



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 6, 2026 – 04:15 PM UTC

PDB ID : 5S7K / pdb_00005s7k
Title : XChem group deposition – Crystal Structure of human ACVR1 in complex with FM010936a
Authors : Williams, E.P.; Adamson, R.J.; Smil, D.; Krojer, T.; Burgess-Brown, N.; von Delft, F.; Bountra, C.; Bullock, A.N.
Deposited on : 2020-12-11
Resolution : 1.31 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	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

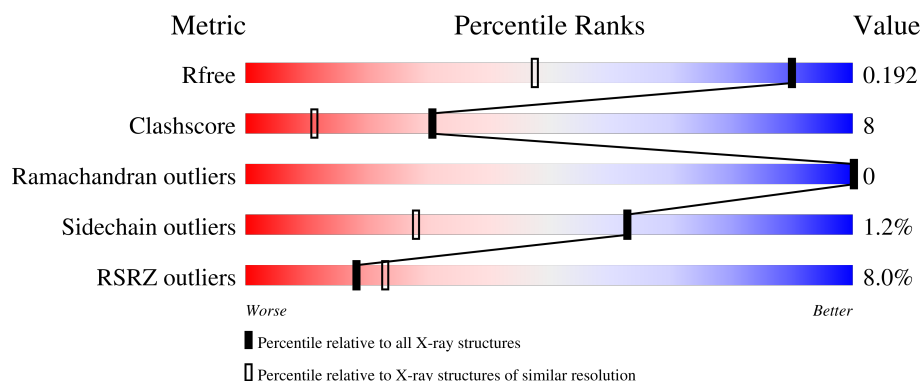
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.31 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}	180053	2531 (1.34-1.30)
Clashscore	190562	2585 (1.34-1.30)
Ramachandran outliers	187476	2528 (1.34-1.30)
Sidechain outliers	187428	2528 (1.34-1.30)
RSRZ outliers	180081	2528 (1.34-1.30)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. 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	301	8% 81% 13% • 5%
1	B	301	8% 89% 8% •

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
4	XEJ	A	508[A]	-	-	X	-
4	XEJ	A	508[B]	-	-	X	-
4	XEJ	B	504	-	X	-	-

2 Entry composition [i](#)

There are 6 unique types of molecules in this entry. The entry contains 5815 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 Activin receptor type-1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	285	Total	C	N	O	S	0	22	0
			2415	1543	415	441	16			
1	B	293	Total	C	N	O	S	0	9	0
			2382	1521	409	436	16			

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	199	SER	-	expression tag	UNP Q04771
A	200	MET	-	expression tag	UNP Q04771
A	207	ASP	GLN	conflict	UNP Q04771
B	199	SER	-	expression tag	UNP Q04771
B	200	MET	-	expression tag	UNP Q04771
B	207	ASP	GLN	conflict	UNP Q04771

- Molecule 2 is 4-methyl-3-[4-(1-methylpiperidin-4-yl)phenyl]-5-(3,4,5-trimethoxyphenyl)pyridine (CCD ID: LU8) (formula: C₂₇H₃₂N₂O₃).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	C	N	O	0	1
			64	54	4	6		
2	A	1	Total	C	N	O	0	0
			32	27	2	3		
2	A	1	Total	C	N	O	0	0
			32	27	2	3		
2	B	1	Total	C	N	O	0	0
			32	27	2	3		

- Molecule 3 is 1,2-ETHANEDIOL (CCD ID: EDO) (formula: C₂H₆O₂).



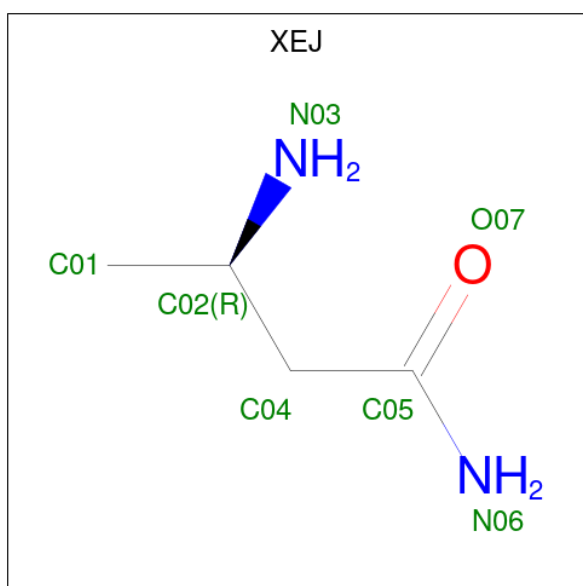
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			4	2	2		
3	A	1	Total	C	O	0	0
			4	2	2		
3	A	1	Total	C	O	0	0
			4	2	2		
3	A	1	Total	C	O	0	0
			4	2	2		
3	A	1	Total	C	O	0	0
			4	2	2		
3	A	1	Total	C	O	0	0
			4	2	2		
3	A	1	Total	C	O	0	0
			4	2	2		

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			4	2	2		
3	B	1	Total	C	O	0	0
			4	2	2		
3	B	1	Total	C	O	0	0
			4	2	2		
3	B	1	Total	C	O	0	0
			4	2	2		
3	B	1	Total	C	O	0	0
			4	2	2		

- Molecule 4 is (3R)-3-aminobutanamide (CCD ID: XEJ) (formula: C₄H₁₀N₂O).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	A	1	Total	C	N	O	0	1
			14	8	4	2		
4	B	1	Total	C	N	O	0	0
			7	4	2	1		

- Molecule 5 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total	O	S	0	0
			5	4	1		
5	A	1	Total	O	S	0	0
			5	4	1		
5	B	1	Total	O	S	0	0
			5	4	1		
5	B	1	Total	O	S	0	0
			5	4	1		
5	B	1	Total	O	S	0	0
			5	4	1		

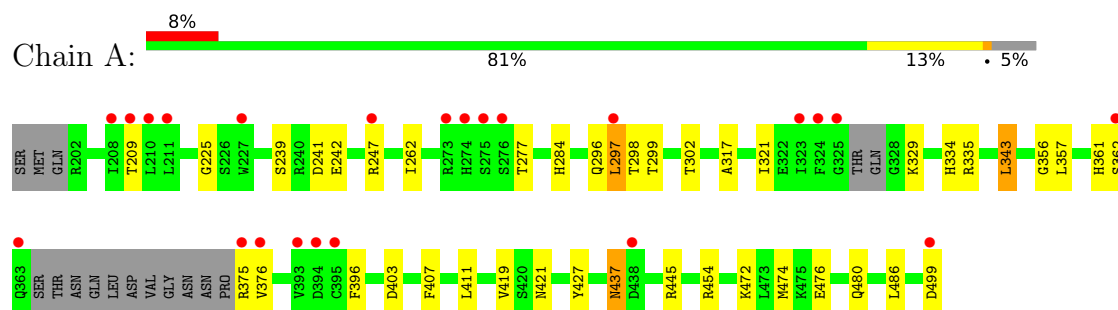
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	374	Total	O	0	1
			375	375		
6	B	385	Total	O	0	0
			385	385		

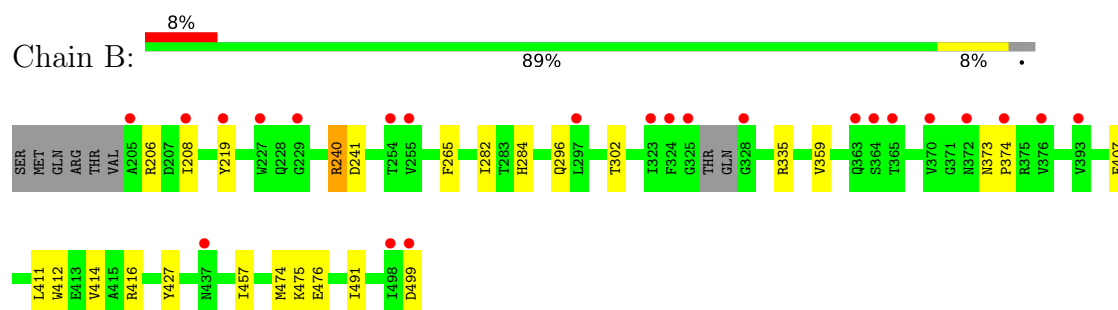
3 Residue-property plots [i](#)

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: Activin receptor type-1



- Molecule 1: Activin receptor type-1



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	127.11Å 84.78Å 87.80Å 90.00° 130.95° 90.00°	Depositor
Resolution (Å)	48.05 – 1.31 48.05 – 1.31	Depositor EDS
% Data completeness (in resolution range)	69.8 (48.05-1.31) 69.8 (48.05-1.31)	Depositor EDS
R_{merge}	0.05	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	0.99 (at 1.31Å)	Xtriage
Refinement program	REFMAC 5.8.0258	Depositor
R, R_{free}	0.160 , 0.188 0.163 , 0.192	Depositor DCC
R_{free} test set	5901 reflections (3.50%)	wwPDB-VP
Wilson B-factor (Å ²)	17.3	Xtriage
Anisotropy	0.094	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 49.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	0.010 for -h+k-l,-l,-k 0.000 for -h-k-l,l,k 0.014 for -h-2*l,-k,l	Xtriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	5815	wwPDB-VP
Average B, all atoms (Å ²)	23.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.09% 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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: XEJ, EDO, LU8, SO4

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	1.02	1/2477 (0.0%)	1.16	6/3357 (0.2%)
1	B	1.08	1/2444 (0.0%)	1.21	3/3318 (0.1%)
All	All	1.05	2/4921 (0.0%)	1.18	9/6675 (0.1%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	334	HIS	CE1-NE2	5.45	1.38	1.32
1	B	414	VAL	C-O	5.15	1.29	1.24

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	437	ASN	CA-C-O	-7.44	112.59	120.63
1	A	403	ASP	CA-CB-CG	5.65	118.25	112.60
1	A	296	GLN	CA-C-N	5.38	131.00	122.19
1	A	296	GLN	C-N-CA	5.38	131.00	122.19
1	B	284	HIS	CB-CA-C	5.34	119.18	109.62
1	A	296	GLN	O-C-N	5.32	128.82	122.27
1	A	297	LEU	N-CA-CB	-5.25	103.36	110.66
1	B	296	GLN	CA-C-N	5.10	131.12	122.36
1	B	296	GLN	C-N-CA	5.10	131.12	122.36

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	2415	0	2377	56	0
1	B	2382	0	2349	18	0
2	A	128	0	0	3	0
2	B	32	0	0	0	0
3	A	36	0	50	6	0
3	B	16	0	23	1	0
4	A	14	0	0	13	0
4	B	7	0	0	1	1
5	A	10	0	0	0	0
5	B	15	0	0	0	0
6	A	375	0	0	20	1
6	B	385	0	0	5	2
All	All	5815	0	4799	82	2

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 8.

All (82) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:247:ARG:HD3	4:A:508[A]:XEJ:N03	1.45	1.31
1:A:247:ARG:NH2	6:A:601:HOH:O	1.70	1.20
1:A:242:GLU:OE1	6:A:602:HOH:O	1.84	0.95
1:A:247:ARG:HG2	4:A:508[B]:XEJ:C01	1.99	0.93
1:A:356:GLY:O	4:A:508[A]:XEJ:N06	2.08	0.86
1:A:241[A]:ASP:OD2	6:A:603:HOH:O	1.94	0.84
1:A:247:ARG:CD	4:A:508[A]:XEJ:N03	2.38	0.83
1:A:247:ARG:CZ	6:A:613:HOH:O	2.27	0.83
1:A:247:ARG:HD3	4:A:508[B]:XEJ:N03	1.94	0.81
4:A:508[A]:XEJ:O07	6:A:604:HOH:O	1.98	0.81
1:A:299[B]:THR:HG22	6:A:778:HOH:O	1.84	0.77
1:A:357[A]:LEU:HD23	4:A:508[A]:XEJ:N06	1.98	0.77
1:A:411[A]:LEU:HG	1:A:474:MET:HE2	1.68	0.76
1:A:299[B]:THR:CG2	1:A:419:VAL:HG23	2.16	0.76
4:B:504:XEJ:N03	4:B:504:XEJ:O07	2.01	0.74

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:317:ALA:O	1:A:321[B]:ILE:HD13	1.87	0.73
1:A:284[B]:HIS:HE1	6:A:797:HOH:O	1.73	0.71
1:A:375:ARG:O	6:A:605:HOH:O	2.08	0.71
3:B:507:EDO:H12	6:B:725:HOH:O	1.92	0.69
1:A:299[B]:THR:HG23	1:A:419:VAL:HG23	1.74	0.68
1:A:437:ASN:HA	3:A:505:EDO:H11	1.75	0.68
1:A:247:ARG:HG2	4:A:508[A]:XEJ:C01	2.22	0.68
1:A:454:ARG:HH22	1:A:480[B]:GLN:CD	2.02	0.67
4:A:508[A]:XEJ:C01	6:A:606:HOH:O	2.43	0.65
1:A:335:ARG:NH1	6:A:606:HOH:O	2.26	0.65
1:A:302:THR:HG21	1:A:499:ASP:OD2	1.98	0.64
1:A:407:PHE:HE2	1:A:411[B]:LEU:HD11	1.63	0.64
1:A:407:PHE:CE2	1:A:411[B]:LEU:HD11	2.32	0.64
1:A:299[B]:THR:CG2	1:A:419:VAL:CG2	2.76	0.63
1:B:457:ILE:HG13	1:B:475:LYS:NZ	2.14	0.62
1:B:208:ILE:CD1	1:B:282:ILE:HD13	2.31	0.61
1:B:335:ARG:HD2	1:B:359[B]:VAL:HG23	1.82	0.61
1:A:247:ARG:CD	4:A:508[B]:XEJ:N03	2.64	0.59
1:A:247:ARG:NE	6:A:613:HOH:O	2.35	0.59
1:B:411[B]:LEU:HG	1:B:474:MET:HE2	1.84	0.59
1:A:454:ARG:NH2	1:A:480[B]:GLN:OE1	2.36	0.59
1:A:299[B]:THR:HG21	1:A:419:VAL:CG2	2.32	0.58
1:B:208:ILE:HD11	1:B:282:ILE:HD13	1.84	0.58
1:B:457:ILE:HG13	1:B:475:LYS:HZ1	1.67	0.58
1:A:357[B]:LEU:HA	4:A:508[B]:XEJ:C01	2.34	0.57
1:B:373:ASN:HD22	1:B:374:PRO:HD2	1.71	0.55
1:A:357[B]:LEU:HD11	1:A:376:VAL:CB	2.38	0.54
1:B:499:ASP:OD1	6:B:601:HOH:O	2.19	0.53
1:A:247:ARG:NH1	6:A:613:HOH:O	2.40	0.53
1:A:445:ARG:HH22	3:A:504:EDO:H21	1.73	0.52
1:B:476:GLU:HG2	6:B:638:HOH:O	2.09	0.52
4:A:508[B]:XEJ:C01	4:A:508[B]:XEJ:N06	2.72	0.52
1:A:329:LYS:HB3	3:A:511:EDO:H21	1.91	0.51
1:A:247:ARG:HD2	6:A:613:HOH:O	2.12	0.49
1:A:262[A]:ILE:O	3:A:502:EDO:H11	2.14	0.48
1:A:437:ASN:HD22	3:A:505:EDO:C2	2.26	0.48
1:A:247:ARG:CD	6:A:613:HOH:O	2.63	0.47
1:A:472:LYS:O	1:A:476[B]:GLU:HG3	2.13	0.47
2:A:501[B]:LU8:C25	2:A:501[B]:LU8:C12	2.93	0.47
1:A:421[B]:ASN:CG	6:A:623:HOH:O	2.57	0.47
1:A:361:HIS:HB2	1:A:396:PHE:CD1	2.49	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:476[A]:GLU:HB3	1:A:486:LEU:HG	1.98	0.46
1:A:357[A]:LEU:HG	6:A:923:HOH:O	2.14	0.46
1:B:302:THR:HG21	1:B:499:ASP:OD2	2.15	0.46
1:A:357[A]:LEU:HA	4:A:508[A]:XEJ:N06	2.30	0.45
1:A:437:ASN:HA	3:A:505:EDO:C1	2.46	0.45
1:B:240:ARG:NH1	1:B:241[B]:ASP:OD1	2.50	0.45
1:B:335:ARG:CD	1:B:359[B]:VAL:HG23	2.47	0.45
1:B:240:ARG:CZ	1:B:241[B]:ASP:OD1	2.65	0.45
1:B:412:TRP:CZ2	1:B:416:ARG:HD2	2.52	0.45
1:A:321[B]:ILE:HD12	6:A:833:HOH:O	2.17	0.44
1:A:321[A]:ILE:O	1:A:329:LYS:NZ	2.49	0.44
1:A:298[A]:THR:HG22	1:A:299[A]:THR:O	2.17	0.44
2:A:501[B]:LU8:C15	2:A:501[B]:LU8:C19	2.88	0.43
1:A:357[A]:LEU:HD11	6:A:923:HOH:O	2.17	0.43
1:A:357[A]:LEU:CD1	6:A:923:HOH:O	2.67	0.43
1:A:277:THR:HB	6:A:602:HOH:O	2.18	0.43
1:A:357[B]:LEU:HD21	1:A:376:VAL:CB	2.49	0.43
1:B:206:ARG:NH1	6:B:603:HOH:O	2.37	0.42
1:A:427:TYR:CD2	1:A:427:TYR:C	2.98	0.42
1:B:219:TYR:HB2	6:B:604:HOH:O	2.19	0.42
2:A:501[B]:LU8:C25	2:A:501[B]:LU8:C26	2.97	0.41
1:A:407:PHE:CZ	1:A:411[B]:LEU:HD21	2.56	0.41
1:A:209:THR:O	1:A:225:GLY:HA2	2.21	0.41
1:B:427:TYR:CD2	1:B:427:TYR:C	2.99	0.40
1:B:407[B]:PHE:CE2	1:B:491:ILE:HG21	2.56	0.40

All (2) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:B:504:XEJ:C01	6:B:919:HOH:O[2_454]	2.02	0.18
6:A:746:HOH:O	6:B:900:HOH:O[3_546]	2.07	0.13

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	301/301 (100%)	298 (99%)	3 (1%)	0	100	100
1	B	298/301 (99%)	294 (99%)	4 (1%)	0	100	100
All	All	599/602 (100%)	592 (99%)	7 (1%)	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	262/270 (97%)	257 (98%)	5 (2%)	50	14
1	B	261/270 (97%)	259 (99%)	2 (1%)	73	45
All	All	523/540 (97%)	516 (99%)	7 (1%)	63	24

All (7) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	239	SER
1	A	297	LEU
1	A	343[A]	LEU
1	A	343[B]	LEU
1	A	362	SER
1	B	240	ARG
1	B	265	PHE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	361	HIS
1	A	437	ASN
1	B	284	HIS

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Mol	Chain	Res	Type
1	B	373	ASN

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 oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

26 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	LU8	A	507	-	35,35,35	1.22	4 (11%)	47,49,49	1.47	7 (14%)
2	LU8	A	501[A]	-	35,35,35	1.00	1 (2%)	47,49,49	1.40	6 (12%)
3	EDO	B	508	-	3,3,3	0.41	0	2,2,2	0.27	0
5	SO4	A	509	-	4,4,4	0.94	0	6,6,6	0.26	0
3	EDO	A	504	-	3,3,3	0.25	0	2,2,2	0.29	0
3	EDO	A	502	-	3,3,3	1.03	0	2,2,2	1.06	0
3	EDO	B	507	-	3,3,3	0.82	0	2,2,2	1.63	0
3	EDO	A	514	-	3,3,3	0.13	0	2,2,2	0.02	0
3	EDO	B	509	-	3,3,3	0.23	0	2,2,2	0.11	0
4	XEJ	B	504	-	6,6,6	1.96	2 (33%)	7,7,7	6.74	3 (42%)
5	SO4	B	505	-	4,4,4	0.26	0	6,6,6	0.13	0
5	SO4	B	506	-	4,4,4	0.92	0	6,6,6	0.28	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	EDO	A	513	-	3,3,3	0.93	0	2,2,2	0.71	0
3	EDO	A	512	-	3,3,3	0.11	0	2,2,2	0.14	0
3	EDO	A	511	-	3,3,3	0.03	0	2,2,2	0.63	0
4	XEJ	A	508[B]	-	6,6,6	1.99	2 (33%)	7,7,7	1.78	1 (14%)
3	EDO	A	515	-	3,3,3	0.39	0	2,2,2	0.39	0
3	EDO	A	505	-	3,3,3	0.99	0	2,2,2	0.71	0
4	XEJ	A	508[A]	-	6,6,6	1.85	1 (16%)	7,7,7	0.75	0
5	SO4	A	510	-	4,4,4	0.29	0	6,6,6	0.34	0
2	LU8	A	501[B]	-	35,35,35	0.74	1 (2%)	47,49,49	1.87	11 (23%)
3	EDO	B	503	-	3,3,3	0.61	0	2,2,2	0.57	0
2	LU8	B	501	-	35,35,35	1.13	4 (11%)	47,49,49	1.51	10 (21%)
2	LU8	A	506	-	35,35,35	1.23	3 (8%)	47,49,49	2.36	19 (40%)
5	SO4	B	502	-	4,4,4	0.34	0	6,6,6	0.34	0
3	EDO	A	503	-	3,3,3	0.99	0	2,2,2	0.86	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
2	LU8	A	507	-	-	4/18/28/28	0/4/4/4
2	LU8	A	501[A]	-	-	0/18/28/28	0/4/4/4
3	EDO	B	508	-	-	1/1/1/1	-
3	EDO	A	504	-	-	0/1/1/1	-
3	EDO	A	502	-	-	1/1/1/1	-
3	EDO	B	507	-	-	0/1/1/1	-
3	EDO	A	514	-	-	1/1/1/1	-
3	EDO	B	509	-	-	1/1/1/1	-
4	XEJ	B	504	-	-	2/4/4/4	-
3	EDO	A	513	-	-	1/1/1/1	-
3	EDO	A	512	-	-	1/1/1/1	-
3	EDO	A	511	-	-	1/1/1/1	-
4	XEJ	A	508[B]	-	-	2/4/4/4	-
3	EDO	A	515	-	-	0/1/1/1	-
3	EDO	A	505	-	-	1/1/1/1	-
4	XEJ	A	508[A]	-	-	2/4/4/4	-
2	LU8	A	501[B]	-	-	1/18/28/28	0/4/4/4
3	EDO	B	503	-	-	0/1/1/1	-
2	LU8	B	501	-	-	1/18/28/28	0/4/4/4
2	LU8	A	506	-	-	0/18/28/28	0/4/4/4

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	EDO	A	503	-	-	1/1/1/1	-

All (18) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	508[A]	XEJ	C05-N06	3.99	1.45	1.32
4	B	504	XEJ	C04-C05	3.64	1.61	1.51
4	A	508[B]	XEJ	C05-N06	3.52	1.44	1.32
2	A	506	LU8	C26-C05	3.24	1.45	1.39
2	A	506	LU8	O02-C03	3.17	1.42	1.37
2	A	506	LU8	C10-C11	-3.01	1.44	1.49
2	A	507	LU8	C12-C13	-2.72	1.34	1.38
2	A	507	LU8	C09-C10	-2.70	1.35	1.39
2	A	507	LU8	C14-C15	-2.58	1.47	1.52
2	A	507	LU8	C10-C11	-2.47	1.45	1.49
4	B	504	XEJ	C04-C02	-2.42	1.49	1.53
4	A	508[B]	XEJ	O07-C05	-2.38	1.16	1.23
2	A	501[B]	LU8	C10-C24	-2.20	1.37	1.40
2	B	501	LU8	C26-C05	2.17	1.43	1.39
2	B	501	LU8	C06-C24	2.16	1.43	1.40
2	B	501	LU8	O02-C03	2.14	1.40	1.37
2	B	501	LU8	C13-C14	-2.07	1.35	1.39
2	A	501[A]	LU8	C10-C11	2.00	1.53	1.49

All (57) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	B	504	XEJ	C02-C04-C05	-16.90	90.54	112.62
2	A	501[B]	LU8	C20-C21-C15	6.39	118.48	111.00
2	A	506	LU8	C07-C06-C05	-6.18	110.63	119.56
2	A	506	LU8	C20-C21-C15	6.04	118.07	111.00
2	A	501[B]	LU8	C16-C17-N18	-5.62	103.95	111.20
2	A	506	LU8	C26-C05-C06	-5.33	111.67	120.61
4	B	504	XEJ	C04-C02-N03	-4.80	97.64	110.72
2	A	506	LU8	C21-C20-N18	4.63	117.17	111.20
2	A	501[A]	LU8	C20-N18-C17	4.39	116.53	109.54
2	A	506	LU8	C16-C17-N18	4.22	116.64	111.20
2	A	501[B]	LU8	C19-N18-C17	-3.63	103.71	110.63
2	A	507	LU8	C12-C13-C14	3.60	124.78	121.18
2	B	501	LU8	C20-N18-C17	3.46	115.04	109.54
2	A	501[B]	LU8	C16-C15-C14	-3.31	104.83	112.67
2	A	507	LU8	C20-N18-C17	3.18	114.61	109.54

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	501	LU8	C22-C14-C13	3.18	122.25	118.30
2	A	507	LU8	C20-C21-C15	3.11	114.64	111.00
2	A	506	LU8	C17-C16-C15	-3.10	107.38	111.00
4	A	508[B]	XEJ	C04-C05-N06	3.07	123.55	116.19
2	A	506	LU8	C04-C05-C06	3.05	125.72	120.61
2	A	506	LU8	C06-C07-N08	-2.89	120.20	124.27
2	A	501[B]	LU8	C20-N18-C17	-2.80	105.08	109.54
2	A	506	LU8	C27-C30-C03	2.78	122.28	119.56
2	A	501[A]	LU8	C09-C10-C11	-2.76	115.57	119.56
2	B	501	LU8	C23-C22-C14	-2.73	118.46	121.18
2	A	506	LU8	C20-N18-C17	2.72	113.87	109.54
2	A	506	LU8	C05-C06-C24	2.71	126.93	122.47
2	A	506	LU8	C04-C05-C26	2.69	122.29	118.35
2	A	501[B]	LU8	O28-C27-C26	-2.63	119.55	124.08
2	A	506	LU8	C23-C11-C10	-2.61	116.58	120.91
2	A	506	LU8	C12-C11-C10	2.61	125.23	120.91
2	B	501	LU8	C23-C11-C12	2.56	122.26	117.68
2	A	507	LU8	C29-O28-C27	2.52	121.21	117.51
2	B	501	LU8	C17-C16-C15	2.47	113.89	111.00
2	A	501[B]	LU8	O28-C27-C30	2.46	119.36	115.14
2	A	506	LU8	C05-C04-C03	-2.45	116.86	120.19
2	A	501[A]	LU8	C17-C16-C15	-2.45	108.14	111.00
4	B	504	XEJ	O07-C05-C04	2.43	125.94	120.87
2	B	501	LU8	C27-C30-C03	2.40	121.90	119.56
2	A	507	LU8	C06-C24-C10	2.37	121.26	118.39
2	A	506	LU8	O02-C03-C04	-2.32	120.07	124.08
2	A	501[B]	LU8	C26-C05-C06	-2.29	116.76	120.61
2	B	501	LU8	C13-C12-C11	-2.27	118.20	121.12
2	A	507	LU8	C19-N18-C20	-2.27	106.31	110.63
2	A	501[A]	LU8	C29-O28-C27	2.26	120.83	117.51
2	A	507	LU8	C06-C07-N08	-2.26	121.09	124.27
2	B	501	LU8	C06-C24-C10	-2.23	115.68	118.39
2	B	501	LU8	C06-C07-N08	-2.22	121.14	124.27
2	A	506	LU8	C29-O28-C27	2.22	120.77	117.51
2	A	501[B]	LU8	C06-C07-N08	-2.12	121.29	124.27
2	A	501[A]	LU8	C11-C10-C24	2.10	125.94	122.47
2	A	501[B]	LU8	C16-C15-C21	2.09	114.22	109.68
2	A	506	LU8	O31-C30-C27	-2.04	117.20	120.12
2	B	501	LU8	C21-C20-N18	2.03	113.82	111.20
2	A	506	LU8	C12-C13-C14	2.03	123.21	121.18
2	A	501[B]	LU8	O02-C03-C30	2.03	118.61	115.14
2	A	501[A]	LU8	C13-C14-C15	-2.03	115.95	121.09

There are no chirality outliers.

All (21) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	505	EDO	O1-C1-C2-O2
3	B	508	EDO	O1-C1-C2-O2
3	A	513	EDO	O1-C1-C2-O2
3	A	514	EDO	O1-C1-C2-O2
3	B	509	EDO	O1-C1-C2-O2
4	A	508[A]	XEJ	C02-C04-C05-N06
4	A	508[B]	XEJ	C02-C04-C05-N06
4	A	508[A]	XEJ	C02-C04-C05-O07
4	A	508[B]	XEJ	C02-C04-C05-O07
3	A	511	EDO	O1-C1-C2-O2
2	A	507	LU8	C04-C05-C06-C07
3	A	502	EDO	O1-C1-C2-O2
3	A	512	EDO	O1-C1-C2-O2
2	A	507	LU8	C04-C05-C06-C24
4	B	504	XEJ	C02-C04-C05-O07
2	A	507	LU8	C26-C05-C06-C07
3	A	503	EDO	O1-C1-C2-O2
4	B	504	XEJ	N03-C02-C04-C05
2	A	507	LU8	C26-C05-C06-C24
2	B	501	LU8	C22-C14-C15-C16
2	A	501[B]	LU8	C13-C14-C15-C21

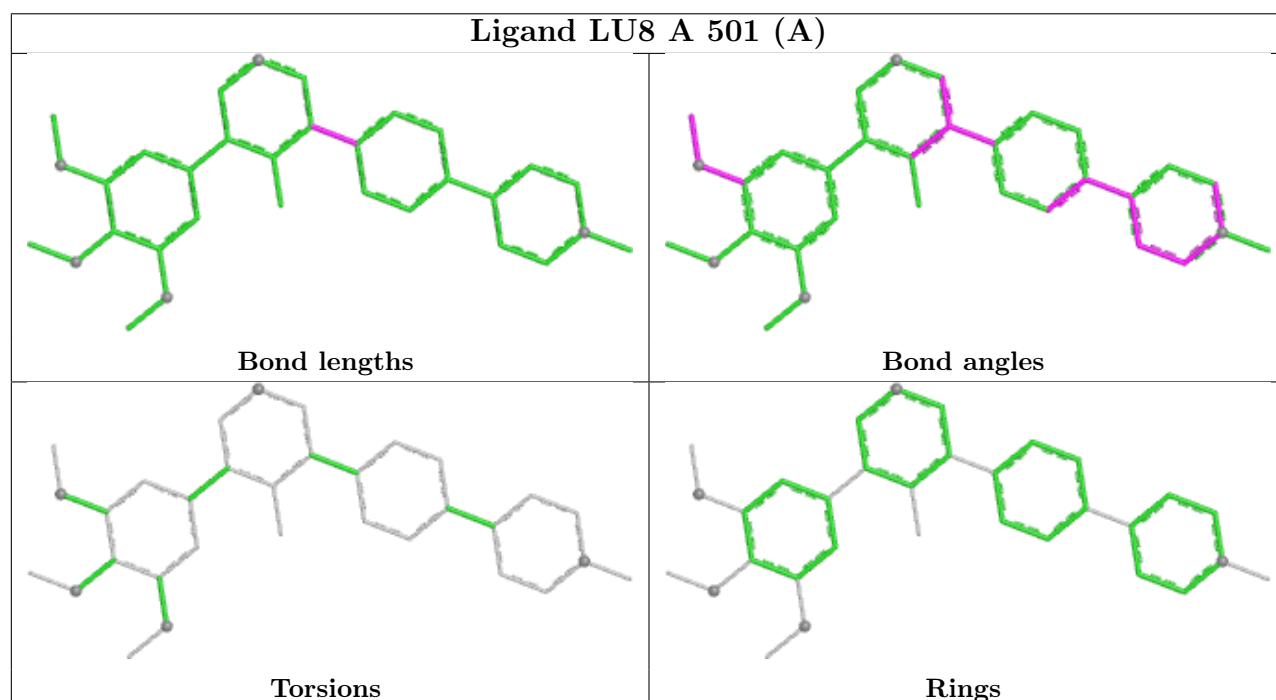
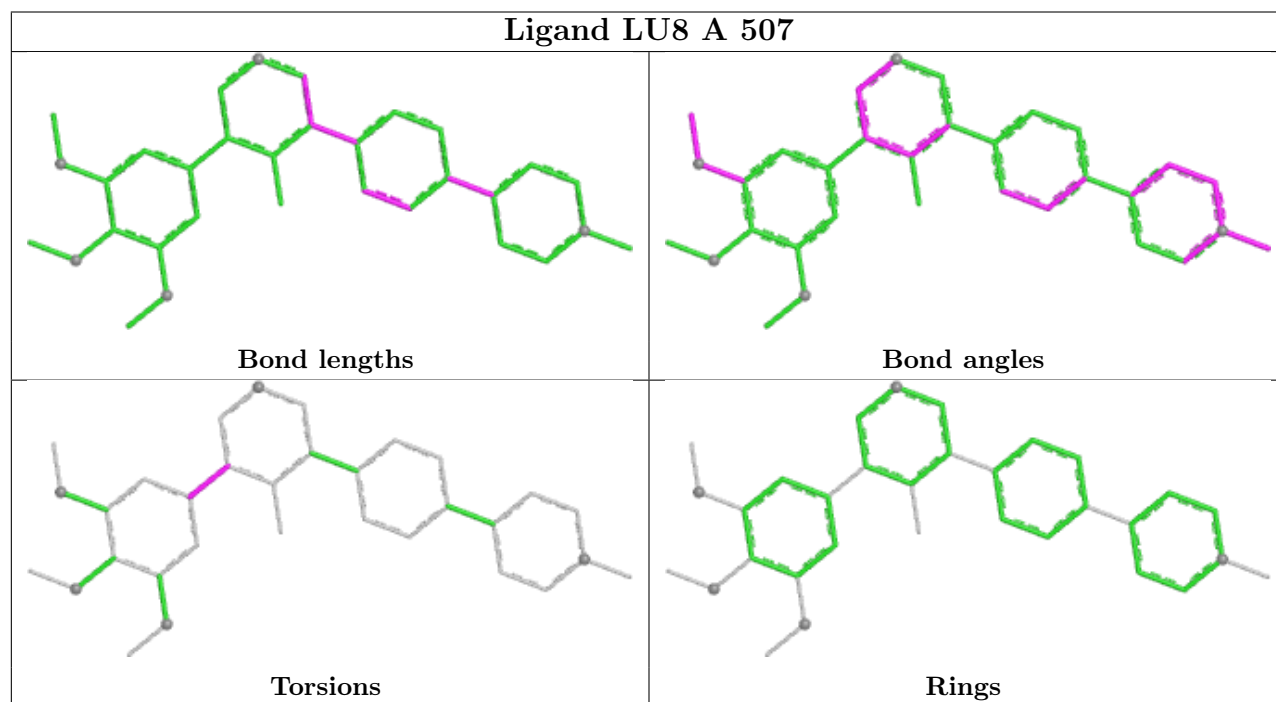
There are no ring outliers.

9 monomers are involved in 25 short contacts:

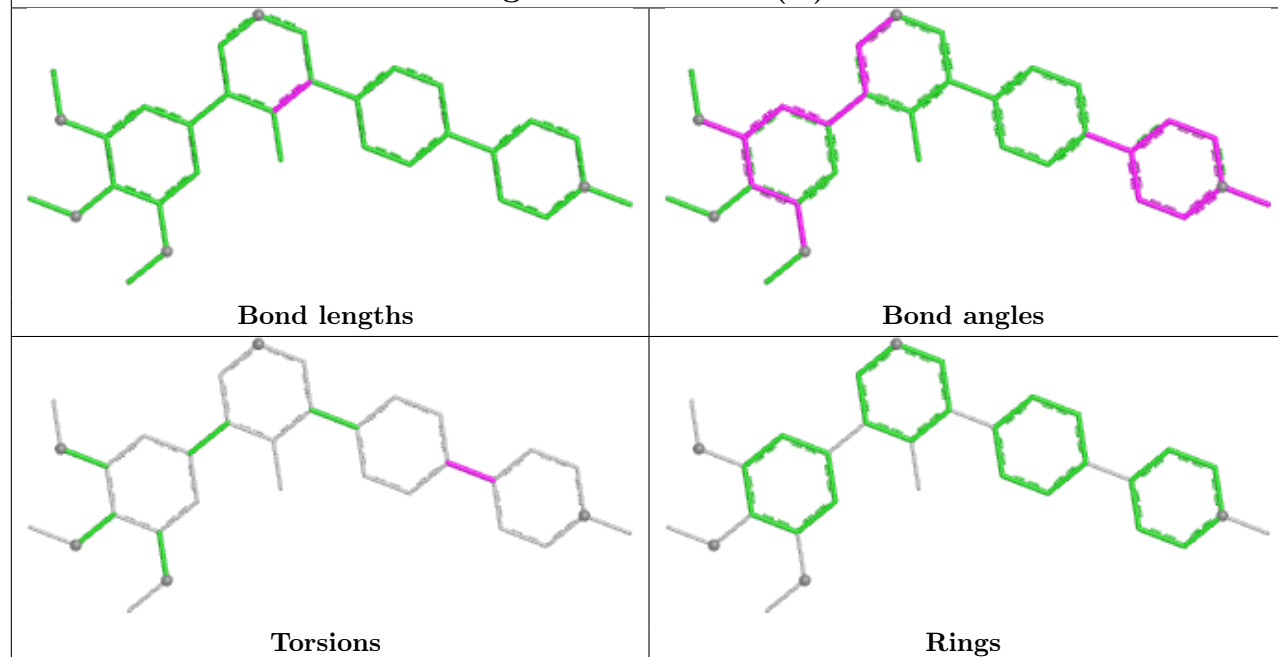
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	504	EDO	1	0
3	A	502	EDO	1	0
3	B	507	EDO	1	0
4	B	504	XEJ	1	1
3	A	511	EDO	1	0
4	A	508[B]	XEJ	5	0
3	A	505	EDO	3	0
4	A	508[A]	XEJ	8	0
2	A	501[B]	LU8	3	0

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

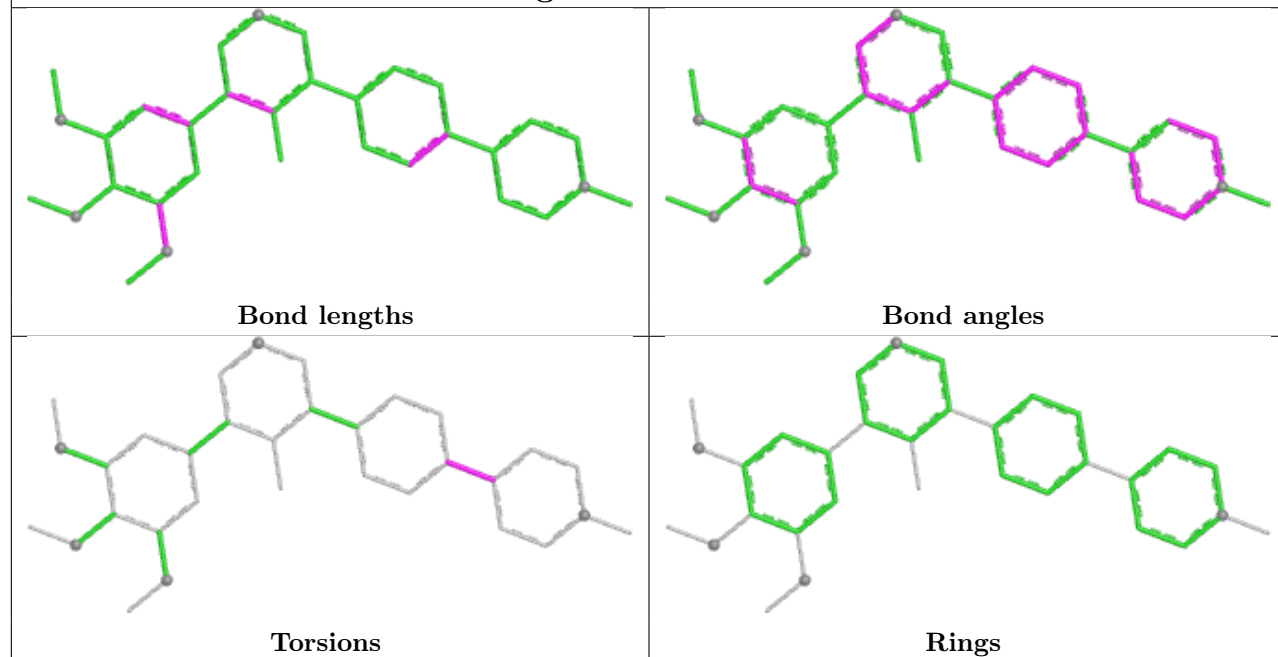
within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question 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.

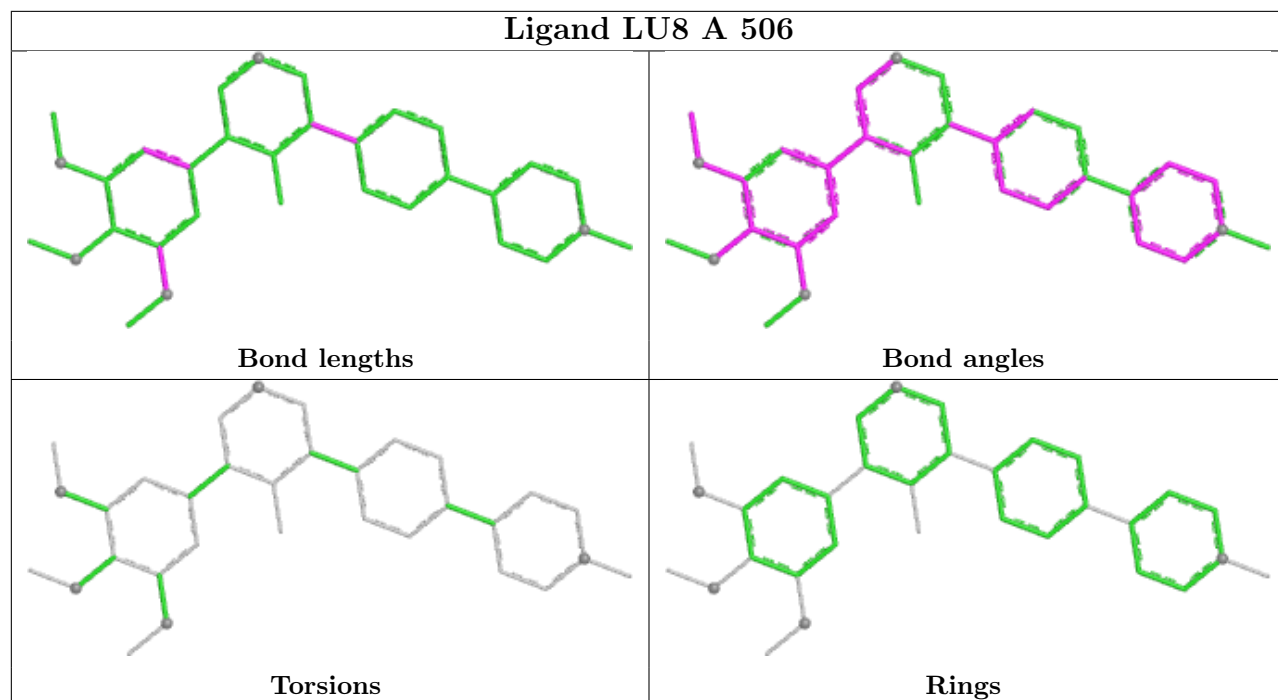


Ligand LU8 A 501 (B)



Ligand LU8 B 501





5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

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

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	285/301 (94%)	0.28	23 (8%) 18 22	7, 17, 38, 70	22 (7%)
1	B	293/301 (97%)	0.34	23 (7%) 19 23	7, 19, 38, 59	9 (3%)
All	All	578/602 (96%)	0.31	46 (7%) 18 23	7, 18, 38, 70	31 (5%)

All (46) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	297	LEU	5.4
1	B	297	LEU	4.9
1	B	324	PHE	4.5
1	A	376	VAL	4.4
1	B	323	ILE	4.4
1	B	205	ALA	4.3
1	B	372	ASN	4.2
1	A	325	GLY	4.1
1	B	325	GLY	4.1
1	A	375	ARG	4.0
1	B	499	ASP	4.0
1	A	324	PHE	3.8
1	A	275	SER	3.7
1	A	362	SER	3.6
1	A	363	GLN	3.5
1	B	255	VAL	3.5
1	A	393	VAL	3.5
1	B	370	VAL	3.3
1	A	247	ARG	3.3
1	B	374	PRO	3.2
1	B	328	GLY	3.0
1	A	395[A]	CYS	2.9
1	B	364	SER	2.9
1	B	229	GLY	2.8

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Mol	Chain	Res	Type	RSRZ
1	B	227	TRP	2.8
1	B	498	ILE	2.8
1	A	499	ASP	2.8
1	B	376	VAL	2.7
1	A	211	LEU	2.7
1	B	437	ASN	2.6
1	A	209	THR	2.5
1	B	365	THR	2.5
1	A	274	HIS	2.5
1	A	394	ASP	2.5
1	A	208	ILE	2.4
1	A	210	LEU	2.3
1	B	393	VAL	2.3
1	A	276	SER	2.3
1	B	363	GLN	2.2
1	A	227	TRP	2.2
1	A	323	ILE	2.2
1	A	273	ARG	2.1
1	A	438	ASP	2.1
1	B	254	THR	2.1
1	B	219	TYR	2.1
1	B	208	ILE	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 oligosaccharides 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
4	XEJ	A	508[A]	7/7	0.57	0.21	26,33,38,39	7

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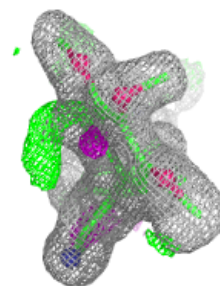
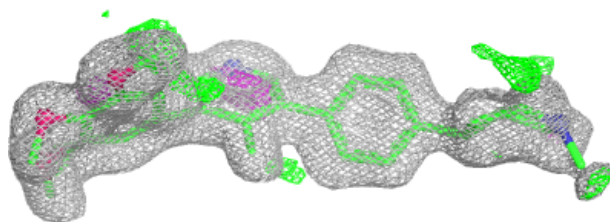
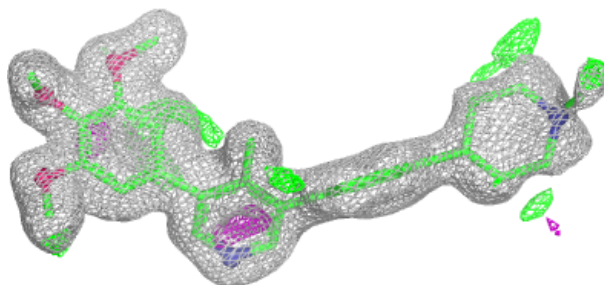
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
4	XEJ	A	508[B]	7/7	0.57	0.21	26,32,37,39	7
3	EDO	A	504	4/4	0.73	0.19	44,44,45,50	0
3	EDO	B	509	4/4	0.75	0.18	44,48,49,49	0
3	EDO	A	515	4/4	0.77	0.17	41,51,53,56	0
3	EDO	A	512	4/4	0.80	0.19	50,53,56,63	0
3	EDO	A	514	4/4	0.81	0.18	54,56,58,62	0
5	SO4	B	505	5/5	0.81	0.11	57,57,60,67	5
3	EDO	B	508	4/4	0.82	0.16	32,36,36,37	0
3	EDO	A	505	4/4	0.88	0.13	19,34,36,37	0
5	SO4	B	506	5/5	0.90	0.15	22,27,35,37	5
2	LU8	A	506	32/32	0.91	0.12	19,23,50,56	0
3	EDO	B	507	4/4	0.92	0.15	16,25,26,26	0
3	EDO	A	503	4/4	0.93	0.10	23,25,25,29	0
3	EDO	B	503	4/4	0.94	0.08	21,21,22,27	0
3	EDO	A	513	4/4	0.94	0.10	17,21,28,36	0
2	LU8	A	501[A]	32/32	0.95	0.09	12,15,31,35	32
2	LU8	A	501[B]	32/32	0.95	0.09	15,16,26,28	32
3	EDO	A	511	4/4	0.95	0.09	17,31,33,43	0
2	LU8	B	501	32/32	0.96	0.08	15,17,43,47	0
4	XEJ	B	504	7/7	0.96	0.10	12,17,28,28	7
3	EDO	A	502	4/4	0.96	0.12	13,26,27,29	0
2	LU8	A	507	32/32	0.96	0.07	16,18,38,45	0
5	SO4	A	509	5/5	0.97	0.20	10,12,15,16	5
5	SO4	A	510	5/5	0.98	0.05	18,22,29,31	0
5	SO4	B	502	5/5	0.98	0.05	26,27,29,30	0

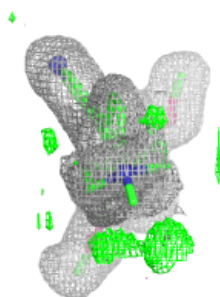
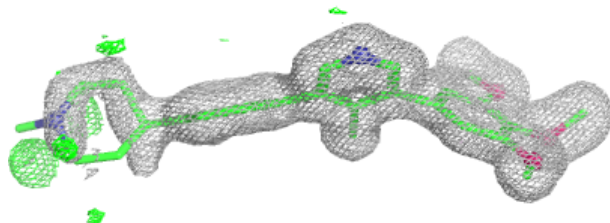
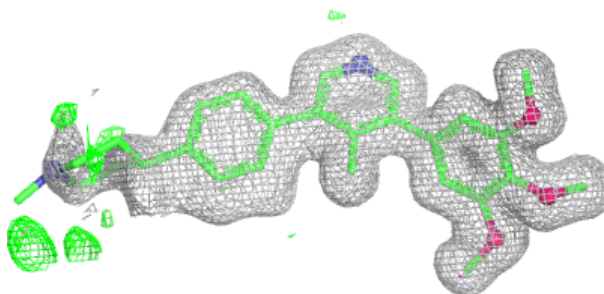
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around LU8 A 506:

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

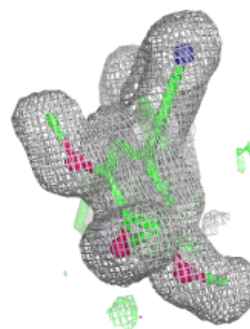
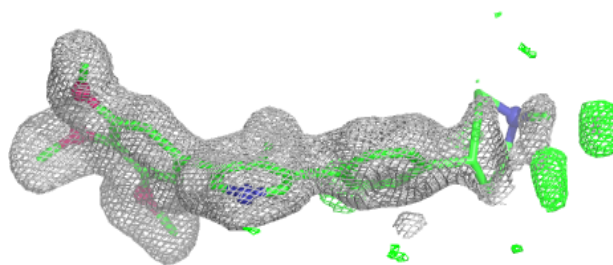
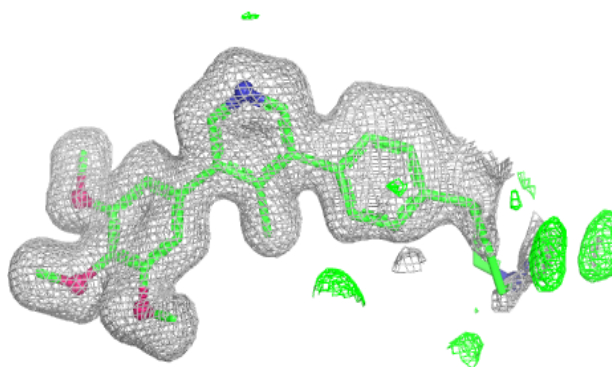
**Electron density around LU8 A 501 (A):**

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

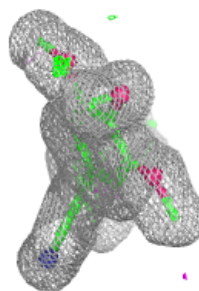
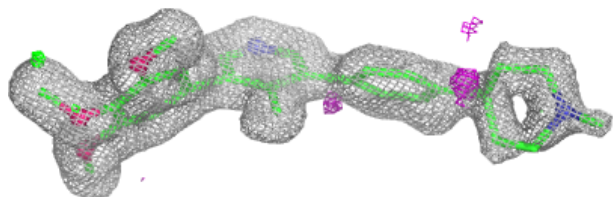
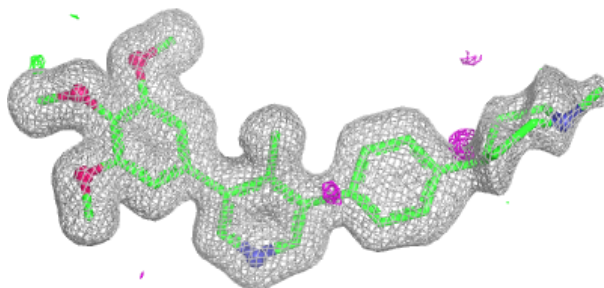


Electron density around LU8 A 501 (B):

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

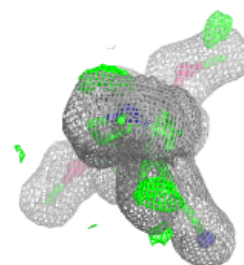
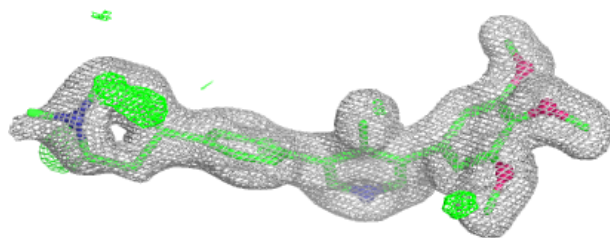
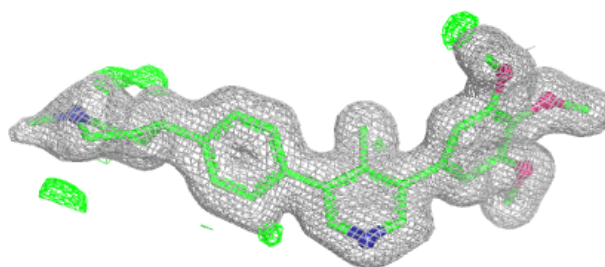
**Electron density around LU8 B 501:**

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



Electron density around LU8 A 507:

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



6.5 Other polymers [i](#)

There are no such residues in this entry.