



# Full wwPDB X-ray Structure Validation Report ⓘ

Sep 24, 2023 – 06:48 AM EDT

PDB ID : 5UAV  
Title : Structure of human PYCR-1 complexed with NADPH and L-tetrahydrofuroic acid  
Authors : Tanner, J.J.  
Deposited on : 2016-12-20  
Resolution : 1.85 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](mailto: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>.

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The following versions of software and data (see [references ⓘ](#)) 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 : 2.35.1  
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) : 2.35.1

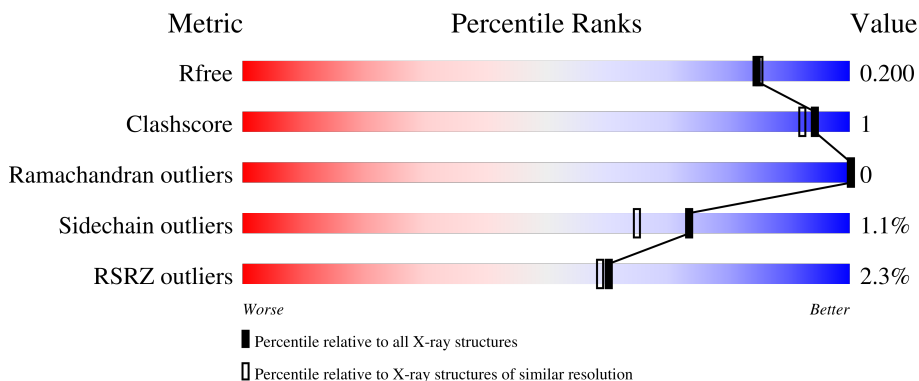
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.85 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	2469 (1.86-1.86)
Clashscore	141614	2625 (1.86-1.86)
Ramachandran outliers	138981	2592 (1.86-1.86)
Sidechain outliers	138945	2592 (1.86-1.86)
RSRZ outliers	127900	2436 (1.86-1.86)

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  $\geq 3$ , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions  $\leq 5\%$ . The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	322	 3% 82% 14%
1	B	322	 2% 83% 13%
1	C	322	 2% 84% 14%
1	D	322	 2% 83% 13%
1	E	322	 % 81% 15%

## 2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 11035 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 Pyrroline-5-carboxylate reductase 1, mitochondrial.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	278	2023	1277	357	375	14	0	3	0
1	B	279	2025	1277	356	380	12	0	0	0
1	C	277	2009	1267	351	378	13	0	1	0
1	D	279	2045	1293	359	380	13	0	3	0
1	E	275	1987	1251	349	374	13	0	0	0

There are 110 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-21	MET	-	initiating methionine	UNP P32322
A	-20	HIS	-	expression tag	UNP P32322
A	-19	HIS	-	expression tag	UNP P32322
A	-18	HIS	-	expression tag	UNP P32322
A	-17	HIS	-	expression tag	UNP P32322
A	-16	HIS	-	expression tag	UNP P32322
A	-15	HIS	-	expression tag	UNP P32322
A	-14	SER	-	expression tag	UNP P32322
A	-13	SER	-	expression tag	UNP P32322
A	-12	GLY	-	expression tag	UNP P32322
A	-11	VAL	-	expression tag	UNP P32322
A	-10	ASP	-	expression tag	UNP P32322
A	-9	LEU	-	expression tag	UNP P32322
A	-8	GLY	-	expression tag	UNP P32322
A	-7	THR	-	expression tag	UNP P32322
A	-6	GLU	-	expression tag	UNP P32322
A	-5	ASN	-	expression tag	UNP P32322
A	-4	LEU	-	expression tag	UNP P32322
A	-3	TYR	-	expression tag	UNP P32322

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Chain	Residue	Modelled	Actual	Comment	Reference
A	-2	PHE	-	expression tag	UNP P32322
A	-1	GLN	-	expression tag	UNP P32322
A	0	SER	-	expression tag	UNP P32322
B	-21	MET	-	initiating methionine	UNP P32322
B	-20	HIS	-	expression tag	UNP P32322
B	-19	HIS	-	expression tag	UNP P32322
B	-18	HIS	-	expression tag	UNP P32322
B	-17	HIS	-	expression tag	UNP P32322
B	-16	HIS	-	expression tag	UNP P32322
B	-15	HIS	-	expression tag	UNP P32322
B	-14	SER	-	expression tag	UNP P32322
B	-13	SER	-	expression tag	UNP P32322
B	-12	GLY	-	expression tag	UNP P32322
B	-11	VAL	-	expression tag	UNP P32322
B	-10	ASP	-	expression tag	UNP P32322
B	-9	LEU	-	expression tag	UNP P32322
B	-8	GLY	-	expression tag	UNP P32322
B	-7	THR	-	expression tag	UNP P32322
B	-6	GLU	-	expression tag	UNP P32322
B	-5	ASN	-	expression tag	UNP P32322
B	-4	LEU	-	expression tag	UNP P32322
B	-3	TYR	-	expression tag	UNP P32322
B	-2	PHE	-	expression tag	UNP P32322
B	-1	GLN	-	expression tag	UNP P32322
B	0	SER	-	expression tag	UNP P32322
C	-21	MET	-	initiating methionine	UNP P32322
C	-20	HIS	-	expression tag	UNP P32322
C	-19	HIS	-	expression tag	UNP P32322
C	-18	HIS	-	expression tag	UNP P32322
C	-17	HIS	-	expression tag	UNP P32322
C	-16	HIS	-	expression tag	UNP P32322
C	-15	HIS	-	expression tag	UNP P32322
C	-14	SER	-	expression tag	UNP P32322
C	-13	SER	-	expression tag	UNP P32322
C	-12	GLY	-	expression tag	UNP P32322
C	-11	VAL	-	expression tag	UNP P32322
C	-10	ASP	-	expression tag	UNP P32322
C	-9	LEU	-	expression tag	UNP P32322
C	-8	GLY	-	expression tag	UNP P32322
C	-7	THR	-	expression tag	UNP P32322
C	-6	GLU	-	expression tag	UNP P32322
C	-5	ASN	-	expression tag	UNP P32322

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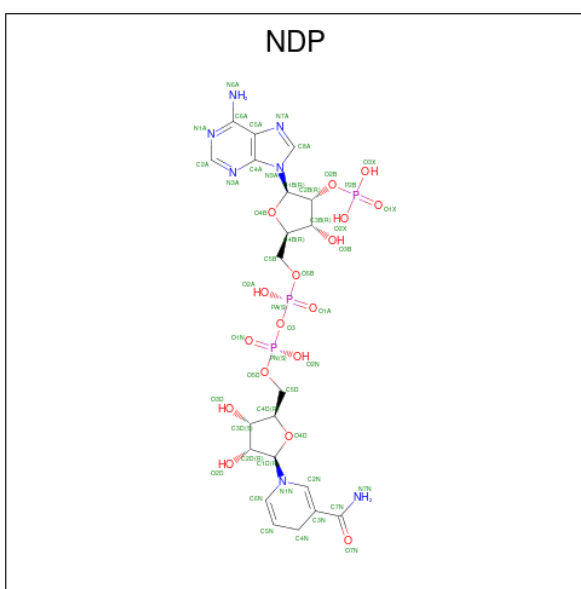
Chain	Residue	Modelled	Actual	Comment	Reference
C	-4	LEU	-	expression tag	UNP P32322
C	-3	TYR	-	expression tag	UNP P32322
C	-2	PHE	-	expression tag	UNP P32322
C	-1	GLN	-	expression tag	UNP P32322
C	0	SER	-	expression tag	UNP P32322
D	-21	MET	-	initiating methionine	UNP P32322
D	-20	HIS	-	expression tag	UNP P32322
D	-19	HIS	-	expression tag	UNP P32322
D	-18	HIS	-	expression tag	UNP P32322
D	-17	HIS	-	expression tag	UNP P32322
D	-16	HIS	-	expression tag	UNP P32322
D	-15	HIS	-	expression tag	UNP P32322
D	-14	SER	-	expression tag	UNP P32322
D	-13	SER	-	expression tag	UNP P32322
D	-12	GLY	-	expression tag	UNP P32322
D	-11	VAL	-	expression tag	UNP P32322
D	-10	ASP	-	expression tag	UNP P32322
D	-9	LEU	-	expression tag	UNP P32322
D	-8	GLY	-	expression tag	UNP P32322
D	-7	THR	-	expression tag	UNP P32322
D	-6	GLU	-	expression tag	UNP P32322
D	-5	ASN	-	expression tag	UNP P32322
D	-4	LEU	-	expression tag	UNP P32322
D	-3	TYR	-	expression tag	UNP P32322
D	-2	PHE	-	expression tag	UNP P32322
D	-1	GLN	-	expression tag	UNP P32322
D	0	SER	-	expression tag	UNP P32322
E	-21	MET	-	initiating methionine	UNP P32322
E	-20	HIS	-	expression tag	UNP P32322
E	-19	HIS	-	expression tag	UNP P32322
E	-18	HIS	-	expression tag	UNP P32322
E	-17	HIS	-	expression tag	UNP P32322
E	-16	HIS	-	expression tag	UNP P32322
E	-15	HIS	-	expression tag	UNP P32322
E	-14	SER	-	expression tag	UNP P32322
E	-13	SER	-	expression tag	UNP P32322
E	-12	GLY	-	expression tag	UNP P32322
E	-11	VAL	-	expression tag	UNP P32322
E	-10	ASP	-	expression tag	UNP P32322
E	-9	LEU	-	expression tag	UNP P32322
E	-8	GLY	-	expression tag	UNP P32322
E	-7	THR	-	expression tag	UNP P32322

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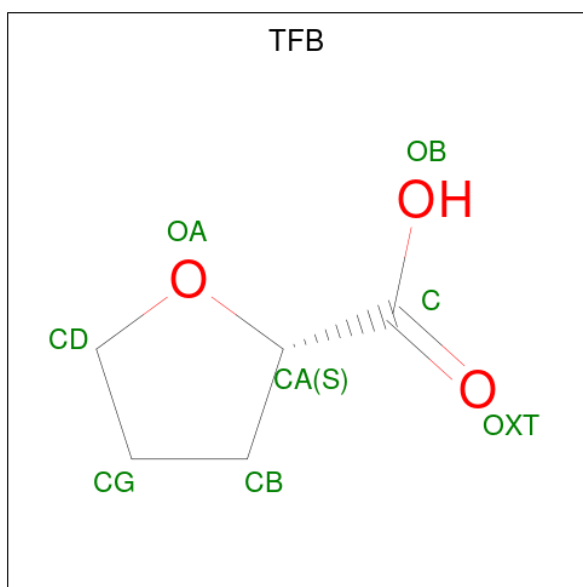
Chain	Residue	Modelled	Actual	Comment	Reference
E	-6	GLU	-	expression tag	UNP P32322
E	-5	ASN	-	expression tag	UNP P32322
E	-4	LEU	-	expression tag	UNP P32322
E	-3	TYR	-	expression tag	UNP P32322
E	-2	PHE	-	expression tag	UNP P32322
E	-1	GLN	-	expression tag	UNP P32322
E	0	SER	-	expression tag	UNP P32322

- Molecule 2 is NADPH DIHYDRO-NICOTINAMIDE-ADENINE-DINUCLEOTIDE PHOSPHATE (three-letter code: NDP) (formula: C<sub>21</sub>H<sub>30</sub>N<sub>7</sub>O<sub>17</sub>P<sub>3</sub>).



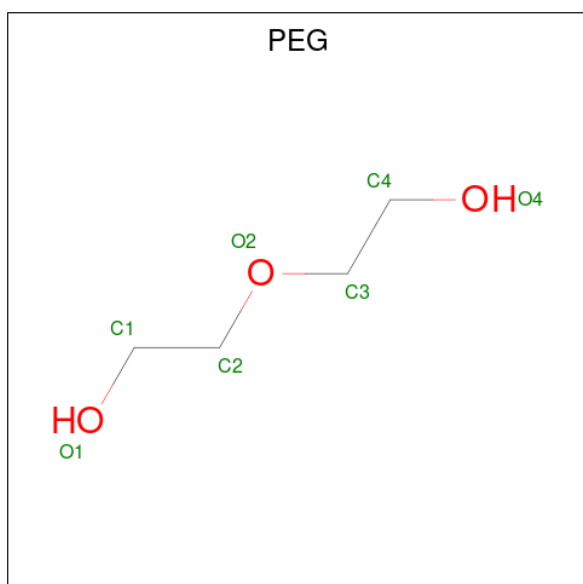
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	
			Total	C	N	O	P			
2	A	1	Total	48	21	7	17	3	0	0
2	B	1	Total	48	21	7	17	3	0	0
2	C	1	Total	48	21	7	17	3	0	0
2	D	1	Total	48	21	7	17	3	0	0
2	E	1	Total	48	21	7	17	3	0	0

- Molecule 3 is TETRAHYDROFURAN-2-CARBOXYLIC ACID (three-letter code: TFB) (formula: C<sub>5</sub>H<sub>8</sub>O<sub>3</sub>).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total C O 8 5 3	0	0
3	B	1	Total C O 8 5 3	0	0
3	C	1	Total C O 8 5 3	0	0
3	D	1	Total C O 8 5 3	0	0
3	E	1	Total C O 8 5 3	0	0

- Molecule 4 is DI(HYDROXYETHYL)ETHER (three-letter code: PEG) (formula: C<sub>4</sub>H<sub>10</sub>O<sub>3</sub>).



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

- Molecule 5 is water.

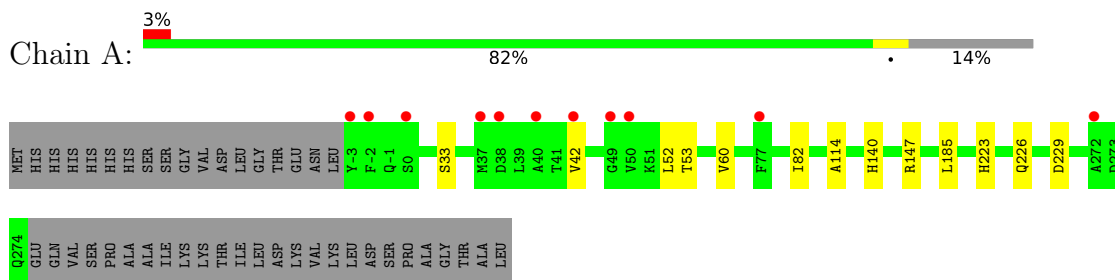
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	113	Total	O	0	0
			113	113		
5	B	129	Total	O	0	0
			129	129		
5	C	155	Total	O	0	0
			155	155		
5	D	139	Total	O	0	0
			139	139		
5	E	123	Total	O	0	0
			123	123		



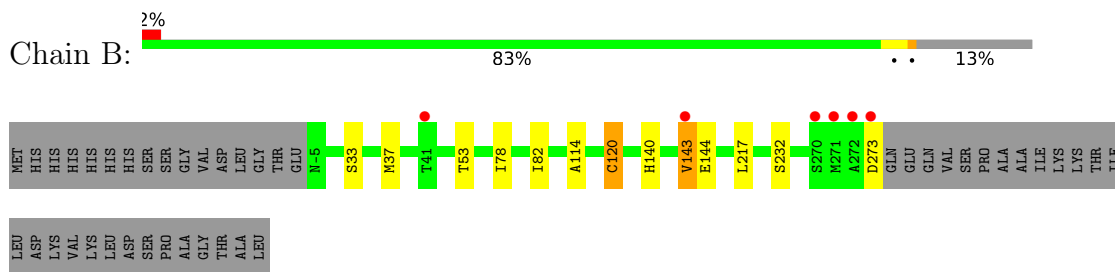
### 3 Residue-property plots [i](#)

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.

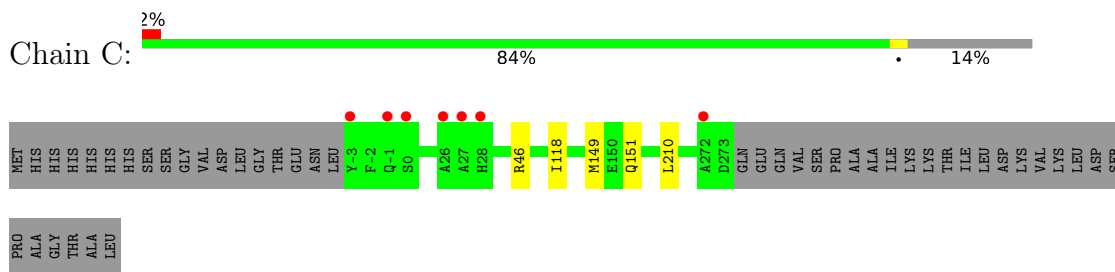
- Molecule 1: Pyrroline-5-carboxylate reductase 1, mitochondrial



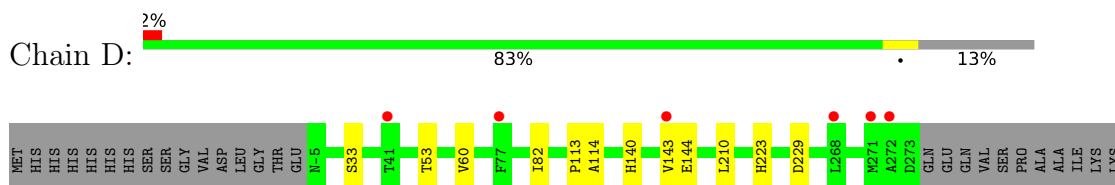
- Molecule 1: Pyrroline-5-carboxylate reductase 1, mitochondrial



- Molecule 1: Pyrroline-5-carboxylate reductase 1, mitochondrial




- Molecule 1: Pyrroline-5-carboxylate reductase 1, mitochondrial



THR  
ILE  
LEU  
ASP  
LYS  
VAL  
LYS  
LEU  
ASP  
SER  
PRO  
ALA  
GLY  
THR  
ALA  
LEU

- Molecule 1: Pyrroline-5-carboxylate reductase 1, mitochondrial

Chain E: 

MET  
HIS  
HIS  
HIS  
HIS  
HIS  
HIS  
SER  
SER  
GLY  
VAL  
ASP  
ASP  
LEU  
GLY  
THR  
GLU  
ASN  
LEU  
TYR  
PHE  
GLN  
S0  
F19  
L26  
A26  
A27  
H28  
K29  
S33  
T63  
A114  
T133  
H140  
A141  
Q142  
D145  
C159  
M216  
S232  
Q274  
GLU  
GLN  
VAL  
SER  
PRO  
ALA  
ALA  
ILE

LYS  
LYS  
THR  
ILE  
LEU  
ASP  
LYS  
VAL  
LYS  
LEU  
ASP  
SER  
PRO  
ALA  
GLY  
THR  
ALA  
LEU

## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	161.48Å 87.66Å 115.56Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	59.39 – 1.85 59.39 – 1.85	Depositor EDS
% Data completeness (in resolution range)	99.6 (59.39-1.85) 99.7 (59.39-1.85)	Depositor EDS
$R_{merge}$	0.08	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.05 (at 1.86Å)	Xtrriage
Refinement program	PHENIX (1.10.1_2155)	Depositor
R, $R_{free}$	0.172 , 0.200 0.172 , 0.200	Depositor DCC
$R_{free}$ test set	6832 reflections (4.89%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	20.4	Xtrriage
Anisotropy	0.295	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.36 , 51.2	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	11035	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	26.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.48% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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: PEG, TFB, 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	0.34	0/2064	0.52	0/2800
1	B	0.38	1/2058 (0.0%)	0.52	0/2792
1	C	0.36	0/2044	0.54	0/2774
1	D	0.36	0/2087	0.52	0/2830
1	E	0.34	0/2018	0.51	0/2739
All	All	0.35	1/10271 (0.0%)	0.52	0/13935

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	120	CYS	CB-SG	-5.14	1.73	1.81

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	A	2023	0	2045	9	0
1	B	2025	0	2040	5	0
1	C	2009	0	2025	3	0
1	D	2045	0	2080	9	0
1	E	1987	0	2008	6	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	A	48	0	26	0	0
2	B	48	0	26	0	0
2	C	48	0	26	0	0
2	D	48	0	26	0	0
2	E	48	0	26	0	0
3	A	8	0	7	0	0
3	B	8	0	7	0	0
3	C	8	0	7	0	0
3	D	8	0	7	0	0
3	E	8	0	7	0	0
4	C	7	0	10	0	0
5	A	113	0	0	0	0
5	B	129	0	0	0	0
5	C	155	0	0	1	0
5	D	139	0	0	0	0
5	E	123	0	0	0	0
All	All	11035	0	10373	26	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 1.

All (26) 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:210:LEU:HD11	1:D:210:LEU:HD13	1.57	0.85
1:A:223:HIS:NE2	1:D:229:ASP:OD2	2.26	0.69
1:A:42:VAL:HG12	1:A:52:LEU:HD13	1.84	0.58
1:A:223:HIS:HE2	1:D:229:ASP:CG	2.08	0.57
1:C:151:GLN:OE1	5:C:501:HOH:O	2.19	0.53
1:D:143:VAL:HG13	1:D:144:GLU:HG3	1.93	0.51
1:B:78:ILE:O	1:B:82:ILE:HG13	2.12	0.49
1:D:60:VAL:HG21	1:D:82:ILE:HB	1.95	0.49
1:A:229:ASP:CG	1:D:223:HIS:HE2	2.19	0.46
1:D:114:ALA:HA	1:D:140:HIS:CG	2.52	0.45
1:B:114:ALA:HA	1:B:140:HIS:CG	2.52	0.44
1:B:143:VAL:HG22	1:B:144:GLU:HG3	1.99	0.44
1:C:118:ILE:HD12	1:C:149[B]:MET:HG3	1.99	0.44
1:A:185:LEU:HD13	1:B:217:LEU:HD23	1.98	0.44
1:A:114:ALA:HA	1:A:140:HIS:CG	2.53	0.43
1:A:33:SER:HA	1:A:53:THR:O	2.19	0.43
1:A:60:VAL:HG21	1:A:82:ILE:HB	2.00	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:19:PHE:HB3	1:E:25:LEU:HD12	2.00	0.43
1:D:33:SER:HA	1:D:53:THR:O	2.19	0.42
1:E:114:ALA:HA	1:E:140:HIS:CD2	2.55	0.42
1:E:133:THR:O	1:E:159:CYS:HA	2.19	0.42
1:E:142:GLN:HG3	1:E:145:ASP:OD2	2.21	0.41
1:E:26:ALA:HB3	1:E:29:LYS:HG2	2.03	0.41
1:A:226:GLN:OE1	1:D:223:HIS:HB2	2.21	0.40
1:B:33:SER:HA	1:B:53:THR:O	2.21	0.40
1:E:33:SER:HA	1:E:53:THR:O	2.22	0.40

There are no symmetry-related clashes.

### 5.3 Torsion angles [i](#)

#### 5.3.1 Protein backbone [i](#)

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	279/322 (87%)	275 (99%)	4 (1%)	0	100	100
1	B	277/322 (86%)	274 (99%)	3 (1%)	0	100	100
1	C	276/322 (86%)	265 (96%)	11 (4%)	0	100	100
1	D	280/322 (87%)	276 (99%)	4 (1%)	0	100	100
1	E	273/322 (85%)	267 (98%)	6 (2%)	0	100	100
All	All	1385/1610 (86%)	1357 (98%)	28 (2%)	0	100	100

There are no Ramachandran outliers to report.

#### 5.3.2 Protein sidechains [i](#)

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	208/254 (82%)	207 (100%)	1 (0%)	88	86
1	B	209/254 (82%)	204 (98%)	5 (2%)	49	33
1	C	208/254 (82%)	207 (100%)	1 (0%)	88	86
1	D	213/254 (84%)	212 (100%)	1 (0%)	88	86
1	E	206/254 (81%)	203 (98%)	3 (2%)	65	53
All	All	1044/1270 (82%)	1033 (99%)	11 (1%)	73	65

All (11) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	147	ARG
1	B	37	MET
1	B	120	CYS
1	B	143	VAL
1	B	232	SER
1	B	273	ASP
1	C	46	ARG
1	D	113	PRO
1	E	142	GLN
1	E	216	MET
1	E	232	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	28	HIS
1	B	61	GLN
1	C	142	GLN
1	C	226	GLN
1	C	230	ASN

### 5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

## 5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

11 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	A	401	-	45,52,52	2.39	7 (15%)	53,80,80	1.61	6 (11%)
2	NDP	C	401	-	45,52,52	2.04	6 (13%)	53,80,80	1.55	9 (16%)
2	NDP	B	401	-	45,52,52	2.19	9 (20%)	53,80,80	1.61	9 (16%)
2	NDP	E	401	-	45,52,52	2.28	8 (17%)	53,80,80	1.62	9 (16%)
3	TFB	A	402	-	8,8,8	3.65	5 (62%)	8,10,10	1.79	2 (25%)
3	TFB	B	402	-	8,8,8	3.65	4 (50%)	8,10,10	1.72	3 (37%)
3	TFB	C	402	-	8,8,8	3.82	3 (37%)	8,10,10	1.53	1 (12%)
3	TFB	E	402	-	8,8,8	3.76	4 (50%)	8,10,10	1.99	2 (25%)
4	PEG	C	403	-	6,6,6	0.63	0	5,5,5	0.60	0
2	NDP	D	401	-	45,52,52	2.18	6 (13%)	53,80,80	1.59	8 (15%)
3	TFB	D	402	-	8,8,8	3.74	5 (62%)	8,10,10	1.65	2 (25%)

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	A	401	-	-	4/30/77/77	0/5/5/5

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	NDP	C	401	-	-	5/30/77/77	0/5/5/5
2	NDP	B	401	-	-	4/30/77/77	0/5/5/5
2	NDP	E	401	-	-	5/30/77/77	0/5/5/5
3	TFB	A	402	-	-	3/4/11/11	0/1/1/1
3	TFB	B	402	-	-	3/4/11/11	0/1/1/1
3	TFB	C	402	-	-	0/4/11/11	0/1/1/1
3	TFB	E	402	-	-	2/4/11/11	0/1/1/1
4	PEG	C	403	-	-	1/4/4/4	-
2	NDP	D	401	-	-	3/30/77/77	0/5/5/5
3	TFB	D	402	-	-	2/4/11/11	0/1/1/1

All (57) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	401	NDP	P2B-O2B	13.52	1.84	1.59
2	E	401	NDP	P2B-O2B	12.68	1.83	1.59
2	B	401	NDP	P2B-O2B	11.77	1.81	1.59
2	D	401	NDP	P2B-O2B	11.71	1.81	1.59
2	C	401	NDP	P2B-O2B	10.46	1.79	1.59
3	C	402	TFB	CB-CA	-8.47	1.32	1.52
3	E	402	TFB	CB-CA	-8.30	1.33	1.52
3	B	402	TFB	CB-CA	-8.09	1.33	1.52
3	D	402	TFB	CB-CA	-8.05	1.33	1.52
3	A	402	TFB	CB-CA	-7.52	1.34	1.52
3	E	402	TFB	OA-CA	4.72	1.54	1.44
3	A	402	TFB	OA-CA	4.72	1.54	1.44
3	C	402	TFB	OA-CA	4.70	1.54	1.44
3	D	402	TFB	OA-CA	4.55	1.54	1.44
3	B	402	TFB	OA-CA	4.53	1.53	1.44
2	D	401	NDP	PN-O5D	4.09	1.75	1.59
2	E	401	NDP	PN-O5D	3.88	1.75	1.59
2	C	401	NDP	PN-O5D	3.72	1.74	1.59
3	A	402	TFB	OA-CD	3.69	1.53	1.42
3	C	402	TFB	OA-CD	3.68	1.53	1.42
3	D	402	TFB	OA-CD	3.57	1.53	1.42
3	B	402	TFB	OA-CD	3.53	1.53	1.42
3	E	402	TFB	OA-CD	3.39	1.53	1.42
2	B	401	NDP	PN-O5D	3.21	1.72	1.59
2	A	401	NDP	PN-O5D	3.19	1.72	1.59
2	B	401	NDP	O2B-C2B	-3.01	1.33	1.44

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	401	NDP	O2B-C2B	-2.84	1.33	1.44
2	D	401	NDP	C7N-N7N	2.81	1.40	1.33
2	A	401	NDP	O2B-C2B	-2.79	1.33	1.44
2	C	401	NDP	C7N-N7N	2.76	1.40	1.33
2	C	401	NDP	C3B-C4B	2.74	1.60	1.53
2	E	401	NDP	C3D-C4D	2.57	1.59	1.53
2	A	401	NDP	C7N-N7N	2.56	1.40	1.33
2	D	401	NDP	C3D-C4D	2.56	1.59	1.53
3	A	402	TFB	CA-C	2.51	1.54	1.52
2	B	401	NDP	C7N-N7N	2.38	1.39	1.33
2	C	401	NDP	C6N-N1N	2.38	1.43	1.37
2	E	401	NDP	C2A-N1A	2.30	1.38	1.33
2	E	401	NDP	C7N-N7N	2.29	1.39	1.33
2	B	401	NDP	C4A-N3A	2.29	1.38	1.35
3	B	402	TFB	CG-CB	2.28	1.61	1.51
2	E	401	NDP	C4A-N3A	2.28	1.38	1.35
2	C	401	NDP	C2A-N3A	2.28	1.35	1.32
2	B	401	NDP	O5D-C5D	-2.26	1.36	1.44
2	B	401	NDP	C2A-N1A	2.24	1.38	1.33
3	D	402	TFB	CA-C	2.22	1.54	1.52
2	A	401	NDP	C2A-N1A	2.21	1.38	1.33
2	E	401	NDP	O2B-C2B	-2.19	1.36	1.44
2	E	401	NDP	C3B-C4B	2.17	1.58	1.53
3	E	402	TFB	CG-CB	2.16	1.60	1.51
2	D	401	NDP	C6N-N1N	2.14	1.42	1.37
2	A	401	NDP	C4A-N3A	2.13	1.38	1.35
2	B	401	NDP	C3D-C4D	2.12	1.58	1.53
3	D	402	TFB	CG-CB	2.10	1.60	1.51
3	A	402	TFB	CG-CB	2.08	1.60	1.51
2	A	401	NDP	C1D-N1N	2.06	1.52	1.46
2	B	401	NDP	O5B-C5B	-2.06	1.36	1.44

All (51) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	401	NDP	PN-O3-PA	-5.83	112.83	132.83
2	B	401	NDP	PN-O3-PA	-5.71	113.23	132.83
2	D	401	NDP	PN-O3-PA	-5.40	114.28	132.83
2	E	401	NDP	PN-O3-PA	-5.28	114.71	132.83
2	C	401	NDP	PN-O3-PA	-4.78	116.42	132.83
2	B	401	NDP	O2B-P2B-O1X	-3.81	94.69	109.39
2	A	401	NDP	O2B-P2B-O1X	-3.75	94.93	109.39

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	E	402	TFB	OA-CA-C	-3.58	105.13	109.98
2	E	401	NDP	O5D-PN-O1N	-3.55	95.19	109.07
2	C	401	NDP	O2B-P2B-O1X	-3.53	95.78	109.39
2	D	401	NDP	O2B-P2B-O1X	-3.45	96.09	109.39
2	C	401	NDP	C3B-C2B-C1B	-3.13	97.00	102.89
2	E	401	NDP	O2B-P2B-O1X	-3.11	97.38	109.39
3	B	402	TFB	OB-C-CA	3.07	121.80	113.03
2	D	401	NDP	C3B-C2B-C1B	-3.07	97.13	102.89
2	E	401	NDP	C3B-C2B-C1B	-2.95	97.34	102.89
2	D	401	NDP	O5D-PN-O1N	-2.90	97.75	109.07
2	A	401	NDP	C3B-C2B-C1B	-2.86	97.51	102.89
2	A	401	NDP	PA-O5B-C5B	-2.79	105.33	121.68
2	B	401	NDP	C3B-C2B-C1B	-2.74	97.74	102.89
3	A	402	TFB	OB-C-CA	2.68	120.67	113.03
2	C	401	NDP	O5D-PN-O1N	-2.67	98.64	109.07
2	A	401	NDP	O5D-PN-O1N	-2.62	98.84	109.07
3	C	402	TFB	OB-C-CA	2.60	120.46	113.03
2	B	401	NDP	O3X-P2B-O2X	2.59	117.52	107.64
3	E	402	TFB	OB-C-CA	2.59	120.41	113.03
2	D	401	NDP	O3X-P2B-O2X	2.56	117.43	107.64
2	C	401	NDP	O3X-P2B-O2X	2.50	117.18	107.64
2	A	401	NDP	O3X-P2B-O2X	2.50	117.17	107.64
2	B	401	NDP	PA-O5B-C5B	-2.49	107.07	121.68
2	D	401	NDP	PA-O5B-C5B	-2.41	107.57	121.68
2	E	401	NDP	O3X-P2B-O2X	2.40	116.81	107.64
2	D	401	NDP	C1B-N9A-C4A	-2.38	122.47	126.64
2	E	401	NDP	PA-O5B-C5B	-2.37	107.78	121.68
3	D	402	TFB	OB-C-CA	2.36	119.77	113.03
2	E	401	NDP	O4B-C4B-C3B	2.36	109.78	105.11
2	B	401	NDP	O5D-PN-O1N	-2.35	99.88	109.07
2	E	401	NDP	C1B-N9A-C4A	-2.33	122.55	126.64
2	C	401	NDP	PA-O5B-C5B	-2.29	108.27	121.68
3	B	402	TFB	OXT-C-CA	-2.28	117.18	122.57
2	E	401	NDP	C3N-C2N-N1N	-2.28	119.84	123.10
2	B	401	NDP	C5B-C4B-C3B	-2.22	106.85	115.18
2	D	401	NDP	O7N-C7N-N7N	-2.21	117.70	122.88
2	C	401	NDP	O7N-C7N-N7N	-2.20	117.73	122.88
3	B	402	TFB	CG-CB-CA	2.16	109.67	103.57
2	C	401	NDP	C1B-N9A-C4A	-2.15	122.87	126.64
3	D	402	TFB	OA-CA-C	-2.13	107.09	109.98
2	C	401	NDP	O4B-C4B-C3B	2.13	109.33	105.11
2	B	401	NDP	O2N-PN-O1N	2.12	122.73	112.24

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	401	NDP	O7N-C7N-C3N	2.06	124.78	120.90
3	A	402	TFB	OB-C-OXT	-2.02	119.49	124.09

There are no chirality outliers.

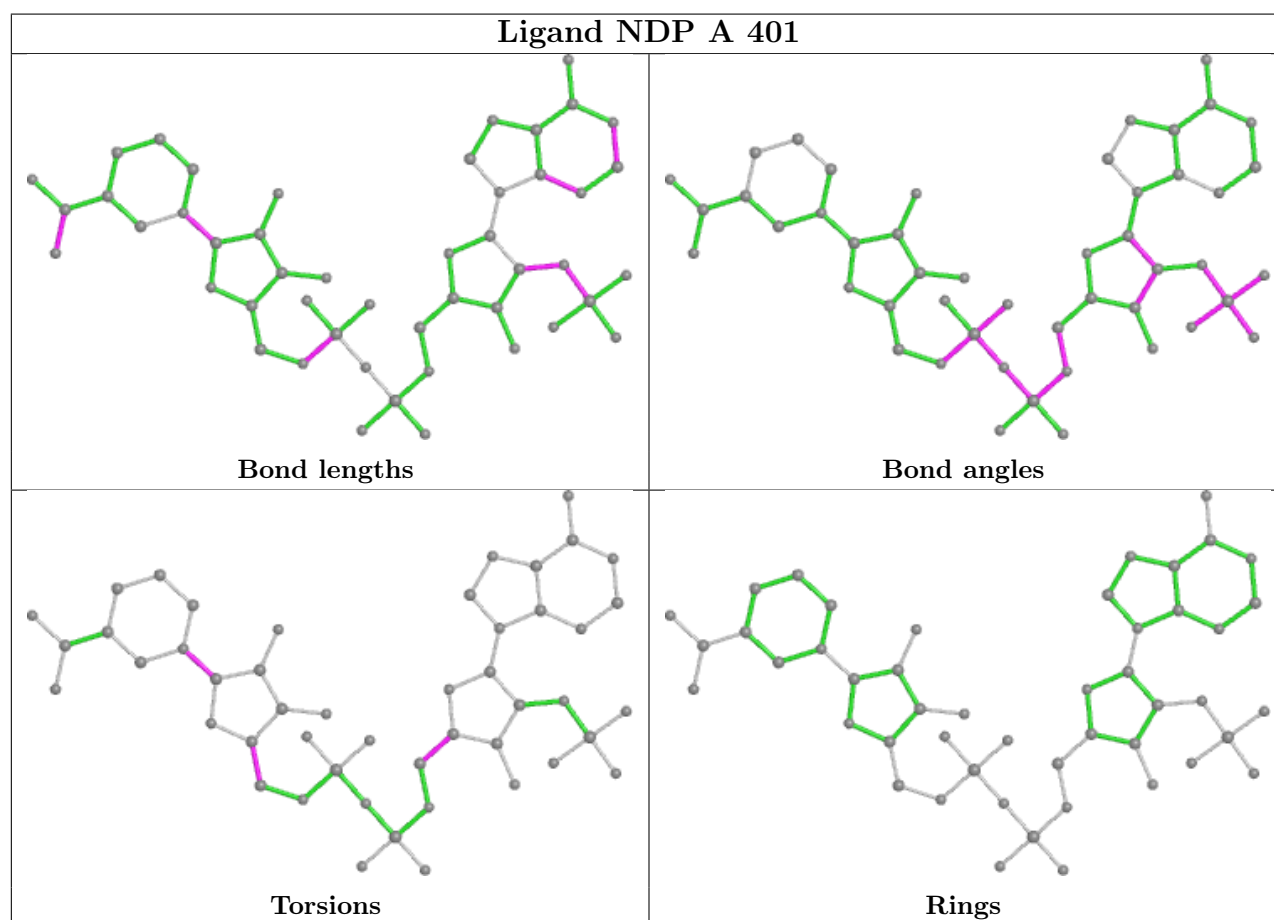
All (32) torsion outliers are listed below:

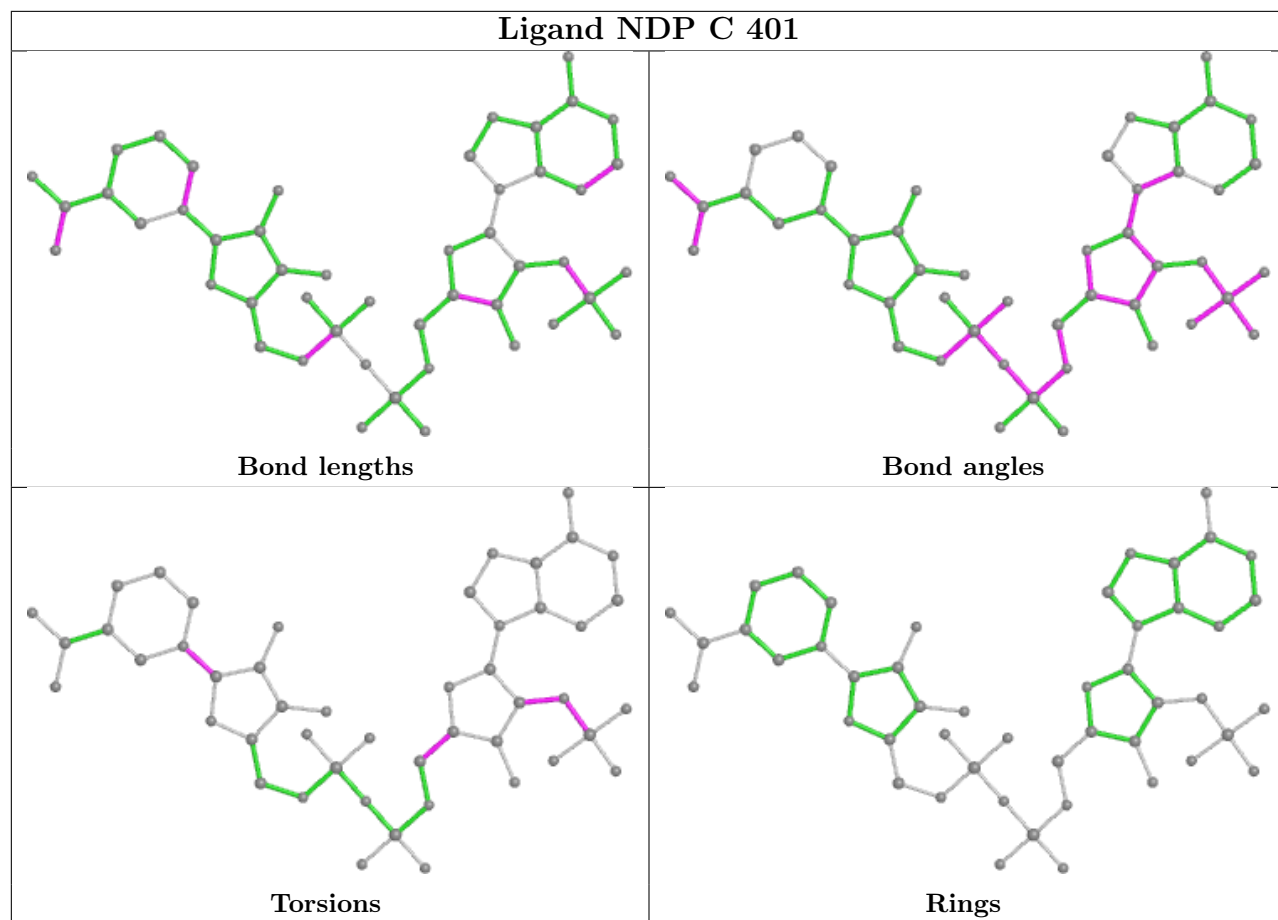
Mol	Chain	Res	Type	Atoms
2	E	401	NDP	O4B-C4B-C5B-O5B
3	A	402	TFB	OXT-C-CA-OA
3	B	402	TFB	OXT-C-CA-OA
2	C	401	NDP	C3B-C2B-O2B-P2B
2	E	401	NDP	C3B-C2B-O2B-P2B
2	E	401	NDP	C3B-C4B-C5B-O5B
3	E	402	TFB	OB-C-CA-CB
4	C	403	PEG	O1-C1-C2-O2
2	B	401	NDP	O4B-C4B-C5B-O5B
2	C	401	NDP	C2B-O2B-P2B-O2X
2	E	401	NDP	C2B-O2B-P2B-O2X
3	A	402	TFB	OXT-C-CA-CB
3	B	402	TFB	OB-C-CA-CB
3	B	402	TFB	OXT-C-CA-CB
2	E	401	NDP	O4D-C1D-N1N-C6N
2	A	401	NDP	O4B-C4B-C5B-O5B
2	C	401	NDP	O4B-C4B-C5B-O5B
2	D	401	NDP	O4B-C4B-C5B-O5B
2	A	401	NDP	O4D-C1D-N1N-C6N
2	B	401	NDP	O4D-C1D-N1N-C6N
2	C	401	NDP	O4D-C1D-N1N-C6N
2	D	401	NDP	O4D-C1D-N1N-C6N
2	B	401	NDP	C2D-C1D-N1N-C6N
3	A	402	TFB	OB-C-CA-CB
3	D	402	TFB	OB-C-CA-CB
3	D	402	TFB	OXT-C-CA-CB
3	E	402	TFB	OXT-C-CA-CB
2	A	401	NDP	C2D-C1D-N1N-C6N
2	C	401	NDP	C2D-C1D-N1N-C6N
2	A	401	NDP	O4D-C4D-C5D-O5D
2	D	401	NDP	C2D-C1D-N1N-C6N
2	B	401	NDP	C3B-C4B-C5B-O5B

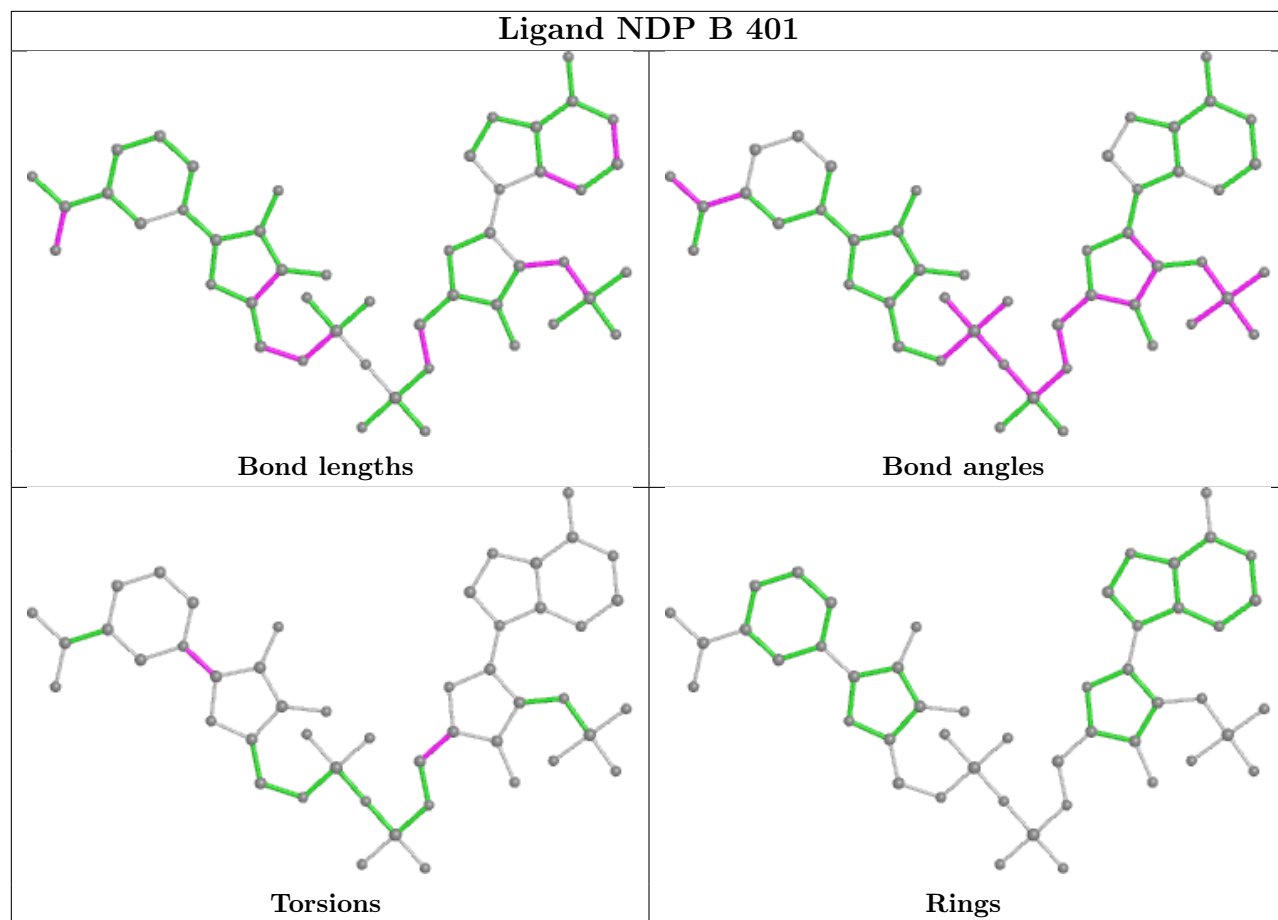
There are no ring outliers.

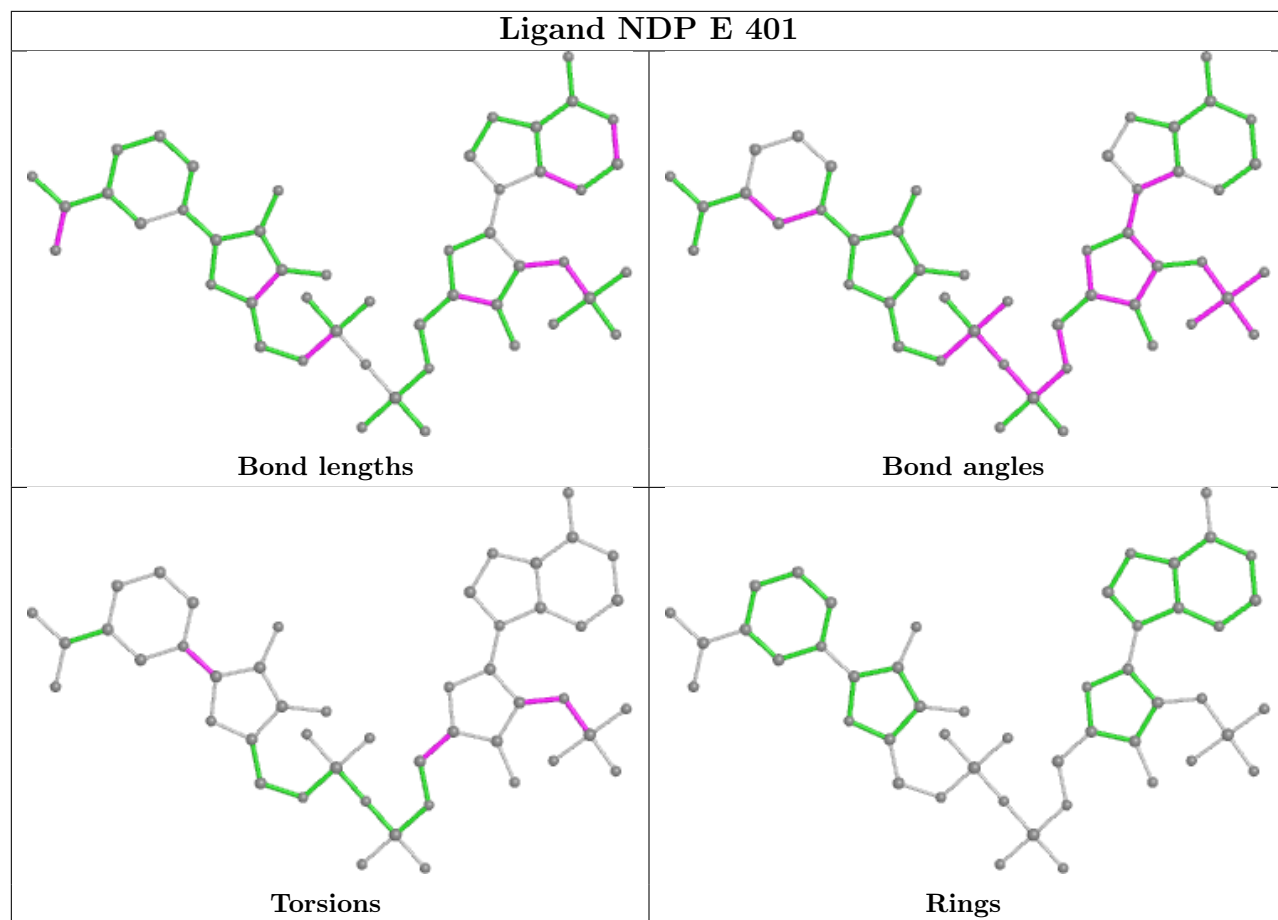
No monomer is involved in short contacts.

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.

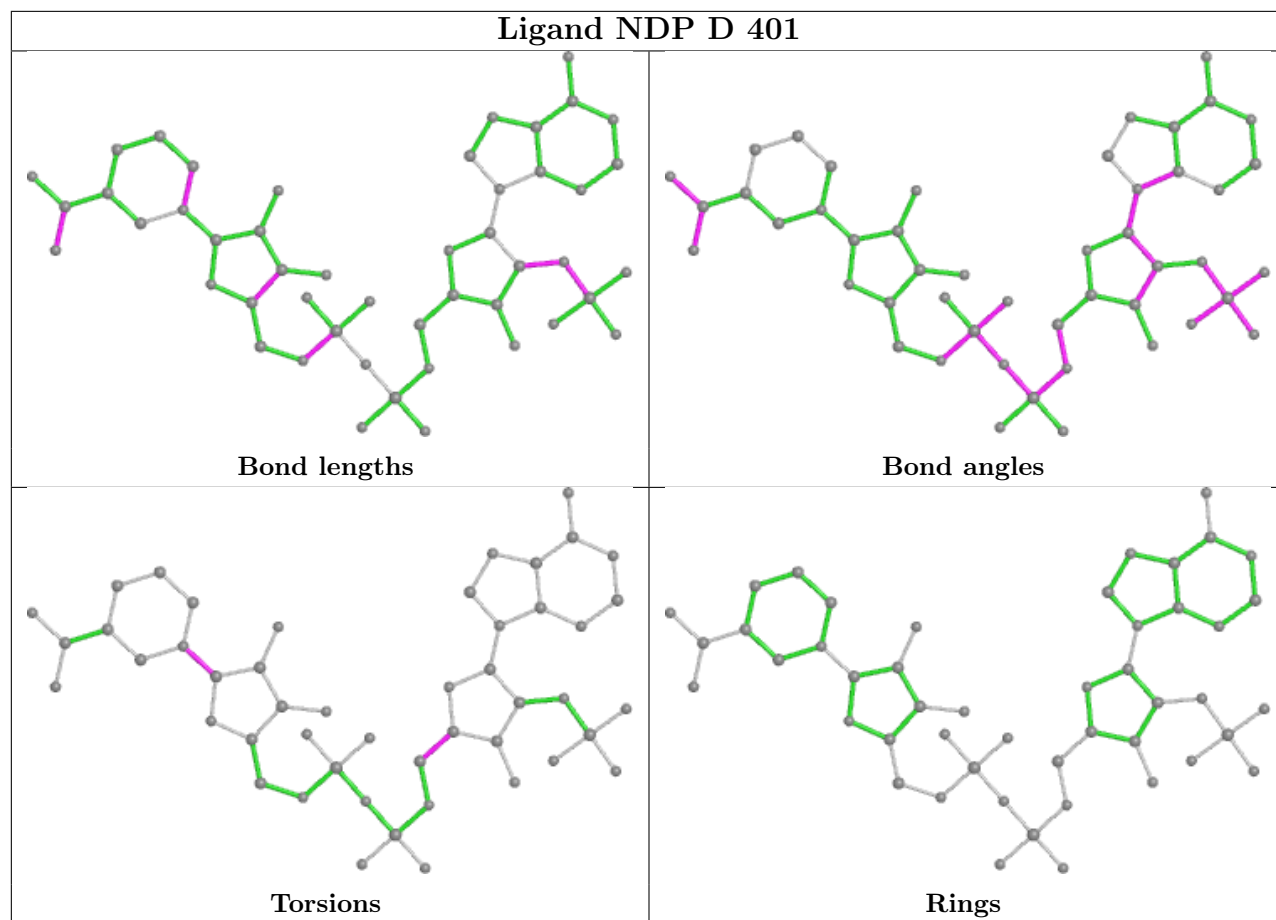












## 5.7 Other polymers [\(i\)](#)

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

### 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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	278/322 (86%)	0.13	11 (3%) 38 36	11, 27, 60, 77	0
1	B	279/322 (86%)	-0.24	6 (2%) 62 61	11, 21, 49, 82	0
1	C	277/322 (86%)	-0.16	7 (2%) 57 56	11, 20, 42, 66	0
1	D	279/322 (86%)	-0.13	6 (2%) 62 61	12, 21, 48, 72	0
1	E	275/322 (85%)	-0.11	2 (0%) 87 88	12, 25, 46, 68	0
All	All	1388/1610 (86%)	-0.10	32 (2%) 60 59	11, 23, 50, 82	0

All (32) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	-2	PHE	5.0
1	B	271	MET	4.8
1	A	38	ASP	4.7
1	E	27	ALA	4.7
1	A	37	MET	4.1
1	B	272	ALA	3.9
1	A	42	VAL	3.6
1	A	-3	TYR	3.4
1	E	25	LEU	3.0
1	C	-3	TYR	3.0
1	C	26	ALA	2.9
1	A	0	SER	2.8
1	A	272	ALA	2.6
1	D	41	THR	2.6
1	D	271	MET	2.4
1	D	268	LEU	2.3
1	A	50	VAL	2.3
1	A	40	ALA	2.3
1	B	143	VAL	2.3
1	C	27	ALA	2.3

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Mol	Chain	Res	Type	RSRZ
1	A	49	GLY	2.3
1	C	-1	GLN	2.3
1	D	77	PHE	2.2
1	D	143	VAL	2.2
1	C	28	HIS	2.2
1	C	272	ALA	2.2
1	C	0	SER	2.1
1	A	77	PHE	2.1
1	B	273	ASP	2.1
1	B	41	THR	2.1
1	B	270	SER	2.1
1	D	272	ALA	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](#)

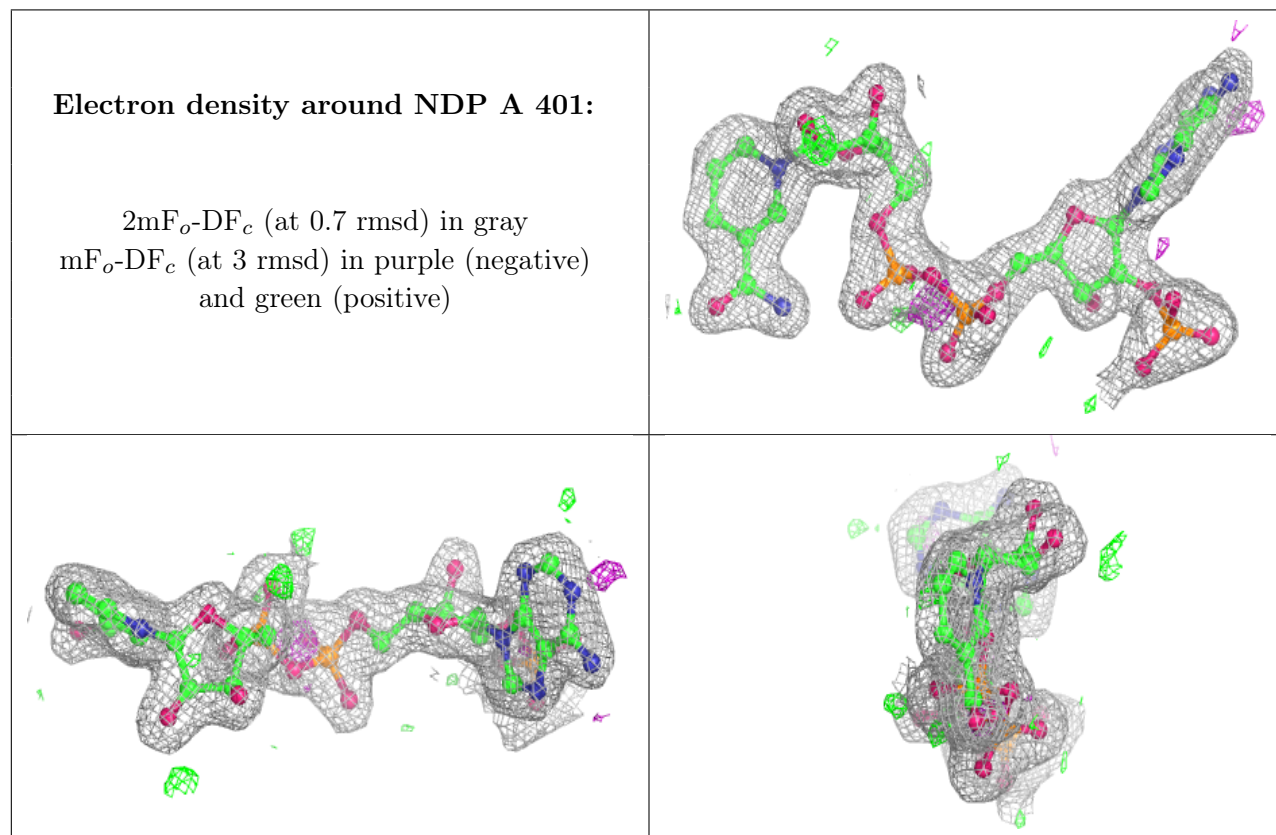
There are no monosaccharides in this entry.

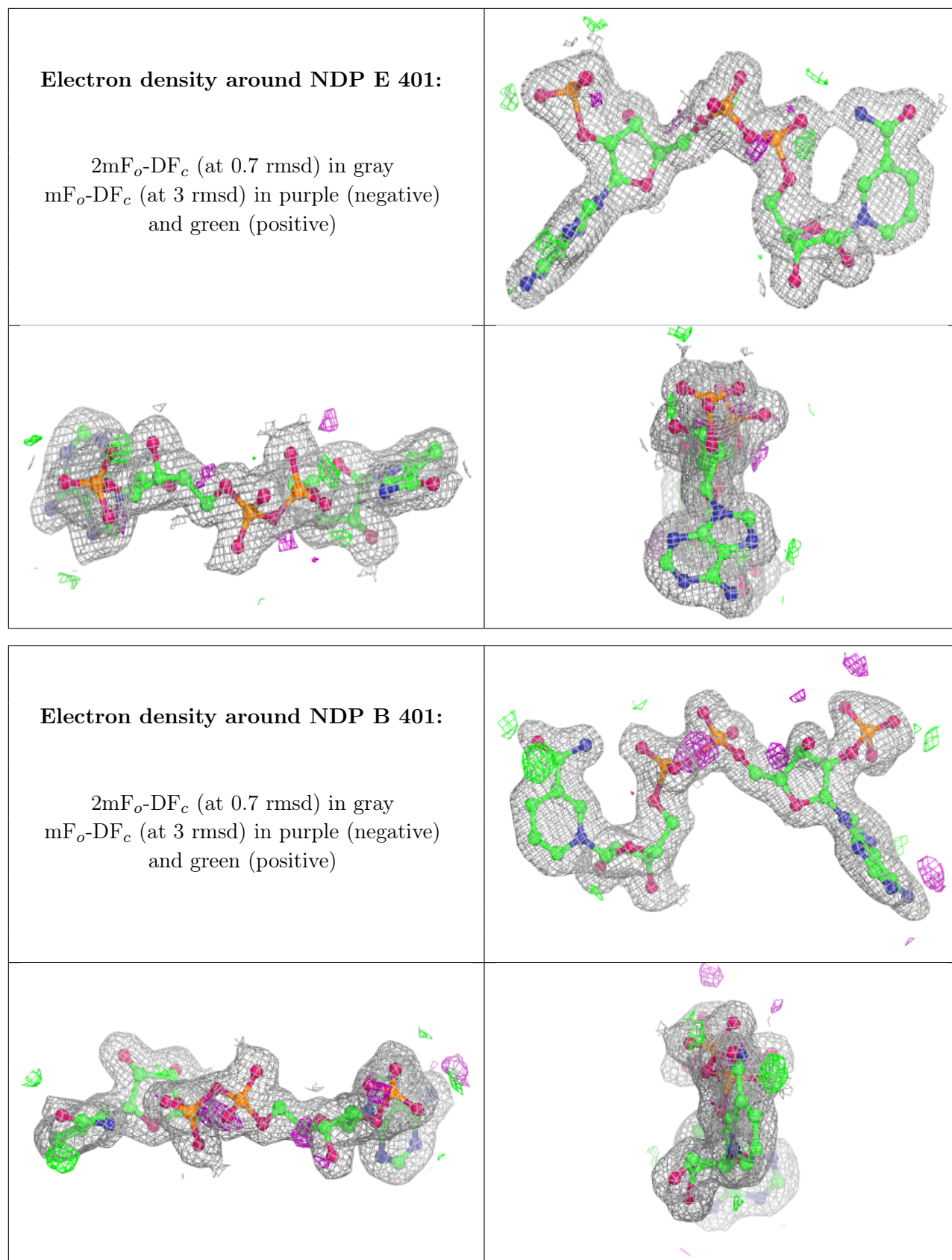
## 6.4 Ligands [i](#)

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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
3	TFB	B	402	8/8	0.94	0.10	20,25,31,37	0
3	TFB	C	402	8/8	0.94	0.14	18,30,35,38	0
3	TFB	E	402	8/8	0.94	0.10	20,27,37,46	0
4	PEG	C	403	7/7	0.94	0.14	39,40,44,45	0
2	NDP	A	401	48/48	0.95	0.11	18,30,59,65	0
3	TFB	A	402	8/8	0.96	0.10	18,23,25,26	0
2	NDP	E	401	48/48	0.97	0.08	16,23,30,40	0
3	TFB	D	402	8/8	0.97	0.10	17,21,27,30	0
2	NDP	B	401	48/48	0.97	0.09	15,25,42,50	0
2	NDP	D	401	48/48	0.97	0.08	18,23,46,55	0
2	NDP	C	401	48/48	0.98	0.09	13,17,23,31	0

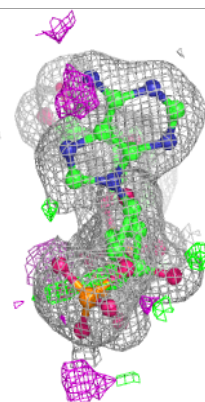
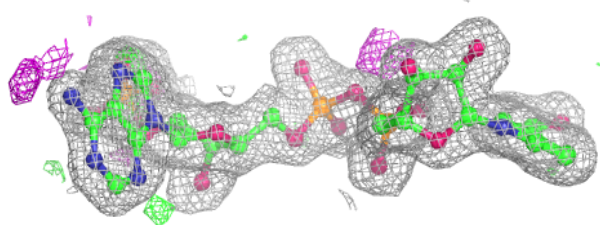
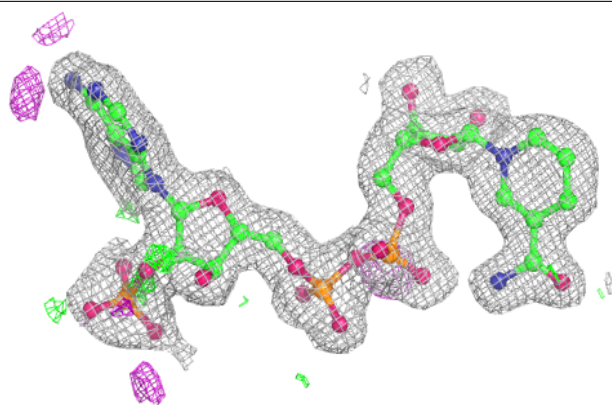
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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



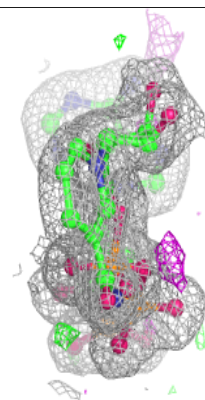
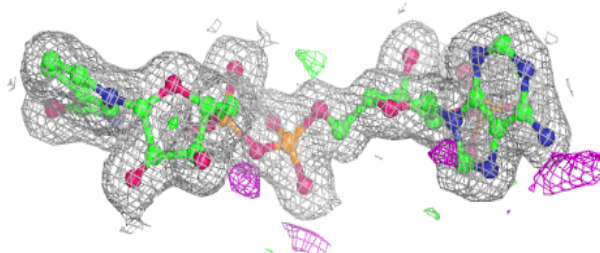
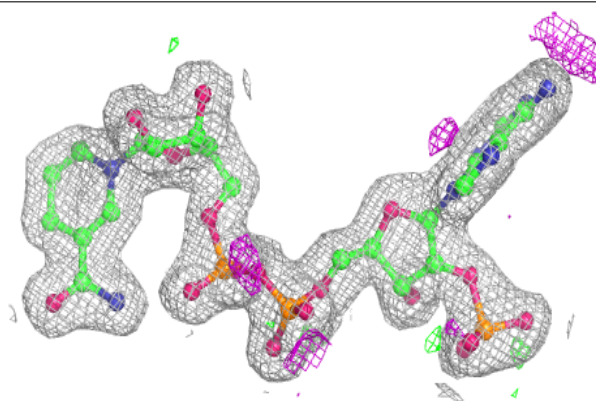


**Electron density around NDP D 401:**

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

**Electron density around NDP C 401:**

$2mF_o-DF_c$  (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.