



Full wwPDB X-ray Structure Validation Report ⓘ

Sep 22, 2022 – 02:13 pm BST

PDB ID : 7ZXS
Title : Crystal structure of DPP9 in complex with a 4-oxo-b-lactam based inhibitor, A295
Authors : Ross, B.; Huber, R.
Deposited on : 2022-05-22
Resolution : 1.81 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 : 1.8.4, CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.30
buster-report : 1.1.7 (2018)
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac : 5.8.0267
CCP4 : 7.1.010 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.30

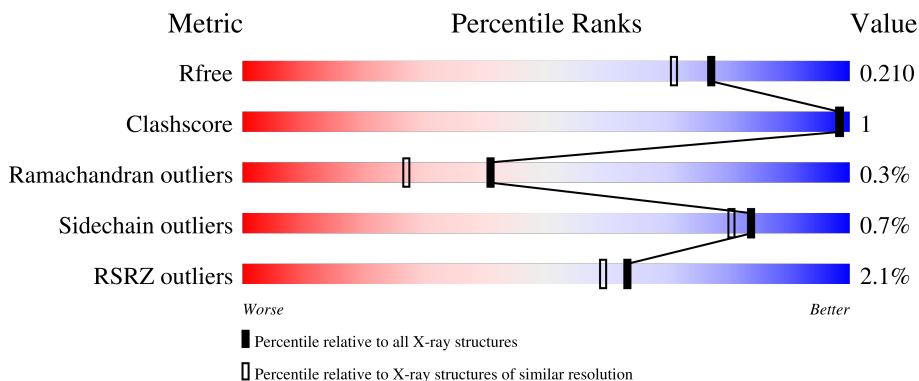
1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.81 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	7484 (1.84-1.80)
Clashscore	141614	8401 (1.84-1.80)
Ramachandran outliers	138981	8290 (1.84-1.80)
Sidechain outliers	138945	8290 (1.84-1.80)
RSRZ outliers	127900	7371 (1.84-1.80)

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	850	98%
1	C	850	97%
2	B	850	96%
2	D	850	96%

2 Entry composition i

There are 6 unique types of molecules in this entry. The entry contains 29394 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 Dipeptidyl peptidase 9.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	844	6854	4399	1170	1256	29	145	4	0
1	C	843	6881	4415	1178	1258	30	155	8	0

There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	864	HIS	-	expression tag	UNP Q86TI2
A	865	HIS	-	expression tag	UNP Q86TI2
A	866	HIS	-	expression tag	UNP Q86TI2
A	867	HIS	-	expression tag	UNP Q86TI2
A	868	HIS	-	expression tag	UNP Q86TI2
A	869	HIS	-	expression tag	UNP Q86TI2
C	864	HIS	-	expression tag	UNP Q86TI2
C	865	HIS	-	expression tag	UNP Q86TI2
C	866	HIS	-	expression tag	UNP Q86TI2
C	867	HIS	-	expression tag	UNP Q86TI2
C	868	HIS	-	expression tag	UNP Q86TI2
C	869	HIS	-	expression tag	UNP Q86TI2

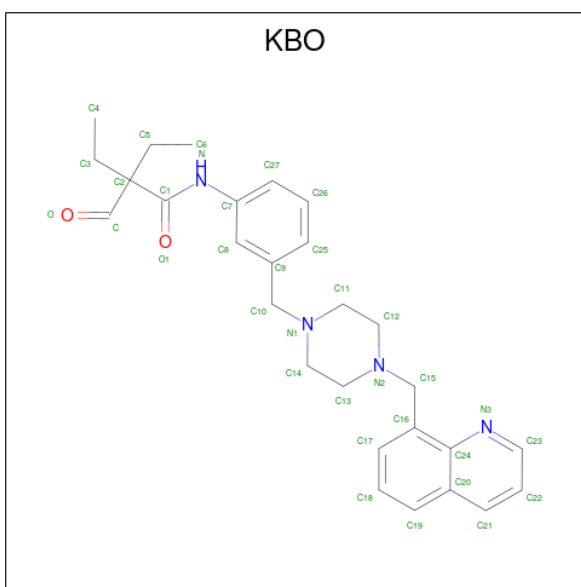
- Molecule 2 is a protein called Dipeptidyl peptidase 9.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	839	6855	4396	1174	1254	31	127	10	0
2	D	838	6830	4379	1168	1252	31	122	8	0

There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	864	HIS	-	expression tag	UNP Q86TI2
B	865	HIS	-	expression tag	UNP Q86TI2
B	866	HIS	-	expression tag	UNP Q86TI2
B	867	HIS	-	expression tag	UNP Q86TI2
B	868	HIS	-	expression tag	UNP Q86TI2
B	869	HIS	-	expression tag	UNP Q86TI2
D	864	HIS	-	expression tag	UNP Q86TI2
D	865	HIS	-	expression tag	UNP Q86TI2
D	866	HIS	-	expression tag	UNP Q86TI2
D	867	HIS	-	expression tag	UNP Q86TI2
D	868	HIS	-	expression tag	UNP Q86TI2
D	869	HIS	-	expression tag	UNP Q86TI2

- Molecule 3 is 2-ethyl-2-methanoyl- {N}-[3-[[4-(quinolin-8-ylmethyl)piperazin-1-yl]methyl]phenyl]butanamide (three-letter code: KBO) (formula: C₂₈H₃₄N₄O₂) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
3	A	1	Total	C	N	O	10	0
			34	28	4	2		
3	B	1	Total	C	N	O	10	0
			34	28	4	2		
3	C	1	Total	C	N	O	10	0
			34	28	4	2		
3	D	1	Total	C	N	O	10	0
			34	28	4	2		

- Molecule 4 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: C₂H₆O₂).



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

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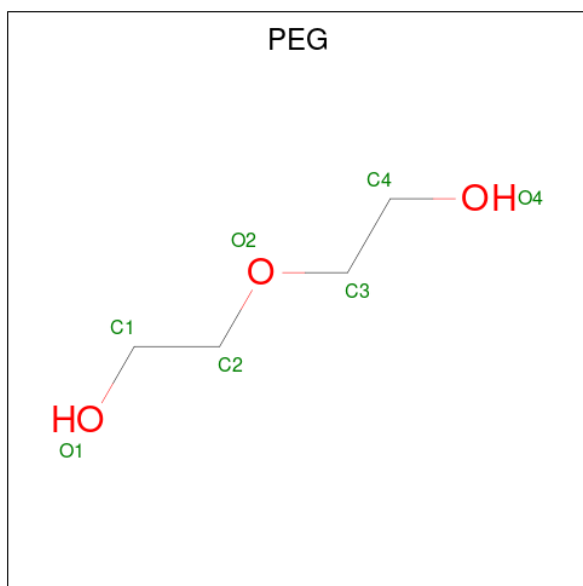
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	B	1	Total	C	O	0	0
			4	2	2		
4	B	1	Total	C	O	0	0
			4	2	2		
4	B	1	Total	C	O	0	0
			4	2	2		
4	B	1	Total	C	O	0	0
			4	2	2		
4	C	1	Total	C	O	0	0
			4	2	2		
4	C	1	Total	C	O	0	0
			4	2	2		
4	C	1	Total	C	O	0	0
			4	2	2		
4	C	1	Total	C	O	0	0
			4	2	2		
4	C	1	Total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

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

- Molecule 5 is DI(HYDROXYETHYL)ETHER (three-letter code: PEG) (formula: C₄H₁₀O₃).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	B	1	Total C O 7 4 3	0	0
5	C	1	Total C O 7 4 3	0	0
5	D	1	Total C O 7 4 3	0	0

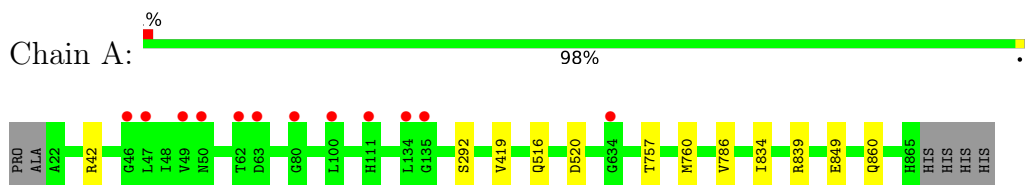
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	331	Total 331	O 331	0	0
6	B	425	Total 425	O 425	0	0
6	C	419	Total 419	O 419	0	0
6	D	478	Total 478	O 478	0	0

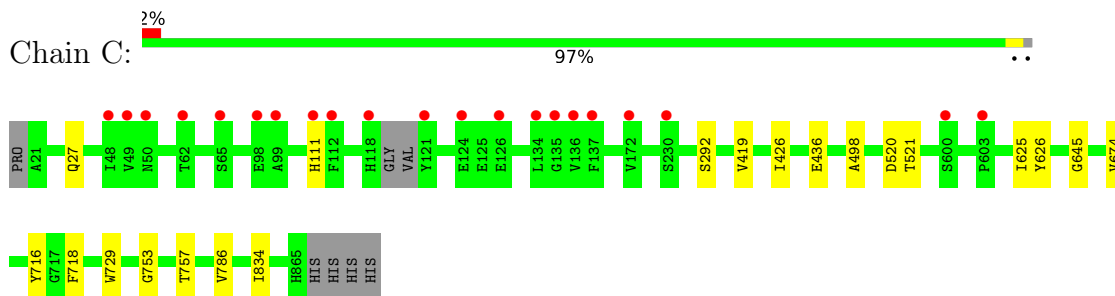
3 Residue-property plots [i](#)

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.

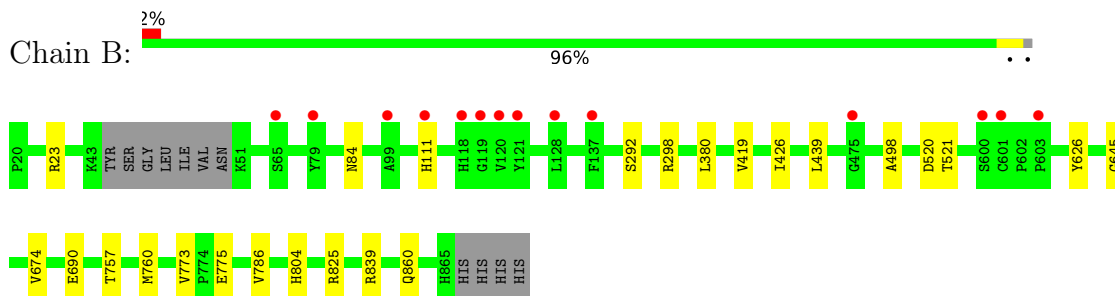
- Molecule 1: Dipeptidyl peptidase 9



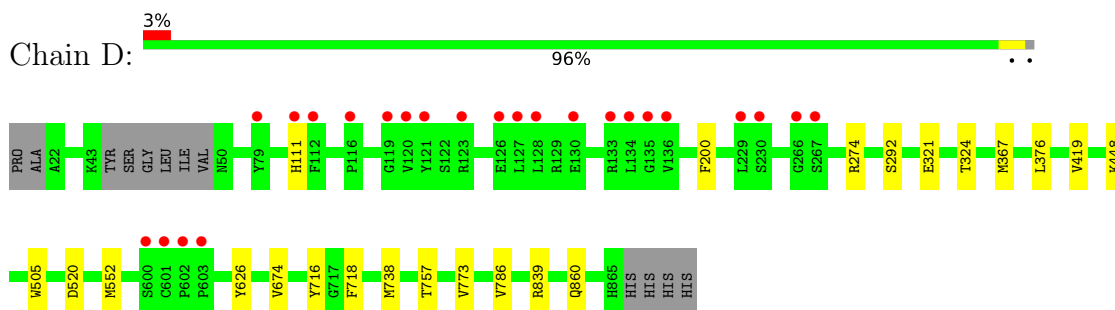
- Molecule 1: Dipeptidyl peptidase 9



- Molecule 2: Dipeptidyl peptidase 9



- Molecule 2: Dipeptidyl peptidase 9



4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α , β , γ	88.35Å 106.18Å 121.13Å 65.25° 70.43° 75.86°	Depositor
Resolution (Å)	106.09 – 1.81 106.09 – 1.81	Depositor EDS
% Data completeness (in resolution range)	64.6 (106.09-1.81) 64.6 (106.09-1.81)	Depositor EDS
R_{merge}	0.05	Depositor
R_{sym}	0.05	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.60 (at 1.81Å)	Xtriage
Refinement program	REFMAC 5.8.0267	Depositor
R, R_{free}	0.175 , 0.203 0.181 , 0.210	Depositor DCC
R_{free} test set	1707 reflections (0.77%)	wwPDB-VP
Wilson B-factor (Å ²)	30.1	Xtriage
Anisotropy	0.023	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	(Not available) , (Not available)	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.34$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	29394	wwPDB-VP
Average B, all atoms (Å ²)	38.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.27% 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: CSO, EDO, PEG, KBO

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	0.64	0/7053	0.77	0/9571
1	C	0.63	0/7080	0.77	0/9605
2	B	0.63	0/7061	0.78	1/9581 (0.0%)
2	D	0.64	0/7035	0.78	0/9547
All	All	0.63	0/28229	0.77	1/38304 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	298	ARG	NE-CZ-NH2	-5.08	117.76	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	6854	0	6625	3	0
1	C	6881	0	6650	7	0
2	B	6855	0	6623	12	0
2	D	6830	0	6594	9	0
3	A	34	0	0	0	0
3	B	34	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	C	34	0	0	0	0
3	D	34	0	0	0	0
4	A	28	0	42	0	0
4	B	48	0	72	0	0
4	C	40	0	60	0	0
4	D	48	0	72	0	0
5	B	7	0	10	0	0
5	C	7	0	10	0	0
5	D	7	0	10	0	0
6	A	331	0	0	0	0
6	B	425	0	0	2	0
6	C	419	0	0	1	0
6	D	478	0	0	1	0
All	All	29394	0	26768	30	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 1.

All (30) 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)
2:B:825[B]:ARG:HH11	2:B:825[B]:ARG:HG2	1.44	0.81
2:B:825[A]:ARG:HH11	2:B:825[A]:ARG:HG3	1.59	0.67
2:B:825[B]:ARG:HG2	2:B:825[B]:ARG:NH1	2.06	0.64
2:B:825[A]:ARG:HG3	2:B:825[A]:ARG:NH1	2.19	0.55
1:A:834[B]:ILE:HD11	1:C:834[B]:ILE:HD11	1.90	0.54
1:C:645:GLY:HA2	6:C:1171:HOH:O	2.09	0.53
2:D:200:PHE:CZ	2:D:324:THR:HG21	2.44	0.52
1:C:716:TYR:HB3	1:C:718:PHE:CE2	2.46	0.50
2:D:716:TYR:HB3	2:D:718:PHE:CE2	2.47	0.50
1:C:757:THR:HA	1:C:786:VAL:HG22	1.95	0.49
2:B:690:GLU:HG3	6:B:1003:HOH:O	2.12	0.49
2:D:757:THR:HA	2:D:786:VAL:HG22	1.96	0.47
2:B:380:LEU:HD11	2:B:439:LEU:HD22	1.97	0.46
2:B:426:ILE:HD12	2:B:498:ALA:HB2	1.98	0.45
2:B:773:VAL:HG23	2:B:775:GLU:HG2	1.99	0.45
2:B:23:ARG:HA	2:B:23:ARG:HD3	1.84	0.45
2:D:367:MET:HE3	2:D:376:LEU:HD11	1.99	0.45
1:C:626:TYR:HB2	1:C:674:VAL:HB	1.98	0.44
2:B:645:GLY:HA2	6:B:1118:HOH:O	2.17	0.44
1:A:757:THR:HA	1:A:786:VAL:HG22	2.00	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:757:THR:HA	2:B:786:VAL:HG22	2.00	0.43
2:D:505:TRP:CD1	2:D:552:MET:HB3	2.53	0.43
2:D:274:ARG:HG2	2:D:321:GLU:HG2	2.01	0.43
1:C:729:TRP:CE3	1:C:753:GLY:HA3	2.54	0.42
2:B:626:TYR:HB2	2:B:674:VAL:HB	2.01	0.42
1:A:42:ARG:HD3	1:A:849:GLU:HG2	2.02	0.41
2:D:626:TYR:HB2	2:D:674:VAL:HB	2.02	0.41
2:D:773:VAL:HG13	6:D:1380:HOH:O	2.19	0.41
2:D:738:MET:CE	2:D:786:VAL:HG12	2.51	0.40
1:C:426:ILE:HD12	1:C:498:ALA:HB2	2.03	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	845/850 (99%)	821 (97%)	22 (3%)	2 (0%)	47 33
1	C	846/850 (100%)	823 (97%)	21 (2%)	2 (0%)	47 33
2	B	845/850 (99%)	821 (97%)	21 (2%)	3 (0%)	34 21
2	D	842/850 (99%)	824 (98%)	15 (2%)	3 (0%)	34 21
All	All	3378/3400 (99%)	3289 (97%)	79 (2%)	10 (0%)	41 27

All (10) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	839	ARG
1	C	111	HIS
2	D	111	HIS
2	B	111	HIS
2	B	839	ARG

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Mol	Chain	Res	Type
2	D	839	ARG
1	A	419	VAL
2	B	419	VAL
1	C	419	VAL
2	D	419	VAL

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	745/746 (100%)	740 (99%)	5 (1%)	84	80
1	C	748/746 (100%)	742 (99%)	6 (1%)	81	77
2	B	747/747 (100%)	740 (99%)	7 (1%)	78	74
2	D	745/747 (100%)	740 (99%)	5 (1%)	84	80
All	All	2985/2986 (100%)	2962 (99%)	23 (1%)	84	77

All (23) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	292	SER
1	A	516	GLN
1	A	520	ASP
1	A	760	MET
1	A	860	GLN
2	B	84	ASN
2	B	292	SER
2	B	520	ASP
2	B	521	THR
2	B	760	MET
2	B	804	HIS
2	B	860	GLN
1	C	27	GLN
1	C	292	SER
1	C	436	GLU
1	C	520	ASP

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Mol	Chain	Res	Type
1	C	521	THR
1	C	625	ILE
2	D	292[A]	SER
2	D	292[B]	SER
2	D	448	LYS
2	D	520	ASP
2	D	860	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

2 non-standard protein/DNA/RNA residues 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
1	CSO	A	844	1	3,6,7	0.59	0	0,6,8	-	-
1	CSO	C	844	1	3,6,7	0.71	0	0,6,8	-	-

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
1	CSO	A	844	1	-	0/1/5/7	-
1	CSO	C	844	1	-	0/1/5/7	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

5.6 Ligand geometry [i](#)

48 ligands are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
3	KBO	A	901	1	35,37,37	0.91	0	47,51,51	1.47	10 (21%)
4	EDO	C	903	-	3,3,3	0.10	0	2,2,2	0.25	0
4	EDO	A	908	-	3,3,3	0.19	0	2,2,2	0.13	0
4	EDO	B	910	-	3,3,3	0.05	0	2,2,2	0.17	0
4	EDO	D	905	-	3,3,3	0.35	0	2,2,2	0.57	0
4	EDO	A	903	-	3,3,3	0.11	0	2,2,2	0.07	0
4	EDO	A	905	-	3,3,3	0.10	0	2,2,2	0.21	0
4	EDO	D	906	-	3,3,3	0.11	0	2,2,2	0.36	0
4	EDO	D	910	-	3,3,3	0.17	0	2,2,2	0.06	0
4	EDO	C	908	-	3,3,3	0.19	0	2,2,2	0.42	0
4	EDO	A	904	-	3,3,3	0.07	0	2,2,2	0.31	0
5	PEG	B	913	-	6,6,6	0.17	0	5,5,5	0.13	0
4	EDO	C	907	-	3,3,3	0.06	0	2,2,2	0.27	0
4	EDO	B	908	-	3,3,3	0.11	0	2,2,2	0.14	0
4	EDO	B	902	-	3,3,3	0.12	0	2,2,2	0.36	0
4	EDO	D	902	-	3,3,3	0.02	0	2,2,2	0.12	0
4	EDO	B	903	-	3,3,3	0.08	0	2,2,2	0.10	0
4	EDO	C	912	-	3,3,3	0.06	0	2,2,2	0.10	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
4	EDO	B	912	-	3,3,3	0.22	0	2,2,2	0.26	0
4	EDO	D	907	-	3,3,3	0.09	0	2,2,2	0.39	0
4	EDO	A	907	-	3,3,3	0.20	0	2,2,2	0.25	0
4	EDO	C	905	-	3,3,3	0.04	0	2,2,2	0.25	0
4	EDO	C	910	-	3,3,3	0.10	0	2,2,2	0.37	0
4	EDO	C	906	-	3,3,3	0.09	0	2,2,2	0.12	0
4	EDO	A	902	-	3,3,3	0.12	0	2,2,2	0.34	0
4	EDO	B	911	-	3,3,3	0.05	0	2,2,2	0.25	0
4	EDO	D	904	-	3,3,3	0.16	0	2,2,2	0.35	0
4	EDO	D	911	-	3,3,3	0.25	0	2,2,2	0.42	0
4	EDO	B	906	-	3,3,3	0.14	0	2,2,2	0.37	0
4	EDO	D	913	-	3,3,3	0.18	0	2,2,2	0.54	0
4	EDO	B	909	-	3,3,3	0.18	0	2,2,2	0.49	0
4	EDO	B	904	-	3,3,3	0.07	0	2,2,2	0.38	0
4	EDO	D	909	-	3,3,3	0.11	0	2,2,2	0.42	0
4	EDO	C	904	-	3,3,3	0.18	0	2,2,2	0.31	0
4	EDO	A	906	-	3,3,3	0.10	0	2,2,2	0.29	0
4	EDO	B	914	-	3,3,3	0.12	0	2,2,2	0.45	0
3	KBO	D	901	2	35,37,37	0.94	1 (2%)	47,51,51	1.46	6 (12%)
4	EDO	B	907	-	3,3,3	0.20	0	2,2,2	0.41	0
4	EDO	C	902	-	3,3,3	0.04	0	2,2,2	0.08	0
3	KBO	C	901	1	35,37,37	0.92	1 (2%)	47,51,51	1.59	9 (19%)
3	KBO	B	901	2	35,37,37	0.96	1 (2%)	47,51,51	1.66	9 (19%)
5	PEG	C	909	-	6,6,6	0.19	0	5,5,5	0.10	0
4	EDO	D	914	-	3,3,3	0.08	0	2,2,2	0.26	0
4	EDO	D	908	-	3,3,3	0.13	0	2,2,2	0.24	0
5	PEG	D	912	-	6,6,6	0.17	0	5,5,5	0.15	0
4	EDO	D	903	-	3,3,3	0.14	0	2,2,2	0.32	0
4	EDO	C	911	-	3,3,3	0.07	0	2,2,2	0.32	0
4	EDO	B	905	-	3,3,3	0.07	0	2,2,2	0.25	0

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	KBO	A	901	1	-	6/24/37/37	0/4/4/4
4	EDO	C	903	-	-	0/1/1/1	-
4	EDO	A	908	-	-	0/1/1/1	-
4	EDO	B	910	-	-	1/1/1/1	-
4	EDO	D	905	-	-	0/1/1/1	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	EDO	A	903	-	-	0/1/1/1	-
4	EDO	A	905	-	-	0/1/1/1	-
4	EDO	D	906	-	-	1/1/1/1	-
4	EDO	D	910	-	-	0/1/1/1	-
4	EDO	C	908	-	-	1/1/1/1	-
4	EDO	A	904	-	-	1/1/1/1	-
5	PEG	B	913	-	-	1/4/4/4	-
4	EDO	C	907	-	-	1/1/1/1	-
4	EDO	B	908	-	-	0/1/1/1	-
4	EDO	B	902	-	-	1/1/1/1	-
4	EDO	D	902	-	-	0/1/1/1	-
4	EDO	B	903	-	-	0/1/1/1	-
4	EDO	C	912	-	-	0/1/1/1	-
4	EDO	B	912	-	-	0/1/1/1	-
4	EDO	D	907	-	-	1/1/1/1	-
4	EDO	A	907	-	-	1/1/1/1	-
4	EDO	C	905	-	-	0/1/1/1	-
4	EDO	C	910	-	-	0/1/1/1	-
4	EDO	C	906	-	-	0/1/1/1	-
4	EDO	A	902	-	-	0/1/1/1	-
4	EDO	B	911	-	-	0/1/1/1	-
4	EDO	D	904	-	-	0/1/1/1	-
4	EDO	D	911	-	-	1/1/1/1	-
4	EDO	B	906	-	-	0/1/1/1	-
4	EDO	D	913	-	-	1/1/1/1	-
4	EDO	B	909	-	-	1/1/1/1	-
4	EDO	B	904	-	-	1/1/1/1	-
4	EDO	D	909	-	-	0/1/1/1	-
4	EDO	C	904	-	-	0/1/1/1	-
4	EDO	A	906	-	-	1/1/1/1	-
4	EDO	B	914	-	-	0/1/1/1	-
3	KBO	D	901	2	-	6/24/37/37	0/4/4/4
4	EDO	B	907	-	-	1/1/1/1	-
4	EDO	C	902	-	-	1/1/1/1	-
3	KBO	C	901	1	-	8/24/37/37	0/4/4/4
3	KBO	B	901	2	-	3/24/37/37	0/4/4/4
5	PEG	C	909	-	-	0/4/4/4	-
4	EDO	D	914	-	-	1/1/1/1	-
4	EDO	D	908	-	-	1/1/1/1	-
5	PEG	D	912	-	-	2/4/4/4	-
4	EDO	D	903	-	-	0/1/1/1	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	EDO	C	911	-	-	0/1/1/1	-
4	EDO	B	905	-	-	0/1/1/1	-

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	901	KBO	C8-C7	2.20	1.43	1.39
3	D	901	KBO	C8-C7	2.18	1.43	1.39
3	C	901	KBO	C8-C7	2.04	1.42	1.39

All (34) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	901	KBO	C16-C15-N2	-5.63	106.11	114.14
3	C	901	KBO	C16-C15-N2	-4.63	107.54	114.14
3	D	901	KBO	C16-C15-N2	-4.27	108.05	114.14
3	C	901	KBO	C23-N3-C24	3.84	122.08	117.30
3	D	901	KBO	C23-N3-C24	3.84	122.08	117.30
3	B	901	KBO	C23-N3-C24	3.80	122.03	117.30
3	A	901	KBO	C23-N3-C24	3.76	121.98	117.30
3	C	901	KBO	C2-C1-N	3.64	120.83	115.43
3	B	901	KBO	C2-C1-N	3.60	120.77	115.43
3	D	901	KBO	C20-C24-N3	-3.24	119.07	122.62
3	D	901	KBO	C2-C1-N	3.23	120.22	115.43
3	C	901	KBO	C20-C24-N3	-3.23	119.08	122.62
3	A	901	KBO	C2-C1-N	3.18	120.14	115.43
3	A	901	KBO	C20-C24-N3	-3.16	119.17	122.62
3	B	901	KBO	C20-C24-N3	-3.01	119.32	122.62
3	C	901	KBO	C27-C7-C8	-3.00	116.09	119.65
3	A	901	KBO	C16-C15-N2	-2.98	109.88	114.14
3	B	901	KBO	O1-C1-C2	-2.73	116.82	121.21
3	B	901	KBO	C27-C7-C8	-2.72	116.42	119.65
3	D	901	KBO	C27-C7-C8	-2.64	116.52	119.65
3	B	901	KBO	C26-C27-C7	2.64	122.88	119.72
3	C	901	KBO	O1-C1-C2	-2.63	116.97	121.21
3	A	901	KBO	C27-C7-C8	-2.60	116.57	119.65
3	B	901	KBO	C22-C23-N3	-2.39	120.28	123.94
3	C	901	KBO	C22-C23-N3	-2.36	120.32	123.94
3	D	901	KBO	C22-C23-N3	-2.32	120.39	123.94
3	A	901	KBO	C22-C23-N3	-2.31	120.40	123.94
3	A	901	KBO	C4-C3-C2	2.30	117.07	114.38
3	C	901	KBO	C26-C27-C7	2.18	122.33	119.72

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	901	KBO	O1-C1-C2	-2.18	117.71	121.21
3	C	901	KBO	C6-C5-C2	2.08	116.81	114.38
3	A	901	KBO	C8-C7-N	2.07	126.94	120.18
3	B	901	KBO	C25-C9-C8	2.06	121.42	118.54
3	A	901	KBO	C15-C16-C24	2.03	122.11	118.84

There are no chirality outliers.

All (43) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	901	KBO	O-C-C2-C3
3	B	901	KBO	O-C-C2-C3
3	C	901	KBO	O-C-C2-C3
3	C	901	KBO	O-C-C2-C5
3	D	901	KBO	O-C-C2-C3
4	D	906	EDO	O1-C1-C2-O2
3	D	901	KBO	C16-C15-N2-C12
3	D	901	KBO	C16-C15-N2-C13
5	D	912	PEG	O1-C1-C2-O2
4	A	907	EDO	O1-C1-C2-O2
4	D	907	EDO	O1-C1-C2-O2
4	D	911	EDO	O1-C1-C2-O2
3	C	901	KBO	C16-C15-N2-C12
3	C	901	KBO	C3-C2-C5-C6
3	C	901	KBO	C16-C15-N2-C13
3	A	901	KBO	C16-C15-N2-C12
4	B	902	EDO	O1-C1-C2-O2
4	C	902	EDO	O1-C1-C2-O2
4	D	913	EDO	O1-C1-C2-O2
4	D	914	EDO	O1-C1-C2-O2
5	B	913	PEG	O2-C3-C4-O4
3	A	901	KBO	C16-C15-N2-C13
3	A	901	KBO	N2-C15-C16-C17
4	B	910	EDO	O1-C1-C2-O2
3	D	901	KBO	N2-C15-C16-C17
5	D	912	PEG	C4-C3-O2-C2
3	B	901	KBO	N2-C15-C16-C17
3	C	901	KBO	N2-C15-C16-C17
4	B	907	EDO	O1-C1-C2-O2
4	B	909	EDO	O1-C1-C2-O2
3	A	901	KBO	O-C-C2-C5
3	B	901	KBO	O-C-C2-C5

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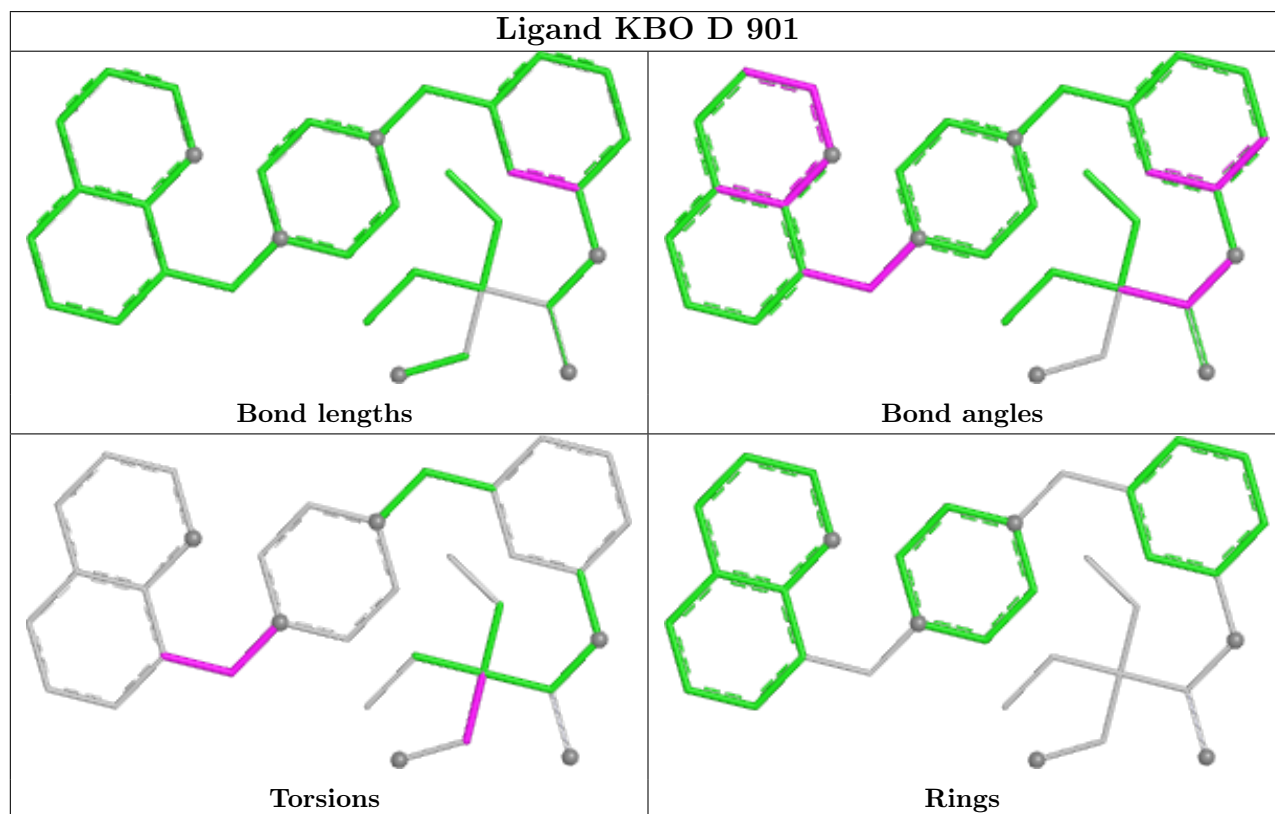
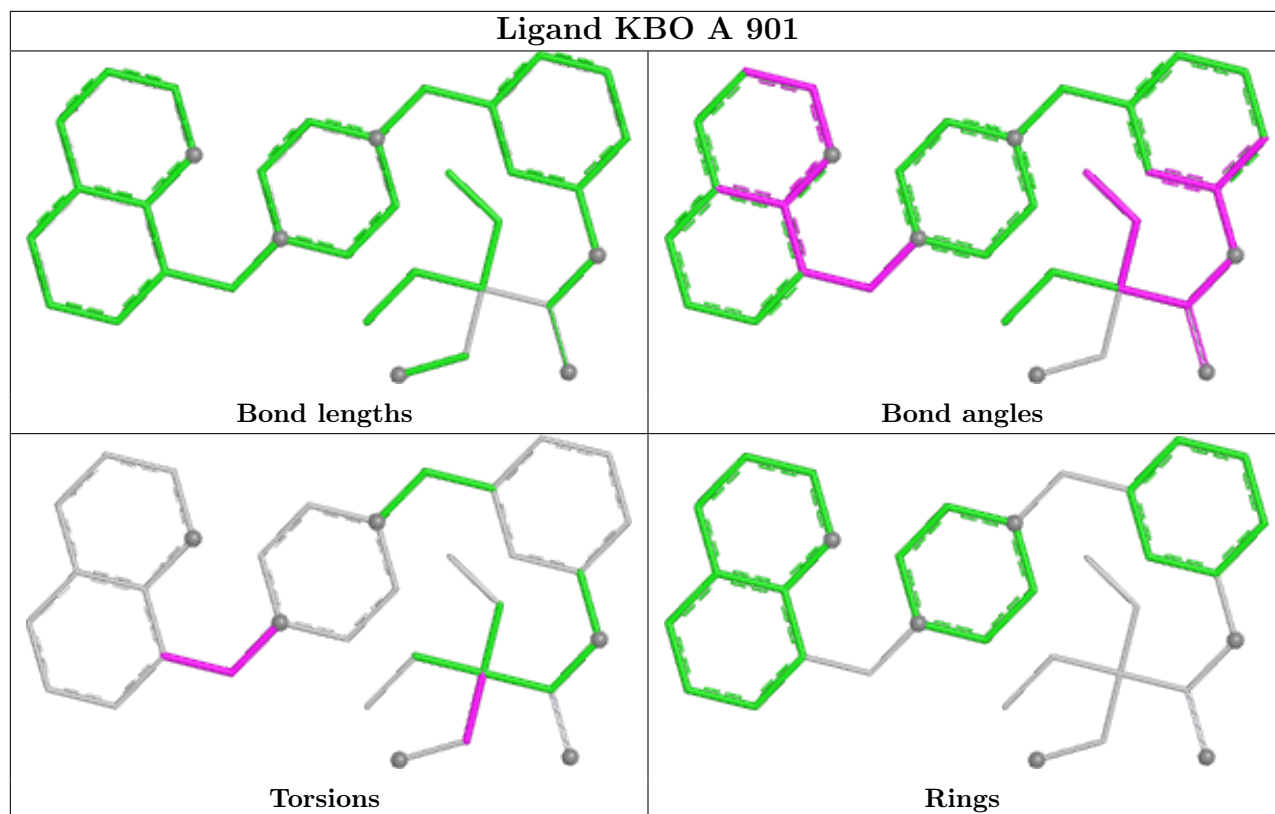
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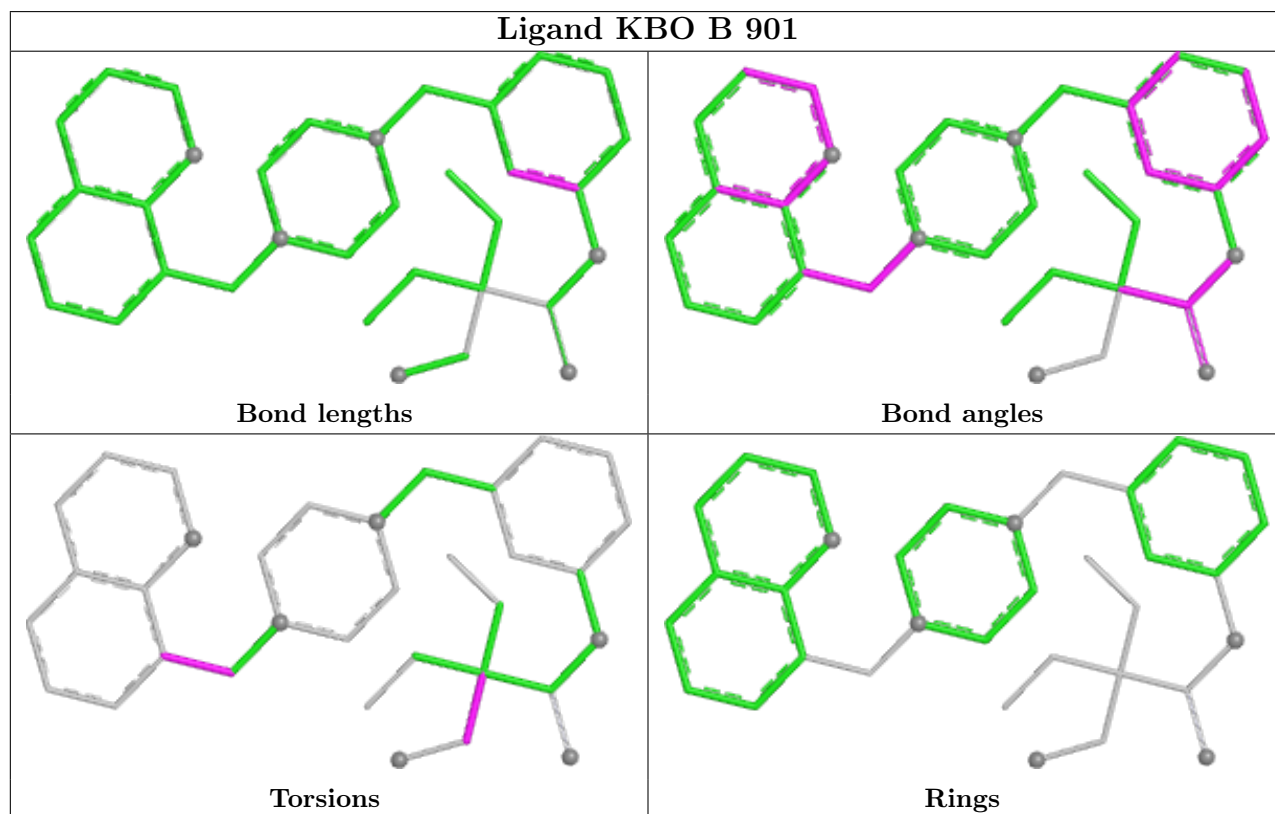
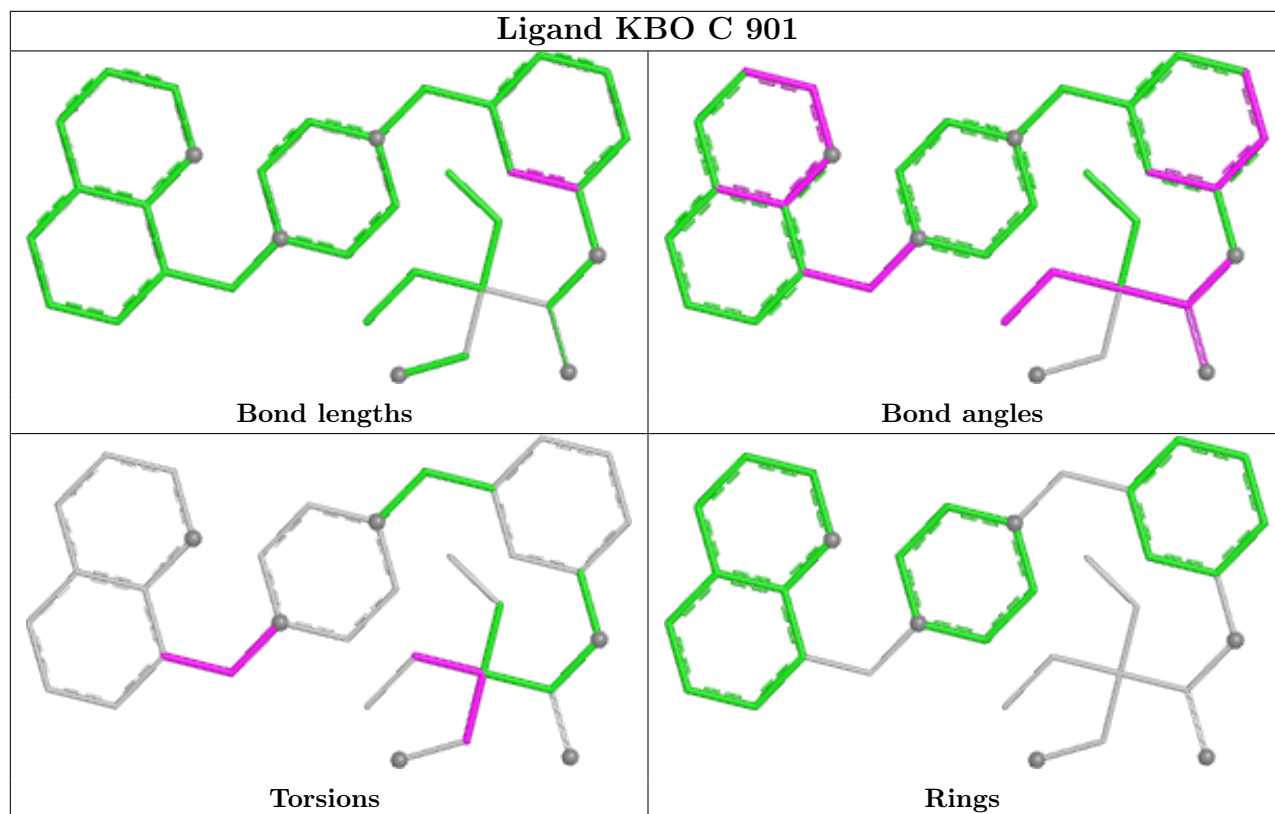
Mol	Chain	Res	Type	Atoms
3	D	901	KBO	O-C-C2-C5
4	C	907	EDO	O1-C1-C2-O2
3	C	901	KBO	C-C2-C5-C6
4	A	904	EDO	O1-C1-C2-O2
4	D	908	EDO	O1-C1-C2-O2
3	A	901	KBO	N2-C15-C16-C24
3	C	901	KBO	N2-C15-C16-C24
3	D	901	KBO	N2-C15-C16-C24
4	C	908	EDO	O1-C1-C2-O2
4	A	906	EDO	O1-C1-C2-O2
4	B	904	EDO	O1-C1-C2-O2

There are no ring outliers.

No monomer is involved in short contacts.

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 [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	843/850 (99%)	-0.18	12 (1%) 75 72	20, 41, 77, 107	57 (6%)
1	C	842/850 (99%)	-0.28	21 (2%) 57 52	20, 32, 75, 104	55 (6%)
2	B	839/850 (98%)	-0.29	14 (1%) 70 66	19, 31, 67, 92	46 (5%)
2	D	838/850 (98%)	-0.28	24 (2%) 51 46	18, 30, 68, 110	43 (5%)
All	All	3362/3400 (98%)	-0.26	71 (2%) 63 59	18, 33, 73, 110	201 (5%)

All (71) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	D	136	VAL	6.4
2	D	135	GLY	5.3
2	B	65	SER	5.0
1	C	50	ASN	5.0
2	D	134	LEU	4.9
1	A	49	VAL	4.7
2	D	119	GLY	4.6
1	C	135	GLY	4.6
1	C	111	HIS	4.6
1	C	134	LEU	4.5
2	B	118	HIS	4.5
2	D	121	TYR	4.5
1	A	47	LEU	4.0
2	B	79	TYR	3.9
2	D	79	TYR	3.9
2	D	123	ARG	3.7
2	B	603	PRO	3.7
2	D	600	SER	3.7
1	A	135	GLY	3.6
2	B	120	VAL	3.5
2	D	120	VAL	3.5

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Mol	Chain	Res	Type	RSRZ
1	C	121	TYR	3.5
1	C	99	ALA	3.5
1	C	603	PRO	3.4
1	C	112	PHE	3.4
1	C	118	HIS	3.3
1	A	50	ASN	3.3
1	C	49	VAL	3.2
1	C	600	SER	3.2
2	B	119	GLY	3.1
1	A	134	LEU	3.1
2	D	601	CYS	3.0
1	A	62	THR	3.0
2	B	111	HIS	3.0
1	C	48	ILE	2.8
2	D	229	LEU	2.8
2	B	137	PHE	2.8
2	B	600	SER	2.7
1	C	126	GLU	2.7
2	B	475	GLY	2.6
1	C	230	SER	2.6
2	D	127	LEU	2.6
2	D	111	HIS	2.6
1	C	172	VAL	2.6
1	A	111	HIS	2.5
1	C	137	PHE	2.4
2	D	602	PRO	2.4
2	D	126	GLU	2.4
1	A	63	ASP	2.4
2	D	133	ARG	2.4
1	A	46	GLY	2.4
1	A	634	GLY	2.4
2	D	116	PRO	2.4
2	D	128	LEU	2.3
2	B	121	TYR	2.3
1	C	62	THR	2.3
1	C	124	GLU	2.3
2	B	601	CYS	2.2
1	C	136	VAL	2.2
1	A	80	GLY	2.2
2	D	130	GLU	2.2
2	D	266	GLY	2.2
1	C	98	GLU	2.2

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Mol	Chain	Res	Type	RSRZ
2	D	230	SER	2.1
1	A	100	LEU	2.1
2	B	99	ALA	2.1
2	D	112	PHE	2.1
1	C	65	SER	2.1
2	D	267	SER	2.0
2	D	603	PRO	2.0
2	B	128	LEU	2.0

6.2 Non-standard residues in protein, DNA, RNA chains [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
1	CSO	A	844	7/8	0.91	0.08	35,38,47,52	0
1	CSO	C	844	7/8	0.95	0.07	34,40,52,53	0

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
4	EDO	D	914	4/4	0.78	0.20	54,54,57,63	0
5	PEG	C	909	7/7	0.78	0.12	63,64,66,66	0
4	EDO	D	906	4/4	0.82	0.13	56,57,58,60	0
4	EDO	D	913	4/4	0.83	0.24	49,56,57,58	0
4	EDO	B	911	4/4	0.87	0.11	47,49,49,56	0
4	EDO	D	905	4/4	0.87	0.13	36,43,43,45	0
4	EDO	B	907	4/4	0.88	0.13	51,52,52,57	0
4	EDO	A	903	4/4	0.88	0.13	54,56,57,59	0

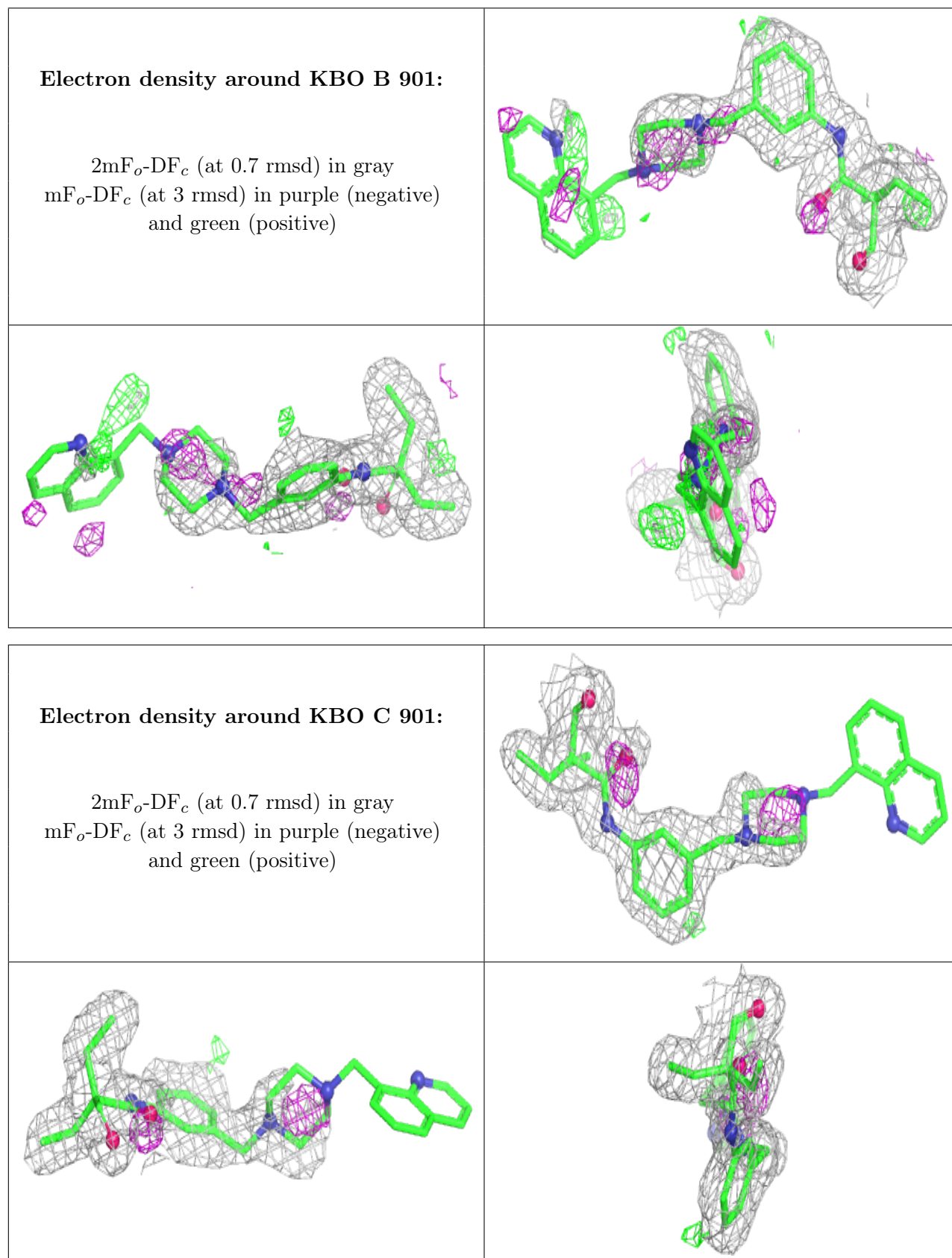
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
4	EDO	C	908	4/4	0.88	0.11	56,56,57,59	0
4	EDO	A	907	4/4	0.88	0.22	55,55,55,57	0
5	PEG	D	912	7/7	0.88	0.11	69,71,72,73	0
4	EDO	B	902	4/4	0.89	0.11	60,61,61,62	0
3	KBO	B	901	34/34	0.89	0.16	24,49,63,64	10
4	EDO	D	910	4/4	0.90	0.16	45,47,47,50	0
4	EDO	A	905	4/4	0.90	0.10	39,41,42,43	0
4	EDO	D	902	4/4	0.90	0.11	41,41,43,45	0
4	EDO	B	909	4/4	0.90	0.11	54,57,57,58	0
4	EDO	B	905	4/4	0.90	0.12	55,55,57,58	0
4	EDO	A	902	4/4	0.91	0.12	38,39,40,44	0
4	EDO	A	908	4/4	0.91	0.12	44,44,47,49	0
3	KBO	C	901	34/34	0.91	0.15	25,57,76,76	10
4	EDO	B	912	4/4	0.91	0.23	43,46,52,56	0
4	EDO	B	903	4/4	0.91	0.14	40,40,41,44	0
5	PEG	B	913	7/7	0.91	0.16	56,63,64,66	0
4	EDO	C	911	4/4	0.91	0.08	68,69,70,70	0
3	KBO	D	901	34/34	0.91	0.15	25,52,65,66	10
4	EDO	C	907	4/4	0.92	0.12	34,36,37,39	0
4	EDO	A	906	4/4	0.92	0.11	54,55,55,55	0
4	EDO	C	903	4/4	0.92	0.12	40,41,41,42	0
4	EDO	C	905	4/4	0.92	0.17	38,39,42,44	0
4	EDO	B	910	4/4	0.93	0.14	37,38,39,43	0
4	EDO	D	911	4/4	0.94	0.15	31,39,43,48	0
4	EDO	B	904	4/4	0.94	0.10	34,37,40,44	0
3	KBO	A	901	34/34	0.94	0.12	26,45,59,59	10
4	EDO	A	904	4/4	0.94	0.14	57,57,58,58	0
4	EDO	D	908	4/4	0.94	0.10	36,39,40,41	0
4	EDO	C	912	4/4	0.94	0.18	44,45,47,51	0
4	EDO	B	906	4/4	0.95	0.09	46,47,48,51	0
4	EDO	D	909	4/4	0.95	0.14	55,59,59,61	0
4	EDO	C	904	4/4	0.95	0.10	37,39,40,43	0
4	EDO	C	902	4/4	0.96	0.14	45,47,47,47	0
4	EDO	D	903	4/4	0.96	0.09	34,34,35,38	0
4	EDO	D	907	4/4	0.96	0.14	44,45,46,48	0
4	EDO	D	904	4/4	0.96	0.10	30,34,34,35	0
4	EDO	C	910	4/4	0.97	0.14	29,34,37,39	0
4	EDO	B	914	4/4	0.97	0.14	31,38,39,41	0
4	EDO	C	906	4/4	0.97	0.10	33,34,34,35	0
4	EDO	B	908	4/4	0.98	0.10	34,38,39,39	0

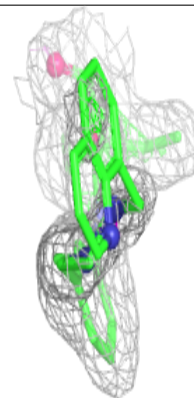
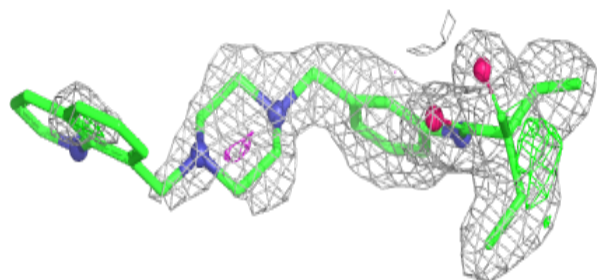
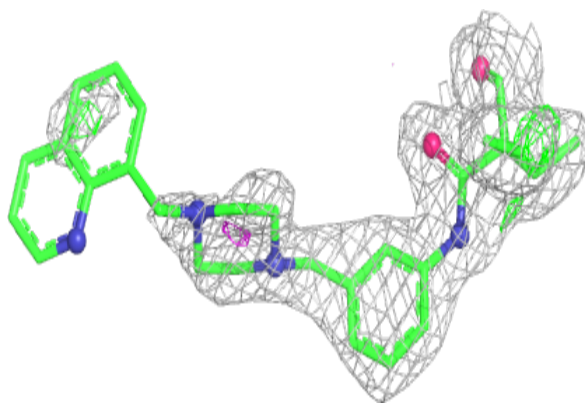
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers

as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

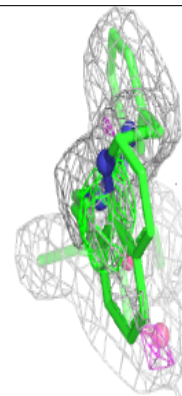
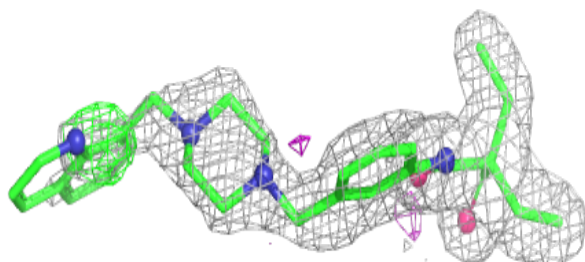
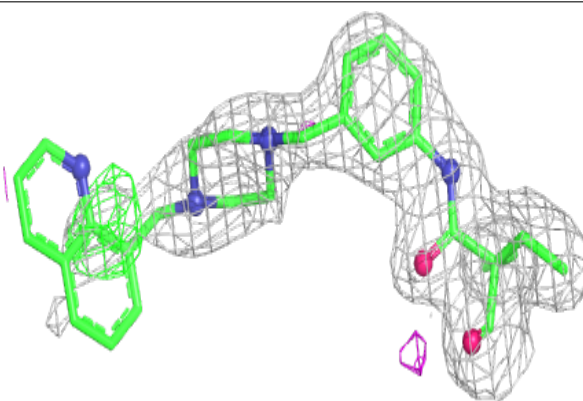


Electron density around KBO D 901:

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

**Electron density around KBO A 901:**

$2mF_o-DF_c$ (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.