



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 10, 2026 – 01:26 AM UTC

PDB ID : 6M5X / pdb_00006m5x
Title : A fungal glyceraldehyde-3-phosphate dehydrogenase with self-resistance to inhibitor heptelidic acid
Authors : Yan, Y.; Zang, X.; Cooper, S.J.; Lin, H.; Zhou, J.; Tang, Y.
Deposited on : 2020-03-12
Resolution : 2.06 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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

MolProbity : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 2.0
EDS : 3.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

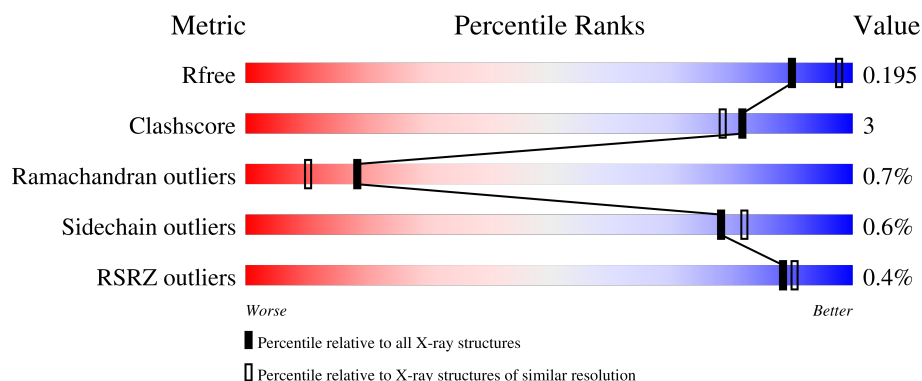
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.06 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	3774 (2.08-2.04)
Clashscore	190562	3883 (2.08-2.04)
Ramachandran outliers	187476	3860 (2.08-2.04)
Sidechain outliers	187428	3860 (2.08-2.04)
RSRZ outliers	180081	3775 (2.08-2.04)

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	O	334	93% 6%
1	P	334	91% 8%
1	Q	334	94% 6%
1	R	334	93% 7%

2 Entry composition [i](#)

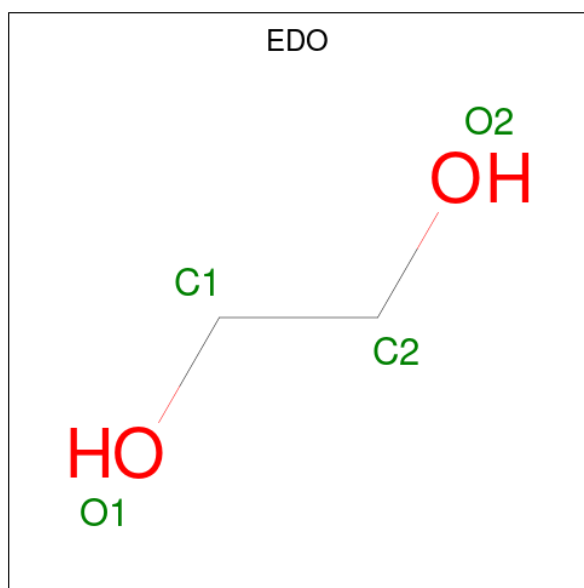
There are 7 unique types of molecules in this entry. The entry contains 11160 atoms, of which 0 are hydrogens and 0 are deuteriums.

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	O	334	Total	C	N	O	S	0	2	0
			2547	1618	431	489	9			
1	R	334	Total	C	N	O	S	0	1	0
			2545	1615	432	490	8			
1	P	333	Total	C	N	O	S	0	0	0
			2530	1607	427	488	8			
1	Q	334	Total	C	N	O	S	0	2	0
			2547	1618	431	489	9			

- Molecule 2 is 1,2-ETHANEDIOL (CCD ID: EDO) (formula: C₂H₆O₂).



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

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	O	1	Total 4	C 2	O 2	0	0
2	O	1	Total 4	C 2	O 2	0	0
2	O	1	Total 4	C 2	O 2	0	0
2	O	1	Total 4	C 2	O 2	0	0
2	O	1	Total 4	C 2	O 2	0	0
2	R	1	Total 4	C 2	O 2	0	0
2	R	1	Total 4	C 2	O 2	0	0
2	R	1	Total 4	C 2	O 2	0	0
2	R	1	Total 4	C 2	O 2	0	0
2	R	1	Total 4	C 2	O 2	0	0
2	R	1	Total 4	C 2	O 2	0	0
2	R	1	Total 4	C 2	O 2	0	0
2	R	1	Total 4	C 2	O 2	0	0
2	R	1	Total 4	C 2	O 2	0	0
2	P	1	Total 4	C 2	O 2	0	0
2	P	1	Total 4	C 2	O 2	0	0
2	P	1	Total 4	C 2	O 2	0	0
2	P	1	Total 4	C 2	O 2	0	0
2	P	1	Total 4	C 2	O 2	0	0
2	P	1	Total 4	C 2	O 2	0	0
2	Q	1	Total 4	C 2	O 2	0	0
2	Q	1	Total 4	C 2	O 2	0	0

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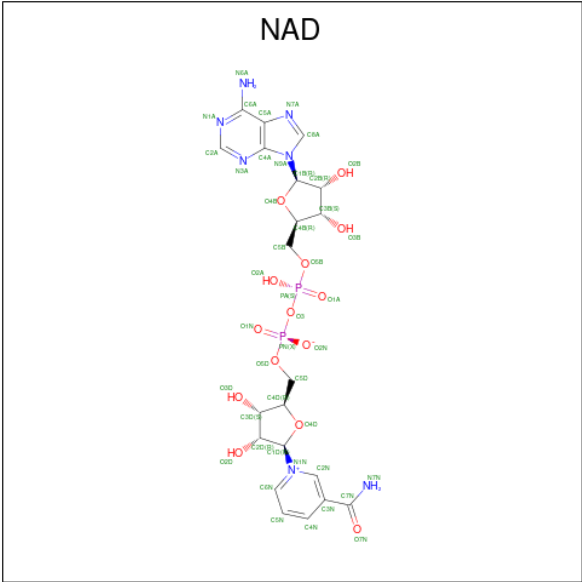
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	Q	1	Total	C	O	0	0
			4	2	2		
2	Q	1	Total	C	O	0	0
			4	2	2		

- Molecule 3 is GLYCEROL (CCD ID: GOL) (formula: $C_3H_8O_3$).



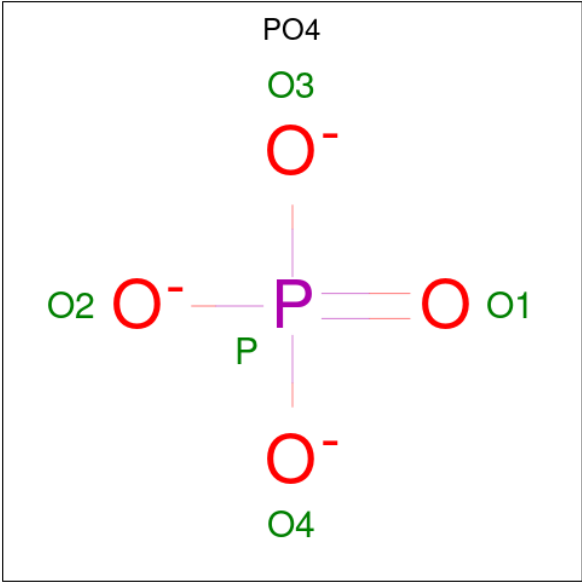
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	O	1	Total	C	O	0	0
			6	3	3		
3	R	1	Total	C	O	0	0
			6	3	3		
3	P	1	Total	C	O	0	0
			6	3	3		
3	Q	1	Total	C	O	0	0
			6	3	3		
3	Q	1	Total	C	O	0	0
			6	3	3		
3	Q	1	Total	C	O	0	0
			6	3	3		

- Molecule 4 is NICOTINAMIDE-ADENINE-DINUCLEOTIDE (CCD ID: NAD) (formula: $C_{21}H_{27}N_7O_{14}P_2$).



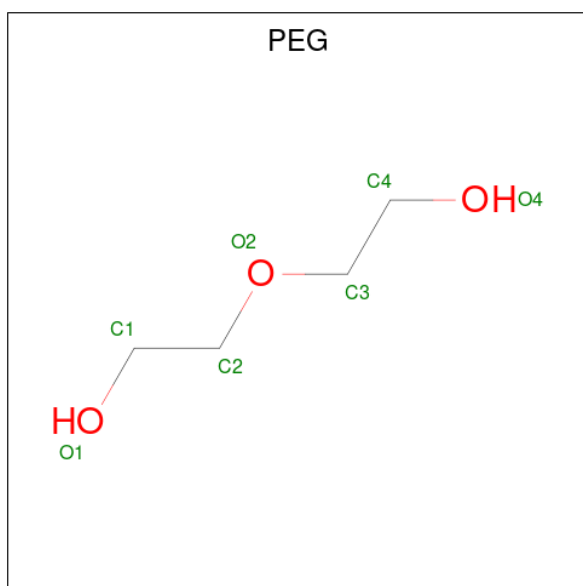
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	O	1	Total	C	N	O	P	0	0
			44	21	7	14	2		
4	R	1	Total	C	N	O	P	0	0
			44	21	7	14	2		
4	P	1	Total	C	N	O	P	0	0
			44	21	7	14	2		
4	Q	1	Total	C	N	O	P	0	0
			44	21	7	14	2		

- Molecule 5 is PHOSPHATE ION (CCD ID: PO4) (formula: O₄P).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	O	1	Total O P 5 4 1	0	0
5	R	1	Total O P 5 4 1	0	0
5	P	1	Total O P 5 4 1	0	0
5	P	1	Total O P 5 4 1	0	0
5	Q	1	Total O P 5 4 1	0	0

- Molecule 6 is DI(HYDROXYETHYL)ETHER (CCD ID: PEG) (formula: $C_4H_{10}O_3$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	R	1	Total C O 7 4 3	0	0

- Molecule 7 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	O	163	Total O 163 163	0	0
7	R	154	Total O 154 154	0	0
7	P	151	Total O 151 151	0	0
7	Q	179	Total O 179 179	0	0

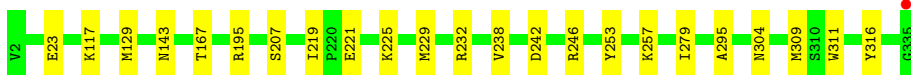
3 Residue-property plots [i](#)

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

- Molecule 1: Glyceraldehyde-3-phosphate dehydrogenase



- Molecule 1: Glyceraldehyde-3-phosphate dehydrogenase



- Molecule 1: Glyceraldehyde-3-phosphate dehydrogenase



- Molecule 1: Glyceraldehyde-3-phosphate dehydrogenase



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	76.67Å 96.56Å 96.70Å 90.00° 96.95° 90.00°	Depositor
Resolution (Å)	39.29 – 2.06 39.29 – 2.06	Depositor EDS
% Data completeness (in resolution range)	90.5 (39.29-2.06) 90.5 (39.29-2.06)	Depositor EDS
R_{merge}	0.13	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.29 (at 2.06Å)	Xtriage
Refinement program	PHENIX 1.11.1 _2575	Depositor
R, R_{free}	0.150 , 0.193 0.152 , 0.195	Depositor DCC
R_{free} test set	3859 reflections (4.46%)	wwPDB-VP
Wilson B-factor (Å ²)	25.1	Xtriage
Anisotropy	0.247	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.38 , 44.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	11160	wwPDB-VP
Average B, all atoms (Å ²)	26.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.35% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: EDO, NAD, PEG, GOL, PO4

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	O	0.29	0/2603	0.50	0/3528
1	P	0.28	0/2580	0.48	0/3499
1	Q	0.29	0/2603	0.48	0/3528
1	R	0.28	0/2595	0.48	0/3518
All	All	0.28	0/10381	0.49	0/14073

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 [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	O	2547	0	2559	14	0
1	P	2530	0	2534	15	0
1	Q	2547	0	2559	11	0
1	R	2545	0	2549	16	0
2	O	28	0	42	1	0
2	P	24	0	36	1	0
2	Q	16	0	24	2	0
2	R	32	0	48	3	0
3	O	6	0	8	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	P	6	0	8	0	0
3	Q	18	0	24	1	0
3	R	6	0	8	0	0
4	O	44	0	26	0	0
4	P	44	0	26	1	0
4	Q	44	0	26	0	0
4	R	44	0	26	1	0
5	O	5	0	0	0	0
5	P	10	0	0	0	0
5	Q	5	0	0	0	0
5	R	5	0	0	0	0
6	R	7	0	10	0	0
7	O	163	0	0	1	0
7	P	151	0	0	0	0
7	Q	179	0	0	1	0
7	R	154	0	0	0	0
All	All	11160	0	10513	53	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 3.

All (53) 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:P:209:THR:HG22	1:P:211:ALA:H	1.38	0.88
1:P:288:PRO:HG2	2:P:402:EDO:H21	1.74	0.70
1:O:278:ASP:HB3	1:P:195:ARG:HG2	1.76	0.68
1:Q:210:GLY:H	3:Q:407:GOL:H32	1.58	0.68
1:P:261:LYS:NZ	1:P:265:GLU:OE1	2.27	0.67
1:P:82:ALA:HB1	1:P:112:LYS:HD2	1.82	0.60
1:Q:273:ALA:HB1	2:Q:403:EDO:H12	1.85	0.58
1:Q:47:LYS:NZ	7:Q:504:HOH:O	2.38	0.54
1:Q:129:MET:HE1	1:Q:214:ALA:HB1	1.90	0.54
1:Q:41:TYR:O	1:Q:45:MET:HG3	2.06	0.54
1:O:207:SER:HB2	1:O:232[B]:ARG:CZ	2.41	0.51
1:Q:68:ILE:HD12	1:Q:73:ILE:HD12	1.94	0.50
1:O:47:LYS:HG3	7:O:571:HOH:O	2.12	0.49
1:O:40:HIS:HA	1:O:61:VAL:HG21	1.97	0.47
1:O:276:GLU:O	1:O:296:LYS:HE2	2.14	0.47
1:P:242:ASP:HB2	1:P:309:MET:HE3	1.97	0.46
1:O:139:TYR:CZ	1:O:329:VAL:HG13	2.50	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:O:177:HIS:HB3	1:O:232[A]:ARG:HD3	1.97	0.46
1:R:207:SER:HB2	1:R:232[B]:ARG:CZ	2.45	0.46
2:R:403:EDO:H12	4:R:411:NAD:O3	2.15	0.46
1:P:40:HIS:HA	1:P:61:VAL:HG21	1.98	0.45
1:R:195:ARG:HG2	1:Q:278:ASP:HB3	1.98	0.45
1:Q:136:GLU:CD	2:Q:401:EDO:H22	2.42	0.45
1:O:195:ARG:HH11	2:O:403:EDO:H22	1.81	0.44
1:R:129:MET:H	2:R:405:EDO:H21	1.81	0.44
1:R:253:TYR:O	1:R:257:LYS:HG3	2.17	0.44
1:R:207:SER:HB2	1:R:232[B]:ARG:NH1	2.33	0.43
1:O:229[B]:MET:HE2	1:O:229[B]:MET:HB2	1.84	0.43
1:R:242:ASP:HB2	1:R:309:MET:HE3	2.00	0.43
1:R:257:LYS:HD2	1:R:295:ALA:HB1	2.00	0.43
1:O:54:ARG:NH1	1:Q:283:ASP:O	2.49	0.43
1:O:82:ALA:HB1	1:O:112:LYS:HD2	2.01	0.43
1:P:242:ASP:CB	1:P:309:MET:HE3	2.50	0.42
1:O:195:ARG:HG2	1:P:278:ASP:HB3	2.00	0.42
1:O:207:SER:HB2	1:O:232[B]:ARG:NH2	2.35	0.41
1:R:23:GLU:OE2	1:R:316:TYR:OH	2.25	0.41
1:R:229:MET:HE2	1:R:229:MET:HB2	1.98	0.41
1:R:279:ILE:HD11	1:R:311:TRP:CD1	2.54	0.41
1:P:11:GLY:HA3	4:P:408:NAD:O5B	2.20	0.41
1:Q:43:GLU:HG3	1:Q:59:ILE:HG12	2.02	0.41
1:P:246:ARG:HA	1:P:304:ASN:O	2.20	0.41
1:O:63:GLY:C	1:O:65:ASP:H	2.28	0.41
1:P:201:ALA:HA	1:P:234:PRO:HB3	2.02	0.41
1:R:242:ASP:CB	1:R:309:MET:HE3	2.50	0.41
1:P:177:HIS:HA	1:P:239:SER:HB3	2.01	0.41
1:R:195:ARG:HE	2:R:402:EDO:H22	1.85	0.41
1:Q:116:LYS:HG2	1:Q:117:LYS:HG2	2.03	0.41
1:P:111:PHE:CZ	1:P:143:ASN:HB3	2.56	0.40
1:R:219:ILE:HG22	1:R:221:GLU:HG2	2.03	0.40
1:R:117:LYS:HD3	1:R:143:ASN:HA	2.04	0.40
1:R:221:GLU:O	1:R:225:LYS:NZ	2.49	0.40
1:P:47:LYS:HE3	1:P:48:TYR:CE2	2.57	0.40
1:R:246:ARG:HA	1:R:304:ASN:O	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	O	334/334 (100%)	319 (96%)	12 (4%)	3 (1%)	14	7
1	P	331/334 (99%)	317 (96%)	12 (4%)	2 (1%)	21	13
1	Q	334/334 (100%)	318 (95%)	14 (4%)	2 (1%)	21	13
1	R	333/334 (100%)	318 (96%)	13 (4%)	2 (1%)	21	13
All	All	1332/1336 (100%)	1272 (96%)	51 (4%)	9 (1%)	18	10

All (9) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	O	238	VAL
1	R	238	VAL
1	P	238	VAL
1	Q	238	VAL
1	O	63	GLY
1	R	167	THR
1	Q	167	THR
1	O	167	THR
1	P	167	THR

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	O	272/270 (101%)	270 (99%)	2 (1%)	76	79
1	P	270/270 (100%)	268 (99%)	2 (1%)	76	79

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	Q	272/270 (101%)	269 (99%)	3 (1%)	65	68
1	R	271/270 (100%)	271 (100%)	0	100	100
All	All	1085/1080 (100%)	1078 (99%)	7 (1%)	78	82

All (7) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	O	241	VAL
1	O	286	THR
1	P	241	VAL
1	P	312	TYR
1	Q	64	LYS
1	Q	251	VAL
1	Q	286	THR

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 oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

41 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	$\# Z > 2$
4	NAD	R	411	-	46,48,48	1.25	7 (15%)	64,73,73	1.52	9 (14%)
2	EDO	O	403	-	3,3,3	0.41	0	2,2,2	0.50	0
2	EDO	Q	401	-	3,3,3	0.47	0	2,2,2	0.32	0
2	EDO	R	404	-	3,3,3	0.53	0	2,2,2	0.17	0
2	EDO	P	404	-	3,3,3	0.49	0	2,2,2	0.25	0
2	EDO	R	403	-	3,3,3	0.42	0	2,2,2	0.42	0
2	EDO	O	404	-	3,3,3	0.42	0	2,2,2	0.57	0
4	NAD	O	409	-	46,48,48	1.25	5 (10%)	64,73,73	1.55	10 (15%)
5	PO4	P	409	-	4,4,4	0.74	0	6,6,6	0.56	0
2	EDO	R	401	-	3,3,3	0.49	0	2,2,2	0.29	0
2	EDO	R	405	-	3,3,3	0.43	0	2,2,2	0.61	0
2	EDO	Q	404	-	3,3,3	0.42	0	2,2,2	0.54	0
5	PO4	P	410	-	4,4,4	0.89	0	6,6,6	0.46	0
2	EDO	R	407	-	3,3,3	0.48	0	2,2,2	0.38	0
5	PO4	Q	409	-	4,4,4	0.80	0	6,6,6	0.55	0
3	GOL	Q	406	-	5,5,5	0.36	0	5,5,5	0.34	0
2	EDO	O	402	-	3,3,3	0.48	0	2,2,2	0.21	0
3	GOL	Q	407	-	5,5,5	0.33	0	5,5,5	0.52	0
2	EDO	P	401	-	3,3,3	0.47	0	2,2,2	0.38	0
4	NAD	P	408	-	46,48,48	1.21	4 (8%)	64,73,73	1.65	13 (20%)
2	EDO	P	405	-	3,3,3	0.42	0	2,2,2	0.51	0
2	EDO	R	406	-	3,3,3	0.44	0	2,2,2	0.49	0
2	EDO	P	406	-	3,3,3	0.57	0	2,2,2	0.27	0
2	EDO	R	408	-	3,3,3	0.52	0	2,2,2	0.22	0
5	PO4	O	410	-	4,4,4	0.79	0	6,6,6	0.43	0
2	EDO	P	402	-	3,3,3	0.44	0	2,2,2	0.48	0
5	PO4	R	412	-	4,4,4	0.80	0	6,6,6	0.56	0
2	EDO	O	401	-	3,3,3	0.48	0	2,2,2	0.20	0
2	EDO	O	405	-	3,3,3	0.41	0	2,2,2	0.48	0
2	EDO	O	406	-	3,3,3	0.46	0	2,2,2	0.60	0
2	EDO	O	407	-	3,3,3	0.43	0	2,2,2	0.60	0
2	EDO	R	402	-	3,3,3	0.52	0	2,2,2	0.30	0
3	GOL	P	407	-	5,5,5	0.25	0	5,5,5	0.60	0
3	GOL	O	408	-	5,5,5	0.27	0	5,5,5	0.68	0
3	GOL	R	409	-	5,5,5	0.20	0	5,5,5	0.58	0
2	EDO	P	403	-	3,3,3	0.44	0	2,2,2	0.48	0
2	EDO	Q	403	-	3,3,3	0.50	0	2,2,2	0.35	0
3	GOL	Q	405	-	5,5,5	0.31	0	5,5,5	0.96	0
2	EDO	Q	402	-	3,3,3	0.48	0	2,2,2	0.41	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
4	NAD	Q	408	-	46,48,48	1.33	5 (10%)	64,73,73	1.61	12 (18%)
6	PEG	R	410	-	6,6,6	0.50	0	5,5,5	0.38	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
4	NAD	R	411	-	-	8/30/62/62	0/5/5/5
2	EDO	O	403	-	-	1/1/1/1	-
2	EDO	Q	401	-	-	0/1/1/1	-
2	EDO	R	404	-	-	1/1/1/1	-
2	EDO	P	404	-	-	0/1/1/1	-
2	EDO	R	403	-	-	1/1/1/1	-
2	EDO	O	404	-	-	0/1/1/1	-
4	NAD	O	409	-	-	7/30/62/62	0/5/5/5
2	EDO	R	401	-	-	1/1/1/1	-
2	EDO	R	405	-	-	0/1/1/1	-
2	EDO	Q	404	-	-	1/1/1/1	-
2	EDO	R	407	-	-	1/1/1/1	-
3	GOL	Q	406	-	-	2/4/4/4	-
2	EDO	O	402	-	-	0/1/1/1	-
3	GOL	Q	407	-	-	2/4/4/4	-
2	EDO	P	401	-	-	0/1/1/1	-
4	NAD	P	408	-	-	5/30/62/62	0/5/5/5
2	EDO	P	405	-	-	1/1/1/1	-
2	EDO	R	406	-	-	1/1/1/1	-
2	EDO	P	406	-	-	0/1/1/1	-
2	EDO	R	408	-	-	1/1/1/1	-
2	EDO	P	402	-	-	0/1/1/1	-
2	EDO	O	401	-	-	1/1/1/1	-
2	EDO	O	405	-	-	1/1/1/1	-
2	EDO	O	406	-	-	0/1/1/1	-
2	EDO	O	407	-	-	1/1/1/1	-
2	EDO	R	402	-	-	0/1/1/1	-
3	GOL	P	407	-	-	0/4/4/4	-
3	GOL	O	408	-	-	2/4/4/4	-
3	GOL	R	409	-	-	0/4/4/4	-
2	EDO	P	403	-	-	0/1/1/1	-
2	EDO	Q	403	-	-	1/1/1/1	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	GOL	Q	405	-	-	2/4/4/4	-
2	EDO	Q	402	-	-	1/1/1/1	-
4	NAD	Q	408	-	-	6/30/62/62	0/5/5/5
6	PEG	R	410	-	-	0/4/4/4	-

All (21) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	Q	408	NAD	C5A-C4A	4.80	1.47	1.39
4	R	411	NAD	C5A-C4A	4.79	1.47	1.39
4	P	408	NAD	C5A-C4A	4.56	1.47	1.39
4	O	409	NAD	C5A-C4A	4.35	1.46	1.39
4	Q	408	NAD	PA-O3	3.54	1.63	1.59
4	O	409	NAD	PA-O3	3.54	1.63	1.59
4	P	408	NAD	O4D-C1D	2.84	1.44	1.40
4	P	408	NAD	C5A-C6A	2.83	1.48	1.41
4	R	411	NAD	C5A-C6A	2.80	1.48	1.41
4	Q	408	NAD	PN-O3	2.77	1.62	1.59
4	Q	408	NAD	C5A-C6A	2.77	1.48	1.41
4	O	409	NAD	C5A-C6A	2.77	1.48	1.41
4	P	408	NAD	C8A-N7A	2.72	1.36	1.31
4	Q	408	NAD	C8A-N7A	2.62	1.36	1.31
4	R	411	NAD	PA-O3	2.53	1.62	1.59
4	O	409	NAD	C8A-N7A	2.40	1.36	1.31
4	R	411	NAD	C8A-N7A	2.34	1.36	1.31
4	R	411	NAD	C4A-N9A	-2.19	1.33	1.37
4	R	411	NAD	O4D-C1D	2.16	1.43	1.40
4	O	409	NAD	O4D-C1D	2.06	1.43	1.40
4	R	411	NAD	C5A-N7A	-2.02	1.35	1.39

All (44) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	P	408	NAD	C5A-C4A-N3A	-5.46	119.19	126.72
4	Q	408	NAD	C5A-C4A-N3A	-5.11	119.67	126.72
4	R	411	NAD	C5A-C4A-N3A	-5.06	119.74	126.72
4	O	409	NAD	C5A-C4A-N3A	-5.01	119.83	126.72
4	P	408	NAD	N3A-C4A-N9A	4.33	134.53	127.17
4	O	409	NAD	N3A-C4A-N9A	4.21	134.32	127.17
4	R	411	NAD	N3A-C4A-N9A	4.11	134.16	127.17
4	Q	408	NAD	N3A-C4A-N9A	3.91	133.82	127.17
4	P	408	NAD	N3A-C2A-N1A	-3.89	122.70	128.58

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	P	408	NAD	C2A-N3A-C4A	3.79	121.08	111.83
4	Q	408	NAD	C4A-C5A-N7A	-3.74	106.30	110.58
4	O	409	NAD	N3A-C2A-N1A	-3.52	123.25	128.58
4	O	409	NAD	C4A-N9A-C8A	3.51	109.43	105.74
4	R	411	NAD	C4A-C5A-N7A	-3.48	106.61	110.58
4	O	409	NAD	C2A-N3A-C4A	3.44	120.23	111.83
4	R	411	NAD	C2A-N3A-C4A	3.39	120.11	111.83
4	Q	408	NAD	C2A-N3A-C4A	3.36	120.03	111.83
4	P	408	NAD	C4A-C5A-N7A	-3.27	106.84	110.58
4	R	411	NAD	C4A-N9A-C8A	3.25	109.15	105.74
4	P	408	NAD	C4A-N9A-C8A	3.23	109.13	105.74
4	Q	408	NAD	N3A-C2A-N1A	-3.16	123.79	128.58
4	O	409	NAD	C4A-C5A-N7A	-3.08	107.06	110.58
4	R	411	NAD	N3A-C2A-N1A	-3.07	123.93	128.58
4	Q	408	NAD	C4A-N9A-C8A	2.94	108.83	105.74
4	P	408	NAD	C3N-C7N-N7N	2.80	121.19	117.74
4	Q	408	NAD	C5A-N7A-C8A	2.69	107.68	103.45
4	P	408	NAD	N9A-C8A-N7A	-2.58	110.27	113.94
4	P	408	NAD	C5A-N7A-C8A	2.57	107.49	103.45
4	R	411	NAD	C5A-N7A-C8A	2.52	107.40	103.45
4	Q	408	NAD	C6A-C5A-N7A	2.45	136.81	132.09
4	O	409	NAD	N9A-C8A-N7A	-2.45	110.46	113.94
4	O	409	NAD	C5A-N7A-C8A	2.40	107.22	103.45
4	R	411	NAD	C6A-C5A-N7A	2.32	136.57	132.09
4	Q	408	NAD	O3D-C3D-C4D	-2.31	104.43	111.08
4	O	409	NAD	C6A-C5A-N7A	2.30	136.52	132.09
4	Q	408	NAD	N9A-C8A-N7A	-2.29	110.68	113.94
4	P	408	NAD	C6A-C5A-N7A	2.29	136.51	132.09
4	O	409	NAD	O4B-C1B-N9A	2.28	112.47	108.09
4	P	408	NAD	C2A-N1A-C6A	2.26	122.45	118.73
4	R	411	NAD	N9A-C8A-N7A	-2.25	110.74	113.94
4	P	408	NAD	O7N-C7N-C3N	-2.09	117.04	119.60
4	Q	408	NAD	O2A-PA-O1A	2.07	122.07	112.44
4	Q	408	NAD	C5N-C4N-C3N	-2.06	118.34	120.36
4	P	408	NAD	O4B-C1B-N9A	2.06	112.04	108.09

There are no chirality outliers.

All (48) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	O	408	GOL	O1-C1-C2-O2
3	O	408	GOL	O1-C1-C2-C3

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Mol	Chain	Res	Type	Atoms
3	Q	407	GOL	O1-C1-C2-C3
4	O	409	NAD	O4D-C1D-N1N-C2N
4	O	409	NAD	O4D-C1D-N1N-C6N
4	O	409	NAD	C2D-C1D-N1N-C2N
4	O	409	NAD	C2D-C1D-N1N-C6N
4	R	411	NAD	O4D-C1D-N1N-C2N
4	R	411	NAD	O4D-C1D-N1N-C6N
4	R	411	NAD	C2D-C1D-N1N-C2N
4	R	411	NAD	C2D-C1D-N1N-C6N
4	P	408	NAD	O4D-C1D-N1N-C2N
4	P	408	NAD	O4D-C1D-N1N-C6N
4	P	408	NAD	C2D-C1D-N1N-C2N
4	P	408	NAD	C2D-C1D-N1N-C6N
4	Q	408	NAD	O4D-C1D-N1N-C2N
4	Q	408	NAD	O4D-C1D-N1N-C6N
4	Q	408	NAD	C2D-C1D-N1N-C2N
4	Q	408	NAD	C2D-C1D-N1N-C6N
3	Q	405	GOL	O1-C1-C2-C3
3	Q	406	GOL	C1-C2-C3-O3
3	Q	405	GOL	O1-C1-C2-O2
2	Q	402	EDO	O1-C1-C2-O2
3	Q	407	GOL	O1-C1-C2-O2
4	R	411	NAD	O4B-C4B-C5B-O5B
3	Q	406	GOL	O2-C2-C3-O3
2	R	408	EDO	O1-C1-C2-O2
4	O	409	NAD	O4B-C4B-C5B-O5B
2	R	401	EDO	O1-C1-C2-O2
2	R	404	EDO	O1-C1-C2-O2
2	P	405	EDO	O1-C1-C2-O2
4	R	411	NAD	C2B-C1B-N9A-C8A
4	P	408	NAD	C2B-C1B-N9A-C8A
4	Q	408	NAD	O4B-C4B-C5B-O5B
4	O	409	NAD	C3B-C4B-C5B-O5B
4	R	411	NAD	C3B-C4B-C5B-O5B
2	O	407	EDO	O1-C1-C2-O2
2	R	403	EDO	O1-C1-C2-O2
2	R	407	EDO	O1-C1-C2-O2
2	Q	403	EDO	O1-C1-C2-O2
2	Q	404	EDO	O1-C1-C2-O2
2	O	401	EDO	O1-C1-C2-O2
2	O	403	EDO	O1-C1-C2-O2
2	R	406	EDO	O1-C1-C2-O2

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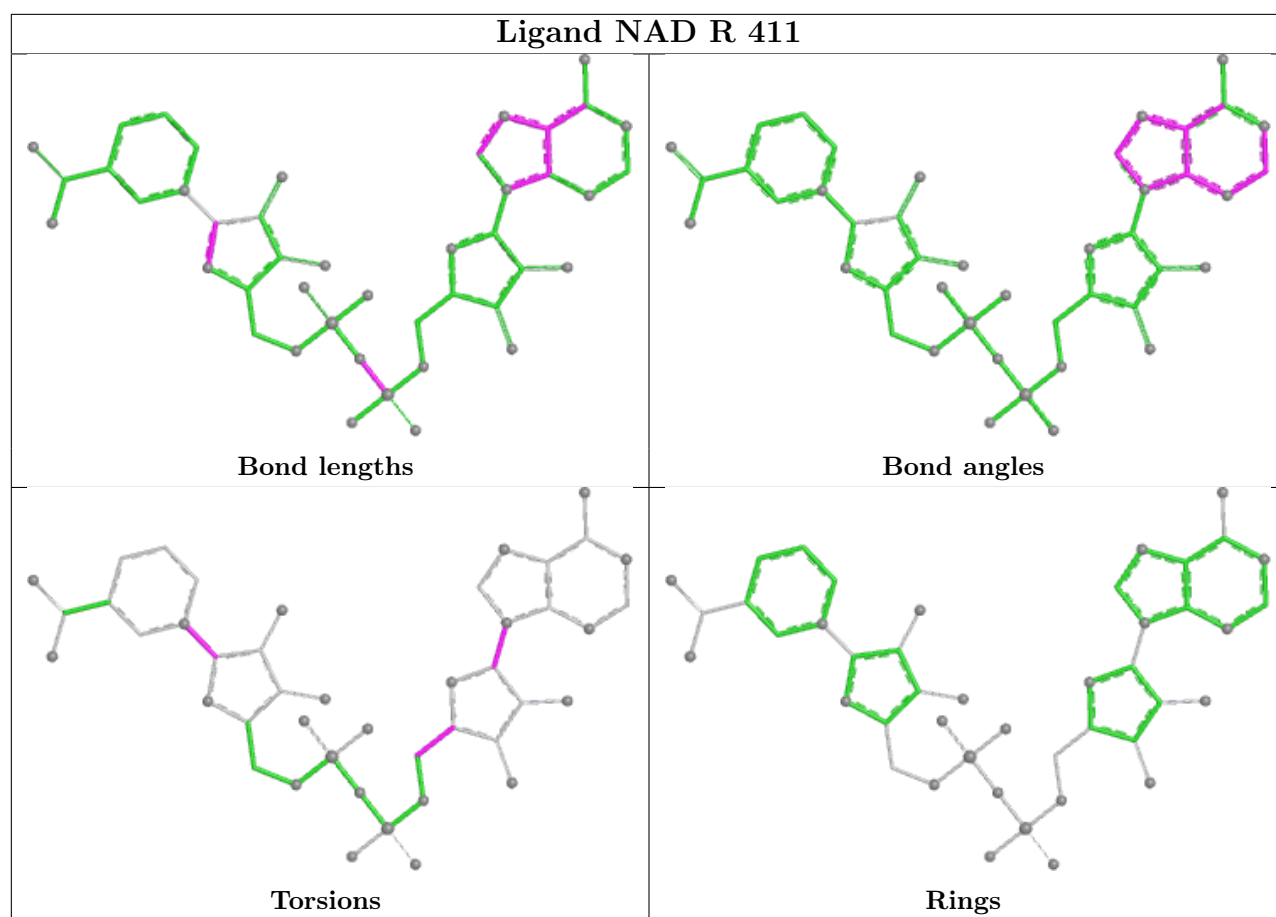
Mol	Chain	Res	Type	Atoms
4	O	409	NAD	C2B-C1B-N9A-C8A
4	Q	408	NAD	C2B-C1B-N9A-C8A
4	R	411	NAD	O4B-C1B-N9A-C8A
2	O	405	EDO	O1-C1-C2-O2

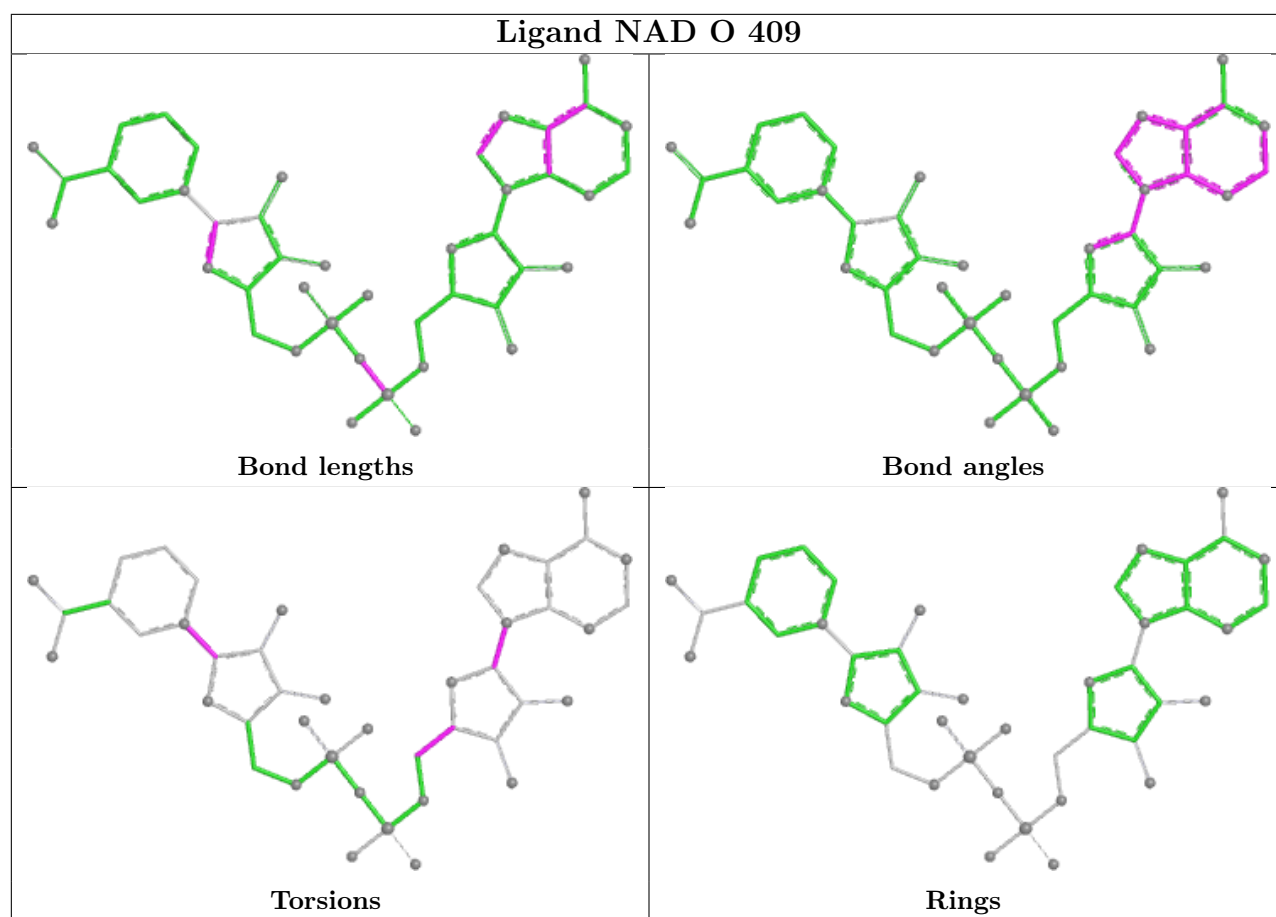
There are no ring outliers.

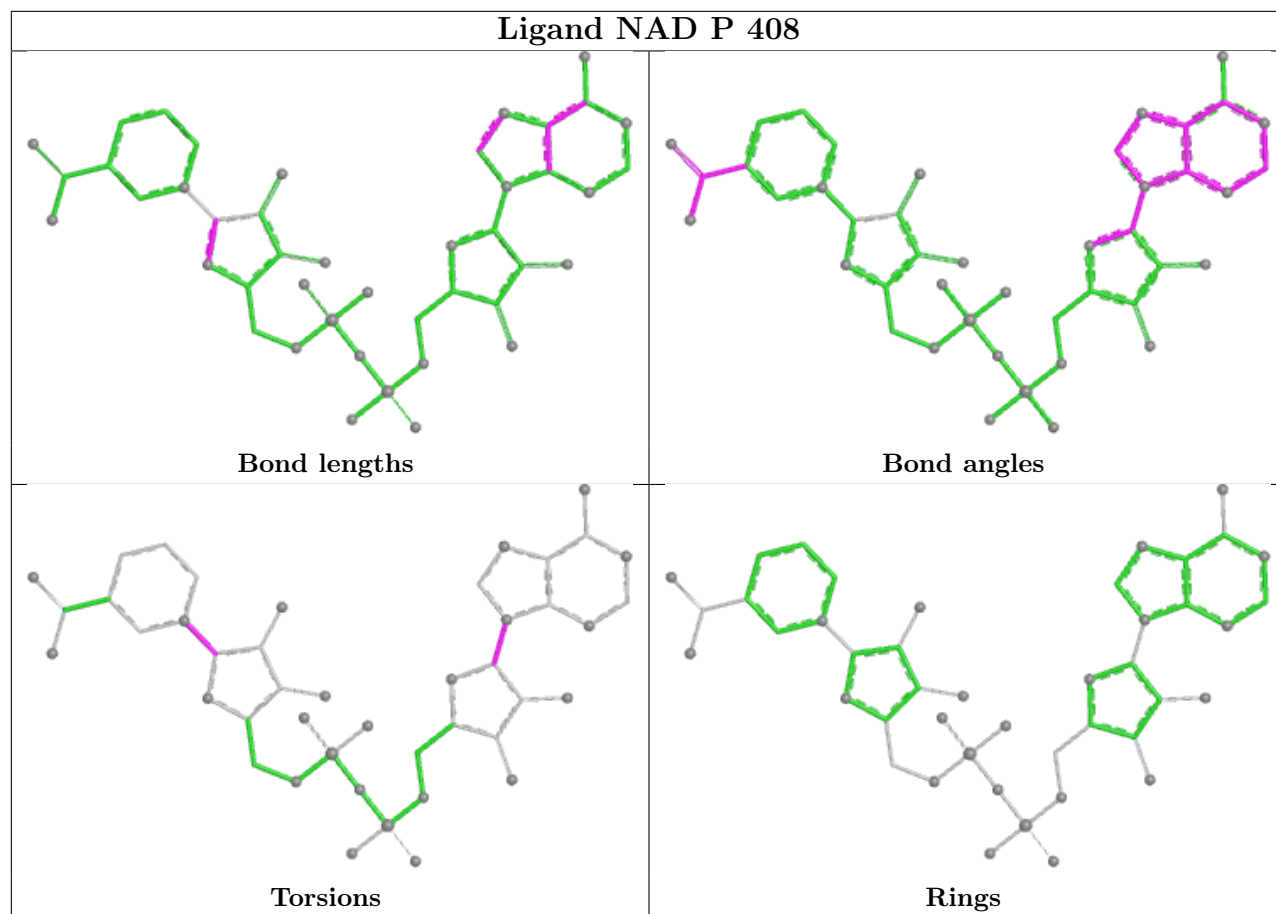
10 monomers are involved in 9 short contacts:

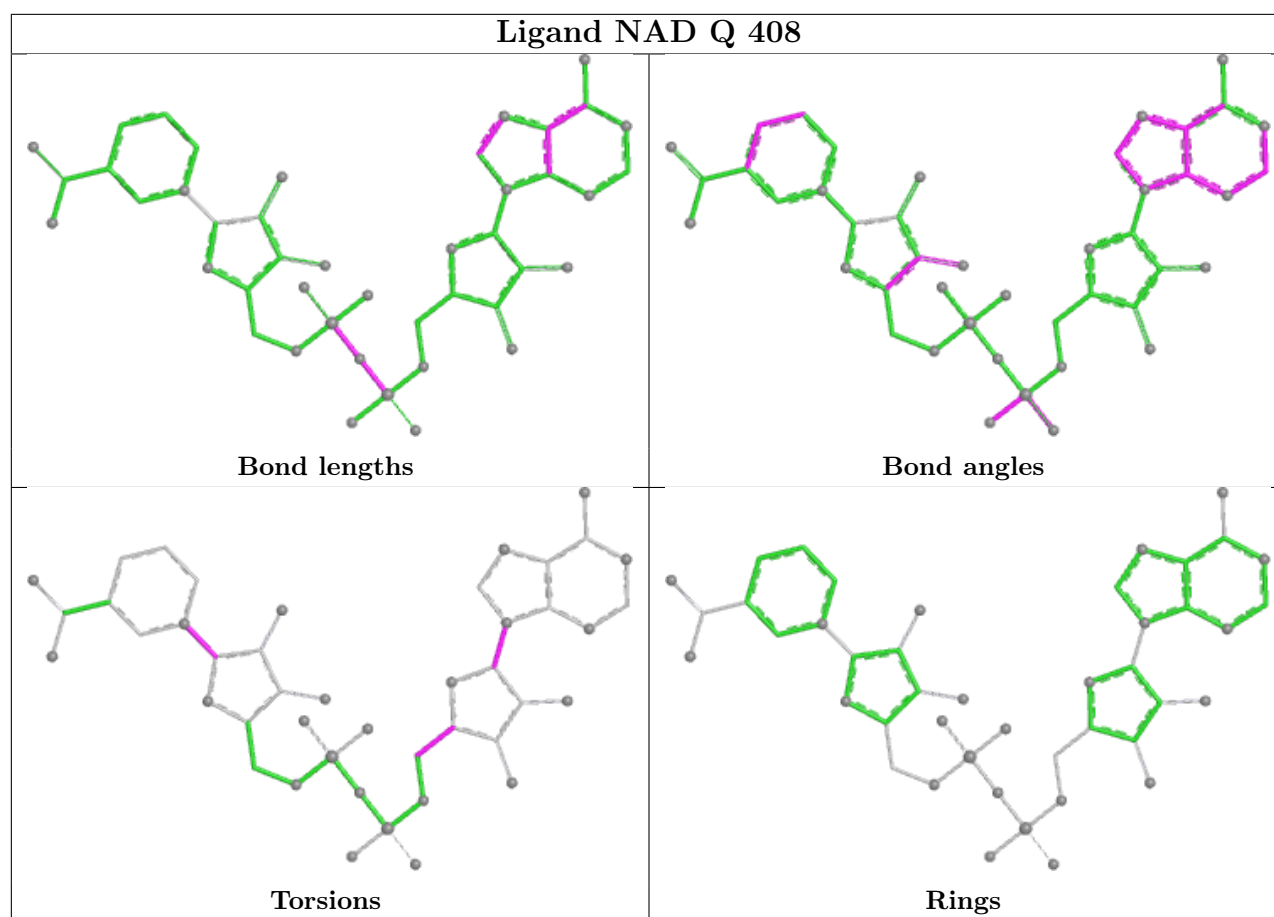
Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	R	411	NAD	1	0
2	O	403	EDO	1	0
2	Q	401	EDO	1	0
2	R	403	EDO	1	0
2	R	405	EDO	1	0
3	Q	407	GOL	1	0
4	P	408	NAD	1	0
2	P	402	EDO	1	0
2	R	402	EDO	1	0
2	Q	403	EDO	1	0

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









5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data [i](#)

6.1 Protein, DNA and RNA chains [i](#)

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

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	O	334/334 (100%)	-0.59	2 (0%) 85 88	10, 24, 40, 53	2 (0%)
1	P	333/334 (99%)	-0.53	1 (0%) 90 92	15, 25, 40, 57	0
1	Q	334/334 (100%)	-0.54	2 (0%) 85 88	11, 24, 40, 52	2 (0%)
1	R	334/334 (100%)	-0.54	1 (0%) 90 92	10, 26, 39, 48	1 (0%)
All	All	1335/1336 (99%)	-0.55	6 (0%) 88 90	10, 25, 40, 57	5 (0%)

All (6) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	R	335	GLY	2.7
1	O	2	VAL	2.7
1	Q	335	GLY	2.6
1	O	63	GLY	2.2
1	Q	191	SER	2.1
1	P	209	THR	2.0

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

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

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

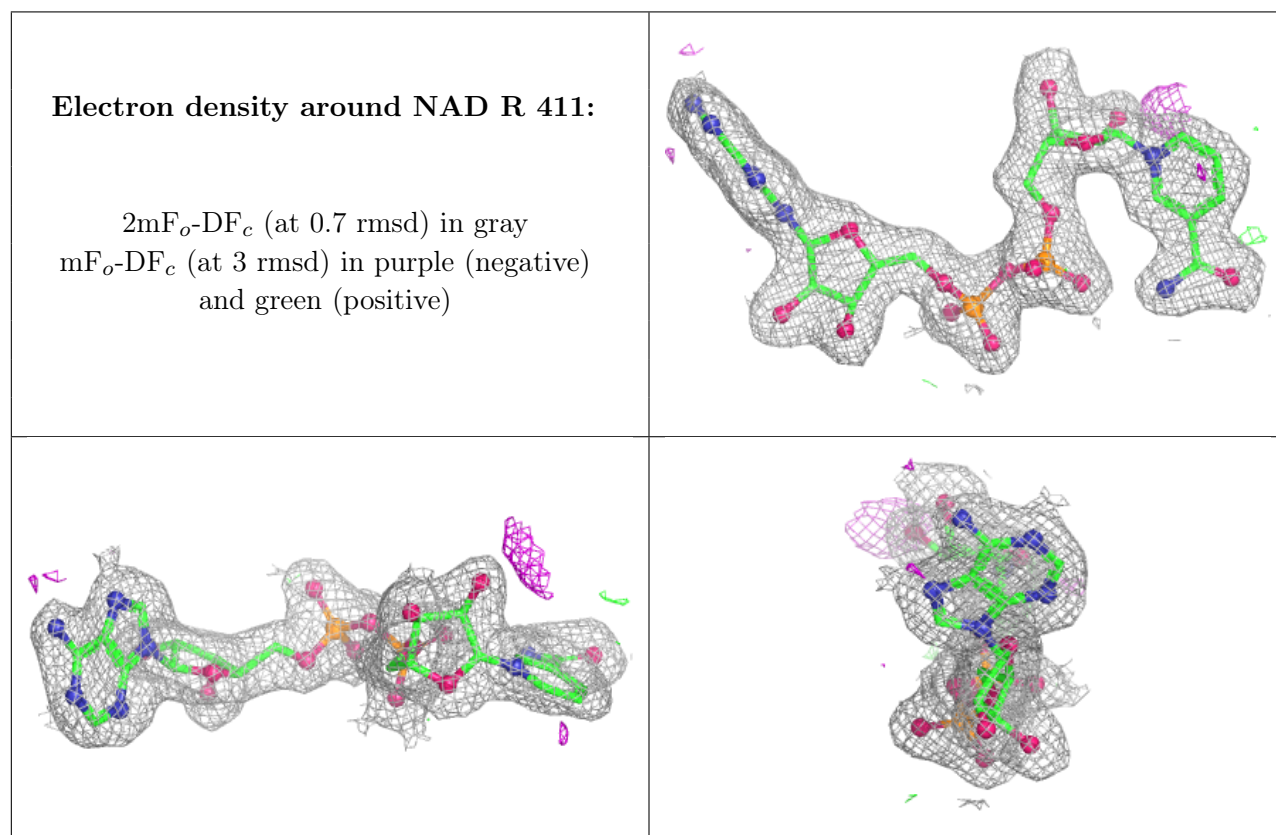
6.4 Ligands [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum,

median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

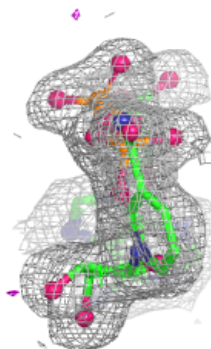
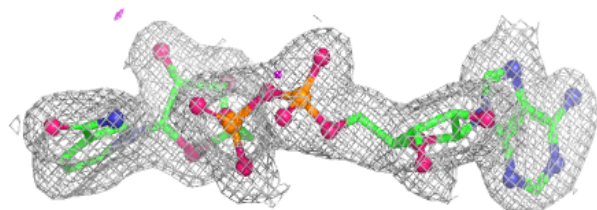
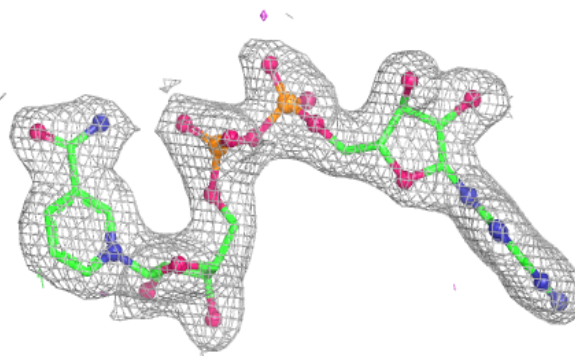
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
2	EDO	Q	402	4/4	0.73	0.14	38,45,49,53	0
2	EDO	O	404	4/4	0.75	0.16	39,39,43,50	0
5	PO4	P	409	5/5	0.75	0.11	57,60,67,80	0
5	PO4	Q	409	5/5	0.75	0.12	47,52,61,65	0
2	EDO	O	406	4/4	0.80	0.13	34,45,45,48	0
2	EDO	Q	404	4/4	0.81	0.15	34,41,46,46	0
3	GOL	Q	407	6/6	0.82	0.12	34,44,47,55	0
2	EDO	R	401	4/4	0.82	0.12	40,40,41,45	0
2	EDO	R	407	4/4	0.82	0.12	38,39,42,43	0
2	EDO	R	406	4/4	0.85	0.10	37,39,41,48	0
2	EDO	O	407	4/4	0.85	0.16	36,38,40,41	0
2	EDO	P	404	4/4	0.85	0.12	39,41,44,51	0
2	EDO	O	401	4/4	0.85	0.13	30,35,42,51	0
2	EDO	P	405	4/4	0.86	0.11	35,37,40,42	0
2	EDO	R	403	4/4	0.86	0.12	34,36,36,42	0
2	EDO	O	402	4/4	0.86	0.11	37,43,45,48	0
2	EDO	Q	403	4/4	0.87	0.15	28,41,49,51	0
2	EDO	O	405	4/4	0.87	0.12	33,34,39,49	0
2	EDO	P	402	4/4	0.87	0.12	29,31,34,44	0
5	PO4	O	410	5/5	0.87	0.20	50,51,53,64	0
2	EDO	P	406	4/4	0.87	0.12	29,36,37,46	0
2	EDO	P	403	4/4	0.87	0.15	33,37,40,44	0
6	PEG	R	410	7/7	0.87	0.13	32,39,48,52	0
3	GOL	O	408	6/6	0.88	0.10	29,35,43,46	0
2	EDO	R	402	4/4	0.89	0.10	38,38,39,39	0
2	EDO	O	403	4/4	0.89	0.10	30,33,36,41	0
2	EDO	P	401	4/4	0.90	0.15	38,40,45,50	0
2	EDO	R	404	4/4	0.90	0.12	39,39,42,43	0
2	EDO	R	405	4/4	0.90	0.11	31,33,34,48	0
3	GOL	P	407	6/6	0.91	0.10	29,33,35,46	0
5	PO4	R	412	5/5	0.92	0.17	41,43,49,55	0
3	GOL	Q	405	6/6	0.92	0.09	25,28,38,40	0
2	EDO	Q	401	4/4	0.92	0.09	35,35,37,51	0
2	EDO	R	408	4/4	0.92	0.08	31,36,38,42	0
3	GOL	R	409	6/6	0.93	0.10	35,36,43,45	0
5	PO4	P	410	5/5	0.94	0.09	42,44,46,48	0
3	GOL	Q	406	6/6	0.96	0.07	21,23,28,35	0
4	NAD	R	411	44/44	0.97	0.05	17,23,26,28	0
4	NAD	O	409	44/44	0.98	0.05	16,23,27,28	0
4	NAD	P	408	44/44	0.98	0.04	15,21,25,29	0
4	NAD	Q	408	44/44	0.98	0.04	17,23,27,29	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.

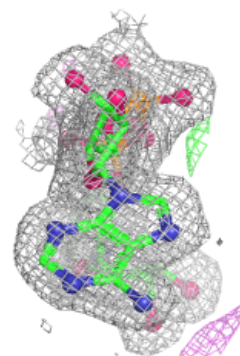
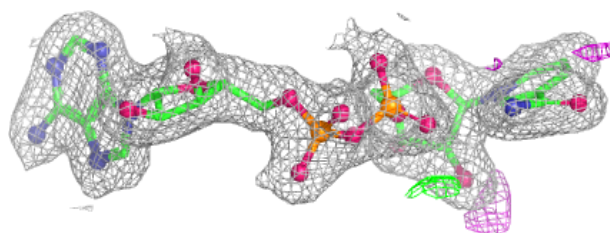
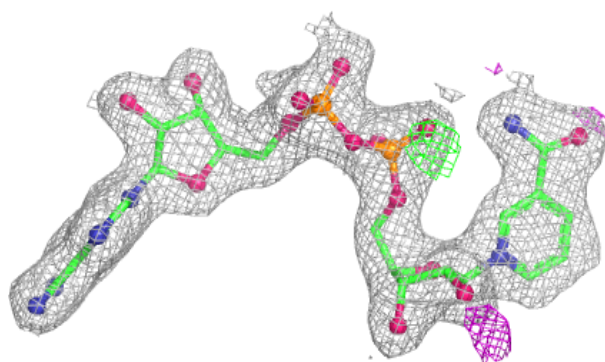


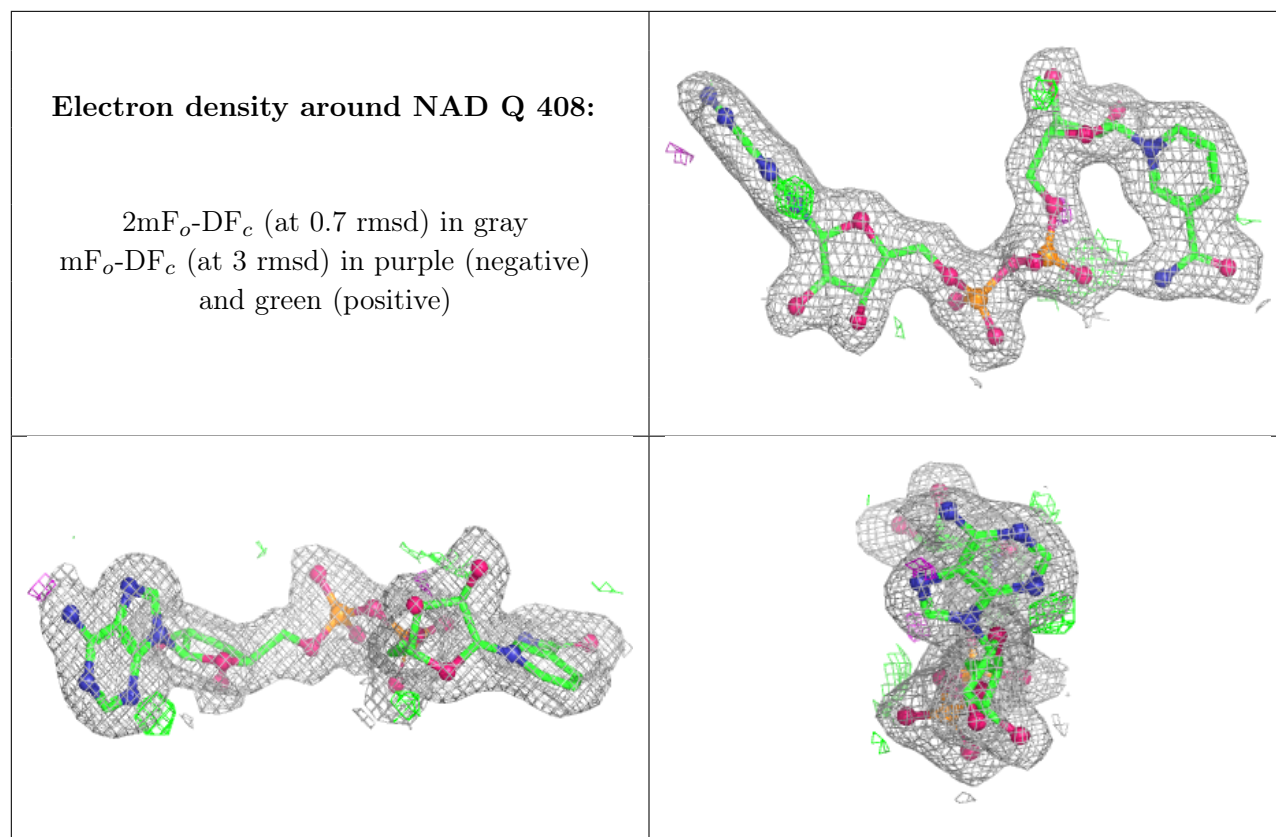
Electron density around NAD O 409:

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

**Electron density around NAD P 408:**

$2mF_o-DF_c$ (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.