



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 4, 2024 – 01:35 PM EST

PDB ID : 1JIF
Title : Crystal structure of bleomycin-binding protein from bleomycin-producing *Streptomyces verticillus* complexed with copper(II)-bleomycin
Authors : Sugiyama, M.; Kumagai, T.; Hayashida, M.; Maruyama, M.; Matoba, Y.
Deposited on : 2001-07-02
Resolution : 1.60 Å(reported)

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

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

A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

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

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

MolProbity : 4.02b-467
Mogul : 1.8.5 (274361), CSD as541be (2020)
Xtrriage (Phenix) : **NOT EXECUTED**
EDS : **NOT EXECUTED**
buster-report : 1.1.7 (2018)
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.36

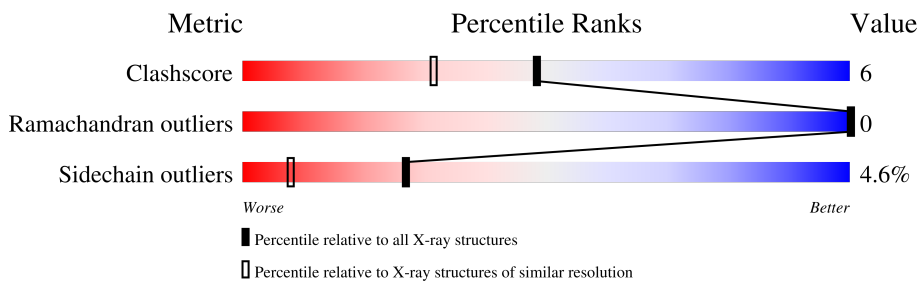
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.60 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))
Clashscore	141614	3665 (1.60-1.60)
Ramachandran outliers	138981	3564 (1.60-1.60)
Sidechain outliers	138945	3563 (1.60-1.60)

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 $\leq 5\%$.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	122	
1	B	122	

2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 2243 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 bleomycin-binding protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	122	958	600	170	185	3	0	6	0
1	B	122	952	595	169	185	3	0	5	0

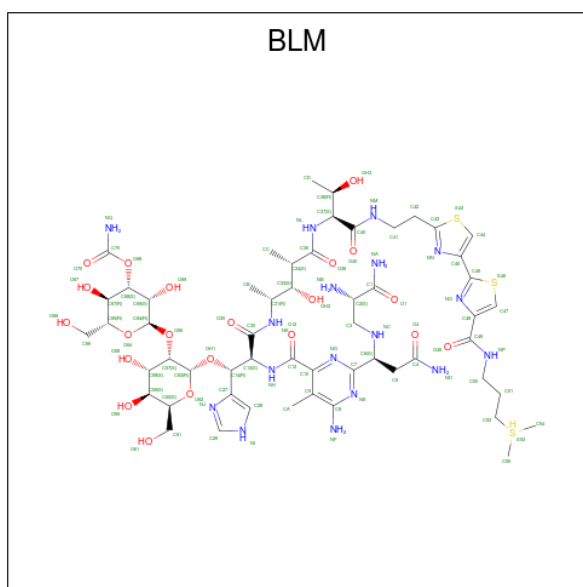
- Molecule 2 is COPPER (II) ION (three-letter code: CU) (formula: Cu).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total	Cu	0	0
			1	1		
2	B	1	Total	Cu	0	0
			1	1		

- Molecule 3 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	1	Total	Cl	0	0
			1	1		
3	B	1	Total	Cl	0	0
			1	1		

- Molecule 4 is BLEOMYCIN A2 (three-letter code: BLM) (formula: C₅₅H₈₅N₁₇O₂₁S₃).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	
			Total	C	N	O			S
4	B	1	99	57	17	22	3	0	1
4	B	1	113	66	19	23	5	0	1

- Molecule 5 is water.


Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	51	Total	O	0	0
			51	51		
5	B	66	Total	O	0	0
			66	66		

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. 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. 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.


Note EDS was not executed.

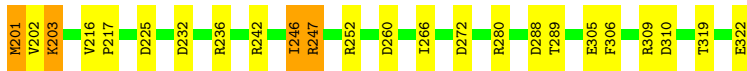
- Molecule 1: bleomycin-binding protein

Chain A:  84% 12%



- Molecule 1: bleomycin-binding protein

Chain B:  80% 16%



4 Data and refinement statistics

Xtrriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	35.73Å 83.47Å 43.06Å 90.00° 106.20° 90.00°	Depositor
Resolution (Å)	10.00 – 1.60	Depositor
% Data completeness (in resolution range)	83.3 (10.00-1.60)	Depositor
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	SHELXL-97	Depositor
R, R_{free}	0.150 , 0.207	Depositor
Estimated twinning fraction	No twinning to report.	Xtrriage
Total number of atoms	2243	wwPDB-VP
Average B, all atoms (Å ²)	22.0	wwPDB-VP

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: CL, BLM, CU

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	0.71	0/1011	1.55	10/1377 (0.7%)
1	B	0.72	0/1002	1.66	16/1366 (1.2%)
All	All	0.71	0/2013	1.61	26/2743 (0.9%)

There are no bond length outliers.

All (26) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	43	ARG	NE-CZ-NH1	12.33	126.47	120.30
1	B	247	ARG	NE-CZ-NH2	-11.02	114.79	120.30
1	B	260	ASP	CB-CG-OD1	10.18	127.46	118.30
1	A	47	ARG	NE-CZ-NH2	-8.32	116.14	120.30
1	B	309	ARG	NE-CZ-NH2	-8.02	116.29	120.30
1	B	225	ASP	CB-CG-OD2	8.01	125.51	118.30
1	B	310	ASP	CB-CG-OD2	-7.83	111.25	118.30
1	B	247	ARG	CD-NE-CZ	-6.95	113.88	123.60
1	A	33	PHE	CB-CG-CD1	6.68	125.48	120.80
1	B	306	PHE	CB-CG-CD2	-6.06	116.56	120.80
1	A	35	ASP	CB-CG-OD1	5.82	123.53	118.30
1	A	41	VAL	O-C-N	5.78	131.94	122.70
1	B	247	ARG	NH1-CZ-NH2	5.64	125.60	119.40
1	B	306	PHE	CD1-CG-CD2	5.46	125.40	118.30
1	B	272	ASP	CB-CG-OD1	-5.43	113.41	118.30
1	A	33	PHE	C-N-CA	-5.41	110.94	122.30
1	A	29	PHE	CB-CG-CD1	5.30	124.51	120.80
1	B	309	ARG	NE-CZ-NH1	5.24	122.92	120.30
1	B	252	ARG	NE-CZ-NH1	-5.22	117.69	120.30
1	B	203	LYS	CB-CG-CD	5.20	125.11	111.60
1	B	260	ASP	CB-CG-OD2	-5.16	113.65	118.30
1	B	288	ASP	CB-CG-OD2	-5.16	113.66	118.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	247	ARG	CA-CB-CG	-5.15	102.06	113.40
1	A	43	ARG	NE-CZ-NH2	-5.13	117.73	120.30
1	A	77	GLU	O-C-N	-5.08	114.58	122.70
1	A	122	GLU	CA-CB-CG	5.04	124.48	113.40

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	958	0	911	8	0
1	B	952	0	899	9	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
3	A	1	0	0	1	0
3	B	1	0	0	0	0
4	B	212	0	54	7	0
5	A	51	0	0	0	0
5	B	66	0	0	6	0
All	All	2243	0	1864	23	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 6.

All (23) 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)
4:B:402[A]:BLM:H542	5:B:716:HOH:O	1.50	1.08
4:B:402[B]:BLM:H551	5:B:717:HOH:O	1.60	1.01
4:B:402[B]:BLM:C55	5:B:717:HOH:O	2.21	0.83
4:B:402[A]:BLM:S46	5:B:717:HOH:O	2.36	0.82
4:B:402[B]:BLM:S53	5:B:717:HOH:O	2.41	0.77
1:B:305:GLU:HB3	1:B:319[B]:THR:HG22	1.72	0.71
1:B:236[B]:ARG:HG2	1:B:236[B]:ARG:HH11	1.61	0.65

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:105:GLU:HB3	1:A:119[A]:THR:HG23	1.80	0.64
1:B:246:ILE:HD13	1:B:266[A]:ILE:HD12	1.81	0.63
1:B:201:MET:HG2	1:B:202:VAL:N	2.18	0.58
4:B:402[B]:BLM:S46	5:B:716:HOH:O	2.57	0.57
1:B:236[B]:ARG:HG2	1:B:236[B]:ARG:NH1	2.26	0.51
1:B:305:GLU:CB	1:B:319[B]:THR:HG22	2.40	0.50
3:A:502:CL:CL	4:B:402[D]:BLM:HDA	2.50	0.49
1:A:79:ALA:HA	1:A:94:MET:HE1	1.97	0.46
1:A:32:ASP:OD2	1:A:42[B]:ARG:NH2	2.50	0.45
1:A:42[B]:ARG:HG2	1:A:43:ARG:N	2.32	0.45
1:B:216:VAL:HB	1:B:217:PRO:HD3	2.00	0.44
1:B:232:ASP:OD1	1:B:242[A]:ARG:NH2	2.50	0.44
1:A:67:GLU:OE2	1:B:247:ARG:NH2	2.50	0.44
1:A:119[A]:THR:HG22	1:A:120:ALA:N	2.34	0.41
1:A:38:PHE:CE1	1:A:51:SER:HB2	2.56	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	126/122 (103%)	123 (98%)	3 (2%)	0	100	100
1	B	125/122 (102%)	124 (99%)	1 (1%)	0	100	100
All	All	251/244 (103%)	247 (98%)	4 (2%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains [i](#)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar

resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	103/97 (106%)	99 (96%)	4 (4%)	32	10
1	B	102/97 (105%)	95 (93%)	7 (7%)	15	3
All	All	205/194 (106%)	194 (95%)	11 (5%)	27	5

All (11) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	42[A]	ARG
1	A	42[B]	ARG
1	A	105	GLU
1	A	122	GLU
1	B	201	MET
1	B	203	LYS
1	B	246	ILE
1	B	280	ARG
1	B	289[A]	THR
1	B	289[B]	THR
1	B	322	GLU

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](#)

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

Of 10 ligands modelled in this entry, 4 are monoatomic - leaving 6 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	BLM	B	401[B]	-	88,101,101	1.67	13 (14%)	108,143,143	2.66	27 (25%)
4	BLM	B	401[A]	-	88,101,101	1.67	13 (14%)	108,143,143	2.67	28 (25%)

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
4	BLM	B	401[B]	-	-	15/86/142/142	0/6/6/6
4	BLM	B	401[A]	-	-	11/86/142/142	0/6/6/6

All (26) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	B	401[A]	BLM	C8-NE	8.37	1.47	1.35
4	B	401[B]	BLM	C8-NE	8.37	1.47	1.35
4	B	401[A]	BLM	C10-NG	6.07	1.47	1.34
4	B	401[B]	BLM	C10-NG	6.07	1.47	1.34
4	B	401[A]	BLM	C9-C8	4.48	1.54	1.43
4	B	401[B]	BLM	C9-C8	4.48	1.54	1.43
4	B	401[A]	BLM	C27-C14	4.09	1.54	1.51
4	B	401[B]	BLM	C27-C14	4.09	1.54	1.51
4	B	401[A]	BLM	C7-NG	3.29	1.39	1.34
4	B	401[B]	BLM	C7-NG	3.29	1.39	1.34
4	B	401[A]	BLM	C10-C12	-2.90	1.46	1.50
4	B	401[B]	BLM	C10-C12	-2.90	1.46	1.50
4	B	401[A]	BLM	C7-NE	-2.66	1.29	1.34
4	B	401[B]	BLM	C7-NE	-2.66	1.29	1.34
4	B	401[A]	BLM	C1-NA	2.54	1.39	1.32

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	B	401[B]	BLM	C1-NA	2.54	1.39	1.32
4	B	401[A]	BLM	C6-NC	-2.25	1.43	1.47
4	B	401[B]	BLM	C6-NC	-2.25	1.43	1.47
4	B	401[A]	BLM	O1-C1	-2.18	1.19	1.23
4	B	401[B]	BLM	O1-C1	-2.18	1.19	1.23
4	B	401[A]	BLM	C4-ND	-2.16	1.25	1.32
4	B	401[B]	BLM	C4-ND	-2.16	1.25	1.32
4	B	401[A]	BLM	C12-NH	2.16	1.38	1.34
4	B	401[B]	BLM	C12-NH	2.16	1.38	1.34
4	B	401[A]	BLM	C5-C6	2.12	1.59	1.53
4	B	401[B]	BLM	C5-C6	2.12	1.59	1.53

All (55) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	B	401[A]	BLM	C45-C44-S43	-16.48	107.93	112.53
4	B	401[B]	BLM	C45-C44-S43	-16.48	107.93	112.53
4	B	401[A]	BLM	C12-C10-NG	-12.23	104.57	115.99
4	B	401[B]	BLM	C12-C10-NG	-12.23	104.57	115.99
4	B	401[A]	BLM	C2-C1-NA	6.19	127.30	116.68
4	B	401[B]	BLM	C2-C1-NA	6.19	127.30	116.68
4	B	401[A]	BLM	O1-C1-NA	-5.63	113.22	123.00
4	B	401[B]	BLM	O1-C1-NA	-5.63	113.22	123.00
4	B	401[A]	BLM	C5-C4-ND	4.39	126.79	116.21
4	B	401[B]	BLM	C5-C4-ND	4.39	126.79	116.21
4	B	401[A]	BLM	C9-C10-C12	4.06	131.03	123.14
4	B	401[B]	BLM	C9-C10-C12	4.06	131.03	123.14
4	B	401[A]	BLM	C5-C6-C7	-4.01	104.03	110.64
4	B	401[B]	BLM	C5-C6-C7	-4.01	104.03	110.64
4	B	401[A]	BLM	CA-C9-C8	-3.92	115.56	121.27
4	B	401[B]	BLM	CA-C9-C8	-3.92	115.56	121.27
4	B	401[A]	BLM	O4-C4-C5	-3.43	113.65	120.87
4	B	401[B]	BLM	O4-C4-C5	-3.43	113.65	120.87
4	B	401[A]	BLM	C55-S53-C52	3.08	107.09	101.63
4	B	401[B]	BLM	C55-S53-C52	3.08	107.09	101.63
4	B	401[A]	BLM	C33-C31-NK	-2.94	103.87	109.56
4	B	401[B]	BLM	C33-C31-NK	-2.94	103.87	109.56
4	B	401[A]	BLM	C54-S53-C52	2.82	106.63	101.63
4	B	401[B]	BLM	C54-S53-C52	2.82	106.63	101.63
4	B	401[A]	BLM	O36-C36-C34	2.77	126.01	121.02
4	B	401[B]	BLM	O36-C36-C34	2.77	126.01	121.02
4	B	401[A]	BLM	C38-C37-NL	-2.75	104.69	111.72

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	B	401[A]	BLM	C47-S46-C46	-2.70	87.87	91.12
4	B	401[B]	BLM	C47-S46-C46	-2.70	87.87	91.12
4	B	401[A]	BLM	C42-C41-NM	-2.69	103.86	111.99
4	B	401[B]	BLM	C42-C41-NM	-2.69	103.86	111.99
4	B	401[A]	BLM	O30-C30-NK	-2.65	118.02	122.93
4	B	401[B]	BLM	O30-C30-NK	-2.65	118.02	122.93
4	B	401[A]	BLM	O61-C61-C60	-2.61	102.34	111.29
4	B	401[B]	BLM	O61-C61-C60	-2.61	102.34	111.29
4	B	401[A]	BLM	OH3-C38-C37	-2.48	104.15	109.13
4	B	401[A]	BLM	C54-S53-C55	2.48	104.74	101.49
4	B	401[B]	BLM	C54-S53-C55	2.48	104.74	101.49
4	B	401[B]	BLM	OH3-C38-C37	-2.45	104.22	109.13
4	B	401[A]	BLM	O40-C40-NM	-2.33	117.99	122.99
4	B	401[B]	BLM	O40-C40-NM	-2.33	117.99	122.99
4	B	401[A]	BLM	NF-C8-NE	2.32	120.32	117.03
4	B	401[B]	BLM	NF-C8-NE	2.32	120.32	117.03
4	B	401[A]	BLM	C13-NH-C12	-2.23	117.50	121.52
4	B	401[B]	BLM	C13-NH-C12	-2.23	117.50	121.52
4	B	401[A]	BLM	OH2-C33-C31	-2.18	103.31	109.08
4	B	401[B]	BLM	OH2-C33-C31	-2.18	103.31	109.08
4	B	401[A]	BLM	O59-C59-C60	-2.10	104.08	109.30
4	B	401[B]	BLM	O59-C59-C60	-2.10	104.08	109.30
4	B	401[A]	BLM	CA-C9-C10	2.07	127.21	122.87
4	B	401[B]	BLM	CA-C9-C10	2.07	127.21	122.87
4	B	401[A]	BLM	C68-O68-C70	-2.04	114.21	117.12
4	B	401[B]	BLM	C68-O68-C70	-2.04	114.21	117.12
4	B	401[A]	BLM	O36-C36-NL	-2.03	119.17	122.93
4	B	401[B]	BLM	O36-C36-NL	-2.03	119.17	122.93

There are no chirality outliers.

All (26) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	B	401[A]	BLM	C5-C6-C7-NG
4	B	401[A]	BLM	C5-C6-C7-NE
4	B	401[B]	BLM	C5-C6-C7-NG
4	B	401[B]	BLM	C5-C6-C7-NE
4	B	401[A]	BLM	O1-C1-C2-C3
4	B	401[B]	BLM	O1-C1-C2-C3
4	B	401[A]	BLM	C51-C52-S53-C55
4	B	401[B]	BLM	C51-C52-S53-C55
4	B	401[B]	BLM	NL-C37-C38-CD

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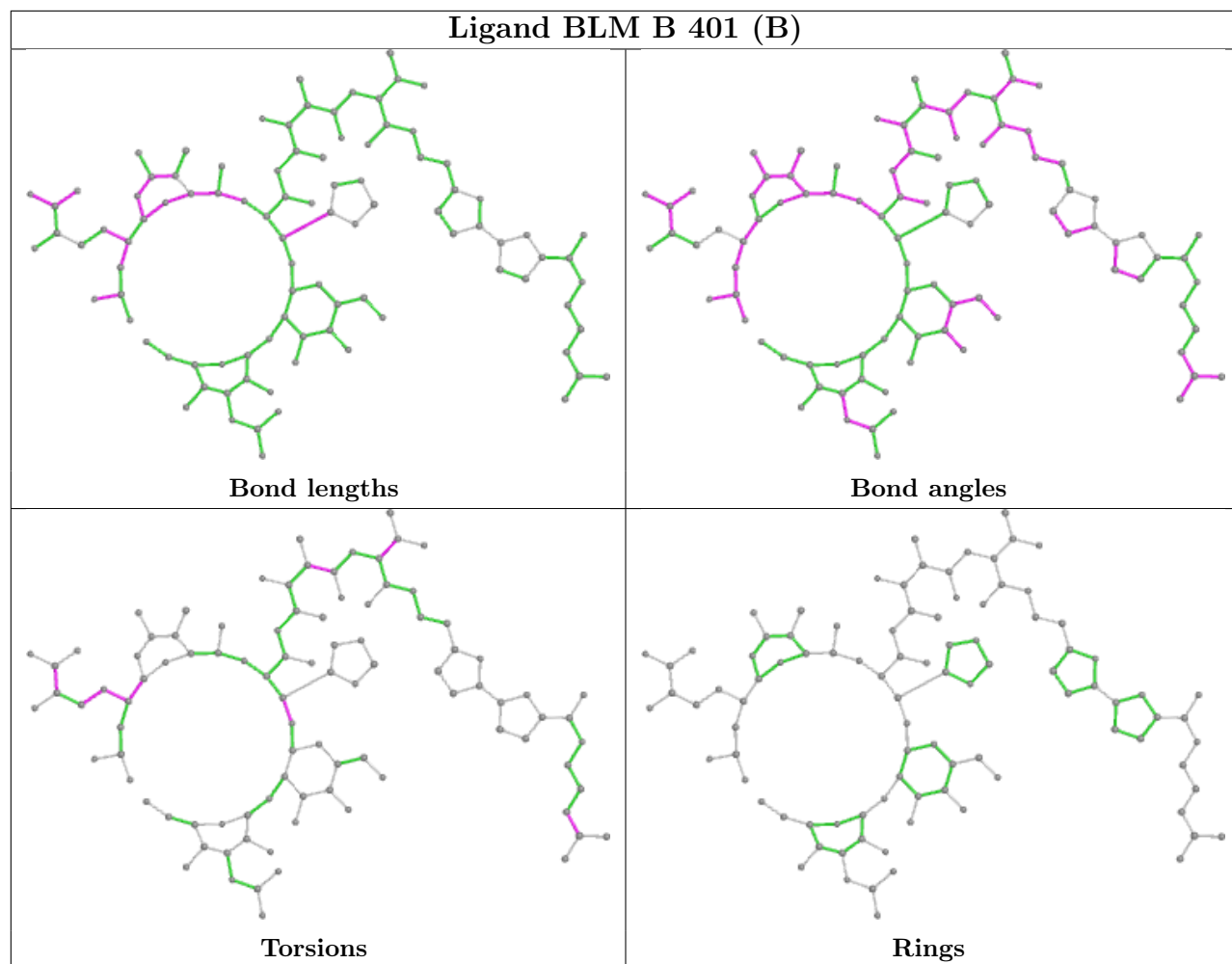
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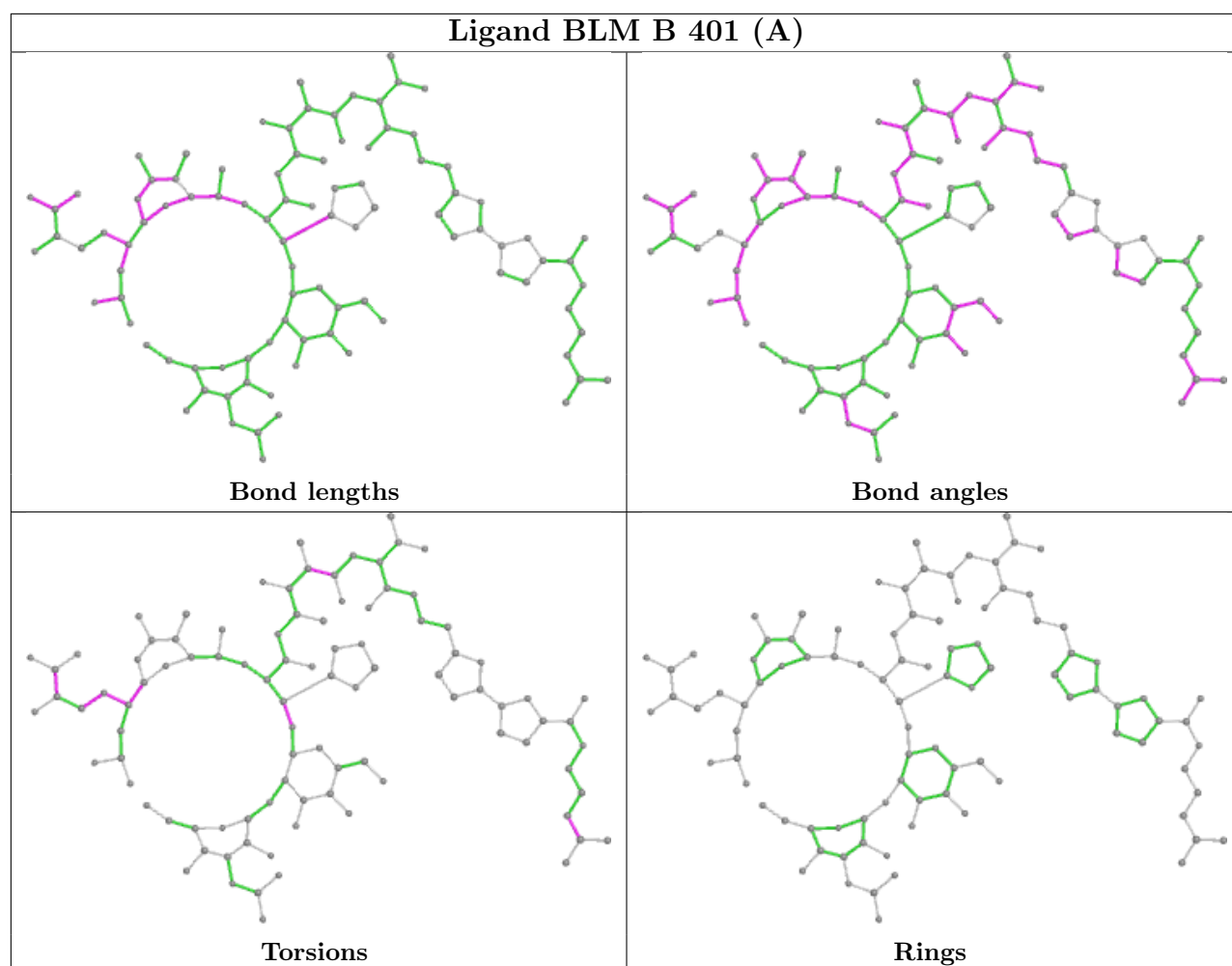
Mol	Chain	Res	Type	Atoms
4	B	401[A]	BLM	C5-C6-NC-C3
4	B	401[B]	BLM	C5-C6-NC-C3
4	B	401[A]	BLM	NA-C1-C2-C3
4	B	401[B]	BLM	NA-C1-C2-C3
4	B	401[A]	BLM	C27-C14-OH1-C63
4	B	401[B]	BLM	C27-C14-OH1-C63
4	B	401[A]	BLM	CC-C34-C36-O36
4	B	401[B]	BLM	CC-C34-C36-O36
4	B	401[A]	BLM	O1-C1-C2-NB
4	B	401[B]	BLM	O1-C1-C2-NB
4	B	401[B]	BLM	C40-C37-C38-CD
4	B	401[B]	BLM	NL-C37-C38-OH3
4	B	401[B]	BLM	C40-C37-C38-OH3
4	B	401[A]	BLM	CC-C34-C36-NL
4	B	401[B]	BLM	CC-C34-C36-NL
4	B	401[A]	BLM	C2-C3-NC-C6
4	B	401[B]	BLM	C2-C3-NC-C6

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](#)

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates [i](#)

EDS was not executed - this section is therefore empty.

6.4 Ligands [i](#)

EDS was not executed - this section is therefore empty.

6.5 Other polymers [i](#)

EDS was not executed - this section is therefore empty.