



Full wwPDB X-ray Structure Validation Report ⓘ

Nov 1, 2023 – 04:01 PM JST

PDB ID : 5T2P
Title : Hepatitis B virus core protein Y132A mutant in complex with sulfamoylbenzamide (SBA_R01)
Authors : Zhou, Z.; Xu, Z.H.
Deposited on : 2016-08-24
Resolution : 1.69 Å(reported)

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

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

A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

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

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

MolProbity : 4.02b-467
Mogul : 1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.36
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) : 2.36

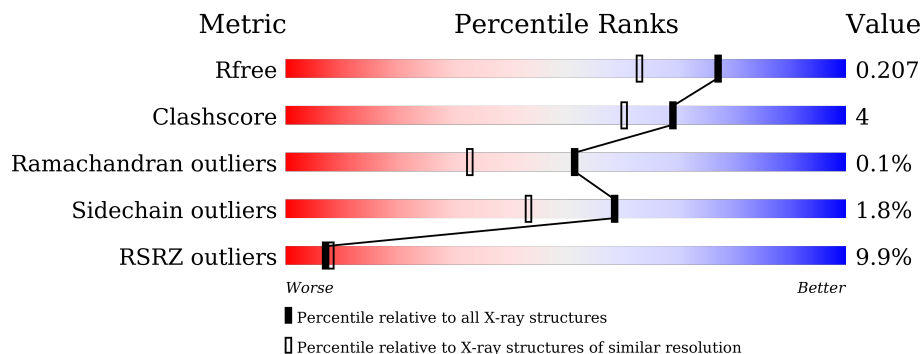
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.69 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	4298 (1.70-1.70)
Clashscore	141614	4695 (1.70-1.70)
Ramachandran outliers	138981	4610 (1.70-1.70)
Sidechain outliers	138945	4610 (1.70-1.70)
RSRZ outliers	127900	4222 (1.70-1.70)

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	155	 8% 89% 6% • 5%
1	B	155	 % 92% 8%
1	C	155	 10% 85% 6% • 8%
1	D	155	 8% 94% 6% •
1	E	155	 14% 83% 12% • •
1	F	155	 15% 89% 6% • 5%

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

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
3	IPA	A	203	-	-	X	-

2 Entry composition [i](#)

There are 7 unique types of molecules in this entry. The entry contains 8151 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 Core protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	148	1210	783	199	222	6	0	4	0
1	B	155	1265	816	206	237	6	0	5	0
1	C	142	1137	735	188	209	5	0	2	0
1	D	155	1260	814	205	236	5	0	4	0
1	E	150	1221	790	202	223	6	0	3	0
1	F	148	1205	779	199	221	6	0	3	0

There are 42 discrepancies between the modelled and reference sequences:

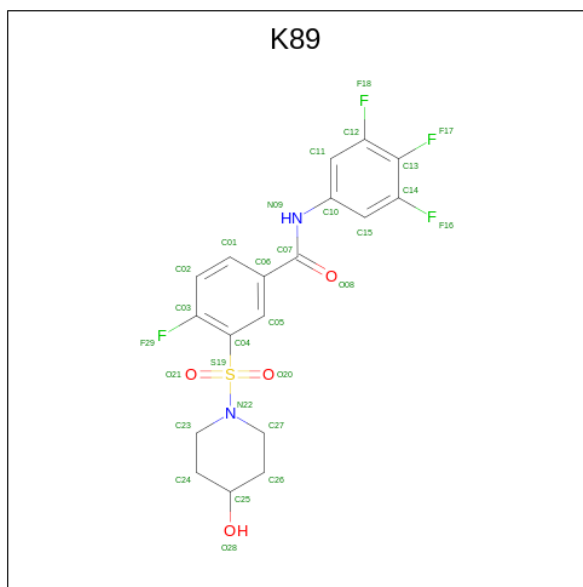
Chain	Residue	Modelled	Actual	Comment	Reference
A	132	ALA	TYR	engineered mutation	UNP L7R9I1
A	150	GLU	-	expression tag	UNP L7R9I1
A	151	ASN	-	expression tag	UNP L7R9I1
A	152	LEU	-	expression tag	UNP L7R9I1
A	153	TYR	-	expression tag	UNP L7R9I1
A	154	PHE	-	expression tag	UNP L7R9I1
A	155	GLN	-	expression tag	UNP L7R9I1
B	132	ALA	TYR	engineered mutation	UNP L7R9I1
B	150	GLU	-	expression tag	UNP L7R9I1
B	151	ASN	-	expression tag	UNP L7R9I1
B	152	LEU	-	expression tag	UNP L7R9I1
B	153	TYR	-	expression tag	UNP L7R9I1
B	154	PHE	-	expression tag	UNP L7R9I1
B	155	GLN	-	expression tag	UNP L7R9I1
C	132	ALA	TYR	engineered mutation	UNP L7R9I1
C	150	GLU	-	expression tag	UNP L7R9I1
C	151	ASN	-	expression tag	UNP L7R9I1

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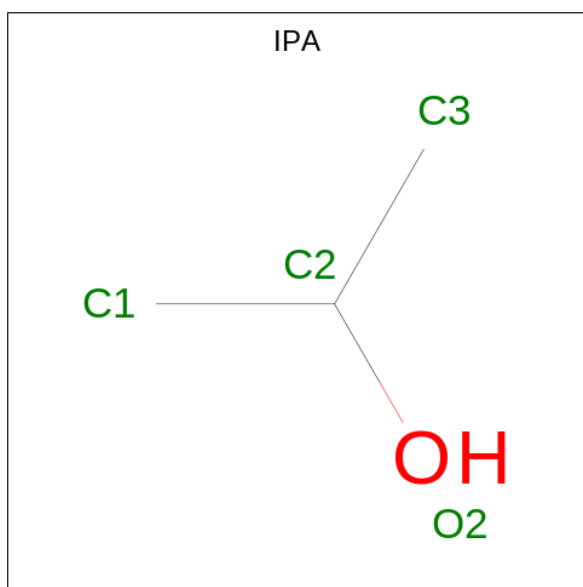
Chain	Residue	Modelled	Actual	Comment	Reference
C	152	LEU	-	expression tag	UNP L7R9I1
C	153	TYR	-	expression tag	UNP L7R9I1
C	154	PHE	-	expression tag	UNP L7R9I1
C	155	GLN	-	expression tag	UNP L7R9I1
D	132	ALA	TYR	engineered mutation	UNP L7R9I1
D	150	GLU	-	expression tag	UNP L7R9I1
D	151	ASN	-	expression tag	UNP L7R9I1
D	152	LEU	-	expression tag	UNP L7R9I1
D	153	TYR	-	expression tag	UNP L7R9I1
D	154	PHE	-	expression tag	UNP L7R9I1
D	155	GLN	-	expression tag	UNP L7R9I1
E	132	ALA	TYR	engineered mutation	UNP L7R9I1
E	150	GLU	-	expression tag	UNP L7R9I1
E	151	ASN	-	expression tag	UNP L7R9I1
E	152	LEU	-	expression tag	UNP L7R9I1
E	153	TYR	-	expression tag	UNP L7R9I1
E	154	PHE	-	expression tag	UNP L7R9I1
E	155	GLN	-	expression tag	UNP L7R9I1
F	132	ALA	TYR	engineered mutation	UNP L7R9I1
F	150	GLU	-	expression tag	UNP L7R9I1
F	151	ASN	-	expression tag	UNP L7R9I1
F	152	LEU	-	expression tag	UNP L7R9I1
F	153	TYR	-	expression tag	UNP L7R9I1
F	154	PHE	-	expression tag	UNP L7R9I1
F	155	GLN	-	expression tag	UNP L7R9I1

- Molecule 2 is 4-fluoranyl-3-(4-oxidanylpiperidin-1-yl)sulfonyl- {N}-[3,4,5-tris(fluoranyl)phenyl]benzamide (three-letter code: K89) (formula: C₁₈H₁₆F₄N₂O₄S).



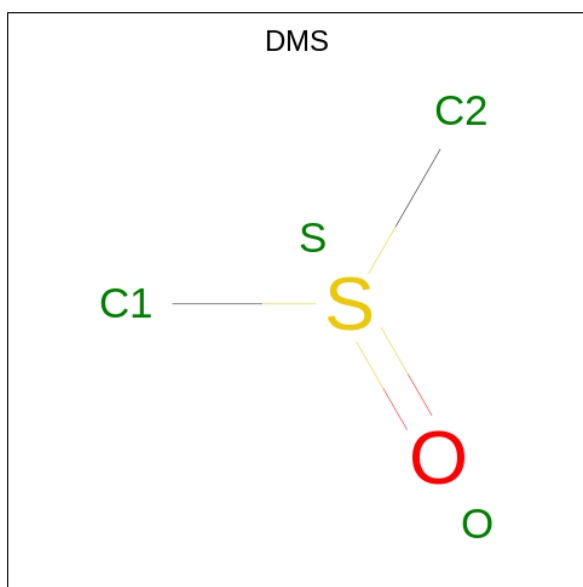
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	
			Total	C	F	N	O			S
2	A	1	Total	C	F	N	O	S	0	0
			29	18	4	2	4	1		
2	B	1	Total	C	F	N	O	S	0	0
			29	18	4	2	4	1		
2	C	1	Total	C	F	N	O	S	0	0
			29	18	4	2	4	1		
2	D	1	Total	C	F	N	O	S	0	0
			29	18	4	2	4	1		
2	E	1	Total	C	F	N	O	S	0	0
			29	18	4	2	4	1		
2	F	1	Total	C	F	N	O	S	0	0
			29	18	4	2	4	1		

- Molecule 3 is ISOPROPYL ALCOHOL (three-letter code: IPA) (formula: C₃H₈O).



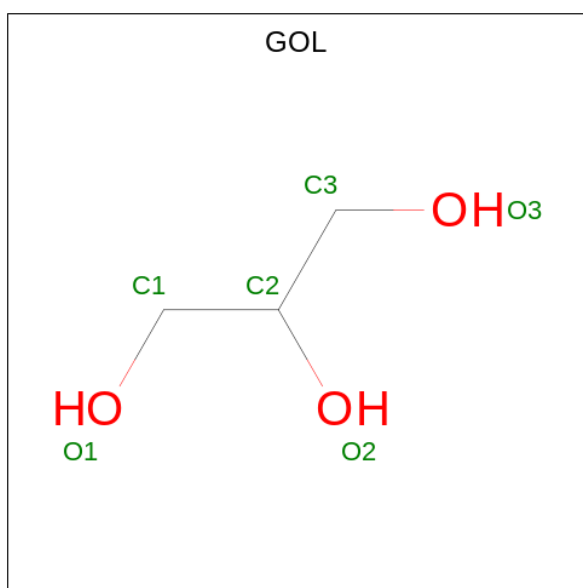
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total C O 4 3 1	0	0
3	A	1	Total C O 4 3 1	0	0
3	B	1	Total C O 4 3 1	0	0
3	C	1	Total C O 4 3 1	0	0
3	C	1	Total C O 4 3 1	0	0
3	C	1	Total C O 4 3 1	0	0
3	D	1	Total C O 4 3 1	0	0
3	E	1	Total C O 4 3 1	0	0
3	E	1	Total C O 4 3 1	0	0
3	F	1	Total C O 4 3 1	0	0

- Molecule 4 is DIMETHYL SULFOXIDE (three-letter code: DMS) (formula: C₂H₆OS).



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

- Molecule 5 is GLYCEROL (three-letter code: GOL) (formula: $C_3H_8O_3$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	B	1	Total	C	O	0	0
			6	3	3		
5	D	1	Total	C	O	0	0
			6	3	3		

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	D	1	Total	C	O	0	0
			6	3	3		

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

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	C	1	Total	Cl	0	0
			1	1		
6	D	2	Total	Cl	0	0
			2	2		
6	E	1	Total	Cl	0	0
			1	1		
6	F	1	Total	Cl	0	0
			1	1		

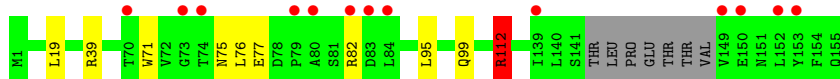
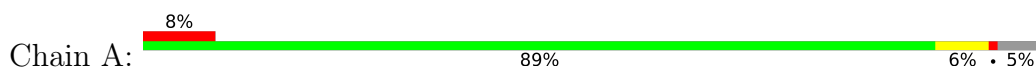
- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	99	Total	O	0	0
			99	99		
7	B	138	Total	O	0	0
			138	138		
7	C	85	Total	O	0	0
			85	85		
7	D	109	Total	O	0	0
			109	109		
7	E	93	Total	O	0	0
			93	93		
7	F	84	Total	O	0	0
			84	84		

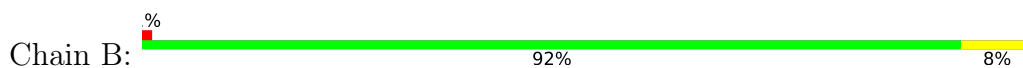
3 Residue-property plots [i](#)

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.

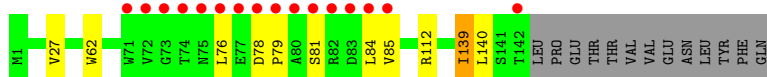
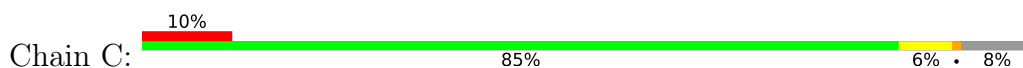
- Molecule 1: Core protein



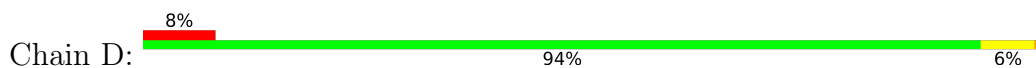
- Molecule 1: Core protein



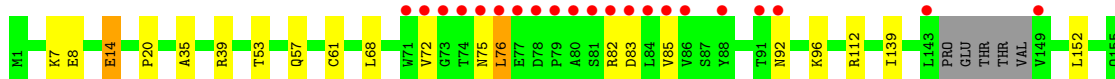
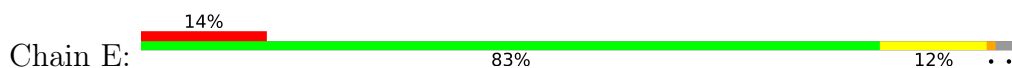
- Molecule 1: Core protein




- Molecule 1: Core protein

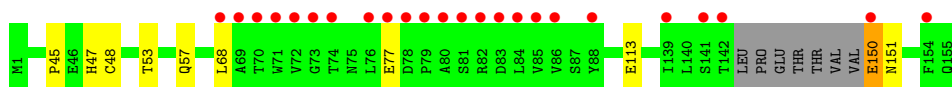


- Molecule 1: Core protein



- Molecule 1: Core protein

Chain F:  15% 89% 6% • 5%



4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α , β , γ	63.93Å 68.05Å 85.70Å 68.49° 69.99° 83.49°	Depositor
Resolution (Å)	39.04 – 1.69 39.04 – 1.69	Depositor EDS
% Data completeness (in resolution range)	95.3 (39.04-1.69) 86.5 (39.04-1.69)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	0.78 (at 1.69Å)	Xtrriage
Refinement program	PHENIX 1.10.1_2155	Depositor
R, R_{free}	0.179 , 0.208 0.180 , 0.207	Depositor DCC
R_{free} test set	3216 reflections (2.40%)	wwPDB-VP
Wilson B-factor (Å ²)	23.7	Xtrriage
Anisotropy	0.368	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 47.1	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	8151	wwPDB-VP
Average B, all atoms (Å ²)	40.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.79% 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: GOL, IPA, CL, DMS, K89

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	0.41	0/1245	0.58	1/1701 (0.1%)
1	B	0.44	0/1302	0.53	0/1784
1	C	0.42	0/1171	0.54	0/1605
1	D	0.41	0/1297	0.53	0/1778
1	E	0.43	0/1256	0.56	0/1717
1	F	0.38	0/1241	0.53	0/1697
All	All	0.42	0/7512	0.54	1/10282 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	112	ARG	NE-CZ-NH1	6.03	123.31	120.30

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	1210	0	1178	11	1
1	B	1265	0	1229	9	0
1	C	1137	0	1113	7	0
1	D	1260	0	1228	8	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	E	1221	0	1192	16	0
1	F	1205	0	1166	7	1
2	A	29	0	0	0	0
2	B	29	0	0	1	0
2	C	29	0	0	1	0
2	D	29	0	0	1	0
2	E	29	0	0	1	0
2	F	29	0	0	0	0
3	A	8	0	16	5	0
3	B	4	0	8	1	0
3	C	12	0	24	0	0
3	D	4	0	8	0	0
3	E	8	0	16	1	0
3	F	4	0	8	0	0
4	B	4	0	6	0	0
4	C	4	0	6	0	0
5	B	6	0	8	0	0
5	D	12	0	16	2	0
6	C	1	0	0	0	0
6	D	2	0	0	0	0
6	E	1	0	0	0	0
6	F	1	0	0	0	0
7	A	99	0	0	1	0
7	B	138	0	0	0	0
7	C	85	0	0	1	0
7	D	109	0	0	3	0
7	E	93	0	0	4	0
7	F	84	0	0	1	0
All	All	8151	0	7222	54	1

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 4.

All (54) 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:F:113:GLU:OE1	7:F:301:HOH:O	2.01	0.78
1:A:77:GLU:OE2	7:A:301:HOH:O	2.03	0.77
1:D:112:ARG:NH1	7:D:303:HOH:O	2.20	0.74
1:A:112:ARG:HG3	1:A:112:ARG:HH11	1.56	0.69
1:D:130:PRO:HA	1:D:133:ARG:HG2	1.78	0.66

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:32:ASP:OD1	7:D:301:HOH:O	2.13	0.65
1:B:139:ILE:HD12	1:B:140:LEU:H	1.60	0.64
1:D:132:ALA:O	7:D:302:HOH:O	2.15	0.63
1:A:95:LEU:HD21	3:A:203:IPA:H33	1.81	0.62
1:E:75:ASN:HB3	1:E:76:LEU:HD23	1.82	0.61
1:D:78:ASP:OD1	1:D:78:ASP:N	2.18	0.61
1:E:72:VAL:HG12	1:E:85:VAL:HG21	1.83	0.61
1:E:112:ARG:NH2	7:E:303:HOH:O	2.34	0.60
1:C:76:LEU:HG	1:C:78:ASP:H	1.69	0.57
1:A:39:ARG:HG3	1:B:1:MET:HG2	1.86	0.57
1:B:134:PRO:HA	3:B:203:IPA:H13	1.88	0.56
1:A:19:LEU:O	3:A:203:IPA:H32	2.06	0.56
1:E:8:GLU:OE1	1:F:47[B]:HIS:ND1	2.17	0.56
1:C:139:ILE:HD12	1:C:140:LEU:H	1.71	0.55
1:E:14:GLU:H	1:E:14:GLU:CD	2.10	0.55
1:D:139:ILE:HD12	1:D:140:LEU:H	1.71	0.54
1:A:71:TRP:O	1:A:75:ASN:ND2	2.33	0.54
1:A:112:ARG:HH11	1:A:112:ARG:CG	2.19	0.53
5:D:206:GOL:H12	1:E:20:PRO:HB3	1.91	0.53
1:B:14:GLU:O	1:B:17[B]:SER:OG	2.19	0.52
1:A:76:LEU:O	1:A:82:ARG:NH1	2.43	0.51
1:F:53:THR:O	1:F:57:GLN:HG2	2.10	0.51
1:B:139:ILE:HD11	2:B:201:K89:C23	2.42	0.49
1:E:96:LYS:NZ	7:E:305:HOH:O	2.45	0.49
1:A:99:GLN:HE21	3:A:203:IPA:H31	1.78	0.48
1:B:139:ILE:HD12	1:B:140:LEU:N	2.28	0.48
1:B:53:THR:O	1:B:57:GLN:HG2	2.13	0.48
1:E:72:VAL:CG1	1:E:85:VAL:HG21	2.43	0.47
3:A:202:IPA:H11	1:B:61[B]:CYS:SG	2.55	0.46
1:A:112:ARG:HG3	1:A:112:ARG:NH1	2.26	0.46
1:C:112:ARG:NH1	7:C:301:HOH:O	2.27	0.46
1:E:139:ILE:HD11	2:E:201:K89:C23	2.46	0.46
1:C:81:SER:O	1:C:84:LEU:HB2	2.16	0.46
1:D:117:GLU:HA	5:D:205:GOL:H11	1.96	0.45
1:C:84:LEU:HD23	1:C:84:LEU:HA	1.85	0.44
1:F:47[B]:HIS:O	1:F:48:CYS:HB2	2.18	0.44
1:E:139:ILE:HG22	7:E:302:HOH:O	2.17	0.44
1:D:139:ILE:HD11	2:D:201:K89:C23	2.49	0.43
1:C:139:ILE:HD11	2:C:201:K89:C23	2.49	0.42
1:F:150:GLU:HB3	1:F:151:ASN:H	1.66	0.42
1:B:110:PHE:HA	1:B:142:THR:HG22	2.02	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:27:VAL:HG11	1:C:62:TRP:CE2	2.56	0.41
1:E:68:LEU:HD23	1:F:68:LEU:HD23	2.02	0.41
1:E:7:LYS:HE2	1:F:45:PRO:HD3	2.02	0.40
1:E:53:THR:O	1:E:57:GLN:HG2	2.21	0.40
1:E:61[B]:CYS:SG	3:E:203:IPA:H11	2.61	0.40
1:E:35:ALA:HB1	1:E:39[B]:ARG:NH2	2.36	0.40
1:A:99:GLN:NE2	3:A:203:IPA:H31	2.37	0.40
1:E:139:ILE:N	7:E:302:HOH:O	2.34	0.40

All (1) 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)
1:A:82:ARG:NH2	1:F:113:GLU:OE2[1_655]	2.13	0.07

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	148/155 (96%)	146 (99%)	2 (1%)	0	100	100
1	B	158/155 (102%)	157 (99%)	1 (1%)	0	100	100
1	C	142/155 (92%)	138 (97%)	3 (2%)	1 (1%)	22	8
1	D	157/155 (101%)	154 (98%)	3 (2%)	0	100	100
1	E	149/155 (96%)	143 (96%)	6 (4%)	0	100	100
1	F	147/155 (95%)	145 (99%)	2 (1%)	0	100	100
All	All	901/930 (97%)	883 (98%)	17 (2%)	1 (0%)	51	33

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	79	PRO

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	134/137 (98%)	133 (99%)	1 (1%)	84	77
1	B	142/137 (104%)	141 (99%)	1 (1%)	84	77
1	C	126/137 (92%)	124 (98%)	2 (2%)	62	48
1	D	141/137 (103%)	139 (99%)	2 (1%)	67	53
1	E	135/137 (98%)	129 (96%)	6 (4%)	28	11
1	F	133/137 (97%)	131 (98%)	2 (2%)	65	51
All	All	811/822 (99%)	797 (98%)	14 (2%)	59	46

All (14) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	112	ARG
1	B	28	ARG
1	C	85	VAL
1	C	139	ILE
1	D	77	GLU
1	D	78	ASP
1	E	14	GLU
1	E	76	LEU
1	E	82	ARG
1	E	83	ASP
1	E	92	ASN
1	E	152	LEU
1	F	77	GLU
1	F	150	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	E	155	GLN

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](#)

Of 26 ligands modelled in this entry, 5 are monoatomic - leaving 21 for Mogul analysis.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
4	DMS	B	202	-	3,3,3	0.71	0	3,3,3	0.52	0
3	IPA	E	204	-	3,3,3	0.60	0	3,3,3	0.26	0
2	K89	F	201	-	31,31,31	1.64	5 (16%)	43,46,46	1.90	12 (27%)
3	IPA	C	204	-	3,3,3	0.52	0	3,3,3	0.30	0
3	IPA	A	203	-	3,3,3	0.57	0	3,3,3	0.19	0
3	IPA	D	204	-	3,3,3	0.57	0	3,3,3	0.34	0
5	GOL	D	206	-	5,5,5	0.36	0	5,5,5	0.36	0
2	K89	E	201	-	31,31,31	1.36	3 (9%)	43,46,46	1.95	11 (25%)
3	IPA	C	205	-	3,3,3	0.53	0	3,3,3	0.28	0
5	GOL	B	204	-	5,5,5	0.30	0	5,5,5	0.37	0
5	GOL	D	205	-	5,5,5	0.38	0	5,5,5	0.31	0
2	K89	D	201	-	31,31,31	1.52	4 (12%)	43,46,46	1.98	9 (20%)
3	IPA	E	203	-	3,3,3	0.55	0	3,3,3	0.30	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	K89	B	201	-	31,31,31	1.44	7 (22%)	43,46,46	2.11	11 (25%)
4	DMS	C	202	-	3,3,3	0.67	0	3,3,3	0.77	0
2	K89	A	201	-	31,31,31	1.53	4 (12%)	43,46,46	1.91	10 (23%)
3	IPA	A	202	-	3,3,3	0.56	0	3,3,3	0.21	0
3	IPA	C	206	-	3,3,3	0.54	0	3,3,3	0.35	0
3	IPA	B	203	-	3,3,3	0.51	0	3,3,3	0.40	0
3	IPA	F	203	-	3,3,3	0.51	0	3,3,3	0.32	0
2	K89	C	201	-	31,31,31	1.35	3 (9%)	43,46,46	2.05	12 (27%)

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
5	GOL	D	205	-	-	2/4/4/4	-
2	K89	D	201	-	-	0/20/30/30	0/3/3/3
2	K89	B	201	-	-	2/20/30/30	0/3/3/3
2	K89	A	201	-	-	0/20/30/30	0/3/3/3
2	K89	F	201	-	-	1/20/30/30	0/3/3/3
5	GOL	D	206	-	-	4/4/4/4	-
2	K89	E	201	-	-	2/20/30/30	0/3/3/3
2	K89	C	201	-	-	0/20/30/30	0/3/3/3
5	GOL	B	204	-	-	2/4/4/4	-

All (26) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	201	K89	C27-N22	4.90	1.53	1.47
2	A	201	K89	C23-N22	4.06	1.52	1.47
2	E	201	K89	C06-C07	-3.77	1.42	1.50
2	F	201	K89	C27-N22	3.62	1.51	1.47
2	F	201	K89	C04-S19	-3.59	1.73	1.78
2	F	201	K89	C06-C07	-3.42	1.43	1.50
2	C	201	K89	C06-C07	-3.29	1.43	1.50
2	F	201	K89	C23-N22	3.28	1.51	1.47
2	B	201	K89	C06-C07	-3.25	1.43	1.50
2	A	201	K89	C05-C06	3.25	1.44	1.39
2	A	201	K89	C06-C07	-3.22	1.43	1.50
2	C	201	K89	C27-N22	3.11	1.51	1.47

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	201	K89	C27-N22	2.89	1.50	1.47
2	B	201	K89	C05-C06	2.72	1.43	1.39
2	D	201	K89	C10-N09	-2.59	1.36	1.41
2	C	201	K89	C05-C06	2.58	1.43	1.39
2	B	201	K89	O20-S19	-2.52	1.40	1.43
2	F	201	K89	S19-N22	2.39	1.66	1.63
2	E	201	K89	C27-N22	2.37	1.50	1.47
2	D	201	K89	C06-C07	-2.34	1.45	1.50
2	E	201	K89	C10-N09	-2.25	1.37	1.41
2	B	201	K89	C14-C13	2.17	1.42	1.37
2	B	201	K89	C23-N22	2.12	1.50	1.47
2	B	201	K89	C03-C04	-2.12	1.37	1.39
2	D	201	K89	O20-S19	-2.11	1.41	1.43
2	A	201	K89	C14-C13	2.05	1.41	1.37

All (65) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	201	K89	C26-C27-N22	7.20	119.24	109.43
2	C	201	K89	C26-C27-N22	6.13	117.78	109.43
2	B	201	K89	C24-C23-N22	5.66	117.13	109.43
2	A	201	K89	C26-C27-N22	5.64	117.11	109.43
2	D	201	K89	C26-C27-N22	5.60	117.05	109.43
2	E	201	K89	C26-C27-N22	5.55	117.00	109.43
2	F	201	K89	C26-C27-N22	5.26	116.60	109.43
2	A	201	K89	C24-C23-N22	5.20	116.52	109.43
2	D	201	K89	C24-C23-N22	5.20	116.52	109.43
2	E	201	K89	C24-C23-N22	5.02	116.27	109.43
2	F	201	K89	C24-C23-N22	4.73	115.87	109.43
2	C	201	K89	C24-C23-N22	4.70	115.84	109.43
2	B	201	K89	C27-C26-C25	4.44	116.22	111.15
2	C	201	K89	C23-C24-C25	4.38	116.16	111.15
2	E	201	K89	C06-C05-C04	3.99	126.46	120.52
2	E	201	K89	C05-C04-S19	3.82	122.34	117.57
2	D	201	K89	O20-S19-N22	3.80	110.15	106.69
2	F	201	K89	C23-N22-S19	3.71	123.78	117.05
2	F	201	K89	C23-C24-C25	3.69	115.37	111.15
2	D	201	K89	C23-N22-S19	3.66	123.69	117.05
2	D	201	K89	C06-C05-C04	3.63	125.92	120.52
2	C	201	K89	C10-C15-C14	3.58	121.69	118.76
2	B	201	K89	C23-C24-C25	3.44	115.08	111.15
2	E	201	K89	C23-N22-S19	3.39	123.20	117.05

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	201	K89	C10-C11-C12	3.37	121.51	118.76
2	A	201	K89	C23-N22-S19	3.32	123.08	117.05
2	A	201	K89	C23-C24-C25	3.26	114.87	111.15
2	C	201	K89	C06-C05-C04	3.26	125.37	120.52
2	C	201	K89	C23-N22-S19	3.22	122.89	117.05
2	C	201	K89	C10-C11-C12	3.18	121.36	118.76
2	D	201	K89	C10-C11-C12	3.18	121.36	118.76
2	E	201	K89	C10-C15-C14	3.14	121.33	118.76
2	F	201	K89	C05-C04-S19	3.14	121.49	117.57
2	D	201	K89	C05-C04-S19	3.10	121.44	117.57
2	F	201	K89	C06-C05-C04	3.10	125.13	120.52
2	F	201	K89	C10-C11-C12	3.01	121.22	118.76
2	B	201	K89	C10-C11-C12	2.98	121.19	118.76
2	B	201	K89	C06-C05-C04	2.95	124.91	120.52
2	F	201	K89	C10-C15-C14	2.87	121.11	118.76
2	E	201	K89	C10-C11-C12	2.86	121.10	118.76
2	D	201	K89	C10-C15-C14	2.83	121.08	118.76
2	A	201	K89	O20-S19-N22	2.82	109.26	106.69
2	C	201	K89	C27-C26-C25	2.76	114.31	111.15
2	A	201	K89	C06-C05-C04	2.68	124.51	120.52
2	B	201	K89	C23-N22-S19	2.66	121.88	117.05
2	E	201	K89	C23-C24-C25	2.61	114.13	111.15
2	B	201	K89	C27-N22-S19	2.53	121.64	117.05
2	C	201	K89	C27-N22-S19	2.42	121.45	117.05
2	C	201	K89	C01-C06-C05	-2.39	116.41	119.24
2	F	201	K89	F17-C13-C14	2.39	124.08	119.11
2	A	201	K89	C05-C04-S19	2.38	120.55	117.57
2	C	201	K89	C10-N09-C07	2.36	132.72	126.58
2	B	201	K89	C10-C15-C14	2.36	120.69	118.76
2	C	201	K89	C05-C04-S19	2.34	120.49	117.57
2	A	201	K89	F17-C13-C14	2.29	123.89	119.11
2	E	201	K89	C27-N22-S19	2.25	121.13	117.05
2	A	201	K89	C27-N22-S19	2.22	121.07	117.05
2	E	201	K89	C27-C26-C25	2.19	113.65	111.15
2	E	201	K89	C01-C06-C05	-2.16	116.69	119.24
2	B	201	K89	C05-C04-S19	2.14	120.25	117.57
2	F	201	K89	C27-N22-S19	2.12	120.91	117.05
2	D	201	K89	C01-C06-C05	-2.11	116.75	119.24
2	F	201	K89	C01-C06-C05	-2.07	116.79	119.24
2	B	201	K89	C27-N22-C23	2.07	114.46	112.17
2	F	201	K89	F16-C14-C13	2.01	121.12	118.30

There are no chirality outliers.

All (13) torsion outliers are listed below:

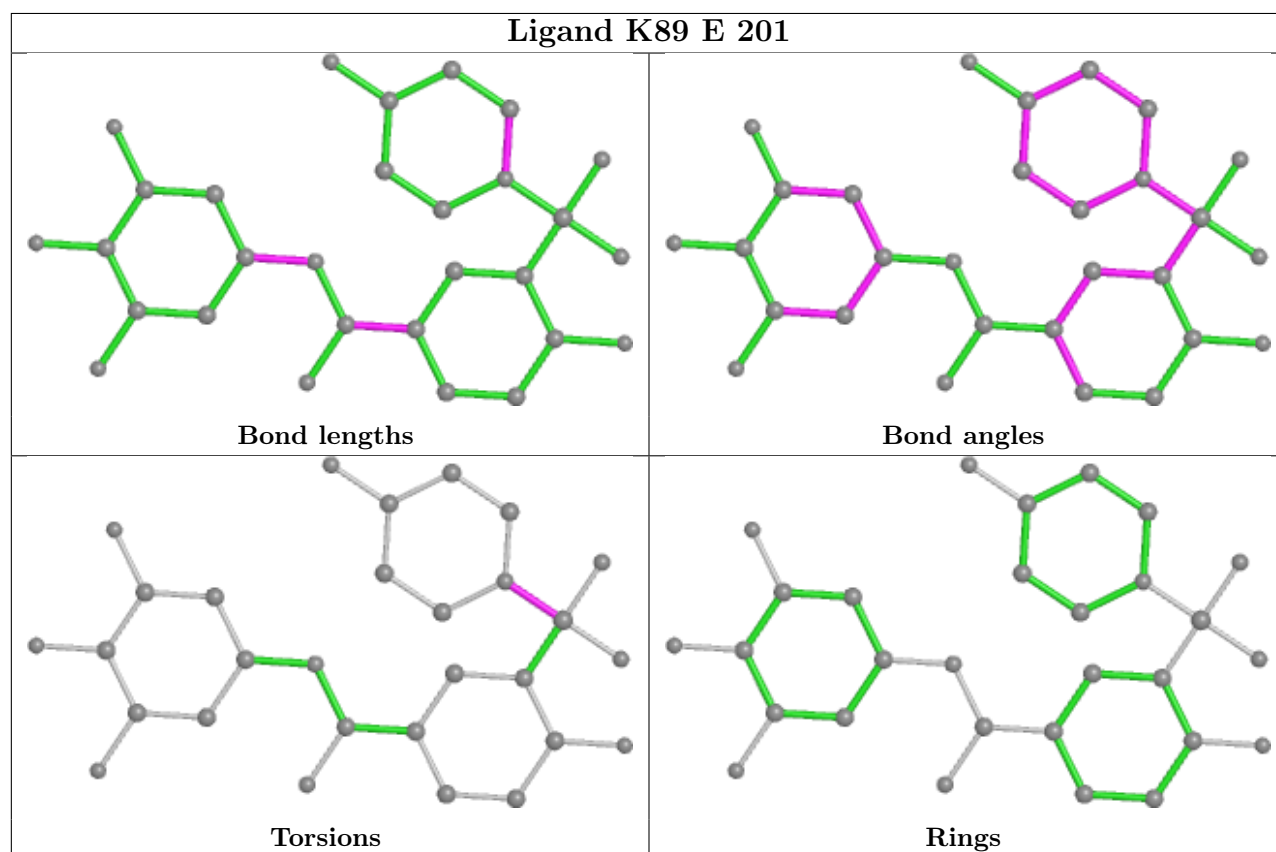
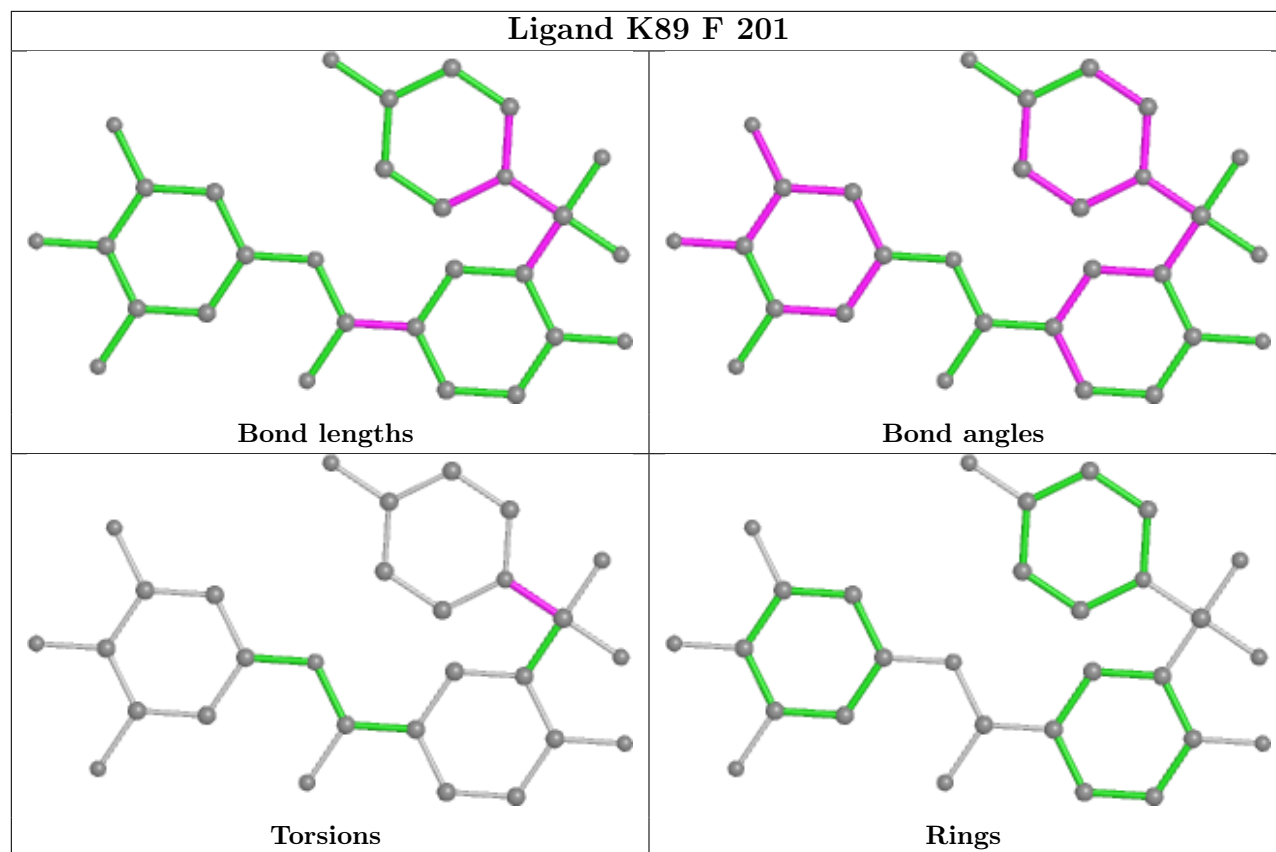
Mol	Chain	Res	Type	Atoms
5	D	205	GOL	O1-C1-C2-C3
5	D	206	GOL	O1-C1-C2-C3
5	D	206	GOL	C1-C2-C3-O3
5	D	206	GOL	O2-C2-C3-O3
5	D	206	GOL	O1-C1-C2-O2
5	D	205	GOL	O1-C1-C2-O2
5	B	204	GOL	C1-C2-C3-O3
2	E	201	K89	C23-N22-S19-O21
2	F	201	K89	C23-N22-S19-O21
5	B	204	GOL	O2-C2-C3-O3
2	B	201	K89	C23-N22-S19-O20
2	B	201	K89	C23-N22-S19-O21
2	E	201	K89	C23-N22-S19-O20

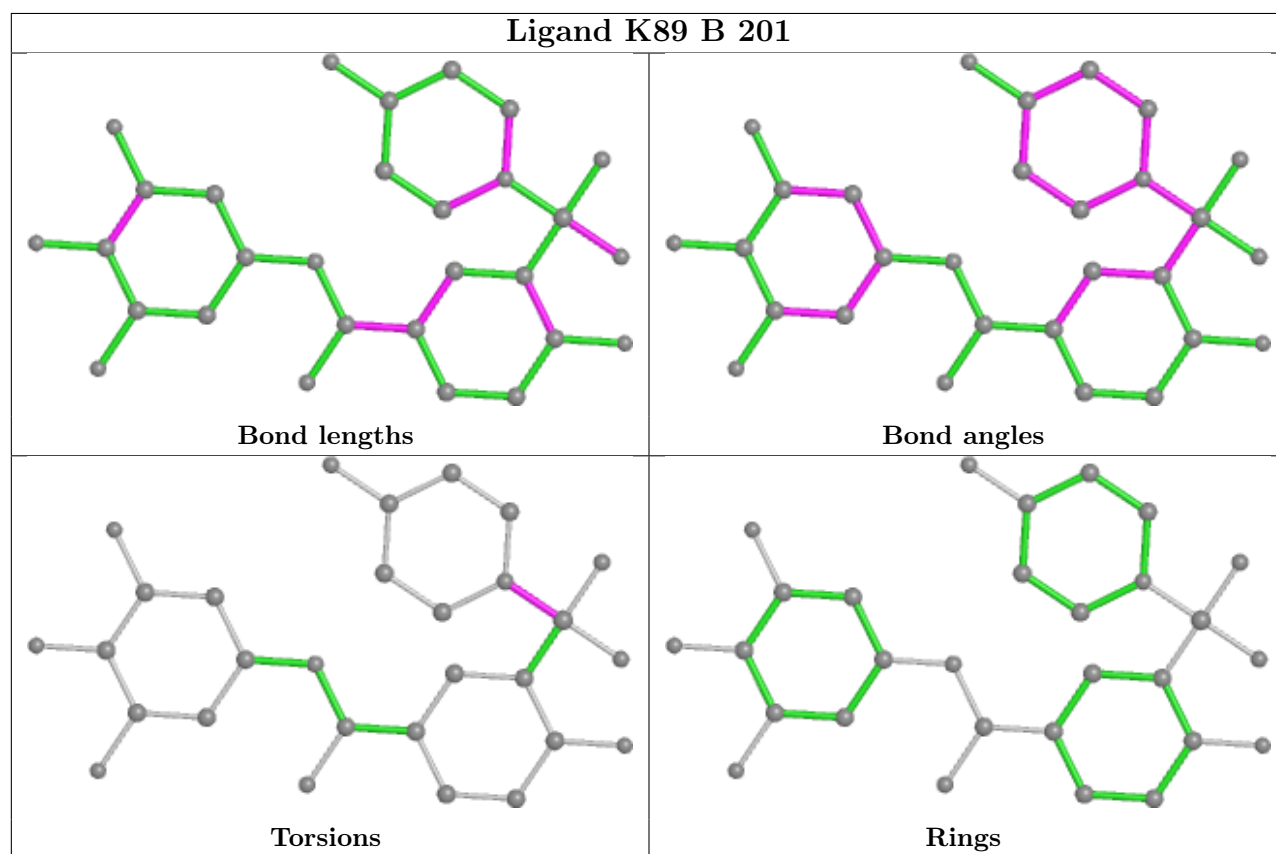
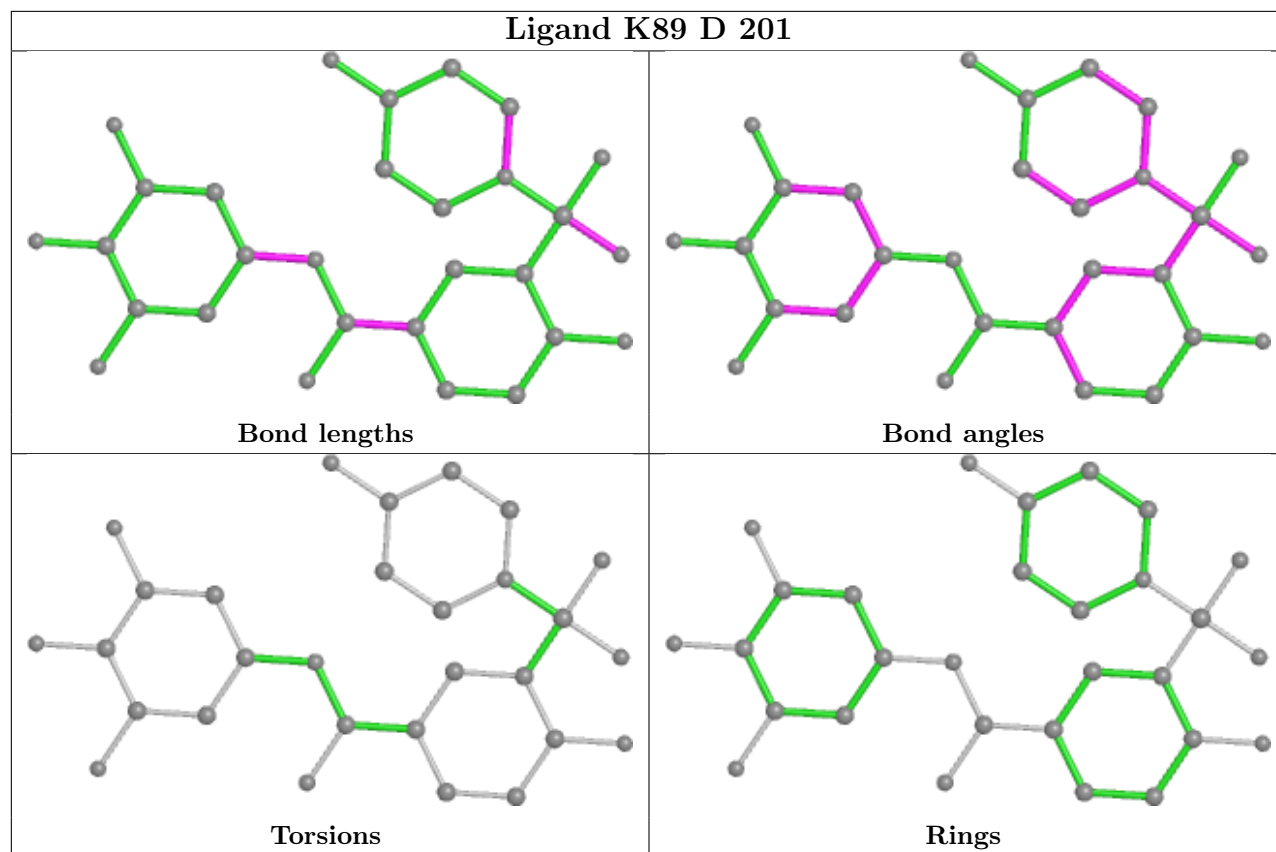
There are no ring outliers.

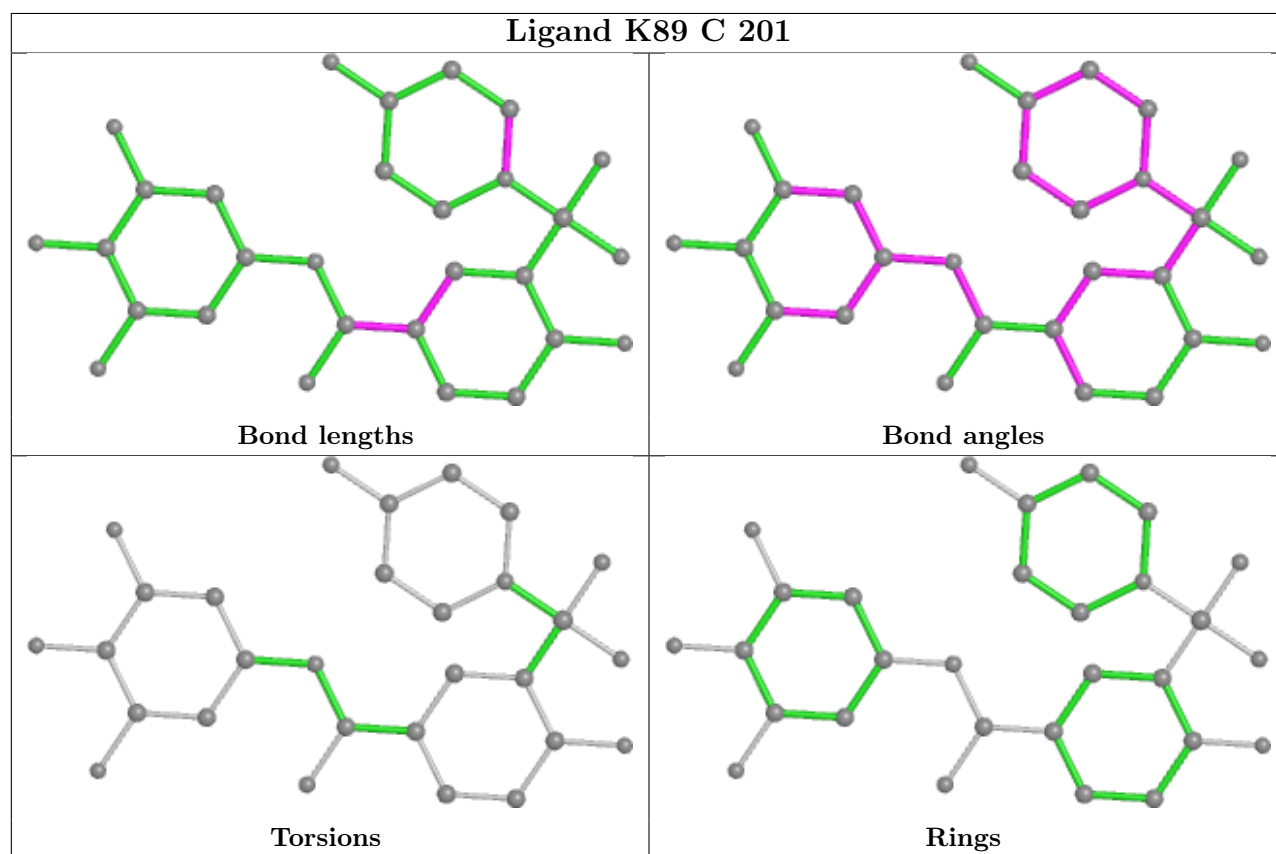
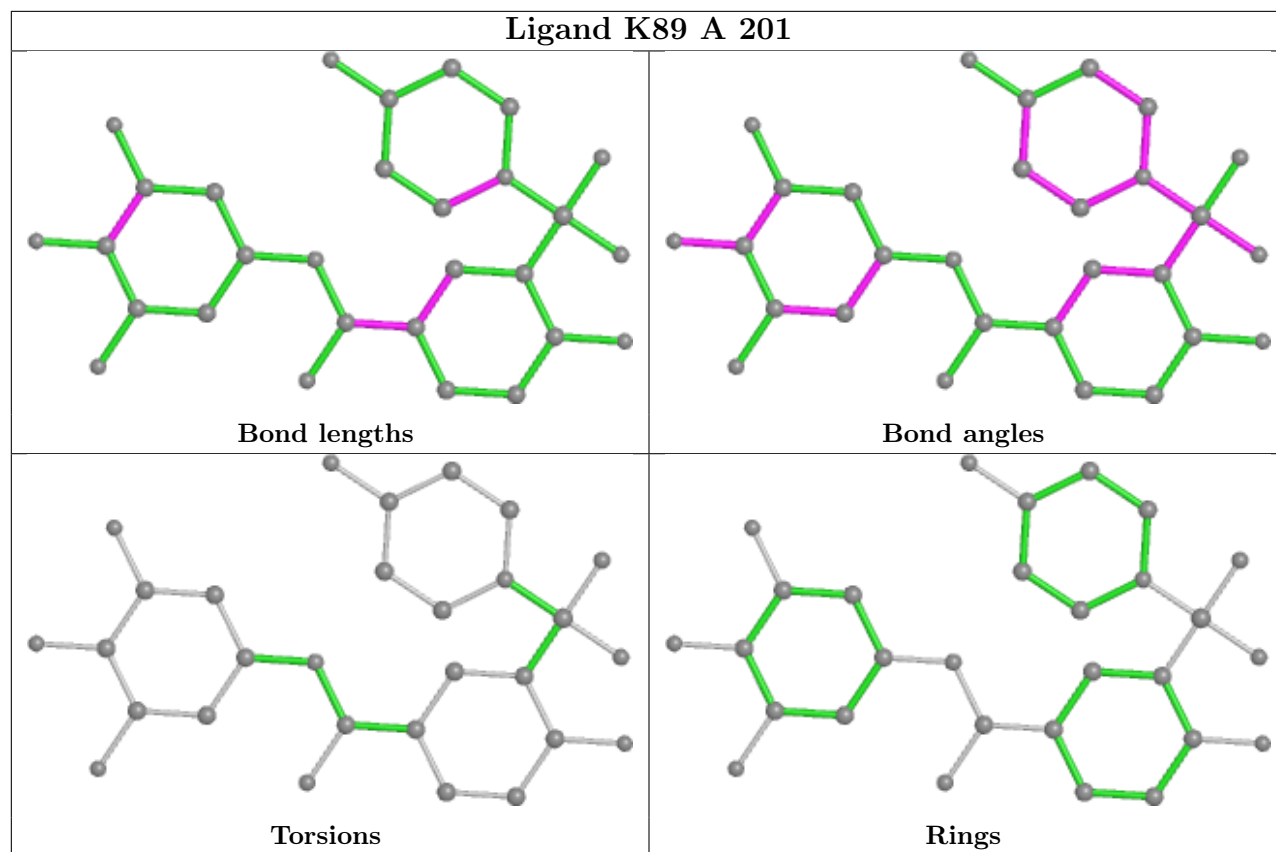
10 monomers are involved in 13 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	203	IPA	4	0
5	D	206	GOL	1	0
2	E	201	K89	1	0
5	D	205	GOL	1	0
2	D	201	K89	1	0
3	E	203	IPA	1	0
2	B	201	K89	1	0
3	A	202	IPA	1	0
3	B	203	IPA	1	0
2	C	201	K89	1	0

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







5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

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

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	148/155 (95%)	0.19	13 (8%) 10 11	25, 36, 66, 88	0
1	B	155/155 (100%)	-0.18	2 (1%) 77 81	22, 31, 55, 74	0
1	C	142/155 (91%)	0.26	16 (11%) 5 6	24, 31, 81, 124	0
1	D	155/155 (100%)	0.22	13 (8%) 11 12	22, 31, 87, 128	0
1	E	150/155 (96%)	0.41	21 (14%) 2 3	23, 32, 105, 133	0
1	F	148/155 (95%)	0.66	24 (16%) 1 1	24, 36, 96, 125	0
All	All	898/930 (96%)	0.26	89 (9%) 7 8	22, 33, 83, 133	0

All (89) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	76	LEU	8.2
1	F	79	PRO	7.8
1	E	76	LEU	7.7
1	C	78	ASP	7.0
1	C	79	PRO	6.8
1	F	71	TRP	6.4
1	E	85	VAL	6.1
1	F	85	VAL	5.9
1	D	76	LEU	5.8
1	C	80	ALA	5.8
1	A	149	VAL	5.6
1	F	86	VAL	5.4
1	D	80	ALA	5.4
1	F	76	LEU	5.4
1	E	80	ALA	5.3
1	D	77	GLU	5.2
1	C	81	SER	5.2
1	F	72	VAL	5.2
1	E	75	ASN	5.1

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Mol	Chain	Res	Type	RSRZ
1	F	70	THR	5.0
1	F	81	SER	5.0
1	F	80	ALA	4.7
1	F	69	ALA	4.7
1	E	88	TYR	4.7
1	E	82	ARG	4.7
1	F	74	THR	4.7
1	F	84	LEU	4.6
1	E	86	VAL	4.6
1	C	82	ARG	4.4
1	E	78	ASP	4.4
1	F	78	ASP	4.4
1	A	84	LEU	4.3
1	D	143	LEU	4.3
1	E	84	LEU	4.3
1	E	77	GLU	4.3
1	E	79	PRO	4.2
1	C	83	ASP	4.2
1	F	142	THR	4.2
1	E	83	ASP	4.1
1	F	82	ARG	4.0
1	F	68	LEU	4.0
1	A	79	PRO	3.9
1	D	145	GLU	3.7
1	D	79	PRO	3.6
1	F	88	TYR	3.6
1	A	139	ILE	3.6
1	C	74	THR	3.6
1	E	74	THR	3.6
1	A	150	GLU	3.6
1	E	71	TRP	3.6
1	D	81	SER	3.5
1	A	73	GLY	3.5
1	C	77	GLU	3.4
1	C	71	TRP	3.4
1	E	91	THR	3.4
1	F	77	GLU	3.3
1	F	73	GLY	3.3
1	E	81	SER	3.2
1	E	143	LEU	3.2
1	A	153	TYR	3.1
1	F	83	ASP	3.1

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Mol	Chain	Res	Type	RSRZ
1	A	80	ALA	3.1
1	F	141	SER	3.0
1	A	74	THR	3.0
1	B	143	LEU	2.8
1	C	72	VAL	2.8
1	A	70	THR	2.7
1	D	148	VAL	2.7
1	C	73	GLY	2.7
1	E	72	VAL	2.7
1	B	146	THR	2.6
1	F	139	ILE	2.6
1	C	85	VAL	2.6
1	E	73	GLY	2.6
1	F	150	GLU	2.5
1	C	84	LEU	2.5
1	D	144	PRO	2.4
1	A	152	LEU	2.4
1	E	149	VAL	2.4
1	D	84	LEU	2.3
1	A	82	ARG	2.2
1	D	146	THR	2.2
1	F	154	PHE	2.2
1	C	142	THR	2.2
1	A	83	ASP	2.1
1	D	83	ASP	2.1
1	C	75	ASN	2.1
1	D	78	ASP	2.0
1	E	92	ASN	2.0

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

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

6.3 Carbohydrates [i](#)

There are no monosaccharides in this entry.

6.4 Ligands [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum,

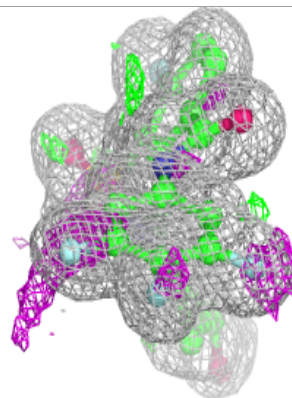
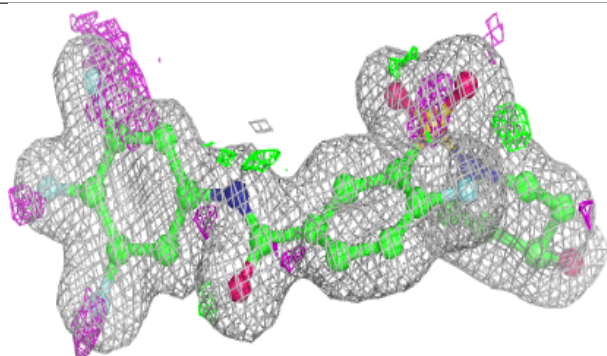
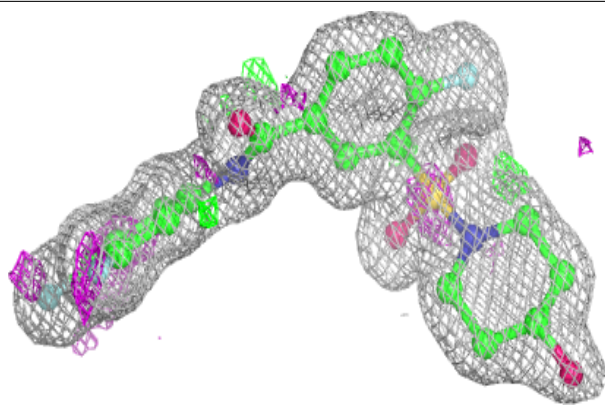
median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
5	GOL	D	205	6/6	0.42	0.28	81,86,90,92	0
3	IPA	A	203	4/4	0.72	0.17	47,48,54,58	0
3	IPA	E	204	4/4	0.79	0.14	32,42,50,51	0
6	CL	D	202	1/1	0.82	0.07	64,64,64,64	0
3	IPA	E	203	4/4	0.83	0.18	40,52,55,55	0
3	IPA	D	204	4/4	0.84	0.15	38,42,43,44	0
5	GOL	D	206	6/6	0.86	0.14	71,78,82,88	0
3	IPA	A	202	4/4	0.86	0.15	36,50,52,53	0
4	DMS	B	202	4/4	0.88	0.15	59,73,76,76	0
3	IPA	C	206	4/4	0.89	0.12	58,59,62,63	0
6	CL	F	202	1/1	0.90	0.17	76,76,76,76	0
3	IPA	B	203	4/4	0.91	0.19	41,52,56,66	0
6	CL	C	203	1/1	0.92	0.11	64,64,64,64	0
3	IPA	F	203	4/4	0.92	0.12	52,52,53,57	0
6	CL	D	203	1/1	0.92	0.06	56,56,56,56	0
3	IPA	C	205	4/4	0.92	0.13	42,46,47,50	0
6	CL	E	202	1/1	0.93	0.07	62,62,62,62	0
4	DMS	C	202	4/4	0.94	0.12	68,70,70,72	0
5	GOL	B	204	6/6	0.96	0.07	35,53,56,58	0
3	IPA	C	204	4/4	0.96	0.09	46,49,49,51	0
2	K89	F	201	29/29	0.97	0.07	22,28,40,56	0
2	K89	A	201	29/29	0.97	0.07	22,27,36,52	0
2	K89	D	201	29/29	0.97	0.07	21,26,38,49	0
2	K89	C	201	29/29	0.98	0.07	21,26,40,54	0
2	K89	B	201	29/29	0.98	0.07	19,24,36,49	0
2	K89	E	201	29/29	0.98	0.07	20,25,36,43	0

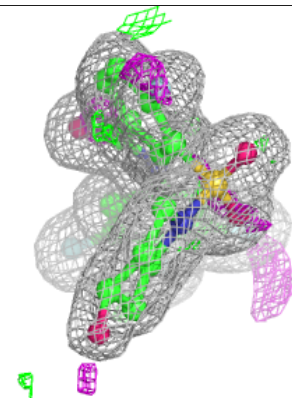
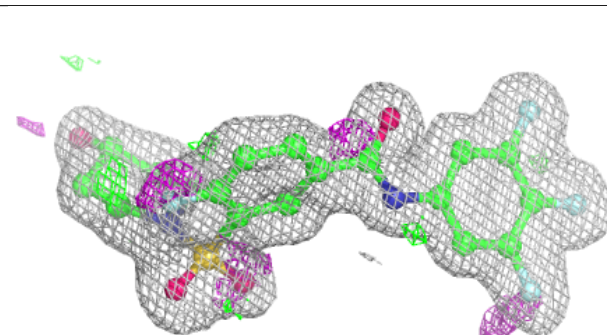
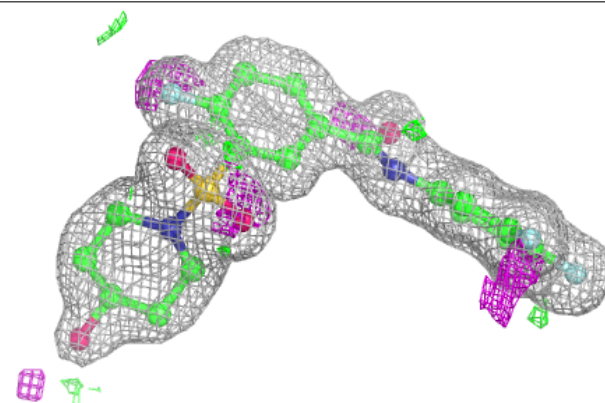
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around K89 F 201:

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

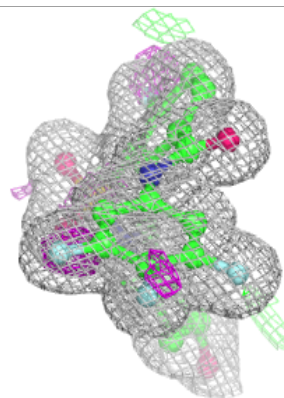
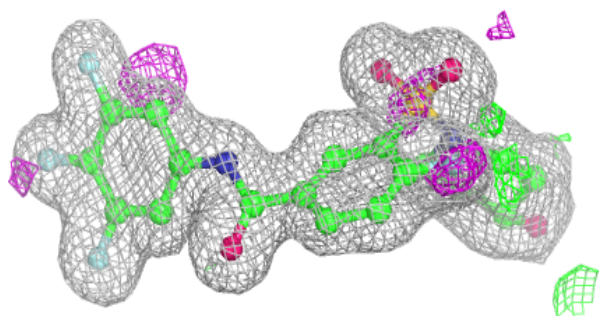
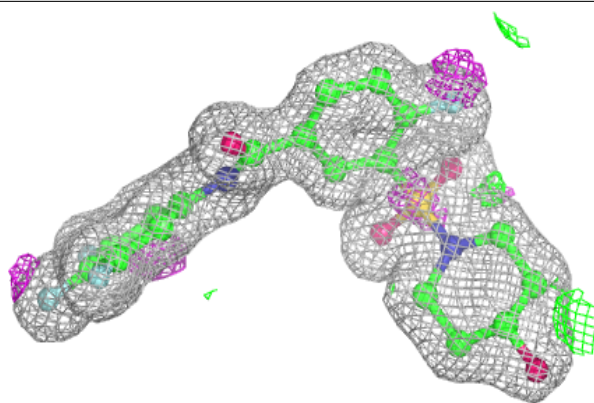
**Electron density around K89 A 201:**

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

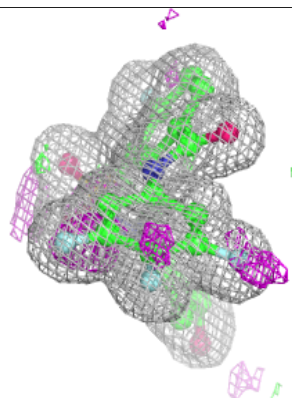
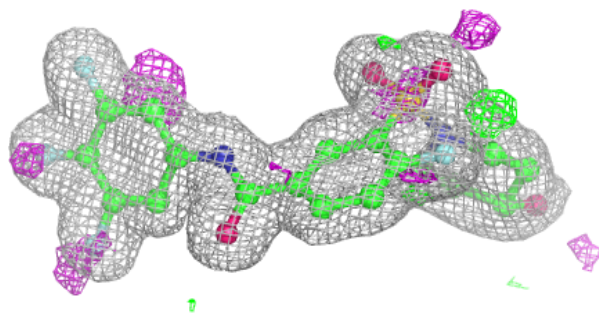
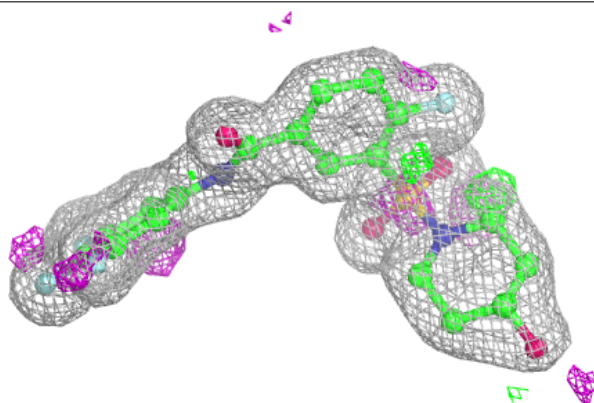


Electron density around K89 D 201:

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

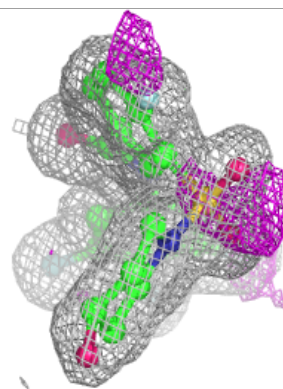
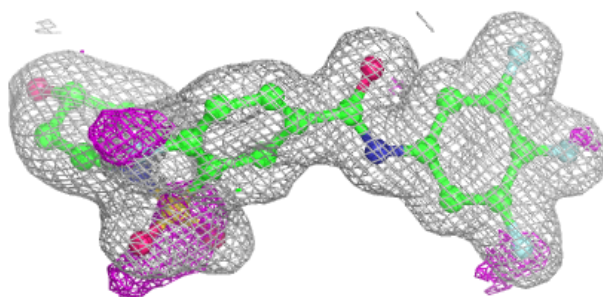
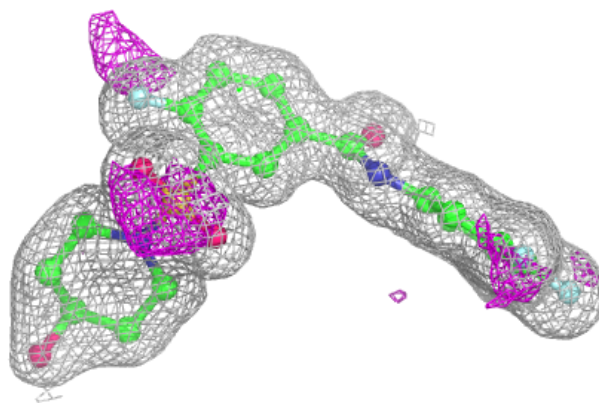
**Electron density around K89 C 201:**

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

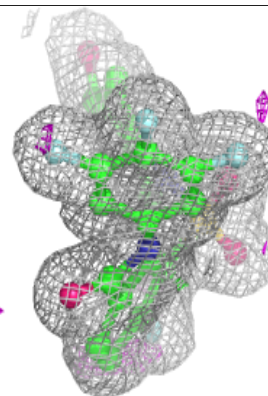
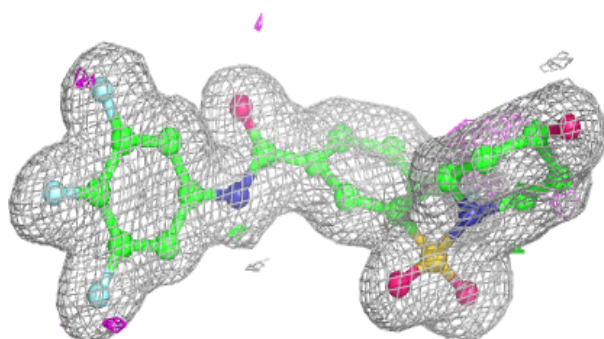
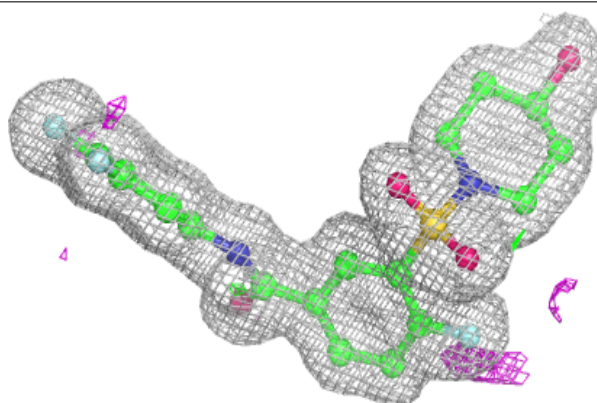


Electron density around K89 B 201:

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

**Electron density around K89 E 201:**

$2mF_o-DF_c$ (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.