Full wwPDB X-ray Structure Validation Report (i)

Apr 28, 2024 – 01:33 am BST

PDB ID	:	6G9X
Title	:	Crystal structure of a MFS transporter at 2.54 Angstroem resolution
Authors	:	Kalbermatter, D.; Bosshart, P.; Bonetti, S.; Fotiadis, D.
Deposited on	:	2018-04-11
Resolution	:	2.30 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:

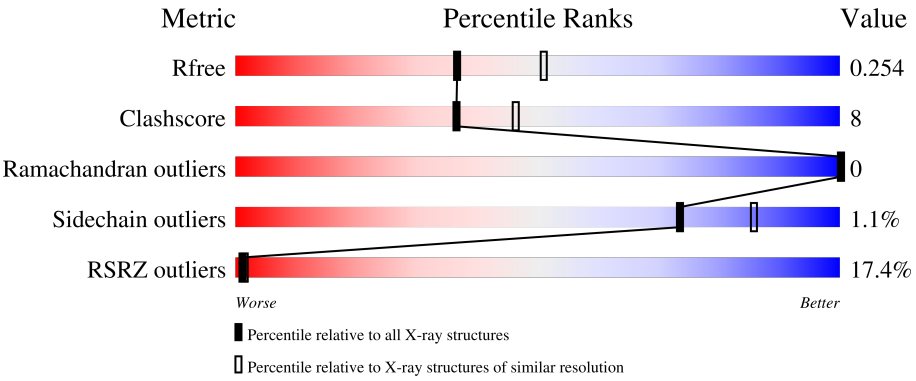
MolProbity	:	4.02b-467
Mogul	:	1.8.4, CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.36.2
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36.2

1 Overall quality at a glance (i)

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

The reported resolution of this entry is 2.30 Å.

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



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	5042 (2.30-2.30)
Clashscore	141614	5643 (2.30-2.30)
Ramachandran outliers	138981	5575 (2.30-2.30)
Sidechain outliers	138945	5575 (2.30-2.30)
RSRZ outliers	127900	4938 (2.30-2.30)

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	420	14% 76% 18% 6%
1	B	420	18% 69% 19% 12%

2 Entry composition (i)

There are 6 unique types of molecules in this entry. The entry contains 5932 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 Major facilitator superfamily MFS_1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	396	Total	C	N	O	S	0	0	0
			2985	1995	471	495	24			
1	B	368	Total	C	N	O	S	0	0	0
			2772	1857	434	458	23			

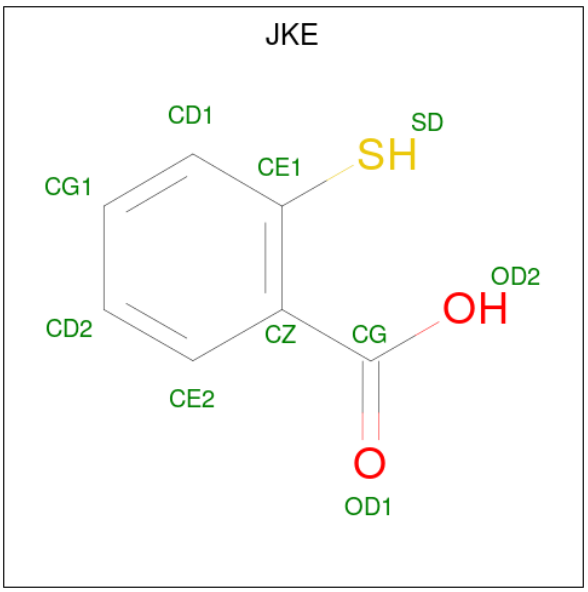
There are 16 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	413	LEU	-	expression tag	UNP A0LNN5
A	414	GLU	-	expression tag	UNP A0LNN5
A	415	LEU	-	expression tag	UNP A0LNN5
A	416	GLU	-	expression tag	UNP A0LNN5
A	417	VAL	-	expression tag	UNP A0LNN5
A	418	LEU	-	expression tag	UNP A0LNN5
A	419	PHE	-	expression tag	UNP A0LNN5
A	420	GLN	-	expression tag	UNP A0LNN5
B	413	LEU	-	expression tag	UNP A0LNN5
B	414	GLU	-	expression tag	UNP A0LNN5
B	415	LEU	-	expression tag	UNP A0LNN5
B	416	GLU	-	expression tag	UNP A0LNN5
B	417	VAL	-	expression tag	UNP A0LNN5
B	418	LEU	-	expression tag	UNP A0LNN5
B	419	PHE	-	expression tag	UNP A0LNN5
B	420	GLN	-	expression tag	UNP A0LNN5

- Molecule 2 is MERCURY (II) ION (three-letter code: HG) (formula: Hg).

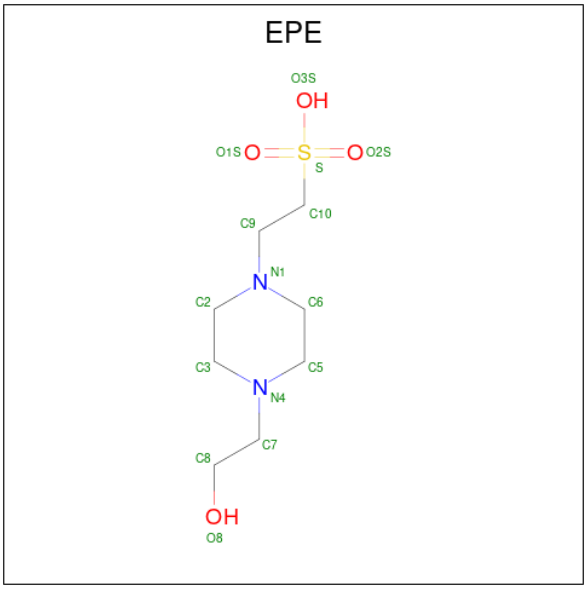
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	7	Total	Hg	0	0
			7	7		
2	B	5	Total	Hg	0	0
			5	5		

- Molecule 3 is 2-sulfanylbenzoic acid (three-letter code: JKE) (formula: $C_7H_6O_2S$).



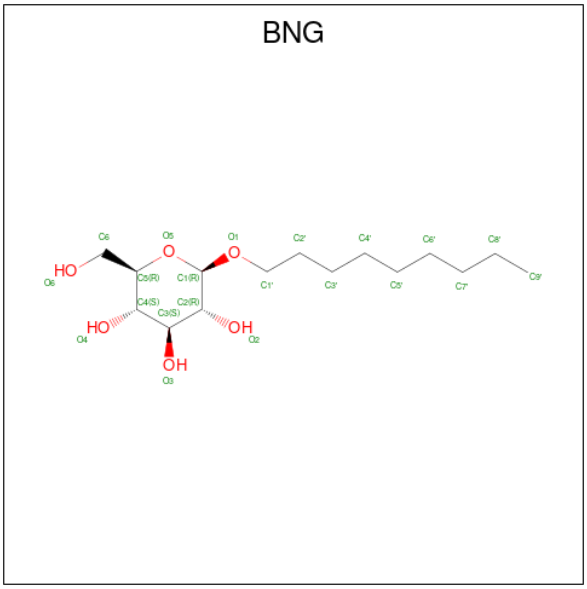
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total C O S 10 7 2 1	0	0
3	B	1	Total C O S 10 7 2 1	0	0

- Molecule 4 is 4-(2-HYDROXYETHYL)-1-PIPERAZINE ETHANESULFONIC ACID (three-letter code: EPE) (formula: $C_8H_{18}N_2O_4S$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total C N O S 15 8 2 4 1	0	0

- Molecule 5 is nonyl beta-D-glucopyranoside (three-letter code: BNG) (formula: $C_{15}H_{30}O_6$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	1	Total C O 21 15 6	0	0
5	A	1	Total C O 21 15 6	0	0
5	A	1	Total C O 21 15 6	0	0
5	B	1	Total C O 21 15 6	0	0
5	B	1	Total C O 21 15 6	0	0
5	B	1	Total C O 21 15 6	0	0

- Molecule 6 is water.

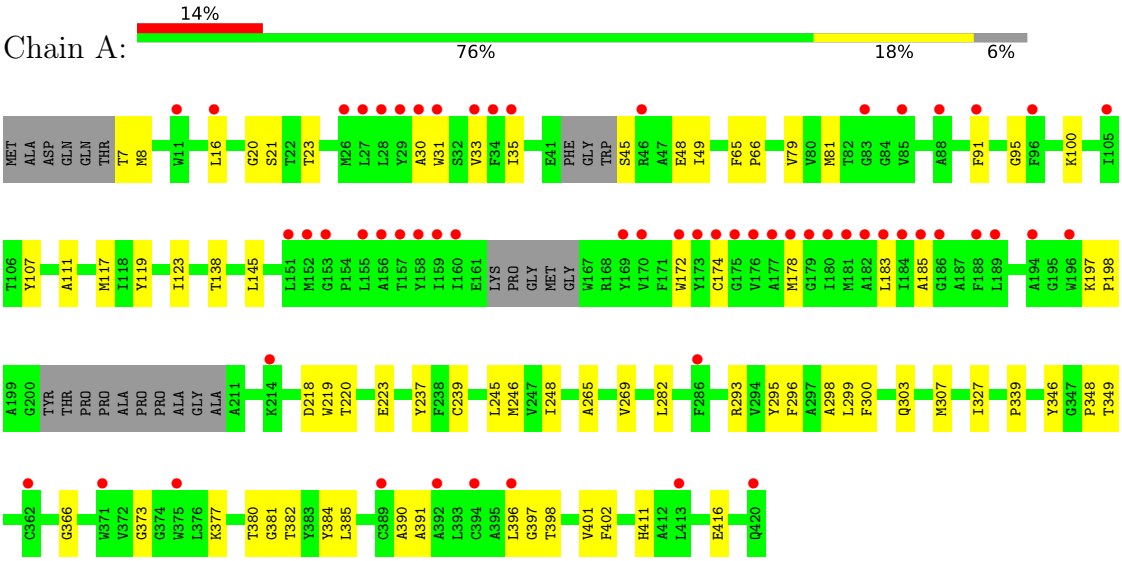
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	1	Total O 1 1	0	0
6	B	1	Total O 1 1	0	0

3 Residue-property plots (i)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density (RSRZ > 2). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

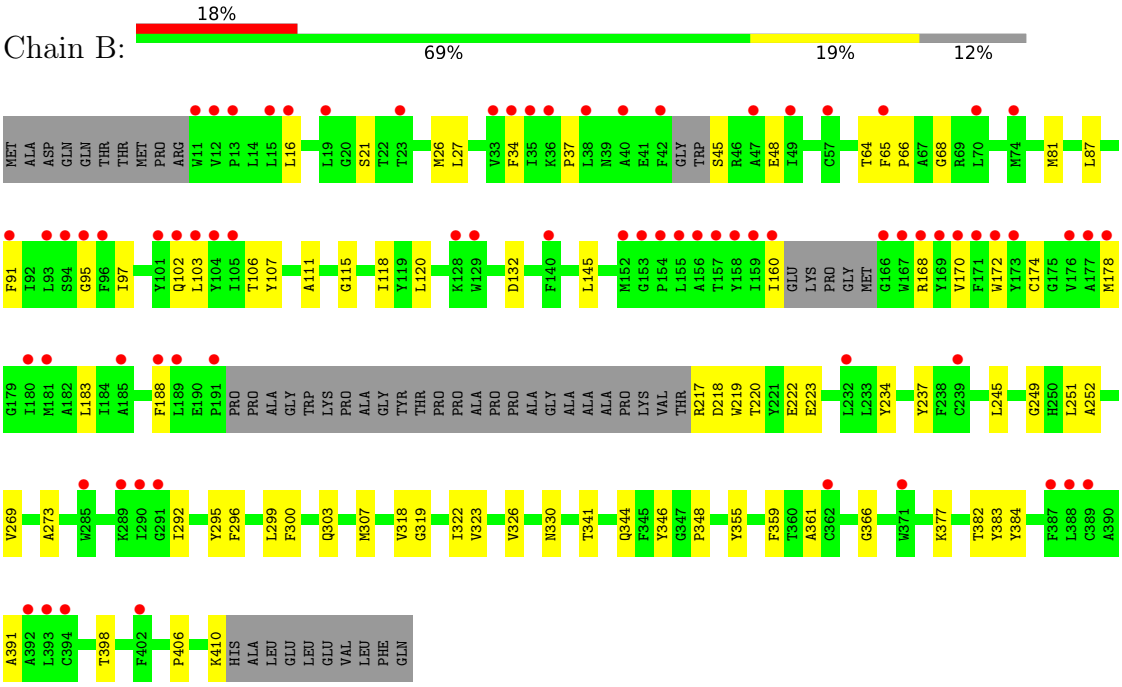
• Molecule 1: Major facilitator superfamily MFS_1

Chain A:



• Molecule 1: Major facilitator superfamily MFS_1

Chain B:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, α, β, γ	106.77Å 200.54Å 64.56Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	24.79 – 2.30 53.26 – 2.30	Depositor EDS
% Data completeness (in resolution range)	55.5 (24.79-2.30) 52.5 (53.26-2.30)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	0.22 (at 2.29Å)	Xtriage
Refinement program	PHENIX 1.13_2998	Depositor
R, R_{free}	0.217 , 0.254 0.217 , 0.254	Depositor DCC
R_{free} test set	1996 reflections (5.76%)	wwPDB-VP
Wilson B-factor (Å^2)	64.3	Xtriage
Anisotropy	0.023	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.31 , 70.5	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	0.89	EDS
Total number of atoms	5932	wwPDB-VP
Average B, all atoms (Å^2)	80.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.68% 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: HG, BNG, JKE, EPE

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	0.49	0/3075	0.66	0/4184
1	B	0.42	0/2854	0.60	0/3879
All	All	0.46	0/5929	0.63	0/8063

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

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	2985	0	3024	47	0
1	B	2772	0	2805	47	0
2	A	7	0	0	0	0
2	B	5	0	0	0	0
3	A	10	0	5	0	0
3	B	10	0	5	0	0
4	A	15	0	18	1	0
5	A	63	0	89	2	0
5	B	63	0	90	2	0
6	A	1	0	0	0	0
6	B	1	0	0	0	0
All	All	5932	0	6036	94	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 8.

All (94) 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:79:VAL:HG13	1:A:117:MET:HE3	1.72	0.70
1:A:298:ALA:HB1	5:A:511:BNG:H8'2	1.82	0.61
1:B:26:MET:HB3	1:B:178:MET:HE1	1.81	0.61
1:B:245:LEU:HD13	1:B:366:GLY:HA2	1.83	0.61
1:A:21:SER:HB2	1:A:145:LEU:HD12	1.83	0.60
1:B:273:ALA:HB2	5:B:507:BNG:H61	1.85	0.57
1:A:245:LEU:HD13	1:A:366:GLY:HA2	1.86	0.56
1:B:95:GLY:O	1:B:168:ARG:NH2	2.37	0.56
1:B:382:THR:HG23	1:B:384:TYR:H	1.69	0.56
1:A:107:TYR:O	1:A:111:ALA:HB3	2.06	0.55
1:A:81:MET:HE3	1:A:183:LEU:HD22	1.89	0.54
1:A:16:LEU:HD22	1:A:185:ALA:HA	1.90	0.54
1:B:160:ILE:HG13	1:B:170:VAL:HG21	1.89	0.54
1:B:91:PHE:HE2	1:B:178:MET:HE3	1.73	0.53
1:A:20:GLY:O	1:A:23:THR:HB	2.08	0.53
1:B:303:GLN:HG2	1:B:330:ASN:HB3	1.89	0.53
1:B:307:MET:HB2	1:B:391:ALA:HB2	1.88	0.53
1:B:295:TYR:CZ	1:B:299:LEU:HD11	2.43	0.53
1:B:222:GLU:OE1	1:B:222:GLU:N	2.39	0.52
1:A:65:PHE:HB3	1:A:66:PRO:HD3	1.90	0.52
1:A:45:SER:O	1:A:49:ILE:HG13	2.10	0.52
1:B:303:GLN:HG2	1:B:330:ASN:CB	2.41	0.51
1:A:218:ASP:OD2	1:A:348:PRO:HD2	2.10	0.51
1:B:97:ILE:HD13	1:B:103:LEU:HD13	1.92	0.51
1:B:344:GLN:OE1	1:B:406:PRO:HG3	2.11	0.51
1:B:292:ILE:HG21	1:B:341:THR:OG1	2.11	0.50
1:A:138:THR:HG21	1:A:339:PRO:HG2	1.92	0.50
1:B:217:ARG:NH1	1:B:410:LYS:HD3	2.26	0.50
1:A:397:GLY:O	1:A:401:VAL:HG23	2.11	0.50
1:B:21:SER:HB2	1:B:145:LEU:HD12	1.93	0.50
1:A:377:LYS:O	1:A:381:GLY:N	2.44	0.50
1:A:174:CYS:HB3	1:A:178:MET:HE3	1.93	0.50
1:B:132:ASP:OD1	1:B:132:ASP:N	2.37	0.49
1:A:31:TRP:CZ3	1:A:35:ILE:HD11	2.48	0.49
1:A:95:GLY:HA3	1:A:172:TRP:NE1	2.27	0.49
1:B:16:LEU:HD21	1:B:188:PHE:HB2	1.94	0.49
1:A:246:MET:HE3	1:A:390:ALA:HB2	1.95	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:30:ALA:O	1:A:33:VAL:HG22	2.12	0.48
1:B:68:GLY:CA	1:B:120:LEU:HD23	2.44	0.48
1:B:120:LEU:HD11	1:B:355:TYR:HD2	1.79	0.48
1:A:219:TRP:HB2	1:A:346:TYR:HB3	1.95	0.47
1:B:81:MET:HE3	1:B:183:LEU:HD22	1.97	0.47
1:B:91:PHE:CE2	1:B:178:MET:HE3	2.50	0.47
1:A:307:MET:HB2	1:A:391:ALA:HB2	1.96	0.47
1:A:295:TYR:HD1	5:A:511:BNG:H6'2	1.80	0.46
1:B:65:PHE:HB3	1:B:66:PRO:HD3	1.96	0.46
1:A:248:ILE:HG21	4:A:508:EPE:H51	1.97	0.46
1:A:411:HIS:NE2	1:A:416:GLU:OE1	2.49	0.46
1:B:27:LEU:HD13	1:B:87:LEU:HD11	1.98	0.46
1:B:107:TYR:O	1:B:111:ALA:HB3	2.16	0.46
1:B:303:GLN:O	1:B:307:MET:HG2	2.15	0.46
1:B:249:GLY:HA2	5:B:507:BNG:H8'1	1.97	0.45
1:A:239:CYS:SG	1:A:396:LEU:HD23	2.56	0.45
1:A:282:LEU:HA	1:A:282:LEU:HD23	1.70	0.45
1:A:293:ARG:HD2	1:A:402:PHE:O	2.17	0.45
1:B:223:GLU:CD	1:B:410:LYS:HE3	2.37	0.45
1:A:303:GLN:O	1:A:307:MET:HG2	2.17	0.44
1:A:295:TYR:CZ	1:A:299:LEU:HD11	2.53	0.44
1:A:300:PHE:HB3	1:A:398:THR:OG1	2.18	0.44
1:A:119:TYR:CZ	1:A:123:ILE:HD11	2.53	0.44
1:B:102:GLN:O	1:B:106:THR:HG23	2.18	0.43
1:B:115:GLY:HA2	1:B:118:ILE:HD12	2.00	0.43
1:B:64:THR:HG21	1:B:359:PHE:CD2	2.54	0.43
1:B:174:CYS:HB3	1:B:178:MET:HE3	2.00	0.43
1:A:295:TYR:CE2	1:A:299:LEU:HD11	2.53	0.43
1:B:219:TRP:HB2	1:B:346:TYR:HB3	2.01	0.43
1:A:218:ASP:OD2	1:A:349:THR:HG23	2.19	0.43
1:B:252:ALA:HA	1:B:269:VAL:HG21	2.00	0.43
1:B:234:TYR:CE1	1:B:361:ALA:HB2	2.54	0.42
1:A:382:THR:HG23	1:A:384:TYR:H	1.83	0.42
1:B:45:SER:HB3	1:B:48:GLU:CD	2.40	0.42
1:A:35:ILE:HG23	1:A:49:ILE:HD12	2.01	0.42
1:B:95:GLY:HA3	1:B:172:TRP:NE1	2.34	0.42
1:A:385:LEU:HD13	1:A:385:LEU:HA	1.86	0.42
1:A:7:THR:OG1	1:A:8:MET:N	2.48	0.42
1:A:45:SER:HB3	1:A:48:GLU:CG	2.50	0.42
1:A:31:TRP:O	1:A:35:ILE:HG13	2.19	0.42
1:B:299:LEU:HD22	1:B:330:ASN:OD1	2.19	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:218:ASP:OD2	1:B:348:PRO:HD2	2.19	0.42
1:B:251:LEU:HA	1:B:251:LEU:HD23	1.79	0.42
1:A:303:GLN:OE1	1:A:327:ILE:HA	2.19	0.41
1:B:300:PHE:HB3	1:B:398:THR:OG1	2.20	0.41
1:A:197:LYS:HA	1:A:198:PRO:HD2	1.96	0.41
1:A:220:THR:HG23	1:A:223:GLU:OE1	2.21	0.41
1:A:265:ALA:O	1:A:269:VAL:HG23	2.20	0.41
1:B:322:ILE:O	1:B:326:VAL:HG23	2.20	0.41
1:B:220:THR:HG23	1:B:223:GLU:OE1	2.21	0.41
1:B:34:PHE:C	1:B:37:PRO:HD2	2.41	0.41
1:B:377:LYS:HE2	1:B:383:TYR:CZ	2.56	0.41
1:A:246:MET:HG3	1:A:373:GLY:HA3	2.02	0.40
1:A:246:MET:HG3	1:A:373:GLY:CA	2.52	0.40
1:B:319:GLY:O	1:B:323:VAL:HG23	2.21	0.40
1:A:100:LYS:HE3	1:A:100:LYS:HB2	1.40	0.40
1:A:380:THR:HB	1:A:382:THR:HG22	2.04	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	388/420 (92%)	379 (98%)	9 (2%)	0	100	100
1	B	360/420 (86%)	355 (99%)	5 (1%)	0	100	100
All	All	748/840 (89%)	734 (98%)	14 (2%)	0	100	100

There are no Ramachandran outliers to report.

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	291/307 (95%)	288 (99%)	3 (1%)	76 87
1	B	269/307 (88%)	266 (99%)	3 (1%)	73 86
All	All	560/614 (91%)	554 (99%)	6 (1%)	73 86

All (6) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	91	PHE
1	A	237	TYR
1	A	296	PHE
1	B	237	TYR
1	B	296	PHE
1	B	318	VAL

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

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 monosaccharides in this entry.

5.6 Ligand geometry

Of 21 ligands modelled in this entry, 12 are monoatomic - leaving 9 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
5	BNG	A	511	-	21,21,21	1.33	2 (9%)	26,26,26	1.19	2 (7%)
5	BNG	A	510	2	21,21,21	1.21	2 (9%)	26,26,26	1.40	3 (11%)
3	JKE	A	507	-	10,10,10	1.31	1 (10%)	12,13,13	2.16	3 (25%)
5	BNG	A	509	-	21,21,21	1.30	2 (9%)	26,26,26	1.06	2 (7%)
4	EPE	A	508	-	15,15,15	0.72	1 (6%)	18,20,20	0.72	0
3	JKE	B	506	-	10,10,10	1.22	2 (20%)	12,13,13	1.61	3 (25%)
5	BNG	B	509	-	21,21,21	1.32	2 (9%)	26,26,26	1.23	2 (7%)
5	BNG	B	508	-	21,21,21	1.25	2 (9%)	26,26,26	1.46	5 (19%)
5	BNG	B	507	-	21,21,21	1.28	1 (4%)	26,26,26	1.40	4 (15%)

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
5	BNG	A	511	-	-	4/12/32/32	0/1/1/1
5	BNG	A	510	2	-	6/12/32/32	0/1/1/1
3	JKE	A	507	-	-	2/4/4/4	0/1/1/1
5	BNG	A	509	-	-	6/12/32/32	0/1/1/1
4	EPE	A	508	-	-	1/9/19/19	0/1/1/1
3	JKE	B	506	-	-	0/4/4/4	0/1/1/1
5	BNG	B	509	-	-	6/12/32/32	0/1/1/1
5	BNG	B	508	-	-	6/12/32/32	0/1/1/1
5	BNG	B	507	-	-	10/12/32/32	0/1/1/1

All (15) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	B	509	BNG	O5-C1	4.08	1.52	1.41
5	A	511	BNG	O5-C1	3.89	1.51	1.41

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	A	509	BNG	O5-C1	3.84	1.51	1.41
5	B	507	BNG	O5-C1	3.59	1.51	1.41
5	A	510	BNG	O5-C1	3.27	1.50	1.41
3	A	507	JKE	CZ-CG	3.21	1.56	1.49
5	B	508	BNG	O5-C1	3.16	1.49	1.41
4	A	508	EPE	O3S-S	2.47	1.56	1.47
3	B	506	JKE	CZ-CG	2.47	1.54	1.49
5	A	510	BNG	O3-C3	2.43	1.48	1.43
5	B	509	BNG	O3-C3	2.30	1.48	1.43
3	B	506	JKE	CE1-SD	2.13	1.84	1.76
5	A	511	BNG	O5-C5	2.05	1.49	1.44
5	A	509	BNG	O1-C1	-2.05	1.36	1.40
5	B	508	BNG	C3-C2	-2.04	1.47	1.52

All (24) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	A	507	JKE	OD2-CG-CZ	4.41	128.01	115.31
5	B	508	BNG	O5-C5-C4	4.01	116.97	109.69
3	A	507	JKE	OD2-CG-OD1	-3.89	114.72	123.35
5	A	510	BNG	C3-C4-C5	3.69	116.83	110.24
5	A	510	BNG	C1-C2-C3	3.35	116.98	110.00
5	B	509	BNG	C1-C2-C3	3.33	116.93	110.00
5	B	507	BNG	O5-C5-C4	3.31	115.71	109.69
5	B	509	BNG	O5-C1-C2	3.10	116.90	110.35
5	B	507	BNG	C3-C4-C5	3.02	115.63	110.24
3	B	506	JKE	CE1-CZ-CG	2.93	126.20	122.07
3	B	506	JKE	OD2-CG-CZ	2.83	123.46	115.31
3	A	507	JKE	CE1-CZ-CG	2.72	125.91	122.07
5	B	508	BNG	C3-C4-C5	2.65	114.96	110.24
5	B	507	BNG	O1-C1-C2	2.57	112.32	108.30
3	B	506	JKE	OD2-CG-OD1	-2.54	117.71	123.35
5	B	508	BNG	C1'-O1-C1	2.49	117.97	113.84
5	A	511	BNG	C1-C2-C3	2.30	114.78	110.00
5	B	508	BNG	O3-C3-C2	-2.25	105.14	110.35
5	A	509	BNG	O5-C5-C4	2.17	113.64	109.69
5	B	508	BNG	C1-O5-C5	2.14	117.89	113.69
5	A	509	BNG	C6-C5-C4	-2.13	108.01	113.00
5	B	507	BNG	C1-C2-C3	-2.06	105.70	110.00
5	A	511	BNG	O5-C5-C4	2.05	113.42	109.69
5	A	510	BNG	C4-C3-C2	2.05	114.40	110.82

There are no chirality outliers.

All (41) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	508	EPE	C10-C9-N1-C6
5	A	509	BNG	C2-C1-O1-C1'
5	A	509	BNG	O5-C1-O1-C1'
5	A	510	BNG	C2-C1-O1-C1'
5	A	510	BNG	O5-C1-O1-C1'
5	A	511	BNG	C2'-C1'-O1-C1
5	B	507	BNG	C2-C1-O1-C1'
5	B	509	BNG	C2-C1-O1-C1'
5	B	509	BNG	O5-C1-O1-C1'
5	B	509	BNG	C2'-C1'-O1-C1
5	B	508	BNG	C4-C5-C6-O6
5	B	508	BNG	O5-C5-C6-O6
5	B	509	BNG	O5-C5-C6-O6
5	A	509	BNG	O5-C5-C6-O6
5	B	507	BNG	O5-C5-C6-O6
5	B	507	BNG	O5-C1-O1-C1'
5	B	508	BNG	O5-C1-O1-C1'
5	B	507	BNG	C4-C5-C6-O6
5	A	509	BNG	C4-C5-C6-O6
5	B	509	BNG	C4-C5-C6-O6
5	B	507	BNG	C1'-C2'-C3'-C4'
5	B	508	BNG	C5'-C6'-C7'-C8'
5	A	510	BNG	C2'-C1'-O1-C1
5	B	508	BNG	O1-C1'-C2'-C3'
5	A	511	BNG	C3'-C4'-C5'-C6'
5	B	507	BNG	C3'-C4'-C5'-C6'
5	B	507	BNG	C6'-C7'-C8'-C9'
5	A	510	BNG	O1-C1'-C2'-C3'
5	A	510	BNG	O5-C5-C6-O6
5	B	508	BNG	C2'-C3'-C4'-C5'
5	B	509	BNG	O1-C1'-C2'-C3'
5	A	510	BNG	C4'-C5'-C6'-C7'
5	A	511	BNG	C1'-C2'-C3'-C4'
5	B	507	BNG	C2'-C3'-C4'-C5'
5	A	509	BNG	C6'-C7'-C8'-C9'
5	B	507	BNG	O1-C1'-C2'-C3'
5	A	511	BNG	C5'-C6'-C7'-C8'
3	A	507	JKE	OD2-CG-CZ-CE1
3	A	507	JKE	OD1-CG-CZ-CE1
5	A	509	BNG	O1-C1'-C2'-C3'

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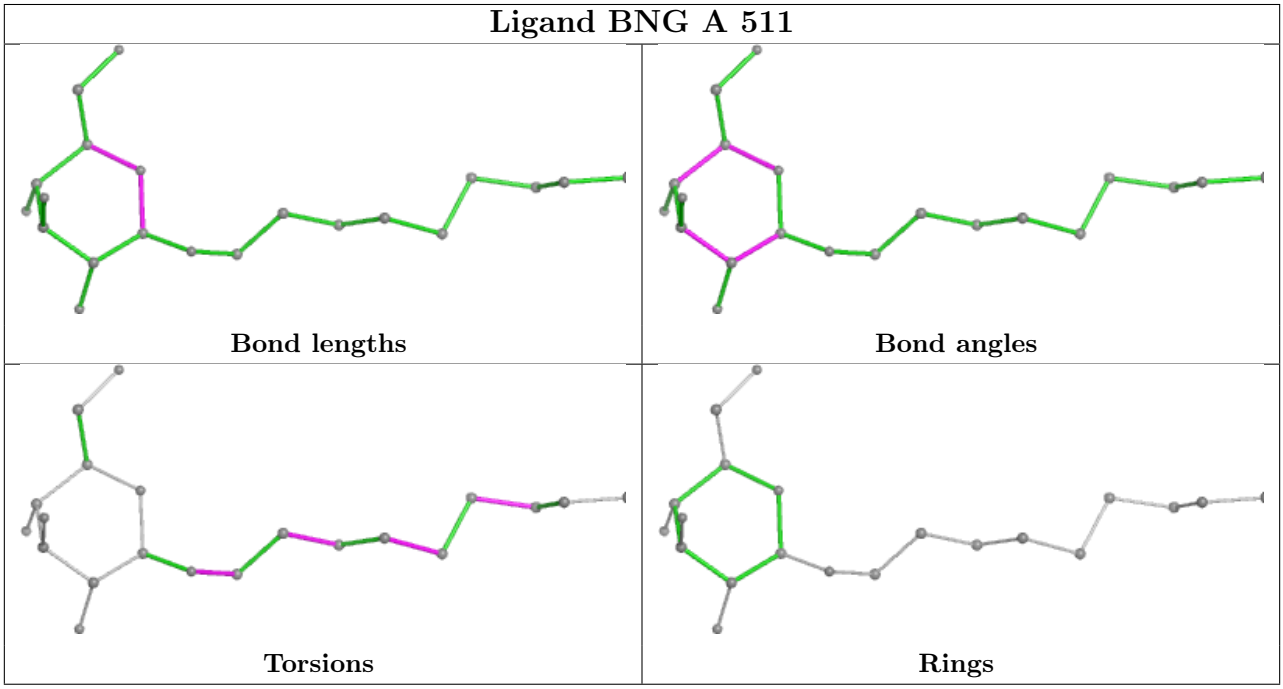
Mol	Chain	Res	Type	Atoms
5	B	507	BNG	C5'-C6'-C7'-C8'

There are no ring outliers.

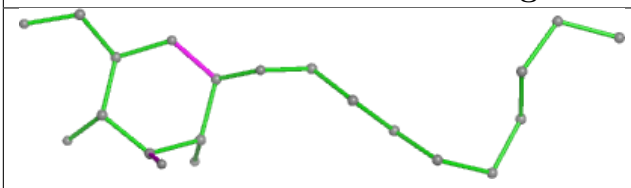
3 monomers are involved in 5 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	A	511	BNG	2	0
4	A	508	EPE	1	0
5	B	507	BNG	2	0

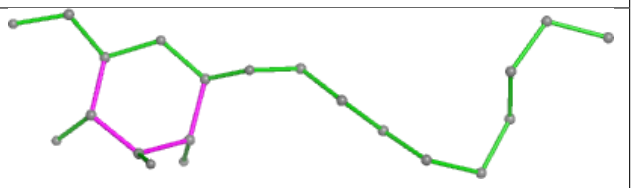
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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



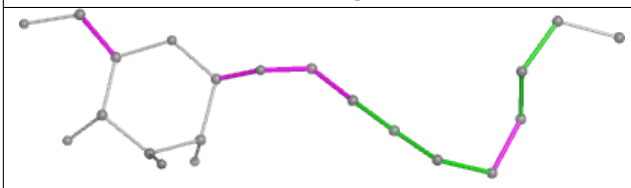
Ligand BNG A 510



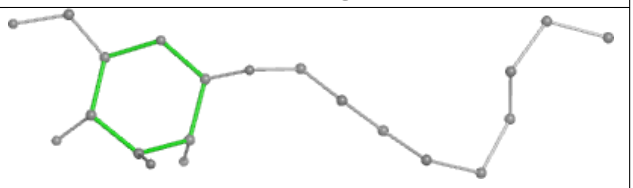
Bond lengths



Bond angles

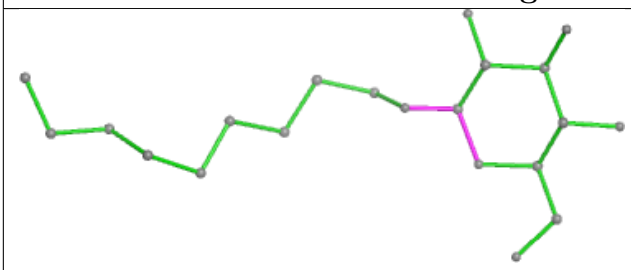


Torsions

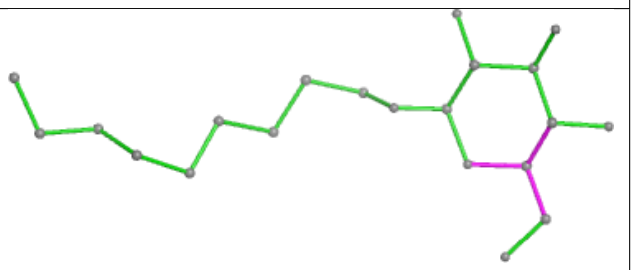


Rings

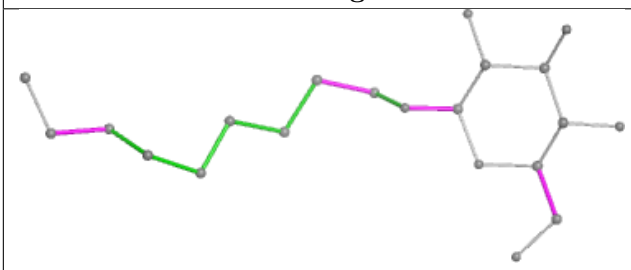
Ligand BNG A 509



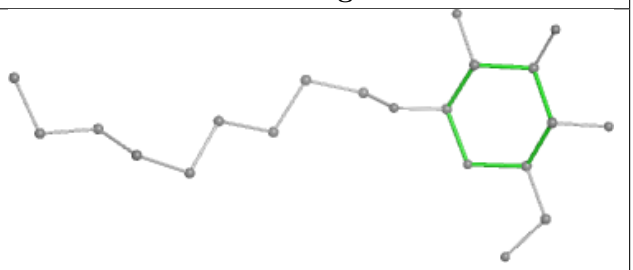
Bond lengths



Bond angles

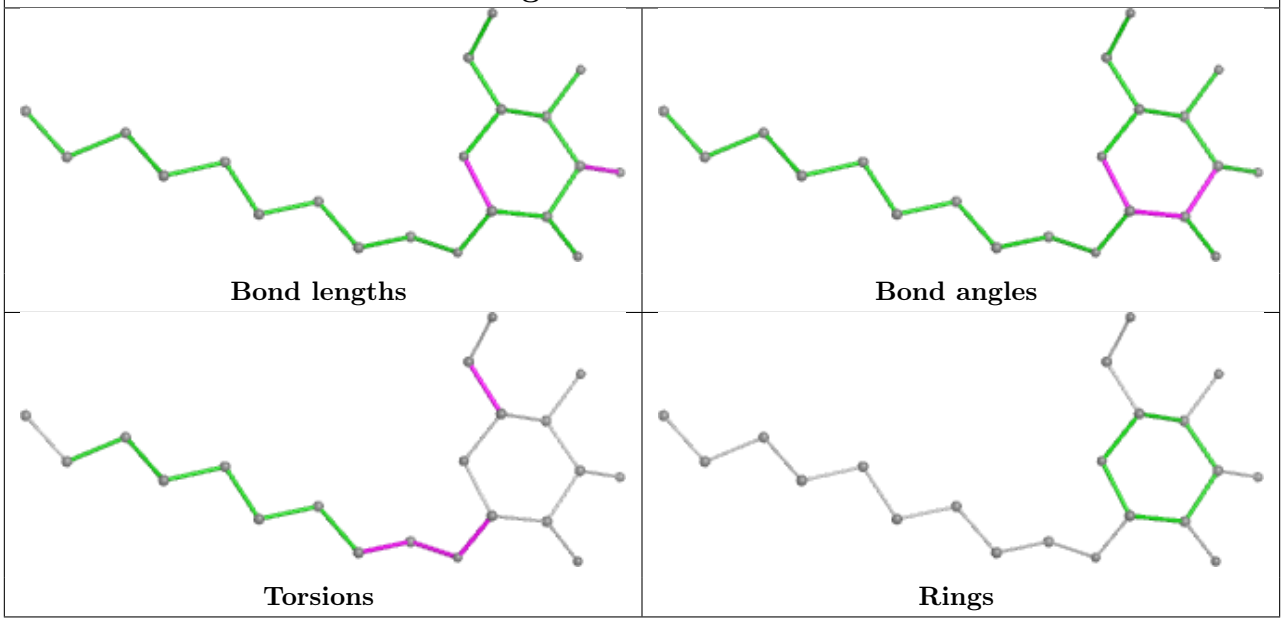


Torsions

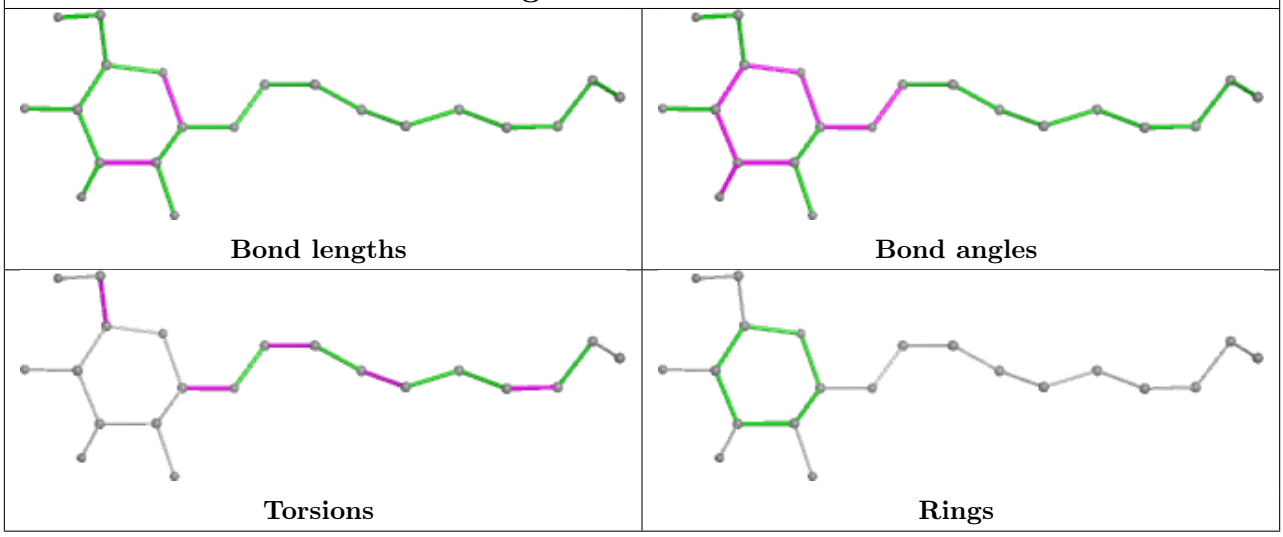


Rings

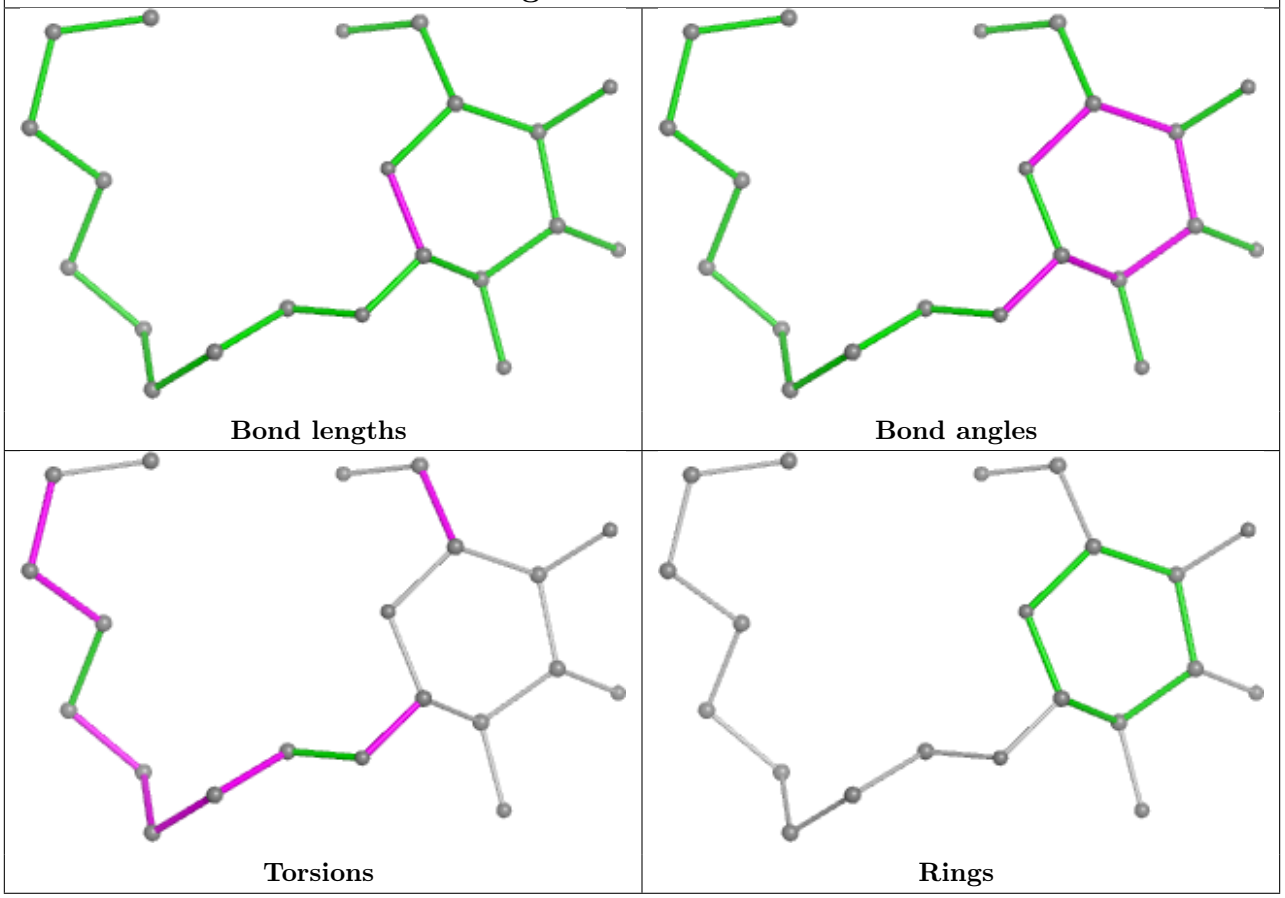
Ligand BNG B 509



Ligand BNG B 508



Ligand BNG B 507



5.7 Other polymers (i)

There are no such residues in this entry.

5.8 Polymer linkage issues (i)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

In the following table, the column labelled '#RSRZ> 2' contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 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	396/420 (94%)	1.02	59 (14%)	2 3	30, 67, 127, 161	0
1	B	368/420 (87%)	1.17	74 (20%)	1 1	38, 83, 130, 151	2 (0%)
All	All	764/840 (90%)	1.09	133 (17%)	1 1	30, 75, 128, 161	2 (0%)

All (133) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	173	TYR	11.9
1	A	176	VAL	11.8
1	B	155	LEU	11.4
1	B	158	TYR	11.3
1	A	173	TYR	10.0
1	A	155	LEU	9.7
1	B	169	TYR	9.5
1	A	178	MET	9.5
1	B	172	TRP	8.9
1	A	158	TYR	8.4
1	B	160	ILE	8.1
1	B	12	VAL	8.0
1	B	157	THR	8.0
1	B	156	ALA	7.9
1	A	30	ALA	7.6
1	A	26	MET	7.6
1	B	170	VAL	6.6
1	B	19	LEU	6.6
1	B	152	MET	6.5
1	A	188	PHE	6.5
1	A	85	VAL	6.4
1	B	101	TYR	6.2
1	A	170	VAL	6.1
1	B	129	TRP	6.1

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Mol	Chain	Res	Type	RSRZ
1	A	157	THR	6.1
1	A	180	ILE	6.0
1	A	175	GLY	6.0
1	A	177	ALA	6.0
1	B	159	ILE	5.9
1	B	180	ILE	5.8
1	A	181	MET	5.8
1	A	185	ALA	5.6
1	B	167	TRP	5.5
1	B	178	MET	5.4
1	B	176	VAL	5.2
1	A	152	MET	5.2
1	B	11	TRP	5.2
1	A	159	ILE	5.2
1	B	177	ALA	5.2
1	B	38	LEU	5.1
1	B	153	GLY	5.1
1	A	169	TYR	5.1
1	A	151	LEU	5.0
1	A	34	PHE	4.9
1	B	93	LEU	4.8
1	A	186	GLY	4.8
1	B	96	PHE	4.7
1	A	28	LEU	4.4
1	B	185	ALA	4.4
1	B	154	PRO	4.4
1	A	420	GLN	4.3
1	A	46	ARG	4.3
1	B	15	LEU	4.2
1	B	189	LEU	4.2
1	B	36	LYS	4.0
1	B	181	MET	4.0
1	A	156	ALA	4.0
1	A	184	ILE	3.9
1	A	160	ILE	3.9
1	B	103	LEU	3.8
1	A	91	PHE	3.8
1	B	16	LEU	3.8
1	A	11	TRP	3.8
1	B	42	PHE	3.7
1	A	96	PHE	3.7
1	B	34	PHE	3.7

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Mol	Chain	Res	Type	RSRZ
1	A	189	LEU	3.7
1	A	153	GLY	3.7
1	B	285	TRP	3.6
1	A	413	LEU	3.6
1	B	171	PHE	3.5
1	B	105	ILE	3.5
1	A	35	ILE	3.4
1	A	174	CYS	3.4
1	A	371	TRP	3.4
1	A	31	TRP	3.3
1	B	70	LEU	3.2
1	B	389	CYS	3.2
1	B	35	ILE	3.2
1	B	95	GLY	3.1
1	B	232	LEU	3.1
1	B	289	LYS	3.1
1	B	33	VAL	3.1
1	B	290	ILE	3.0
1	A	172	TRP	3.0
1	B	191	PRO	3.0
1	B	188	PHE	2.9
1	B	291	GLY	2.9
1	B	102	GLN	2.9
1	A	182	ALA	2.9
1	B	402	PHE	2.8
1	B	394	CYS	2.8
1	B	94	SER	2.7
1	A	394	CYS	2.7
1	B	371	TRP	2.7
1	A	183	LEU	2.7
1	B	13	PRO	2.7
1	A	362	CYS	2.6
1	B	392	ALA	2.6
1	B	104	TYR	2.5
1	A	88	ALA	2.5
1	B	40	ALA	2.5
1	A	194	ALA	2.5
1	B	168	ARG	2.5
1	B	387	PHE	2.4
1	B	388	LEU	2.4
1	A	214	LYS	2.4
1	A	29	TYR	2.4

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Mol	Chain	Res	Type	RSRZ
1	B	239	CYS	2.3
1	A	105	ILE	2.3
1	A	389	CYS	2.3
1	B	393	LEU	2.3
1	B	23	THR	2.3
1	A	83	GLY	2.2
1	A	33	VAL	2.2
1	A	286	PHE	2.2
1	A	375	TRP	2.2
1	A	179	GLY	2.2
1	B	47	ALA	2.2
1	A	396	LEU	2.1
1	B	362	CYS	2.1
1	B	166	GLY	2.1
1	B	74	MET	2.1
1	B	128	LYS	2.1
1	A	16	LEU	2.1
1	A	196	TRP	2.1
1	B	65	PHE	2.1
1	B	140	PHE	2.1
1	B	91	PHE	2.1
1	B	57	CYS	2.0
1	B	49	ILE	2.0
1	A	392	ALA	2.0
1	A	27	LEU	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)

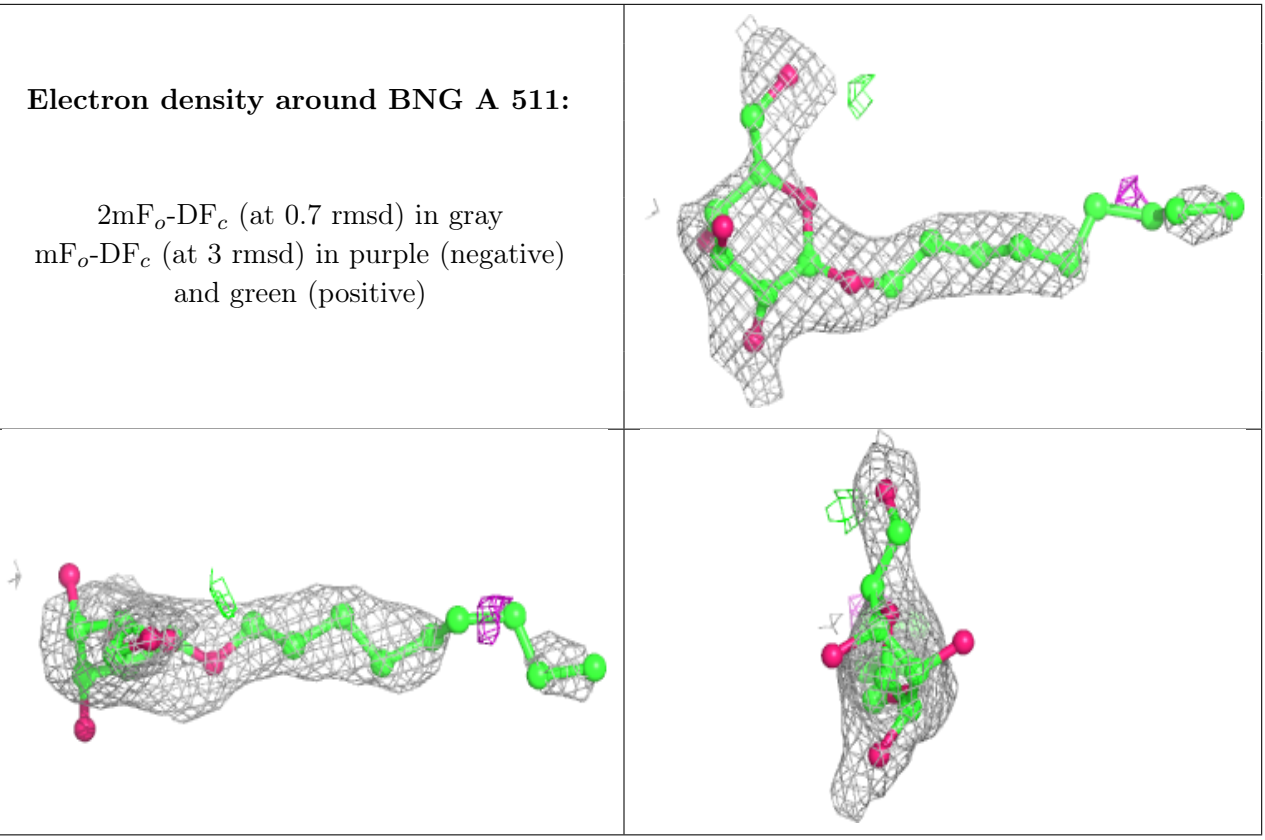
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' 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
3	JKE	A	507	10/10	0.78	0.23	57,66,90,95	0
3	JKE	B	506	10/10	0.78	0.17	70,75,96,105	0
5	BNG	A	511	21/21	0.81	0.39	50,83,127,128	0
5	BNG	B	509	21/21	0.81	0.22	55,89,118,124	0
2	HG	A	506	1/1	0.84	0.35	54,54,54,54	1
5	BNG	A	509	21/21	0.87	0.21	65,90,97,99	0
5	BNG	B	508	21/21	0.87	0.17	63,84,113,127	0
5	BNG	A	510	21/21	0.87	0.19	54,75,98,107	0
4	EPE	A	508	15/15	0.89	0.34	38,86,129,141	0
5	BNG	B	507	21/21	0.91	0.18	53,97,120,121	0
2	HG	B	505	1/1	0.92	0.36	52,52,52,52	1
2	HG	A	504	1/1	0.93	0.19	93,93,93,93	1
2	HG	B	504	1/1	0.95	0.24	58,58,58,58	1
2	HG	A	505	1/1	0.97	0.19	57,57,57,57	1
2	HG	A	512	1/1	0.98	0.30	59,59,59,59	1
2	HG	A	502	1/1	0.98	0.23	72,72,72,72	1
2	HG	B	503	1/1	0.99	0.26	97,97,97,97	1
2	HG	A	503	1/1	0.99	0.28	49,49,49,49	1
2	HG	B	502	1/1	0.99	0.25	78,78,78,78	1
2	HG	B	501	1/1	1.00	0.29	58,58,58,58	1
2	HG	A	501	1/1	1.00	0.31	42,42,42,42	1

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

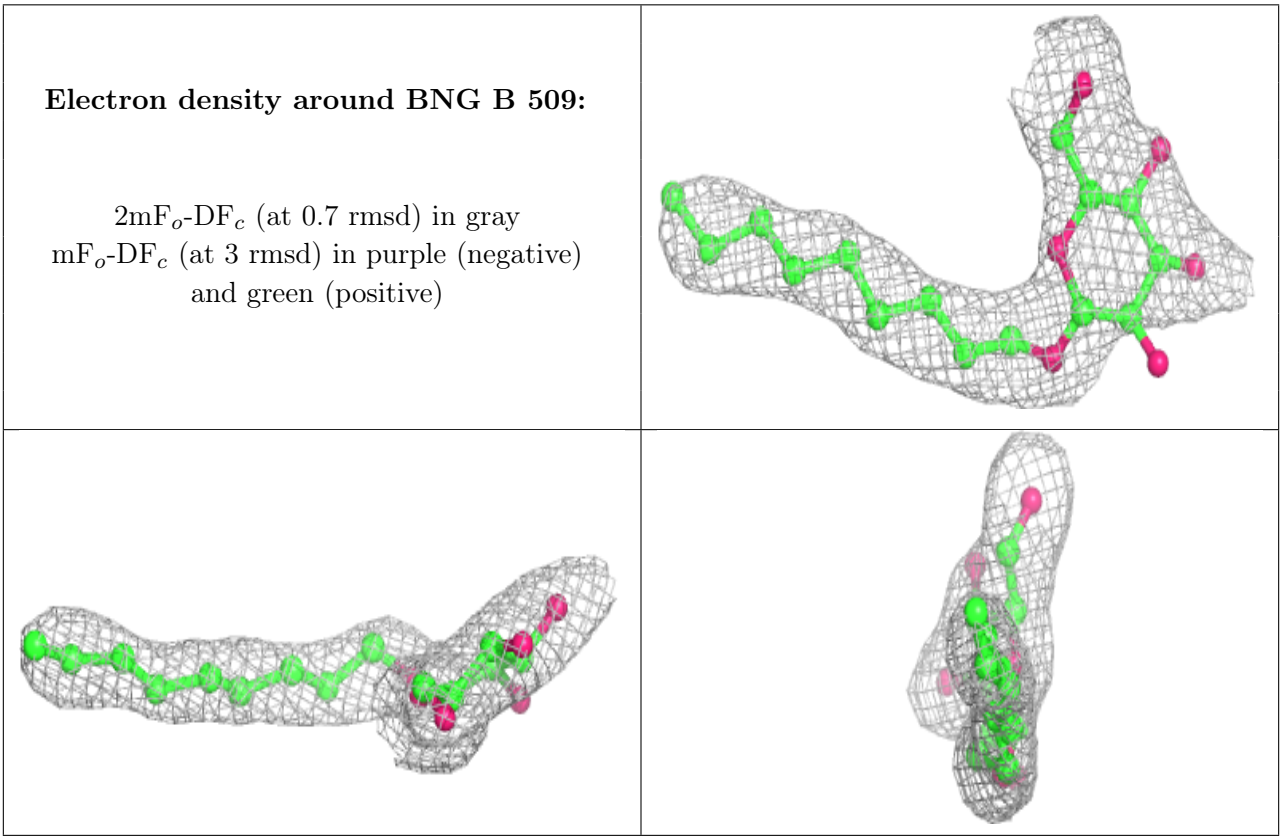
Electron density around BNG A 511:

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



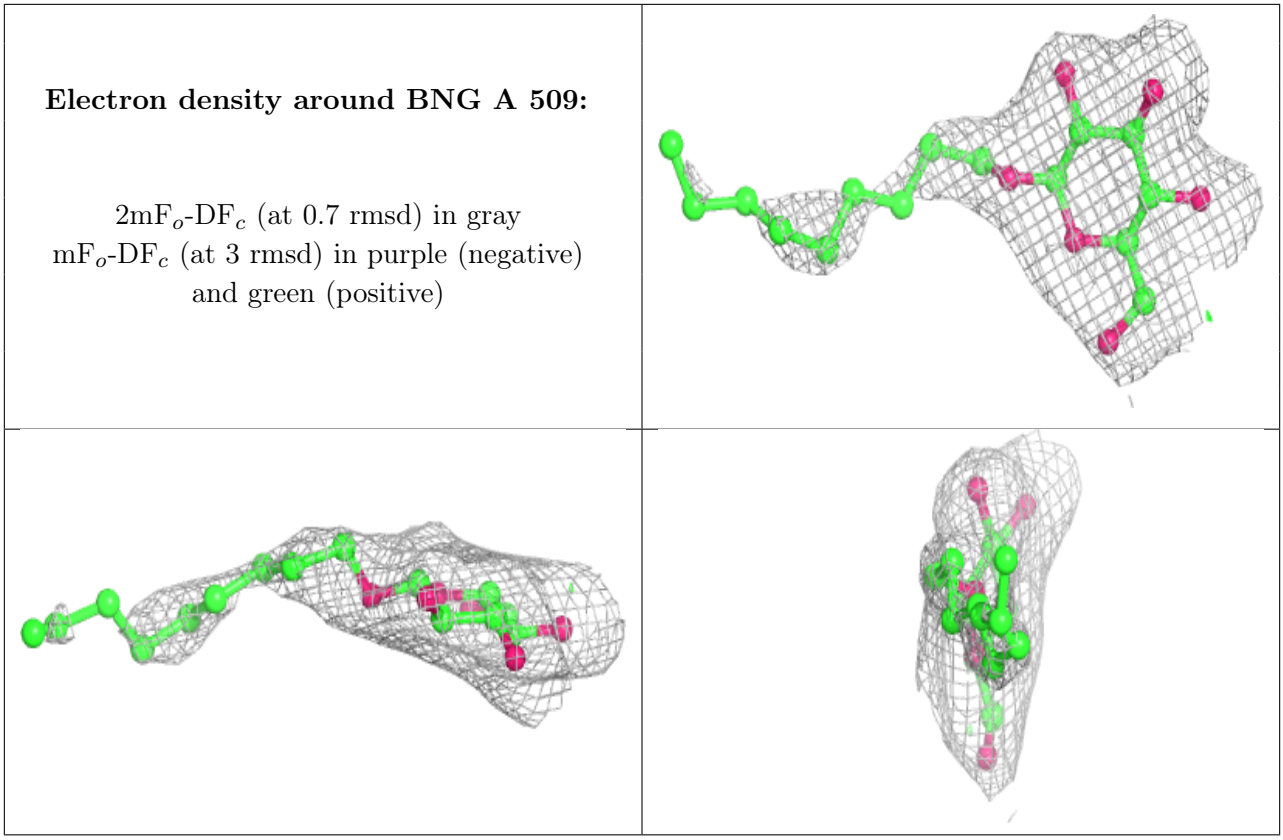
Electron density around BNG B 509:

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



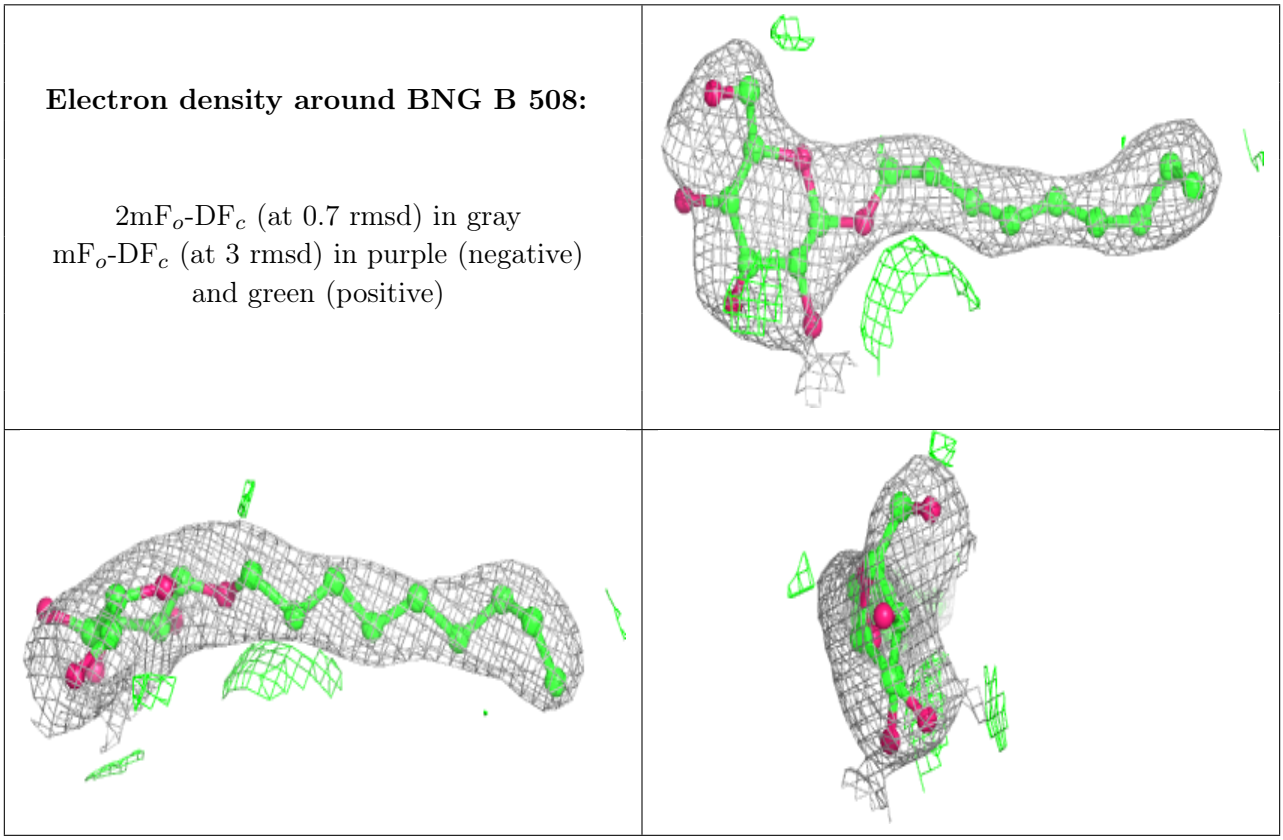
Electron density around BNG A 509:

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



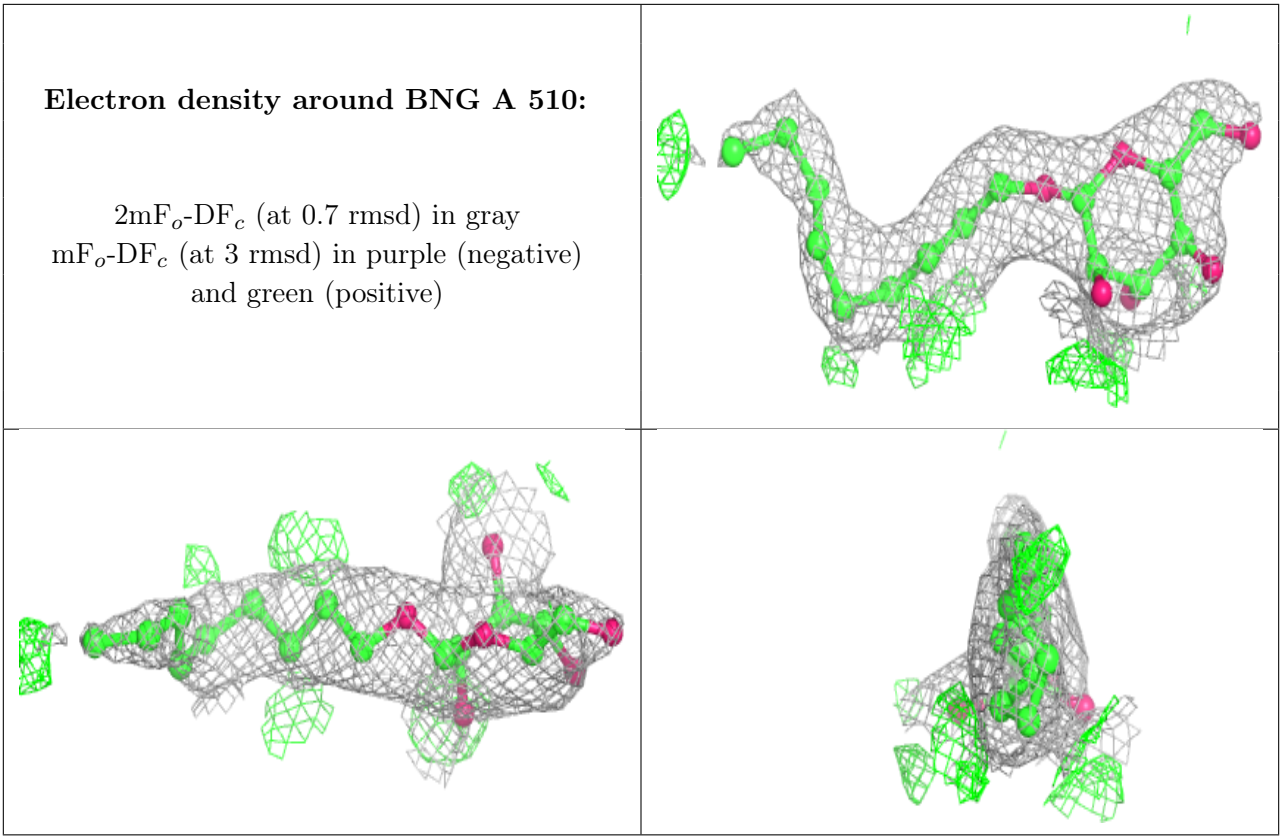
Electron density around BNG B 508:

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



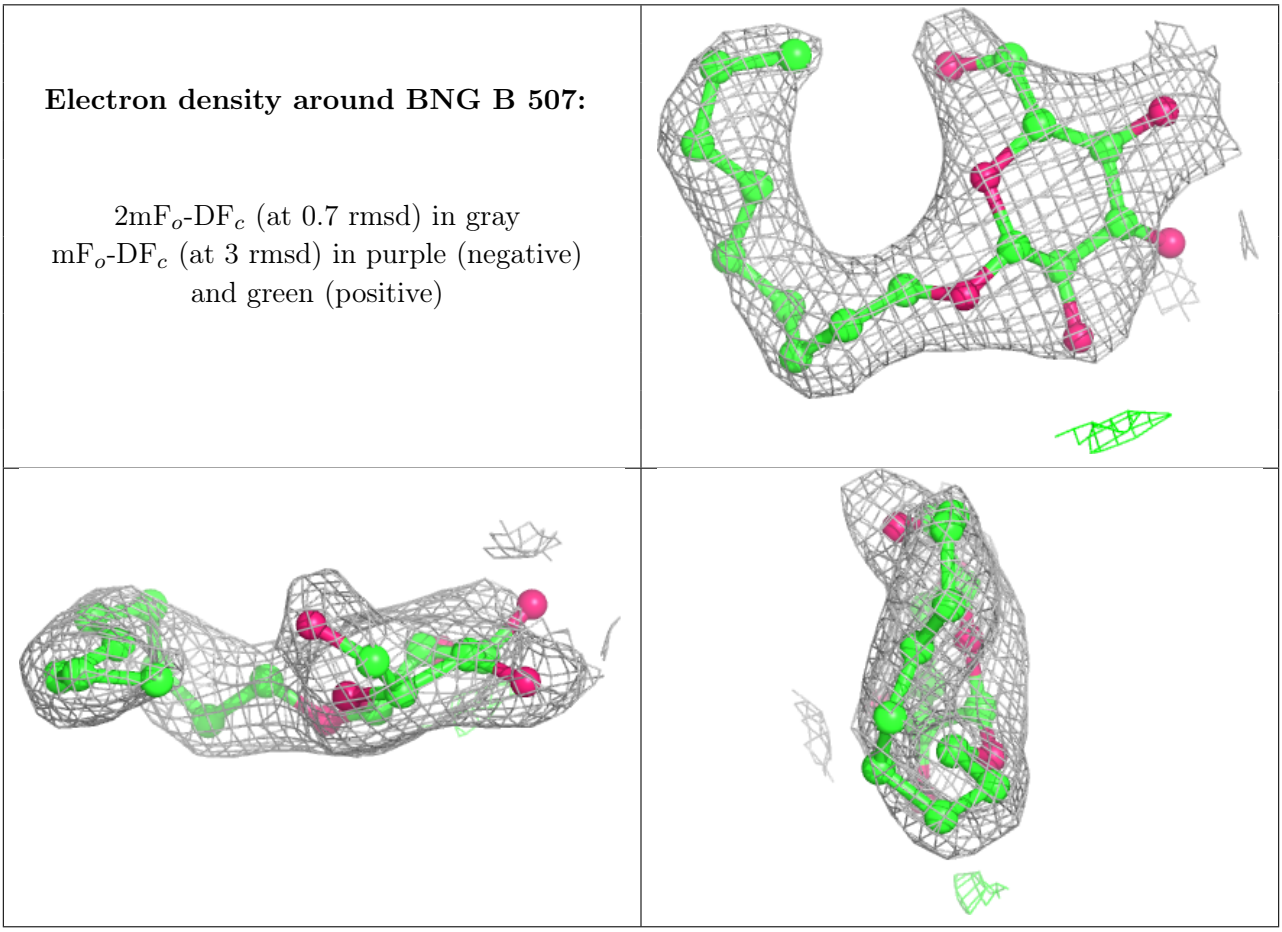
Electron density around BNG A 510:

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



Electron density around BNG B 507:

$2mF_o$-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.