Full wwPDB X-ray Structure Validation Report ⓘ

Oct 7, 2024 – 05:46 pm BST

PDB ID	:	8RUW
Title	:	Crystal structure of Archaeoglobus fulgidus (S)-3-O-geranylgeranylglyceryl phosphate synthase
Authors	:	Eilert, L.; Blankenfeldt, W.
Deposited on	:	2024-01-31
Resolution	:	2.48 Å(reported)

The following versions of software and data (see references ⓘ) were used in the production of this report:

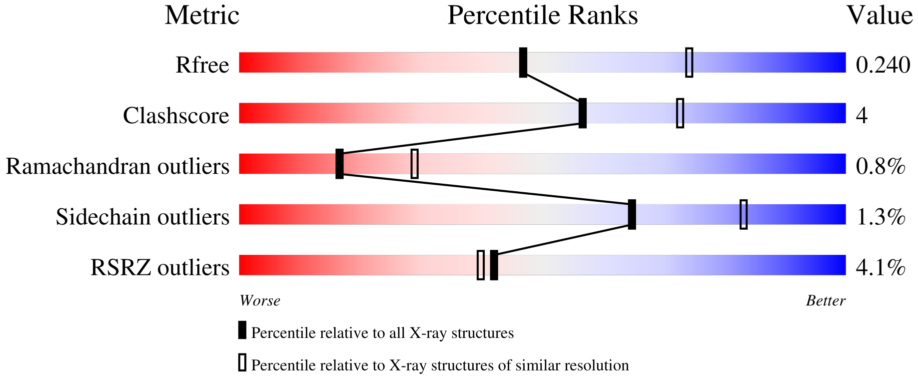
MolProbity	:	4.02b-467
Mogul	:	1.8.4, CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	3.0
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.003 (Gargrove)
Density-Fitness	:	1.0.11
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.39

1 Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

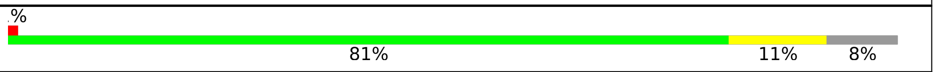
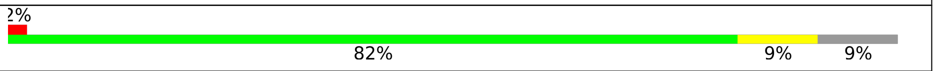
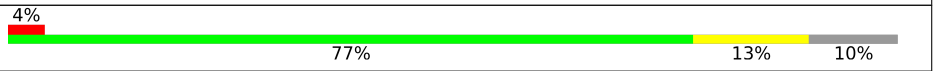
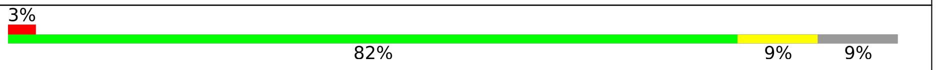
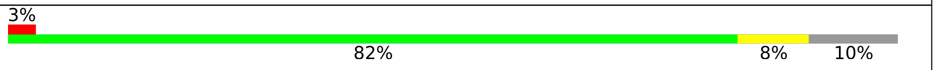
The reported resolution of this entry is 2.48 Å.

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	7106 (2.50-2.46)
Clashscore	180529	7991 (2.50-2.46)
Ramachandran outliers	177936	7888 (2.50-2.46)
Sidechain outliers	177891	7890 (2.50-2.46)
RSRZ outliers	164620	7106 (2.50-2.46)

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 <=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	250	
1	B	250	
1	C	250	
1	D	250	
1	E	250	

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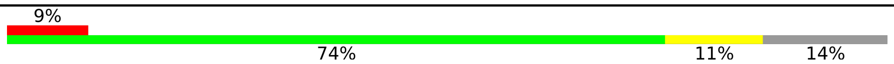
Mol	**Chain**	**Length**	**Quality of chain**
1	F	250	

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**
2	PO4	D	301	-	-	X	-

2 Entry composition (i)

There are 4 unique types of molecules in this entry. The entry contains 20507 atoms, of which 9984 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 Geranylgeranylglyceryl phosphate synthase.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	B	228	Total 3453	C 1130	H 1701	N 286	O 332	S 4	0	0	0
1	A	231	Total 3581	C 1161	H 1776	N 298	O 341	S 5	0	0	0
1	C	225	Total 3373	C 1110	H 1655	N 288	O 316	S 4	0	0	0
1	D	227	Total 3442	C 1123	H 1695	N 286	O 333	S 5	0	0	0
1	E	225	Total 3441	C 1118	H 1701	N 286	O 331	S 5	0	0	0
1	F	214	Total 3033	C 1014	H 1456	N 265	O 294	S 4	0	0	0

There are 114 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	-18	MET	-	initiating methionine	UNP O29844
B	-17	GLY	-	expression tag	UNP O29844
B	-16	SER	-	expression tag	UNP O29844
B	-15	HIS	-	expression tag	UNP O29844
B	-14	HIS	-	expression tag	UNP O29844
B	-13	HIS	-	expression tag	UNP O29844
B	-12	HIS	-	expression tag	UNP O29844
B	-11	HIS	-	expression tag	UNP O29844
B	-10	HIS	-	expression tag	UNP O29844
B	-9	SER	-	expression tag	UNP O29844
B	-8	SER	-	expression tag	UNP O29844
B	-7	GLU	-	expression tag	UNP O29844
B	-6	ASN	-	expression tag	UNP O29844
B	-5	LEU	-	expression tag	UNP O29844
B	-4	TYR	-	expression tag	UNP O29844
B	-3	PHE	-	expression tag	UNP O29844
B	-2	GLN	-	expression tag	UNP O29844

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Chain	Residue	Modelled	Actual	Comment	Reference
B	-1	SER	-	expression tag	UNP O29844
B	0	HIS	-	expression tag	UNP O29844
A	-18	MET	-	initiating methionine	UNP O29844
A	-17	GLY	-	expression tag	UNP O29844
A	-16	SER	-	expression tag	UNP O29844
A	-15	HIS	-	expression tag	UNP O29844
A	-14	HIS	-	expression tag	UNP O29844
A	-13	HIS	-	expression tag	UNP O29844
A	-12	HIS	-	expression tag	UNP O29844
A	-11	HIS	-	expression tag	UNP O29844
A	-10	HIS	-	expression tag	UNP O29844
A	-9	SER	-	expression tag	UNP O29844
A	-8	SER	-	expression tag	UNP O29844
A	-7	GLU	-	expression tag	UNP O29844
A	-6	ASN	-	expression tag	UNP O29844
A	-5	LEU	-	expression tag	UNP O29844
A	-4	TYR	-	expression tag	UNP O29844
A	-3	PHE	-	expression tag	UNP O29844
A	-2	GLN	-	expression tag	UNP O29844
A	-1	SER	-	expression tag	UNP O29844
A	0	HIS	-	expression tag	UNP O29844
C	-18	MET	-	initiating methionine	UNP O29844
C	-17	GLY	-	expression tag	UNP O29844
C	-16	SER	-	expression tag	UNP O29844
C	-15	HIS	-	expression tag	UNP O29844
C	-14	HIS	-	expression tag	UNP O29844
C	-13	HIS	-	expression tag	UNP O29844
C	-12	HIS	-	expression tag	UNP O29844
C	-11	HIS	-	expression tag	UNP O29844
C	-10	HIS	-	expression tag	UNP O29844
C	-9	SER	-	expression tag	UNP O29844
C	-8	SER	-	expression tag	UNP O29844
C	-7	GLU	-	expression tag	UNP O29844
C	-6	ASN	-	expression tag	UNP O29844
C	-5	LEU	-	expression tag	UNP O29844
C	-4	TYR	-	expression tag	UNP O29844
C	-3	PHE	-	expression tag	UNP O29844
C	-2	GLN	-	expression tag	UNP O29844
C	-1	SER	-	expression tag	UNP O29844
C	0	HIS	-	expression tag	UNP O29844
D	-18	MET	-	initiating methionine	UNP O29844
D	-17	GLY	-	expression tag	UNP O29844

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Chain	Residue	Modelled	Actual	Comment	Reference
D	-16	SER	-	expression tag	UNP O29844
D	-15	HIS	-	expression tag	UNP O29844
D	-14	HIS	-	expression tag	UNP O29844
D	-13	HIS	-	expression tag	UNP O29844
D	-12	HIS	-	expression tag	UNP O29844
D	-11	HIS	-	expression tag	UNP O29844
D	-10	HIS	-	expression tag	UNP O29844
D	-9	SER	-	expression tag	UNP O29844
D	-8	SER	-	expression tag	UNP O29844
D	-7	GLU	-	expression tag	UNP O29844
D	-6	ASN	-	expression tag	UNP O29844
D	-5	LEU	-	expression tag	UNP O29844
D	-4	TYR	-	expression tag	UNP O29844
D	-3	PHE	-	expression tag	UNP O29844
D	-2	GLN	-	expression tag	UNP O29844
D	-1	SER	-	expression tag	UNP O29844
D	0	HIS	-	expression tag	UNP O29844
E	-18	MET	-	initiating methionine	UNP O29844
E	-17	GLY	-	expression tag	UNP O29844
E	-16	SER	-	expression tag	UNP O29844
E	-15	HIS	-	expression tag	UNP O29844
E	-14	HIS	-	expression tag	UNP O29844
E	-13	HIS	-	expression tag	UNP O29844
E	-12	HIS	-	expression tag	UNP O29844
E	-11	HIS	-	expression tag	UNP O29844
E	-10	HIS	-	expression tag	UNP O29844
E	-9	SER	-	expression tag	UNP O29844
E	-8	SER	-	expression tag	UNP O29844
E	-7	GLU	-	expression tag	UNP O29844
E	-6	ASN	-	expression tag	UNP O29844
E	-5	LEU	-	expression tag	UNP O29844
E	-4	TYR	-	expression tag	UNP O29844
E	-3	PHE	-	expression tag	UNP O29844
E	-2	GLN	-	expression tag	UNP O29844
E	-1	SER	-	expression tag	UNP O29844
E	0	HIS	-	expression tag	UNP O29844
F	-18	MET	-	initiating methionine	UNP O29844
F	-17	GLY	-	expression tag	UNP O29844
F	-16	SER	-	expression tag	UNP O29844
F	-15	HIS	-	expression tag	UNP O29844
F	-14	HIS	-	expression tag	UNP O29844
F	-13	HIS	-	expression tag	UNP O29844

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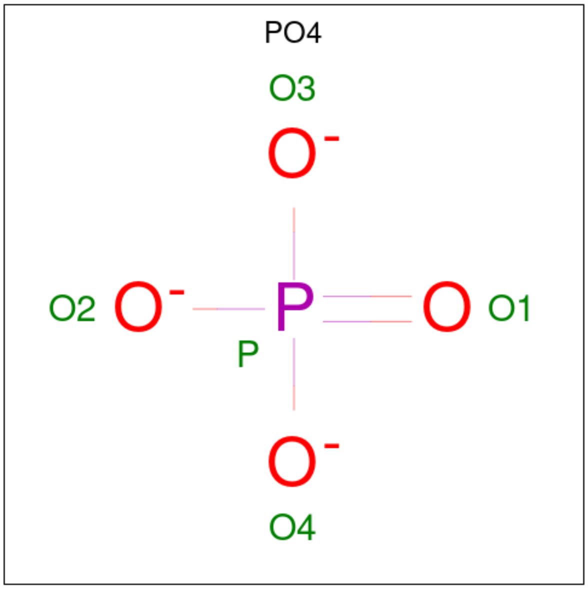
Chain	Residue	Modelled	Actual	Comment	Reference
F	-12	HIS	-	expression tag	UNP O29844
F	-11	HIS	-	expression tag	UNP O29844
F	-10	HIS	-	expression tag	UNP O29844
F	-9	SER	-	expression tag	UNP O29844
F	-8	SER	-	expression tag	UNP O29844
F	-7	GLU	-	expression tag	UNP O29844
F	-6	ASN	-	expression tag	UNP O29844
F	-5	LEU	-	expression tag	UNP O29844
F	-4	TYR	-	expression tag	UNP O29844
F	-3	PHE	-	expression tag	UNP O29844
F	-2	GLN	-	expression tag	UNP O29844
F	-1	SER	-	expression tag	UNP O29844
F	0	HIS	-	expression tag	UNP O29844

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



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

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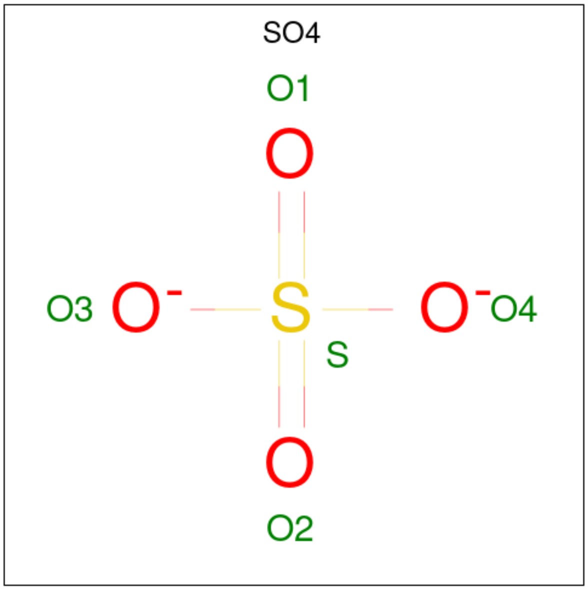
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	E	1	Total O P 5 4 1	0	0
2	F	1	Total O P 5 4 1	0	0

- Molecule 3 is SULFATE ION (three-letter code: SO4) (formula: O_4S).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	C	1	Total O S 5 4 1	0	0

- Molecule 4 is water.

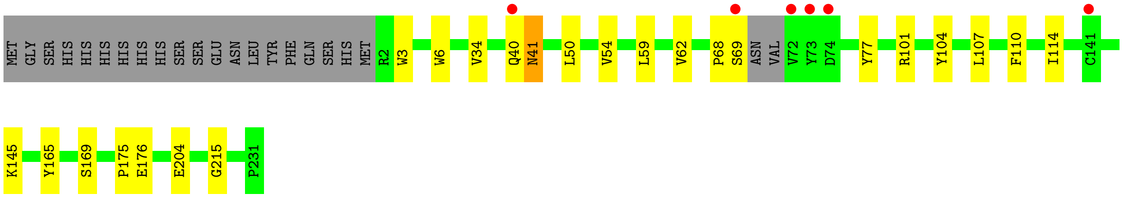
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	B	18	Total O 18 18	0	0
4	A	30	Total O 30 30	0	0
4	C	29	Total O 29 29	0	0
4	D	33	Total O 33 33	0	0
4	E	32	Total O 32 32	0	0
4	F	7	Total O 7 7	0	0

3 Residue-property plots

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.

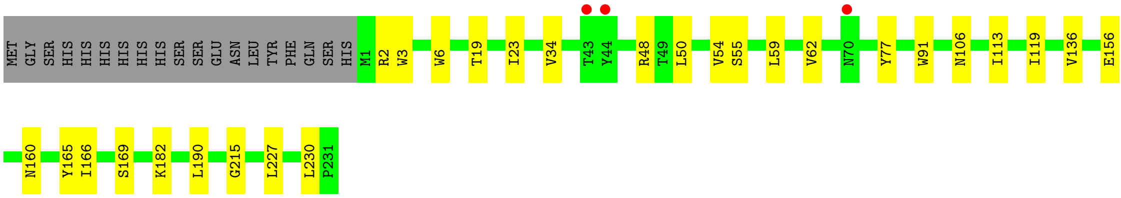
- Molecule 1: Geranylgeranylglyceryl phosphate synthase

Chain B:



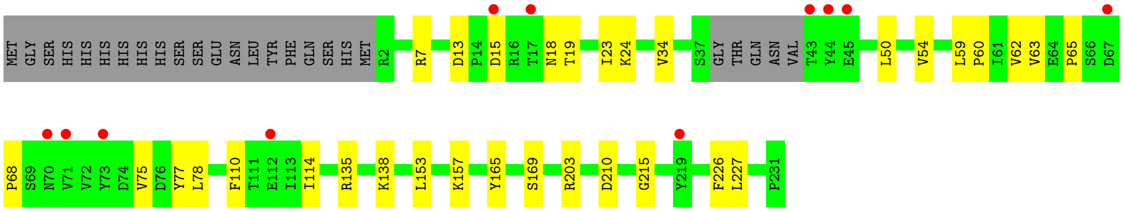
- Molecule 1: Geranylgeranylglyceryl phosphate synthase

Chain A:



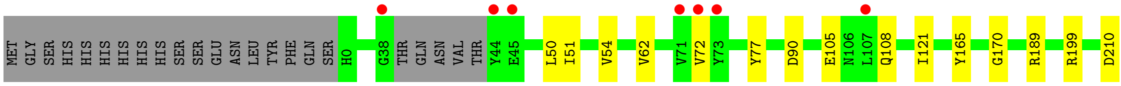
- Molecule 1: Geranylgeranylglyceryl phosphate synthase

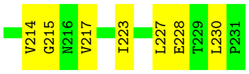
Chain C:



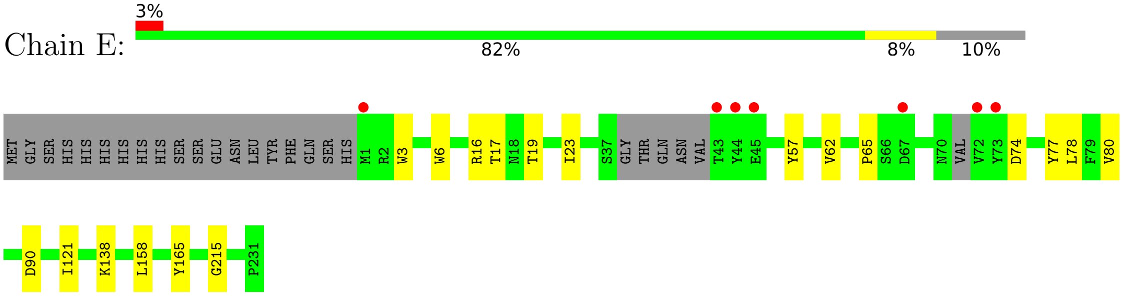
- Molecule 1: Geranylgeranylglyceryl phosphate synthase

Chain D:

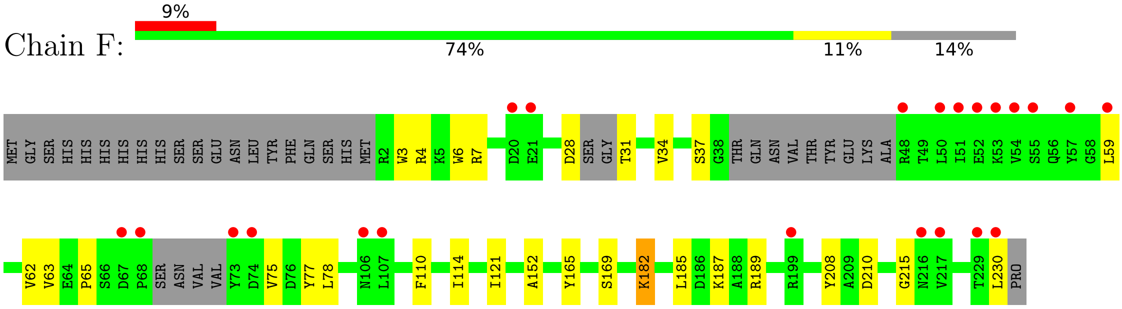




- Molecule 1: Geranylgeranylglyceryl phosphate synthase



- Molecule 1: Geranylgeranylglyceryl phosphate synthase



4 Data and refinement statistics ⓘ

Property	**Value**	**Source**
Space group	P 32 2 1	Depositor
Cell constants a, b, c, α, β, γ	94.89Å 94.89Å 273.79Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	61.07 – 2.48 61.07 – 2.48	Depositor EDS
% Data completeness (in resolution range)	99.9 (61.07-2.48) 100.0 (61.07-2.48)	Depositor EDS
R_{merge}	0.20	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.18 (at 2.48Å)	Xtriage
Refinement program	PHENIX (1.20.1_4487: ???)	Depositor
R, R_{free}	0.201 , 0.239 0.201 , 0.240	Depositor DCC
R_{free} test set	2507 reflections (4.85%)	wwPDB-VP
Wilson B-factor (Å^2)	43.8	Xtriage
Anisotropy	0.414	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.39 , 63.4	EDS
L-test for twinning[2]	$< \|L\| > = 0.47$, $< L^2 > = 0.30$	Xtriage
Estimated twinning fraction	0.036 for -h,-k,l	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	20507	wwPDB-VP
Average B, all atoms (Å^2)	59.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 11.77% of the height of the origin peak. No significant pseudotranslation is detected.*

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[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ 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: PO4, SO4

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	0.29	0/1843	0.50	0/2509
1	B	0.29	0/1788	0.49	0/2438
1	C	0.33	1/1754 (0.1%)	0.50	0/2389
1	D	0.30	0/1783	0.49	0/2430
1	E	0.29	0/1774	0.49	0/2411
1	F	0.27	0/1608	0.48	0/2194
All	All	0.30	1/10550 (0.0%)	0.49	0/14371

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	68	PRO	N-CD	-5.65	1.40	1.47

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	1805	1776	1778	18	1
1	B	1752	1701	1701	12	0
1	C	1718	1655	1655	19	1
1	D	1747	1695	1697	14	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	E	1740	1701	1703	11	0
1	F	1577	1456	1456	20	0
2	A	5	0	0	0	0
2	B	5	0	0	0	0
2	C	5	0	0	0	0
2	D	5	0	0	2	0
2	E	5	0	0	1	0
2	F	5	0	0	0	0
3	C	5	0	0	0	0
4	A	30	0	0	1	0
4	B	18	0	0	1	0
4	C	29	0	0	0	0
4	D	33	0	0	1	1
4	E	32	0	0	2	0
4	F	7	0	0	1	0
All	All	10523	9984	9990	91	2

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 4.

All (91) 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:B:34:VAL:HG23	1:B:59:LEU:HD23	1.63	0.81
1:E:74:ASP:O	4:E:401:HOH:O	2.03	0.75
1:D:105:GLU:N	1:D:105:GLU:OE1	2.21	0.72
1:F:4:ARG:O	1:F:189:ARG:NH1	2.23	0.71
1:B:62:VAL:HG22	1:B:77:TYR:HB2	1.77	0.67
2:D:301:PO4:O2	4:D:401:HOH:O	2.12	0.67
1:D:199:ARG:HG2	1:D:228:GLU:OE1	2.01	0.61
1:C:19:THR:O	1:C:23:ILE:HG13	2.00	0.61
1:F:210:ASP:OD2	4:F:401:HOH:O	2.16	0.59
1:F:62:VAL:HG22	1:F:77:TYR:HB2	1.85	0.59
1:A:48:ARG:HH11	1:A:48:ARG:HG2	1.67	0.58
1:C:110:PHE:CE2	1:C:114:ILE:HD11	2.38	0.58
1:F:182:LYS:HD3	1:F:208:TYR:O	2.04	0.58
1:C:135:ARG:NH1	1:E:57:TYR:O	2.36	0.58
1:C:62:VAL:HG22	1:C:77:TYR:HB2	1.87	0.56
1:F:28:ASP:HB3	1:F:230:LEU:HD13	1.87	0.56
1:A:2:ARG:HH11	1:A:2:ARG:HG2	1.71	0.54
1:A:2:ARG:NH2	4:A:403:HOH:O	2.38	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:106:ASN:O	1:A:106:ASN:OD1	2.26	0.54
1:A:113:ILE:HG22	1:A:119:ILE:HD13	1.90	0.53
1:A:62:VAL:HG22	1:A:77:TYR:HB2	1.90	0.53
1:F:34:VAL:HG23	1:F:59:LEU:HD21	1.91	0.53
1:A:34:VAL:HG23	1:A:59:LEU:HD11	1.89	0.53
1:F:182:LYS:HE3	1:F:210:ASP:OD1	2.09	0.51
1:C:153:LEU:HD22	1:C:157:LYS:HG2	1.92	0.51
1:F:4:ARG:NH2	1:F:187:LYS:O	2.44	0.51
1:D:62:VAL:HG22	1:D:77:TYR:HB2	1.91	0.51
1:F:110:PHE:O	1:F:114:ILE:HG12	2.11	0.50
1:E:19:THR:O	1:E:23:ILE:HD12	2.10	0.50
1:D:223:ILE:HD12	1:D:223:ILE:N	2.27	0.49
1:C:34:VAL:HG23	1:C:59:LEU:HD21	1.93	0.49
1:B:104:TYR:HA	1:B:107:LEU:HD13	1.94	0.49
1:A:19:THR:O	1:A:23:ILE:HD12	2.13	0.49
1:F:34:VAL:HG23	1:F:59:LEU:CD2	2.43	0.49
1:B:3:TRP:HA	1:B:6:TRP:CE2	2.48	0.48
1:C:138:LYS:HE2	1:E:74:ASP:HA	1.95	0.48
1:B:40:GLN:O	1:B:41:ASN:CB	2.61	0.48
1:F:63:VAL:CG2	1:F:75:VAL:HG11	2.44	0.48
1:F:121:ILE:HD12	1:F:121:ILE:N	2.28	0.48
1:A:166:ILE:CD1	1:A:190:LEU:HD11	2.44	0.48
1:C:34:VAL:N	1:C:59:LEU:HD21	2.28	0.48
1:C:138:LYS:CE	1:E:74:ASP:HA	2.44	0.48
1:D:50:LEU:O	1:D:54:VAL:HG23	2.14	0.48
1:B:101:ARG:NH2	4:B:402:HOH:O	2.37	0.47
1:D:189:ARG:CZ	1:D:210:ASP:HB3	2.45	0.47
1:C:226:PHE:HD1	1:C:227:LEU:HD22	1.78	0.47
1:A:3:TRP:HA	1:A:6:TRP:CE2	2.49	0.47
1:D:51:ILE:HD12	1:D:72:VAL:HG11	1.95	0.47
1:E:80:VAL:HB	1:E:121:ILE:HD13	1.97	0.47
1:F:7:ARG:HD2	1:F:210:ASP:O	2.15	0.47
1:A:156:GLU:O	1:A:160:ASN:HA	2.15	0.46
1:F:110:PHE:CZ	1:F:114:ILE:HD11	2.49	0.46
1:E:62:VAL:HG22	1:E:77:TYR:HB2	1.97	0.46
1:A:48:ARG:HG2	1:A:48:ARG:NH1	2.30	0.46
1:A:166:ILE:HD12	1:A:190:LEU:HD11	1.99	0.45
1:C:59:LEU:HD23	1:C:60:PRO:O	2.16	0.45
1:C:65:PRO:HD3	1:C:78:LEU:CD1	2.46	0.45
1:A:34:VAL:HG11	1:A:54:VAL:HG11	1.99	0.45
1:C:13:ASP:OD1	1:C:15:ASP:N	2.47	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:63:VAL:HG23	1:C:75:VAL:HG21	1.98	0.45
1:C:18:ASN:ND2	1:C:50:LEU:CD2	2.80	0.45
1:F:65:PRO:HD3	1:F:78:LEU:CD2	2.47	0.44
1:F:65:PRO:HG3	1:F:78:LEU:HD21	1.98	0.44
1:D:51:ILE:CD1	1:D:72:VAL:HG11	2.47	0.44
1:C:18:ASN:HD22	1:C:50:LEU:HD22	1.82	0.44
1:D:121:ILE:HD11	1:E:158:LEU:HD22	1.99	0.44
1:F:65:PRO:HD3	1:F:78:LEU:HD21	2.00	0.44
1:E:65:PRO:HD3	1:E:78:LEU:HD11	2.00	0.44
1:C:7:ARG:HD2	1:C:210:ASP:O	2.18	0.44
1:B:34:VAL:CG2	1:B:59:LEU:HD23	2.43	0.43
1:D:199:ARG:HE	1:D:228:GLU:HG2	1.82	0.43
1:C:50:LEU:O	1:C:54:VAL:HG23	2.18	0.43
1:B:176:GLU:HG2	1:A:106:ASN:ND2	2.33	0.43
1:A:227:LEU:HA	1:A:230:LEU:HD23	2.00	0.42
1:B:68:PRO:O	1:B:69:SER:CB	2.67	0.42
2:E:301:PO4:O4	4:E:402:HOH:O	2.20	0.42
1:A:91:TRP:CZ2	1:A:136:VAL:HG12	2.55	0.42
1:F:28:ASP:HB2	1:F:31:THR:N	2.35	0.42
1:A:50:LEU:O	1:A:54:VAL:HG23	2.19	0.42
1:D:170:GLY:HA2	2:D:301:PO4:O3	2.20	0.41
1:F:152:ALA:HB1	1:F:185:LEU:HD21	2.03	0.41
1:D:214:VAL:HG12	1:D:217:VAL:HG12	2.03	0.41
1:E:16:ARG:HD2	1:E:17:THR:H	1.85	0.41
1:D:108:GLN:OE1	1:D:108:GLN:HA	2.21	0.41
1:B:50:LEU:O	1:B:54:VAL:HG23	2.21	0.41
1:C:18:ASN:HD22	1:C:50:LEU:CD2	2.33	0.41
1:D:227:LEU:HA	1:D:230:LEU:HD23	2.01	0.40
1:E:3:TRP:HA	1:E:6:TRP:CE2	2.56	0.40
1:F:3:TRP:HA	1:F:6:TRP:CE2	2.55	0.40
1:B:110:PHE:CE2	1:B:114:ILE:HD11	2.55	0.40
1:B:175:PRO:HG3	1:B:204:GLU:OE2	2.21	0.40

All (2) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:D:411:HOH:O	4:D:423:HOH:O[4_555]	2.16	0.04
1:A:182:LYS:O	1:C:203:ARG:HH22[6_654]	1.60	0.00

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

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	229/250 (92%)	221 (96%)	6 (3%)	2 (1%)	14	26
1	B	224/250 (90%)	215 (96%)	6 (3%)	3 (1%)	10	17
1	C	221/250 (88%)	209 (95%)	10 (4%)	2 (1%)	14	26
1	D	223/250 (89%)	215 (96%)	7 (3%)	1 (0%)	30	47
1	E	219/250 (88%)	211 (96%)	7 (3%)	1 (0%)	25	41
1	F	206/250 (82%)	193 (94%)	11 (5%)	2 (1%)	13	23
All	All	1322/1500 (88%)	1264 (96%)	47 (4%)	11 (1%)	16	29

All (11) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	169	SER
1	A	215	GLY
1	C	169	SER
1	C	215	GLY
1	F	169	SER
1	F	215	GLY
1	B	215	GLY
1	A	169	SER
1	B	41	ASN
1	E	215	GLY
1	D	215	GLY

5.3.2 Protein sidechains ⓘ

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	189/218 (87%)	187 (99%)	2 (1%)	70	86
1	B	179/218 (82%)	177 (99%)	2 (1%)	70	86
1	C	169/218 (78%)	167 (99%)	2 (1%)	67	84
1	D	181/218 (83%)	179 (99%)	2 (1%)	70	86
1	E	181/218 (83%)	178 (98%)	3 (2%)	56	77
1	F	147/218 (67%)	144 (98%)	3 (2%)	50	73
All	All	1046/1308 (80%)	1032 (99%)	14 (1%)	65	83

All (14) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	145	LYS
1	B	165	TYR
1	A	55	SER
1	A	165	TYR
1	C	24	LYS
1	C	165	TYR
1	D	90	ASP
1	D	165	TYR
1	E	90	ASP
1	E	138	LYS
1	E	165	TYR
1	F	37	SER
1	F	165	TYR
1	F	182	LYS

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

Mol	Chain	Res	Type
1	B	103	HIS
1	C	142	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

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	$\#\|Z\| > 2$
2	PO4	D	301	-	4,4,4	1.84	2 (50%)	6,6,6	0.37	0
2	PO4	C	301	-	4,4,4	0.83	0	6,6,6	0.37	0
3	SO4	C	302	-	4,4,4	0.14	0	6,6,6	0.04	0
2	PO4	B	301	-	4,4,4	0.97	0	6,6,6	0.47	0
2	PO4	A	301	-	4,4,4	1.75	1 (25%)	6,6,6	0.48	0
2	PO4	F	301	-	4,4,4	0.94	0	6,6,6	0.48	0
2	PO4	E	301	-	4,4,4	1.45	0	6,6,6	0.43	0

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	301	PO4	P-O3	-2.20	1.48	1.54
2	D	301	PO4	P-O2	-2.07	1.48	1.54
2	A	301	PO4	P-O3	-2.03	1.48	1.54

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

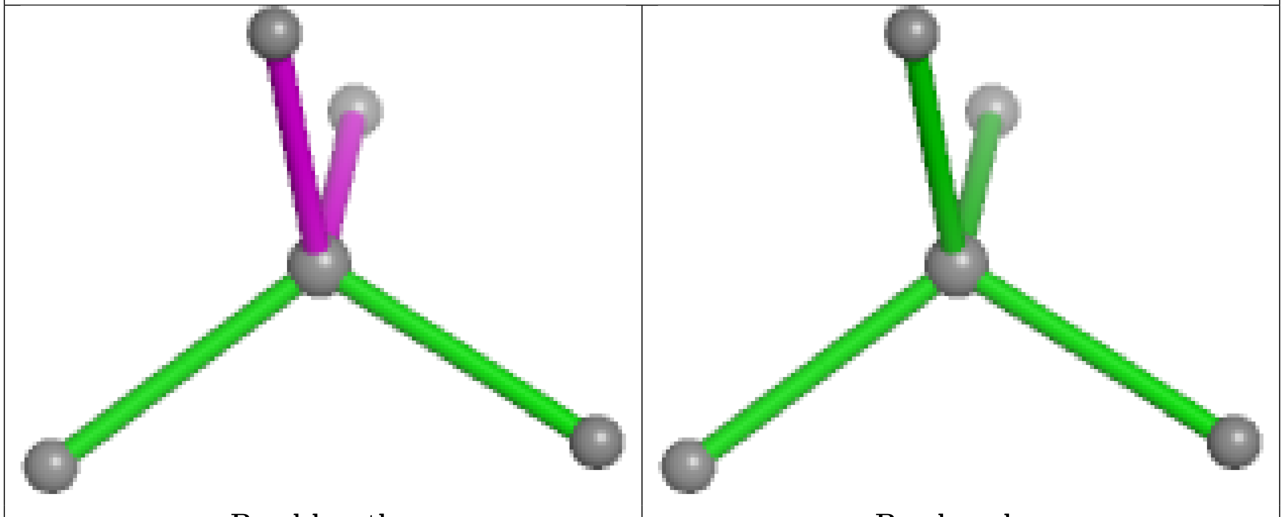
There are no ring outliers.

2 monomers are involved in 3 short contacts:

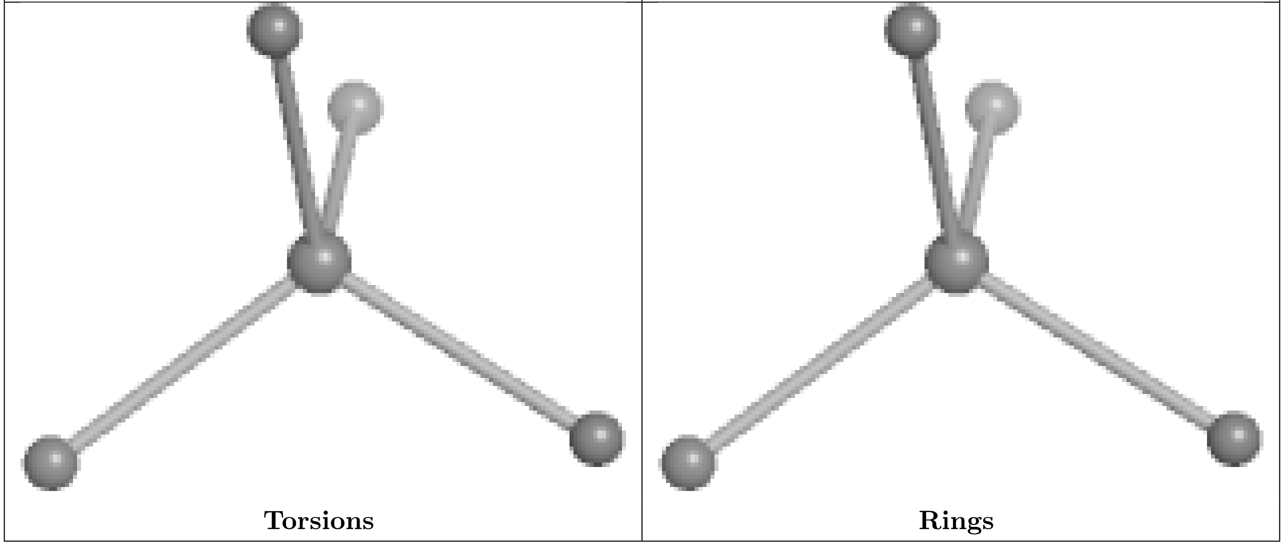
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	D	301	PO4	2	0
2	E	301	PO4	1	0

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 then 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 301

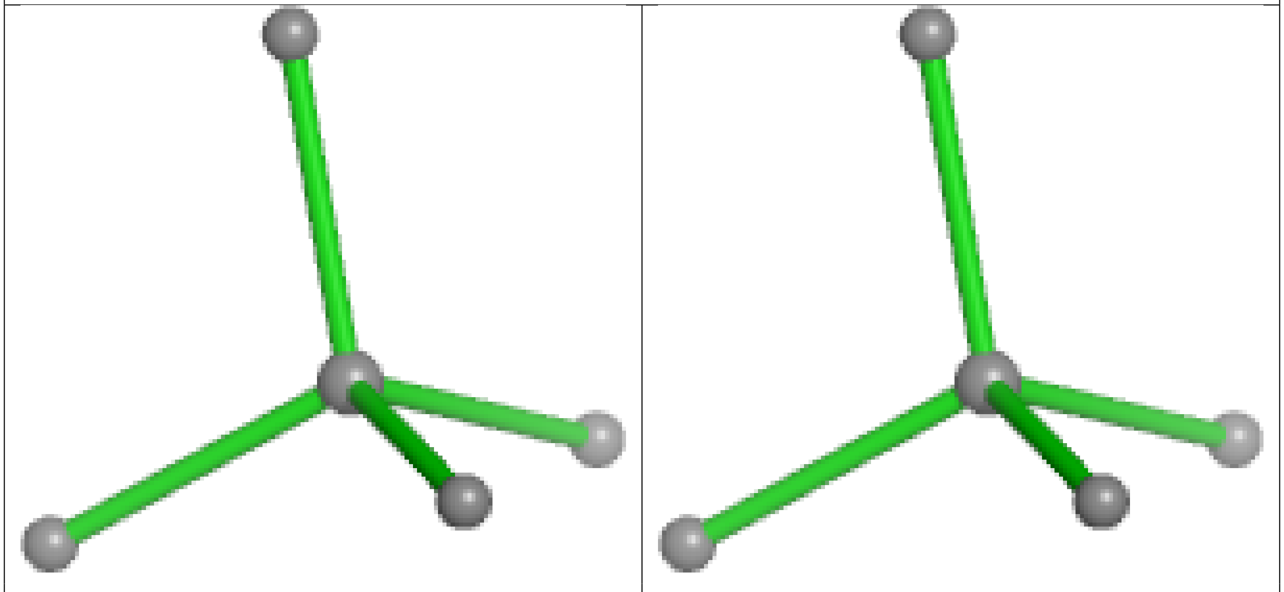


Bond lengths **Bond angles**

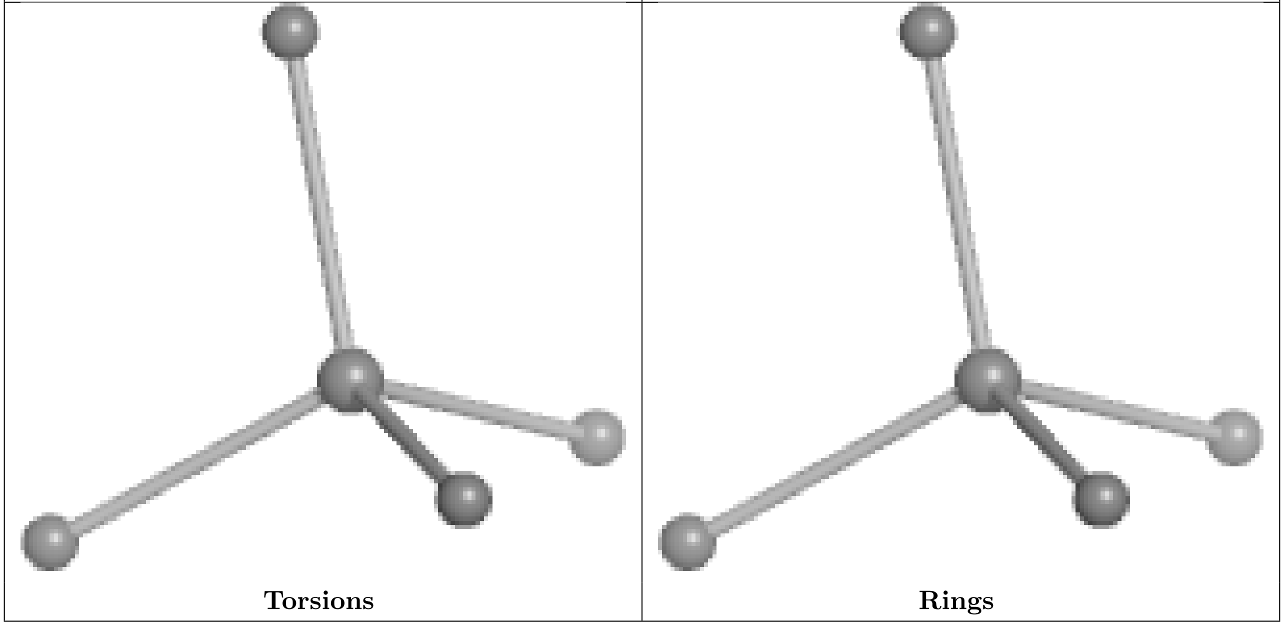


Torsions **Rings**

Ligand PO4 C 301

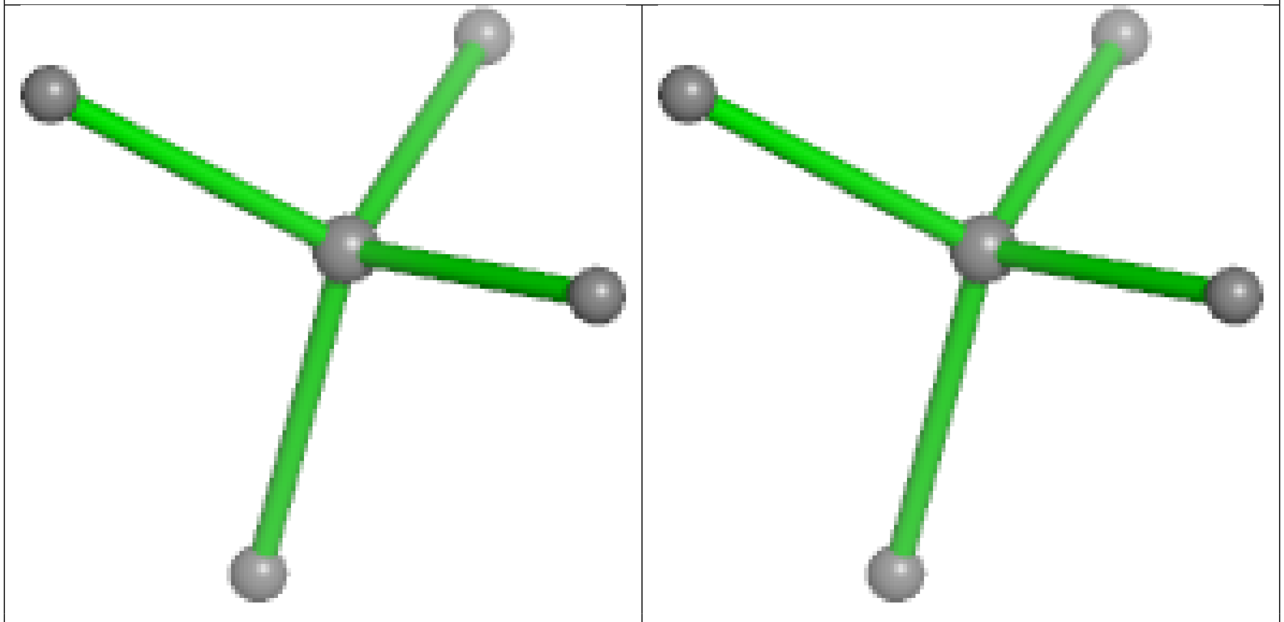


Bond lengths **Bond angles**

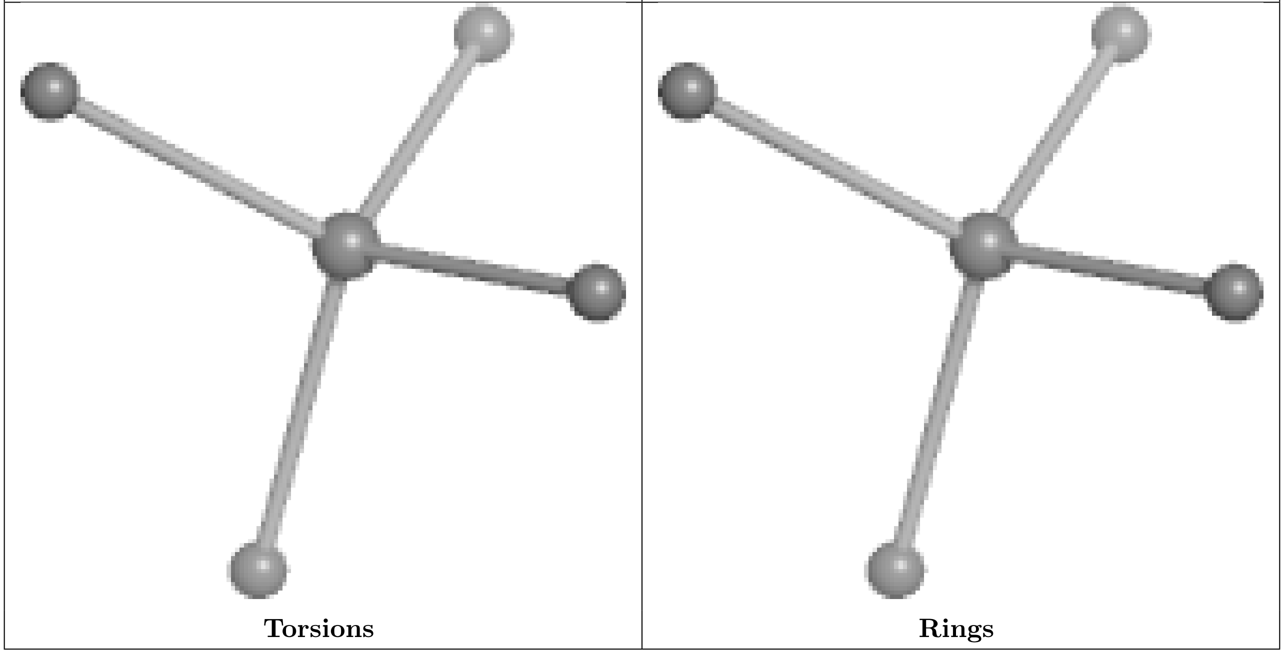


Torsions **Rings**

Ligand PO4 B 301

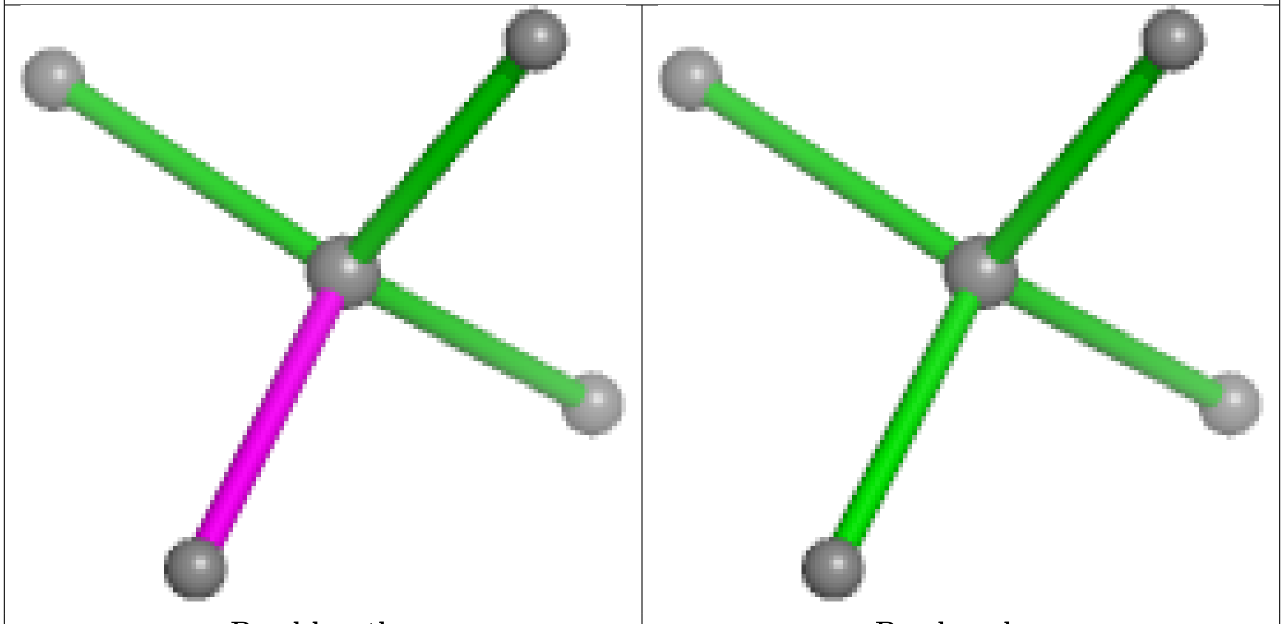


Bond lengths **Bond angles**



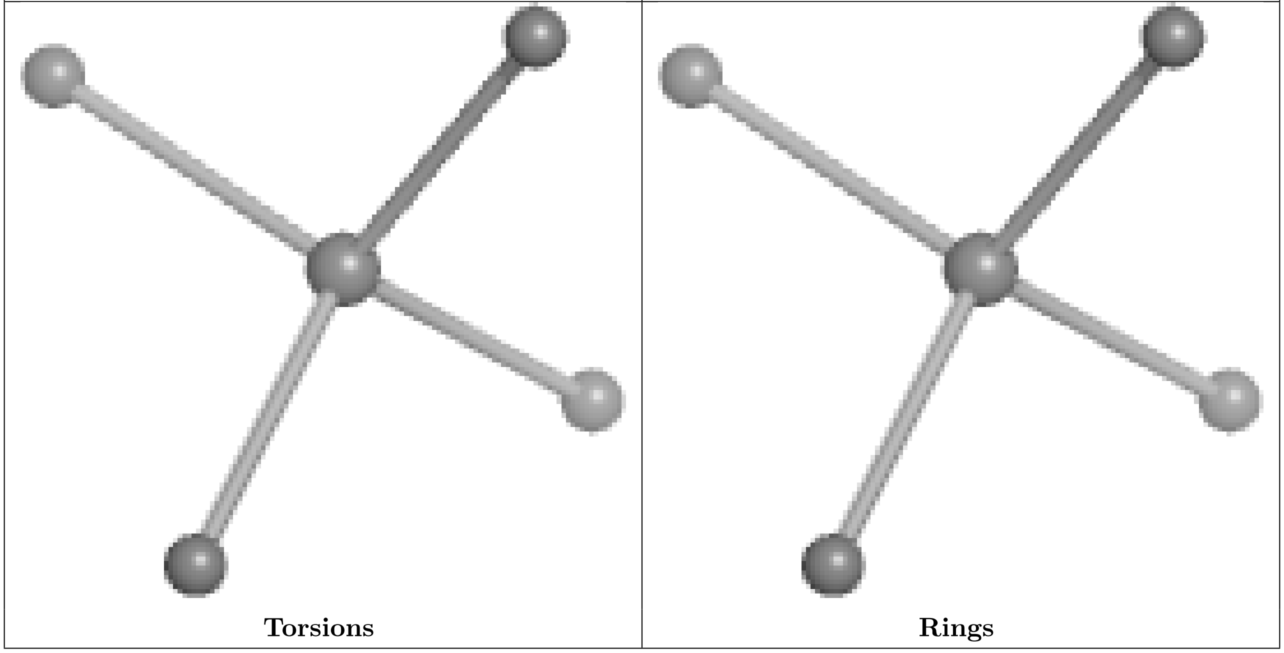
Torsions **Rings**

Ligand PO4 A 301



Bond lengths

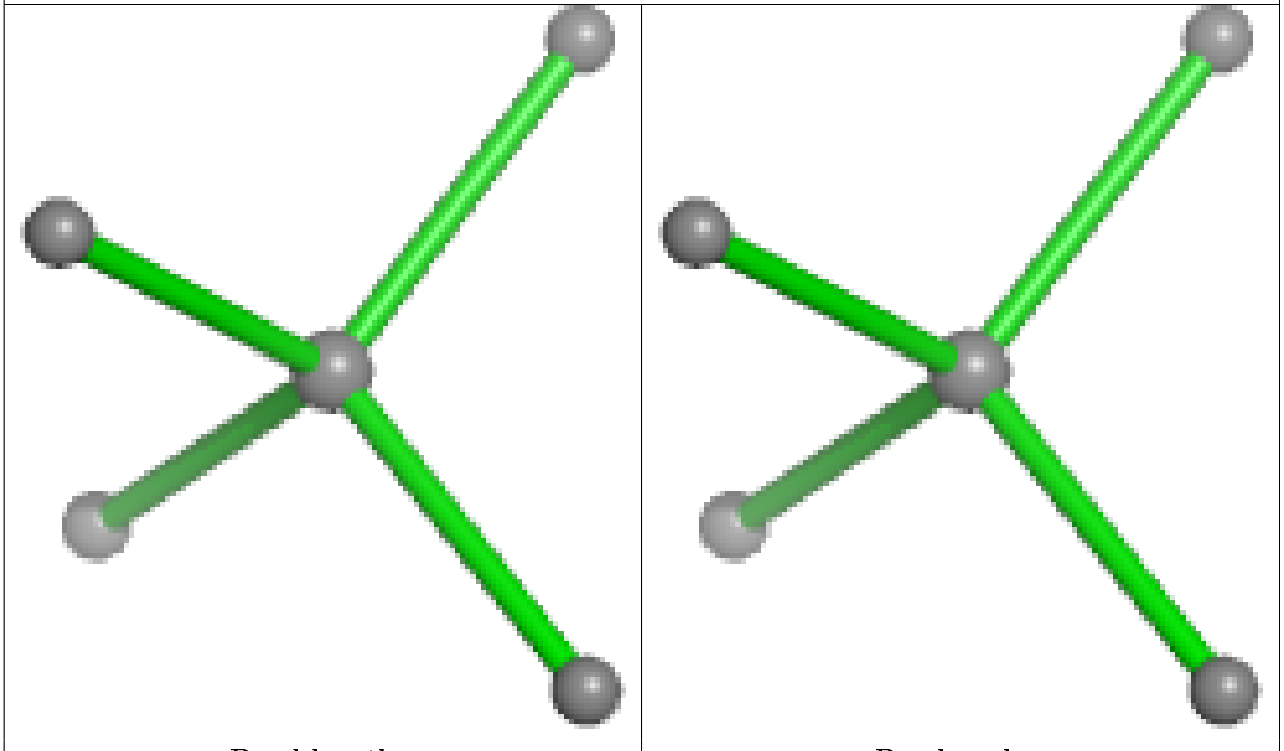
Bond angles



Torsions

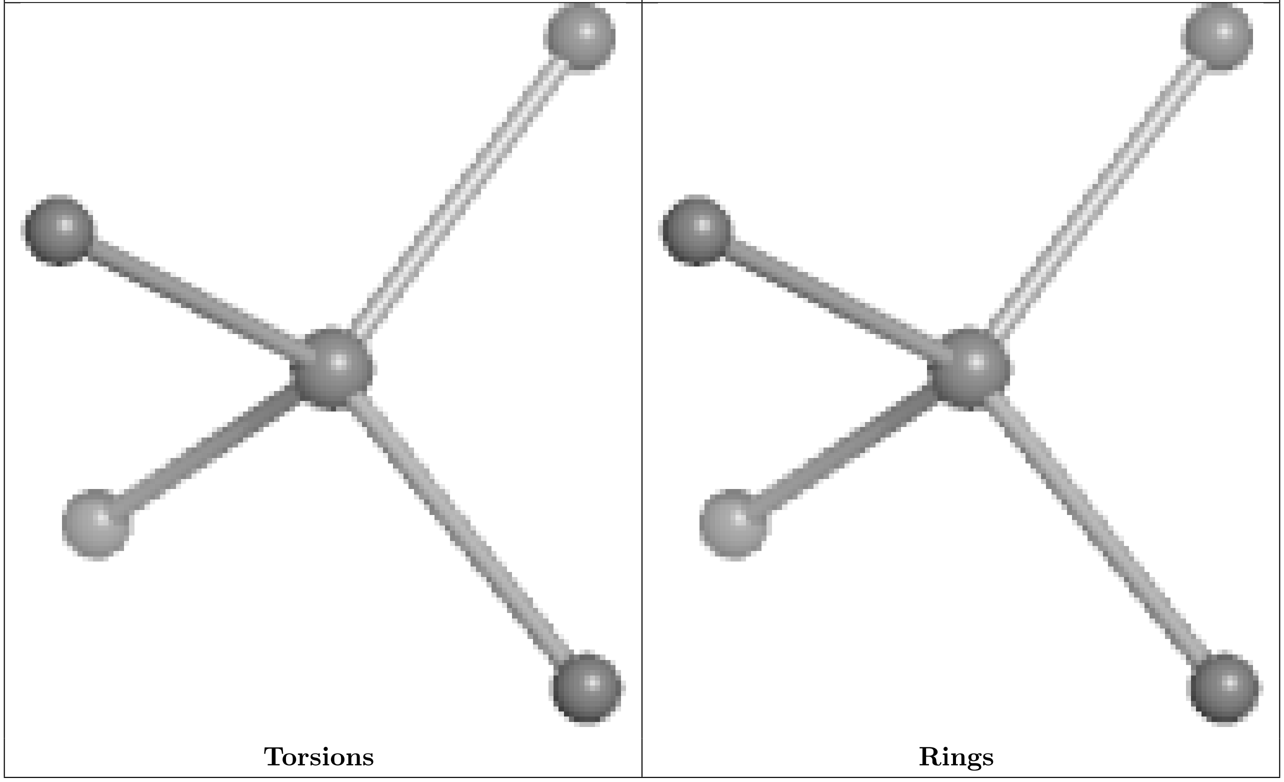
Rings

Ligand PO4 F 301



Bond lengths

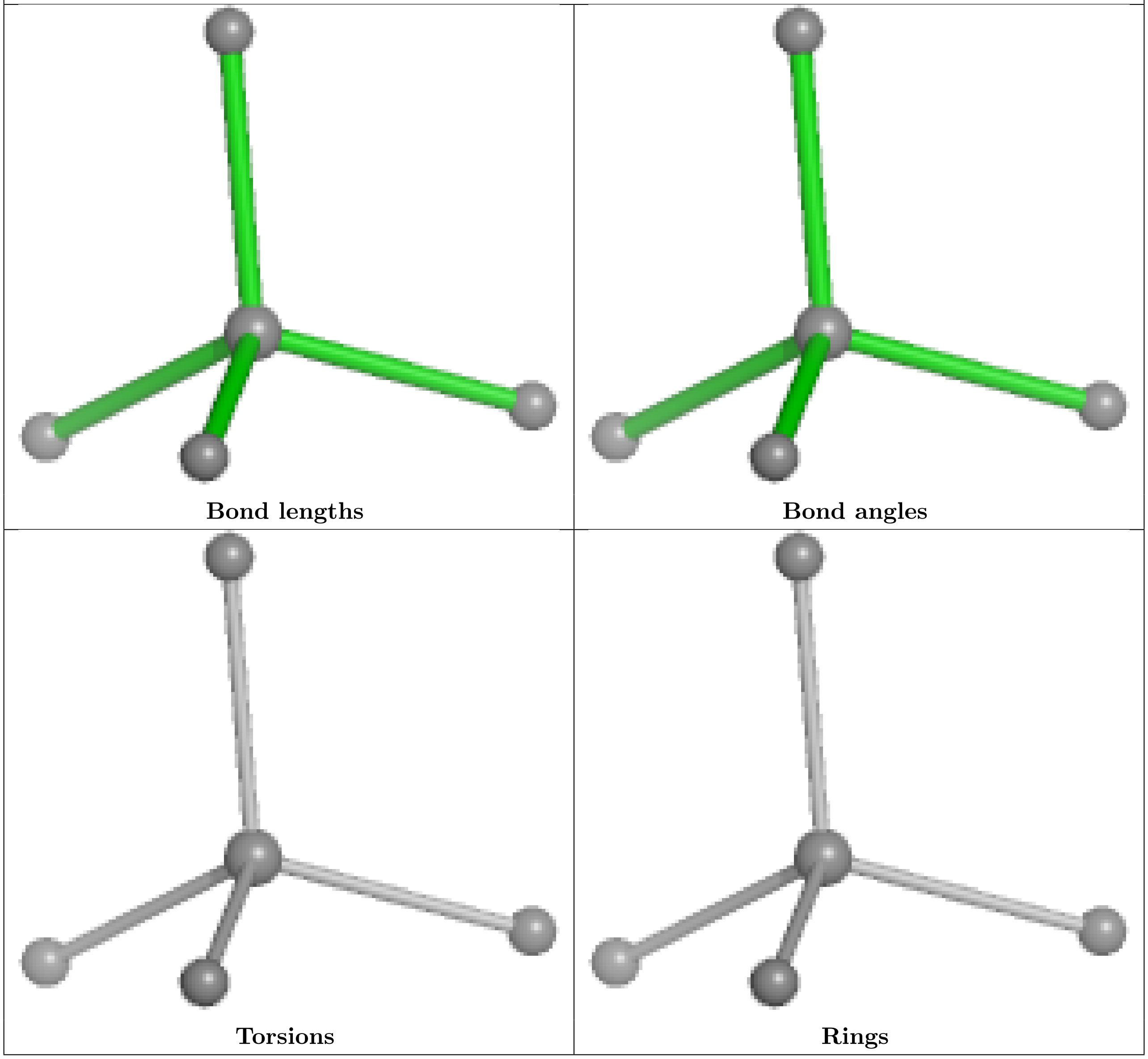
Bond angles



Torsions

Rings

Ligand PO4 E 301



Bond lengths

Bond angles

Torsions

Rings

5.7 Other polymers ⓘ

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 ⓘ

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	231/250 (92%)	-0.03	3 (1%)	74	73	33, 53, 95, 127	0
1	B	228/250 (91%)	-0.07	6 (2%)	57	55	34, 52, 79, 100	0
1	C	225/250 (90%)	0.03	11 (4%)	36	34	33, 54, 100, 130	0
1	D	227/250 (90%)	-0.03	7 (3%)	51	49	33, 53, 98, 133	0
1	E	225/250 (90%)	-0.12	7 (3%)	51	49	32, 49, 94, 120	0
1	F	214/250 (85%)	0.58	22 (10%)	13	13	44, 74, 116, 129	0
All	All	1350/1500 (90%)	0.06	56 (4%)	42	40	32, 56, 100, 133	0

All (56) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	44	TYR	5.0
1	D	73	TYR	4.4
1	B	73	TYR	4.3
1	B	69	SER	4.2
1	F	20	ASP	4.2
1	C	43	THR	4.2
1	B	74	ASP	4.1
1	D	38	GLY	4.0
1	F	230	LEU	3.9
1	E	72	VAL	3.7
1	F	54	VAL	3.7
1	F	73	TYR	3.7
1	F	217	VAL	3.7
1	C	44	TYR	3.6
1	A	43	THR	3.3
1	E	73	TYR	3.3
1	D	107	LEU	3.3
1	A	70	ASN	3.2
1	C	17	THR	3.1

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Mol	Chain	Res	Type	RSRZ
1	E	44	TYR	3.0
1	F	55	SER	3.0
1	F	53	LYS	3.0
1	C	67	ASP	3.0
1	F	52	GLU	2.9
1	B	72	VAL	2.9
1	F	74	ASP	2.9
1	D	72	VAL	2.8
1	E	43	THR	2.8
1	F	216	ASN	2.8
1	F	48	ARG	2.8
1	C	71	VAL	2.8
1	F	68	PRO	2.7
1	F	21	GLU	2.7
1	E	67	ASP	2.6
1	F	106	ASN	2.6
1	F	67	ASP	2.6
1	C	15	ASP	2.6
1	D	71	VAL	2.5
1	F	51	ILE	2.5
1	A	44	TYR	2.5
1	E	1	MET	2.5
1	C	45	GLU	2.4
1	C	73	TYR	2.4
1	F	59	LEU	2.4
1	B	40	GLN	2.4
1	E	45	GLU	2.3
1	F	57	TYR	2.3
1	C	219	TYR	2.3
1	D	45	GLU	2.2
1	F	107	LEU	2.2
1	C	112	GLU	2.1
1	B	141	CYS	2.1
1	F	50	LEU	2.1
1	F	199	ARG	2.0
1	F	229	THR	2.0
1	C	70	ASN	2.0

6.2 Non-standard residues in protein, DNA, RNA chains ⓘ

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)

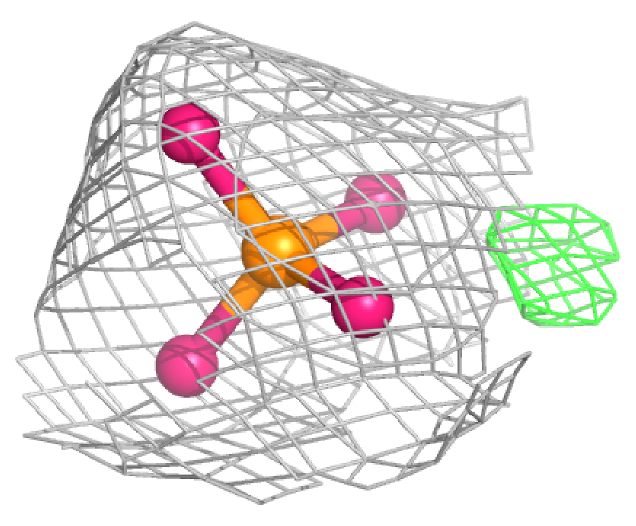
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9'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

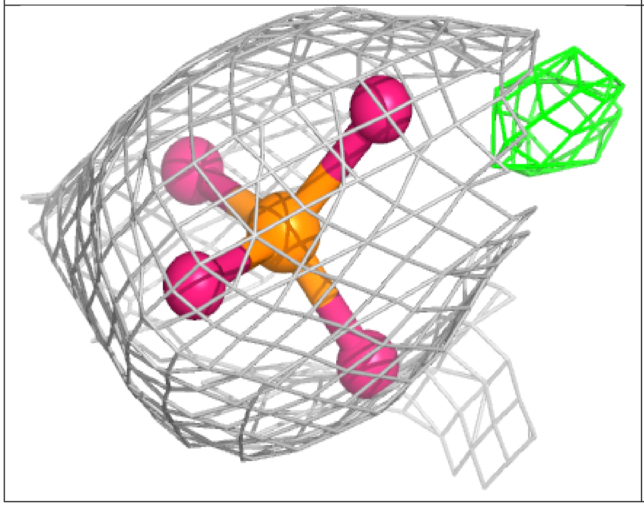
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($Å^2$)	Q<0.9
3	SO4	C	302	5/5	0.69	0.09	90,96,97,99	0
2	PO4	F	301	5/5	0.89	0.09	64,68,74,75	0
2	PO4	D	301	5/5	0.89	0.32	66,76,89,151	0
2	PO4	E	301	5/5	0.90	0.19	48,50,59,114	0
2	PO4	C	301	5/5	0.92	0.09	55,57,62,63	0
2	PO4	A	301	5/5	0.94	0.17	62,71,81,88	0
2	PO4	B	301	5/5	0.96	0.09	47,47,50,53	0

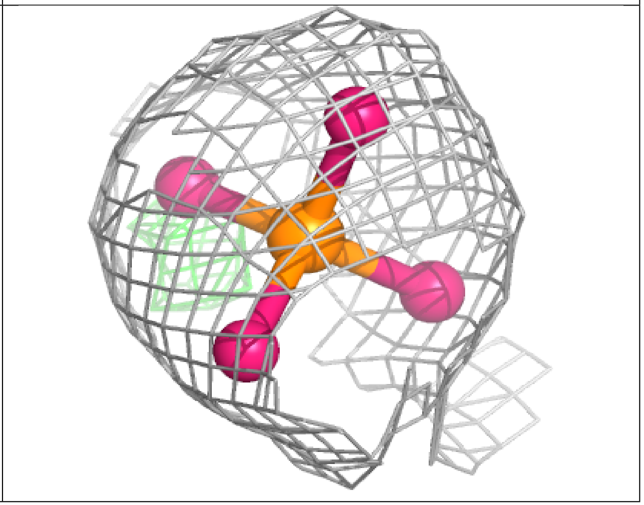
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

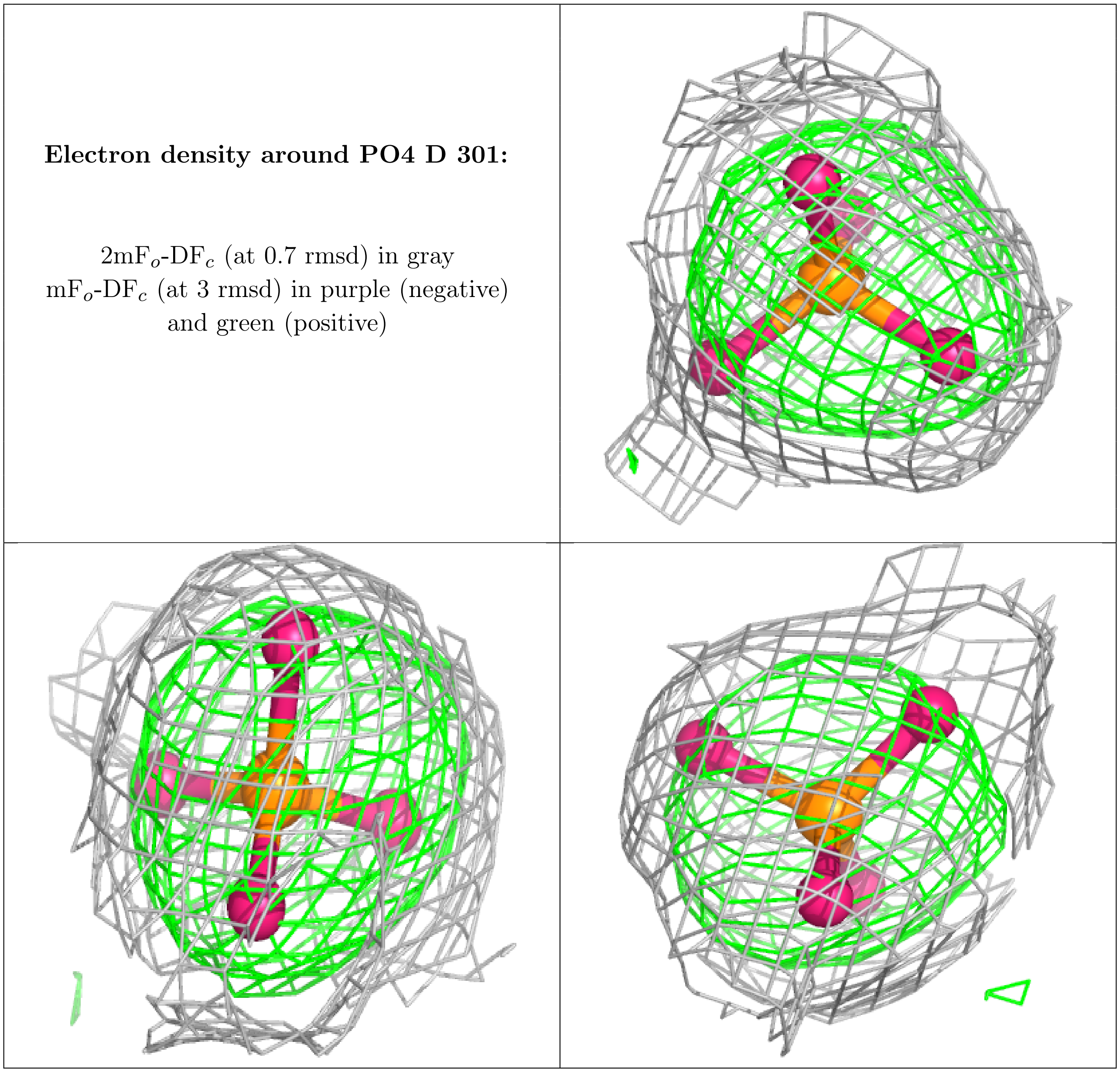
Electron density around PO4 F 301:

2mF$_o$-DF$_c$ (at 0.7 rmsd) in gray
mF$_o$-DF$_c$ (at 3 rmsd) in purple (negative)
and green (positive)



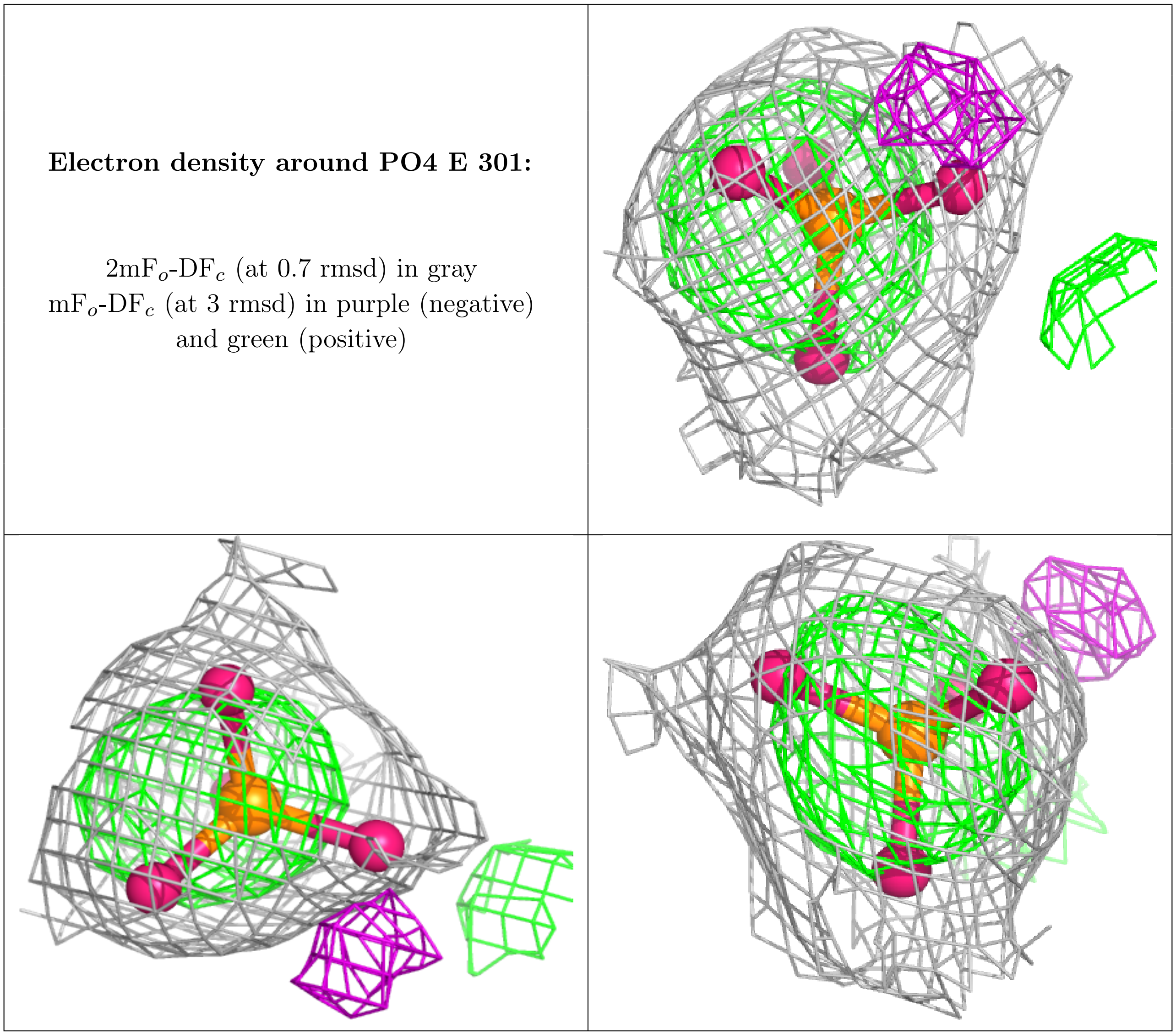






Electron density around PO4 D 301:

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

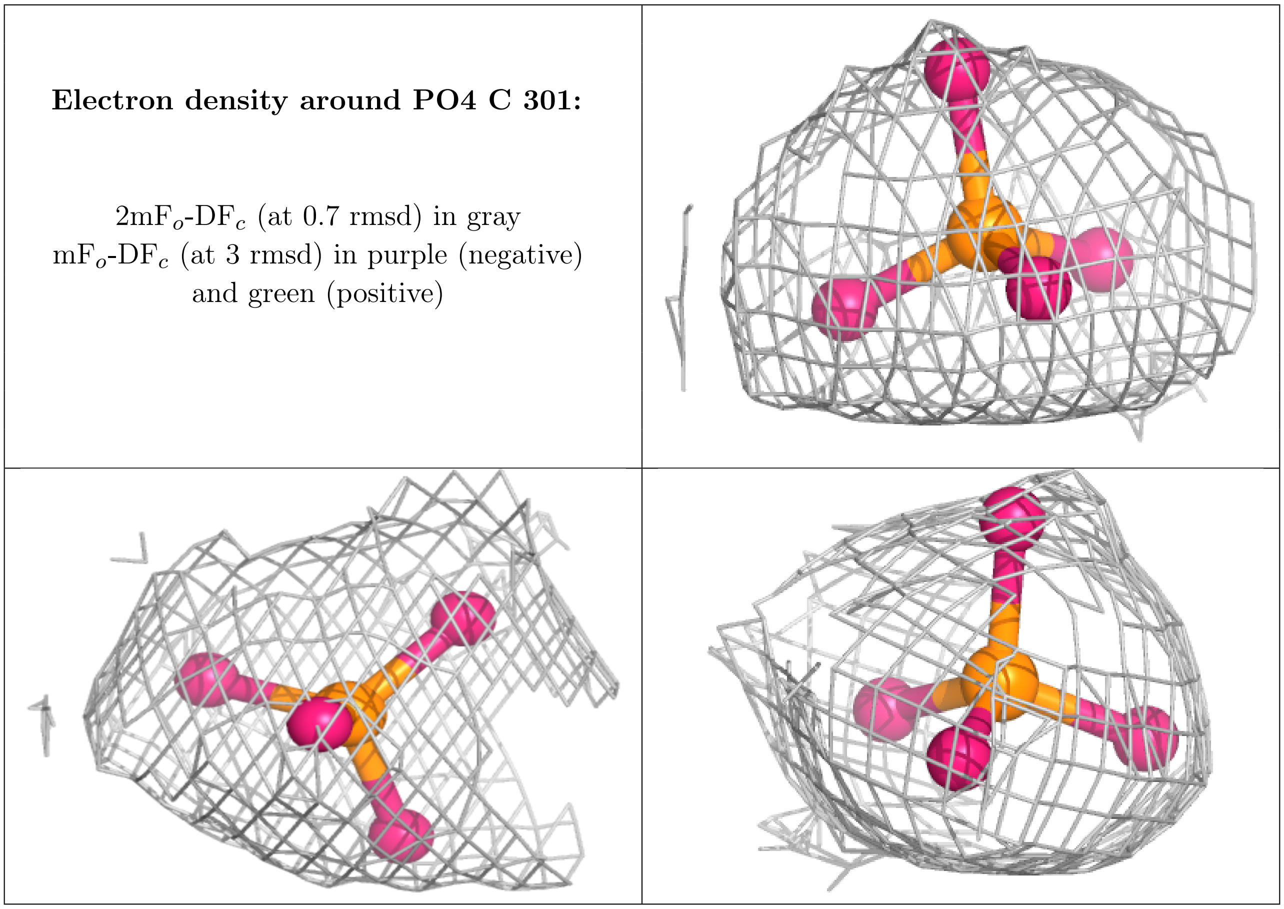


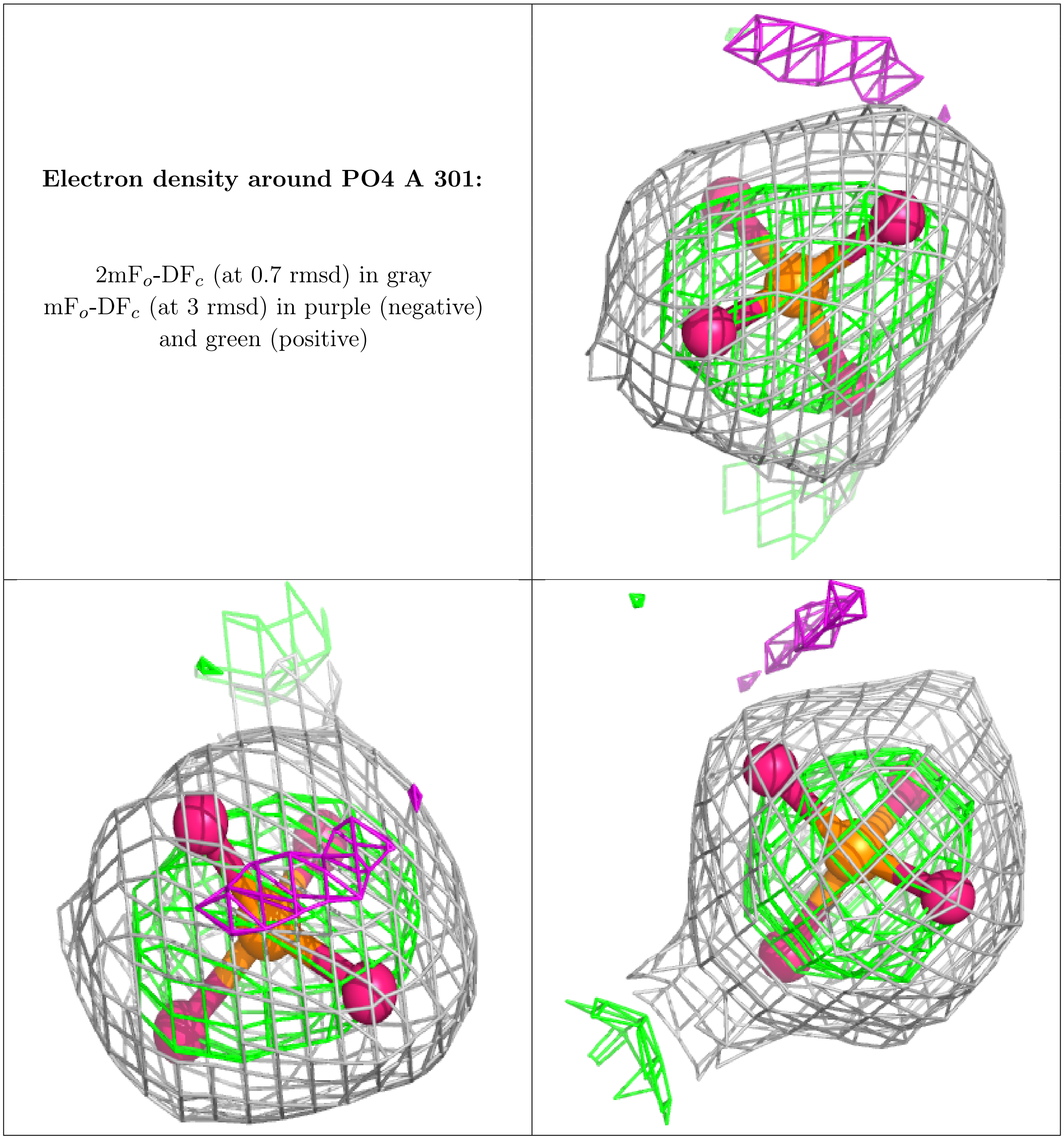
Electron density around PO4 E 301:

$2mF_o$-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 301:

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



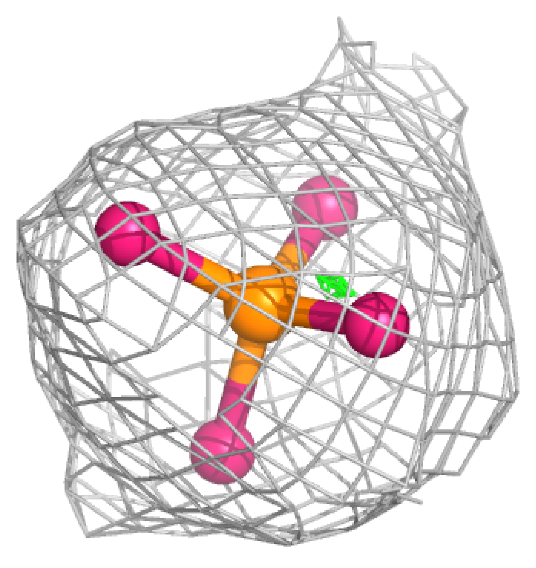


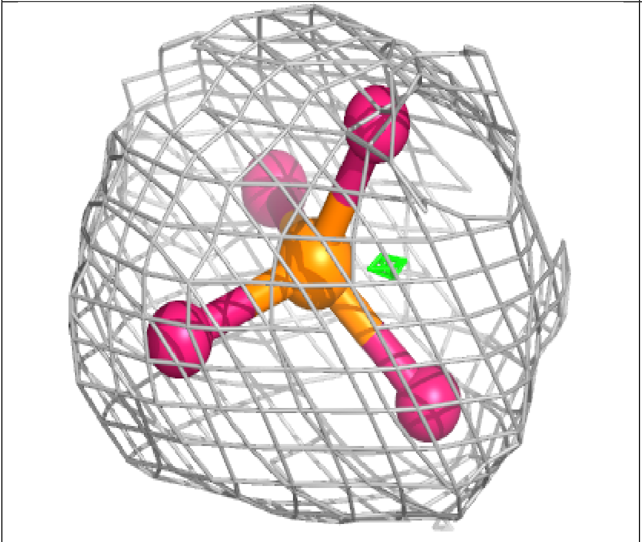
Electron density around PO4 A 301:

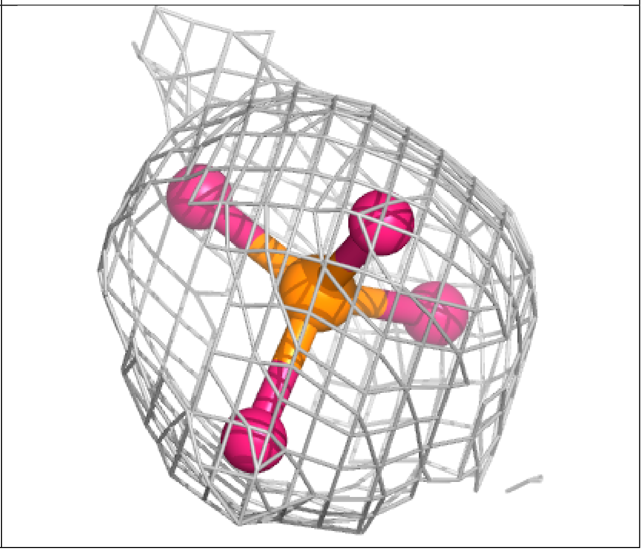
2mF$_o$-DF$_c$ (at 0.7 rmsd) in gray
mF$_o$-DF$_c$ (at 3 rmsd) in purple (negative)
and green (positive)

Electron density around PO4 B 301:

$2mF_o$-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.