



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 07:20 PM UTC

PDB ID : 4ZWL / pdb_00004zwl
Title : 2.60 Angstrom resolution crystal structure of betaine aldehyde dehydrogenase (betB) H448F/Y450L double mutant from Staphylococcus aureus in complex with NAD⁺ and BME-free Cys289
Authors : Halavaty, A.S.; Minasov, G.; Chen, C.; Joo, J.C.; Yakunin, A.F.; Anderson, W.F.; Center for Structural Genomics of Infectious Diseases (CSGID)
Deposited on : 2015-05-19
Resolution : 2.60 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

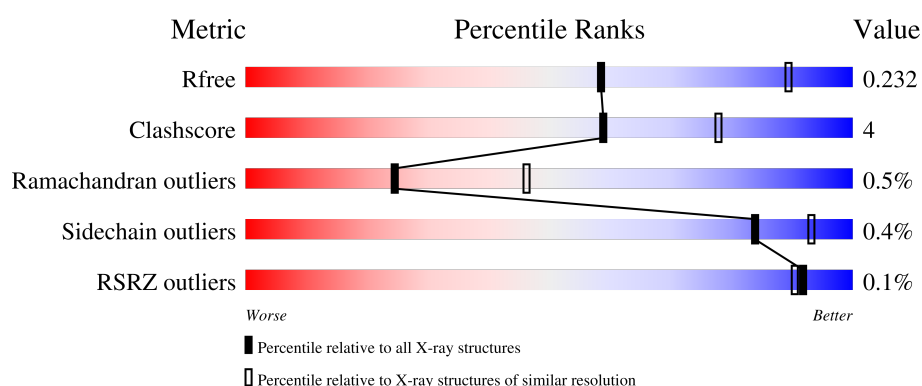
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

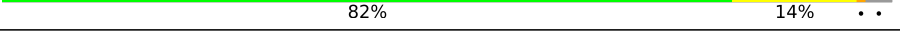
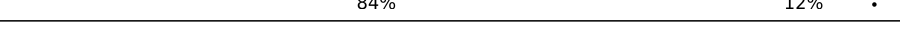
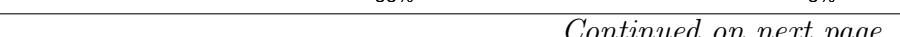
The reported resolution of this entry is 2.60 Å.

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	4008 (2.60-2.60)
Clashscore	190562	4347 (2.60-2.60)
Ramachandran outliers	187476	4277 (2.60-2.60)
Sidechain outliers	187428	4277 (2.60-2.60)
RSRZ outliers	180081	4008 (2.60-2.60)

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	517	
1	B	517	
1	C	517	
1	D	517	
1	E	517	

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Mol	Chain	Length	Quality of chain
1	F	517	 85% 9% . .
1	G	517	 85% 11% . .
1	H	517	 86% 9% .

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 32907 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 Betaine-aldehyde dehydrogenase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	499	Total	C	N	O	S	0	10	0
			3954	2492	667	780	15			
1	B	499	Total	C	N	O	S	0	6	0
			3916	2469	665	768	14			
1	C	499	Total	C	N	O	S	0	7	0
			3927	2475	665	773	14			
1	D	498	Total	C	N	O	S	0	6	0
			3912	2464	665	769	14			
1	E	496	Total	C	N	O	S	0	10	0
			3929	2474	667	774	14			
1	F	496	Total	C	N	O	S	0	5	0
			3885	2449	658	764	14			
1	G	496	Total	C	N	O	S	0	4	0
			3876	2444	656	762	14			
1	H	496	Total	C	N	O	S	0	4	0
			3877	2445	657	761	14			

There are 184 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-20	MET	-	expression tag	UNP Q5HCU0
A	-19	GLY	-	expression tag	UNP Q5HCU0
A	-18	SER	-	expression tag	UNP Q5HCU0
A	-17	SER	-	expression tag	UNP Q5HCU0
A	-16	HIS	-	expression tag	UNP Q5HCU0
A	-15	HIS	-	expression tag	UNP Q5HCU0
A	-14	HIS	-	expression tag	UNP Q5HCU0
A	-13	HIS	-	expression tag	UNP Q5HCU0
A	-12	HIS	-	expression tag	UNP Q5HCU0
A	-11	HIS	-	expression tag	UNP Q5HCU0
A	-10	SER	-	expression tag	UNP Q5HCU0
A	-9	SER	-	expression tag	UNP Q5HCU0
A	-8	GLY	-	expression tag	UNP Q5HCU0

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Chain	Residue	Modelled	Actual	Comment	Reference
A	-7	ARG	-	expression tag	UNP Q5HCU0
A	-6	GLU	-	expression tag	UNP Q5HCU0
A	-5	ASN	-	expression tag	UNP Q5HCU0
A	-4	LEU	-	expression tag	UNP Q5HCU0
A	-3	TYR	-	expression tag	UNP Q5HCU0
A	-2	PHE	-	expression tag	UNP Q5HCU0
A	-1	GLN	-	expression tag	UNP Q5HCU0
A	0	GLY	-	expression tag	UNP Q5HCU0
A	448	PHE	HIS	engineered mutation	UNP Q5HCU0
A	450	LEU	TYR	engineered mutation	UNP Q5HCU0
B	-20	MET	-	expression tag	UNP Q5HCU0
B	-19	GLY	-	expression tag	UNP Q5HCU0
B	-18	SER	-	expression tag	UNP Q5HCU0
B	-17	SER	-	expression tag	UNP Q5HCU0
B	-16	HIS	-	expression tag	UNP Q5HCU0
B	-15	HIS	-	expression tag	UNP Q5HCU0
B	-14	HIS	-	expression tag	UNP Q5HCU0
B	-13	HIS	-	expression tag	UNP Q5HCU0
B	-12	HIS	-	expression tag	UNP Q5HCU0
B	-11	HIS	-	expression tag	UNP Q5HCU0
B	-10	SER	-	expression tag	UNP Q5HCU0
B	-9	SER	-	expression tag	UNP Q5HCU0
B	-8	GLY	-	expression tag	UNP Q5HCU0
B	-7	ARG	-	expression tag	UNP Q5HCU0
B	-6	GLU	-	expression tag	UNP Q5HCU0
B	-5	ASN	-	expression tag	UNP Q5HCU0
B	-4	LEU	-	expression tag	UNP Q5HCU0
B	-3	TYR	-	expression tag	UNP Q5HCU0
B	-2	PHE	-	expression tag	UNP Q5HCU0
B	-1	GLN	-	expression tag	UNP Q5HCU0
B	0	GLY	-	expression tag	UNP Q5HCU0
B	448	PHE	HIS	engineered mutation	UNP Q5HCU0
B	450	LEU	TYR	engineered mutation	UNP Q5HCU0
C	-20	MET	-	expression tag	UNP Q5HCU0
C	-19	GLY	-	expression tag	UNP Q5HCU0
C	-18	SER	-	expression tag	UNP Q5HCU0
C	-17	SER	-	expression tag	UNP Q5HCU0
C	-16	HIS	-	expression tag	UNP Q5HCU0
C	-15	HIS	-	expression tag	UNP Q5HCU0
C	-14	HIS	-	expression tag	UNP Q5HCU0
C	-13	HIS	-	expression tag	UNP Q5HCU0
C	-12	HIS	-	expression tag	UNP Q5HCU0

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Chain	Residue	Modelled	Actual	Comment	Reference
C	-11	HIS	-	expression tag	UNP Q5HCU0
C	-10	SER	-	expression tag	UNP Q5HCU0
C	-9	SER	-	expression tag	UNP Q5HCU0
C	-8	GLY	-	expression tag	UNP Q5HCU0
C	-7	ARG	-	expression tag	UNP Q5HCU0
C	-6	GLU	-	expression tag	UNP Q5HCU0
C	-5	ASN	-	expression tag	UNP Q5HCU0
C	-4	LEU	-	expression tag	UNP Q5HCU0
C	-3	TYR	-	expression tag	UNP Q5HCU0
C	-2	PHE	-	expression tag	UNP Q5HCU0
C	-1	GLN	-	expression tag	UNP Q5HCU0
C	0	GLY	-	expression tag	UNP Q5HCU0
C	448	PHE	HIS	engineered mutation	UNP Q5HCU0
C	450	LEU	TYR	engineered mutation	UNP Q5HCU0
D	-20	MET	-	expression tag	UNP Q5HCU0
D	-19	GLY	-	expression tag	UNP Q5HCU0
D	-18	SER	-	expression tag	UNP Q5HCU0
D	-17	SER	-	expression tag	UNP Q5HCU0
D	-16	HIS	-	expression tag	UNP Q5HCU0
D	-15	HIS	-	expression tag	UNP Q5HCU0
D	-14	HIS	-	expression tag	UNP Q5HCU0
D	-13	HIS	-	expression tag	UNP Q5HCU0
D	-12	HIS	-	expression tag	UNP Q5HCU0
D	-11	HIS	-	expression tag	UNP Q5HCU0
D	-10	SER	-	expression tag	UNP Q5HCU0
D	-9	SER	-	expression tag	UNP Q5HCU0
D	-8	GLY	-	expression tag	UNP Q5HCU0
D	-7	ARG	-	expression tag	UNP Q5HCU0
D	-6	GLU	-	expression tag	UNP Q5HCU0
D	-5	ASN	-	expression tag	UNP Q5HCU0
D	-4	LEU	-	expression tag	UNP Q5HCU0
D	-3	TYR	-	expression tag	UNP Q5HCU0
D	-2	PHE	-	expression tag	UNP Q5HCU0
D	-1	GLN	-	expression tag	UNP Q5HCU0
D	0	GLY	-	expression tag	UNP Q5HCU0
D	448	PHE	HIS	engineered mutation	UNP Q5HCU0
D	450	LEU	TYR	engineered mutation	UNP Q5HCU0
E	-20	MET	-	expression tag	UNP Q5HCU0
E	-19	GLY	-	expression tag	UNP Q5HCU0
E	-18	SER	-	expression tag	UNP Q5HCU0
E	-17	SER	-	expression tag	UNP Q5HCU0
E	-16	HIS	-	expression tag	UNP Q5HCU0

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Chain	Residue	Modelled	Actual	Comment	Reference
E	-15	HIS	-	expression tag	UNP Q5HCU0
E	-14	HIS	-	expression tag	UNP Q5HCU0
E	-13	HIS	-	expression tag	UNP Q5HCU0
E	-12	HIS	-	expression tag	UNP Q5HCU0
E	-11	HIS	-	expression tag	UNP Q5HCU0
E	-10	SER	-	expression tag	UNP Q5HCU0
E	-9	SER	-	expression tag	UNP Q5HCU0
E	-8	GLY	-	expression tag	UNP Q5HCU0
E	-7	ARG	-	expression tag	UNP Q5HCU0
E	-6	GLU	-	expression tag	UNP Q5HCU0
E	-5	ASN	-	expression tag	UNP Q5HCU0
E	-4	LEU	-	expression tag	UNP Q5HCU0
E	-3	TYR	-	expression tag	UNP Q5HCU0
E	-2	PHE	-	expression tag	UNP Q5HCU0
E	-1	GLN	-	expression tag	UNP Q5HCU0
E	0	GLY	-	expression tag	UNP Q5HCU0
E	448	PHE	HIS	engineered mutation	UNP Q5HCU0
E	450	LEU	TYR	engineered mutation	UNP Q5HCU0
F	-20	MET	-	expression tag	UNP Q5HCU0
F	-19	GLY	-	expression tag	UNP Q5HCU0
F	-18	SER	-	expression tag	UNP Q5HCU0
F	-17	SER	-	expression tag	UNP Q5HCU0
F	-16	HIS	-	expression tag	UNP Q5HCU0
F	-15	HIS	-	expression tag	UNP Q5HCU0
F	-14	HIS	-	expression tag	UNP Q5HCU0
F	-13	HIS	-	expression tag	UNP Q5HCU0
F	-12	HIS	-	expression tag	UNP Q5HCU0
F	-11	HIS	-	expression tag	UNP Q5HCU0
F	-10	SER	-	expression tag	UNP Q5HCU0
F	-9	SER	-	expression tag	UNP Q5HCU0
F	-8	GLY	-	expression tag	UNP Q5HCU0
F	-7	ARG	-	expression tag	UNP Q5HCU0
F	-6	GLU	-	expression tag	UNP Q5HCU0
F	-5	ASN	-	expression tag	UNP Q5HCU0
F	-4	LEU	-	expression tag	UNP Q5HCU0
F	-3	TYR	-	expression tag	UNP Q5HCU0
F	-2	PHE	-	expression tag	UNP Q5HCU0
F	-1	GLN	-	expression tag	UNP Q5HCU0
F	0	GLY	-	expression tag	UNP Q5HCU0
F	448	PHE	HIS	engineered mutation	UNP Q5HCU0
F	450	LEU	TYR	engineered mutation	UNP Q5HCU0
G	-20	MET	-	expression tag	UNP Q5HCU0

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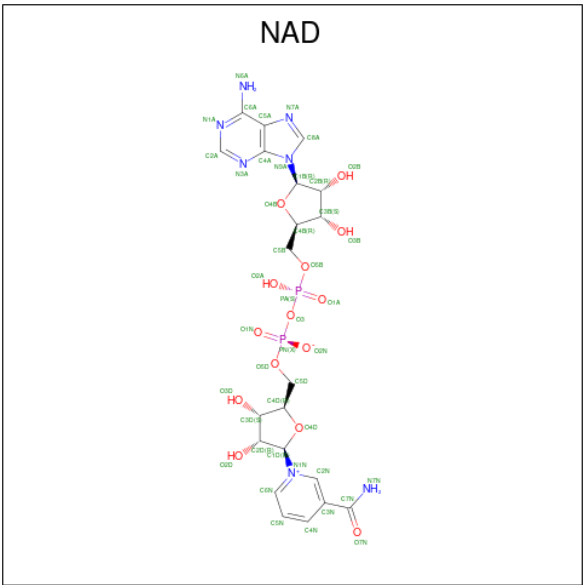
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G	-18	SER	-	expression tag	UNP Q5HCU0
G	-17	SER	-	expression tag	UNP Q5HCU0
G	-16	HIS	-	expression tag	UNP Q5HCU0
G	-15	HIS	-	expression tag	UNP Q5HCU0
G	-14	HIS	-	expression tag	UNP Q5HCU0
G	-13	HIS	-	expression tag	UNP Q5HCU0
G	-12	HIS	-	expression tag	UNP Q5HCU0
G	-11	HIS	-	expression tag	UNP Q5HCU0
G	-10	SER	-	expression tag	UNP Q5HCU0
G	-9	SER	-	expression tag	UNP Q5HCU0
G	-8	GLY	-	expression tag	UNP Q5HCU0
G	-7	ARG	-	expression tag	UNP Q5HCU0
G	-6	GLU	-	expression tag	UNP Q5HCU0
G	-5	ASN	-	expression tag	UNP Q5HCU0
G	-4	LEU	-	expression tag	UNP Q5HCU0
G	-3	TYR	-	expression tag	UNP Q5HCU0
G	-2	PHE	-	expression tag	UNP Q5HCU0
G	-1	GLN	-	expression tag	UNP Q5HCU0
G	0	GLY	-	expression tag	UNP Q5HCU0
G	448	PHE	HIS	engineered mutation	UNP Q5HCU0
G	450	LEU	TYR	engineered mutation	UNP Q5HCU0
H	-20	MET	-	expression tag	UNP Q5HCU0
H	-19	GLY	-	expression tag	UNP Q5HCU0
H	-18	SER	-	expression tag	UNP Q5HCU0
H	-17	SER	-	expression tag	UNP Q5HCU0
H	-16	HIS	-	expression tag	UNP Q5HCU0
H	-15	HIS	-	expression tag	UNP Q5HCU0
H	-14	HIS	-	expression tag	UNP Q5HCU0
H	-13	HIS	-	expression tag	UNP Q5HCU0
H	-12	HIS	-	expression tag	UNP Q5HCU0
H	-11	HIS	-	expression tag	UNP Q5HCU0
H	-10	SER	-	expression tag	UNP Q5HCU0
H	-9	SER	-	expression tag	UNP Q5HCU0
H	-8	GLY	-	expression tag	UNP Q5HCU0
H	-7	ARG	-	expression tag	UNP Q5HCU0
H	-6	GLU	-	expression tag	UNP Q5HCU0
H	-5	ASN	-	expression tag	UNP Q5HCU0
H	-4	LEU	-	expression tag	UNP Q5HCU0
H	-3	TYR	-	expression tag	UNP Q5HCU0
H	-2	PHE	-	expression tag	UNP Q5HCU0
H	-1	GLN	-	expression tag	UNP Q5HCU0

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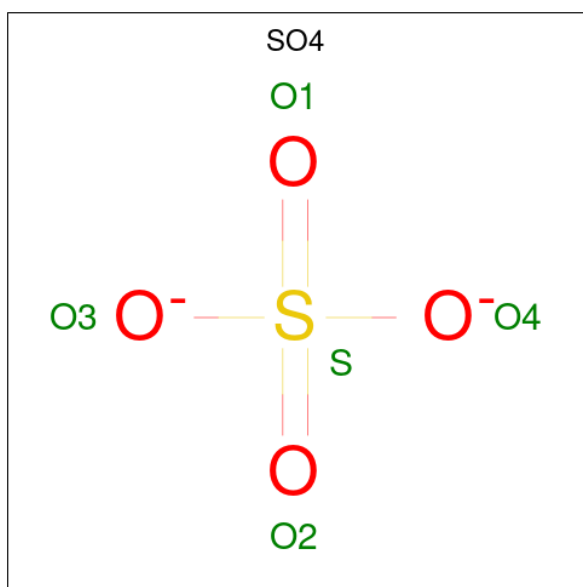
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H	448	PHE	HIS	engineered mutation	UNP Q5HCU0
H	450	LEU	TYR	engineered mutation	UNP Q5HCU0

- Molecule 2 is NICOTINAMIDE-ADENINE-DINUCLEOTIDE (CCD ID: NAD) (formula: $C_{21}H_{27}N_7O_{14}P_2$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	N	O	P	0	0
			44	21	7	14	2		
2	B	1	Total	C	N	O	P	0	0
			44	21	7	14	2		
2	C	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		
2	E	1	Total	C	N	O	P	0	0
			44	21	7	14	2		
2	F	1	Total	C	N	O	P	0	0
			44	21	7	14	2		
2	G	1	Total	C	N	O	P	0	0
			44	21	7	14	2		
2	H	1	Total	C	N	O	P	0	0
			44	21	7	14	2		

- Molecule 3 is SULFATE ION (CCD ID: SO4) (formula: O_4S).



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

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	G	1	Total	O	S	0	0
			5	4	1		

- Molecule 4 is water.

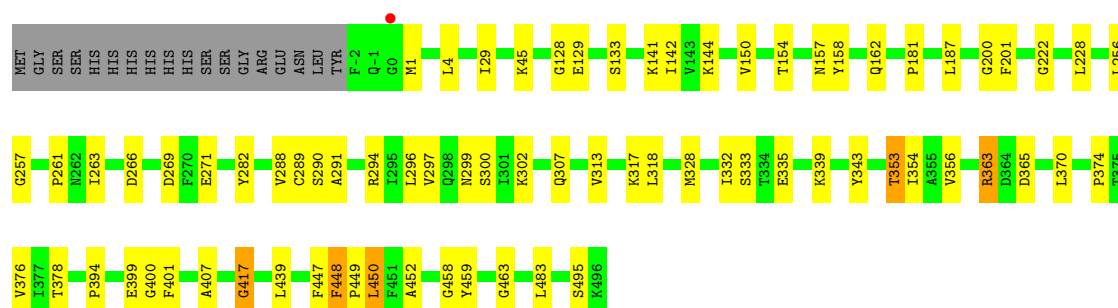
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	177	Total	O		0	5
			180	180			
4	B	182	Total	O		0	2
			183	183			
4	C	166	Total	O		0	3
			168	168			
4	D	174	Total	O		0	3
			176	176			
4	E	125	Total	O		0	2
			125	125			
4	F	151	Total	O		0	2
			151	151			
4	G	122	Total	O		0	1
			123	123			
4	H	98	Total	O		0	1
			98	98			

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.

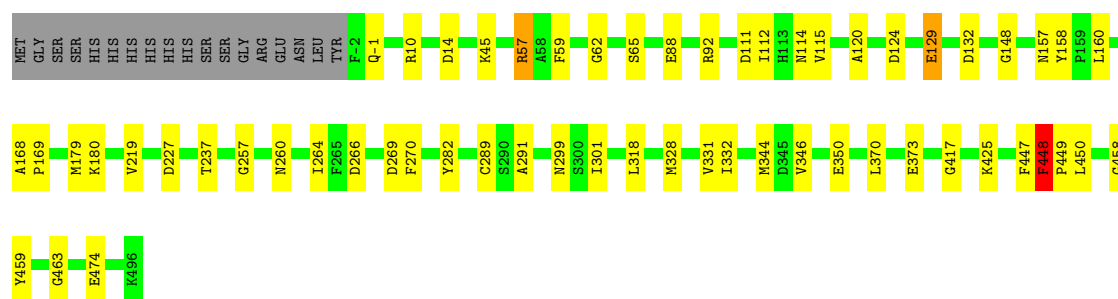
- Molecule 1: Betaine-aldehyde dehydrogenase

Chain A: 



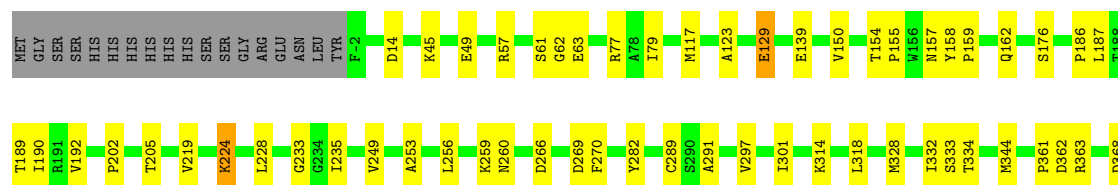
- Molecule 1: Betaine-aldehyde dehydrogenase

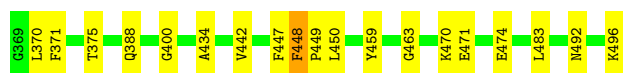
Chain B: 



- Molecule 1: Betaine-aldehyde dehydrogenase

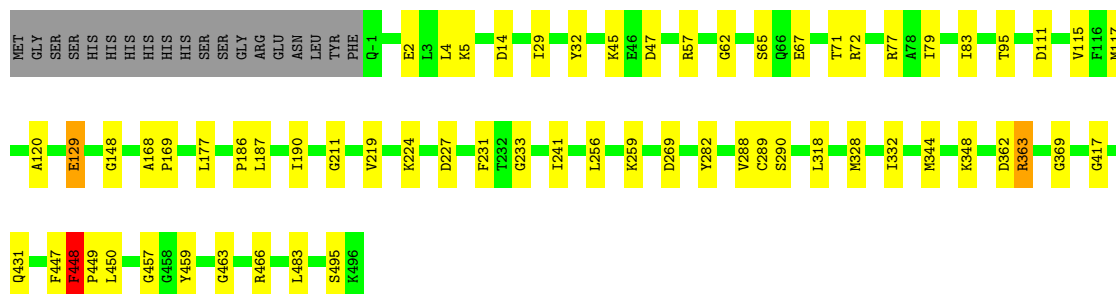
Chain C: 





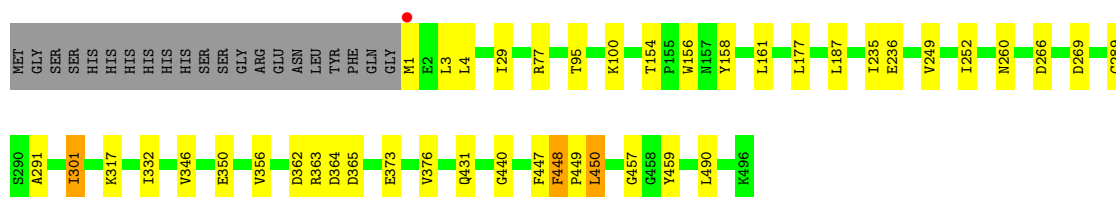
• Molecule 1: Betaine-aldehyde dehydrogenase

Chain D: 84% 12%



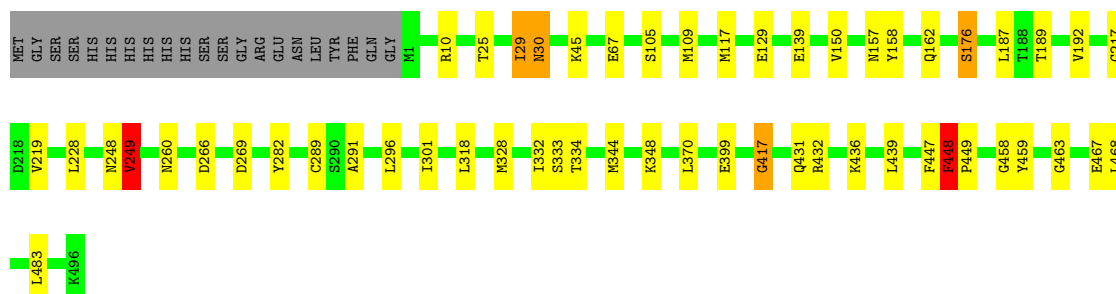
• Molecule 1: Betaine-aldehyde dehydrogenase

Chain E: 88% 8%



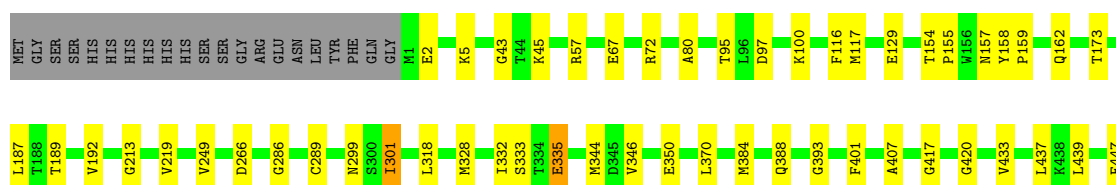
• Molecule 1: Betaine-aldehyde dehydrogenase

Chain F: 85% 9%



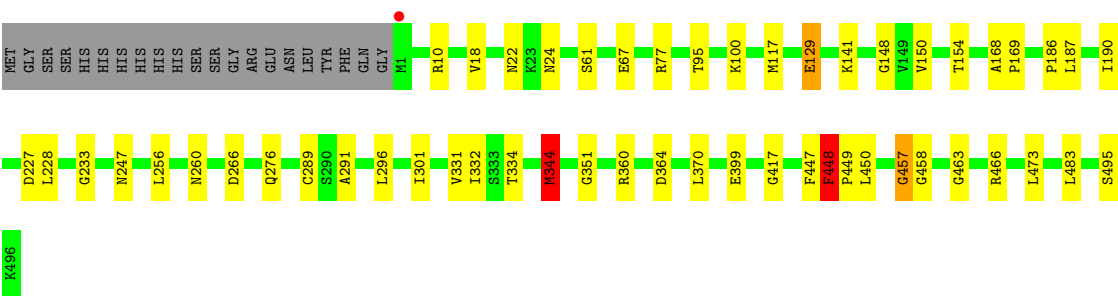
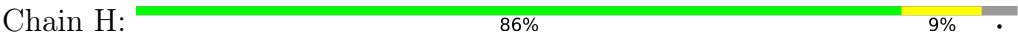
• Molecule 1: Betaine-aldehyde dehydrogenase

Chain G: 85% 11%





● Molecule 1: Betaine-aldehyde dehydrogenase



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	89.14Å 170.97Å 137.58Å 90.00° 102.77° 90.00°	Depositor
Resolution (Å)	29.95 – 2.60 29.95 – 2.60	Depositor EDS
% Data completeness (in resolution range)	99.9 (29.95-2.60) 99.9 (29.95-2.60)	Depositor EDS
R_{merge}	0.13	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.46 (at 2.61Å)	Xtriage
Refinement program	REFMAC 5.7.0029	Depositor
R, R_{free}	0.158 , 0.232 0.163 , 0.232	Depositor DCC
R_{free} test set	6075 reflections (4.93%)	wwPDB-VP
Wilson B-factor (Å ²)	32.5	Xtriage
Anisotropy	0.593	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.30 , 36.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	32907	wwPDB-VP
Average B, all atoms (Å ²)	37.0	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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: SO4, NAD

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	0.76	0/4025	1.12	21/5438 (0.4%)
1	B	0.76	0/3991	1.14	22/5393 (0.4%)
1	C	0.73	0/3998	1.09	18/5403 (0.3%)
1	D	0.74	0/3982	1.10	17/5381 (0.3%)
1	E	0.73	0/4001	1.09	13/5406 (0.2%)
1	F	0.73	0/3955	1.12	15/5346 (0.3%)
1	G	0.70	0/3946	1.11	8/5334 (0.1%)
1	H	0.69	0/3947	1.09	15/5335 (0.3%)
All	All	0.73	0/31845	1.11	129/43036 (0.3%)

There are no bond length outliers.

All (129) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	332	ILE	N-CA-C	14.00	123.86	110.42
1	B	332	ILE	N-CA-C	13.03	122.77	110.53
1	A	332	ILE	N-CA-C	11.96	122.80	110.72
1	E	332	ILE	N-CA-C	11.82	122.66	110.72
1	F	332	ILE	N-CA-C	10.35	121.18	110.62
1	C	332	ILE	N-CA-C	10.15	120.98	110.62
1	G	332	ILE	N-CA-C	9.66	120.48	110.72
1	B	-1	GLN	N-CA-C	9.25	120.96	111.07
1	C	459	TYR	N-CA-C	-8.61	97.72	110.46
1	H	332	ILE	N-CA-C	8.17	119.90	111.00
1	D	187	LEU	N-CA-C	8.10	119.79	110.97
1	G	43	GLY	N-CA-C	7.99	121.12	112.33
1	B	463	GLY	N-CA-C	7.95	122.65	110.88
1	E	459	TYR	N-CA-C	-7.86	97.95	110.14
1	A	459	TYR	N-CA-C	-7.86	97.96	110.14
1	F	269	ASP	N-CA-C	-7.82	98.31	109.96

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	F	459	TYR	N-CA-C	-7.82	98.30	110.42
1	F	463	GLY	N-CA-C	7.58	121.47	110.63
1	B	459	TYR	N-CA-C	-7.37	98.99	110.42
1	C	269	ASP	N-CA-C	-7.29	98.65	109.15
1	D	448	PHE	CA-C-N	-7.25	112.17	119.93
1	D	448	PHE	C-N-CA	-7.25	112.17	119.93
1	B	120	ALA	N-CA-C	-7.21	103.35	111.07
1	H	129	GLU	N-CA-C	7.14	119.79	109.14
1	A	354	ILE	N-CA-C	-7.08	96.17	106.44
1	A	495	SER	N-CA-C	7.05	119.40	110.24
1	B	157	ASN	N-CA-C	7.00	118.56	111.07
1	C	463	GLY	N-CA-C	6.99	120.07	110.56
1	F	157	ASN	N-CA-C	6.95	118.65	111.14
1	A	299	ASN	N-CA-C	6.95	119.74	111.33
1	B	373	GLU	N-CA-C	6.88	118.57	109.83
1	E	269	ASP	N-CA-C	-6.87	98.02	108.67
1	A	463	GLY	N-CA-C	6.86	119.89	110.56
1	F	187	LEU	N-CA-C	6.76	119.26	111.02
1	B	129	GLU	N-CA-C	6.75	119.19	109.14
1	A	187	LEU	N-CA-C	6.74	119.25	111.02
1	E	29	ILE	N-CA-C	6.67	119.02	108.89
1	H	448	PHE	CA-C-N	-6.60	112.70	119.83
1	H	448	PHE	C-N-CA	-6.60	112.70	119.83
1	G	459	TYR	N-CA-C	-6.59	100.70	110.46
1	H	473	LEU	N-CA-C	-6.51	104.10	111.14
1	E	235	ILE	N-CA-C	6.42	117.16	110.62
1	D	177	LEU	N-CA-C	6.39	118.89	109.24
1	H	463	GLY	N-CA-C	6.39	119.77	110.63
1	A	269	ASP	N-CA-C	-6.38	100.21	109.59
1	G	301	ILE	CB-CA-C	-6.37	103.88	111.65
1	B	269	ASP	N-CA-C	-6.33	100.03	109.15
1	F	10	ARG	N-CA-C	6.31	119.46	109.81
1	C	253	ALA	N-CA-C	-6.27	97.85	108.26
1	E	4	LEU	N-CA-C	6.24	120.73	113.18
1	D	269	ASP	N-CA-C	-6.24	99.00	108.67
1	C	187	LEU	N-CA-C	6.12	118.49	111.02
1	A	29	ILE	N-CA-C	6.07	118.12	108.89
1	C	375	THR	N-CA-C	6.07	119.08	109.50
1	D	129	GLU	N-CA-C	6.03	117.40	108.60
1	E	154	THR	CA-C-N	5.97	127.30	120.85
1	E	154	THR	C-N-CA	5.97	127.30	120.85
1	G	299	ASN	N-CA-C	5.95	118.53	111.33

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	120	ALA	N-CA-C	-5.93	104.90	111.36
1	B	124	ASP	N-CA-C	5.92	119.47	112.72
1	C	157	ASN	N-CA-C	5.89	117.50	111.14
1	C	176	SER	N-CA-C	-5.87	100.14	109.59
1	C	79	ILE	N-CA-C	-5.86	104.80	110.72
1	H	67	GLU	N-CA-C	-5.84	102.82	110.53
1	B	158	TYR	CA-C-N	-5.83	112.55	119.84
1	B	158	TYR	C-N-CA	-5.83	112.55	119.84
1	B	282	TYR	N-CA-C	5.83	121.11	113.30
1	H	351	GLY	N-CA-C	5.79	123.34	115.30
1	A	1	MET	N-CA-C	-5.78	106.18	113.18
1	D	29	ILE	N-CA-C	5.78	117.68	108.89
1	F	176	SER	N-CA-C	-5.75	100.81	109.95
1	C	129	GLU	N-CA-C	5.74	117.57	108.79
1	A	263	ILE	N-CA-C	5.72	117.00	108.54
1	B	448	PHE	N-CA-C	5.71	122.42	109.81
1	E	373	GLU	N-CA-C	5.70	117.07	109.83
1	H	344	MET	N-CA-C	-5.67	105.18	111.36
1	F	448	PHE	CA-C-N	-5.65	113.43	119.98
1	F	448	PHE	C-N-CA	-5.65	113.43	119.98
1	A	302	LYS	N-CA-C	5.62	117.09	111.07
1	C	388	GLN	N-CA-C	5.62	118.34	111.82
1	B	10	ARG	N-CA-C	5.60	118.38	109.81
1	A	157	ASN	N-CA-C	5.59	117.17	111.14
1	B	132	ASP	N-CA-C	-5.57	100.04	108.67
1	A	222	GLY	N-CA-C	5.52	124.27	115.66
1	D	259	LYS	N-CA-C	-5.50	96.06	107.67
1	A	4	LEU	N-CA-C	5.50	120.05	113.23
1	F	458	GLY	N-CA-C	5.50	121.91	112.51
1	C	282	TYR	N-CA-C	5.47	121.72	114.12
1	C	259	LYS	N-CA-C	-5.46	99.47	108.49
1	F	282	TYR	N-CA-C	5.45	121.78	113.61
1	H	457	GLY	CA-C-N	-5.45	117.62	122.47
1	H	457	GLY	C-N-CA	-5.45	117.62	122.47
1	H	187	LEU	N-CA-C	5.44	116.90	110.97
1	G	129	GLU	N-CA-C	5.43	117.33	109.07
1	C	270	PHE	N-CA-C	5.43	116.88	111.07
1	C	235	ILE	N-CA-C	5.41	115.61	110.42
1	H	458	GLY	N-CA-C	5.38	120.93	111.57
1	F	29	ILE	N-CA-C	5.38	117.07	108.89
1	B	270	PHE	N-CA-C	5.37	116.82	111.07
1	B	458	GLY	N-CA-C	5.35	121.84	112.10

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	463	GLY	N-CA-C	5.32	117.79	110.56
1	B	299	ASN	N-CA-C	5.31	117.75	111.33
1	G	388	GLN	N-CA-C	5.31	119.47	112.89
1	D	459	TYR	N-CA-C	-5.29	102.70	110.52
1	A	458	GLY	N-CA-C	5.28	121.54	112.51
1	A	133	SER	N-CA-C	5.28	116.53	109.83
1	H	364	ASP	N-CA-C	5.28	116.72	110.97
1	B	237	THR	N-CA-C	-5.27	105.61	111.36
1	D	2	GLU	N-CA-C	5.23	117.66	111.33
1	C	224	LYS	N-CA-C	5.23	117.89	111.82
1	A	452	ALA	N-CA-C	5.23	117.72	111.71
1	C	123	ALA	N-CA-C	5.21	117.36	111.11
1	E	154	THR	N-CA-C	5.20	118.56	109.82
1	H	154	THR	N-CA-C	5.18	118.10	109.09
1	E	156	TRP	N-CA-C	5.16	119.63	113.23
1	B	114	ASN	N-CA-C	5.16	117.64	111.71
1	F	30	ASN	N-CA-C	-5.14	101.22	109.04
1	A	201	PHE	CA-C-N	-5.14	114.94	120.03
1	A	201	PHE	C-N-CA	-5.14	114.94	120.03
1	D	67	GLU	N-CA-C	-5.13	102.89	110.48
1	E	187	LEU	N-CA-C	5.12	117.25	111.11
1	G	335	GLU	CB-CA-C	-5.11	102.63	110.81
1	E	301	ILE	CB-CA-C	-5.10	105.43	111.65
1	D	47	ASP	N-CA-C	-5.07	105.75	111.28
1	F	67	GLU	N-CA-C	-5.06	103.85	110.53
1	A	282	TYR	N-CA-C	5.05	120.06	113.30
1	B	264	ILE	N-CA-C	5.03	114.72	106.72
1	D	282	TYR	N-CA-C	5.03	121.15	113.61
1	D	211	GLY	N-CA-C	5.01	117.90	110.63

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	3954	0	3889	45	0
1	B	3916	0	3865	31	0
1	C	3927	0	3867	42	0
1	D	3912	0	3858	35	0
1	E	3929	0	3871	30	0
1	F	3885	0	3834	40	0
1	G	3876	0	3828	35	0
1	H	3877	0	3832	35	0
2	A	44	0	26	7	0
2	B	44	0	26	5	0
2	C	44	0	26	4	0
2	D	44	0	26	2	0
2	E	44	0	26	5	0
2	F	44	0	26	5	0
2	G	44	0	26	2	0
2	H	44	0	26	5	0
3	A	10	0	0	0	0
3	B	10	0	0	0	0
3	C	10	0	0	0	0
3	D	5	0	0	0	0
3	E	10	0	0	0	0
3	F	15	0	0	0	0
3	G	15	0	0	0	0
4	A	180	0	0	5	0
4	B	183	0	0	5	0
4	C	168	0	0	4	0
4	D	176	0	0	3	0
4	E	125	0	0	3	0
4	F	151	0	0	3	0
4	G	123	0	0	3	0
4	H	98	0	0	6	0
All	All	32907	0	31052	278	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 (278) 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:D:431[A]:GLN:HG2	4:D:704[A]:HOH:O	1.26	1.25
1:E:289:CYS:SG	2:E:501:NAD:C4N	2.29	1.20
1:B:289:CYS:SG	2:B:501:NAD:C4N	2.38	1.11

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:289:CYS:SG	2:A:501:NAD:C4N	2.42	1.07
1:F:289:CYS:SG	2:F:501:NAD:C4N	2.49	0.99
1:H:289:CYS:SG	2:H:501:NAD:C4N	2.52	0.97
1:C:289:CYS:SG	2:C:501:NAD:C4N	2.55	0.94
1:E:363:ARG:HD2	1:E:365:ASP:OD1	1.73	0.88
1:D:289:CYS:SG	2:D:501:NAD:C4N	2.64	0.85
1:F:431[A]:GLN:HG2	4:F:678[A]:HOH:O	1.76	0.83
1:E:317:LYS:HD2	4:E:722:HOH:O	1.82	0.78
1:E:289:CYS:SG	2:E:501:NAD:C3N	2.71	0.78
1:G:289:CYS:SG	2:G:501:NAD:C4N	2.73	0.77
1:A:353[A]:THR:HG23	4:A:622:HOH:O	1.84	0.77
1:A:289:CYS:SG	2:A:501:NAD:C3N	2.76	0.73
1:B:289:CYS:SG	2:B:501:NAD:H4N	2.27	0.73
1:C:289:CYS:SG	2:C:501:NAD:C3N	2.81	0.69
1:H:360:ARG:HB3	4:H:691:HOH:O	1.94	0.67
1:E:289:CYS:SG	2:E:501:NAD:H4N	2.33	0.67
1:E:289:CYS:SG	2:E:501:NAD:C5N	2.83	0.67
1:G:45:LYS:HB2	1:G:219:VAL:HG21	1.78	0.65
1:B:289:CYS:SG	2:B:501:NAD:C3N	2.86	0.64
1:A:150:VAL:HG12	1:A:228:LEU:HB3	1.81	0.63
1:D:450:LEU:O	1:D:450:LEU:HD12	1.99	0.63
1:E:266:ASP:HA	1:E:301:ILE:HD13	1.82	0.62
1:E:450:LEU:HD12	1:E:450:LEU:O	2.00	0.61
1:A:447:PHE:C	1:A:449:PRO:HD3	2.26	0.60
1:E:1:MET:C	1:E:3:LEU:H	2.08	0.60
1:B:111:ASP:O	1:B:115:VAL:HG23	2.01	0.60
1:C:314:LYS:HE2	4:C:643:HOH:O	2.02	0.60
1:H:276:GLN:OE1	1:H:276:GLN:HA	2.02	0.59
1:C:150:VAL:HG12	1:C:228:LEU:HB3	1.83	0.59
1:C:447:PHE:C	1:C:449:PRO:HD3	2.28	0.59
1:F:483:LEU:HD22	1:G:449:PRO:HB2	1.84	0.59
1:A:363:ARG:NH2	1:A:365:ASP:OD1	2.35	0.59
1:A:307:GLN:HG3	4:A:761:HOH:O	2.03	0.58
1:D:449:PRO:HA	4:D:632:HOH:O	2.03	0.58
1:H:289:CYS:SG	2:H:501:NAD:C3N	2.91	0.58
1:C:314:LYS:CE	4:C:643:HOH:O	2.52	0.58
1:C:45:LYS:HB2	1:C:219:VAL:HG21	1.85	0.58
1:B:129:GLU:HA	1:D:129:GLU:HA	1.86	0.57
1:G:333:SER:HA	1:G:370:LEU:HD13	1.85	0.57
1:F:158:TYR:O	1:F:162:GLN:HG2	2.05	0.57
1:F:483:LEU:CD2	1:G:449:PRO:HB2	2.35	0.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:G:289:CYS:SG	2:G:501:NAD:C3N	2.92	0.57
1:H:22:ASN:OD1	1:H:24:ASN:HB3	2.05	0.57
1:E:447:PHE:C	1:E:449:PRO:HD3	2.30	0.57
1:F:344:MET:HE2	1:F:344:MET:HA	1.86	0.57
1:H:150:VAL:HG12	1:H:228:LEU:HB3	1.86	0.57
1:A:318:LEU:CD2	1:A:328:MET:HE2	2.35	0.56
1:G:420:GLY:HA3	1:G:439:LEU:HD13	1.87	0.56
1:D:447:PHE:O	1:D:448:PHE:HB2	2.06	0.56
1:A:129:GLU:HA	1:C:129:GLU:HA	1.87	0.56
1:C:368:ASP:OD1	4:C:601:HOH:O	2.16	0.56
1:H:447:PHE:C	1:H:449:PRO:HD3	2.31	0.56
1:E:449:PRO:HB2	1:H:483:LEU:CD2	2.36	0.56
1:H:296:LEU:HD23	1:H:399:GLU:HB2	1.88	0.56
1:H:495:SER:O	4:H:601:HOH:O	2.18	0.55
1:H:168:ALA:HB3	1:H:169:PRO:HD3	1.89	0.55
1:B:260:ASN:HB2	1:B:291:ALA:O	2.06	0.55
1:A:483:LEU:HD22	1:D:449:PRO:HB2	1.89	0.55
1:B:425:LYS:HD2	4:B:734:HOH:O	2.05	0.55
1:E:77[A]:ARG:NH2	4:E:602:HOH:O	2.39	0.55
1:D:362:ASP:O	1:D:363:ARG:C	2.50	0.54
1:F:289:CYS:SG	2:F:501:NAD:C3N	2.95	0.54
1:G:344:MET:HE2	1:G:344:MET:HA	1.89	0.54
1:H:22:ASN:OD1	1:H:24:ASN:CB	2.55	0.54
1:D:148:GLY:HA3	1:D:227:ASP:OD2	2.07	0.54
1:C:447:PHE:O	1:C:448:PHE:HB2	2.07	0.53
1:F:139:GLU:OE1	1:H:141:LYS:NZ	2.41	0.53
1:B:92:ARG:HD3	4:B:721:HOH:O	2.08	0.53
1:A:141:LYS:NZ	1:C:139:GLU:OE1	2.34	0.53
1:E:447:PHE:O	1:E:448:PHE:HB2	2.08	0.53
1:A:313:VAL:HG13	1:A:374:PRO:HB2	1.91	0.53
1:D:344:MET:O	1:D:348:LYS:HG3	2.08	0.53
1:F:129:GLU:HA	1:H:129:GLU:HA	1.89	0.53
1:B:450:LEU:O	1:B:450:LEU:HD12	2.10	0.52
1:F:248:ASN:O	1:F:249:VAL:C	2.53	0.52
1:F:260:ASN:HB2	1:F:291:ALA:O	2.08	0.52
1:A:266:ASP:OD2	1:A:300:SER:OG	2.28	0.52
1:D:495:SER:HA	4:D:765:HOH:O	2.10	0.52
1:A:257:GLY:HA2	2:A:501:NAD:O2D	2.10	0.52
1:H:233:GLY:O	1:H:256:LEU:HA	2.10	0.52
1:A:353[B]:THR:HB	1:A:378:THR:HG1	1.72	0.51
1:D:289:CYS:SG	2:D:501:NAD:C3N	2.97	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:318:LEU:HD21	1:A:328:MET:HE2	1.92	0.51
1:C:14:ASP:CG	1:C:57:ARG:HH22	2.19	0.51
1:F:289:CYS:SG	2:F:501:NAD:H4N	2.48	0.51
1:F:334:THR:HG22	1:F:370:LEU:HD21	1.93	0.51
1:B:346:VAL:O	1:B:350:GLU:HG2	2.10	0.50
1:F:150:VAL:HG12	1:F:228:LEU:HB3	1.92	0.50
1:B:57[A]:ARG:CZ	1:B:57[A]:ARG:HB3	2.41	0.50
1:F:432:ARG:O	1:F:436:LYS:HG2	2.11	0.50
1:D:288:VAL:HG12	1:D:290:SER:H	1.77	0.50
1:C:62:GLY:O	1:C:63:GLU:C	2.54	0.50
1:A:335[B]:GLU:OE1	1:A:335[B]:GLU:N	2.33	0.50
1:A:447:PHE:O	1:A:448:PHE:HB2	2.12	0.50
1:B:474:GLU:HG2	4:B:700:HOH:O	2.11	0.50
1:H:344:MET:HA	1:H:344:MET:HE2	1.94	0.50
1:B:14:ASP:OD1	1:B:57[A]:ARG:NH1	2.44	0.50
1:G:97:ASP:HB2	1:G:187:LEU:HD12	1.93	0.49
1:B:450:LEU:HD12	1:B:450:LEU:C	2.37	0.49
1:F:296:LEU:HD23	1:F:399:GLU:HB2	1.94	0.49
1:B:112:ILE:HD13	1:B:160:LEU:HG	1.95	0.49
1:E:252:ILE:O	1:E:252:ILE:HG13	2.11	0.49
1:G:346:VAL:O	1:G:350:GLU:HG2	2.13	0.49
1:A:154:THR:OG1	1:A:181:PRO:HA	2.13	0.49
1:F:45:LYS:HB2	1:F:219:VAL:HG21	1.95	0.49
1:C:434:ALA:CB	1:C:442:VAL:HG11	2.42	0.49
1:G:286:GLY:HA3	1:G:393:GLY:O	2.12	0.49
1:F:344:MET:O	1:F:348:LYS:HG3	2.12	0.48
1:G:447:PHE:O	1:G:448:PHE:HB2	2.14	0.48
1:A:297:VAL:O	1:A:400:GLY:HA2	2.14	0.48
1:C:155:PRO:HB3	2:C:501:NAD:H52N	1.95	0.48
1:E:289:CYS:HB3	2:E:501:NAD:C6N	2.43	0.48
1:C:266:ASP:HA	1:C:301:ILE:HD13	1.95	0.48
1:D:318:LEU:CD2	1:D:328:MET:HE2	2.44	0.48
1:F:449:PRO:HB2	1:G:483:LEU:HD22	1.95	0.48
1:D:344:MET:HE2	1:D:344:MET:HA	1.95	0.48
1:F:431[A]:GLN:CG	4:F:678[A]:HOH:O	2.50	0.48
1:B:289:CYS:SG	2:B:501:NAD:C5N	3.01	0.48
1:F:289:CYS:SG	2:F:501:NAD:C5N	3.02	0.48
1:C:471:GLU:HG3	4:C:743:HOH:O	2.14	0.47
1:G:189:THR:HA	1:G:192:VAL:HG12	1.96	0.47
1:H:186:PRO:O	1:H:190:ILE:HG13	2.14	0.47
1:C:61:SER:HB3	1:C:63:GLU:OE2	2.14	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:45:LYS:O	1:C:49[A]:GLU:HG3	2.14	0.47
1:F:25:THR:HG23	4:F:602:HOH:O	2.14	0.47
1:A:339[A]:LYS:HE2	1:A:343:TYR:HE2	1.79	0.47
1:H:77[B]:ARG:HG3	1:H:117:MET:SD	2.54	0.47
1:B:88:GLU:HB3	4:B:633:HOH:O	2.14	0.47
1:B:331:VAL:HG22	1:B:370:LEU:O	2.15	0.47
1:F:333:SER:HA	1:F:370:LEU:HD13	1.95	0.47
1:G:335:GLU:HG3	4:G:705:HOH:O	2.14	0.47
1:H:331:VAL:HG22	1:H:370:LEU:O	2.15	0.47
1:C:362:ASP:N	1:C:362:ASP:OD1	2.47	0.47
1:C:333:SER:HA	1:C:370:LEU:HD13	1.97	0.47
1:H:95:THR:HG23	1:H:100:LYS:O	2.14	0.47
1:C:154:THR:HB	1:C:155:PRO:HD2	1.96	0.47
1:A:288:VAL:HG12	1:A:290:SER:H	1.79	0.46
1:C:158:TYR:O	1:C:162:GLN:HG2	2.16	0.46
1:D:318:LEU:HD21	1:D:328:MET:HE2	1.97	0.46
1:A:289:CYS:SG	2:A:501:NAD:H4N	2.46	0.46
1:F:318:LEU:CD2	1:F:328:MET:HB3	2.46	0.46
1:F:266:ASP:HA	1:F:301:ILE:HD13	1.98	0.46
1:F:447:PHE:C	1:F:449:PRO:HD3	2.41	0.46
1:A:449:PRO:HB2	1:D:483:LEU:HD22	1.97	0.46
1:E:440:GLY:HA3	1:E:457:GLY:O	2.15	0.46
1:D:111:ASP:O	1:D:115:VAL:HG23	2.15	0.46
1:F:189:THR:O	1:F:192:VAL:HG12	2.15	0.46
1:C:189:THR:O	1:C:192:VAL:HG12	2.16	0.46
1:F:344:MET:HE2	1:F:344:MET:CA	2.46	0.46
1:E:77[A]:ARG:NH1	1:F:117:MET:HE3	2.30	0.46
1:C:186:PRO:O	1:C:190:ILE:HG13	2.15	0.46
1:G:433:VAL:O	1:G:437:LEU:HG	2.17	0.45
1:H:289:CYS:SG	2:H:501:NAD:H4N	2.52	0.45
1:B:62:GLY:HA2	1:B:65:SER:OG	2.17	0.45
1:E:362:ASP:OD1	1:E:362:ASP:C	2.58	0.45
1:H:334:THR:HG22	1:H:370:LEU:HD21	1.99	0.45
1:A:261:PRO:HA	1:A:294:ARG:O	2.17	0.45
1:A:289:CYS:SG	2:A:501:NAD:C5N	3.01	0.45
1:A:401:PHE:CD1	1:A:407:ALA:HB2	2.52	0.45
1:B:45:LYS:HB2	1:B:219:VAL:HG21	1.98	0.45
1:D:45:LYS:HB2	1:D:219:VAL:HG21	1.99	0.45
1:E:1:MET:C	1:E:3:LEU:N	2.74	0.45
1:H:450:LEU:HD12	1:H:450:LEU:C	2.41	0.45
1:C:344:MET:HA	1:C:344:MET:HE2	1.98	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:G:401:PHE:CD1	1:G:407:ALA:HB2	2.52	0.45
1:A:45:LYS:HD3	4:A:758:HOH:O	2.15	0.45
1:E:260:ASN:HB2	1:E:291:ALA:O	2.17	0.45
1:C:318:LEU:CD2	1:C:328:MET:HB3	2.47	0.45
1:D:14:ASP:CG	1:D:57[A]:ARG:HH22	2.25	0.45
1:A:448:PHE:N	1:A:449:PRO:CD	2.80	0.44
1:C:361:PRO:HG2	1:C:371:PHE:HB2	1.99	0.44
1:E:346:VAL:O	1:E:350:GLU:HG2	2.17	0.44
1:F:150:VAL:O	1:F:150:VAL:HG23	2.16	0.44
1:A:318:LEU:HD22	1:A:328:MET:HE2	2.00	0.44
1:H:260:ASN:HB2	1:H:291:ALA:O	2.18	0.44
1:A:256:LEU:O	2:A:501:NAD:H2N	2.18	0.44
1:D:79:ILE:O	1:D:83:ILE:HG12	2.18	0.44
1:F:467:GLU:O	1:F:468:LEU:HB2	2.18	0.44
1:D:32:TYR:O	1:D:369:GLY:HA3	2.18	0.44
1:G:80:ALA:HB1	1:G:117:MET:HE2	1.99	0.44
1:G:318:LEU:HD22	1:G:328:MET:HE2	2.00	0.44
1:C:202:PRO:O	1:C:205:THR:OG1	2.35	0.43
1:H:22:ASN:HA	4:H:645:HOH:O	2.18	0.43
1:H:289:CYS:HB3	2:H:501:NAD:C6N	2.49	0.43
1:D:447:PHE:C	1:D:449:PRO:HD3	2.44	0.43
1:H:61:SER:HA	4:H:677:HOH:O	2.19	0.43
1:C:260:ASN:HB2	1:C:291:ALA:O	2.19	0.43
1:G:95:THR:HG23	1:G:100:LYS:O	2.18	0.43
1:A:333:SER:HA	1:A:370:LEU:HD13	1.99	0.43
1:C:155:PRO:CB	2:C:501:NAD:H52N	2.49	0.43
1:D:71:THR:O	1:D:72:ARG:C	2.61	0.43
1:F:29:ILE:HG22	1:F:30:ASN:N	2.34	0.43
1:B:266:ASP:HA	1:B:301:ILE:HD13	1.99	0.43
1:E:77[A]:ARG:HH11	1:F:117:MET:HE3	1.83	0.43
1:G:2:GLU:O	1:G:5:LYS:HG2	2.18	0.43
1:C:470:LYS:O	1:C:474[A]:GLU:HG3	2.19	0.43
1:G:249:VAL:HG12	1:G:249:VAL:O	2.18	0.43
1:C:434:ALA:HB1	1:C:442:VAL:HG11	2.00	0.43
1:E:158:TYR:HB3	1:E:161:LEU:HB3	2.00	0.43
1:E:236[B]:GLU:HG2	4:E:720:HOH:O	2.18	0.43
1:G:157:ASN:C	1:G:159:PRO:HD3	2.43	0.43
1:A:288:VAL:HB	1:A:291:ALA:HB2	2.00	0.42
1:C:233:GLY:O	1:C:256:LEU:HA	2.19	0.42
1:H:10:ARG:HB3	1:H:18:VAL:O	2.19	0.42
1:C:297:VAL:O	1:C:400:GLY:HA2	2.20	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:186:PRO:O	1:D:190:ILE:HG13	2.20	0.42
1:A:353[A]:THR:OG1	1:A:378:THR:OG1	2.31	0.42
1:G:333:SER:CA	1:G:370:LEU:HD13	2.48	0.42
1:H:266:ASP:HA	1:H:301:ILE:HD13	2.01	0.42
1:D:62:GLY:HA2	1:D:65:SER:OG	2.19	0.42
1:G:154:THR:HB	1:G:155:PRO:HD2	2.02	0.42
1:B:148:GLY:HA3	1:B:227:ASP:OD2	2.19	0.42
1:B:344:MET:HE2	1:B:344:MET:HA	2.01	0.42
1:D:457:GLY:HA3	1:D:466:ARG:HD3	2.02	0.42
1:G:80:ALA:HB2	1:G:116:PHE:HB3	2.02	0.42
1:A:158:TYR:O	1:A:162:GLN:HG2	2.20	0.42
1:A:374:PRO:HA	1:A:394:PRO:HB2	2.00	0.42
1:G:173:THR:HB	1:G:477:LEU:HD21	2.01	0.42
1:A:200:GLY:HA2	4:A:720:HOH:O	2.20	0.42
1:E:95:THR:HG23	1:E:100:LYS:O	2.19	0.42
1:G:487:ASN:CG	1:G:487:ASN:O	2.61	0.42
1:C:14:ASP:OD2	1:C:57:ARG:NH2	2.53	0.42
1:G:213:GLY:N	4:G:610:HOH:O	2.52	0.42
1:F:447:PHE:O	1:F:448:PHE:HB2	2.20	0.42
1:A:128:GLY:HA3	1:A:142:ILE:O	2.19	0.41
1:D:447:PHE:O	1:D:448:PHE:CB	2.68	0.41
1:E:490:LEU:HD12	1:E:490:LEU:N	2.35	0.41
1:H:447:PHE:O	1:H:448:PHE:HB2	2.20	0.41
1:C:77[A]:ARG:HG3	1:C:117:MET:SD	2.61	0.41
1:F:318:LEU:CD2	1:F:328:MET:HE2	2.50	0.41
1:H:457:GLY:HA3	1:H:466:ARG:HD3	2.01	0.41
1:B:59:PHE:CE1	1:B:148:GLY:HA2	2.55	0.41
1:G:57:ARG:NH1	4:G:611:HOH:O	2.53	0.41
1:H:289:CYS:SG	2:H:501:NAD:C5N	3.06	0.41
1:A:296:LEU:HD23	1:A:399:GLU:HB2	2.02	0.41
1:B:318:LEU:CD2	1:B:328:MET:HB3	2.51	0.41
1:B:449:PRO:HG2	1:C:483:LEU:CD2	2.50	0.41
1:C:334:THR:HG23	1:C:370:LEU:HD21	2.02	0.41
1:E:177:LEU:HD12	1:E:177:LEU:C	2.46	0.41
1:E:356:VAL:HG12	1:E:376:VAL:HB	2.02	0.41
1:B:257:GLY:HA2	2:B:501:NAD:O2D	2.21	0.41
1:F:217:GLY:HA3	2:F:501:NAD:C2A	2.50	0.41
1:F:333:SER:CA	1:F:370:LEU:HD13	2.51	0.41
1:A:417:GLY:HA2	1:A:439:LEU:HD23	2.02	0.41
1:C:492:ASN:OD1	1:C:496:LYS:HE3	2.21	0.41
1:D:168:ALA:HB3	1:D:169:PRO:CD	2.51	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:289:CYS:HB3	2:A:501:NAD:C6N	2.51	0.41
1:B:168:ALA:HB3	1:B:169:PRO:HD3	2.03	0.41
1:B:447:PHE:O	1:B:448:PHE:HB2	2.20	0.41
1:C:318:LEU:CD2	1:C:328:MET:HE2	2.51	0.41
1:D:77[A]:ARG:HG2	1:D:117:MET:SD	2.60	0.41
1:D:224:LYS:HE3	1:D:224:LYS:HB2	1.83	0.41
1:D:233:GLY:O	1:D:256:LEU:HA	2.21	0.41
1:E:363:ARG:NH2	1:E:365:ASP:OD2	2.54	0.41
1:H:301:ILE:HA	4:H:684:HOH:O	2.20	0.41
1:D:448:PHE:O	1:D:449:PRO:C	2.63	0.41
1:F:150:VAL:HG22	1:F:176:SER:O	2.21	0.41
1:F:417:GLY:HA2	1:F:439:LEU:HD23	2.01	0.41
1:G:158:TYR:O	1:G:162:GLN:HG2	2.21	0.41
1:G:350:GLU:O	1:G:384:MET:HE2	2.21	0.41
1:A:271[A]:GLU:OE1	1:A:271[A]:GLU:HA	2.21	0.40
1:A:450:LEU:HD12	1:A:450:LEU:O	2.21	0.40
1:G:117:MET:SD	1:H:77[B]:ARG:NH1	2.94	0.40
1:B:179:MET:CG	1:B:180:LYS:N	2.84	0.40
1:G:266:ASP:HA	1:G:301:ILE:HD13	2.02	0.40
1:A:356:VAL:HG12	1:A:376:VAL:HB	2.04	0.40
1:B:57[A]:ARG:HG2	4:B:679:HOH:O	2.21	0.40
1:E:431:GLN:HG2	4:H:663:HOH:O	2.21	0.40
1:H:148:GLY:HA3	1:H:227:ASP:OD2	2.21	0.40
1:F:105:SER:O	1:F:109:MET:HG2	2.22	0.40
1:G:67:GLU:O	1:G:72:ARG:NH1	2.55	0.40
1:A:144:LYS:NZ	4:A:616[A]:HOH:O	2.55	0.40
1:C:224:LYS:HE3	1:C:224:LYS:HB2	1.92	0.40
1:D:4:LEU:O	1:D:5:LYS:C	2.64	0.40
1:D:231:PHE:CD1	1:D:241:ILE:CD1	3.04	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	507/517 (98%)	490 (97%)	14 (3%)	3 (1%)	21	42
1	B	503/517 (97%)	488 (97%)	13 (3%)	2 (0%)	30	51
1	C	504/517 (98%)	483 (96%)	18 (4%)	3 (1%)	21	42
1	D	502/517 (97%)	487 (97%)	12 (2%)	3 (1%)	21	42
1	E	504/517 (98%)	488 (97%)	15 (3%)	1 (0%)	43	66
1	F	499/517 (96%)	485 (97%)	11 (2%)	3 (1%)	21	42
1	G	498/517 (96%)	475 (95%)	21 (4%)	2 (0%)	30	51
1	H	498/517 (96%)	475 (95%)	20 (4%)	3 (1%)	21	42
All	All	4015/4136 (97%)	3871 (96%)	124 (3%)	20 (0%)	24	46

All (20) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	448	PHE
1	B	448	PHE
1	C	363	ARG
1	C	448	PHE
1	D	448	PHE
1	E	448	PHE
1	F	448	PHE
1	G	448	PHE
1	H	448	PHE
1	H	247	ASN
1	A	363	ARG
1	D	363	ARG
1	A	417	GLY
1	D	417	GLY
1	F	417	GLY
1	B	417	GLY
1	G	417	GLY
1	C	159	PRO
1	H	417	GLY
1	F	249	VAL

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	423/429 (99%)	419 (99%)	4 (1%)	70	87
1	B	419/429 (98%)	417 (100%)	2 (0%)	81	92
1	C	420/429 (98%)	418 (100%)	2 (0%)	81	92
1	D	418/429 (97%)	417 (100%)	1 (0%)	87	95
1	E	421/429 (98%)	418 (99%)	3 (1%)	76	89
1	F	416/429 (97%)	415 (100%)	1 (0%)	87	95
1	G	415/429 (97%)	415 (100%)	0	100	100
1	H	415/429 (97%)	414 (100%)	1 (0%)	87	95
All	All	3347/3432 (98%)	3333 (100%)	14 (0%)	84	93

All (14) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	317	LYS
1	A	353[A]	THR
1	A	353[B]	THR
1	A	450	LEU
1	B	57[A]	ARG
1	B	57[B]	ARG
1	C	249	VAL
1	C	450	LEU
1	D	95	THR
1	E	249	VAL
1	E	364	ASP
1	E	450	LEU
1	F	249	VAL
1	H	344	MET

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (17) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	248	ASN
1	A	279	ASN
1	C	34	GLN
1	C	409	GLN
1	C	487	ASN

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Mol	Chain	Res	Type
1	D	251	ASN
1	D	260	ASN
1	D	338	ASN
1	E	34	GLN
1	E	162	GLN
1	E	279	ASN
1	E	299	ASN
1	G	248	ASN
1	G	409	GLN
1	H	6	HIS
1	H	34	GLN
1	H	86	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](#)

23 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	G	504	-	4,4,4	0.53	0	6,6,6	0.29	0
2	NAD	B	501	-	46,48,48	1.10	5 (10%)	64,73,73	1.84	12 (18%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	NAD	D	501	-	46,48,48	1.22	5 (10%)	64,73,73	1.55	10 (15%)
3	SO4	G	502	-	4,4,4	0.48	0	6,6,6	0.36	0
2	NAD	H	501	-	46,48,48	1.18	4 (8%)	64,73,73	1.59	13 (20%)
2	NAD	G	501	-	46,48,48	1.14	3 (6%)	64,73,73	1.74	13 (20%)
3	SO4	A	502	-	4,4,4	0.50	0	6,6,6	0.15	0
3	SO4	E	502	-	4,4,4	0.50	0	6,6,6	0.27	0
3	SO4	C	502	-	4,4,4	0.52	0	6,6,6	0.32	0
2	NAD	F	501	-	46,48,48	1.22	6 (13%)	64,73,73	1.62	11 (17%)
2	NAD	A	501	-	46,48,48	1.17	4 (8%)	64,73,73	1.82	14 (21%)
3	SO4	F	502	-	4,4,4	0.46	0	6,6,6	0.25	0
3	SO4	C	503	-	4,4,4	0.52	0	6,6,6	0.31	0
3	SO4	D	502	-	4,4,4	0.45	0	6,6,6	0.16	0
2	NAD	C	501	-	46,48,48	1.15	5 (10%)	64,73,73	1.68	10 (15%)
2	NAD	E	501	-	46,48,48	1.11	3 (6%)	64,73,73	1.70	11 (17%)
3	SO4	F	503	-	4,4,4	0.52	0	6,6,6	0.74	0
3	SO4	B	503	-	4,4,4	0.54	0	6,6,6	0.36	0
3	SO4	G	503	-	4,4,4	0.48	0	6,6,6	0.12	0
3	SO4	A	503	-	4,4,4	0.50	0	6,6,6	0.25	0
3	SO4	E	503	-	4,4,4	0.51	0	6,6,6	0.49	0
3	SO4	F	504	-	4,4,4	0.46	0	6,6,6	0.38	0
3	SO4	B	502	-	4,4,4	0.25	0	6,6,6	0.56	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	E	501	-	-	9/30/62/62	0/5/5/5
2	NAD	F	501	-	-	5/30/62/62	0/5/5/5
2	NAD	A	501	-	-	5/30/62/62	0/5/5/5
2	NAD	B	501	-	-	4/30/62/62	0/5/5/5
2	NAD	D	501	-	-	5/30/62/62	0/5/5/5
2	NAD	H	501	-	-	6/30/62/62	0/5/5/5
2	NAD	G	501	-	-	5/30/62/62	0/5/5/5
2	NAD	C	501	-	-	9/30/62/62	0/5/5/5

All (35) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	501	NAD	O7N-C7N	5.24	1.33	1.24
2	G	501	NAD	O7N-C7N	5.09	1.33	1.24
2	H	501	NAD	O7N-C7N	4.83	1.33	1.24
2	F	501	NAD	O7N-C7N	4.79	1.33	1.24
2	E	501	NAD	O7N-C7N	4.67	1.32	1.24
2	C	501	NAD	O7N-C7N	4.01	1.31	1.24
2	A	501	NAD	O7N-C7N	3.88	1.31	1.24
2	B	501	NAD	O7N-C7N	3.83	1.31	1.24
2	A	501	NAD	PA-O3	3.34	1.63	1.59
2	D	501	NAD	PA-O3	2.98	1.62	1.59
2	C	501	NAD	PN-O3	2.85	1.62	1.59
2	E	501	NAD	PA-O3	2.64	1.62	1.59
2	D	501	NAD	C8A-N7A	2.62	1.36	1.31
2	E	501	NAD	C8A-N7A	2.60	1.36	1.31
2	B	501	NAD	C8A-N7A	2.59	1.36	1.31
2	D	501	NAD	PN-O3	2.56	1.62	1.59
2	C	501	NAD	C4A-N9A	-2.49	1.32	1.37
2	H	501	NAD	C4A-N9A	-2.47	1.32	1.37
2	C	501	NAD	C5A-N7A	-2.45	1.34	1.39
2	A	501	NAD	C8A-N7A	2.43	1.36	1.31
2	H	501	NAD	C5A-N7A	-2.42	1.34	1.39
2	B	501	NAD	PN-O3	2.37	1.62	1.59
2	F	501	NAD	PA-O3	2.36	1.62	1.59
2	G	501	NAD	C8A-N7A	2.31	1.36	1.31
2	F	501	NAD	PN-O3	2.26	1.61	1.59
2	G	501	NAD	C4A-N9A	-2.25	1.33	1.37
2	A	501	NAD	C5A-N7A	-2.21	1.35	1.39
2	F	501	NAD	C8A-N7A	2.16	1.35	1.31
2	B	501	NAD	PA-O3	2.12	1.61	1.59
2	F	501	NAD	C5A-N7A	-2.12	1.35	1.39
2	C	501	NAD	PA-O3	2.06	1.61	1.59
2	D	501	NAD	C4A-N9A	-2.03	1.33	1.37
2	F	501	NAD	O4D-C1D	2.03	1.43	1.40
2	H	501	NAD	C8A-N9A	-2.01	1.34	1.37
2	B	501	NAD	C8A-N9A	-2.01	1.34	1.37

All (94) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	501	NAD	N3A-C2A-N1A	-6.13	119.31	128.58
2	A	501	NAD	C5A-C4A-N3A	-5.70	118.87	126.72
2	H	501	NAD	C5A-C4A-N3A	-5.54	119.08	126.72
2	B	501	NAD	C5A-C4A-N3A	-5.45	119.21	126.72

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	E	501	NAD	N3A-C2A-N1A	-5.35	120.49	128.58
2	C	501	NAD	C5A-C4A-N3A	-5.30	119.42	126.72
2	F	501	NAD	C5A-C4A-N3A	-5.19	119.58	126.72
2	D	501	NAD	N3A-C2A-N1A	-5.12	120.83	128.58
2	A	501	NAD	N3A-C2A-N1A	-4.83	121.27	128.58
2	G	501	NAD	N9A-C8A-N7A	-4.81	107.12	113.94
2	E	501	NAD	C5A-C4A-N3A	-4.80	120.11	126.72
2	G	501	NAD	C5A-C4A-N3A	-4.59	120.40	126.72
2	D	501	NAD	C5A-C4A-N3A	-4.49	120.53	126.72
2	G	501	NAD	N3A-C2A-N1A	-4.45	121.85	128.58
2	C	501	NAD	N3A-C2A-N1A	-4.38	121.95	128.58
2	F	501	NAD	N3A-C2A-N1A	-4.32	122.04	128.58
2	H	501	NAD	N3A-C2A-N1A	-4.32	122.04	128.58
2	G	501	NAD	C4A-C5A-N7A	-4.27	105.70	110.58
2	B	501	NAD	C2A-N3A-C4A	4.26	122.24	111.83
2	E	501	NAD	N9A-C8A-N7A	-4.26	107.90	113.94
2	G	501	NAD	C4A-N9A-C8A	4.19	110.14	105.74
2	B	501	NAD	N9A-C8A-N7A	-3.89	108.42	113.94
2	C	501	NAD	C4A-C5A-N7A	-3.87	106.15	110.58
2	C	501	NAD	N9A-C8A-N7A	-3.73	108.65	113.94
2	A	501	NAD	N9A-C8A-N7A	-3.71	108.67	113.94
2	A	501	NAD	C2A-N3A-C4A	3.71	120.88	111.83
2	C	501	NAD	C2A-N3A-C4A	3.68	120.83	111.83
2	E	501	NAD	C2A-N3A-C4A	3.67	120.80	111.83
2	B	501	NAD	C3N-C7N-N7N	3.60	122.17	117.74
2	D	501	NAD	C2A-N3A-C4A	3.58	120.57	111.83
2	H	501	NAD	C2A-N3A-C4A	3.56	120.51	111.83
2	E	501	NAD	C4A-C5A-N7A	-3.53	106.54	110.58
2	F	501	NAD	N9A-C8A-N7A	-3.48	109.00	113.94
2	G	501	NAD	C5A-N7A-C8A	3.44	108.86	103.45
2	B	501	NAD	N3A-C4A-N9A	3.44	133.01	127.17
2	A	501	NAD	N3A-C4A-N9A	3.42	132.99	127.17
2	H	501	NAD	N9A-C8A-N7A	-3.41	109.10	113.94
2	G	501	NAD	C2A-N3A-C4A	3.34	119.98	111.83
2	F	501	NAD	C2A-N3A-C4A	3.32	119.93	111.83
2	H	501	NAD	N3A-C4A-N9A	3.31	132.79	127.17
2	D	501	NAD	N9A-C8A-N7A	-3.29	109.27	113.94
2	A	501	NAD	C4A-C5A-N7A	-3.21	106.91	110.58
2	E	501	NAD	C5A-N7A-C8A	3.16	108.42	103.45
2	C	501	NAD	C5A-C4A-N9A	3.15	109.24	105.81
2	H	501	NAD	C4A-C5A-N7A	-3.12	107.02	110.58
2	C	501	NAD	C5A-N7A-C8A	3.11	108.34	103.45

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	F	501	NAD	C4A-C5A-N7A	-3.07	107.08	110.58
2	C	501	NAD	C3N-C7N-N7N	3.06	121.51	117.74
2	B	501	NAD	O7N-C7N-N7N	-3.00	118.28	122.62
2	E	501	NAD	C4A-N9A-C8A	2.97	108.85	105.74
2	A	501	NAD	C5A-N7A-C8A	2.96	108.11	103.45
2	A	501	NAD	C5N-C4N-C3N	-2.94	117.47	120.36
2	G	501	NAD	C3N-C7N-N7N	2.93	121.35	117.74
2	F	501	NAD	N3A-C4A-N9A	2.92	132.13	127.17
2	H	501	NAD	O7N-C7N-N7N	-2.79	118.59	122.62
2	B	501	NAD	C4A-N9A-C8A	2.75	108.62	105.74
2	A	501	NAD	O4B-C1B-N9A	2.71	113.30	108.09
2	B	501	NAD	C4A-C5A-N7A	-2.71	107.49	110.58
2	B	501	NAD	C5A-N7A-C8A	2.70	107.69	103.45
2	D	501	NAD	C4A-N9A-C1B	-2.69	120.34	126.63
2	D	501	NAD	N3A-C4A-N9A	2.68	131.73	127.17
2	D	501	NAD	O4B-C1B-N9A	2.65	113.18	108.09
2	H	501	NAD	C5A-N7A-C8A	2.63	107.59	103.45
2	E	501	NAD	N3A-C4A-N9A	2.61	131.61	127.17
2	F	501	NAD	C5A-N7A-C8A	2.61	107.56	103.45
2	D	501	NAD	C4A-N9A-C8A	2.59	108.46	105.74
2	G	501	NAD	C4A-N9A-C1B	-2.59	120.58	126.63
2	H	501	NAD	C3N-C7N-N7N	2.58	120.92	117.74
2	E	501	NAD	C4A-N9A-C1B	-2.58	120.59	126.63
2	B	501	NAD	C4A-N9A-C1B	-2.54	120.69	126.63
2	G	501	NAD	N3A-C4A-N9A	2.51	131.43	127.17
2	C	501	NAD	N3A-C4A-N9A	2.45	131.33	127.17
2	F	501	NAD	C5N-C4N-C3N	-2.43	117.98	120.36
2	D	501	NAD	O7N-C7N-N7N	-2.41	119.14	122.62
2	C	501	NAD	O4D-C4D-C5D	-2.35	101.80	109.33
2	F	501	NAD	C4D-O4D-C1D	-2.33	107.79	109.92
2	A	501	NAD	O4D-C4D-C5D	-2.31	101.92	109.33
2	A	501	NAD	C4A-N9A-C8A	2.31	108.17	105.74
2	H	501	NAD	C4A-N9A-C8A	2.31	108.16	105.74
2	F	501	NAD	C5A-C4A-N9A	2.28	108.29	105.81
2	E	501	NAD	C5A-C4A-N9A	2.27	108.28	105.81
2	D	501	NAD	C4A-C5A-N7A	-2.24	108.03	110.58
2	F	501	NAD	C4A-N9A-C8A	2.22	108.07	105.74
2	G	501	NAD	C5A-C4A-N9A	2.15	108.16	105.81
2	A	501	NAD	C4D-O4D-C1D	2.14	111.89	109.92
2	A	501	NAD	C5A-C4A-N9A	2.14	108.14	105.81
2	G	501	NAD	C6A-C5A-N7A	2.13	136.19	132.09
2	H	501	NAD	C5A-C4A-N9A	2.12	108.12	105.81

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	H	501	NAD	O2N-PN-O3	2.07	112.86	107.27
2	A	501	NAD	C4A-N9A-C1B	-2.03	121.89	126.63
2	G	501	NAD	O7N-C7N-N7N	-2.03	119.69	122.62
2	E	501	NAD	O2N-PN-O3	2.03	112.75	107.27
2	B	501	NAD	O2N-PN-O1N	2.02	121.82	112.44
2	H	501	NAD	O4B-C1B-C2B	-2.00	102.33	106.62

There are no chirality outliers.

All (48) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	C	501	NAD	O4D-C1D-N1N-C6N
2	E	501	NAD	O4D-C1D-N1N-C6N
2	F	501	NAD	PN-O3-PA-O5B
2	A	501	NAD	O4D-C4D-C5D-O5D
2	G	501	NAD	O4D-C4D-C5D-O5D
2	H	501	NAD	O4D-C4D-C5D-O5D
2	A	501	NAD	C3D-C4D-C5D-O5D
2	E	501	NAD	C3D-C4D-C5D-O5D
2	G	501	NAD	C3D-C4D-C5D-O5D
2	H	501	NAD	C3D-C4D-C5D-O5D
2	C	501	NAD	O4D-C4D-C5D-O5D
2	C	501	NAD	C3D-C4D-C5D-O5D
2	D	501	NAD	O4D-C4D-C5D-O5D
2	D	501	NAD	C3D-C4D-C5D-O5D
2	E	501	NAD	O4D-C4D-C5D-O5D
2	B	501	NAD	C4D-C5D-O5D-PN
2	A	501	NAD	C2B-C1B-N9A-C8A
2	B	501	NAD	C2B-C1B-N9A-C8A
2	C	501	NAD	C2B-C1B-N9A-C8A
2	D	501	NAD	C2B-C1B-N9A-C8A
2	E	501	NAD	C2B-C1B-N9A-C8A
2	F	501	NAD	C2B-C1B-N9A-C8A
2	G	501	NAD	C2B-C1B-N9A-C8A
2	H	501	NAD	C2B-C1B-N9A-C8A
2	G	501	NAD	C4D-C5D-O5D-PN
2	C	501	NAD	C5B-O5B-PA-O3
2	E	501	NAD	C5B-O5B-PA-O3
2	A	501	NAD	C4D-C5D-O5D-PN
2	F	501	NAD	C4D-C5D-O5D-PN
2	B	501	NAD	C2B-C1B-N9A-C4A
2	H	501	NAD	C4D-C5D-O5D-PN

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Mol	Chain	Res	Type	Atoms
2	E	501	NAD	C4D-C5D-O5D-PN
2	C	501	NAD	O4D-C1D-N1N-C2N
2	E	501	NAD	O4D-C1D-N1N-C2N
2	C	501	NAD	C4D-C5D-O5D-PN
2	D	501	NAD	C4D-C5D-O5D-PN
2	A	501	NAD	O4B-C1B-N9A-C8A
2	C	501	NAD	O4B-C1B-N9A-C8A
2	F	501	NAD	O4B-C1B-N9A-C8A
2	F	501	NAD	C2B-C1B-N9A-C4A
2	E	501	NAD	C2B-C1B-N9A-C4A
2	H	501	NAD	C2B-C1B-N9A-C4A
2	D	501	NAD	O4B-C1B-N9A-C8A
2	G	501	NAD	O4B-C1B-N9A-C8A
2	B	501	NAD	O4B-C1B-N9A-C8A
2	E	501	NAD	O4B-C1B-N9A-C8A
2	C	501	NAD	C2B-C1B-N9A-C4A
2	H	501	NAD	O4B-C1B-N9A-C8A

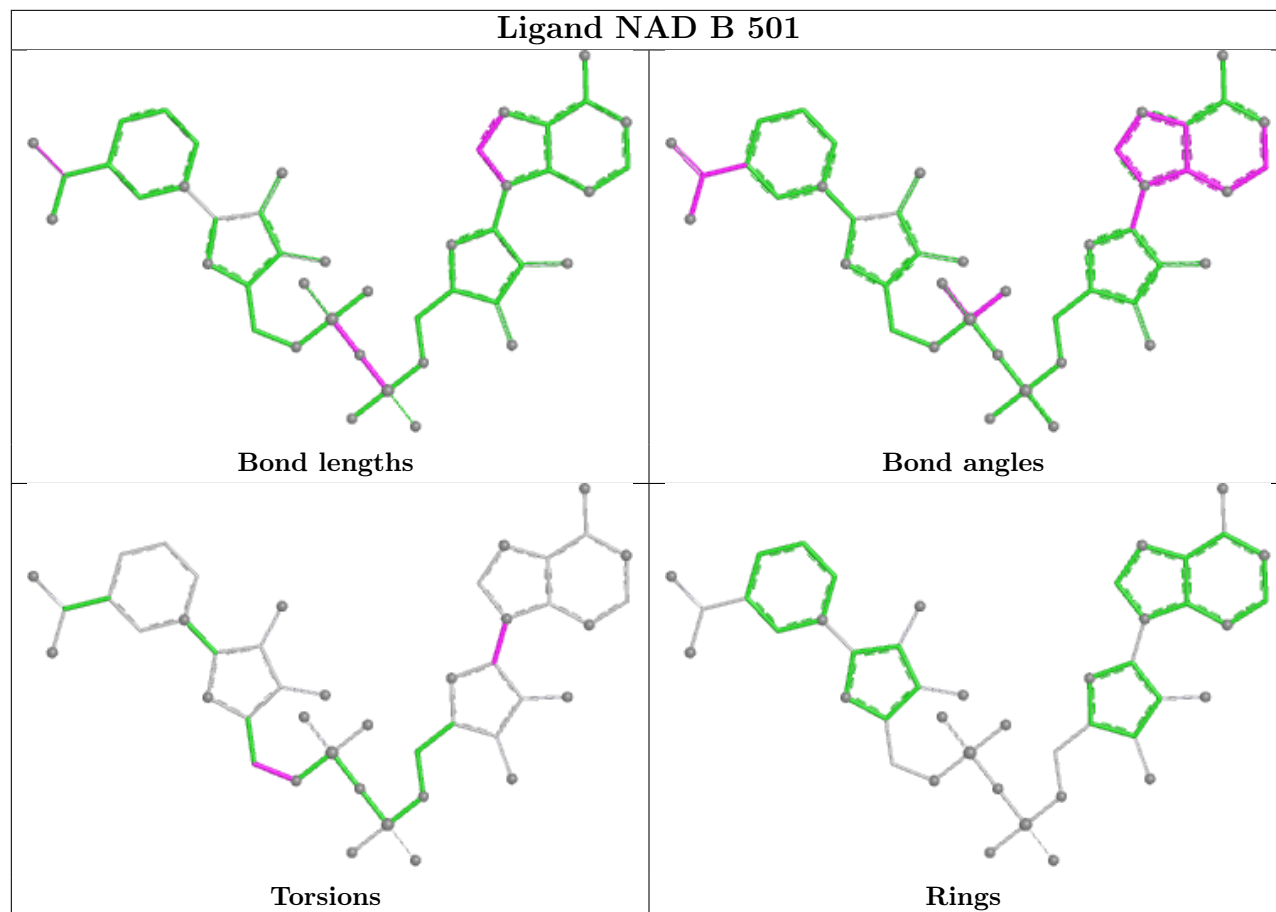
There are no ring outliers.

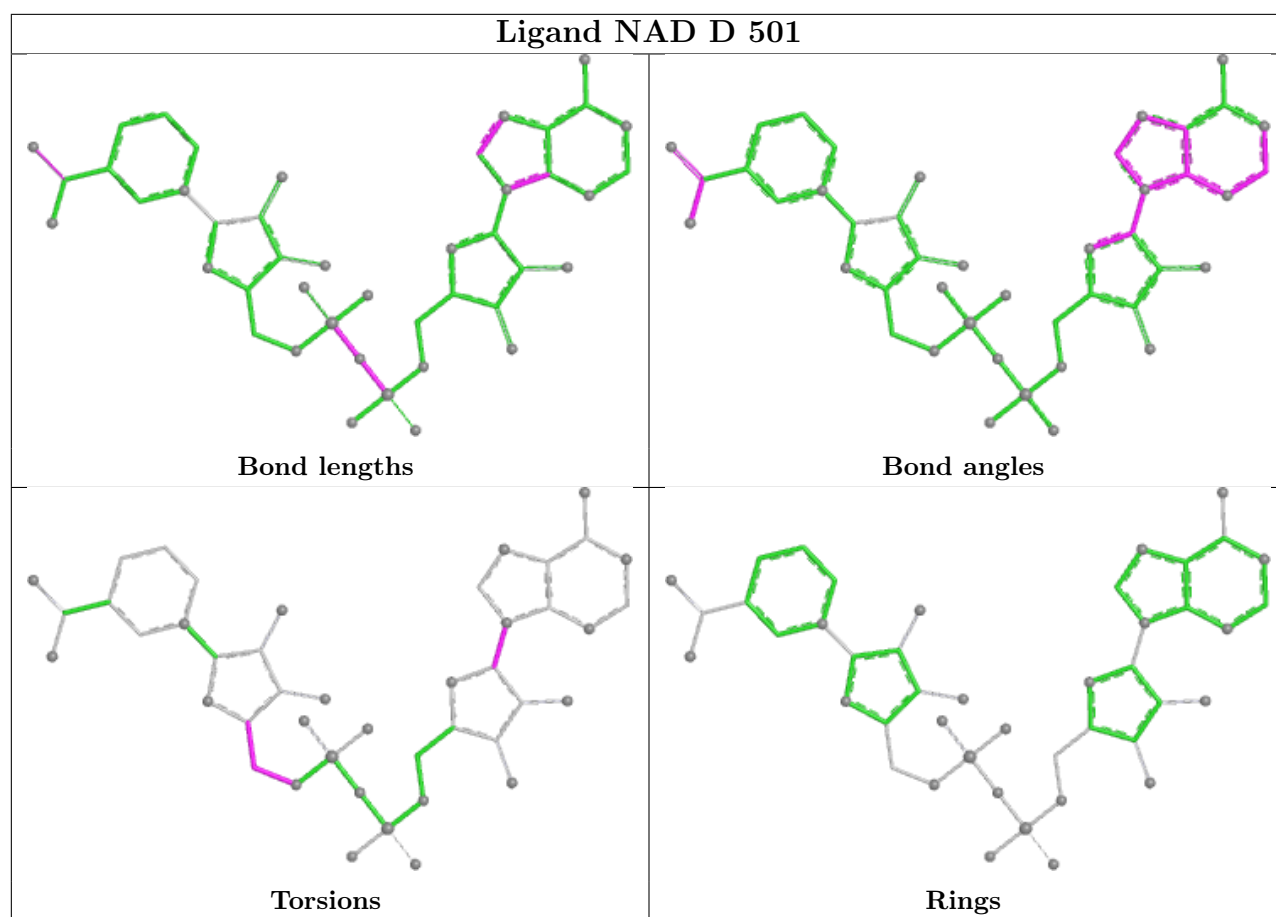
8 monomers are involved in 35 short contacts:

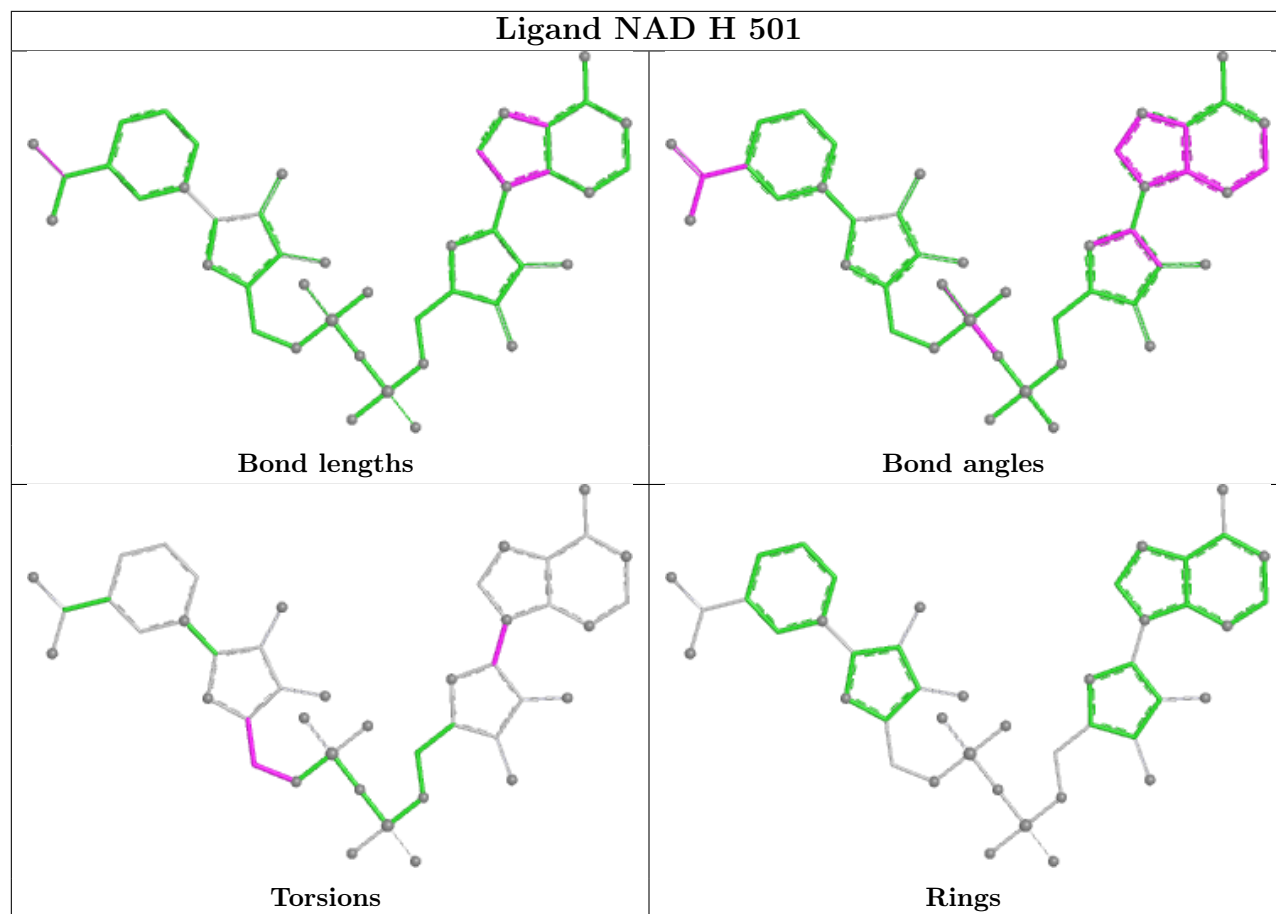
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	501	NAD	5	0
2	D	501	NAD	2	0
2	H	501	NAD	5	0
2	G	501	NAD	2	0
2	F	501	NAD	5	0
2	A	501	NAD	7	0
2	C	501	NAD	4	0
2	E	501	NAD	5	0

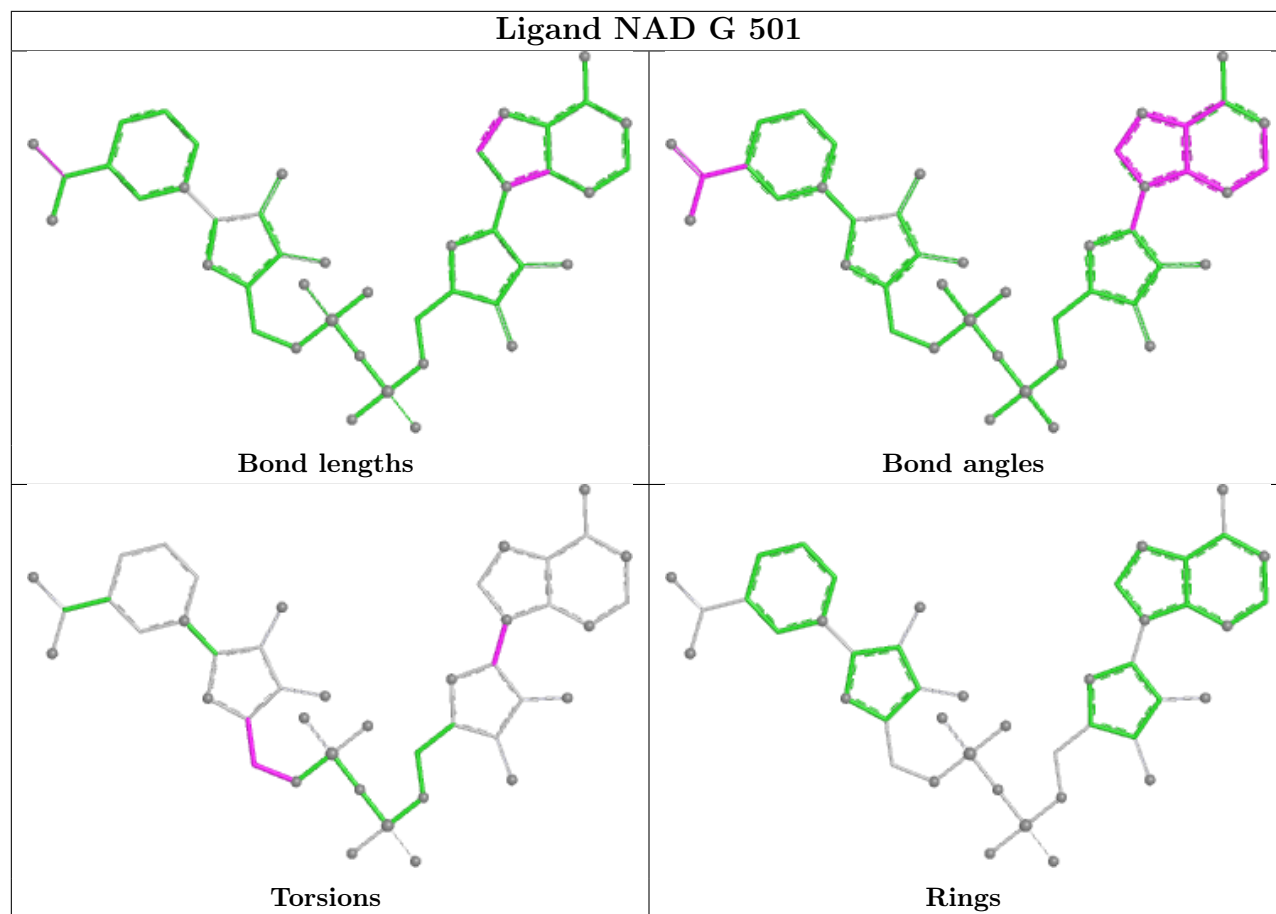
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. 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

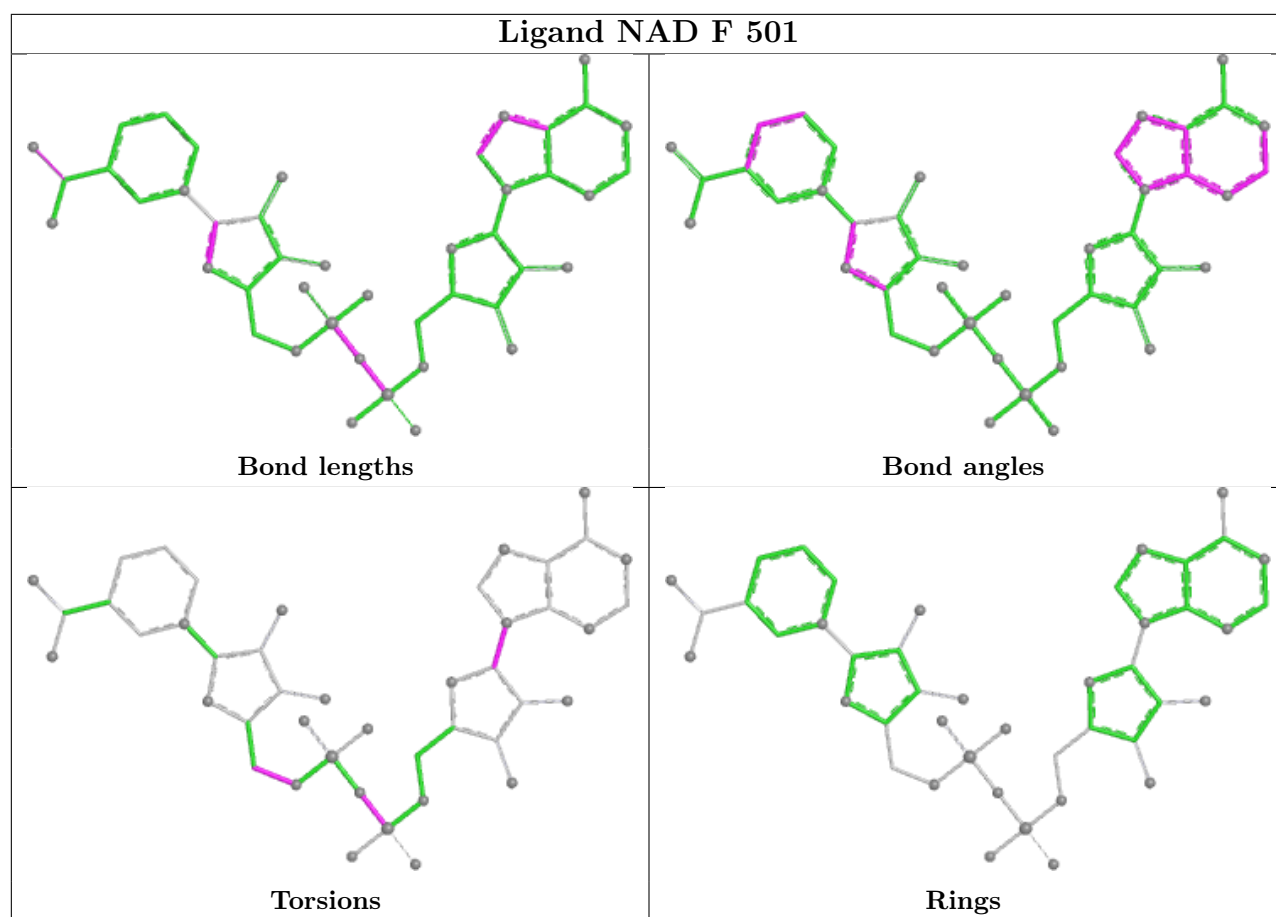
equivalents in the CSD to analyse the geometry.

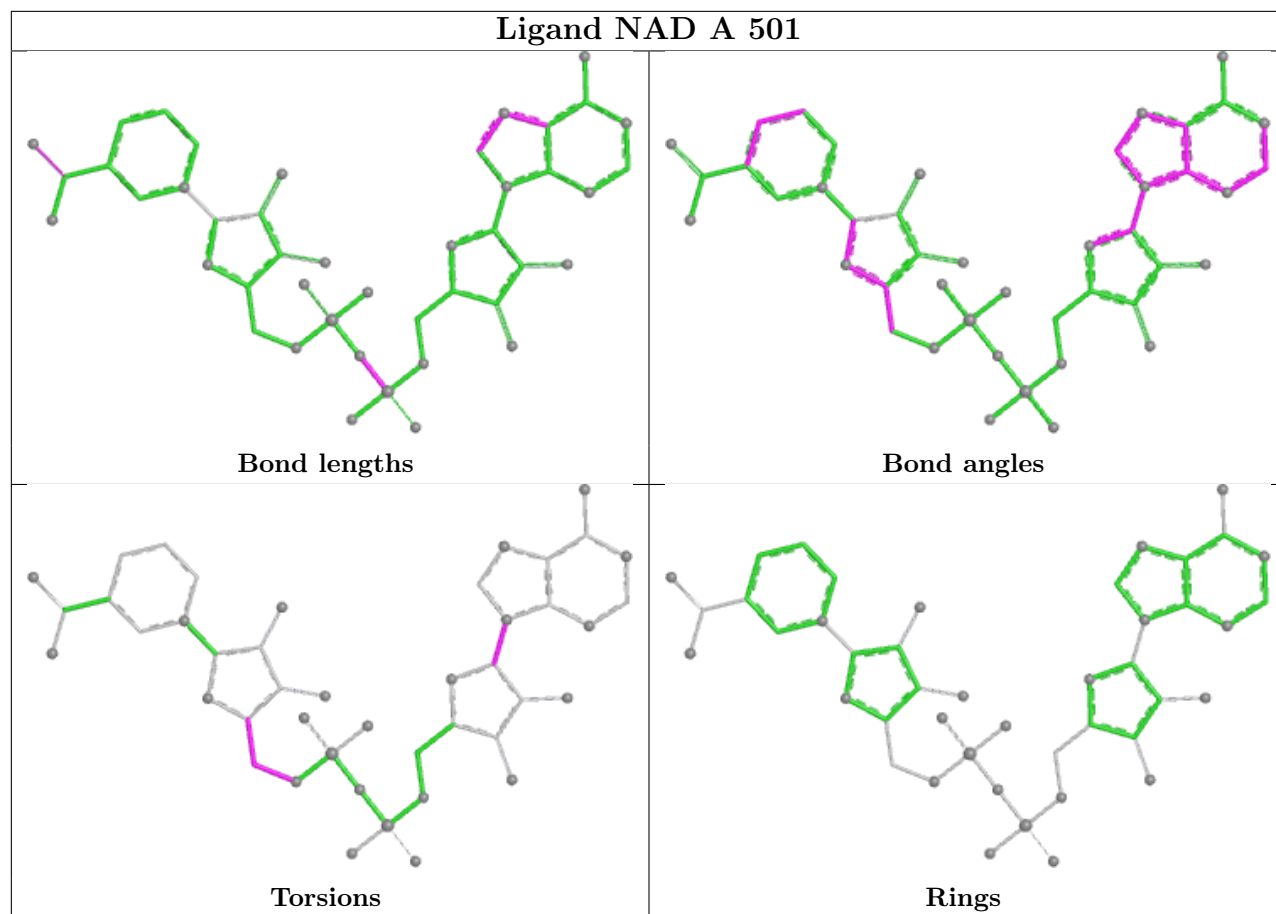


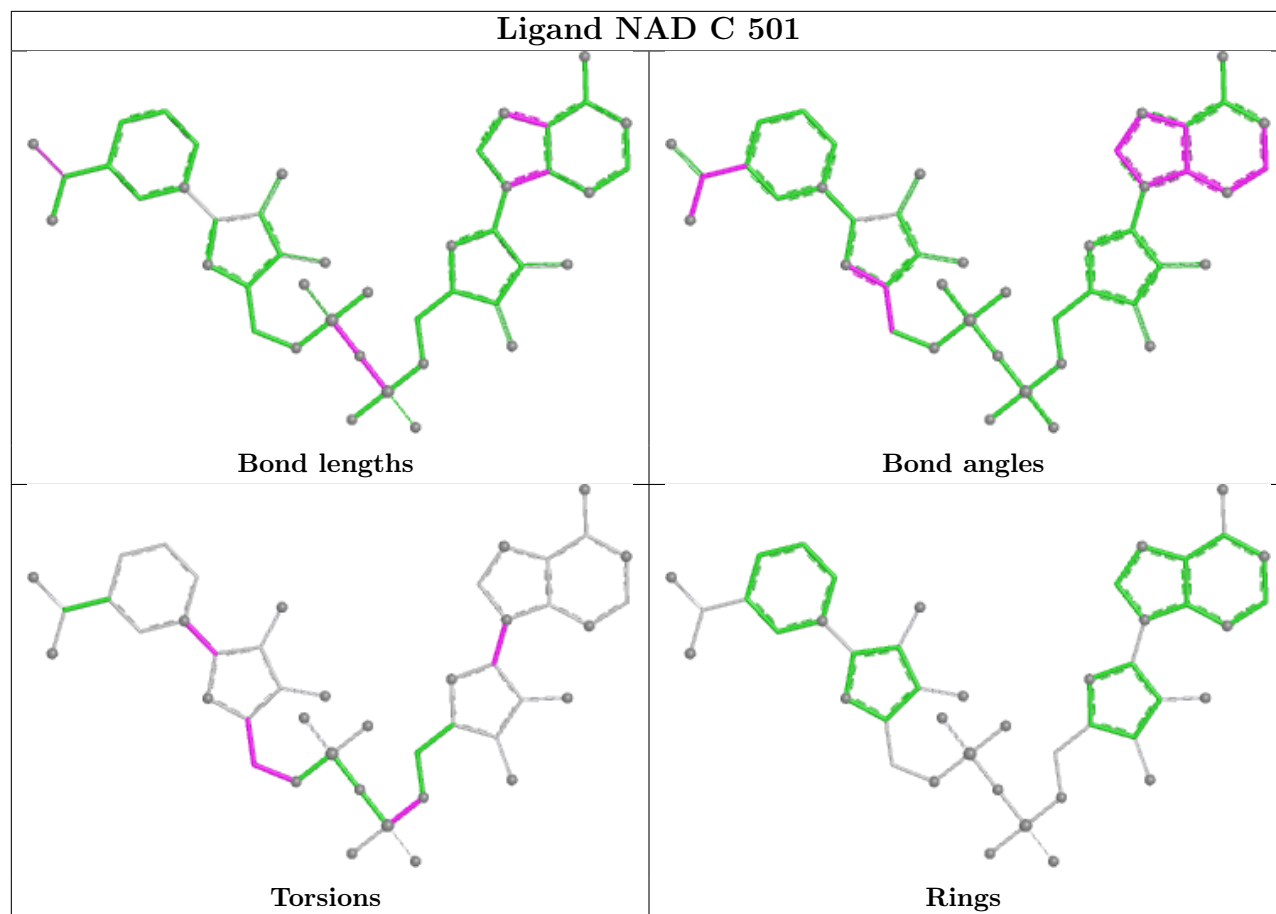


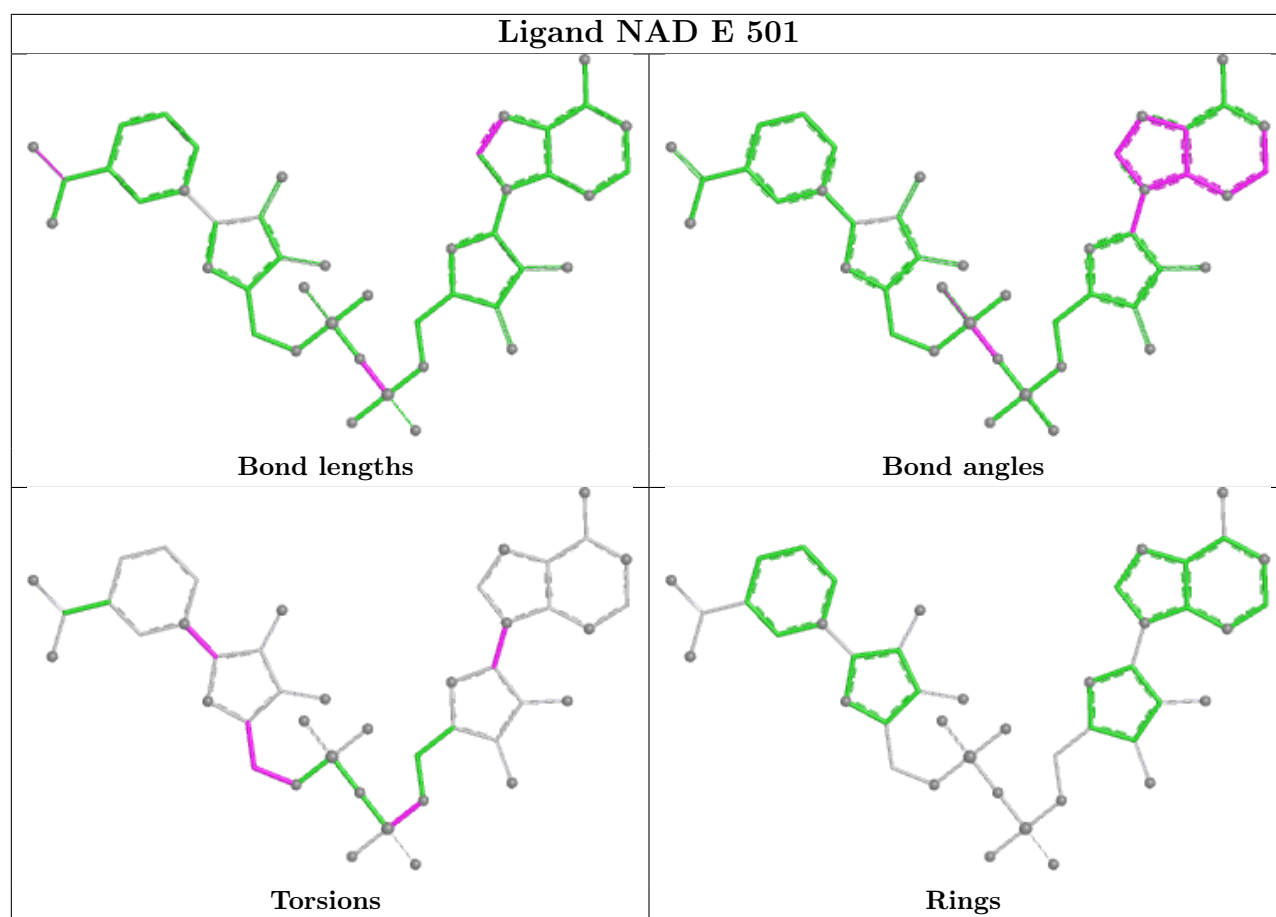












5.7 Other polymers [i](#)

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	499/517 (96%)	-0.80	1 (0%) 91 90	12, 30, 47, 122	10 (2%)
1	B	499/517 (96%)	-0.80	0 100 100	14, 31, 48, 87	6 (1%)
1	C	499/517 (96%)	-0.73	0 100 100	15, 34, 55, 80	7 (1%)
1	D	498/517 (96%)	-0.70	0 100 100	14, 34, 54, 102	6 (1%)
1	E	496/517 (95%)	-0.70	1 (0%) 91 90	15, 35, 57, 98	10 (2%)
1	F	496/517 (95%)	-0.74	0 100 100	14, 34, 54, 93	5 (1%)
1	G	496/517 (95%)	-0.59	0 100 100	17, 40, 63, 104	4 (0%)
1	H	496/517 (95%)	-0.50	1 (0%) 91 90	17, 44, 70, 111	4 (0%)
All	All	3979/4136 (96%)	-0.70	3 (0%) 92 90	12, 35, 60, 122	52 (1%)

All (3) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	0	GLY	2.3
1	E	1	MET	2.2
1	H	1	MET	2.2

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 ⓘ

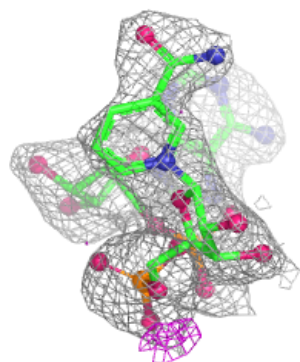
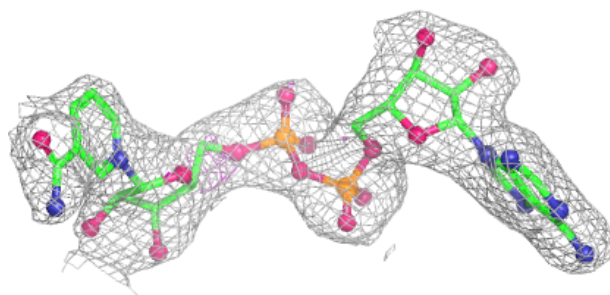
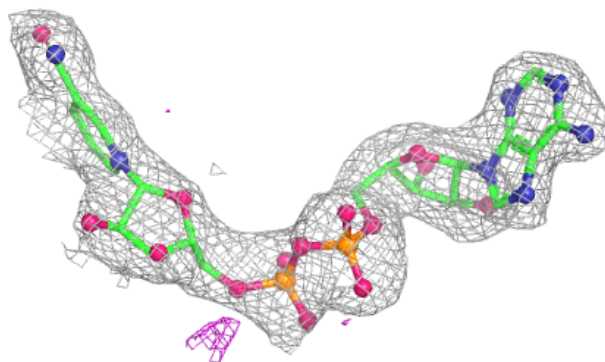
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q<0.9' lists 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	SO4	F	504	5/5	0.63	0.14	70,72,75,86	5
3	SO4	A	502	5/5	0.72	0.10	61,62,78,80	5
3	SO4	E	502	5/5	0.79	0.18	75,76,91,106	0
3	SO4	E	503	5/5	0.82	0.10	60,67,78,85	0
3	SO4	C	502	5/5	0.82	0.14	75,89,99,124	0
3	SO4	G	503	5/5	0.84	0.10	62,65,71,73	5
3	SO4	C	503	5/5	0.86	0.08	49,58,67,80	0
3	SO4	F	502	5/5	0.87	0.12	58,93,97,107	0
3	SO4	B	503	5/5	0.88	0.09	46,69,76,83	0
3	SO4	D	502	5/5	0.89	0.08	46,47,57,60	5
3	SO4	G	502	5/5	0.90	0.08	42,49,64,66	5
3	SO4	G	504	5/5	0.93	0.10	48,51,57,62	5
3	SO4	F	503	5/5	0.95	0.09	37,42,52,53	0
2	NAD	G	501	44/44	0.96	0.06	23,37,48,60	0
2	NAD	H	501	44/44	0.96	0.06	29,41,51,57	0
2	NAD	E	501	44/44	0.96	0.06	22,38,45,49	0
3	SO4	A	503	5/5	0.96	0.07	36,43,48,51	0
2	NAD	C	501	44/44	0.97	0.06	25,33,44,50	0
2	NAD	D	501	44/44	0.97	0.05	26,36,41,45	0
2	NAD	A	501	44/44	0.97	0.06	21,30,38,41	0
2	NAD	F	501	44/44	0.97	0.06	18,30,35,38	0
2	NAD	B	501	44/44	0.98	0.05	17,29,35,40	0
3	SO4	B	502	5/5	0.98	0.06	39,42,48,56	0

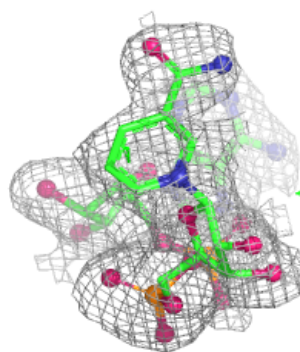
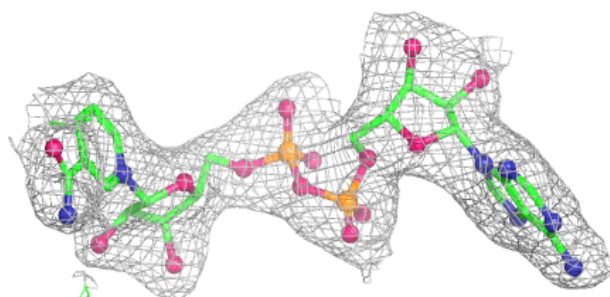
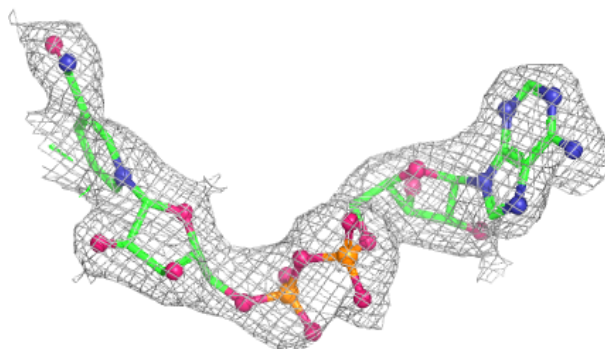
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

Electron density around NAD G 501:

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

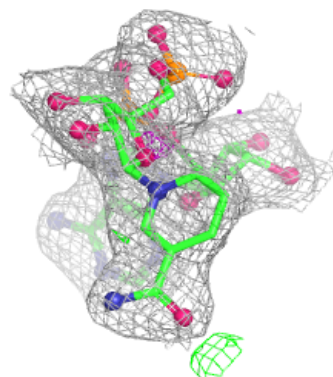
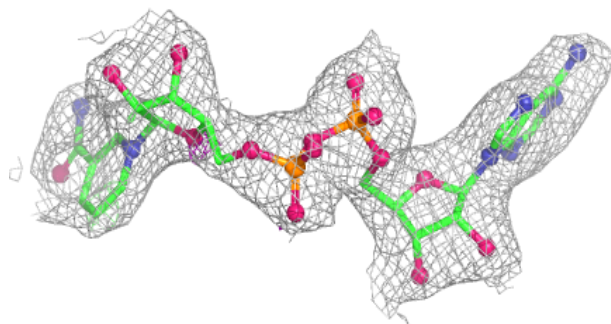
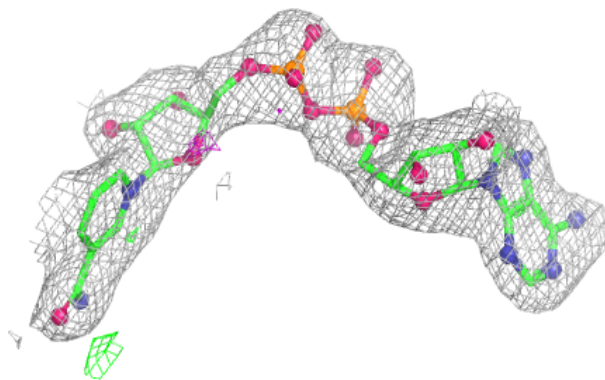
**Electron density around NAD H 501:**

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

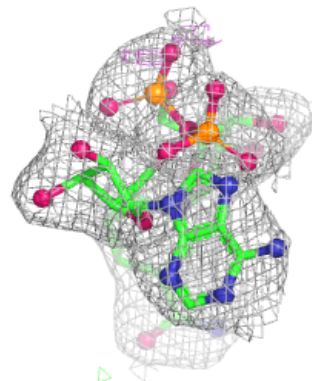
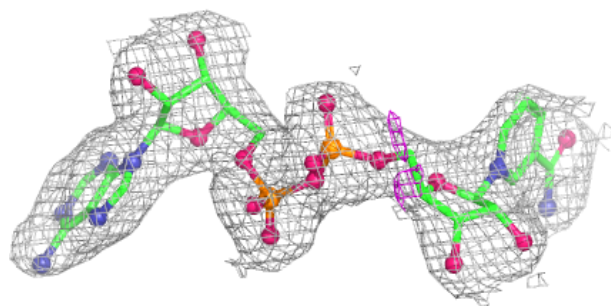
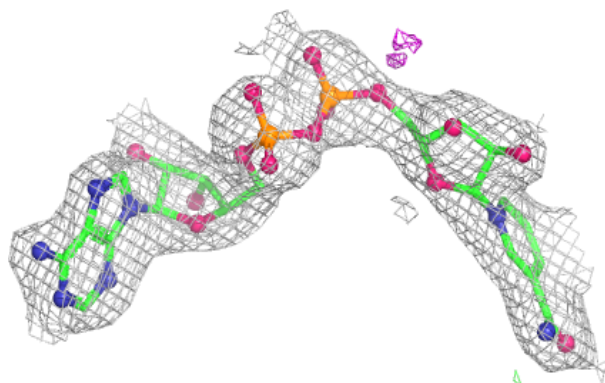


Electron density around NAD E 501:

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

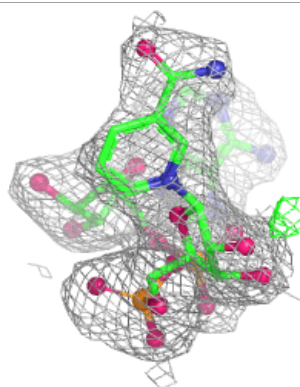
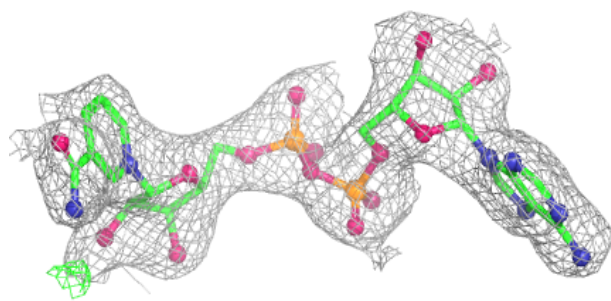
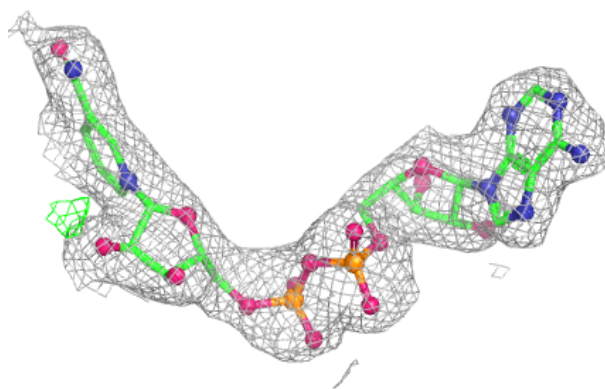
**Electron density around NAD C 501:**

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

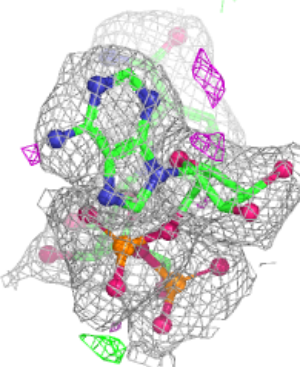
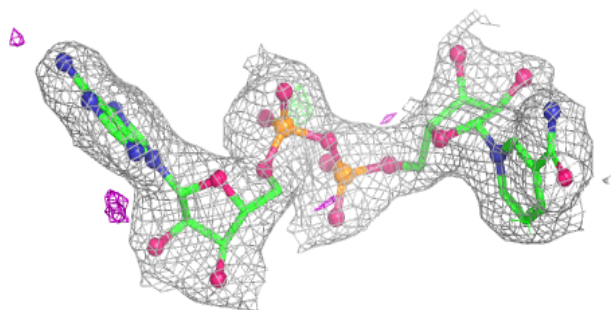
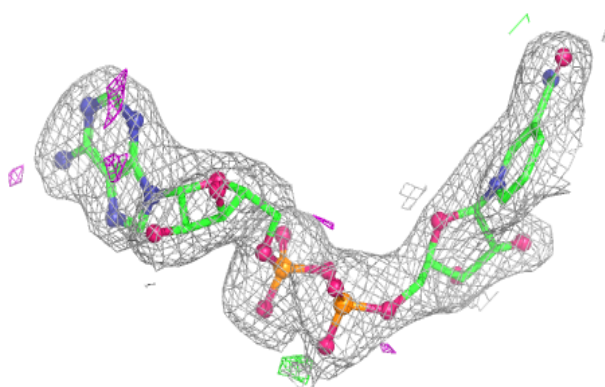


Electron density around NAD D 501:

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

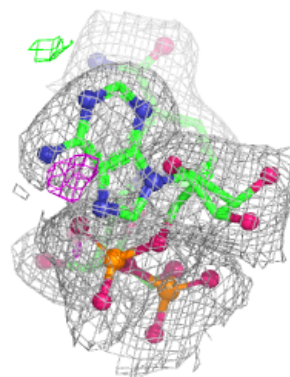
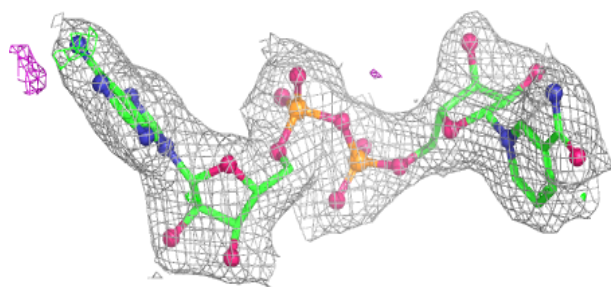
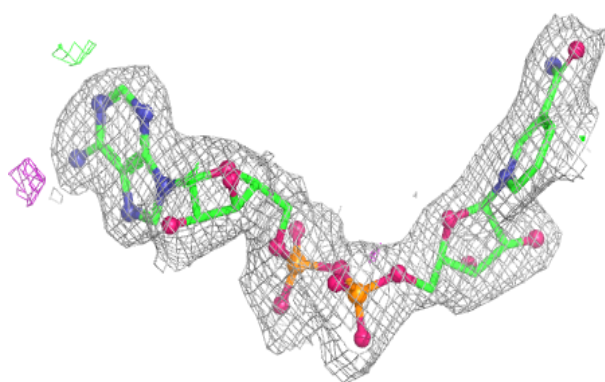
**Electron density around NAD A 501:**

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

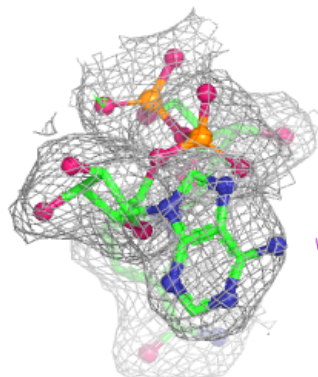
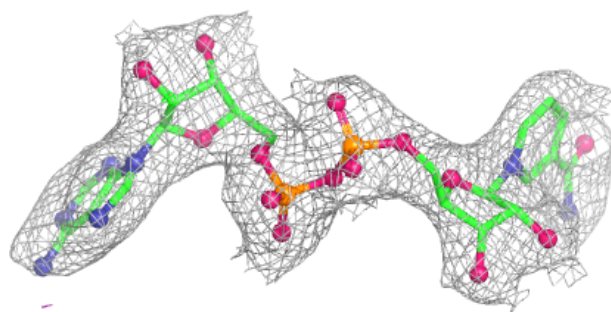
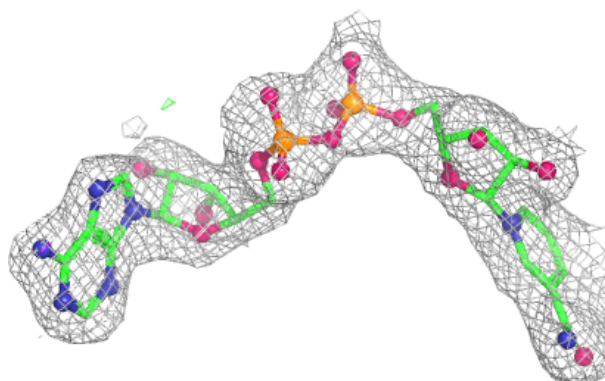


Electron density around NAD F 501:

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

**Electron density around NAD B 501:**

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



6.5 Other polymers [i](#)

There are no such residues in this entry.