



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 07:44 PM UTC

PDB ID : 3GFZ / pdb_00003gfz
Title : Klebsiella pneumoniae BlrP1 pH 6 manganese/cy-diGMP complex
Authors : Barends, T.; Hartmann, E.; Griesse, J.; Beitlich, T.; Kirienko, N.; Ryjenkov, D.; Reinstein, J.; Shoeman, R.; Gomelsky, M.; Schlichting, I.
Deposited on : 2009-02-27
Resolution : 2.05 Å(reported)

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

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

A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

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

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

MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

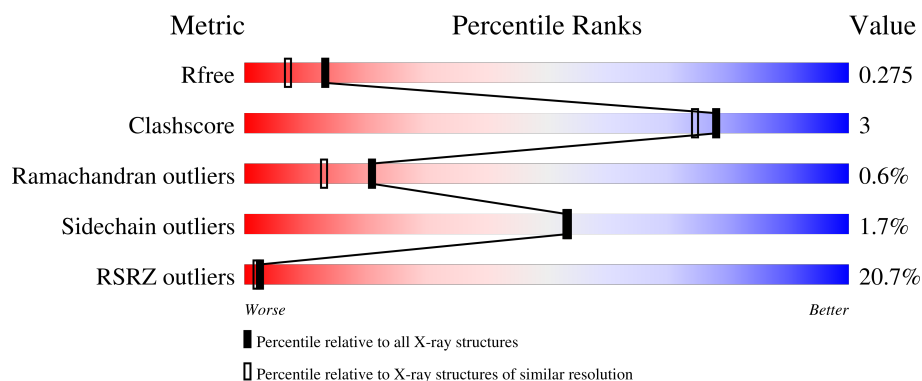
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.05 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	2260 (2.04-2.04)
Clashscore	190562	2333 (2.04-2.04)
Ramachandran outliers	187476	2318 (2.04-2.04)
Sidechain outliers	187428	2318 (2.04-2.04)
RSRZ outliers	180081	2260 (2.04-2.04)

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	413	 20% 88% 6% • 5%
1	B	413	 20% 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
2	C2E	A	501	X	-	-	-
2	C2E	B	501	X	-	-	-

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 6678 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.

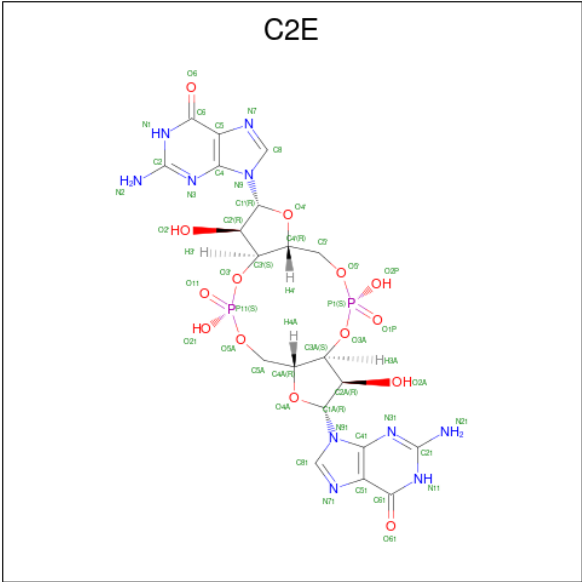
- Molecule 1 is a protein called *Klebsiella pneumoniae* BlrP1.

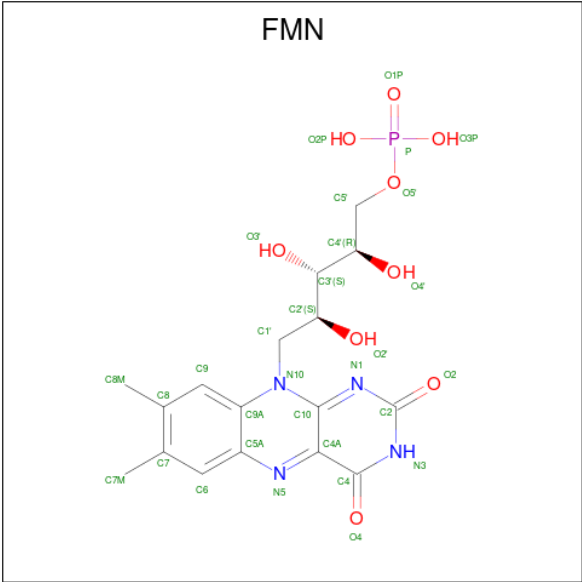
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	393	Total	C	N	O	S	0	0	0
			3080	1973	533	556	18			
1	B	394	Total	C	N	O	S	0	0	0
			3094	1983	534	559	18			

There are 16 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-7	ILE	-	expression tag	UNP A6T8V8
A	-6	SER	-	expression tag	UNP A6T8V8
A	-5	GLU	-	expression tag	UNP A6T8V8
A	-4	PHE	-	expression tag	UNP A6T8V8
A	-3	GLY	-	expression tag	UNP A6T8V8
A	-2	SER	-	expression tag	UNP A6T8V8
A	-1	SER	-	expression tag	UNP A6T8V8
A	0	ARG	-	expression tag	UNP A6T8V8
B	-7	ILE	-	expression tag	UNP A6T8V8
B	-6	SER	-	expression tag	UNP A6T8V8
B	-5	GLU	-	expression tag	UNP A6T8V8
B	-4	PHE	-	expression tag	UNP A6T8V8
B	-3	GLY	-	expression tag	UNP A6T8V8
B	-2	SER	-	expression tag	UNP A6T8V8
B	-1	SER	-	expression tag	UNP A6T8V8
B	0	ARG	-	expression tag	UNP A6T8V8

- Molecule 2 is 9,9'-[(2R,3R,3aS,5S,7aR,9R,10R,10aS,12S,14aR)-3,5,10,12-tetrahydroxy-5,12-dioxidoctahydro-2H,7H-difuro[3,2-d:3',2'-j][1,3,7,9,2,8]tetraoxadiphosphacyclododecine-2,9-diyl]bis(2-amino-1,9-dihydro-6H-purin-6-one) (CCD ID: C2E) (formula: C₂₀H₂₄N₁₀O₁₄P₂).

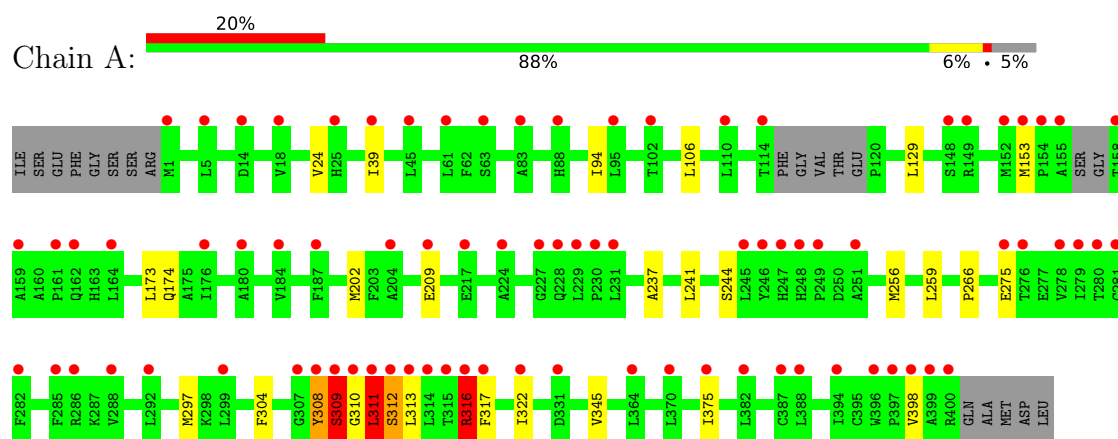




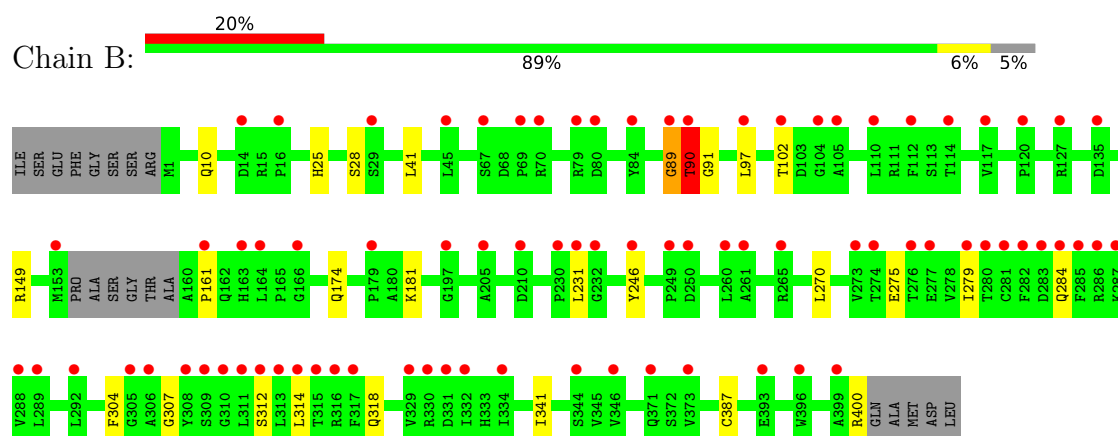
3 Residue-property plots [i](#)

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: *Klebsiella pneumoniae* BlrP1



• Molecule 1: *Klebsiella pneumoniae* BlrP1



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	68.45Å 97.09Å 127.17Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	48.54 – 2.05 48.54 – 2.05	Depositor EDS
% Data completeness (in resolution range)	97.1 (48.54-2.05) 97.1 (48.54-2.05)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.77 (at 2.05Å)	Xtriage
Refinement program	REFMAC 5.2.0005	Depositor
R, R_{free}	0.229 , 0.272 0.232 , 0.275	Depositor DCC
R_{free} test set	2618 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	28.4	Xtriage
Anisotropy	0.522	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 34.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.30$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.91	EDS
Total number of atoms	6678	wwPDB-VP
Average B, all atoms (Å ²)	41.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.75% 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: FMN, MN, C2E

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	0.56	1/3148 (0.0%)	0.80	1/4266 (0.0%)
1	B	0.53	0/3163	0.77	1/4287 (0.0%)
All	All	0.55	1/6311 (0.0%)	0.78	2/8553 (0.0%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	3
1	B	0	2
All	All	0	5

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	237	ALA	CA-CB	-6.11	1.45	1.53

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	316	ARG	CB-CA-C	-5.54	100.08	109.38
1	B	90	THR	N-CA-C	5.50	122.52	110.80

There are no chirality outliers.

All (5) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	308	TYR	Peptide
1	A	309	SER	Peptide
1	A	316	ARG	Peptide
1	B	89	GLY	Peptide
1	B	90	THR	Peptide

5.2 Too-close contacts

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	3080	0	3100	19	0
1	B	3094	0	3110	20	0
2	A	46	0	17	1	0
2	B	46	0	18	1	0
3	A	2	0	0	0	0
3	B	2	0	0	0	0
4	A	31	0	19	0	0
4	B	31	0	19	0	0
5	A	208	0	0	0	0
5	B	138	0	0	0	0
All	All	6678	0	6283	35	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 3.

All (35) 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:B:90:THR:HG23	1:B:91:GLY:C	1.95	0.91
1:B:90:THR:HG23	1:B:91:GLY:O	1.83	0.77
1:A:310:GLY:O	1:A:313:LEU:N	2.27	0.64
1:B:314:LEU:O	1:B:318:GLN:NE2	2.36	0.59
1:A:153:MET:HE3	1:A:398:VAL:HG21	1.84	0.58
1:A:256:MET:HE1	1:A:266:PRO:HB3	1.86	0.57
1:B:89:GLY:O	1:B:90:THR:CB	2.54	0.56
1:A:311:LEU:HD23	1:B:341:ILE:HG23	1.87	0.56
1:B:149:ARG:O	1:B:400:ARG:N	2.39	0.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:24:VAL:HG21	1:A:94:ILE:HB	1.91	0.52
1:B:28:SER:HB3	1:B:91:GLY:HA2	1.92	0.52
1:B:41:LEU:HB3	1:B:97:LEU:HD21	1.92	0.51
1:A:317:PHE:N	1:A:317:PHE:CD1	2.80	0.50
1:B:89:GLY:O	1:B:90:THR:OG1	2.29	0.50
1:B:246:TYR:CD2	1:B:284:GLN:HB2	2.48	0.49
1:B:275:GLU:O	1:B:279:ILE:HG22	2.13	0.49
1:B:161:PRO:HG3	1:B:387:CYS:SG	2.54	0.47
1:A:39:ILE:HD11	1:A:129:LEU:HD21	1.97	0.46
1:A:275:GLU:CD	1:A:309:SER:HA	2.40	0.46
1:A:256:MET:HE3	1:A:297:MET:HE2	1.98	0.45
1:B:28:SER:CB	1:B:91:GLY:HA2	2.47	0.44
1:B:90:THR:CG2	1:B:91:GLY:C	2.78	0.44
1:A:304:PHE:CE1	1:A:310:GLY:HA3	2.52	0.44
1:A:174:GLN:OE1	2:A:501:C2E:H8	2.17	0.43
1:A:256:MET:HE2	1:A:259:LEU:HD21	1.99	0.43
1:A:312:SER:HB3	1:B:307:GLY:O	2.18	0.43
1:A:241:LEU:O	1:A:244:SER:OG	2.34	0.42
1:B:246:TYR:CE2	1:B:284:GLN:HB2	2.54	0.42
1:A:308:TYR:HA	1:B:312:SER:OG	2.18	0.42
1:A:311:LEU:HD13	1:B:304:PHE:CE2	2.55	0.42
1:B:174:GLN:OE1	2:B:501:C2E:H8	2.19	0.42
1:A:322:ILE:HD11	1:A:345:VAL:CG1	2.50	0.41
1:A:256:MET:HE1	1:A:266:PRO:CB	2.50	0.41
1:B:90:THR:HA	1:B:91:GLY:O	2.21	0.40
1:A:202:MET:HE3	1:A:202:MET:O	2.22	0.40

There are no symmetry-related clashes.

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	A	387/413 (94%)	378 (98%)	7 (2%)	2 (0%)	24	16
1	B	390/413 (94%)	381 (98%)	6 (2%)	3 (1%)	16	9
All	All	777/826 (94%)	759 (98%)	13 (2%)	5 (1%)	21	13

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	90	THR
1	A	311	LEU
1	A	309	SER
1	B	102	THR
1	B	231	LEU

5.3.2 Protein sidechains ⓘ

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	330/346 (95%)	323 (98%)	7 (2%)	47	46
1	B	332/346 (96%)	328 (99%)	4 (1%)	63	65
All	All	662/692 (96%)	651 (98%)	11 (2%)	53	53

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

Mol	Chain	Res	Type
1	A	106	LEU
1	A	173	LEU
1	A	209	GLU
1	A	311	LEU
1	A	312	SER
1	A	316	ARG
1	A	375	ILE
1	B	10	GLN
1	B	25	HIS
1	B	181	LYS
1	B	270	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	12	HIS
1	A	66	GLN
1	B	66	GLN
1	B	167	GLN
1	B	268	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 oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 8 ligands modelled in this entry, 4 are monoatomic - leaving 4 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	FMN	B	504	-	33,33,33	1.00	2 (6%)	48,50,50	1.33	7 (14%)
4	FMN	A	504	-	33,33,33	1.00	2 (6%)	48,50,50	1.48	10 (20%)
2	C2E	B	501	3	52,52,52	1.94	11 (21%)	78,82,82	2.48	38 (48%)
2	C2E	A	501	3	52,52,52	2.00	11 (21%)	78,82,82	2.41	30 (38%)

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	FMN	B	504	-	-	2/18/18/18	0/3/3/3
4	FMN	A	504	-	-	4/18/18/18	0/3/3/3
2	C2E	B	501	3	1/1/10/10	3/30/62/62	0/6/7/7
2	C2E	A	501	3	1/1/10/10	5/30/62/62	0/6/7/7

All (26) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	501	C2E	C2'-C1'	-6.19	1.34	1.53
2	B	501	C2E	C2'-C1'	-6.18	1.34	1.53
2	A	501	C2E	C2A-C1A	-6.07	1.34	1.53
2	B	501	C2E	C2A-C1A	-5.81	1.35	1.53
2	A	501	C2E	C1A-N91	-3.99	1.36	1.47
2	A	501	C2E	C8-N9	-3.85	1.28	1.37
2	B	501	C2E	C1A-N91	-3.79	1.36	1.47
2	A	501	C2E	O2'-C2'	-3.75	1.33	1.43
4	A	504	FMN	C4A-N5	3.71	1.38	1.30
2	B	501	C2E	C1'-N9	-3.65	1.37	1.47
2	B	501	C2E	O2'-C2'	-3.64	1.33	1.43
2	B	501	C2E	O2A-C2A	-3.59	1.34	1.43
2	A	501	C2E	C1'-N9	-3.58	1.37	1.47
2	B	501	C2E	C8-N9	-3.56	1.29	1.37
2	A	501	C2E	O2A-C2A	-3.43	1.34	1.43
4	B	504	FMN	C4A-N5	3.35	1.38	1.30
2	A	501	C2E	O4'-C1'	2.64	1.48	1.42
2	A	501	C2E	C2'-C3'	-2.60	1.47	1.53
4	B	504	FMN	C10-N1	2.59	1.38	1.33
2	A	501	C2E	C6-N1	-2.54	1.34	1.38
2	A	501	C2E	P11-O11	2.47	1.59	1.50
2	B	501	C2E	P11-O11	2.41	1.59	1.50
2	B	501	C2E	O4'-C1'	2.41	1.47	1.42
2	B	501	C2E	C2'-C3'	-2.24	1.48	1.53
4	A	504	FMN	C10-N1	2.18	1.37	1.33
2	B	501	C2E	C41-N91	-2.08	1.32	1.38

All (85) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	501	C2E	O4A-C1A-N91	7.68	125.76	108.36

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	501	C2E	O4A-C1A-N91	7.35	125.02	108.36
2	A	501	C2E	C5-C4-N3	-5.29	119.97	128.39
2	A	501	C2E	C51-C41-N31	-5.07	120.31	128.39
2	B	501	C2E	C5-C4-N3	-4.91	120.57	128.39
2	A	501	C2E	N91-C41-N31	4.90	135.75	125.95
2	A	501	C2E	N9-C4-N3	4.89	135.74	125.95
2	B	501	C2E	C51-C41-N31	-4.71	120.89	128.39
2	B	501	C2E	N91-C41-N31	4.70	135.34	125.95
2	B	501	C2E	N9-C4-N3	4.53	135.01	125.95
2	A	501	C2E	O2'-C2'-C1'	4.40	125.26	110.10
2	A	501	C2E	N91-C81-N71	-4.38	105.28	113.40
2	A	501	C2E	C21-N31-C41	4.23	119.59	112.30
2	B	501	C2E	C21-N31-C41	4.20	119.54	112.30
2	B	501	C2E	O2'-C2'-C1'	4.18	124.51	110.10
2	A	501	C2E	C81-N91-C41	4.13	113.77	106.03
2	B	501	C2E	N91-C81-N71	-3.92	106.12	113.40
2	B	501	C2E	C81-N91-C41	3.91	113.35	106.03
2	B	501	C2E	O4'-C1'-N9	3.90	117.20	108.36
2	B	501	C2E	C2-N3-C4	3.81	118.87	112.30
4	A	504	FMN	C4A-C10-N10	3.80	121.92	116.48
4	A	504	FMN	C4-N3-C2	-3.77	118.94	125.64
2	B	501	C2E	C4A-O4A-C1A	-3.61	101.50	109.47
2	A	501	C2E	C2-N3-C4	3.51	118.35	112.30
2	B	501	C2E	O4A-C1A-C2A	3.50	114.11	106.62
2	A	501	C2E	C3'-C2'-C1'	3.44	107.45	99.89
2	B	501	C2E	C8-N7-C5	3.44	110.38	104.26
2	B	501	C2E	C4-C5-N7	-3.39	105.29	110.67
2	B	501	C2E	C3'-C2'-C1'	3.34	107.24	99.89
2	A	501	C2E	C8-N7-C5	3.28	110.10	104.26
4	B	504	FMN	C4-N3-C2	-3.26	119.86	125.64
2	B	501	C2E	O5A-C5A-C4A	-3.23	97.99	108.99
2	A	501	C2E	O21-P11-O5A	3.22	122.16	107.57
2	A	501	C2E	C4-C5-N7	-3.20	105.61	110.67
2	A	501	C2E	C4A-O4A-C1A	-3.16	102.50	109.47
2	B	501	C2E	O61-C61-C51	-3.13	118.26	126.53
2	B	501	C2E	C8-N9-C4	3.12	111.87	106.03
2	A	501	C2E	C8-N9-C4	3.09	111.82	106.03
2	A	501	C2E	O4A-C1A-C2A	3.06	113.16	106.62
4	B	504	FMN	C4A-C10-N10	2.99	120.76	116.48
4	A	504	FMN	C4A-C4-N3	2.90	120.64	113.25
2	B	501	C2E	N9-C8-N7	-2.90	108.03	113.40
2	B	501	C2E	O3A-P1-O1P	-2.88	100.59	109.81

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	501	C2E	C2'-C1'-N9	2.85	121.19	113.25
4	A	504	FMN	C10-C4A-N5	-2.85	118.98	124.81
2	A	501	C2E	C1A-N91-C81	-2.84	118.67	126.73
2	A	501	C2E	N9-C8-N7	-2.82	108.17	113.40
2	B	501	C2E	C6-C5-N7	2.72	135.25	130.29
4	B	504	FMN	C10-C4A-N5	-2.69	119.31	124.81
2	A	501	C2E	C81-N71-C51	2.68	109.03	104.26
2	A	501	C2E	C21-N11-C61	-2.66	120.29	125.11
2	B	501	C2E	C5'-C4'-C3'	-2.63	105.61	114.38
2	B	501	C2E	C2'-C1'-N9	2.63	120.56	113.25
2	A	501	C2E	C2A-C1A-N91	2.60	120.50	113.25
2	B	501	C2E	O21-P11-O5A	2.56	119.16	107.57
4	B	504	FMN	C4A-C4-N3	2.55	119.75	113.25
2	B	501	C2E	C21-N11-C61	-2.54	120.50	125.11
2	B	501	C2E	C1A-N91-C81	-2.54	119.53	126.73
2	A	501	C2E	C5'-C4'-C3'	-2.53	105.95	114.38
2	A	501	C2E	O61-C61-C51	-2.51	119.91	126.53
2	B	501	C2E	N21-C21-N11	2.51	122.05	116.76
2	B	501	C2E	C51-C61-N11	2.42	119.41	113.25
4	A	504	FMN	C4-C4A-N5	2.40	121.53	118.21
2	A	501	C2E	O4'-C1'-N9	2.38	113.76	108.36
2	A	501	C2E	O4'-C4'-C5'	2.34	116.82	109.33
2	B	501	C2E	O4'-C4'-C5'	2.33	116.81	109.33
2	A	501	C2E	O5'-P1-O1P	-2.31	99.80	108.94
4	B	504	FMN	C9A-C5A-N5	-2.26	120.06	122.45
2	A	501	C2E	C6-C5-N7	2.25	134.39	130.29
2	A	501	C2E	C51-C61-N11	2.24	118.95	113.25
2	B	501	C2E	C2-N1-C6	-2.23	121.06	125.11
4	B	504	FMN	O4-C4-C4A	-2.23	120.64	126.53
4	A	504	FMN	C4A-C10-N1	-2.23	119.13	124.59
2	B	501	C2E	O3A-C3A-C2A	2.16	119.42	111.68
4	B	504	FMN	C4-C4A-N5	2.16	121.19	118.21
4	A	504	FMN	C9A-C5A-N5	-2.16	120.17	122.45
4	A	504	FMN	O2-C2-N1	-2.15	118.24	121.80
2	B	501	C2E	O6-C6-C5	-2.11	120.96	126.53
2	B	501	C2E	C2A-C1A-N91	2.08	119.04	113.25
4	A	504	FMN	O4-C4-C4A	-2.08	121.05	126.53
2	B	501	C2E	O2P-P1-O1P	2.05	122.00	112.44
4	A	504	FMN	C10-N1-C2	2.05	121.28	116.85
2	B	501	C2E	C5-C6-N1	2.03	118.42	113.25
2	B	501	C2E	O5A-P11-O11	-2.01	100.95	108.94
2	B	501	C2E	O4A-C4A-C5A	2.00	115.75	109.33

All (2) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
2	A	501	C2E	C1A
2	B	501	C2E	C1A

All (14) torsion outliers are listed below:

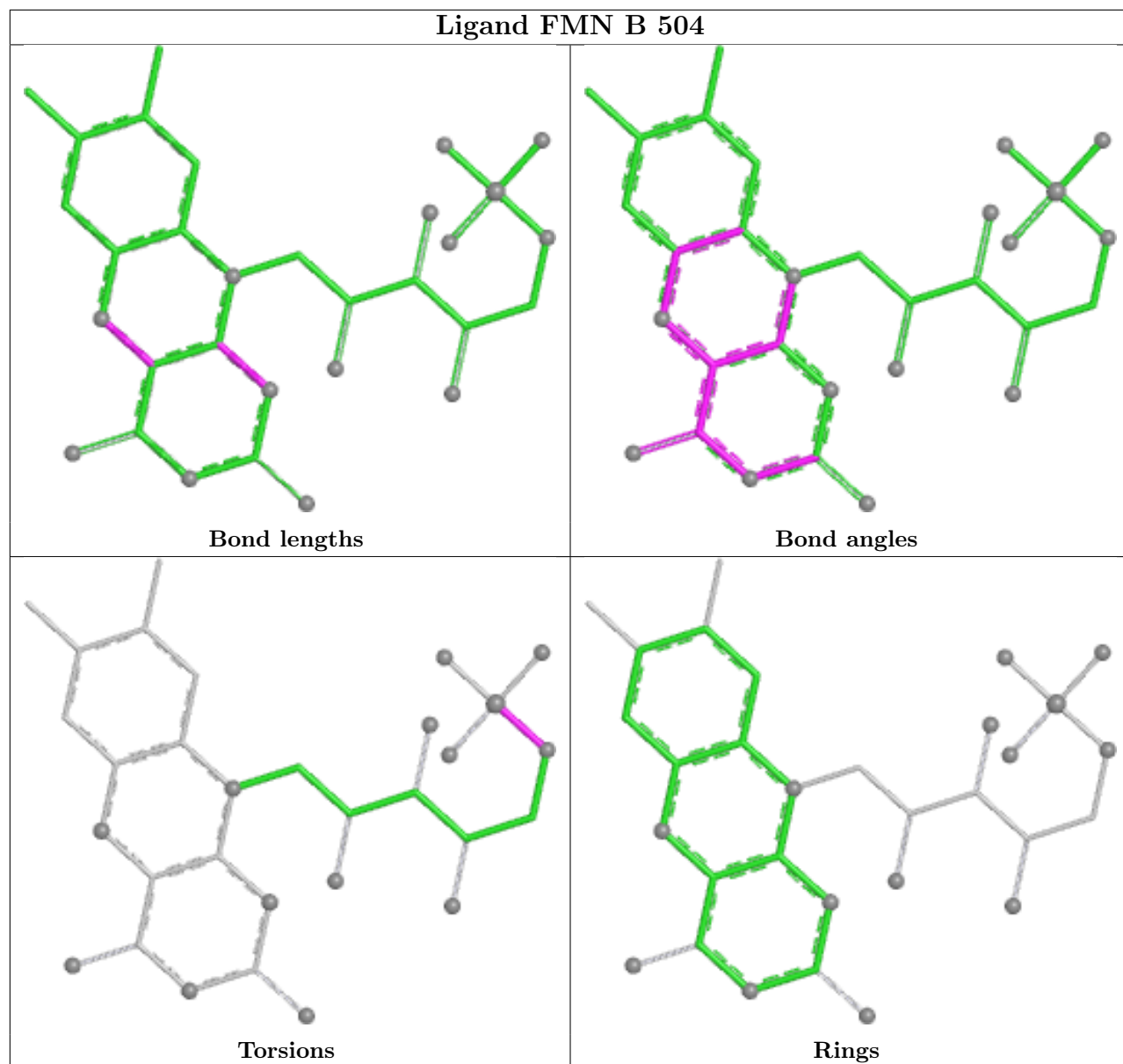
Mol	Chain	Res	Type	Atoms
4	B	504	FMN	C5'-O5'-P-O2P
4	B	504	FMN	C5'-O5'-P-O3P
2	B	501	C2E	C2A-C3A-O3A-P1
2	B	501	C2E	C4A-C3A-O3A-P1
2	B	501	C2E	C4'-C5'-O5'-P1
2	A	501	C2E	C2A-C3A-O3A-P1
4	A	504	FMN	C2'-C3'-C4'-O4'
2	A	501	C2E	C4'-C5'-O5'-P1
2	A	501	C2E	C4A-C3A-O3A-P1
4	A	504	FMN	C4'-C5'-O5'-P
4	A	504	FMN	O3'-C3'-C4'-O4'
2	A	501	C2E	O4A-C4A-C5A-O5A
2	A	501	C2E	C3'-O3'-P11-O21
4	A	504	FMN	O3'-C3'-C4'-C5'

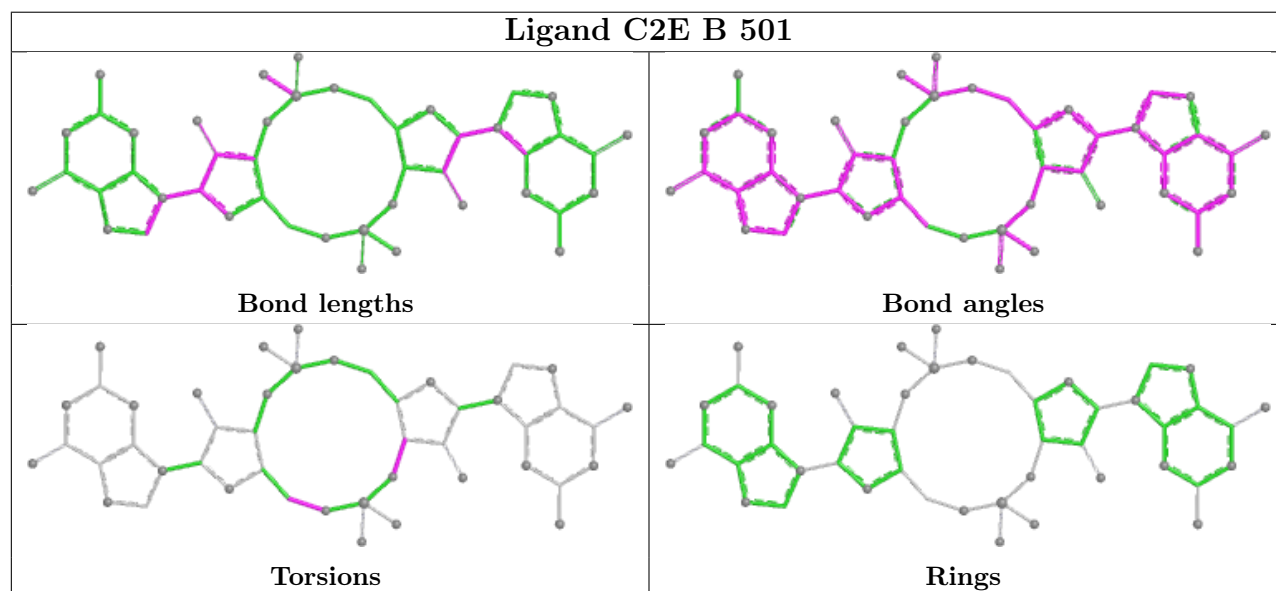
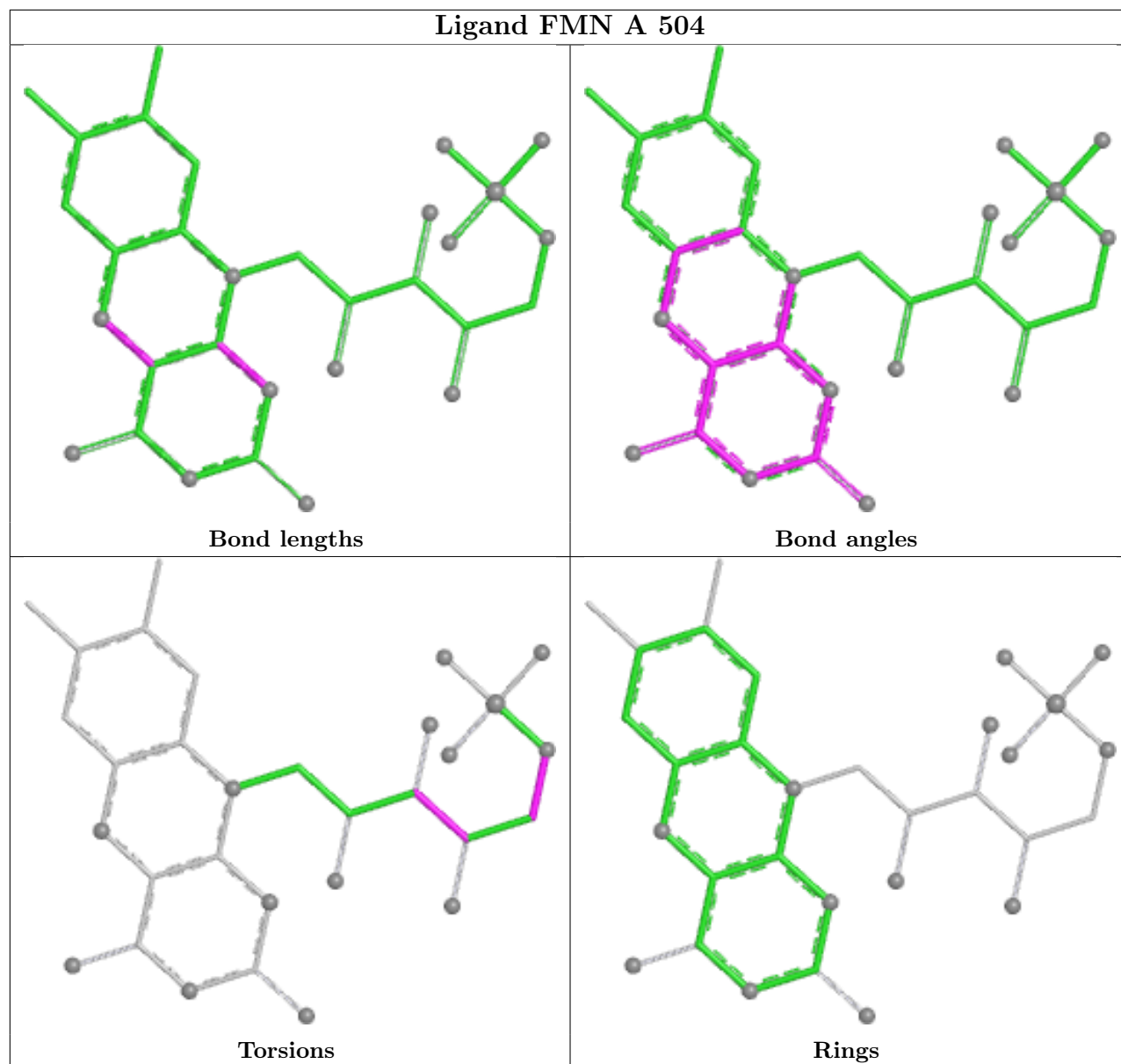
There are no ring outliers.

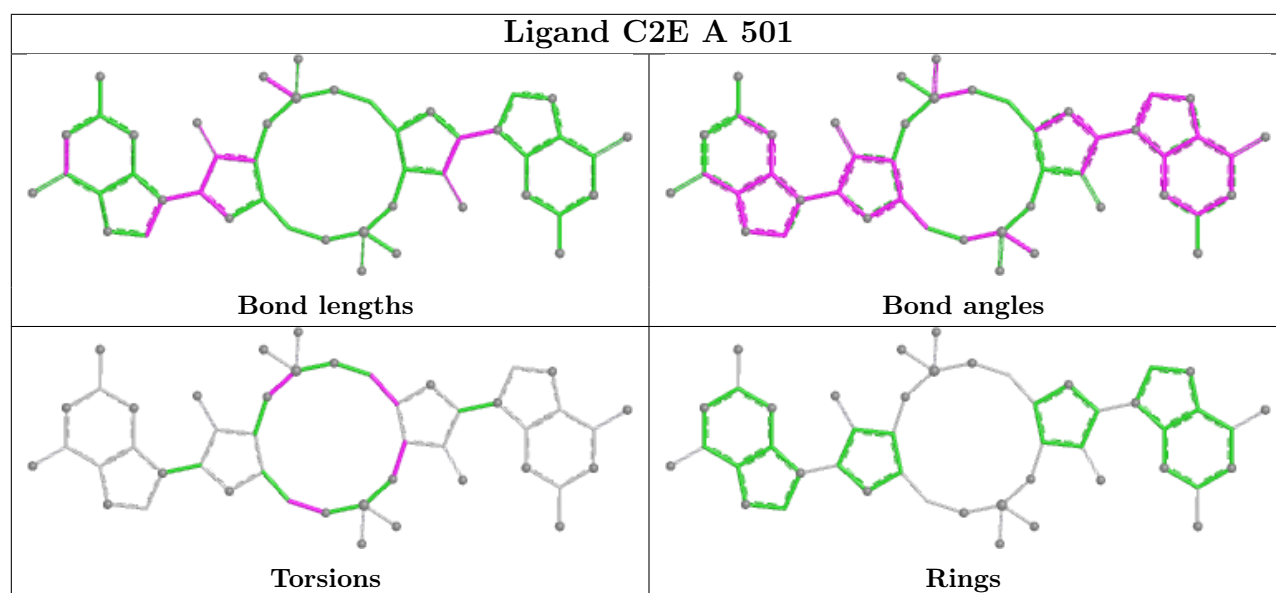
2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	501	C2E	1	0
2	A	501	C2E	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	393/413 (95%)	1.49	82 (20%) 2 2	35, 41, 50, 55	0
1	B	394/413 (95%)	1.47	81 (20%) 2 2	34, 41, 49, 53	0
All	All	787/826 (95%)	1.48	163 (20%) 2 2	34, 41, 50, 55	0

All (163) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	311	LEU	7.3
1	A	308	TYR	7.2
1	B	285	PHE	5.7
1	A	279	ILE	5.7
1	B	282	PHE	5.4
1	A	281	CYS	5.4
1	A	247	HIS	5.3
1	B	308	TYR	5.0
1	A	282	PHE	5.0
1	A	312	SER	4.7
1	A	311	LEU	4.7
1	B	279	ILE	4.6
1	A	310	GLY	4.5
1	B	309	SER	4.4
1	B	314	LEU	4.4
1	B	284	GLN	4.4
1	A	280	THR	4.3
1	B	161	PRO	4.3
1	B	313	LEU	4.1
1	A	114	THR	3.9
1	B	231	LEU	3.9
1	B	249	PRO	3.9
1	A	155	ALA	3.8
1	A	278	VAL	3.8

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Mol	Chain	Res	Type	RSRZ
1	A	400	ARG	3.8
1	B	310	GLY	3.8
1	A	276	THR	3.7
1	A	149	ARG	3.6
1	B	102	THR	3.6
1	B	163	HIS	3.6
1	A	246	TYR	3.4
1	A	25	HIS	3.4
1	A	317	PHE	3.4
1	A	313	LEU	3.3
1	A	309	SER	3.3
1	B	112	PHE	3.3
1	A	399	ALA	3.2
1	B	14	ASP	3.1
1	B	312	SER	3.1
1	A	248	HIS	3.1
1	A	382	LEU	3.1
1	B	90	THR	3.1
1	A	18	VAL	3.0
1	B	317	PHE	3.0
1	A	229	LEU	3.0
1	B	276	THR	3.0
1	B	316	ARG	2.9
1	A	39	ILE	2.9
1	B	283	ASP	2.9
1	B	306	ALA	2.9
1	A	14	ASP	2.9
1	B	281	CYS	2.9
1	B	373	VAL	2.9
1	A	316	ARG	2.8
1	B	280	THR	2.8
1	A	184	VAL	2.8
1	B	277	GLU	2.7
1	B	334	ILE	2.7
1	B	305	GLY	2.7
1	A	245	LEU	2.7
1	B	289	LEU	2.7
1	A	288	VAL	2.7
1	B	250	ASP	2.7
1	A	83	ALA	2.7
1	A	275	GLU	2.7
1	B	230	PRO	2.7

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Mol	Chain	Res	Type	RSRZ
1	A	398	VAL	2.7
1	A	209	GLU	2.6
1	A	322	ILE	2.6
1	A	158	THR	2.6
1	A	187	PHE	2.6
1	A	364	LEU	2.6
1	B	273	VAL	2.6
1	B	288	VAL	2.6
1	A	285	PHE	2.6
1	B	114	THR	2.6
1	B	153	MET	2.5
1	B	127	ARG	2.5
1	A	159	ALA	2.5
1	B	110	LEU	2.5
1	A	152	MET	2.5
1	B	332	ILE	2.5
1	A	231	LEU	2.5
1	A	388	LEU	2.5
1	A	394	ILE	2.5
1	A	228	GLN	2.5
1	A	251	ALA	2.5
1	A	88	HIS	2.5
1	A	314	LEU	2.4
1	A	162	GLN	2.4
1	B	117	VAL	2.4
1	A	102	THR	2.4
1	A	153	MET	2.4
1	A	110	LEU	2.4
1	A	176	ILE	2.4
1	B	104	GLY	2.4
1	B	287	LYS	2.4
1	A	387	CYS	2.4
1	A	224	ALA	2.3
1	B	246	TYR	2.3
1	A	95	LEU	2.3
1	A	307	GLY	2.3
1	B	344	SER	2.3
1	B	45	LEU	2.3
1	B	260	LEU	2.3
1	B	265	ARG	2.3
1	B	29	SER	2.3
1	B	329	VAL	2.3

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Mol	Chain	Res	Type	RSRZ
1	A	180	ALA	2.3
1	A	331	ASP	2.3
1	A	249	PRO	2.2
1	A	315	THR	2.2
1	B	315	THR	2.2
1	B	330	ARG	2.2
1	A	164	LEU	2.2
1	B	70	ARG	2.2
1	A	161	PRO	2.2
1	A	375	ILE	2.2
1	A	397	PRO	2.2
1	B	210	ASP	2.2
1	B	261	ALA	2.2
1	A	292	LEU	2.2
1	B	371	GLN	2.2
1	A	396	TRP	2.2
1	B	396	TRP	2.2
1	A	1	MET	2.2
1	B	80	ASP	2.2
1	B	346	VAL	2.2
1	A	227	GLY	2.2
1	A	45	LEU	2.2
1	A	148	SER	2.2
1	B	286	ARG	2.2
1	A	154	PRO	2.1
1	B	16	PRO	2.1
1	B	120	PRO	2.1
1	B	135	ASP	2.2
1	B	105	ALA	2.1
1	B	67	SER	2.1
1	B	393	GLU	2.1
1	B	89	GLY	2.1
1	B	166	GLY	2.1
1	B	164	LEU	2.1
1	B	84	TYR	2.1
1	B	69	PRO	2.1
1	B	179	PRO	2.1
1	A	204	ALA	2.1
1	B	399	ALA	2.1
1	A	5	LEU	2.1
1	A	61	LEU	2.1
1	B	79	ARG	2.1

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Mol	Chain	Res	Type	RSRZ
1	B	197	GLY	2.1
1	B	232	GLY	2.1
1	A	63	SER	2.1
1	A	217	GLU	2.0
1	B	205	ALA	2.1
1	A	299	LEU	2.0
1	A	370	LEU	2.0
1	B	331	ASP	2.0
1	A	286	ARG	2.0
1	B	97	LEU	2.0
1	B	292	LEU	2.0
1	A	230	PRO	2.0
1	B	274	THR	2.0

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

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

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

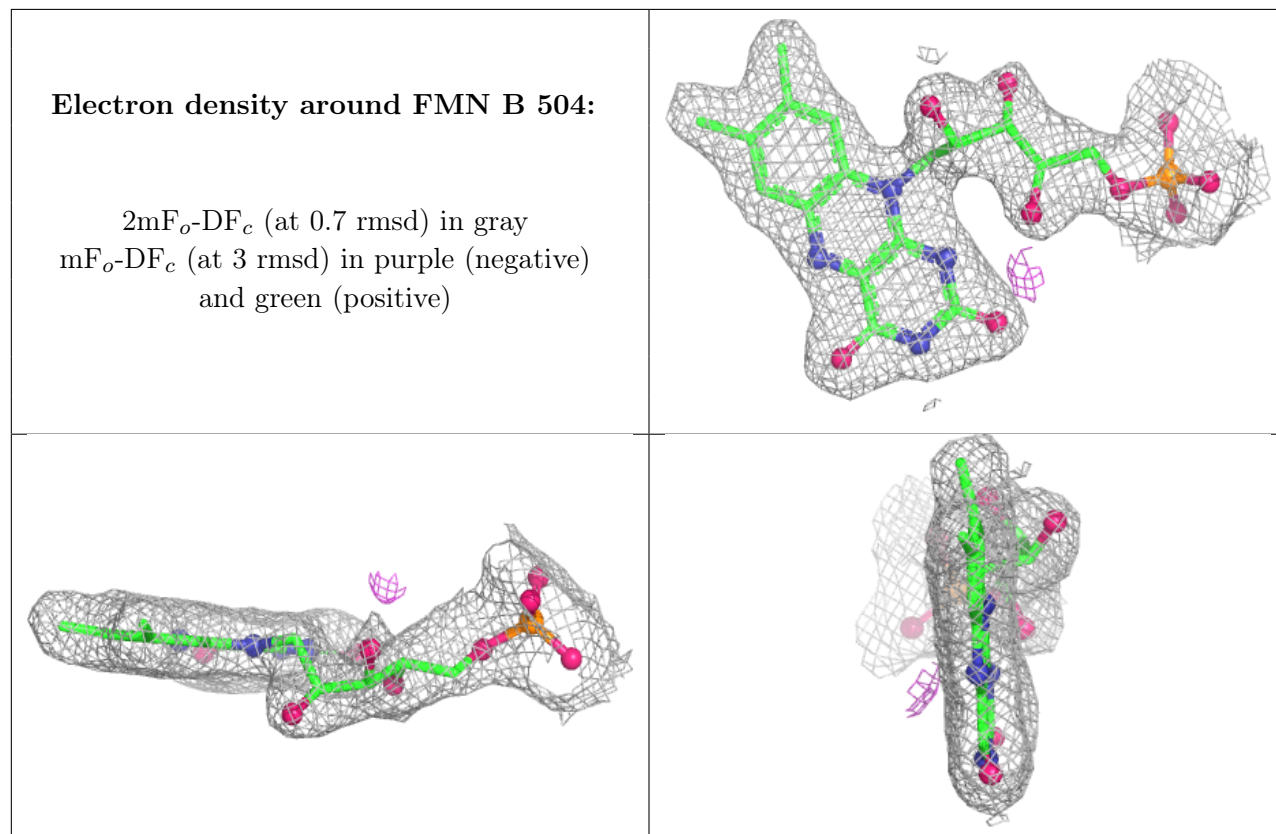
6.4 Ligands [i](#)

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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
4	FMN	B	504	31/31	0.91	0.10	36,38,52,53	0
4	FMN	A	504	31/31	0.92	0.10	34,37,52,52	0
2	C2E	B	501	46/46	0.93	0.09	36,40,43,46	0
2	C2E	A	501	46/46	0.94	0.09	36,39,44,47	0
3	MN	A	503	1/1	0.96	0.14	49,49,49,49	0
3	MN	A	502	1/1	0.98	0.08	43,43,43,43	0
3	MN	B	503	1/1	0.98	0.15	53,53,53,53	0
3	MN	B	502	1/1	0.99	0.08	41,41,41,41	0

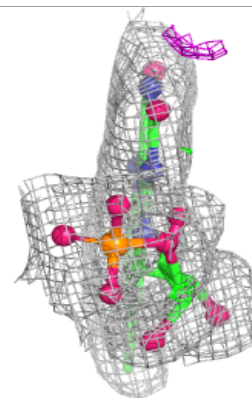
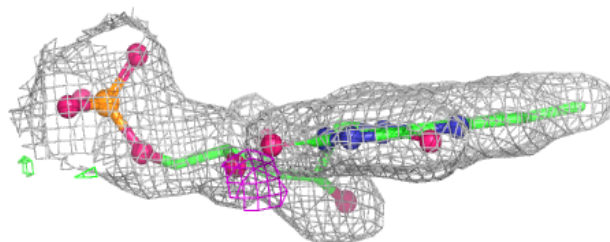
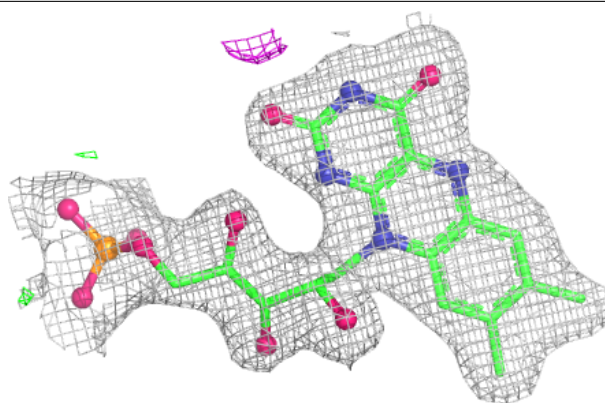
The following is a graphical depiction of the model fit to experimental electron density of all

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.

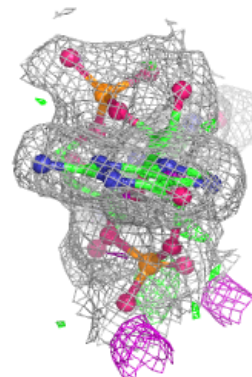
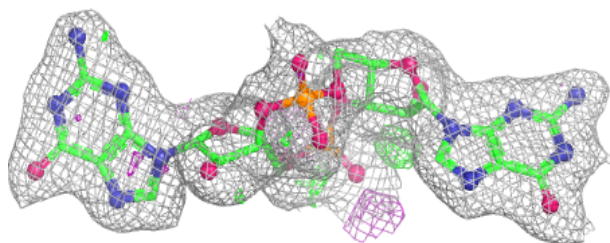
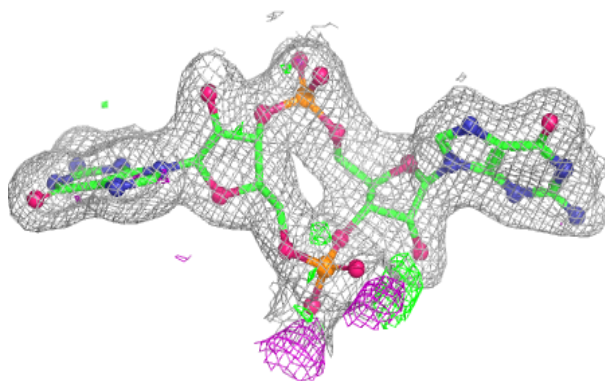


Electron density around FMN A 504:

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

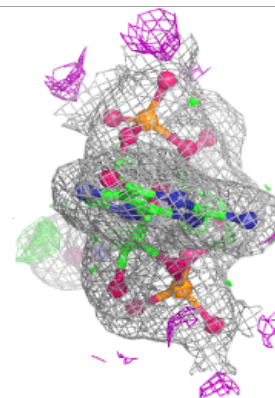
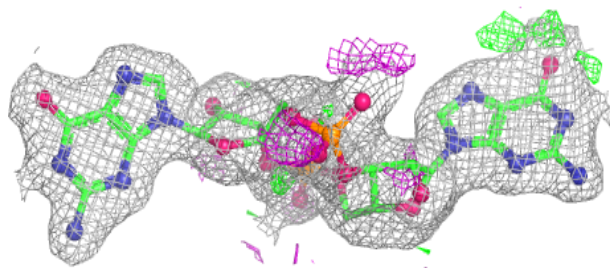
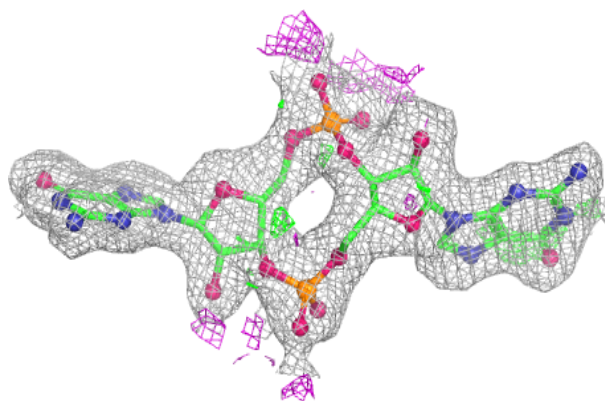
**Electron density around C2E B 501:**

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



Electron density around C2E A 501:

$2mF_o-DF_c$ (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.