WORLDWIDE wwPDB PROTEIN DATA BANK

Full wwPDB X-ray Structure Validation Report ⓘ

Jun 22, 2024 – 07:14 PM EDT

PDB ID : 5L78
Title : Crystal structure of human aminoadipate semialdehyde synthase, saccharopine dehydrogenase domain (in NAD+ bound form)
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Deposited on : 2016-06-02
Resolution : 2.68 Å(reported)

The following versions of software and data (see references ①) were used in the production of this report:

|		
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.37.1
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.37.1

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 2.68 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.
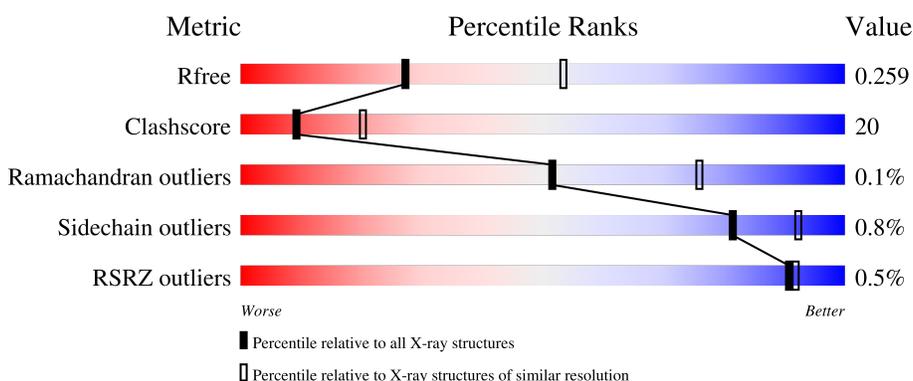
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	3863 (2.70-2.66)
Clashscore	141614	4210 (2.70-2.66)
Ramachandran outliers	138981	4141 (2.70-2.66)
Sidechain outliers	138945	4141 (2.70-2.66)
RSRZ outliers	127900	3780 (2.70-2.66)

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 <=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	497	57% 30% 12%
1	B	497	.% 65% 22% · 12%

2 Entry composition ⓘ

There are 4 unique types of molecules in this entry. The entry contains 6845 atoms, of which 12 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 Alpha-aminoadipic semialdehyde synthase, mitochondrial.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	436	Total 3324	C 2130	N 542	O 632	S 20	0	2	0
1	B	435	Total 3299	C 2115	N 533	O 631	S 20	0	2	0

There are 50 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	430	MET	-	initiating methionine	UNP Q9UDR5
A	431	GLY	-	expression tag	UNP Q9UDR5
A	432	HIS	-	expression tag	UNP Q9UDR5
A	433	HIS	-	expression tag	UNP Q9UDR5
A	434	HIS	-	expression tag	UNP Q9UDR5
A	435	HIS	-	expression tag	UNP Q9UDR5
A	436	HIS	-	expression tag	UNP Q9UDR5
A	437	HIS	-	expression tag	UNP Q9UDR5
A	438	SER	-	expression tag	UNP Q9UDR5
A	439	SER	-	expression tag	UNP Q9UDR5
A	440	GLY	-	expression tag	UNP Q9UDR5
A	441	VAL	-	expression tag	UNP Q9UDR5
A	442	ASP	-	expression tag	UNP Q9UDR5
A	443	LEU	-	expression tag	UNP Q9UDR5
A	444	GLY	-	expression tag	UNP Q9UDR5
A	445	THR	-	expression tag	UNP Q9UDR5
A	446	GLU	-	expression tag	UNP Q9UDR5
A	447	ASN	-	expression tag	UNP Q9UDR5
A	448	LEU	-	expression tag	UNP Q9UDR5
A	449	TYR	-	expression tag	UNP Q9UDR5
A	450	PHE	-	expression tag	UNP Q9UDR5
A	451	GLN	-	expression tag	UNP Q9UDR5
A	452	SER	-	expression tag	UNP Q9UDR5
A	453	MET	-	expression tag	UNP Q9UDR5
A	454	ALA	-	expression tag	UNP Q9UDR5

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Chain	Residue	Modelled	Actual	Comment	Reference
B	430	MET	-	initiating methionine	UNP Q9UDR5
B	431	GLY	-	expression tag	UNP Q9UDR5
B	432	HIS	-	expression tag	UNP Q9UDR5
B	433	HIS	-	expression tag	UNP Q9UDR5
B	434	HIS	-	expression tag	UNP Q9UDR5
B	435	HIS	-	expression tag	UNP Q9UDR5
B	436	HIS	-	expression tag	UNP Q9UDR5
B	437	HIS	-	expression tag	UNP Q9UDR5
B	438	SER	-	expression tag	UNP Q9UDR5
B	439	SER	-	expression tag	UNP Q9UDR5
B	440	GLY	-	expression tag	UNP Q9UDR5
B	441	VAL	-	expression tag	UNP Q9UDR5
B	442	ASP	-	expression tag	UNP Q9UDR5
B	443	LEU	-	expression tag	UNP Q9UDR5
B	444	GLY	-	expression tag	UNP Q9UDR5
B	445	THR	-	expression tag	UNP Q9UDR5
B	446	GLU	-	expression tag	UNP Q9UDR5
B	447	ASN	-	expression tag	UNP Q9UDR5
B	448	LEU	-	expression tag	UNP Q9UDR5
B	449	TYR	-	expression tag	UNP Q9UDR5
B	450	PHE	-	expression tag	UNP Q9UDR5
B	451	GLN	-	expression tag	UNP Q9UDR5
B	452	SER	-	expression tag	UNP Q9UDR5
B	453	MET	-	expression tag	UNP Q9UDR5
B	454	ALA	-	expression tag	UNP Q9UDR5

- Molecule 2 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: $C_2H_6O_2$).

EDO

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total 4	C 2	O 2		0	0
2	A	1	Total 10	C 2	H 6	O 2	0	0
2	A	1	Total 10	C 2	H 6	O 2	0	0

- Molecule 3 is NICOTINAMIDE-ADENINE-DINUCLEOTIDE (three-letter code: NAD) (formula: $C_{21}H_{27}N_7O_{14}P_2$).

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

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	60	Total 60	O 60	0	0
4	B	50	Total 50	O 50	0	0

3 Residue-property plots ⓘ

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density (RSRZ > 2). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

• Molecule 1: Alpha-aminoadipic semialdehyde synthase, mitochondrial
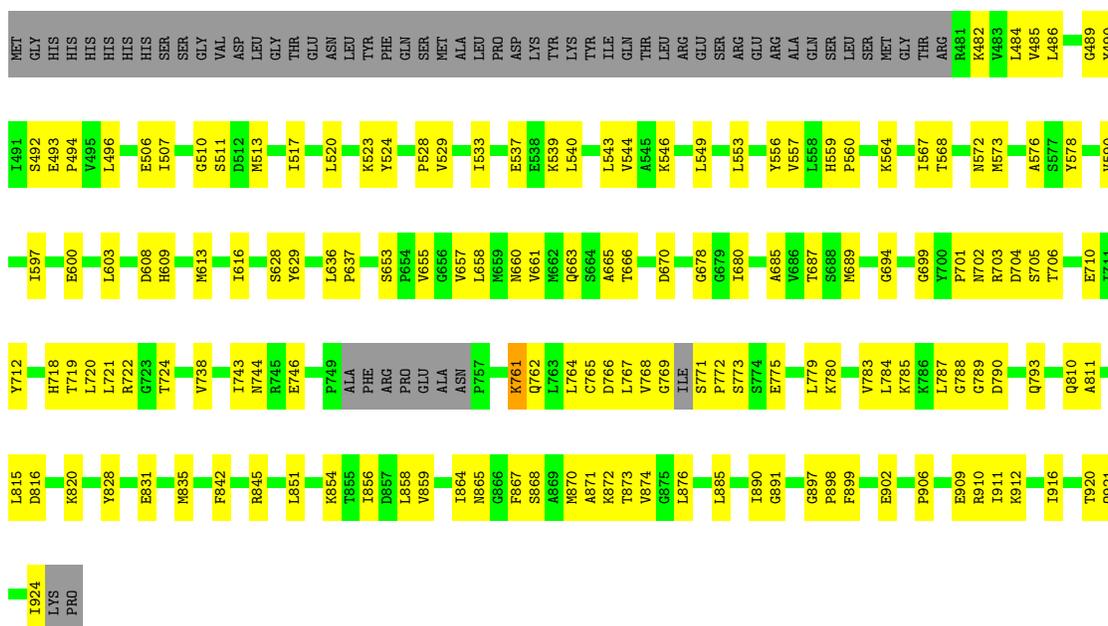
• Molecule 1: Alpha-aminoadipic semialdehyde synthase, mitochondrial

H776 L779 V783 L784 K785 K786 L787 G788 G789 D790 N791 T792 Q793 L794 E795 E798 L803 E812 S813 I814 L815 D816 A817 L818 E831 E832 K833 D834 M835 M838 R839 D840 G843 H853 K854 T855 I856 D857 L858 I864 N865 G866 F867 A881 Y904 G905 P906 I907

R910 I911 E914 G915 I916 I917 Y918 S922 T923 I924 LYS PRO
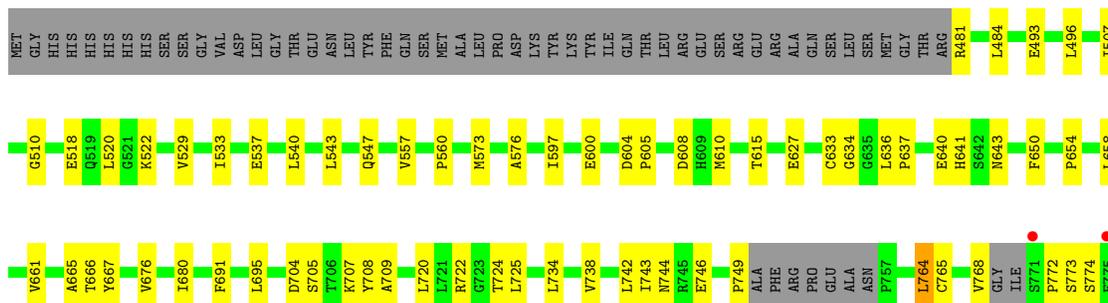
4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	71.22Å 86.63Å 149.92Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	75.01 – 2.68 75.01 – 2.68	Depositor EDS
% Data completeness (in resolution range)	99.5 (75.01-2.68) 99.5 (75.01-2.68)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.17 (at 2.69Å)	Xtriage
Refinement program	PHENIX (1.10.1_2155: ???)	Depositor
R, R_{free}	0.186 , 0.259 0.187 , 0.259	Depositor DCC
R_{free} test set	1346 reflections (5.05%)	wwPDB-VP
Wilson B-factor (Å^2)	51.6	Xtriage
Anisotropy	0.172	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.30 , 44.0	EDS
L-test for twinning[2]	$< |L| > = 0.48, < L^2 > = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	6845	wwPDB-VP
Average B, all atoms (Å^2)	47.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.78% of the height of the origin peak. No significant pseudotranslation is detected.*

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[1]Intensities estimated from amplitudes.
[2]Theoretical values of $< |L| >$, $< L^2 >$ 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: EDO, 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	0.45	0/3390	0.62	0/4588
1	B	0.45	0/3365	0.63	0/4559
All	All	0.45	0/6755	0.63	0/9147

There are no bond length outliers.

There are no bond angle outliers.

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	3324	0	3381	151	0
1	B	3299	0	3325	119	0
2	A	12	12	18	3	0
3	A	44	0	25	4	0
3	B	44	0	24	1	0
4	A	60	0	0	3	0
4	B	50	0	0	9	0
All	All	6833	12	6773	268	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 20.

All (268) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:670:ASP:H	1:A:719:THR:HG22	1.15	1.07
1:A:764[B]:LEU:HG	1:A:780:LYS:HZ1	1.22	0.99
1:B:768:VAL:HG21	1:B:783:VAL:HG12	1.46	0.98
1:B:795:GLU:O	4:B:1102:HOH:O	1.88	0.92
1:B:865:ASN:OD1	4:B:1101:HOH:O	1.86	0.91
1:A:718:HIS:ND1	1:A:719:THR:HG23	1.87	0.90
1:B:787:LEU:HD12	1:B:787:LEU:H	1.38	0.89
1:B:773:SER:N	1:B:774:SER:OG	2.06	0.88
1:A:764[B]:LEU:HD21	1:A:784:LEU:HD11	1.56	0.87
1:B:658:LEU:O	1:B:661:VAL:HG12	1.75	0.86
1:B:496:LEU:HD12	1:B:520:LEU:HD22	1.56	0.85
1:A:765:CYS:HB3	1:A:772:PRO:HA	1.58	0.85
1:A:771:SER:O	4:A:1101:HOH:O	1.94	0.85
1:B:785:LYS:O	1:B:785:LYS:NZ	2.09	0.84
1:B:764:LEU:HD21	1:B:784:LEU:HD21	1.60	0.82
1:A:670:ASP:N	1:A:719:THR:HG22	1.94	0.81
1:B:493:GLU:HG2	1:B:867:PHE:HE1	1.47	0.79
1:B:798:GLU:HB2	4:B:1102:HOH:O	1.82	0.79
1:A:764[B]:LEU:HG	1:A:780:LYS:NZ	1.99	0.78
1:B:815:LEU:O	1:B:817:ALA:N	2.16	0.78
1:A:670:ASP:H	1:A:719:THR:CG2	1.96	0.77
1:B:914:GLU:OE2	4:B:1103:HOH:O	2.01	0.77
1:A:658:LEU:O	1:A:661:VAL:HG12	1.85	0.76
1:A:533:ILE:HG23	1:A:540:LEU:HD22	1.67	0.76
1:B:764:LEU:CD2	1:B:784:LEU:HD21	2.17	0.75
1:A:533:ILE:HD13	3:A:1004:NAD:H2A	1.69	0.75
1:B:790:ASP:OD1	1:B:793:GLN:HG3	1.88	0.74
1:A:533:ILE:HD13	3:A:1004:NAD:C2A	2.17	0.73
1:A:513:MET:O	1:A:517:ILE:HD12	1.88	0.73
1:B:743:ILE:HA	1:B:815:LEU:HD13	1.71	0.73
1:A:546:LYS:NZ	4:A:1102:HOH:O	2.20	0.72
1:B:784:LEU:HD13	1:B:803:LEU:HD21	1.70	0.72
1:B:481:ARG:HA	1:B:481:ARG:NE	2.04	0.72
1:A:613:MET:HE1	1:A:712:TYR:HB3	1.70	0.72
1:A:854:LYS:HE3	1:A:920:THR:HG21	1.72	0.71
1:A:787:LEU:HD12	1:A:787:LEU:H	1.56	0.70
1:A:540:LEU:O	1:A:544:VAL:HG23	1.92	0.69
1:B:787:LEU:O	4:B:1104:HOH:O	2.11	0.68
1:A:511:SER:OG	1:A:517:ILE:HD11	1.94	0.68
1:B:493:GLU:HG2	1:B:867:PHE:CE1	2.28	0.68

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:811:ALA:HB1	1:A:816:ASP:HB3	1.76	0.67
1:A:870:MET:HE2	1:A:874:VAL:HG23	1.75	0.67
1:A:872:LYS:HA	1:A:876:LEU:HD23	1.76	0.67
1:A:775[B]:GLU:CG	1:A:779:LEU:HD12	2.24	0.67
1:A:769:GLY:C	1:A:771:SER:HA	2.16	0.67
1:A:790:ASP:OD1	1:A:793:GLN:HG3	1.95	0.66
1:B:749:PRO:O	4:B:1105:HOH:O	2.12	0.66
1:B:744:ASN:OD1	1:B:746:GLU:HG3	1.95	0.66
1:A:557:VAL:O	1:A:560:PRO:HD2	1.96	0.66
1:A:768:VAL:HB	1:A:783:VAL:CG1	2.26	0.66
1:B:785:LYS:HZ1	1:B:789:GLY:HA3	1.61	0.65
1:A:764[B]:LEU:HD21	1:A:784:LEU:CD1	2.26	0.65
1:A:780:LYS:O	1:A:784:LEU:HD23	1.97	0.65
1:A:868:SER:HB3	2:A:1003:EDO:H21	1.78	0.65
1:B:914:GLU:HB3	4:B:1107:HOH:O	1.96	0.65
1:A:576:ALA:O	3:A:1004:NAD:H2N	1.97	0.64
1:B:708:TYR:OH	4:B:1106:HOH:O	2.14	0.64
1:A:613:MET:HE2	1:A:613:MET:HA	1.78	0.64
1:A:924:ILE:HD11	2:A:1002:EDO:O1	1.98	0.63
1:B:858:LEU:HD23	1:B:858:LEU:C	2.19	0.62
1:A:870:MET:CE	1:A:874:VAL:HG23	2.30	0.61
1:A:496:LEU:HD12	1:A:520:LEU:HD22	1.80	0.61
1:A:567:ILE:HD11	1:A:590:VAL:HG22	1.83	0.60
1:B:768:VAL:HG23	1:B:787:LEU:HD11	1.84	0.60
1:A:744:ASN:OD1	1:A:746:GLU:HG3	2.01	0.60
1:B:785:LYS:HZ1	1:B:789:GLY:CA	2.15	0.60
1:A:775[B]:GLU:HG2	1:A:779:LEU:HD12	1.82	0.59
1:A:653:SER:OG	1:A:655:VAL:HG13	2.02	0.59
1:B:785:LYS:NZ	1:B:789:GLY:CA	2.65	0.59
1:A:613:MET:HE2	1:A:616:ILE:HD12	1.83	0.59
1:B:768:VAL:CG2	1:B:783:VAL:HG12	2.28	0.58
1:B:787:LEU:HD12	1:B:787:LEU:N	2.16	0.58
1:B:576:ALA:O	3:B:1001:NAD:H2N	2.04	0.58
1:B:650:PHE:CE1	1:B:654:PRO:HB3	2.39	0.58
1:B:798:GLU:N	4:B:1102:HOH:O	2.37	0.58
1:A:666:THR:O	1:A:704:ASP:O	2.22	0.57
1:B:636:LEU:HD21	1:B:725:LEU:O	2.05	0.57
1:B:906:PRO:O	1:B:910:ARG:HG3	2.04	0.57
1:A:768:VAL:HG11	1:A:784:LEU:HD22	1.85	0.57
1:B:746:GLU:O	1:B:813:SER:HA	2.05	0.56
1:B:814:ILE:O	1:B:817:ALA:HB3	2.05	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:613:MET:HE1	1:A:712:TYR:CB	2.36	0.56
1:B:812:GLU:OE1	1:B:812:GLU:N	2.38	0.56
1:A:629:TYR:HB3	1:A:720:LEU:HD23	1.88	0.56
1:A:613:MET:HA	1:A:613:MET:CE	2.36	0.55
1:B:768:VAL:HG21	1:B:783:VAL:CG1	2.29	0.55
1:A:484:LEU:HD21	1:A:486:LEU:HD21	1.87	0.55
1:A:704:ASP:O	1:A:706:THR:N	2.38	0.55
1:A:872:LYS:O	1:A:876:LEU:HD23	2.06	0.55
1:A:768:VAL:HB	1:A:783:VAL:HG11	1.87	0.55
1:A:769:GLY:C	1:A:772:PRO:HD3	2.26	0.54
1:B:857:ASP:O	1:B:918:TYR:HA	2.07	0.54
1:A:549:LEU:HD12	1:A:572:ASN:O	2.08	0.54
1:A:493:GLU:HG2	1:A:867:PHE:HE1	1.72	0.54
1:B:680:ILE:CD1	1:B:738:VAL:HG12	2.37	0.53
1:A:496:LEU:HD22	1:A:507:ILE:HG21	1.91	0.53
1:A:765:CYS:HB3	1:A:773:SER:HA	1.91	0.53
1:A:842:PHE:HE1	1:A:856:ILE:HD13	1.74	0.53
1:B:650:PHE:CD1	1:B:654:PRO:HB3	2.43	0.53
1:A:811:ALA:HB2	1:A:820:LYS:HE2	1.91	0.53
1:B:481:ARG:NE	1:B:481:ARG:CA	2.71	0.53
1:A:924:ILE:HD11	2:A:1002:EDO:C1	2.40	0.52
1:A:859:VAL:HG21	1:B:640:GLU:HB3	1.90	0.52
1:A:761:LYS:HG3	1:A:762:GLN:N	2.25	0.52
1:B:838:MET:HE3	1:B:858:LEU:HD22	1.90	0.52
1:A:636:LEU:HB3	1:A:637:PRO:HD2	1.91	0.52
1:B:853:HIS:O	1:B:922:SER:HA	2.09	0.52
1:A:533:ILE:HD12	1:A:533:ILE:N	2.25	0.52
1:A:704:ASP:O	1:A:705:SER:HB2	2.09	0.51
1:A:769:GLY:O	1:A:772:PRO:HD3	2.10	0.51
1:A:911:ILE:HD12	1:A:912:LYS:N	2.24	0.51
1:B:615:THR:HG23	1:B:854:LYS:NZ	2.25	0.51
1:B:608:ASP:OD2	1:B:722:ARG:NH1	2.44	0.51
1:A:779:LEU:O	1:A:779:LEU:HD22	2.11	0.51
1:A:785:LYS:O	1:A:789:GLY:HA2	2.11	0.51
1:B:518:GLU:HG2	1:B:522:LYS:HE2	1.93	0.50
1:A:665:ALA:HB1	1:A:702:ASN:O	2.11	0.50
1:B:510:GLY:HA2	1:B:529:VAL:O	2.11	0.50
1:A:660:ASN:OD1	1:A:703:ARG:HD2	2.11	0.50
1:A:764[B]:LEU:HG	1:A:780:LYS:CE	2.42	0.50
1:B:768:VAL:HG22	1:B:768:VAL:O	2.11	0.50
1:B:772:PRO:CB	1:B:773:SER:HA	2.37	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:768:VAL:HB	1:A:783:VAL:HG12	1.91	0.49
1:A:628:SER:HB2	1:A:719:THR:OG1	2.11	0.49
1:B:633:CYS:SG	1:B:634:GLY:N	2.85	0.49
1:A:858:LEU:C	1:A:858:LEU:HD23	2.32	0.49
1:B:640:GLU:OE2	1:B:833:LYS:HE3	2.12	0.49
1:A:613:MET:CE	1:A:616:ILE:HD12	2.42	0.49
1:A:694:GLY:O	1:B:695:LEU:HD12	2.11	0.49
1:B:787:LEU:H	1:B:787:LEU:CD1	2.19	0.49
1:B:573:MET:O	1:B:597:ILE:HA	2.12	0.49
1:B:765:CYS:HB3	1:B:772:PRO:HA	1.94	0.49
1:A:539:LYS:O	1:A:543:LEU:HG	2.13	0.49
1:B:881:ALA:HB2	1:B:907:ILE:HD11	1.93	0.49
1:A:687:THR:OG1	1:A:689:MET:CE	2.61	0.49
1:A:764[A]:LEU:HD23	1:A:767:LEU:HD12	1.95	0.49
1:B:537:GLU:O	1:B:540:LEU:HB3	2.13	0.48
1:A:764[A]:LEU:HA	1:A:767:LEU:HD12	1.95	0.48
1:A:765:CYS:N	1:A:780:LYS:HE2	2.28	0.48
1:A:810:GLN:O	1:A:820:LYS:HE3	2.13	0.48
1:B:665:ALA:HB3	1:B:676:VAL:CG2	2.43	0.48
1:A:920:THR:HG22	1:A:921:GLN:N	2.27	0.48
1:B:484:LEU:CB	1:B:547:GLN:HG3	2.43	0.48
1:B:636:LEU:HB3	1:B:637:PRO:HD2	1.95	0.48
1:B:680:ILE:HD13	1:B:738:VAL:HG12	1.95	0.48
1:B:785:LYS:HZ2	1:B:785:LYS:HG3	1.11	0.48
1:A:911:ILE:HD13	1:A:916:ILE:O	2.14	0.48
1:B:840:ASP:O	1:B:855:THR:HA	2.14	0.48
1:A:637:PRO:HA	1:A:828:TYR:OH	2.14	0.47
1:A:636:LEU:HD12	1:A:835:MET:CE	2.44	0.47
1:A:787:LEU:HD12	1:A:787:LEU:N	2.27	0.47
1:A:775[B]:GLU:HG3	1:A:779:LEU:HB3	1.96	0.47
1:B:791:ASN:O	1:B:795:GLU:OE2	2.32	0.47
1:A:523:LYS:HB2	1:A:524:TYR:CE2	2.49	0.47
1:B:641:HIS:CE1	1:B:833:LYS:H	2.32	0.47
1:B:815:LEU:O	1:B:816:ASP:HB3	2.15	0.47
1:B:481:ARG:HA	1:B:481:ARG:CZ	2.43	0.47
1:B:496:LEU:CD2	1:B:507:ILE:HG21	2.45	0.47
1:A:567:ILE:HD11	1:A:590:VAL:CG2	2.44	0.47
1:A:578:TYR:HA	1:A:600:GLU:OE1	2.14	0.47
1:A:764[B]:LEU:HD23	1:A:780:LYS:HE3	1.97	0.47
1:B:790:ASP:OD1	1:B:792:THR:HB	2.15	0.46
1:A:873:THR:HG22	1:A:916:ILE:HD13	1.97	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:891:GLY:N	1:A:902:GLU:OE2	2.41	0.46
1:A:533:ILE:N	1:A:533:ILE:CD1	2.78	0.46
1:A:872:LYS:O	1:A:876:LEU:HB2	2.16	0.46
1:A:768:VAL:HG22	1:A:780:LYS:HZ3	1.80	0.46
1:A:663:GLN:O	1:A:678:GLY:HA3	2.15	0.46
1:A:764[B]:LEU:HA	1:A:767:LEU:HD12	1.97	0.46
1:A:764[B]:LEU:HD11	1:A:784:LEU:HD11	1.98	0.46
1:B:831:GLU:HA	1:B:864:ILE:HD12	1.97	0.46
1:B:557:VAL:O	1:B:560:PRO:HD2	2.15	0.46
1:A:608:ASP:OD1	1:A:609:HIS:N	2.49	0.46
1:A:685:ALA:O	1:A:687:THR:HG23	2.15	0.46
1:A:906:PRO:O	1:A:910:ARG:HG3	2.15	0.45
1:B:529:VAL:HG11	1:B:543:LEU:HD11	1.97	0.45
1:A:680:ILE:HD11	1:A:738:VAL:HG12	1.99	0.45
1:B:636:LEU:O	1:B:835:MET:N	2.49	0.45
1:A:721:LEU:HD12	1:A:722:ARG:N	2.32	0.45
1:B:484:LEU:HB3	1:B:547:GLN:HG3	1.99	0.45
1:B:691:PHE:HB3	1:B:839:ARG:CZ	2.47	0.45
1:B:815:LEU:O	1:B:816:ASP:CB	2.65	0.45
1:A:510:GLY:HA2	1:A:529:VAL:O	2.17	0.45
1:A:775[B]:GLU:HG2	1:A:779:LEU:CD1	2.47	0.44
1:B:773:SER:H	1:B:774:SER:HG	1.50	0.44
1:B:815:LEU:C	1:B:817:ALA:N	2.71	0.44
1:A:845:ARG:NH1	1:A:851:LEU:HB2	2.32	0.44
1:B:764:LEU:HD22	1:B:784:LEU:HD21	1.99	0.44
1:A:603:LEU:HD22	1:A:870:MET:HE3	2.00	0.44
1:B:768:VAL:CG2	1:B:783:VAL:CG1	2.94	0.44
1:B:772:PRO:HB3	1:B:773:SER:HA	2.00	0.44
1:B:856:ILE:N	1:B:856:ILE:HD12	2.32	0.44
1:A:482:LYS:HG2	1:A:506:GLU:HB3	1.99	0.44
1:A:788:GLY:HA3	1:A:789:GLY:HA2	1.75	0.44
1:A:854:LYS:HE3	1:A:920:THR:CG2	2.44	0.44
1:A:870:MET:CE	1:A:870:MET:HA	2.48	0.44
1:A:603:LEU:HD22	1:A:870:MET:CE	2.48	0.44
1:B:573:MET:HB3	1:B:597:ILE:HG12	2.00	0.44
1:B:814:ILE:C	1:B:815:LEU:O	2.56	0.44
1:A:489:GLY:O	1:A:492:SER:OG	2.27	0.44
1:B:667:TYR:HB3	1:B:705:SER:HB2	1.99	0.44
1:A:636:LEU:O	1:A:835:MET:N	2.50	0.43
1:B:798:GLU:CG	1:B:803:LEU:HD22	2.47	0.43
1:A:529:VAL:HG11	1:A:543:LEU:CD1	2.49	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:496:LEU:CD1	1:B:520:LEU:HD22	2.37	0.43
1:A:768:VAL:HG23	1:A:771:SER:N	2.33	0.43
1:A:768:VAL:CG2	1:A:780:LYS:NZ	2.82	0.43
1:B:709:ALA:HB2	1:B:720:LEU:HD11	1.99	0.43
1:A:493:GLU:N	1:A:494:PRO:HD2	2.33	0.43
1:B:610:MET:HB3	1:B:904:TYR:HB2	2.00	0.43
1:A:537:GLU:N	1:A:537:GLU:OE1	2.52	0.43
1:A:743:ILE:HA	1:A:815:LEU:HD13	2.00	0.43
1:A:897:GLY:HA3	1:A:899:PHE:CE2	2.54	0.43
1:A:573:MET:O	1:A:597:ILE:HA	2.19	0.42
1:A:771:SER:N	4:A:1101:HOH:O	2.52	0.42
1:A:780:LYS:NZ	1:A:784:LEU:HD21	2.35	0.42
1:B:785:LYS:NZ	1:B:789:GLY:HA3	2.29	0.42
1:A:657:VAL:O	1:A:660:ASN:HB3	2.20	0.42
1:A:701:PRO:HB3	1:A:721:LEU:HD11	2.01	0.42
1:A:772:PRO:HA	1:A:773:SER:HA	1.81	0.42
1:A:560:PRO:O	1:A:564:LYS:HG3	2.19	0.42
1:A:831:GLU:HA	1:A:864:ILE:HG23	2.02	0.42
1:B:543:LEU:HD23	1:B:543:LEU:HA	1.82	0.42
1:B:627:GLU:N	1:B:843:GLY:O	2.34	0.42
1:B:533:ILE:HD13	1:B:533:ILE:HA	1.81	0.42
1:B:633:CYS:O	1:B:724:THR:HA	2.20	0.42
1:B:772:PRO:C	1:B:774:SER:O	2.59	0.42
1:A:859:VAL:O	1:B:833:LYS:NZ	2.53	0.41
1:A:885:LEU:HD23	1:A:885:LEU:HA	1.88	0.41
3:A:1004:NAD:H3D	3:A:1004:NAD:O1N	2.21	0.41
1:B:667:TYR:CB	1:B:705:SER:HB2	2.51	0.41
1:B:667:TYR:HB2	1:B:720:LEU:O	2.21	0.41
1:A:494:PRO:HG3	1:A:871:ALA:HB1	2.02	0.41
1:A:766:ASP:HA	1:A:772:PRO:HG3	2.02	0.41
1:A:769:GLY:O	1:A:772:PRO:CD	2.68	0.41
1:A:517:ILE:HG22	1:A:528:PRO:HB3	2.02	0.41
1:B:734:LEU:HD23	1:B:734:LEU:HA	1.75	0.41
1:B:641:HIS:CE1	1:B:832:GLU:HA	2.56	0.41
1:B:784:LEU:CD1	1:B:803:LEU:HD21	2.44	0.41
1:B:911:ILE:CG2	1:B:916:ILE:HB	2.51	0.41
1:A:687:THR:OG1	1:A:689:MET:HE1	2.21	0.41
1:A:872:LYS:CA	1:A:876:LEU:HD23	2.49	0.41
1:A:890:ILE:HA	1:A:902:GLU:OE2	2.21	0.41
1:B:680:ILE:HD11	1:B:738:VAL:HG12	2.03	0.41
1:B:798:GLU:HG2	1:B:803:LEU:HD22	2.03	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:517:ILE:CG2	1:A:528:PRO:HB3	2.51	0.41
1:A:553:LEU:HD23	1:A:553:LEU:HA	1.86	0.41
1:A:600:GLU:O	1:A:898:PRO:HG3	2.21	0.41
1:A:699:GLY:HA2	1:A:724:THR:O	2.21	0.41
1:B:484:LEU:HB2	1:B:547:GLN:HG3	2.03	0.41
1:B:704:ASP:OD2	1:B:707:LYS:HB3	2.21	0.41
1:A:484:LEU:HD12	1:A:485:VAL:N	2.36	0.41
1:A:564:LYS:O	1:A:568:THR:HG23	2.21	0.41
1:B:600:GLU:HA	1:B:605:PRO:HG2	2.03	0.40
1:B:604:ASP:HA	1:B:605:PRO:HA	1.90	0.40
1:B:666:THR:HG22	1:B:704:ASP:HA	2.02	0.40
1:B:831:GLU:C	1:B:864:ILE:HD12	2.40	0.40
1:A:556:TYR:HA	1:A:559:HIS:CD2	2.56	0.40
1:B:695:LEU:HD12	1:B:695:LEU:HA	1.73	0.40
1:B:742:LEU:HB3	1:B:818:LEU:HD22	2.04	0.40
1:A:865:ASN:OD1	1:A:865:ASN:N	2.43	0.40
1:B:666:THR:O	1:B:666:THR:HG23	2.21	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	432/497 (87%)	414 (96%)	18 (4%)	0	100	100
1	B	431/497 (87%)	414 (96%)	16 (4%)	1 (0%)	47	71
All	All	863/994 (87%)	828 (96%)	34 (4%)	1 (0%)	51	76

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	815	LEU

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	362/418 (87%)	358 (99%)	4 (1%)	73	89
1	B	356/418 (85%)	354 (99%)	2 (1%)	86	94
All	All	718/836 (86%)	712 (99%)	6 (1%)	81	92

All (6) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	490	TYR
1	A	710	GLU
1	A	761	LYS
1	A	909	GLU
1	B	764	LEU
1	B	785	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates ⓘ

There are no monosaccharides in this entry.

5.6 Ligand geometry ⓘ

5 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	#$|Z| > 2$
2	EDO	A	1001	-	3,3,3	0.67	0	2,2,2	0.06	0
3	NAD	A	1004	-	42,48,48	5.20	17 (40%)	50,73,73	1.26	6 (12%)
2	EDO	A	1003	-	3,3,3	0.57	0	2,2,2	0.17	0
2	EDO	A	1002	-	3,3,3	0.55	0	2,2,2	0.07	0
3	NAD	B	1001	-	42,48,48	5.20	18 (42%)	50,73,73	1.58	9 (18%)

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	EDO	A	1001	-	-	0/1/1/1	-
3	NAD	A	1004	-	-	1/26/62/62	0/5/5/5
2	EDO	A	1003	-	-	0/1/1/1	-
2	EDO	A	1002	-	-	0/1/1/1	-
3	NAD	B	1001	-	-	3/26/62/62	0/5/5/5

All (35) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	1001	NAD	O4D-C1D	15.72	1.63	1.41
3	B	1001	NAD	C2B-C1B	-15.18	1.30	1.53
3	A	1004	NAD	C2D-C1D	-15.09	1.30	1.53
3	A	1004	NAD	O4D-C1D	15.07	1.62	1.41
3	A	1004	NAD	O4B-C1B	14.87	1.61	1.41
3	B	1001	NAD	C2D-C1D	-14.56	1.31	1.53
3	A	1004	NAD	C2B-C1B	-14.53	1.31	1.53
3	B	1001	NAD	O4B-C1B	13.99	1.60	1.41
3	A	1004	NAD	C7N-N7N	8.96	1.50	1.33
3	B	1001	NAD	C7N-N7N	8.86	1.49	1.33
3	A	1004	NAD	O4D-C4D	-6.43	1.30	1.45
3	B	1001	NAD	O4D-C4D	-6.28	1.31	1.45
3	B	1001	NAD	O4B-C4B	-5.36	1.33	1.45

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	1004	NAD	O4B-C4B	-5.19	1.33	1.45
3	B	1001	NAD	O2B-C2B	3.30	1.50	1.43
3	A	1004	NAD	O3B-C3B	-3.28	1.35	1.43
3	B	1001	NAD	O3B-C3B	-3.15	1.35	1.43
3	A	1004	NAD	C3N-C7N	3.09	1.55	1.50
3	A	1004	NAD	O2B-C2B	3.09	1.50	1.43
3	A	1004	NAD	C2A-N3A	2.99	1.36	1.32
3	B	1001	NAD	C3N-C7N	2.98	1.55	1.50
3	B	1001	NAD	C2A-N3A	2.92	1.36	1.32
3	A	1004	NAD	C6A-N6A	2.88	1.44	1.34
3	B	1001	NAD	C6A-N6A	2.86	1.44	1.34
3	B	1001	NAD	O3D-C3D	-2.63	1.36	1.43
3	A	1004	NAD	PN-O5D	2.53	1.69	1.59
3	B	1001	NAD	PN-O5D	2.50	1.69	1.59
3	A	1004	NAD	O2D-C2D	2.43	1.48	1.43
3	B	1001	NAD	C5A-C4A	-2.39	1.34	1.40
3	A	1004	NAD	O3D-C3D	-2.34	1.37	1.43
3	B	1001	NAD	O2D-C2D	2.30	1.48	1.43
3	A	1004	NAD	C5A-C4A	-2.30	1.34	1.40
3	B	1001	NAD	C5D-C4D	2.21	1.58	1.51
3	A	1004	NAD	C5D-C4D	2.18	1.58	1.51
3	B	1001	NAD	C4N-C3N	-2.06	1.35	1.39

All (15) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	1001	NAD	N3A-C2A-N1A	-5.89	119.48	128.68
3	A	1004	NAD	N3A-C2A-N1A	-5.16	120.62	128.68
3	B	1001	NAD	C3N-C7N-N7N	3.89	122.42	117.75
3	B	1001	NAD	PN-O3-PA	-3.48	120.90	132.83
3	B	1001	NAD	O7N-C7N-N7N	-3.23	117.98	122.58
3	B	1001	NAD	O4B-C1B-C2B	-3.06	102.45	106.93
3	A	1004	NAD	O4D-C1D-C2D	-2.62	103.09	106.93
3	B	1001	NAD	C6N-N1N-C2N	-2.55	119.64	121.97
3	B	1001	NAD	C5A-C6A-N6A	2.17	123.64	120.35
3	B	1001	NAD	C1B-N9A-C4A	-2.13	122.90	126.64
3	A	1004	NAD	C5A-C6A-N6A	2.09	123.53	120.35
3	A	1004	NAD	C5B-C4B-C3B	-2.07	107.44	115.18
3	A	1004	NAD	O7N-C7N-N7N	-2.02	119.70	122.58
3	A	1004	NAD	O4B-C1B-C2B	-2.02	103.98	106.93
3	B	1001	NAD	C3D-C2D-C1D	2.00	103.99	100.98

There are no chirality outliers.

All (4) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	B	1001	NAD	O4B-C4B-C5B-O5B
3	B	1001	NAD	C3B-C4B-C5B-O5B
3	A	1004	NAD	C4D-C5D-O5D-PN
3	B	1001	NAD	PA-O3-PN-O2N

There are no ring outliers.

4 monomers are involved in 8 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	1004	NAD	4	0
2	A	1003	EDO	1	0
2	A	1002	EDO	2	0
3	B	1001	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 then 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.

Ligand NAD A 1004

Bond lengths

Bond angles

Torsions

Rings

Ligand NAD B 1001

Bond lengths

Bond angles

Torsions

Rings
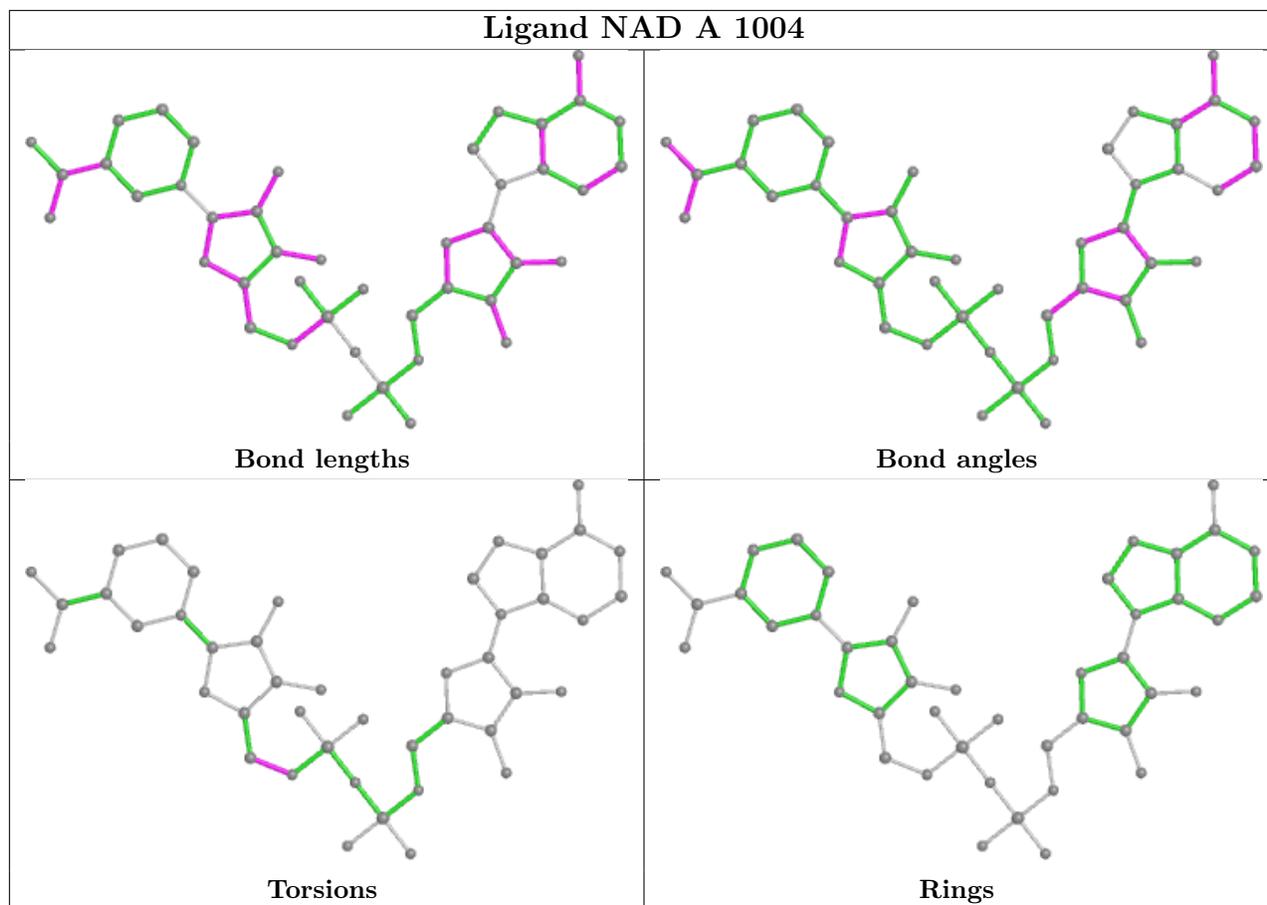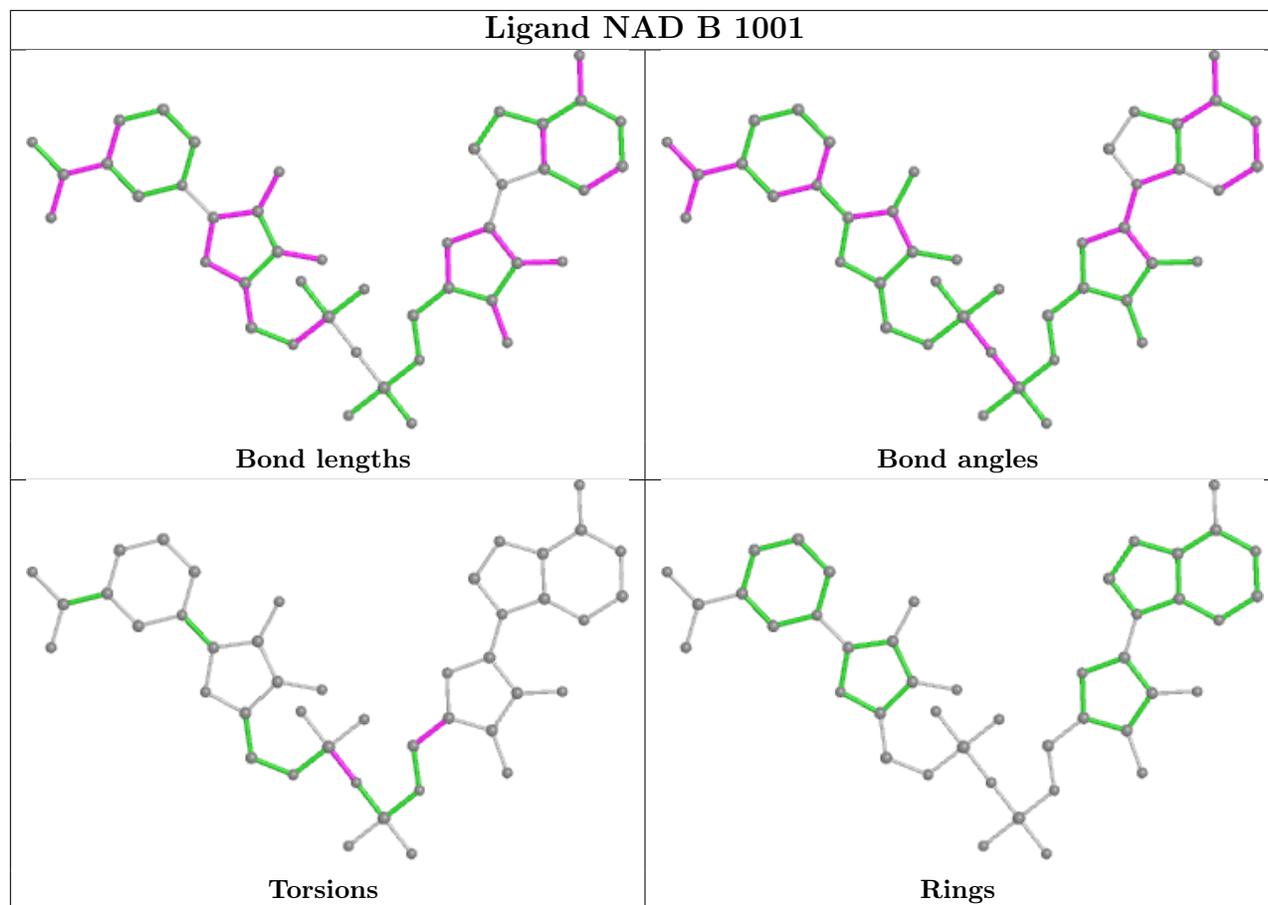
5.7　Other polymers ⓘ

There are no such residues in this entry.

5.8　Polymer linkage issues ⓘ

There are no chain breaks in this entry.

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

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

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2			OWAB(Å^2)	Q<0.9
1	A	436/497 (87%)	-0.40	0	100	100	28, 47, 68, 84	0
1	B	435/497 (87%)	-0.38	4 (0%)	84	85	27, 43, 73, 97	0
All	All	871/994 (87%)	-0.39	4 (0%)	91	92	27, 45, 70, 97	0

All (4) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	775	GLU	2.4
1	B	776	HIS	2.3
1	B	779	LEU	2.3
1	B	771	SER	2.3

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

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

6.3 Carbohydrates ⓘ

There are no monosaccharides 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
2	EDO	A	1001	4/4	0.85	0.24	43,45,52,58	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
2	EDO	A	1002	4/4	0.85	0.15	58,73,75,90	0
2	EDO	A	1003	4/4	0.94	0.16	42,51,59,71	0
3	NAD	A	1004	44/44	0.94	0.13	45,57,64,78	0
3	NAD	B	1001	44/44	0.95	0.12	38,52,71,74	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 A 1004:

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

Electron density around NAD B 1001:

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

6.5 Other polymers ⓘ

There are no such residues in this entry.