



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 6, 2026 – 09:42 AM UTC

PDB ID : 9IIM / pdb_00009iim
Title : Structure of the complex of erythrose-4-phosphate dehydrogenase from *Acinetobacter baumannii* with nicotinamide adenine dinucleotide at 2.74 Å resolution.
Authors : Viswanathan, V.; Kumari, A.; Singh, A.; Kumar, A.; Sharma, P.; Chopra, S.; Jeyakanthan, J.; Sharma, S.; Raje, C.I.; Singh, T.P.
Deposited on : 2024-06-20
Resolution : 2.74 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:

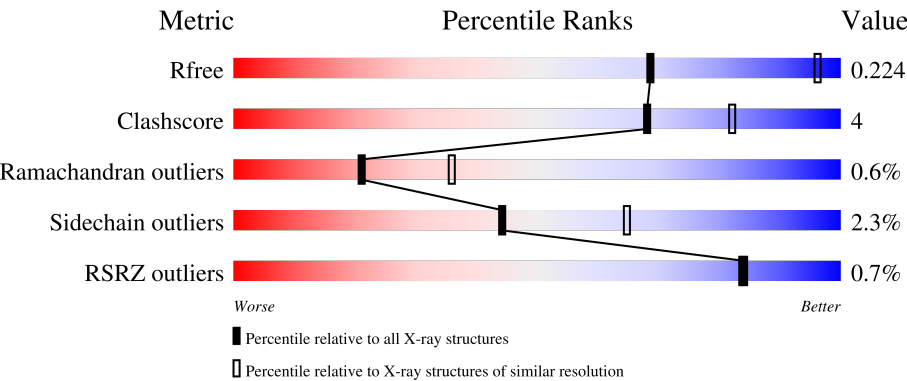
MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal 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 i

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 2.74 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	1819 (2.76-2.72)
Clashscore	190562	1866 (2.76-2.72)
Ramachandran outliers	187476	1830 (2.76-2.72)
Sidechain outliers	187428	1831 (2.76-2.72)
RSRZ outliers	180081	1819 (2.76-2.72)

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	341	% 90% 9% .
1	B	341	% 86% 12% .
1	C	341	87% 12% .
1	D	341	% 84% 15% .

2 Entry composition [i](#)

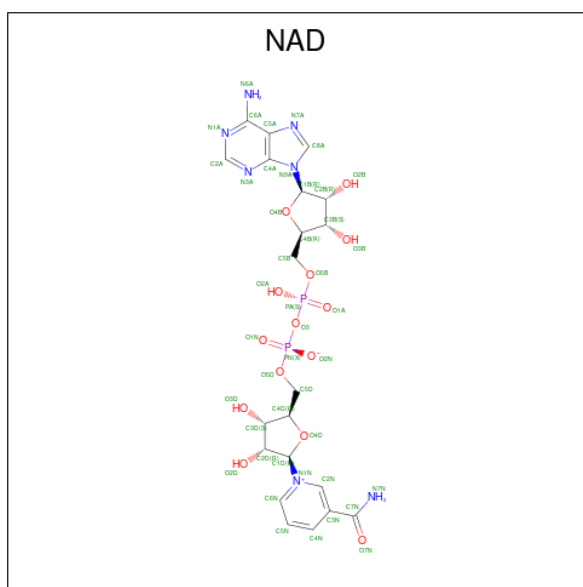
There are 4 unique types of molecules in this entry. The entry contains 11379 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 Glyceraldehyde-3-phosphate dehydrogenase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	341	Total	C	N	O	S	0	1	0
			2690	1707	474	500	9			
1	C	341	Total	C	N	O	S	0	0	0
			2679	1701	470	499	9			
1	B	341	Total	C	N	O	S	0	0	0
			2679	1701	470	499	9			
1	D	341	Total	C	N	O	S	0	1	0
			2690	1707	474	500	9			

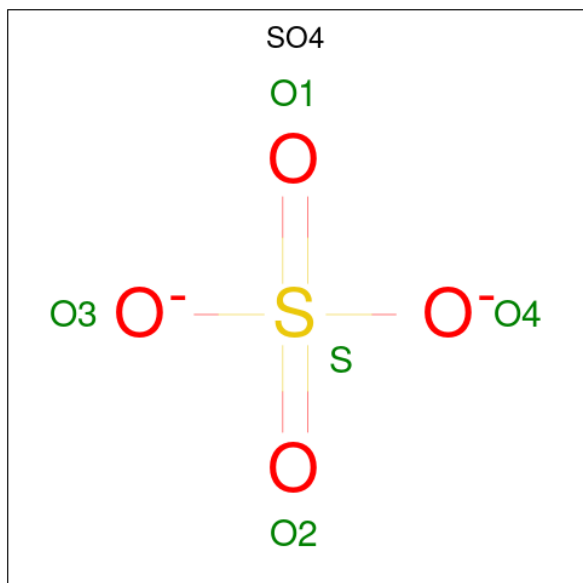
- Molecule 2 is NICOTINAMIDE-ADENINE-DINUCLEOTIDE (CCD ID: NAD) (formula: $C_{21}H_{27}N_7O_{14}P_2$) (labeled as "Ligand of Interest" by depositor).



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

- Molecule 3 is SULFATE ION (CCD ID: SO4) (formula: O₄S) (labeled as "Ligand of Interest" by depositor).



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

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	98	Total	O	0	0
			98	98		
4	C	126	Total	O	0	0
			126	126		
4	B	110	Total	O	0	0
			110	110		

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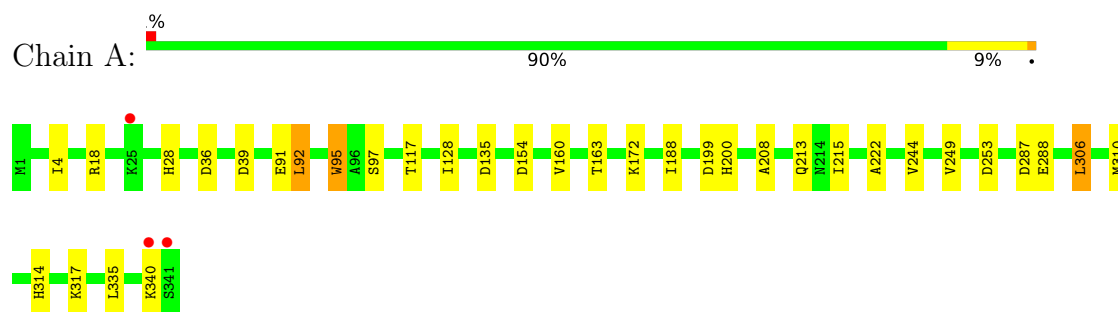
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	D	111	Total 111	O 111	0	0

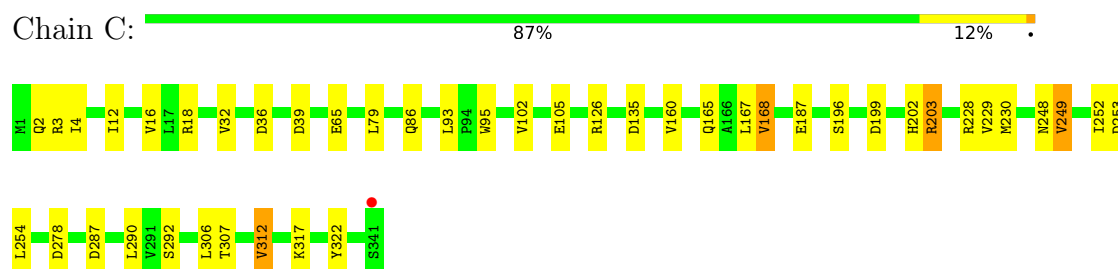
3 Residue-property plots [i](#)

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.

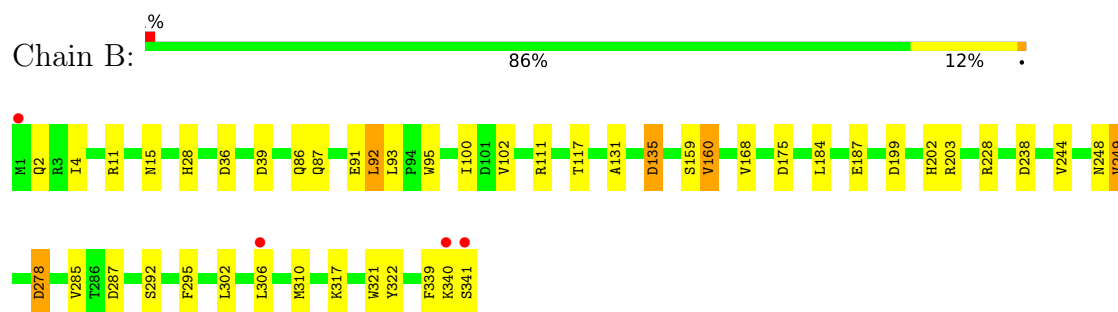
- Molecule 1: Glyceraldehyde-3-phosphate dehydrogenase



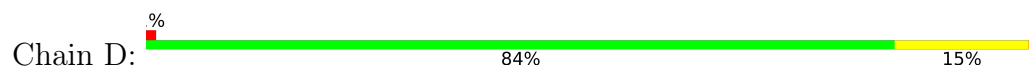
- Molecule 1: Glyceraldehyde-3-phosphate dehydrogenase

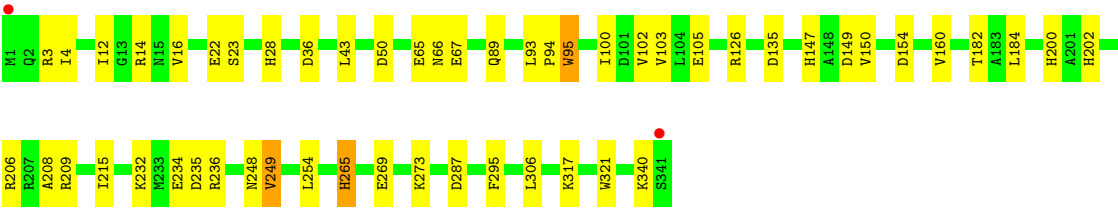


- Molecule 1: Glyceraldehyde-3-phosphate dehydrogenase



- Molecule 1: Glyceraldehyde-3-phosphate dehydrogenase





4 Data and refinement statistics

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, α , β , γ	147.26Å 167.62Å 151.58Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	45.96 – 2.74 45.96 – 2.74	Depositor EDS
% Data completeness (in resolution range)	99.9 (45.96-2.74) 99.9 (45.96-2.74)	Depositor EDS
R_{merge}	0.42	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.96 (at 2.73Å)	Xtriage
Refinement program	REFMAC 5.8.0425	Depositor
R, R_{free}	0.164 , 0.229 0.170 , 0.224	Depositor DCC
R_{free} test set	1536 reflections (3.10%)	wwPDB-VP
Wilson B-factor (Å ²)	43.2	Xtriage
Anisotropy	0.039	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 33.0	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	11379	wwPDB-VP
Average B, all atoms (Å ²)	42.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.85% 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: NAD, SO4

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	0.53	0/2744	1.02	8/3730 (0.2%)
1	B	0.54	0/2733	1.04	6/3716 (0.2%)
1	C	0.56	0/2733	1.07	9/3716 (0.2%)
1	D	0.55	0/2744	1.03	8/3730 (0.2%)
All	All	0.54	0/10954	1.04	31/14892 (0.2%)

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

Mol	Chain	#Chirality outliers	#Planarity outliers
1	B	0	1
1	C	0	3
1	D	0	3
All	All	0	7

There are no bond length outliers.

All (31) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	253	ASP	CB-CA-C	-8.71	96.08	110.19
1	D	50	ASP	CA-CB-CG	6.67	119.27	112.60
1	A	18	ARG	CB-CA-C	-6.62	99.81	110.79
1	A	199	ASP	CA-CB-CG	6.54	119.14	112.60
1	C	105	GLU	CB-CA-C	6.43	121.27	110.79
1	A	135	ASP	CA-CB-CG	6.33	118.93	112.60
1	C	135	ASP	CA-CB-CG	6.12	118.72	112.60
1	B	278	ASP	CA-CB-CG	6.11	118.71	112.60
1	D	135	ASP	CA-CB-CG	6.03	118.63	112.60

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	154	ASP	CA-CB-CG	5.93	118.53	112.60
1	D	94	PRO	N-CA-CB	-5.93	98.88	102.79
1	A	154	ASP	CA-CB-CG	5.91	118.51	112.60
1	B	175	ASP	CA-CB-CG	5.79	118.39	112.60
1	D	149	ASP	CA-CB-CG	5.77	118.37	112.60
1	C	199	ASP	CA-CB-CG	5.67	118.27	112.60
1	D	36	ASP	CA-CB-CG	5.66	118.26	112.60
1	D	89	GLN	CB-CA-C	5.60	115.48	110.44
1	C	165	GLN	CB-CA-C	-5.60	100.27	110.63
1	C	168	VAL	N-CA-CB	5.58	114.80	110.45
1	C	39	ASP	CA-CB-CG	5.43	118.03	112.60
1	B	135	ASP	CA-CB-CG	5.39	117.99	112.60
1	B	202	HIS	CA-CB-CG	5.38	119.18	113.80
1	B	39	ASP	CA-CB-CG	5.33	117.93	112.60
1	A	36	ASP	CA-CB-CG	5.33	117.93	112.60
1	A	117	THR	CA-CB-OG1	-5.23	101.75	109.60
1	D	202	HIS	CA-CB-CG	5.22	119.02	113.80
1	C	65	GLU	N-CA-CB	-5.21	101.94	110.95
1	A	253	ASP	CA-CB-CG	5.18	117.78	112.60
1	C	202	HIS	CA-CB-CG	5.17	118.97	113.80
1	B	199	ASP	CA-CB-CG	5.08	117.68	112.60
1	A	39	ASP	CA-CB-CG	5.02	117.62	112.60

There are no chirality outliers.

All (7) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	B	203	ARG	Sidechain
1	C	126	ARG	Sidechain
1	C	203	ARG	Sidechain
1	C	228	ARG	Sidechain
1	D	126	ARG	Sidechain
1	D	14	ARG	Sidechain
1	D	209	ARG	Sidechain

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	2690	0	2696	14	0
1	B	2679	0	2684	23	0
1	C	2679	0	2684	22	0
1	D	2690	0	2696	28	0
2	A	44	0	26	0	0
2	B	44	0	26	0	0
2	C	44	0	26	0	0
2	D	44	0	26	1	0
3	A	5	0	0	0	0
3	B	5	0	0	0	0
3	C	5	0	0	0	0
3	D	5	0	0	0	0
4	A	98	0	0	1	0
4	B	110	0	0	0	0
4	C	126	0	0	4	0
4	D	111	0	0	4	0
All	All	11379	0	10864	79	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 4.

All (79) 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:C:287:ASP:HB3	1:C:306:LEU:HD21	1.61	0.81
1:C:229:VAL:HG23	1:C:230:MET:HG3	1.73	0.70
1:D:287:ASP:HB3	1:D:306:LEU:HD21	1.75	0.69
1:C:3:ARG:HD2	4:C:546:HOH:O	1.96	0.64
1:D:232:LYS:HG2	4:D:572:HOH:O	1.99	0.63
1:A:287:ASP:HB3	1:A:306:LEU:HD21	1.82	0.60
1:C:312:VAL:CG2	1:D:182:THR:HB	2.35	0.56
1:A:91:GLU:HG2	1:A:92:LEU:HD13	1.88	0.56
1:B:287:ASP:HB3	1:B:306:LEU:HD12	1.88	0.56
1:B:187:GLU:OE2	1:B:322:TYR:OH	2.24	0.55
1:B:340:LYS:O	1:B:341:SER:C	2.50	0.55
1:D:93:LEU:HD13	1:D:95:TRP:CZ2	2.41	0.54
1:C:167:LEU:HD13	1:C:252:ILE:HD11	1.89	0.54
1:B:111:ARG:HD2	1:B:131:ALA:HB3	1.90	0.53
1:B:93:LEU:HD13	1:B:95:TRP:CZ2	2.44	0.52
1:C:168:VAL:HG21	1:C:229:VAL:HG21	1.92	0.51
1:C:306:LEU:HD21	4:C:585:HOH:O	2.09	0.51
1:D:12:ILE:O	1:D:16:VAL:HG23	2.10	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:65:GLU:O	1:D:66:ASN:C	2.54	0.50
1:B:285:VAL:HG11	1:B:306:LEU:HD21	1.94	0.50
1:D:234:GLU:OE1	1:D:235:ASP:N	2.45	0.50
1:C:254:LEU:O	1:C:317:LYS:HA	2.11	0.50
1:D:248:ASN:O	1:D:249:VAL:HB	2.12	0.49
1:D:3:ARG:HD2	4:D:551:HOH:O	2.12	0.49
1:A:287:ASP:HA	1:A:306:LEU:HG	1.95	0.49
1:C:187:GLU:OE2	1:C:322:TYR:OH	2.26	0.49
1:C:36:ASP:O	1:C:86:GLN:HA	2.12	0.49
2:D:401:NAD:H3D	4:D:593:HOH:O	2.12	0.49
1:D:265:HIS:CD2	1:D:269:GLU:OE2	2.67	0.48
1:A:306:LEU:HD12	1:A:306:LEU:C	2.39	0.48
1:C:312:VAL:HG23	1:D:182:THR:HB	1.95	0.48
1:B:95:TRP:CE3	1:B:100:ILE:HG13	2.48	0.48
1:B:36:ASP:O	1:B:86:GLN:HA	2.15	0.47
1:B:295:PHE:CE2	1:B:321:TRP:CD1	3.03	0.47
1:C:93:LEU:HD13	1:C:95:TRP:CZ2	2.50	0.47
1:D:295:PHE:CE2	1:D:321:TRP:CD1	3.02	0.47
1:A:28:HIS:O	1:A:340:LYS:HE2	2.15	0.46
1:A:200:HIS:O	1:A:208:ALA:HB1	2.15	0.46
1:A:310:MET:HE2	1:A:317:LYS:HD2	1.98	0.46
1:B:4:ILE:HG13	1:B:102:VAL:HB	1.98	0.45
1:B:184:LEU:HA	1:B:238:ASP:O	2.16	0.45
1:C:4:ILE:HG13	1:C:102:VAL:HB	1.98	0.45
1:B:339:PHE:O	1:B:340:LYS:C	2.60	0.45
1:A:215:ILE:HB	1:B:292:SER:HB3	1.99	0.45
1:C:203:ARG:HG2	4:C:575:HOH:O	2.17	0.45
1:D:234:GLU:O	1:D:235:ASP:HB2	2.16	0.45
1:B:135:ASP:O	1:B:228:ARG:NH1	2.40	0.44
1:D:200:HIS:O	1:D:208:ALA:HB1	2.18	0.44
1:B:11:ARG:O	1:B:15:ASN:ND2	2.44	0.44
1:B:28:HIS:HB2	1:B:340:LYS:HE3	2.00	0.44
1:B:302:LEU:N	1:B:302:LEU:HD23	2.33	0.44
1:C:290:LEU:O	1:D:206[B]:ARG:NH1	2.44	0.44
1:C:292:SER:HB3	1:D:215:ILE:HB	2.00	0.44
1:C:312:VAL:HG23	1:D:182:THR:CG2	2.48	0.44
1:D:4:ILE:HG13	1:D:102:VAL:HB	2.00	0.43
1:A:314:HIS:HD2	4:A:529:HOH:O	2.02	0.43
1:C:306:LEU:CD2	4:C:585:HOH:O	2.65	0.43
1:A:4:ILE:HD12	1:A:4:ILE:N	2.33	0.43
1:D:95:TRP:CE3	1:D:100:ILE:HG13	2.54	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:163:THR:HB	1:A:222:ALA:HB2	1.99	0.43
1:B:248:ASN:O	1:B:249:VAL:HB	2.17	0.43
1:D:28:HIS:HD2	1:D:340:LYS:HD3	1.84	0.43
1:A:128:ILE:HD13	1:A:335:LEU:HD23	2.00	0.43
1:D:254:LEU:O	1:D:317:LYS:HA	2.19	0.43
1:B:159:SER:C	1:B:160:VAL:HG22	2.44	0.42
1:C:248:ASN:O	1:C:249:VAL:HB	2.20	0.42
1:C:312:VAL:HG23	1:D:182:THR:HG21	2.01	0.42
1:D:100:ILE:HG21	1:D:103:VAL:HG22	2.01	0.42
1:D:147:HIS:O	1:D:150:VAL:HG23	2.20	0.42
1:D:236:ARG:NE	4:D:504:HOH:O	2.42	0.41
1:C:12:ILE:O	1:C:16:VAL:HG23	2.20	0.41
1:B:91:GLU:HG2	1:B:92:LEU:HD22	2.01	0.41
1:B:87:GLN:HB3	1:B:93:LEU:HD21	2.02	0.41
1:A:95:TRP:HA	1:A:95:TRP:CE3	2.56	0.41
1:B:310:MET:HE2	1:B:317:LYS:HD2	2.02	0.41
1:D:95:TRP:CE3	1:D:95:TRP:HA	2.55	0.41
1:A:244:VAL:HG11	1:B:244:VAL:HG11	2.03	0.41
1:D:22:GLU:O	1:D:23:SER:C	2.64	0.40
1:C:312:VAL:HG13	1:D:184:LEU:HD21	2.04	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	340/341 (100%)	324 (95%)	14 (4%)	2 (1%)	21	36
1	B	339/341 (99%)	324 (96%)	13 (4%)	2 (1%)	21	36
1	C	339/341 (99%)	324 (96%)	13 (4%)	2 (1%)	21	36
1	D	340/341 (100%)	325 (96%)	13 (4%)	2 (1%)	21	36
All	All	1358/1364 (100%)	1297 (96%)	53 (4%)	8 (1%)	21	36

All (8) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	160	VAL
1	A	249	VAL
1	C	160	VAL
1	C	249	VAL
1	B	160	VAL
1	B	249	VAL
1	D	160	VAL
1	D	249	VAL

5.3.2 Protein sidechains [i](#)

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	293/292 (100%)	285 (97%)	8 (3%)	39	61
1	B	292/292 (100%)	287 (98%)	5 (2%)	53	71
1	C	292/292 (100%)	284 (97%)	8 (3%)	39	61
1	D	293/292 (100%)	287 (98%)	6 (2%)	48	67
All	All	1170/1168 (100%)	1143 (98%)	27 (2%)	44	65

All (27) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	92	LEU
1	A	95	TRP
1	A	97	SER
1	A	172	LYS
1	A	188	ILE
1	A	213	GLN
1	A	288	GLU
1	A	306	LEU
1	C	2	GLN
1	C	18	ARG
1	C	32	VAL
1	C	79	LEU

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Mol	Chain	Res	Type
1	C	196	SER
1	C	278	ASP
1	C	307	THR
1	C	312	VAL
1	B	2	GLN
1	B	92	LEU
1	B	117	THR
1	B	168	VAL
1	B	278	ASP
1	D	43	LEU
1	D	67	GLU
1	D	95	TRP
1	D	105	GLU
1	D	265	HIS
1	D	273	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (24) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	72	ASN
1	A	113	HIS
1	A	136	HIS
1	A	213	GLN
1	A	248	ASN
1	A	276	GLN
1	A	296	ASN
1	C	89	GLN
1	C	113	HIS
1	C	155	GLN
1	C	248	ASN
1	C	266	HIS
1	C	296	ASN
1	C	315	GLN
1	B	77	GLN
1	B	165	GLN
1	B	248	ASN
1	B	296	ASN
1	B	315	GLN
1	D	28	HIS
1	D	89	GLN
1	D	113	HIS
1	D	248	ASN

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Mol	Chain	Res	Type
1	D	265	HIS

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](#)

8 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	SO4	D	402	-	4,4,4	0.33	0	6,6,6	0.18	0
3	SO4	A	402	-	4,4,4	0.31	0	6,6,6	0.11	0
2	NAD	A	401	-	46,48,48	0.67	1 (2%)	64,73,73	0.60	1 (1%)
3	SO4	B	402	-	4,4,4	0.34	0	6,6,6	0.08	0
2	NAD	B	401	-	46,48,48	0.80	3 (6%)	64,73,73	0.63	1 (1%)
2	NAD	C	401	-	46,48,48	0.65	1 (2%)	64,73,73	0.61	0
2	NAD	D	401	-	46,48,48	0.64	1 (2%)	64,73,73	0.57	1 (1%)
3	SO4	C	402	-	4,4,4	0.32	0	6,6,6	0.16	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
2	NAD	D	401	-	-	20/30/62/62	0/5/5/5
2	NAD	A	401	-	-	5/30/62/62	0/5/5/5
2	NAD	B	401	-	-	15/30/62/62	0/5/5/5
2	NAD	C	401	-	-	13/30/62/62	0/5/5/5

All (6) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	401	NAD	C2N-N1N	3.20	1.38	1.35
2	A	401	NAD	C2N-N1N	3.12	1.38	1.35
2	D	401	NAD	C2N-N1N	2.98	1.38	1.35
2	C	401	NAD	C2N-N1N	2.94	1.38	1.35
2	B	401	NAD	PN-O3	2.68	1.62	1.59
2	B	401	NAD	PA-O3	2.04	1.61	1.59

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	401	NAD	C6N-N1N-C2N	-2.23	119.98	121.88
2	B	401	NAD	C6N-N1N-C2N	-2.07	120.12	121.88
2	A	401	NAD	C6N-N1N-C2N	-2.07	120.12	121.88

There are no chirality outliers.

All (53) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	401	NAD	O4D-C1D-N1N-C2N
2	A	401	NAD	O4D-C1D-N1N-C6N
2	C	401	NAD	C5B-O5B-PA-O1A
2	C	401	NAD	C5B-O5B-PA-O3
2	C	401	NAD	C5D-O5D-PN-O2N
2	C	401	NAD	O4D-C1D-N1N-C2N
2	C	401	NAD	O4D-C1D-N1N-C6N
2	B	401	NAD	C5B-O5B-PA-O1A
2	B	401	NAD	C5B-O5B-PA-O3
2	B	401	NAD	PN-O3-PA-O5B
2	B	401	NAD	C5D-O5D-PN-O3
2	B	401	NAD	C5D-O5D-PN-O1N
2	B	401	NAD	C5D-O5D-PN-O2N
2	B	401	NAD	O4D-C1D-N1N-C2N

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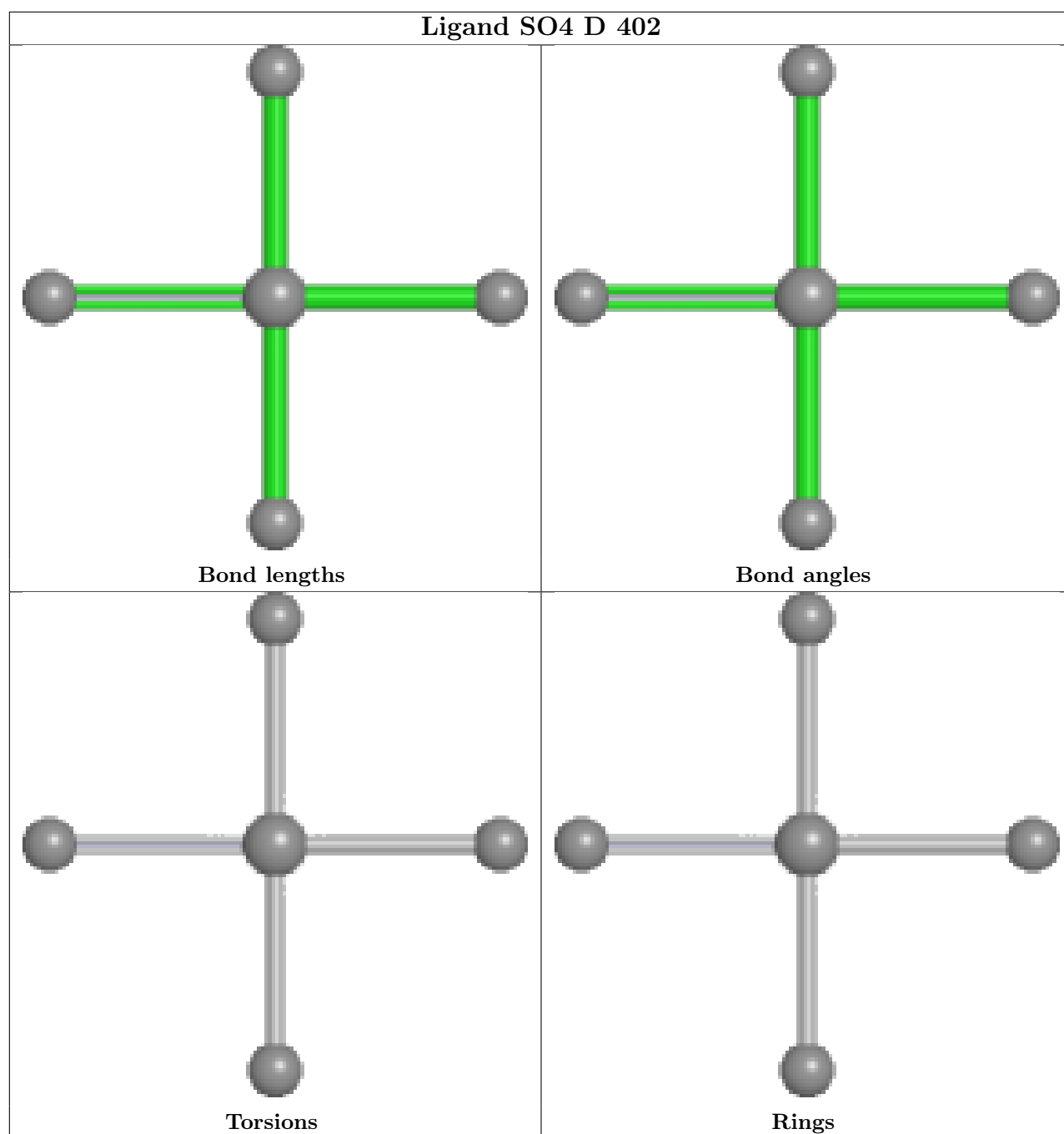
Mol	Chain	Res	Type	Atoms
2	B	401	NAD	O4D-C1D-N1N-C6N
2	B	401	NAD	C2D-C1D-N1N-C2N
2	B	401	NAD	C2D-C1D-N1N-C6N
2	D	401	NAD	C5B-O5B-PA-O1A
2	D	401	NAD	C5B-O5B-PA-O2A
2	D	401	NAD	C5B-O5B-PA-O3
2	D	401	NAD	PN-O3-PA-O5B
2	D	401	NAD	C5D-O5D-PN-O3
2	D	401	NAD	C5D-O5D-PN-O1N
2	D	401	NAD	C5D-O5D-PN-O2N
2	D	401	NAD	O4D-C1D-N1N-C2N
2	D	401	NAD	O4D-C1D-N1N-C6N
2	D	401	NAD	C2D-C1D-N1N-C2N
2	D	401	NAD	C2D-C1D-N1N-C6N
2	D	401	NAD	O4B-C4B-C5B-O5B
2	D	401	NAD	C3B-C4B-C5B-O5B
2	C	401	NAD	O4B-C4B-C5B-O5B
2	D	401	NAD	C2B-C1B-N9A-C8A
2	C	401	NAD	C3B-C4B-C5B-O5B
2	C	401	NAD	C5B-O5B-PA-O2A
2	B	401	NAD	C5B-O5B-PA-O2A
2	B	401	NAD	O4B-C4B-C5B-O5B
2	B	401	NAD	PA-O3-PN-O2N
2	D	401	NAD	PA-O3-PN-O1N
2	D	401	NAD	PA-O3-PN-O2N
2	A	401	NAD	C2D-C1D-N1N-C2N
2	A	401	NAD	C2D-C1D-N1N-C6N
2	C	401	NAD	C2D-C1D-N1N-C2N
2	C	401	NAD	C2D-C1D-N1N-C6N
2	A	401	NAD	C2B-C1B-N9A-C8A
2	B	401	NAD	C2B-C1B-N9A-C8A
2	D	401	NAD	C4B-C5B-O5B-PA
2	C	401	NAD	PA-O3-PN-O1N
2	C	401	NAD	PA-O3-PN-O2N
2	D	401	NAD	O4D-C4D-C5D-O5D
2	B	401	NAD	C3B-C4B-C5B-O5B
2	D	401	NAD	C3D-C4D-C5D-O5D
2	D	401	NAD	O4B-C1B-N9A-C8A
2	C	401	NAD	C2B-C1B-N9A-C8A

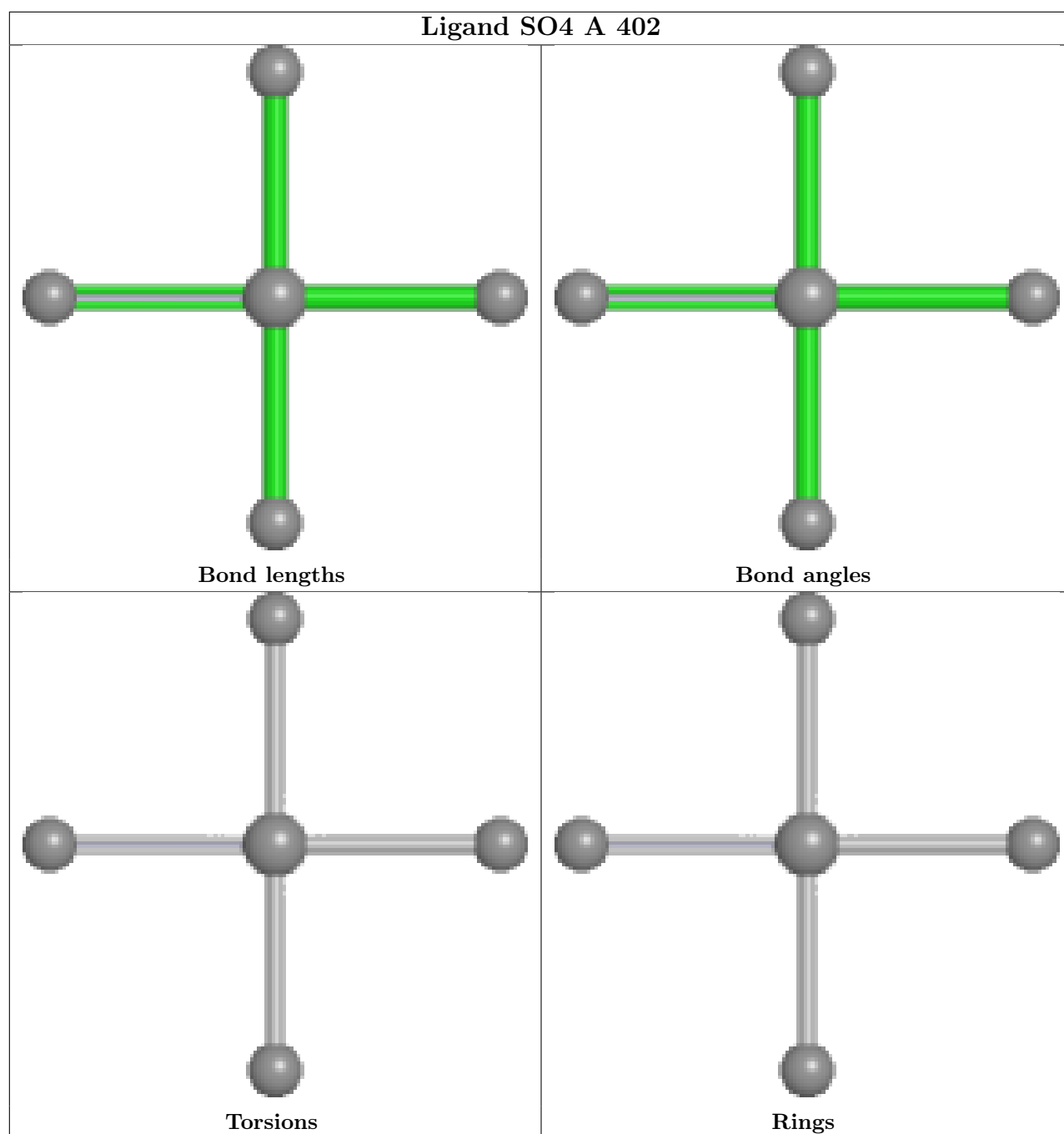
There are no ring outliers.

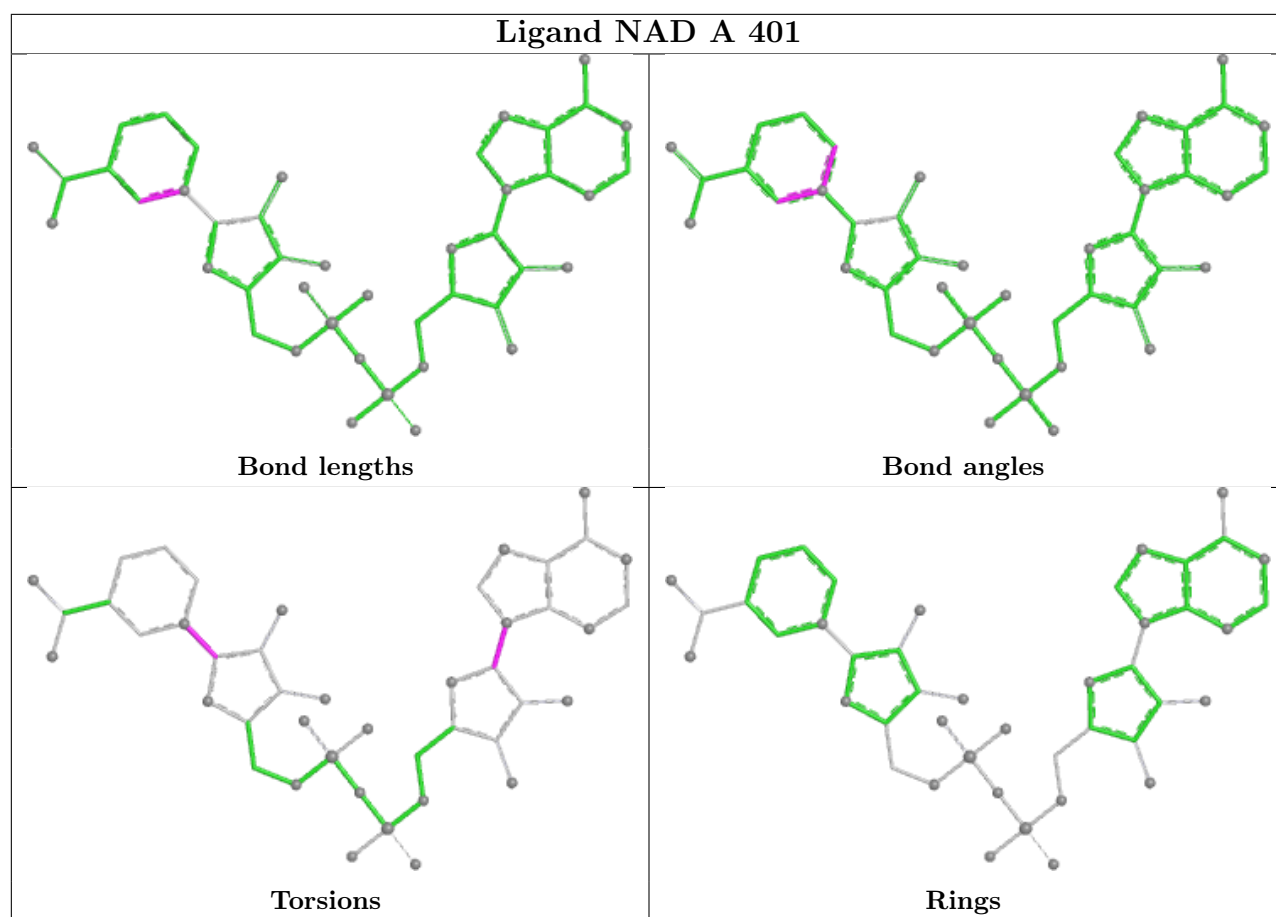
1 monomer is involved in 1 short contact:

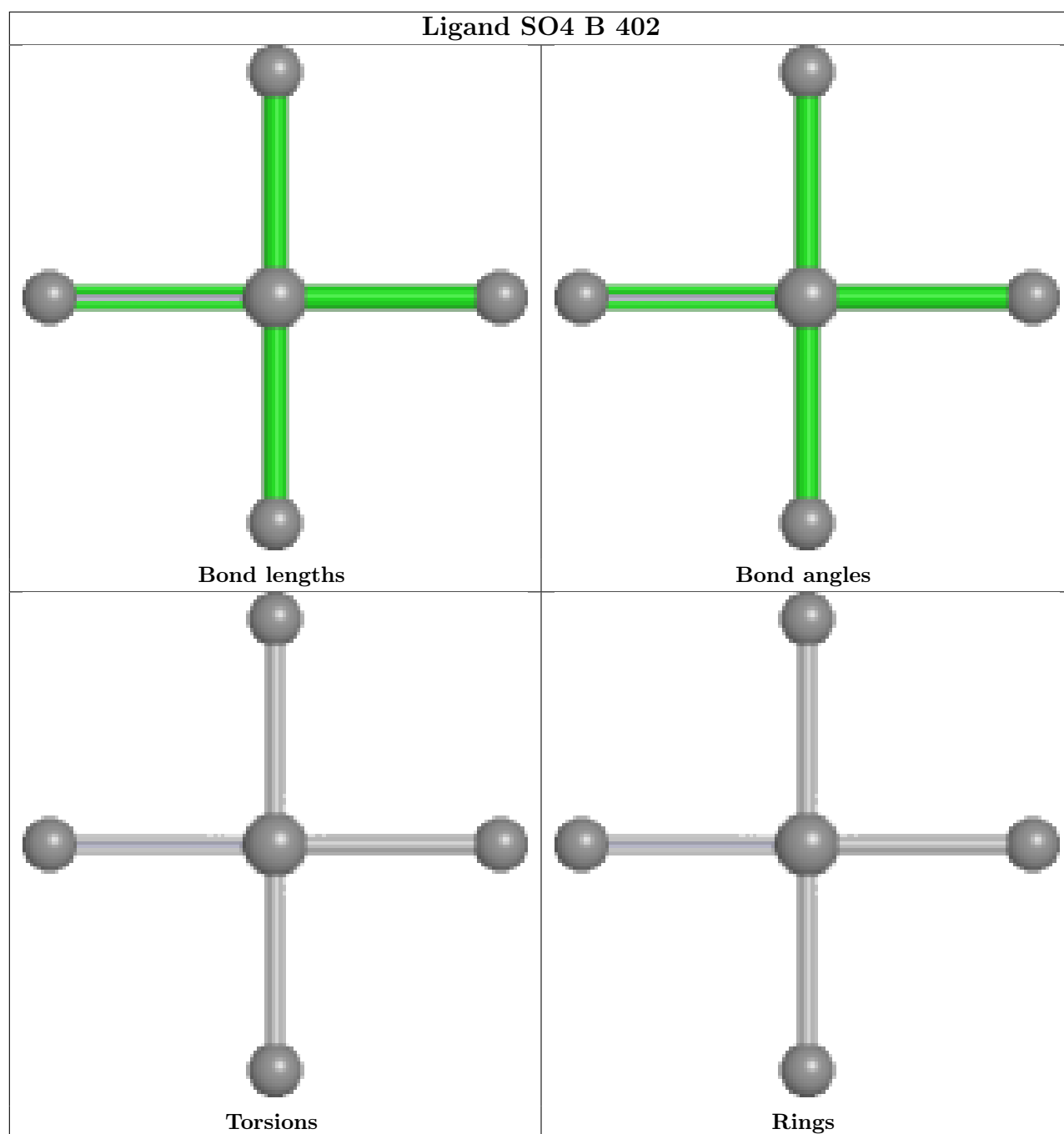
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	D	401	NAD	1	0

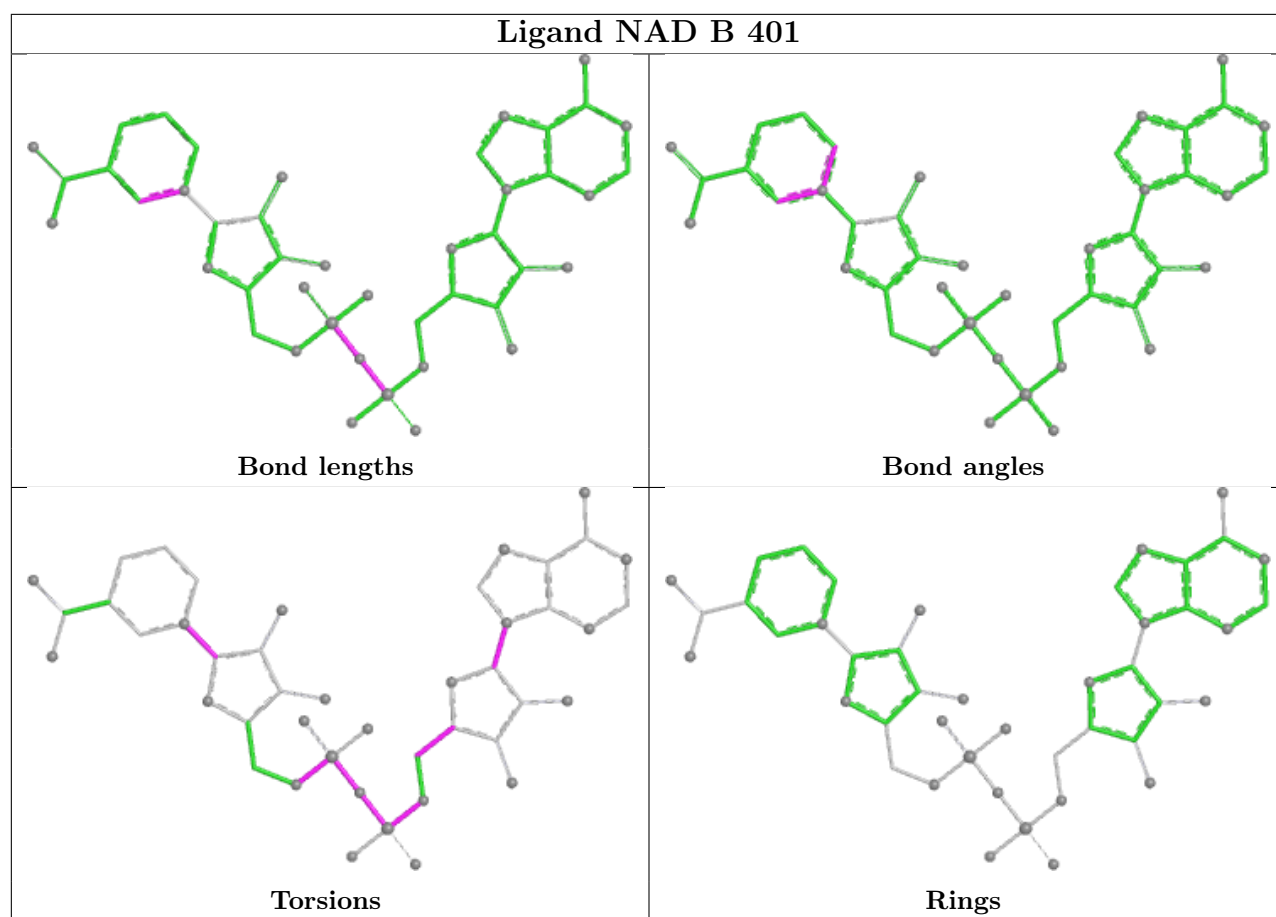
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

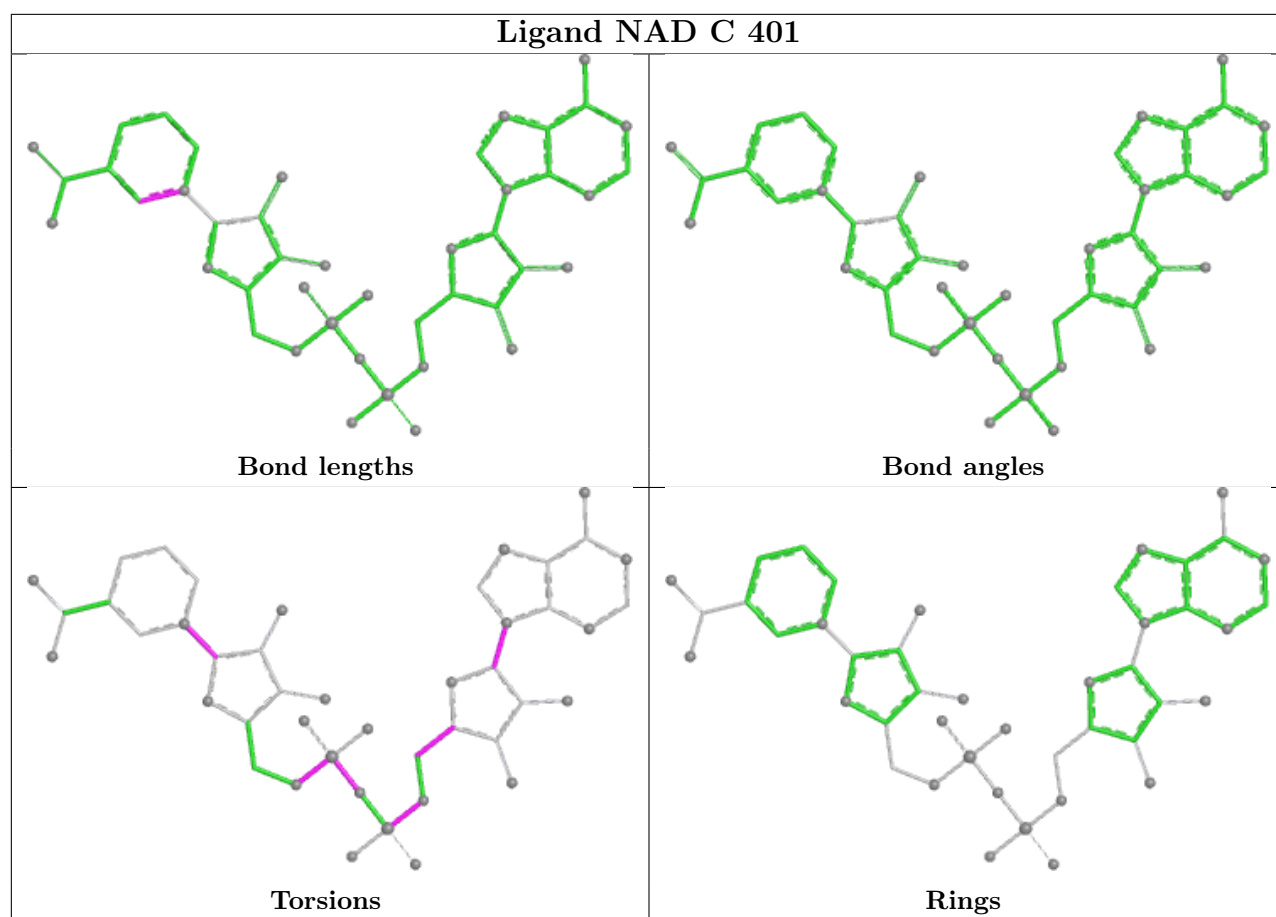


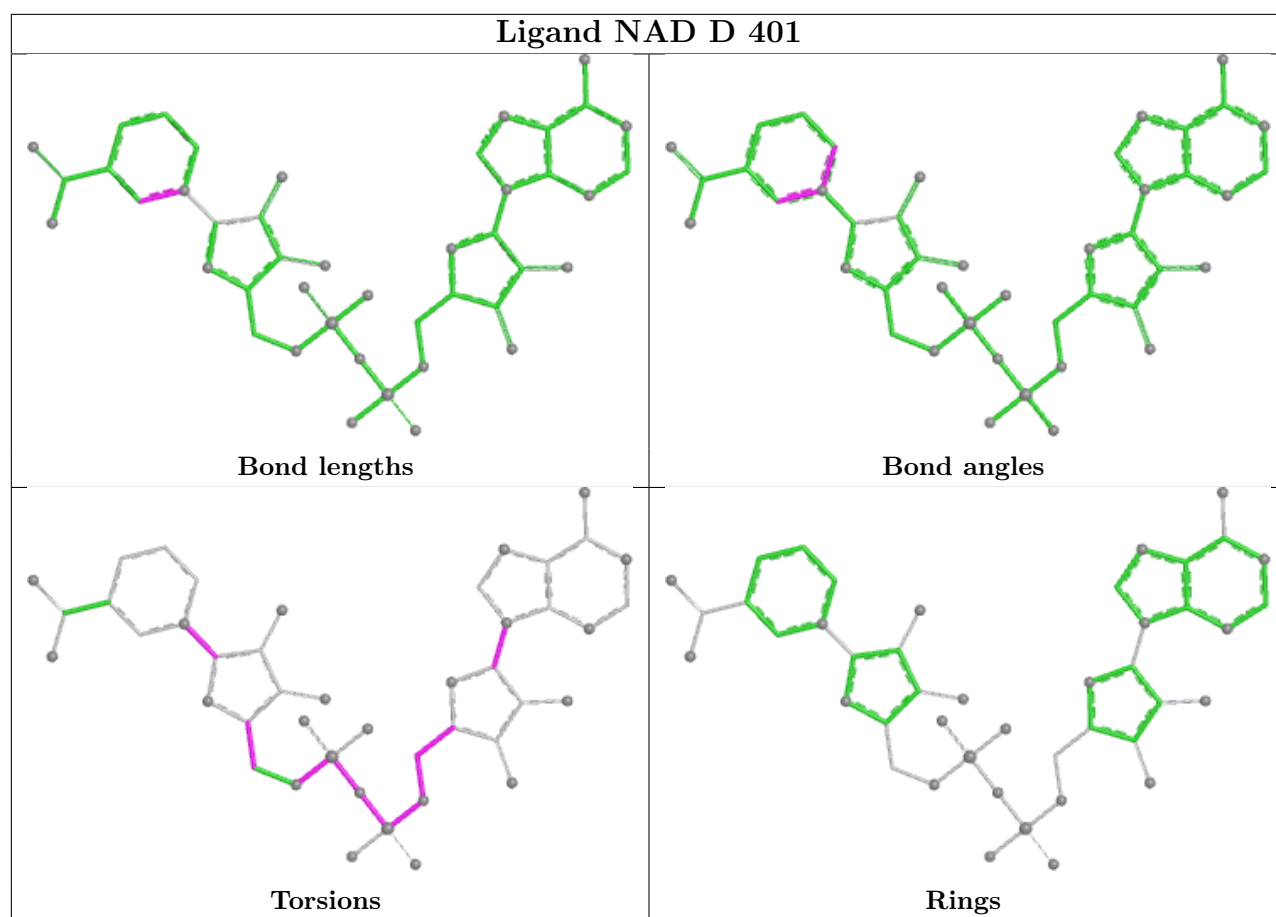


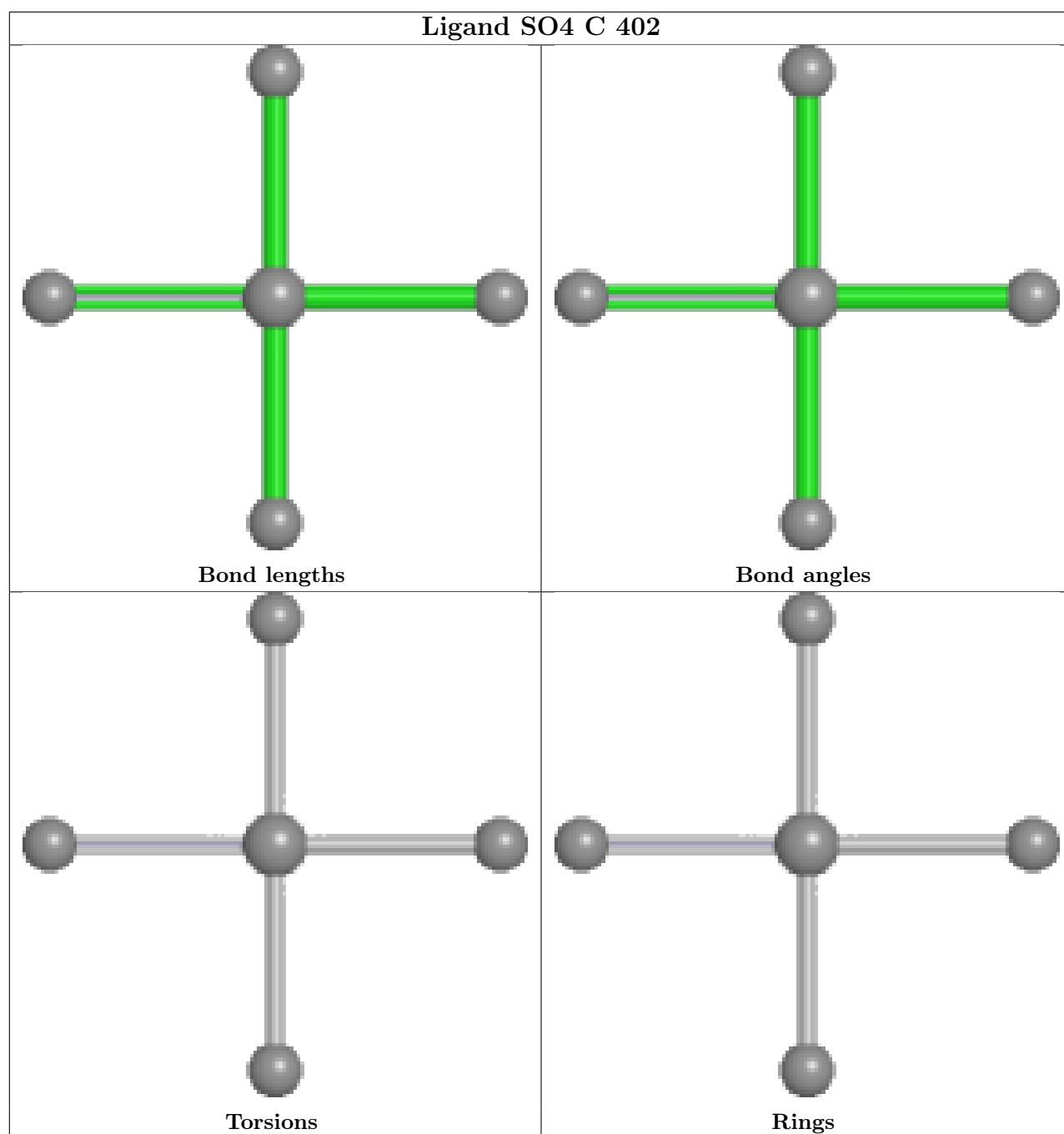












5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data [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	341/341 (100%)	-0.30	3 (0%) 81 81	16, 42, 69, 113	1 (0%)
1	B	341/341 (100%)	-0.40	4 (1%) 76 75	22, 38, 69, 130	0
1	C	341/341 (100%)	-0.40	1 (0%) 90 91	22, 37, 62, 110	0
1	D	341/341 (100%)	-0.37	2 (0%) 85 85	16, 38, 62, 122	1 (0%)
All	All	1364/1364 (100%)	-0.37	10 (0%) 84 84	16, 39, 66, 130	2 (0%)

All (10) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	1	MET	3.0
1	A	341	SER	3.0
1	B	306	LEU	2.9
1	B	341	SER	2.9
1	D	341	SER	2.6
1	A	25	LYS	2.5
1	B	340	LYS	2.4
1	B	1	MET	2.2
1	A	340	LYS	2.1
1	C	341	SER	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

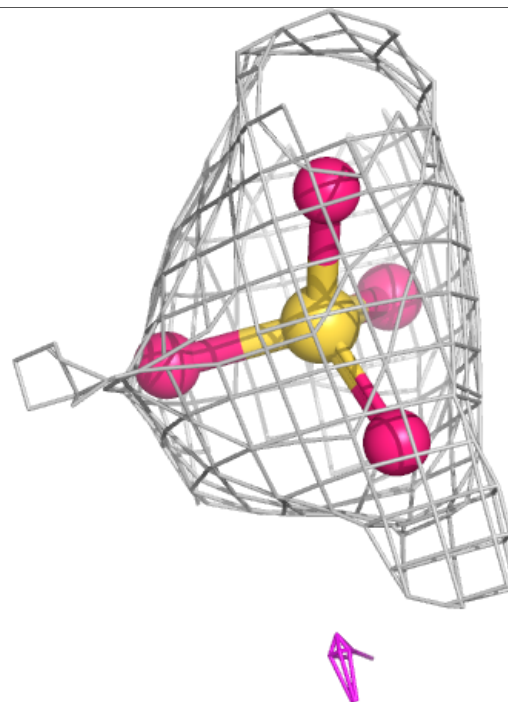
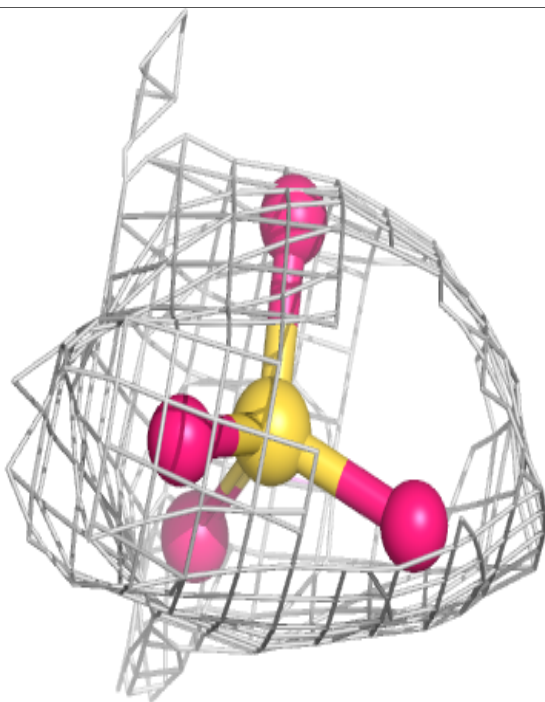
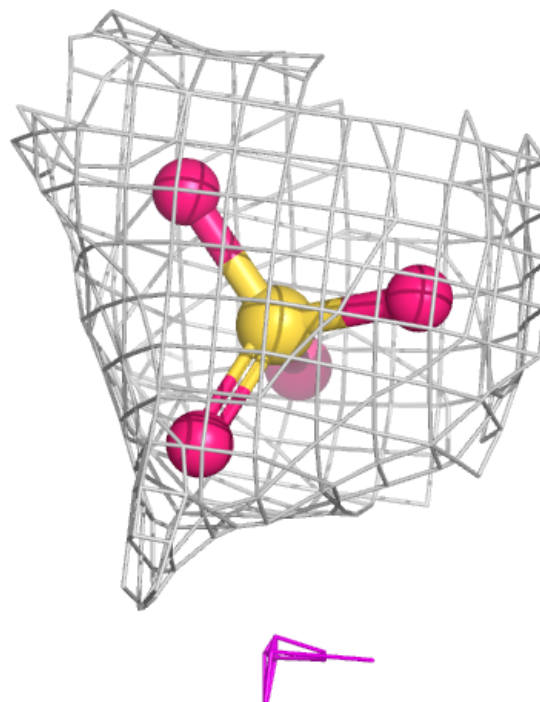
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists 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	SO4	A	402	5/5	0.85	0.13	88,96,100,102	0
3	SO4	D	402	5/5	0.86	0.13	72,74,79,83	0
3	SO4	C	402	5/5	0.92	0.16	87,88,94,95	0
3	SO4	B	402	5/5	0.93	0.14	66,73,79,84	0
2	NAD	B	401	44/44	0.95	0.08	35,46,52,56	0
2	NAD	A	401	44/44	0.97	0.06	35,43,58,67	0
2	NAD	C	401	44/44	0.98	0.06	32,38,61,63	0
2	NAD	D	401	44/44	0.98	0.06	29,39,58,62	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.

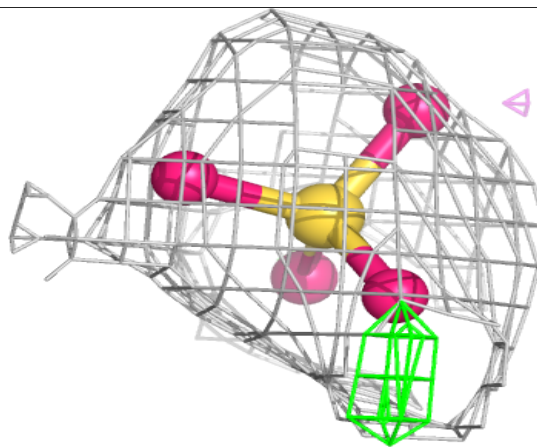
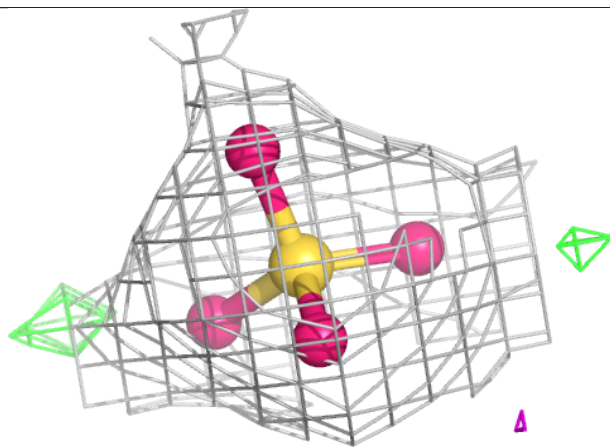
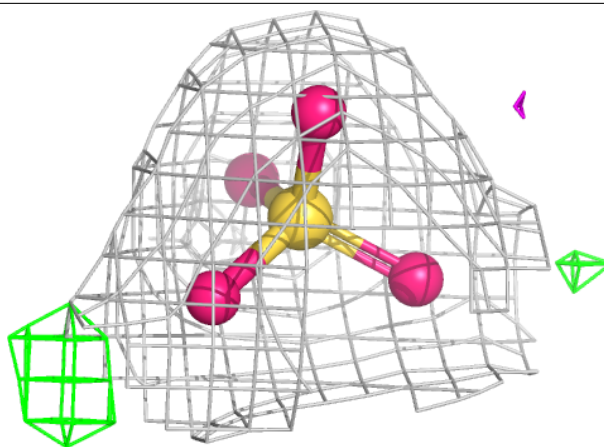
Electron density around SO4 A 402:

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



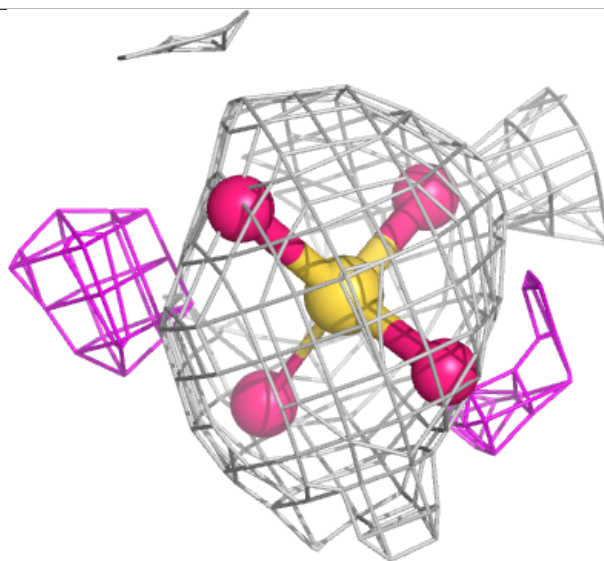
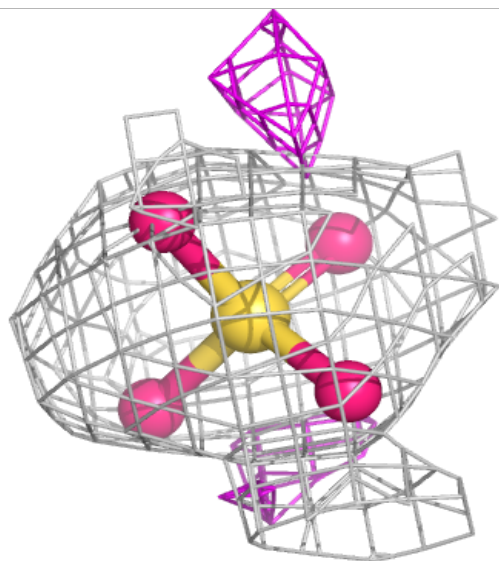
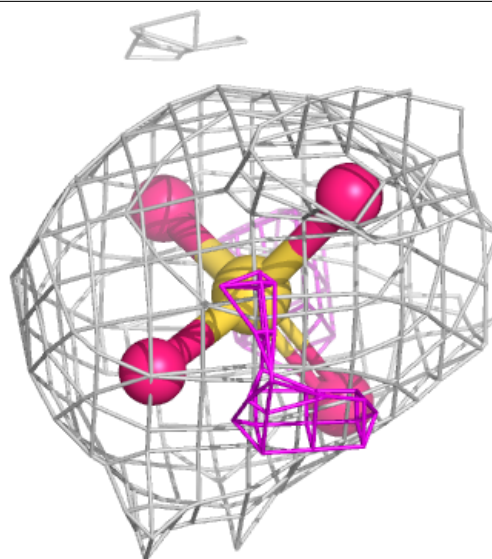
Electron density around SO4 D 402:

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



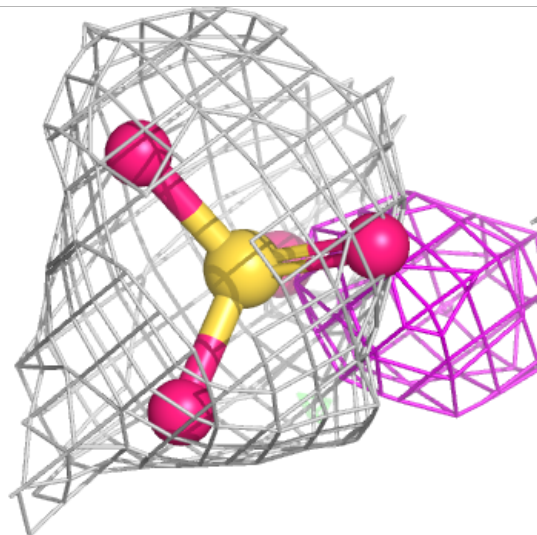
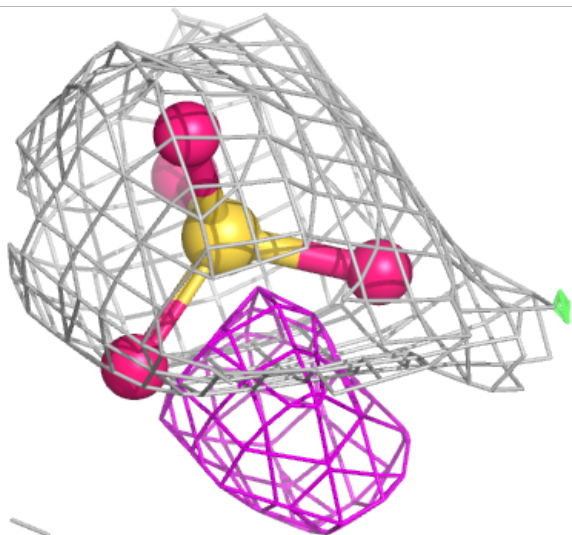
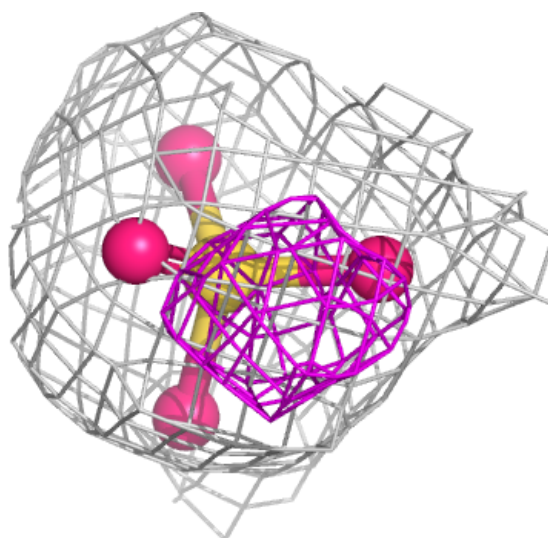
Electron density around SO4 C 402:

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



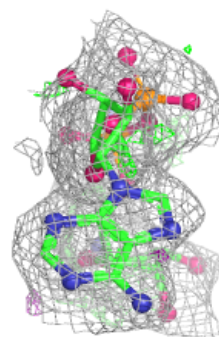
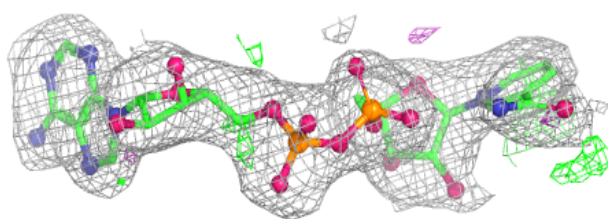
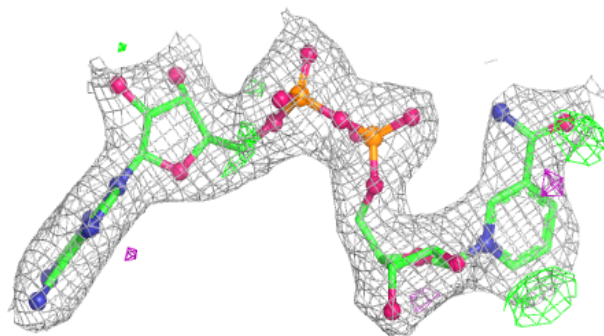
Electron density around SO4 B 402:

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

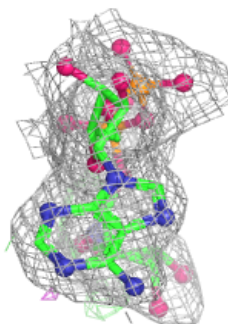
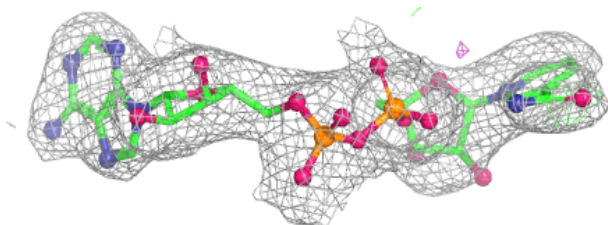
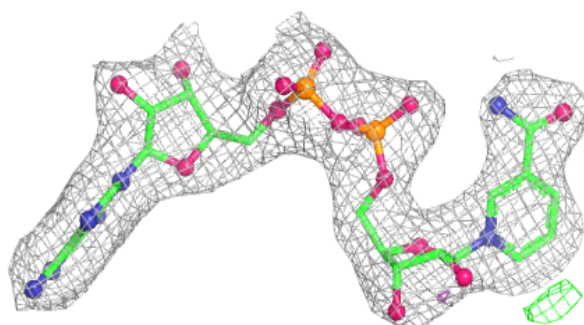


Electron density around NAD B 401:

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

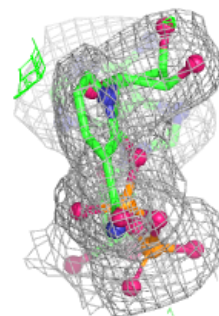
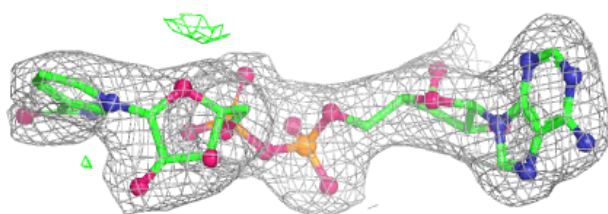
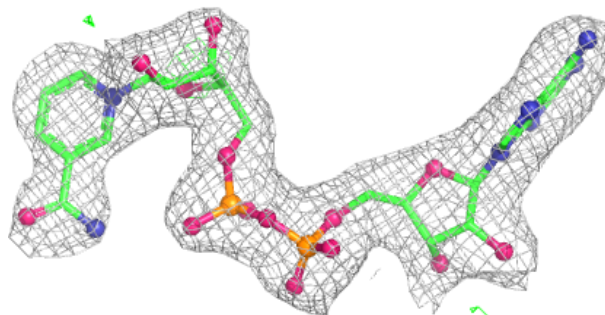
**Electron density around NAD A 401:**

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

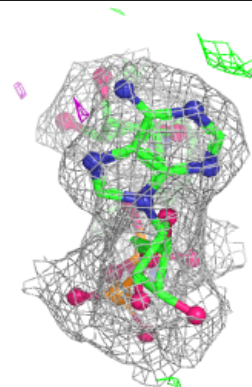
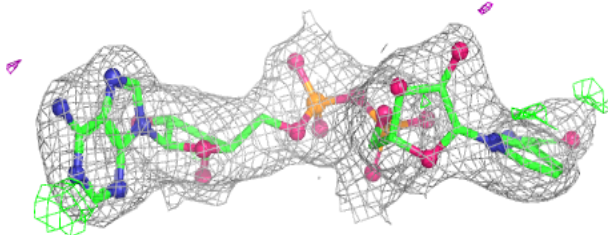
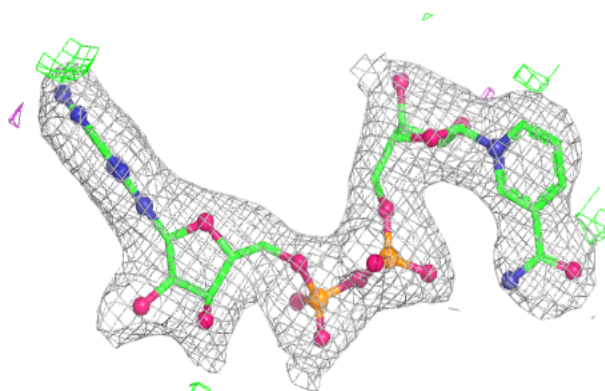


Electron density around NAD C 401:

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

**Electron density around NAD D 401:**

$2mF_o-DF_c$ (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.