W O R L D W I D E
wwPDB
PROTEIN DATA BANK

wwPDB X-ray Structure Validation Summary Report (i)

May 3, 2022 – 02:08 PM EDT

PDB ID	:	6NA6
Title	:	Serial Femtosecond X-ray Crystallography Structure of ECR in complex with NADPH
Authors	:	DeMirci, H.
Deposited on	:	2018-12-05
Resolution	:	2.10 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	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.28.1
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)	:	2.28.1

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 2.10 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.
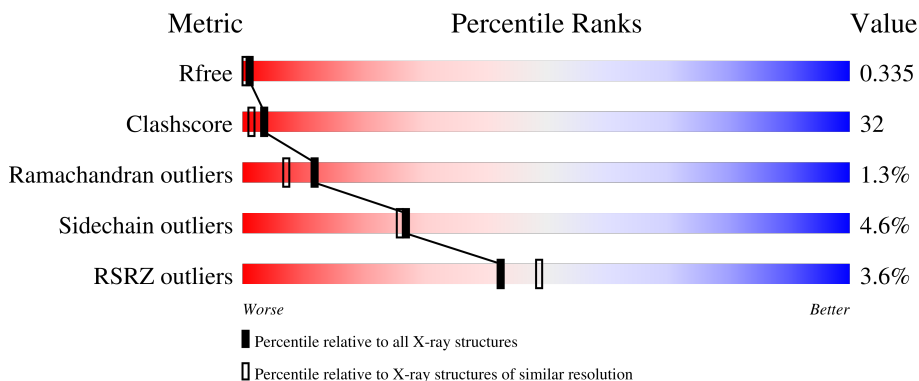
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	5197 (2.10-2.10)
Clashscore	141614	5710 (2.10-2.10)
Ramachandran outliers	138981	5647 (2.10-2.10)
Sidechain outliers	138945	5648 (2.10-2.10)
RSRZ outliers	127900	5083 (2.10-2.10)

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	445	3% 52% 45% •
1	B	445	2% 56% 40% •
1	C	445	2% 56% 40% •
1	D	445	7% 58% 38% •

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard

residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	NDP	A	501	X	-	-	-
2	NDP	B	501	X	-	-	-
2	NDP	C	501	X	-	-	-
2	NDP	D	501	X	-	-	-

2 Entry composition ⓘ

There are 3 unique types of molecules in this entry. The entry contains 14569 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.
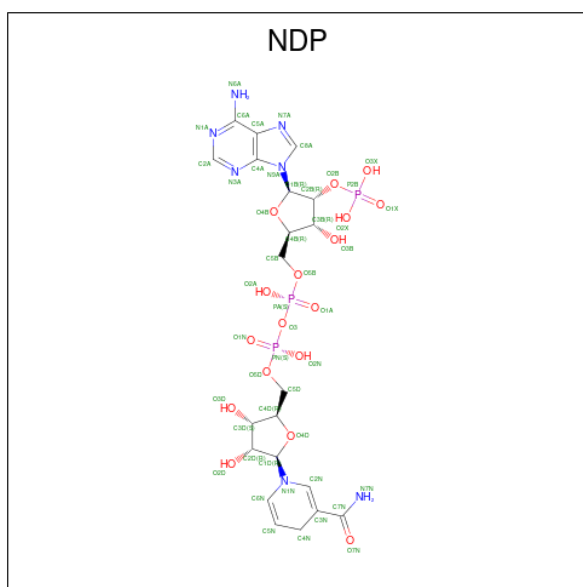
- Molecule 1 is a protein called Putative crotonyl-CoA reductase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	445	Total	C	N	O	S	0	1	0
			3443	2166	620	644	13			
1	B	445	Total	C	N	O	S	6	2	0
			3449	2169	621	646	13			
1	D	445	Total	C	N	O	S	6	2	0
			3449	2169	621	646	13			
1	C	445	Total	C	N	O	S	6	2	0
			3449	2169	621	646	13			

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-1	ARG	-	expression tag	UNP E4N096
A	0	HIS	-	expression tag	UNP E4N096
B	-1	ARG	-	expression tag	UNP E4N096
B	0	HIS	-	expression tag	UNP E4N096
D	-1	ARG	-	expression tag	UNP E4N096
D	0	HIS	-	expression tag	UNP E4N096
C	-1	ARG	-	expression tag	UNP E4N096
C	0	HIS	-	expression tag	UNP E4N096

- Molecule 2 is NADPH DIHYDRO-NICOTINAMIDE-ADENINE-DINUCLEOTIDE PHOSPHATE (three-letter code: NDP) (formula: $C_{21}H_{30}N_7O_{17}P_3$).

NDP

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	N	O	P	0	0
			48	21	7	17	3		
2	B	1	Total	C	N	O	P	0	0
			48	21	7	17	3		
2	D	1	Total	C	N	O	P	0	0
			48	21	7	17	3		
2	C	1	Total	C	N	O	P	0	0
			48	21	7	17	3		

- Molecule 3 is water.

| Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	119	Total	O	0	0
			119	119		
3	B	152	Total	O	0	0
			152	152		
3	D	145	Total	O	0	0
			145	145		
3	C	171	Total	O	0	0
			171	171		

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.
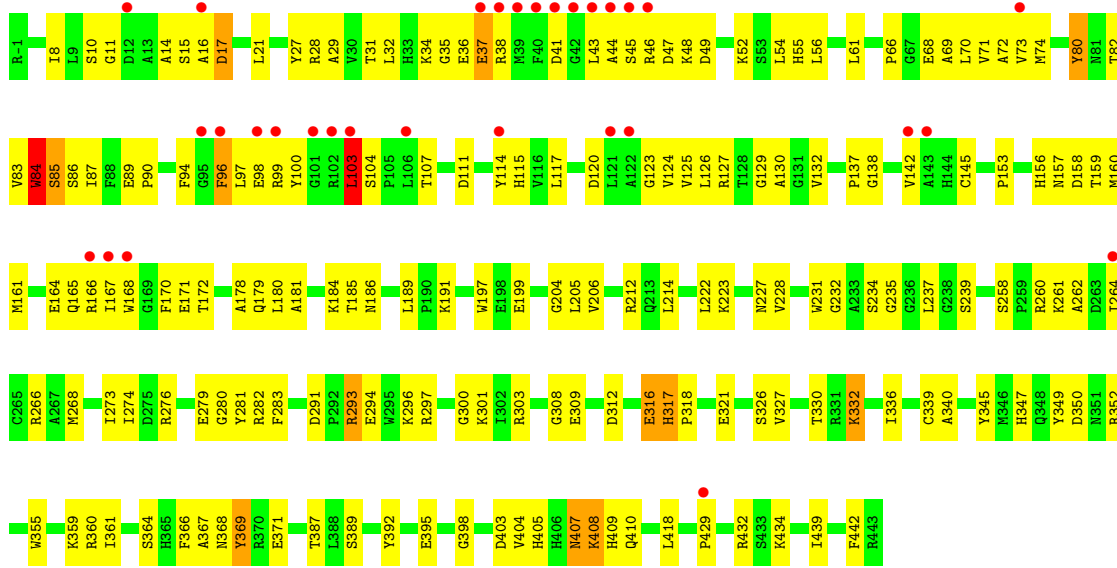
• Molecule 1: Putative crotonyl-CoA reductase
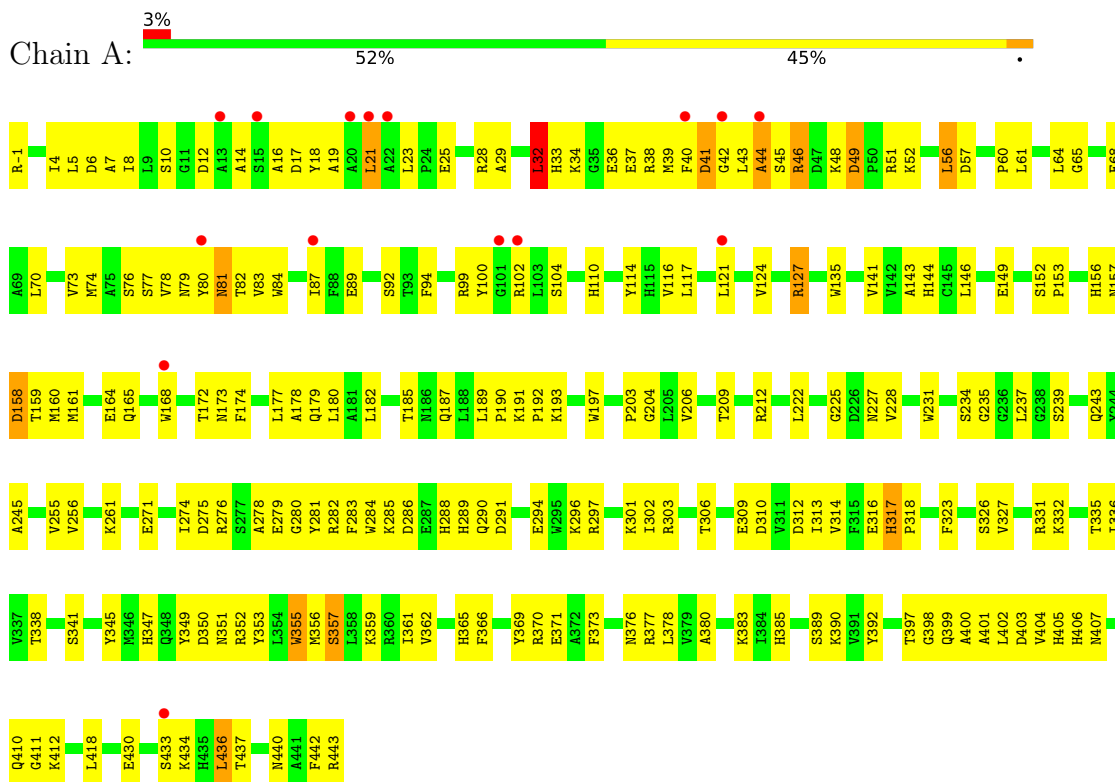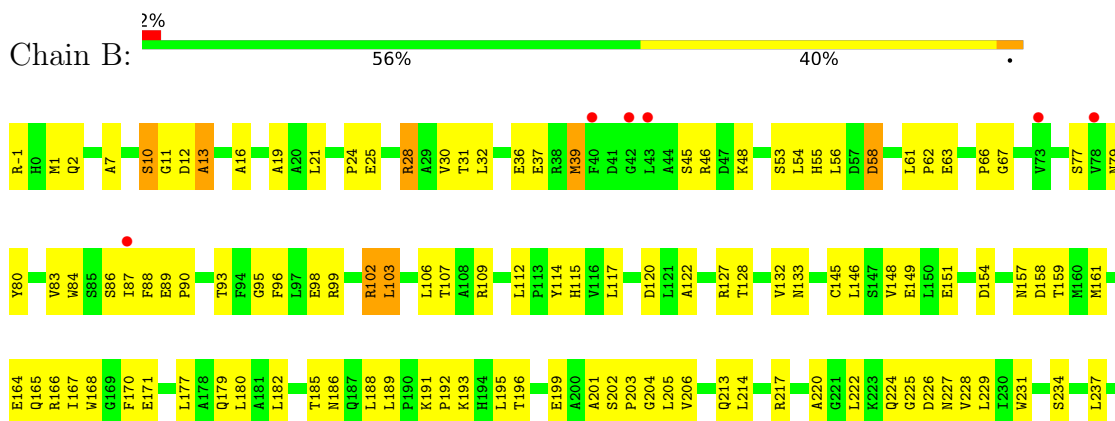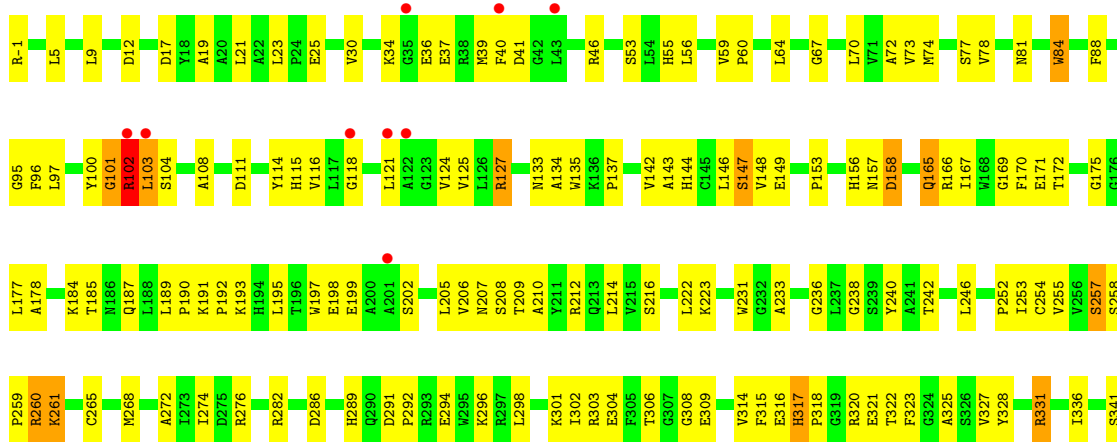

• Molecule 1: Putative crotonyl-CoA reductase

• Molecule 1: Putative crotonyl-CoA reductase

Chain D:

• Molecule 1: Putative crotonyl-CoA reductase

Chain C:

Y345 M346 H347 Q348 Y349 D350 N351 R352 Y353 L354 W355 M356 S357 L358 K359 R360 H365 F366 A367 N368 Y369 R370 E371 N376 R377 K381 G382 K390 V391 Y392 A393 L394 E395 E396 A400 D403 V404 H405 H406 N407 K408 H409 Q410 Q411 K412 V413 L424 G425 V426 S433

N440 R443

4   Data and refinement statistics ⓘ

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	109.76Å 78.05Å 138.00Å 90.00° 107.76° 90.00°	Depositor
Resolution (Å)	31.82 – 2.10 31.82 – 1.63	Depositor EDS
% Data completeness (in resolution range)	98.6 (31.82-2.10) 44.5 (31.82-1.63)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	0.19 (at 1.62Å)	Xtriage
Refinement program	PHENIX	Depositor
R, R_{free}	0.274 , 0.333 0.274 , 0.335	Depositor DCC
R_{free} test set	1851 reflections (1.21%)	wwPDB-VP
Wilson B-factor (Å^2)	13.5	Xtriage
Anisotropy	0.075	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.29 , 69.3	EDS
L-test for twinning[2]	$< |L| > = 0.43, < L^2 > = 0.26$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.86	EDS
Total number of atoms	14569	wwPDB-VP
Average B, all atoms (Å^2)	36.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 45.68 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 1.2758e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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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: NDP

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	0.66	2/3525 (0.1%)	0.72	2/4779 (0.0%)
1	B	0.49	2/3531 (0.1%)	0.65	2/4787 (0.0%)
1	C	0.49	1/3531 (0.0%)	0.65	0/4787
1	D	0.45	0/3531	0.63	1/4787 (0.0%)
All	All	0.53	5/14118 (0.0%)	0.66	5/19140 (0.0%)

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

Mol	Chain	#Chirality outliers	#Planarity outliers
1	B	0	1
1	D	0	1
All	All	0	2

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	339	CYS	CB-SG	-9.30	1.66	1.82
1	B	311	VAL	CB-CG2	-6.03	1.40	1.52
1	A	100	TYR	CE1-CZ	-5.58	1.31	1.38
1	A	430	GLU	CD-OE1	-5.52	1.19	1.25
1	C	84	TRP	CB-CG	-5.17	1.41	1.50

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	39	MET	CG-SD-CE	7.18	111.69	100.20
1	A	32	LEU	CA-CB-CG	6.26	129.70	115.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	237	LEU	CA-CB-CG	5.96	129.02	115.30
1	D	103	LEU	C-N-CA	-5.60	107.70	121.70
1	B	377	ARG	NE-CZ-NH2	-5.21	117.70	120.30

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	B	338	THR	Peptide
1	D	84	TRP	Peptide

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	3443	0	3375	256	0
1	B	3449	0	3379	203	0
1	C	3449	0	3379	235	0
1	D	3449	0	3379	222	0
2	A	48	0	25	11	0
2	B	48	0	25	3	0
2	C	48	0	24	5	0
2	D	48	0	25	16	0
3	A	119	0	0	88	0
3	B	152	0	0	71	0
3	C	171	0	0	93	0
3	D	145	0	0	86	0
All	All	14569	0	13611	876	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 32.

The worst 5 of 876 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:142:VAL:HG22	3:C:606:HOH:O	1.29	1.30

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:115:HIS:HE1	3:B:608:HOH:O	1.11	1.27
1:D:71:VAL:HG12	3:D:605:HOH:O	1.25	1.26
1:A:190:PRO:HA	3:A:605:HOH:O	1.26	1.24
1:B:415:VAL:HG13	3:B:607:HOH:O	1.36	1.23

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	444/445 (100%)	408 (92%)	32 (7%)	4 (1%)	17	12
1	B	445/445 (100%)	418 (94%)	21 (5%)	6 (1%)	12	7
1	C	445/445 (100%)	424 (95%)	15 (3%)	6 (1%)	12	7
1	D	445/445 (100%)	401 (90%)	37 (8%)	7 (2%)	9	5
All	All	1779/1780 (100%)	1651 (93%)	105 (6%)	23 (1%)	12	7

5 of 23 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	44	ALA
1	A	317	HIS
1	B	12	ASP
1	B	317	HIS
1	D	103	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	358/357 (100%)	339 (95%)	19 (5%)	22	20
1	B	359/357 (101%)	345 (96%)	14 (4%)	32	33
1	C	359/357 (101%)	343 (96%)	16 (4%)	27	27
1	D	359/357 (101%)	342 (95%)	17 (5%)	26	25
All	All	1435/1428 (100%)	1369 (95%)	66 (5%)	27	26

5 of 66 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	257	SER
1	C	261	LYS
1	C	443	ARG
1	B	77	SER
1	B	58	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 10 such sidechains are listed below:

Mol	Chain	Res	Type
1	D	409	HIS
1	C	194	HIS
1	C	385	HIS
1	B	289	HIS
1	B	317	HIS

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 ⓘ

4 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	NDP	D	501	-	45,52,52	4.02	17 (37%)	53,80,80	1.86	11 (20%)
2	NDP	B	501	-	45,52,52	3.93	20 (44%)	53,80,80	1.30	7 (13%)
2	NDP	C	501	-	45,52,52	3.99	18 (40%)	53,80,80	1.70	12 (22%)
2	NDP	A	501	-	45,52,52	4.02	20 (44%)	53,80,80	1.37	9 (16%)

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	NDP	D	501	-	3/3/14/17	13/30/77/77	0/5/5/5
2	NDP	B	501	-	3/3/14/17	10/30/77/77	0/5/5/5
2	NDP	C	501	-	3/3/14/17	15/30/77/77	0/5/5/5
2	NDP	A	501	-	3/3/14/17	9/30/77/77	0/5/5/5

The worst 5 of 75 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	501	NDP	O4B-C1B	16.17	1.63	1.41
2	D	501	NDP	O4B-C1B	15.42	1.62	1.41
2	C	501	NDP	O4B-C1B	15.37	1.62	1.41
2	B	501	NDP	O4B-C1B	14.62	1.61	1.41
2	B	501	NDP	O4B-C4B	-8.86	1.25	1.45

The worst 5 of 39 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	501	NDP	O5D-C5D-C4D	-5.21	91.07	108.99

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	A	501	NDP	N3A-C2A-N1A	-4.63	121.43	128.68
2	C	501	NDP	N3A-C2A-N1A	-4.52	121.62	128.68
2	D	501	NDP	PN-O3-PA	-4.37	117.85	132.83
2	B	501	NDP	N3A-C2A-N1A	-4.15	122.19	128.68

5 of 12 chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
2	A	501	NDP	C4D
2	A	501	NDP	C2D
2	A	501	NDP	C3D
2	B	501	NDP	C4D
2	B	501	NDP	C2D

5 of 47 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	501	NDP	C4D-C5D-O5D-PN
2	B	501	NDP	C5B-O5B-PA-O1A
2	B	501	NDP	C5B-O5B-PA-O2A
2	B	501	NDP	C5B-O5B-PA-O3
2	B	501	NDP	O4B-C4B-C5B-O5B

There are no ring outliers.

4 monomers are involved in 35 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	D	501	NDP	16	0
2	B	501	NDP	3	0
2	C	501	NDP	5	0
2	A	501	NDP	11	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.
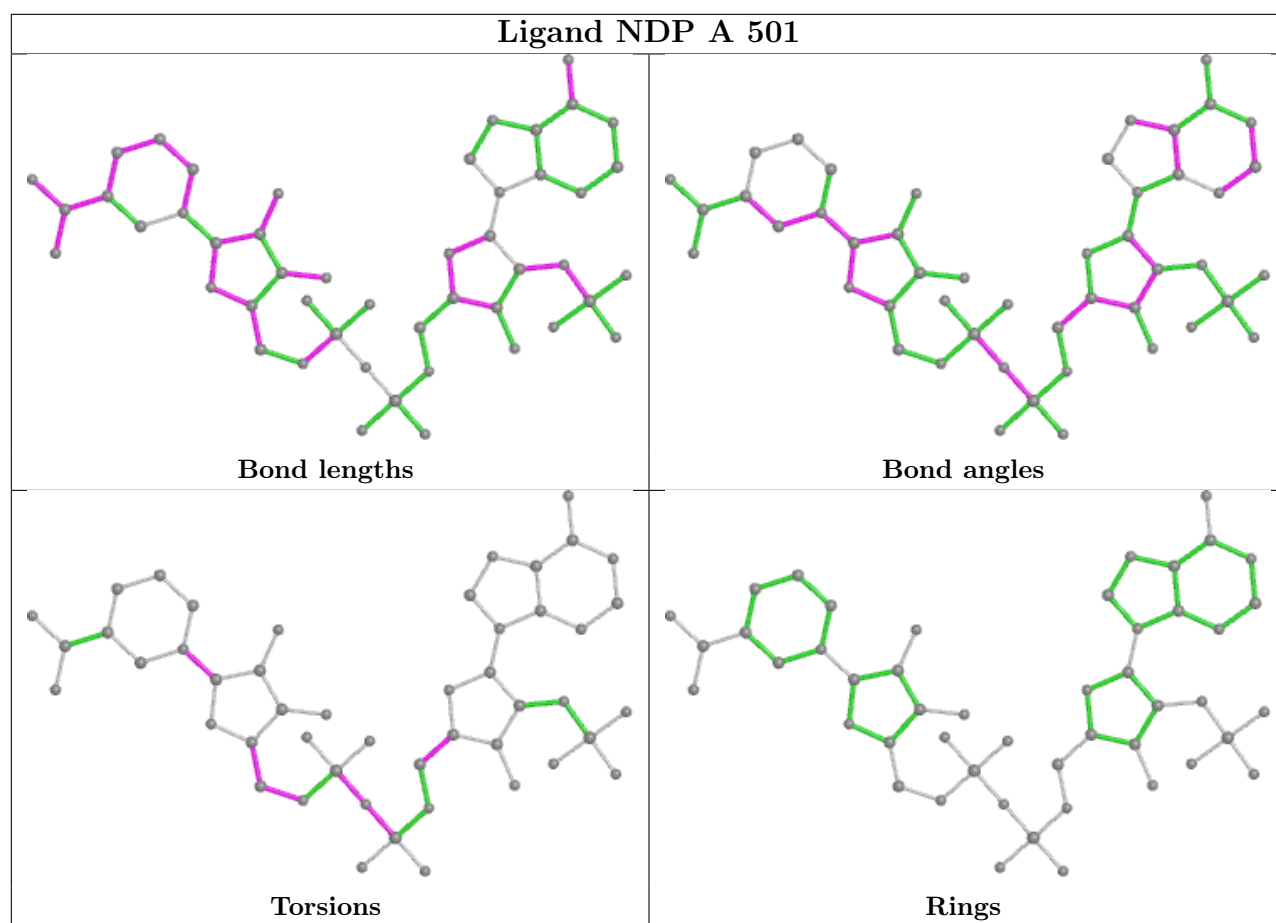
The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

Ligand NDP D 501

Bond lengths

Bond angles

Torsions

Rings

Ligand NDP B 501

Bond lengths

Bond angles

Torsions

Rings

Ligand NDP C 501

Bond lengths

Bond angles

Torsions

Rings

Ligand NDP A 501

Bond lengths

Bond angles

Torsions

Rings
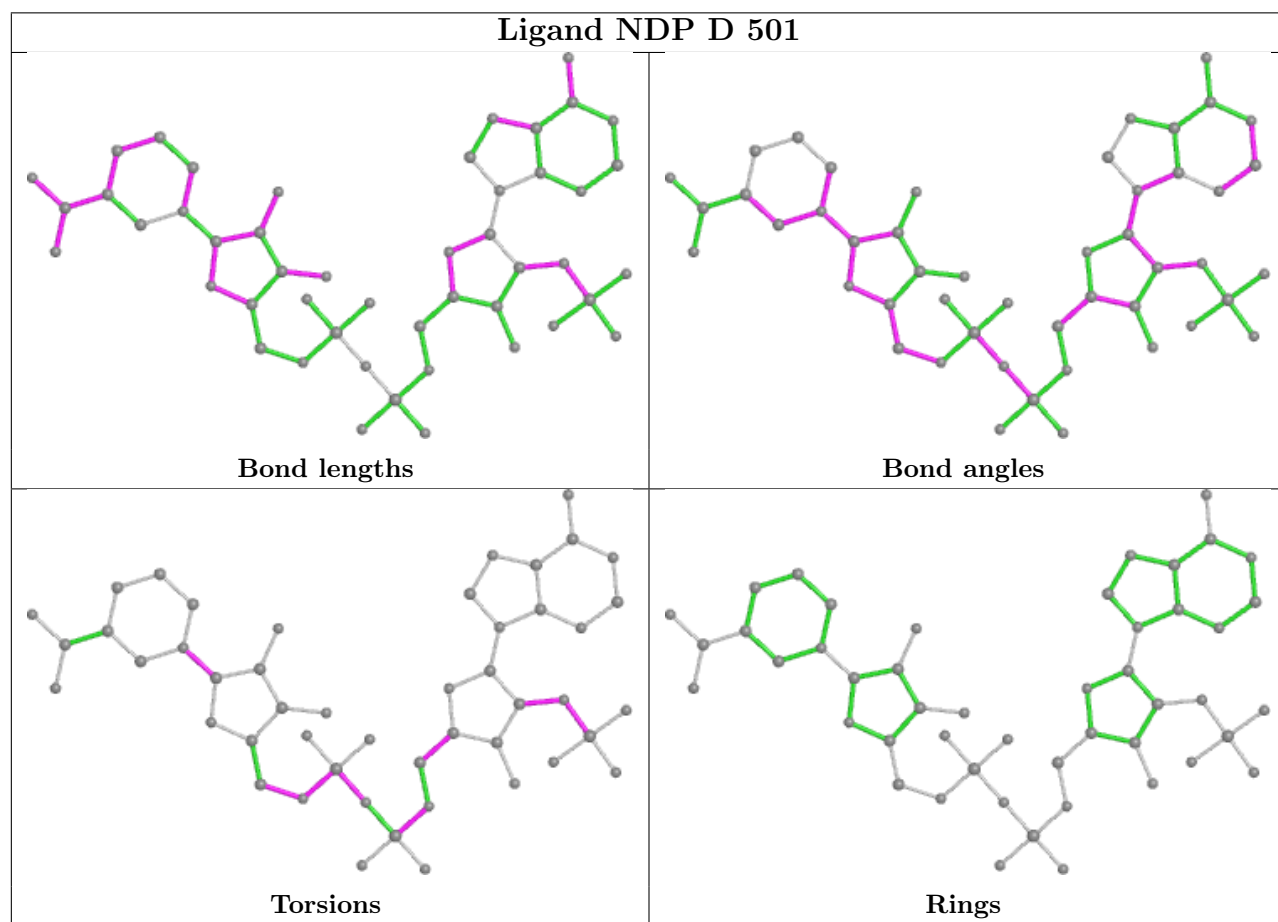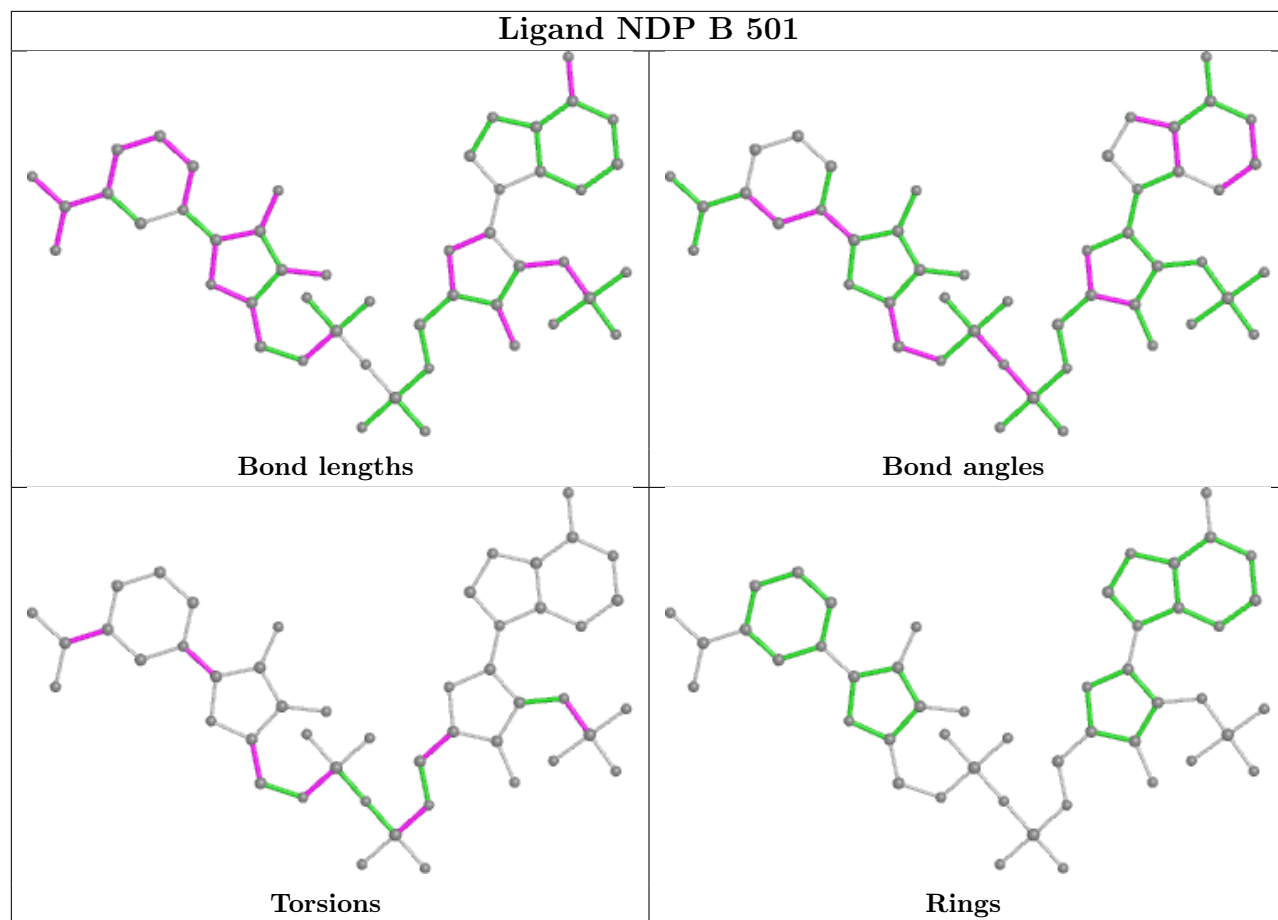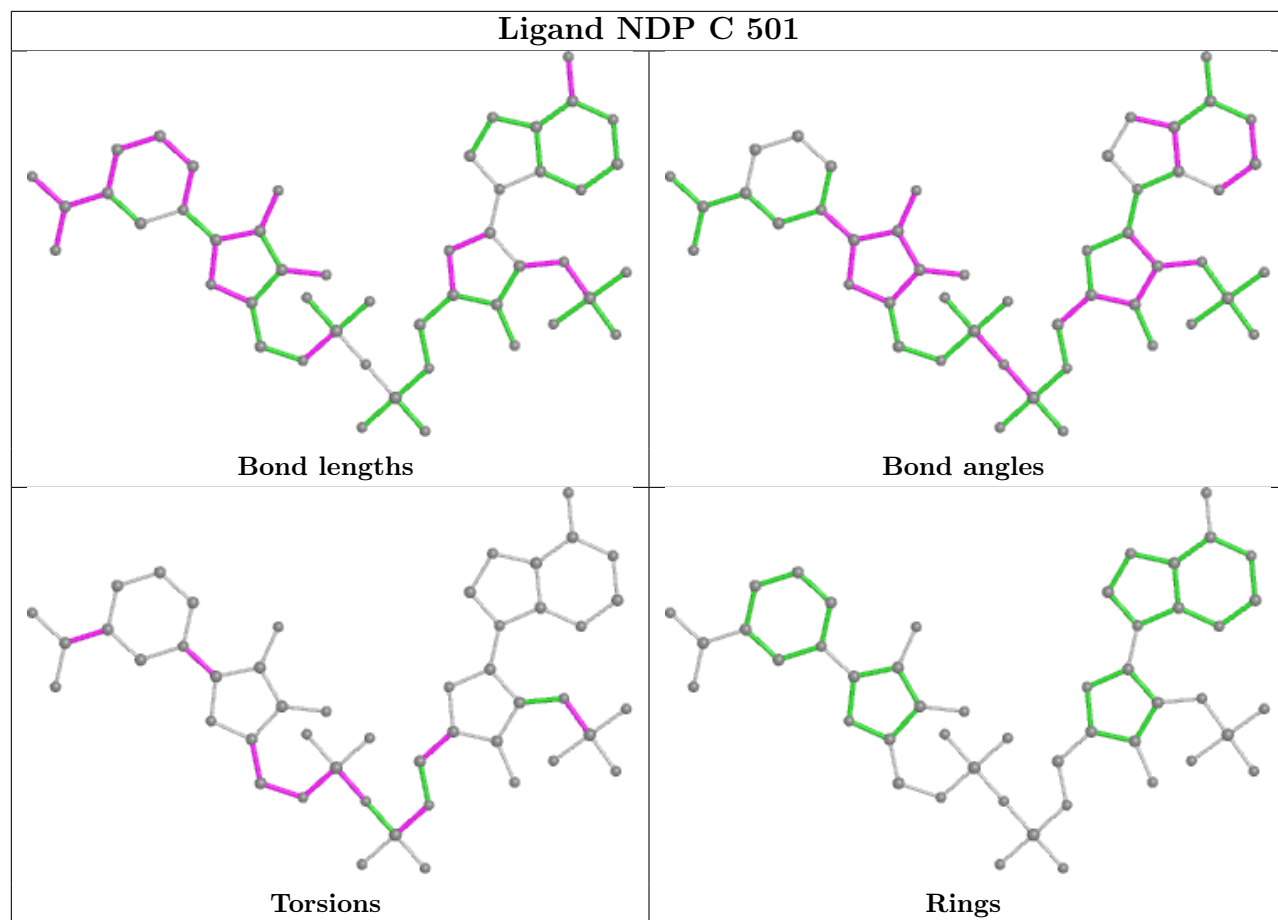
5.7 Other polymers (i)

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(Å²)	Q<0.9
1	A	445/445 (100%)	0.20	15 (3%)	45	51	10, 36, 62, 80	0
1	B	445/445 (100%)	0.07	8 (1%)	68	72	13, 30, 54, 79	0
1	C	445/445 (100%)	0.12	10 (2%)	62	66	13, 31, 53, 72	0
1	D	445/445 (100%)	0.37	31 (6%)	16	20	10, 37, 74, 110	0
All	All	1780/1780 (100%)	0.19	64 (3%)	42	49	10, 33, 62, 110	0

The worst 5 of 64 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	103	LEU	9.6
1	C	103	LEU	6.3
1	D	39	MET	6.1
1	A	42	GLY	4.9
1	D	43	LEU	4.9

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

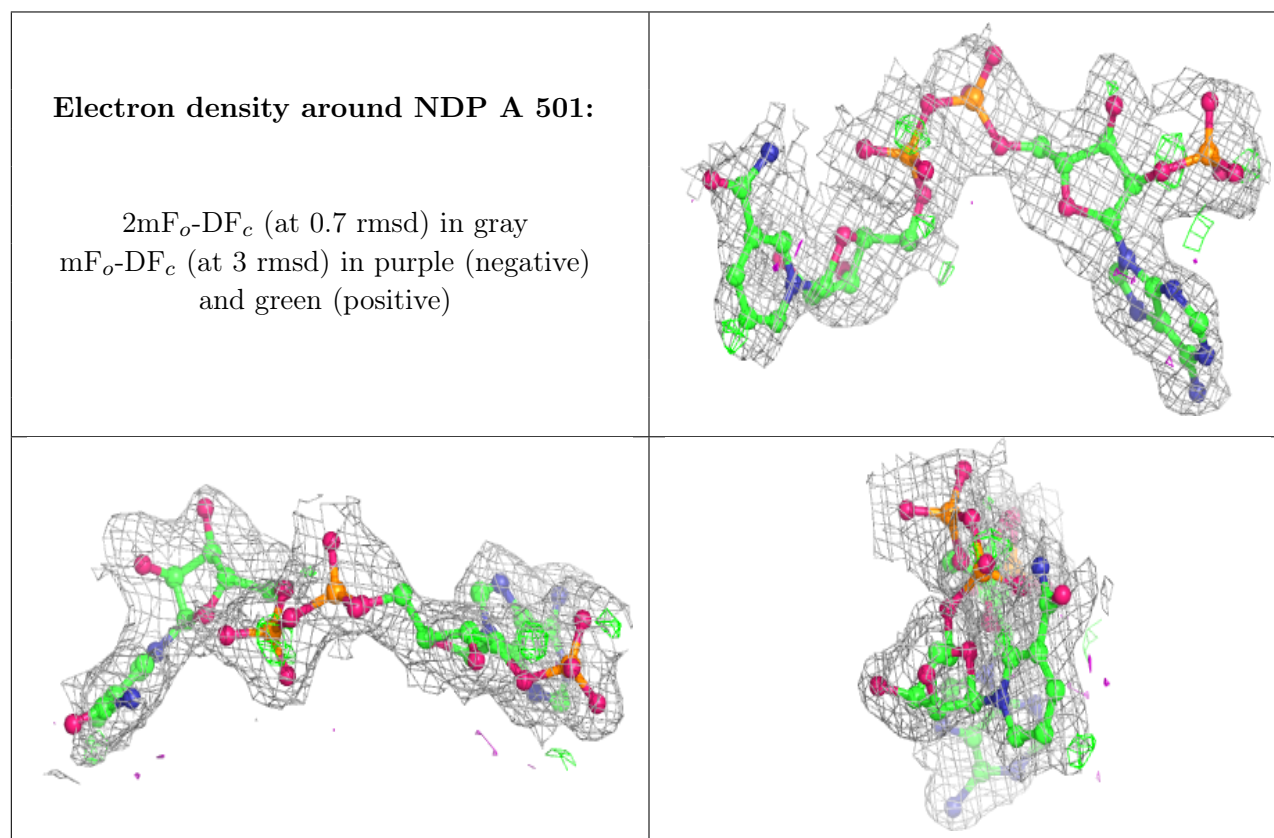There are no non-standard protein/DNA/RNA residues in this entry.

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($\mathring{A}^2$)	Q<0.9
2	NDP	A	501	48/48	0.89	0.14	29,53,69,85	0
2	NDP	D	501	48/48	0.92	0.14	24,42,60,62	0
2	NDP	C	501	48/48	0.92	0.13	12,28,42,55	0
2	NDP	B	501	48/48	0.94	0.12	15,35,70,76	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 NDP A 501:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
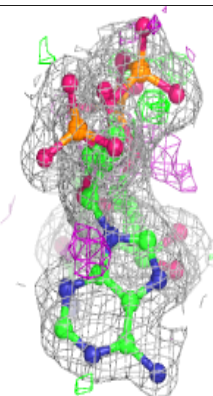mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)
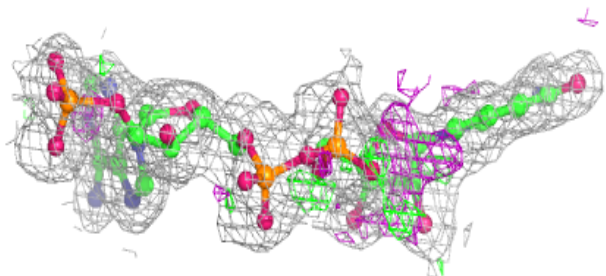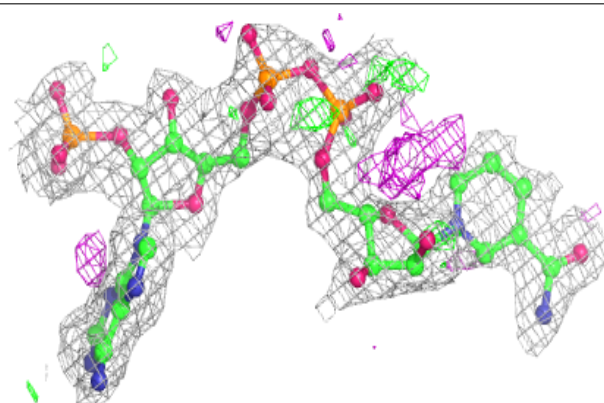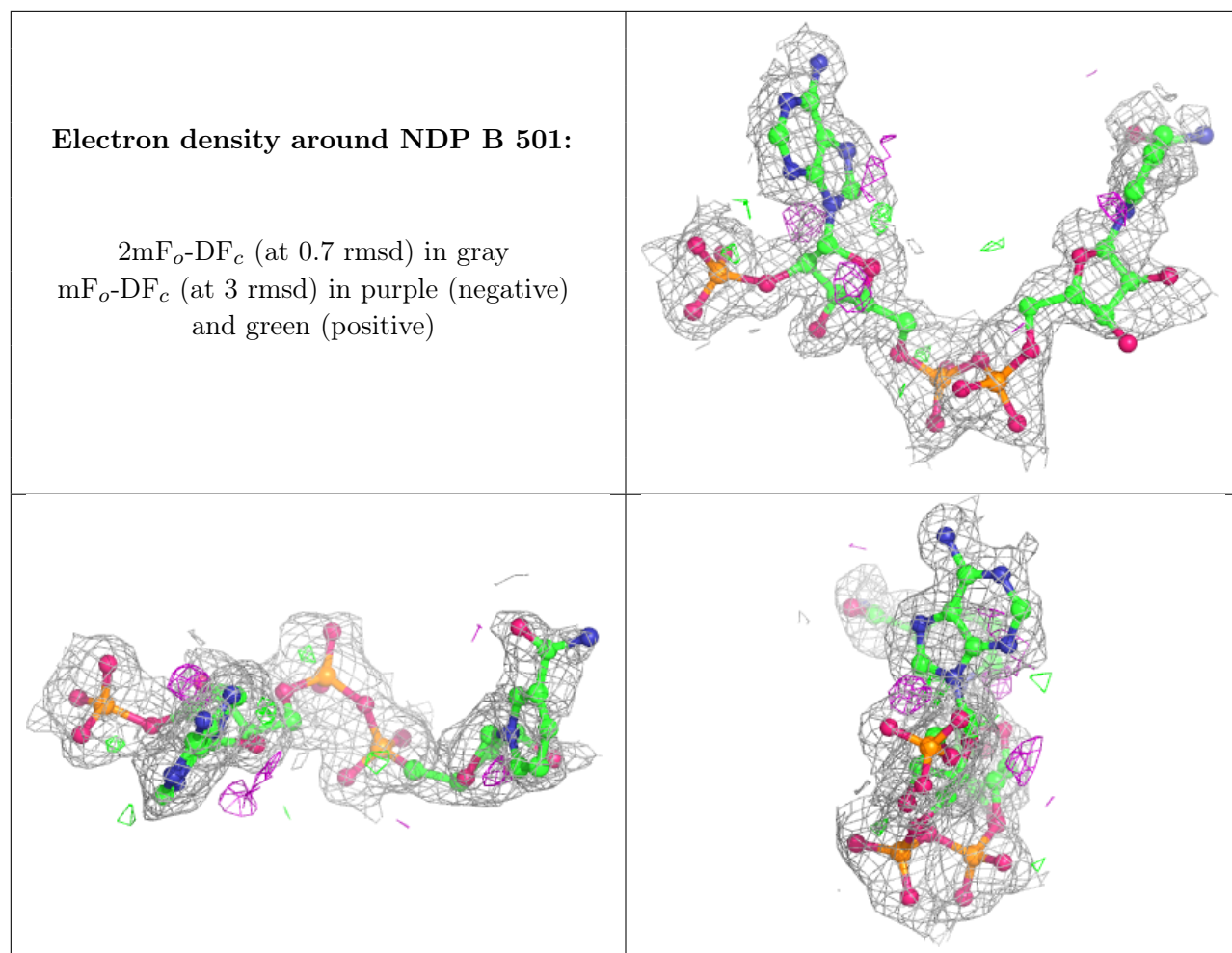
Electron density around NDP D 501:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)
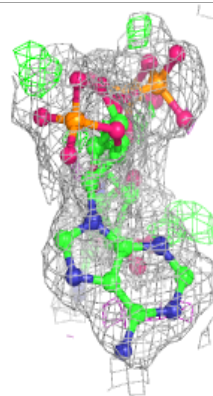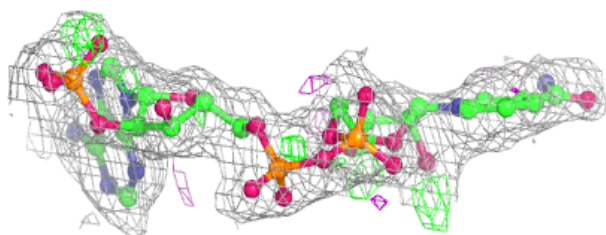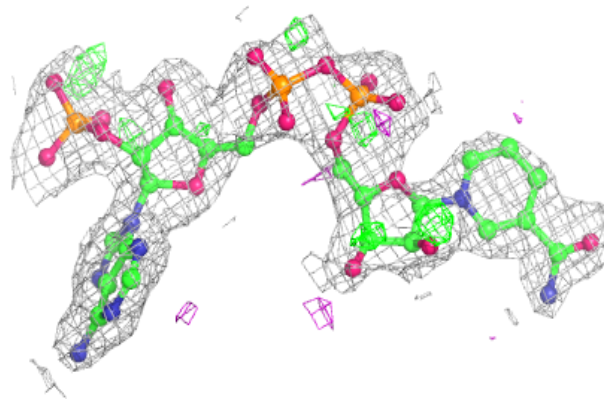
Electron density around NDP C 501:

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

Electron density around NDP B 501:

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

6.5 Other polymers (i)

There are no such residues in this entry.