Full wwPDB X-ray Structure Validation Report (i)

Dec 3, 2023 – 01:31 pm GMT

PDB ID	:	2BF7
Title	:	Leishmania major pteridine reductase 1 in complex with NADP and biopterin
Authors	:	Schuettelkopf, A.W.; Hunter, W.N.
Deposited on	:	2004-12-06
Resolution	:	2.40 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 (i) 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 (i)) were used in the production of this report:

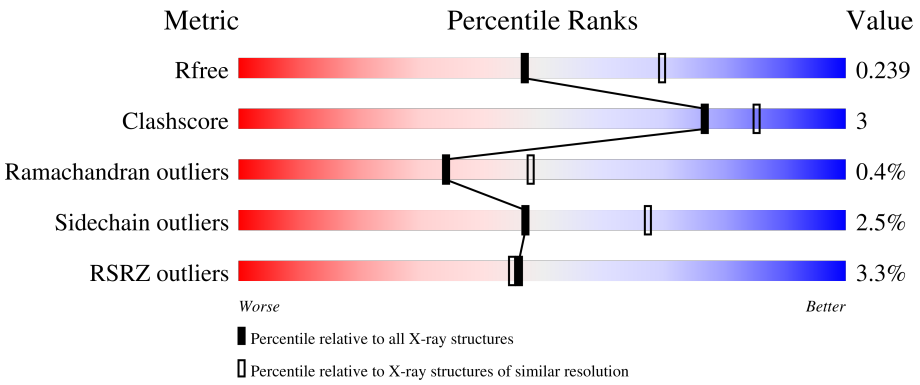
MolProbity	:	4.02b-467
Mogul	:	1.8.4, CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.36
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 2.40 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	3907 (2.40-2.40)
Clashscore	141614	4398 (2.40-2.40)
Ramachandran outliers	138981	4318 (2.40-2.40)
Sidechain outliers	138945	4319 (2.40-2.40)
RSRZ outliers	127900	3811 (2.40-2.40)

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	288	3% 84% 7% 8%
1	B	288	4% 83% 8% 8%
1	C	288	2% 80% 6% • 12%
1	D	288	2% 80% 8% 12%

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
4	EDO	C	1291	-	-	X	-

2 Entry composition (i)

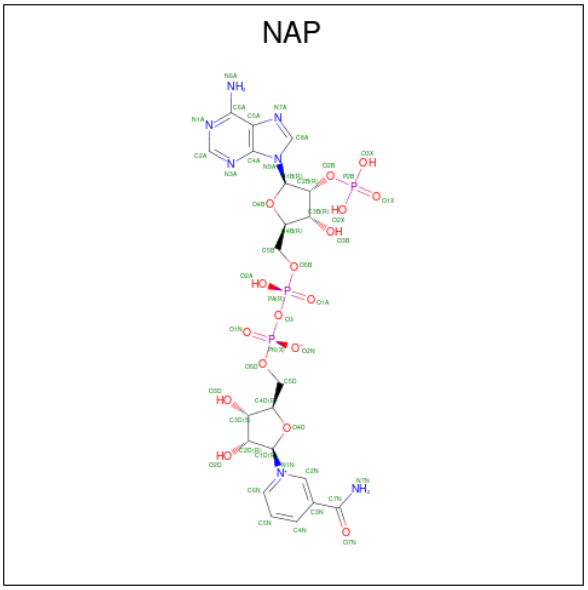
There are 5 unique types of molecules in this entry. The entry contains 8259 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 PTERIDINE REDUCTASE 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	265	1973	1244	349	369	11	0	0	0
1	B	265	1974	1245	349	369	11	0	0	0
1	C	253	1877	1185	333	349	10	0	0	0
1	D	253	1887	1190	337	350	10	0	0	0

- Molecule 2 is NADP NICOTINAMIDE-ADENINE-DINUCLEOTIDE PHOSPHATE (three-letter code: NAP) (formula: $C_{21}H_{28}N_7O_{17}P_3$).



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

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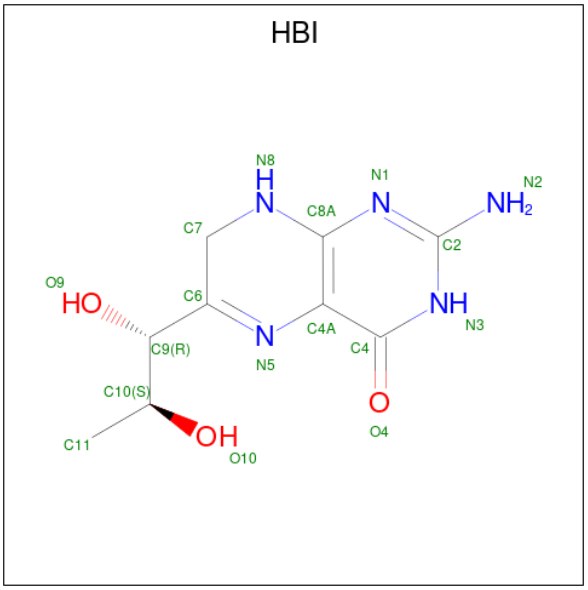
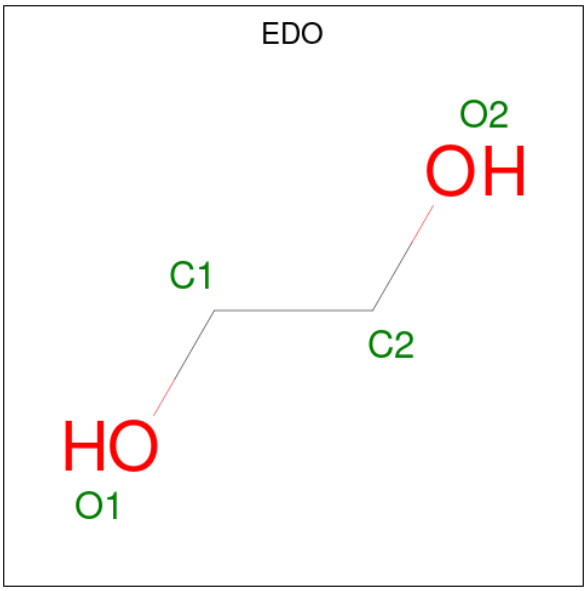
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	P		
2	C	1	48	21	7	17	3	0	0
			Total	C	N	O	P		
2	D	1	48	21	7	17	3	0	0

- Molecule 3 is 7,8-DIHYDROBIOPTERIN (three-letter code: HBI) (formula: $C_9H_{13}N_5O_3$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
3	A	1	17	9	5	3	0	0
			Total	C	N	O		
3	B	1	17	9	5	3	0	0
			Total	C	N	O		
3	C	1	17	9	5	3	0	0
			Total	C	N	O		
3	D	1	17	9	5	3	0	0

- Molecule 4 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: $C_2H_6O_2$).



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

- Molecule 5 is water.

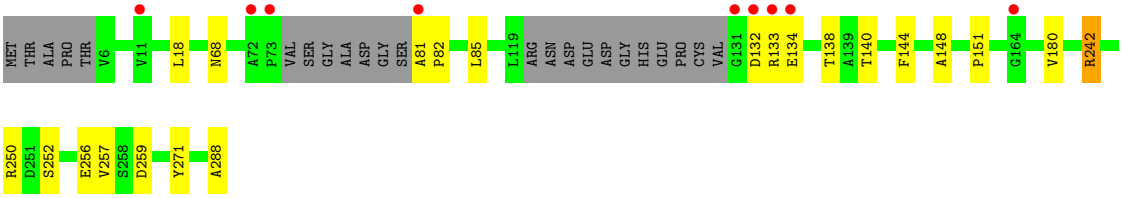
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
5	A	79	79	79	0	0
5	B	55	55	55	0	0
5	C	79	79	79	0	0
5	D	55	55	55	0	0

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.

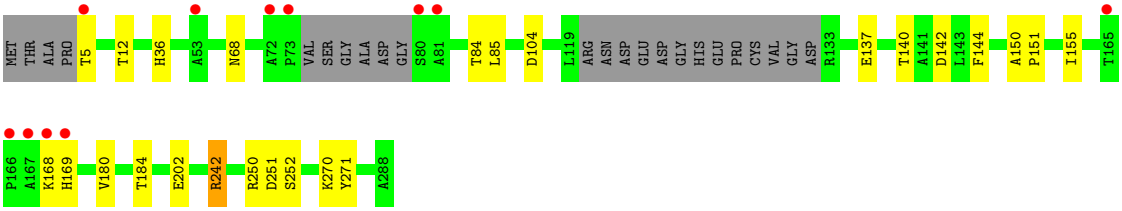
• Molecule 1: PTERIDINE REDUCTASE 1

Chain A:



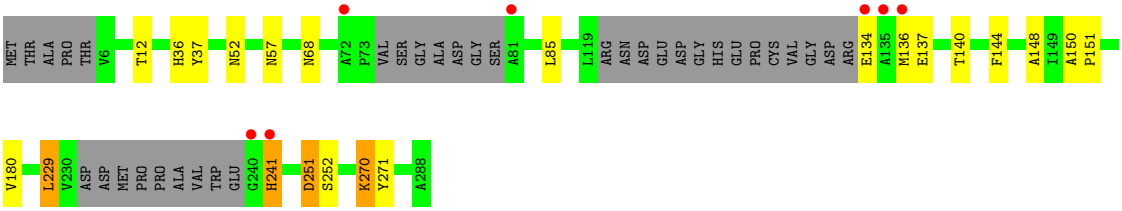
• Molecule 1: PTERIDINE REDUCTASE 1

Chain B:



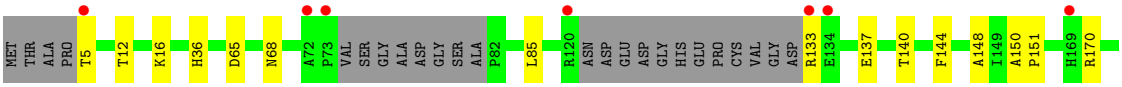
• Molecule 1: PTERIDINE REDUCTASE 1

Chain C:



• Molecule 1: PTERIDINE REDUCTASE 1

Chain D:



Y174
V180
L229
V230
ASP
ASP
MET
PRO
PRO
ALA
VAL
TRP
GLU
GLY
HIS
R242
S252
D259
Y271
T286
R287
A288

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	95.27Å 104.55Å 138.07Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	24.77 – 2.40 24.80 – 2.40	Depositor EDS
% Data completeness (in resolution range)	100.0 (24.77-2.40) 86.9 (24.80-2.40)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.63 (at 2.39Å)	Xtriage
Refinement program	REFMAC 5.1.24	Depositor
R, R_{free}	0.219 , 0.242 0.219 , 0.239	Depositor DCC
R_{free} test set	2385 reflections (5.02%)	wwPDB-VP
Wilson B-factor (Å^2)	29.4	Xtriage
Anisotropy	0.132	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.35 , 39.4	EDS
L-test for twinning[2]	$< \|L\| > = 0.48$, $< L^2 > = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.93	EDS
Total number of atoms	8259	wwPDB-VP
Average B, all atoms (Å^2)	33.0	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 36.77 % 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 4.7475e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

[1]Intensities estimated from amplitudes.

[2]Theoretical values of $< |L| >$, $< L^2 >$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality (i)

5.1 Standard geometry (i)

Bond lengths and bond angles in the following residue types are not validated in this section: EDO, NAP, HBI

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	0.42	0/2012	0.74	2/2741 (0.1%)
1	B	0.42	0/2013	0.74	3/2743 (0.1%)
1	C	0.41	0/1911	0.72	1/2600 (0.0%)
1	D	0.41	0/1920	0.72	2/2610 (0.1%)
All	All	0.41	0/7856	0.73	8/10694 (0.1%)

There are no bond length outliers.

All (8) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	251	ASP	CB-CG-OD2	5.65	123.39	118.30
1	C	251	ASP	CB-CG-OD2	5.46	123.22	118.30
1	A	259	ASP	CB-CG-OD2	5.35	123.12	118.30
1	A	132	ASP	CB-CG-OD2	5.30	123.07	118.30
1	B	142	ASP	CB-CG-OD2	5.24	123.02	118.30
1	D	259	ASP	CB-CG-OD2	5.20	122.98	118.30
1	B	104	ASP	CB-CG-OD2	5.19	122.97	118.30
1	D	65	ASP	CB-CG-OD2	5.16	122.95	118.30

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	1973	0	1977	12	0
1	B	1974	0	1982	10	0
1	C	1877	0	1895	15	0
1	D	1887	0	1914	13	0
2	A	48	0	25	1	0
2	B	48	0	25	1	0
2	C	48	0	25	1	0
2	D	48	0	25	1	0
3	A	17	0	13	1	0
3	B	17	0	13	1	0
3	C	17	0	13	1	0
3	D	17	0	13	1	0
4	A	4	0	6	1	0
4	B	4	0	6	0	0
4	C	8	0	12	6	0
4	D	4	0	6	3	0
5	A	79	0	0	0	0
5	B	55	0	0	0	0
5	C	79	0	0	1	0
5	D	55	0	0	0	0
All	All	8259	0	7950	48	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 (48) 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)
4:C:1292:EDO:H12	1:D:68:ASN:HD22	1.39	0.87
4:C:1292:EDO:H12	1:D:68:ASN:ND2	2.06	0.70
1:C:241:HIS:H	1:C:241:HIS:CD2	2.07	0.70
1:D:174:TYR:CE2	4:D:1291:EDO:H22	2.31	0.66
1:D:174:TYR:HE2	4:D:1291:EDO:H22	1.62	0.65
1:A:133:ARG:HD2	1:B:84:THR:HG21	1.81	0.60
1:D:12:THR:HA	1:D:36:HIS:HB3	1.85	0.58
1:A:242:ARG:HB2	1:A:250:ARG:HA	1.88	0.56
2:C:1289:NAP:C4N	3:C:1290:HBI:H71	2.37	0.54
2:A:1289:NAP:C4N	3:A:1290:HBI:H71	2.39	0.53
2:B:1289:NAP:C4N	3:B:1290:HBI:H71	2.39	0.53
1:C:52:ASN:HB3	4:C:1291:EDO:C2	2.40	0.52
1:C:241:HIS:CD2	1:C:241:HIS:N	2.78	0.52
1:C:68:ASN:HA	1:C:85:LEU:HD22	1.94	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:C:1291:EDO:O2	5:C:2079:HOH:O	2.19	0.49
1:A:256:GLU:OE2	1:C:270:LYS:HE3	2.11	0.49
1:C:52:ASN:HB3	4:C:1291:EDO:H22	1.94	0.49
1:C:12:THR:HA	1:C:36:HIS:HB3	1.95	0.49
1:C:229:LEU:HD22	1:C:251:ASP:HB3	1.94	0.48
1:C:57:ASN:H	4:C:1291:EDO:H21	1.79	0.48
1:A:252:SER:HB3	1:C:271:TYR:CE2	2.49	0.47
4:A:1291:EDO:H22	1:B:202:GLU:OE1	2.14	0.47
1:D:68:ASN:HA	1:D:85:LEU:HD22	1.97	0.47
1:B:68:ASN:HA	1:B:85:LEU:HD22	1.97	0.46
1:A:271:TYR:CE2	1:C:252:SER:HB3	2.50	0.46
1:A:68:ASN:HA	1:A:85:LEU:HD22	1.97	0.46
1:D:170:ARG:HB3	4:D:1291:EDO:H21	1.98	0.45
2:D:1289:NAP:C4N	3:D:1290:HBI:H71	2.46	0.45
1:D:150:ALA:HB3	1:D:151:PRO:HD3	1.99	0.45
1:C:150:ALA:HB3	1:C:151:PRO:HD3	1.99	0.45
1:D:140:THR:O	1:D:144:PHE:HB2	2.16	0.44
1:D:148:ALA:C	1:D:151:PRO:HD2	2.38	0.44
1:B:140:THR:O	1:B:144:PHE:HB2	2.17	0.44
1:A:81:ALA:HA	1:A:82:PRO:HD3	1.91	0.44
1:B:12:THR:HA	1:B:36:HIS:HB3	1.98	0.44
1:A:18:LEU:HD13	1:A:257:VAL:HG11	1.99	0.43
1:B:150:ALA:HB3	1:B:151:PRO:HD3	1.99	0.43
1:B:151:PRO:O	1:B:155:ILE:HG13	2.18	0.43
1:C:140:THR:O	1:C:144:PHE:HB2	2.19	0.43
1:B:252:SER:HB3	1:D:271:TYR:CE2	2.53	0.43
1:B:271:TYR:CE2	1:D:252:SER:HB3	2.53	0.42
1:A:140:THR:O	1:A:144:PHE:HB2	2.18	0.42
1:B:242:ARG:HB2	1:B:250:ARG:HA	2.01	0.42
1:C:148:ALA:C	1:C:151:PRO:HD2	2.40	0.42
1:A:134:GLU:O	1:A:138:THR:HG23	2.20	0.41
1:A:288:ALA:HB2	1:D:286:THR:HB	2.03	0.41
1:C:36:HIS:CG	1:C:37:TYR:N	2.89	0.41
1:A:148:ALA:C	1:A:151:PRO:HD2	2.42	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	259/288 (90%)	247 (95%)	11 (4%)	1 (0%)	34	48
1	B	259/288 (90%)	245 (95%)	13 (5%)	1 (0%)	34	48
1	C	245/288 (85%)	234 (96%)	10 (4%)	1 (0%)	34	48
1	D	245/288 (85%)	234 (96%)	10 (4%)	1 (0%)	34	48
All	All	1008/1152 (88%)	960 (95%)	44 (4%)	4 (0%)	34	48

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	180	VAL
1	B	180	VAL
1	C	180	VAL
1	D	180	VAL

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	205/223 (92%)	204 (100%)	1 (0%)	88	95
1	B	206/223 (92%)	199 (97%)	7 (3%)	37	56
1	C	195/223 (87%)	189 (97%)	6 (3%)	40	60
1	D	197/223 (88%)	191 (97%)	6 (3%)	41	61
All	All	803/892 (90%)	783 (98%)	20 (2%)	47	67

All (20) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	242	ARG
1	B	5	THR
1	B	137	GLU
1	B	168	LYS
1	B	169	HIS
1	B	184	THR
1	B	242	ARG
1	B	270	LYS
1	C	134	GLU
1	C	136	MET
1	C	137	GLU
1	C	229	LEU
1	C	241	HIS
1	C	270	LYS
1	D	5	THR
1	D	16	LYS
1	D	133	ARG
1	D	137	GLU
1	D	229	LEU
1	D	242	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	216	GLN
1	B	216	GLN
1	C	216	GLN
1	C	241	HIS
1	D	68	ASN
1	D	216	GLN

5.3.3 RNA (i)

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)

13 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	$\#\|Z\| > 2$
3	HBI	D	1290	-	13,18,18	3.43	8 (61%)	14,26,26	2.38	6 (42%)
2	NAP	C	1289	-	45,52,52	1.62	4 (8%)	56,80,80	1.27	6 (10%)
3	HBI	A	1290	-	13,18,18	3.38	8 (61%)	14,26,26	2.37	6 (42%)
4	EDO	C	1292	-	3,3,3	0.30	0	2,2,2	0.19	0
2	NAP	A	1289	-	45,52,52	1.61	4 (8%)	56,80,80	1.29	3 (5%)
4	EDO	B	1291	-	3,3,3	0.31	0	2,2,2	0.22	0
4	EDO	D	1291	-	3,3,3	0.29	0	2,2,2	0.31	0
2	NAP	B	1289	-	45,52,52	1.54	4 (8%)	56,80,80	1.20	4 (7%)
3	HBI	C	1290	-	13,18,18	3.47	8 (61%)	14,26,26	2.45	6 (42%)
4	EDO	C	1291	-	3,3,3	0.37	0	2,2,2	0.22	0
2	NAP	D	1289	-	45,52,52	1.73	4 (8%)	56,80,80	1.19	6 (10%)
4	EDO	A	1291	-	3,3,3	0.30	0	2,2,2	0.50	0
3	HBI	B	1290	-	13,18,18	3.34	8 (61%)	14,26,26	2.20	6 (42%)

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
3	HBI	D	1290	-	-	4/4/17/17	0/2/2/2
2	NAP	C	1289	-	-	0/31/67/67	0/5/5/5
3	HBI	A	1290	-	-	3/4/17/17	0/2/2/2
4	EDO	C	1292	-	-	1/1/1/1	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	NAP	A	1289	-	-	0/31/67/67	0/5/5/5
4	EDO	B	1291	-	-	0/1/1/1	-
4	EDO	D	1291	-	-	1/1/1/1	-
2	NAP	B	1289	-	-	0/31/67/67	0/5/5/5
3	HBI	C	1290	-	-	4/4/17/17	0/2/2/2
4	EDO	C	1291	-	-	0/1/1/1	-
2	NAP	D	1289	-	-	0/31/67/67	0/5/5/5
4	EDO	A	1291	-	-	1/1/1/1	-
3	HBI	B	1290	-	-	4/4/17/17	0/2/2/2

All (48) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	1289	NAP	O7N-C7N	9.02	1.41	1.24
2	A	1289	NAP	O7N-C7N	8.61	1.40	1.24
2	C	1289	NAP	O7N-C7N	8.53	1.40	1.24
2	B	1289	NAP	O7N-C7N	8.16	1.39	1.24
3	C	1290	HBI	O4-C4	6.14	1.40	1.24
3	D	1290	HBI	O4-C4	5.97	1.39	1.24
3	A	1290	HBI	O4-C4	5.96	1.39	1.24
3	B	1290	HBI	O4-C4	5.56	1.38	1.24
3	D	1290	HBI	C6-N5	5.28	1.35	1.28
3	B	1290	HBI	C6-N5	5.07	1.35	1.28
3	C	1290	HBI	C6-N5	4.97	1.34	1.28
3	A	1290	HBI	C2-N2	4.97	1.43	1.33
3	A	1290	HBI	C6-N5	4.89	1.34	1.28
3	D	1290	HBI	C2-N2	4.85	1.43	1.33
3	C	1290	HBI	C7-N8	4.78	1.53	1.45
3	C	1290	HBI	C2-N2	4.68	1.43	1.33
3	B	1290	HBI	C2-N2	4.62	1.43	1.33
3	D	1290	HBI	C7-N8	4.41	1.53	1.45
3	A	1290	HBI	C7-N8	4.21	1.52	1.45
3	B	1290	HBI	C7-N8	4.12	1.52	1.45
2	D	1289	NAP	C2A-N3A	3.97	1.38	1.32
3	B	1290	HBI	C4-N3	3.60	1.39	1.33
3	C	1290	HBI	C8A-N1	3.59	1.41	1.34
3	D	1290	HBI	C8A-N1	3.57	1.41	1.34
2	C	1289	NAP	C2A-N3A	3.45	1.37	1.32
3	C	1290	HBI	C4-N3	3.42	1.39	1.33
3	B	1290	HBI	C2-N1	3.40	1.41	1.35
3	A	1290	HBI	C4-N3	3.39	1.38	1.33
3	A	1290	HBI	C8A-N1	3.38	1.40	1.34

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	D	1290	HBI	C4-N3	3.36	1.38	1.33
3	B	1290	HBI	C8A-N1	3.32	1.40	1.34
3	C	1290	HBI	C2-N1	3.31	1.41	1.35
2	B	1289	NAP	C2A-N3A	3.26	1.37	1.32
2	A	1289	NAP	C2A-N3A	3.10	1.37	1.32
3	A	1290	HBI	C2-N1	3.03	1.40	1.35
3	D	1290	HBI	C2-N1	3.02	1.40	1.35
2	D	1289	NAP	C2A-N1A	2.62	1.38	1.33
2	D	1289	NAP	C2N-N1N	2.61	1.38	1.35
2	C	1289	NAP	C2N-N1N	2.53	1.38	1.35
3	C	1290	HBI	O9-C9	2.49	1.47	1.42
3	A	1290	HBI	O9-C9	2.45	1.47	1.42
2	A	1289	NAP	C2N-N1N	2.40	1.37	1.35
3	D	1290	HBI	O9-C9	2.39	1.47	1.42
2	A	1289	NAP	C2A-N1A	2.36	1.38	1.33
3	B	1290	HBI	O9-C9	2.29	1.46	1.42
2	C	1289	NAP	C2A-N1A	2.26	1.38	1.33
2	B	1289	NAP	C2N-N1N	2.21	1.37	1.35
2	B	1289	NAP	C2A-N1A	2.18	1.38	1.33

All (43) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	C	1289	NAP	N3A-C2A-N1A	-6.01	119.29	128.68
2	A	1289	NAP	N3A-C2A-N1A	-5.98	119.33	128.68
2	B	1289	NAP	N3A-C2A-N1A	-5.89	119.47	128.68
2	D	1289	NAP	N3A-C2A-N1A	-5.59	119.94	128.68
3	C	1290	HBI	C8A-C4A-C4	4.77	117.65	114.53
3	D	1290	HBI	C2-N3-C4	4.61	123.26	115.93
3	A	1290	HBI	C2-N3-C4	4.24	122.67	115.93
3	C	1290	HBI	C2-N3-C4	4.19	122.58	115.93
3	D	1290	HBI	N1-C2-N3	-4.17	118.88	125.42
3	A	1290	HBI	N1-C2-N3	-4.01	119.13	125.42
3	B	1290	HBI	N1-C2-N3	-3.72	119.58	125.42
3	B	1290	HBI	C2-N3-C4	3.68	121.78	115.93
3	C	1290	HBI	N1-C2-N3	-3.59	119.78	125.42
2	A	1289	NAP	C3N-C7N-N7N	3.36	121.78	117.75
3	A	1290	HBI	C2-N1-C8A	3.27	121.87	114.54
3	D	1290	HBI	N2-C2-N1	3.22	122.25	117.25
3	A	1290	HBI	N2-C2-N1	3.20	122.23	117.25
2	C	1289	NAP	C3N-C7N-N7N	3.20	121.59	117.75
3	C	1290	HBI	N2-C2-N1	3.09	122.06	117.25

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	B	1290	HBI	C2-N1-C8A	3.00	121.27	114.54
2	C	1289	NAP	O7N-C7N-N7N	-2.96	118.37	122.58
3	D	1290	HBI	C2-N1-C8A	2.94	121.13	114.54
3	B	1290	HBI	C8A-C4A-C4	2.92	116.44	114.53
3	A	1290	HBI	C8A-C4A-C4	2.88	116.42	114.53
3	C	1290	HBI	C2-N1-C8A	2.85	120.93	114.54
3	C	1290	HBI	C4A-C4-N3	-2.79	119.62	123.43
3	D	1290	HBI	C8A-C4A-C4	2.70	116.29	114.53
3	B	1290	HBI	N2-C2-N1	2.62	121.33	117.25
2	A	1289	NAP	PN-O3-PA	-2.53	124.15	132.83
3	D	1290	HBI	C4A-C4-N3	-2.52	119.98	123.43
2	B	1289	NAP	C3N-C7N-N7N	2.47	120.71	117.75
2	D	1289	NAP	PN-O3-PA	-2.40	124.60	132.83
2	D	1289	NAP	O7N-C7N-N7N	-2.35	119.24	122.58
3	A	1290	HBI	C4A-C4-N3	-2.32	120.26	123.43
2	D	1289	NAP	C3N-C7N-N7N	2.32	120.54	117.75
2	C	1289	NAP	PN-O3-PA	-2.31	124.89	132.83
3	B	1290	HBI	C11-C10-C9	2.30	117.12	111.55
2	D	1289	NAP	C4A-C5A-N7A	-2.26	107.04	109.40
2	B	1289	NAP	C1B-N9A-C4A	-2.20	122.77	126.64
2	C	1289	NAP	C4A-C5A-N7A	-2.11	107.19	109.40
2	B	1289	NAP	PN-O3-PA	-2.10	125.63	132.83
2	C	1289	NAP	C1B-N9A-C4A	-2.06	123.02	126.64
2	D	1289	NAP	C1B-N9A-C4A	-2.00	123.12	126.64

There are no chirality outliers.

All (18) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	1290	HBI	C11-C10-C9-C6
3	C	1290	HBI	O10-C10-C9-O9
4	D	1291	EDO	O1-C1-C2-O2
3	A	1290	HBI	O10-C10-C9-C6
3	B	1290	HBI	O10-C10-C9-C6
3	C	1290	HBI	O10-C10-C9-C6
3	D	1290	HBI	O10-C10-C9-C6
3	B	1290	HBI	C11-C10-C9-C6
3	C	1290	HBI	C11-C10-C9-C6
3	D	1290	HBI	C11-C10-C9-C6
3	B	1290	HBI	C11-C10-C9-O9
3	C	1290	HBI	C11-C10-C9-O9
3	D	1290	HBI	C11-C10-C9-O9

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Mol	Chain	Res	Type	Atoms
3	D	1290	HBI	O10-C10-C9-O9
4	C	1292	EDO	O1-C1-C2-O2
3	B	1290	HBI	O10-C10-C9-O9
4	A	1291	EDO	O1-C1-C2-O2
3	A	1290	HBI	O10-C10-C9-O9

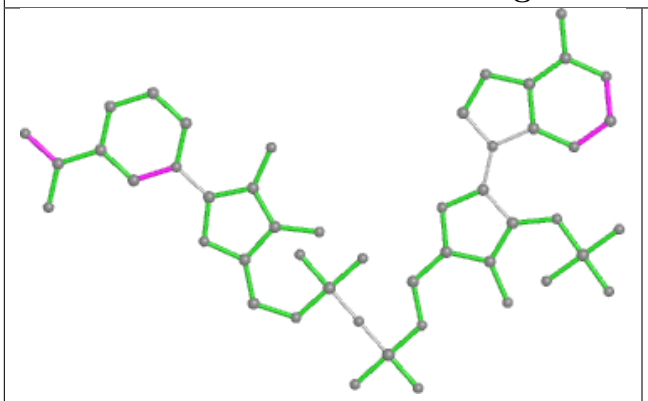
There are no ring outliers.

12 monomers are involved in 14 short contacts:

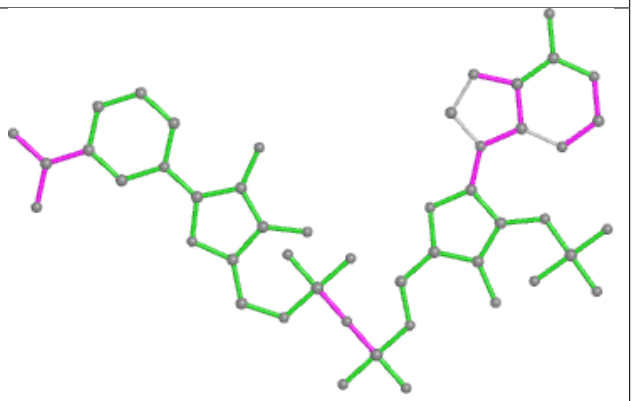
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	D	1290	HBI	1	0
2	C	1289	NAP	1	0
3	A	1290	HBI	1	0
4	C	1292	EDO	2	0
2	A	1289	NAP	1	0
4	D	1291	EDO	3	0
2	B	1289	NAP	1	0
3	C	1290	HBI	1	0
4	C	1291	EDO	4	0
2	D	1289	NAP	1	0
4	A	1291	EDO	1	0
3	B	1290	HBI	1	0

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

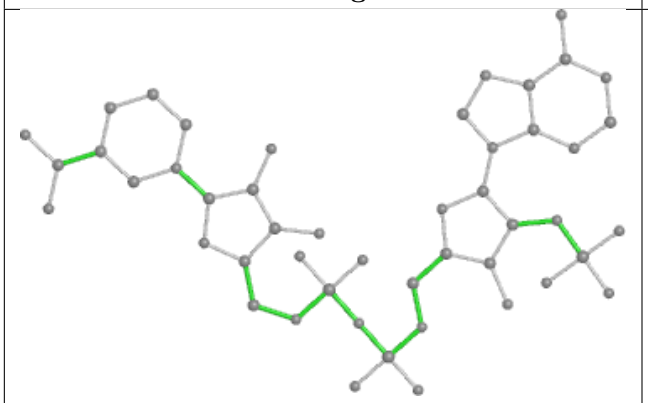
Ligand NAP C 1289



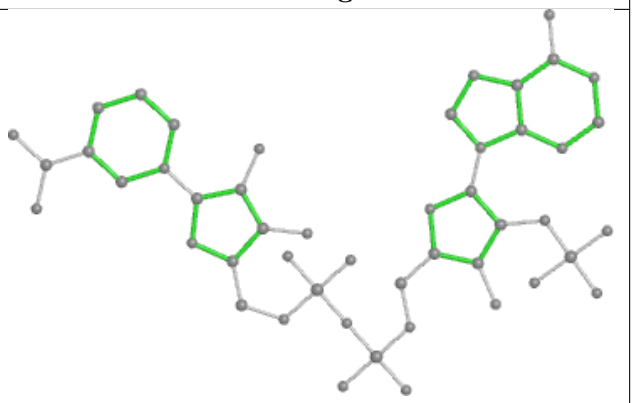
Bond lengths



Bond angles

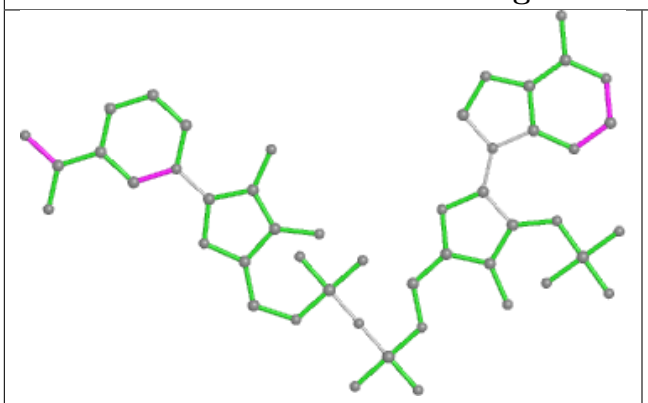


Torsions

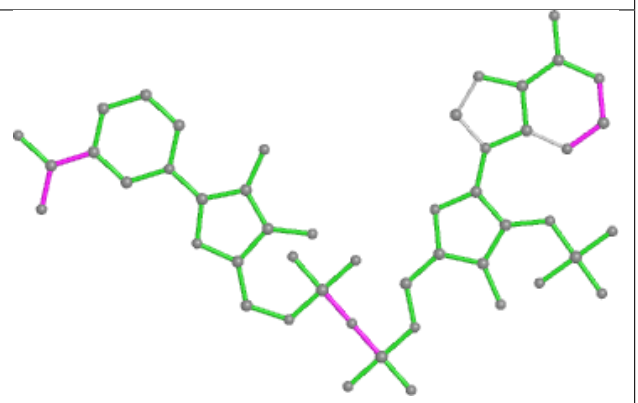


Rings

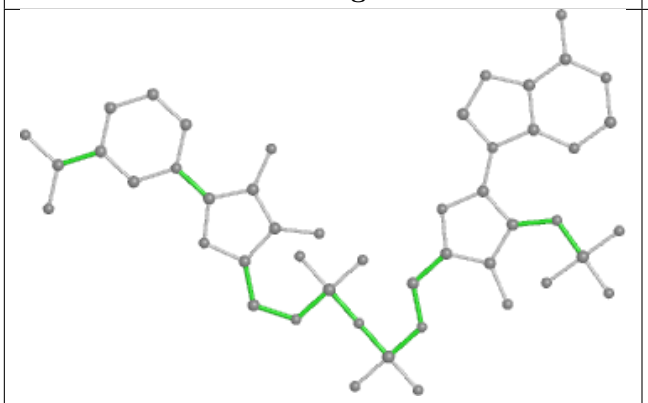
Ligand NAP A 1289



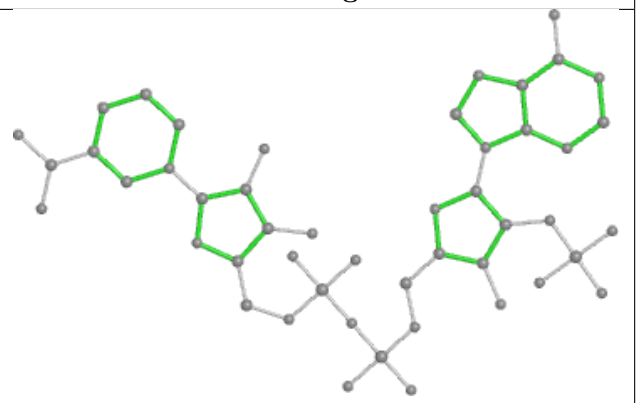
Bond lengths



Bond angles

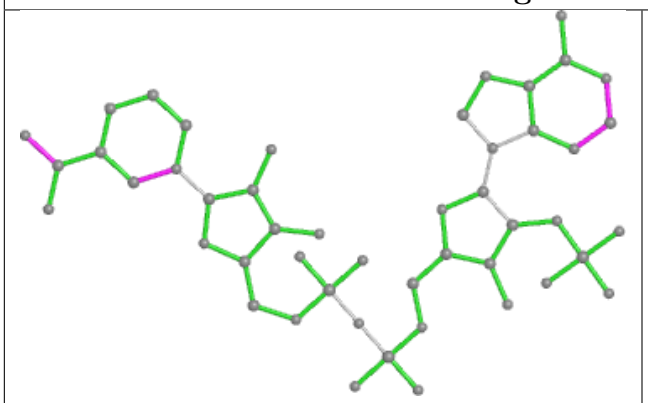


Torsions

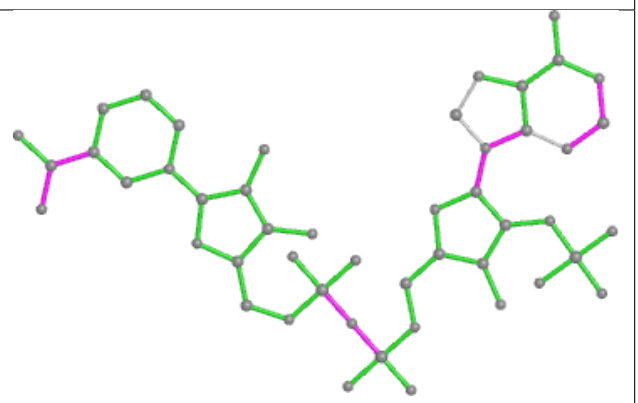


Rings

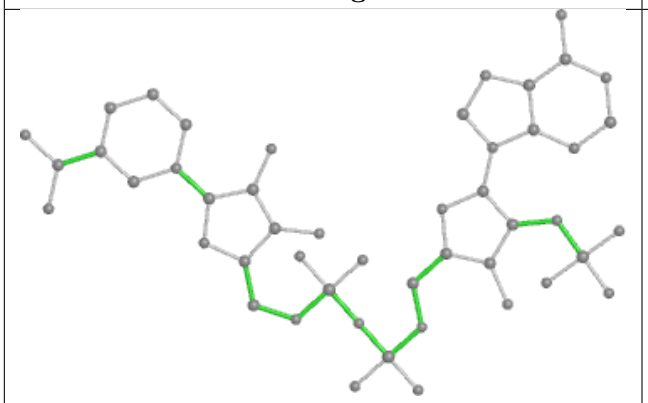
Ligand NAP B 1289



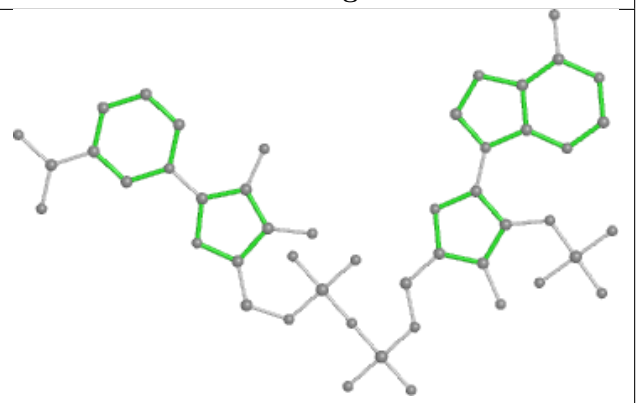
Bond lengths



Bond angles

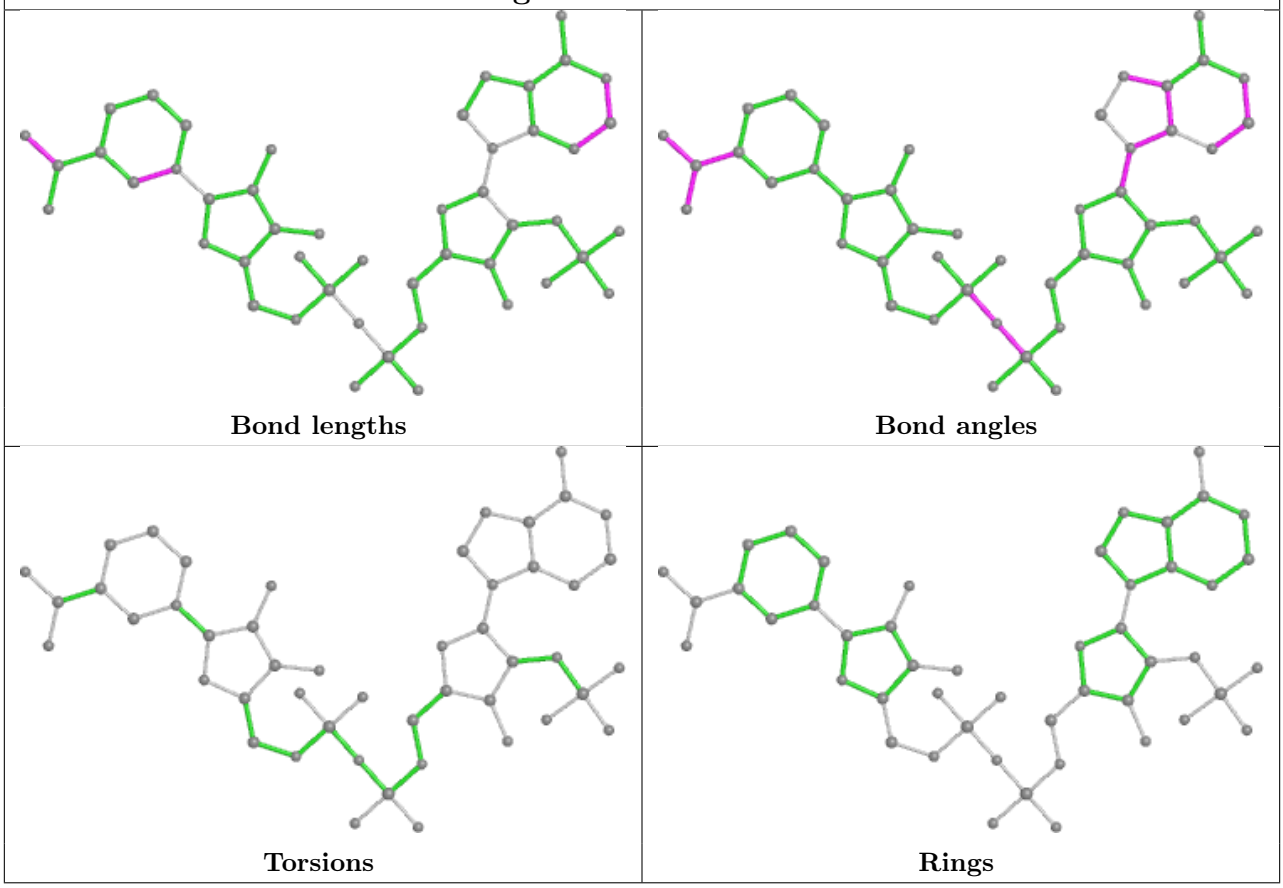


Torsions



Rings

Ligand NAP D 1289



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	A	265/288 (92%)	-0.18	9 (3%)	45	44	23, 31, 47, 80	0
1	B	265/288 (92%)	-0.05	11 (4%)	36	35	23, 32, 47, 64	3 (1%)
1	C	253/288 (87%)	-0.24	7 (2%)	53	51	23, 31, 48, 67	3 (1%)
1	D	253/288 (87%)	-0.18	7 (2%)	53	51	23, 31, 48, 78	2 (0%)
All	All	1036/1152 (89%)	-0.16	34 (3%)	46	45	23, 31, 48, 80	8 (0%)

All (34) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	80	SER	9.3
1	A	131	GLY	5.7
1	D	72	ALA	5.2
1	B	81	ALA	4.9
1	A	81	ALA	4.9
1	B	72	ALA	4.5
1	D	120	ARG	4.4
1	A	132	ASP	4.2
1	B	53	ALA	3.7
1	B	5	THR	3.6
1	A	133	ARG	3.2
1	D	133	ARG	3.2
1	A	73	PRO	3.2
1	B	169	HIS	3.1
1	A	72	ALA	3.0
1	D	73	PRO	2.9
1	D	5	THR	2.8
1	C	240	GLY	2.7
1	D	134	GLU	2.7
1	A	134	GLU	2.6
1	C	72	ALA	2.5

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Mol	Chain	Res	Type	RSRZ
1	A	164	GLY	2.5
1	D	169	HIS	2.5
1	B	165	THR	2.4
1	C	81	ALA	2.4
1	C	136	MET	2.3
1	B	166	PRO	2.3
1	C	241	HIS	2.3
1	B	168	LYS	2.3
1	B	167	ALA	2.2
1	A	11	VAL	2.1
1	C	135	ALA	2.0
1	C	134	GLU	2.0
1	B	73	PRO	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, 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
3	HBI	C	1290	17/17	0.89	0.20	41,44,45,46	0
3	HBI	D	1290	17/17	0.90	0.19	45,47,48,48	0
4	EDO	A	1291	4/4	0.90	0.21	37,38,38,39	0
3	HBI	B	1290	17/17	0.91	0.16	34,38,43,44	0
4	EDO	B	1291	4/4	0.91	0.42	41,43,45,45	0
4	EDO	C	1291	4/4	0.91	0.32	42,43,43,43	0
3	HBI	A	1290	17/17	0.92	0.15	35,37,38,39	0
4	EDO	C	1292	4/4	0.94	0.22	46,47,48,48	0
4	EDO	D	1291	4/4	0.95	0.13	48,48,49,49	0
2	NAP	D	1289	48/48	0.96	0.10	24,29,33,34	0

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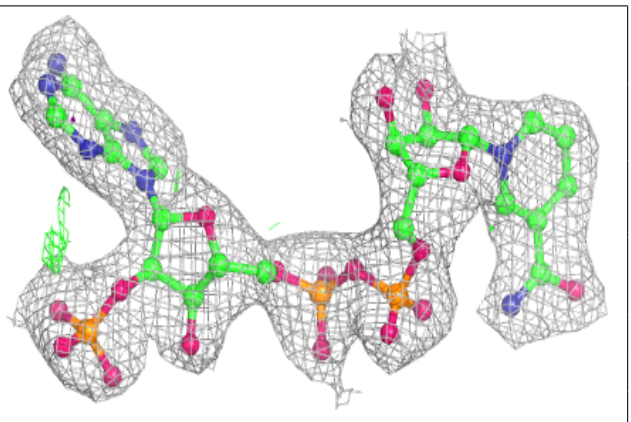
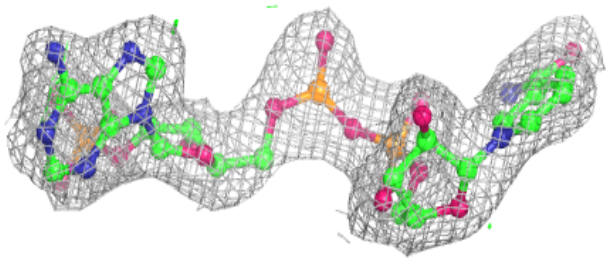
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
2	NAP	A	1289	48/48	0.96	0.11	24,29,33,34	0
2	NAP	B	1289	48/48	0.97	0.10	24,29,33,34	0
2	NAP	C	1289	48/48	0.97	0.09	24,29,33,34	0

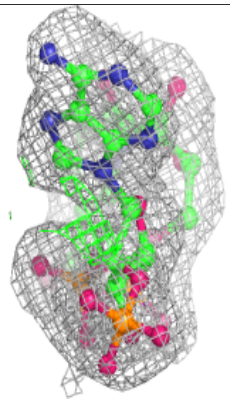
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around NAP D 1289:

2mF$_o$-DF$_c$ (at 0.7 rmsd) in gray
mF$_o$-DF$_c$ (at 3 rmsd) in purple (negative)
and green (positive)

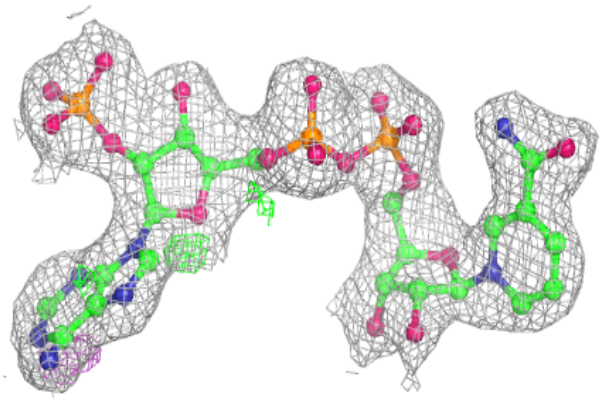


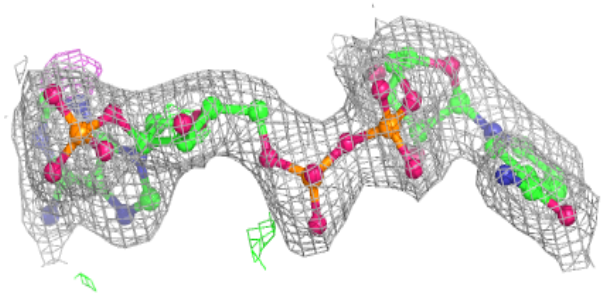


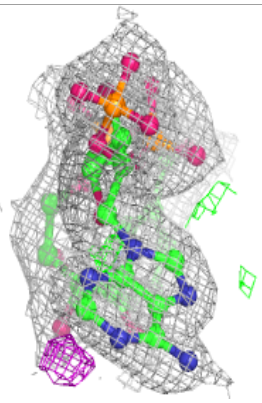


Electron density around NAP A 1289:

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

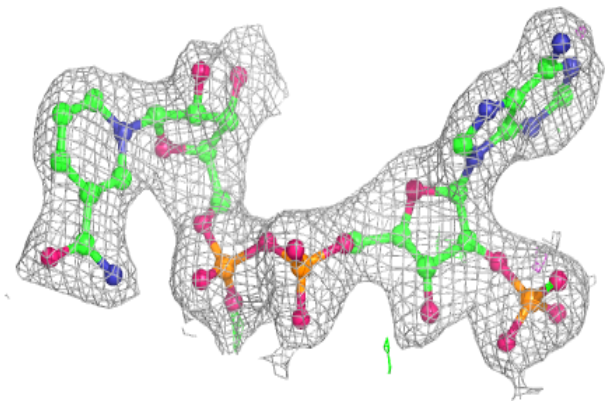


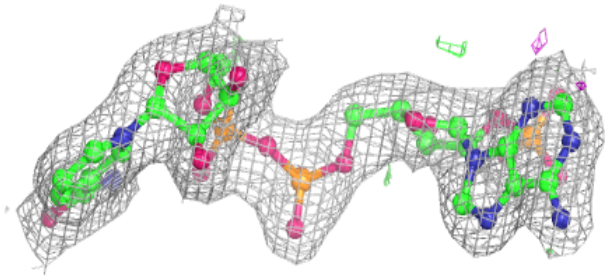


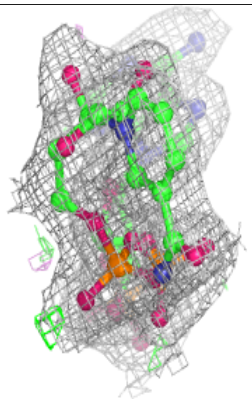


Electron density around NAP B 1289:

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

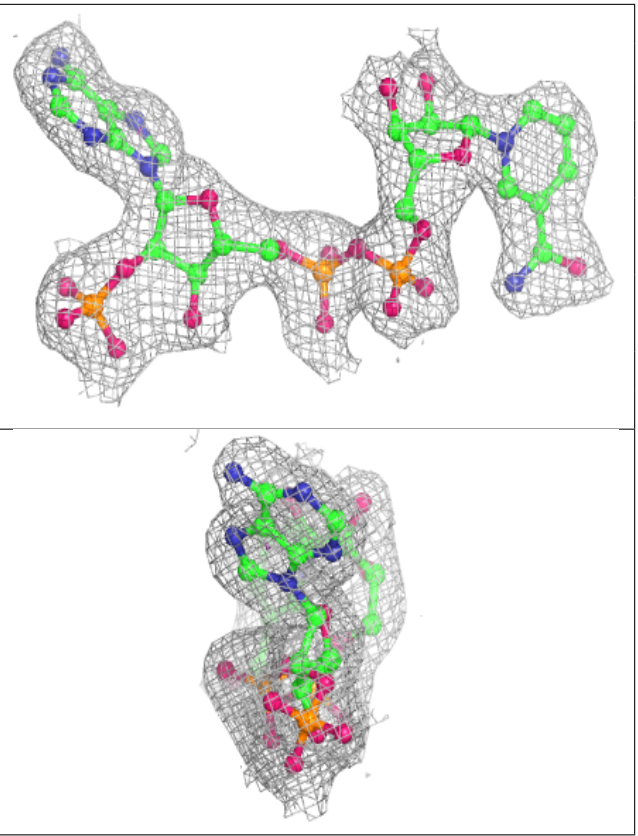






Electron density around NAP C 1289:

$2mF_o$-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.