



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 06:54 PM UTC

PDB ID : 1VRQ / pdb_00001vrq
Title : Crystal Structure of Heterotetrameric Sarcosine Oxidase from *Corynebacterium* sp. U-96 in complex with Folinic Acid
Authors : Ida, K.; Moriguchi, T.; Suzuki, H.
Deposited on : 2005-04-27
Resolution : 2.20 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

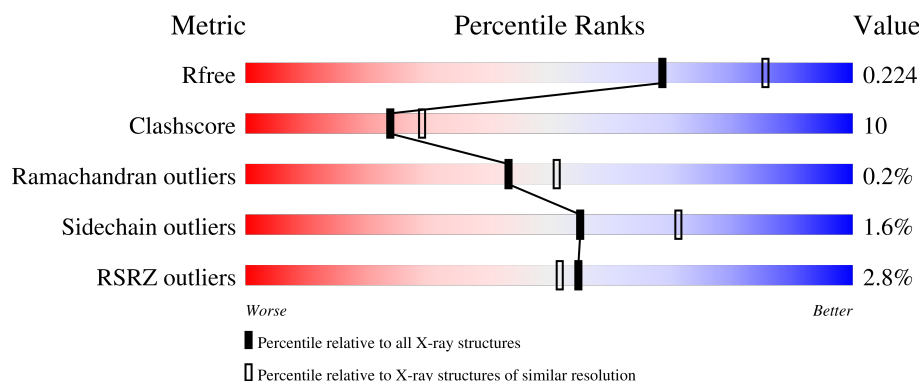
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

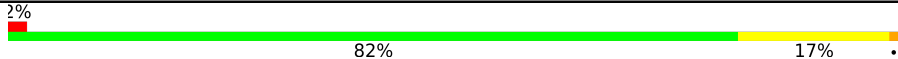
The reported resolution of this entry is 2.20 Å.

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	6164 (2.20-2.20)
Clashscore	190562	6851 (2.20-2.20)
Ramachandran outliers	187476	6768 (2.20-2.20)
Sidechain outliers	187428	6769 (2.20-2.20)
RSRZ outliers	180081	6166 (2.20-2.20)

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	964	
2	B	404	
3	C	206	
4	D	99	

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
10	DMG	B	1005	-	-	X	-
5	SO4	A	2002	-	-	X	-
9	FMN	B	1004	-	-	X	-

2 Entry composition

There are 12 unique types of molecules in this entry. The entry contains 13880 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 Sarcosine oxidase alpha subunit.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	963	Total	C	N	O	S	0	0	0
			7229	4507	1287	1413	22			

- Molecule 2 is a protein called Sarcosine oxidase beta subunit.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	402	Total	C	N	O	S	0	0	0
			3093	1972	537	574	10			

- Molecule 3 is a protein called Sarcosine oxidase gamma subunit.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	C	195	Total	C	N	O	S	0	0	0
			1433	902	257	271	3			

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	201	HIS	-	expression tag	UNP Q50LE9
C	202	HIS	-	expression tag	UNP Q50LE9
C	203	HIS	-	expression tag	UNP Q50LE9
C	204	HIS	-	expression tag	UNP Q50LE9
C	205	HIS	-	expression tag	UNP Q50LE9
C	206	HIS	-	expression tag	UNP Q50LE9

- Molecule 4 is a protein called Sarcosine oxidase delta subunit.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
4	D	91	Total	C	N	O	S	0	0	0
			749	476	135	133	5			

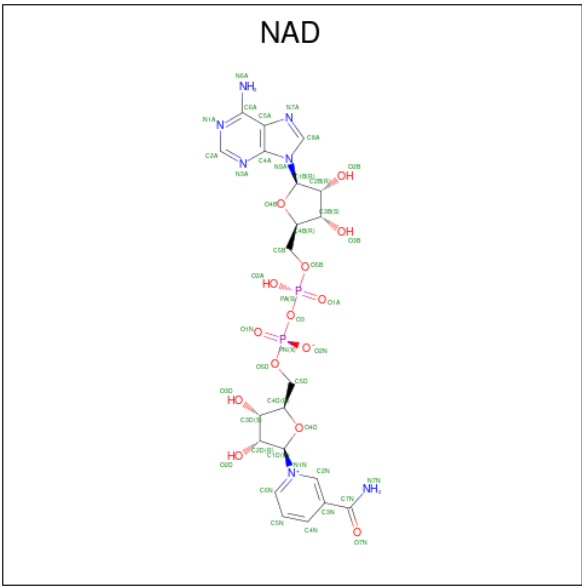
- Molecule 5 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total	O	S	0	0
			5	4	1		
5	A	1	Total	O	S	0	0
			5	4	1		
5	A	1	Total	O	S	0	0
			5	4	1		
5	A	1	Total	O	S	0	0
			5	4	1		
5	A	1	Total	O	S	0	0
			5	4	1		
5	A	1	Total	O	S	0	0
			5	4	1		
5	B	1	Total	O	S	0	0
			5	4	1		
5	B	1	Total	O	S	0	0
			5	4	1		
5	C	1	Total	O	S	0	0
			5	4	1		
5	D	1	Total	O	S	0	0
			5	4	1		
5	D	1	Total	O	S	0	0
			5	4	1		

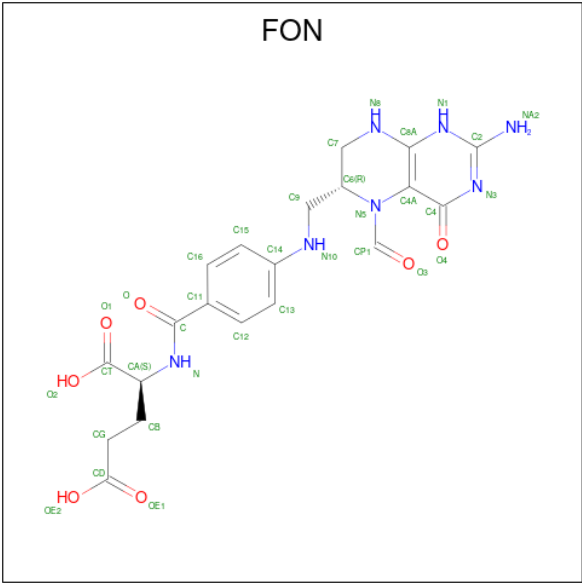
- Molecule 6 is NICOTINAMIDE-ADENINE-DINUCLEOTIDE (CCD ID: NAD) (formula:

C₂₁H₂₇N₇O₁₄P₂).



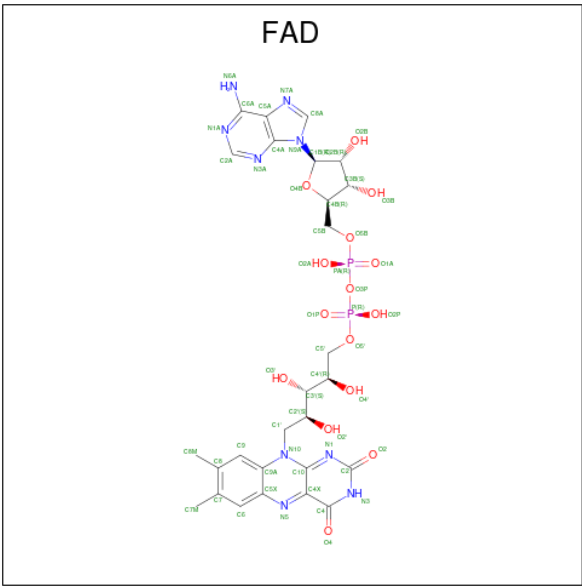
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
6	A	1	Total	C	N	O	P	0	0
			44	21	7	14	2		

- Molecule 7 is N-{[4-({[(6R)-2-amino-5-formyl-4-oxo-1,4,5,6,7,8-hexahydropteridin-6-yl]methyl}amino)phenyl]carbonyl}-L-glutamic acid (CCD ID: FON) (formula: C₂₀H₂₃N₇O₇).



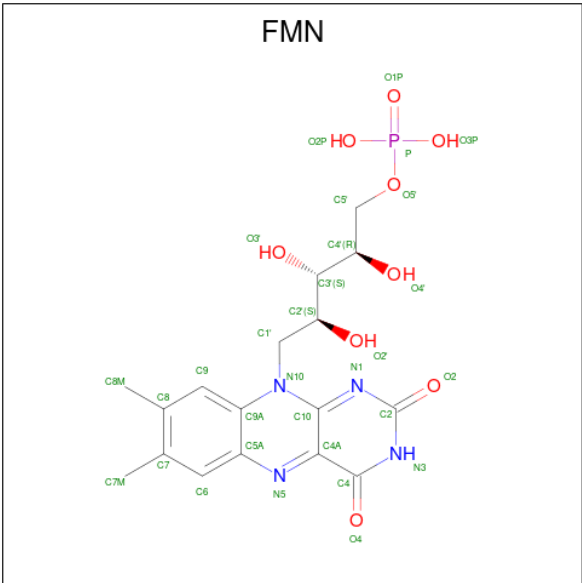
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
7	A	1	Total	C	N	O	0	0
			34	20	7	7		

- Molecule 8 is FLAVIN-ADENINE DINUCLEOTIDE (CCD ID: FAD) (formula: C₂₇H₃₃N₉O₁₅P₂).



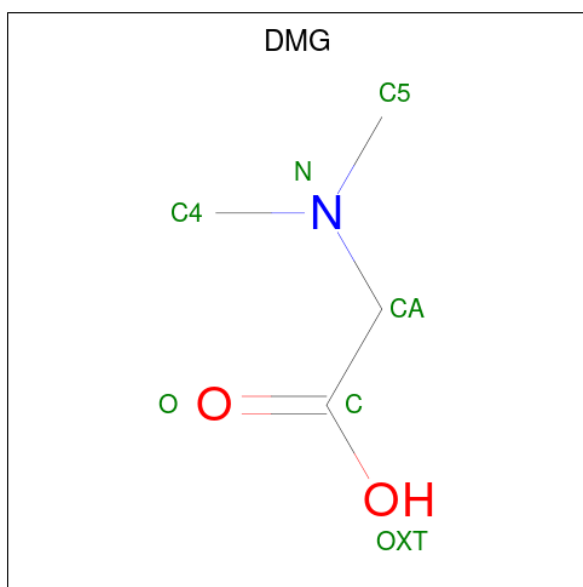
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
8	B	1	Total	C	N	O	P	0	0
			53	27	9	15	2		

- Molecule 9 is FLAVIN MONONUCLEOTIDE (CCD ID: FMN) (formula: C₁₇H₂₁N₄O₉P).



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

- Molecule 10 is N,N-DIMETHYLGLYCINE (CCD ID: DMG) (formula: C₄H₉NO₂).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
10	B	1	Total	C	N	O	0	0
			7	4	1	2		

- Molecule 11 is ZINC ION (CCD ID: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
11	D	1	Total	Zn	0	0
			1	1		

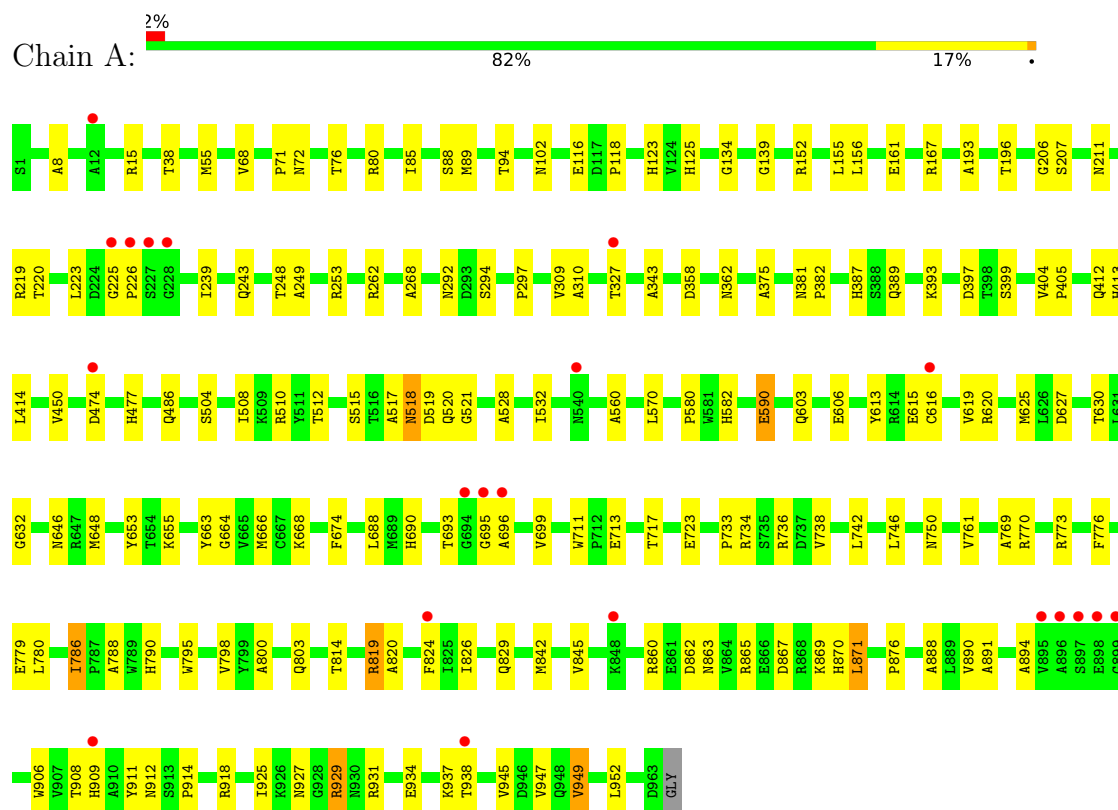
- Molecule 12 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
12	A	673	Total	O	0	0
			673	673		
12	B	229	Total	O	0	0
			229	229		
12	C	147	Total	O	0	0
			147	147		
12	D	92	Total	O	0	0
			92	92		

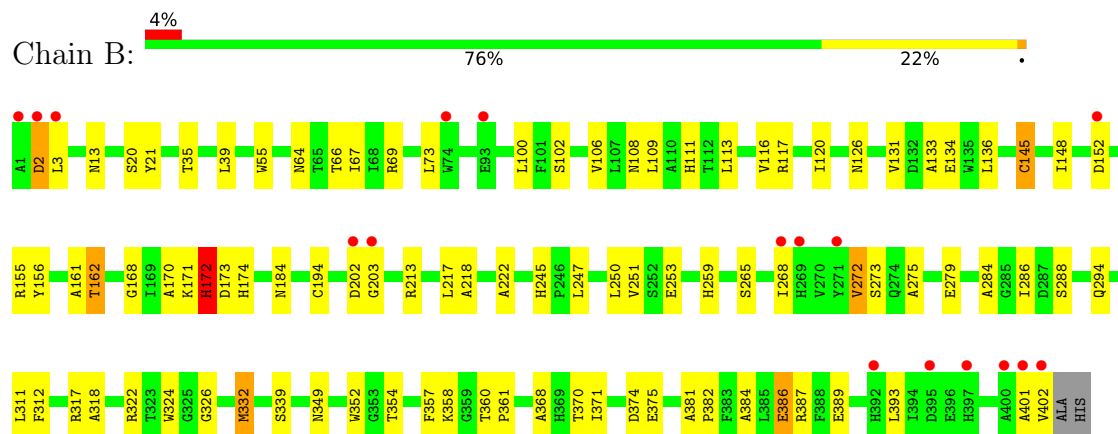
3 Residue-property plots

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.

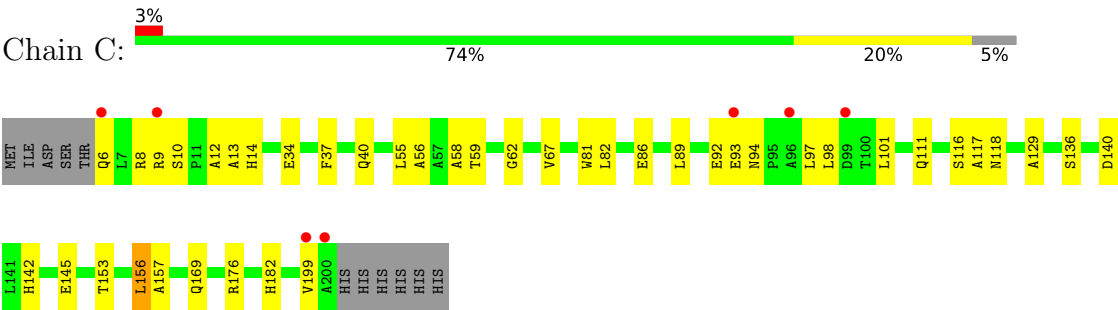
• Molecule 1: Sarcosine oxidase alpha subunit



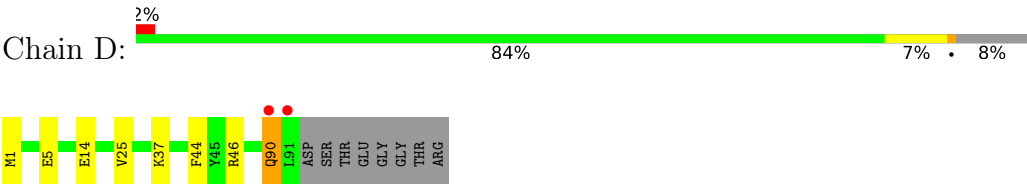
• Molecule 2: Sarcosine oxidase beta subunit



• Molecule 3: Sarcosine oxidase gamma subunit



• Molecule 4: Sarcosine oxidase delta subunit



4 Data and refinement statistics

Property	Value	Source
Space group	P 65 2 2	Depositor
Cell constants a, b, c, α , β , γ	199.40Å 199.40Å 197.31Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	99.50 – 2.20 99.50 – 2.20	Depositor EDS
% Data completeness (in resolution range)	(Not available) (99.50-2.20) 100.0 (99.50-2.20)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	8.04 (at 2.20Å)	Xtriage
Refinement program	CNS	Depositor
R, R_{free}	0.192 , 0.224 0.192 , 0.224	Depositor DCC
R_{free} test set	11676 reflections (10.01%)	wwPDB-VP
Wilson B-factor (Å ²)	25.1	Xtriage
Anisotropy	0.468	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 44.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	13880	wwPDB-VP
Average B, all atoms (Å ²)	27.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.45% 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: NAD, ZN, FMN, SO4, DMG, FON, FAD

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	0.44	0/7361	0.85	7/10017 (0.1%)
2	B	0.43	0/3173	0.89	13/4318 (0.3%)
3	C	0.44	0/1461	0.85	1/1998 (0.1%)
4	D	0.40	0/772	0.84	0/1040
All	All	0.43	0/12767	0.86	21/17373 (0.1%)

There are no bond length outliers.

All (21) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	450	VAL	N-CA-C	10.58	118.45	107.76
2	B	318	ALA	N-CA-C	-9.63	96.23	110.48
2	B	259	HIS	CA-C-N	6.75	126.38	119.56
2	B	259	HIS	C-N-CA	6.75	126.38	119.56
2	B	202	ASP	N-CA-C	-6.50	105.64	113.97
2	B	3	LEU	N-CA-C	-6.42	105.02	112.92
2	B	73	LEU	N-CA-C	6.32	118.04	111.03
1	A	38	THR	N-CA-C	-6.17	101.07	110.14
1	A	55	MET	N-CA-C	6.16	117.99	111.28
2	B	374	ASP	N-CA-C	-5.72	104.92	112.24
3	C	153	THR	N-CA-C	-5.64	101.29	110.20
1	A	450	VAL	O-C-N	-5.53	116.76	121.57
2	B	145	CYS	CA-C-N	5.53	125.36	119.28
2	B	145	CYS	C-N-CA	5.53	125.36	119.28
2	B	172	HIS	N-CA-C	5.42	117.62	111.11
2	B	162	THR	N-CA-C	-5.36	103.32	110.55
1	A	239	ILE	N-CA-C	5.26	115.44	107.75
2	B	288	SER	N-CA-C	5.21	117.64	111.33
1	A	219	ARG	N-CA-C	5.15	117.68	111.40
1	A	72	ASN	N-CA-C	5.05	119.40	112.68

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	272	VAL	N-CA-C	5.04	115.63	108.42

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	7229	0	7104	154	0
2	B	3093	0	3023	73	0
3	C	1433	0	1434	28	0
4	D	749	0	706	6	0
5	A	40	0	0	4	0
5	B	10	0	0	0	0
5	C	5	0	0	0	0
5	D	10	0	0	0	0
6	A	44	0	26	5	0
7	A	34	0	21	7	0
8	B	53	0	31	6	0
9	B	31	0	19	12	0
10	B	7	0	8	7	0
11	D	1	0	0	0	0
12	A	673	0	0	14	0
12	B	229	0	0	5	0
12	C	147	0	0	1	0
12	D	92	0	0	1	0
All	All	13880	0	12372	254	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 10.

All (254) 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:B:172:HIS:HE2	9:B:1004:FMN:C8M	1.63	1.09

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
10:B:1005:DMG:H43	10:B:1005:DMG:O	1.53	1.04
2:B:172:HIS:NE2	9:B:1004:FMN:HM83	1.82	0.94
2:B:172:HIS:HE2	9:B:1004:FMN:HM83	1.30	0.94
1:A:819:ARG:HG2	1:A:824:PHE:HB2	1.50	0.91
1:A:824:PHE:HE1	7:A:1003:FON:HG1	1.39	0.88
1:A:646:ASN:HD21	1:A:653:TYR:H	1.22	0.87
2:B:67:ILE:HD12	10:B:1005:DMG:C4	2.06	0.85
1:A:860:ARG:HH21	1:A:863:ASN:HD21	1.24	0.83
1:A:510:ARG:HH21	9:B:1004:FMN:H5'2	1.43	0.83
2:B:268:ILE:HD11	2:B:311:LEU:HD22	1.59	0.82
10:B:1005:DMG:O	10:B:1005:DMG:C4	2.29	0.81
2:B:349:ASN:HD21	2:B:352:TRP:HE1	1.30	0.80
2:B:172:HIS:NE2	9:B:1004:FMN:C8M	2.41	0.79
1:A:85:ILE:HD11	2:B:317:ARG:HG3	1.65	0.78
1:A:15:ARG:HD3	1:A:161:GLU:OE2	1.83	0.77
2:B:100:LEU:HD12	2:B:171:LYS:HD2	1.70	0.73
1:A:769:ALA:HB2	1:A:786:ILE:HG22	1.69	0.73
2:B:172:HIS:CD2	9:B:1004:FMN:HM83	2.23	0.73
1:A:520:GLN:HE22	2:B:322:ARG:HD2	1.54	0.73
1:A:249:ALA:HB1	12:A:3005:HOH:O	1.89	0.72
1:A:253:ARG:HG2	12:A:4102:HOH:O	1.89	0.72
1:A:510:ARG:NH2	9:B:1004:FMN:H5'2	2.04	0.72
1:A:15:ARG:HD2	1:A:167:ARG:HD2	1.72	0.71
1:A:690:HIS:CD2	7:A:1003:FON:HN21	2.08	0.71
1:A:226:PRO:HB2	12:A:3369:HOH:O	1.90	0.70
2:B:67:ILE:HD12	10:B:1005:DMG:H41	1.72	0.70
1:A:776:PHE:CZ	1:A:819:ARG:HG3	2.26	0.70
2:B:339:SER:HB3	2:B:384:ALA:HA	1.75	0.69
1:A:842:MET:O	1:A:845:VAL:HG12	1.93	0.69
2:B:245:HIS:HB2	2:B:286:ILE:HD11	1.74	0.69
3:C:37:PHE:O	3:C:93:GLU:HG2	1.93	0.68
1:A:690:HIS:HB3	7:A:1003:FON:HN1	1.58	0.68
1:A:211:ASN:ND2	1:A:412:GLN:HE21	1.93	0.67
1:A:824:PHE:CE1	7:A:1003:FON:HG1	2.27	0.66
1:A:888:ALA:O	1:A:938:THR:HG23	1.95	0.66
1:A:632:GLY:HA3	1:A:696:ALA:HB2	1.78	0.65
1:A:736:ARG:HB2	1:A:780:LEU:HD21	1.78	0.65
2:B:339:SER:HB2	12:B:4081:HOH:O	1.96	0.64
1:A:860:ARG:NH2	1:A:863:ASN:HD21	1.95	0.64
1:A:512:THR:HA	5:A:2011:SO4:O4	1.97	0.63
1:A:249:ALA:HB2	6:A:1002:NAD:O3	1.98	0.63

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:360:THR:HB	2:B:361:PRO:HD3	1.81	0.63
2:B:294:GLN:HE21	2:B:326:GLY:HA2	1.62	0.62
1:A:750:ASN:HD22	1:A:773:ARG:HH12	1.47	0.61
1:A:206:GLY:HA2	1:A:389:GLN:HE22	1.64	0.61
1:A:891:ALA:HB3	1:A:894:ALA:HB2	1.81	0.61
3:C:176:ARG:HD3	12:C:3421:HOH:O	2.01	0.60
2:B:172:HIS:ND1	2:B:173:ASP:N	2.49	0.59
1:A:717:THR:HG22	3:C:111:GLN:HE21	1.68	0.59
1:A:819:ARG:NH1	1:A:909:HIS:ND1	2.50	0.59
1:A:223:LEU:CD1	1:A:226:PRO:HB3	2.32	0.59
1:A:249:ALA:HB2	6:A:1002:NAD:PA	2.42	0.59
1:A:688:LEU:HD22	1:A:770:ARG:HH21	1.68	0.59
1:A:742:LEU:HD21	1:A:798:VAL:HG22	1.84	0.59
2:B:172:HIS:HE2	9:B:1004:FMN:HM81	1.63	0.59
2:B:386:GLU:CD	2:B:386:GLU:H	2.09	0.59
3:C:136:SER:OG	3:C:156:LEU:HD22	2.02	0.59
1:A:207:SER:H	1:A:389:GLN:NE2	2.01	0.57
1:A:8:ALA:N	5:A:2013:SO4:O3	2.29	0.57
1:A:788:ALA:HB3	3:C:117:ALA:HB1	1.87	0.57
2:B:284:ALA:O	2:B:402:VAL:HG12	2.05	0.57
1:A:504:SER:O	1:A:508:ILE:HG12	2.04	0.57
2:B:349:ASN:ND2	2:B:352:TRP:HE1	2.00	0.57
3:C:82:LEU:HB2	3:C:86:GLU:HG2	1.87	0.56
1:A:696:ALA:HB3	5:A:2002:SO4:O1	2.06	0.56
1:A:829:GLN:HG3	2:B:117:ARG:NE	2.20	0.56
1:A:292:ASN:ND2	1:A:294:SER:H	2.04	0.55
1:A:253:ARG:HH11	1:A:381:ASN:HD21	1.54	0.54
1:A:750:ASN:ND2	1:A:773:ARG:HH12	2.05	0.54
2:B:247:LEU:HD22	2:B:354:THR:HG22	1.89	0.54
1:A:223:LEU:HD12	1:A:226:PRO:HB3	1.88	0.54
1:A:648:MET:HB3	1:A:666:MET:HE3	1.90	0.54
1:A:776:PHE:CE2	1:A:819:ARG:HG3	2.42	0.54
1:A:125:HIS:HD2	12:A:3262:HOH:O	1.90	0.53
1:A:695:GLY:O	1:A:699:VAL:HG23	2.08	0.53
1:A:663:TYR:CD1	7:A:1003:FON:C15	2.92	0.53
2:B:64:ASN:HA	8:B:1001:FAD:C6	2.37	0.53
1:A:613:TYR:CE1	1:A:914:PRO:HG3	2.44	0.53
1:A:123:HIS:HE1	1:A:560:ALA:O	1.91	0.53
2:B:265:SER:OG	2:B:268:ILE:HG12	2.07	0.53
1:A:226:PRO:C	12:A:3977:HOH:O	2.51	0.53
1:A:696:ALA:HB3	5:A:2002:SO4:S	2.49	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:152:ARG:HD3	3:C:142:HIS:CD2	2.44	0.52
1:A:914:PRO:HD2	12:A:3717:HOH:O	2.09	0.52
2:B:171:LYS:HE2	2:B:174:HIS:CD2	2.44	0.52
1:A:486:GLN:NE2	1:A:518:ASN:H	2.08	0.52
1:A:786:ILE:HD13	1:A:786:ILE:H	1.75	0.52
1:A:211:ASN:HD21	1:A:412:GLN:HE21	1.58	0.52
1:A:819:ARG:NH2	1:A:909:HIS:CE1	2.78	0.51
8:B:1001:FAD:N5	10:B:1005:DMG:H53	2.25	0.51
8:B:1001:FAD:C4	10:B:1005:DMG:HA2	2.41	0.51
1:A:938:THR:HG22	12:A:3477:HOH:O	2.10	0.51
3:C:12:ALA:HB3	3:C:34:GLU:CD	2.35	0.51
3:C:9:ARG:NH2	3:C:14:HIS:HB3	2.26	0.51
2:B:172:HIS:HE2	9:B:1004:FMN:C8	2.21	0.51
2:B:332:MET:HA	2:B:332:MET:HE2	1.93	0.51
8:B:1001:FAD:O4	10:B:1005:DMG:H42	2.10	0.51
3:C:40:GLN:HB2	3:C:116:SER:HA	1.91	0.51
1:A:262:ARG:HD3	1:A:343:ALA:HB2	1.91	0.51
1:A:625:MET:HE2	1:A:795:TRP:CE2	2.45	0.51
2:B:2:ASP:HA	12:B:3755:HOH:O	2.12	0.50
1:A:358:ASP:OD2	1:A:362:ASN:HB2	2.11	0.50
1:A:688:LEU:HD22	1:A:770:ARG:NH2	2.27	0.50
1:A:517:ALA:HB3	1:A:519:ASP:OD1	2.12	0.50
2:B:152:ASP:HB2	12:B:3319:HOH:O	2.12	0.50
1:A:909:HIS:HB3	1:A:911:TYR:CE1	2.47	0.50
2:B:194:CYS:HB2	2:B:213:ARG:HD3	1.93	0.50
1:A:80:ARG:NH2	12:A:4067:HOH:O	2.38	0.49
1:A:870:HIS:CE1	1:A:929:ARG:HH12	2.29	0.49
1:A:253:ARG:HH11	1:A:381:ASN:ND2	2.10	0.49
1:A:776:PHE:O	1:A:819:ARG:HB2	2.12	0.49
1:A:603:GLN:O	1:A:606:GLU:HG3	2.12	0.49
1:A:616:CYS:SG	1:A:914:PRO:HG2	2.52	0.49
1:A:613:TYR:CD1	1:A:914:PRO:HG3	2.46	0.49
1:A:116:GLU:O	1:A:118:PRO:HD3	2.12	0.49
2:B:111:HIS:HD2	2:B:156:TYR:O	1.96	0.49
2:B:389:GLU:HG3	4:D:37:LYS:HA	1.94	0.49
3:C:55:LEU:O	3:C:59:THR:HG23	2.13	0.48
1:A:620:ARG:NH1	1:A:779:GLU:HG2	2.28	0.48
1:A:829:GLN:CD	1:A:909:HIS:CE1	2.92	0.48
1:A:243:GLN:OE1	1:A:413:HIS:HE1	1.95	0.48
1:A:486:GLN:NE2	1:A:517:ALA:HB1	2.29	0.48
1:A:912:ASN:O	1:A:914:PRO:HD3	2.14	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:C:10:SER:OG	3:C:13:ALA:HB2	2.14	0.48
1:A:790:HIS:CE1	3:C:8:ARG:HB3	2.49	0.48
2:B:148:ILE:HG12	2:B:312:PHE:CE1	2.48	0.48
2:B:370:THR:HA	2:B:375:GLU:O	2.13	0.48
1:A:292:ASN:HD22	1:A:294:SER:H	1.61	0.48
1:A:582:HIS:HE1	1:A:627:ASP:OD2	1.98	0.47
1:A:397:ASP:OD1	1:A:399:SER:HB3	2.13	0.47
1:A:929:ARG:HB2	1:A:929:ARG:HH11	1.79	0.47
4:D:1:MET:SD	4:D:14:GLU:HG2	2.54	0.47
1:A:220:THR:HB	1:A:223:LEU:HD12	1.96	0.47
1:A:819:ARG:NH1	1:A:820:ALA:HB2	2.30	0.47
1:A:663:TYR:CE1	7:A:1003:FON:C15	2.98	0.47
2:B:13:ASN:H	2:B:184:ASN:ND2	2.13	0.47
1:A:89:MET:HG3	2:B:253:GLU:HG3	1.96	0.47
2:B:39:LEU:HD13	2:B:368:ALA:HA	1.96	0.46
1:A:616:CYS:HB3	1:A:814:THR:HG23	1.97	0.46
1:A:15:ARG:CD	1:A:161:GLU:OE2	2.58	0.46
1:A:474:ASP:HB3	1:A:477:HIS:CD2	2.51	0.46
3:C:67:VAL:HA	3:C:81:TRP:CE3	2.51	0.46
1:A:387:HIS:HE1	1:A:393:LYS:O	1.99	0.46
2:B:55:TRP:CD1	2:B:55:TRP:H	2.33	0.46
2:B:64:ASN:HA	8:B:1001:FAD:C5X	2.46	0.46
3:C:58:ALA:HB3	3:C:101:LEU:HD23	1.98	0.46
1:A:248:THR:O	1:A:249:ALA:HB3	2.15	0.46
1:A:292:ASN:ND2	1:A:294:SER:HB3	2.31	0.46
1:A:663:TYR:CE1	7:A:1003:FON:H15	2.51	0.45
1:A:249:ALA:HB2	6:A:1002:NAD:H51A	1.99	0.45
9:B:1004:FMN:N1	9:B:1004:FMN:O2'	2.49	0.45
3:C:92:GLU:O	3:C:93:GLU:C	2.58	0.45
1:A:249:ALA:CB	6:A:1002:NAD:O2A	2.65	0.45
1:A:829:GLN:NE2	1:A:909:HIS:CE1	2.85	0.45
1:A:869:LYS:HA	1:A:925:ILE:O	2.16	0.45
1:A:927:ASN:HB3	1:A:931:ARG:HD2	1.99	0.45
2:B:20:SER:HB3	2:B:217:LEU:HB2	1.98	0.45
1:A:510:ARG:HH21	9:B:1004:FMN:C5'	2.22	0.45
1:A:819:ARG:HH22	1:A:909:HIS:CE1	2.35	0.45
2:B:102:SER:O	2:B:168:GLY:HA3	2.17	0.45
2:B:251:VAL:HG13	2:B:324:TRP:CH2	2.52	0.45
3:C:140:ASP:OD2	3:C:145:GLU:HG3	2.17	0.45
1:A:193:ALA:HB3	1:A:196:THR:HB	1.98	0.45
1:A:309:VAL:O	1:A:310:ALA:HB2	2.17	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:580:PRO:HG2	3:C:9:ARG:HH12	1.82	0.45
1:A:934:GLU:O	1:A:949:VAL:HG12	2.17	0.45
1:A:382:PRO:HG2	1:A:404:VAL:HG12	1.99	0.44
1:A:646:ASN:ND2	1:A:653:TYR:H	2.02	0.44
1:A:733:PRO:HB2	1:A:734:ARG:HH12	1.81	0.44
2:B:381:ALA:HB3	2:B:382:PRO:HD3	1.99	0.44
1:A:76:THR:HA	1:A:88:SER:HA	1.99	0.44
1:A:223:LEU:HB2	1:A:226:PRO:HD3	2.00	0.44
1:A:405:PRO:HB2	1:A:414:LEU:HD13	2.00	0.44
1:A:292:ASN:HD21	1:A:294:SER:CB	2.30	0.44
9:B:1004:FMN:H9	9:B:1004:FMN:H1'2	1.77	0.44
3:C:6:GLN:C	3:C:8:ARG:H	2.25	0.44
1:A:648:MET:HE3	1:A:711:TRP:HZ3	1.82	0.44
2:B:145:CYS:SG	2:B:148:ILE:HG13	2.57	0.44
1:A:653:TYR:OH	1:A:664:GLY:HA3	2.18	0.44
2:B:109:LEU:HA	2:B:161:ALA:HB2	2.00	0.44
1:A:253:ARG:CG	12:A:4102:HOH:O	2.59	0.44
1:A:570:LEU:HD23	2:B:155:ARG:HB3	1.99	0.44
1:A:937:LYS:HA	1:A:945:VAL:O	2.18	0.44
2:B:250:LEU:HD12	2:B:250:LEU:C	2.43	0.44
3:C:157:ALA:O	3:C:182:HIS:HE1	2.00	0.44
2:B:332:MET:HG3	4:D:44:PHE:HB3	1.99	0.43
1:A:155:LEU:C	1:A:156:LEU:HD12	2.43	0.43
1:A:528:ALA:O	1:A:532:ILE:HG13	2.18	0.43
1:A:713:GLU:CD	1:A:713:GLU:H	2.26	0.43
2:B:357:PHE:HB3	8:B:1001:FAD:C2	2.49	0.43
4:D:25:VAL:HG11	4:D:46:ARG:CZ	2.49	0.43
1:A:800:ALA:HA	1:A:803:GLN:HG2	2.01	0.43
2:B:69:ARG:HG2	2:B:358:LYS:HE2	2.01	0.43
1:A:615:GLU:O	1:A:619:VAL:HG23	2.18	0.43
2:B:13:ASN:H	2:B:184:ASN:HD21	1.67	0.43
2:B:35:THR:O	2:B:39:LEU:HB2	2.18	0.43
2:B:294:GLN:NE2	2:B:326:GLY:HA2	2.31	0.43
2:B:354:THR:HG21	2:B:402:VAL:CG2	2.48	0.43
1:A:723:GLU:HB2	3:C:118:ASN:OD1	2.19	0.43
2:B:116:VAL:O	2:B:120:ILE:HG12	2.18	0.43
3:C:56:ALA:O	3:C:62:GLY:HA2	2.19	0.43
1:A:68:VAL:HG12	1:A:94:THR:HG21	1.99	0.43
1:A:225:GLY:HA2	12:A:3423:HOH:O	2.18	0.43
1:A:906:TRP:CH2	1:A:908:THR:HG22	2.53	0.43
2:B:108:ASN:HB2	2:B:162:THR:OG1	2.19	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:C:40:GLN:HA	3:C:89:LEU:O	2.19	0.43
3:C:129:ALA:HB3	3:C:169:GLN:HG3	2.01	0.43
1:A:668:LYS:HE2	1:A:674:PHE:CD1	2.54	0.42
1:A:776:PHE:C	1:A:824:PHE:CE2	2.97	0.42
1:A:294:SER:O	1:A:297:PRO:HD2	2.19	0.42
2:B:251:VAL:HG13	2:B:324:TRP:HH2	1.84	0.42
1:A:223:LEU:HD13	1:A:226:PRO:HB3	2.00	0.42
3:C:9:ARG:HH21	3:C:14:HIS:HB3	1.84	0.42
4:D:5:GLU:HG2	12:D:3798:HOH:O	2.19	0.42
1:A:786:ILE:HD13	1:A:786:ILE:N	2.34	0.42
1:A:918:ARG:HG3	1:A:918:ARG:HH11	1.84	0.42
4:D:90:GLN:H	4:D:90:GLN:NE2	2.17	0.42
1:A:226:PRO:HD2	12:A:3423:HOH:O	2.18	0.42
2:B:381:ALA:N	2:B:382:PRO:CD	2.82	0.42
3:C:89:LEU:HD21	3:C:97:LEU:HD23	2.02	0.42
2:B:106:VAL:O	2:B:106:VAL:HG13	2.19	0.42
1:A:769:ALA:CB	1:A:786:ILE:HG22	2.43	0.42
2:B:294:GLN:NE2	12:B:3234:HOH:O	2.51	0.42
1:A:630:THR:HB	1:A:693:THR:HG23	2.02	0.41
1:A:486:GLN:HE22	1:A:518:ASN:H	1.66	0.41
1:A:819:ARG:HD2	1:A:826:ILE:HD11	2.02	0.41
2:B:66:THR:HB	2:B:170:ALA:O	2.20	0.41
2:B:126:ASN:HD22	2:B:133:ALA:HB2	1.85	0.41
1:A:515:SER:HB2	1:A:521:GLY:HA3	2.02	0.41
1:A:862:ASP:O	1:A:865:ARG:HG3	2.20	0.41
2:B:21:TYR:O	2:B:218:ALA:HA	2.20	0.41
2:B:184:ASN:ND2	12:B:3551:HOH:O	2.53	0.41
2:B:272:VAL:HG22	2:B:273:SER:N	2.34	0.41
1:A:876:PRO:HA	1:A:947:VAL:HA	2.01	0.41
2:B:39:LEU:HD12	2:B:39:LEU:HA	1.94	0.41
3:C:94:ASN:C	3:C:94:ASN:HD22	2.27	0.41
1:A:746:LEU:HD13	1:A:746:LEU:C	2.46	0.41
1:A:268:ALA:HA	1:A:375:ALA:HB1	2.02	0.41
2:B:134:GLU:OE1	2:B:136:LEU:HD21	2.20	0.41
1:A:387:HIS:HD2	12:A:3002:HOH:O	2.02	0.41
1:A:871:LEU:HD13	1:A:952:LEU:HD11	2.03	0.41
1:A:134:GLY:O	1:A:139:GLY:HA3	2.20	0.41
1:A:655:LYS:HB2	12:A:3676:HOH:O	2.21	0.41
1:A:734:ARG:O	1:A:738:VAL:HG23	2.20	0.41
2:B:222:ALA:HB2	2:B:371:ILE:HD11	2.03	0.41
2:B:354:THR:HG21	2:B:402:VAL:HG21	2.02	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:249:ALA:HB2	6:A:1002:NAD:O2A	2.21	0.40
1:A:590:GLU:OE1	2:B:113:LEU:HD12	2.21	0.40
2:B:275:ALA:HB3	2:B:279:GLU:OE1	2.21	0.40
1:A:738:VAL:O	1:A:742:LEU:HD13	2.21	0.40
1:A:865:ARG:HB3	1:A:867:ASP:OD1	2.21	0.40
1:A:890:VAL:HG22	1:A:937:LYS:O	2.22	0.40
12:A:3248:HOH:O	3:C:182:HIS:HD2	2.03	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	961/964 (100%)	929 (97%)	31 (3%)	1 (0%)	48	57
2	B	400/404 (99%)	386 (96%)	12 (3%)	2 (0%)	24	27
3	C	193/206 (94%)	183 (95%)	9 (5%)	1 (0%)	24	27
4	D	89/99 (90%)	84 (94%)	5 (6%)	0	100	100
All	All	1643/1673 (98%)	1582 (96%)	57 (4%)	4 (0%)	43	51

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	401	ALA
3	C	199	VAL
1	A	71	PRO
2	B	203	GLY

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	747/747 (100%)	737 (99%)	10 (1%)	61	76
2	B	318/319 (100%)	311 (98%)	7 (2%)	45	61
3	C	143/154 (93%)	141 (99%)	2 (1%)	59	75
4	D	75/81 (93%)	74 (99%)	1 (1%)	61	76
All	All	1283/1301 (99%)	1263 (98%)	20 (2%)	55	71

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

Mol	Chain	Res	Type
1	A	102	ASN
1	A	327	THR
1	A	518	ASN
1	A	590	GLU
1	A	761	VAL
1	A	786	ILE
1	A	819	ARG
1	A	871	LEU
1	A	929	ARG
1	A	949	VAL
2	B	2	ASP
2	B	131	VAL
2	B	172	HIS
2	B	332	MET
2	B	386	GLU
2	B	387	ARG
2	B	393	LEU
3	C	98	LEU
3	C	156	LEU
4	D	90	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (49) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	10	GLN
1	A	29	GLN
1	A	82	GLN
1	A	123	HIS
1	A	125	HIS
1	A	181	GLN
1	A	200	GLN
1	A	211	ASN
1	A	243	GLN
1	A	259	ASN
1	A	276	ASN
1	A	292	ASN
1	A	362	ASN
1	A	367	GLN
1	A	381	ASN
1	A	387	HIS
1	A	389	GLN
1	A	395	ASN
1	A	412	GLN
1	A	413	HIS
1	A	452	GLN
1	A	477	HIS
1	A	486	GLN
1	A	489	GLN
1	A	520	GLN
1	A	582	HIS
1	A	594	GLN
1	A	646	ASN
1	A	690	HIS
1	A	750	ASN
1	A	863	ASN
1	A	870	HIS
1	A	912	ASN
1	A	930	ASN
2	B	7	HIS
2	B	13	ASN
2	B	111	HIS
2	B	184	ASN
2	B	266	ASN
2	B	267	HIS
2	B	294	GLN
2	B	344	GLN
2	B	349	ASN

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Mol	Chain	Res	Type
3	C	94	ASN
3	C	102	GLN
3	C	111	GLN
3	C	123	GLN
3	C	182	HIS
4	D	90	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 19 ligands modelled in this entry, 1 is monoatomic - leaving 18 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	$\# Z > 2$
5	SO4	A	2007	-	4,4,4	0.35	0	6,6,6	0.17	0
5	SO4	A	2010	-	4,4,4	0.39	0	6,6,6	0.24	0
5	SO4	A	2008	-	4,4,4	0.38	0	6,6,6	0.15	0
5	SO4	A	2011	-	4,4,4	0.47	0	6,6,6	0.10	0
8	FAD	B	1001	-	58,58,58	1.22	5 (8%)	85,89,89	1.55	16 (18%)
5	SO4	B	2004	-	4,4,4	0.36	0	6,6,6	0.11	0
5	SO4	B	2006	-	4,4,4	0.35	0	6,6,6	0.12	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
6	NAD	A	1002	-	46,48,48	1.63	7 (15%)	64,73,73	1.53	9 (14%)
5	SO4	D	2005	-	4,4,4	0.38	0	6,6,6	0.17	0
9	FMN	B	1004	-	33,33,33	1.33	2 (6%)	48,50,50	1.39	8 (16%)
7	FON	A	1003	-	34,36,36	3.64	9 (26%)	34,50,50	1.51	4 (11%)
5	SO4	A	2009	-	4,4,4	0.38	0	6,6,6	0.12	0
10	DMG	B	1005	-	6,6,6	1.14	0	7,7,7	1.41	0
5	SO4	D	2012	-	4,4,4	0.47	0	6,6,6	0.10	0
5	SO4	A	2003	-	4,4,4	0.39	0	6,6,6	0.09	0
5	SO4	A	2013	-	4,4,4	0.47	0	6,6,6	0.10	0
5	SO4	A	2002	-	4,4,4	0.32	0	6,6,6	0.12	0
5	SO4	C	2001	-	4,4,4	0.40	0	6,6,6	0.14	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
8	FAD	B	1001	-	-	2/34/50/50	0/6/6/6
6	NAD	A	1002	-	-	3/30/62/62	0/5/5/5
7	FON	A	1003	-	-	3/24/37/37	0/3/3/3
10	DMG	B	1005	-	-	3/4/4/4	-
9	FMN	B	1004	-	-	3/18/18/18	0/3/3/3

All (23) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	A	1003	FON	C8A-N8	15.54	1.48	1.32
7	A	1003	FON	C7-N8	11.62	1.58	1.46
6	A	1002	NAD	O7N-C7N	6.59	1.36	1.24
6	A	1002	NAD	C2N-N1N	5.23	1.40	1.35
9	B	1004	FMN	C4A-N5	4.53	1.40	1.30
8	B	1001	FAD	C4X-N5	4.51	1.40	1.30
8	B	1001	FAD	C10-N1	3.67	1.40	1.33
9	B	1004	FMN	C10-N1	3.62	1.40	1.33
7	A	1003	FON	C16-C11	3.48	1.44	1.39
8	B	1001	FAD	C5A-N7A	-2.97	1.33	1.39
6	A	1002	NAD	C5A-N7A	-2.91	1.33	1.39
7	A	1003	FON	C8A-N1	2.82	1.41	1.37
7	A	1003	FON	C2-NA2	2.69	1.40	1.34

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	A	1003	FON	C15-C14	2.66	1.43	1.39
6	A	1002	NAD	O4D-C1D	2.66	1.44	1.40
7	A	1003	FON	C16-C15	2.53	1.42	1.38
7	A	1003	FON	CA-N	2.51	1.51	1.45
8	B	1001	FAD	C8A-N9A	-2.46	1.33	1.37
6	A	1002	NAD	C6N-N1N	2.39	1.40	1.35
7	A	1003	FON	C-N	2.30	1.39	1.34
6	A	1002	NAD	C8A-N9A	-2.26	1.33	1.37
6	A	1002	NAD	C4A-N9A	-2.11	1.33	1.37
8	B	1001	FAD	C4A-N9A	-2.09	1.33	1.37

All (37) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
8	B	1001	FAD	N3A-C2A-N1A	-5.18	120.74	128.58
6	A	1002	NAD	N3A-C2A-N1A	-5.13	120.82	128.58
6	A	1002	NAD	C5A-C4A-N3A	-5.03	119.79	126.72
8	B	1001	FAD	C5A-C4A-N3A	-4.79	120.12	126.72
9	B	1004	FMN	O5'-P-O1P	4.25	117.92	106.44
7	A	1003	FON	N1-C8A-N8	3.88	124.57	117.28
7	A	1003	FON	C9-N10-C14	3.68	131.37	122.00
6	A	1002	NAD	C2A-N3A-C4A	3.67	120.80	111.83
8	B	1001	FAD	C2A-N3A-C4A	3.66	120.77	111.83
6	A	1002	NAD	N3A-C4A-N9A	3.56	133.22	127.17
8	B	1001	FAD	N3A-C4A-N9A	3.35	132.86	127.17
8	B	1001	FAD	C4-N3-C2	-3.07	120.19	125.64
6	A	1002	NAD	N9A-C8A-N7A	-3.06	109.59	113.94
9	B	1004	FMN	C4-N3-C2	-3.03	120.26	125.64
8	B	1001	FAD	C4B-O4B-C1B	-2.91	103.03	109.47
6	A	1002	NAD	C4A-C5A-N7A	-2.83	107.35	110.58
6	A	1002	NAD	C5A-N7A-C8A	2.80	107.84	103.45
9	B	1004	FMN	C9A-C5A-N5	-2.74	119.54	122.45
8	B	1001	FAD	N9A-C8A-N7A	-2.74	110.05	113.94
8	B	1001	FAD	C4A-C5A-N7A	-2.74	107.45	110.58
8	B	1001	FAD	C4X-C4-N3	2.71	120.16	113.25
8	B	1001	FAD	C9A-C5X-N5	-2.71	119.58	122.45
9	B	1004	FMN	C4A-C4-N3	2.70	120.12	113.25
9	B	1004	FMN	O4-C4-C4A	-2.64	119.56	126.53
8	B	1001	FAD	O4B-C1B-C2B	-2.61	101.03	106.62
8	B	1001	FAD	O4-C4-C4X	-2.60	119.67	126.53
8	B	1001	FAD	C5A-N7A-C8A	2.58	107.50	103.45
8	B	1001	FAD	C10-C4X-N5	-2.48	119.74	124.81

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	A	1002	NAD	C4A-N9A-C8A	2.37	108.23	105.74
9	B	1004	FMN	C5A-C9A-N10	2.33	120.08	117.97
9	B	1004	FMN	C10-C4A-N5	-2.31	120.09	124.81
7	A	1003	FON	C13-C14-N10	-2.30	115.75	120.96
8	B	1001	FAD	C4X-C10-N10	2.19	119.62	116.48
7	A	1003	FON	O2-CT-CA	2.16	120.81	113.51
8	B	1001	FAD	C4A-N9A-C8A	2.15	107.99	105.74
6	A	1002	NAD	C6N-N1N-C2N	-2.09	120.10	121.88
9	B	1004	FMN	C4A-C10-N10	2.05	119.41	116.48

There are no chirality outliers.

All (14) torsion outliers are listed below:

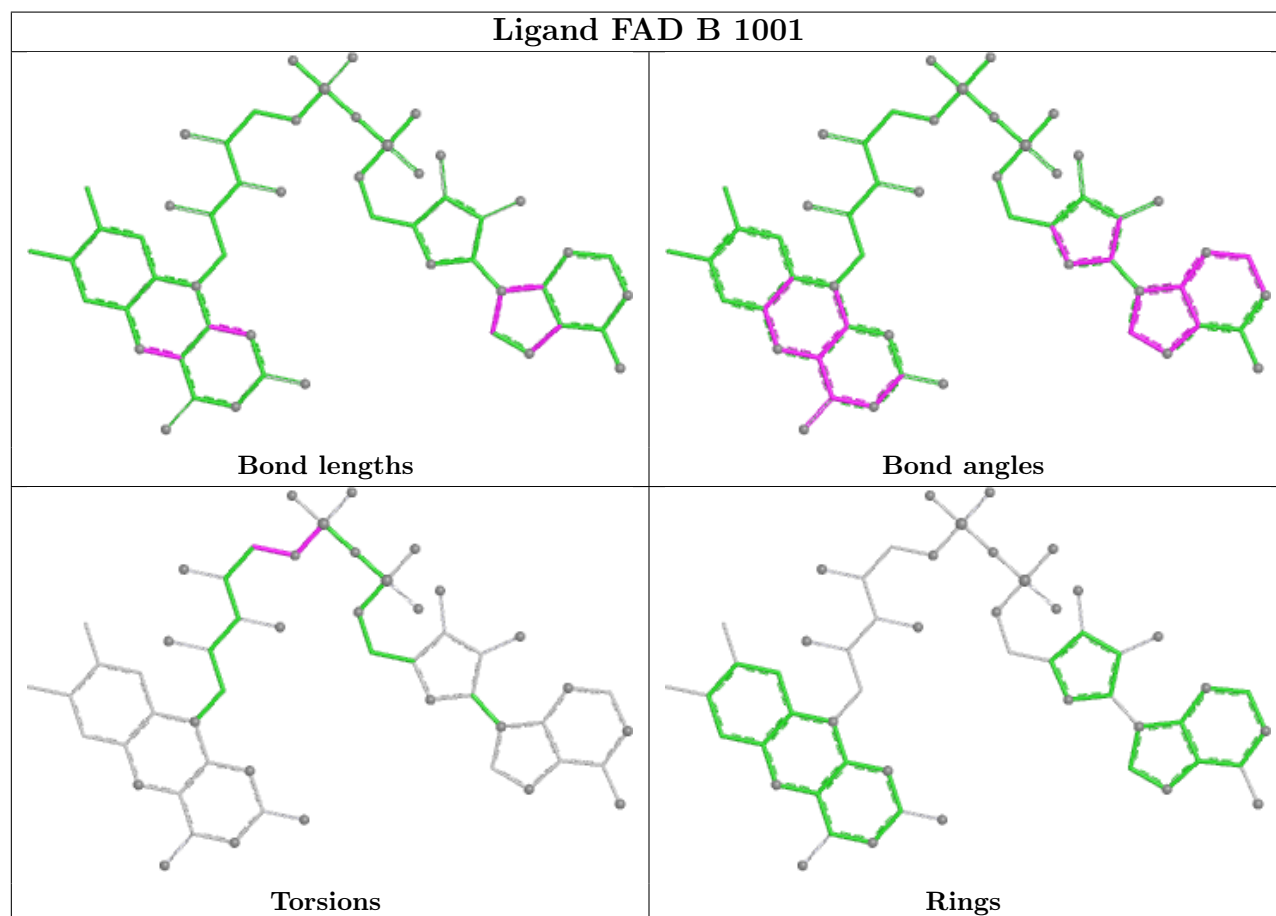
Mol	Chain	Res	Type	Atoms
6	A	1002	NAD	C5D-O5D-PN-O1N
9	B	1004	FMN	C5'-O5'-P-O1P
9	B	1004	FMN	C5'-O5'-P-O2P
9	B	1004	FMN	C5'-O5'-P-O3P
7	A	1003	FON	N-CA-CT-O1
7	A	1003	FON	N-CA-CT-O2
10	B	1005	DMG	OXT-C-CA-N
10	B	1005	DMG	O-C-CA-N
8	B	1001	FAD	C4'-C5'-O5'-P
6	A	1002	NAD	PA-O3-PN-O5D
6	A	1002	NAD	C5D-O5D-PN-O3
8	B	1001	FAD	C5'-O5'-P-O1P
10	B	1005	DMG	C-CA-N-C4
7	A	1003	FON	CB-CA-N-C

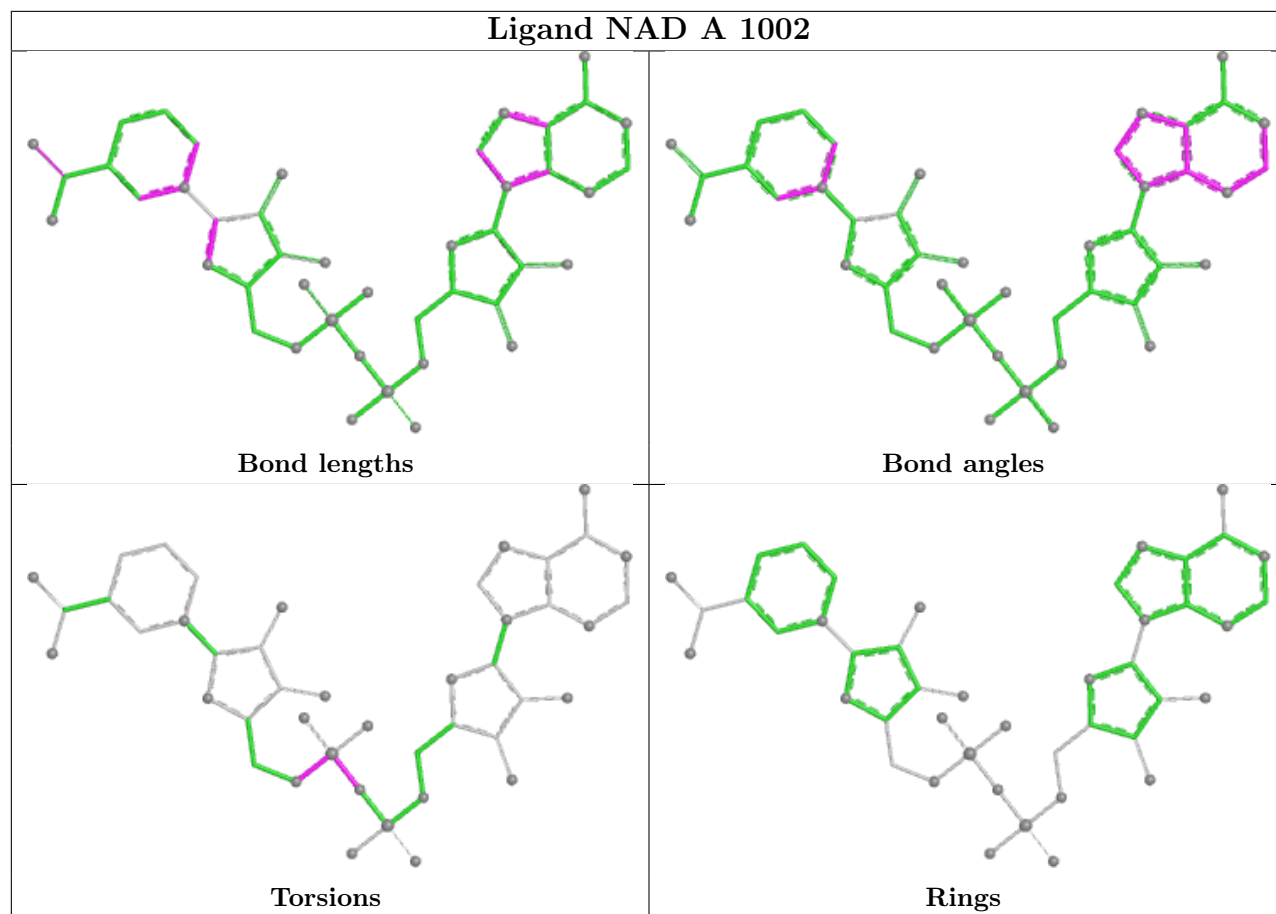
There are no ring outliers.

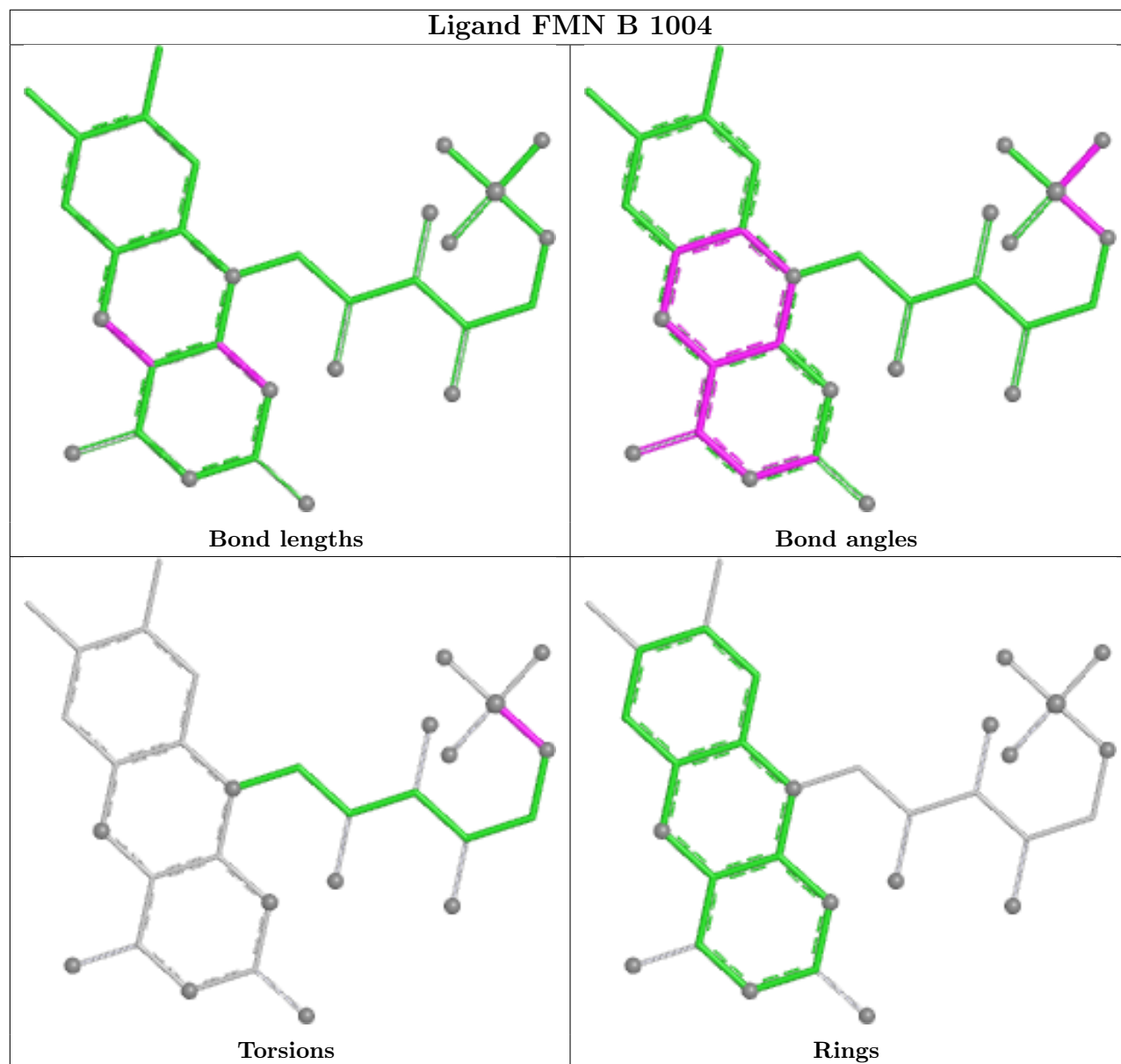
8 monomers are involved in 38 short contacts:

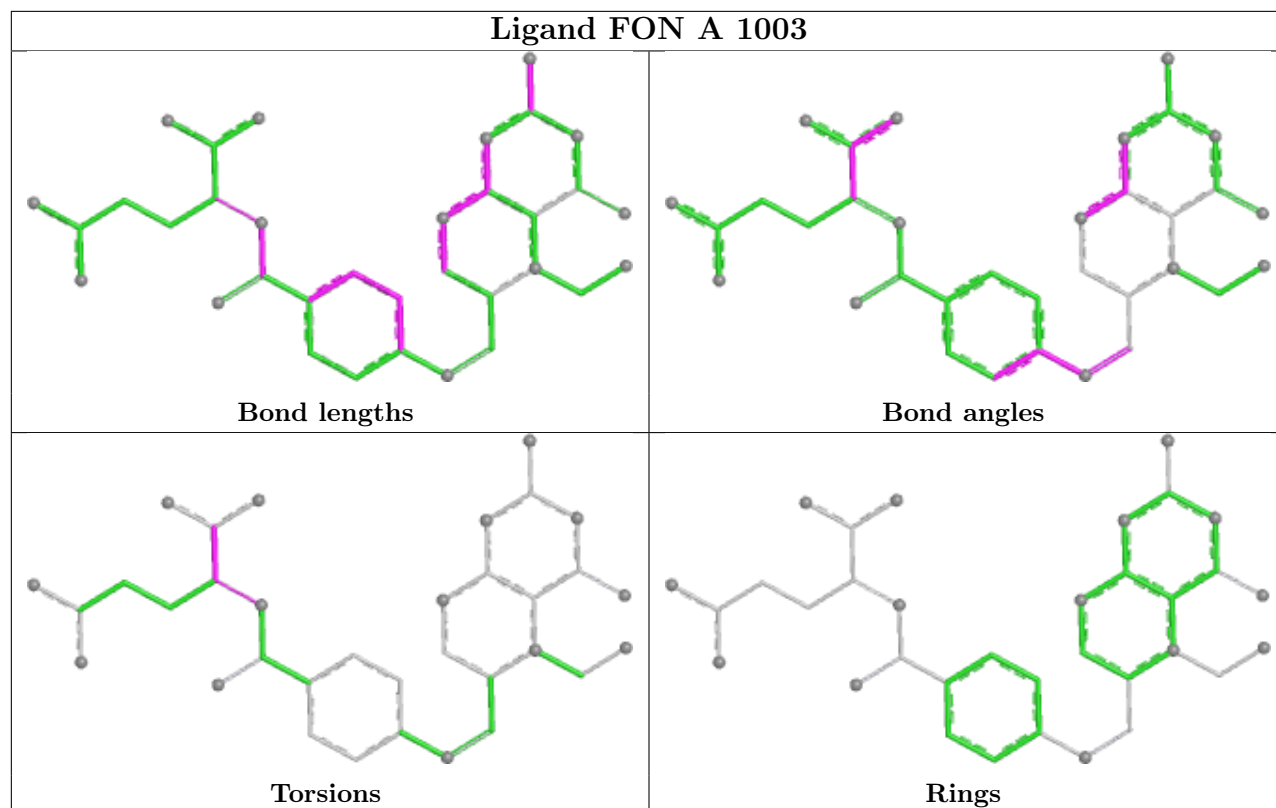
Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	A	2011	SO4	1	0
8	B	1001	FAD	6	0
6	A	1002	NAD	5	0
9	B	1004	FMN	12	0
7	A	1003	FON	7	0
10	B	1005	DMG	7	0
5	A	2013	SO4	1	0
5	A	2002	SO4	2	0

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 ⓘ

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	963/964 (99%)	-0.04	21 (2%) 62 59	12, 26, 44, 66	0
2	B	402/404 (99%)	0.05	17 (4%) 40 37	13, 26, 43, 71	0
3	C	195/206 (94%)	-0.04	7 (3%) 46 43	16, 23, 44, 71	0
4	D	91/99 (91%)	-0.16	2 (2%) 62 59	15, 23, 43, 56	0
All	All	1651/1673 (98%)	-0.02	47 (2%) 55 52	12, 25, 44, 71	0

All (47) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
3	C	200	ALA	9.9
2	B	402	VAL	8.3
1	A	226	PRO	7.9
1	A	225	GLY	6.6
2	B	1	ALA	5.8
2	B	202	ASP	5.3
1	A	909	HIS	4.6
1	A	327	THR	4.4
2	B	2	ASP	4.2
2	B	401	ALA	4.0
2	B	268	ILE	3.9
1	A	694	GLY	3.8
1	A	228	GLY	3.5
4	D	91	LEU	3.5
3	C	199	VAL	3.4
1	A	227	SER	3.4
2	B	74	TRP	3.3
1	A	474	ASP	3.3
2	B	400	ALA	3.2
1	A	897	SER	3.2
1	A	896	ALA	3.1

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Mol	Chain	Res	Type	RSRZ
2	B	397	HIS	3.1
2	B	395	ASP	3.1
1	A	616	CYS	3.0
3	C	6	GLN	3.0
2	B	152	ASP	2.9
4	D	90	GLN	2.8
2	B	392	HIS	2.7
1	A	695	GLY	2.7
2	B	3	LEU	2.7
1	A	824	PHE	2.6
3	C	9	ARG	2.5
3	C	96	ALA	2.5
2	B	203	GLY	2.5
2	B	93	GLU	2.4
1	A	696	ALA	2.3
1	A	938	THR	2.3
1	A	899	GLY	2.2
3	C	93	GLU	2.2
1	A	540	ASN	2.2
2	B	269	HIS	2.2
1	A	848	LYS	2.2
3	C	99	ASP	2.1
2	B	271	TYR	2.1
1	A	12	ALA	2.0
1	A	895	VAL	2.0
1	A	898	GLU	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](#)

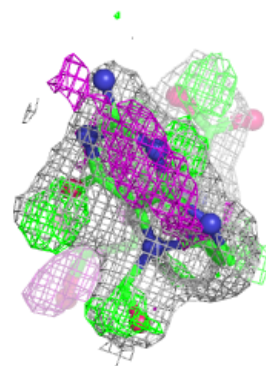
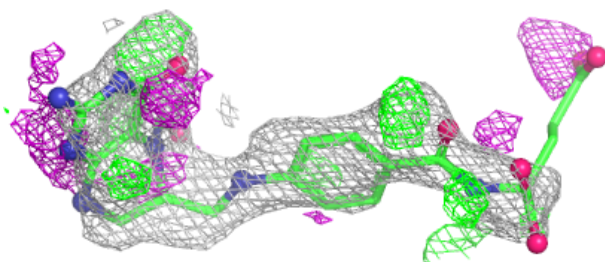
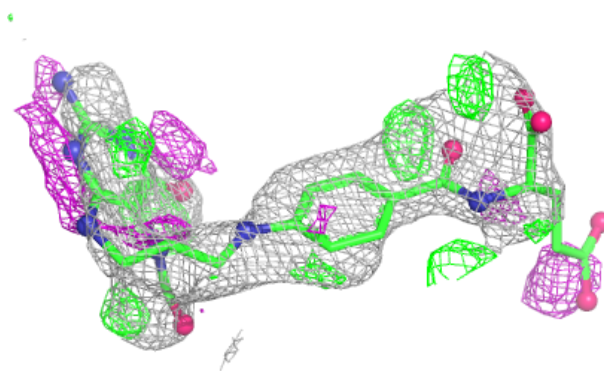
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists 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
7	FON	A	1003	34/34	0.65	0.27	57,61,75,76	0
5	SO4	A	2010	5/5	0.73	0.20	81,81,81,82	0
5	SO4	D	2012	5/5	0.75	0.23	85,86,86,88	0
5	SO4	A	2011	5/5	0.75	0.21	81,82,82,82	0
5	SO4	A	2013	5/5	0.77	0.13	74,76,77,77	0
5	SO4	B	2006	5/5	0.77	0.17	72,73,74,74	0
5	SO4	D	2005	5/5	0.79	0.17	74,76,77,78	0
5	SO4	A	2007	5/5	0.81	0.14	71,73,75,77	0
10	DMG	B	1005	7/7	0.83	0.21	52,53,54,54	0
5	SO4	B	2004	5/5	0.88	0.11	69,69,70,70	0
5	SO4	A	2003	5/5	0.91	0.16	56,59,60,61	0
5	SO4	C	2001	5/5	0.91	0.18	53,54,55,57	0
5	SO4	A	2002	5/5	0.92	0.17	43,44,46,47	0
5	SO4	A	2008	5/5	0.92	0.09	66,66,67,68	0
9	FMN	B	1004	31/31	0.93	0.10	13,19,25,26	0
8	FAD	B	1001	53/53	0.96	0.07	14,21,30,33	0
5	SO4	A	2009	5/5	0.97	0.07	47,49,51,52	0
6	NAD	A	1002	44/44	0.98	0.06	11,16,24,28	0
11	ZN	D	1006	1/1	1.00	0.04	22,22,22,22	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.

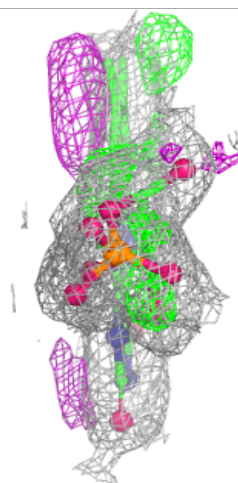
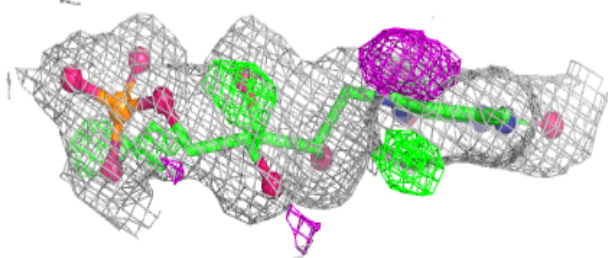
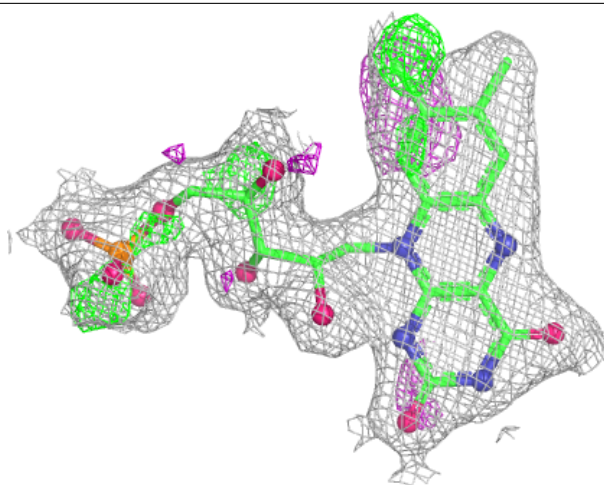
Electron density around FON A 1003:

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



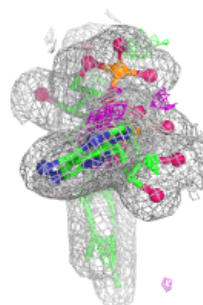
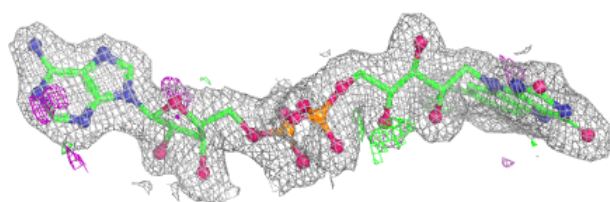
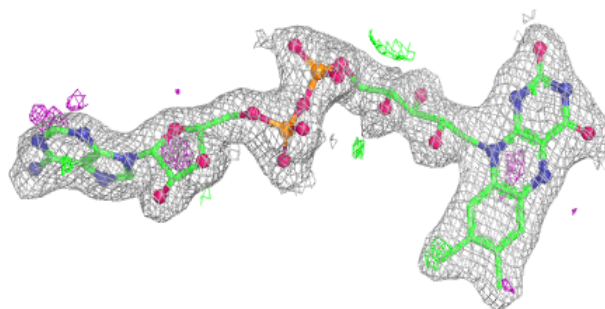
Electron density around FMN B 1004:

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

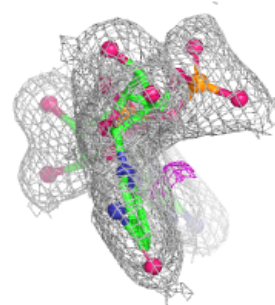
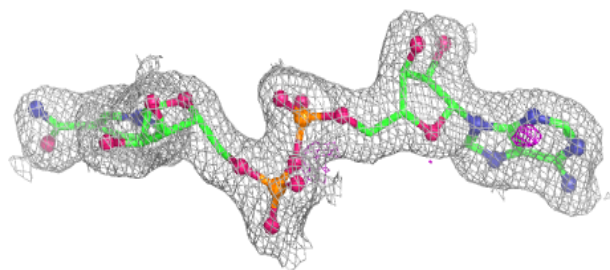
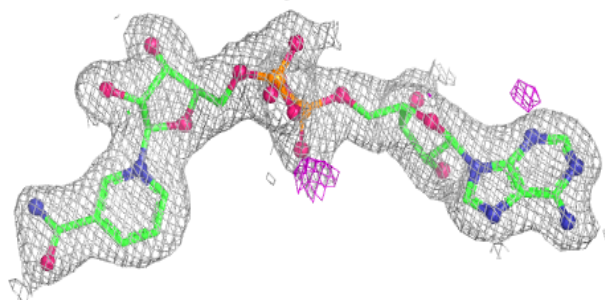


Electron density around FAD B 1001:

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

**Electron density around NAD A 1002:**

$2mF_o-DF_c$ (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.