



Full wwPDB X-ray Structure Validation Report ⓘ

Jun 12, 2024 – 09:48 PM EDT

PDB ID : 4ACF
Title : CRYSTAL STRUCTURE OF MYCOBACTERIUM TUBERCULOSIS GLUTAMINE SYNTHETASE IN COMPLEX WITH IMIDAZOPYRIDINE INHIBITOR ((4-(6-BROMO-3-(BUTYLAMINO)IMIDAZO(1,2-A)PYRIDIN-2-YL)PHENOXY) ACETIC ACID) AND L-METHIONINE-S-SULFOXIMINE PHOSPHATE.
Authors : Nilsson, M.T.; Mowbray, S.L.
Deposited on : 2011-12-15
Resolution : 2.00 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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

MolProbity	:	4.02b-467
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	1.20.1
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)

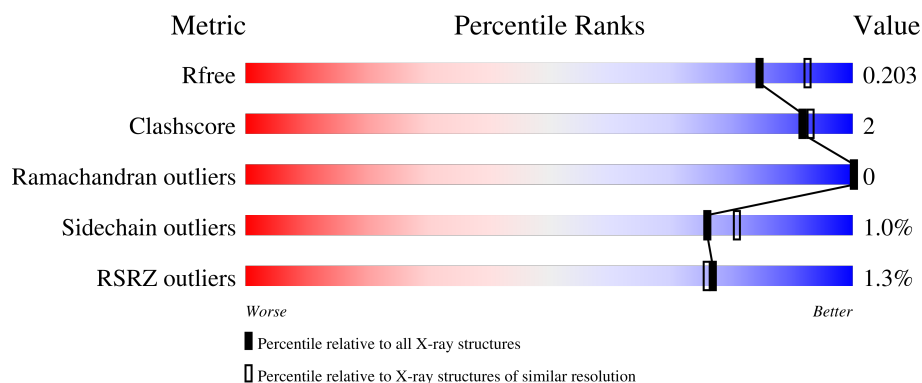
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

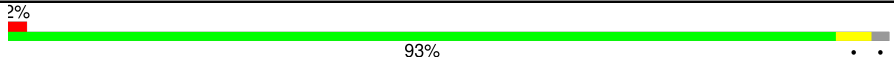
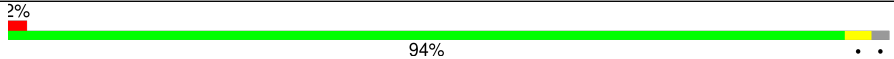
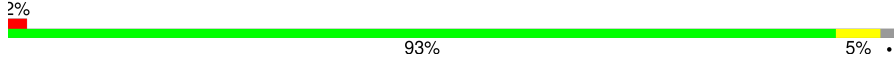
The reported resolution of this entry is 2.00 Å.

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	8085 (2.00-2.00)
Clashscore	141614	9178 (2.00-2.00)
Ramachandran outliers	138981	9054 (2.00-2.00)
Sidechain outliers	138945	9053 (2.00-2.00)
RSRZ outliers	127900	7900 (2.00-2.00)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	486	
1	B	486	
1	C	486	

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Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
 Validation Pipeline (wwPDB-VP) : 2.36.2

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Mol	Chain	Length	Quality of chain
1	D	486	<div><div>%</div><div><div></div><div>95%</div><div></div></div><div><div></div><div></div></div></div>
1	E	486	<div><div></div><div>94%</div><div></div></div> <div><div></div><div></div></div>

2 Entry composition

There are 7 unique types of molecules in this entry. The entry contains 24804 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 GLUTAMINE SYNTHETASE 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	475	Total	C	N	O	S	0	0	0
			3762	2397	631	722	12			
1	B	475	Total	C	N	O	S	0	0	0
			3762	2397	631	722	12			
1	C	475	Total	C	N	O	S	0	0	0
			3762	2397	631	722	12			
1	D	475	Total	C	N	O	S	0	0	0
			3762	2397	631	722	12			
1	E	475	Total	C	N	O	S	0	0	0
			3762	2397	631	722	12			
1	F	475	Total	C	N	O	S	0	0	0
			3762	2397	631	722	12			

There are 54 discrepancies between the modelled and reference sequences:

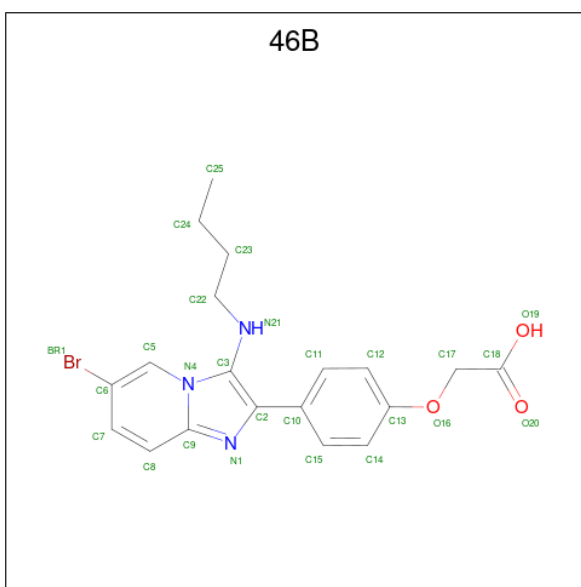
Chain	Residue	Modelled	Actual	Comment	Reference
A	-7	MET	-	expression tag	UNP P0A590
A	-6	ALA	-	expression tag	UNP P0A590
A	-5	HIS	-	expression tag	UNP P0A590
A	-4	HIS	-	expression tag	UNP P0A590
A	-3	HIS	-	expression tag	UNP P0A590
A	-2	HIS	-	expression tag	UNP P0A590
A	-1	HIS	-	expression tag	UNP P0A590
A	0	HIS	-	expression tag	UNP P0A590
A	1	GLY	-	expression tag	UNP P0A590
B	-7	MET	-	expression tag	UNP P0A590
B	-6	ALA	-	expression tag	UNP P0A590
B	-5	HIS	-	expression tag	UNP P0A590
B	-4	HIS	-	expression tag	UNP P0A590
B	-3	HIS	-	expression tag	UNP P0A590
B	-2	HIS	-	expression tag	UNP P0A590
B	-1	HIS	-	expression tag	UNP P0A590
B	0	HIS	-	expression tag	UNP P0A590

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Chain	Residue	Modelled	Actual	Comment	Reference
B	1	GLY	-	expression tag	UNP P0A590
C	-7	MET	-	expression tag	UNP P0A590
C	-6	ALA	-	expression tag	UNP P0A590
C	-5	HIS	-	expression tag	UNP P0A590
C	-4	HIS	-	expression tag	UNP P0A590
C	-3	HIS	-	expression tag	UNP P0A590
C	-2	HIS	-	expression tag	UNP P0A590
C	-1	HIS	-	expression tag	UNP P0A590
C	0	HIS	-	expression tag	UNP P0A590
C	1	GLY	-	expression tag	UNP P0A590
D	-7	MET	-	expression tag	UNP P0A590
D	-6	ALA	-	expression tag	UNP P0A590
D	-5	HIS	-	expression tag	UNP P0A590
D	-4	HIS	-	expression tag	UNP P0A590
D	-3	HIS	-	expression tag	UNP P0A590
D	-2	HIS	-	expression tag	UNP P0A590
D	-1	HIS	-	expression tag	UNP P0A590
D	0	HIS	-	expression tag	UNP P0A590
D	1	GLY	-	expression tag	UNP P0A590
E	-7	MET	-	expression tag	UNP P0A590
E	-6	ALA	-	expression tag	UNP P0A590
E	-5	HIS	-	expression tag	UNP P0A590
E	-4	HIS	-	expression tag	UNP P0A590
E	-3	HIS	-	expression tag	UNP P0A590
E	-2	HIS	-	expression tag	UNP P0A590
E	-1	HIS	-	expression tag	UNP P0A590
E	0	HIS	-	expression tag	UNP P0A590
E	1	GLY	-	expression tag	UNP P0A590
F	-7	MET	-	expression tag	UNP P0A590
F	-6	ALA	-	expression tag	UNP P0A590
F	-5	HIS	-	expression tag	UNP P0A590
F	-4	HIS	-	expression tag	UNP P0A590
F	-3	HIS	-	expression tag	UNP P0A590
F	-2	HIS	-	expression tag	UNP P0A590
F	-1	HIS	-	expression tag	UNP P0A590
F	0	HIS	-	expression tag	UNP P0A590
F	1	GLY	-	expression tag	UNP P0A590

- Molecule 2 is {4-[6-BROMO-3-(BUTYLAMINO)IMIDAZO[1,2-A]PYRIDIN-2-YL]PHENOXY}ACETIC ACID (three-letter code: 46B) (formula: C₁₉H₂₀BrN₃O₃).

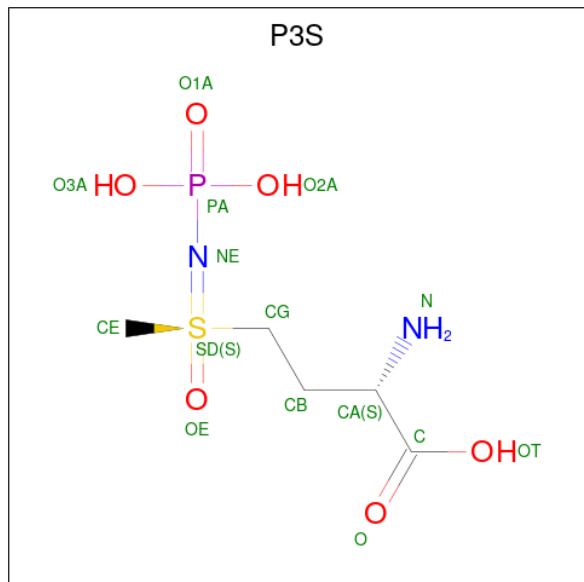


Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	Br	C	N	O	0	0
			26	1	19	3	3		
2	B	1	Total	Br	C	N	O	0	0
			26	1	19	3	3		
2	C	1	Total	Br	C	N	O	0	0
			26	1	19	3	3		
2	D	1	Total	Br	C	N	O	0	0
			26	1	19	3	3		
2	E	1	Total	Br	C	N	O	0	0
			26	1	19	3	3		
2	F	1	Total	Br	C	N	O	0	0
			26	1	19	3	3		

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

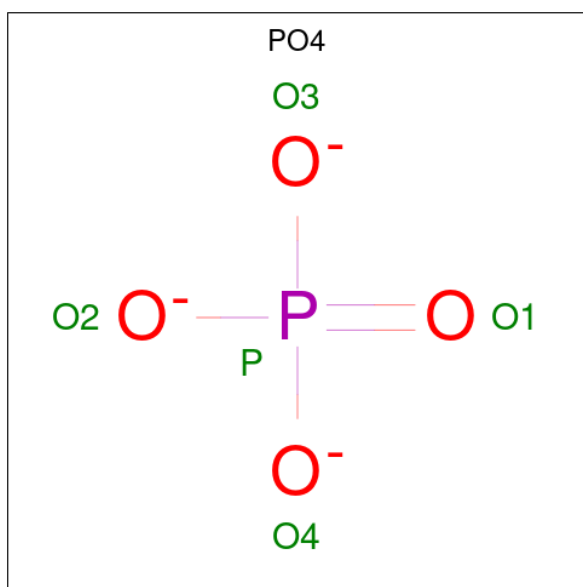
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	4	Total	Mg	0	0
			4	4		
3	B	4	Total	Mg	0	0
			4	4		
3	C	4	Total	Mg	0	0
			4	4		
3	D	4	Total	Mg	0	0
			4	4		
3	E	4	Total	Mg	0	0
			4	4		
3	F	4	Total	Mg	0	0
			4	4		

- Molecule 4 is L-METHIONINE-S-SULFOXIMINE PHOSPHATE (three-letter code: P3S) (formula: $C_5H_{13}N_2O_6PS$).



Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
4	A	1	Total	C	N	O	P	S	0	0
			15	5	2	6	1	1		
4	B	1	Total	C	N	O	P	S	0	0
			15	5	2	6	1	1		
4	C	1	Total	C	N	O	P	S	0	0
			15	5	2	6	1	1		
4	D	1	Total	C	N	O	P	S	0	0
			15	5	2	6	1	1		
4	E	1	Total	C	N	O	P	S	0	0
			15	5	2	6	1	1		
4	F	1	Total	C	N	O	P	S	0	0
			15	5	2	6	1	1		

- Molecule 5 is PHOSPHATE ION (three-letter code: PO4) (formula: O_4P).



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

- Molecule 6 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	1	Total	Cl	0	0
			1	1		
6	B	1	Total	Cl	0	0
			1	1		
6	C	1	Total	Cl	0	0
			1	1		
6	D	1	Total	Cl	0	0
			1	1		
6	E	1	Total	Cl	0	0
			1	1		
6	F	1	Total	Cl	0	0
			1	1		

- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	349	Total 349	O 349	0	0
7	B	325	Total 325	O 325	0	0
7	C	320	Total 320	O 320	0	0
7	D	318	Total 318	O 318	0	0
7	E	320	Total 320	O 320	0	0
7	F	294	Total 294	O 294	0	0

• Molecule 1: GLUTAMINE SYNTHETASE 1



● Molecule 1: GLUTAMINE SYNTHETASE 1

Chain E:  94% ..



● Molecule 1: GLUTAMINE SYNTHETASE 1

Chain F:  93% ..



4 Data and refinement statistics

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, α , β , γ	132.59Å 227.39Å 202.35Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	20.00 – 2.00 19.99 – 2.00	Depositor EDS
% Data completeness (in resolution range)	99.1 (20.00-2.00) 99.1 (19.99-2.00)	Depositor EDS
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.66 (at 2.01Å)	Xtriage
Refinement program	REFMAC 5.5.0109	Depositor
R, R_{free}	0.165 , 0.198 0.172 , 0.203	Depositor DCC
R_{free} test set	10190 reflections (5.03%)	wwPDB-VP
Wilson B-factor (Å ²)	20.2	Xtriage
Anisotropy	0.505	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.40 , 52.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	0.015 for 1/2*h-1/2*k,-3/2*h-1/2*k,-l 0.020 for 1/2*h+1/2*k,3/2*h-1/2*k,-l	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	24804	wwPDB-VP
Average B, all atoms (Å ²)	21.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.32% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: CL, 46B, MG, P3S, PO4

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	0.68	0/3868	0.72	2/5257 (0.0%)
1	B	0.66	0/3868	0.71	1/5257 (0.0%)
1	C	0.67	0/3868	0.71	0/5257
1	D	0.67	0/3868	0.72	1/5257 (0.0%)
1	E	0.69	0/3868	0.73	2/5257 (0.0%)
1	F	0.69	0/3868	0.72	0/5257
All	All	0.68	0/23208	0.72	6/31542 (0.0%)

There are no bond length outliers.

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	E	147	ARG	NE-CZ-NH2	-6.26	117.17	120.30
1	A	147	ARG	NE-CZ-NH2	-5.85	117.38	120.30
1	B	156	ASP	CB-CG-OD1	5.42	123.18	118.30
1	A	147	ARG	NE-CZ-NH1	5.36	122.98	120.30
1	D	147	ARG	NE-CZ-NH2	-5.12	117.74	120.30
1	E	147	ARG	NE-CZ-NH1	5.08	122.84	120.30

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	3762	0	3591	10	0
1	B	3762	0	3591	11	0
1	C	3762	0	3591	15	0
1	D	3762	0	3591	12	0
1	E	3762	0	3591	9	0
1	F	3762	0	3591	14	0
2	A	26	0	19	0	0
2	B	26	0	19	0	0
2	C	26	0	19	1	0
2	D	26	0	19	0	0
2	E	26	0	19	0	0
2	F	26	0	19	1	0
3	A	4	0	0	0	0
3	B	4	0	0	0	0
3	C	4	0	0	0	0
3	D	4	0	0	0	0
3	E	4	0	0	0	0
3	F	4	0	0	0	0
4	A	15	0	10	0	0
4	B	15	0	10	0	0
4	C	15	0	10	0	0
4	D	15	0	10	0	0
4	E	15	0	10	0	0
4	F	15	0	10	0	0
5	A	5	0	0	0	0
5	B	5	0	0	0	0
5	C	5	0	0	0	0
5	D	5	0	0	0	0
5	E	5	0	0	0	0
5	F	5	0	0	0	0
6	A	1	0	0	0	0
6	B	1	0	0	0	0
6	C	1	0	0	0	0
6	D	1	0	0	0	0
6	E	1	0	0	0	0
6	F	1	0	0	0	0
7	A	349	0	0	2	0
7	B	325	0	0	4	0
7	C	320	0	0	2	0
7	D	318	0	0	2	0
7	E	320	0	0	2	0
7	F	294	0	0	3	0
All	All	24804	0	21720	69	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 2.

All (69) 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:328:LYS:NZ	7:B:2253:HOH:O	2.30	0.63
1:D:328:LYS:NZ	7:D:2248:HOH:O	2.26	0.62
1:F:28:LEU:HD11	1:F:447:LEU:HD11	1.82	0.61
1:B:341:VAL:CG2	1:B:405:LEU:HD11	2.34	0.57
1:B:341:VAL:HG21	1:B:405:LEU:HD11	1.87	0.57
1:B:63:SER:HG	1:B:65:HIS:CE1	2.23	0.55
1:E:328:LYS:NZ	7:E:2248:HOH:O	2.37	0.54
1:A:328:LYS:NZ	7:A:2272:HOH:O	2.39	0.53
1:C:328:LYS:NZ	7:C:2251:HOH:O	2.38	0.53
1:E:147:ARG:HD2	7:E:2132:HOH:O	2.09	0.52
1:D:341:VAL:HG21	1:D:405:LEU:CD1	2.39	0.52
1:F:289:MET:HG2	7:F:2200:HOH:O	2.09	0.51
1:F:328:LYS:NZ	7:F:2223:HOH:O	2.27	0.51
1:F:341:VAL:CG2	1:F:405:LEU:HD13	2.41	0.50
1:C:28:LEU:HD11	1:C:447:LEU:HD11	1.94	0.50
1:C:265:LYS:HG2	1:C:328:LYS:HB3	1.96	0.48
1:F:113:ARG:HD3	7:F:2073:HOH:O	2.12	0.48
1:C:113:ARG:HD3	7:C:2094:HOH:O	2.14	0.48
1:A:63:SER:OG	1:A:65:HIS:CE1	2.67	0.48
1:B:113:ARG:HD3	7:B:2097:HOH:O	2.14	0.48
1:D:341:VAL:CG2	1:D:405:LEU:CD1	2.92	0.47
1:E:23:VAL:HG13	1:E:93:PHE:CE1	2.51	0.46
1:B:183:LYS:HA	1:B:220:VAL:HG12	1.98	0.46
1:C:323:THR:O	1:C:326:SER:HB2	2.16	0.46
1:B:63:SER:OG	1:B:65:HIS:CE1	2.68	0.45
1:F:23:VAL:O	1:F:34:HIS:HA	2.17	0.45
1:C:28:LEU:HD11	1:C:447:LEU:CD1	2.47	0.45
1:D:113:ARG:HD3	7:D:2092:HOH:O	2.17	0.45
1:B:371:ASP:HB2	7:B:2223:HOH:O	2.16	0.45
1:E:265:LYS:HG2	1:E:328:LYS:HB3	1.99	0.45
1:C:161:TRP:O	1:C:164:THR:HG23	2.17	0.44
1:B:147:ARG:HD2	7:B:2138:HOH:O	2.17	0.44
1:C:322:PRO:HG3	1:C:374:GLY:HA3	1.97	0.44
1:C:64:ILE:HD13	1:D:348:SER:HB3	2.00	0.44
1:C:361:LYS:HD2	2:C:1479:46B:O20	2.18	0.44
1:D:341:VAL:HG21	1:D:405:LEU:HD11	1.97	0.44
1:A:28:LEU:HD11	1:A:447:LEU:HD11	1.99	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:245:TYR:O	1:C:249:ILE:HG12	2.18	0.43
1:E:18:VAL:HG21	1:E:89:LEU:HB2	2.00	0.43
1:E:137:TYR:CE1	1:E:225:GLN:HB2	2.54	0.43
1:F:235:LEU:C	1:F:235:LEU:HD23	2.38	0.43
1:F:43:ASP:OD1	1:F:45:SER:HB3	2.18	0.43
1:A:461:GLU:HB3	1:A:462:PRO:HD3	2.01	0.43
1:B:263:MET:HA	1:B:264:PRO:HD3	1.91	0.43
1:D:341:VAL:CG2	1:D:405:LEU:HD11	2.49	0.43
1:D:461:GLU:HB3	1:D:462:PRO:HD3	2.00	0.42
1:C:313:ALA:HB3	1:C:314:PRO:HD3	2.01	0.42
1:E:369:SER:N	1:E:370:PRO:CD	2.82	0.42
1:F:461:GLU:HB3	1:F:462:PRO:HD3	2.00	0.42
1:E:185:GLY:O	1:E:187:PHE:HA	2.19	0.42
1:F:28:LEU:HD11	1:F:447:LEU:CD1	2.46	0.42
1:F:341:VAL:HG21	1:F:405:LEU:HD13	2.02	0.42
1:A:263:MET:HA	1:A:264:PRO:HD3	1.90	0.42
1:F:341:VAL:CG2	1:F:405:LEU:CD1	2.97	0.42
1:D:28:LEU:HB3	1:D:29:PRO:HD3	2.01	0.42
1:A:411:GLU:HG2	1:A:412:GLU:N	2.35	0.41
1:A:278:HIS:HA	1:A:365:LEU:O	2.19	0.41
1:A:119:LEU:HD11	1:A:125:ALA:HB3	2.02	0.41
1:C:81:ASP:HA	1:C:82:PRO:HD3	1.94	0.41
1:E:28:LEU:HD11	1:E:447:LEU:CD1	2.51	0.41
1:A:147:ARG:HD2	7:A:2140:HOH:O	2.21	0.41
1:F:427:ILE:CG2	1:F:452:ILE:HG23	2.50	0.41
1:F:361:LYS:HD2	2:F:1479:46B:O20	2.21	0.40
1:C:66:GLU:HA	1:D:345:ARG:HD3	2.03	0.40
1:D:341:VAL:HG21	1:D:405:LEU:HD13	2.03	0.40
1:D:349:ALA:HA	1:D:405:LEU:HD12	2.04	0.40
1:A:322:PRO:HD2	1:A:373:SER:OG	2.22	0.40
1:B:253:ALA:CB	1:B:260:VAL:HG23	2.52	0.40
1:C:301:THR:HG23	1:C:391:ILE:HD13	2.04	0.40

There are no symmetry-related clashes.

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	473/486 (97%)	464 (98%)	9 (2%)	0	100	100
1	B	473/486 (97%)	465 (98%)	8 (2%)	0	100	100
1	C	473/486 (97%)	465 (98%)	8 (2%)	0	100	100
1	D	473/486 (97%)	462 (98%)	11 (2%)	0	100	100
1	E	473/486 (97%)	468 (99%)	5 (1%)	0	100	100
1	F	473/486 (97%)	465 (98%)	8 (2%)	0	100	100
All	All	2838/2916 (97%)	2789 (98%)	49 (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	402/411 (98%)	399 (99%)	3 (1%)	84	88
1	B	402/411 (98%)	398 (99%)	4 (1%)	76	81
1	C	402/411 (98%)	398 (99%)	4 (1%)	76	81
1	D	402/411 (98%)	398 (99%)	4 (1%)	76	81
1	E	402/411 (98%)	398 (99%)	4 (1%)	76	81
1	F	402/411 (98%)	396 (98%)	6 (2%)	65	69
All	All	2412/2466 (98%)	2387 (99%)	25 (1%)	76	81

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

Mol	Chain	Res	Type
1	A	113	ARG
1	A	187	PHE
1	A	192	ASN

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Mol	Chain	Res	Type
1	B	68	ASP
1	B	113	ARG
1	B	187	PHE
1	B	192	ASN
1	C	68	ASP
1	C	113	ARG
1	C	187	PHE
1	C	192	ASN
1	D	68	ASP
1	D	113	ARG
1	D	187	PHE
1	D	192	ASN
1	E	68	ASP
1	E	187	PHE
1	E	192	ASN
1	E	303	ARG
1	F	34	HIS
1	F	68	ASP
1	F	82	PRO
1	F	113	ARG
1	F	187	PHE
1	F	192	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	65	HIS
1	D	65	HIS
1	F	65	HIS

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 [i](#)

There are no monosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 48 ligands modelled in this entry, 30 are monoatomic - leaving 18 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	PO4	C	1484	3	4,4,4	0.83	0	6,6,6	1.09	0
5	PO4	D	1484	3	4,4,4	1.04	0	6,6,6	0.90	0
2	46B	F	1479	-	24,28,28	1.26	3 (12%)	25,38,38	0.71	0
2	46B	A	1479	-	24,28,28	1.26	1 (4%)	25,38,38	0.76	1 (4%)
2	46B	D	1479	-	24,28,28	1.12	2 (8%)	25,38,38	0.74	0
2	46B	B	1479	-	24,28,28	1.20	1 (4%)	25,38,38	0.82	1 (4%)
4	P3S	E	1483	3	11,14,14	1.76	2 (18%)	9,21,21	1.04	0
5	PO4	B	1484	3	4,4,4	0.68	0	6,6,6	1.01	1 (16%)
5	PO4	A	1484	3	4,4,4	0.77	0	6,6,6	1.12	0
2	46B	C	1479	-	24,28,28	1.22	2 (8%)	25,38,38	0.73	1 (4%)
4	P3S	B	1483	3	11,14,14	1.76	3 (27%)	9,21,21	0.95	0
4	P3S	C	1483	3	11,14,14	1.91	2 (18%)	9,21,21	0.93	1 (11%)
4	P3S	F	1483	3	11,14,14	1.82	4 (36%)	9,21,21	1.01	1 (11%)
4	P3S	D	1483	3	11,14,14	1.76	2 (18%)	9,21,21	1.14	0
5	PO4	E	1484	3	4,4,4	1.13	0	6,6,6	0.66	0
2	46B	E	1479	-	24,28,28	1.23	1 (4%)	25,38,38	0.79	0
4	P3S	A	1483	3	11,14,14	2.23	3 (27%)	9,21,21	1.09	0
5	PO4	F	1484	3	4,4,4	1.26	1 (25%)	6,6,6	1.15	1 (16%)

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
2	46B	F	1479	-	-	7/12/14/14	0/3/3/3
2	46B	A	1479	-	-	7/12/14/14	0/3/3/3
2	46B	D	1479	-	-	7/12/14/14	0/3/3/3
2	46B	B	1479	-	-	7/12/14/14	0/3/3/3
4	P3S	E	1483	3	-	4/9/16/16	-
2	46B	C	1479	-	-	7/12/14/14	0/3/3/3
4	P3S	B	1483	3	-	4/9/16/16	-
4	P3S	C	1483	3	-	4/9/16/16	-
4	P3S	F	1483	3	-	4/9/16/16	-
4	P3S	D	1483	3	-	4/9/16/16	-
2	46B	E	1479	-	-	7/12/14/14	0/3/3/3
4	P3S	A	1483	3	-	4/9/16/16	-

All (27) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	1483	P3S	PA-O1A	5.25	1.54	1.46
4	C	1483	P3S	PA-O1A	4.63	1.53	1.46
2	A	1479	46B	C8-C9	-4.49	1.34	1.40
2	F	1479	46B	C8-C9	-4.29	1.34	1.40
2	B	1479	46B	C8-C9	-4.02	1.35	1.40
2	E	1479	46B	C8-C9	-4.00	1.35	1.40
2	C	1479	46B	C8-C9	-3.97	1.35	1.40
4	B	1483	P3S	PA-O1A	3.96	1.52	1.46
2	D	1479	46B	C8-C9	-3.78	1.35	1.40
4	E	1483	P3S	PA-O1A	3.74	1.52	1.46
4	D	1483	P3S	PA-O1A	3.70	1.52	1.46
4	A	1483	P3S	PA-NE	3.41	1.70	1.58
4	C	1483	P3S	PA-NE	3.37	1.70	1.58
4	F	1483	P3S	PA-NE	3.21	1.70	1.58
4	A	1483	P3S	CB-CG	2.90	1.55	1.52
4	F	1483	P3S	PA-O3A	-2.76	1.49	1.54
4	D	1483	P3S	PA-NE	2.67	1.68	1.58
4	B	1483	P3S	PA-NE	2.57	1.67	1.58
4	E	1483	P3S	PA-NE	2.47	1.67	1.58
4	B	1483	P3S	CB-CG	2.45	1.55	1.52
4	F	1483	P3S	PA-O1A	2.25	1.50	1.46
2	F	1479	46B	BR1-C6	-2.19	1.86	1.90
2	F	1479	46B	C2-N1	-2.18	1.33	1.37
2	C	1479	46B	BR1-C6	-2.17	1.86	1.90
4	F	1483	P3S	OT-C	-2.11	1.23	1.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	1479	46B	C2-N1	-2.09	1.33	1.37
5	F	1484	PO4	P-O2	-2.06	1.48	1.54

All (7) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	1479	46B	C17-O16-C13	2.41	121.95	117.63
5	F	1484	PO4	O3-P-O2	2.18	114.68	107.91
2	C	1479	46B	C17-O16-C13	2.07	121.34	117.63
4	F	1483	P3S	O3A-PA-O2A	2.05	114.64	106.57
5	B	1484	PO4	O3-P-O2	2.02	114.20	107.91
2	A	1479	46B	BR1-C6-C7	2.02	122.05	119.30
4	C	1483	P3S	O3A-PA-O2A	2.01	114.49	106.57

There are no chirality outliers.

All (66) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	B	1479	46B	C11-C10-C2-C3
2	D	1479	46B	C11-C10-C2-C3
2	F	1479	46B	C11-C10-C2-C3
4	A	1483	P3S	O-C-CA-N
4	B	1483	P3S	O-C-CA-N
4	F	1483	P3S	O-C-CA-N
4	A	1483	P3S	OT-C-CA-CB
4	C	1483	P3S	OT-C-CA-CB
4	D	1483	P3S	OT-C-CA-CB
4	E	1483	P3S	OT-C-CA-N
4	B	1483	P3S	OT-C-CA-CB
4	E	1483	P3S	OT-C-CA-CB
4	F	1483	P3S	OT-C-CA-CB
4	C	1483	P3S	OT-C-CA-N
2	D	1479	46B	O16-C17-C18-O19
2	E	1479	46B	O16-C17-C18-O19
2	F	1479	46B	O16-C17-C18-O19
4	C	1483	P3S	O-C-CA-CB
4	D	1483	P3S	O-C-CA-CB
2	A	1479	46B	O16-C17-C18-O19
2	B	1479	46B	O16-C17-C18-O19
2	C	1479	46B	O16-C17-C18-O19
4	D	1483	P3S	OT-C-CA-N
2	A	1479	46B	O16-C17-C18-O20

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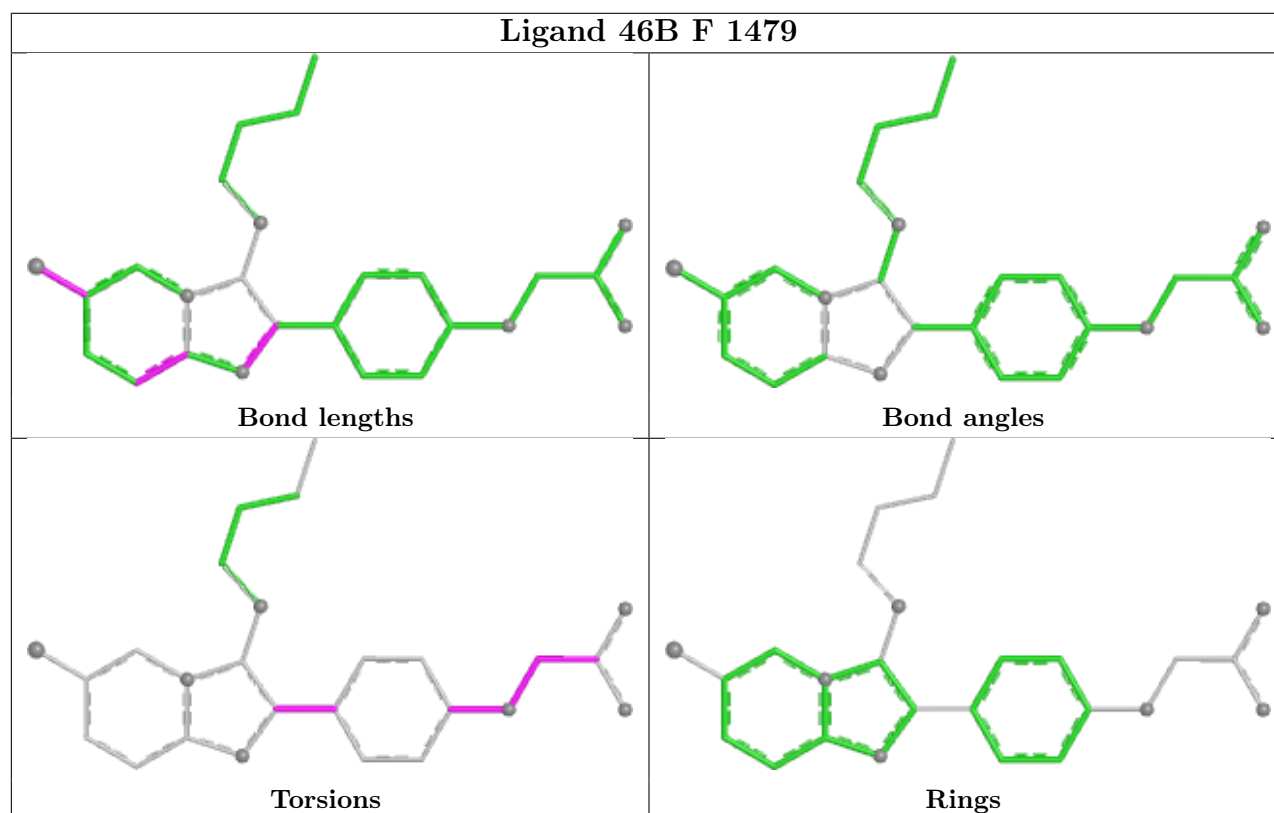
Mol	Chain	Res	Type	Atoms
2	B	1479	46B	O16-C17-C18-O20
2	C	1479	46B	O16-C17-C18-O20
2	D	1479	46B	O16-C17-C18-O20
2	E	1479	46B	O16-C17-C18-O20
2	F	1479	46B	O16-C17-C18-O20
4	A	1483	P3S	O-C-CA-CB
4	B	1483	P3S	O-C-CA-CB
4	A	1483	P3S	OT-C-CA-N
4	F	1483	P3S	OT-C-CA-N
4	B	1483	P3S	OT-C-CA-N
4	E	1483	P3S	O-C-CA-CB
4	F	1483	P3S	O-C-CA-CB
2	E	1479	46B	C12-C13-O16-C17
2	D	1479	46B	C12-C13-O16-C17
2	B	1479	46B	C12-C13-O16-C17
2	F	1479	46B	C12-C13-O16-C17
2	A	1479	46B	C12-C13-O16-C17
2	C	1479	46B	C12-C13-O16-C17
2	B	1479	46B	C14-C13-O16-C17
2	E	1479	46B	C14-C13-O16-C17
4	C	1483	P3S	O-C-CA-N
4	D	1483	P3S	O-C-CA-N
4	E	1483	P3S	O-C-CA-N
2	D	1479	46B	C14-C13-O16-C17
2	A	1479	46B	C14-C13-O16-C17
2	F	1479	46B	C14-C13-O16-C17
2	C	1479	46B	C14-C13-O16-C17
2	A	1479	46B	C15-C10-C2-C3
2	A	1479	46B	C11-C10-C2-C3
2	B	1479	46B	C15-C10-C2-C3
2	C	1479	46B	C15-C10-C2-C3
2	C	1479	46B	C11-C10-C2-C3
2	D	1479	46B	C15-C10-C2-C3
2	E	1479	46B	C15-C10-C2-C3
2	E	1479	46B	C11-C10-C2-C3
2	F	1479	46B	C15-C10-C2-C3
2	A	1479	46B	C18-C17-O16-C13
2	B	1479	46B	C18-C17-O16-C13
2	D	1479	46B	C18-C17-O16-C13
2	E	1479	46B	C18-C17-O16-C13
2	C	1479	46B	C18-C17-O16-C13
2	F	1479	46B	C18-C17-O16-C13

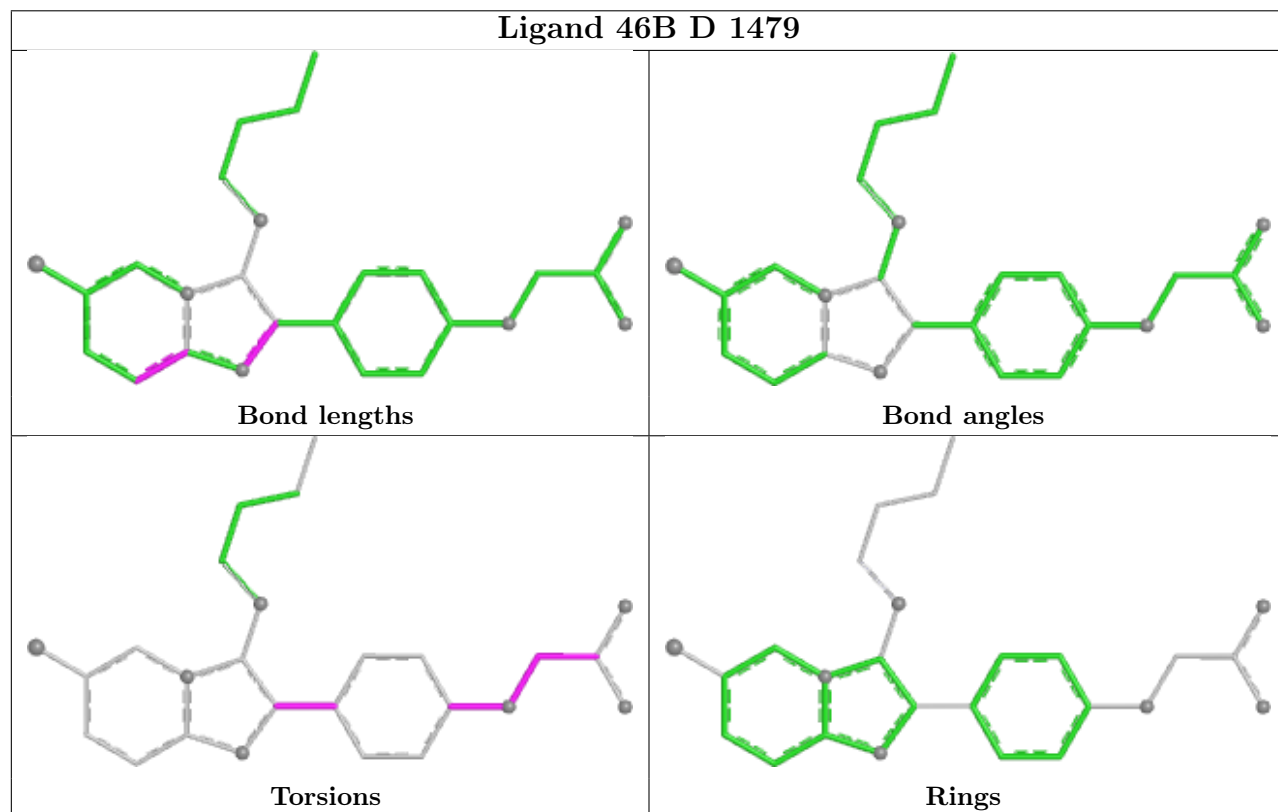
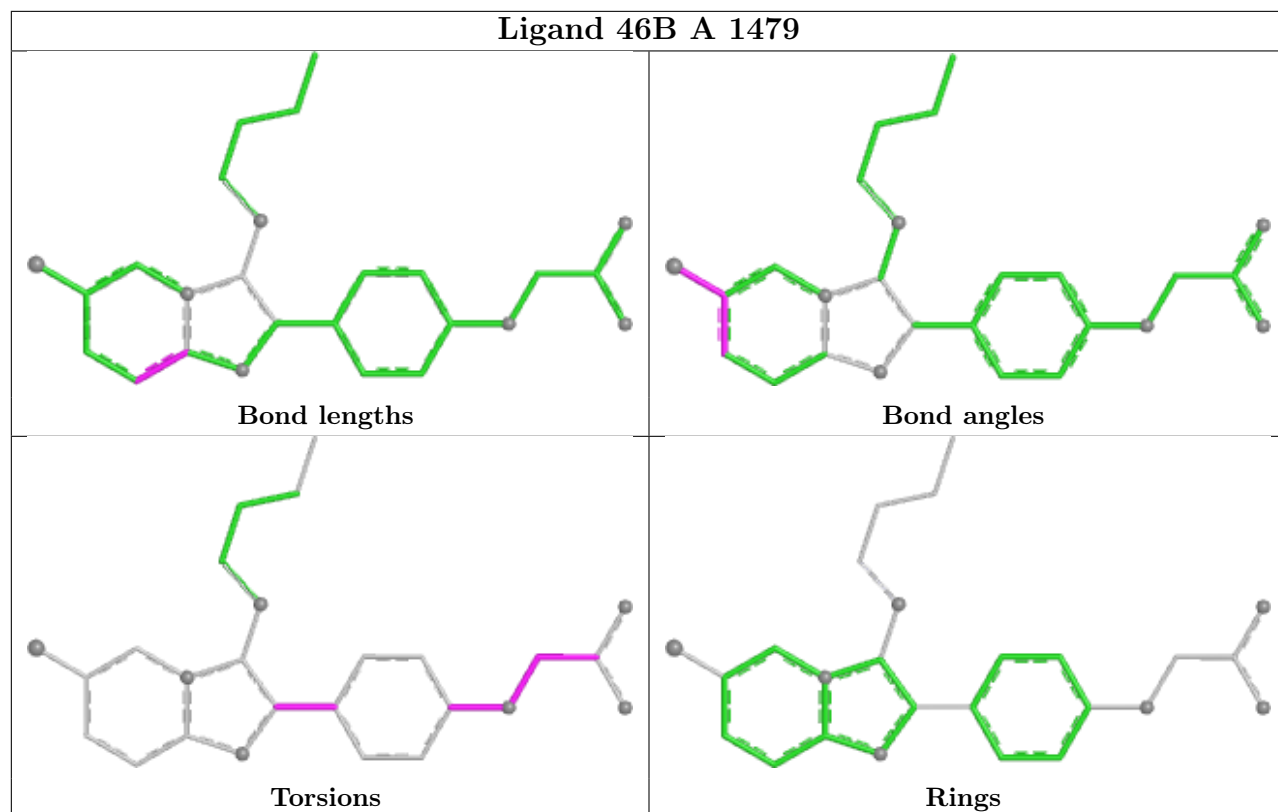
There are no ring outliers.

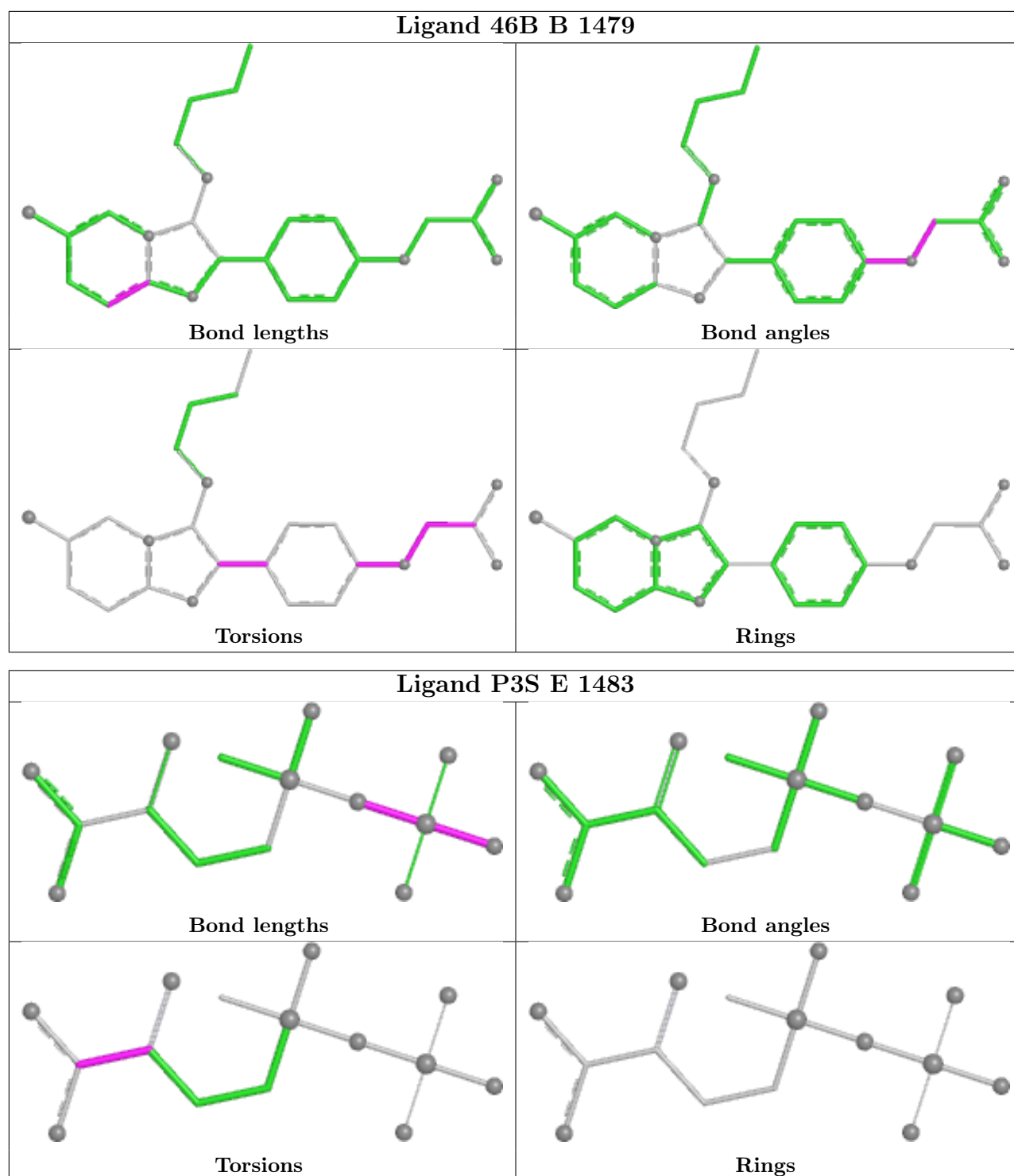
2 monomers are involved in 2 short contacts:

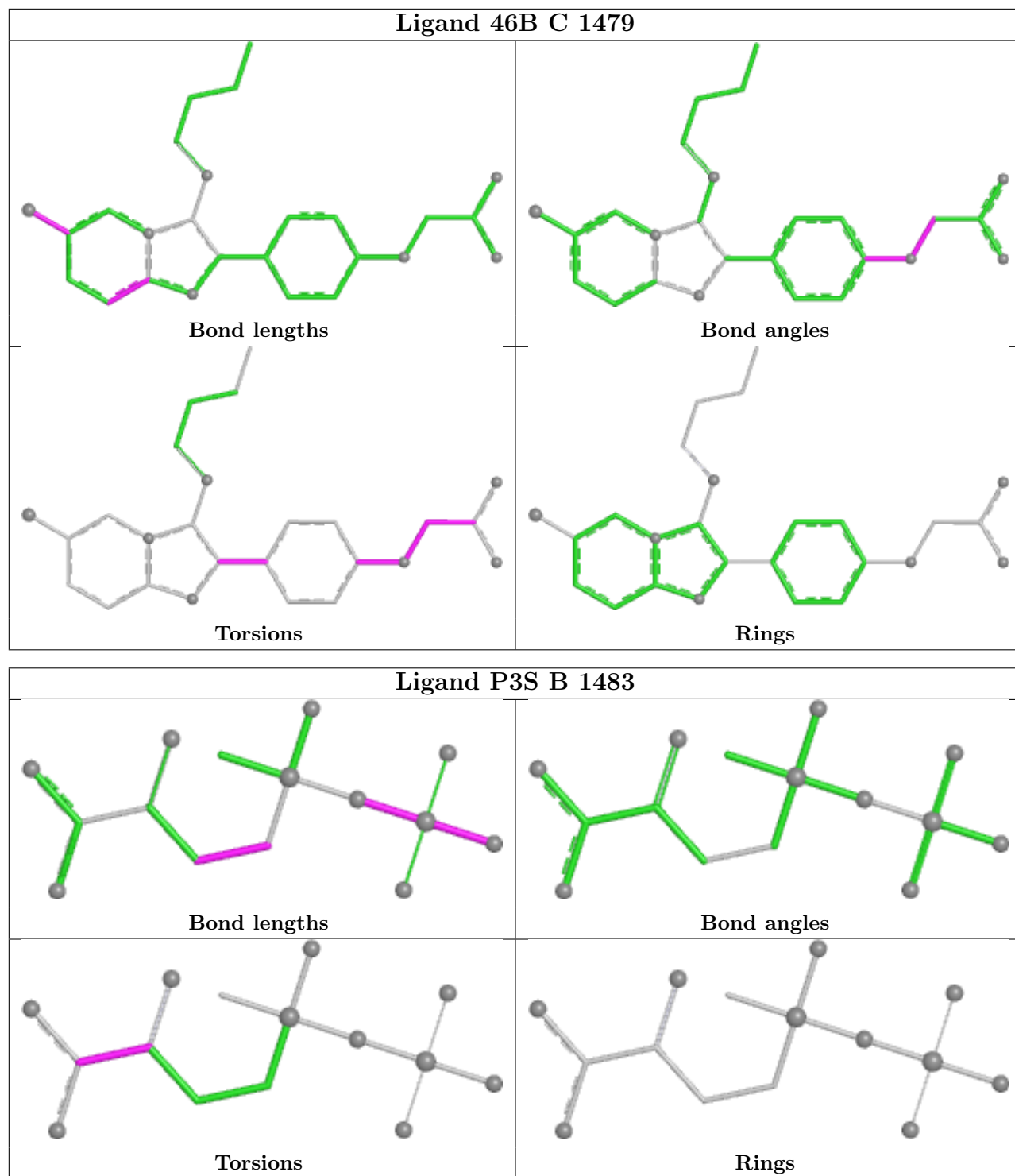
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	F	1479	46B	1	0
2	C	1479	46B	1	0

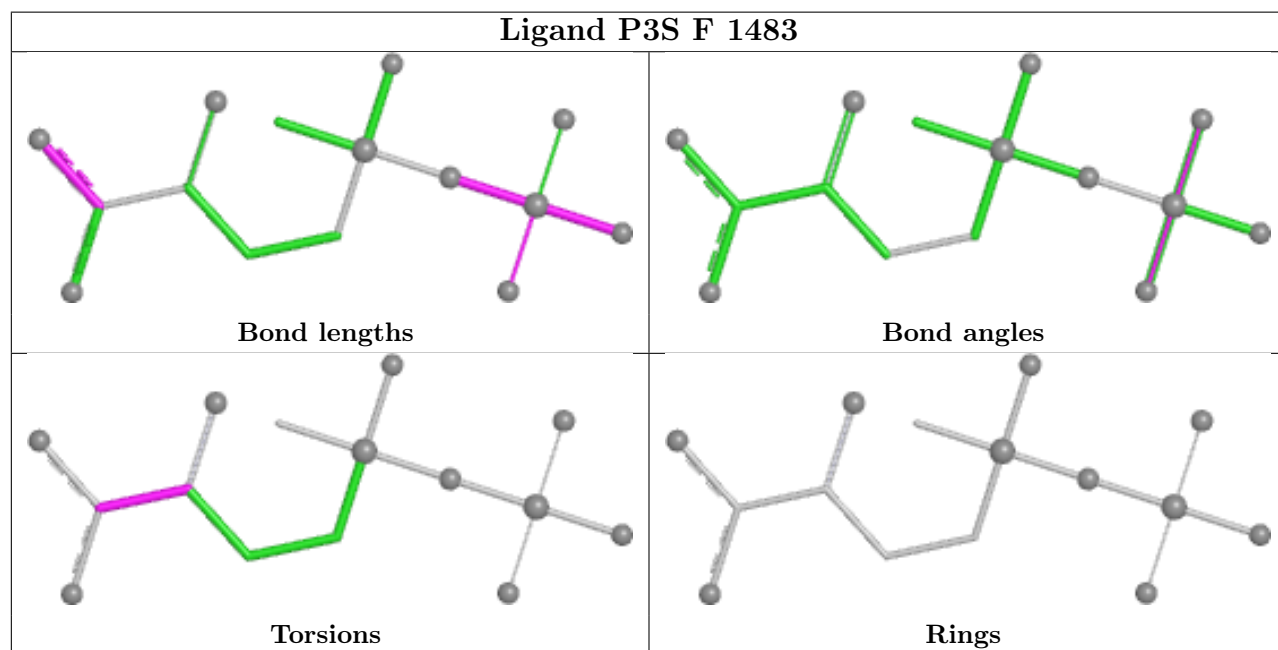
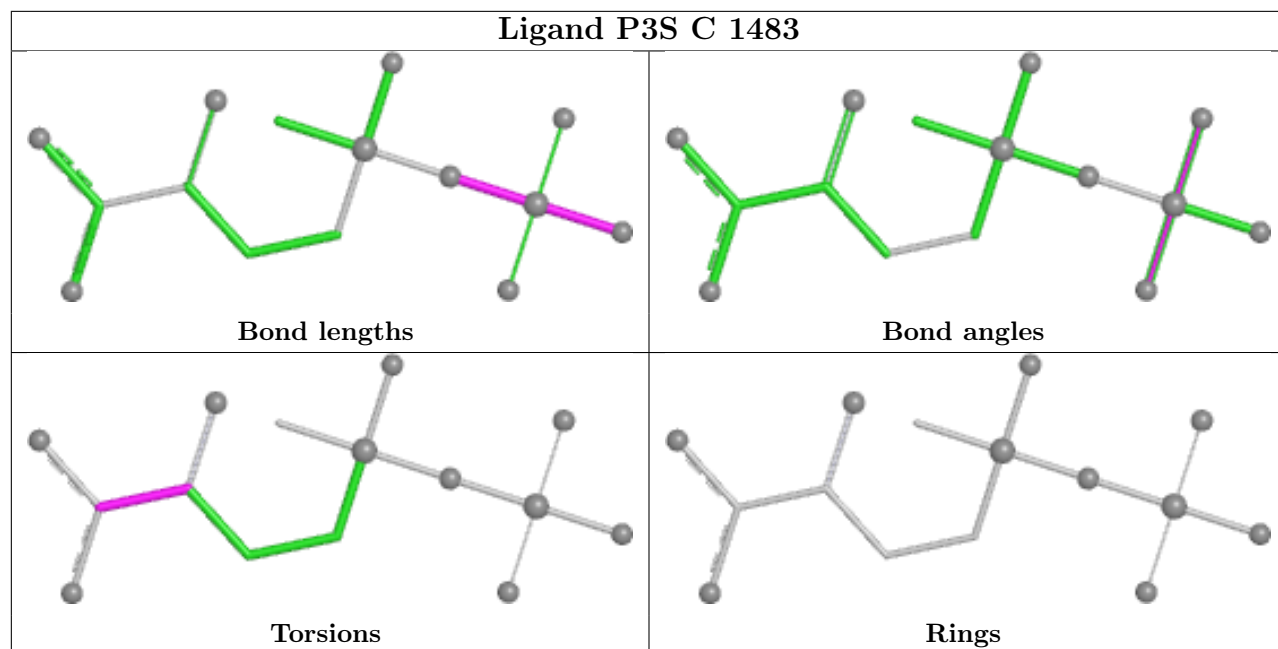
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

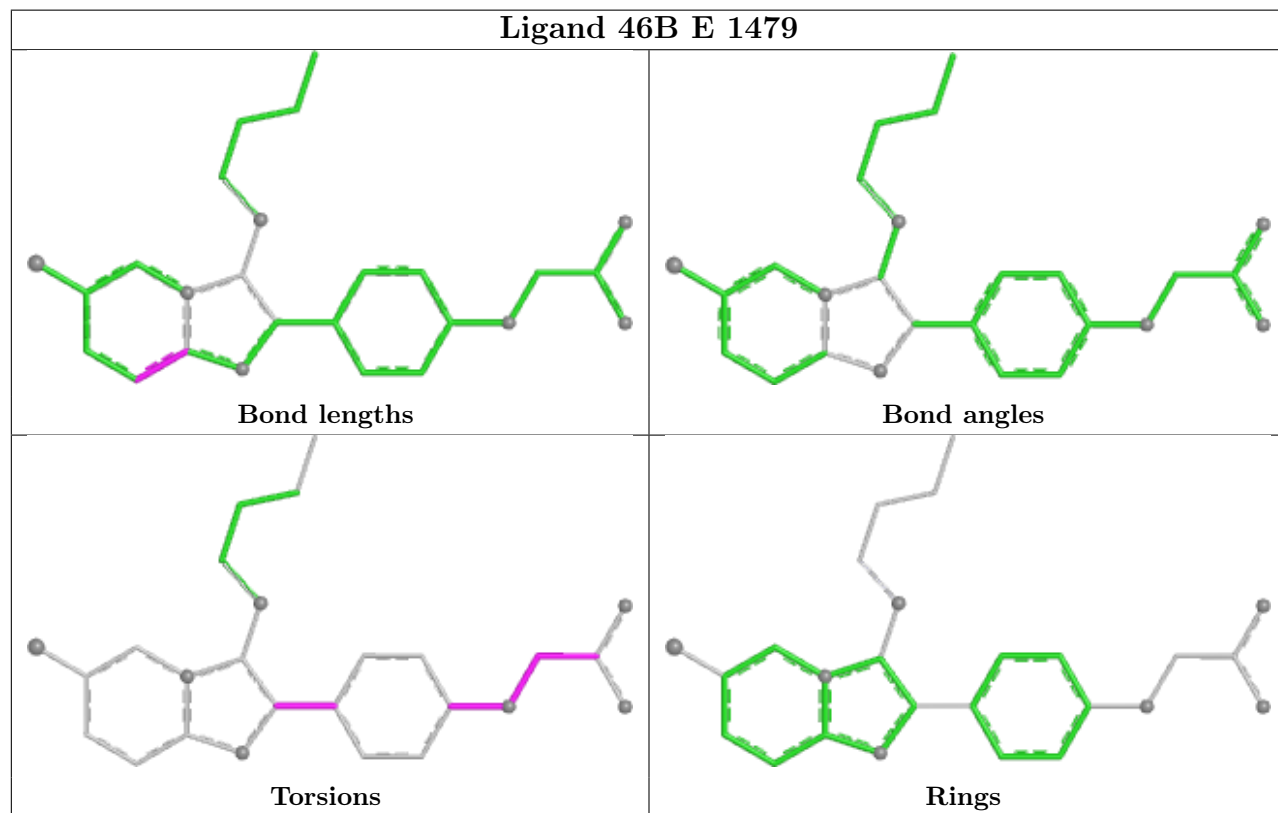
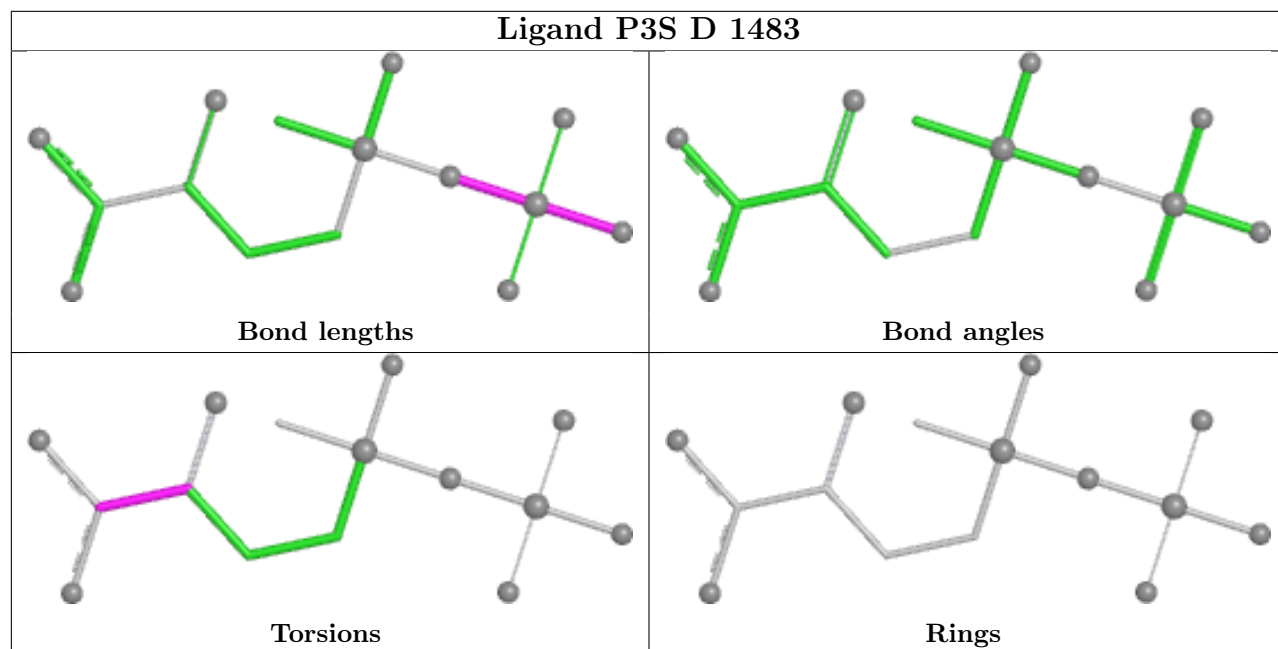


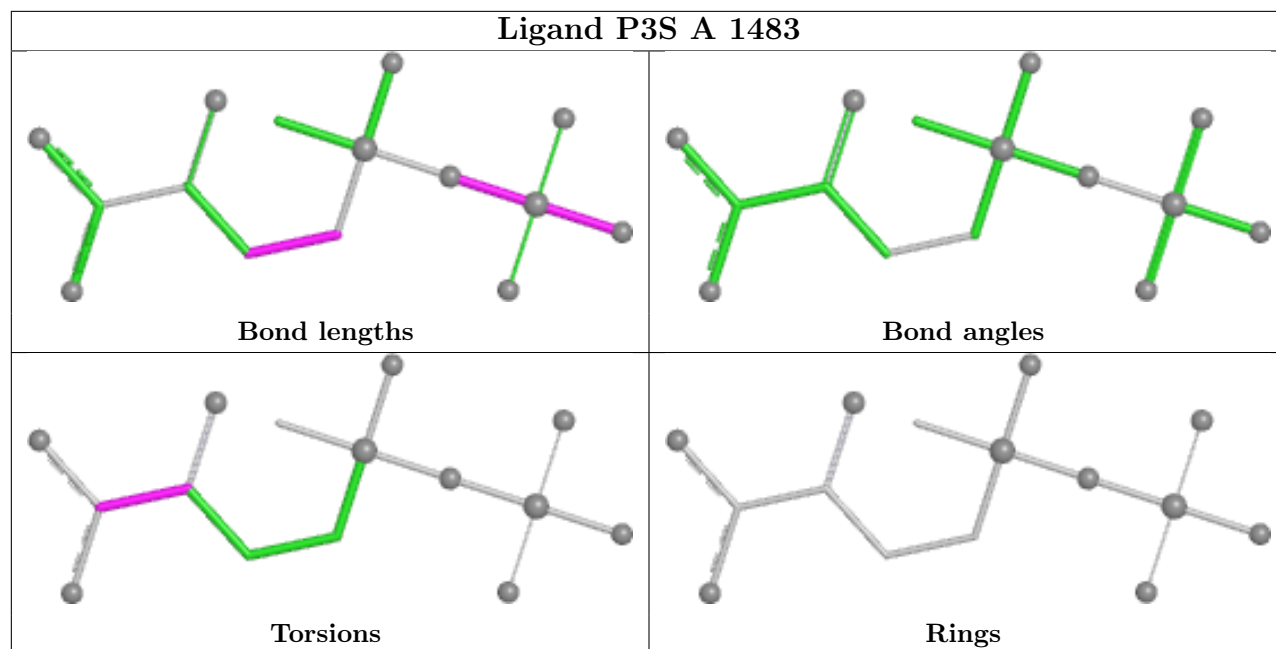












5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q < 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	475/486 (97%)	-0.27	9 (1%) 66 65	12, 20, 33, 52	0
1	B	475/486 (97%)	-0.27	8 (1%) 70 68	12, 20, 33, 49	0
1	C	475/486 (97%)	-0.21	10 (2%) 63 62	13, 21, 33, 51	0
1	D	475/486 (97%)	-0.36	6 (1%) 77 76	11, 19, 32, 49	0
1	E	475/486 (97%)	-0.40	0 100 100	12, 18, 30, 45	0
1	F	475/486 (97%)	-0.34	3 (0%) 89 88	11, 19, 31, 45	0
All	All	2850/2916 (97%)	-0.31	36 (1%) 77 76	11, 19, 32, 52	0

All (36) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	414	ALA	5.3
1	B	414	ALA	5.2
1	A	414	ALA	4.8
1	C	411	GLU	4.3
1	A	410	PRO	4.1
1	A	293	THR	3.8
1	C	410	PRO	3.8
1	B	410	PRO	3.6
1	A	292	GLU	3.5
1	A	411	GLU	3.4
1	C	292	GLU	3.3
1	C	293	THR	3.3
1	C	409	PRO	3.1
1	D	414	ALA	3.0
1	D	410	PRO	2.7
1	B	411	GLU	2.7
1	C	44	LYS	2.6
1	B	292	GLU	2.5
1	D	4	LYS	2.5

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Mol	Chain	Res	Type	RSRZ
1	B	5	THR	2.4
1	D	44	LYS	2.4
1	C	415	SER	2.3
1	A	409	PRO	2.3
1	C	5	THR	2.3
1	A	413	ALA	2.2
1	F	5	THR	2.2
1	D	11	LYS	2.2
1	B	284	ASP	2.2
1	D	15	ASP	2.1
1	B	99	PHE	2.1
1	F	435	GLU	2.1
1	A	4	LYS	2.1
1	F	7	ASP	2.1
1	C	8	ASP	2.1
1	A	294	GLY	2.0
1	B	48	ASP	2.0

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

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

6.3 Carbohydrates [i](#)

There are no monosaccharides in this entry.

6.4 Ligands [i](#)

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

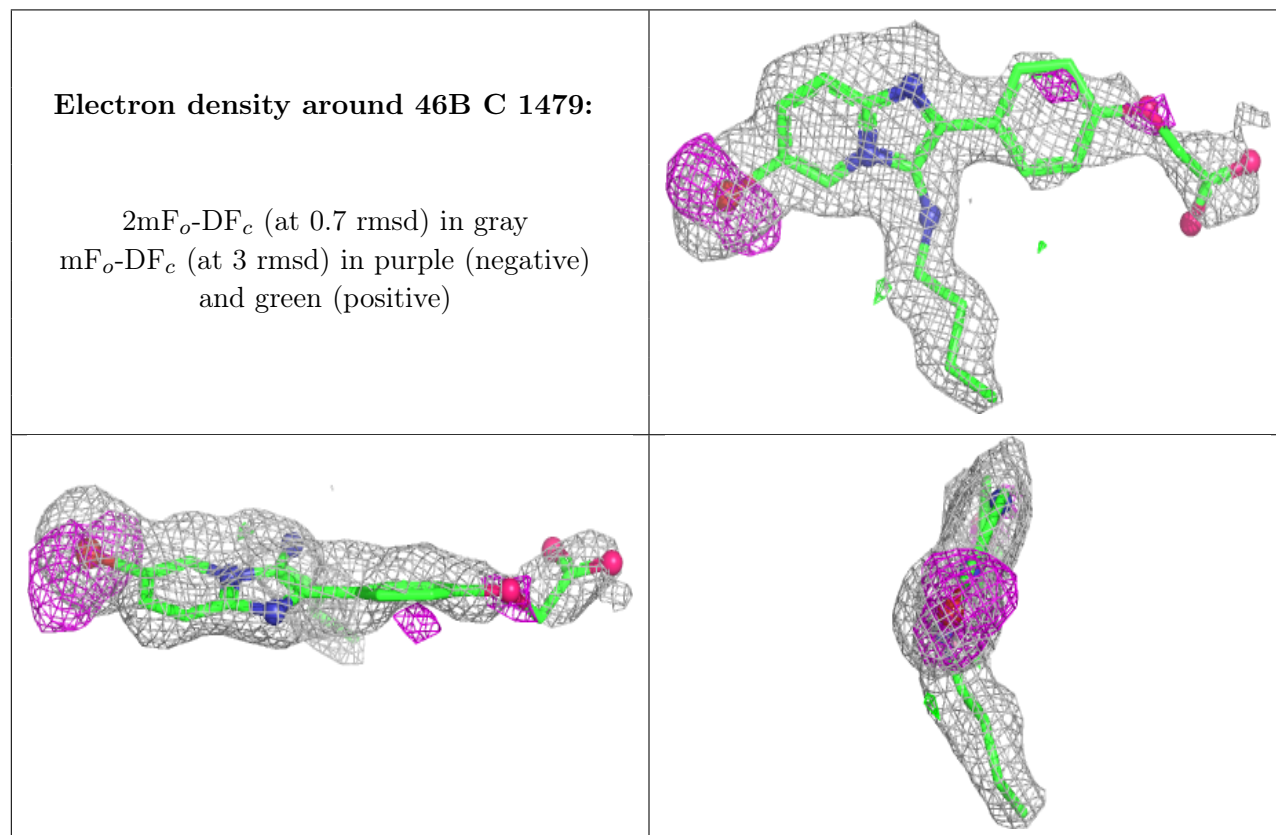
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
3	MG	A	1486	1/1	0.80	0.20	42,42,42,42	0
3	MG	C	1486	1/1	0.87	0.22	42,42,42,42	0
2	46B	C	1479	26/26	0.89	0.25	39,42,55,57	0
3	MG	F	1486	1/1	0.89	0.24	42,42,42,42	0
3	MG	B	1486	1/1	0.90	0.27	42,42,42,42	0
2	46B	A	1479	26/26	0.91	0.23	39,42,54,57	0

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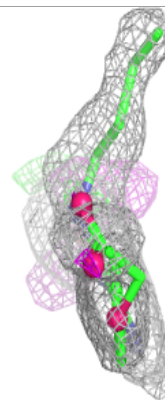
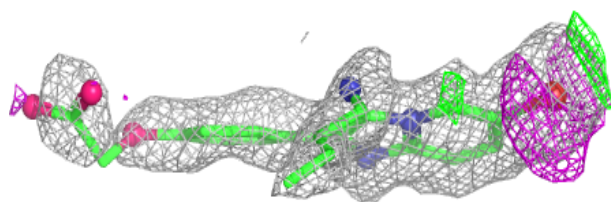
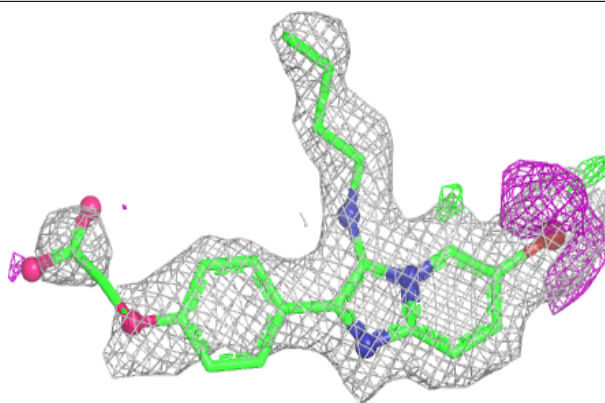
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
2	46B	E	1479	26/26	0.91	0.22	39,41,55,57	0
2	46B	B	1479	26/26	0.91	0.27	39,42,55,57	0
2	46B	F	1479	26/26	0.92	0.19	37,42,55,57	0
2	46B	D	1479	26/26	0.93	0.20	39,41,55,57	0
3	MG	E	1486	1/1	0.95	0.25	42,42,42,42	0
3	MG	B	1482	1/1	0.97	0.12	17,17,17,17	0
4	P3S	A	1483	15/15	0.97	0.10	14,16,17,19	0
5	PO4	B	1484	5/5	0.97	0.11	19,20,23,25	0
3	MG	D	1486	1/1	0.98	0.18	42,42,42,42	0
3	MG	E	1481	1/1	0.98	0.05	16,16,16,16	0
3	MG	C	1480	1/1	0.98	0.05	16,16,16,16	0
3	MG	F	1482	1/1	0.98	0.05	16,16,16,16	0
3	MG	C	1482	1/1	0.98	0.05	17,17,17,17	0
3	MG	B	1480	1/1	0.98	0.04	15,15,15,15	0
4	P3S	B	1483	15/15	0.98	0.08	14,16,17,18	0
4	P3S	C	1483	15/15	0.98	0.07	14,16,17,19	0
5	PO4	A	1484	5/5	0.98	0.17	19,21,24,25	0
3	MG	D	1481	1/1	0.98	0.06	16,16,16,16	0
5	PO4	C	1484	5/5	0.98	0.14	19,21,24,25	0
5	PO4	D	1484	5/5	0.98	0.09	19,20,23,25	0
6	CL	C	1485	1/1	0.98	0.06	23,23,23,23	0
6	CL	D	1485	1/1	0.98	0.05	22,22,22,22	0
3	MG	C	1481	1/1	0.99	0.10	17,17,17,17	0
3	MG	E	1480	1/1	0.99	0.06	14,14,14,14	0
4	P3S	D	1483	15/15	0.99	0.06	14,16,17,18	0
4	P3S	E	1483	15/15	0.99	0.09	14,15,16,16	0
4	P3S	F	1483	15/15	0.99	0.09	13,15,16,16	0
3	MG	A	1481	1/1	0.99	0.06	17,17,17,17	0
3	MG	E	1482	1/1	0.99	0.07	15,15,15,15	0
3	MG	A	1482	1/1	0.99	0.10	16,16,16,16	0
3	MG	D	1480	1/1	0.99	0.04	15,15,15,15	0
5	PO4	E	1484	5/5	0.99	0.07	18,20,22,25	0
5	PO4	F	1484	5/5	0.99	0.06	18,19,24,25	0
6	CL	A	1485	1/1	0.99	0.05	22,22,22,22	0
6	CL	B	1485	1/1	0.99	0.04	23,23,23,23	0
3	MG	B	1481	1/1	0.99	0.03	17,17,17,17	0
3	MG	D	1482	1/1	0.99	0.03	16,16,16,16	0
6	CL	F	1485	1/1	0.99	0.07	22,22,22,22	0
3	MG	F	1480	1/1	1.00	0.04	14,14,14,14	0
3	MG	F	1481	1/1	1.00	0.05	16,16,16,16	0
6	CL	E	1485	1/1	1.00	0.05	22,22,22,22	0
3	MG	A	1480	1/1	1.00	0.02	15,15,15,15	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.

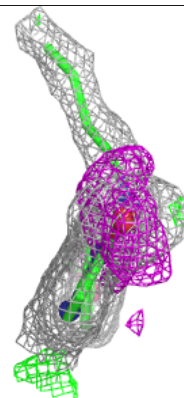
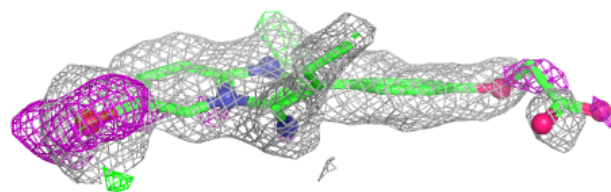
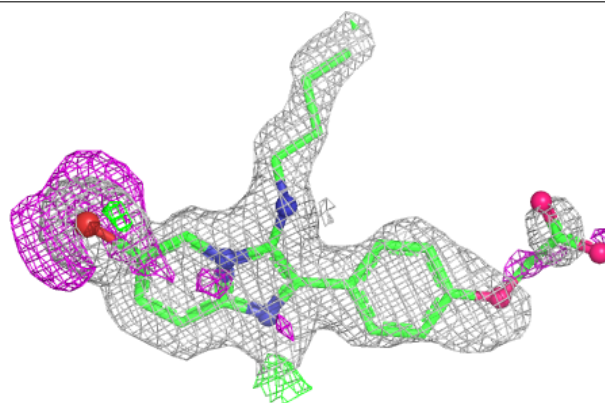


Electron density around 46B A 1479:

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

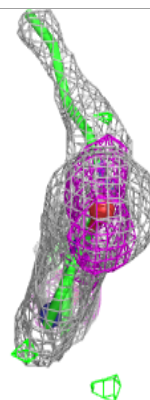
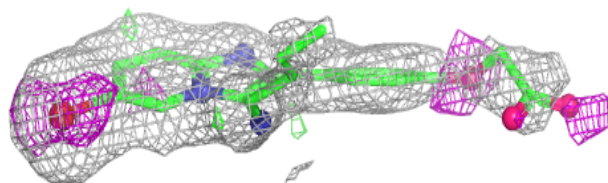
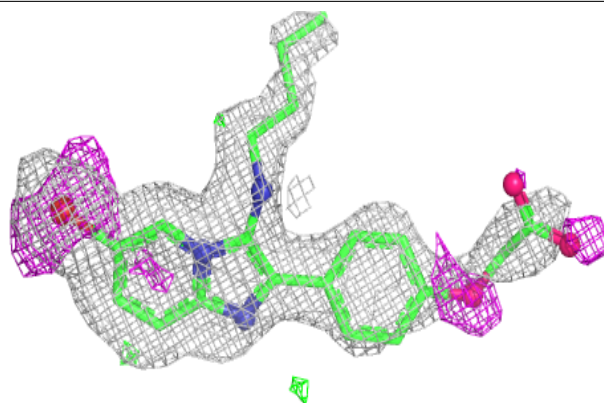
**Electron density around 46B E 1479:**

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

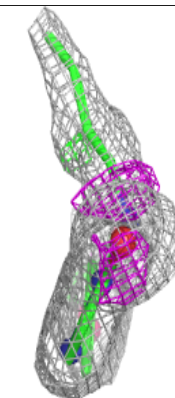
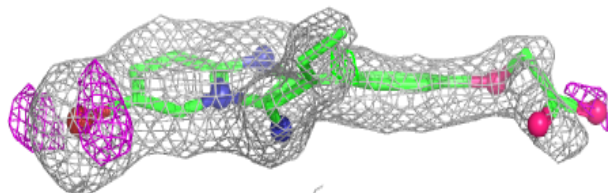
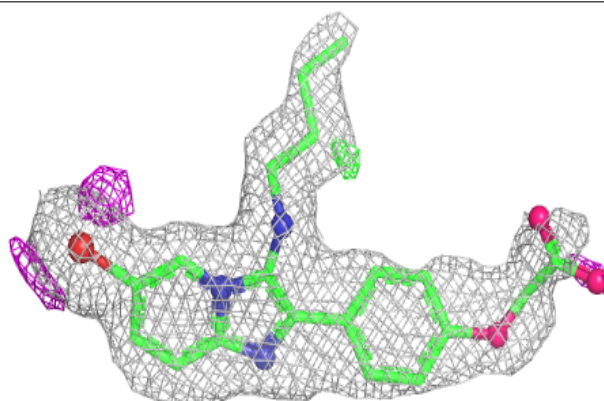


Electron density around 46B B 1479:

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

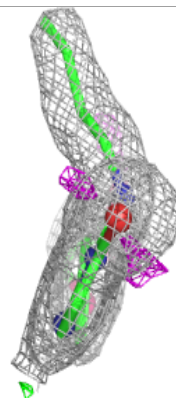
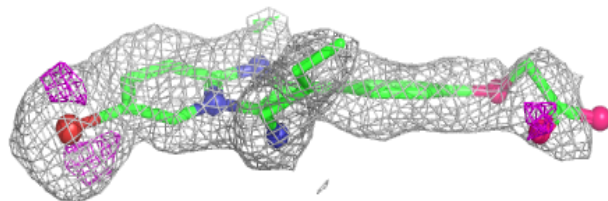
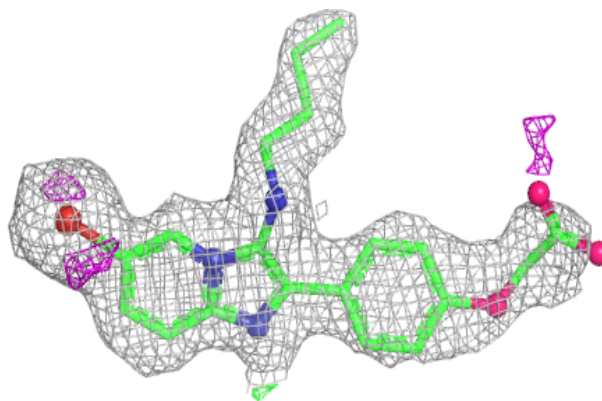
**Electron density around 46B F 1479:**

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

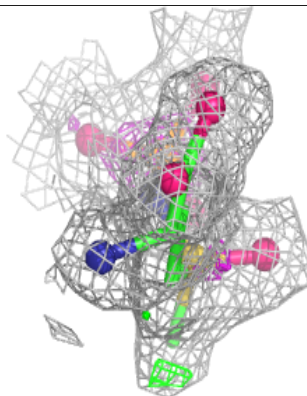
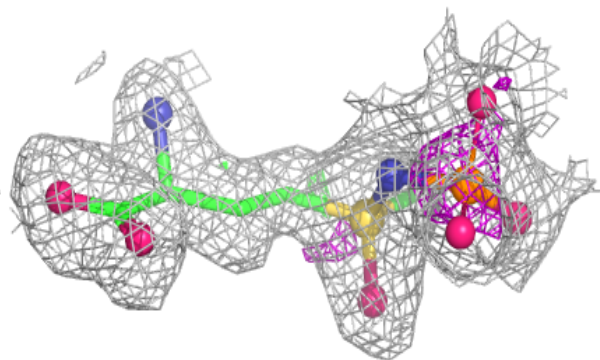
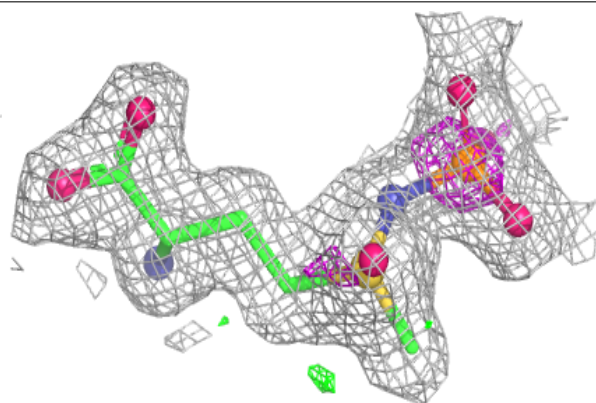


Electron density around 46B D 1479:

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

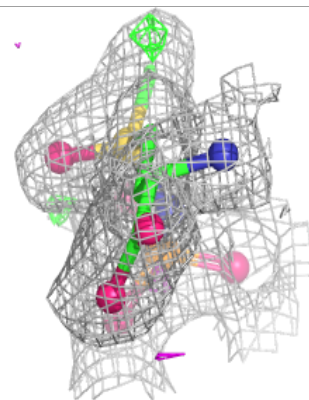
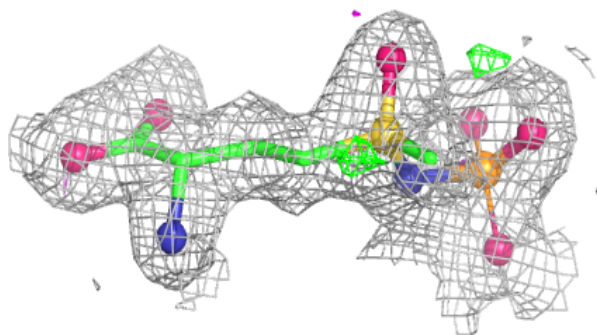
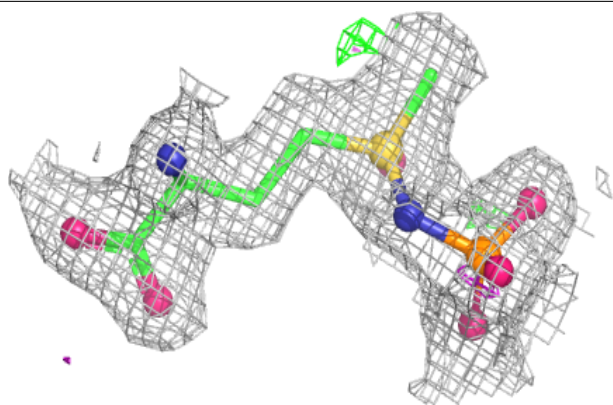
**Electron density around P3S A 1483:**

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

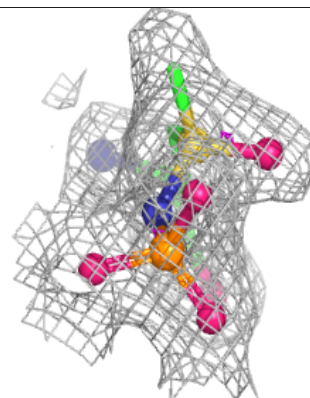
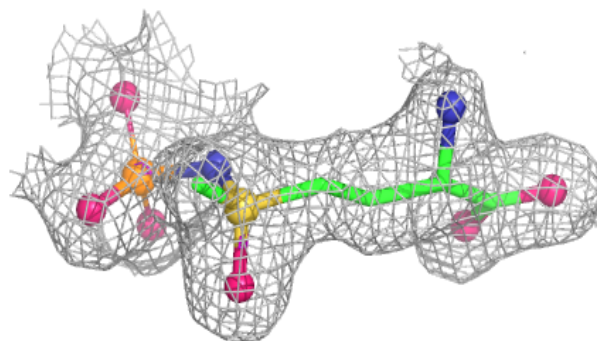
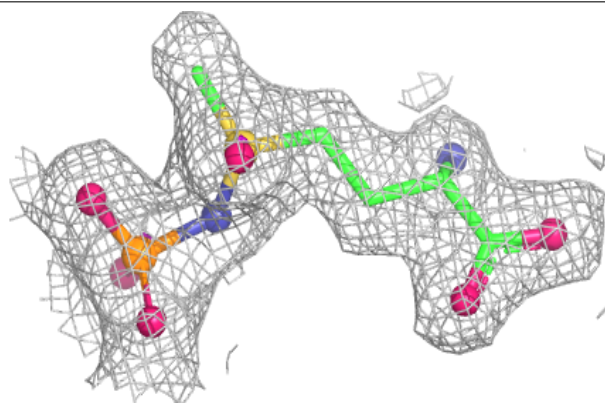


Electron density around P3S B 1483:

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

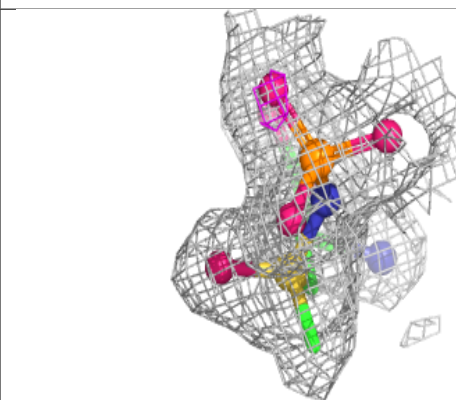
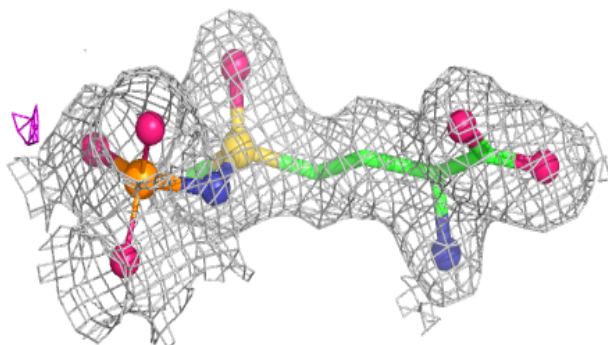
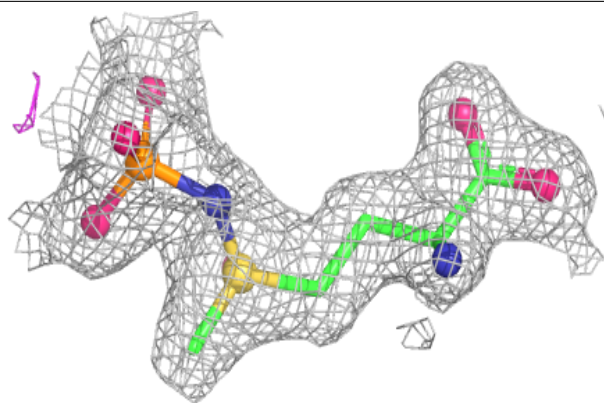
**Electron density around P3S C 1483:**

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

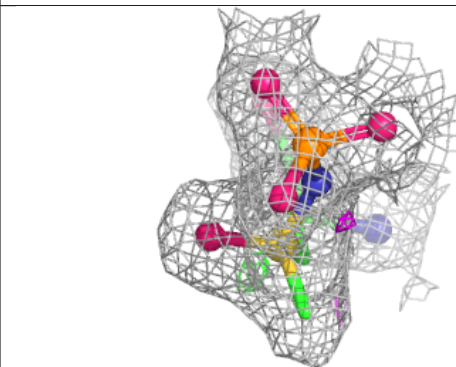
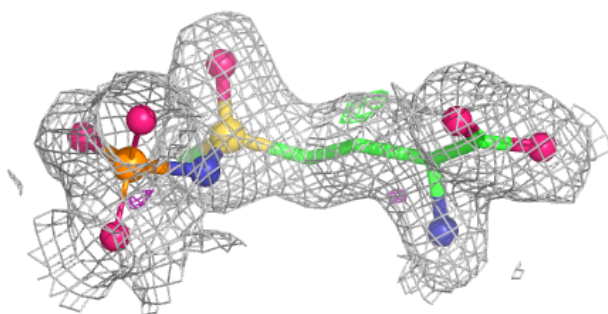


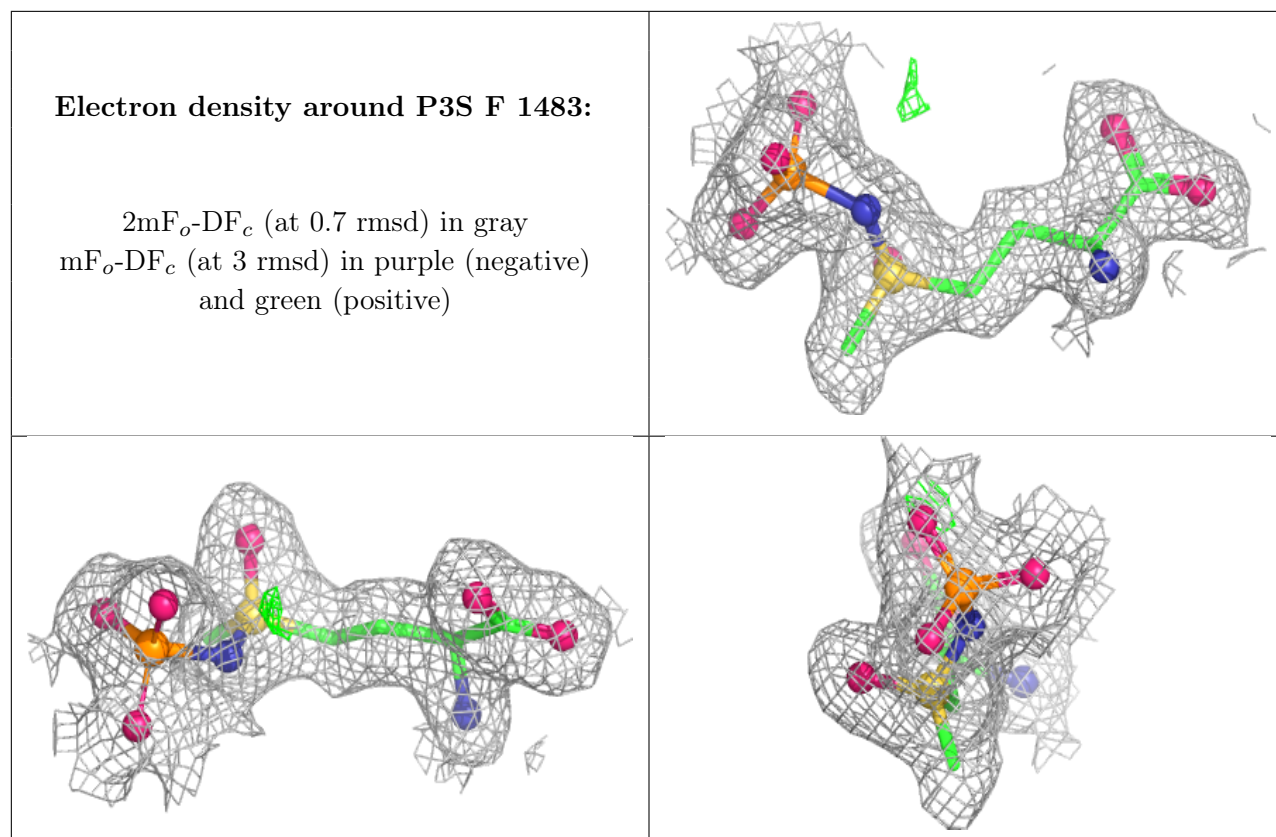
Electron density around P3S D 1483:

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

**Electron density around P3S E 1483:**

$2mF_o-DF_c$ (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.