



Full wwPDB X-ray Structure Validation Report ⓘ

May 22, 2020 – 02:19 pm BST

PDB ID : 6QSX
Title : Complement factor B protease domain in complex with the reversible inhibitor ((2S,4S)-1-((5,7-dimethyl-1H-indol-4-yl)methyl)-4-methoxypiperidin-2-yl)methanol.
Authors : Adams, C.M.; Sellner, H.; Ehara, T.; Mac Sweeney, A.; Crowley, M.; Anderson, K.; Karki, R.; Mainolfi, N.; Valeur, E.; Sirockin, F.; Gerhartz, B.; Erbel, P.; Hughes, N.; Smith, T.M.; Cumin, F.; Argikar, U.; Mogi, M.; Sedrani, R.; Wiesmann, C.; Jaffee, B.; Maibaum, J.; Flohr, S.; Harrison, R.; Eder, J.
Deposited on : 2019-02-22
Resolution : 1.77 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 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	:	2.11
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)	:	2.11

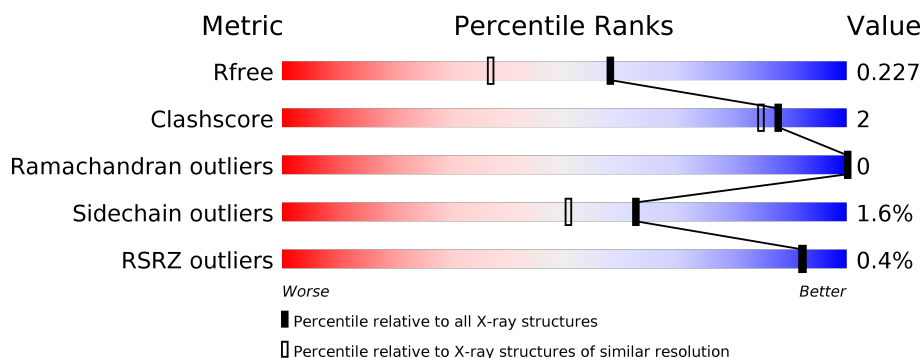
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.77 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	9185 (1.80-1.76)
Clashscore	141614	10184 (1.80-1.76)
Ramachandran outliers	138981	10051 (1.80-1.76)
Sidechain outliers	138945	10050 (1.80-1.76)
RSRZ outliers	127900	9032 (1.80-1.76)

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 on 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	AAA	291	
1	BBB	291	

2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 9393 atoms, of which 4453 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 Complement factor B.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	AAA	285	Total	C	H	N	O	S	106	1	0
			4447	1420	2214	383	418	12			
1	BBB	286	Total	C	H	N	O	S	107	2	0
			4482	1424	2239	388	419	12			

- Molecule 2 is SULFATE ION (three-letter code: SO4) (formula: O₄S).



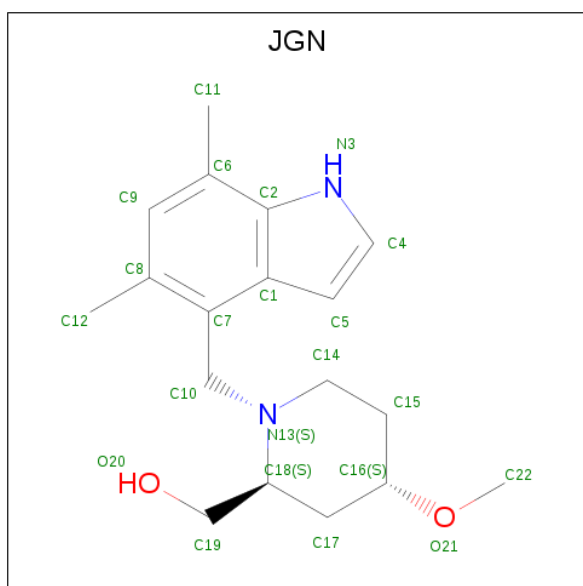
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	AAA	1	Total	O	S	0	0
			5	4	1		
2	AAA	1	Total	O	S	0	0
			5	4	1		
2	AAA	1	Total	O	S	0	0
			5	4	1		
2	BBB	1	Total	O	S	0	0
			5	4	1		

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	BBB	1	Total	O	S	0	0
			5	4	1		
2	BBB	1	Total	O	S	0	0
			5	4	1		
2	BBB	1	Total	O	S	0	0
			5	4	1		

- Molecule 3 is [(2 {S},4 {S})-1-[(5,7-dimethyl-1 {H}-indol-4-yl)methyl]-4-methoxy-piperidin-2-yl]methanol (three-letter code: JGN) (formula: C₁₈H₂₆N₂O₂).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	AAA	1	Total	C	N	O	0	0
			22	18	2	2		
3	BBB	1	Total	C	N	O	0	0
			22	18	2	2		

- Molecule 4 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	BBB	2	Total	Zn	0	0
			2	2		

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	AAA	185	Total 185	O 185	0	0
5	BBB	198	Total 198	O 198	0	0

3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA 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.

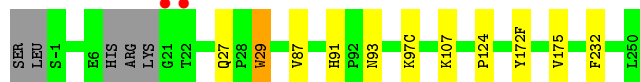
- Molecule 1: Complement factor B

Chain AAA:  90% 7% ..



- Molecule 1: Complement factor B

Chain BBB:  95% ..



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	55.59Å 98.06Å 61.72Å 90.00° 99.17° 90.00°	Depositor
Resolution (Å)	51.75 – 1.77 51.75 – 1.77	Depositor EDS
% Data completeness (in resolution range)	99.5 (51.75-1.77) 99.5 (51.75-1.77)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.92 (at 1.77Å)	Xtriage
Refinement program	REFMAC 5.8.0238 2018/15/10	Depositor
R, R_{free}	0.189 , 0.220 0.197 , 0.227	Depositor DCC
R_{free} test set	3163 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	21.4	Xtriage
Anisotropy	0.097	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.38 , 39.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	9393	wwPDB-VP
Average B, all atoms (Å ²)	26.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.79% 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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: ZN, SO4, JGN

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	AAA	0.72	0/2286	0.83	0/3095
1	BBB	0.72	0/2294	0.82	0/3104
All	All	0.72	0/4580	0.83	0/6199

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	AAA	2233	2214	2193	11	2
1	BBB	2243	2239	2216	7	0
2	AAA	15	0	0	0	0
2	BBB	20	0	0	0	0
3	AAA	22	0	0	0	0
3	BBB	22	0	0	0	0
4	BBB	2	0	0	0	2
5	AAA	185	0	0	0	0
5	BBB	198	0	0	0	0
All	All	4940	4453	4409	18	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 2.

All (18) 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:AAA:0:LEU:HB3	1:AAA:3:MET:CE	2.00	0.92
1:AAA:91:HIS:HD2	1:AAA:93:ASN:H	1.31	0.76
1:BBB:91:HIS:HD2	1:BBB:93:ASN:H	1.33	0.75
1:AAA:0:LEU:HB3	1:AAA:3:MET:HE3	1.75	0.68
1:AAA:0:LEU:HB3	1:AAA:3:MET:HE1	1.79	0.61
1:BBB:27:GLN:NE2	1:BBB:29:TRP:HE1	2.04	0.56
1:AAA:97(B):LYS:HB3	1:AAA:97(G):ILE:HB	1.89	0.54
1:BBB:91:HIS:CD2	1:BBB:93:ASN:H	2.21	0.52
1:BBB:87[A]:VAL:CG1	1:BBB:107:LYS:HB3	2.42	0.49
1:AAA:91:HIS:CD2	1:AAA:93:ASN:H	2.21	0.48
1:AAA:87:VAL:CG1	1:AAA:107:LYS:HB3	2.44	0.47
1:BBB:124:PRO:HB3	1:BBB:232:PHE:CZ	2.53	0.43
1:AAA:124:PRO:HB3	1:AAA:232:PHE:CZ	2.54	0.42
1:BBB:172(F):TYR:CE2	1:BBB:175:VAL:HG11	2.53	0.42
1:BBB:87[A]:VAL:HG12	1:BBB:107:LYS:HB3	2.01	0.42
1:AAA:181:LEU:HG	1:AAA:230:ASN:HB2	2.02	0.41
1:AAA:135:LYS:HD3	1:AAA:159:GLU:OE1	2.21	0.41
1:AAA:125(B):GLU:OE2	1:AAA:250:LEU:HD23	2.22	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)
1:AAA:62(D):HIS:HE2	4:BBB:306:ZN:ZN[1_556]	1.16	0.44
1:AAA:223:HIS:HD1	4:BBB:307:ZN:ZN[1_655]	1.24	0.36

5.3 Torsion angles

5.3.1 Protein backbone

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	AAA	282/291 (97%)	274 (97%)	8 (3%)	0	100	100
1	BBB	284/291 (98%)	278 (98%)	6 (2%)	0	100	100
All	All	566/582 (97%)	552 (98%)	14 (2%)	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	AAA	243/256 (95%)	237 (98%)	6 (2%)	47	31
1	BBB	245/256 (96%)	243 (99%)	2 (1%)	81	76
All	All	488/512 (95%)	480 (98%)	8 (2%)	62	51

All (8) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	AAA	81	ARG
1	AAA	97(B)	LYS
1	AAA	97(C)	LYS
1	AAA	125(B)	GLU
1	AAA	143	GLU
1	AAA	220(B)	ASN
1	BBB	29	TRP
1	BBB	97(C)	LYS

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

5.3.3 RNA ⓘ

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 carbohydrates in this entry.

5.6 Ligand geometry [i](#)

Of 11 ligands modelled in this entry, 2 are monoatomic - leaving 9 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	$\# Z > 2$
2	SO4	BBB	303	-	4,4,4	0.33	0	6,6,6	0.26	0
2	SO4	AAA	303	-	4,4,4	0.33	0	6,6,6	0.15	0
3	JGN	BBB	305	-	21,24,24	2.90	5 (23%)	25,34,34	2.64	11 (44%)
2	SO4	BBB	304	-	4,4,4	0.15	0	6,6,6	0.13	0
2	SO4	AAA	302	-	4,4,4	0.41	0	6,6,6	0.45	0
2	SO4	BBB	302	-	4,4,4	0.45	0	6,6,6	0.15	0
3	JGN	AAA	304	-	21,24,24	2.46	10 (47%)	25,34,34	2.08	8 (32%)
2	SO4	BBB	301	-	4,4,4	0.41	0	6,6,6	0.14	0
2	SO4	AAA	301	-	4,4,4	0.40	0	6,6,6	0.18	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	JGN	BBB	305	-	-	2/8/21/21	0/3/3/3
3	JGN	AAA	304	-	-	2/8/21/21	0/3/3/3

All (15) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	BBB	305	JGN	C10-C7	10.30	1.58	1.51
3	AAA	304	JGN	C10-C7	5.93	1.55	1.51
3	BBB	305	JGN	C10-N13	5.79	1.57	1.47
3	AAA	304	JGN	C10-N13	5.17	1.56	1.47
3	AAA	304	JGN	C18-N13	3.10	1.53	1.48
3	AAA	304	JGN	C9-C8	2.74	1.43	1.39
3	AAA	304	JGN	C14-N13	2.72	1.52	1.47
3	AAA	304	JGN	C11-C6	2.72	1.56	1.51
3	BBB	305	JGN	C7-C1	-2.50	1.39	1.43
3	AAA	304	JGN	C9-C6	2.40	1.41	1.37
3	BBB	305	JGN	C18-N13	2.26	1.51	1.48
3	AAA	304	JGN	C8-C7	2.23	1.43	1.40
3	BBB	305	JGN	C11-C6	2.07	1.54	1.51
3	AAA	304	JGN	C15-C14	2.04	1.58	1.52
3	AAA	304	JGN	C15-C16	2.00	1.56	1.51

All (19) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	BBB	305	JGN	C8-C7-C1	-7.83	114.91	119.76
3	BBB	305	JGN	C17-C18-N13	5.63	116.17	110.51
3	AAA	304	JGN	C17-C18-N13	4.43	114.97	110.51
3	AAA	304	JGN	C17-C18-C19	-3.89	104.78	111.58
3	AAA	304	JGN	C8-C7-C1	-3.62	117.52	119.76
3	BBB	305	JGN	C15-C14-N13	3.59	116.93	111.43
3	AAA	304	JGN	C10-C7-C8	3.48	125.01	119.75
3	BBB	305	JGN	C9-C8-C7	3.39	122.82	118.87
3	AAA	304	JGN	C8-C9-C6	-3.34	120.17	124.36
3	AAA	304	JGN	C10-C7-C1	-2.91	117.44	120.96
3	BBB	305	JGN	C17-C18-C19	-2.70	106.86	111.58
3	BBB	305	JGN	C17-C16-C15	-2.68	108.08	111.54
3	AAA	304	JGN	C14-C15-C16	2.55	113.12	110.32
3	BBB	305	JGN	C8-C9-C6	-2.47	121.27	124.36
3	BBB	305	JGN	C10-C7-C8	2.44	123.43	119.75
3	BBB	305	JGN	C11-C6-C2	2.38	122.34	120.03
3	BBB	305	JGN	C14-N13-C18	-2.20	105.38	109.67
3	AAA	304	JGN	C17-C16-C15	-2.08	108.85	111.54
3	BBB	305	JGN	C12-C8-C9	-2.03	115.74	119.49

There are no chirality outliers.

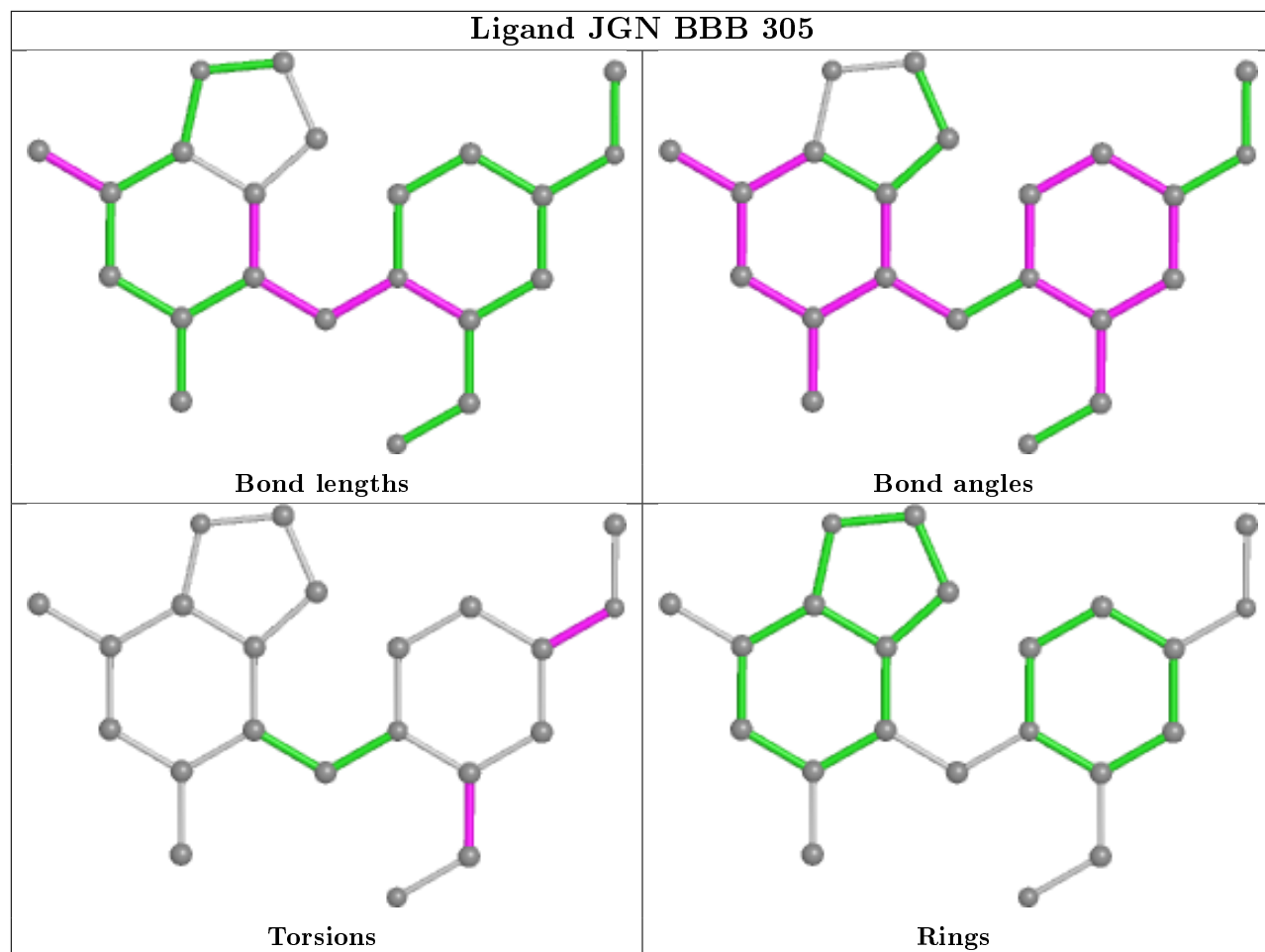
All (4) torsion outliers are listed below:

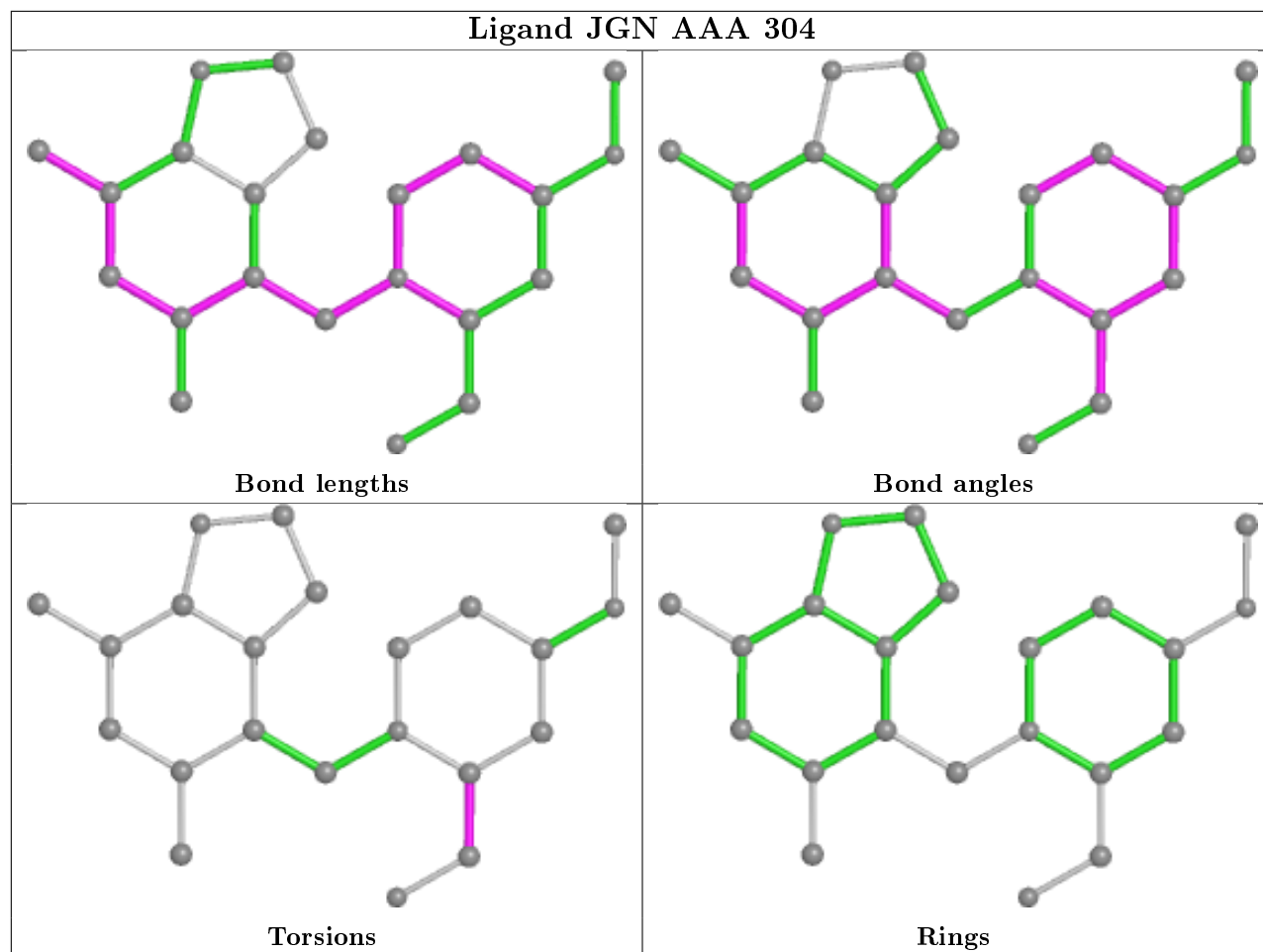
Mol	Chain	Res	Type	Atoms
3	BBB	305	JGN	C17-C18-C19-O20
3	AAA	304	JGN	N13-C18-C19-O20
3	AAA	304	JGN	C17-C18-C19-O20
3	BBB	305	JGN	C15-C16-O21-C22

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	AAA	285/291 (97%)	-0.16	0	100 100	14, 24, 38, 50	0
1	BBB	286/291 (98%)	-0.16	2 (0%)	87 88	14, 23, 44, 60	0
All	All	571/582 (98%)	-0.16	2 (0%)	92 92	14, 24, 43, 60	0

All (2) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	BBB	22	THR	2.4
1	BBB	21	GLY	2.1

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 carbohydrates in this entry.

6.4 Ligands [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled ‘Q< 0.9’ lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
2	SO4	BBB	304	5/5	0.91	0.21	37,52,56,61	0
3	JGN	BBB	305	22/22	0.95	0.08	16,19,25,36	0
3	JGN	AAA	304	22/22	0.96	0.07	13,17,26,28	0

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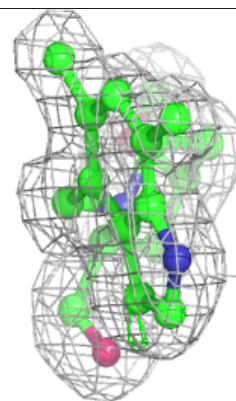
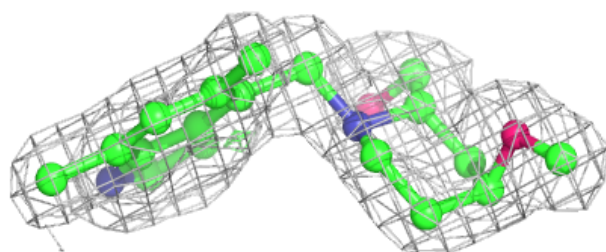
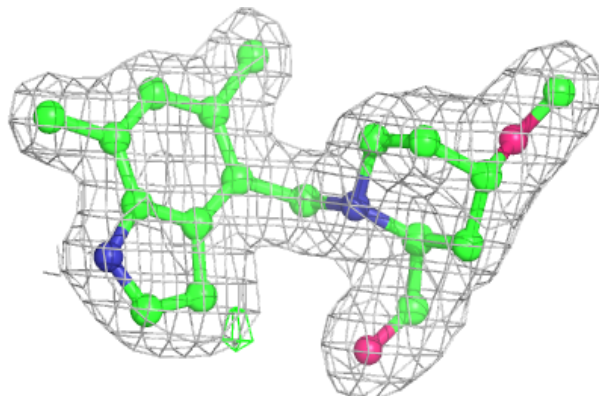
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
2	SO4	BBB	303	5/5	0.96	0.13	39,48,51,62	0
2	SO4	AAA	303	5/5	0.97	0.07	35,38,46,47	0
2	SO4	AAA	302	5/5	0.97	0.10	29,32,37,46	0
2	SO4	BBB	301	5/5	0.97	0.08	43,46,49,50	0
2	SO4	AAA	301	5/5	0.98	0.10	49,50,53,56	0
2	SO4	BBB	302	5/5	0.98	0.07	42,44,46,47	0
4	ZN	BBB	306	1/1	0.99	0.11	22,22,22,22	0
4	ZN	BBB	307	1/1	0.99	0.10	23,23,23,23	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.

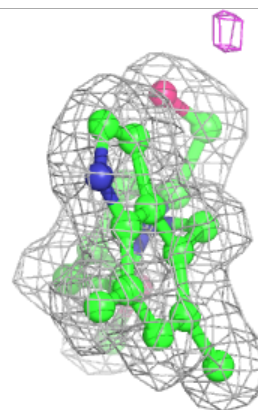
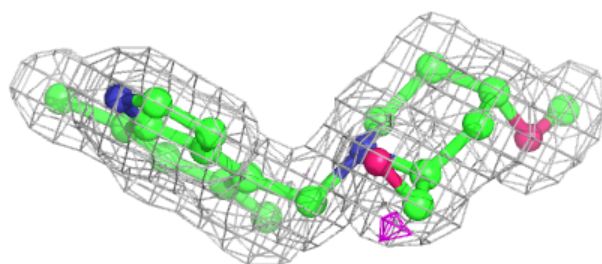
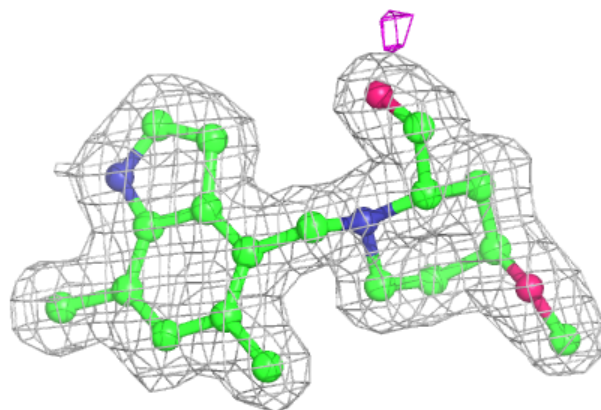
Electron density around JGN BBB 305:

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 JGN AAA 304:

$2mF_o-DF_c$ (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.