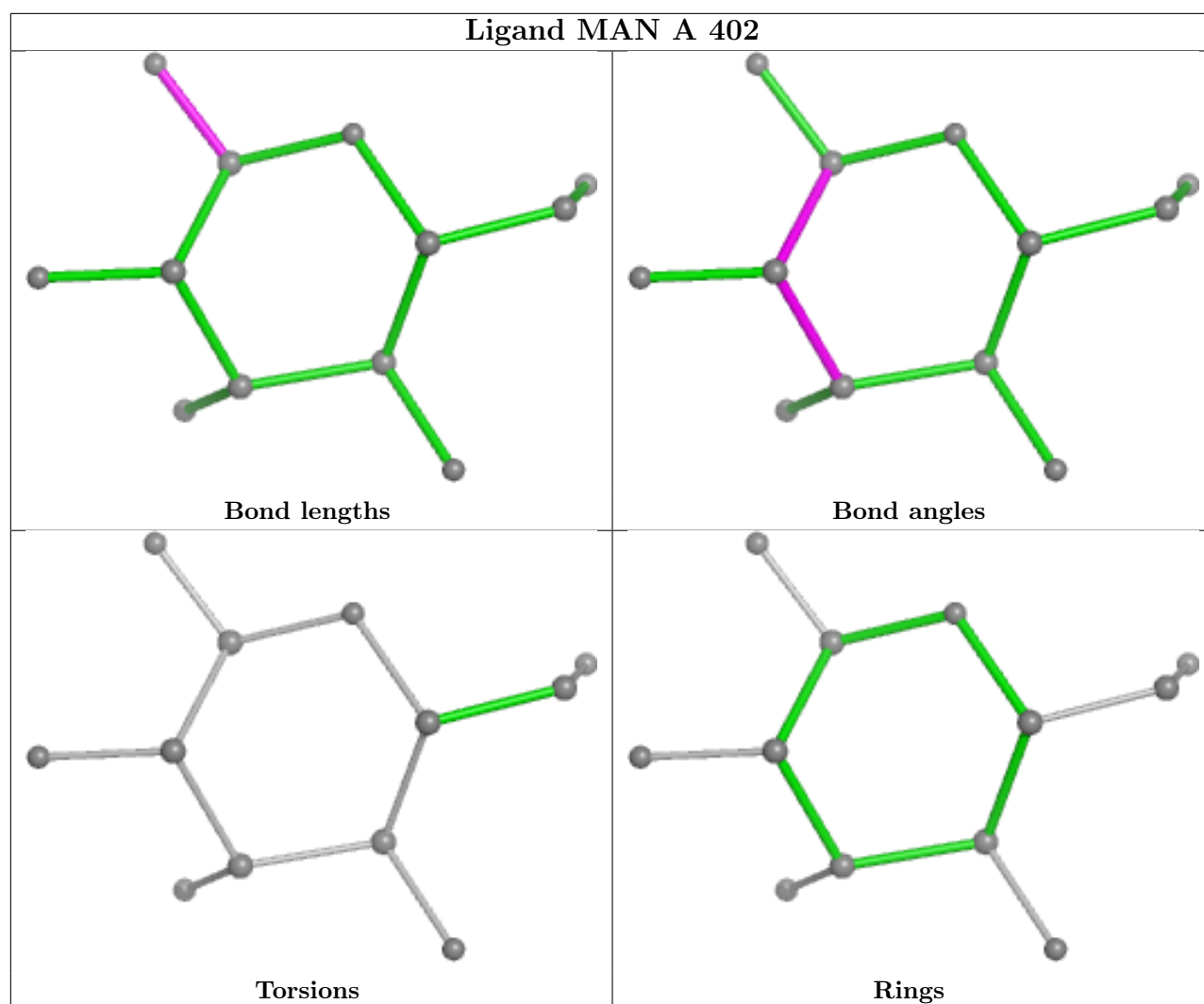


Ligand PO4 B 401









4.7 Other polymers [i](#)

There are no such residues in this entry.

4.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

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

5.1 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	302/303 (99%)	-0.05	6 (1%) 64 68	9, 22, 36, 58	1 (0%)
1	B	296/303 (97%)	0.16	1 (0%) 90 91	16, 24, 40, 59	0
1	C	302/303 (99%)	-0.06	3 (0%) 79 81	15, 21, 37, 56	0
1	D	302/303 (99%)	0.26	5 (1%) 69 71	16, 24, 39, 48	0
All	All	1202/1212 (99%)	0.08	15 (1%) 76 79	9, 22, 38, 59	1 (0%)

All (15) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	303	HIS	4.9
1	C	300	HIS	3.4
1	C	298	HIS	3.2
1	A	300	HIS	3.1
1	D	2	GLY	2.8
1	D	236	LYS	2.6
1	A	272	ASP	2.6
1	D	114	PHE	2.5
1	D	155	LYS	2.4
1	A	232	GLU	2.3
1	A	298	HIS	2.3
1	A	236	LYS	2.2
1	D	303	HIS	2.2
1	A	303	HIS	2.0
1	B	238	ILE	2.0

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

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

5.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.4 Ligands [i](#)

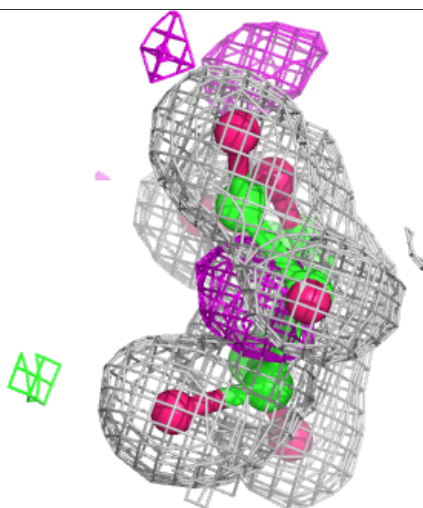
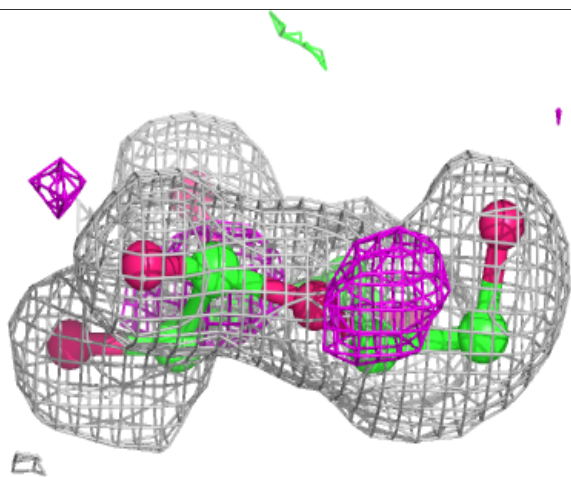
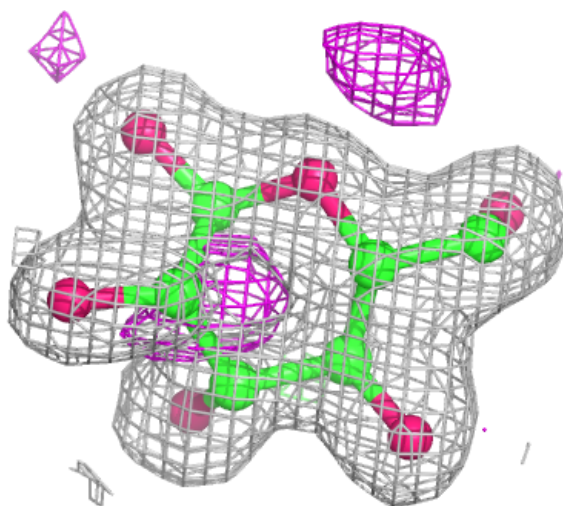
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists 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	EDO	B	405	4/4	0.80	0.14	34,39,40,40	0
4	EDO	B	404	4/4	0.84	0.15	33,33,36,36	0
4	EDO	C	404	4/4	0.88	0.13	36,37,39,42	0
3	MAN	B	402	12/12	0.90	0.10	24,28,32,32	0
4	EDO	C	403	4/4	0.95	0.06	19,22,23,24	0
3	MAN	C	402	12/12	0.95	0.06	18,19,20,20	0
3	MAN	D	402	12/12	0.96	0.06	18,20,22,22	0
4	EDO	B	403	4/4	0.96	0.07	21,22,23,24	0
3	MAN	A	402	12/12	0.96	0.06	18,20,21,22	0
4	EDO	D	403	4/4	0.97	0.06	22,24,26,27	0
4	EDO	A	403	4/4	0.98	0.05	20,21,21,23	0
2	PO4	D	401	5/5	0.99	0.04	18,20,21,22	0
2	PO4	A	401	5/5	0.99	0.04	17,18,19,20	0
2	PO4	B	401	5/5	0.99	0.04	20,24,25,25	0
2	PO4	C	401	5/5	0.99	0.04	16,16,18,20	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.

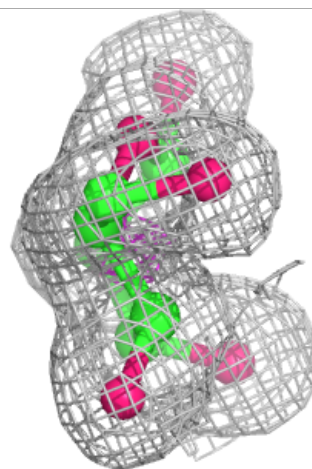
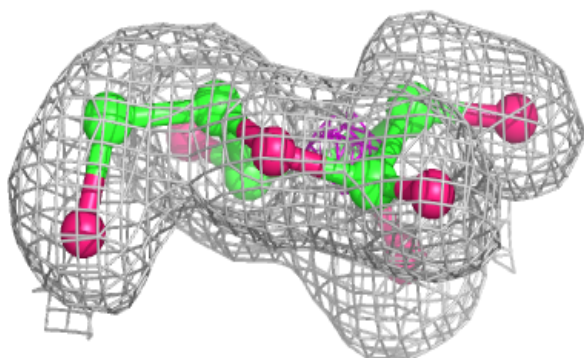
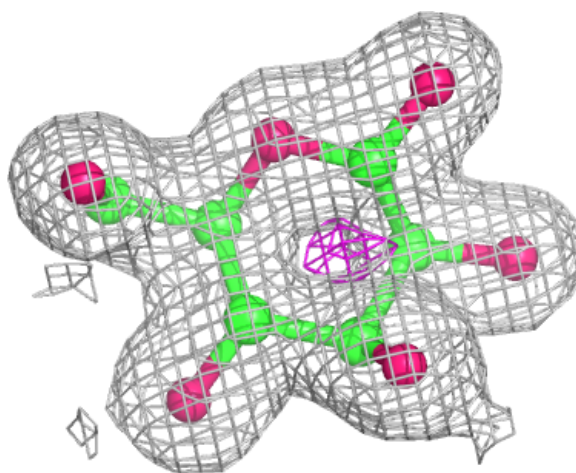
Electron density around MAN B 402:

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



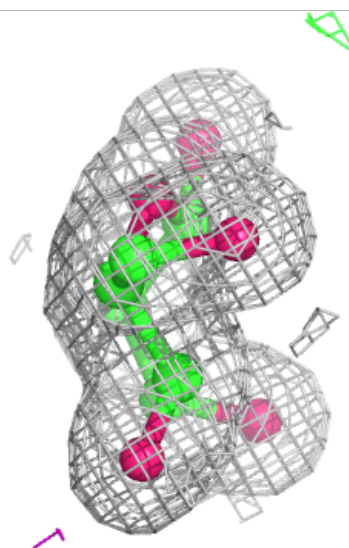
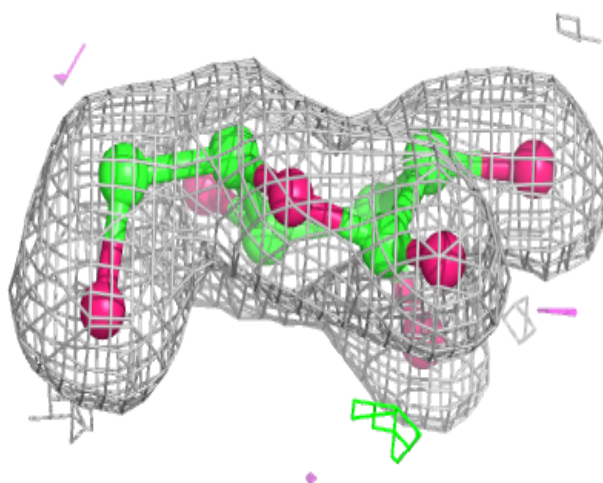
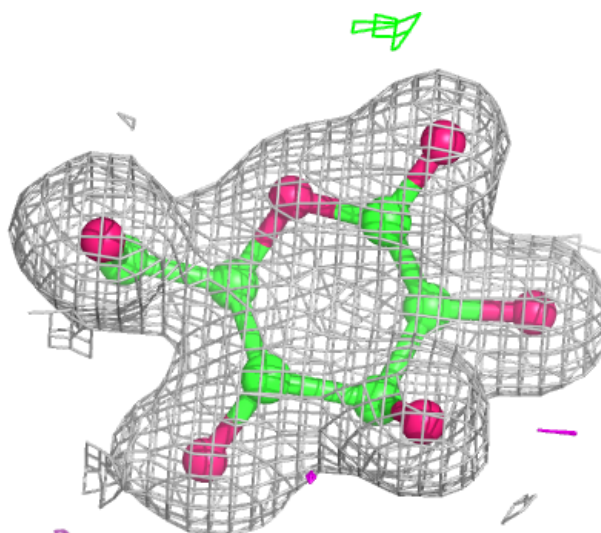
Electron density around MAN C 402:

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



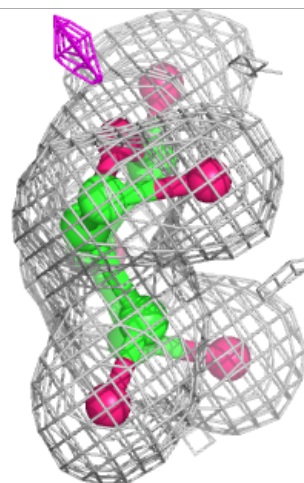
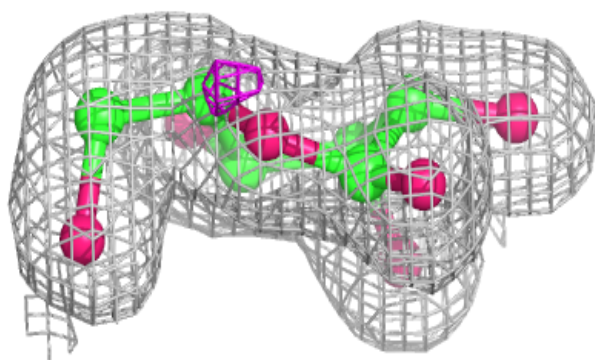
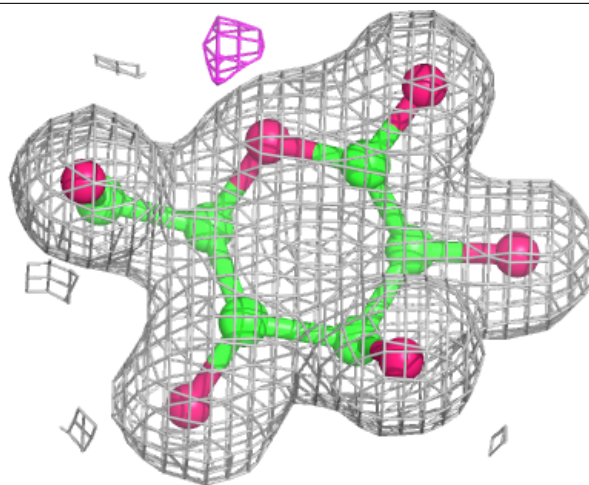
Electron density around MAN D 402:

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



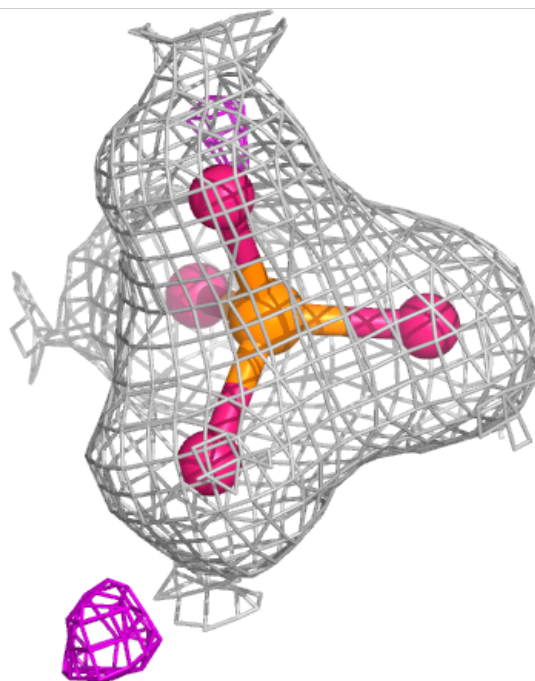
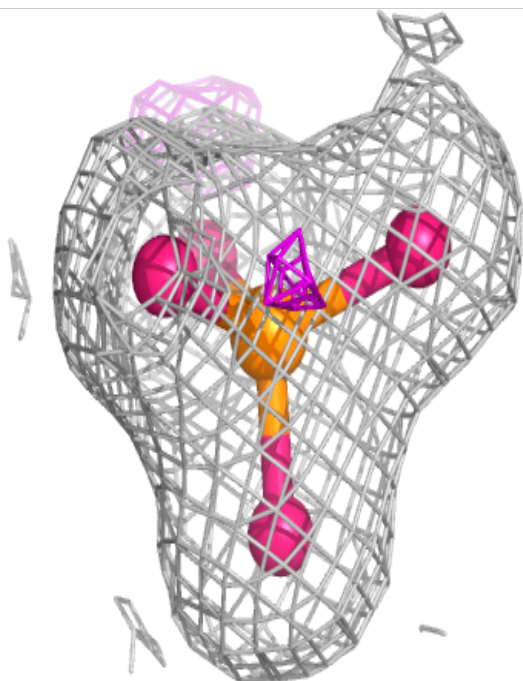
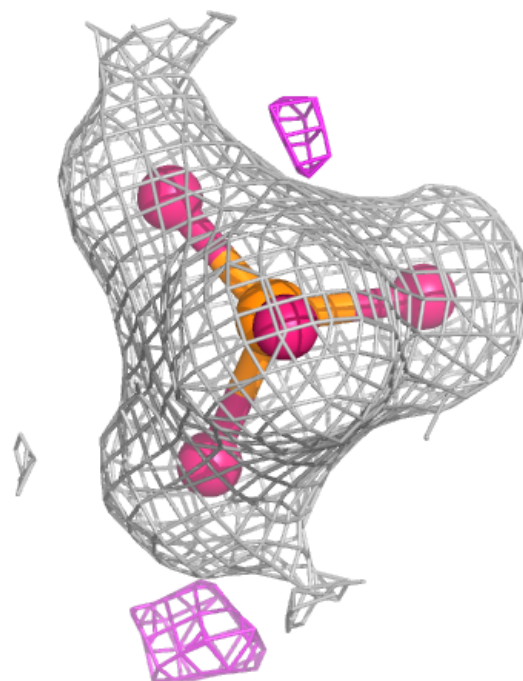
Electron density around MAN A 402:

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



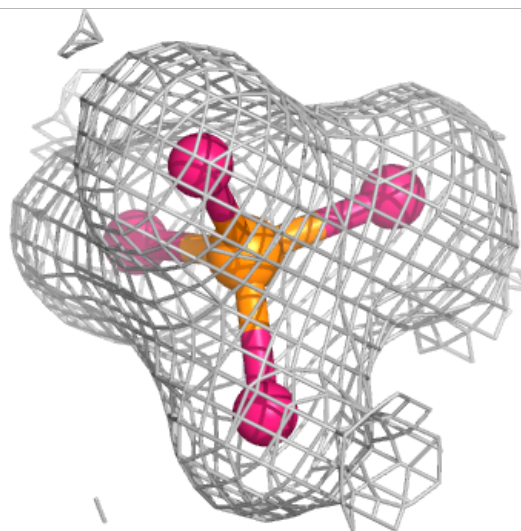
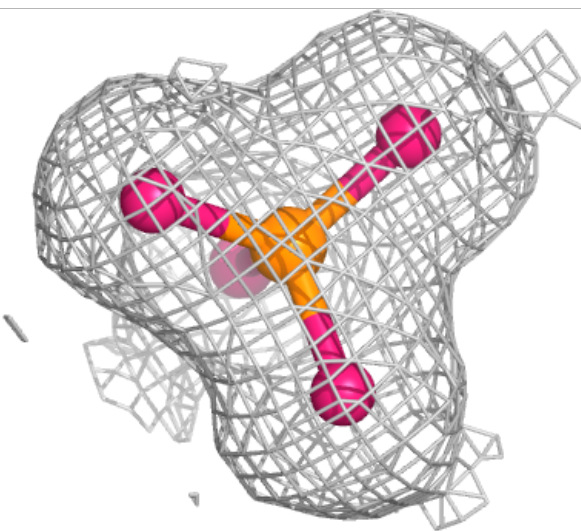
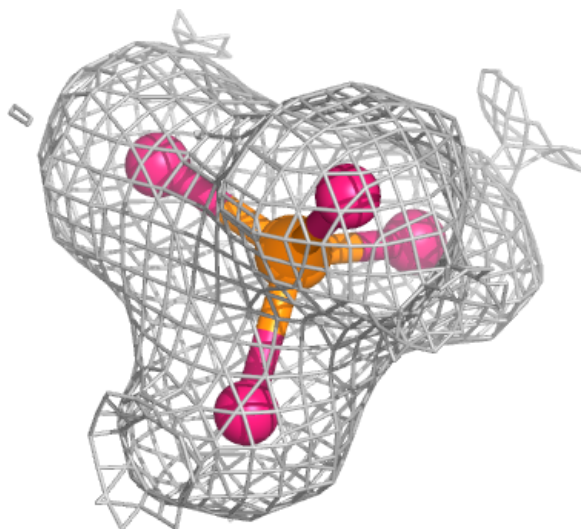
Electron density around PO4 D 401:

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



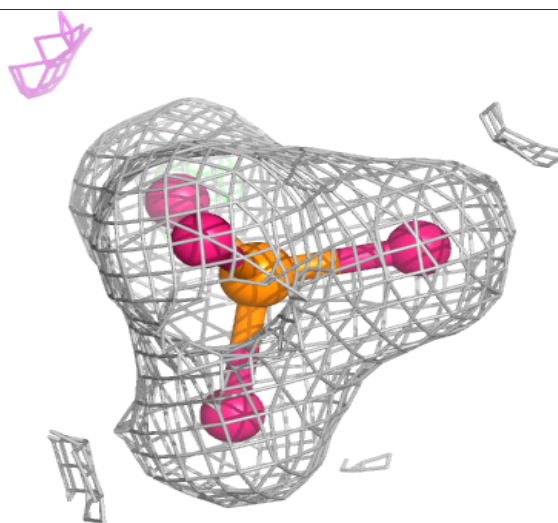
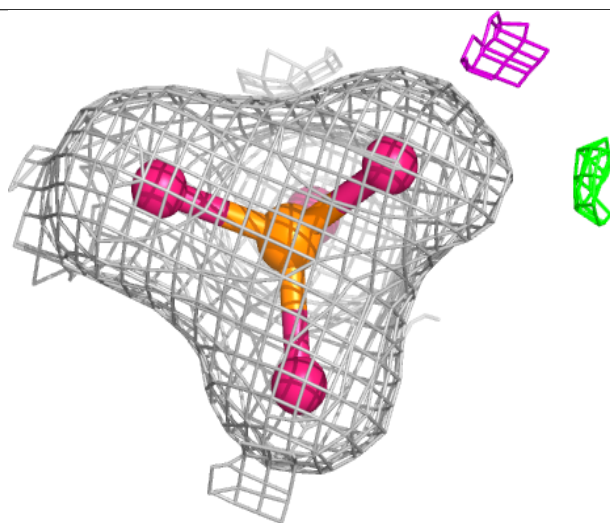
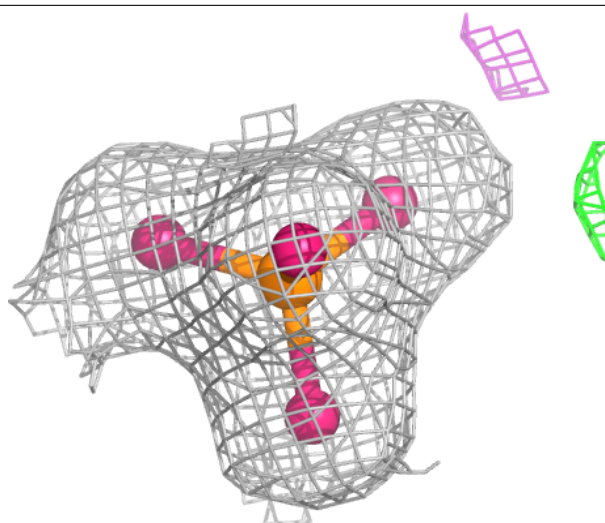
Electron density around PO4 A 401:

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



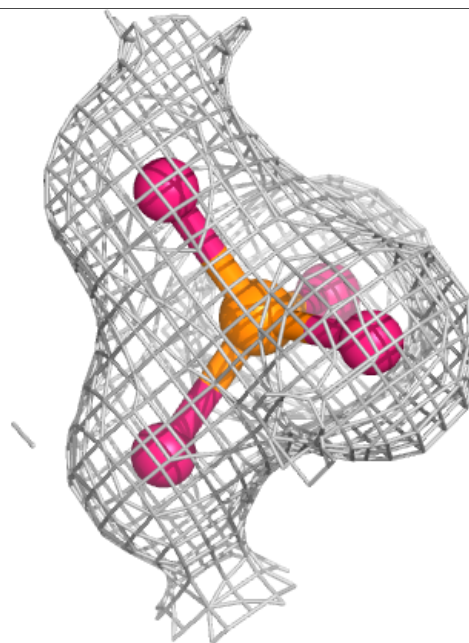
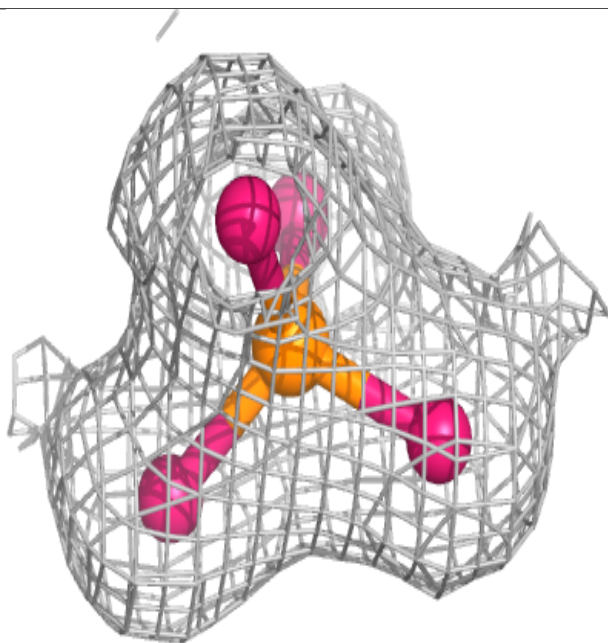
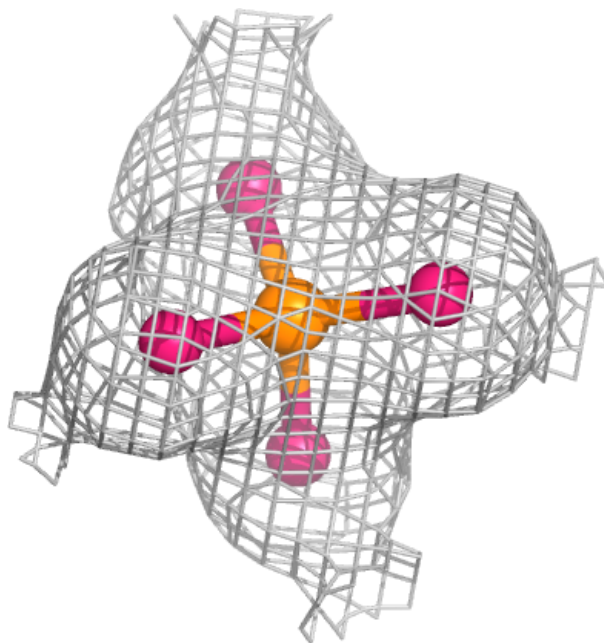
Electron density around PO4 B 401:

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



Electron density around PO4 C 401:

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



5.5 Other polymers ⓘ

There are no such residues in this entry.