



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 04:41 AM UTC

PDB ID : 3W2U / pdb_00003w2u
Title : Structure of Trypanosoma cruzi dihydroorotate dehydrogenase in complex with MII-3-193
Authors : Inaoka, D.K.; Iida, M.; Tabuchi, T.; Lee, N.; Matsuoka, S.; Shiba, T.; Sakamoto, K.; Suzuki, S.; Balogun, E.O.; Nara, T.; Aoki, T.; Inoue, M.; Honma, T.; Tanaka, A.; Harada, S.; Kita, K.
Deposited on : 2012-12-05
Resolution : 2.25 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](#) ①) were used in the production of this report:

MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtrriage (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

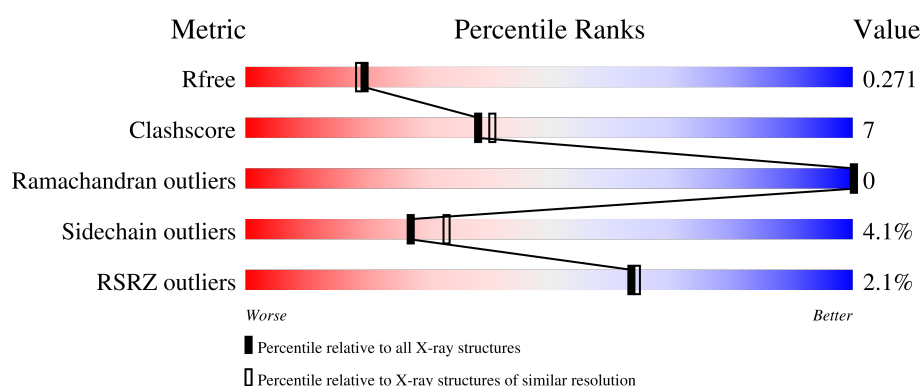
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.25 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	1898 (2.26-2.26)
Clashscore	190562	2005 (2.26-2.26)
Ramachandran outliers	187476	1965 (2.26-2.26)
Sidechain outliers	187428	1966 (2.26-2.26)
RSRZ outliers	180081	1898 (2.26-2.26)

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.

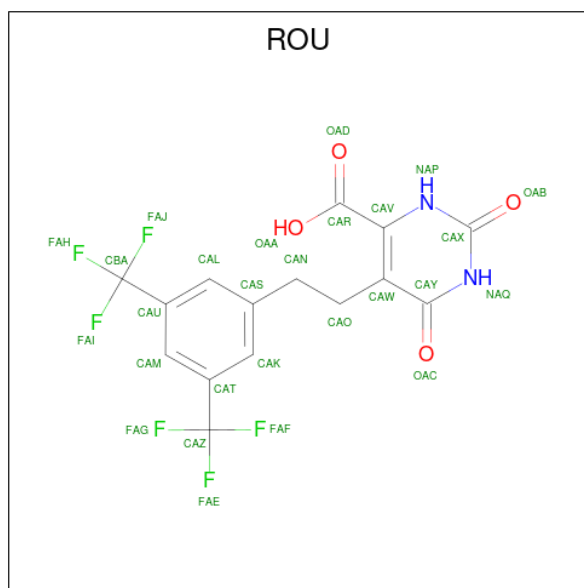
Mol	Chain	Length	Quality of chain
1	A	313	% 82% 15% .
1	B	313	3% 83% 14% .

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 Dihydroorotate dehydrogenase (fumarate).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	313	Total 2388	C 1530	N 396	O 444	S 18	0	0	0
1	B	313	Total 2388	C 1530	N 396	O 444	S 18	0	0	0

- Molecule 2 is 5-{2-[3,5-bis(trifluoromethyl)phenyl]ethyl}-2,6-dioxo-1,2,3,6-tetrahydropyrimidine-4-carboxylic acid (CCD ID: ROU) (formula: C₁₅H₁₀F₆N₂O₄).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total 27	C 15	F 6	N 2	O 4	0	0
2	B	1	Total 27	C 15	F 6	N 2	O 4	0	0

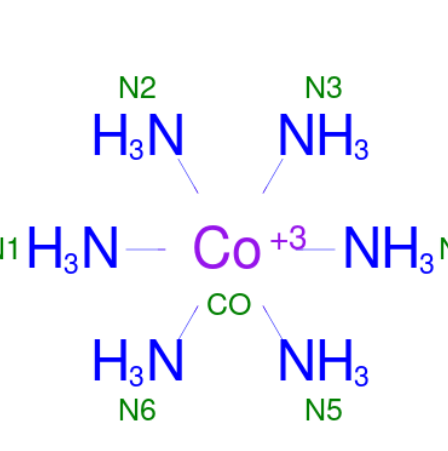
- Molecule 3 is GLYCEROL (CCD ID: GOL) (formula: $\text{C}_3\text{H}_8\text{O}_3$).



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

-
- The image displays the chemical structure of Flavin Mononucleotide (FMN). It features an isoalloxazine ring system, which is a tricyclic aromatic heterocycle consisting of a benzene ring fused to two pyrimidine rings. The ring atoms are labeled: N1, N3, N5, N10 for nitrogen atoms and C2, C4, C5A, C6, C7, C8, C9 for carbon atoms. A ribityl chain is attached to the N10 position of the isoalloxazine ring. The ribityl chain consists of three carbon atoms (C1, C2, C3) and a phosphate group. The C1 atom is bonded to a hydroxyl group (OH) and a hydrogen atom (H). The C2 atom is bonded to a hydroxyl group (OH) and a hydrogen atom (H). The C3 atom is bonded to a hydroxyl group (OH) and a hydrogen atom (H). The phosphate group is attached to the C3 atom and consists of a phosphorus atom (P) bonded to four oxygen atoms: one double-bonded oxygen (O1P), one single-bonded oxygen (O2P), and two single-bonded oxygens (O3P, O4P) that are part of the phosphate group. The ribityl chain is shown in a 3D representation with wedged and dashed bonds indicating stereochemistry.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	A	1	Total 31	C 17	N 4	O 9	P 1	0	0
4	B	1	Total 31	C 17	N 4	O 9	P 1	0	0

- NCO
- 
- Chemical structure diagram of hexamminecobalt(III) ion, $[Co(NH_3)_6]^{3+}$. The central cobalt atom (Co) is colored purple and has a +3 charge. It is surrounded by six ammonia (NH₃) ligands in an octahedral arrangement. The ligands are colored blue. The nitrogen atoms are labeled N1 through N6 in green. The bonds between the cobalt and the nitrogens are colored blue. The overall structure is enclosed in a black rectangular box.

Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total 7	Co 1	N 6	0	0

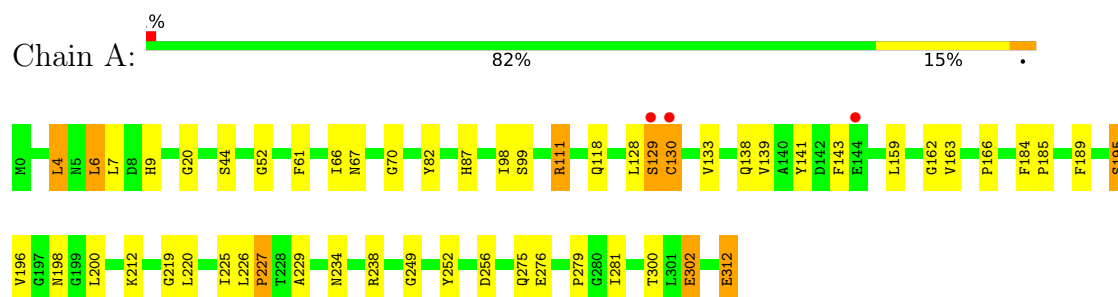
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	166	Total 166	O 166	0	0
6	B	163	Total 163	O 163	0	0

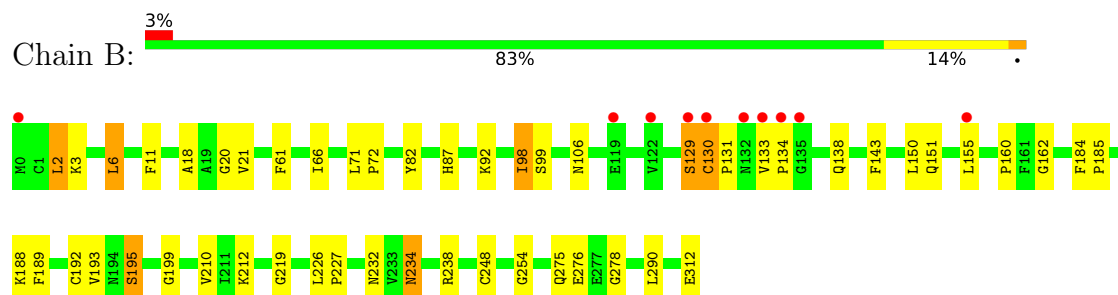
3 Residue-property plots

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: Dihydroorotate dehydrogenase (fumarate)



- Molecule 1: Dihydroorotate dehydrogenase (fumarate)



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	68.22Å 71.67Å 129.67Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	36.51 – 2.25 36.51 – 2.25	Depositor EDS
% Data completeness (in resolution range)	99.6 (36.51-2.25) 99.7 (36.51-2.25)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	5.05 (at 2.24Å)	Xtriage
Refinement program	REFMAC 5.7.0029	Depositor
R, R_{free}	0.205 , 0.270 0.211 , 0.271	Depositor DCC
R_{free} test set	1569 reflections (5.05%)	wwPDB-VP
Wilson B-factor (Å ²)	21.0	Xtriage
Anisotropy	0.213	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 37.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	0.000 for k,h,-l	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	5312	wwPDB-VP
Average B, all atoms (Å ²)	23.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 42.79 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 1.9375e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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, NCO, GOL, ROU

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	1.23	4/2440 (0.2%)	1.13	5/3305 (0.2%)
1	B	1.18	3/2440 (0.1%)	1.17	8/3305 (0.2%)
All	All	1.21	7/4880 (0.1%)	1.15	13/6610 (0.2%)

All (7) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	276	GLU	C-O	-10.86	1.10	1.24
1	B	276	GLU	C-O	-7.93	1.13	1.24
1	A	256	ASP	N-CA	7.09	1.55	1.46
1	B	210	VAL	N-CA	5.45	1.51	1.46
1	A	200	LEU	CA-C	5.37	1.58	1.52
1	B	254	GLY	C-O	5.22	1.30	1.23
1	A	111	ARG	CA-C	-5.04	1.46	1.52

All (13) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	130	CYS	CA-C-N	-7.71	112.40	120.03
1	B	130	CYS	C-N-CA	-7.71	112.40	120.03
1	B	232	ASN	N-CA-C	6.95	119.45	111.11
1	B	278	GLY	CA-C-N	6.39	126.08	119.82
1	B	278	GLY	C-N-CA	6.39	126.08	119.82
1	A	198	ASN	N-CA-C	5.88	119.36	111.24
1	A	225	ILE	N-CA-C	5.67	118.60	113.10
1	B	234	ASN	N-CA-C	5.59	117.46	111.36
1	B	199	GLY	N-CA-C	-5.48	104.21	112.60
1	A	61	PHE	N-CA-C	-5.32	103.33	108.07
1	A	212	LYS	CA-C-N	-5.21	114.87	120.03
1	A	212	LYS	C-N-CA	-5.21	114.87	120.03

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	61	PHE	N-CA-C	-5.19	102.17	108.14

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	A	2388	0	2391	37	0
1	B	2388	0	2391	31	0
2	A	27	0	9	1	0
2	B	27	0	9	1	0
3	A	72	0	96	7	0
3	B	12	0	16	0	0
4	A	31	0	19	1	0
4	B	31	0	19	4	0
5	A	7	0	0	0	0
6	A	166	0	0	3	0
6	B	163	0	0	0	0
All	All	5312	0	4950	68	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 7.

All (68) 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:A:7:LEU:O	1:A:9:HIS:HD2	1.57	0.86
1:A:7:LEU:O	1:A:9:HIS:CD2	2.42	0.73
1:B:20:GLY:HA3	4:B:404:FMN:N5	2.06	0.70
1:B:98:ILE:CD1	1:B:106:ASN:OD1	2.40	0.70
1:B:129:SER:HA	1:B:138:GLN:NE2	2.06	0.69
1:B:234:ASN:HD21	1:B:238:ARG:HE	1.43	0.64
1:B:20:GLY:HA3	4:B:404:FMN:C5A	2.28	0.63
1:B:82:TYR:OH	1:B:87:HIS:HD2	1.84	0.60

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:118:GLN:CG	1:A:159:LEU:HD11	2.31	0.60
1:A:129:SER:HB2	6:A:649:HOH:O	2.01	0.59
1:B:162:GLY:HA3	1:B:189:PHE:CZ	2.37	0.59
1:B:98:ILE:HD12	1:B:106:ASN:OD1	2.04	0.57
1:A:129:SER:O	1:A:130:CYS:C	2.47	0.56
1:B:66:ILE:HA	1:B:219:GLY:O	2.07	0.54
1:A:44:SER:HB3	1:A:99:SER:HB2	1.89	0.53
1:B:162:GLY:HA3	1:B:189:PHE:CE2	2.43	0.53
1:A:129:SER:CB	6:A:649:HOH:O	2.58	0.52
1:A:118:GLN:HG2	1:A:159:LEU:HD11	1.91	0.52
1:A:129:SER:HA	1:A:138:GLN:NE2	2.25	0.51
1:A:226:LEU:HB3	1:A:227:PRO:HD3	1.92	0.51
1:B:160:PRO:HB3	1:B:188:LYS:HG3	1.92	0.51
1:A:128:LEU:HD12	1:A:163:VAL:HG11	1.92	0.50
1:A:128:LEU:HG	1:A:163:VAL:HG13	1.93	0.50
1:A:252:TYR:HB3	3:A:413:GOL:H2	1.93	0.50
1:B:133:VAL:HG12	1:B:134:PRO:O	2.12	0.50
1:B:2:LEU:HG	1:B:290:LEU:HD21	1.93	0.49
1:B:234:ASN:ND2	1:B:238:ARG:HE	2.11	0.49
1:B:226:LEU:HB3	1:B:227:PRO:HD3	1.95	0.49
1:A:234:ASN:HD21	1:A:238:ARG:HE	1.60	0.49
1:A:143:PHE:HB2	3:A:412:GOL:C1	2.42	0.48
1:B:195:SER:OG	2:B:401:ROU:OAB	2.31	0.48
1:B:131:PRO:HA	1:B:138:GLN:HA	1.96	0.48
1:A:312:GLU:N	1:A:312:GLU:OE2	2.46	0.48
1:A:143:PHE:HB2	3:A:412:GOL:H11	1.96	0.47
1:B:87:HIS:HE1	1:B:92:LYS:O	1.97	0.47
1:A:300:THR:HB	1:A:302:GLU:OE1	2.14	0.47
1:B:162:GLY:HA3	1:B:189:PHE:CE1	2.49	0.47
3:A:408:GOL:H11	1:B:143:PHE:CE2	2.50	0.46
1:A:312:GLU:HB2	1:B:212:LYS:HE3	1.96	0.46
1:A:196:VAL:HB	1:A:220:LEU:HB2	1.98	0.46
1:B:21:VAL:HG13	1:B:275:GLN:HE21	1.79	0.46
1:B:82:TYR:CE2	1:B:87:HIS:HB2	2.52	0.45
2:A:401:ROU:OAA	2:A:401:ROU:H5	2.15	0.45
1:A:20:GLY:HA3	4:A:414:FMN:N5	2.31	0.45
1:A:82:TYR:CE2	1:A:87:HIS:HB2	2.52	0.45
1:B:18:ALA:HB1	4:B:404:FMN:O2'	2.18	0.44
1:A:138:GLN:HE22	1:A:166:PRO:HB3	1.82	0.43
1:A:66:ILE:HA	1:A:219:GLY:O	2.18	0.43
1:A:111:ARG:CD	3:A:409:GOL:O1	2.66	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:52:GLY:HA2	1:A:70:GLY:O	2.19	0.43
1:A:4:LEU:HD12	1:A:6:LEU:CD2	2.49	0.43
1:B:71:LEU:N	1:B:72:PRO:CD	2.82	0.42
1:B:99:SER:OG	1:B:130:CYS:SG	2.72	0.42
1:A:118:GLN:HG3	1:A:159:LEU:HD11	2.00	0.42
1:A:130:CYS:O	1:A:139:VAL:HG23	2.19	0.42
1:A:195:SER:HB3	6:A:664:HOH:O	2.19	0.42
1:B:6:LEU:HD12	1:B:11:PHE:CE1	2.55	0.41
1:A:275:GLN:HE22	3:A:410:GOL:C1	2.34	0.41
1:A:279:PRO:C	1:A:281:ILE:H	2.28	0.41
1:B:129:SER:HA	1:B:138:GLN:HE22	1.84	0.41
1:B:184:PHE:HA	1:B:185:PRO:HD2	1.95	0.41
1:A:141:TYR:HB3	3:A:407:GOL:H2	2.02	0.41
1:B:192:CYS:HA	1:B:193:VAL:HA	1.79	0.41
1:B:248:CYS:SG	4:B:404:FMN:H3'	2.61	0.40
1:A:229:ALA:CB	1:A:249:GLY:HA3	2.52	0.40
1:A:162:GLY:HA3	1:A:189:PHE:CE1	2.56	0.40
1:A:234:ASN:ND2	1:A:238:ARG:HE	2.20	0.40
1:A:184:PHE:HA	1:A:185:PRO:HD2	1.96	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	311/313 (99%)	299 (96%)	12 (4%)	0	100	100
1	B	311/313 (99%)	301 (97%)	10 (3%)	0	100	100
All	All	622/626 (99%)	600 (96%)	22 (4%)	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	A	258/258 (100%)	247 (96%)	11 (4%)	26	31
1	B	258/258 (100%)	248 (96%)	10 (4%)	28	35
All	All	516/516 (100%)	495 (96%)	21 (4%)	27	33

All (21) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	4	LEU
1	A	6	LEU
1	A	67	ASN
1	A	98	ILE
1	A	129	SER
1	A	130	CYS
1	A	133	VAL
1	A	195	SER
1	A	227	PRO
1	A	302	GLU
1	A	312	GLU
1	B	2	LEU
1	B	3	LYS
1	B	6	LEU
1	B	98	ILE
1	B	129	SER
1	B	150	LEU
1	B	151	GLN
1	B	155	LEU
1	B	195	SER
1	B	312	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (11) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	9	HIS

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Mol	Chain	Res	Type
1	A	87	HIS
1	A	138	GLN
1	A	234	ASN
1	A	275	GLN
1	B	9	HIS
1	B	87	HIS
1	B	118	GLN
1	B	138	GLN
1	B	234	ASN
1	B	275	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 ⓘ

19 ligands are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
3	GOL	B	402	-	5,5,5	0.39	0	5,5,5	1.05	0
5	NCO	A	415	-	6,6,6	1.77	1 (16%)	-		
2	ROU	A	401	-	28,28,28	2.45	12 (42%)	41,43,43	1.75	6 (14%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	GOL	A	404	-	5,5,5	0.57	0	5,5,5	0.49	0
3	GOL	B	403	-	5,5,5	0.38	0	5,5,5	0.33	0
4	FMN	B	404	-	33,33,33	1.66	6 (18%)	48,50,50	1.39	7 (14%)
3	GOL	A	405	-	5,5,5	0.20	0	5,5,5	0.22	0
4	FMN	A	414	-	33,33,33	1.49	5 (15%)	48,50,50	1.23	4 (8%)
3	GOL	A	407	-	5,5,5	0.56	0	5,5,5	0.66	0
3	GOL	A	408	-	5,5,5	0.59	0	5,5,5	0.70	0
3	GOL	A	409	-	5,5,5	0.32	0	5,5,5	0.72	0
3	GOL	A	413	-	5,5,5	0.54	0	5,5,5	0.31	0
3	GOL	A	410	-	5,5,5	0.66	0	5,5,5	0.76	0
2	ROU	B	401	-	28,28,28	2.19	8 (28%)	41,43,43	1.74	7 (17%)
3	GOL	A	411	-	5,5,5	0.66	0	5,5,5	0.67	0
3	GOL	A	412	-	5,5,5	0.26	0	5,5,5	0.56	0
3	GOL	A	402	-	5,5,5	0.53	0	5,5,5	0.88	0
3	GOL	A	406	-	5,5,5	0.60	0	5,5,5	0.89	0
3	GOL	A	403	-	5,5,5	0.36	0	5,5,5	0.96	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	GOL	A	407	-	-	2/4/4/4	-
3	GOL	A	408	-	-	4/4/4/4	-
3	GOL	A	409	-	-	2/4/4/4	-
3	GOL	A	412	-	-	2/4/4/4	-
3	GOL	A	410	-	-	2/4/4/4	-
3	GOL	A	413	-	-	0/4/4/4	-
3	GOL	A	402	-	-	0/4/4/4	-
3	GOL	B	402	-	-	2/4/4/4	-
2	ROU	A	401	-	-	5/21/21/21	0/2/2/2
3	GOL	A	406	-	-	4/4/4/4	-
3	GOL	A	404	-	-	1/4/4/4	-
3	GOL	B	403	-	-	2/4/4/4	-
4	FMN	B	404	-	-	4/18/18/18	0/3/3/3
2	ROU	B	401	-	-	4/21/21/21	0/2/2/2
3	GOL	A	405	-	-	0/4/4/4	-
3	GOL	A	403	-	-	0/4/4/4	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	FMN	A	414	-	-	5/18/18/18	0/3/3/3
3	GOL	A	411	-	-	0/4/4/4	-

All (32) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	401	ROU	FAE-CAZ	-6.44	1.09	1.33
2	B	401	ROU	FAI-CBA	6.16	1.55	1.33
4	B	404	FMN	C9A-C5A	6.06	1.50	1.41
2	A	401	ROU	CAO-CAW	-5.40	1.37	1.51
4	A	414	FMN	C9A-C5A	4.73	1.48	1.41
2	A	401	ROU	CAN-CAS	-4.16	1.39	1.51
2	A	401	ROU	FAH-CBA	4.13	1.47	1.33
5	A	415	NCO	CO-N5	3.75	2.08	1.96
2	B	401	ROU	CAN-CAS	-3.65	1.41	1.51
2	A	401	ROU	CAV-CAR	-3.54	1.42	1.48
2	B	401	ROU	CAO-CAW	-3.53	1.42	1.51
4	B	404	FMN	C8-C7	3.44	1.49	1.40
2	B	401	ROU	CAV-CAR	-3.41	1.43	1.48
2	B	401	ROU	OAD-CAR	3.22	1.30	1.22
4	A	414	FMN	C8-C7	3.05	1.48	1.40
4	A	414	FMN	C2-N3	-2.84	1.32	1.39
2	B	401	ROU	FAJ-CBA	2.73	1.42	1.33
2	B	401	ROU	FAH-CBA	2.66	1.42	1.33
2	B	401	ROU	CBA-CAU	-2.53	1.44	1.49
2	A	401	ROU	FAJ-CBA	2.50	1.42	1.33
4	A	414	FMN	C4-N3	-2.48	1.34	1.38
4	A	414	FMN	C1'-C2'	-2.48	1.49	1.52
2	A	401	ROU	CAZ-CAT	-2.42	1.44	1.49
4	B	404	FMN	C5A-N5	-2.38	1.35	1.39
4	B	404	FMN	C4A-N5	2.34	1.35	1.30
2	A	401	ROU	FAF-CAZ	-2.26	1.24	1.33
4	B	404	FMN	C4-N3	-2.21	1.34	1.38
2	A	401	ROU	FAI-CBA	2.17	1.40	1.33
2	A	401	ROU	OAD-CAR	2.16	1.27	1.22
2	A	401	ROU	CBA-CAU	-2.13	1.45	1.49
4	B	404	FMN	C4A-C10	2.11	1.50	1.44
2	A	401	ROU	CAY-CAW	-2.02	1.41	1.44

All (24) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	401	ROU	CAO-CAW-CAY	6.81	125.77	116.64
2	B	401	ROU	CAO-CAW-CAY	5.54	124.06	116.64
2	B	401	ROU	CAW-CAY-NAQ	5.02	119.51	115.70
2	A	401	ROU	OAA-CAR-CAV	3.93	122.96	116.73
4	B	404	FMN	O2P-P-O5'	-3.72	96.98	106.67
2	A	401	ROU	CAW-CAY-NAQ	3.65	118.48	115.70
2	B	401	ROU	CAY-NAQ-CAX	-3.22	121.94	126.37
4	A	414	FMN	O4-C4-C4A	-2.88	118.92	126.53
2	B	401	ROU	FAJ-CBA-CAU	-2.85	106.80	112.90
2	A	401	ROU	CAY-NAQ-CAX	-2.79	122.53	126.37
4	B	404	FMN	O4-C4-C4A	-2.66	119.52	126.53
4	B	404	FMN	O3P-P-O2P	2.64	117.69	107.80
2	B	401	ROU	NAQ-CAX-NAP	2.63	119.87	115.74
2	A	401	ROU	OAD-CAR-CAV	-2.61	115.65	120.20
2	A	401	ROU	CAM-CAT-CAZ	2.51	122.88	119.57
4	B	404	FMN	C5A-C9A-N10	2.49	120.22	117.97
2	B	401	ROU	CAT-CAK-CAS	2.28	123.84	120.99
4	B	404	FMN	O4-C4-N3	2.27	124.38	120.11
2	B	401	ROU	CAM-CAT-CAZ	2.19	122.46	119.57
4	B	404	FMN	C1'-N10-C9A	2.10	124.71	120.63
4	B	404	FMN	O3'-C3'-C2'	-2.08	104.20	108.93
4	A	414	FMN	C4A-C10-N1	-2.08	119.50	124.59
4	A	414	FMN	O3P-P-O1P	2.07	118.91	110.83
4	A	414	FMN	O4'-C4'-C5'	-2.02	105.53	109.99

There are no chirality outliers.

All (39) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	401	ROU	OAA-CAR-CAV-NAP
2	A	401	ROU	CAS-CAN-CAO-CAW
2	B	401	ROU	OAA-CAR-CAV-NAP
3	A	406	GOL	O1-C1-C2-C3
3	A	406	GOL	C1-C2-C3-O3
3	A	406	GOL	O2-C2-C3-O3
3	A	408	GOL	O1-C1-C2-C3
3	A	408	GOL	C1-C2-C3-O3
3	A	409	GOL	C1-C2-C3-O3
3	A	410	GOL	O1-C1-C2-O2
3	A	410	GOL	O1-C1-C2-C3
3	A	412	GOL	O1-C1-C2-C3
3	B	402	GOL	O1-C1-C2-C3
3	B	403	GOL	C1-C2-C3-O3

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Mol	Chain	Res	Type	Atoms
3	A	409	GOL	O2-C2-C3-O3
4	B	404	FMN	O3'-C3'-C4'-O4'
2	B	401	ROU	CAS-CAN-CAO-CAW
3	A	412	GOL	O1-C1-C2-O2
3	B	402	GOL	O1-C1-C2-O2
3	B	403	GOL	O2-C2-C3-O3
4	B	404	FMN	C2'-C3'-C4'-O4'
3	A	408	GOL	O1-C1-C2-O2
3	A	408	GOL	O2-C2-C3-O3
3	A	406	GOL	O1-C1-C2-O2
3	A	407	GOL	O2-C2-C3-O3
4	A	414	FMN	O3'-C3'-C4'-C5'
3	A	407	GOL	O1-C1-C2-O2
4	B	404	FMN	O3'-C3'-C4'-C5'
2	A	401	ROU	OAA-CAR-CAV-CAW
2	A	401	ROU	OAD-CAR-CAV-CAW
4	B	404	FMN	C4'-C5'-O5'-P
3	A	404	GOL	O1-C1-C2-O2
4	A	414	FMN	C2'-C3'-C4'-C5'
4	A	414	FMN	C2'-C3'-C4'-O4'
4	A	414	FMN	C4'-C5'-O5'-P
4	A	414	FMN	O3'-C3'-C4'-O4'
2	B	401	ROU	OAA-CAR-CAV-CAW
2	A	401	ROU	OAD-CAR-CAV-NAP
2	B	401	ROU	OAD-CAR-CAV-NAP

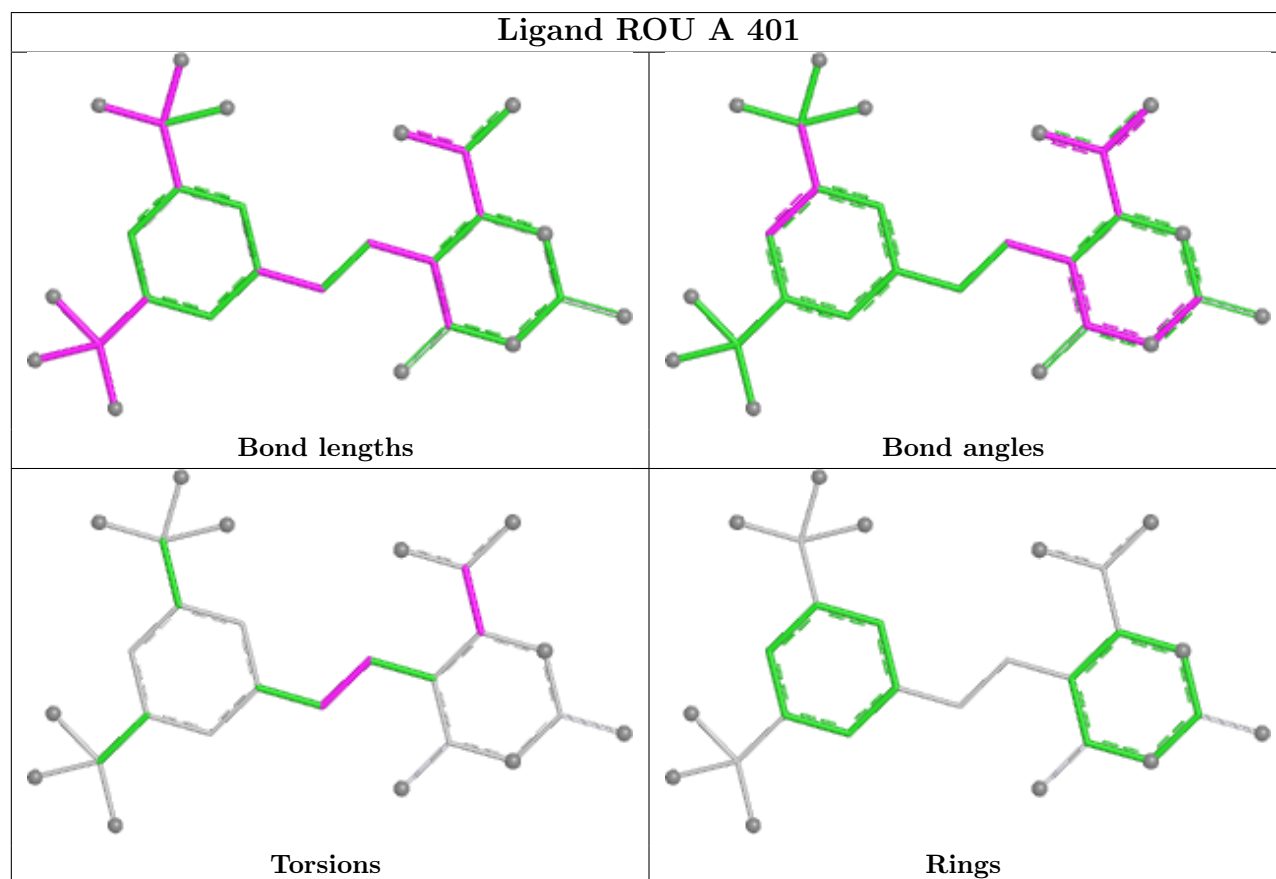
There are no ring outliers.

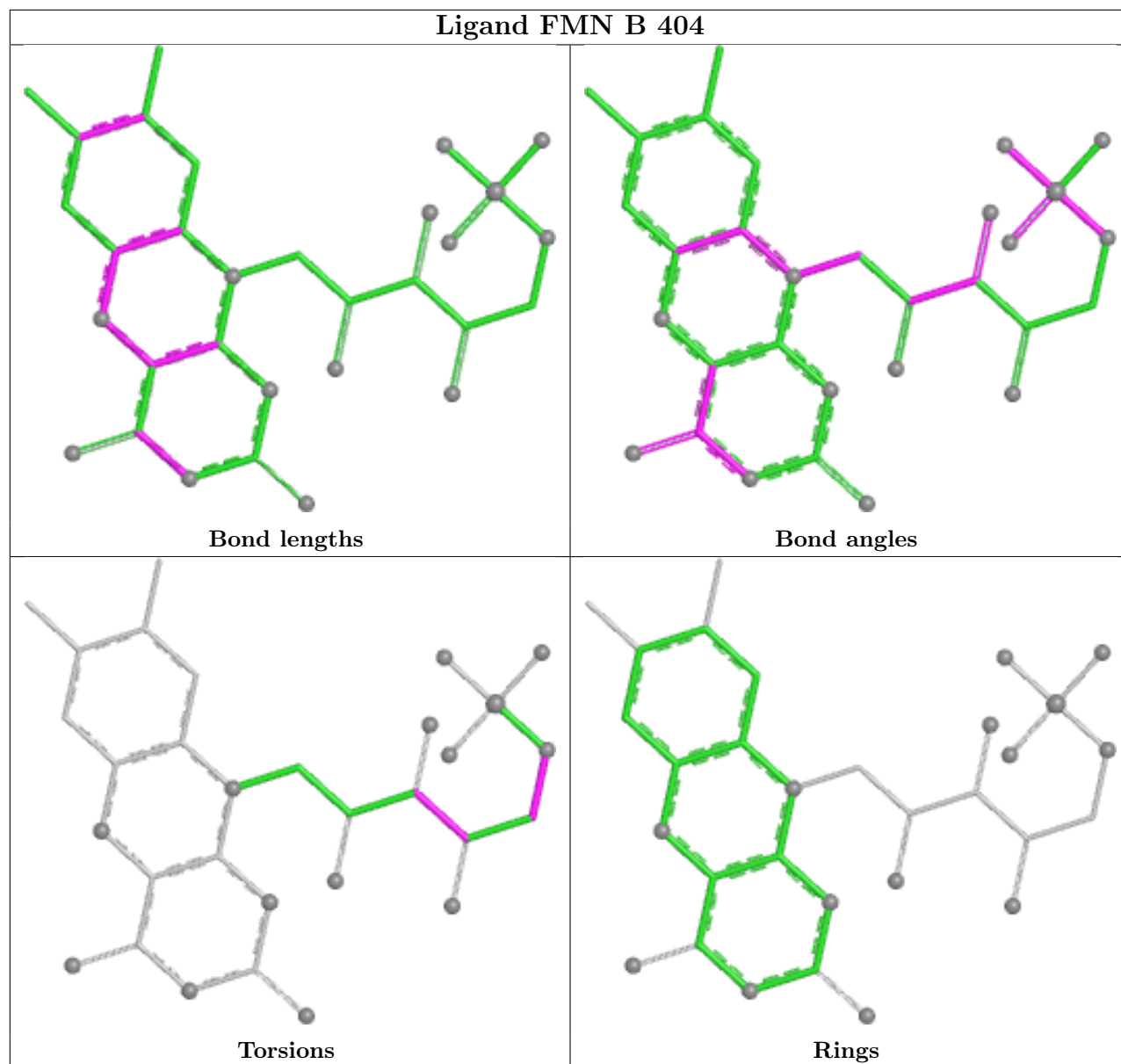
10 monomers are involved in 14 short contacts:

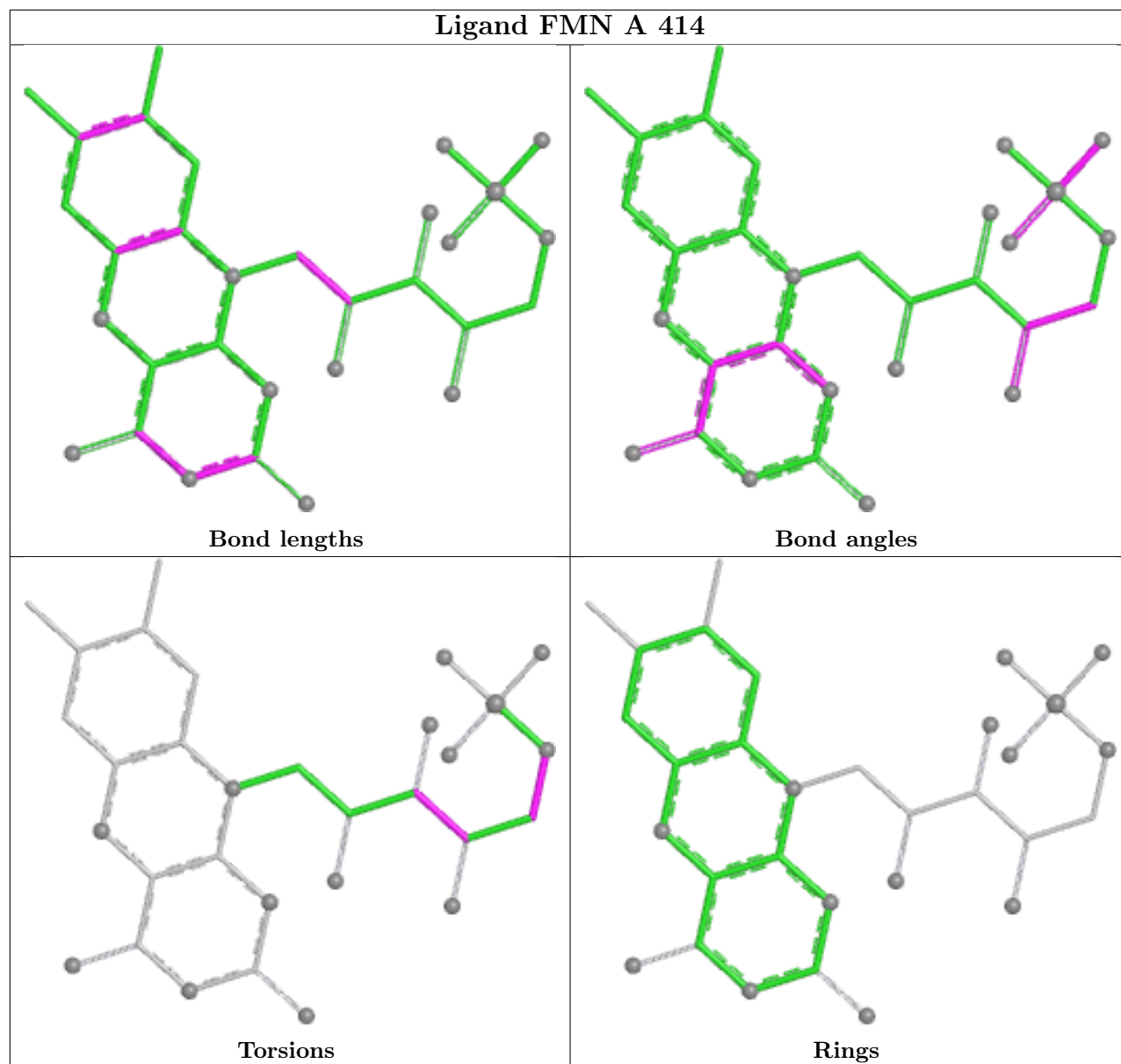
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	401	ROU	1	0
4	B	404	FMN	4	0
4	A	414	FMN	1	0
3	A	407	GOL	1	0
3	A	408	GOL	1	0
3	A	409	GOL	1	0
3	A	413	GOL	1	0
3	A	410	GOL	1	0
2	B	401	ROU	1	0
3	A	412	GOL	2	0

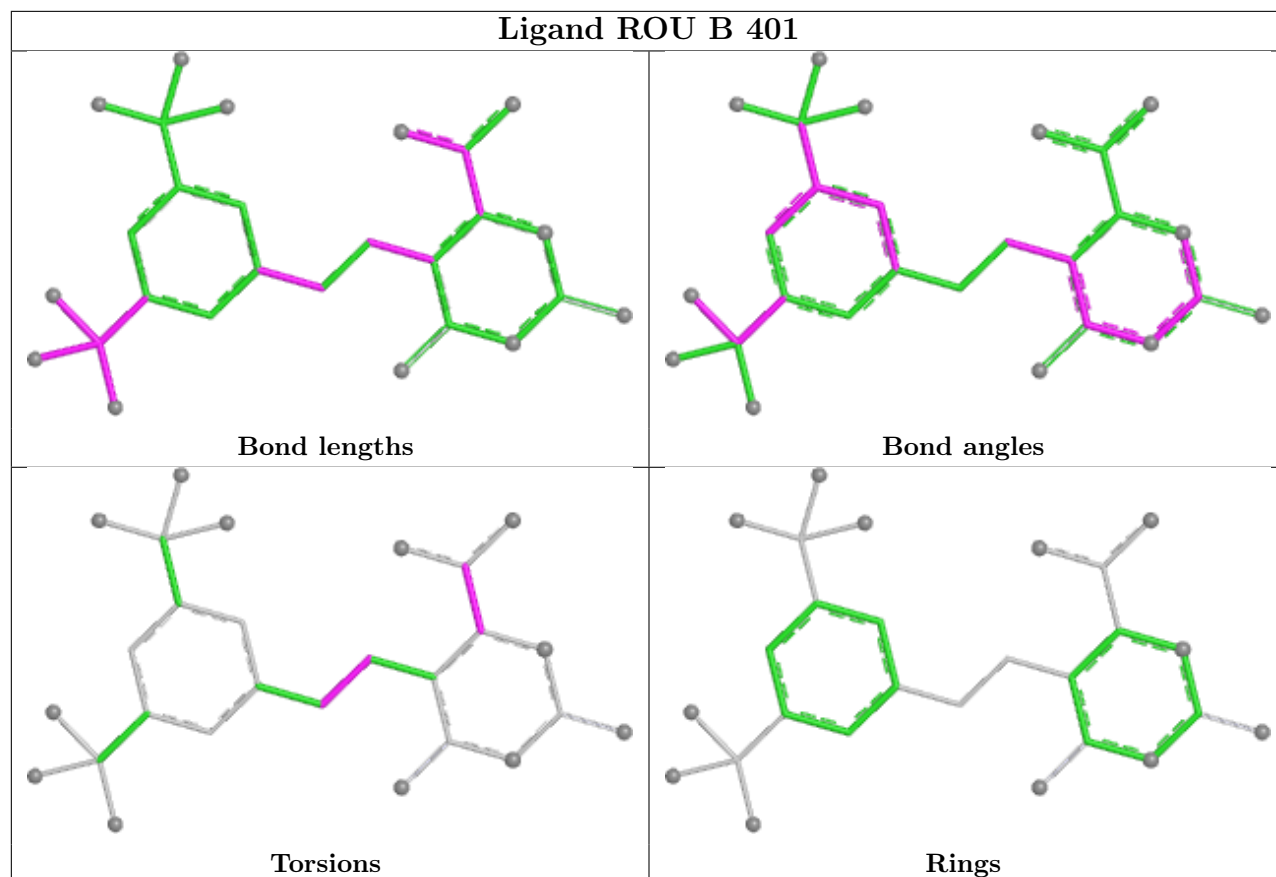
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths,

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 [i](#)

6.1 Protein, DNA and RNA chains [i](#)

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q < 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	313/313 (100%)	0.37	3 (0%) 79 81	10, 21, 36, 50	0
1	B	313/313 (100%)	0.46	10 (3%) 50 50	10, 21, 43, 67	0
All	All	626/626 (100%)	0.42	13 (2%) 63 64	10, 21, 38, 67	0

All (13) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	135	GLY	5.4
1	B	0	MET	4.3
1	B	132	ASN	3.6
1	A	130	CYS	3.3
1	A	129	SER	2.6
1	B	134	PRO	2.6
1	A	144	GLU	2.5
1	B	133	VAL	2.5
1	B	130	CYS	2.4
1	B	129	SER	2.2
1	B	119	GLU	2.1
1	B	122	VAL	2.1
1	B	155	LEU	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 oligosaccharides in this entry.

6.4 Ligands ⓘ

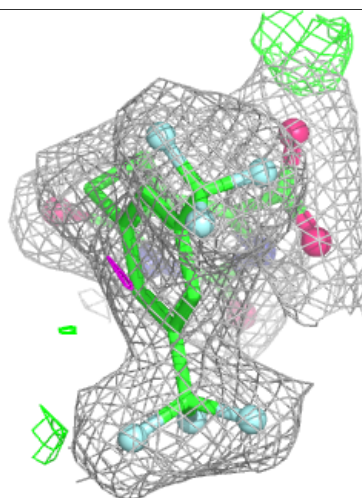
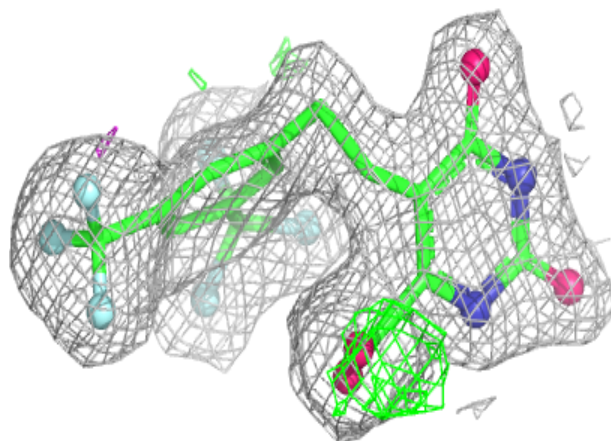
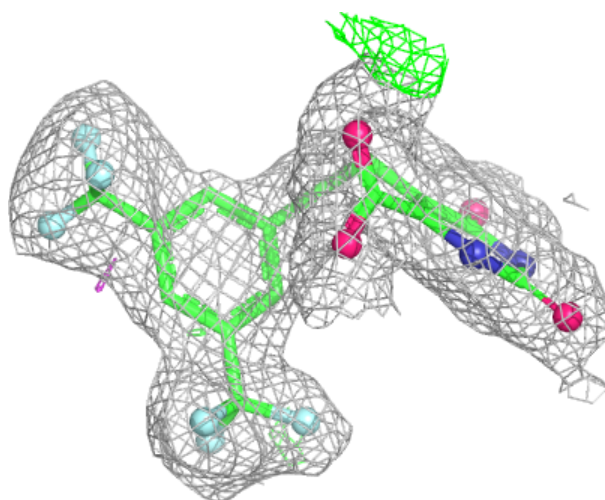
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q<0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
3	GOL	A	407	6/6	0.69	0.20	53,60,63,68	0
3	GOL	B	403	6/6	0.72	0.25	54,56,61,62	0
3	GOL	A	412	6/6	0.74	0.16	63,66,70,70	0
3	GOL	A	409	6/6	0.74	0.16	42,47,49,53	0
3	GOL	A	408	6/6	0.78	0.17	46,47,49,51	0
3	GOL	A	411	6/6	0.78	0.20	35,39,41,41	0
3	GOL	A	410	6/6	0.79	0.18	28,30,33,33	0
3	GOL	A	405	6/6	0.81	0.14	47,52,58,58	0
3	GOL	A	402	6/6	0.82	0.20	25,31,32,33	0
3	GOL	A	413	6/6	0.83	0.19	35,38,40,43	0
3	GOL	A	404	6/6	0.86	0.12	39,42,42,43	0
3	GOL	A	406	6/6	0.87	0.14	33,40,42,43	0
3	GOL	A	403	6/6	0.89	0.10	28,29,30,30	0
2	ROU	A	401	27/27	0.90	0.09	15,22,27,32	0
2	ROU	B	401	27/27	0.91	0.09	12,22,29,34	0
3	GOL	B	402	6/6	0.94	0.10	23,25,26,27	0
4	FMN	B	404	31/31	0.95	0.08	11,18,23,27	0
4	FMN	A	414	31/31	0.96	0.07	9,16,20,24	0
5	NCO	A	415	7/7	0.98	0.08	10,11,12,12	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.

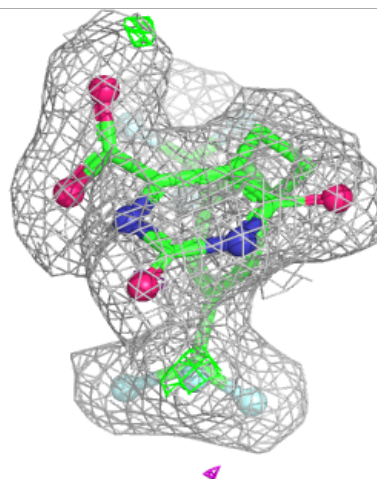
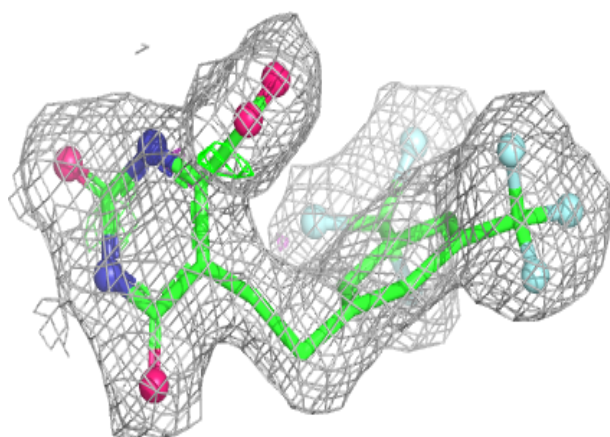
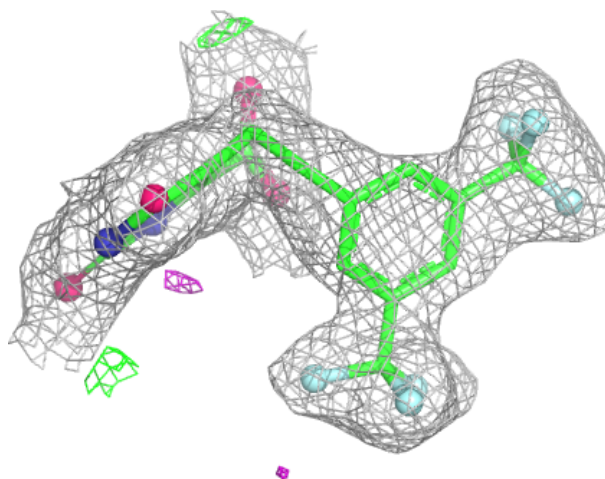
Electron density around ROU A 401:

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



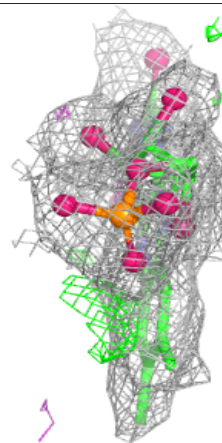
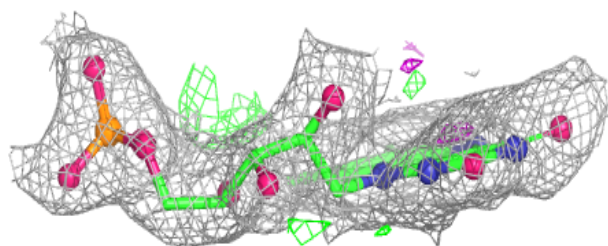
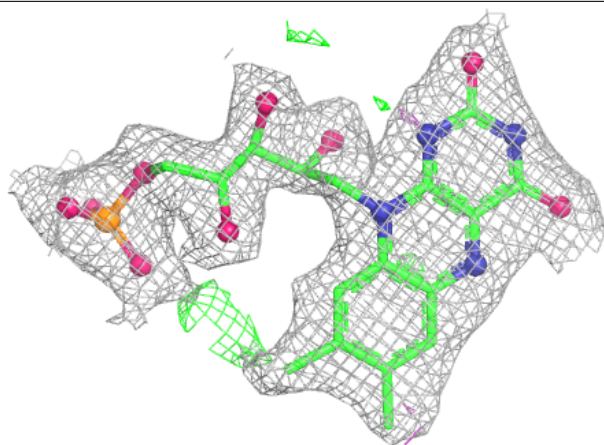
Electron density around ROU B 401:

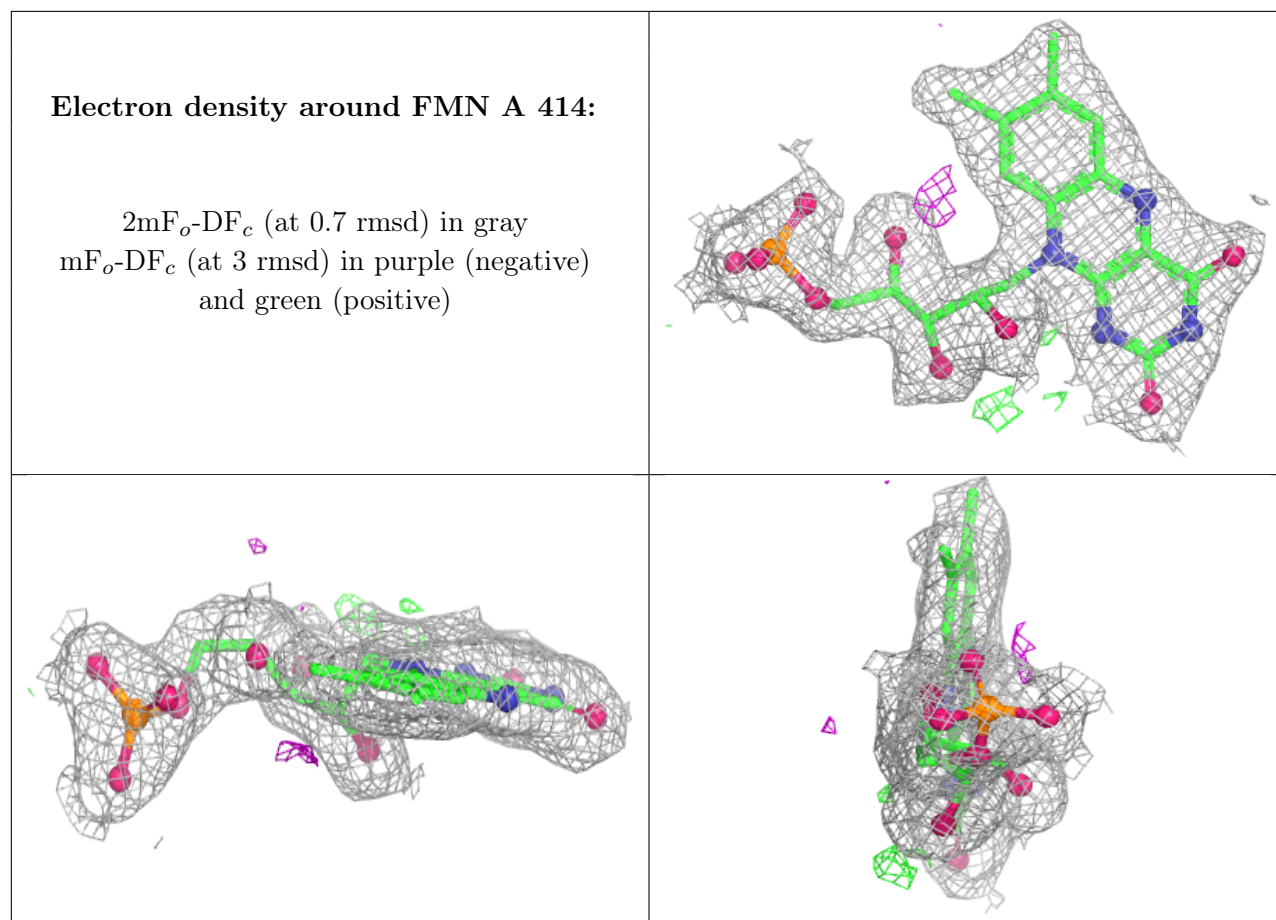
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around FMN B 404:

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





6.5 Other polymers ⓘ

There are no such residues in this entry.