WORLDWIDE PDB
PROTEIN DATA BANK

Full wwPDB X-ray Structure Validation Report (i)

Jun 26, 2023 – 04:50 pm BST

PDB ID	:	8P5F
Title	:	Human wild-type GAPDH,orthorhombic form
Authors	:	Samygina, V.R.; Muronetz, V.I.; Schmalhausen, E.V.
Deposited on	:	2023-05-24
Resolution	:	1.82 Å(reported)

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

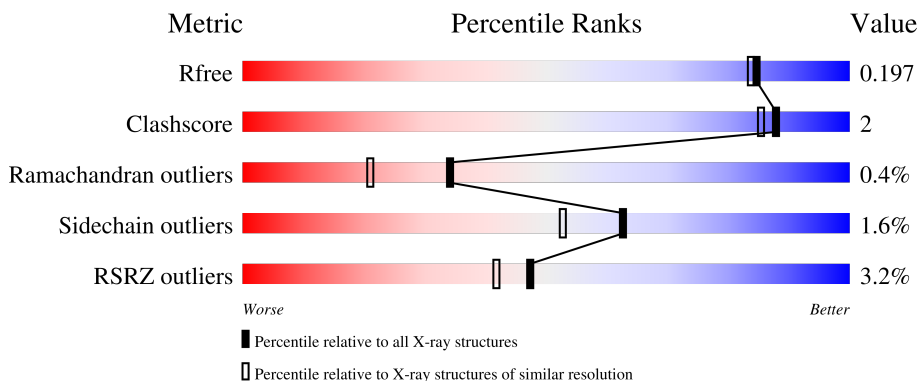|		
MolProbity	:	4.02b-467
Mogul	:	1.8.4, CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.33
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.33

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 1.82 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	7484 (1.84-1.80)
Clashscore	141614	8401 (1.84-1.80)
Ramachandran outliers	138981	8290 (1.84-1.80)
Sidechain outliers	138945	8290 (1.84-1.80)
RSRZ outliers	127900	7371 (1.84-1.80)

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.

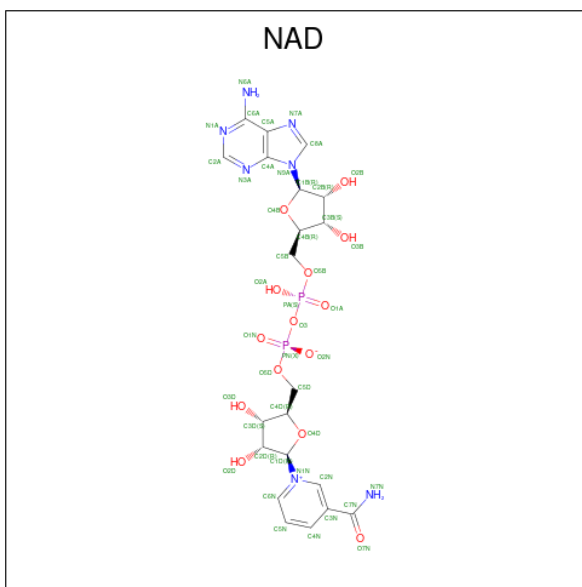| Mol	Chain	Length	Quality of chain
1	AAA	335	
1	DDD	335	
1	EEE	335	
1	GGG	335	

2 Entry composition ⓘ

There are 5 unique types of molecules in this entry. The entry contains 11075 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called Glyceraldehyde-3-phosphate dehydrogenase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	AAA	334	Total	C	N	O	S	0	1	0
			2532	1600	439	480	13			
1	DDD	333	Total	C	N	O	S	0	2	0
			2538	1604	439	482	13			
1	EEE	333	Total	C	N	O	S	0	2	0
			2535	1604	438	481	12			
1	GGG	333	Total	C	N	O	S	0	1	0
			2533	1601	441	479	12			

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

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

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

- Molecule 3 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	EEE	2	Total	Zn	0	0
			2	2		

- Molecule 4 is ACETATE ION (three-letter code: ACT) (formula: $C_2H_3O_2$).

Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	EEE	1	Total	C	O	0	0
			4	2	2		

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	AAA	241	Total	O	0	0
			241	241		
5	DDD	239	Total	O	0	0
			239	239		
5	EEE	173	Total	O	0	0
			173	173		

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	GGG	102	Total 102	O 102	0	0

3 Residue-property plots ⓘ

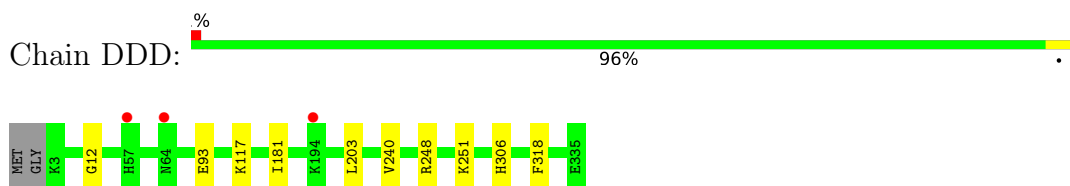These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. 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.

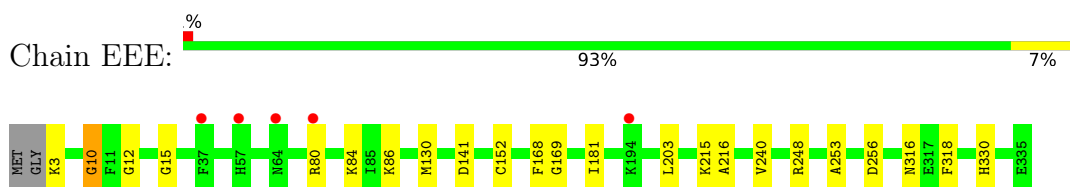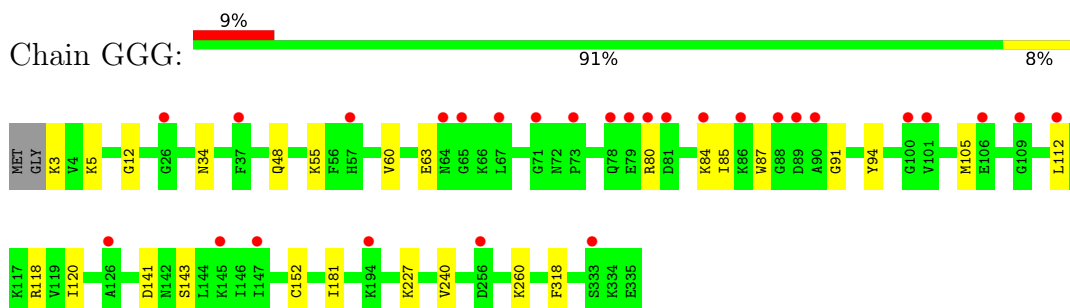- Molecule 1: Glyceraldehyde-3-phosphate dehydrogenase

Chain AAA:

- Molecule 1: Glyceraldehyde-3-phosphate dehydrogenase

Chain DDD:

- Molecule 1: Glyceraldehyde-3-phosphate dehydrogenase

Chain EEE:

- Molecule 1: Glyceraldehyde-3-phosphate dehydrogenase

Chain GGG:

4 Data and refinement statistics ⓘ

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	80.82Å 132.81Å 146.83Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	14.99 – 1.82 14.99 – 1.82	Depositor EDS
% Data completeness (in resolution range)	99.8 (14.99-1.82) 100.0 (14.99-1.82)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.95 (at 1.82Å)	Xtriage
Refinement program	REFMAC 5.8.0257	Depositor
R, R_{free}	0.160 , 0.189 0.170 , 0.197	Depositor DCC
R_{free} test set	6994 reflections (4.94%)	wwPDB-VP
Wilson B-factor (Å²)	36.7	Xtriage
Anisotropy	0.032	Xtriage
Bulk solvent k_{sol}(e/Å³), B_{sol}(Å²)	0.38 , 48.0	EDS
L-test for twinning[2]	$< |L| > = 0.50, < L^2 > = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.97	EDS
Total number of atoms	11075	wwPDB-VP
Average B, all atoms (Å²)	44.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.14% 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 (i)

5.1 Standard geometry (i)

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

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	AAA	0.79	1/2579 (0.0%)	0.91	0/3488
1	DDD	0.77	0/2576	0.90	0/3487
1	EEE	0.78	1/2583 (0.0%)	0.89	0/3495
1	GGG	0.74	0/2578	0.85	0/3487
All	All	0.77	2/10316 (0.0%)	0.89	0/13957

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	AAA	329	ALA	C-O	5.20	1.33	1.23
1	EEE	10	GLY	C-O	5.03	1.31	1.23

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts (i)

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	AAA	2532	0	2532	11	0
1	DDD	2538	0	2539	11	0
1	EEE	2535	0	2539	19	0
1	GGG	2533	0	2537	13	0
2	AAA	44	0	26	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	DDD	44	0	26	1	0
2	EEE	44	0	26	3	0
2	GGG	44	0	26	1	0
3	EEE	2	0	0	0	0
4	EEE	4	0	3	0	0
5	AAA	241	0	0	3	0
5	DDD	239	0	0	1	0
5	EEE	173	0	0	3	0
5	GGG	102	0	0	2	0
All	All	11075	0	10254	42	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 2.

All (42) 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:AAA:24:ASN:HB2	5:AAA:710:HOH:O	1.59	1.00
1:DDD:203[B]:LEU:HB2	1:EEE:203[B]:LEU:HD21	1.43	0.98
1:DDD:203[B]:LEU:HD13	1:EEE:203[B]:LEU:HD22	1.54	0.89
1:AAA:248:ARG:HD2	1:EEE:248:ARG:HD2	1.57	0.85
1:DDD:203[A]:LEU:HD22	1:EEE:181:ILE:HD13	1.68	0.75
1:EEE:330:HIS:ND1	5:EEE:501:HOH:O	2.20	0.75
1:GGG:227:LYS:HE3	5:GGG:520:HOH:O	1.89	0.72
1:DDD:203[B]:LEU:HD13	1:EEE:203[B]:LEU:CD2	2.21	0.69
1:GGG:12:GLY:HA3	2:GGG:401:NAD:O5B	1.98	0.63
1:AAA:203:LEU:HD22	1:GGG:181:ILE:HD13	1.81	0.62
1:AAA:248:ARG:CD	1:EEE:248:ARG:HD2	2.29	0.62
1:EEE:203[A]:LEU:HD12	5:EEE:521:HOH:O	2.02	0.59
1:AAA:248:ARG:HD2	1:EEE:248:ARG:CD	2.30	0.59
1:AAA:172:GLU:OE2	1:AAA:248:ARG:HD3	2.03	0.57
1:EEE:130:MET:HE1	1:EEE:216:ALA:HB1	1.88	0.56
1:AAA:130[B]:MET:HE1	1:AAA:216:ALA:HB1	1.87	0.55
1:AAA:187:THR:HB	1:GGG:181:ILE:HD12	1.89	0.55
1:DDD:181:ILE:HD13	1:EEE:203[B]:LEU:HD12	1.88	0.55
1:DDD:203[A]:LEU:HD22	1:EEE:181:ILE:CD1	2.37	0.54
1:GGG:227:LYS:CE	5:GGG:520:HOH:O	2.49	0.53
1:GGG:141:ASP:OD1	1:GGG:143:SER:OG	2.26	0.53
1:GGG:94:TYR:CE1	1:GGG:118:ARG:HD2	2.45	0.52
1:EEE:86:LYS:HE2	5:EEE:662:HOH:O	2.10	0.51
1:GGG:5:LYS:HD2	1:GGG:91:GLY:O	2.10	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:DDD:203[B]:LEU:CB	1:EEE:203[B]:LEU:HD21	2.29	0.50
1:AAA:145:LYS:HD2	5:AAA:508:HOH:O	2.13	0.47
1:EEE:152:CSD:HB2	2:EEE:401:NAD:H5N	1.97	0.47
1:EEE:10:GLY:O	1:EEE:15:GLY:HA3	2.16	0.46
1:DDD:12:GLY:HA3	2:DDD:401:NAD:O5B	2.15	0.46
1:GGG:34:ASN:ND2	1:GGG:85:ILE:HD11	2.31	0.46
1:DDD:248:ARG:HA	1:DDD:306:HIS:O	2.16	0.45
1:DDD:251:LYS:NZ	5:DDD:508:HOH:O	2.50	0.45
1:GGG:112:LEU:HD23	1:GGG:116:ALA:O	2.17	0.45
1:GGG:120:ILE:N	1:GGG:120:ILE:HD12	2.32	0.45
1:GGG:48:GLN:O	1:GGG:55:LYS:HA	2.17	0.44
1:EEE:168:PHE:CD1	1:EEE:253:ALA:HB2	2.53	0.44
1:GGG:85:ILE:HG21	1:GGG:87:TRP:CE2	2.53	0.43
1:EEE:12:GLY:HA3	2:EEE:401:NAD:O5B	2.18	0.43
1:DDD:93:GLU:HG3	1:DDD:117:LYS:HG3	1.99	0.43
1:AAA:145:LYS:CE	5:AAA:508:HOH:O	2.67	0.43
1:EEE:316:ASN:O	2:EEE:401:NAD:H4N	2.19	0.42
1:AAA:315:ASP:OD1	1:AAA:315:ASP:C	2.59	0.42

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	AAA	332/335 (99%)	322 (97%)	9 (3%)	1 (0%)	41	27
1	DDD	331/335 (99%)	318 (96%)	12 (4%)	1 (0%)	41	27
1	EEE	332/335 (99%)	320 (96%)	10 (3%)	2 (1%)	25	12
1	GGG	331/335 (99%)	317 (96%)	13 (4%)	1 (0%)	41	27
All	All	1326/1340 (99%)	1277 (96%)	44 (3%)	5 (0%)	34	21

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	AAA	240	VAL
1	DDD	240	VAL
1	EEE	240	VAL
1	GGG	240	VAL
1	EEE	169	GLY

5.3.2 Protein sidechains ⓘ

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	AAA	270/270 (100%)	269 (100%)	1 (0%)	91	89
1	DDD	270/270 (100%)	269 (100%)	1 (0%)	91	89
1	EEE	271/270 (100%)	264 (97%)	7 (3%)	46	32
1	GGG	270/270 (100%)	262 (97%)	8 (3%)	41	26
All	All	1081/1080 (100%)	1064 (98%)	17 (2%)	62	53

All (17) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	AAA	215	LYS
1	DDD	318	PHE
1	EEE	3	LYS
1	EEE	80	ARG
1	EEE	84	LYS
1	EEE	141	ASP
1	EEE	215	LYS
1	EEE	256	ASP
1	EEE	318	PHE
1	GGG	3	LYS
1	GGG	60	VAL
1	GGG	63	GLU
1	GGG	80	ARG
1	GGG	84	LYS
1	GGG	105	MET
1	GGG	260	LYS
1	GGG	318	PHE

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 ⓘ

5 non-standard protein/DNA/RNA residues 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	$\#|Z| > 2$
1	CSD	DDD	152[A]	1	3,7,8	0.97	0	1,8,10	0.83	0
1	CSD	DDD	152[B]	1	3,7,8	0.94	0	1,8,10	0.22	0
1	CSD	AAA	152	1	3,7,8	0.92	0	1,8,10	1.01	0
1	CSD	GGG	152	1	3,7,8	1.17	0	1,8,10	2.68	1 (100%)
1	CSD	EEE	152	1	3,7,8	1.31	0	1,8,10	0.16	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
1	CSD	DDD	152[A]	1	-	1/2/6/8	-
1	CSD	DDD	152[B]	1	-	0/2/6/8	-
1	CSD	AAA	152	1	-	0/2/6/8	-
1	CSD	GGG	152	1	-	1/2/6/8	-
1	CSD	EEE	152	1	-	1/2/6/8	-

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	GGG	152	CSD	OD1-SG-CB	2.68	110.64	105.54

There are no chirality outliers.

All (3) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	DDD	152[A]	CSD	CA-CB-SG-OD1
1	EEE	152	CSD	CA-CB-SG-OD1
1	GGG	152	CSD	CA-CB-SG-OD1

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	EEE	152	CSD	1	0

5.5 Carbohydrates ⓘ

There are no monosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 7 ligands modelled in this entry, 2 are monoatomic - leaving 5 for Mogul analysis.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#|Z| > 2$	Counts	RMSZ	$\#|Z| > 2$
2	NAD	DDD	401	-	42,48,48	1.01	1 (2%)	50,73,73	0.89	1 (2%)
4	ACT	EEE	403	3	3,3,3	0.82	0	3,3,3	2.00	1 (33%)
2	NAD	EEE	401	-	42,48,48	1.02	1 (2%)	50,73,73	0.95	3 (6%)
2	NAD	AAA	401	-	42,48,48	1.11	3 (7%)	50,73,73	0.87	1 (2%)
2	NAD	GGG	401	-	42,48,48	1.14	2 (4%)	50,73,73	0.97	3 (6%)

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	DDD	401	-	-	5/26/62/62	0/5/5/5
2	NAD	AAA	401	-	-	5/26/62/62	0/5/5/5
2	NAD	EEE	401	-	-	6/26/62/62	0/5/5/5
2	NAD	GGG	401	-	-	6/26/62/62	0/5/5/5

All (7) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	GGG	401	NAD	C2N-N1N	5.60	1.41	1.35
2	EEE	401	NAD	C2N-N1N	4.82	1.40	1.35
2	DDD	401	NAD	C2N-N1N	4.79	1.40	1.35
2	AAA	401	NAD	C2N-N1N	3.79	1.39	1.35
2	AAA	401	NAD	O4D-C1D	3.74	1.46	1.41
2	GGG	401	NAD	O4D-C1D	2.75	1.44	1.41
2	AAA	401	NAD	C4N-C3N	2.67	1.43	1.39

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	EEE	401	NAD	C6N-N1N-C2N	-3.25	119.01	121.97
2	GGG	401	NAD	C6N-N1N-C2N	-3.04	119.20	121.97
2	GGG	401	NAD	O4D-C1D-C2D	-2.94	102.63	106.93
4	EEE	403	ACT	O-C-CH3	-2.76	111.57	122.33
2	DDD	401	NAD	C3N-C2N-N1N	-2.55	117.93	120.43
2	GGG	401	NAD	C5A-C6A-N6A	2.35	123.93	120.35
2	AAA	401	NAD	C6N-N1N-C2N	-2.30	119.88	121.97
2	EEE	401	NAD	O2A-PA-O1A	2.22	123.22	112.24
2	EEE	401	NAD	O4B-C1B-C2B	-2.17	103.76	106.93

There are no chirality outliers.

All (22) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	AAA	401	NAD	O4D-C1D-N1N-C2N
2	AAA	401	NAD	O4D-C1D-N1N-C6N
2	AAA	401	NAD	C2D-C1D-N1N-C2N
2	AAA	401	NAD	C2D-C1D-N1N-C6N

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Mol	Chain	Res	Type	Atoms
2	DDD	401	NAD	O4D-C1D-N1N-C2N
2	DDD	401	NAD	O4D-C1D-N1N-C6N
2	DDD	401	NAD	C2D-C1D-N1N-C2N
2	DDD	401	NAD	C2D-C1D-N1N-C6N
2	EEE	401	NAD	O4D-C1D-N1N-C2N
2	EEE	401	NAD	O4D-C1D-N1N-C6N
2	EEE	401	NAD	C2D-C1D-N1N-C2N
2	EEE	401	NAD	C2D-C1D-N1N-C6N
2	GGG	401	NAD	O4D-C1D-N1N-C2N
2	GGG	401	NAD	O4D-C1D-N1N-C6N
2	GGG	401	NAD	C2D-C1D-N1N-C2N
2	GGG	401	NAD	C2D-C1D-N1N-C6N
2	GGG	401	NAD	O4B-C4B-C5B-O5B
2	EEE	401	NAD	C4N-C3N-C7N-N7N
2	AAA	401	NAD	O4B-C4B-C5B-O5B
2	DDD	401	NAD	O4B-C4B-C5B-O5B
2	EEE	401	NAD	O4B-C4B-C5B-O5B
2	GGG	401	NAD	C3B-C4B-C5B-O5B

There are no ring outliers.
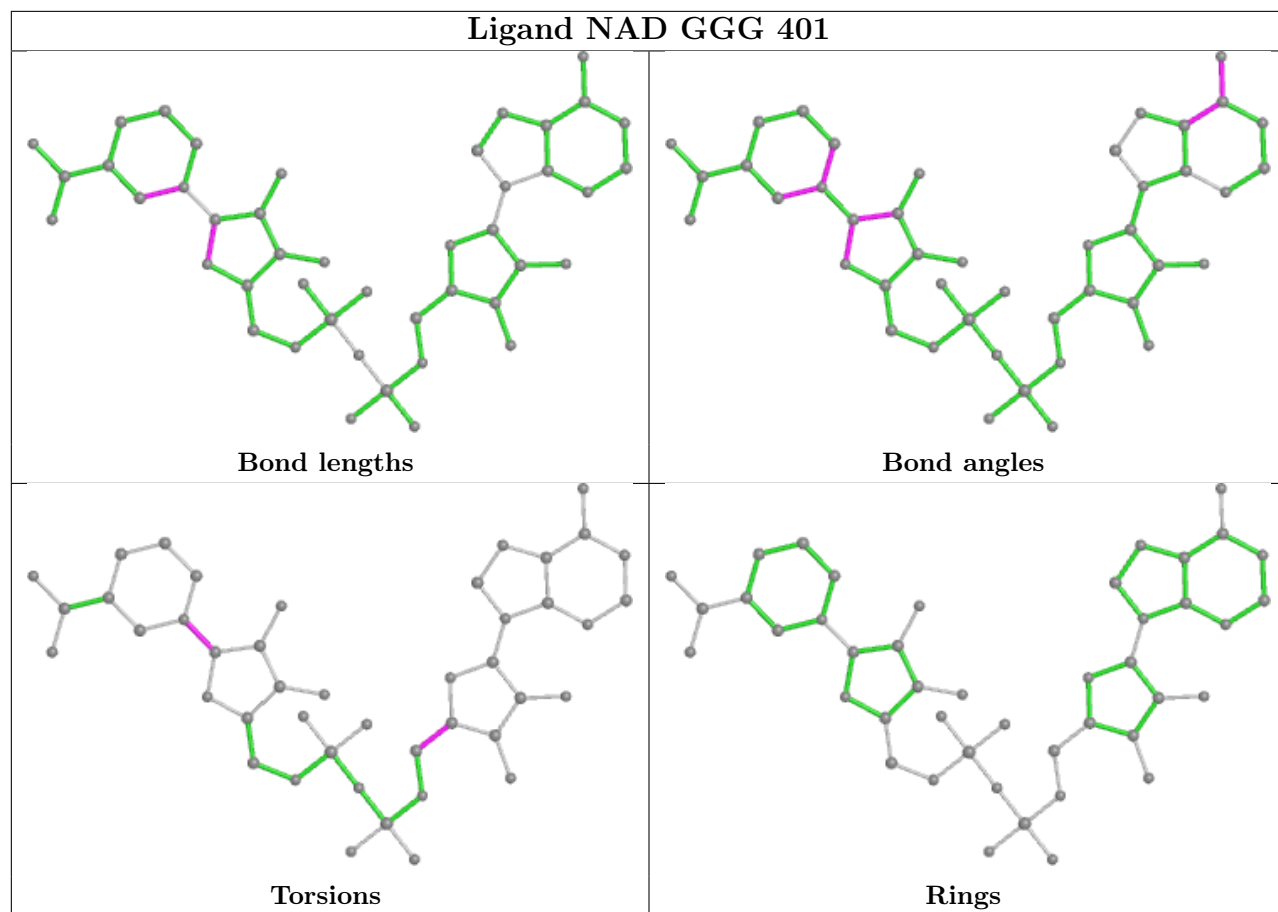
3 monomers are involved in 5 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	DDD	401	NAD	1	0
2	EEE	401	NAD	3	0
2	GGG	401	NAD	1	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less 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 DDD 401

Bond lengths

Bond angles

Torsions

Rings

Ligand NAD EEE 401

Bond lengths

Bond angles

Torsions

Rings

Ligand NAD AAA 401

Bond lengths

Bond angles

Torsions

Rings

Ligand NAD GGG 401

Bond lengths

Bond angles

Torsions

Rings

5.7 Other polymers (i)

There are no such residues in this entry.

5.8 Polymer linkage issues (i)

There are no chain breaks in this entry.

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

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

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2			OWAB(Å^2)	Q<0.9
1	AAA	333/335 (99%)	-0.24	5 (1%)	73	70	27, 36, 54, 74	0
1	DDD	332/335 (99%)	-0.33	3 (0%)	84	82	27, 36, 54, 72	0
1	EEE	332/335 (99%)	-0.14	5 (1%)	73	70	28, 40, 61, 84	0
1	GGG	332/335 (99%)	0.34	29 (8%)	10	8	28, 50, 87, 111	0
All	All	1329/1340 (99%)	-0.09	42 (3%)	47	42	27, 39, 72, 111	0

All (42) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	GGG	64	ASN	5.4
1	GGG	37	PHE	5.2
1	GGG	113	GLN	4.4
1	GGG	57	HIS	4.2
1	GGG	106	GLU	4.1
1	AAA	2	GLY	4.0
1	GGG	80	ARG	4.0
1	GGG	89	ASP	3.9
1	GGG	194	LYS	3.8
1	AAA	194	LYS	3.7
1	DDD	57	HIS	3.6
1	GGG	126	ALA	3.6
1	EEE	194	LYS	3.5
1	GGG	71	GLY	3.3
1	GGG	101	VAL	3.3
1	GGG	78	GLN	3.3
1	GGG	86	LYS	3.2
1	GGG	100	GLY	3.2
1	GGG	26	GLY	3.2
1	GGG	88	GLY	3.1
1	EEE	80	ARG	2.9

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Mol	Chain	Res	Type	RSRZ
1	GGG	65	GLY	2.8
1	AAA	57	HIS	2.7
1	EEE	57	HIS	2.7
1	GGG	90	ALA	2.6
1	AAA	64	ASN	2.6
1	EEE	37	PHE	2.6
1	GGG	112	LEU	2.6
1	GGG	81	ASP	2.5
1	GGG	84	LYS	2.5
1	EEE	64	ASN	2.4
1	GGG	79	GLU	2.4
1	AAA	228	LEU	2.4
1	DDD	64	ASN	2.4
1	DDD	194	LYS	2.4
1	GGG	109	GLY	2.3
1	GGG	145	LYS	2.3
1	GGG	73	PRO	2.3
1	GGG	333	SER	2.2
1	GGG	147	ILE	2.2
1	GGG	67	LEU	2.1
1	GGG	256	ASP	2.1

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

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

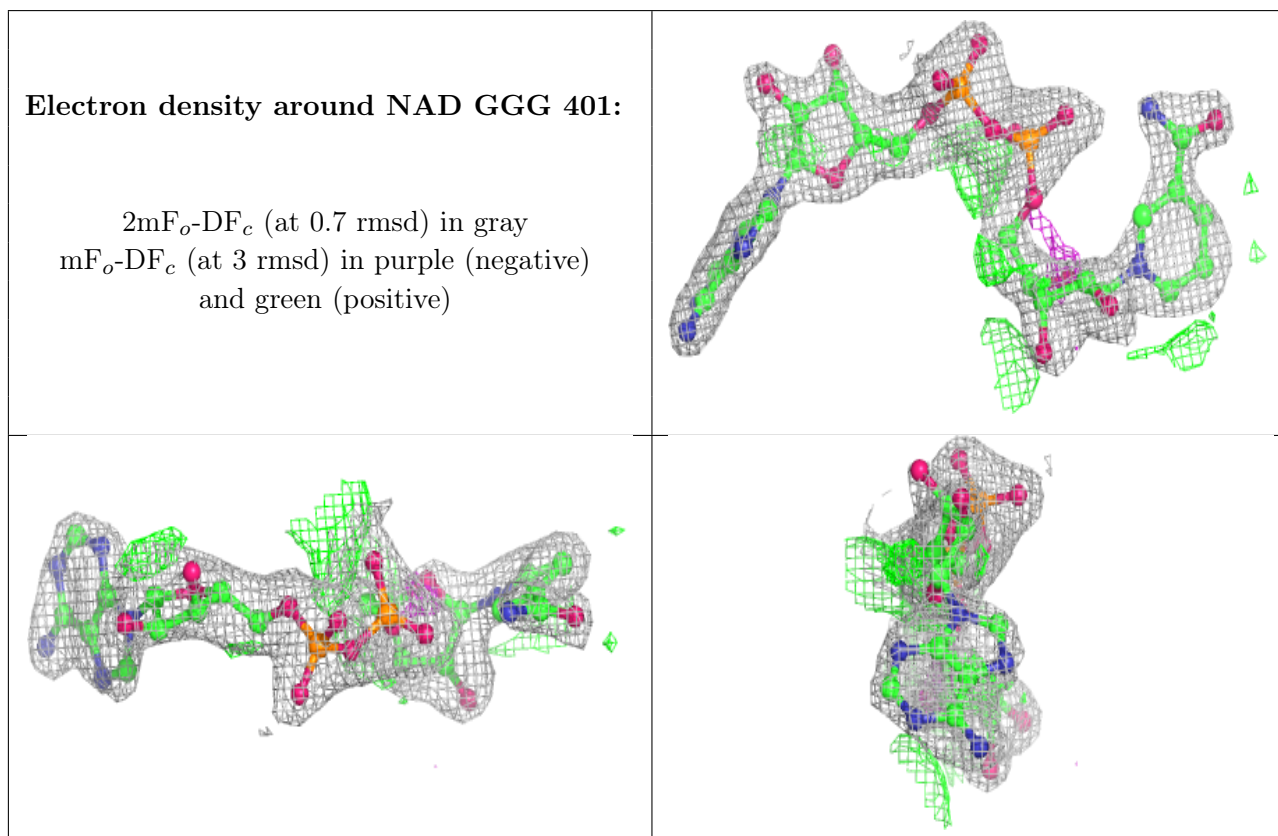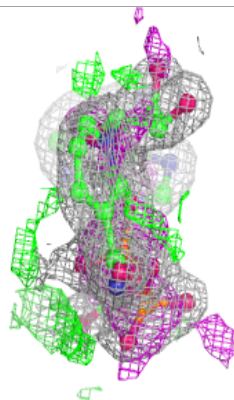| Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
1	CSD	GGG	152	8/9	0.95	0.09	36,40,52,55	0
1	CSD	EEE	152	8/9	0.97	0.07	33,34,43,48	0
1	CSD	DDD	152[B]	8/9	0.98	0.07	27,30,36,38	8
1	CSD	AAA	152	8/9	0.98	0.05	30,32,39,49	0
1	CSD	DDD	152[A]	8/9	0.98	0.07	27,31,37,43	8

6.3 Carbohydrates (i)

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.
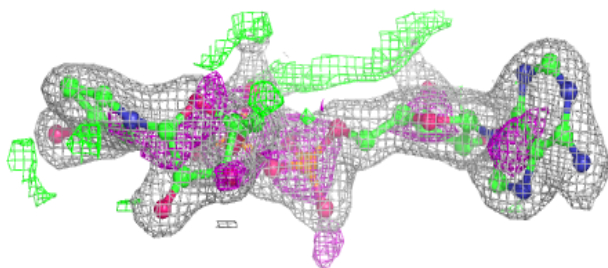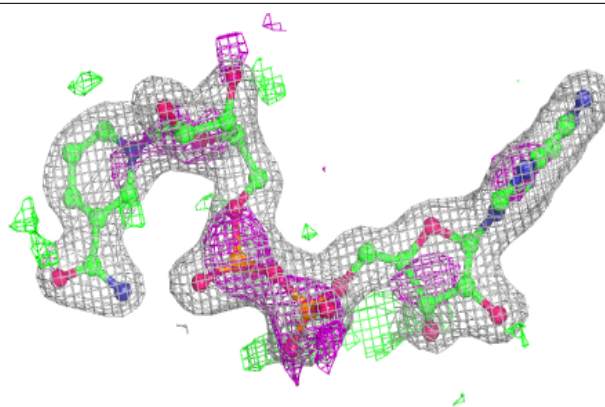
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
2	NAD	GGG	401	44/44	0.87	0.19	42,53,61,63	44
2	NAD	EEE	401	44/44	0.94	0.17	39,44,50,52	0
3	ZN	EEE	402	1/1	0.94	0.07	38,38,38,38	0
2	NAD	DDD	401	44/44	0.97	0.07	30,34,37,40	0
4	ACT	EEE	403	4/4	0.97	0.16	38,43,48,51	0
3	ZN	EEE	404	1/1	0.98	0.04	38,38,38,38	0
2	NAD	AAA	401	44/44	0.98	0.06	29,33,37,38	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.
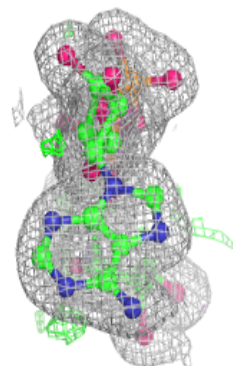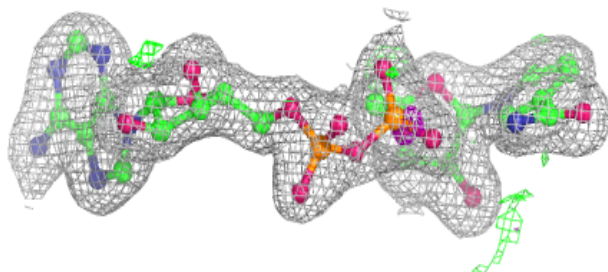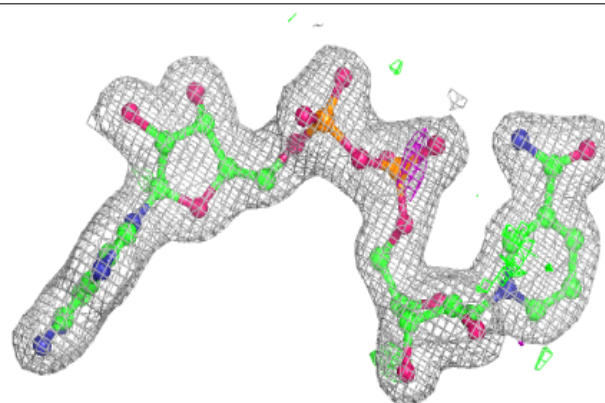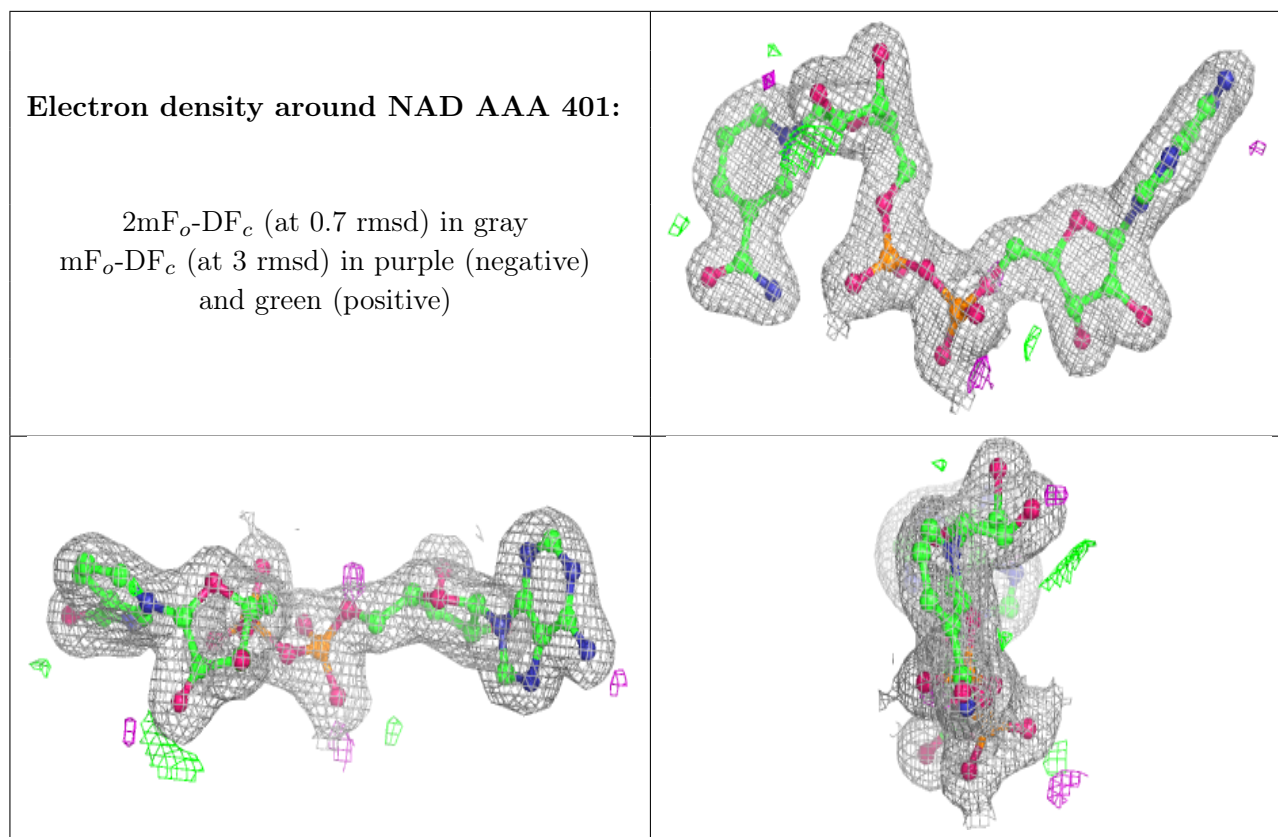

Electron density around NAD GGG 401:

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

Electron density around NAD EEE 401:

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

Electron density around NAD DDD 401:

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

Electron density around NAD AAA 401:

$2mF_o\text{-}DF_c$ (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.