Full wwPDB X-ray Structure Validation Report ⓘ

Feb 22, 2023 – 04:11 PM JST

PDB ID	:	7XJE
Title	:	Crystal structure of bacteriorhodopsin in the K state refined against the extrapolated dataset
Authors	:	Taguchi, S.; Niwa, S.; Takeda, K.
Deposited on	:	2022-04-16
Resolution	:	1.33 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:

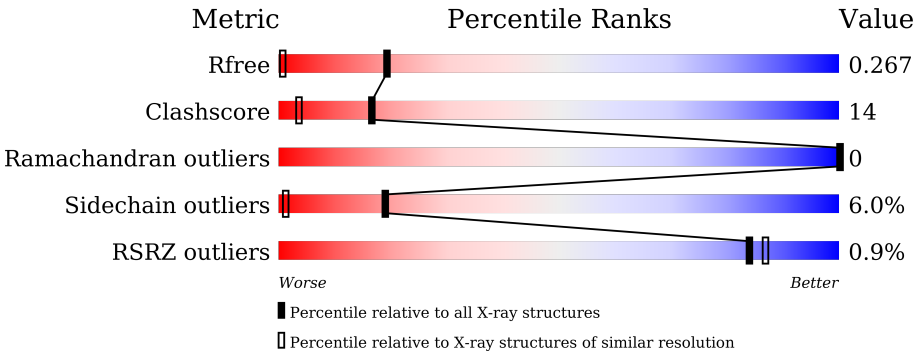
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.32.1
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.32.1

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 1.33 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	1385 (1.36-1.32)
Clashscore	141614	1417 (1.36-1.32)
Ramachandran outliers	138981	1397 (1.36-1.32)
Sidechain outliers	138945	1397 (1.36-1.32)
RSRZ outliers	127900	1369 (1.36-1.32)

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	230	% 77% 20% .

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
3	L2P	A	302	X	-	-	-
3	L2P	A	303	X	-	-	-

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Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
3	L2P	A	304	X	-	-	-
3	L2P	A	305	X	-	-	-

2 Entry composition (i)

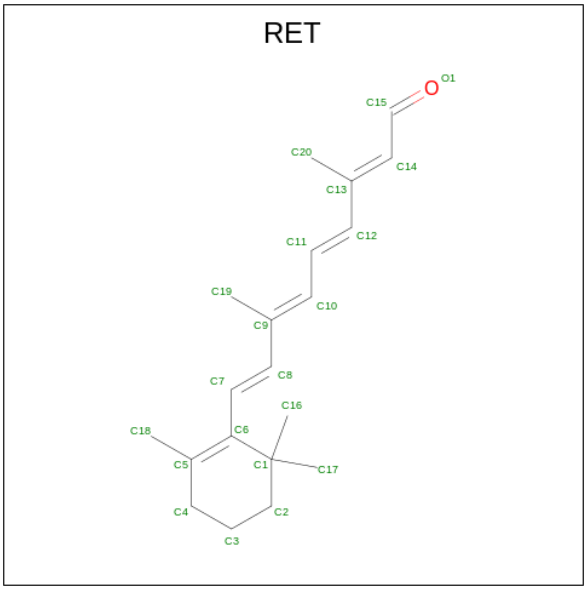
There are 4 unique types of molecules in this entry. The entry contains 2085 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 Bacteriorhodopsin.

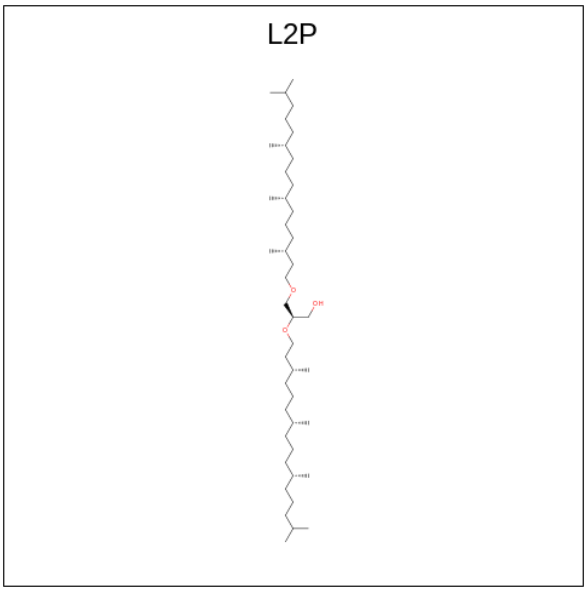
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	230	1819	1215	277	317	10	0	5	0

- Molecule 2 is RETINAL (three-letter code: RET) (formula: $C_{20}H_{28}O$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	C		
2	A	1	20	20	0	0

- Molecule 3 is 2,3-DI-PHYTANYL-GLYCEROL (three-letter code: L2P) (formula: $C_{43}H_{88}O_3$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total C O 46 43 3	0	0
3	A	1	Total C O 40 37 3	0	0
3	A	1	Total C 29 29	0	0
3	A	1	Total C O 29 26 3	0	0
3	A	1	Total C O 9 8 1	0	0
3	A	1	Total C O 26 23 3	0	0
3	A	1	Total C 5 5	0	0
3	A	1	Total C O 10 7 3	0	0
3	A	1	Total C O 18 17 1	0	0
3	A	1	Total C 8 8	0	0

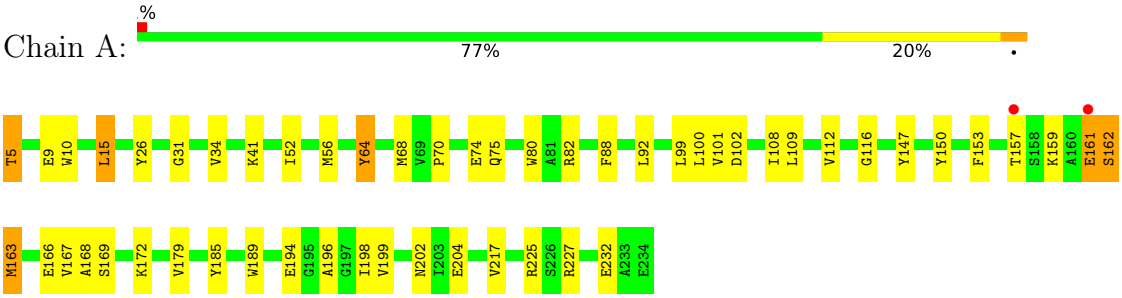
- Molecule 4 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	23	Total O 26 26	0	3

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: Bacteriorhodopsin



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 63	Depositor
Cell constants a, b, c, α, β, γ	60.57Å 60.57Å 110.88Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	20.00 – 1.33 47.42 – 1.33	Depositor EDS
% Data completeness (in resolution range)	100.0 (20.00-1.33) 99.5 (47.42-1.33)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	0.23 (at 1.33Å)	Xtriage
Refinement program	SHELX	Depositor
R, R_{free}	0.274 , 0.293 0.255 , 0.267	Depositor DCC
R_{free} test set	2436 reflections (4.67%)	wwPDB-VP
Wilson B-factor (Å^2)	11.3	Xtriage
Anisotropy	0.162	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.38 , 63.5	EDS
L-test for twinning[2]	$< \|L\| > = 0.44$, $< L^2 > = 0.27$	Xtriage
Estimated twinning fraction	0.237 for h,-h-k,-l	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	2085	wwPDB-VP
Average B, all atoms (Å^2)	31.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.88% 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: RET, L2P

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	0.45	0/1867	1.10	4/2548 (0.2%)

There are no bond length outliers.

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	82	ARG	NE-CZ-NH2	-8.77	115.92	120.30
1	A	225	ARG	NE-CZ-NH1	5.69	123.14	120.30
1	A	64	TYR	CB-CG-CD1	-5.16	117.90	121.00
1	A	189	TRP	CA-CB-CG	5.03	123.25	113.70

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	1819	0	1858	47	0
2	A	20	0	27	2	0
3	A	220	0	343	38	0
4	A	26	0	0	1	0
All	All	2085	0	2228	61	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 14.

All (61) 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)
3:A:305:L2P:H13	3:A:305:L2P:H422	1.56	0.87
1:A:163:MET:HG2	1:A:168:ALA:HB2	1.57	0.84
1:A:217:VAL:HG11	3:A:310:L2P:H222	1.67	0.76
1:A:108:ILE:HG21	3:A:307:L2P:H2	1.67	0.75
3:A:304:L2P:H492	3:A:304:L2P:H201	1.69	0.74
1:A:31:GLY:O	1:A:34:VAL:HG13	1.91	0.70
1:A:80:TRP:HH2	3:A:302:L2P:H122	1.61	0.65
1:A:153:PHE:CE2	1:A:179:VAL:HG21	2.32	0.65
1:A:109:LEU:HD23	3:A:307:L2P:H121	1.78	0.64
1:A:102:ASP:O	1:A:159:LYS:HE2	1.98	0.63
1:A:92:LEU:HD11	3:A:302:L2P:H302	1.79	0.62
1:A:199:VAL:HG22	3:A:305:L2P:H151	1.82	0.61
3:A:304:L2P:H493	3:A:304:L2P:H522	1.84	0.59
1:A:52:ILE:HG12	3:A:302:L2P:H242	1.84	0.59
1:A:41:LYS:HD2	1:A:99:LEU:HD13	1.84	0.59
1:A:150:TYR:CZ	3:A:303:L2P:H192	2.38	0.58
3:A:303:L2P:C29	3:A:303:L2P:H511	2.35	0.57
3:A:303:L2P:H511	3:A:303:L2P:H291	1.86	0.57
1:A:92:LEU:HD11	3:A:302:L2P:C30	2.35	0.57
1:A:166:GLU:HG2	1:A:167:VAL:N	2.21	0.55
3:A:304:L2P:H492	3:A:304:L2P:C20	2.36	0.55
1:A:70:PRO:HA	1:A:74:GLU:O	2.08	0.54
1:A:52:ILE:CD1	3:A:302:L2P:H242	2.37	0.53
3:A:303:L2P:H201	3:A:303:L2P:H251	1.91	0.53
1:A:64:TYR:CE2	3:A:302:L2P:H112	2.44	0.53
1:A:101:VAL:O	1:A:159:LYS:HD2	2.10	0.52
1:A:5:THR:O	1:A:5:THR:OG1	2.27	0.52
1:A:9:GLU:HA	1:A:202[B]:ASN:HD22	1.74	0.52
1:A:198:ILE:HG22	3:A:305:L2P:H421	1.93	0.51
1:A:185:TYR:CE1	2:A:301:RET:H203	2.45	0.51
1:A:153:PHE:HE2	1:A:179:VAL:HG21	1.74	0.50
3:A:305:L2P:H422	3:A:305:L2P:C13	2.36	0.50
1:A:56:MET:HE2	1:A:56:MET:HA	1.94	0.49
1:A:80:TRP:CH2	3:A:302:L2P:H122	2.45	0.49
1:A:112:VAL:HG21	3:A:307:L2P:C42	2.43	0.49
1:A:52:ILE:HD11	3:A:302:L2P:H301	1.94	0.48
1:A:52:ILE:CG1	3:A:302:L2P:H242	2.44	0.47
1:A:196:ALA:HB3	1:A:198:ILE:HD12	1.97	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:5:THR:HA	1:A:10:TRP:CD1	2.49	0.46
3:A:302:L2P:H572	3:A:302:L2P:H53	1.61	0.46
1:A:108:ILE:CG2	3:A:307:L2P:H2	2.43	0.46
1:A:161:GLU:HG3	1:A:162:SER:N	2.30	0.46
1:A:15:LEU:HD23	1:A:15:LEU:HA	1.72	0.45
1:A:64:TYR:HE2	3:A:302:L2P:H112	1.80	0.45
1:A:112:VAL:HG21	3:A:307:L2P:H421	1.99	0.44
1:A:163:MET:HE3	1:A:163:MET:HB2	1.93	0.44
1:A:52:ILE:HD11	3:A:302:L2P:H242	1.99	0.44
1:A:56:MET:CE	3:A:302:L2P:H192	2.48	0.44
1:A:88:PHE:CD1	3:A:302:L2P:H271	2.53	0.43
1:A:26:TYR:OH	3:A:310:L2P:H112	2.18	0.43
1:A:68:MET:HE3	1:A:75:GLN:O	2.18	0.43
2:A:301:RET:H181	2:A:301:RET:H7	1.61	0.43
3:A:305:L2P:H161	3:A:305:L2P:H143	1.71	0.43
1:A:194[A]:GLU:OE1	1:A:204[A]:GLU:OE2	2.38	0.42
1:A:116:GLY:HA2	4:A:422:HOH:O	2.20	0.41
3:A:303:L2P:H412	3:A:303:L2P:O1	2.20	0.41
3:A:302:L2P:O1	3:A:302:L2P:H142	2.20	0.41
1:A:88:PHE:CD1	3:A:302:L2P:H251	2.56	0.40
3:A:304:L2P:H192	3:A:304:L2P:H151	2.04	0.40
1:A:101:VAL:O	1:A:102:ASP:HB3	2.21	0.40
1:A:147:TYR:HE1	3:A:303:L2P:H111	1.85	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	233/230 (101%)	228 (98%)	5 (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	189/184 (103%)	178 (94%)	11 (6%)	20 1

All (11) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	5	THR
1	A	15	LEU
1	A	100	LEU
1	A	157	THR
1	A	161	GLU
1	A	162	SER
1	A	163	MET
1	A	169	SER
1	A	172	LYS
1	A	227	ARG
1	A	232	GLU

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 (i)

11 ligands are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
3	L2P	A	310	-	17,17,45	0.34	0	16,16,53	0.32	0
2	RET	A	301	1	20,20,21	1.99	4 (20%)	27,27,28	2.98	14 (51%)
3	L2P	A	303	-	39,39,45	0.64	0	41,41,53	1.69	7 (17%)
3	L2P	A	307	-	25,25,45	0.71	0	25,25,53	1.99	7 (28%)
3	L2P	A	308	-	4,4,45	0.37	0	3,3,53	0.26	0
3	L2P	A	304	-	27,27,45	0.26	0	30,30,53	1.05	1 (3%)
3	L2P	A	302	-	45,45,45	0.47	0	51,53,53	2.21	11 (21%)
3	L2P	A	306	-	8,8,45	0.41	0	7,7,53	0.96	1 (14%)
3	L2P	A	305	-	28,28,45	0.57	0	30,32,53	2.67	8 (26%)
3	L2P	A	309	-	9,9,45	0.64	0	9,9,53	2.74	1 (11%)
3	L2P	A	311	-	7,7,45	0.30	0	6,6,53	0.19	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	L2P	A	310	-	-	10/15/15/51	-
2	RET	A	301	1	-	4/13/30/31	0/1/1/1
3	L2P	A	303	-	1/1/3/9	29/40/40/51	-
3	L2P	A	307	-	-	14/25/25/51	-
3	L2P	A	308	-	-	1/2/2/51	-
3	L2P	A	304	-	1/1/5/9	13/26/26/51	-
3	L2P	A	302	-	4/4/9/9	26/51/51/51	-
3	L2P	A	306	-	-	3/6/6/51	-
3	L2P	A	305	-	2/2/5/9	17/31/31/51	-
3	L2P	A	309	-	-	2/8/8/51	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	L2P	A	311	-	-	3/5/5/51	-

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	301	RET	C14-C13	7.02	1.39	1.33
2	A	301	RET	C5-C6	2.80	1.39	1.34
2	A	301	RET	C20-C13	-2.35	1.46	1.50
2	A	301	RET	C10-C9	2.11	1.38	1.35

All (50) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	A	301	RET	C11-C10-C9	-8.82	114.72	127.31
3	A	309	L2P	O2-C2-C1	8.17	138.22	109.56
3	A	302	L2P	O2-C41-C42	7.99	125.55	108.77
3	A	302	L2P	C41-O2-C2	7.46	132.55	115.40
3	A	305	L2P	O2-C41-C42	7.40	124.32	108.77
3	A	305	L2P	C41-O2-C2	6.41	130.14	115.40
3	A	303	L2P	O2-C2-C3	6.28	125.35	108.64
3	A	307	L2P	O1-C1-C2	5.33	121.97	109.44
3	A	305	L2P	O2-C2-C3	4.88	121.63	108.64
3	A	305	L2P	O1-C1-C2	4.48	119.98	109.44
3	A	302	L2P	O2-C2-C3	4.42	120.40	108.64
3	A	302	L2P	O3-C3-C2	4.37	123.38	111.78
3	A	305	L2P	O2-C2-C1	4.33	122.71	109.06
2	A	301	RET	C19-C9-C8	4.26	124.79	118.08
2	A	301	RET	C2-C3-C4	4.12	120.57	111.38
3	A	307	L2P	O2-C2-C3	4.10	119.56	108.64
2	A	301	RET	C7-C6-C5	-3.98	111.83	121.46
3	A	303	L2P	O1-C1-C2	3.97	118.78	109.44
3	A	307	L2P	C41-O2-C2	3.70	123.90	115.40
3	A	302	L2P	O1-C1-C2	3.68	118.09	109.44
2	A	301	RET	C8-C9-C10	-3.67	113.31	118.94
2	A	301	RET	C2-C1-C6	3.57	115.98	110.48
2	A	301	RET	C3-C4-C5	-3.49	107.85	114.08
3	A	305	L2P	O1-C11-C12	3.48	122.98	109.78
3	A	303	L2P	C11-O1-C1	3.41	128.87	113.61
2	A	301	RET	C20-C13-C12	-3.36	112.78	118.08
2	A	301	RET	C17-C1-C2	-3.28	95.79	108.91
3	A	303	L2P	O2-C2-C1	3.25	119.29	109.06
2	A	301	RET	C17-C1-C6	3.19	115.47	110.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	A	305	L2P	O3-C3-C2	3.18	120.21	111.78
3	A	302	L2P	O2-C2-C1	3.14	118.95	109.06
2	A	301	RET	C1-C6-C7	3.13	124.63	115.78
3	A	307	L2P	O3-C3-C2	3.12	120.06	111.78
3	A	307	L2P	C11-O1-C1	3.11	127.53	113.61
3	A	302	L2P	C11-O1-C1	3.09	127.44	113.61
3	A	307	L2P	O2-C2-C1	2.93	118.28	109.06
3	A	303	L2P	C41-O2-C2	2.78	121.80	115.40
2	A	301	RET	C7-C8-C9	-2.58	122.34	126.23
3	A	305	L2P	C11-O1-C1	2.53	124.95	113.61
3	A	307	L2P	O2-C41-C42	2.39	117.94	109.56
3	A	303	L2P	O1-C11-C12	2.37	122.70	110.26
2	A	301	RET	C3-C2-C1	-2.32	106.30	114.60
2	A	301	RET	C18-C5-C6	-2.27	121.98	124.53
3	A	302	L2P	O1-C11-C12	2.23	118.22	109.78
3	A	302	L2P	C60-C58-C59	2.16	120.49	110.51
3	A	302	L2P	C1-C2-C3	2.16	116.86	111.80
3	A	302	L2P	C44-C43-C42	2.16	119.11	111.29
3	A	304	L2P	C19-C18-C20	2.09	118.85	111.29
3	A	303	L2P	C56-C55-C53	2.08	125.00	114.42
3	A	306	L2P	O1-C11-C12	2.02	124.93	111.66

All (8) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
3	A	302	L2P	C18
3	A	302	L2P	C23
3	A	302	L2P	C43
3	A	302	L2P	C48
3	A	303	L2P	C2
3	A	304	L2P	C23
3	A	305	L2P	C43
3	A	305	L2P	C2

All (122) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	301	RET	C12-C13-C14-C15
2	A	301	RET	C20-C13-C14-C15
3	A	302	L2P	C41-C42-C43-C44
3	A	302	L2P	C51-C52-C53-C54
3	A	303	L2P	O2-C2-C3-O3

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Mol	Chain	Res	Type	Atoms
3	A	303	L2P	C16-C17-C18-C19
3	A	305	L2P	O2-C2-C3-O3
3	A	305	L2P	C11-C12-C13-C14
3	A	305	L2P	C44-C43-C45-C46
3	A	307	L2P	C1-C2-C3-O3
3	A	307	L2P	O2-C2-C3-O3
3	A	307	L2P	C42-C41-O2-C2
3	A	303	L2P	C12-C11-O1-C1
3	A	303	L2P	C11-C12-C13-C15
3	A	307	L2P	C45-C46-C47-C48
3	A	305	L2P	C2-C1-O1-C11
3	A	302	L2P	C53-C55-C56-C57
3	A	307	L2P	C50-C51-C52-C53
3	A	309	L2P	O1-C1-C2-C3
3	A	302	L2P	C16-C17-C18-C19
3	A	302	L2P	C46-C47-C48-C49
3	A	304	L2P	C16-C17-C18-C19
3	A	304	L2P	C24-C23-C25-C26
3	A	305	L2P	C14-C13-C15-C16
3	A	302	L2P	C25-C26-C27-C28
3	A	304	L2P	C45-C46-C47-C48
3	A	303	L2P	C21-C22-C23-C25
3	A	302	L2P	C42-C43-C45-C46
3	A	304	L2P	C21-C22-C23-C25
2	A	301	RET	C10-C11-C12-C13
3	A	307	L2P	O1-C11-C12-C13
3	A	310	L2P	O1-C11-C12-C13
3	A	304	L2P	C23-C25-C26-C27
3	A	302	L2P	C56-C57-C58-C59
3	A	303	L2P	C25-C26-C27-C28
3	A	307	L2P	C43-C45-C46-C47
3	A	303	L2P	C46-C47-C48-C50
3	A	306	L2P	C15-C16-C17-C18
3	A	310	L2P	C17-C18-C20-C21
3	A	303	L2P	C26-C27-C28-C29
3	A	305	L2P	C42-C41-O2-C2
3	A	303	L2P	C23-C25-C26-C27
3	A	303	L2P	C13-C15-C16-C17
3	A	303	L2P	C52-C53-C55-C56
3	A	303	L2P	C43-C45-C46-C47
3	A	310	L2P	C12-C13-C15-C16
3	A	303	L2P	C51-C52-C53-C55

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Mol	Chain	Res	Type	Atoms
3	A	310	L2P	C20-C21-C22-C23
3	A	304	L2P	C26-C27-C28-C30
3	A	309	L2P	O2-C2-C3-O3
3	A	303	L2P	C53-C55-C56-C57
3	A	302	L2P	C17-C18-C20-C21
3	A	305	L2P	C45-C46-C47-C48
3	A	304	L2P	C20-C21-C22-C23
3	A	302	L2P	C44-C43-C45-C46
3	A	305	L2P	C12-C11-O1-C1
3	A	303	L2P	C12-C13-C15-C16
3	A	310	L2P	C13-C15-C16-C17
3	A	311	L2P	C25-C26-C27-C28
3	A	307	L2P	C12-C13-C15-C16
3	A	302	L2P	C23-C25-C26-C27
3	A	303	L2P	O1-C1-C2-O2
3	A	310	L2P	C22-C23-C25-C26
3	A	302	L2P	C19-C18-C20-C21
3	A	304	L2P	C21-C22-C23-C24
3	A	310	L2P	C21-C22-C23-C25
3	A	305	L2P	C15-C16-C17-C18
3	A	302	L2P	C48-C50-C51-C52
3	A	307	L2P	C53-C55-C56-C57
3	A	303	L2P	O2-C41-C42-C43
3	A	303	L2P	C18-C20-C21-C22
3	A	310	L2P	C18-C20-C21-C22
3	A	304	L2P	C12-C13-C15-C16
3	A	302	L2P	C26-C27-C28-C29
3	A	303	L2P	C1-C2-O2-C41
3	A	307	L2P	O1-C1-C2-C3
3	A	302	L2P	O1-C1-C2-O2
3	A	304	L2P	C26-C27-C28-C29
3	A	311	L2P	C20-C21-C22-C23
3	A	303	L2P	C1-C2-C3-O3
3	A	305	L2P	C19-C18-C20-C21
3	A	302	L2P	C52-C53-C55-C56
3	A	303	L2P	C16-C17-C18-C20
3	A	305	L2P	C16-C17-C18-C20
3	A	303	L2P	C20-C21-C22-C23
3	A	307	L2P	C51-C52-C53-C55
3	A	303	L2P	O1-C11-C12-C13
3	A	307	L2P	C13-C15-C16-C17
3	A	305	L2P	C41-C42-C43-C45

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Mol	Chain	Res	Type	Atoms
3	A	302	L2P	O1-C1-C2-C3
3	A	307	L2P	C2-C1-O1-C11
3	A	305	L2P	C46-C47-C48-C49
3	A	302	L2P	C21-C22-C23-C24
3	A	302	L2P	O2-C41-C42-C43
3	A	305	L2P	O2-C41-C42-C43
3	A	308	L2P	C25-C26-C27-C28
3	A	303	L2P	C45-C46-C47-C48
3	A	311	L2P	C23-C25-C26-C27
3	A	305	L2P	O1-C1-C2-C3
3	A	306	L2P	C12-C13-C15-C16
3	A	305	L2P	C16-C17-C18-C19
3	A	307	L2P	C12-C11-O1-C1
3	A	303	L2P	C47-C48-C50-C51
3	A	310	L2P	C25-C26-C27-C28
3	A	303	L2P	C42-C43-C45-C46
3	A	303	L2P	C22-C23-C25-C26
3	A	303	L2P	C26-C27-C28-C30
3	A	305	L2P	O1-C1-C2-O2
3	A	302	L2P	C42-C41-O2-C2
3	A	306	L2P	O1-C11-C12-C13
3	A	302	L2P	C18-C20-C21-C22
3	A	302	L2P	C54-C53-C55-C56
3	A	303	L2P	O1-C1-C2-C3
2	A	301	RET	C11-C10-C9-C8
3	A	302	L2P	O2-C2-C3-O3
3	A	304	L2P	C15-C16-C17-C18
3	A	304	L2P	C19-C18-C20-C21
3	A	310	L2P	C16-C17-C18-C20
3	A	302	L2P	C47-C48-C50-C51
3	A	302	L2P	C51-C52-C53-C55
3	A	304	L2P	C51-C52-C53-C55
3	A	302	L2P	C14-C13-C15-C16

There are no ring outliers.

7 monomers are involved in 40 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	310	L2P	2	0
2	A	301	RET	2	0
3	A	303	L2P	6	0
3	A	307	L2P	5	0

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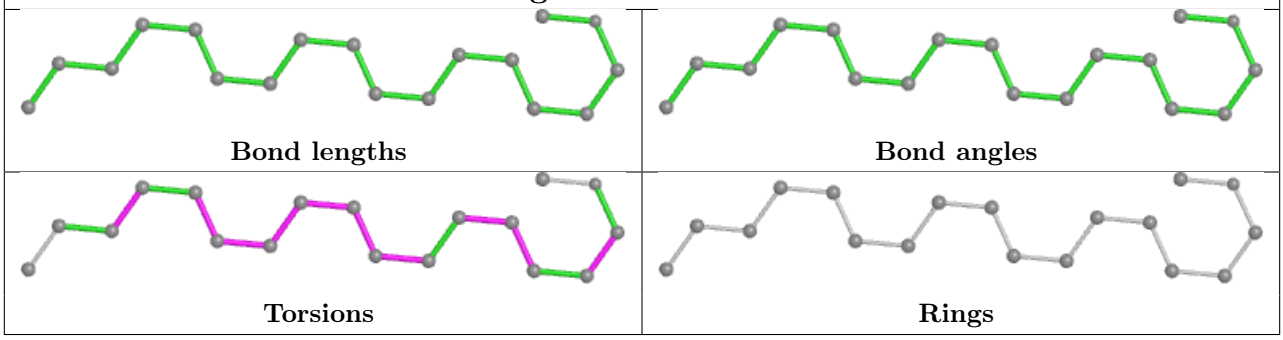
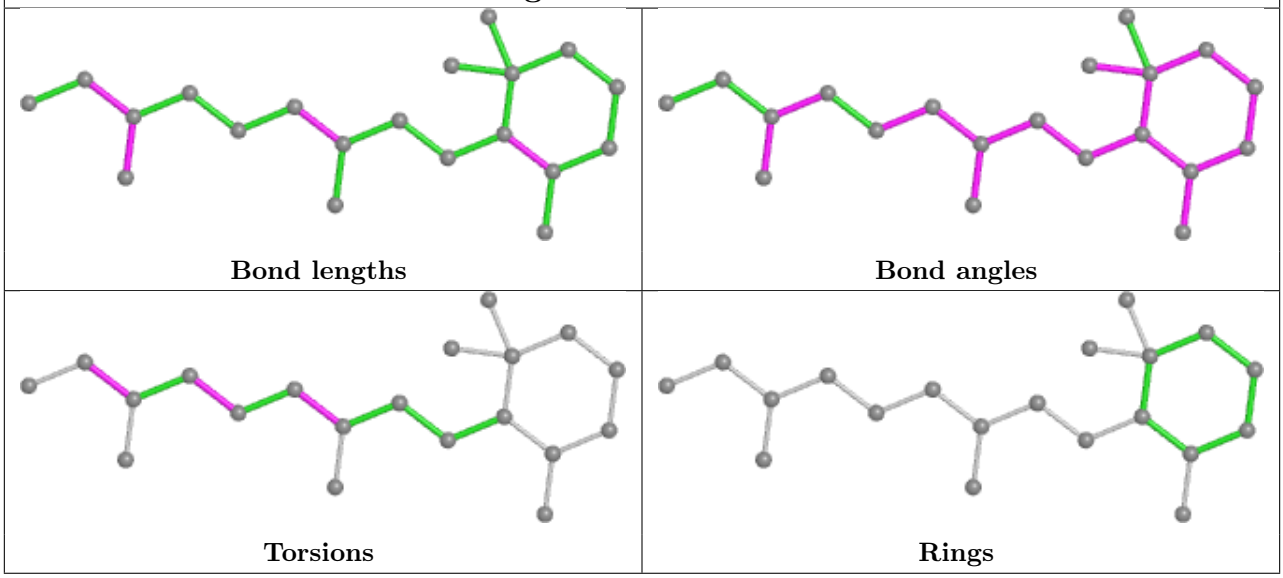
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	304	L2P	4	0
3	A	302	L2P	16	0
3	A	305	L2P	5	0

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.

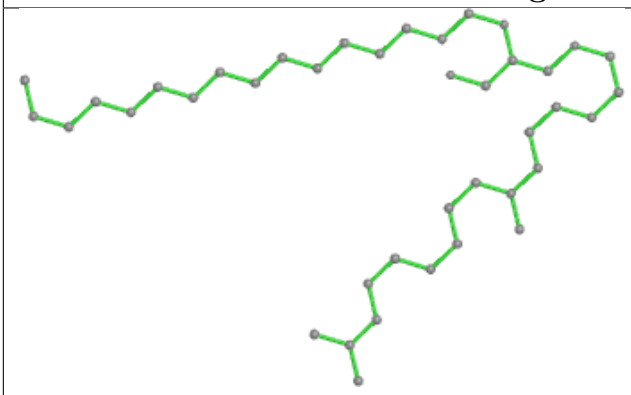
Ligand L2P A 310



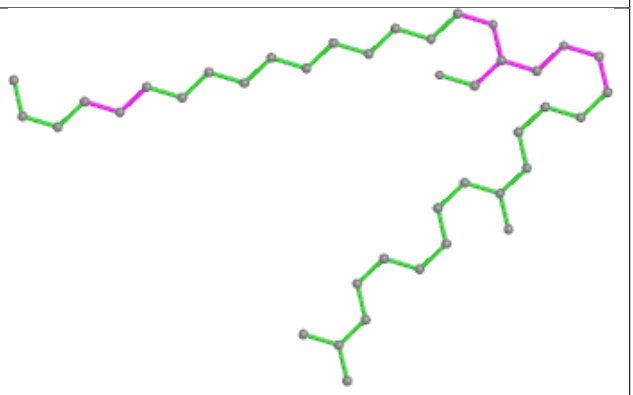
Ligand RET A 301



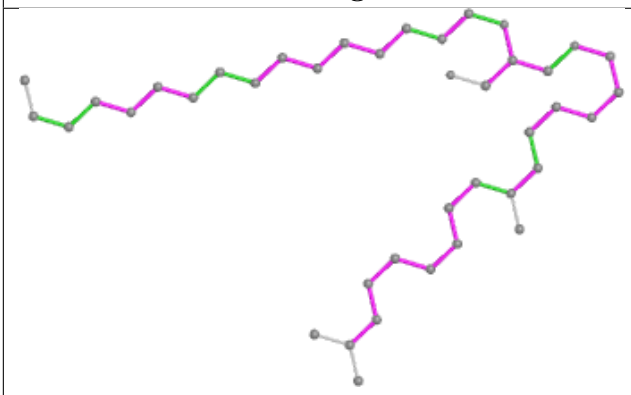
Ligand L2P A 303



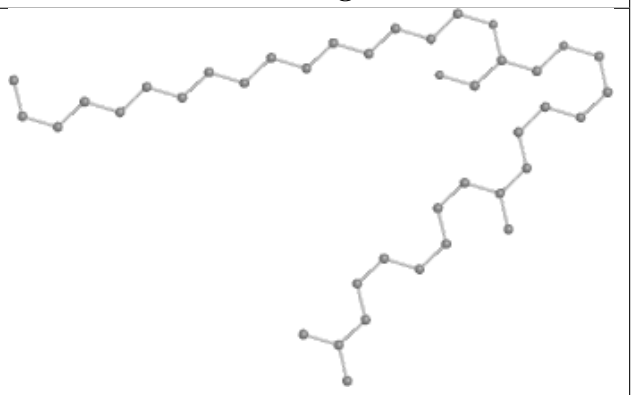
Bond lengths



Bond angles

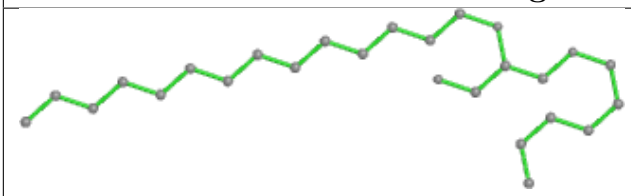


Torsions

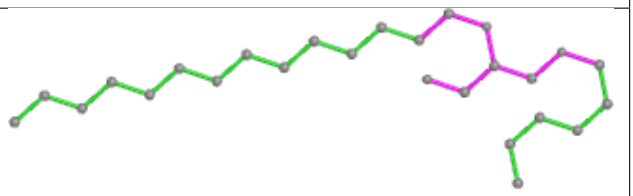


Rings

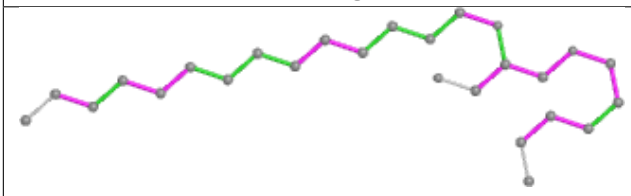
Ligand L2P A 307



Bond lengths



Bond angles



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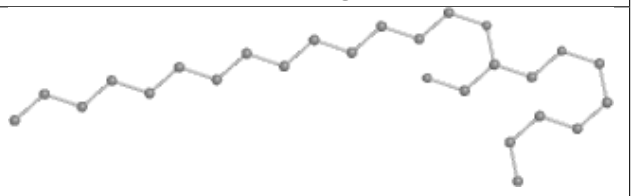
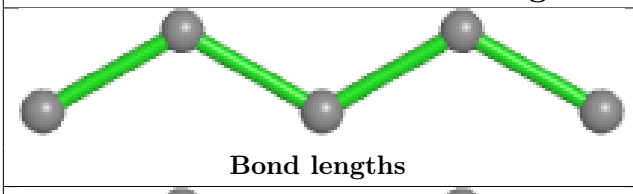
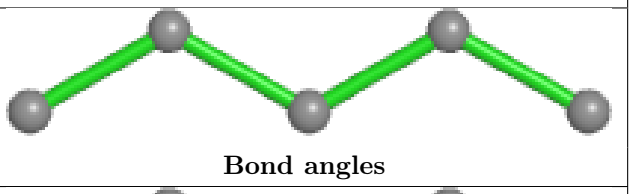


Rings

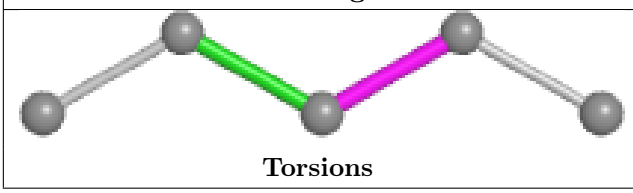
Ligand L2P A 308



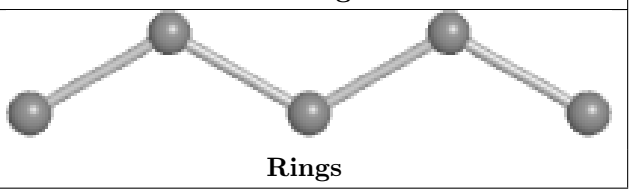
Bond lengths



Bond angles

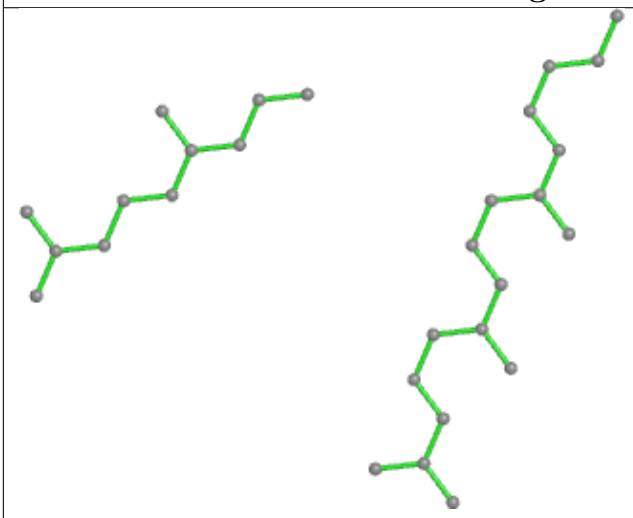


Torsions

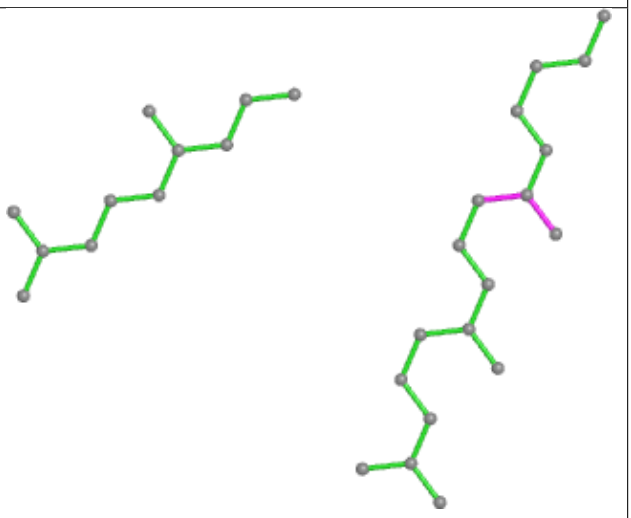


Rings

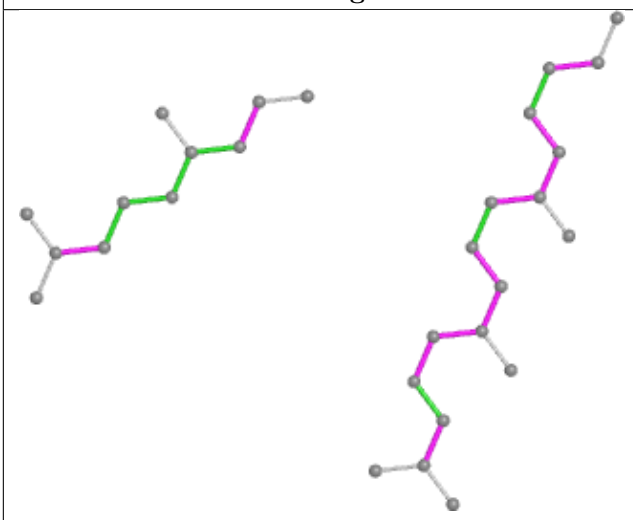
Ligand L2P A 304



Bond lengths



Bond angles



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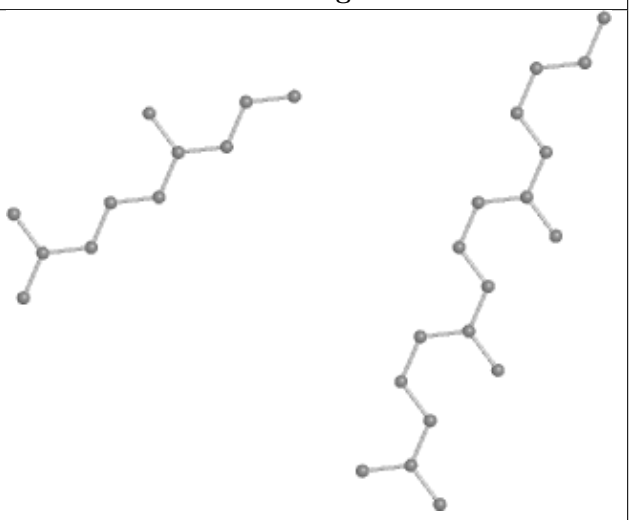
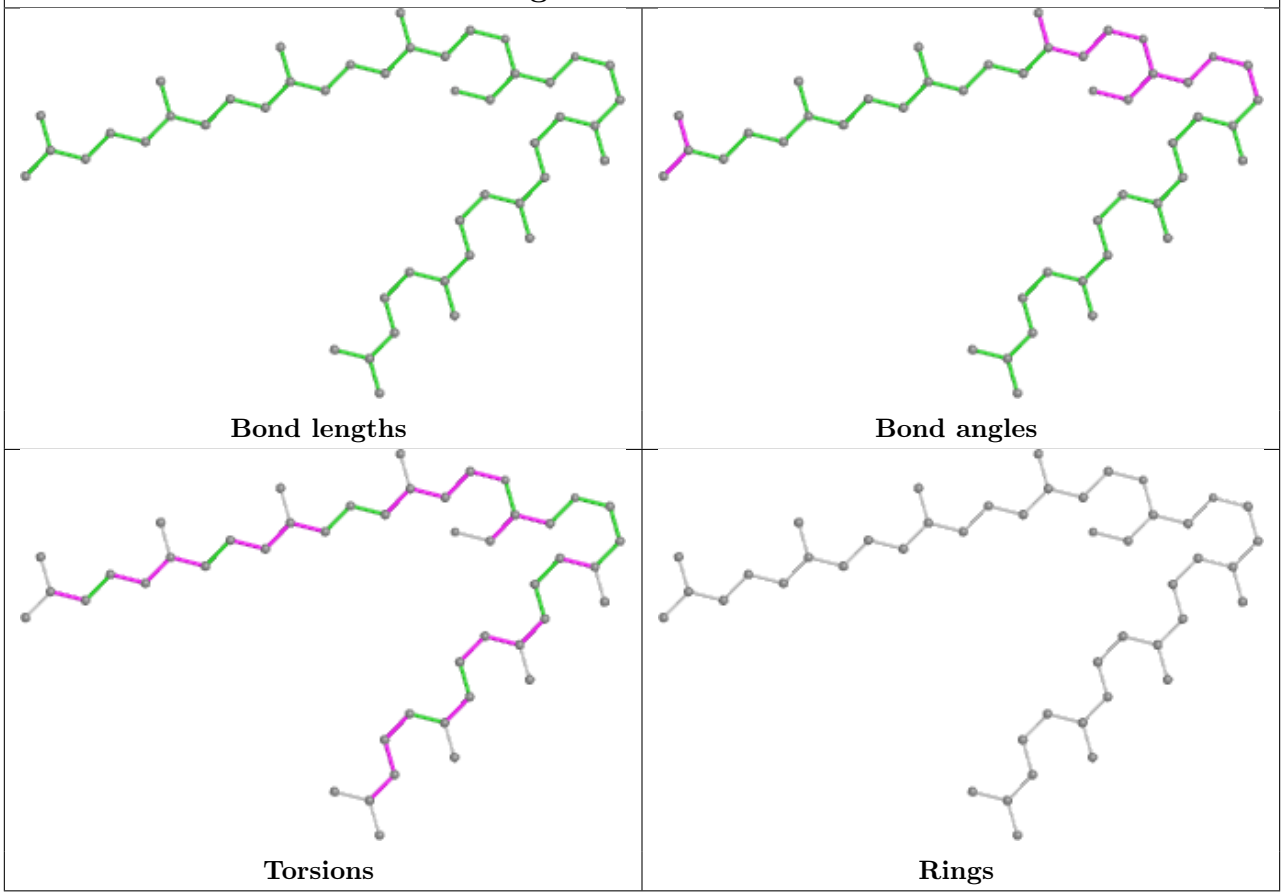


Rings

Ligand L2P A 302



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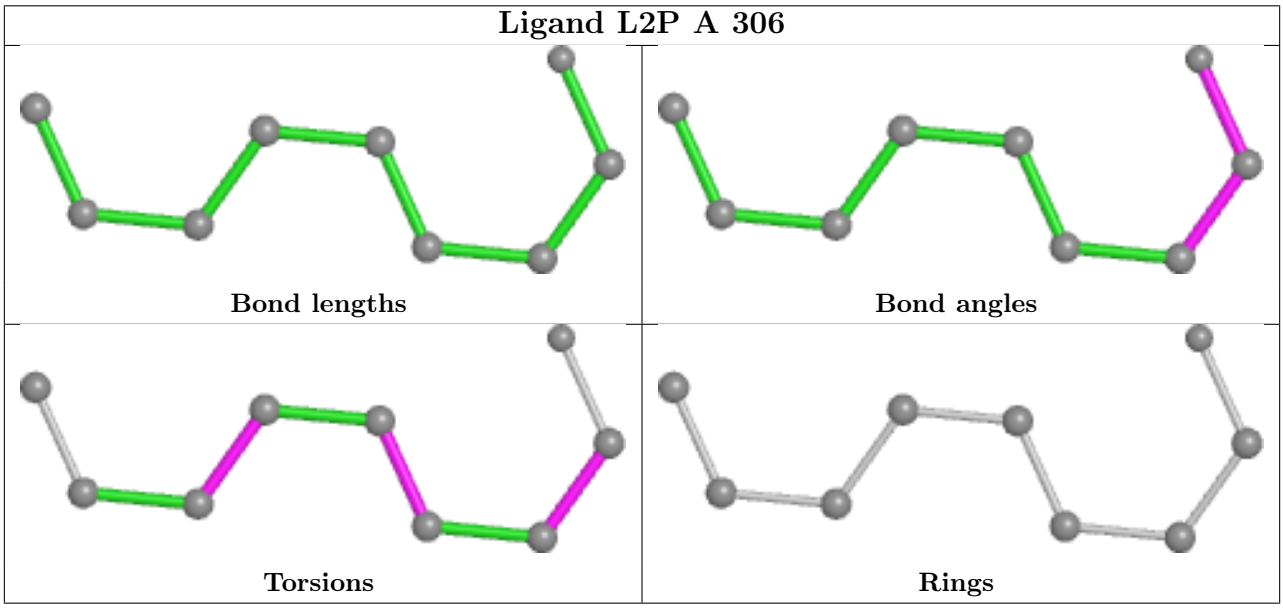

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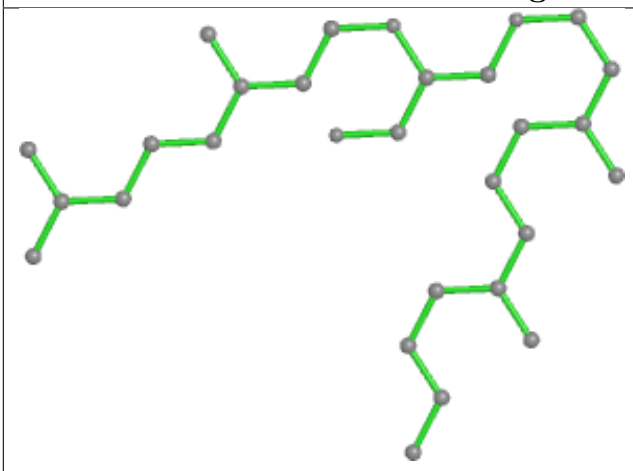
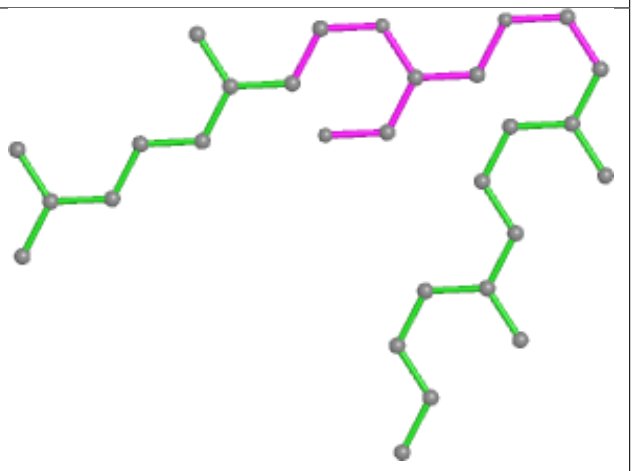
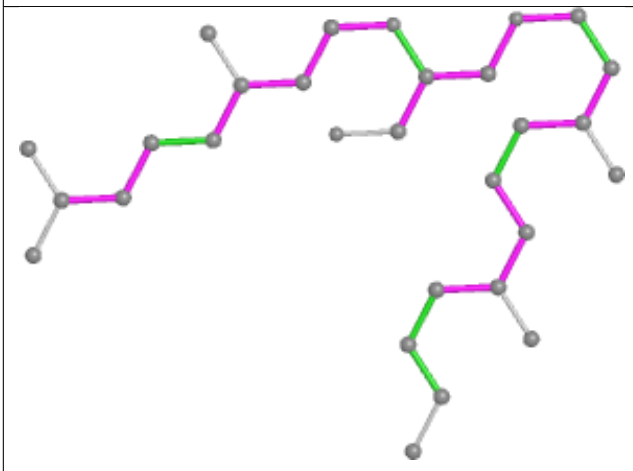


Bond lengths



Bond angles



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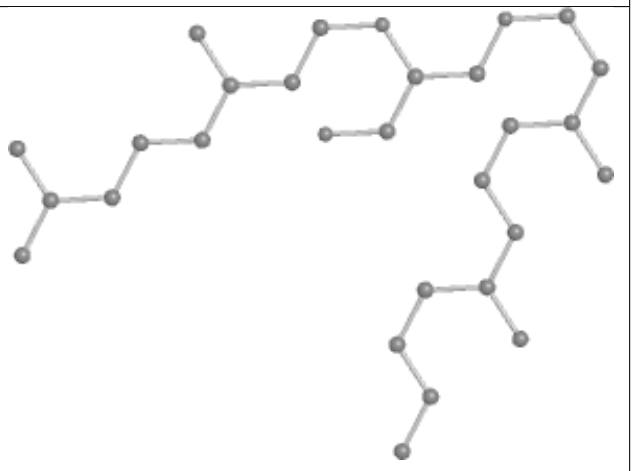
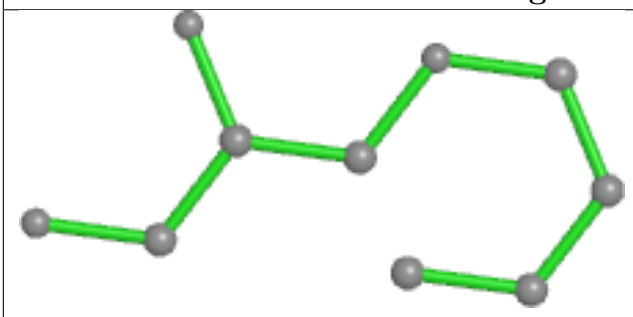
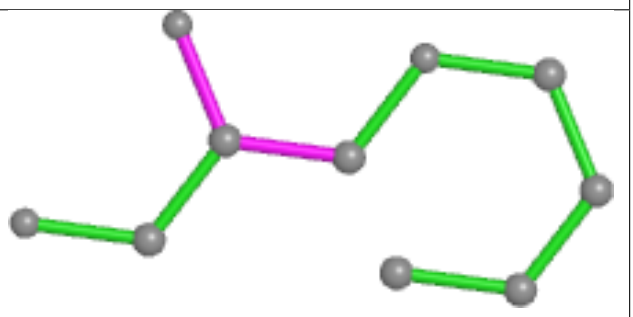


Rings

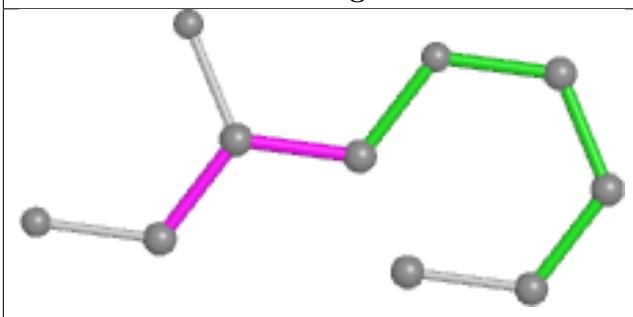
Ligand L2P A 309



Bond lengths



Bond angles



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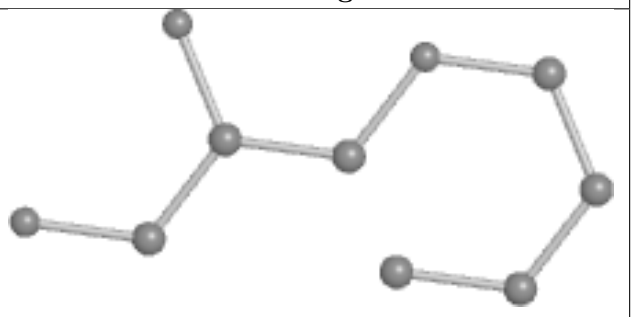
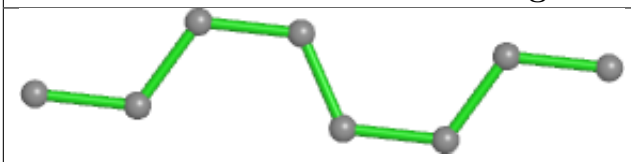
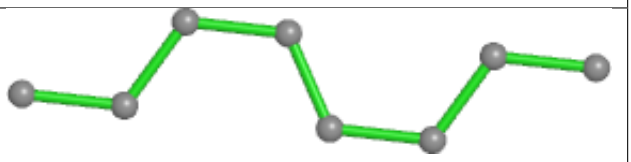
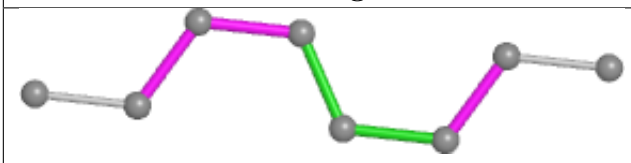
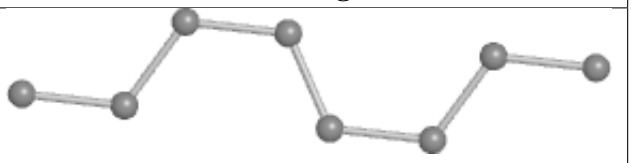


Rings

Ligand L2P A 311	
 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	230/230 (100%)	-0.77	2 (0%)	84	87	14, 23, 54, 89	0

All (2) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	161	GLU	2.4
1	A	157	THR	2.2

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

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

6.3 Carbohydrates

There are no monosaccharides in this entry.

6.4 Ligands

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	L2P	A	305	29/46	0.80	0.23	52,85,128,147	0
3	L2P	A	307	26/46	0.82	0.21	41,77,98,122	0
3	L2P	A	302	46/46	0.85	0.21	40,62,96,130	0
3	L2P	A	308	5/46	0.85	0.19	61,68,82,94	0
3	L2P	A	311	8/46	0.85	0.16	35,58,88,92	0

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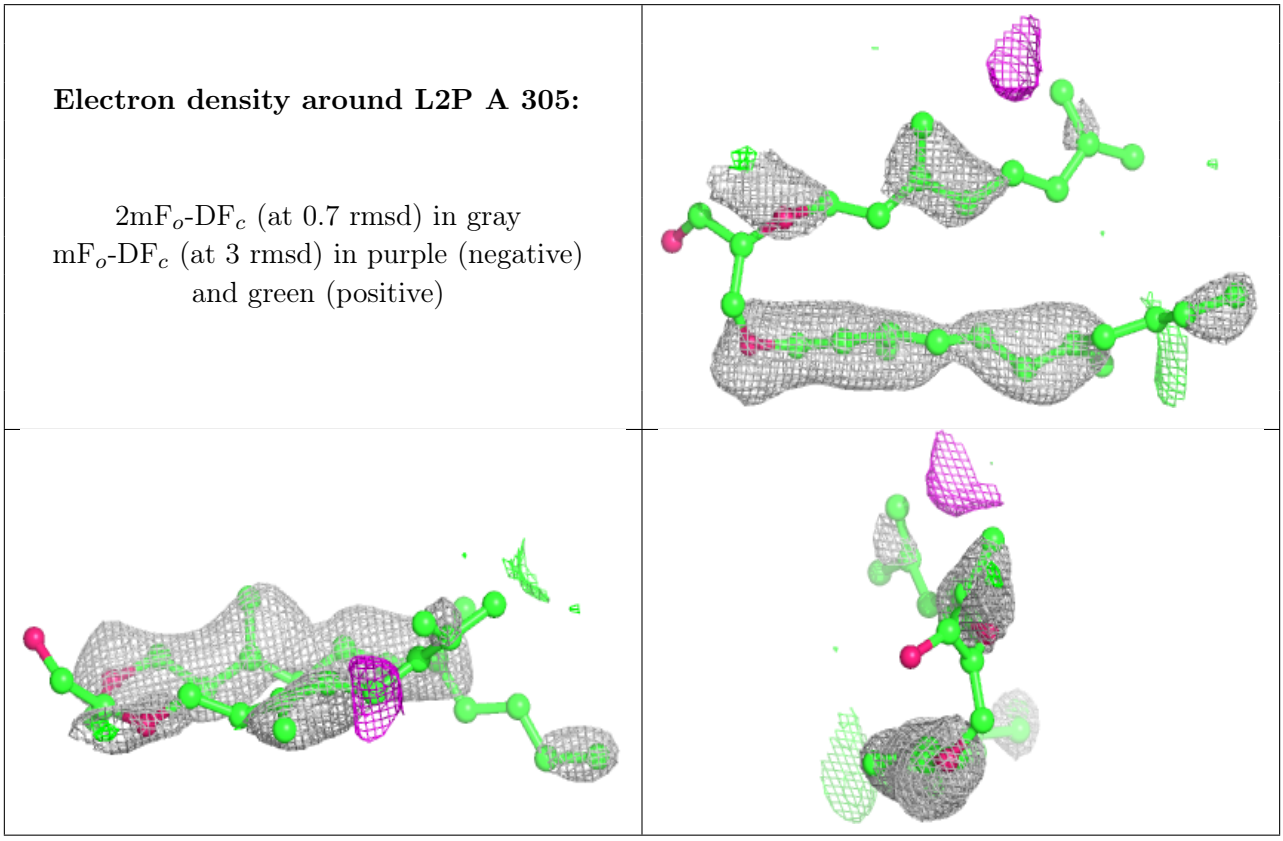
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
3	L2P	A	310	18/46	0.87	0.10	41,58,98,117	0
3	L2P	A	304	29/46	0.89	0.17	38,59,79,86	0
3	L2P	A	303	40/46	0.91	0.13	34,58,88,101	0
3	L2P	A	309	10/46	0.91	0.10	35,59,75,78	0
3	L2P	A	306	9/46	0.96	0.09	34,44,68,74	0
2	RET	A	301	20/21	0.98	0.05	12,15,22,22	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.

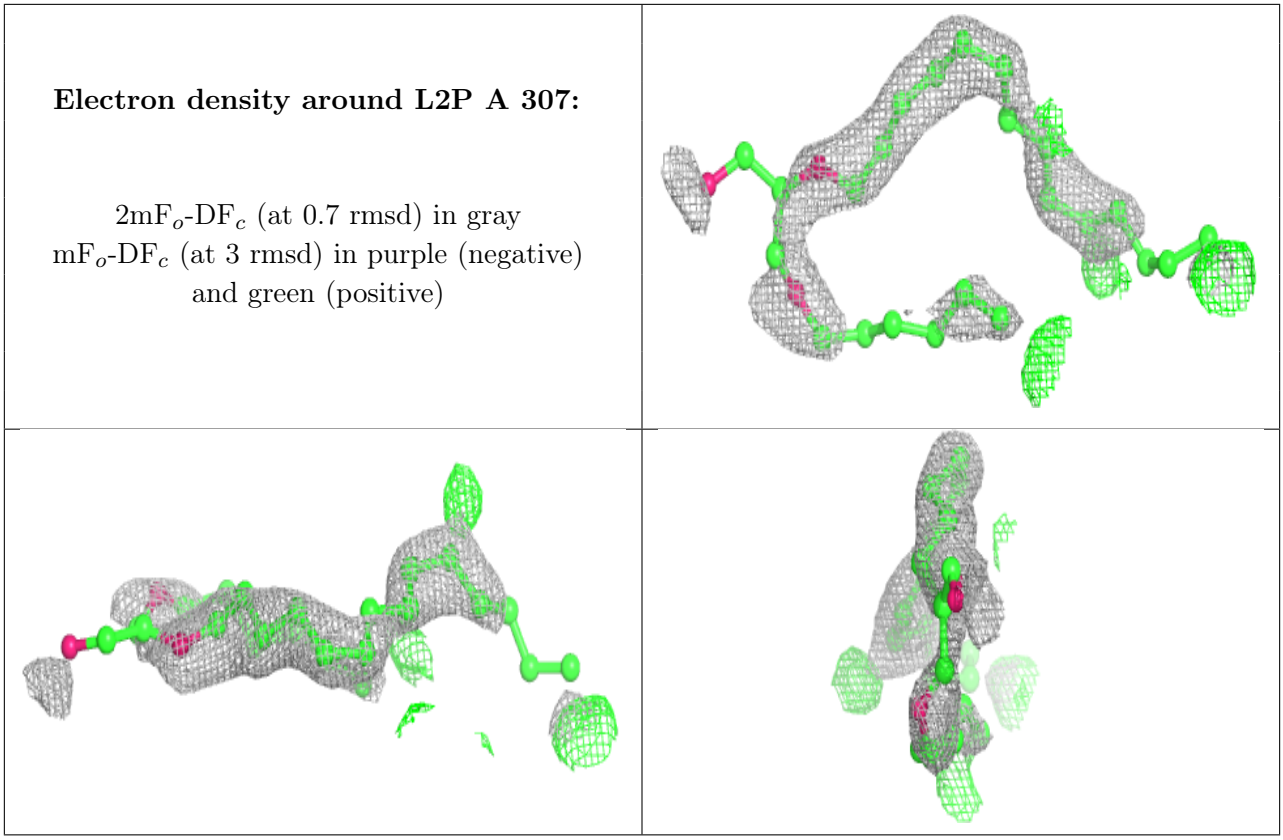
Electron density around L2P A 305:

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



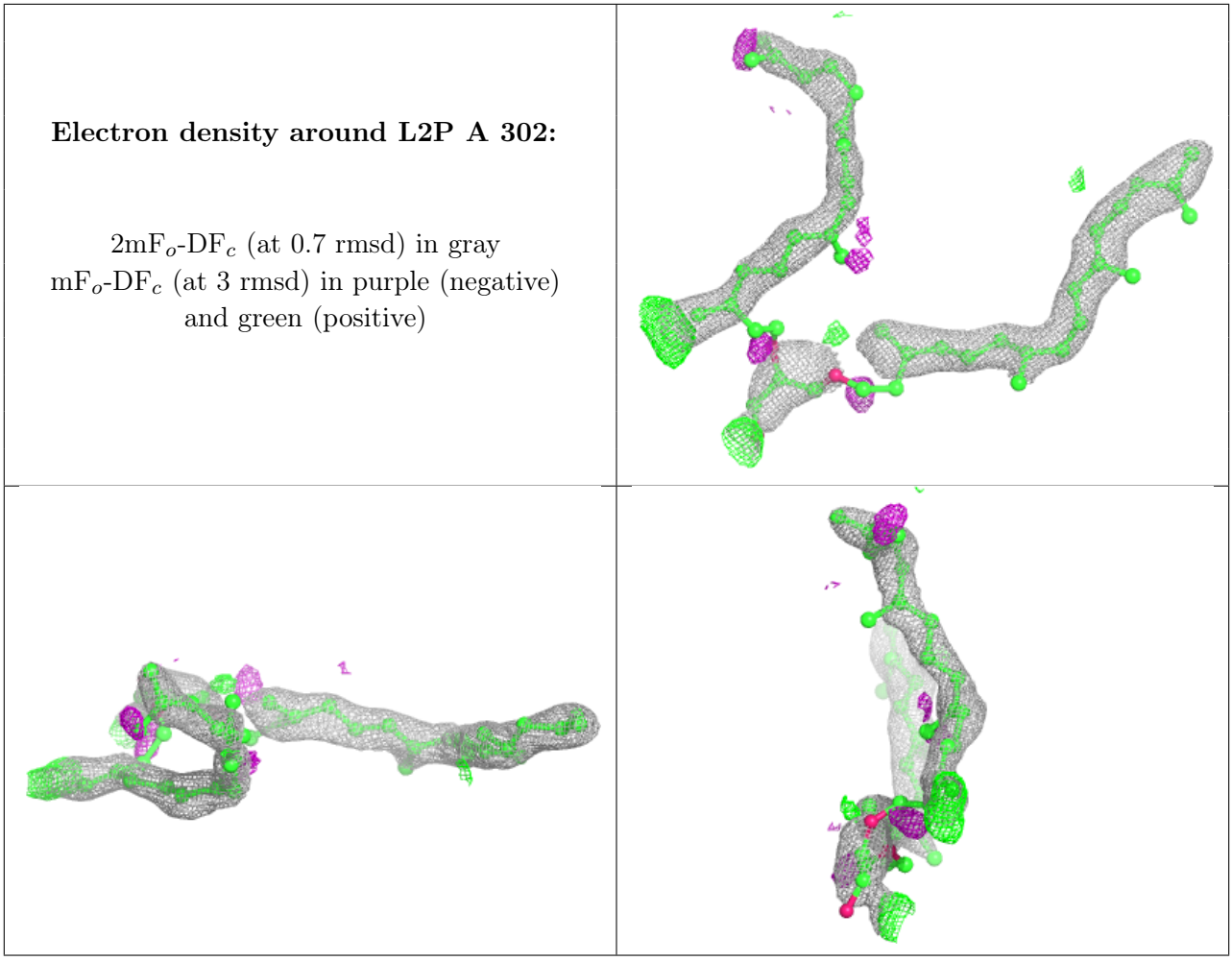
Electron density around L2P A 307:

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



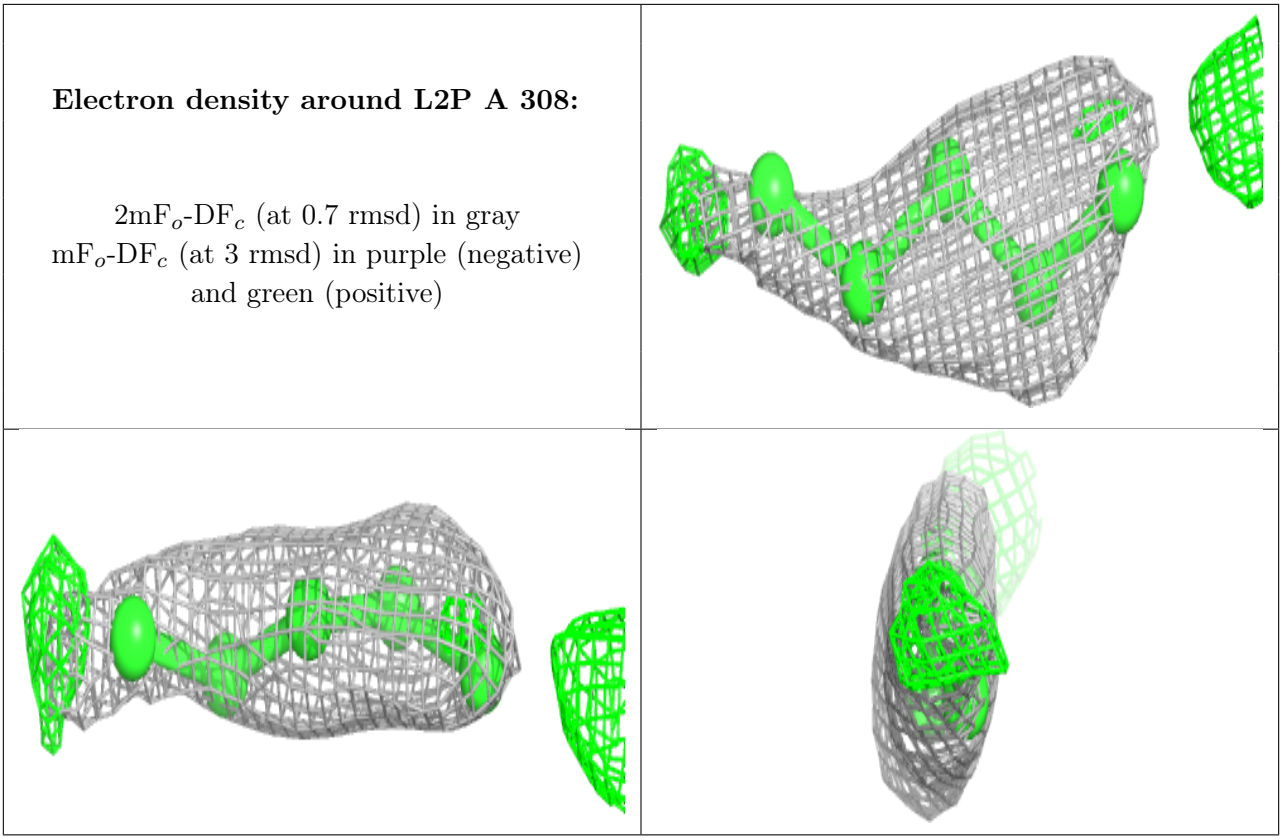
Electron density around L2P A 302:

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



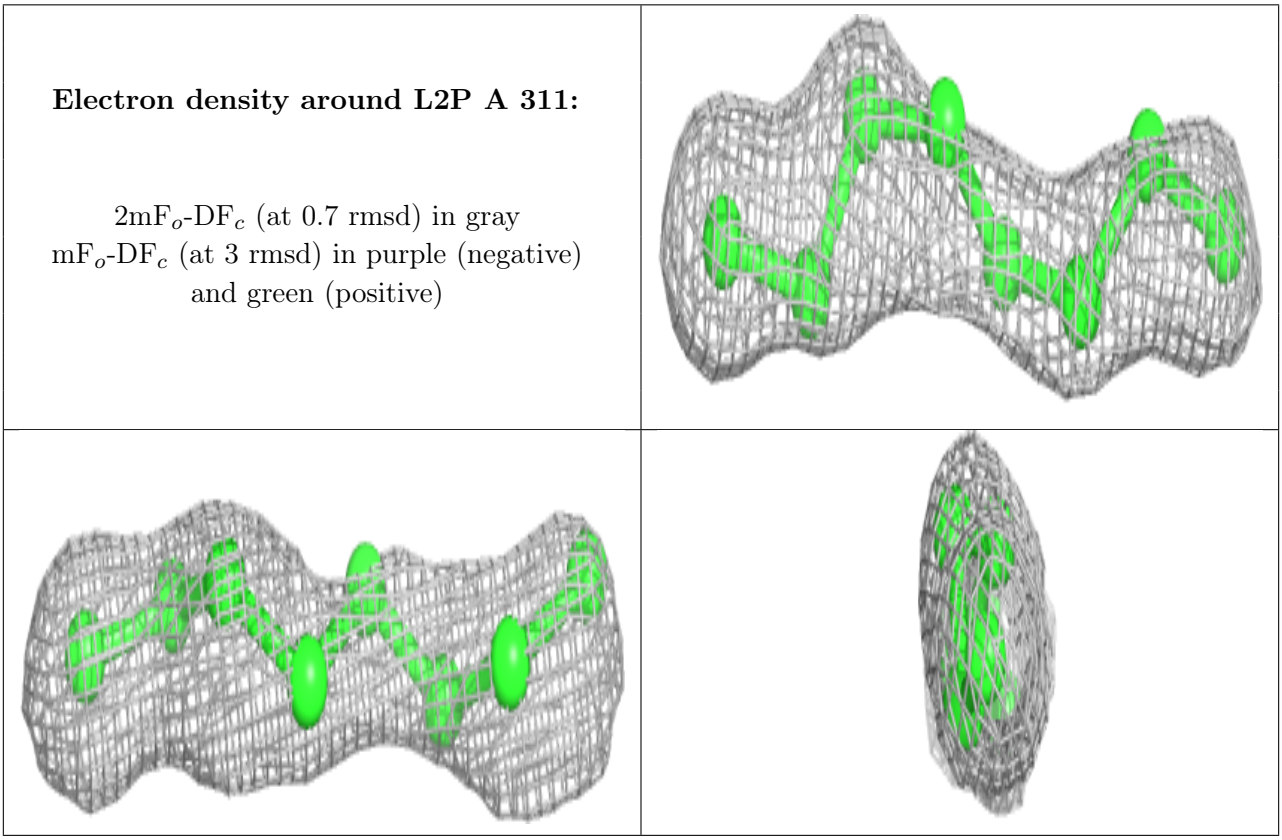
Electron density around L2P A 308:

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



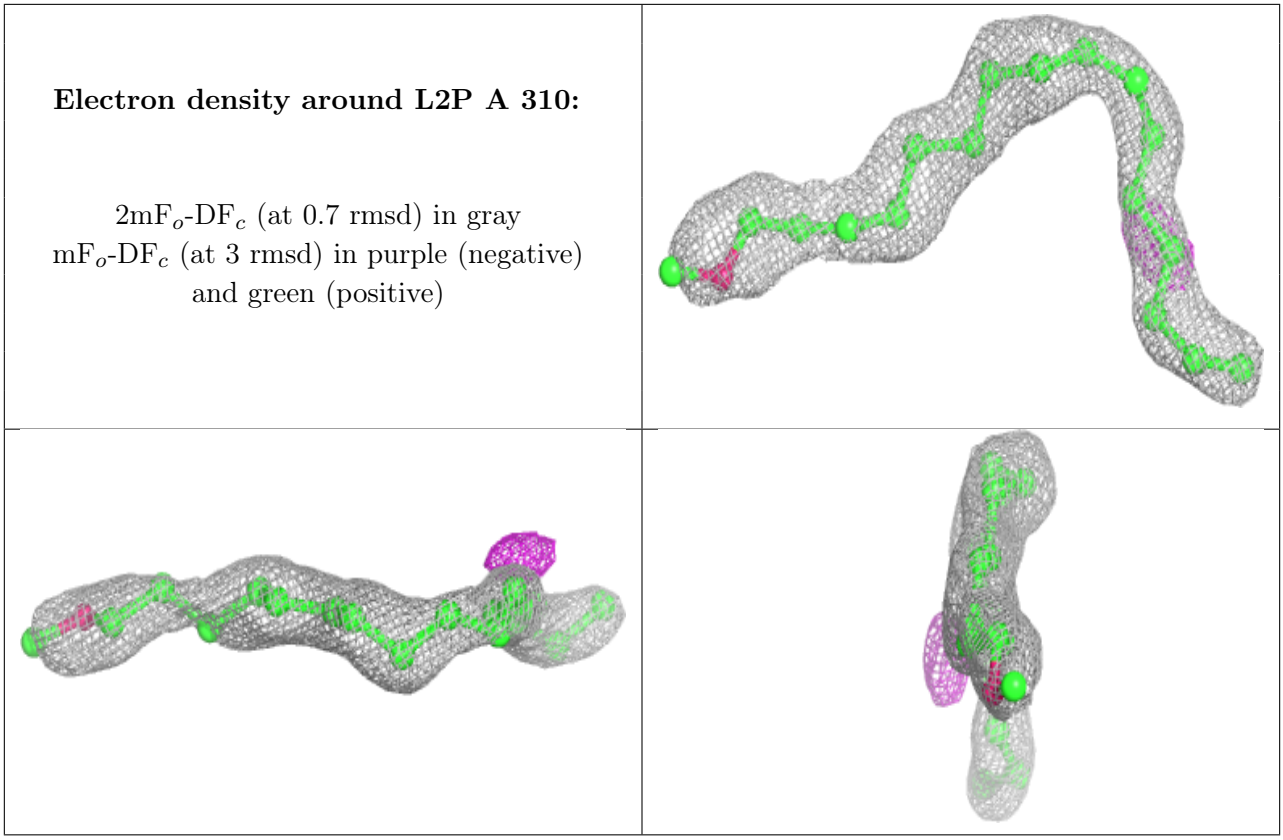
Electron density around L2P A 311:

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



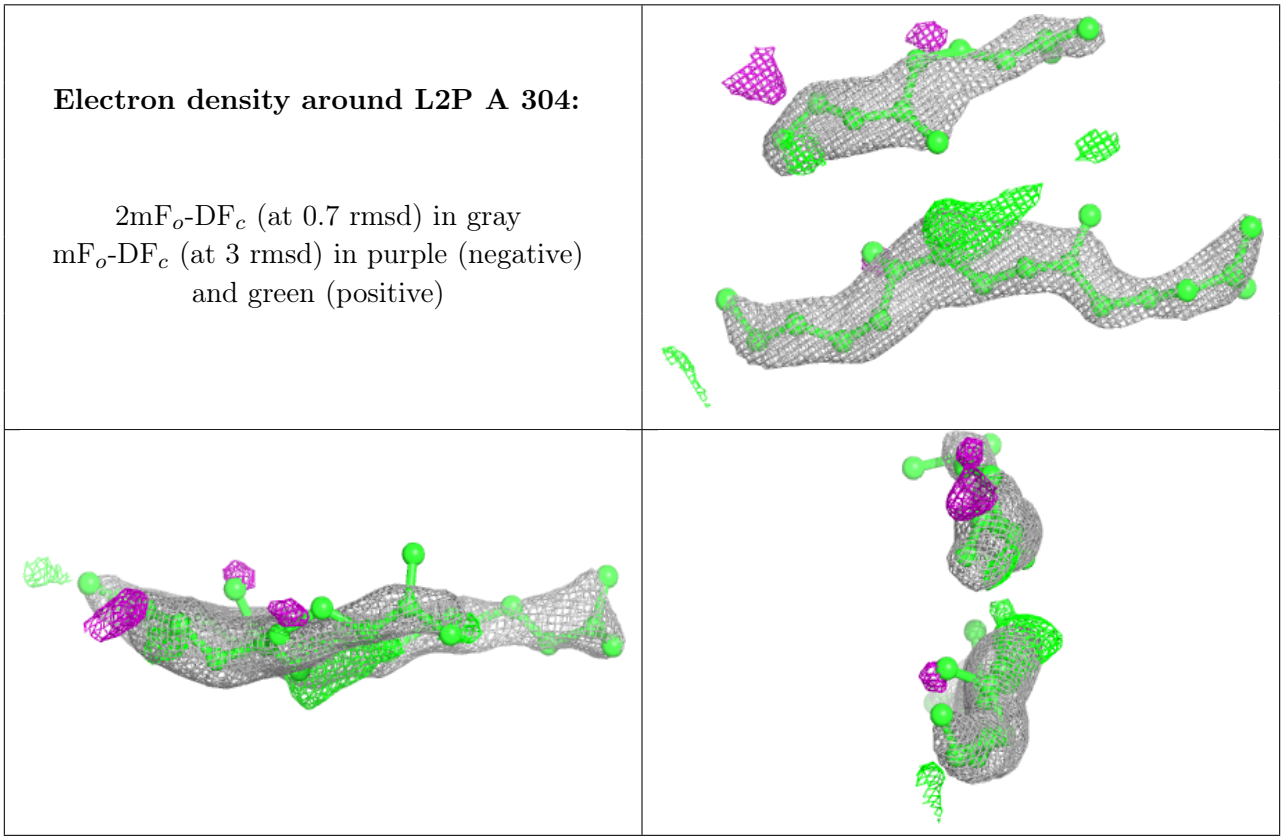
Electron density around L2P A 310:

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



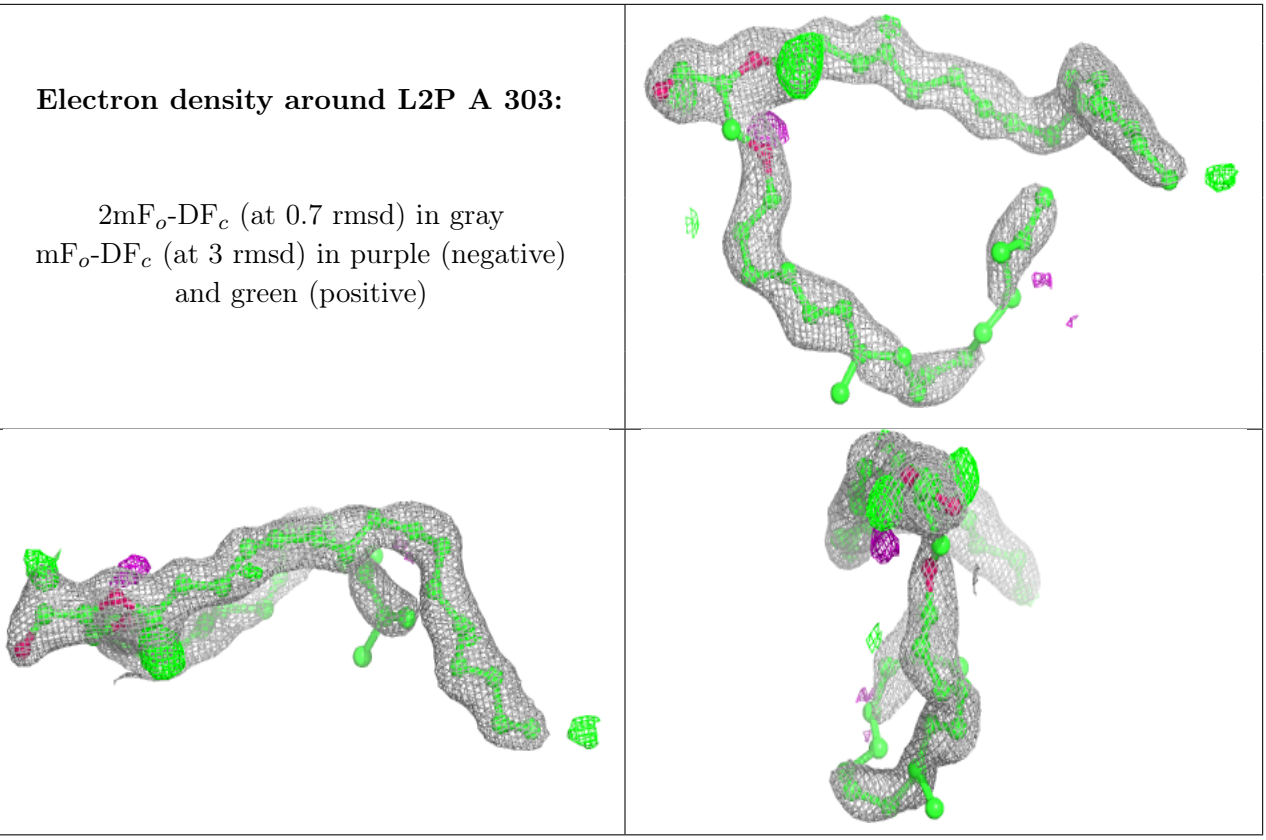
Electron density around L2P A 304:

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



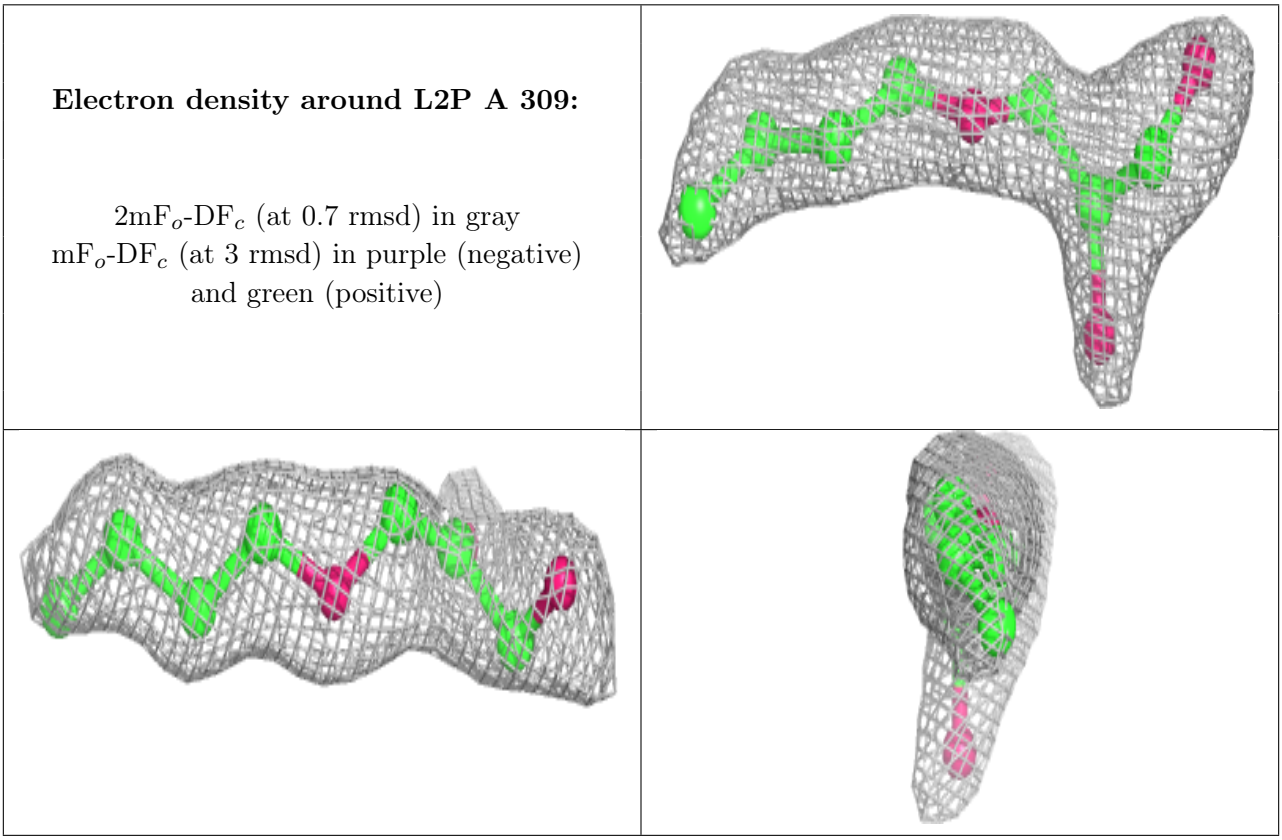
Electron density around L2P A 303:

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



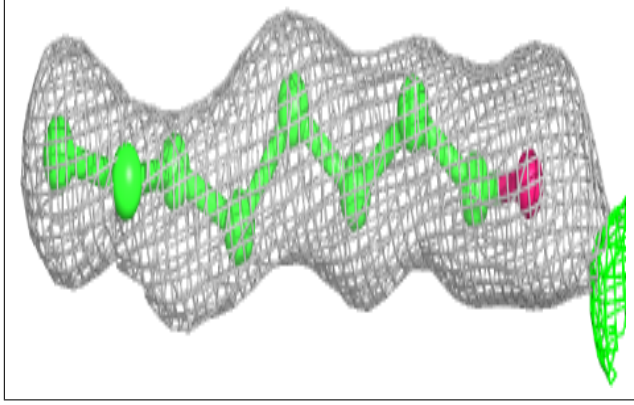
Electron density around L2P A 309:

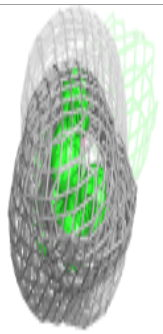
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)



Electron density around L2P A 306:

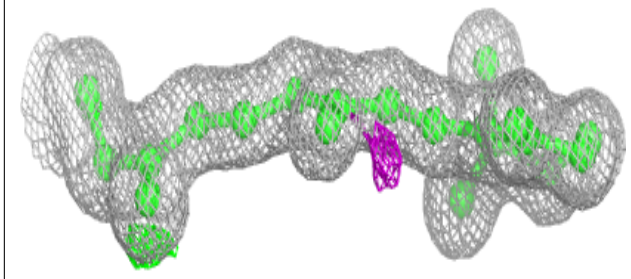
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

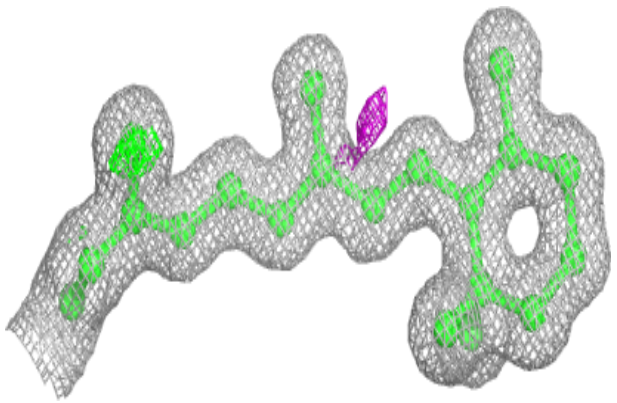


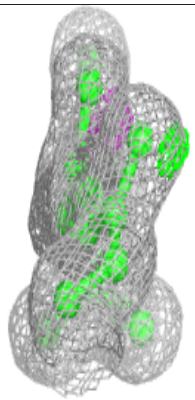


Electron density around RET A 301:

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







6.5 Other polymers (i)

There are no such residues in this entry.