



# Full wwPDB X-ray Structure Validation Report ⓘ

May 17, 2021 – 10:43 AM EDT

PDB ID : 6X3B  
Title : Structure of RMD from Pseudomonas aeruginosa complexed with NADPH  
Authors : Cook, P.D.; Nicholson, B.E.; McHugh, C.S.  
Deposited on : 2020-05-21  
Resolution : 1.91 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.

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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 : 2.18  
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) : 2.18

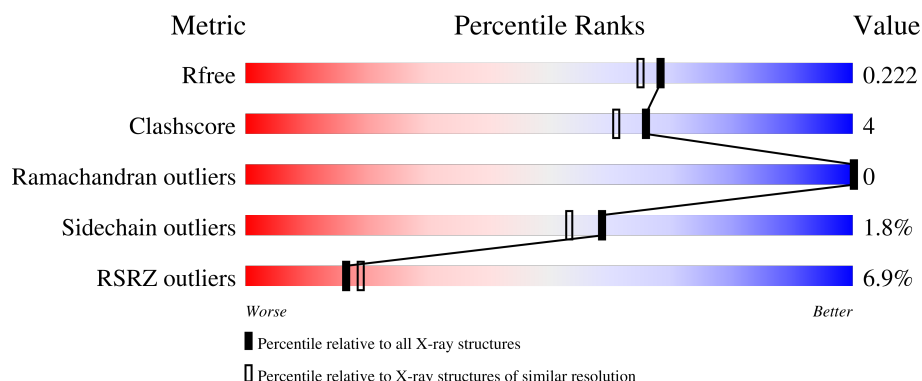
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.91 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	7937 (1.94-1.90)
Clashscore	141614	8644 (1.94-1.90)
Ramachandran outliers	138981	8530 (1.94-1.90)
Sidechain outliers	138945	8530 (1.94-1.90)
RSRZ outliers	127900	7793 (1.94-1.90)

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	324	<div> <div>2%</div> <div>89%</div> <div>7%</div> </div>
1	B	324	<div> <div>4%</div> <div>84%</div> <div>8%</div> <div>8%</div> </div>
1	C	324	<div> <div>10%</div> <div>77%</div> <div>11%</div> <div>11%</div> </div>
1	D	324	<div> <div>9%</div> <div>77%</div> <div>12%</div> <div>10%</div> </div>

## 2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 9919 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 GDP-6-deoxy-D-mannose reductase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	300	Total	C	N	O	S	0	2	0
			2338	1490	420	424	4			
1	B	297	Total	C	N	O	S	0	3	0
			2332	1483	417	429	3			
1	C	289	Total	C	N	O	S	0	2	0
			2237	1430	400	404	3			
1	D	292	Total	C	N	O	S	0	0	0
			2234	1427	397	407	3			

There are 80 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-19	MET	-	initiating methionine	UNP A0A071L2P8
A	-18	GLY	-	expression tag	UNP A0A071L2P8
A	-17	SER	-	expression tag	UNP A0A071L2P8
A	-16	SER	-	expression tag	UNP A0A071L2P8
A	-15	HIS	-	expression tag	UNP A0A071L2P8
A	-14	HIS	-	expression tag	UNP A0A071L2P8
A	-13	HIS	-	expression tag	UNP A0A071L2P8
A	-12	HIS	-	expression tag	UNP A0A071L2P8
A	-11	HIS	-	expression tag	UNP A0A071L2P8
A	-10	HIS	-	expression tag	UNP A0A071L2P8
A	-9	SER	-	expression tag	UNP A0A071L2P8
A	-8	SER	-	expression tag	UNP A0A071L2P8
A	-7	GLU	-	expression tag	UNP A0A071L2P8
A	-6	ASN	-	expression tag	UNP A0A071L2P8
A	-5	LEU	-	expression tag	UNP A0A071L2P8
A	-4	TYR	-	expression tag	UNP A0A071L2P8
A	-3	PHE	-	expression tag	UNP A0A071L2P8
A	-2	GLN	-	expression tag	UNP A0A071L2P8
A	-1	GLY	-	expression tag	UNP A0A071L2P8
A	0	HIS	-	expression tag	UNP A0A071L2P8
B	-19	MET	-	initiating methionine	UNP A0A071L2P8

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Chain	Residue	Modelled	Actual	Comment	Reference
B	-18	GLY	-	expression tag	UNP A0A071L2P8
B	-17	SER	-	expression tag	UNP A0A071L2P8
B	-16	SER	-	expression tag	UNP A0A071L2P8
B	-15	HIS	-	expression tag	UNP A0A071L2P8
B	-14	HIS	-	expression tag	UNP A0A071L2P8
B	-13	HIS	-	expression tag	UNP A0A071L2P8
B	-12	HIS	-	expression tag	UNP A0A071L2P8
B	-11	HIS	-	expression tag	UNP A0A071L2P8
B	-10	HIS	-	expression tag	UNP A0A071L2P8
B	-9	SER	-	expression tag	UNP A0A071L2P8
B	-8	SER	-	expression tag	UNP A0A071L2P8
B	-7	GLU	-	expression tag	UNP A0A071L2P8
B	-6	ASN	-	expression tag	UNP A0A071L2P8
B	-5	LEU	-	expression tag	UNP A0A071L2P8
B	-4	TYR	-	expression tag	UNP A0A071L2P8
B	-3	PHE	-	expression tag	UNP A0A071L2P8
B	-2	GLN	-	expression tag	UNP A0A071L2P8
B	-1	GLY	-	expression tag	UNP A0A071L2P8
B	0	HIS	-	expression tag	UNP A0A071L2P8
C	-19	MET	-	initiating methionine	UNP A0A071L2P8
C	-18	GLY	-	expression tag	UNP A0A071L2P8
C	-17	SER	-	expression tag	UNP A0A071L2P8
C	-16	SER	-	expression tag	UNP A0A071L2P8
C	-15	HIS	-	expression tag	UNP A0A071L2P8
C	-14	HIS	-	expression tag	UNP A0A071L2P8
C	-13	HIS	-	expression tag	UNP A0A071L2P8
C	-12	HIS	-	expression tag	UNP A0A071L2P8
C	-11	HIS	-	expression tag	UNP A0A071L2P8
C	-10	HIS	-	expression tag	UNP A0A071L2P8
C	-9	SER	-	expression tag	UNP A0A071L2P8
C	-8	SER	-	expression tag	UNP A0A071L2P8
C	-7	GLU	-	expression tag	UNP A0A071L2P8
C	-6	ASN	-	expression tag	UNP A0A071L2P8
C	-5	LEU	-	expression tag	UNP A0A071L2P8
C	-4	TYR	-	expression tag	UNP A0A071L2P8
C	-3	PHE	-	expression tag	UNP A0A071L2P8
C	-2	GLN	-	expression tag	UNP A0A071L2P8
C	-1	GLY	-	expression tag	UNP A0A071L2P8
C	0	HIS	-	expression tag	UNP A0A071L2P8
D	-19	MET	-	initiating methionine	UNP A0A071L2P8
D	-18	GLY	-	expression tag	UNP A0A071L2P8
D	-17	SER	-	expression tag	UNP A0A071L2P8

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Chain	Residue	Modelled	Actual	Comment	Reference
D	-16	SER	-	expression tag	UNP A0A071L2P8
D	-15	HIS	-	expression tag	UNP A0A071L2P8
D	-14	HIS	-	expression tag	UNP A0A071L2P8
D	-13	HIS	-	expression tag	UNP A0A071L2P8
D	-12	HIS	-	expression tag	UNP A0A071L2P8
D	-11	HIS	-	expression tag	UNP A0A071L2P8
D	-10	HIS	-	expression tag	UNP A0A071L2P8
D	-9	SER	-	expression tag	UNP A0A071L2P8
D	-8	SER	-	expression tag	UNP A0A071L2P8
D	-7	GLU	-	expression tag	UNP A0A071L2P8
D	-6	ASN	-	expression tag	UNP A0A071L2P8
D	-5	LEU	-	expression tag	UNP A0A071L2P8
D	-4	TYR	-	expression tag	UNP A0A071L2P8
D	-3	PHE	-	expression tag	UNP A0A071L2P8
D	-2	GLN	-	expression tag	UNP A0A071L2P8
D	-1	GLY	-	expression tag	UNP A0A071L2P8
D	0	HIS	-	expression tag	UNP A0A071L2P8

- # NDP

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

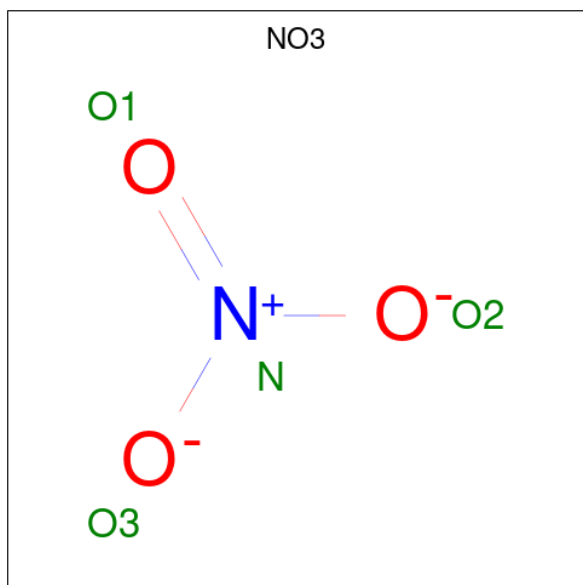


WORLD WIDE  
PDB  
PROTEIN DATA BANK

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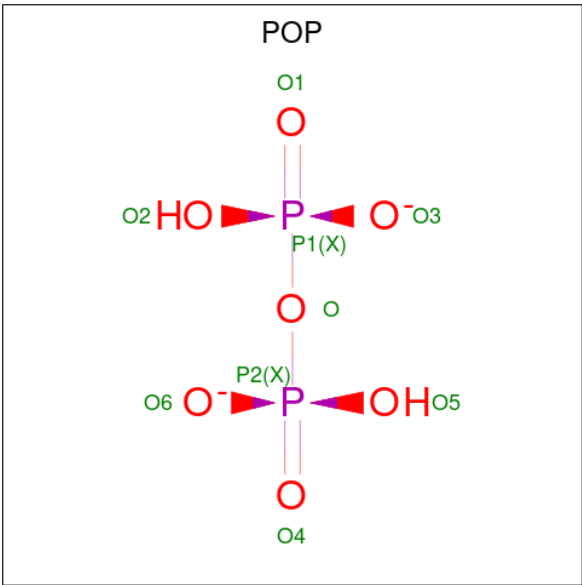
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	C	1	Total	C	N	O	P	0	0
			48	21	7	17	3		
2	D	1	Total	C	N	O	P	0	0
			48	21	7	17	3		
2	D	1	Total	C	N	O	P	0	0
			48	21	7	17	3		

- Molecule 3 is NITRATE ION (three-letter code: NO3) (formula: NO<sub>3</sub>).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	N	O	0	0
			4	1	3		

- Molecule 4 is PYROPHOSPHATE 2- (three-letter code: POP) (formula: H<sub>2</sub>O<sub>7</sub>P<sub>2</sub>).

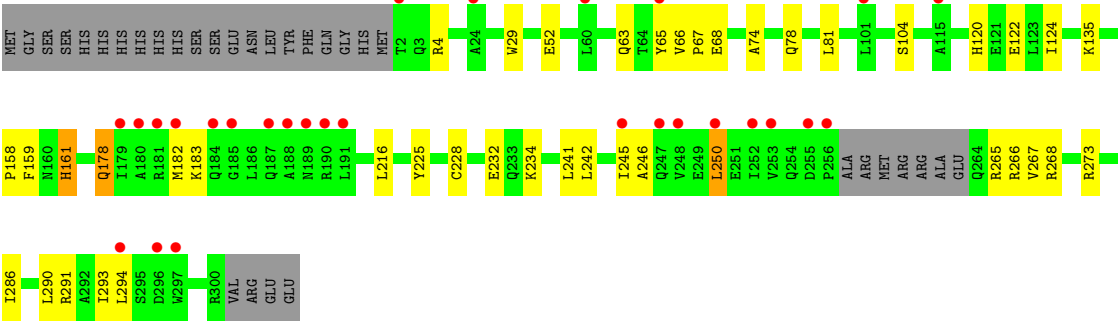
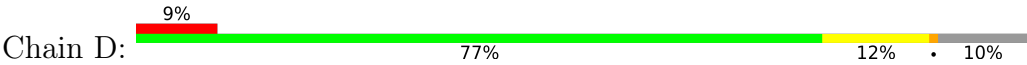


Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	B	1	Total	O	P	0	0
			9	7	2		

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	178	Total	O	0	0
			178	178		
5	B	176	Total	O	0	0
			176	176		
5	C	82	Total	O	0	0
			82	82		
5	D	89	Total	O	0	0
			89	89		





## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	97.68Å 54.05Å 137.92Å 90.00° 107.70° 90.00°	Depositor
Resolution (Å)	34.03 – 1.91 34.03 – 1.91	Depositor EDS
% Data completeness (in resolution range)	98.8 (34.03-1.91) 98.9 (34.03-1.91)	Depositor EDS
$R_{merge}$	0.10	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.03 (at 1.91Å)	Xtriage
Refinement program	PHENIX 1.11.1 _2575	Depositor
R, $R_{free}$	0.187 , 0.224 0.188 , 0.222	Depositor DCC
$R_{free}$ test set	5278 reflections (4.99%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	27.0	Xtriage
Anisotropy	0.270	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.35 , 46.3	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	9919	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	35.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.25% 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: POP, NDP, NO3

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	0.41	0/2393	0.56	0/3256
1	B	0.46	0/2383	0.59	0/3243
1	C	0.39	0/2288	0.53	0/3116
1	D	0.43	0/2285	0.53	0/3116
All	All	0.42	0/9349	0.55	0/12731

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	A	2338	0	2328	7	0
1	B	2332	0	2307	16	0
1	C	2237	0	2215	23	0
1	D	2234	0	2196	31	0
2	A	48	0	26	2	0
2	B	48	0	26	1	0
2	C	48	0	26	0	0
2	D	96	0	52	3	0
3	A	4	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	B	9	0	0	0	0
5	A	178	0	0	0	0
5	B	176	0	0	0	0
5	C	82	0	0	0	0
5	D	89	0	0	0	0
All	All	9919	0	9176	75	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 4.

All (75) 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:D:250:LEU:H	1:D:250:LEU:HD13	1.43	0.84
1:D:250:LEU:H	1:D:250:LEU:CD1	2.05	0.69
1:D:250:LEU:CD1	1:D:250:LEU:N	2.62	0.63
1:B:236:ARG:O	1:B:240:GLU:HG2	2.01	0.60
1:C:177:ARG:HG3	1:C:297:TRP:CZ3	2.40	0.57
1:B:250:LEU:HD22	1:B:251:GLU:H	1.72	0.55
1:D:267:VAL:HG11	2:D:402:NDP:H72N	1.71	0.55
1:D:66:VAL:HB	1:D:67:PRO:HD3	1.88	0.54
1:B:230:GLY:HA2	1:B:269:GLY:O	2.08	0.53
1:B:249:GLU:O	1:B:249:GLU:HG3	2.07	0.53
1:C:177:ARG:HG3	1:C:297:TRP:CE3	2.44	0.53
1:B:158:PRO:HG2	2:B:401:NDP:H6N	1.91	0.52
1:B:263:GLU:OE1	1:B:263:GLU:N	2.22	0.52
1:D:65:TYR:HB3	1:D:68:GLU:HB3	1.93	0.50
1:B:214:ARG:HB3	1:B:278:THR:HB	1.95	0.48
1:D:250:LEU:HD13	1:D:250:LEU:N	2.14	0.48
1:C:27:THR:HB	1:C:28:PRO:HD2	1.96	0.48
1:D:120:HIS:CE1	1:D:122:GLU:HB2	2.48	0.48
1:D:74:ALA:O	1:D:78:GLN:HG2	2.14	0.48
1:D:241:LEU:HD23	1:D:290:LEU:HD12	1.95	0.47
1:D:265:ARG:HD2	1:D:266:ARG:HG3	1.96	0.47
1:D:158:PRO:HB2	1:D:161:HIS:HE1	1.79	0.47
1:C:232:GLU:HG2	1:C:268:ARG:HB2	1.95	0.47
1:C:167:LYS:HG3	1:C:169:SER:H	1.79	0.46
1:C:214:ARG:HB3	1:C:278:THR:HB	1.97	0.46
1:D:250:LEU:C	1:D:250:LEU:HD22	2.35	0.46
1:D:183:LYS:HD2	1:D:246:ALA:O	2.16	0.46
1:C:178:GLN:O	1:C:182:MET:HG3	2.16	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:245:ILE:HD13	1:D:291:ARG:HG3	1.98	0.45
1:D:232:GLU:HG3	1:D:268:ARG:HD3	1.97	0.45
1:C:120:HIS:CE1	1:C:122:GLU:HB2	2.51	0.45
1:B:240:GLU:HA	1:B:240:GLU:OE1	2.17	0.45
1:C:4:ARG:HD3	1:C:52:GLU:OE1	2.15	0.45
1:B:74:ALA:O	1:B:78:GLN:HG2	2.16	0.45
1:C:193:VAL:HG21	1:C:196:ILE:HD13	1.98	0.45
1:D:161:HIS:CE1	2:D:401:NDP:H42N	2.52	0.45
1:B:158:PRO:HB2	1:B:161:HIS:HE1	1.82	0.44
1:C:65:TYR:CZ	1:C:67:PRO:HG2	2.52	0.44
1:B:232:GLU:HG3	1:B:268:ARG:HD3	1.99	0.44
1:A:230:GLY:HA2	1:A:269:GLY:O	2.17	0.44
1:D:178:GLN:O	1:D:182:MET:HG3	2.17	0.44
1:C:66:VAL:HB	1:C:67:PRO:HD3	2.00	0.43
1:A:161:HIS:CE1	2:A:401:NDP:H42N	2.53	0.43
1:A:74:ALA:O	1:A:78:GLN:HG2	2.19	0.43
1:D:104:SER:HA	1:D:135:LYS:HE3	2.01	0.43
1:D:234:LYS:HE3	1:D:234:LYS:HB2	1.78	0.43
1:A:191:LEU:HD12	1:A:191:LEU:HA	1.90	0.42
1:B:294:LEU:HD23	1:B:294:LEU:HA	1.90	0.42
1:D:135:LYS:NZ	2:D:401:NDP:O3D	2.52	0.42
1:D:286:ILE:HD12	1:D:286:ILE:O	2.20	0.42
1:A:158:PRO:HB2	1:A:161:HIS:HE1	1.84	0.42
1:A:241:LEU:HD23	1:A:290:LEU:HD12	2.02	0.42
1:C:77:LEU:HD22	1:D:81:LEU:HD21	2.01	0.42
1:D:4:ARG:NH1	1:D:52:GLU:HB3	2.34	0.42
1:B:275:HIS:CE1	1:B:281:LYS:HE3	2.55	0.42
1:B:182:MET:SD	1:B:189:ASN:HA	2.60	0.42
1:D:225:TYR:CE2	1:D:273:ARG:HG2	2.55	0.41
1:C:18:LEU:HA	1:C:209:LEU:HD13	2.01	0.41
1:D:29:TRP:CZ2	1:D:216:LEU:HB3	2.55	0.41
1:C:232:GLU:HG3	1:C:268:ARG:HD3	2.02	0.41
1:D:159:PHE:CD1	1:D:228:CYS:HB3	2.56	0.41
1:C:232:GLU:CG	1:C:268:ARG:HB2	2.51	0.41
1:C:124:ILE:HD13	1:D:124:ILE:HD13	2.03	0.41
1:C:287:LYS:O	1:C:291:ARG:HG3	2.21	0.41
1:C:285:THR:OG1	1:C:288:GLN:HG3	2.21	0.41
1:C:170:PHE:N	1:C:170:PHE:CD1	2.90	0.40
1:B:249:GLU:O	1:B:249:GLU:CG	2.69	0.40
1:C:6:PHE:O	1:C:57:VAL:HA	2.21	0.40
1:C:241:LEU:O	1:C:245:ILE:HG13	2.22	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:242:LEU:HD22	1:D:294:LEU:HG	2.03	0.40
1:C:74:ALA:O	1:C:78:GLN:HG2	2.21	0.40
1:B:178:GLN:O	1:B:182:MET:HG3	2.22	0.40
1:D:158:PRO:HB2	1:D:161:HIS:CE1	2.57	0.40
1:D:245:ILE:HD13	1:D:291:ARG:CG	2.51	0.40
1:A:105:SER:HB2	2:A:401:NDP:H6N	2.04	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	298/324 (92%)	293 (98%)	5 (2%)	0	100	100
1	B	296/324 (91%)	292 (99%)	4 (1%)	0	100	100
1	C	287/324 (89%)	280 (98%)	7 (2%)	0	100	100
1	D	288/324 (89%)	282 (98%)	6 (2%)	0	100	100
All	All	1169/1296 (90%)	1147 (98%)	22 (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	241/268 (90%)	239 (99%)	2 (1%)	81	81
1	B	241/268 (90%)	236 (98%)	5 (2%)	53	46
1	C	228/268 (85%)	223 (98%)	5 (2%)	52	45
1	D	226/268 (84%)	221 (98%)	5 (2%)	52	45
All	All	936/1072 (87%)	919 (98%)	17 (2%)	59	53

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

Mol	Chain	Res	Type
1	A	63	GLN
1	A	144	GLN
1	B	63	GLN
1	B	144	GLN
1	B	250	LEU
1	B	298	GLU
1	B	300	ARG
1	C	63	GLN
1	C	161	HIS
1	C	167	LYS
1	C	169	SER
1	C	250	LEU
1	D	63	GLN
1	D	161	HIS
1	D	178	GLN
1	D	250	LEU
1	D	293	ILE

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 [i](#)

There are no monosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

7 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	0.62	0	53,80,80	0.56	0
2	NDP	D	402	-	45,52,52	0.60	0	53,80,80	0.53	0
2	NDP	D	401	-	45,52,52	0.62	0	53,80,80	0.54	0
2	NDP	C	401	-	45,52,52	0.61	0	53,80,80	0.54	0
2	NDP	B	401	-	45,52,52	0.61	0	53,80,80	0.54	0
4	POP	B	402	-	6,8,8	0.82	0	13,13,13	0.97	0
3	NO3	A	402	-	1,3,3	0.92	0	0,3,3	0.00	-

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	-	-	6/30/77/77	0/5/5/5
2	NDP	D	402	-	-	5/30/77/77	0/5/5/5
2	NDP	D	401	-	-	5/30/77/77	0/5/5/5
2	NDP	C	401	-	-	8/30/77/77	0/5/5/5
2	NDP	B	401	-	-	8/30/77/77	0/5/5/5
4	POP	B	402	-	-	0/6/6/6	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (32) torsion outliers are listed below:

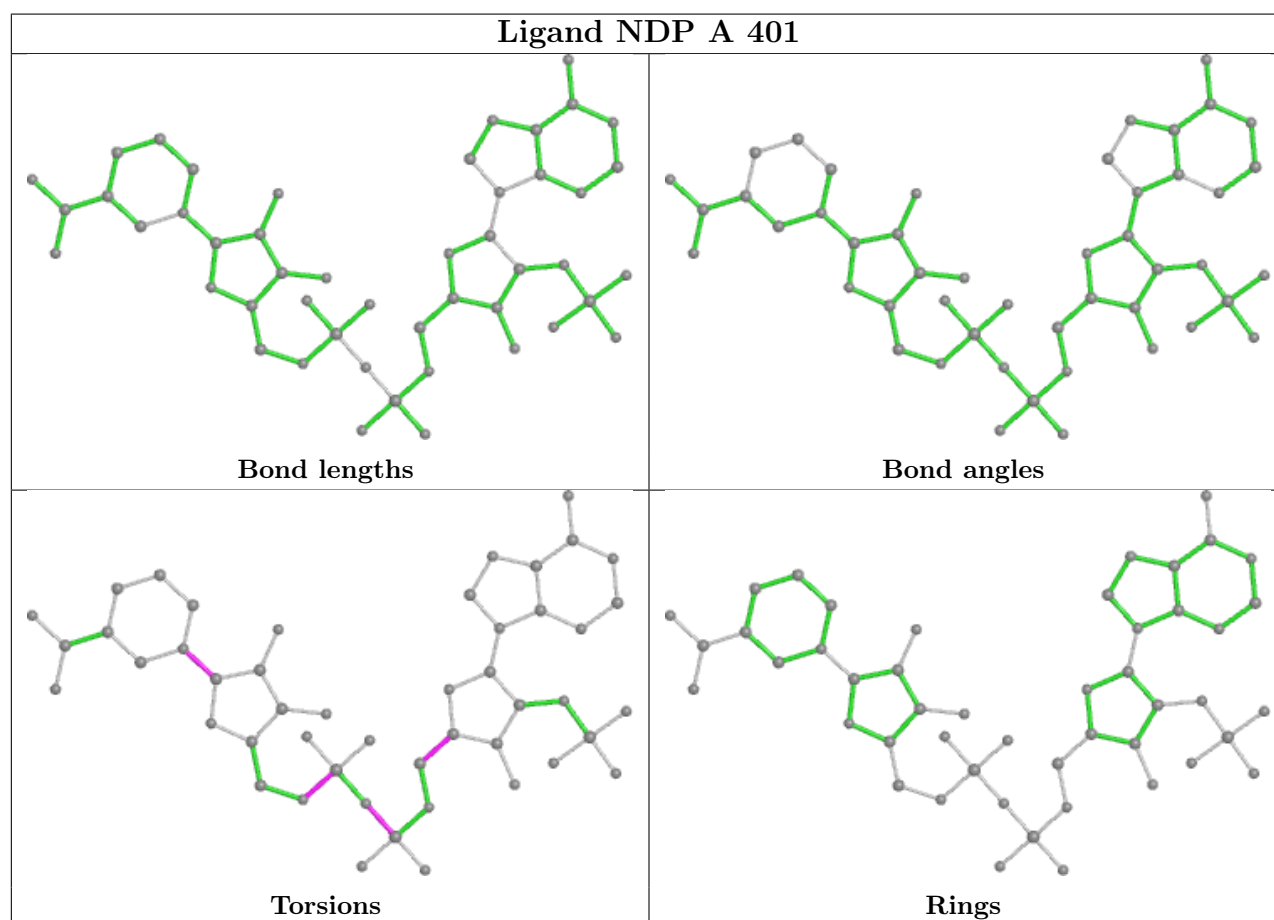
Mol	Chain	Res	Type	Atoms
2	A	401	NDP	C5D-O5D-PN-O1N
2	B	401	NDP	C5D-O5D-PN-O1N
2	C	401	NDP	C2B-O2B-P2B-O2X
2	C	401	NDP	C5D-O5D-PN-O1N
2	A	401	NDP	O4D-C1D-N1N-C6N
2	D	401	NDP	O4D-C1D-N1N-C6N
2	C	401	NDP	O4D-C1D-N1N-C6N
2	C	401	NDP	C2B-O2B-P2B-O1X
2	A	401	NDP	C5D-O5D-PN-O3
2	B	401	NDP	C2B-O2B-P2B-O3X
2	B	401	NDP	C5D-O5D-PN-O3
2	C	401	NDP	C5D-O5D-PN-O3
2	C	401	NDP	PN-O3-PA-O2A
2	D	402	NDP	PN-O3-PA-O1A
2	B	401	NDP	O4D-C1D-N1N-C6N
2	A	401	NDP	PN-O3-PA-O1A
2	A	401	NDP	PN-O3-PA-O2A
2	B	401	NDP	PN-O3-PA-O2A
2	D	401	NDP	PN-O3-PA-O1A
2	D	401	NDP	PN-O3-PA-O2A
2	D	402	NDP	O4D-C1D-N1N-C6N
2	D	402	NDP	C2D-C1D-N1N-C6N
2	B	401	NDP	PN-O3-PA-O1A
2	A	401	NDP	O4B-C4B-C5B-O5B
2	B	401	NDP	O4B-C4B-C5B-O5B
2	C	401	NDP	O4B-C4B-C5B-O5B
2	D	401	NDP	C5D-O5D-PN-O3
2	D	402	NDP	C2B-O2B-P2B-O2X
2	D	401	NDP	O4B-C4B-C5B-O5B
2	C	401	NDP	PN-O3-PA-O1A
2	D	402	NDP	PN-O3-PA-O2A
2	B	401	NDP	C5D-O5D-PN-O2N

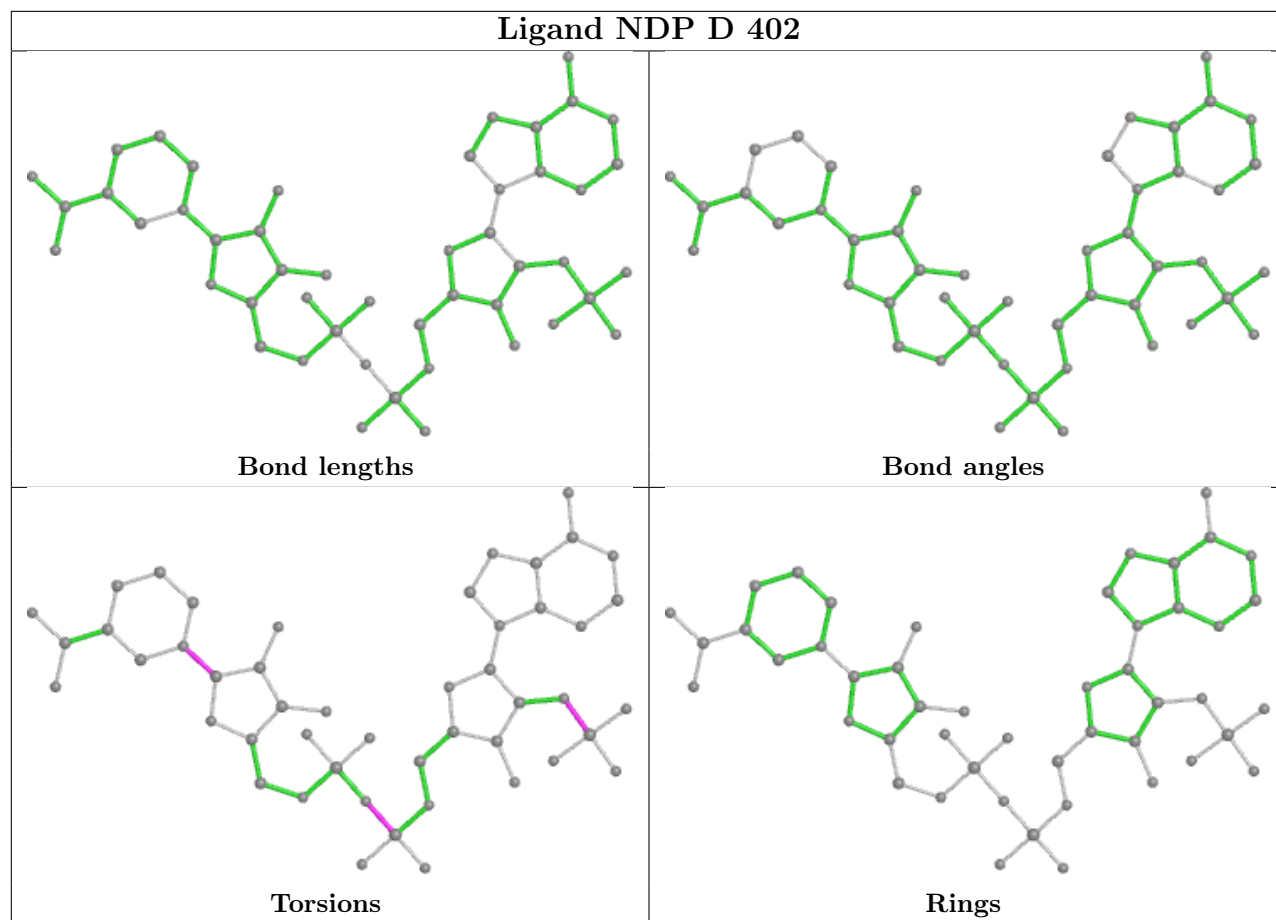
There are no ring outliers.

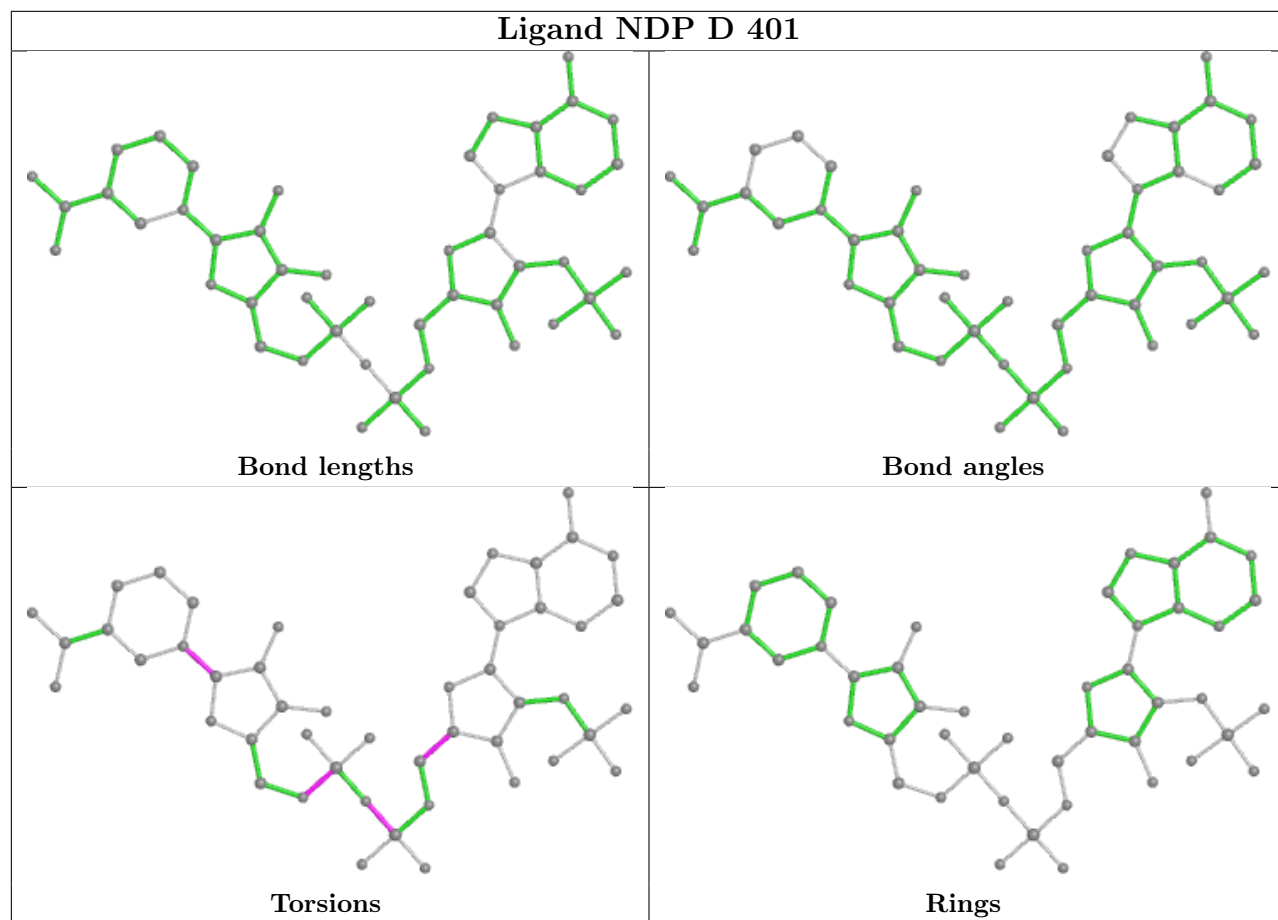
4 monomers are involved in 6 short contacts:

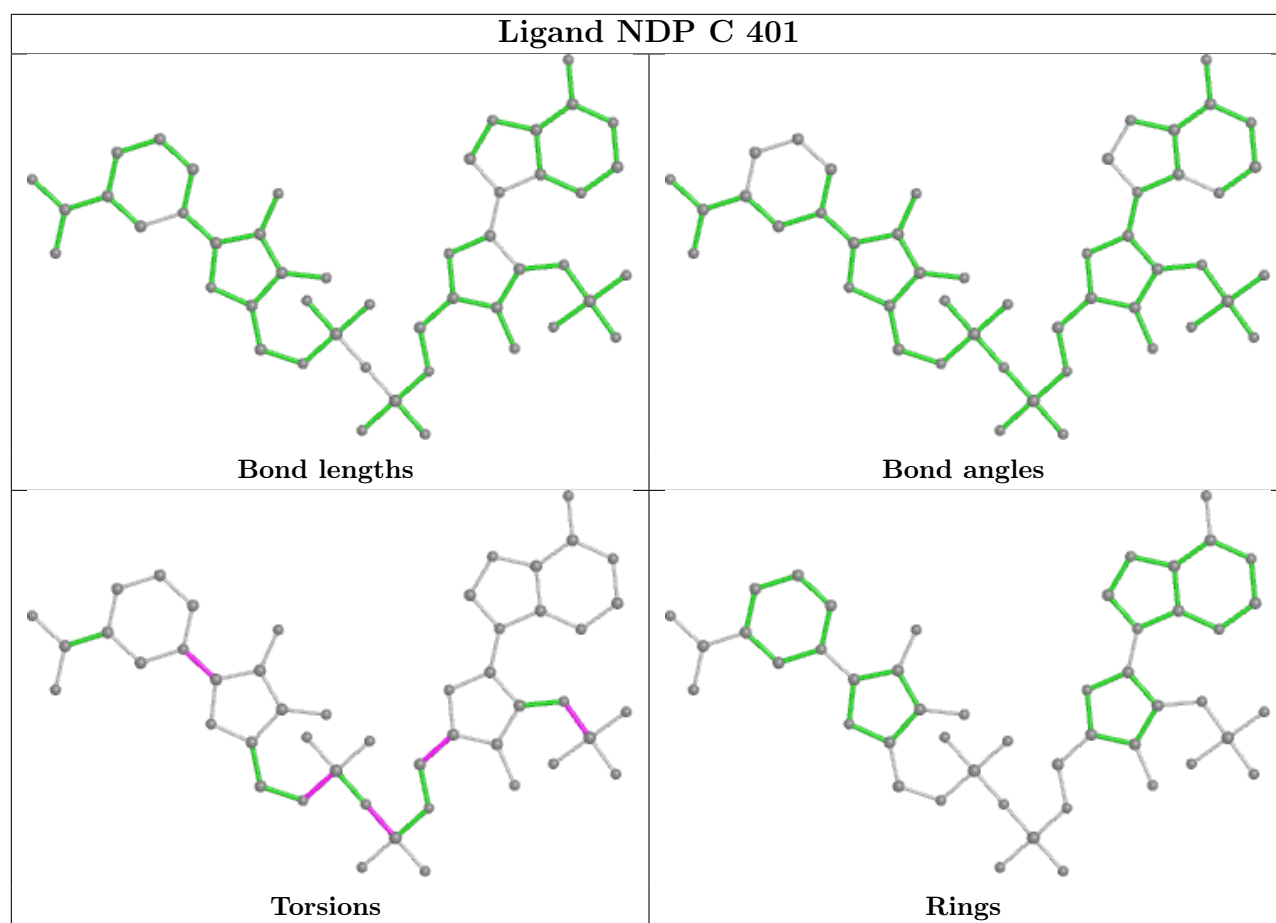
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	401	NDP	2	0
2	D	402	NDP	1	0
2	D	401	NDP	2	0
2	B	401	NDP	1	0

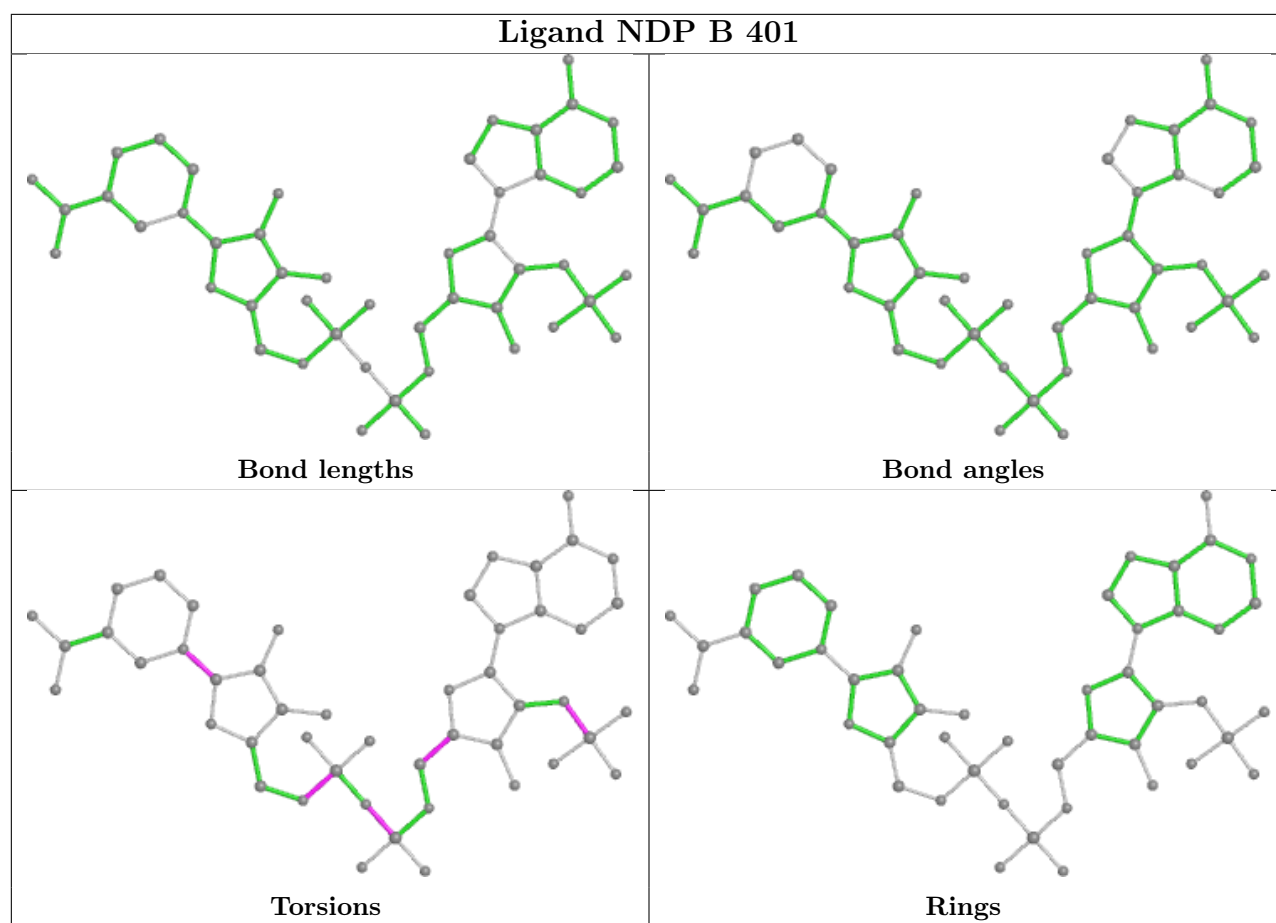
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

### 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	300/324 (92%)	-0.11	6 (2%) 65 68	16, 26, 48, 60	0
1	B	297/324 (91%)	0.15	14 (4%) 31 34	15, 25, 58, 73	0
1	C	289/324 (89%)	0.50	33 (11%) 5 6	23, 40, 69, 78	0
1	D	292/324 (90%)	0.52	28 (9%) 8 9	24, 37, 71, 84	0
All	All	1178/1296 (90%)	0.26	81 (6%) 16 19	15, 32, 66, 84	0

All (81) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	185	GLY	6.3
1	C	191	LEU	6.2
1	D	180	ALA	6.0
1	D	179	ILE	4.8
1	C	297	TRP	4.7
1	C	188	ALA	4.6
1	C	193	VAL	4.3
1	D	188	ALA	4.2
1	B	259	MET	4.2
1	D	245	ILE	4.1
1	C	186	LEU	4.1
1	D	294	LEU	4.1
1	D	115	ALA	3.9
1	B	26	HIS	3.8
1	D	255	ASP	3.7
1	D	253	VAL	3.7
1	C	184	GLN	3.7
1	D	250	LEU	3.6
1	D	252	ILE	3.5
1	D	181	ARG	3.5
1	C	21	TYR	3.4

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Mol	Chain	Res	Type	RSRZ
1	C	247	GLN	3.3
1	D	247	GLN	3.3
1	B	190	ARG	3.3
1	B	192	GLU	3.2
1	D	184	GLN	3.2
1	C	179	ILE	3.1
1	D	182	MET	3.1
1	C	26	HIS	3.0
1	D	187	GLN	3.0
1	C	24	ALA	2.9
1	D	297	TRP	2.9
1	B	299	SER	2.9
1	D	190	ARG	2.9
1	C	250	LEU	2.8
1	C	249	GLU	2.8
1	C	170	PHE	2.7
1	C	192	GLU	2.7
1	B	301	VAL	2.7
1	C	65	TYR	2.6
1	C	295	SER	2.6
1	D	189	ASN	2.6
1	B	300	ARG	2.6
1	D	185	GLY	2.6
1	D	191	LEU	2.5
1	C	299	SER	2.5
1	D	2	THR	2.5
1	A	65	TYR	2.5
1	D	65	TYR	2.4
1	C	177	ARG	2.4
1	C	189	ASN	2.4
1	D	24	ALA	2.4
1	C	252	ILE	2.4
1	C	298	GLU	2.4
1	C	197	ASP	2.4
1	D	256	PRO	2.4
1	A	186	LEU	2.4
1	C	253	VAL	2.4
1	A	262	ALA	2.4
1	B	249	GLU	2.4
1	D	248	VAL	2.4
1	D	296	ASP	2.3
1	A	301	VAL	2.3

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Mol	Chain	Res	Type	RSRZ
1	C	190	ARG	2.3
1	C	34	VAL	2.3
1	B	263	GLU	2.3
1	C	169	SER	2.2
1	B	159	PHE	2.2
1	C	181	ARG	2.2
1	B	103	ILE	2.1
1	B	298	GLU	2.1
1	D	60	LEU	2.1
1	A	208	VAL	2.1
1	B	250	LEU	2.1
1	C	25	ALA	2.1
1	C	194	GLY	2.1
1	A	299	SER	2.1
1	C	171	VAL	2.0
1	D	101	LEU	2.0
1	B	156	ALA	2.0
1	C	180	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.

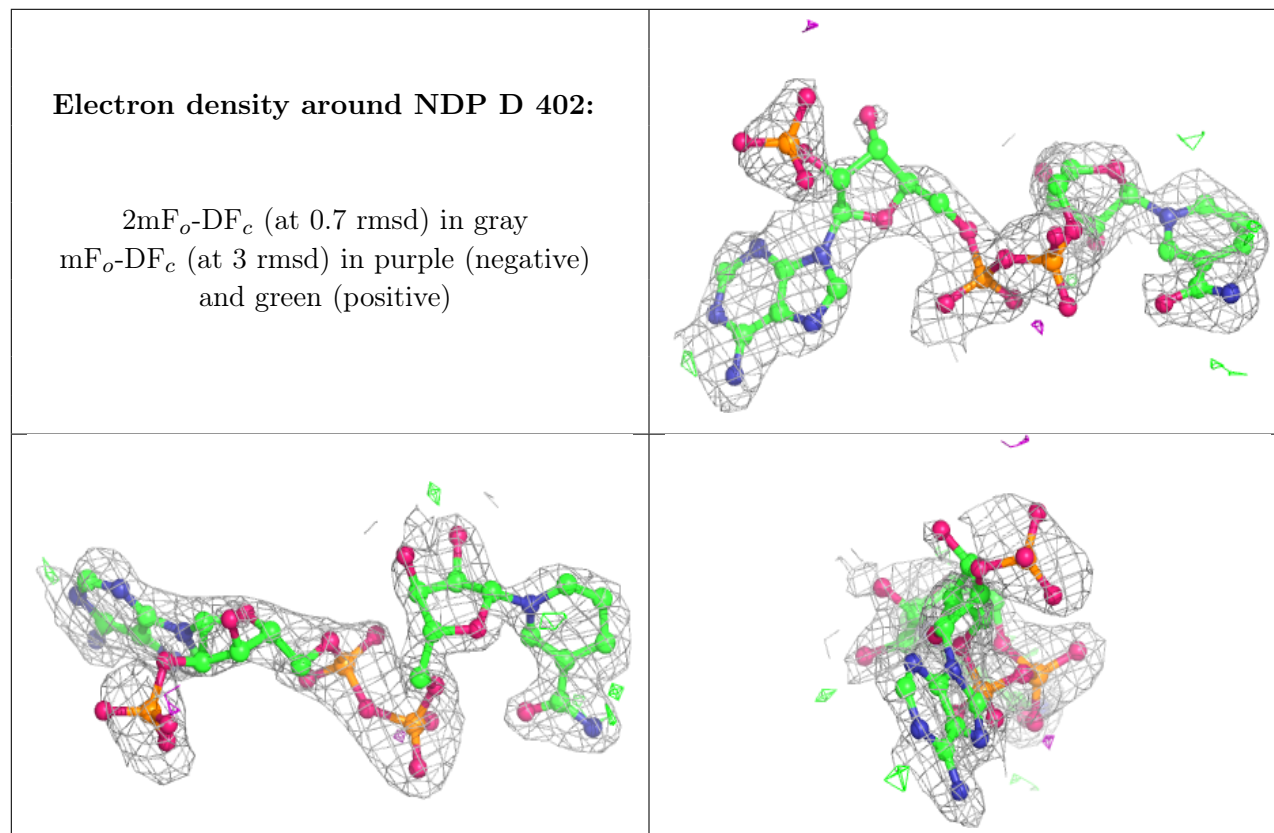
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
3	NO3	A	402	4/4	0.75	0.21	38,40,41,52	0
2	NDP	D	402	48/48	0.79	0.20	29,54,69,74	48
4	POP	B	402	9/9	0.92	0.12	30,32,35,35	9
2	NDP	D	401	48/48	0.95	0.13	28,36,46,48	0
2	NDP	C	401	48/48	0.95	0.10	28,37,51,55	0

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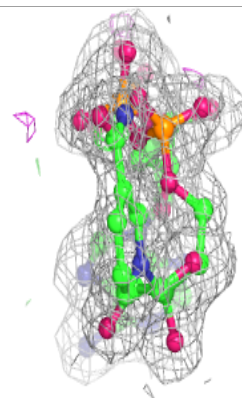
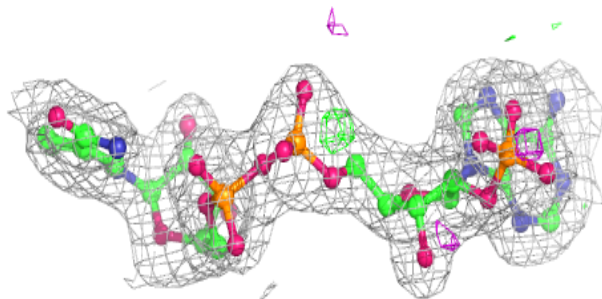
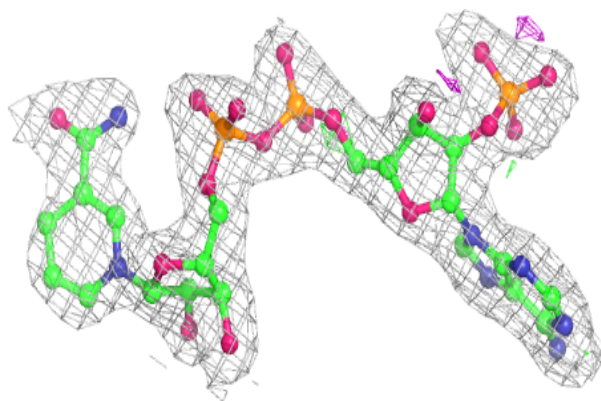
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
2	NDP	B	401	48/48	0.96	0.12	18,23,31,48	0
2	NDP	A	401	48/48	0.97	0.10	17,22,32,43	0

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.

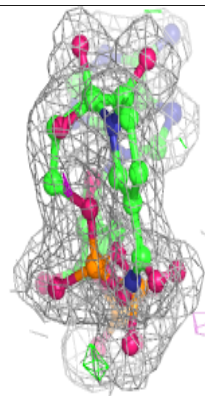
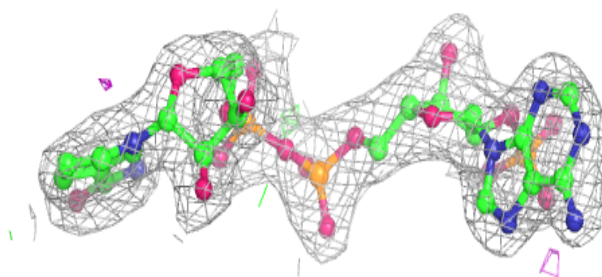
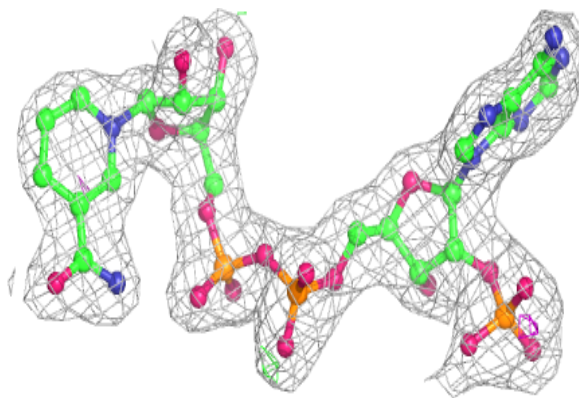


**Electron density around NDP D 401:**

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

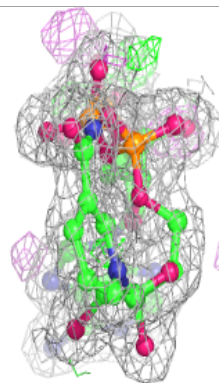
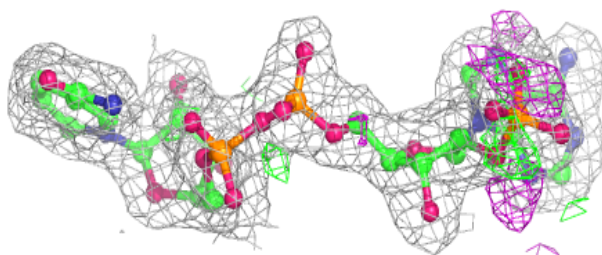
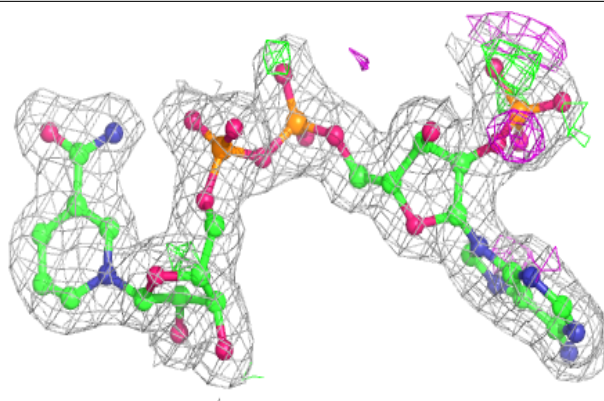
**Electron density around NDP C 401:**

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

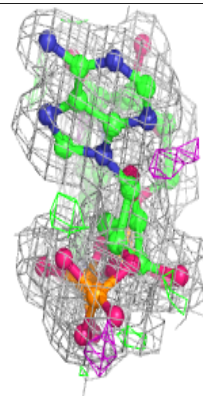
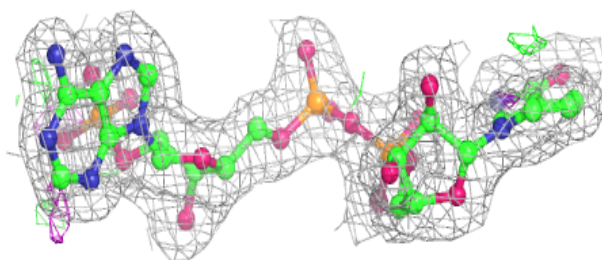
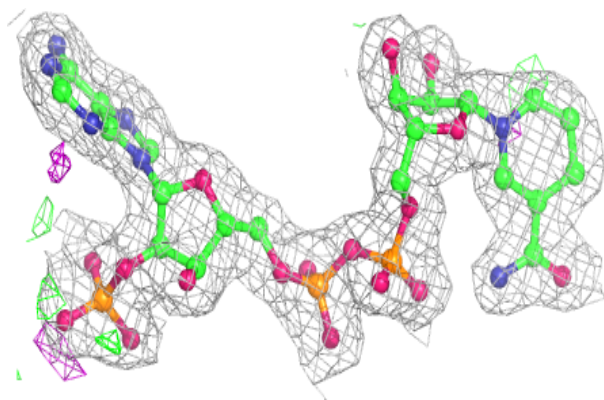


**Electron density around NDP B 401:**

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

**Electron density around NDP A 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.