



Full wwPDB X-ray Structure Validation Report ⓘ

Oct 9, 2023 – 01:53 PM EDT

PDB ID : 7UJM
Title : Estrogen Receptor Alpha Ligand Binding Domain in Complex with a Methylated Lasofoxifene Derivative That Increases Receptor Resonance Time in the Nucleus of Breast Cancer Cells
Authors : Hosfield, D.J.; Greene, G.L.; Fanning, S.W.
Deposited on : 2022-03-31
Resolution : 1.80 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)
Xtrriage (Phenix) : 1.13
EDS : 2.35.1
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) : 2.35.1

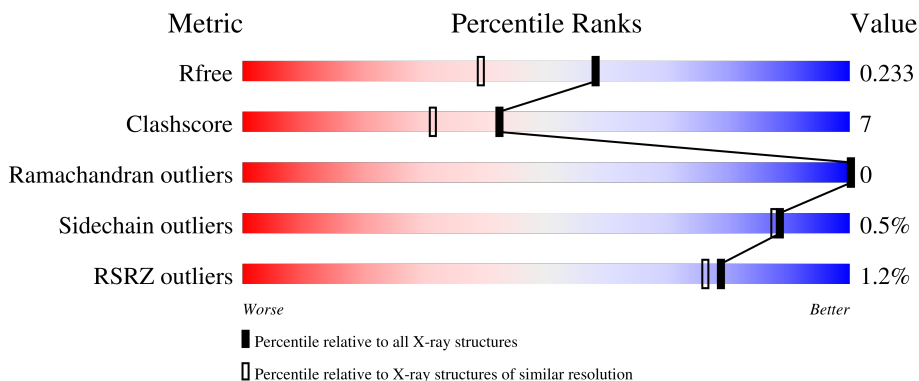
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.80 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	5950 (1.80-1.80)
Clashscore	141614	6793 (1.80-1.80)
Ramachandran outliers	138981	6697 (1.80-1.80)
Sidechain outliers	138945	6696 (1.80-1.80)
RSRZ outliers	127900	5850 (1.80-1.80)

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	262	 79% 10% 11%
1	B	262	 2% 79% 11% 9%
1	C	262	 2% 81% 11% 8%
1	D	262	 2% 82% 9% 9%

2 Entry composition i

There are 3 unique types of molecules in this entry. The entry contains 8414 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 Estrogen receptor.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	B	238	1910	1226	328	340	16	0	6	0
1	A	233	1852	1192	311	333	16	0	2	0
1	C	242	1939	1245	327	351	16	0	8	0
1	D	238	1901	1220	318	347	16	0	6	0

There are 72 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	293	HIS	-	expression tag	UNP P03372
B	294	HIS	-	expression tag	UNP P03372
B	295	HIS	-	expression tag	UNP P03372
B	296	HIS	-	expression tag	UNP P03372
B	297	HIS	-	expression tag	UNP P03372
B	298	HIS	-	expression tag	UNP P03372
B	299	GLU	-	expression tag	UNP P03372
B	300	ASN	-	expression tag	UNP P03372
B	301	LEU	-	expression tag	UNP P03372
B	302	TYR	-	expression tag	UNP P03372
B	303	GLN	-	expression tag	UNP P03372
B	304	PHE	-	expression tag	UNP P03372
B	305	SER	-	expression tag	UNP P03372
B	306	MET	-	expression tag	UNP P03372
B	381	SER	CYS	engineered mutation	UNP P03372
B	417	SER	CYS	engineered mutation	UNP P03372
B	530	SER	CYS	engineered mutation	UNP P03372
B	536	SER	LEU	conflict	UNP P03372
A	293	HIS	-	expression tag	UNP P03372
A	294	HIS	-	expression tag	UNP P03372
A	295	HIS	-	expression tag	UNP P03372

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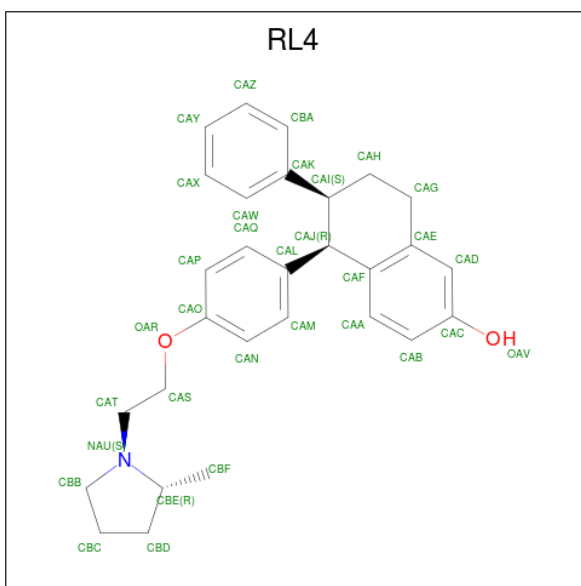
Chain	Residue	Modelled	Actual	Comment	Reference
A	296	HIS	-	expression tag	UNP P03372
A	297	HIS	-	expression tag	UNP P03372
A	298	HIS	-	expression tag	UNP P03372
A	299	GLU	-	expression tag	UNP P03372
A	300	ASN	-	expression tag	UNP P03372
A	301	LEU	-	expression tag	UNP P03372
A	302	TYR	-	expression tag	UNP P03372
A	303	GLN	-	expression tag	UNP P03372
A	304	PHE	-	expression tag	UNP P03372
A	305	SER	-	expression tag	UNP P03372
A	306	MET	-	expression tag	UNP P03372
A	381	SER	CYS	engineered mutation	UNP P03372
A	417	SER	CYS	engineered mutation	UNP P03372
A	530	SER	CYS	engineered mutation	UNP P03372
A	536	SER	LEU	conflict	UNP P03372
C	293	HIS	-	expression tag	UNP P03372
C	294	HIS	-	expression tag	UNP P03372
C	295	HIS	-	expression tag	UNP P03372
C	296	HIS	-	expression tag	UNP P03372
C	297	HIS	-	expression tag	UNP P03372
C	298	HIS	-	expression tag	UNP P03372
C	299	GLU	-	expression tag	UNP P03372
C	300	ASN	-	expression tag	UNP P03372
C	301	LEU	-	expression tag	UNP P03372
C	302	TYR	-	expression tag	UNP P03372
C	303	GLN	-	expression tag	UNP P03372
C	304	PHE	-	expression tag	UNP P03372
C	305	SER	-	expression tag	UNP P03372
C	306	MET	-	expression tag	UNP P03372
C	381	SER	CYS	engineered mutation	UNP P03372
C	417	SER	CYS	engineered mutation	UNP P03372
C	530	SER	CYS	engineered mutation	UNP P03372
C	536	SER	LEU	conflict	UNP P03372
D	293	HIS	-	expression tag	UNP P03372
D	294	HIS	-	expression tag	UNP P03372
D	295	HIS	-	expression tag	UNP P03372
D	296	HIS	-	expression tag	UNP P03372
D	297	HIS	-	expression tag	UNP P03372
D	298	HIS	-	expression tag	UNP P03372
D	299	GLU	-	expression tag	UNP P03372
D	300	ASN	-	expression tag	UNP P03372
D	301	LEU	-	expression tag	UNP P03372

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Chain	Residue	Modelled	Actual	Comment	Reference
D	302	TYR	-	expression tag	UNP P03372
D	303	GLN	-	expression tag	UNP P03372
D	304	PHE	-	expression tag	UNP P03372
D	305	SER	-	expression tag	UNP P03372
D	306	MET	-	expression tag	UNP P03372
D	381	SER	CYS	engineered mutation	UNP P03372
D	417	SER	CYS	engineered mutation	UNP P03372
D	530	SER	CYS	engineered mutation	UNP P03372
D	536	SER	LEU	conflict	UNP P03372

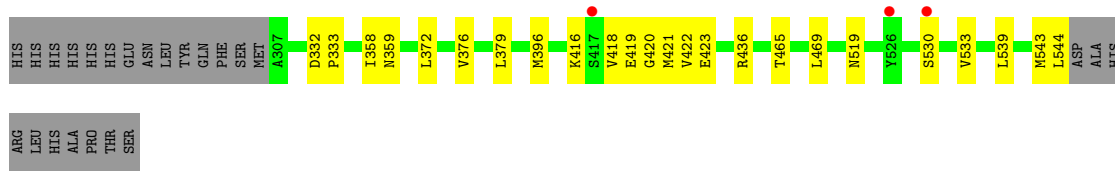
- Molecule 2 is (5R,6S)-5-(4-{2-[(2R)-2-methylpyrrolidin-1-yl]ethoxy}phenyl)-6-phenyl-5,6,7,8-tetrahydronaphthalen-2-ol (three-letter code: RL4) (formula: C₂₉H₃₃NO₂) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	
			Total	C	N			O
2	B	1	32	29	1	2	0	0
2	A	1	32	29	1	2	0	0
2	C	1	32	29	1	2	0	0
2	D	1	32	29	1	2	0	0

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	B	176	Total 176	O 176	0	0
3	A	169	Total 169	O 169	0	0
3	C	173	Total 173	O 173	0	0
3	D	166	Total 166	O 166	0	0



4 Data and refinement statistics i

Property	Value	Source
Space group	P 32	Depositor
Cell constants a, b, c, α , β , γ	58.47Å 58.47Å 275.35Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	44.33 – 1.80 47.52 – 1.64	Depositor EDS
% Data completeness (in resolution range)	76.8 (44.33-1.80) 61.4 (47.52-1.64)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.16 (at 1.64Å)	Xtrriage
Refinement program	PHENIX 1.18.2_3874	Depositor
R, R_{free}	0.190 , 0.233 0.190 , 0.233	Depositor DCC
R_{free} test set	4047 reflections (5.10%)	wwPDB-VP
Wilson B-factor (Å ²)	14.8	Xtrriage
Anisotropy	0.273	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 32.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.51$, $\langle L^2 \rangle = 0.35$	Xtrriage
Estimated twinning fraction	0.488 for -h,-k,l 0.488 for h,-h-k,-l 0.488 for -k,-h,-l	Xtrriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	8414	wwPDB-VP
Average B, all atoms (Å ²)	23.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.35% 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: RL4

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z >5	RMSZ	# Z >5
1	A	0.49	0/1886	0.55	0/2549
1	B	0.42	0/1945	0.56	0/2629
1	C	0.43	0/1979	0.57	0/2678
1	D	0.52	0/1940	0.58	0/2627
All	All	0.47	0/7750	0.57	0/10483

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 [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	1852	0	1884	21	0
1	B	1910	0	1944	31	0
1	C	1939	0	1958	25	0
1	D	1901	0	1917	30	0
2	A	32	0	0	1	0
2	B	32	0	0	3	0
2	C	32	0	0	1	0
2	D	32	0	0	1	0
3	A	169	0	0	2	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	B	176	0	0	6	0
3	C	173	0	0	3	0
3	D	166	0	0	1	0
All	All	8414	0	7703	106	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 7.

All (106) 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:496:THR:HG21	3:C:839:HOH:O	1.50	1.11
1:D:418:VAL:CG2	1:D:421:MET:HE2	1.81	1.09
1:C:530:SER:HB2	1:C:533:VAL:HG13	1.43	0.99
1:D:418:VAL:CG2	1:D:421:MET:CE	2.45	0.95
1:D:418:VAL:CB	1:D:421:MET:HE2	2.00	0.89
1:D:418:VAL:HB	1:D:421:MET:HE2	1.54	0.89
1:D:418:VAL:HG23	1:D:421:MET:CE	2.03	0.87
1:D:418:VAL:HG12	1:D:419:GLU:H	1.40	0.87
1:C:519:ASN:HD22	1:D:519:ASN:HD22	1.24	0.85
1:C:416:LYS:HG2	1:C:422:VAL:HG21	1.60	0.83
1:D:416:LYS:HG2	1:D:422:VAL:HG21	1.63	0.81
1:A:393:TRP:CZ3	1:A:396:MET:HE1	2.19	0.78
1:D:418:VAL:HG21	1:D:421:MET:HE2	1.66	0.75
1:D:418:VAL:HG12	1:D:419:GLU:N	2.02	0.73
1:C:530:SER:HB2	1:C:533:VAL:CG1	2.16	0.73
1:C:496:THR:HG23	1:C:499:GLN:H	1.54	0.72
1:A:539:LEU:O	1:A:543:MET:HG3	1.89	0.71
1:D:418:VAL:HG23	1:D:421:MET:HE1	1.72	0.71
1:D:539:LEU:O	1:D:543:MET:HG3	1.90	0.71
1:B:368:VAL:HG22	3:B:741:HOH:O	1.92	0.69
1:A:465:THR:O	1:A:469:LEU:HD13	1.95	0.66
1:A:418:VAL:HG13	1:A:421:MET:HB2	1.78	0.65
1:B:530[B]:SER:HB2	1:B:533:VAL:HB	1.80	0.64
1:B:530[A]:SER:HB3	1:B:533:VAL:HB	1.83	0.60
1:D:358:ILE:HD13	1:D:543:MET:HB2	1.82	0.60
1:D:465:THR:O	1:D:469:LEU:HD13	2.02	0.59
1:D:420:GLY:O	1:D:423:GLU:HG2	2.03	0.59
1:B:362:LYS:HE2	3:B:821:HOH:O	2.04	0.58
1:A:310:LEU:HD22	1:A:314:GLN:HB3	1.84	0.58
1:B:522:MET:HA	1:B:522:MET:CE	2.34	0.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:372[A]:LEU:HD21	1:B:541:LEU:HD11	1.86	0.57
1:C:496:THR:CG2	1:C:499:GLN:H	2.17	0.57
1:D:418:VAL:HB	1:D:421:MET:CE	2.31	0.56
1:A:522:MET:HA	1:A:522:MET:HE3	1.88	0.56
1:C:533:VAL:HG23	1:C:534:VAL:HG23	1.87	0.56
1:B:310:LEU:HD22	1:B:314:GLN:HB3	1.88	0.56
1:C:372[A]:LEU:HD21	1:C:541:LEU:HD11	1.88	0.55
2:A:601:RL4:CBF	2:A:601:RL4:CAS	2.85	0.55
1:B:522:MET:HA	1:B:522:MET:HE3	1.88	0.55
1:A:415:GLY:O	1:A:421:MET:HE2	2.07	0.55
1:C:310:LEU:HD22	1:C:314:GLN:HB3	1.89	0.55
1:B:396:MET:HE3	1:B:435:PHE:O	2.08	0.54
1:A:396:MET:O	1:A:436:ARG:HD3	2.07	0.54
1:D:418:VAL:CG1	1:D:419:GLU:H	2.17	0.54
1:A:501:HIS:NE2	3:A:703:HOH:O	2.33	0.54
2:C:601:RL4:CBF	2:C:601:RL4:CAS	2.86	0.54
1:D:396:MET:O	1:D:436:ARG:HD3	2.08	0.54
1:B:372[A]:LEU:CD2	1:B:541:LEU:HD11	2.38	0.53
2:B:601:RL4:CAS	2:B:601:RL4:CBF	2.86	0.53
1:C:539:LEU:O	1:C:543:MET:HG3	2.09	0.53
1:C:496:THR:HG22	1:C:499:GLN:CG	2.39	0.53
1:C:496:THR:HG22	1:C:499:GLN:HG3	1.91	0.52
1:A:393:TRP:CZ3	1:A:396:MET:CE	2.91	0.52
1:C:396:MET:O	1:C:436:ARG:HD3	2.09	0.52
1:A:522:MET:HA	1:A:522:MET:CE	2.40	0.51
1:B:372[B]:LEU:O	1:B:376:VAL:HG23	2.10	0.51
1:B:379:LEU:HD12	1:B:544:LEU:HD11	1.94	0.50
1:B:531:LYS:HG2	3:B:824:HOH:O	2.12	0.49
1:C:313:ASP:OD1	3:C:701:HOH:O	2.20	0.49
1:C:519:ASN:ND2	1:D:519:ASN:HD22	2.02	0.49
1:A:379:LEU:HD12	1:A:544:LEU:HD11	1.95	0.48
1:B:343:MET:HE3	1:B:524:HIS:CE1	2.48	0.48
1:C:372[B]:LEU:O	1:C:376:VAL:HG23	2.14	0.48
1:C:547:HIS:CE1	1:C:549:LEU:HB2	2.49	0.48
1:B:335:ARG:HG2	1:B:336:PRO:HD2	1.96	0.48
1:A:530[A]:SER:HB2	1:A:533:VAL:HB	1.96	0.47
1:D:418:VAL:CG2	1:D:421:MET:HE1	2.36	0.47
2:D:601:RL4:CBF	2:D:601:RL4:CAS	2.93	0.47
1:D:416:LYS:CG	1:D:422:VAL:HG21	2.39	0.47
1:D:379:LEU:HD12	1:D:544:LEU:HD11	1.97	0.47
1:B:372[A]:LEU:CG	1:B:541:LEU:HD11	2.45	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:372[A]:LEU:HG	1:B:541:LEU:HD11	1.98	0.46
1:B:522:MET:HB3	1:B:522:MET:HE2	1.84	0.46
1:C:379:LEU:HD12	1:C:544:LEU:HD11	1.98	0.46
1:C:519:ASN:HD22	1:D:519:ASN:ND2	2.03	0.46
1:B:501:HIS:HE1	1:A:484:ASP:OD1	1.99	0.46
1:C:520:LYS:HA	1:C:520:LYS:HD2	1.69	0.45
1:C:415:GLY:O	1:C:421:MET:HB3	2.16	0.45
1:A:393:TRP:CE3	1:A:396:MET:HE2	2.52	0.45
1:B:377:HIS:CD2	1:B:461:PHE:CE1	3.05	0.45
1:A:355:VAL:HA	1:A:543:MET:HE1	1.99	0.44
1:A:522:MET:HE1	1:A:534:VAL:HG22	1.99	0.44
1:C:492:LYS:HE2	3:C:701:HOH:O	2.17	0.44
1:A:418:VAL:HG13	1:A:421:MET:CB	2.47	0.44
1:A:331:TYR:HB3	1:A:345:LEU:HD21	1.98	0.44
1:D:358:ILE:HD13	1:D:543:MET:CB	2.48	0.44
1:B:466:LEU:HB2	1:C:337:PHE:CD1	2.52	0.43
1:D:416:LYS:HG2	1:D:422:VAL:CG2	2.43	0.43
1:B:466:LEU:HD11	3:B:711:HOH:O	2.17	0.43
1:D:530[A]:SER:O	1:D:533:VAL:HG22	2.18	0.43
1:B:520:LYS:HA	1:B:520:LYS:HD2	1.81	0.43
1:B:350:ALA:CB	2:B:601:RL4:CBF	2.97	0.43
1:A:515:ARG:NE	3:A:720:HOH:O	2.52	0.43
1:D:332:ASP:HA	1:D:333:PRO:HD3	1.88	0.42
1:C:413:ASN:HA	1:C:416:LYS:NZ	2.35	0.42
1:B:372[A]:LEU:HG	1:B:541:LEU:CD1	2.50	0.42
1:B:309:SER:HB3	3:B:844:HOH:O	2.19	0.42
1:B:380:GLU:OE1	3:B:701:HOH:O	2.21	0.41
1:D:418:VAL:HG21	1:D:421:MET:CE	2.34	0.41
1:B:396:MET:HE3	1:B:435:PHE:C	2.41	0.41
1:A:316:VAL:HG21	1:A:489:LEU:HD21	2.01	0.41
1:B:380:GLU:HG3	1:B:540:LEU:HD12	2.03	0.41
1:B:424:ILE:HD11	2:B:601:RL4:CBA	2.51	0.41
1:D:359:ASN:ND2	3:D:716:HOH:O	2.54	0.41
1:D:372:LEU:O	1:D:376:VAL:HG23	2.21	0.41
1:B:461:PHE:O	1:B:463:SER:N	2.54	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	229/262 (87%)	228 (100%)	1 (0%)	0	100	100
1	B	237/262 (90%)	232 (98%)	5 (2%)	0	100	100
1	C	245/262 (94%)	244 (100%)	1 (0%)	0	100	100
1	D	242/262 (92%)	239 (99%)	3 (1%)	0	100	100
All	All	953/1048 (91%)	943 (99%)	10 (1%)	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	206/237 (87%)	204 (99%)	2 (1%)	76	71
1	B	213/237 (90%)	213 (100%)	0	100	100
1	C	216/237 (91%)	214 (99%)	2 (1%)	78	75
1	D	211/237 (89%)	211 (100%)	0	100	100
All	All	846/948 (89%)	842 (100%)	4 (0%)	88	87

All (4) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	321	ASP
1	A	396	MET

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Mol	Chain	Res	Type
1	C	432	SER
1	C	464	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	524	HIS
1	A	413	ASN
1	C	359	ASN
1	C	519	ASN
1	D	359	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 monosaccharides in this entry.

5.6 Ligand geometry [i](#)

4 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	$\# Z > 2$
2	RL4	A	601	-	35,36,36	3.06	14 (40%)	46,50,50	1.85	12 (26%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	RL4	B	601	-	35,36,36	3.14	16 (45%)	46,50,50	1.82	8 (17%)
2	RL4	C	601	-	35,36,36	3.01	16 (45%)	46,50,50	1.74	10 (21%)
2	RL4	D	601	-	35,36,36	3.02	13 (37%)	46,50,50	1.87	12 (26%)

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	RL4	A	601	-	-	3/14/37/37	0/5/5/5
2	RL4	B	601	-	-	3/14/37/37	0/5/5/5
2	RL4	C	601	-	-	3/14/37/37	0/5/5/5
2	RL4	D	601	-	-	3/14/37/37	0/5/5/5

All (59) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	601	RL4	CAQ-CAP	7.97	1.53	1.38
2	A	601	RL4	CAQ-CAP	7.47	1.52	1.38
2	C	601	RL4	CAQ-CAP	7.44	1.52	1.38
2	D	601	RL4	CAQ-CAP	6.99	1.51	1.38
2	C	601	RL4	CAE-CAF	-6.51	1.29	1.40
2	D	601	RL4	CAM-CAL	6.42	1.49	1.39
2	A	601	RL4	CAN-CAO	6.13	1.50	1.38
2	A	601	RL4	CAA-CAF	6.10	1.47	1.39
2	B	601	RL4	CAN-CAO	6.08	1.50	1.38
2	D	601	RL4	CAE-CAF	-5.96	1.30	1.40
2	A	601	RL4	CAM-CAL	5.82	1.48	1.39
2	D	601	RL4	CAD-CAE	5.70	1.49	1.39
2	A	601	RL4	CAE-CAF	-5.58	1.30	1.40
2	D	601	RL4	CAN-CAO	5.57	1.49	1.38
2	C	601	RL4	CAM-CAL	5.49	1.47	1.39
2	B	601	RL4	CAA-CAF	5.43	1.46	1.39
2	B	601	RL4	CAM-CAL	5.40	1.47	1.39
2	B	601	RL4	CAD-CAE	5.40	1.48	1.39
2	B	601	RL4	CAE-CAF	-5.37	1.31	1.40
2	C	601	RL4	CAA-CAF	5.35	1.46	1.39
2	B	601	RL4	CAT-NAU	-5.25	1.37	1.47
2	C	601	RL4	CAT-NAU	-4.93	1.38	1.47
2	C	601	RL4	CAN-CAO	4.92	1.48	1.38

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	601	RL4	CAA-CAF	4.58	1.45	1.39
2	D	601	RL4	CAT-NAU	-4.43	1.39	1.47
2	A	601	RL4	CAL-CAJ	-4.40	1.47	1.52
2	B	601	RL4	CAF-CAJ	-4.33	1.45	1.51
2	C	601	RL4	CAL-CAJ	-4.31	1.47	1.52
2	A	601	RL4	CAT-NAU	-4.27	1.39	1.47
2	A	601	RL4	CAD-CAE	4.22	1.46	1.39
2	B	601	RL4	CAL-CAJ	-4.18	1.47	1.52
2	D	601	RL4	CAL-CAJ	-4.17	1.47	1.52
2	D	601	RL4	CAP-CAO	-3.70	1.31	1.38
2	A	601	RL4	CAW-CAK	-3.60	1.33	1.39
2	C	601	RL4	CAQ-CAL	-3.51	1.33	1.39
2	C	601	RL4	CAD-CAE	3.41	1.45	1.39
2	C	601	RL4	CAP-CAO	-3.32	1.32	1.38
2	B	601	RL4	CAQ-CAL	-3.23	1.33	1.39
2	C	601	RL4	CAW-CAK	-3.14	1.34	1.39
2	A	601	RL4	CAP-CAO	-3.12	1.32	1.38
2	D	601	RL4	CAW-CAK	-3.08	1.34	1.39
2	B	601	RL4	CAP-CAO	-2.89	1.32	1.38
2	D	601	RL4	CBA-CAK	-2.87	1.34	1.39
2	A	601	RL4	CAF-CAJ	-2.76	1.47	1.51
2	A	601	RL4	CBD-CBE	-2.74	1.48	1.53
2	D	601	RL4	CAQ-CAL	-2.73	1.34	1.39
2	B	601	RL4	CBD-CBE	-2.63	1.48	1.53
2	A	601	RL4	CAQ-CAL	-2.61	1.34	1.39
2	C	601	RL4	CAM-CAN	-2.50	1.34	1.38
2	B	601	RL4	CAH-CAI	-2.48	1.50	1.53
2	C	601	RL4	CAF-CAJ	-2.48	1.48	1.51
2	B	601	RL4	CAI-CAJ	-2.47	1.47	1.55
2	C	601	RL4	CBA-CAK	-2.29	1.35	1.39
2	C	601	RL4	CBD-CBE	-2.23	1.49	1.53
2	B	601	RL4	CAM-CAN	-2.23	1.34	1.38
2	C	601	RL4	CAB-CAA	-2.22	1.34	1.38
2	A	601	RL4	CBA-CAK	-2.21	1.35	1.39
2	D	601	RL4	CAM-CAN	-2.17	1.34	1.38
2	B	601	RL4	CAW-CAK	-2.06	1.35	1.39

All (42) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	601	RL4	CAL-CAJ-CAF	-6.00	103.80	112.86
2	B	601	RL4	CAB-CAC-CAD	-5.84	113.78	120.17

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	601	RL4	CAB-CAC-CAD	-5.06	114.63	120.17
2	D	601	RL4	CBB-NAU-CBE	-4.92	97.13	104.87
2	B	601	RL4	CAA-CAB-CAC	4.92	125.27	119.88
2	C	601	RL4	CBF-CBE-CBD	-4.42	106.87	113.09
2	C	601	RL4	CAL-CAJ-CAF	-4.34	106.31	112.86
2	D	601	RL4	CAL-CAJ-CAF	-4.21	106.51	112.86
2	A	601	RL4	CAA-CAB-CAC	3.99	124.26	119.88
2	A	601	RL4	CBB-NAU-CBE	-3.81	98.88	104.87
2	C	601	RL4	CAA-CAF-CAJ	-3.45	115.97	124.90
2	B	601	RL4	CAA-CAF-CAJ	-3.30	116.36	124.90
2	B	601	RL4	CAM-CAN-CAO	3.30	123.77	119.73
2	C	601	RL4	CAM-CAN-CAO	3.28	123.74	119.73
2	A	601	RL4	CAA-CAF-CAJ	-3.22	116.56	124.90
2	C	601	RL4	CBA-CAK-CAW	3.21	122.29	118.29
2	A	601	RL4	CAB-CAC-CAD	-3.21	116.66	120.17
2	B	601	RL4	CAT-NAU-CBB	-2.99	108.70	113.97
2	D	601	RL4	CAA-CAB-CAC	2.88	123.04	119.88
2	B	601	RL4	CAN-CAM-CAL	-2.85	118.33	121.20
2	C	601	RL4	CAB-CAC-CAD	-2.80	117.11	120.17
2	B	601	RL4	CBF-CBE-NAU	-2.79	106.10	112.72
2	A	601	RL4	CAF-CAJ-CAI	2.66	113.90	108.11
2	D	601	RL4	CAF-CAJ-CAI	2.65	113.86	108.11
2	C	601	RL4	CAG-CAH-CAI	-2.63	107.05	110.27
2	D	601	RL4	CAQ-CAP-CAO	2.60	122.91	119.73
2	B	601	RL4	CAE-CAF-CAJ	2.59	125.70	120.80
2	D	601	RL4	CAA-CAF-CAJ	-2.54	118.32	124.90
2	A	601	RL4	CBA-CAK-CAW	2.50	121.41	118.29
2	D	601	RL4	CAG-CAH-CAI	-2.46	107.25	110.27
2	A	601	RL4	CAB-CAA-CAF	-2.44	117.01	121.13
2	D	601	RL4	CAT-NAU-CBB	-2.44	109.67	113.97
2	C	601	RL4	CAF-CAJ-CAI	2.41	113.36	108.11
2	A	601	RL4	CAM-CAN-CAO	2.41	122.68	119.73
2	A	601	RL4	CAW-CAK-CAI	-2.33	116.66	121.08
2	D	601	RL4	CBA-CAK-CAW	2.32	121.19	118.29
2	A	601	RL4	CAG-CAH-CAI	-2.23	107.53	110.27
2	D	601	RL4	CAM-CAL-CAJ	-2.18	116.77	121.04
2	C	601	RL4	CAE-CAF-CAJ	2.13	124.83	120.80
2	A	601	RL4	CAN-CAM-CAL	-2.12	119.06	121.20
2	D	601	RL4	CAN-CAO-CAP	-2.02	117.06	120.18
2	C	601	RL4	CAW-CAK-CAI	-2.00	117.29	121.08

There are no chirality outliers.

All (12) torsion outliers are listed below:

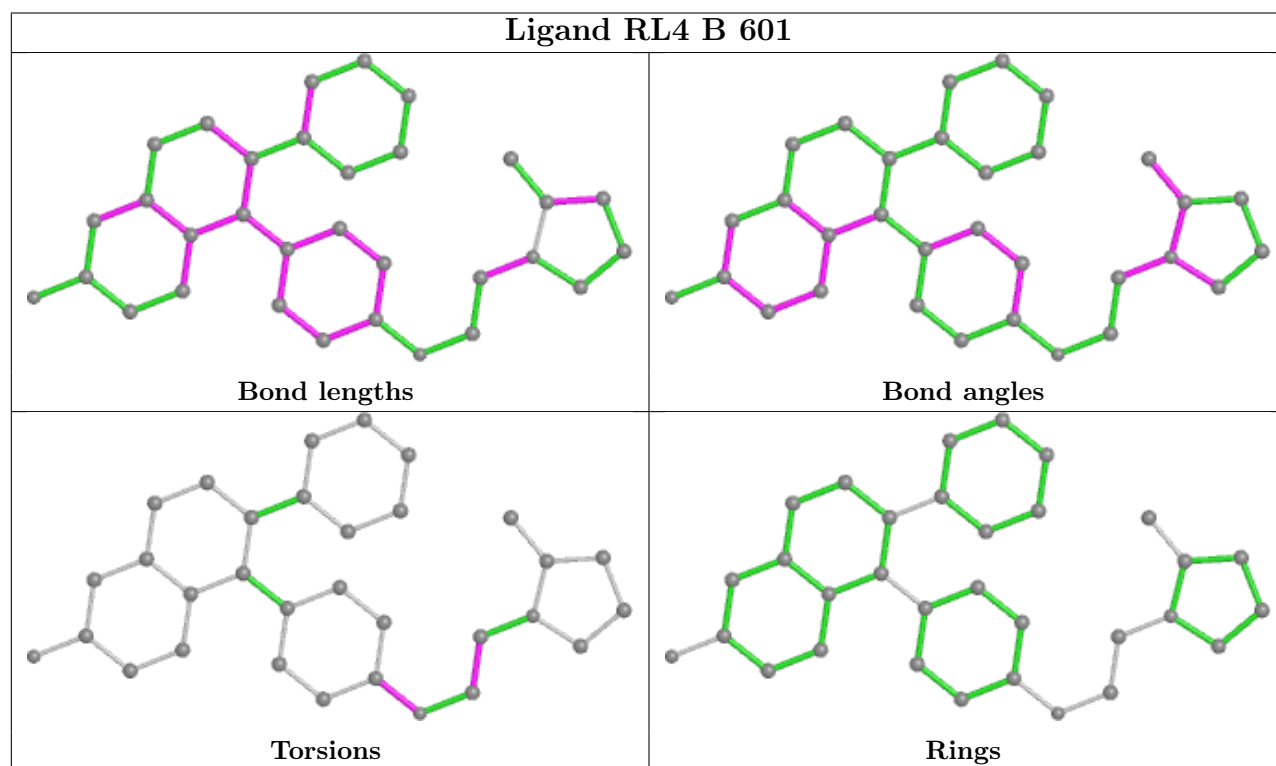
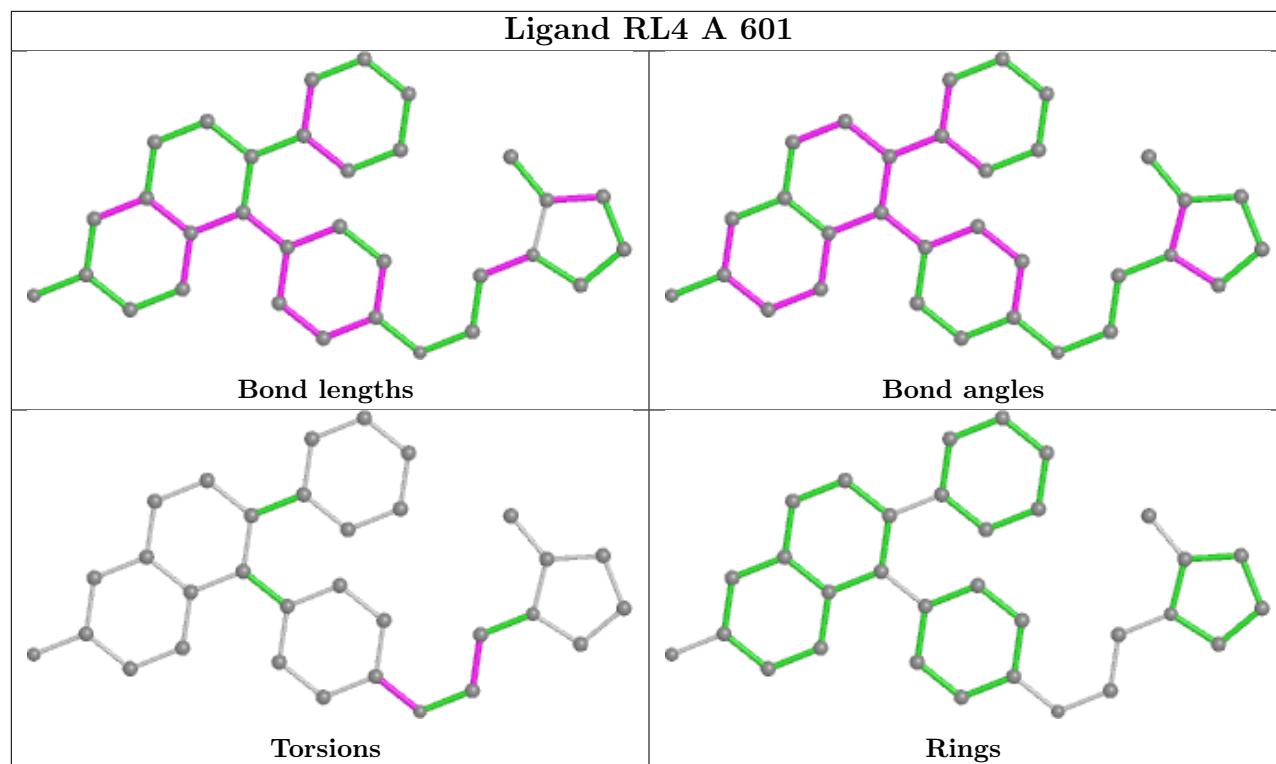
Mol	Chain	Res	Type	Atoms
2	B	601	RL4	OAR-CAS-CAT-NAU
2	D	601	RL4	OAR-CAS-CAT-NAU
2	B	601	RL4	CAN-CAO-OAR-CAS
2	C	601	RL4	OAR-CAS-CAT-NAU
2	A	601	RL4	OAR-CAS-CAT-NAU
2	B	601	RL4	CAP-CAO-OAR-CAS
2	D	601	RL4	CAN-CAO-OAR-CAS
2	A	601	RL4	CAN-CAO-OAR-CAS
2	C	601	RL4	CAN-CAO-OAR-CAS
2	D	601	RL4	CAP-CAO-OAR-CAS
2	A	601	RL4	CAP-CAO-OAR-CAS
2	C	601	RL4	CAP-CAO-OAR-CAS

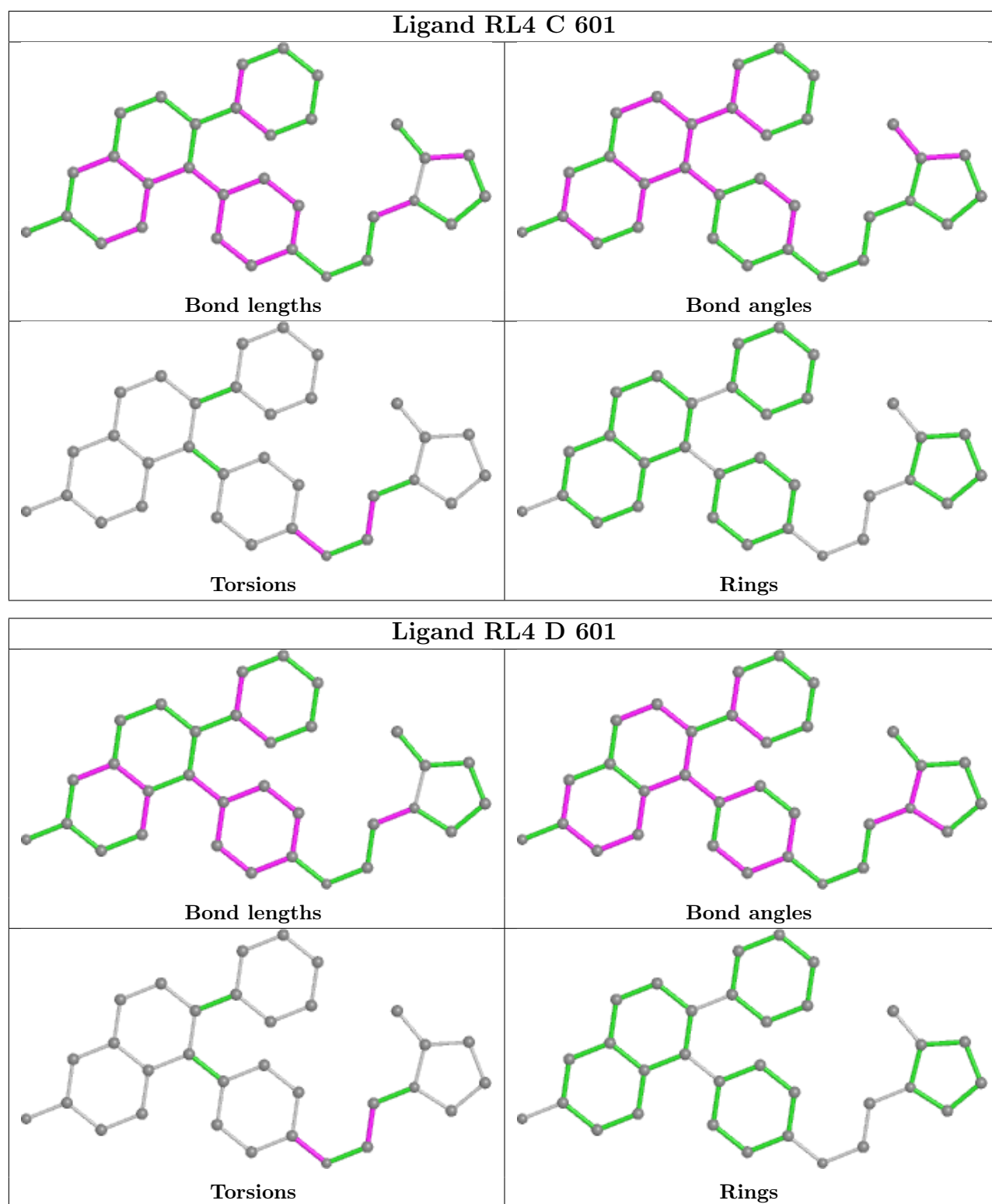
There are no ring outliers.

4 monomers are involved in 6 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	601	RL4	1	0
2	B	601	RL4	3	0
2	C	601	RL4	1	0
2	D	601	RL4	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	233/262 (88%)	-0.57	1 (0%) 92 90	7, 21, 43, 53	1 (0%)
1	B	238/262 (90%)	-0.52	3 (1%) 77 74	6, 21, 44, 54	1 (0%)
1	C	242/262 (92%)	-0.52	4 (1%) 70 66	6, 21, 45, 52	1 (0%)
1	D	238/262 (90%)	-0.50	3 (1%) 77 74	6, 21, 48, 58	0
All	All	951/1048 (90%)	-0.52	11 (1%) 79 76	6, 21, 45, 58	3 (0%)

All (11) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	418	VAL	3.6
1	C	308	LEU	3.1
1	C	462	LEU	3.1
1	D	526	TYR	2.5
1	D	417	SER	2.4
1	B	308	LEU	2.4
1	C	525	LEU	2.3
1	B	549	LEU	2.3
1	D	530[A]	SER	2.1
1	B	533	VAL	2.0
1	C	549	LEU	2.0

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

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

6.3 Carbohydrates [i](#)

There are no monosaccharides in this entry.

6.4 Ligands

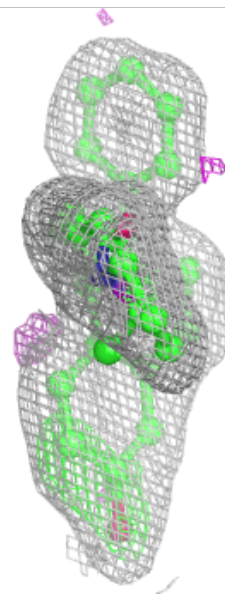
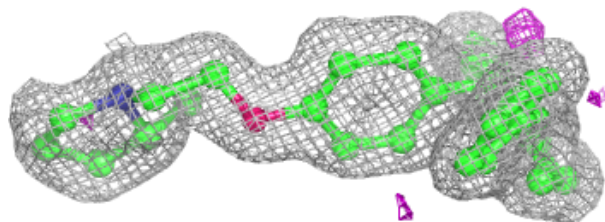
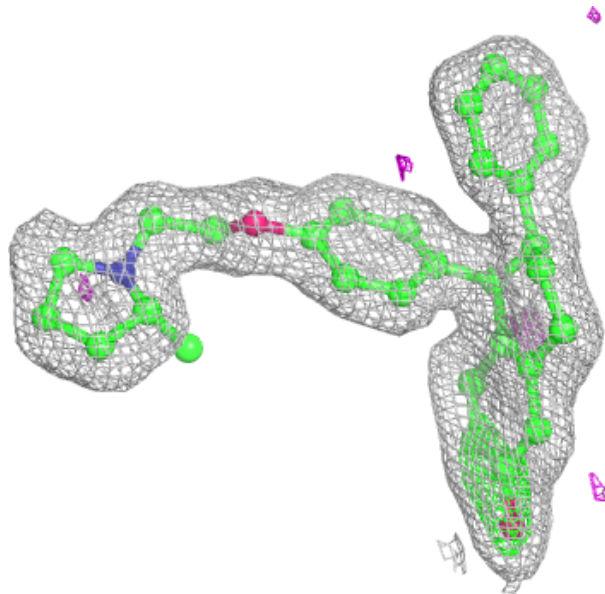
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists 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	RL4	B	601	32/32	0.89	0.10	14,16,39,43	0
2	RL4	A	601	32/32	0.92	0.10	14,14,30,35	0
2	RL4	D	601	32/32	0.92	0.10	14,14,31,42	0
2	RL4	C	601	32/32	0.94	0.09	14,14,32,38	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.

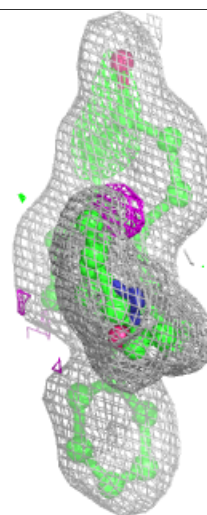
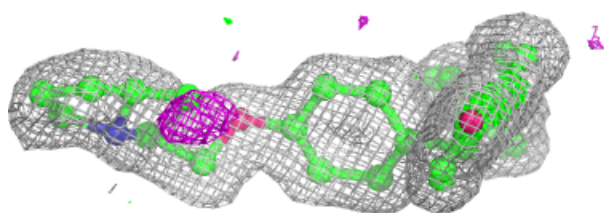
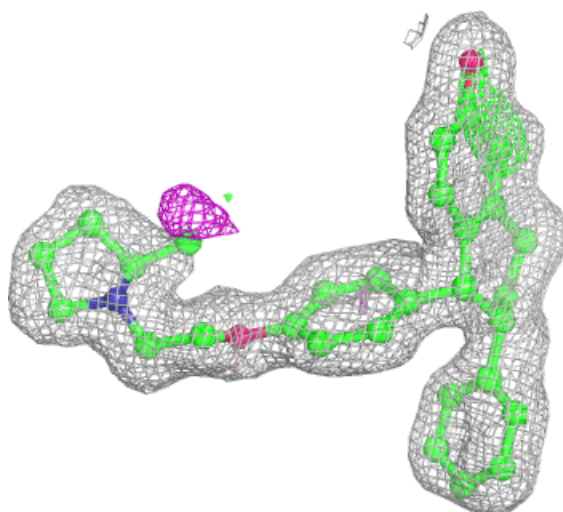
Electron density around RL4 B 601:

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



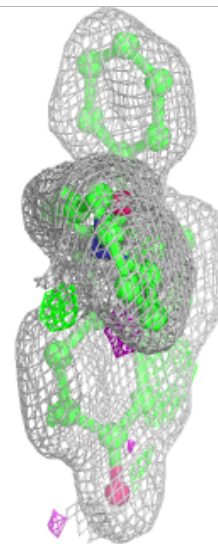
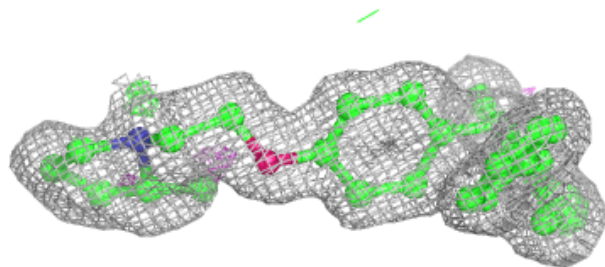
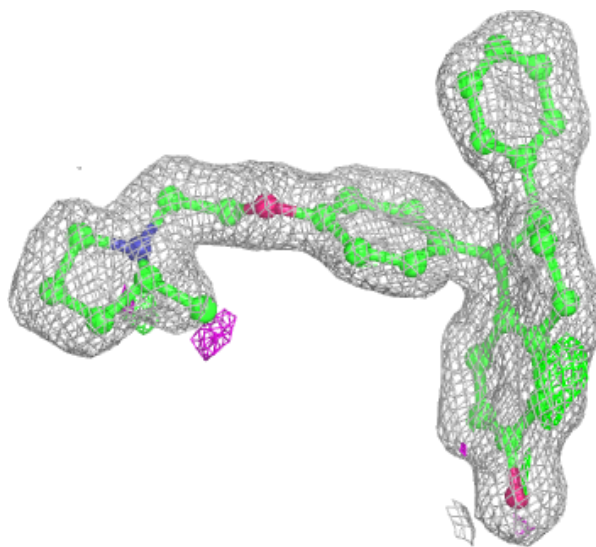
Electron density around RL4 A 601:

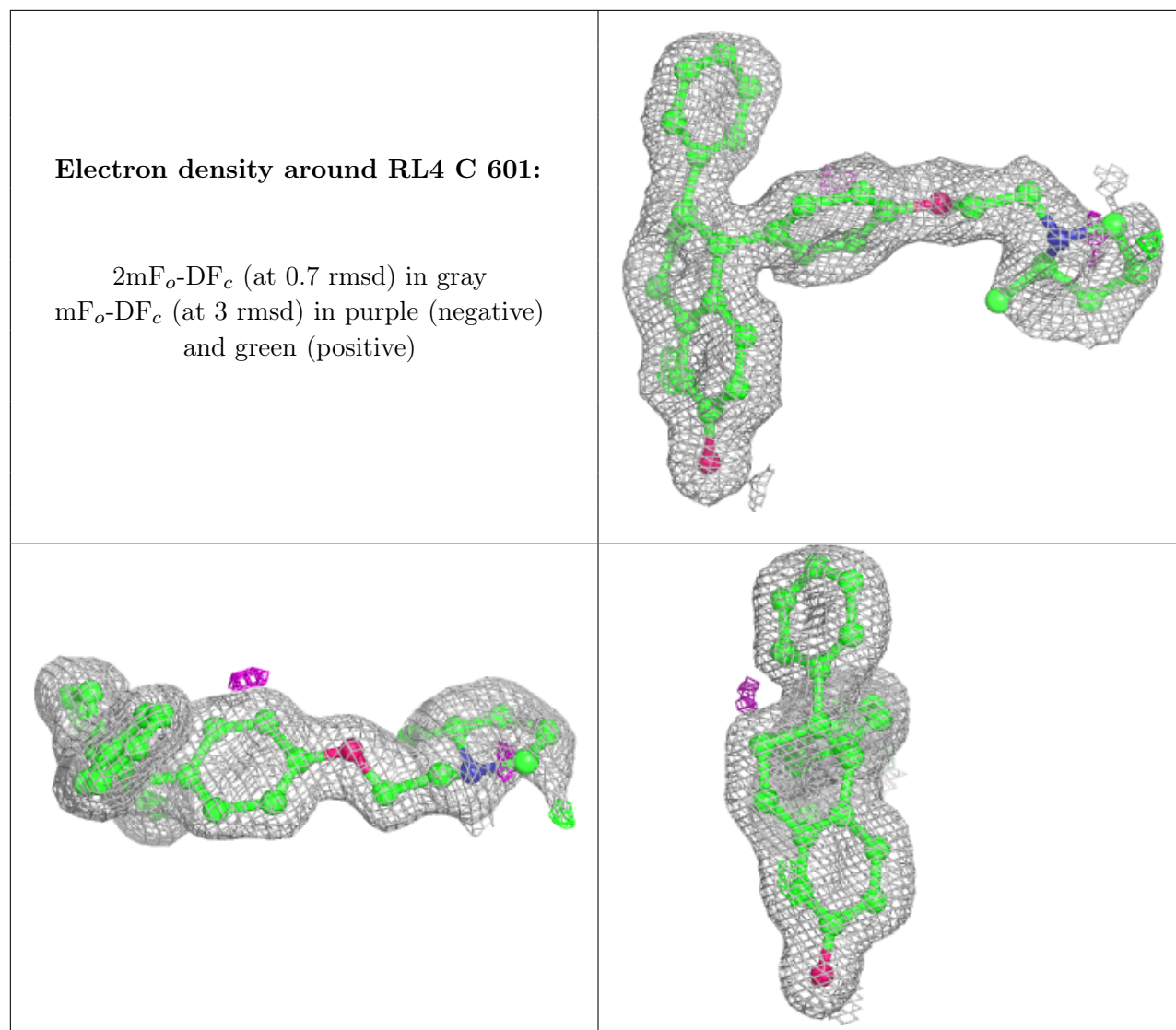
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around RL4 D 601:

$2mF_o-DF_c$ (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.