



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 09:52 AM UTC

PDB ID : 7MMQ / pdb_00007mmq
Title : Crystal Structure of the Class Ie Ribonucleotide Reductase Beta-NrdI complex from *Aerococcus urinae* in Reduced Hydroquinone Form
Authors : Palowitch, G.M.; Boal, A.K.
Deposited on : 2021-04-30
Resolution : 2.40 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

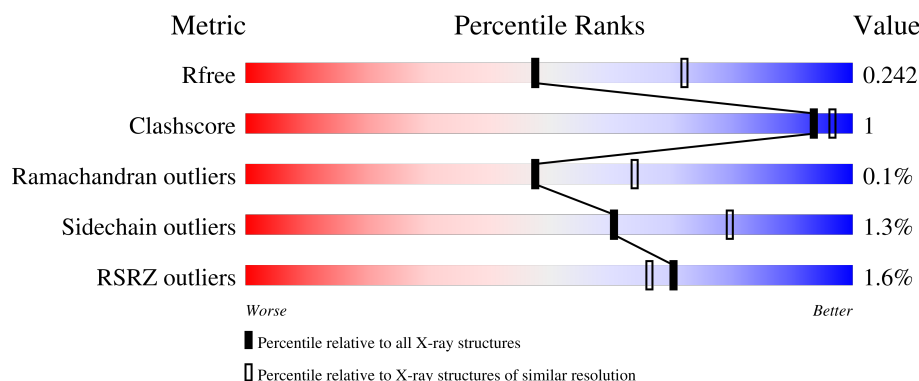
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.40 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	4912 (2.40-2.40)
Clashscore	190562	5391 (2.40-2.40)
Ramachandran outliers	187476	5320 (2.40-2.40)
Sidechain outliers	187428	5321 (2.40-2.40)
RSRZ outliers	180081	4916 (2.40-2.40)

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	342	% 88% 10%
1	B	342	3% 87% 9%
1	C	342	86% 10%
1	D	342	% 92% . .
2	E	147	2% 84% 14%

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Mol	Chain	Length	Quality of chain
2	F	147	 77% 7% 16%
2	G	147	 79% 5% 16%
2	H	147	 76% 11% 14%

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 14639 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 Ribonucleoside-diphosphate reductase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	309	Total	C	N	O	S	0	0	0
			2525	1633	410	476	6			
1	B	312	Total	C	N	O	S	0	0	0
			2550	1648	413	483	6			
1	C	309	Total	C	N	O	S	0	0	0
			2525	1633	410	476	6			
1	D	328	Total	C	N	O	S	0	0	0
			2675	1726	432	511	6			

There are 20 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-4	SER	-	expression tag	UNP F2I8X9
A	-3	ASN	-	expression tag	UNP F2I8X9
A	-2	ILE	-	expression tag	UNP F2I8X9
A	-1	LEU	-	expression tag	UNP F2I8X9
A	0	GLU	-	expression tag	UNP F2I8X9
B	-4	SER	-	expression tag	UNP F2I8X9
B	-3	ASN	-	expression tag	UNP F2I8X9
B	-2	ILE	-	expression tag	UNP F2I8X9
B	-1	LEU	-	expression tag	UNP F2I8X9
B	0	GLU	-	expression tag	UNP F2I8X9
C	-4	SER	-	expression tag	UNP F2I8X9
C	-3	ASN	-	expression tag	UNP F2I8X9
C	-2	ILE	-	expression tag	UNP F2I8X9
C	-1	LEU	-	expression tag	UNP F2I8X9
C	0	GLU	-	expression tag	UNP F2I8X9
D	-4	SER	-	expression tag	UNP F2I8X9
D	-3	ASN	-	expression tag	UNP F2I8X9
D	-2	ILE	-	expression tag	UNP F2I8X9
D	-1	LEU	-	expression tag	UNP F2I8X9
D	0	GLU	-	expression tag	UNP F2I8X9

- Molecule 2 is a protein called Protein NrdI.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	E	126	Total	C	N	O	S	0	0	0
			1010	646	167	196	1			
2	G	124	Total	C	N	O	S	0	0	0
			1001	641	165	194	1			
2	F	124	Total	C	N	O	S	0	0	0
			996	637	164	194	1			
2	H	127	Total	C	N	O	S	0	0	0
			1009	644	167	197	1			

There are 20 discrepancies between the modelled and reference sequences:

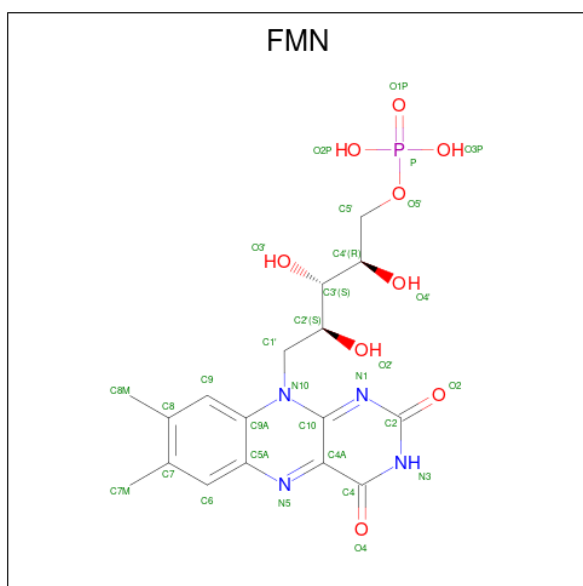
Chain	Residue	Modelled	Actual	Comment	Reference
E	-4	SER	-	expression tag	UNP A0A178HGH7
E	-3	ASN	-	expression tag	UNP A0A178HGH7
E	-2	ILE	-	expression tag	UNP A0A178HGH7
E	-1	LEU	-	expression tag	UNP A0A178HGH7
E	0	GLU	-	expression tag	UNP A0A178HGH7
G	-4	SER	-	expression tag	UNP A0A178HGH7
G	-3	ASN	-	expression tag	UNP A0A178HGH7
G	-2	ILE	-	expression tag	UNP A0A178HGH7
G	-1	LEU	-	expression tag	UNP A0A178HGH7
G	0	GLU	-	expression tag	UNP A0A178HGH7
F	-4	SER	-	expression tag	UNP A0A178HGH7
F	-3	ASN	-	expression tag	UNP A0A178HGH7
F	-2	ILE	-	expression tag	UNP A0A178HGH7
F	-1	LEU	-	expression tag	UNP A0A178HGH7
F	0	GLU	-	expression tag	UNP A0A178HGH7
H	-4	SER	-	expression tag	UNP A0A178HGH7
H	-3	ASN	-	expression tag	UNP A0A178HGH7
H	-2	ILE	-	expression tag	UNP A0A178HGH7
H	-1	LEU	-	expression tag	UNP A0A178HGH7
H	0	GLU	-	expression tag	UNP A0A178HGH7

- Molecule 3 is GLYCEROL (CCD ID: GOL) (formula: $C_3H_8O_3$).



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

- Molecule 4 is FLAVIN MONONUCLEOTIDE (CCD ID: FMN) (formula: $C_{17}H_{21}N_4O_9P$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	E	1	Total	C	N	O	P	0	0
			31	17	4	9	1		
4	G	1	Total	C	N	O	P	0	0
			31	17	4	9	1		
4	F	1	Total	C	N	O	P	0	0
			31	17	4	9	1		
4	H	1	Total	C	N	O	P	0	0
			31	17	4	9	1		

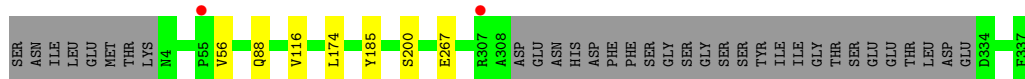
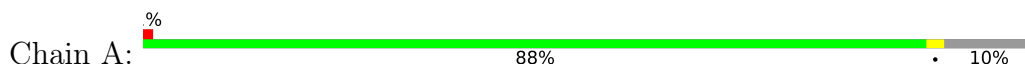
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	57	Total	O	0	0
			57	57		
5	B	44	Total	O	0	0
			44	44		
5	C	45	Total	O	0	0
			45	45		
5	D	39	Total	O	0	0
			39	39		
5	E	4	Total	O	0	0
			4	4		
5	G	6	Total	O	0	0
			6	6		
5	F	4	Total	O	0	0
			4	4		
5	H	7	Total	O	0	0
			7	7		

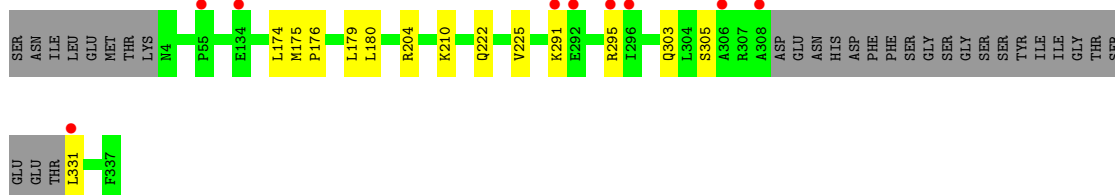
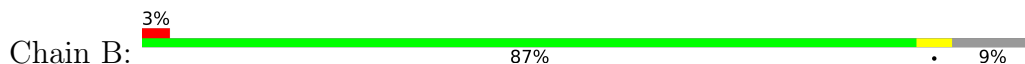
3 Residue-property plots [i](#)

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.

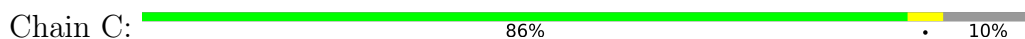
- Molecule 1: Ribonucleoside-diphosphate reductase



- Molecule 1: Ribonucleoside-diphosphate reductase



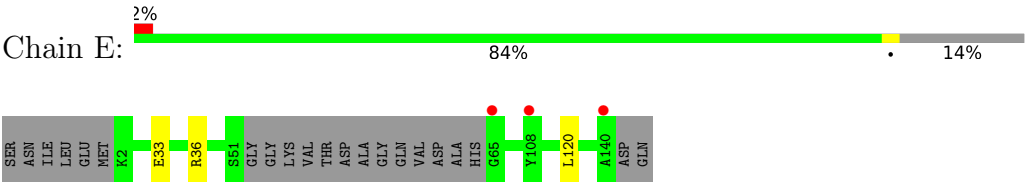
- Molecule 1: Ribonucleoside-diphosphate reductase



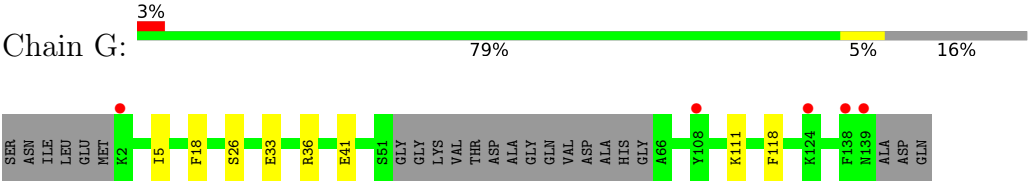
- Molecule 1: Ribonucleoside-diphosphate reductase



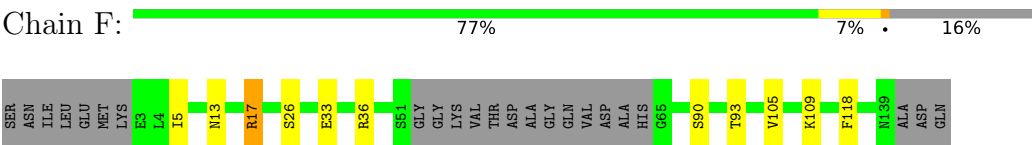
- Molecule 2: Protein NrdI



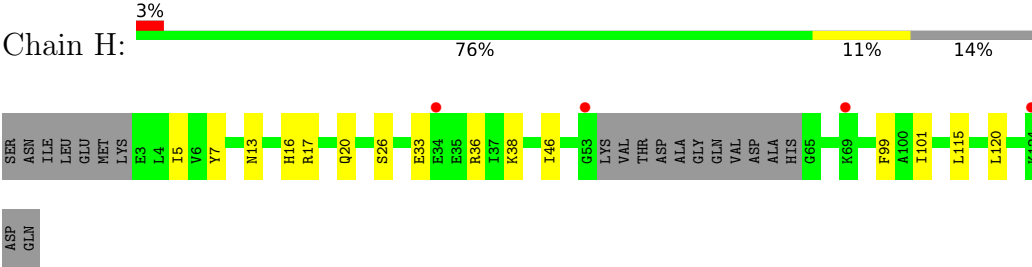
• Molecule 2: Protein NrdI



• Molecule 2: Protein NrdI



• Molecule 2: Protein NrdI



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	78.39Å 105.01Å 138.13Å 90.00° 100.58° 90.00°	Depositor
Resolution (Å)	49.69 – 2.40 49.69 – 2.40	Depositor EDS
% Data completeness (in resolution range)	91.2 (49.69-2.40) 91.4 (49.69-2.40)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.09 (at 2.39Å)	Xtriage
Refinement program	REFMAC 5.8.0258	Depositor
R, R_{free}	0.198 , 0.241 0.204 , 0.242	Depositor DCC
R_{free} test set	3983 reflections (4.61%)	wwPDB-VP
Wilson B-factor (Å ²)	37.5	Xtriage
Anisotropy	0.071	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 21.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	14639	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 3.75% 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 [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: FMN, GOL

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	0.98	0/2590	1.49	0/3516
1	B	0.99	0/2615	1.50	0/3550
1	C	0.98	0/2590	1.49	0/3516
1	D	0.99	0/2744	1.52	2/3724 (0.1%)
2	E	1.02	0/1029	1.38	0/1394
2	F	0.99	0/1015	1.38	0/1376
2	G	1.02	0/1020	1.40	0/1382
2	H	1.01	0/1028	1.39	0/1393
All	All	0.99	0/14631	1.47	2/19851 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	156	LEU	CA-C-N	6.16	124.12	120.24
1	D	156	LEU	C-N-CA	6.16	124.12	120.24

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	2525	0	2450	2	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	B	2550	0	2471	6	0
1	C	2525	0	2450	11	0
1	D	2675	0	2573	4	0
2	E	1010	0	1001	1	0
2	F	996	0	983	8	0
2	G	1001	0	993	3	0
2	H	1009	0	994	6	0
3	B	6	0	8	0	0
3	C	6	0	8	0	0
3	D	6	0	8	0	0
4	E	31	0	19	0	0
4	F	31	0	19	0	0
4	G	31	0	19	0	0
4	H	31	0	19	0	0
5	A	57	0	0	0	0
5	B	44	0	0	0	0
5	C	45	0	0	0	0
5	D	39	0	0	0	0
5	E	4	0	0	0	0
5	F	4	0	0	0	0
5	G	6	0	0	0	0
5	H	7	0	0	0	0
All	All	14639	0	14015	39	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 (39) 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:F:33:GLU:O	2:F:36:ARG:NH1	2.28	0.65
1:C:152:ARG:HH11	1:C:152:ARG:HG3	1.71	0.56
1:B:175:MET:HB3	1:B:176:PRO:HD3	1.90	0.53
2:G:33:GLU:O	2:G:36:ARG:NH1	2.36	0.52
2:E:33:GLU:O	2:E:36:ARG:NH1	2.43	0.50
2:H:13:ASN:O	2:H:17:ARG:HD3	2.12	0.49
2:G:5:ILE:O	2:G:26:SER:HA	2.13	0.49
1:C:175:MET:HB3	1:C:176:PRO:HD3	1.95	0.48
2:H:33:GLU:O	2:H:36:ARG:NH1	2.46	0.47
1:B:222:GLN:OE1	2:F:17:ARG:NH2	2.48	0.46
1:C:152:ARG:NE	1:C:251:GLU:OE2	2.44	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:H:5:ILE:O	2:H:26:SER:HA	2.16	0.46
1:D:175:MET:HB3	1:D:176:PRO:HD3	1.98	0.46
2:H:16:HIS:O	2:H:20:GLN:HG2	2.17	0.45
1:B:180:LEU:HD22	1:B:210:LYS:HE3	1.98	0.45
1:D:88:GLN:HB3	1:D:116:VAL:HG11	1.98	0.44
1:A:88:GLN:HB3	1:A:116:VAL:HG11	1.99	0.44
2:G:18:PHE:CD2	2:G:118:PHE:CZ	3.05	0.44
2:F:105:VAL:O	2:F:109:LYS:HG2	2.18	0.44
1:D:221:TYR:CZ	1:D:225:VAL:HG11	2.52	0.43
1:B:291:LYS:O	1:B:295:ARG:HG3	2.18	0.43
1:C:10:VAL:O	1:C:24:MET:HA	2.18	0.43
1:C:185:TYR:CZ	1:C:267:GLU:HB3	2.53	0.43
1:B:305:SER:HB2	2:F:93:THR:O	2.19	0.42
2:H:115:LEU:HB3	2:H:133:ILE:HG21	2.02	0.42
2:F:5:ILE:O	2:F:26:SER:HA	2.19	0.42
2:F:90:SER:HB3	2:F:118:PHE:CZ	2.53	0.42
1:C:175:MET:HB3	1:C:176:PRO:CD	2.49	0.42
2:F:13:ASN:O	2:F:17:ARG:HD3	2.19	0.42
1:C:20:GLN:N	1:C:20:GLN:OE1	2.52	0.42
1:A:185:TYR:CZ	1:A:267:GLU:HB3	2.55	0.42
1:B:204:ARG:NH1	1:B:303:GLN:O	2.48	0.42
2:H:7:TYR:HA	2:H:46:ILE:O	2.20	0.42
1:C:243:LEU:O	1:C:247:MET:HG2	2.20	0.41
1:C:152:ARG:HH11	1:C:152:ARG:CG	2.33	0.41
1:C:152:ARG:HB2	1:C:153:PRO:CD	2.51	0.41
2:F:90:SER:HA	2:F:118:PHE:O	2.21	0.40
1:C:79:THR:HG22	1:C:143:VAL:HG21	2.03	0.40
1:D:19:ASP:OD1	1:D:21:SER:OG	2.33	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	305/342 (89%)	299 (98%)	6 (2%)	0	100	100
1	B	308/342 (90%)	302 (98%)	6 (2%)	0	100	100
1	C	305/342 (89%)	298 (98%)	7 (2%)	0	100	100
1	D	324/342 (95%)	319 (98%)	5 (2%)	0	100	100
2	E	122/147 (83%)	118 (97%)	4 (3%)	0	100	100
2	F	120/147 (82%)	117 (98%)	3 (2%)	0	100	100
2	G	120/147 (82%)	119 (99%)	1 (1%)	0	100	100
2	H	123/147 (84%)	119 (97%)	3 (2%)	1 (1%)	16	25
All	All	1727/1956 (88%)	1691 (98%)	35 (2%)	1 (0%)	48	64

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	H	99	PHE

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	271/301 (90%)	268 (99%)	3 (1%)	65	82
1	B	274/301 (91%)	270 (98%)	4 (2%)	57	77
1	C	271/301 (90%)	268 (99%)	3 (1%)	65	82
1	D	288/301 (96%)	285 (99%)	3 (1%)	68	84
2	E	115/131 (88%)	114 (99%)	1 (1%)	70	85
2	F	114/131 (87%)	113 (99%)	1 (1%)	70	85
2	G	115/131 (88%)	113 (98%)	2 (2%)	53	74
2	H	114/131 (87%)	111 (97%)	3 (3%)	40	63
All	All	1562/1728 (90%)	1542 (99%)	20 (1%)	61	80

All (20) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	56	VAL
1	A	174	LEU
1	A	200	SER
1	B	174	LEU
1	B	179	LEU
1	B	225	VAL
1	B	331	LEU
1	C	52	GLU
1	C	152	ARG
1	C	334	ASP
1	D	31	LYS
1	D	52	GLU
1	D	193	ARG
2	E	120	LEU
2	G	41	GLU
2	G	111	LYS
2	F	17	ARG
2	H	38	LYS
2	H	101	ILE
2	H	120	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (18) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	46	GLN
1	A	53	ASN
1	B	30	ASN
1	B	111	ASN
1	B	214	ASN
1	B	275	ASN
1	B	281	GLN
1	C	46	GLN
1	C	111	ASN
1	C	281	GLN
1	C	282	ASN
1	D	30	ASN
1	D	111	ASN
1	D	233	GLN
1	D	281	GLN
2	E	94	ASN
2	G	117	GLN
2	F	117	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

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

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

7 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	$\# Z > 2$
4	FMN	G	201	-	33,33,33	0.95	2 (6%)	48,50,50	1.13	6 (12%)
3	GOL	D	401	-	5,5,5	0.11	0	5,5,5	0.32	0
3	GOL	B	401	-	5,5,5	0.11	0	5,5,5	0.31	0
3	GOL	C	401	-	5,5,5	0.10	0	5,5,5	0.32	0
4	FMN	F	201	-	33,33,33	0.90	2 (6%)	48,50,50	1.16	7 (14%)
4	FMN	H	201	-	33,33,33	0.91	2 (6%)	48,50,50	1.17	8 (16%)
4	FMN	E	201	-	33,33,33	0.96	2 (6%)	48,50,50	1.12	6 (12%)

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	G	201	-	-	0/18/18/18	0/3/3/3
3	GOL	D	401	-	-	2/4/4/4	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	GOL	B	401	-	-	0/4/4/4	-
3	GOL	C	401	-	-	2/4/4/4	-
4	FMN	F	201	-	-	0/18/18/18	0/3/3/3
4	FMN	H	201	-	-	4/18/18/18	0/3/3/3
4	FMN	E	201	-	-	0/18/18/18	0/3/3/3

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	E	201	FMN	C4A-N5	3.12	1.37	1.30
4	F	201	FMN	C4A-N5	2.89	1.37	1.30
4	G	201	FMN	C4A-N5	2.83	1.36	1.30
4	H	201	FMN	C4A-N5	2.64	1.36	1.30
4	G	201	FMN	C10-N1	2.50	1.38	1.33
4	E	201	FMN	C10-N1	2.29	1.37	1.33
4	H	201	FMN	C10-N1	2.28	1.37	1.33
4	F	201	FMN	C10-N1	2.02	1.37	1.33

All (27) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	G	201	FMN	C9A-C5A-N5	-2.92	119.35	122.45
4	F	201	FMN	C10-C4A-N5	-2.78	119.12	124.81
4	E	201	FMN	C9A-C5A-N5	-2.78	119.50	122.45
4	F	201	FMN	C9A-C5A-N5	-2.71	119.58	122.45
4	H	201	FMN	C9A-C5A-N5	-2.71	119.58	122.45
4	H	201	FMN	C10-C4A-N5	-2.69	119.32	124.81
4	E	201	FMN	C10-C4A-N5	-2.65	119.41	124.81
4	G	201	FMN	C5A-N5-C4A	2.64	122.36	118.09
4	G	201	FMN	C10-C4A-N5	-2.64	119.42	124.81
4	F	201	FMN	C4-C4A-N5	2.57	121.76	118.21
4	H	201	FMN	C10-N1-C2	2.52	122.30	116.85
4	F	201	FMN	C10-N1-C2	2.48	122.22	116.85
4	E	201	FMN	C5A-N5-C4A	2.48	122.10	118.09
4	E	201	FMN	C10-N1-C2	2.47	122.20	116.85
4	H	201	FMN	C5A-N5-C4A	2.44	122.03	118.09
4	F	201	FMN	C5A-N5-C4A	2.41	121.98	118.09
4	G	201	FMN	C10-N1-C2	2.39	122.02	116.85
4	E	201	FMN	C4-C4A-N5	2.39	121.50	118.21
4	F	201	FMN	C4A-C10-N10	2.31	119.79	116.48
4	H	201	FMN	C4-C4A-N5	2.18	121.22	118.21
4	G	201	FMN	C4-C4A-N5	2.15	121.18	118.21

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	F	201	FMN	O2-C2-N3	2.14	122.69	118.58
4	H	201	FMN	C4A-C10-N1	-2.09	119.46	124.59
4	H	201	FMN	O2-C2-N3	2.04	122.50	118.58
4	E	201	FMN	C4A-C10-N1	-2.02	119.63	124.59
4	H	201	FMN	C4A-C10-N10	2.02	119.38	116.48
4	G	201	FMN	C4A-C10-N1	-2.02	119.63	124.59

There are no chirality outliers.

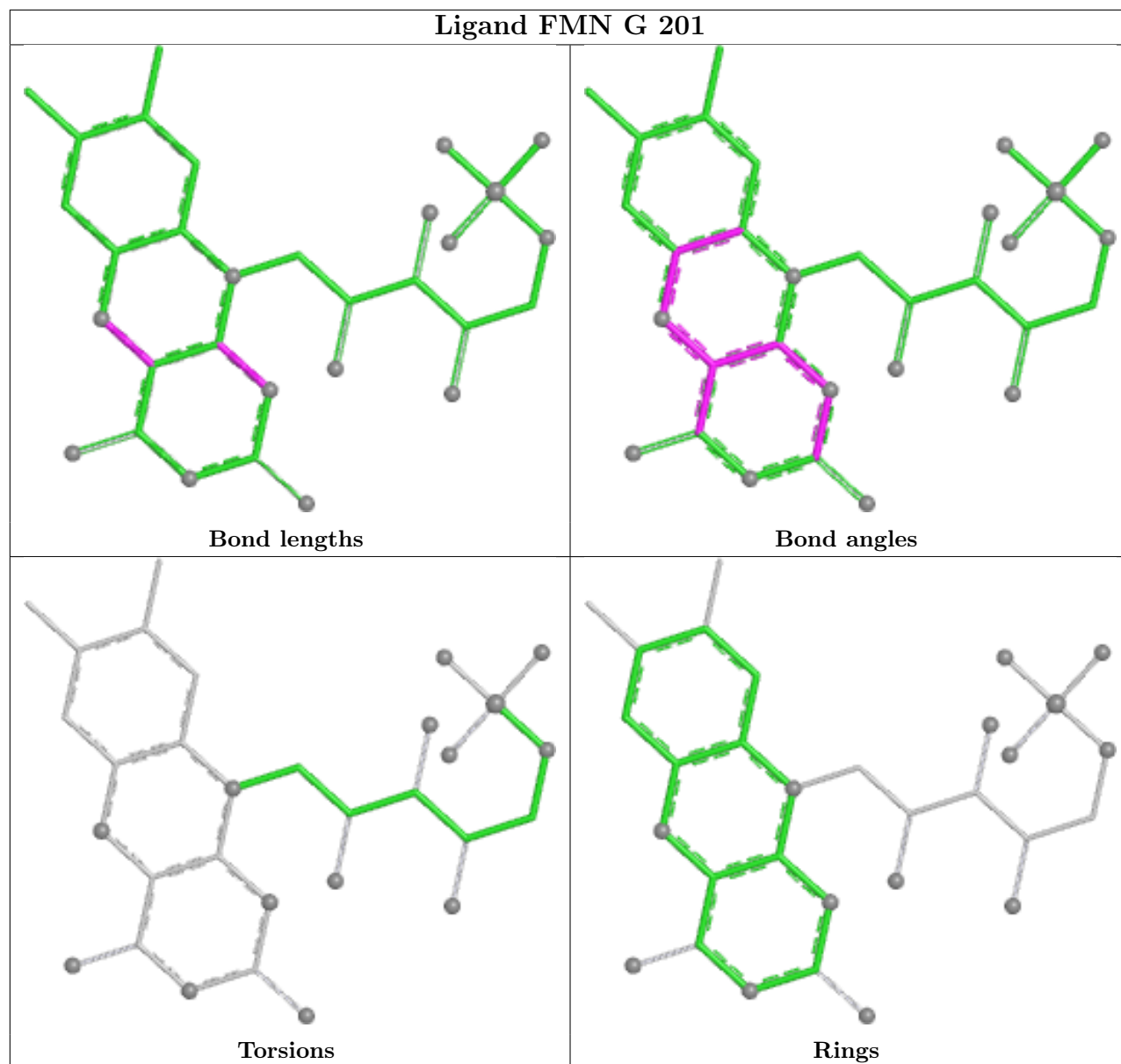
All (8) torsion outliers are listed below:

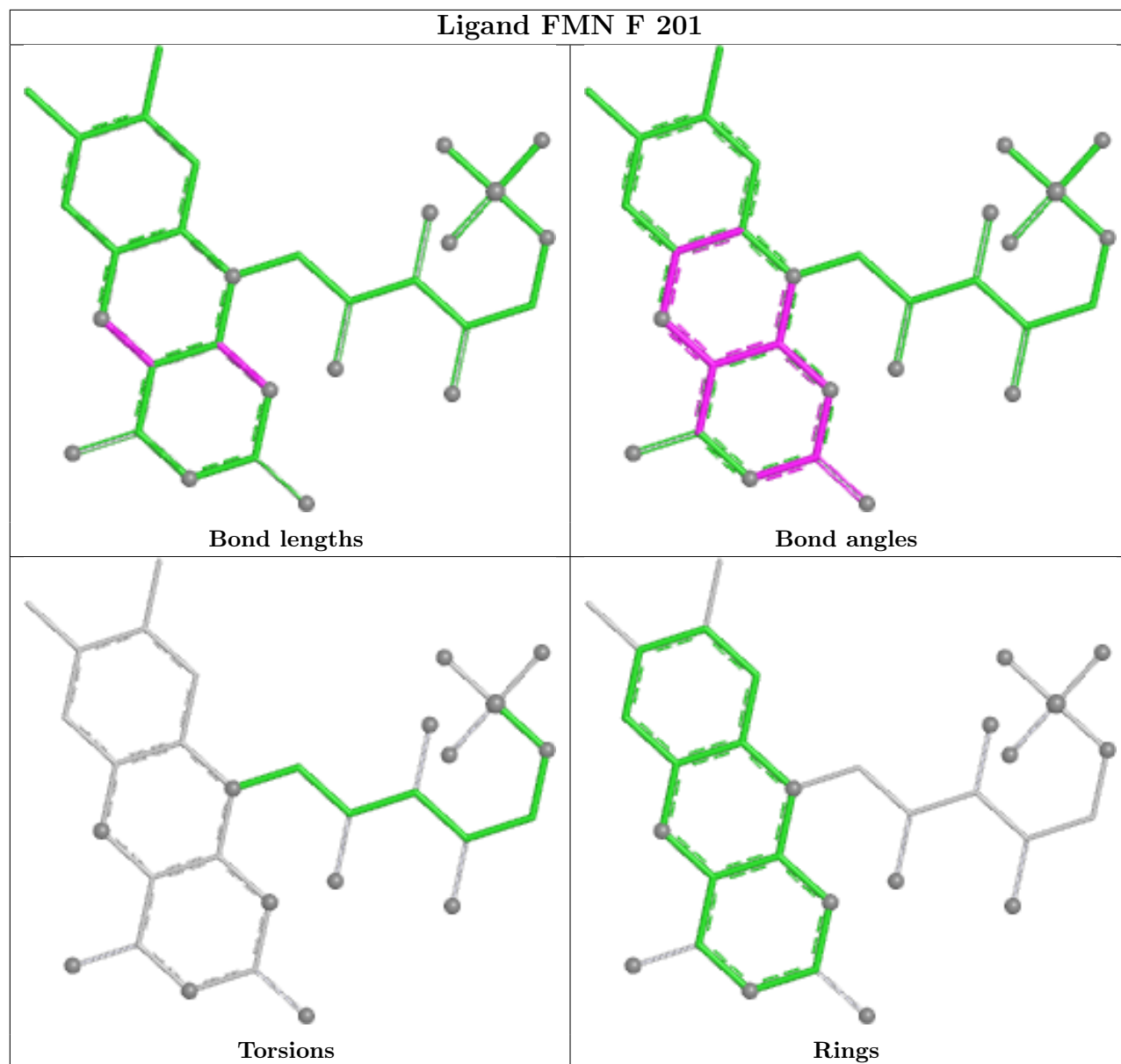
Mol	Chain	Res	Type	Atoms
3	D	401	GOL	O1-C1-C2-C3
4	H	201	FMN	C5'-O5'-P-O2P
4	H	201	FMN	C5'-O5'-P-O3P
3	C	401	GOL	C1-C2-C3-O3
3	C	401	GOL	O2-C2-C3-O3
3	D	401	GOL	O1-C1-C2-O2
4	H	201	FMN	C3'-C4'-C5'-O5'
4	H	201	FMN	O4'-C4'-C5'-O5'

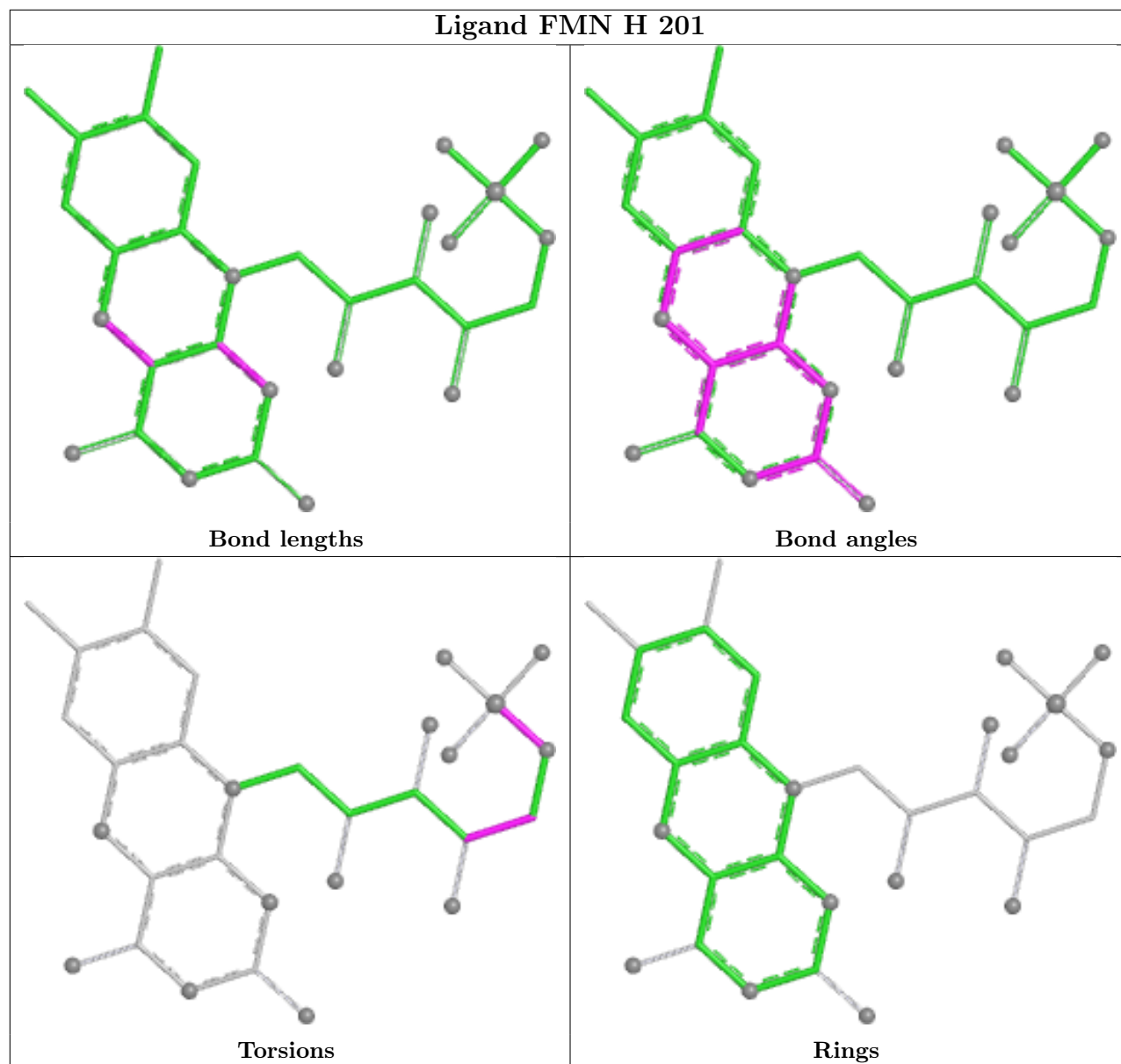
There are no ring outliers.

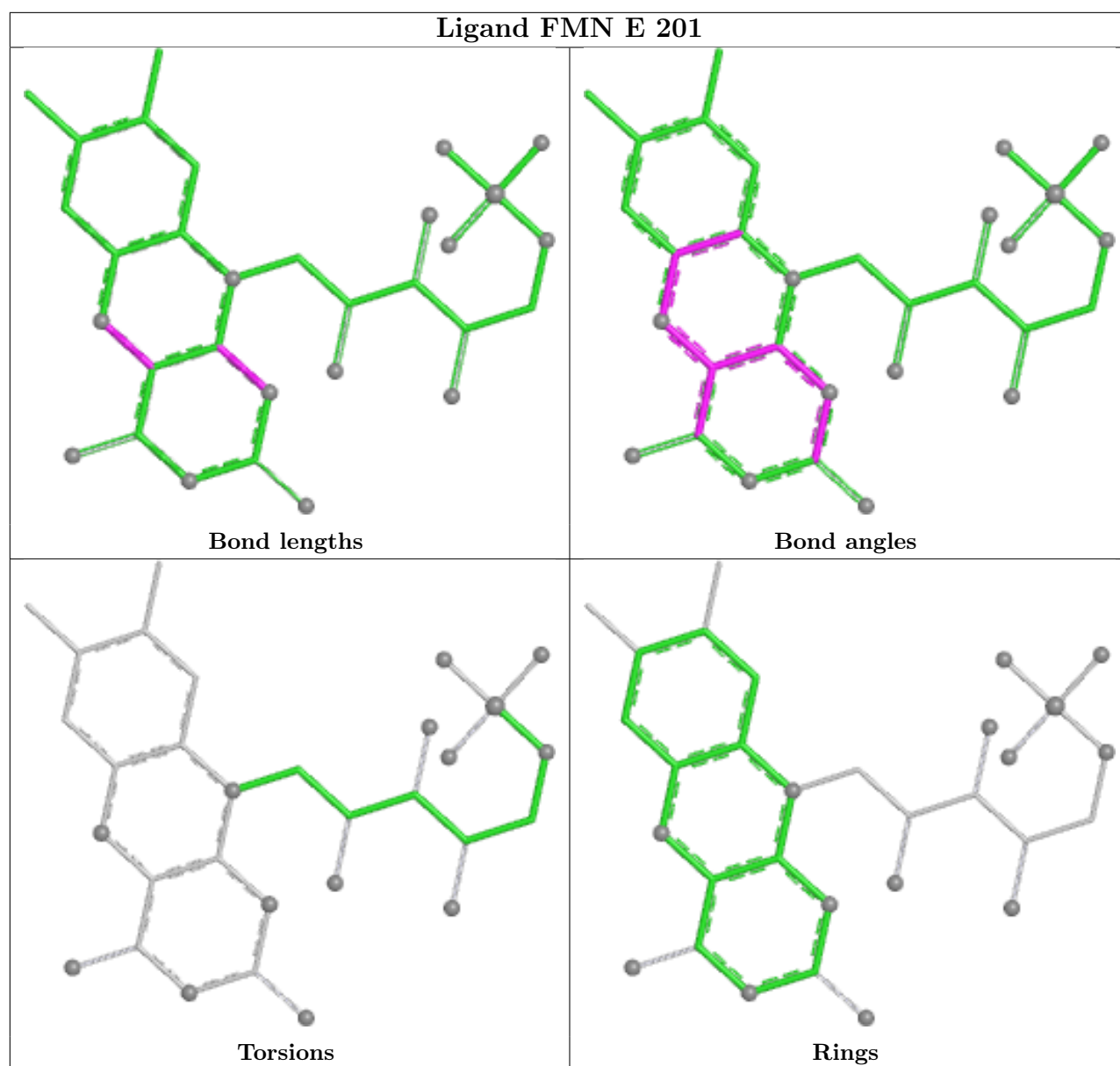
No monomer is involved in short contacts.

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 ⓘ

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	309/342 (90%)	0.01	2 (0%) 85 83	22, 36, 55, 73	0
1	B	312/342 (91%)	0.12	9 (2%) 53 50	22, 39, 62, 93	0
1	C	309/342 (90%)	0.01	1 (0%) 90 88	21, 38, 61, 78	0
1	D	328/342 (95%)	0.10	4 (1%) 76 73	22, 40, 61, 95	0
2	E	126/147 (85%)	0.37	3 (2%) 59 55	29, 45, 69, 94	0
2	F	124/147 (84%)	-0.04	0 100 100	28, 38, 59, 69	0
2	G	124/147 (84%)	0.37	5 (4%) 42 38	28, 48, 67, 83	0
2	H	127/147 (86%)	0.25	5 (3%) 43 39	30, 45, 66, 74	0
All	All	1759/1956 (89%)	0.11	29 (1%) 70 66	21, 40, 64, 95	0

All (29) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	331	LEU	6.0
2	E	140	ALA	4.7
1	B	295	ARG	3.8
1	B	292	GLU	3.4
1	B	306	ALA	3.0
2	H	53	GLY	3.0
1	B	308	ALA	2.9
1	B	291	LYS	2.9
1	B	55	PRO	2.8
1	B	331	LEU	2.8
1	C	308	ALA	2.7
1	D	53	ASN	2.6
1	D	333	GLU	2.6
2	H	140	ALA	2.6
2	G	108	TYR	2.6
1	D	55	PRO	2.4

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Mol	Chain	Res	Type	RSRZ
2	G	139	ASN	2.4
2	G	2	LYS	2.4
2	G	124	LYS	2.4
1	B	134	GLU	2.3
2	E	65	GLY	2.3
1	B	296	ILE	2.3
1	A	55	PRO	2.2
1	A	307	ARG	2.2
2	E	108	TYR	2.1
2	H	69	LYS	2.1
2	H	34	GLU	2.0
2	H	124	LYS	2.0
2	G	138	PHE	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.

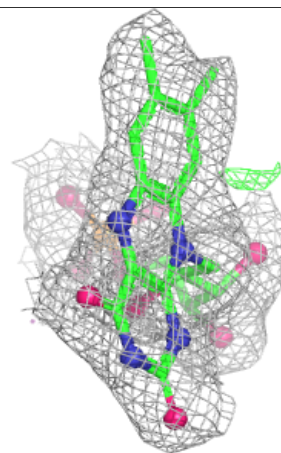
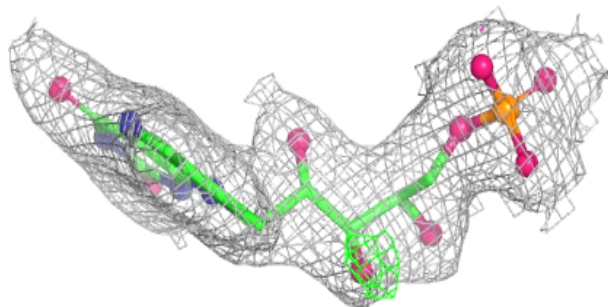
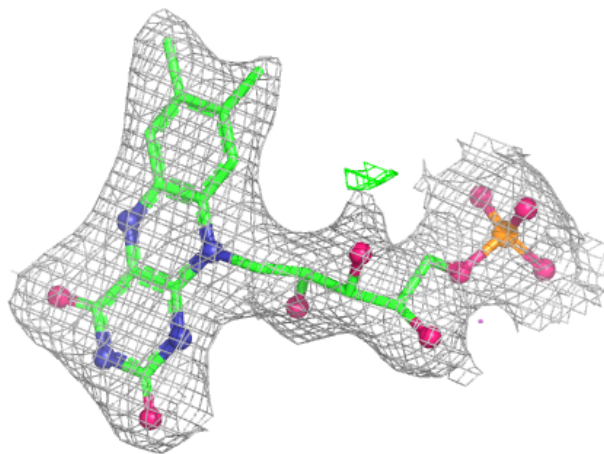
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
3	GOL	B	401	6/6	0.86	0.15	54,56,59,59	0
3	GOL	C	401	6/6	0.90	0.15	63,65,65,66	0
3	GOL	D	401	6/6	0.90	0.12	53,54,55,55	0
4	FMN	H	201	31/31	0.96	0.07	26,28,30,30	0
4	FMN	G	201	31/31	0.97	0.06	28,30,31,32	0
4	FMN	F	201	31/31	0.97	0.06	23,24,26,26	0
4	FMN	E	201	31/31	0.97	0.06	27,29,30,31	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.

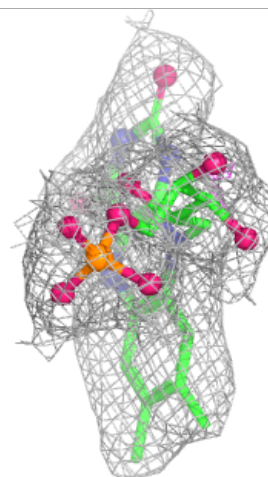
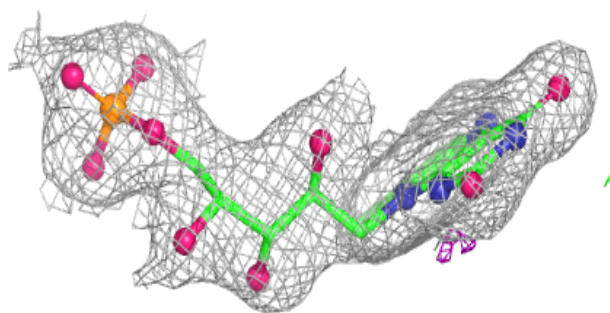
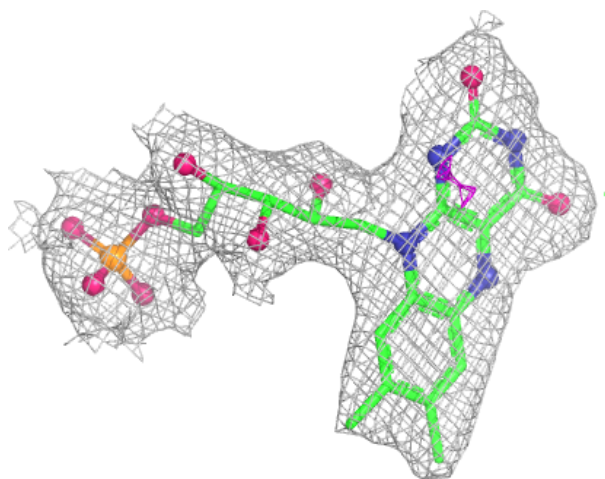
Electron density around FMN H 201:

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



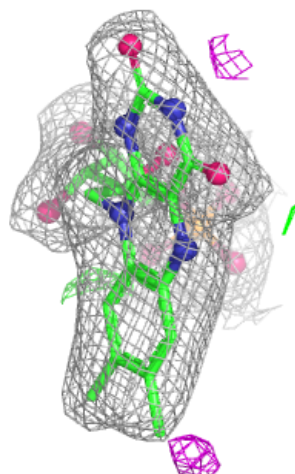
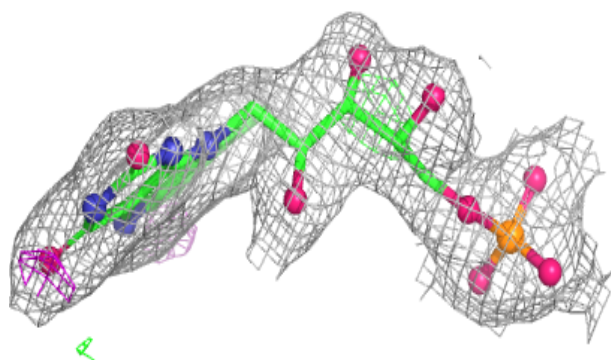
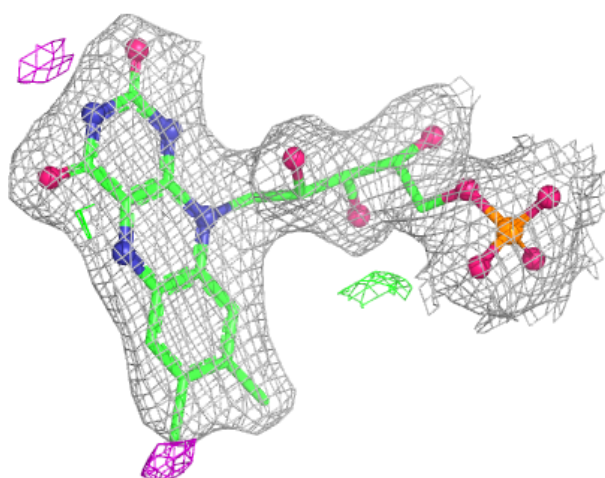
Electron density around FMN G 201:

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



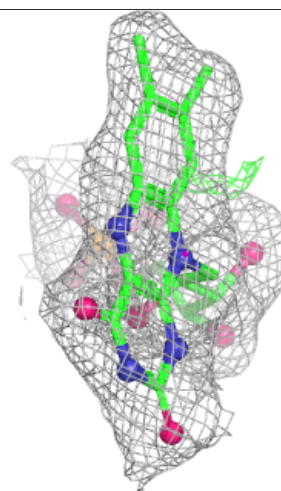
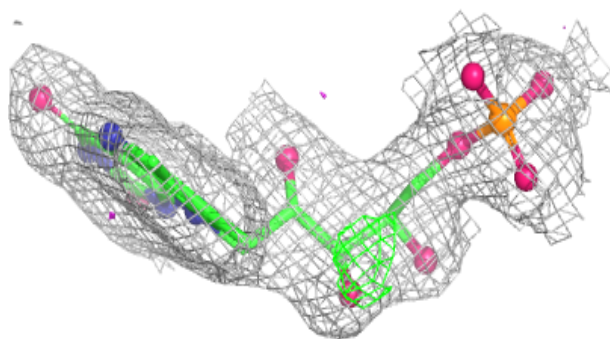
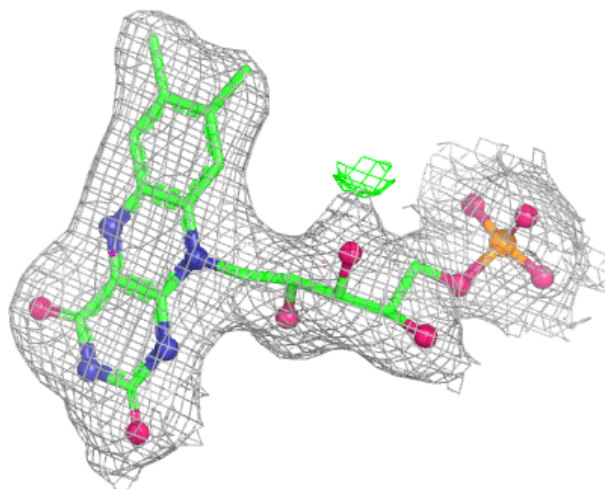
Electron density around FMN F 201:

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



Electron density around FMN E 201:

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



6.5 Other polymers [i](#)

There are no such residues in this entry.