Full wwPDB X-ray Structure Validation Report (i)

Feb 24, 2025 – 03:34 pm GMT

PDB ID	:	8S1T
Title	:	BzdNO-cyclohexa-1,5-diene-1-carboxy-CoA complex
Authors	:	Ermler, U.; Boll, M.; Fuchs, J.; Demmer, U.
Deposited on	:	2024-02-16
Resolution	:	1.45 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 (i) 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 (i)) were used in the production of this report:

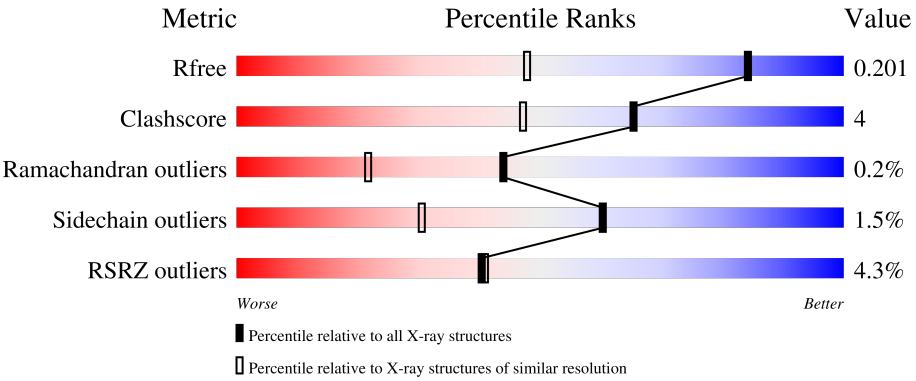
MolProbity	:	4.02b-467
Mogul	:	1.8.4, CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	3.0
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.003 (Gargrove)
Density-Fitness	:	1.0.11
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.41

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 1.45 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	1556 (1.46-1.46)
Clashscore	180529	1653 (1.46-1.46)
Ramachandran outliers	177936	1635 (1.46-1.46)
Sidechain outliers	177891	1635 (1.46-1.46)
RSRZ outliers	164620	1556 (1.46-1.46)

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	447	5% 89% 8%
1	C	447	4% 90% 6%
2	B	379	4% 92% 7%
2	D	379	5% 88% 10%

2 Entry composition (i)

There are 8 unique types of molecules in this entry. The entry contains 27387 atoms, of which 12995 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 BzdO.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	438	Total	C	H	N	O	S	0	14	0
			7090	2303	3480	617	664	26			
1	C	431	Total	C	H	N	O	S	0	6	0
			6936	2247	3415	599	650	25			

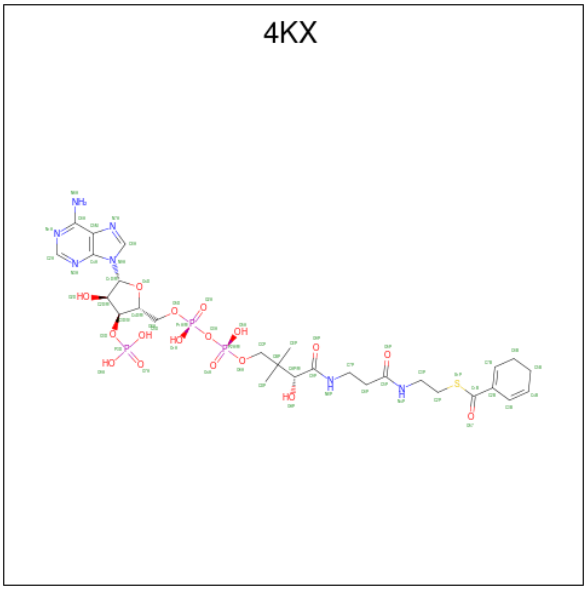
There are 20 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	438	SER	-	expression tag	UNP Q68VL9
A	439	ALA	-	expression tag	UNP Q68VL9
A	440	TRP	-	expression tag	UNP Q68VL9
A	441	SER	-	expression tag	UNP Q68VL9
A	442	HIS	-	expression tag	UNP Q68VL9
A	443	PRO	-	expression tag	UNP Q68VL9
A	444	GLN	-	expression tag	UNP Q68VL9
A	445	PHE	-	expression tag	UNP Q68VL9
A	446	GLU	-	expression tag	UNP Q68VL9
A	447	LYS	-	expression tag	UNP Q68VL9
C	438	SER	-	expression tag	UNP Q68VL9
C	439	ALA	-	expression tag	UNP Q68VL9
C	440	TRP	-	expression tag	UNP Q68VL9
C	441	SER	-	expression tag	UNP Q68VL9
C	442	HIS	-	expression tag	UNP Q68VL9
C	443	PRO	-	expression tag	UNP Q68VL9
C	444	GLN	-	expression tag	UNP Q68VL9
C	445	PHE	-	expression tag	UNP Q68VL9
C	446	GLU	-	expression tag	UNP Q68VL9
C	447	LYS	-	expression tag	UNP Q68VL9

- Molecule 2 is a protein called BzdN.

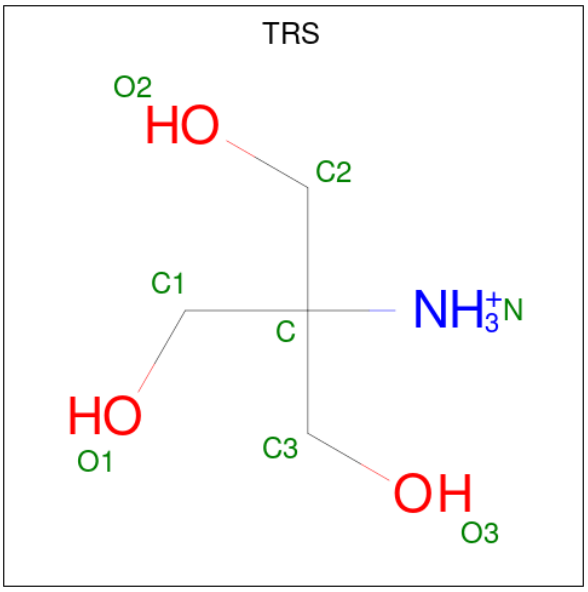
Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
2	B	375	Total	C	H	N	O	S	0	7	0
			6011	1935	2961	527	568	20			
2	D	375	Total	C	H	N	O	S	0	13	0
			6082	1959	2995	532	576	20			

- Molecule 3 is 1,5 Dienoyl-CoA (three-letter code: 4KX) (formula: $C_{28}H_{42}N_7O_{17}P_3S$).



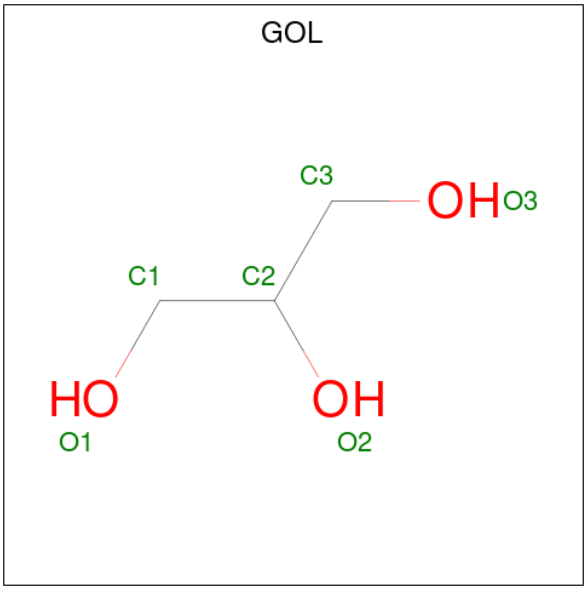
Mol	Chain	Residues	Atoms							ZeroOcc	AltConf
3	A	1	Total	C	H	N	O	P	S	0	0
			94	28	38	7	17	3	1		
3	C	1	Total	C	H	N	O	P	S	0	0
			94	28	38	7	17	3	1		

- Molecule 4 is 2-AMINO-2-HYDROXYMETHYL-PROPANE-1,3-DIOL (three-letter code: TRS) (formula: $C_4H_{12}NO_3$).



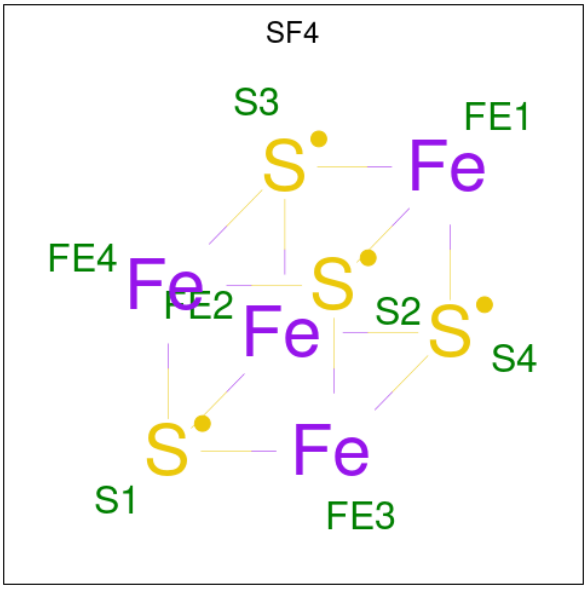
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	A	1	Total	C	H	N	O	0	1
			38	8	22	2	6		
4	D	1	Total	C	H	N	O	0	1
			38	8	22	2	6		

- Molecule 5 is GLYCEROL (three-letter code: GOL) (formula: $C_3H_8O_3$).



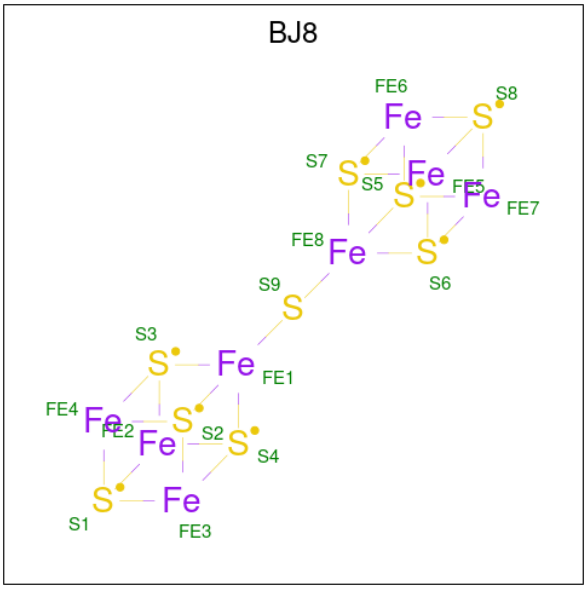
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
5	A	1	Total	C	H	O		0	0
			13	3	7	3			
5	C	1	Total	C	H	O		0	1
			25	6	13	6			

- Molecule 6 is IRON/SULFUR CLUSTER (three-letter code: SF4) (formula: Fe_4S_4) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	1	Total Fe S 8 4 4	0	0
6	C	1	Total Fe S 8 4 4	0	0

- Molecule 7 is Double cubane cluster (three-letter code: BJ8) (formula: Fe_8S_9).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	B	1	Total Fe S 17 8 9	0	0
7	D	1	Total Fe S 17 8 9	0	0

- Molecule 8 is water.

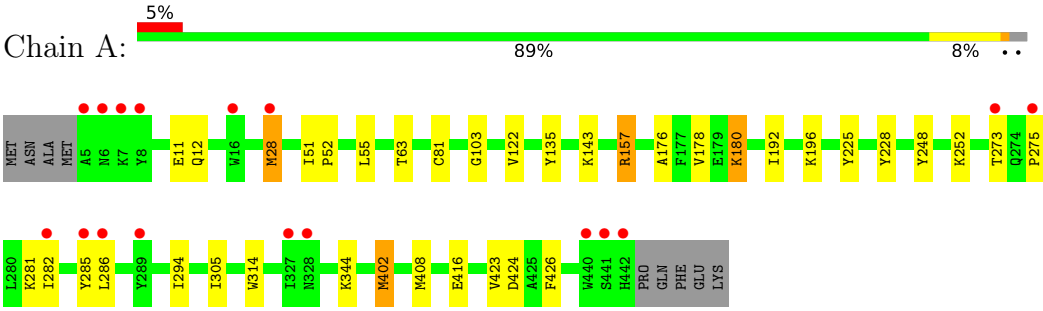
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
8	A	272	Total H O 277 2 275	0	3
8	B	194	Total O 195 195	0	1
8	C	261	Total H O 265 2 263	0	2
8	D	178	Total O 179 179	0	1

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.

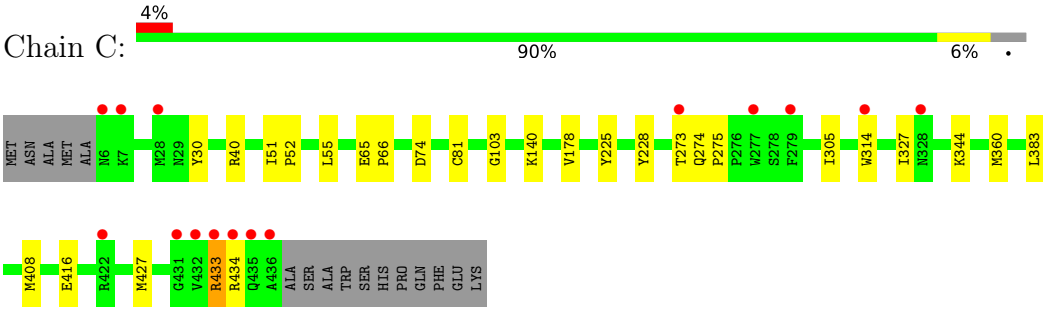
• Molecule 1: BzdO

Chain A:



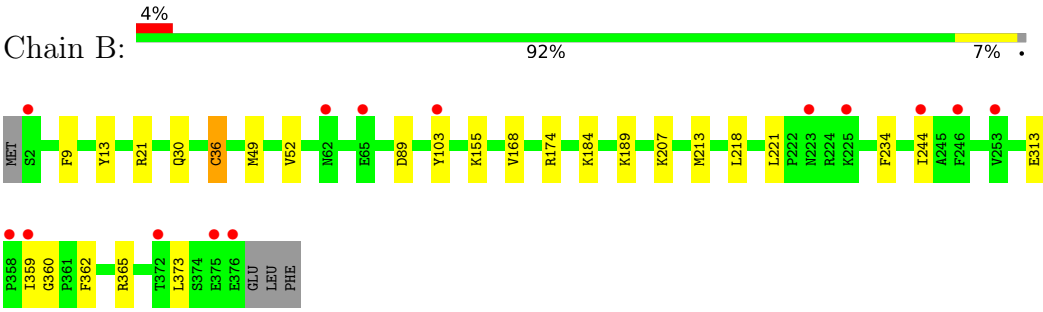
• Molecule 1: BzdO

Chain C:



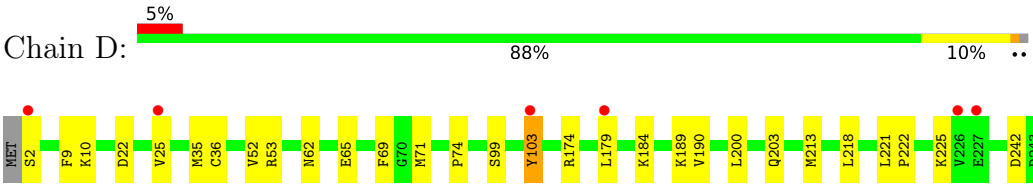
• Molecule 2: BzdN

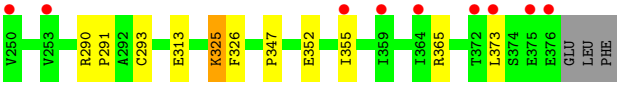
Chain B:



• Molecule 2: BzdN

Chain D:




V250
V253
R290
P291
A292
C293
E313
K325
F326
P347
E352
I355
I359
I364
R365
T372
L373
S374
E375
E376
GLU
LEU
PHE

4 Data and refinement statistics (i)

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α, β, γ	208.21Å 102.75Å 86.82Å 90.00° 102.40° 90.00°	Depositor
Resolution (Å)	43.60 – 1.45 43.60 – 1.45	Depositor EDS
% Data completeness (in resolution range)	98.4 (43.60-1.45) 98.5 (43.60-1.45)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.16 (at 1.45Å)	Xtriage
Refinement program	PHENIX (1.20.1_4487: ???)	Depositor
R, R_{free}	0.182 , 0.200 0.182 , 0.201	Depositor DCC
R_{free} test set	15864 reflections (5.04%)	wwPDB-VP
Wilson B-factor (Å^2)	18.4	Xtriage
Anisotropy	0.385	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.43 , 37.4	EDS
L-test for twinning[2]	$< \|L\| > = 0.50$, $< L^2 > = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.97	EDS
Total number of atoms	27387	wwPDB-VP
Average B, all atoms (Å^2)	28.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 15.39% of the height of the origin peak. No significant pseudotranslation is detected.*

[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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: SF4, TRS, BJ8, 4KX, GOL

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	0.50	0/3737	0.72	0/5050
1	C	0.50	0/3620	0.71	2/4891 (0.0%)
2	B	0.47	0/3149	0.69	0/4264
2	D	0.47	0/3201	0.70	0/4336
All	All	0.48	0/13707	0.70	2/18541 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	C	360	MET	CG-SD-CE	5.95	109.72	100.20
1	C	74	ASP	CB-CG-OD1	5.33	123.10	118.30

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	3610	3480	3464	31	0
1	C	3521	3415	3405	19	0
2	B	3050	2961	2940	18	0
2	D	3087	2995	2945	27	0
3	A	56	38	38	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	C	56	38	38	0	0
4	A	16	22	24	0	0
4	D	16	22	24	0	0
5	A	6	7	8	1	0
5	C	12	13	15	3	0
6	A	8	0	0	0	0
6	C	8	0	0	0	0
7	B	17	0	0	0	0
7	D	17	0	0	1	0
8	A	275	2	0	6	0
8	B	195	0	0	2	0
8	C	263	2	0	5	0
8	D	179	0	0	1	0
All	All	14392	12995	12901	98	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 4.

All (98) 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:28[A]:MET:SD	8:A:787:HOH:O	2.39	0.79
1:A:344[B]:LYS:HG3	8:A:606:HOH:O	1.88	0.73
1:A:305:ILE:HD11	1:A:344[A]:LYS:HG2	1.74	0.70
2:D:179[B]:LEU:CD1	2:D:190:VAL:HG21	2.25	0.67
1:A:180:LYS:N	1:A:180:LYS:HD3	2.12	0.65
1:A:225:TYR:CZ	1:A:275:PRO:HG3	2.32	0.64
1:A:424[A]:ASP:OD2	8:A:601:HOH:O	2.14	0.64
1:C:396:LYS:NZ	8:C:602:HOH:O	2.26	0.64
2:B:359:ILE:HD12	2:B:360:GLY:N	2.12	0.63
1:C:305:ILE:HD11	1:C:344[A]:LYS:HG2	1.80	0.62
2:D:179[B]:LEU:HD11	2:D:190:VAL:HG21	1.81	0.62
5:C:502[A]:GOL:H11	8:C:635:HOH:O	2.02	0.59
1:A:273:THR:HG22	8:A:603:HOH:O	2.02	0.59
1:A:279[B]:PHE:CE1	1:A:416:GLU:OE1	2.56	0.58
1:A:279[B]:PHE:CE2	1:A:282:ILE:HB	2.37	0.58
2:D:62[A]:ASN:ND2	2:D:65:GLU:OE2	2.39	0.56
1:A:305:ILE:HD11	1:A:344[A]:LYS:CG	2.35	0.55
1:C:305:ILE:HD11	1:C:344[A]:LYS:CG	2.37	0.54
1:A:344[B]:LYS:HE3	8:A:644:HOH:O	2.08	0.53
2:B:13:TYR:CZ	2:B:244:ILE:HD12	2.42	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:D:22:ASP:O	2:D:25:VAL:HG22	2.09	0.52
2:D:9:PHE:CZ	2:D:213[B]:MET:HG3	2.45	0.52
1:A:279[B]:PHE:CD1	1:A:416:GLU:OE1	2.62	0.52
1:A:279[B]:PHE:CD1	1:A:281:LYS:NZ	2.78	0.52
1:C:327[B]:ILE:HG23	1:C:327[B]:ILE:O	2.09	0.52
2:D:347:PRO:HG2	2:D:373:LEU:CD2	2.40	0.52
1:A:402[A]:MET:HG2	1:A:426:PHE:CG	2.46	0.51
1:C:225:TYR:CZ	1:C:275:PRO:HG3	2.45	0.51
2:D:35:MET:HB3	2:D:103[B]:TYR:CE2	2.46	0.51
2:B:218:LEU:HD23	2:B:221:LEU:HD12	1.93	0.51
2:D:69:PHE:CD2	2:D:71:MET:HG2	2.47	0.50
1:A:143:LYS:HG3	5:A:503:GOL:H31	1.94	0.49
2:D:325:LYS:HG2	2:D:326:PHE:CD2	2.47	0.49
2:D:325:LYS:HE2	2:D:352:GLU:OE1	2.11	0.49
2:B:184:LYS:HE2	2:B:313:GLU:OE2	2.12	0.49
2:B:184:LYS:HE3	2:B:313:GLU:HG3	1.94	0.49
1:A:279[B]:PHE:CE1	1:A:281:LYS:NZ	2.81	0.48
2:B:189:LYS:HD2	2:B:221:LEU:O	2.13	0.48
2:D:35:MET:HB3	2:D:103[B]:TYR:HE2	1.78	0.48
2:D:200:LEU:HD11	2:D:242:ASP:HB2	1.96	0.48
2:D:325:LYS:HG2	2:D:326:PHE:CE2	2.48	0.47
1:A:286:LEU:HD21	1:A:423:VAL:CG1	2.43	0.47
2:D:347:PRO:HG2	2:D:373:LEU:HD21	1.96	0.47
1:A:281:LYS:NZ	1:A:416:GLU:OE1	2.48	0.47
1:A:294:ILE:HD12	1:A:294:ILE:C	2.35	0.46
2:D:52:VAL:HG23	2:D:52:VAL:O	2.15	0.46
2:D:365:ARG:HG3	2:D:365:ARG:NH1	2.31	0.46
1:A:248:TYR:CE2	1:A:252:LYS:HE2	2.50	0.46
2:B:234:PHE:HE1	2:B:373:LEU:HD11	1.80	0.46
2:B:9:PHE:CZ	2:B:213[B]:MET:HG3	2.51	0.46
2:B:36:CYS:HB3	8:B:526:HOH:O	2.15	0.45
1:A:81:CYS:O	1:A:103:GLY:HA3	2.15	0.45
1:C:81:CYS:O	1:C:103:GLY:HA3	2.16	0.45
2:D:174:ARG:NH2	8:D:509:HOH:O	2.49	0.45
2:B:9:PHE:CZ	2:B:213[A]:MET:HG3	2.52	0.45
2:B:168:VAL:HG12	2:B:207:LYS:HB3	1.99	0.45
2:D:365:ARG:HG3	2:D:365:ARG:HH11	1.82	0.44
1:C:65:GLU:HB2	1:C:66:PRO:HD3	1.99	0.44
1:C:51:ILE:HB	1:C:52:PRO:HD3	1.99	0.44
2:D:218:LEU:HD23	2:D:221:LEU:HD12	2.00	0.44
1:A:51:ILE:HB	1:A:52:PRO:HD3	1.99	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:433:ARG:HA	1:C:433:ARG:NE	2.34	0.43
1:A:285:TYR:HE2	1:A:424[A]:ASP:OD1	2.01	0.43
1:A:55:LEU:HD11	1:A:178:VAL:HB	1.99	0.42
2:B:52:VAL:O	2:B:52:VAL:HG23	2.19	0.42
1:C:344[B]:LYS:HG3	8:C:630:HOH:O	2.18	0.42
5:C:502[A]:GOL:O2	8:C:601:HOH:O	2.20	0.42
2:D:179[B]:LEU:HD12	2:D:190:VAL:HG21	1.98	0.42
2:D:293:CYS:HB2	7:D:401:BJ8:S8	2.58	0.42
1:C:396:LYS:HE3	1:C:396:LYS:HB3	1.94	0.42
1:A:279[A]:PHE:CD2	1:A:416:GLU:HG2	2.54	0.42
2:D:10:LYS:NZ	2:D:10:LYS:HB3	2.35	0.42
2:D:189:LYS:NZ	2:D:222:PRO:O	2.53	0.42
2:B:347:PRO:HG2	2:B:373:LEU:CD2	2.50	0.42
1:C:427:MET:HA	1:C:427:MET:HE2	2.01	0.41
1:C:55:LEU:HD11	1:C:178:VAL:HB	2.02	0.41
8:A:708:HOH:O	5:C:502[A]:GOL:H2	2.19	0.41
2:B:30:GLN:HB2	2:B:49:MET:HG2	2.03	0.41
2:B:174:ARG:NH2	8:B:509:HOH:O	2.53	0.41
1:C:273:THR:HG21	1:C:383:LEU:HB3	2.03	0.41
1:A:11:GLU:HG2	1:A:12:GLN:O	2.21	0.41
1:A:122:VAL:HG11	1:A:135:TYR:HB3	2.02	0.41
2:D:290:ARG:HG2	2:D:291:PRO:HD2	2.03	0.41
2:B:168:VAL:CG1	2:B:207:LYS:HB3	2.51	0.41
2:B:357:ASN:HB3	2:B:362:PHE:HE1	1.86	0.41
1:C:433:ARG:HA	1:C:433:ARG:CZ	2.49	0.41
1:A:176:ALA:O	1:A:180:LYS:HD3	2.20	0.41
1:C:393:ALA:HA	1:C:396:LYS:HE3	2.03	0.41
2:D:53:ARG:HD3	2:D:203:GLN:OE1	2.20	0.41
2:D:184:LYS:HE2	2:D:313:GLU:HG3	2.02	0.41
1:A:192:ILE:O	1:A:196:LYS:HG3	2.22	0.40
2:D:74:PRO:HB3	2:D:355:ILE:HG13	2.04	0.40
1:C:30:TYR:O	1:C:40:ARG:HD3	2.21	0.40
1:C:393:ALA:O	1:C:396:LYS:HE3	2.20	0.40
2:B:21[A]:ARG:NH2	2:B:89:ASP:OD1	2.54	0.40
1:C:416:GLU:HG2	8:C:832:HOH:O	2.21	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	450/447 (101%)	441 (98%)	9 (2%)	0	100 100
1	C	435/447 (97%)	426 (98%)	8 (2%)	1 (0%)	44 22
2	B	380/379 (100%)	369 (97%)	10 (3%)	1 (0%)	37 17
2	D	386/379 (102%)	374 (97%)	9 (2%)	3 (1%)	16 3
All	All	1651/1652 (100%)	1610 (98%)	36 (2%)	5 (0%)	44 17

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	36	CYS
2	D	36	CYS
2	D	99[A]	SER
2	D	99[B]	SER
1	C	274	GLN

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	375/371 (101%)	365 (97%)	10 (3%)	40 9
1	C	365/371 (98%)	358 (98%)	7 (2%)	52 20
2	B	328/325 (101%)	325 (99%)	3 (1%)	75 53
2	D	334/325 (103%)	329 (98%)	5 (2%)	60 30
All	All	1402/1392 (101%)	1377 (98%)	25 (2%)	60 22

All (25) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	28[A]	MET
1	A	28[B]	MET
1	A	157[A]	ARG
1	A	157[B]	ARG
1	A	180	LYS
1	A	228	TYR
1	A	314	TRP
1	A	402[A]	MET
1	A	402[B]	MET
1	A	408	MET
2	B	103	TYR
2	B	155	LYS
2	B	365	ARG
1	C	140	LYS
1	C	228	TYR
1	C	314	TRP
1	C	396	LYS
1	C	408	MET
1	C	433	ARG
1	C	434	ARG
2	D	2	SER
2	D	103[A]	TYR
2	D	103[B]	TYR
2	D	225	LYS
2	D	325	LYS

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

Mol	Chain	Res	Type
2	B	223	ASN
1	C	25	GLN

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 oligosaccharides in this entry.

5.6 Ligand geometry (i)

13 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	$\#\|Z\| > 2$
4	TRS	A	502[B]	-	7,7,7	0.51	0	9,9,9	0.59	0
5	GOL	A	503	-	5,5,5	0.73	0	5,5,5	1.07	1 (20%)
3	4KX	C	501	-	49,59,59	1.91	13 (26%)	58,87,87	1.63	9 (15%)
4	TRS	A	502[A]	-	7,7,7	0.40	0	9,9,9	0.45	0
4	TRS	D	402[B]	-	7,7,7	0.58	0	9,9,9	0.61	0
6	SF4	C	503	1,8	0,12,12	-	-	-		
6	SF4	A	504	1,8	0,12,12	-	-	-		
7	BJ8	B	401	2	0,26,26	-	-	-		
5	GOL	C	502[B]	-	5,5,5	0.99	0	5,5,5	1.04	1 (20%)
3	4KX	A	501	-	49,59,59	1.97	12 (24%)	58,87,87	1.43	8 (13%)
4	TRS	D	402[A]	-	7,7,7	0.44	0	9,9,9	0.54	0
7	BJ8	D	401	2	0,26,26	-	-	-		
5	GOL	C	502[A]	-	5,5,5	1.28	1 (20%)	5,5,5	0.86	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
4	TRS	A	502[B]	-	-	0/9/9/9	-
5	GOL	A	503	-	-	0/4/4/4	-
3	4KX	C	501	-	-	3/48/79/79	0/4/4/4
4	TRS	A	502[A]	-	-	2/9/9/9	-
4	TRS	D	402[B]	-	-	0/9/9/9	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
6	SF4	C	503	1,8	-	-	0/6/5/5
6	SF4	A	504	1,8	-	-	0/6/5/5
7	BJ8	B	401	2	-	-	0/12/10/10
5	GOL	C	502[B]	-	-	2/4/4/4	-
3	4KX	A	501	-	-	3/48/79/79	0/4/4/4
4	TRS	D	402[A]	-	-	2/9/9/9	-
7	BJ8	D	401	2	-	-	0/12/10/10
5	GOL	C	502[A]	-	-	4/4/4/4	-

All (26) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	501	4KX	C6B-C7B	-5.50	1.35	1.50
3	A	501	4KX	C6B-C7B	-5.27	1.36	1.50
3	C	501	4KX	C9P-N8P	5.08	1.44	1.33
3	A	501	4KX	C3B-C2B	-4.75	1.33	1.43
3	A	501	4KX	C9P-N8P	4.72	1.43	1.33
3	A	501	4KX	C5P-N4P	4.69	1.44	1.33
3	C	501	4KX	C3B-C4B	4.61	1.45	1.33
3	A	501	4KX	C3B-C4B	4.50	1.45	1.33
3	C	501	4KX	C5P-N4P	4.04	1.42	1.33
3	C	501	4KX	C3B-C2B	-3.88	1.35	1.43
3	A	501	4KX	C7B-C2B	3.52	1.43	1.34
3	C	501	4KX	C7B-C2B	3.46	1.43	1.34
3	A	501	4KX	P3D-O3D	3.13	1.65	1.59
3	A	501	4KX	O2D-C2D	3.05	1.50	1.43
3	C	501	4KX	P3D-O3D	2.91	1.64	1.59
3	A	501	4KX	C6A-N6A	2.89	1.44	1.34
3	A	501	4KX	C2D-C1D	-2.77	1.49	1.53
3	C	501	4KX	C6A-N6A	2.70	1.43	1.34
3	C	501	4KX	C2D-C1D	-2.64	1.49	1.53
3	C	501	4KX	O4D-C1D	2.57	1.44	1.41
3	A	501	4KX	O4D-C1D	2.38	1.44	1.41
3	C	501	4KX	O2D-C2D	2.27	1.48	1.43
5	C	502[A]	GOL	O2-C2	-2.23	1.36	1.43
3	C	501	4KX	O3D-C3D	-2.17	1.36	1.44
3	C	501	4KX	O57-C1B	2.16	1.27	1.22
3	A	501	4KX	O3D-C3D	-2.16	1.36	1.44

All (19) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	C	501	4KX	N3A-C2A-N1A	-5.23	120.50	128.68
3	C	501	4KX	C2P-S1P-C1B	4.72	105.73	99.80
3	A	501	4KX	N3A-C2A-N1A	-4.56	121.56	128.68
3	A	501	4KX	C5B-C4B-C3B	-3.98	115.04	122.99
3	C	501	4KX	C5B-C4B-C3B	-3.81	115.39	122.99
3	C	501	4KX	O6A-CCP-CBP	-3.59	104.78	110.55
3	A	501	4KX	C2P-S1P-C1B	3.57	104.29	99.80
3	C	501	4KX	C7P-C6P-C5P	-3.02	107.32	112.36
3	C	501	4KX	CEP-CBP-CCP	2.81	112.81	108.23
3	C	501	4KX	C2A-N1A-C6A	2.73	123.42	118.75
3	A	501	4KX	C7P-C6P-C5P	-2.62	108.00	112.36
3	C	501	4KX	O4D-C1D-C2D	-2.58	103.16	106.93
3	A	501	4KX	C2P-C3P-N4P	-2.28	107.62	112.42
3	A	501	4KX	O6A-CCP-CBP	-2.27	106.91	110.55
3	A	501	4KX	CEP-CBP-CCP	2.19	111.81	108.23
3	C	501	4KX	C6P-C7P-N8P	-2.17	107.53	111.90
5	C	502[B]	GOL	C3-C2-C1	-2.10	103.54	111.70
5	A	503	GOL	C3-C2-C1	-2.08	103.62	111.70
3	A	501	4KX	CDP-CBP-CAP	2.07	112.41	108.82

There are no chirality outliers.

All (16) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	501	4KX	C3P-C2P-S1P-C1B
3	C	501	4KX	C3P-C2P-S1P-C1B
4	A	502[A]	TRS	N-C-C3-O3
4	D	402[A]	TRS	N-C-C3-O3
5	C	502[A]	GOL	O1-C1-C2-C3
5	C	502[A]	GOL	C1-C2-C3-O3
5	C	502[B]	GOL	O1-C1-C2-C3
5	C	502[A]	GOL	O1-C1-C2-O2
5	C	502[A]	GOL	O2-C2-C3-O3
4	D	402[A]	TRS	C1-C-C3-O3
3	C	501	4KX	O5P-C5P-C6P-C7P
3	A	501	4KX	N4P-C5P-C6P-C7P
5	C	502[B]	GOL	O1-C1-C2-O2
3	C	501	4KX	N4P-C5P-C6P-C7P
4	A	502[A]	TRS	C1-C-C3-O3
3	A	501	4KX	O5P-C5P-C6P-C7P

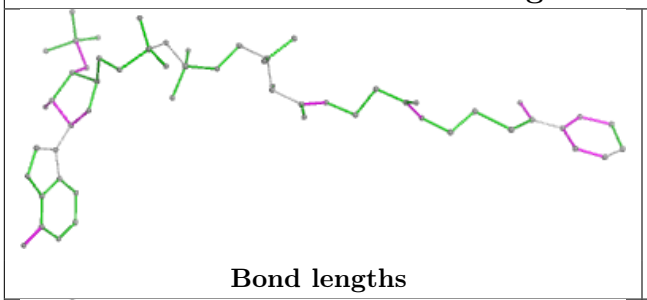
There are no ring outliers.

3 monomers are involved in 5 short contacts:

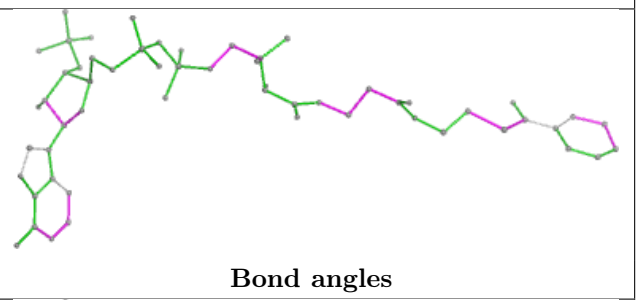
Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	A	503	GOL	1	0
7	D	401	BJ8	1	0
5	C	502[A]	GOL	3	0

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.

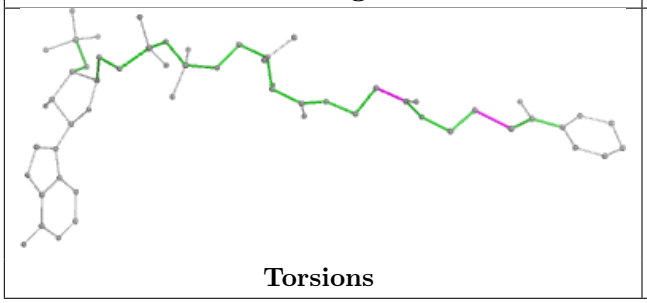
Ligand 4KX C 501



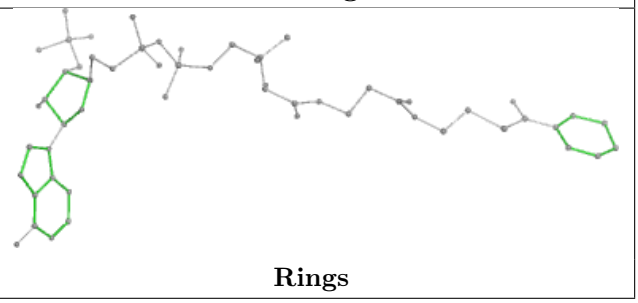
Bond lengths



Bond angles

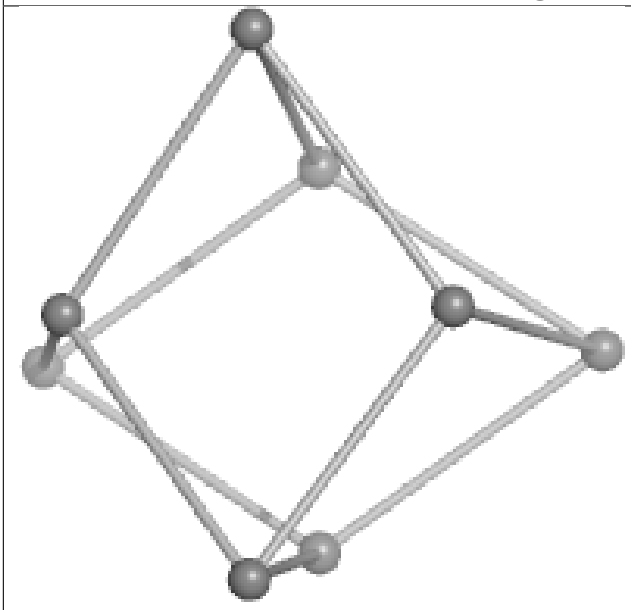


Torsions

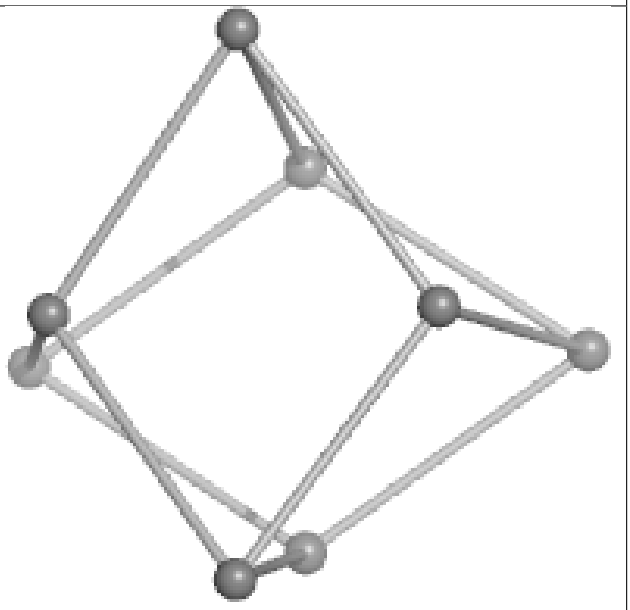


Rings

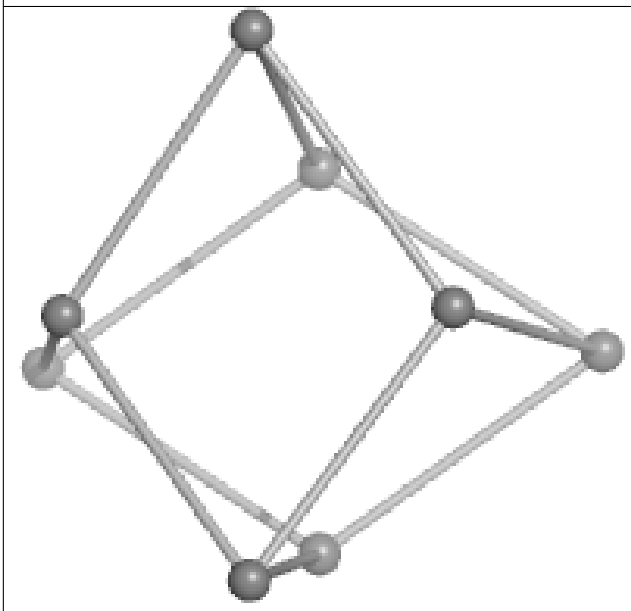
Ligand SF4 C 503



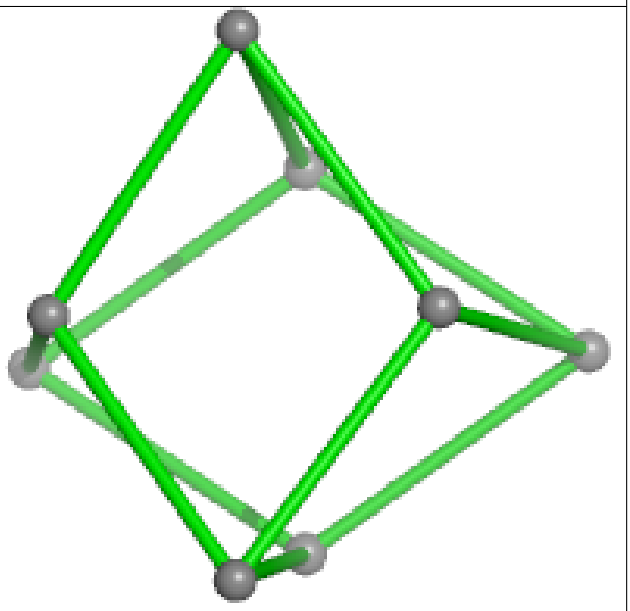
Bond lengths



Bond angles

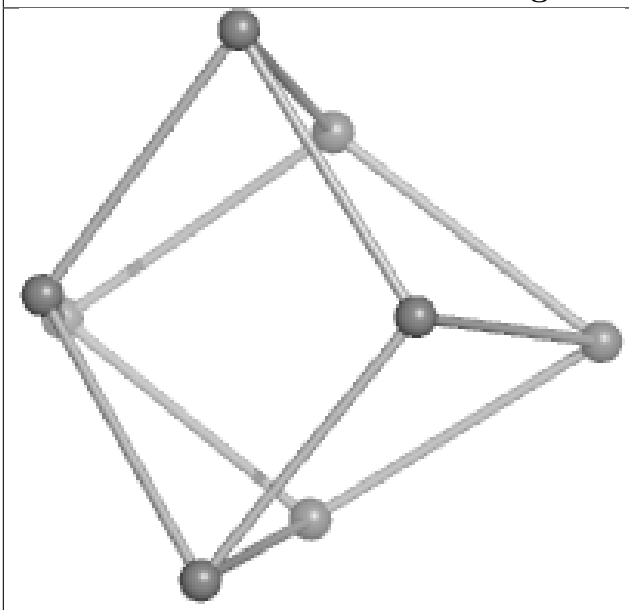


Torsions

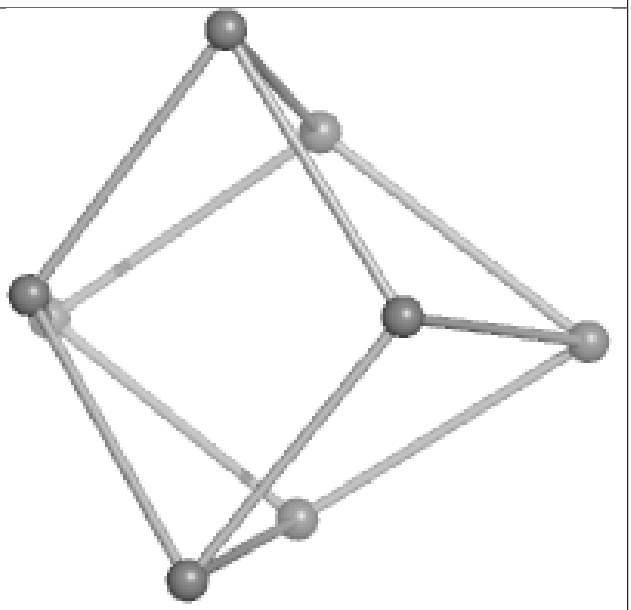


Rings

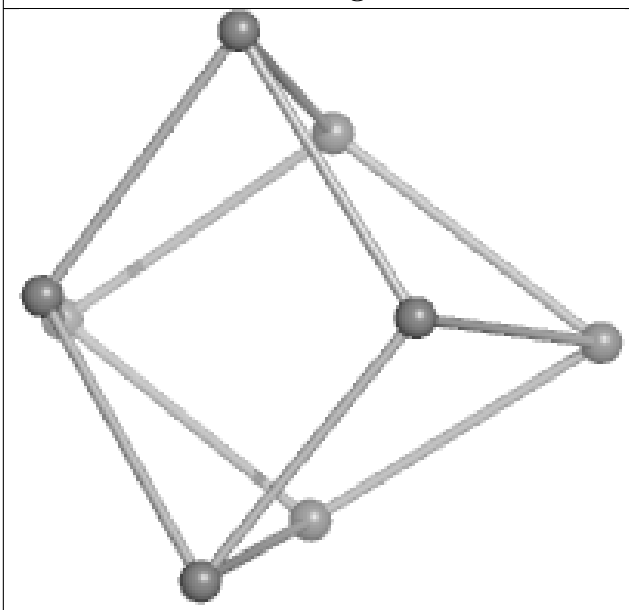
Ligand SF4 A 504



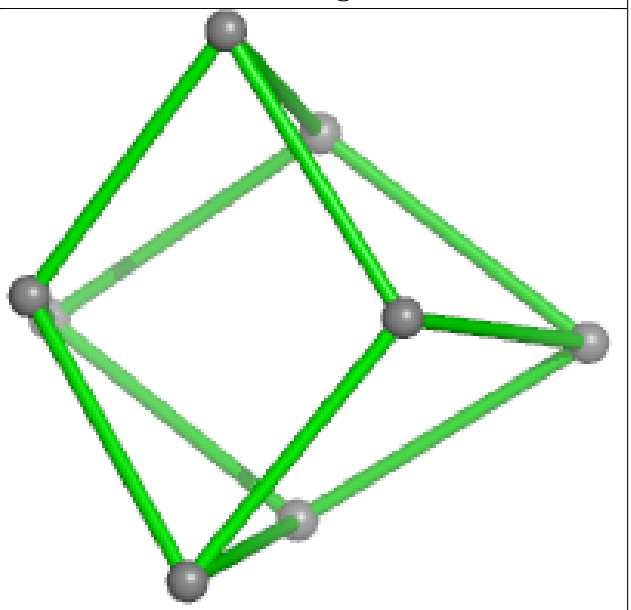
Bond lengths



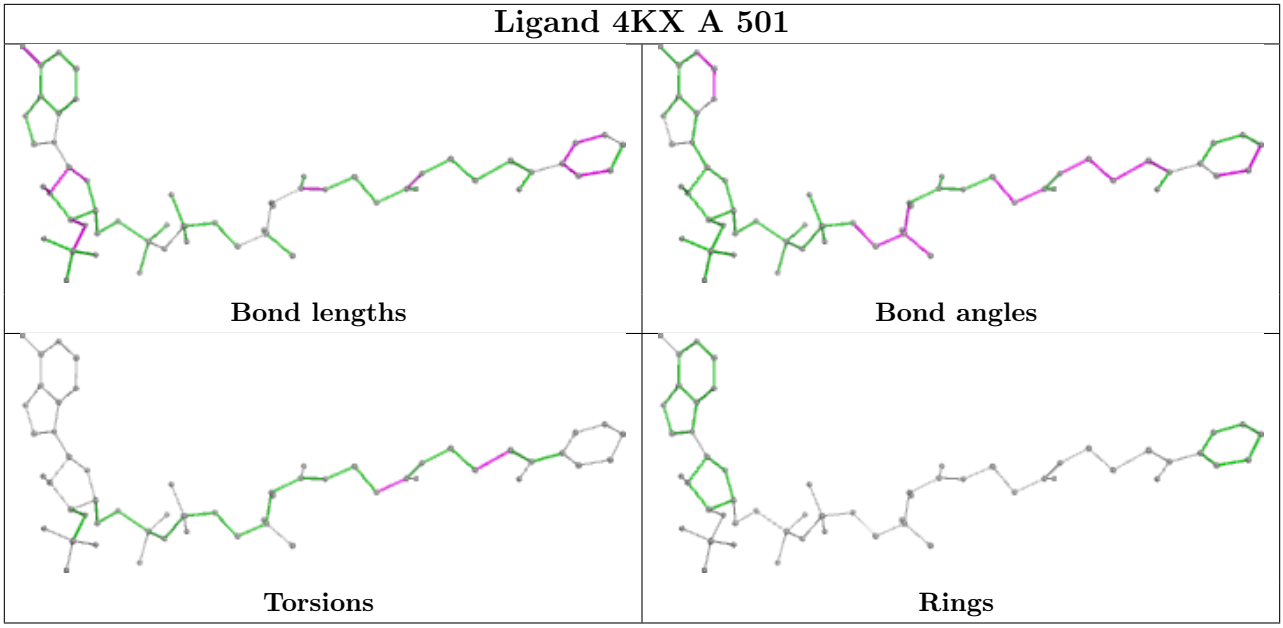
Bond angles



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, 95^{th} 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	438/447 (97%)	0.15	21 (4%)	36	37	10, 23, 39, 74	9 (2%)
1	C	431/447 (96%)	0.22	16 (3%)	45	46	11, 24, 44, 89	5 (1%)
2	B	375/379 (98%)	0.30	14 (3%)	45	46	10, 27, 48, 70	4 (1%)
2	D	375/379 (98%)	0.44	18 (4%)	36	37	10, 27, 51, 69	8 (2%)
All	All	1619/1652 (98%)	0.27	69 (4%)	40	41	10, 25, 45, 89	26 (1%)

All (69) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	279[A]	PHE	7.4
1	A	440	TRP	7.2
1	A	5	ALA	6.6
1	C	436	ALA	6.5
2	D	244	ILE	5.0
2	B	244	ILE	4.9
1	C	434	ARG	4.7
1	A	277	TRP	4.6
2	B	2	SER	4.5
2	D	359	ILE	4.4
1	A	442	HIS	4.3
1	C	433	ARG	4.2
2	D	2	SER	4.0
1	C	432	VAL	4.0
2	D	226	VAL	3.9
1	A	6	ASN	3.6
1	C	431	GLY	3.5
1	C	435	GLN	3.4
2	B	359	ILE	3.3
1	A	328	ASN	3.3
1	C	273	THR	3.1

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Mol	Chain	Res	Type	RSRZ
1	C	6	ASN	3.1
2	D	245	ALA	3.0
2	D	376	GLU	3.0
1	C	328	ASN	3.0
1	C	314	TRP	2.9
1	A	273	THR	2.9
2	D	25	VAL	2.9
2	B	103	TYR	2.9
2	B	376	GLU	2.8
2	D	373	LEU	2.8
1	C	7	LYS	2.8
1	A	441	SER	2.8
2	D	355	ILE	2.7
2	B	62	ASN	2.7
2	D	364	ILE	2.6
1	C	422	ARG	2.6
1	C	396	LYS	2.6
1	A	327	ILE	2.6
1	A	275	PRO	2.5
2	B	372	THR	2.5
1	A	276	PRO	2.5
2	B	223	ASN	2.4
2	B	375	GLU	2.4
2	D	227	GLU	2.4
2	D	375	GLU	2.4
1	A	285	TYR	2.4
2	B	246	PHE	2.4
1	C	277	TRP	2.4
2	B	65	GLU	2.3
2	D	372	THR	2.3
1	A	8	TYR	2.3
2	D	250	VAL	2.2
1	A	278	SER	2.2
2	B	253	VAL	2.2
1	A	7	LYS	2.2
2	B	225	LYS	2.2
1	A	282	ILE	2.1
1	A	289	TYR	2.1
2	D	103[A]	TYR	2.1
1	C	28[A]	MET	2.1
2	D	253	VAL	2.1
1	C	279	PHE	2.1

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Mol	Chain	Res	Type	RSRZ
1	A	16	TRP	2.1
1	A	286	LEU	2.1
2	D	179[A]	LEU	2.1
2	B	358	PRO	2.0
1	A	28[A]	MET	2.0
2	D	246	PHE	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)

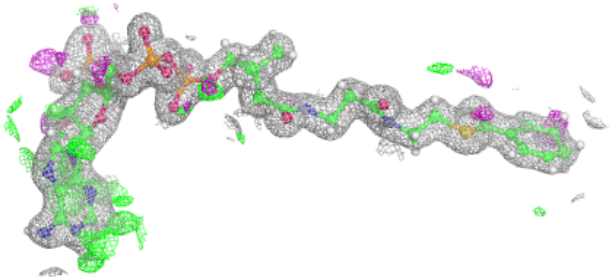
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9'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

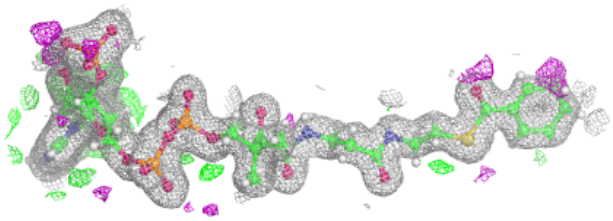
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
4	TRS	A	502[A]	8/8	0.79	0.10	23,28,31,31	19
4	TRS	A	502[B]	8/8	0.79	0.10	21,26,31,31	19
5	GOL	A	503	6/6	0.79	0.12	33,40,48,48	0
4	TRS	D	402[B]	8/8	0.86	0.10	17,26,31,31	19
4	TRS	D	402[A]	8/8	0.86	0.10	22,27,31,31	19
5	GOL	C	502[A]	6/6	0.86	0.12	23,27,34,34	13
5	GOL	C	502[B]	6/6	0.86	0.12	22,31,34,41	12
3	4KX	C	501	56/56	0.96	0.07	14,24,32,38	0
3	4KX	A	501	56/56	0.96	0.07	16,24,32,40	0
7	BJ8	B	401	17/17	0.99	0.03	16,17,19,20	0
7	BJ8	D	401	17/17	0.99	0.03	17,18,19,20	0
6	SF4	A	504	8/8	1.00	0.02	15,16,16,16	0
6	SF4	C	503	8/8	1.00	0.02	15,16,17,17	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 4KX C 501:

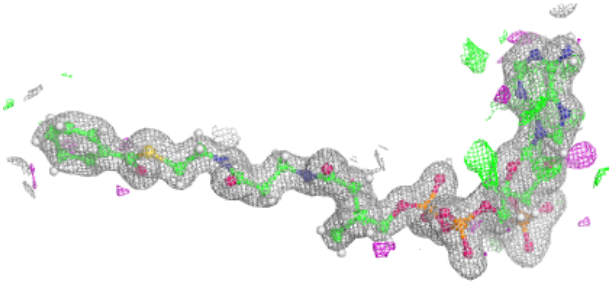
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

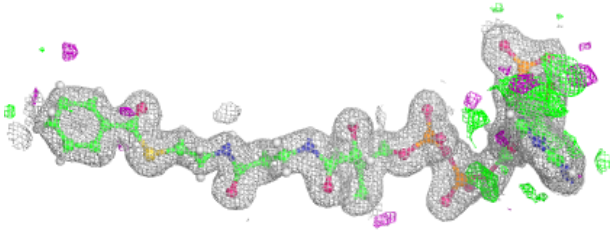


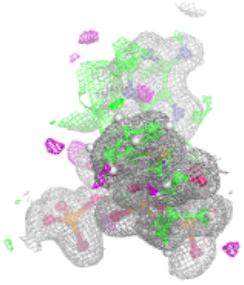


Electron density around 4KX A 501:

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

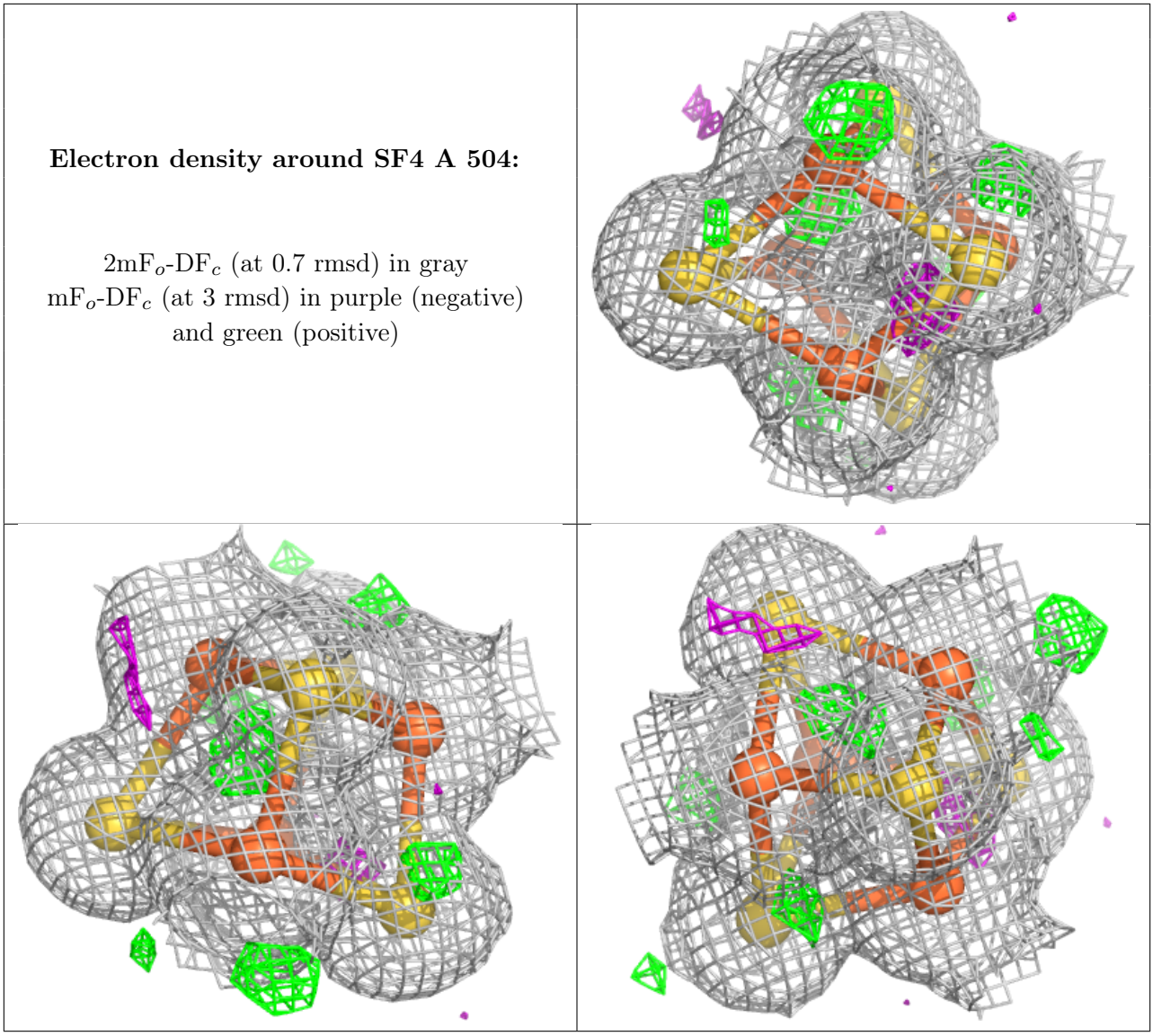






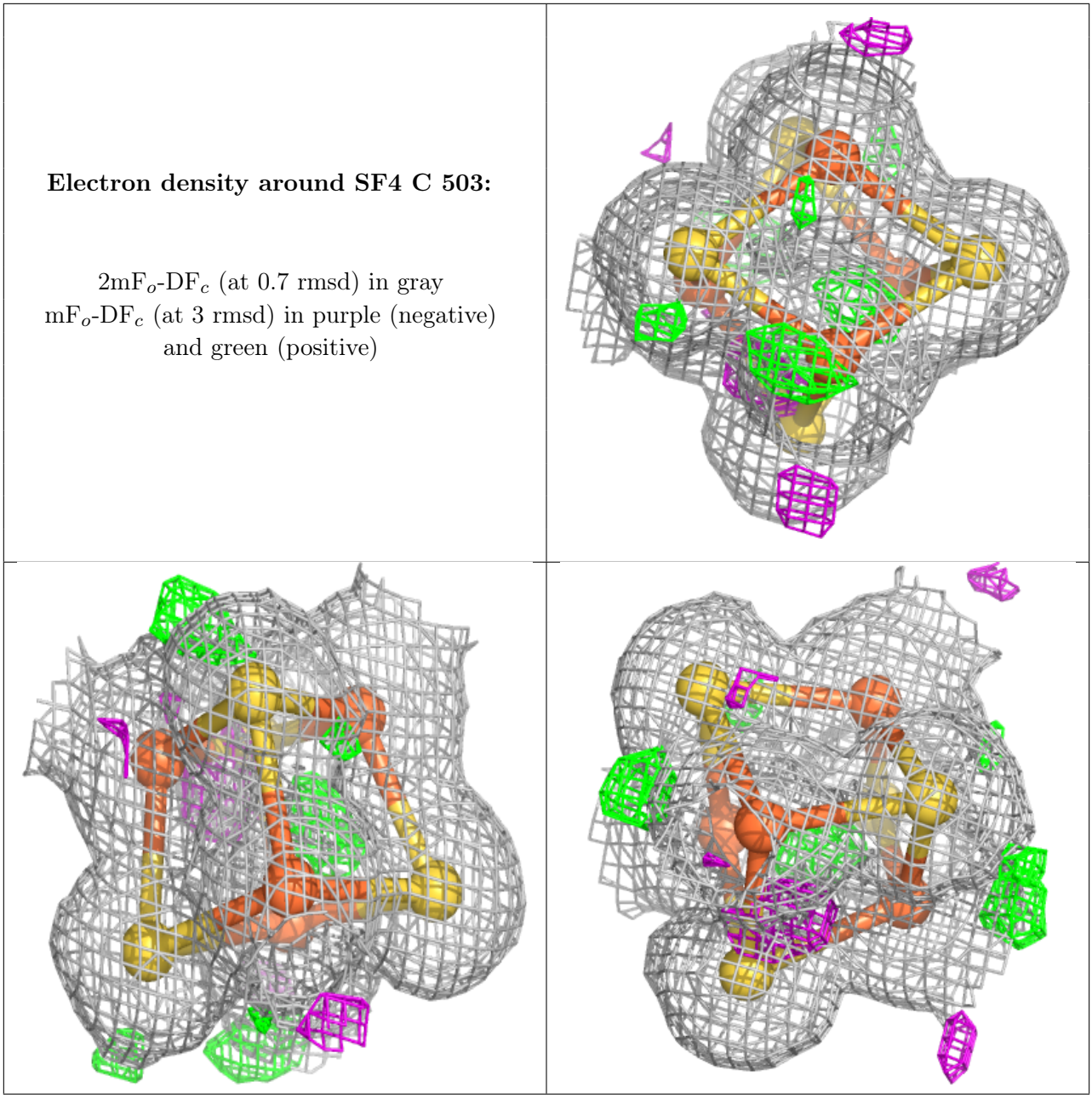
Electron density around SF4 A 504:

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



Electron density around SF4 C 503:

$2mF_o$-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.