



wwPDB X-ray Structure Validation Summary Report ⓘ

Dec 3, 2024 – 12:08 am GMT

PDB ID : 8R97
Title : Crystal structure of the cryorhodopsin CryoR2 at pH 4.6, type B crystals, non-illuminated state
Authors : Kovalev, K.; Lamm, G.H.U.; Marin, E.
Deposited on : 2023-11-30
Resolution : 3.00 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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 : 1.8.4, CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 3.0
buster-report : 1.1.7 (2018)
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4 : 9.0.003 (Gargrove)
Density-Fitness : 1.0.11
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.40

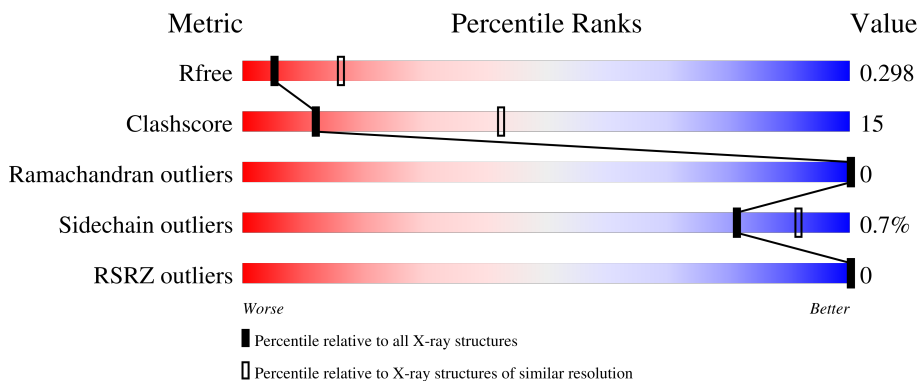
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.00 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}	164625	2511 (3.00-3.00)
Clashscore	180529	2866 (3.00-3.00)
Ramachandran outliers	177936	2778 (3.00-3.00)
Sidechain outliers	177891	2781 (3.00-3.00)
RSRZ outliers	164620	2523 (3.00-3.00)

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	327	 65% 22% 12%
1	B	327	 64% 24% 12%
1	C	327	 62% 25% 12%
1	D	327	 62% 26% 12%
1	E	327	 62% 25% 13%

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Mol	Chain	Length	Quality of chain
1	F	327	 64% 24% 12%
1	G	327	 65% 23% 12%
1	H	327	 61% 27% 12%
1	I	327	 64% 24% 11%
1	K	327	 62% 25% 13%

2 Entry composition [i](#)

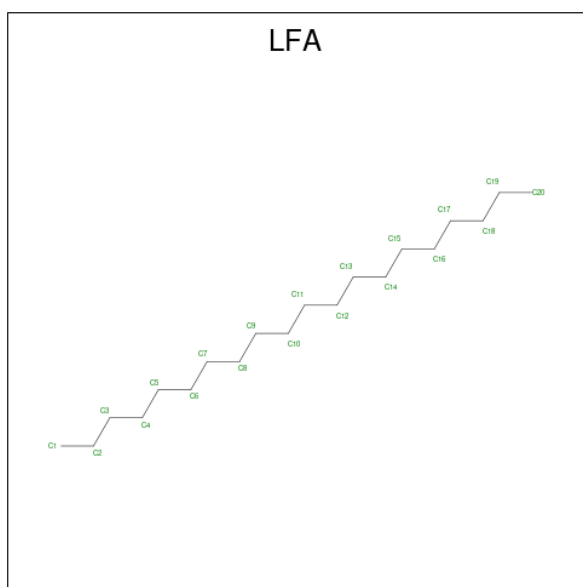
There are 5 unique types of molecules in this entry. The entry contains 21953 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 cryorhodopsin CryoR2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	287	Total 2146	C 1411	N 346	O 383	S 6	0	0	0
1	B	288	Total 2152	C 1413	N 349	O 384	S 6	0	0	0
1	C	287	Total 2138	C 1408	N 344	O 380	S 6	0	0	0
1	D	288	Total 2137	C 1407	N 342	O 382	S 6	0	0	0
1	E	286	Total 2132	C 1402	N 342	O 382	S 6	0	0	0
1	H	287	Total 2131	C 1402	N 344	O 379	S 6	0	0	0
1	G	288	Total 2149	C 1412	N 347	O 384	S 6	0	0	0
1	F	287	Total 2153	C 1413	N 351	O 383	S 6	0	0	0
1	I	290	Total 2138	C 1408	N 339	O 385	S 6	0	0	0
1	K	286	Total 2132	C 1402	N 342	O 382	S 6	0	0	0

- Molecule 2 is EICOSANE (three-letter code: LFA) (formula: C₂₀H₄₂).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	1	Total C 11 11	0	0
2	A	1	Total C 7 7	0	0
2	A	1	Total C 10 10	0	0
2	A	1	Total C 7 7	0	0
2	B	1	Total C 7 7	0	0
2	B	1	Total C 11 11	0	0
2	B	1	Total C 12 12	0	0
2	B	1	Total C 8 8	0	0
2	C	1	Total C 6 6	0	0
2	C	1	Total C 6 6	0	0
2	D	1	Total C 10 10	0	0
2	D	1	Total C 9 9	0	0
2	E	1	Total C 11 11	0	0
2	E	1	Total C 12 12	0	0

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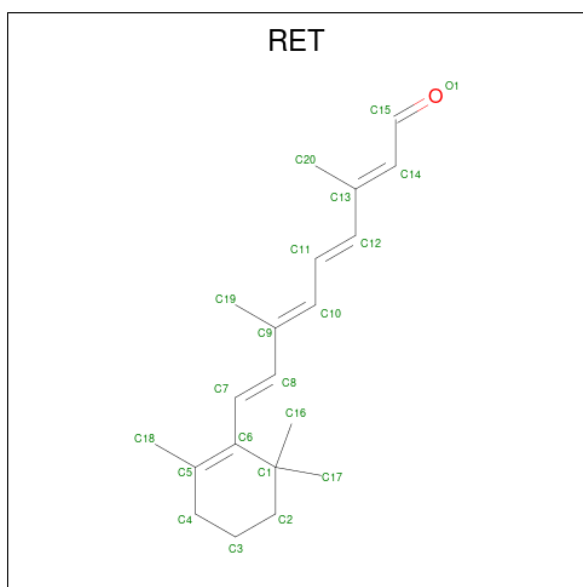
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	H	1	Total C 6 6	0	0
2	H	1	Total C 6 6	0	0
2	G	1	Total C 11 11	0	0
2	G	1	Total C 7 7	0	0
2	G	1	Total C 10 10	0	0
2	G	1	Total C 7 7	0	0
2	F	1	Total C 8 8	0	0
2	F	1	Total C 7 7	0	0
2	F	1	Total C 11 11	0	0
2	F	1	Total C 12 12	0	0
2	I	1	Total C 10 10	0	0
2	K	1	Total C 11 11	0	0
2	K	1	Total C 12 12	0	0
2	K	1	Total C 10 10	0	0

- Molecule 3 is PHOSPHATE ION (three-letter code: PO4) (formula: O₄P).



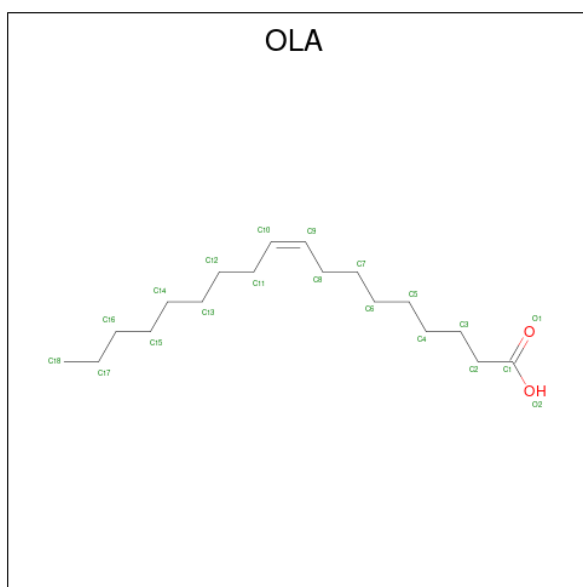
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	O	P	0	0
			5	4	1		
3	B	1	Total	O	P	0	0
			5	4	1		
3	C	1	Total	O	P	0	0
			5	4	1		
3	D	1	Total	O	P	0	0
			5	4	1		
3	E	1	Total	O	P	0	0
			5	4	1		
3	H	1	Total	O	P	0	0
			5	4	1		
3	G	1	Total	O	P	0	0
			5	4	1		
3	F	1	Total	O	P	0	0
			5	4	1		
3	I	1	Total	O	P	0	0
			5	4	1		
3	K	1	Total	O	P	0	0
			5	4	1		

- Molecule 4 is RETINAL (three-letter code: RET) (formula: C₂₀H₂₈O) (labeled as "Ligand of Interest" by depositor).



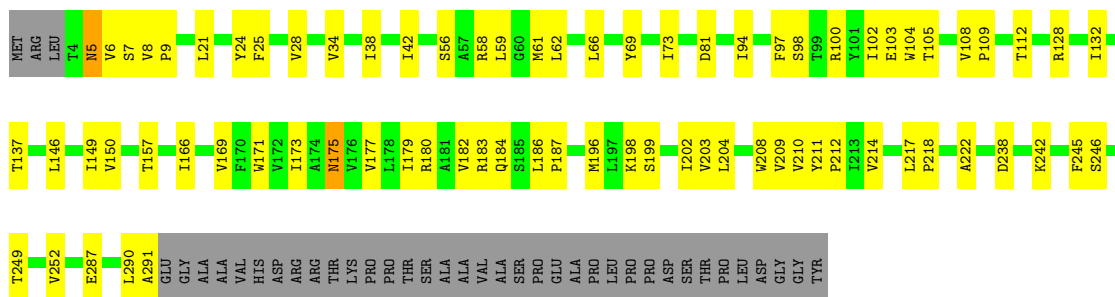
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total C 20 20	0	0
4	B	1	Total C 20 20	0	0
4	C	1	Total C 20 20	0	0
4	D	1	Total C 20 20	0	0
4	E	1	Total C 20 20	0	0
4	H	1	Total C 20 20	0	0
4	G	1	Total C 20 20	0	0
4	F	1	Total C 20 20	0	0
4	I	1	Total C 20 20	0	0
4	K	1	Total C 20 20	0	0

- Molecule 5 is OLEIC ACID (three-letter code: OLA) (formula: $C_{18}H_{34}O_2$).



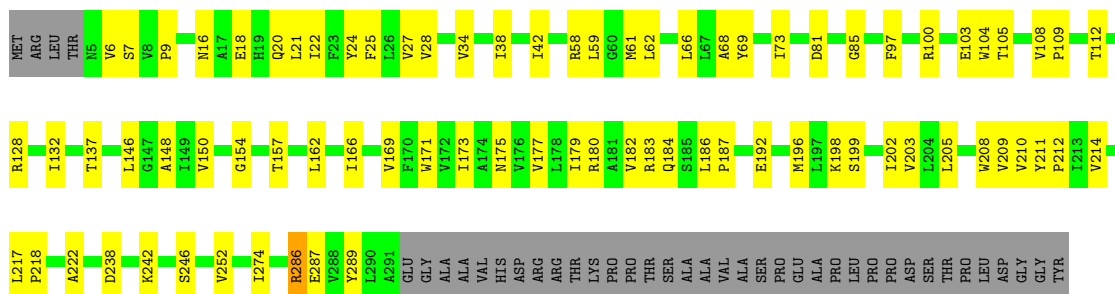
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf	
5	D	1	Total	C	O	0	0
			20	18	2		
5	I	1	Total	C	O	0	0
			20	18	2		

Chain G:  65% 23% 12%



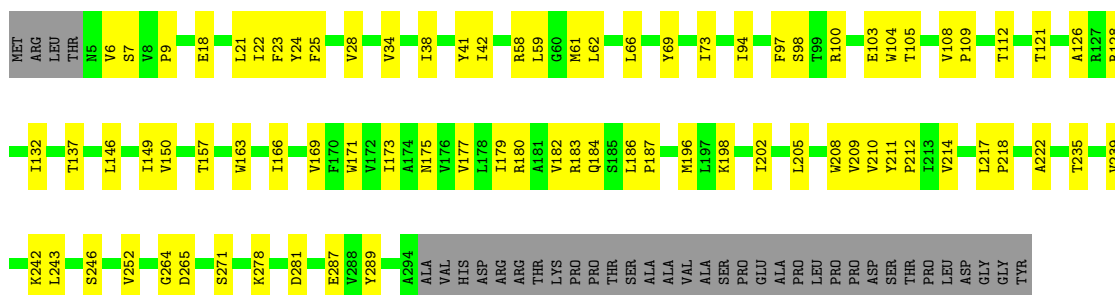
• Molecule 1: cryorhodopsin CryoR2

Chain F:  64% 24% 12%



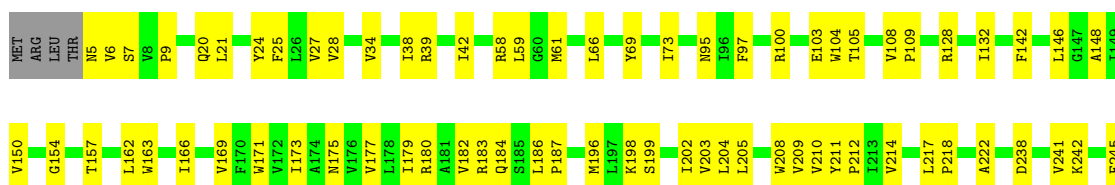
• Molecule 1: cryorhodopsin CryoR2

Chain I:  64% 24% 11%



• Molecule 1: cryorhodopsin CryoR2

Chain K:  62% 25% 13%



S246	T247	Q248	T249	H250	R251	V252	D265	D266	K278	D281	E287	L290	ALA	GLU	GLY	ALA	ALA	ALA	VAL	HIS	ASP	ARG	ARG	THR	LYS	PRO	PRO	THR	THR	SER	ALA	ALA	VAL	ALA	ALA	PRO	GLU	GLU	ALA	PRO	LEU	PRO	PRO	ASP	THR	THR	PRO	LEU	ASP	GLY	GLY	TYR
------	------	------	------	------	------	------	------	------	------	------	------	------	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

4 Data and refinement statistics i

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	149.76Å 84.98Å 296.40Å 90.00° 96.83° 90.00°	Depositor
Resolution (Å)	20.00 – 3.00 20.00 – 3.00	Depositor EDS
% Data completeness (in resolution range)	86.6 (20.00-3.00) 86.6 (20.00-3.00)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.43 (at 2.98Å)	Xtrriage
Refinement program	REFMAC 5.8.0267	Depositor
R, R_{free}	0.266 , 0.301 0.270 , 0.298	Depositor DCC
R_{free} test set	3706 reflections (4.94%)	wwPDB-VP
Wilson B-factor (Å ²)	89.2	Xtrriage
Anisotropy	0.101	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.29 , 44.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.45$, $\langle L^2 \rangle = 0.28$	Xtrriage
Estimated twinning fraction	0.000 for $1/2^*h-3/2^*k,-1/2^*h-1/2^*k,-1/2^*h+1/2^*k-1$ 0.000 for $1/2^*h+3/2^*k,1/2^*h-1/2^*k,-1/2^*h-1/2^*k-1$	Xtrriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	21953	wwPDB-VP
Average B, all atoms (Å ²)	90.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 43.57 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 1.7304e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: RET, OLA, LFA, 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	0.67	0/2194	0.67	0/3013
1	B	0.66	0/2200	0.67	0/3022
1	C	0.67	0/2186	0.68	0/3003
1	D	0.67	0/2185	0.68	0/3004
1	E	0.66	0/2179	0.67	0/2994
1	F	0.66	0/2201	0.68	0/3022
1	G	0.67	0/2197	0.67	0/3018
1	H	0.67	0/2178	0.68	0/2992
1	I	0.67	0/2185	0.68	0/3004
1	K	0.67	0/2179	0.67	0/2994
All	All	0.67	0/21884	0.68	0/30066

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	2146	0	2186	66	0
1	B	2152	0	2192	69	0
1	C	2138	0	2176	73	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	D	2137	0	2171	75	0
1	E	2132	0	2171	73	0
1	F	2153	0	2201	65	0
1	G	2149	0	2187	67	0
1	H	2131	0	2169	75	0
1	I	2138	0	2164	68	0
1	K	2132	0	2171	67	0
2	A	35	0	66	1	0
2	B	38	0	72	2	0
2	C	12	0	22	0	0
2	D	19	0	33	1	0
2	E	23	0	44	1	0
2	F	38	0	72	2	0
2	G	35	0	66	1	0
2	H	12	0	22	1	0
2	I	10	0	19	0	0
2	K	33	0	60	1	0
3	A	5	0	0	0	0
3	B	5	0	0	0	0
3	C	5	0	0	0	0
3	D	5	0	0	1	0
3	E	5	0	0	0	0
3	F	5	0	0	1	0
3	G	5	0	0	0	0
3	H	5	0	0	1	0
3	I	5	0	0	0	0
3	K	5	0	0	0	0
4	A	20	0	27	6	0
4	B	20	0	27	7	0
4	C	20	0	27	5	0
4	D	20	0	27	5	0
4	E	20	0	27	6	0
4	F	20	0	27	7	0
4	G	20	0	27	6	0
4	H	20	0	27	6	0
4	I	20	0	27	6	0
4	K	20	0	27	6	0
5	D	20	0	33	1	0
5	I	20	0	33	2	0
All	All	21953	0	22600	687	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 15.

The worst 5 of 687 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:C:31:LEU:O	1:C:34:VAL:HG12	1.60	1.01
1:H:31:LEU:O	1:H:34:VAL:HG12	1.58	0.99
1:E:5:ASN:HB2	1:E:157:THR:OG1	1.64	0.96
1:D:39:ARG:HG2	1:E:56:SER:HB2	1.49	0.94
1:K:5:ASN:HB2	1:K:157:THR:OG1	1.70	0.91

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	285/327 (87%)	271 (95%)	14 (5%)	0	100	100
1	B	286/327 (88%)	269 (94%)	17 (6%)	0	100	100
1	C	285/327 (87%)	269 (94%)	16 (6%)	0	100	100
1	D	286/327 (88%)	272 (95%)	14 (5%)	0	100	100
1	E	284/327 (87%)	268 (94%)	16 (6%)	0	100	100
1	F	285/327 (87%)	270 (95%)	15 (5%)	0	100	100
1	G	286/327 (88%)	273 (96%)	13 (4%)	0	100	100
1	H	285/327 (87%)	270 (95%)	15 (5%)	0	100	100
1	I	288/327 (88%)	274 (95%)	14 (5%)	0	100	100
1	K	284/327 (87%)	267 (94%)	17 (6%)	0	100	100
All	All	2854/3270 (87%)	2703 (95%)	151 (5%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains [i](#)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	223/261 (85%)	221 (99%)	2 (1%)	75	89
1	B	224/261 (86%)	222 (99%)	2 (1%)	75	89
1	C	221/261 (85%)	219 (99%)	2 (1%)	75	89
1	D	221/261 (85%)	220 (100%)	1 (0%)	86	94
1	E	222/261 (85%)	222 (100%)	0	100	100
1	F	225/261 (86%)	222 (99%)	3 (1%)	65	85
1	G	223/261 (85%)	220 (99%)	3 (1%)	65	85
1	H	220/261 (84%)	218 (99%)	2 (1%)	75	89
1	I	219/261 (84%)	219 (100%)	0	100	100
1	K	222/261 (85%)	222 (100%)	0	100	100
All	All	2220/2610 (85%)	2205 (99%)	15 (1%)	81	91

5 of 15 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	H	88	VAL
1	F	162	LEU
1	H	162	LEU
1	F	286	ARG
1	G	175	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 15 such sidechains are listed below:

Mol	Chain	Res	Type
1	G	5	ASN
1	K	20	GLN
1	G	20	GLN
1	K	175	ASN
1	F	175	ASN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

50 ligands are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
4	RET	C	404	1	20,20,21	1.63	3 (15%)	27,27,28	1.05	1 (3%)
2	LFA	F	402	-	6,6,19	0.14	0	5,5,18	0.09	0
4	RET	D	405	1	20,20,21	1.66	3 (15%)	27,27,28	1.10	2 (7%)
4	RET	K	405	1	20,20,21	1.67	3 (15%)	27,27,28	1.04	1 (3%)
2	LFA	B	403	-	11,11,19	0.09	0	10,10,18	0.07	0
2	LFA	F	404	-	11,11,19	0.10	0	10,10,18	0.06	0
2	LFA	E	402	-	11,11,19	0.09	0	10,10,18	0.10	0
3	PO4	G	405	-	4,4,4	0.66	0	6,6,6	0.42	0
4	RET	H	404	1	20,20,21	1.60	3 (15%)	27,27,28	1.11	2 (7%)
2	LFA	H	402	-	5,5,19	0.17	0	4,4,18	0.11	0
2	LFA	I	402	-	9,9,19	0.10	0	8,8,18	0.08	0
4	RET	I	404	1	20,20,21	1.70	3 (15%)	27,27,28	1.13	2 (7%)
3	PO4	A	405	-	4,4,4	0.65	0	6,6,6	0.44	0
2	LFA	A	401	-	10,10,19	0.10	0	9,9,18	0.09	0
2	LFA	G	401	-	10,10,19	0.10	0	9,9,18	0.09	0
2	LFA	F	401	-	7,7,19	0.14	0	6,6,18	0.10	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
4	RET	B	406	1	20,20,21	1.62	4 (20%)	27,27,28	1.05	2 (7%)
3	PO4	K	404	-	4,4,4	0.64	0	6,6,6	0.45	0
2	LFA	K	403	-	9,9,19	0.08	0	8,8,18	0.09	0
3	PO4	H	403	-	4,4,4	0.63	0	6,6,6	0.43	0
3	PO4	C	403	-	4,4,4	0.66	0	6,6,6	0.44	0
2	LFA	E	401	-	10,10,19	0.11	0	9,9,18	0.08	0
5	OLA	I	401	-	19,19,19	0.52	0	19,19,19	0.46	0
2	LFA	D	402	-	9,9,19	0.10	0	8,8,18	0.09	0
4	RET	E	404	1	20,20,21	1.64	4 (20%)	27,27,28	1.06	1 (3%)
2	LFA	C	402	-	5,5,19	0.14	0	4,4,18	0.10	0
2	LFA	G	404	-	6,6,19	0.12	0	5,5,18	0.08	0
2	LFA	H	401	-	5,5,19	0.18	0	4,4,18	0.11	0
2	LFA	K	402	-	11,11,19	0.09	0	10,10,18	0.11	0
3	PO4	B	405	-	4,4,4	0.67	0	6,6,6	0.43	0
2	LFA	A	403	-	9,9,19	0.11	0	8,8,18	0.08	0
2	LFA	F	403	-	10,10,19	0.12	0	9,9,18	0.08	0
2	LFA	A	404	-	6,6,19	0.13	0	5,5,18	0.10	0
2	LFA	G	403	-	9,9,19	0.11	0	8,8,18	0.07	0
2	LFA	C	401	-	5,5,19	0.16	0	4,4,18	0.10	0
3	PO4	I	403	-	4,4,4	0.65	0	6,6,6	0.44	0
2	LFA	B	401	-	6,6,19	0.15	0	5,5,18	0.08	0
5	OLA	D	401	-	19,19,19	0.52	0	19,19,19	0.47	0
2	LFA	K	401	-	10,10,19	0.11	0	9,9,18	0.08	0
3	PO4	D	404	-	4,4,4	0.69	0	6,6,6	0.42	0
3	PO4	F	405	-	4,4,4	0.61	0	6,6,6	0.44	0
2	LFA	D	403	-	8,8,19	0.10	0	7,7,18	0.11	0
2	LFA	A	402	-	6,6,19	0.15	0	5,5,18	0.11	0
4	RET	G	406	1	20,20,21	1.60	3 (15%)	27,27,28	1.04	1 (3%)
2	LFA	B	402	-	10,10,19	0.11	0	9,9,18	0.09	0
4	RET	A	406	1	20,20,21	1.64	3 (15%)	27,27,28	1.08	2 (7%)
3	PO4	E	403	-	4,4,4	0.67	0	6,6,6	0.41	0
4	RET	F	406	1	20,20,21	1.64	4 (20%)	27,27,28	1.07	2 (7%)
2	LFA	G	402	-	6,6,19	0.15	0	5,5,18	0.10	0
2	LFA	B	404	-	7,7,19	0.12	0	6,6,18	0.07	0

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	RET	C	404	1	-	0/13/30/31	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	LFA	F	402	-	-	0/4/4/17	-
4	RET	D	405	1	-	0/13/30/31	0/1/1/1
4	RET	K	405	1	-	0/13/30/31	0/1/1/1
2	LFA	B	403	-	-	8/9/9/17	-
2	LFA	F	404	-	-	8/9/9/17	-
2	LFA	E	402	-	-	1/9/9/17	-
4	RET	H	404	1	-	0/13/30/31	0/1/1/1
2	LFA	H	402	-	-	0/3/3/17	-
2	LFA	I	402	-	-	0/7/7/17	-
4	RET	I	404	1	-	0/13/30/31	0/1/1/1
2	LFA	A	401	-	-	3/8/8/17	-
2	LFA	G	401	-	-	3/8/8/17	-
2	LFA	F	401	-	-	1/5/5/17	-
4	RET	B	406	1	-	0/13/30/31	0/1/1/1
2	LFA	K	403	-	-	0/7/7/17	-
2	LFA	E	401	-	-	2/8/8/17	-
5	OLA	I	401	-	-	8/17/17/17	-
2	LFA	D	402	-	-	0/7/7/17	-
4	RET	E	404	1	-	0/13/30/31	0/1/1/1
2	LFA	C	402	-	-	0/3/3/17	-
2	LFA	G	404	-	-	0/4/4/17	-
2	LFA	H	401	-	-	1/3/3/17	-
2	LFA	K	402	-	-	1/9/9/17	-
2	LFA	A	403	-	-	1/7/7/17	-
2	LFA	F	403	-	-	3/8/8/17	-
2	LFA	A	404	-	-	2/4/4/17	-
2	LFA	G	403	-	-	0/7/7/17	-
2	LFA	C	401	-	-	1/3/3/17	-
2	LFA	B	401	-	-	0/4/4/17	-
5	OLA	D	401	-	-	4/17/17/17	-
2	LFA	K	401	-	-	0/8/8/17	-
2	LFA	D	403	-	-	0/6/6/17	-
2	LFA	A	402	-	-	0/4/4/17	-
4	RET	G	406	1	-	0/13/30/31	0/1/1/1
2	LFA	B	402	-	-	4/8/8/17	-
4	RET	A	406	1	-	0/13/30/31	0/1/1/1
4	RET	F	406	1	-	0/13/30/31	0/1/1/1
2	LFA	G	402	-	-	0/4/4/17	-
2	LFA	B	404	-	-	1/5/5/17	-

The worst 5 of 33 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	G	406	RET	C10-C9	4.12	1.41	1.35
4	H	404	RET	C10-C9	4.10	1.41	1.35
4	E	404	RET	C10-C9	4.10	1.41	1.35
4	C	404	RET	C10-C9	4.06	1.41	1.35
4	I	404	RET	C10-C9	4.04	1.41	1.35

The worst 5 of 16 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	I	404	RET	C19-C9-C10	-4.18	117.07	122.92
4	D	405	RET	C19-C9-C10	-4.02	117.30	122.92
4	F	406	RET	C19-C9-C10	-3.98	117.34	122.92
4	E	404	RET	C19-C9-C10	-3.90	117.46	122.92
4	H	404	RET	C19-C9-C10	-3.89	117.47	122.92

There are no chirality outliers.

5 of 52 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	404	LFA	C15-C16-C17-C18
2	B	403	LFA	C5-C6-C7-C8
2	F	403	LFA	C6-C7-C8-C9
2	B	403	LFA	C7-C8-C9-C10
5	I	401	OLA	C13-C14-C15-C16

There are no ring outliers.

26 monomers are involved in 74 short contacts:

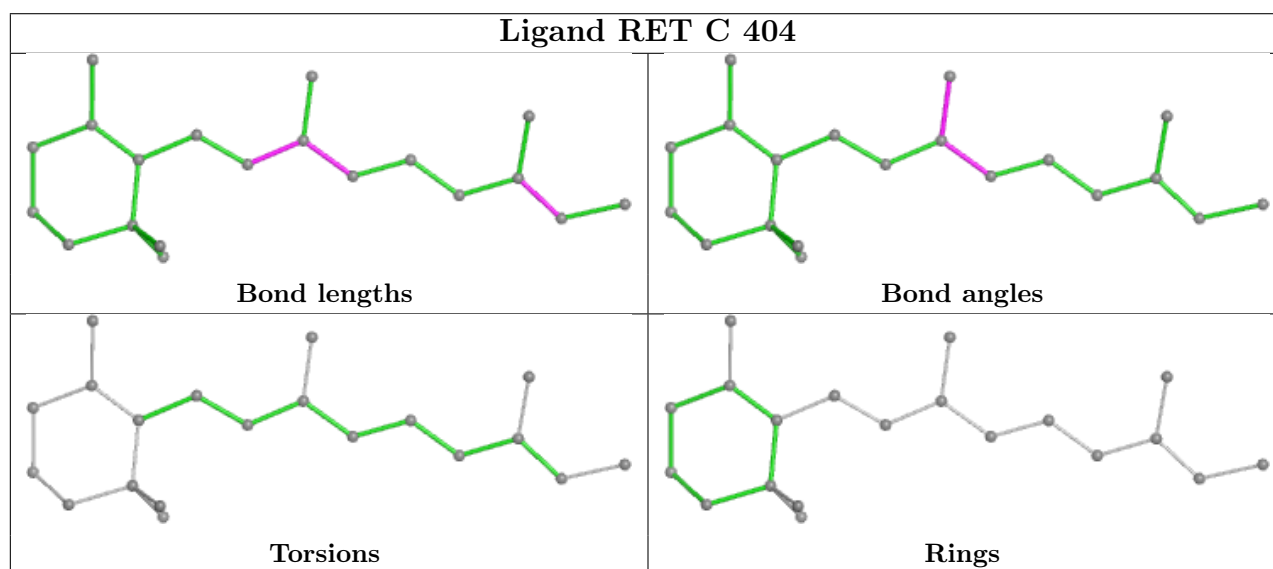
Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	C	404	RET	5	0
4	D	405	RET	5	0
4	K	405	RET	6	0
2	B	403	LFA	1	0
2	F	404	LFA	1	0
2	E	402	LFA	1	0
4	H	404	RET	6	0
4	I	404	RET	6	0
2	F	401	LFA	1	0
4	B	406	RET	7	0
3	H	403	PO4	1	0
5	I	401	OLA	2	0
2	D	402	LFA	1	0

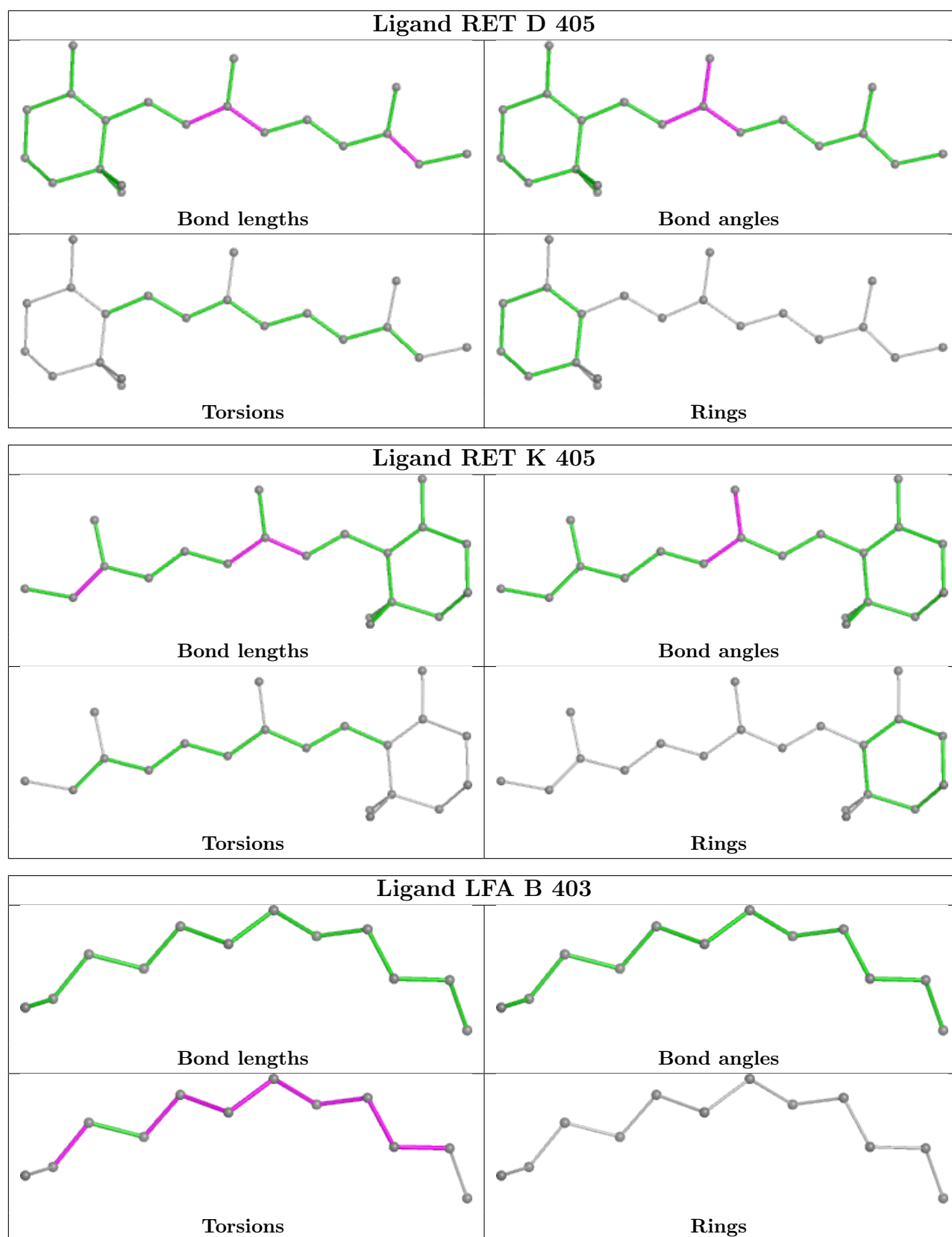
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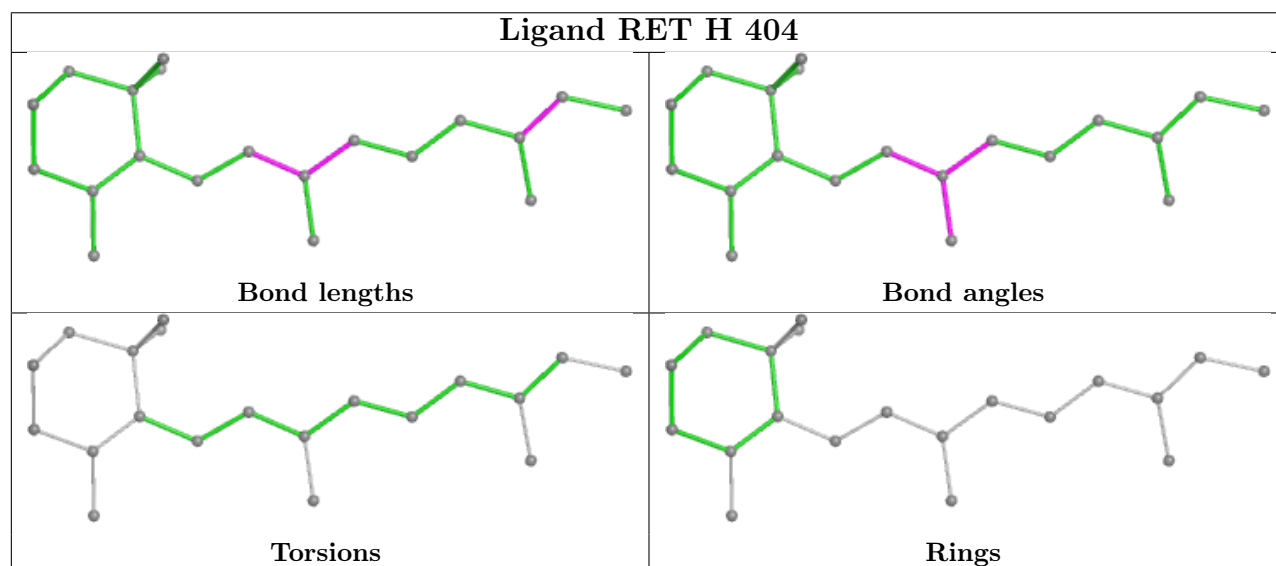
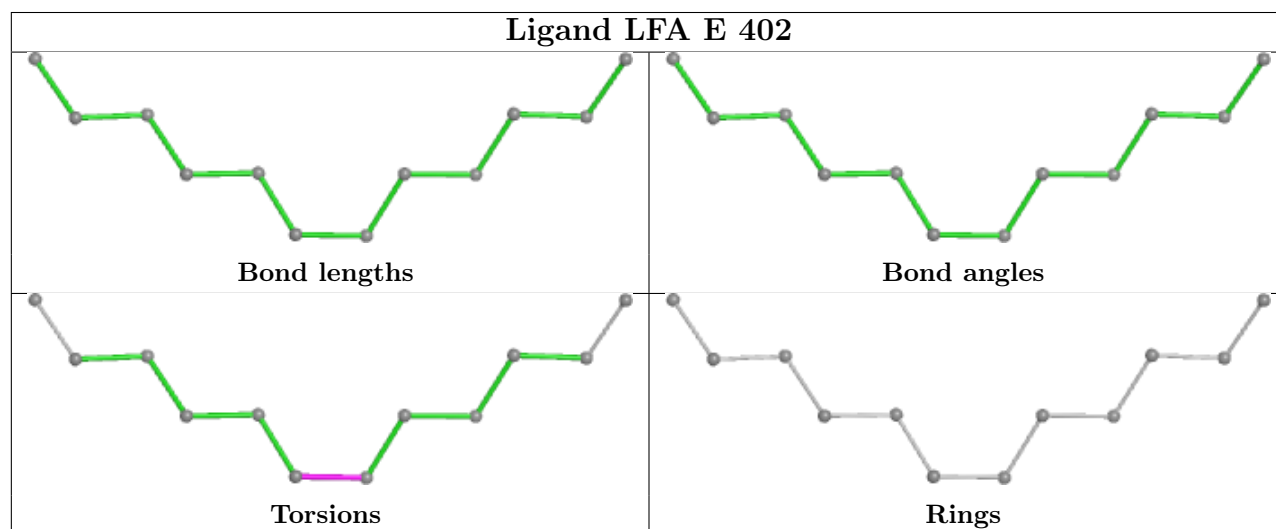
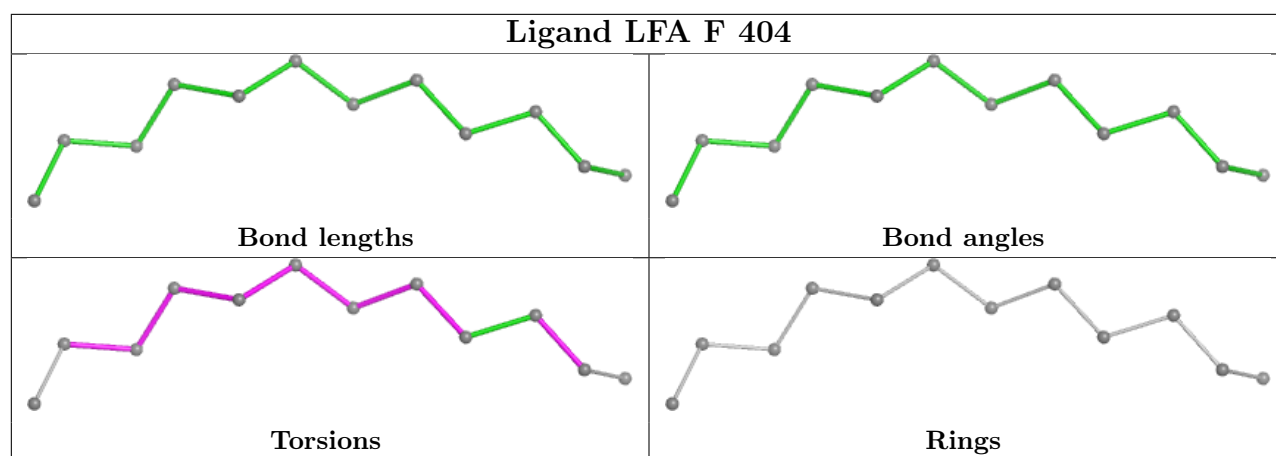
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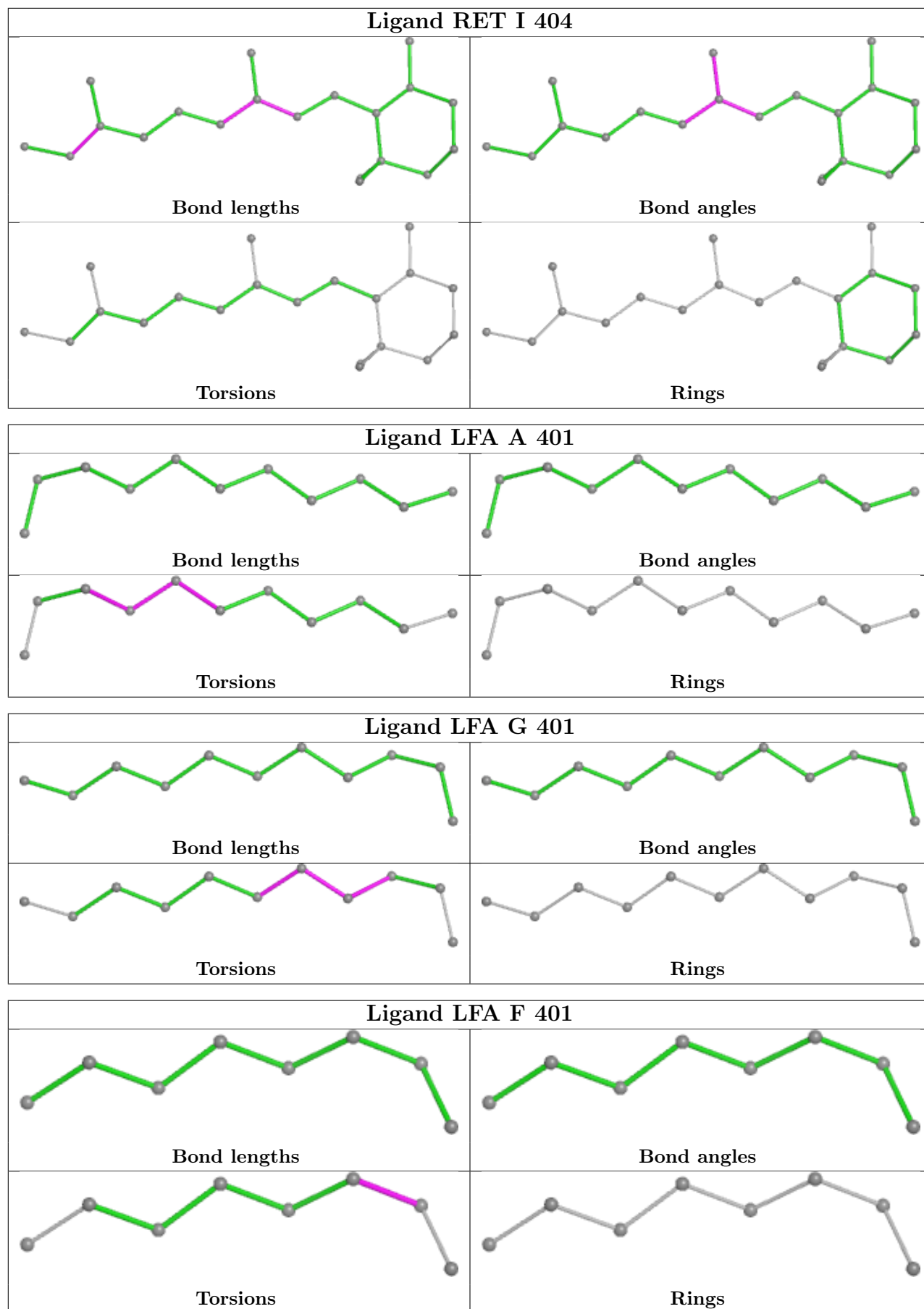
Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	E	404	RET	6	0
2	G	404	LFA	1	0
2	H	401	LFA	1	0
2	K	402	LFA	1	0
2	A	404	LFA	1	0
5	D	401	OLA	1	0
3	D	404	PO4	1	0
3	F	405	PO4	1	0
2	D	403	LFA	1	0
4	G	406	RET	6	0
4	A	406	RET	6	0
4	F	406	RET	7	0
2	B	404	LFA	1	0

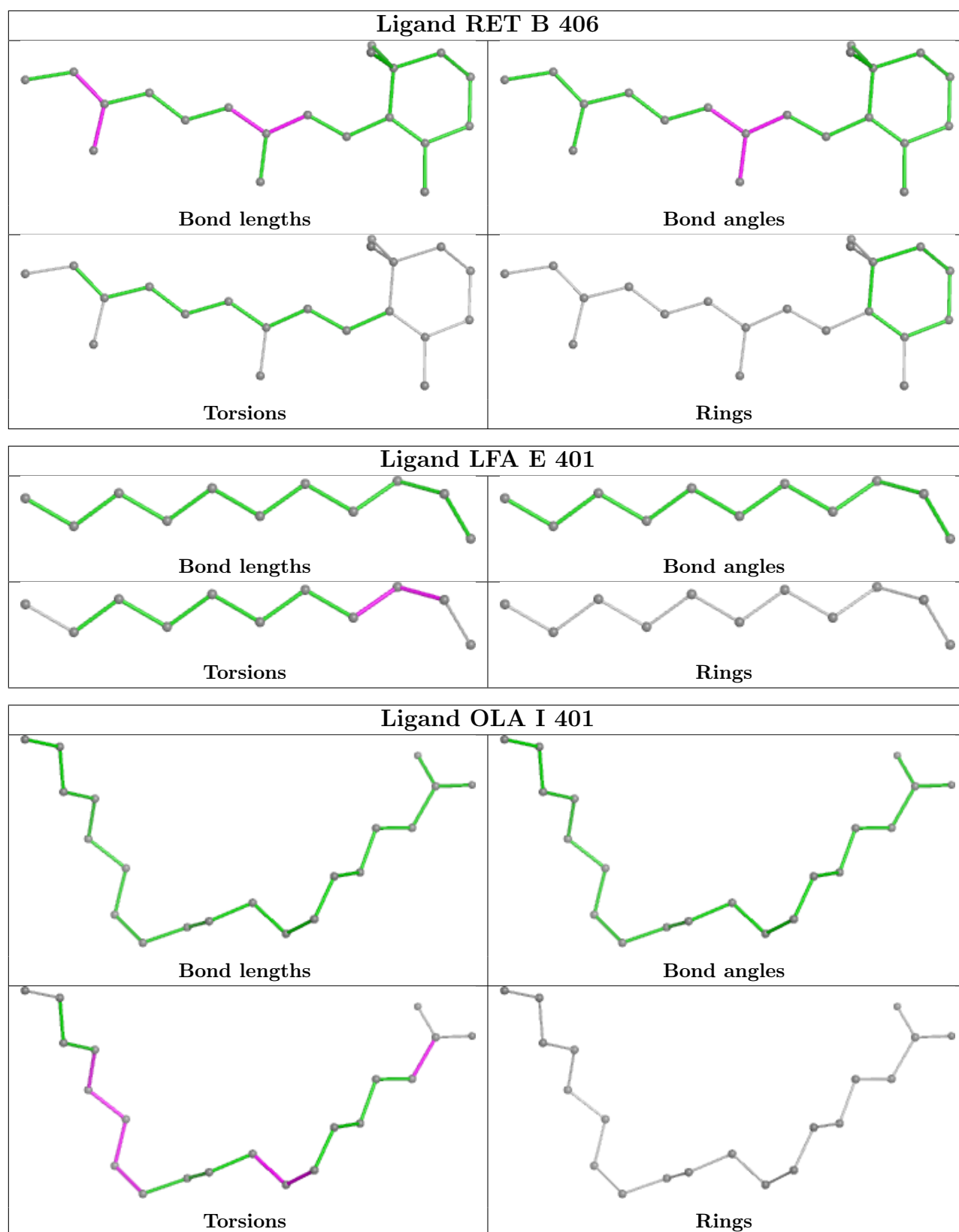
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

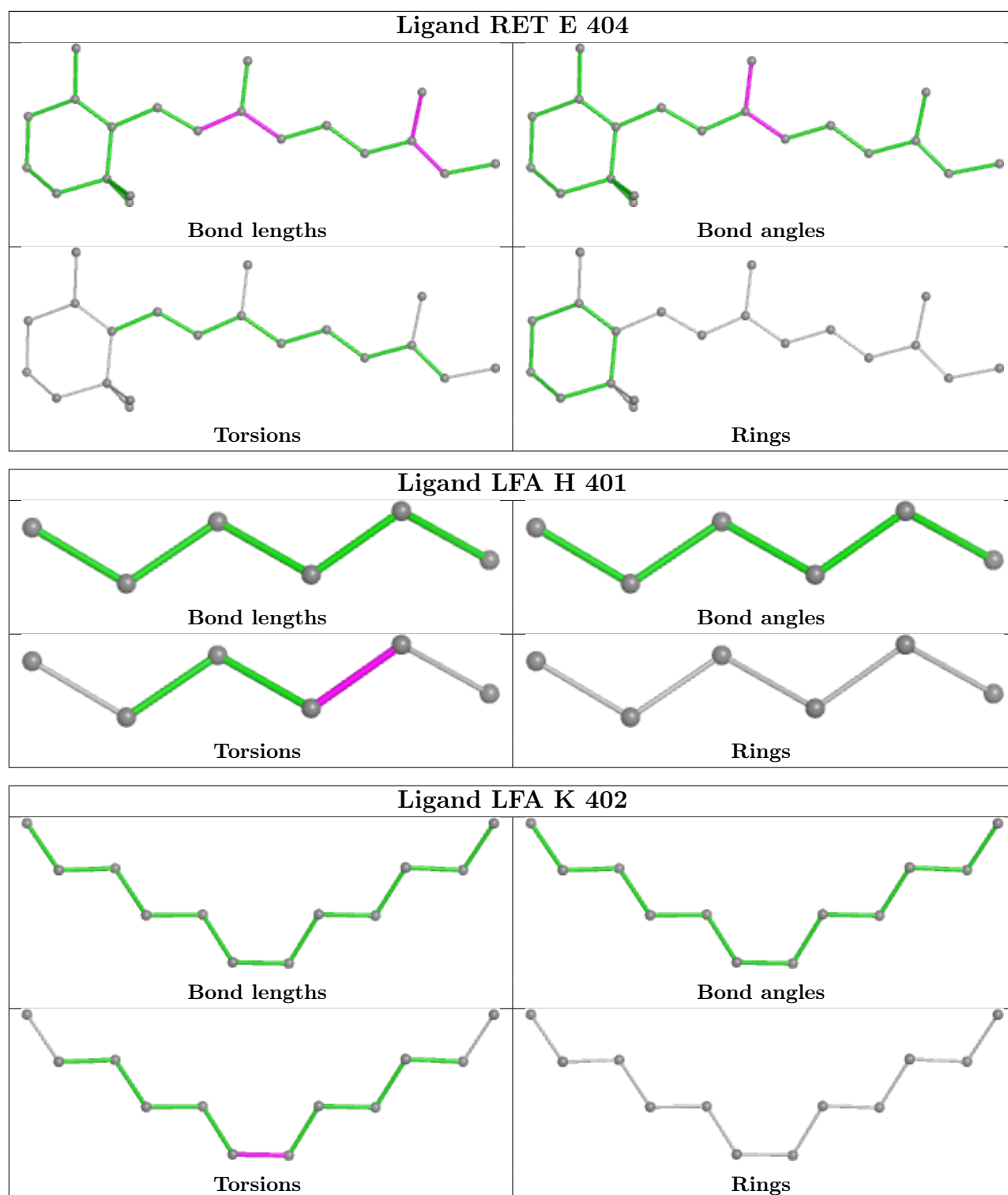


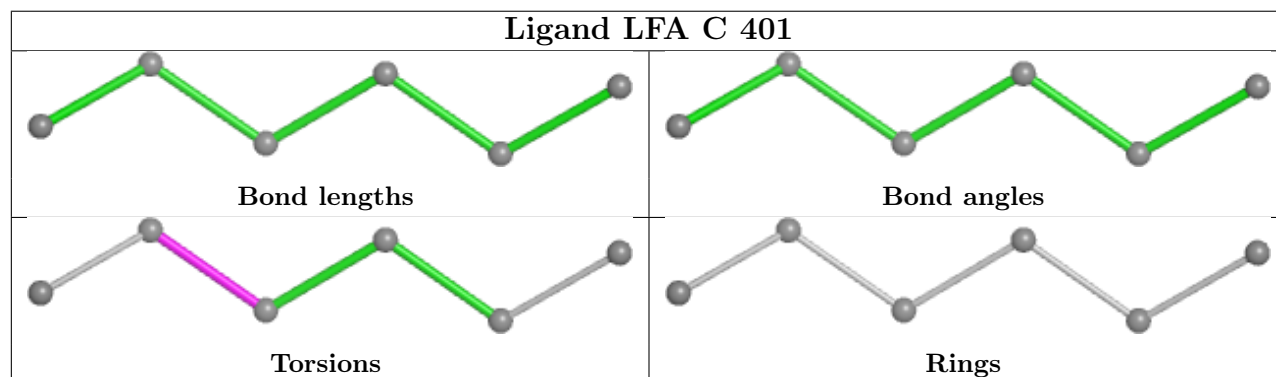
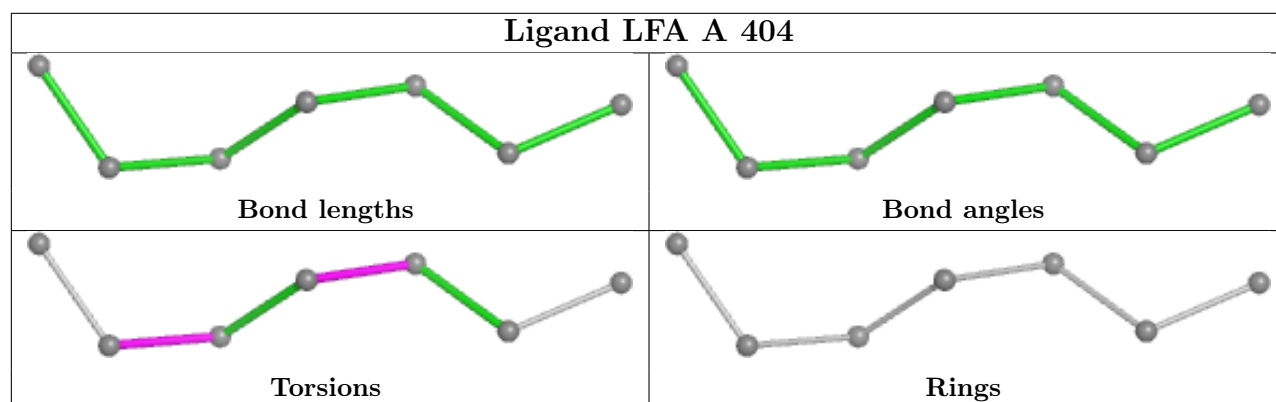
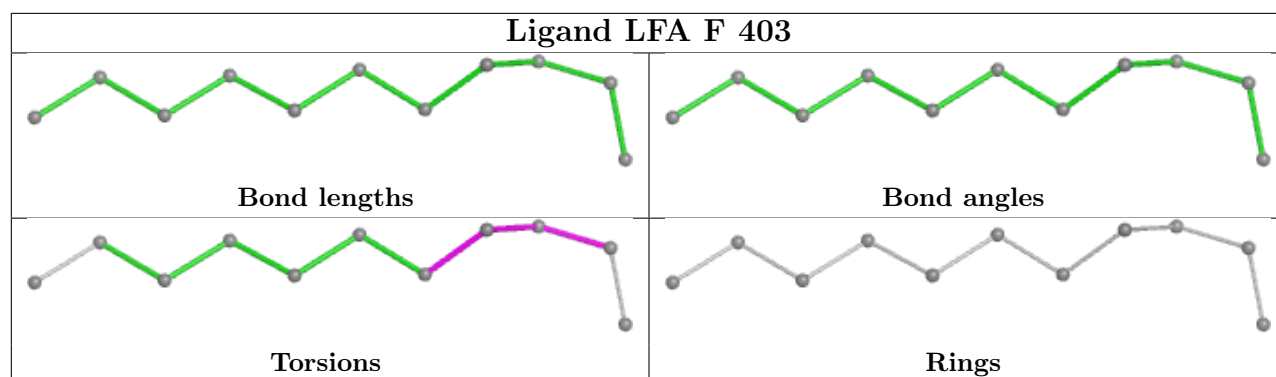
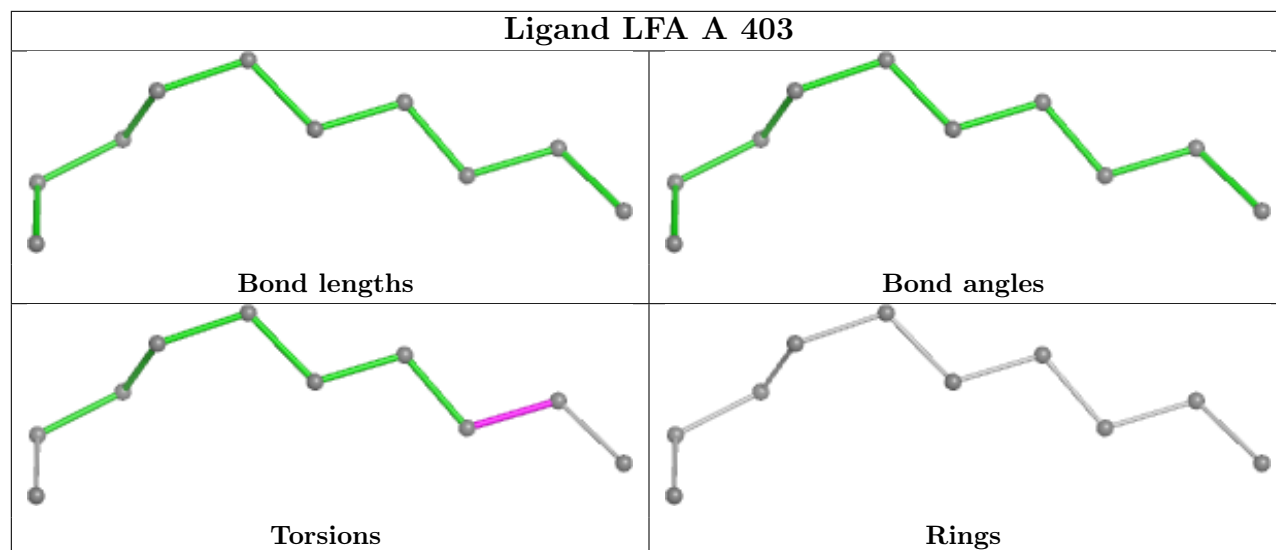


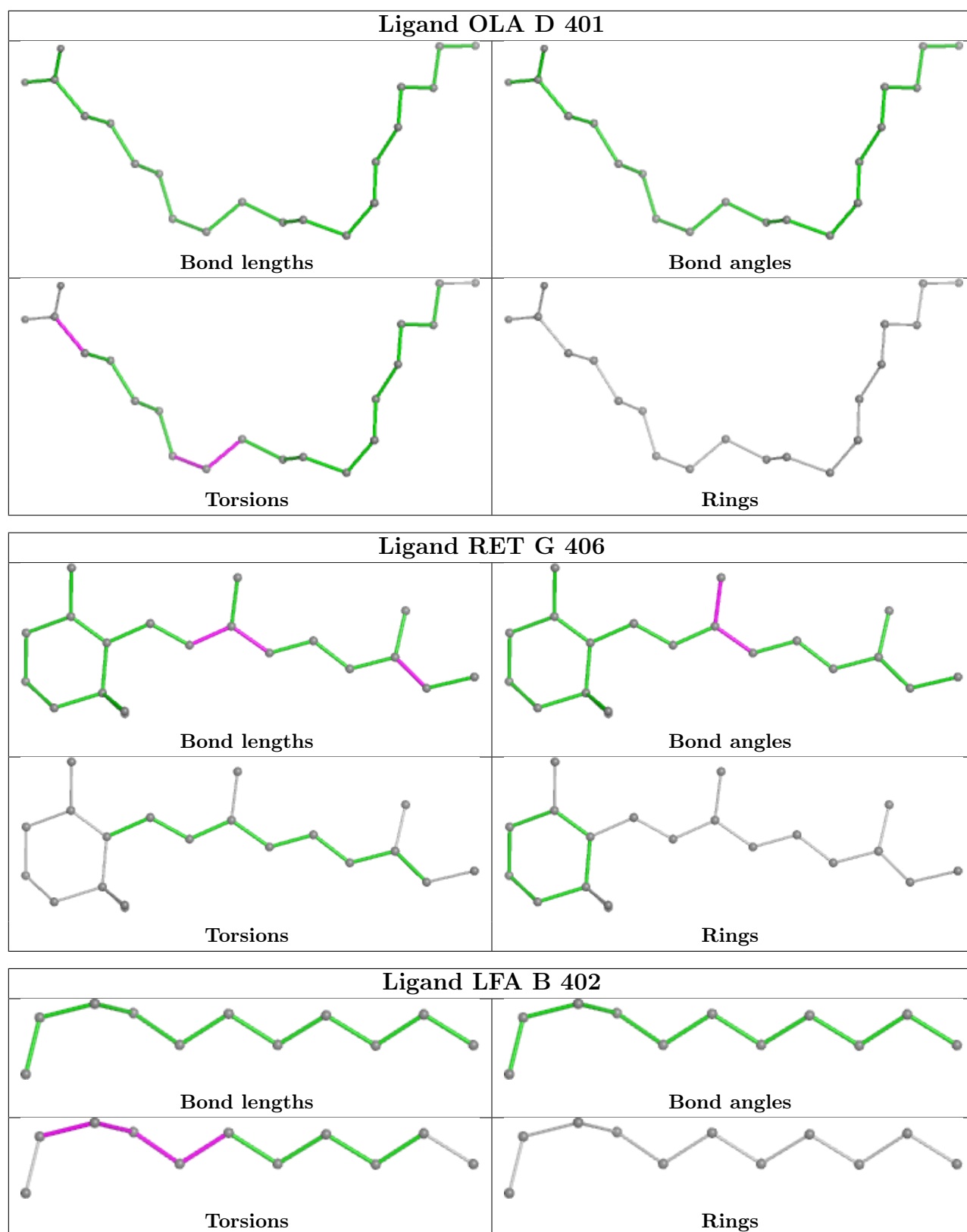


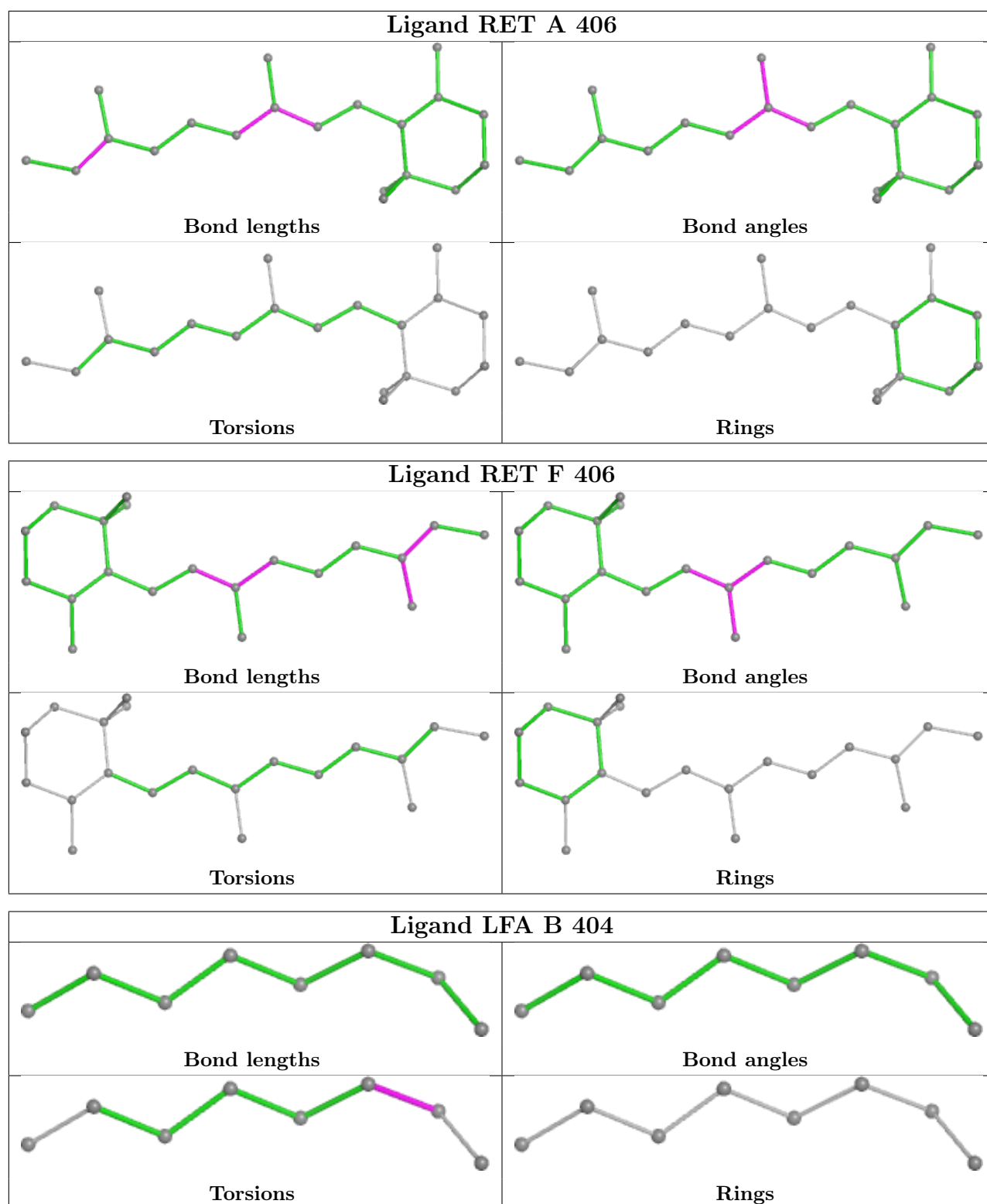












5.7 Other polymers [\(i\)](#)

There are no such residues in this entry.

5.8 Polymer linkage issues

There are no chain breaks in this entry.

6 Fit of model and data [i](#)

6.1 Protein, DNA and RNA chains [i](#)

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	287/327 (87%)	-0.43	0 100 100	58, 85, 131, 174	0
1	B	288/327 (88%)	-0.52	0 100 100	50, 81, 119, 178	0
1	C	287/327 (87%)	-0.41	0 100 100	59, 91, 135, 185	0
1	D	288/327 (88%)	-0.43	0 100 100	56, 93, 130, 164	0
1	E	286/327 (87%)	-0.46	0 100 100	57, 85, 124, 173	0
1	F	287/327 (87%)	-0.52	0 100 100	56, 81, 120, 161	0
1	G	288/327 (88%)	-0.48	0 100 100	54, 86, 130, 157	0
1	H	287/327 (87%)	-0.47	0 100 100	59, 90, 130, 178	0
1	I	290/327 (88%)	-0.44	0 100 100	54, 92, 128, 157	0
1	K	286/327 (87%)	-0.49	0 100 100	52, 86, 122, 158	0
All	All	2874/3270 (87%)	-0.47	0 100 100	50, 87, 129, 185	0

There are no RSRZ outliers to report.

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.

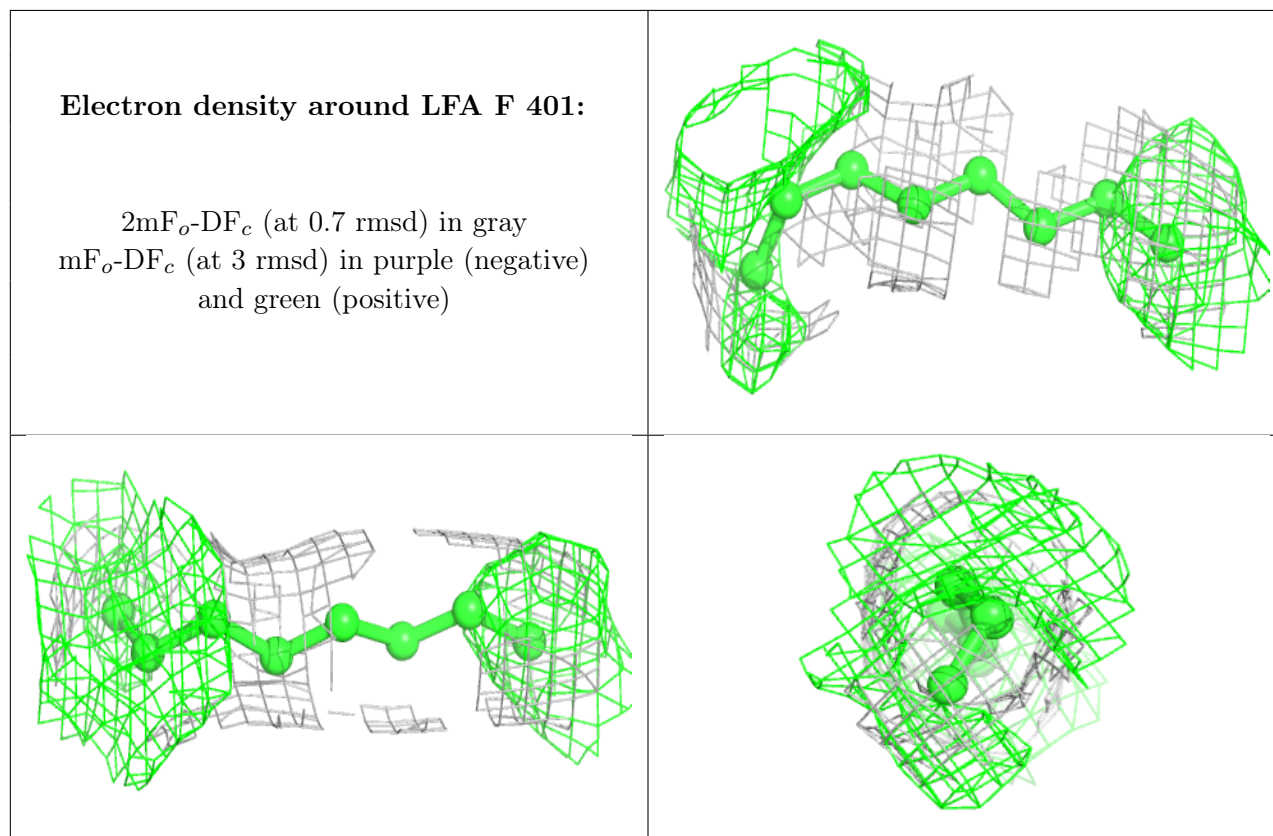
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
2	LFA	F	401	8/20	0.44	0.26	55,65,82,84	0
2	LFA	F	403	11/20	0.58	0.17	58,83,97,97	0
2	LFA	G	402	7/20	0.62	0.12	60,72,85,90	0
2	LFA	B	404	8/20	0.65	0.27	56,73,89,94	0
3	PO4	A	405	5/5	0.66	0.10	107,137,151,157	0
3	PO4	G	405	5/5	0.66	0.12	97,113,131,142	0
2	LFA	H	401	6/20	0.70	0.20	68,90,99,99	0
2	LFA	A	402	7/20	0.70	0.14	53,73,98,103	0
5	OLA	I	401	20/20	0.72	0.18	71,105,119,122	0
2	LFA	C	401	6/20	0.73	0.20	72,93,103,106	0
2	LFA	D	403	9/20	0.75	0.11	68,93,105,114	0
2	LFA	G	404	7/20	0.76	0.10	69,105,110,110	0
2	LFA	B	402	11/20	0.76	0.14	67,84,94,96	0
2	LFA	K	403	10/20	0.77	0.10	78,103,121,124	0
2	LFA	H	402	6/20	0.77	0.09	49,57,58,61	0
2	LFA	B	401	7/20	0.79	0.16	55,82,91,97	0
3	PO4	E	403	5/5	0.79	0.09	114,122,138,139	0
2	LFA	E	402	12/20	0.80	0.10	77,85,100,107	0
2	LFA	D	402	10/20	0.80	0.08	66,90,91,94	0
3	PO4	I	403	5/5	0.80	0.06	113,126,135,137	0
2	LFA	F	402	7/20	0.80	0.17	63,95,101,110	0
5	OLA	D	401	20/20	0.81	0.15	80,109,120,126	0
3	PO4	H	403	5/5	0.81	0.08	133,135,142,168	0
2	LFA	A	404	7/20	0.82	0.09	63,82,98,101	0
2	LFA	C	402	6/20	0.82	0.09	53,61,70,71	0
3	PO4	C	403	5/5	0.83	0.07	110,113,133,139	0
3	PO4	D	404	5/5	0.85	0.06	115,119,123,125	0
3	PO4	B	405	5/5	0.86	0.08	97,101,111,122	0
2	LFA	A	403	10/20	0.86	0.14	74,84,95,100	0
3	PO4	F	405	5/5	0.86	0.07	89,105,115,125	0
2	LFA	G	403	10/20	0.87	0.13	67,86,99,99	0
2	LFA	F	404	12/20	0.87	0.22	75,94,107,107	0
3	PO4	K	404	5/5	0.88	0.08	114,122,128,130	0
2	LFA	I	402	10/20	0.88	0.07	58,83,101,102	0
2	LFA	K	402	12/20	0.88	0.08	85,88,93,99	0
2	LFA	K	401	11/20	0.89	0.09	60,70,80,84	0
2	LFA	G	401	11/20	0.90	0.18	50,76,111,111	0
2	LFA	E	401	11/20	0.90	0.08	53,58,62,63	0
2	LFA	A	401	11/20	0.90	0.13	66,95,116,118	0
4	RET	G	406	20/21	0.92	0.19	73,91,120,122	0
4	RET	I	404	20/21	0.92	0.17	89,114,132,134	0

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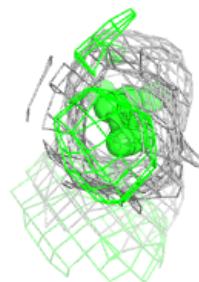
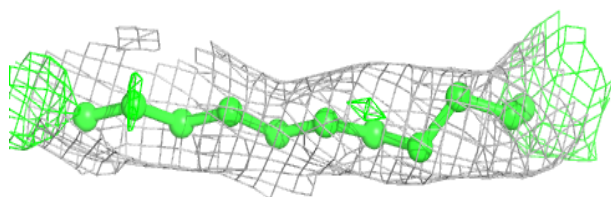
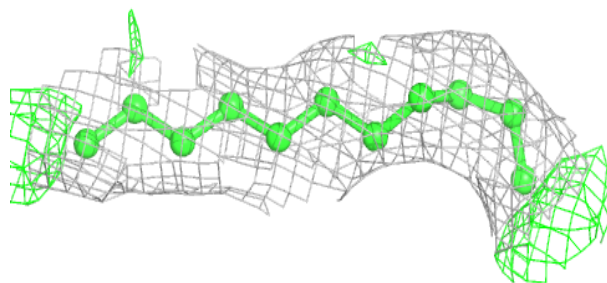
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
4	RET	D	405	20/21	0.93	0.18	86,101,118,126	0
4	RET	H	404	20/21	0.93	0.15	80,91,105,106	0
2	LFA	B	403	12/20	0.94	0.14	60,87,96,100	0
4	RET	A	406	20/21	0.94	0.15	76,92,103,103	0
4	RET	C	404	20/21	0.94	0.15	76,91,110,114	0
4	RET	B	406	20/21	0.95	0.13	70,87,97,99	0
4	RET	K	405	20/21	0.95	0.14	80,95,112,114	0
4	RET	E	404	20/21	0.95	0.12	79,88,101,102	0
4	RET	F	406	20/21	0.95	0.11	59,73,87,96	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.

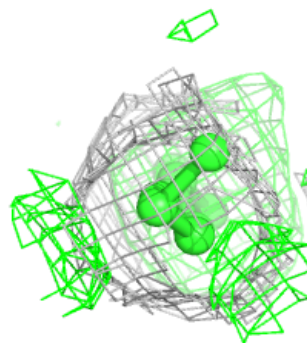
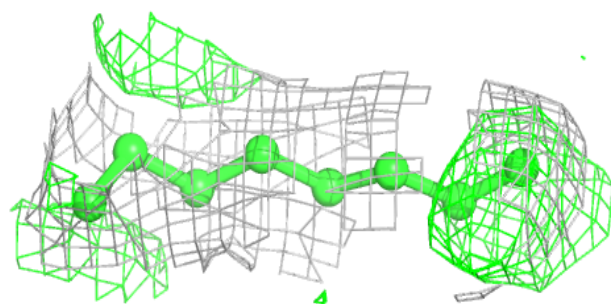
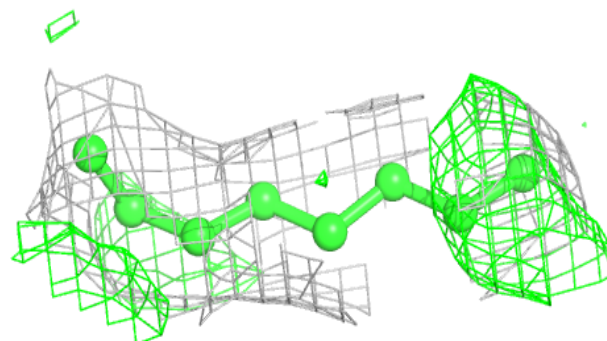


Electron density around LFA F 403:

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

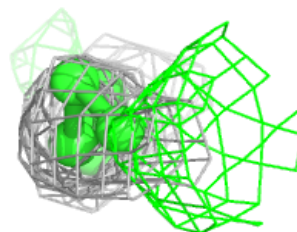
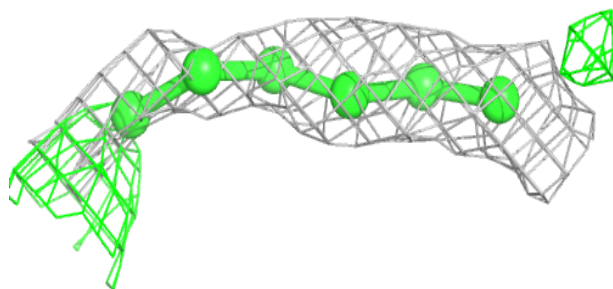
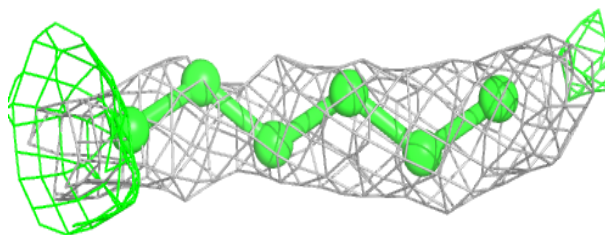
**Electron density around LFA B 404:**

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

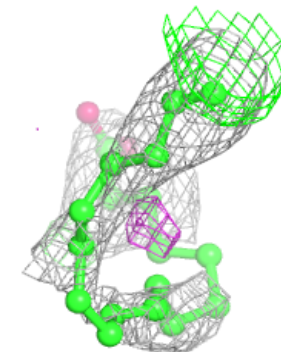
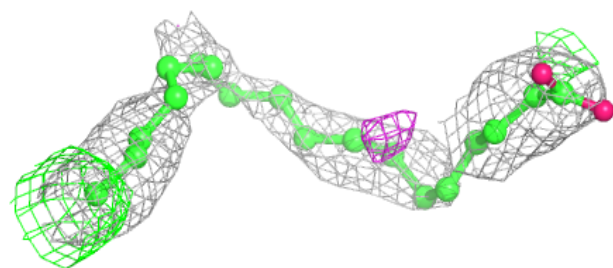
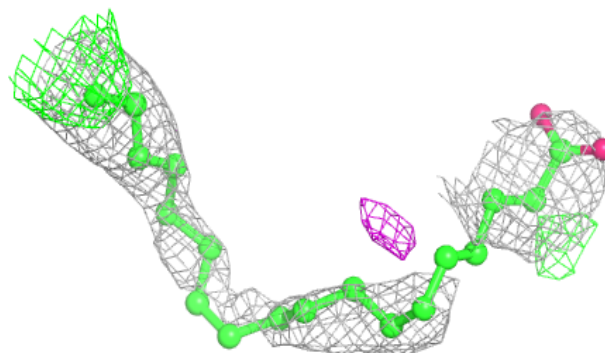


Electron density around LFA H 401:

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

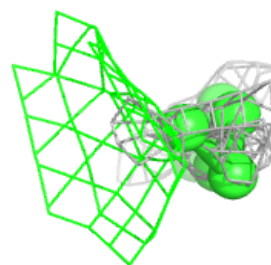
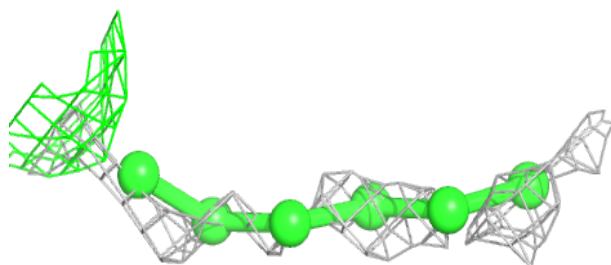
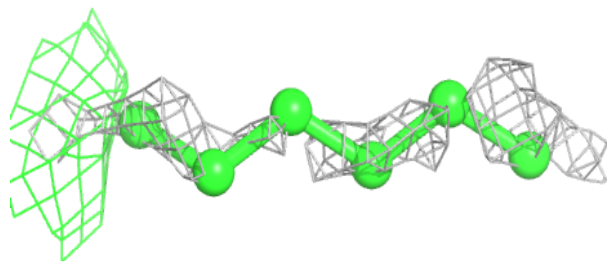
**Electron density around OLA I 401:**

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

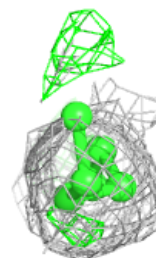
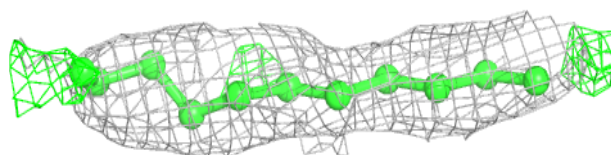
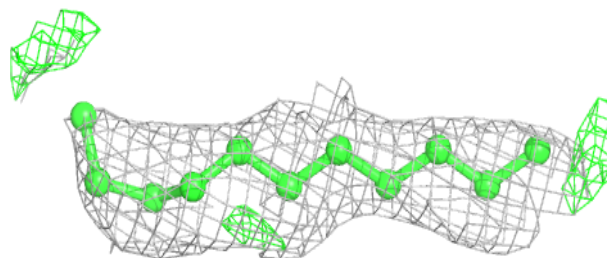


Electron density around LFA C 401:

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

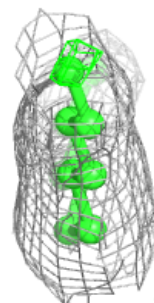
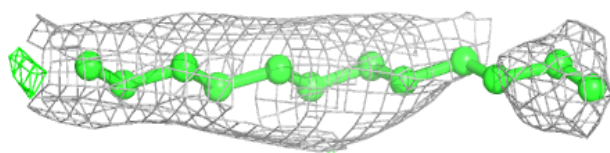
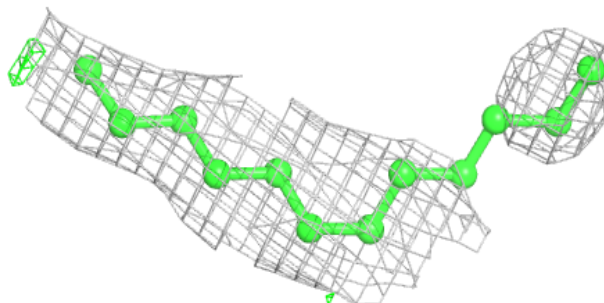
**Electron density around LFA B 402:**

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

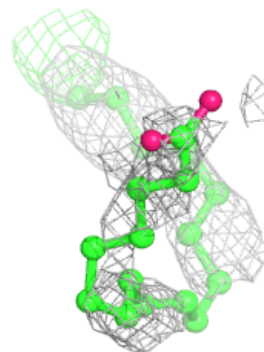
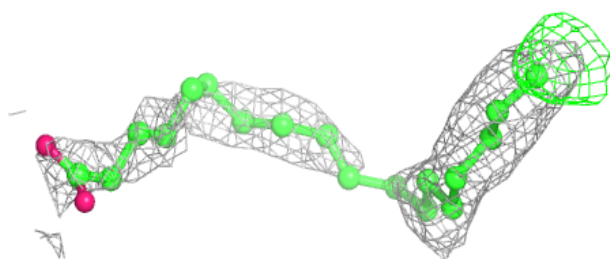
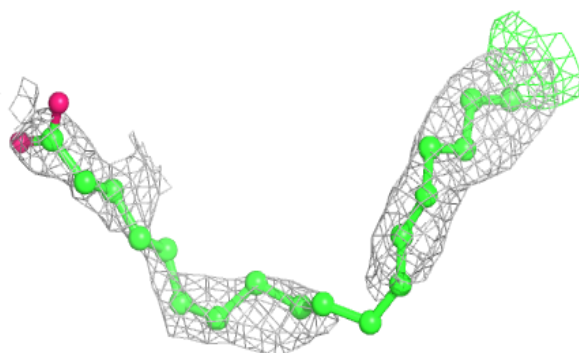


Electron density around LFA E 402:

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

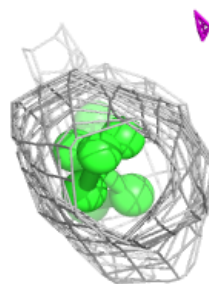
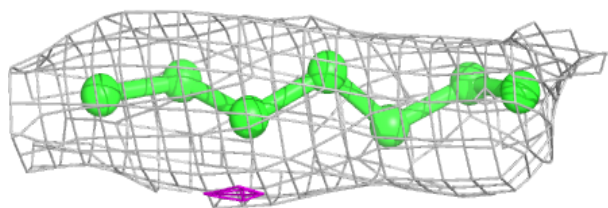
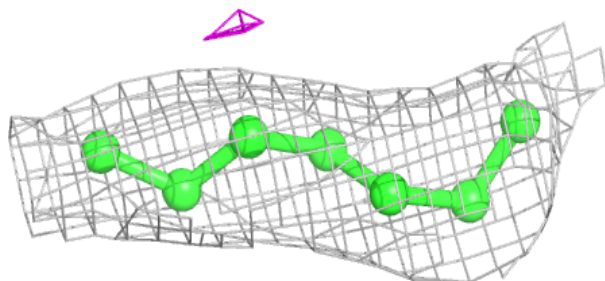
**Electron density around OLA D 401:**

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

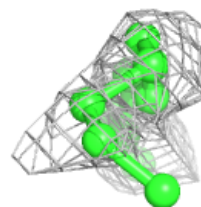
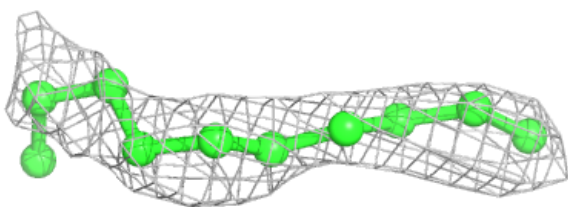
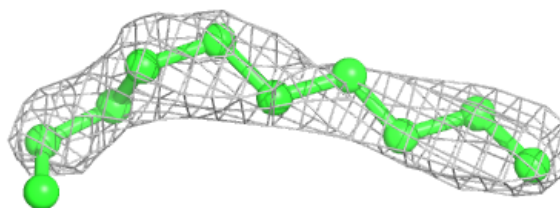


Electron density around LFA A 404:

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

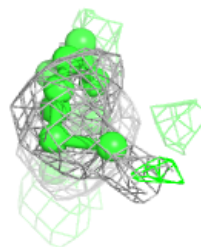
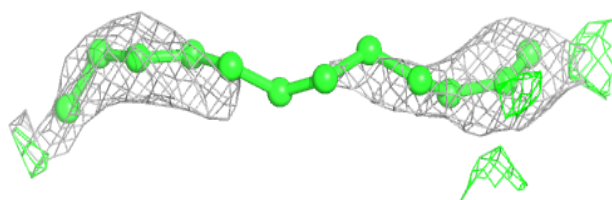
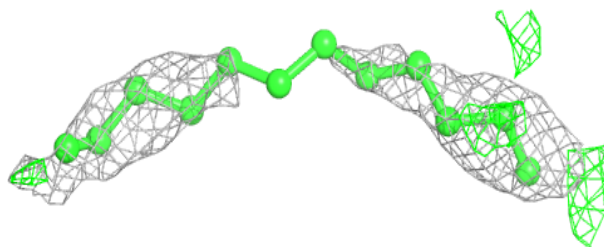
**Electron density around LFA A 403:**

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

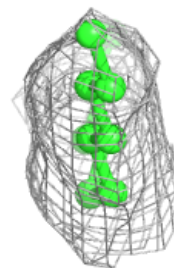
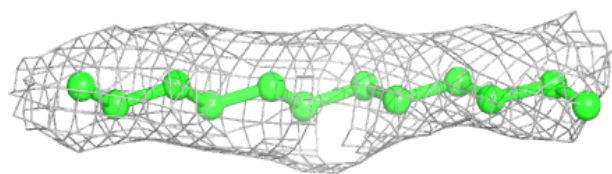
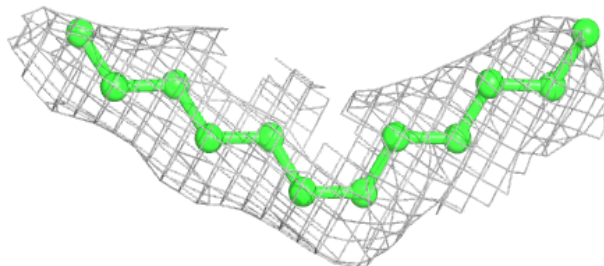


Electron density around LFA F 404:

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

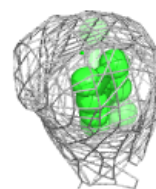
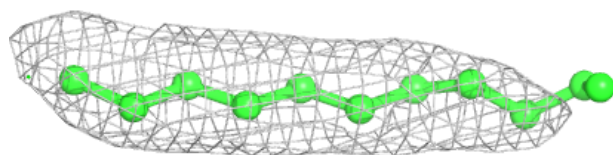
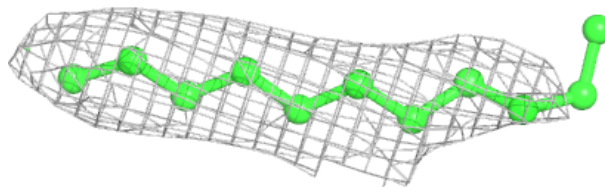
**Electron density around LFA K 402:**

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

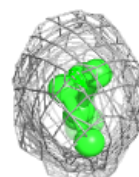
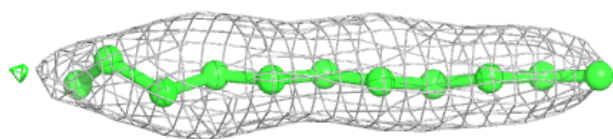
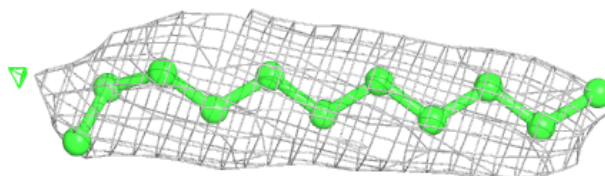


Electron density around LFA G 401:

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

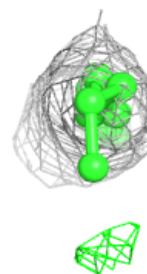
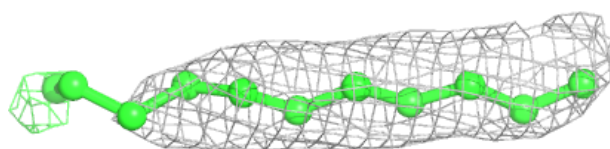
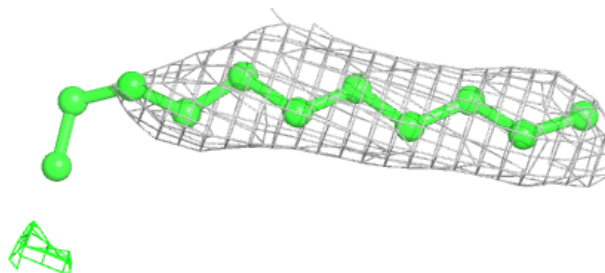
**Electron density around LFA E 401:**

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

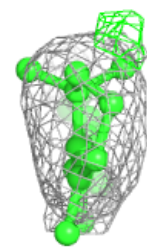
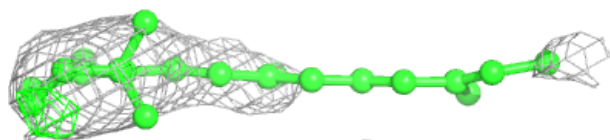
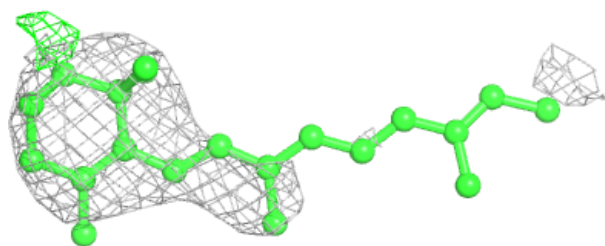


Electron density around LFA A 401:

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

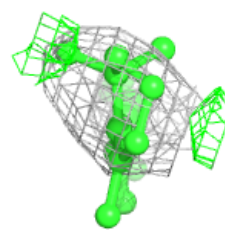
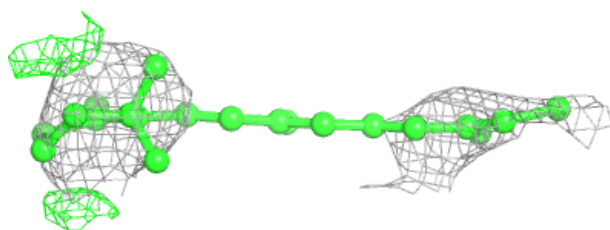
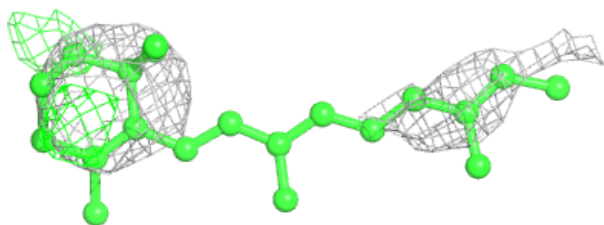
**Electron density around RET G 406:**

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

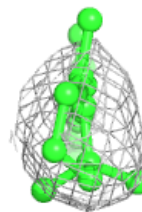
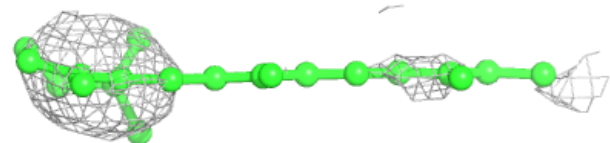
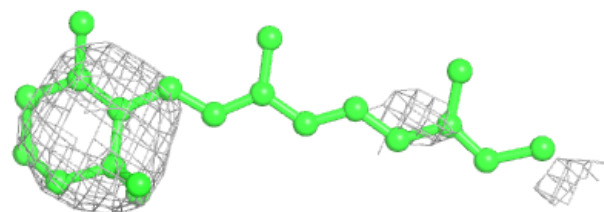


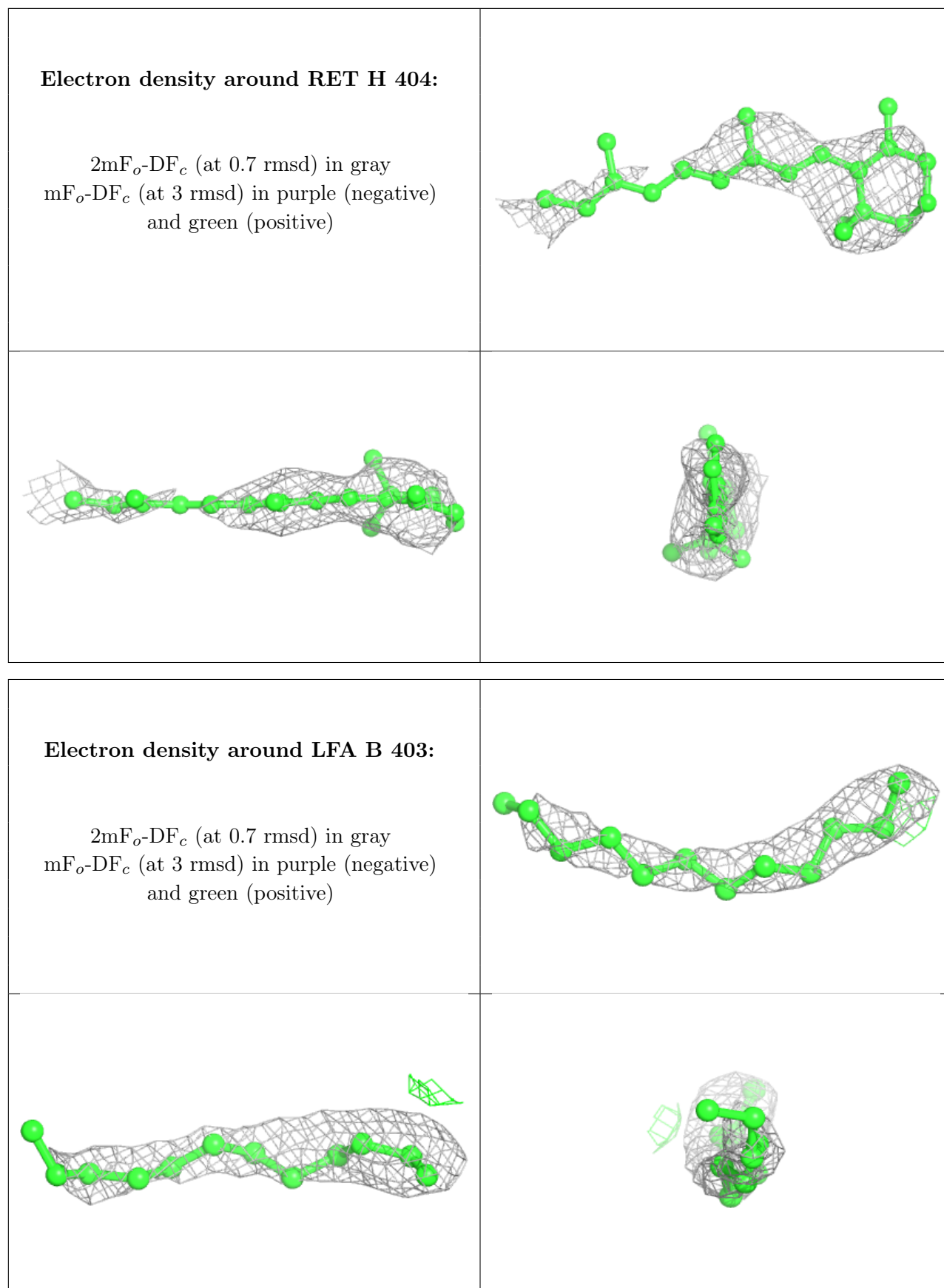
Electron density around RET I 404:

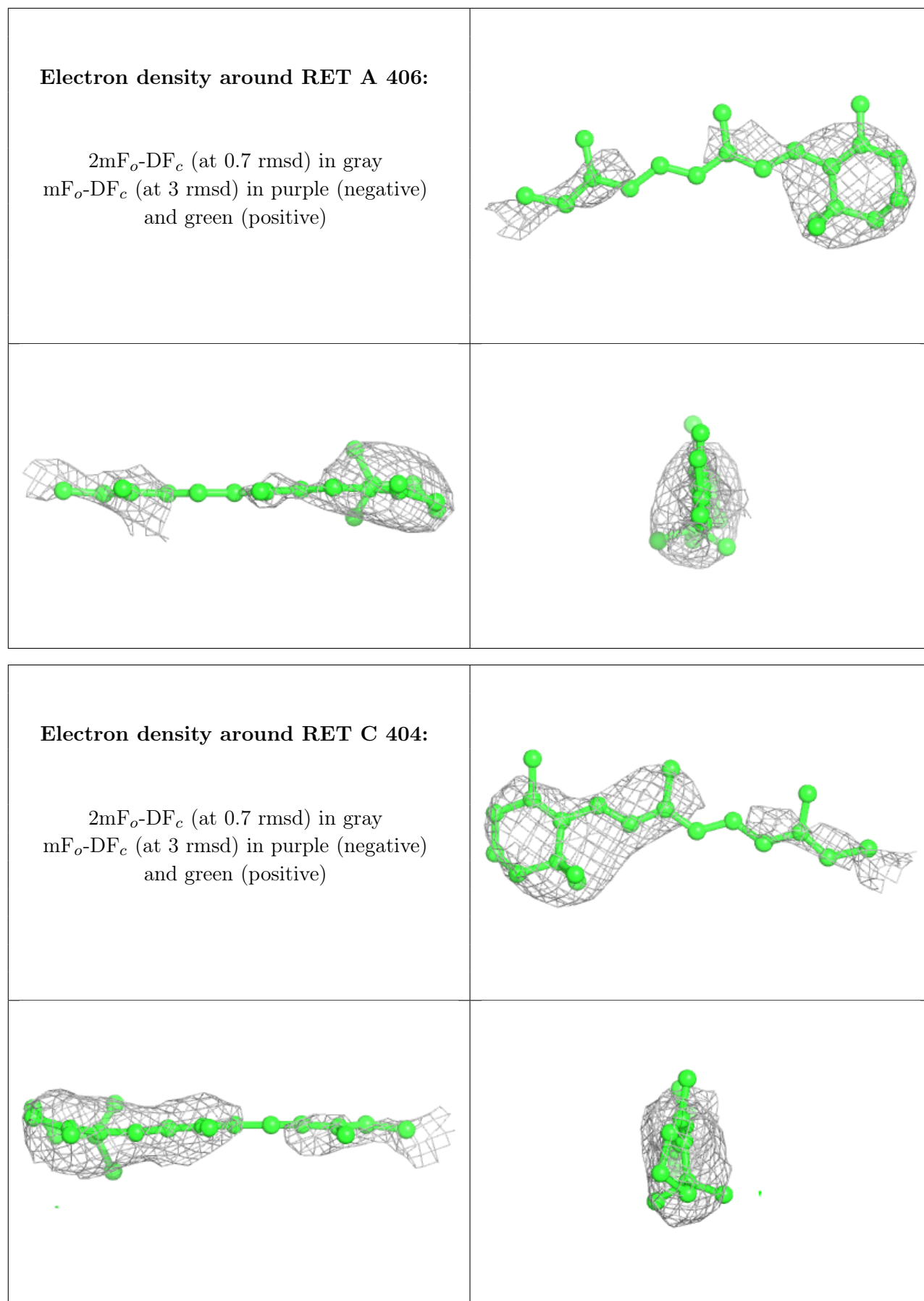
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

**Electron density around RET D 405:**

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

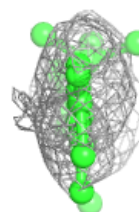
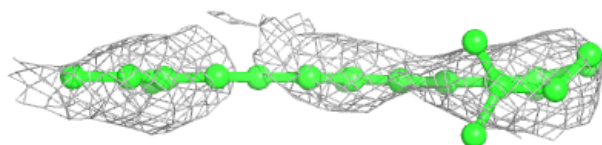
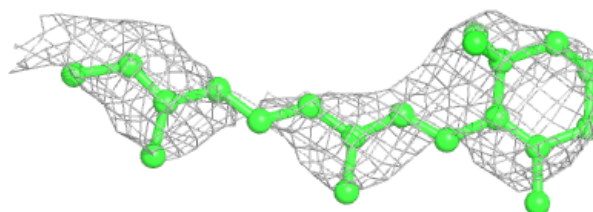




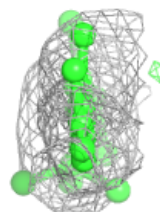
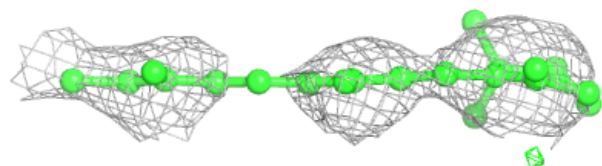
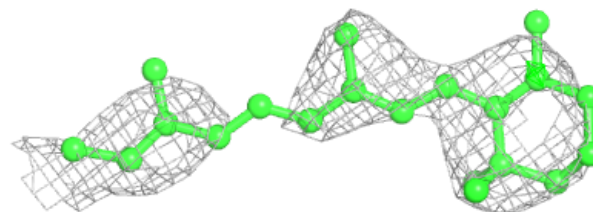


Electron density around RET B 406:

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

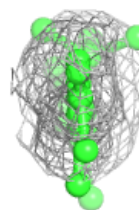
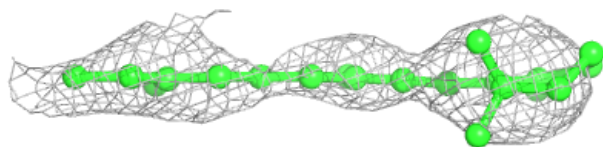
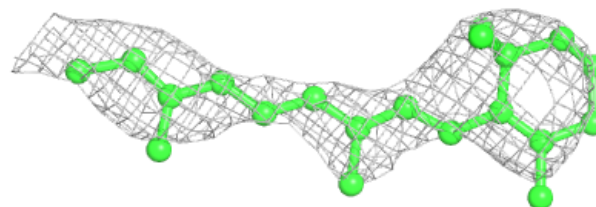
**Electron density around RET K 405:**

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

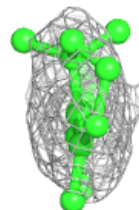
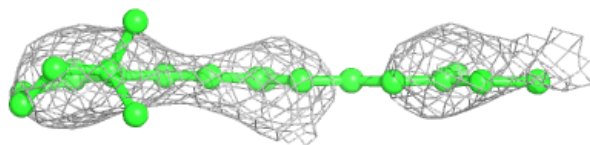
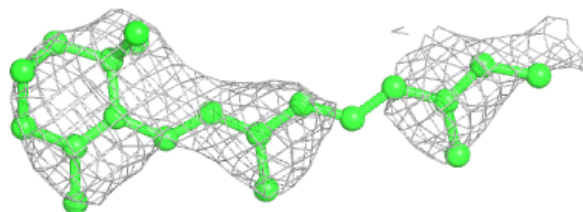


Electron density around RET E 404:

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

**Electron density around RET F 406:**

$2mF_o-DF_c$ (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.