wwPDB X-ray Structure Validation Summary Report (i)

Aug 28, 2023 – 06:12 AM EDT

PDB ID	:	3JQ7
Title	:	Crystal structure of pteridine reductase 1 (PTR1) from Trypanosoma brucei in ternary complex with cofactor (NADP+) and inhibitor 6-phenylpteridine-2 ,4,7-triamine (DX2)
Authors	:	Tulloch, L.B.; Hunter, W.N.
Deposited on	:	2009-09-06
Resolution	:	1.80 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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:

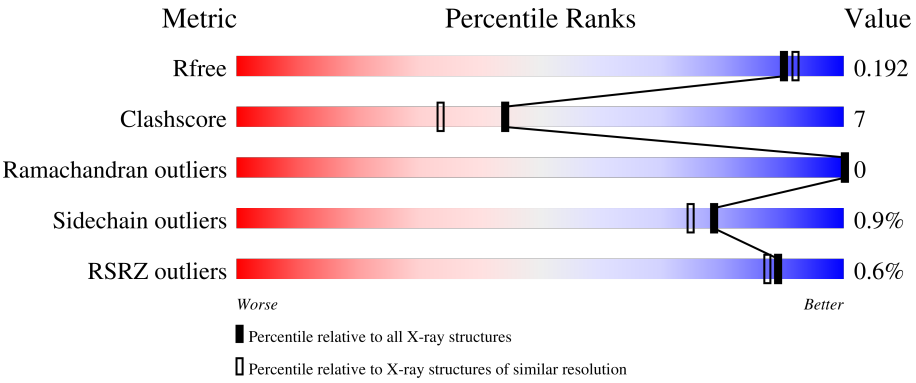
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.35
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.35

1 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 1.80 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	5950 (1.80-1.80)
Clashscore	141614	6793 (1.80-1.80)
Ramachandran outliers	138981	6697 (1.80-1.80)
Sidechain outliers	138945	6696 (1.80-1.80)
RSRZ outliers	127900	5850 (1.80-1.80)

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	77% 10% 14%
1	C	288	2% 75% 8% 17%
1	D	288	78% 9% 14%
2	B	288	78% 7% 14%

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	DX2	B	271	-	-	X	-
4	DX2	D	270	-	-	X	-
6	DTT	B	272[A]	X	-	X	-
6	DTT	B	272[B]	X	-	X	-

2 Entry composition (i)

There are 7 unique types of molecules in this entry. The entry contains 8353 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
1	A	249	Total	C	N	O	S	0	9	0
			1886	1188	329	356	13			
1	C	239	Total	C	N	O	S	0	10	0
			1807	1141	317	339	10			
1	D	249	Total	C	N	O	S	0	10	0
			1879	1182	328	357	12			

There are 60 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-19	MET	-	expression tag	UNP Q581W1
A	-18	GLY	-	expression tag	UNP Q581W1
A	-17	SER	-	expression tag	UNP Q581W1
A	-16	SER	-	expression tag	UNP Q581W1
A	-15	HIS	-	expression tag	UNP Q581W1
A	-14	HIS	-	expression tag	UNP Q581W1
A	-13	HIS	-	expression tag	UNP Q581W1
A	-12	HIS	-	expression tag	UNP Q581W1
A	-11	HIS	-	expression tag	UNP Q581W1
A	-10	HIS	-	expression tag	UNP Q581W1
A	-9	SER	-	expression tag	UNP Q581W1
A	-8	SER	-	expression tag	UNP Q581W1
A	-7	GLY	-	expression tag	UNP Q581W1
A	-6	LEU	-	expression tag	UNP Q581W1
A	-5	VAL	-	expression tag	UNP Q581W1
A	-4	PRO	-	expression tag	UNP Q581W1
A	-3	ARG	-	expression tag	UNP Q581W1
A	-2	GLY	-	expression tag	UNP Q581W1
A	-1	SER	-	expression tag	UNP Q581W1
A	0	HIS	-	expression tag	UNP Q581W1
C	-19	MET	-	expression tag	UNP Q581W1
C	-18	GLY	-	expression tag	UNP Q581W1
C	-17	SER	-	expression tag	UNP Q581W1

Continued on next page...

Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
C	-16	SER	-	expression tag	UNP Q581W1
C	-15	HIS	-	expression tag	UNP Q581W1
C	-14	HIS	-	expression tag	UNP Q581W1
C	-13	HIS	-	expression tag	UNP Q581W1
C	-12	HIS	-	expression tag	UNP Q581W1
C	-11	HIS	-	expression tag	UNP Q581W1
C	-10	HIS	-	expression tag	UNP Q581W1
C	-9	SER	-	expression tag	UNP Q581W1
C	-8	SER	-	expression tag	UNP Q581W1
C	-7	GLY	-	expression tag	UNP Q581W1
C	-6	LEU	-	expression tag	UNP Q581W1
C	-5	VAL	-	expression tag	UNP Q581W1
C	-4	PRO	-	expression tag	UNP Q581W1
C	-3	ARG	-	expression tag	UNP Q581W1
C	-2	GLY	-	expression tag	UNP Q581W1
C	-1	SER	-	expression tag	UNP Q581W1
C	0	HIS	-	expression tag	UNP Q581W1
D	-19	MET	-	expression tag	UNP Q581W1
D	-18	GLY	-	expression tag	UNP Q581W1
D	-17	SER	-	expression tag	UNP Q581W1
D	-16	SER	-	expression tag	UNP Q581W1
D	-15	HIS	-	expression tag	UNP Q581W1
D	-14	HIS	-	expression tag	UNP Q581W1
D	-13	HIS	-	expression tag	UNP Q581W1
D	-12	HIS	-	expression tag	UNP Q581W1
D	-11	HIS	-	expression tag	UNP Q581W1
D	-10	HIS	-	expression tag	UNP Q581W1
D	-9	SER	-	expression tag	UNP Q581W1
D	-8	SER	-	expression tag	UNP Q581W1
D	-7	GLY	-	expression tag	UNP Q581W1
D	-6	LEU	-	expression tag	UNP Q581W1
D	-5	VAL	-	expression tag	UNP Q581W1
D	-4	PRO	-	expression tag	UNP Q581W1
D	-3	ARG	-	expression tag	UNP Q581W1
D	-2	GLY	-	expression tag	UNP Q581W1
D	-1	SER	-	expression tag	UNP Q581W1
D	0	HIS	-	expression tag	UNP Q581W1

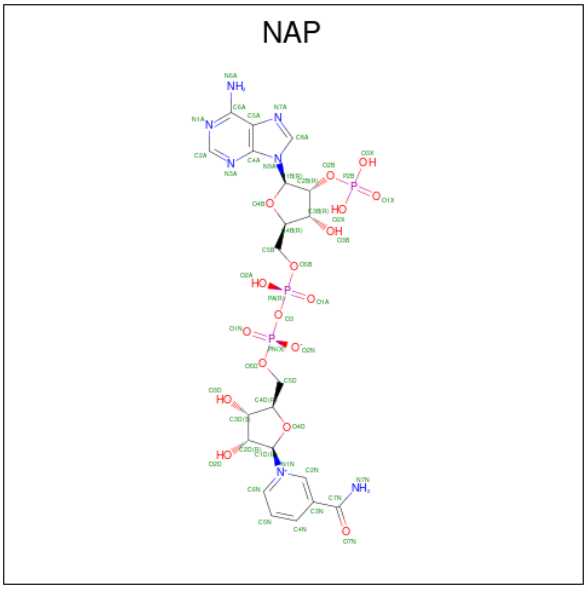
- Molecule 2 is a protein called Pteridine reductase 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	247	Total	C	N	O	S	0	11	0
			1879	1184	328	355	12			

There are 20 discrepancies between the modelled and reference sequences:

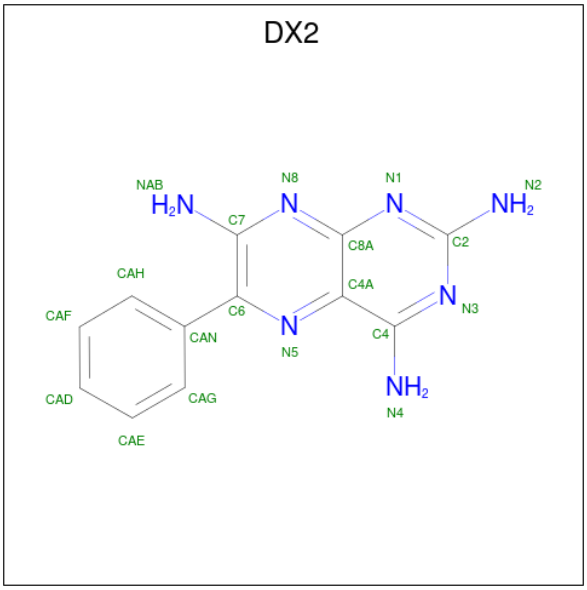
Chain	Residue	Modelled	Actual	Comment	Reference
B	-19	MET	-	expression tag	UNP Q581W1
B	-18	GLY	-	expression tag	UNP Q581W1
B	-17	SER	-	expression tag	UNP Q581W1
B	-16	SER	-	expression tag	UNP Q581W1
B	-15	HIS	-	expression tag	UNP Q581W1
B	-14	HIS	-	expression tag	UNP Q581W1
B	-13	HIS	-	expression tag	UNP Q581W1
B	-12	HIS	-	expression tag	UNP Q581W1
B	-11	HIS	-	expression tag	UNP Q581W1
B	-10	HIS	-	expression tag	UNP Q581W1
B	-9	SER	-	expression tag	UNP Q581W1
B	-8	SER	-	expression tag	UNP Q581W1
B	-7	GLY	-	expression tag	UNP Q581W1
B	-6	LEU	-	expression tag	UNP Q581W1
B	-5	VAL	-	expression tag	UNP Q581W1
B	-4	PRO	-	expression tag	UNP Q581W1
B	-3	ARG	-	expression tag	UNP Q581W1
B	-2	GLY	-	expression tag	UNP Q581W1
B	-1	SER	-	expression tag	UNP Q581W1
B	0	HIS	-	expression tag	UNP Q581W1

- Molecule 3 is NADP NICOTINAMIDE-ADENINE-DINUCLEOTIDE PHOSPHATE (three-letter code: NAP) (formula: $C_{21}H_{28}N_7O_{17}P_3$).



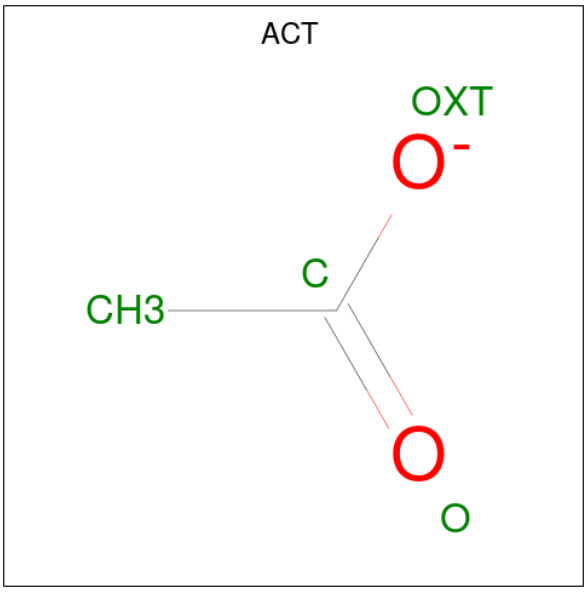
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total C N O P 48 21 7 17 3	0	0
3	B	1	Total C N O P 48 21 7 17 3	0	0
3	C	1	Total C N O P 48 21 7 17 3	0	0
3	D	1	Total C N O P 48 21 7 17 3	0	0

- Molecule 4 is 6-phenylpteridine-2,4,7-triamine (three-letter code: DX2) (formula: $C_{12}H_{11}N_7$).



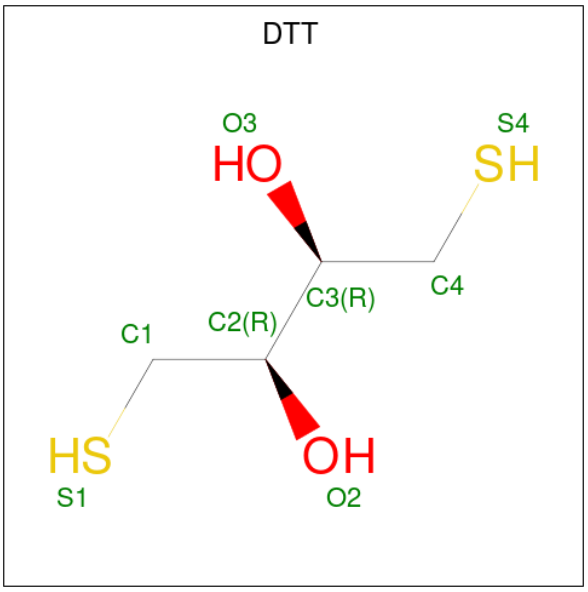
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total C N 19 12 7	0	0
4	B	1	Total C N 19 12 7	0	0
4	C	1	Total C N 19 12 7	0	0
4	D	1	Total C N 19 12 7	0	0

- Molecule 5 is ACETATE ION (three-letter code: ACT) (formula: $C_2H_3O_2$).



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

- Molecule 6 is 2,3-DIHYDROXY-1,4-DITHIOBUTANE (three-letter code: DTT) (formula: $C_4H_{10}O_2S_2$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	B	1	Total C O S 15 8 4 3	0	1

- Molecule 7 is water.

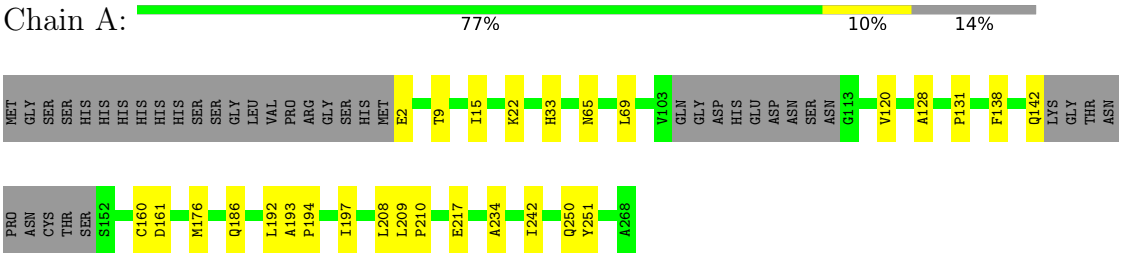
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	A	167	Total O 167 167	0	0
7	B	176	Total O 176 176	0	0
7	C	133	Total O 133 133	0	0
7	D	135	Total O 135 135	0	0

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.

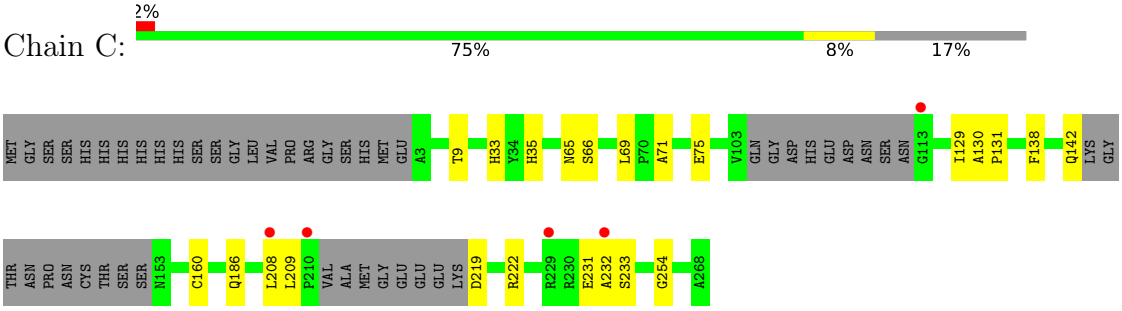
• Molecule 1: Pteridine reductase 1

Chain A:



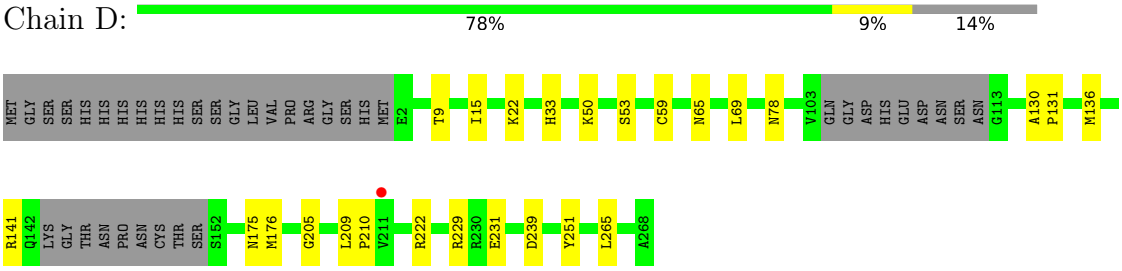
• Molecule 1: Pteridine reductase 1

Chain C:



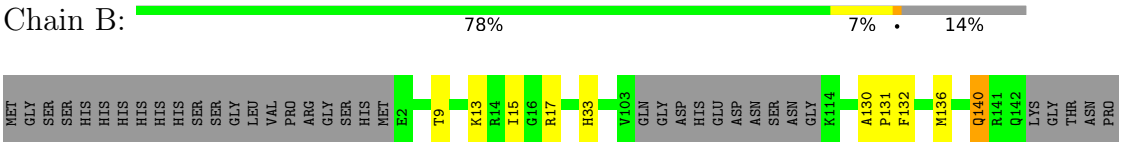
• Molecule 1: Pteridine reductase 1

Chain D:



• Molecule 2: Pteridine reductase 1

Chain B:




ASN
CYS
THR
SER
SER
N153
D161
C168
N175
Q186
G205
L209
P210
V211
R223
R229
A232
Q236
A268

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	74.54Å 90.03Å 82.36Å 90.00° 115.49° 90.00°	Depositor
Resolution (Å)	74.33 – 1.80 74.34 – 1.80	Depositor EDS
% Data completeness (in resolution range)	99.6 (74.33-1.80) 99.6 (74.34-1.80)	Depositor EDS
R_{merge}	0.04	Depositor
R_{sym}	0.04	Depositor
$< I/\sigma(I) >$ [1]	2.15 (at 1.80Å)	Xtriage
Refinement program	REFMAC	Depositor
R, R_{free}	0.152 , 0.191 0.153 , 0.192	Depositor DCC
R_{free} test set	4569 reflections (5.04%)	wwPDB-VP
Wilson B-factor (Å^2)	22.8	Xtriage
Anisotropy	0.711	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.38 , 47.4	EDS
L-test for twinning[2]	$< \|L\| > = 0.50$, $< L^2 > = 0.33$	Xtriage
Estimated twinning fraction	0.007 for h,-k,-h-l	Xtriage
F_o,F_c correlation	0.97	EDS
Total number of atoms	8353	wwPDB-VP
Average B, all atoms (Å^2)	28.0	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 29.61 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 1.5051e-03. 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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: CSX, DTT, ACT, DX2, NAP

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	$\#\|Z\| > 5$	RMSZ	$\#\|Z\| > 5$
1	A	0.66	0/1918	0.65	0/2597
1	C	0.61	0/1835	0.65	0/2488
1	D	0.62	0/1907	0.63	0/2584
2	B	0.68	0/1916	0.68	0/2599
All	All	0.64	0/7576	0.65	0/10268

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

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	1886	0	1930	22	0
1	C	1807	0	1849	22	0
1	D	1879	0	1912	20	0
2	B	1879	0	1914	25	0
3	A	48	0	25	1	0
3	B	48	0	25	1	0
3	C	48	0	25	1	0
3	D	48	0	25	2	0
4	A	19	0	11	4	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	B	19	0	11	17	0
4	C	19	0	11	6	0
4	D	19	0	11	8	0
5	A	4	0	3	0	0
5	B	4	0	3	0	1
6	B	15	0	18	13	0
7	A	167	0	0	4	0
7	B	176	0	0	2	1
7	C	133	0	0	8	2
7	D	135	0	0	4	0
All	All	8353	0	7773	102	2

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 7.

The worst 5 of 102 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)
2:B:168:CYS:SG	6:B:272[B]:DTT:S4	2.50	1.03
4:B:271:DX2:HAG	4:B:271:DX2:HNAB	1.26	1.01
4:C:270:DX2:HNAB	4:C:270:DX2:HAH	1.30	0.95
4:B:271:DX2:HAF	6:B:272[A]:DTT:H41	1.53	0.91
1:D:210:PRO:HD3	4:D:270:DX2:HAG	1.55	0.88

All (2) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
5:B:270:ACT:OXT	7:C:372:HOH:O[1_454]	1.85	0.35
7:B:536:HOH:O	7:C:372:HOH:O[1_454]	1.96	0.24

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	248/288 (86%)	237 (96%)	11 (4%)	0	100	100
1	C	235/288 (82%)	229 (97%)	6 (3%)	0	100	100
1	D	247/288 (86%)	237 (96%)	10 (4%)	0	100	100
2	B	246/288 (85%)	237 (96%)	9 (4%)	0	100	100
All	All	976/1152 (85%)	940 (96%)	36 (4%)	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	202/229 (88%)	201 (100%)	1 (0%)	88	87
1	C	193/229 (84%)	193 (100%)	0	100	100
1	D	201/229 (88%)	198 (98%)	3 (2%)	65	56
2	B	202/230 (88%)	199 (98%)	3 (2%)	65	56
All	All	798/917 (87%)	791 (99%)	7 (1%)	78	75

5 of 7 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	B	229	ARG
1	D	53	SER
1	D	229	ARG
1	D	136	MET
2	B	211	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 12 such sidechains are listed below:

Mol	Chain	Res	Type
2	B	236	GLN

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	D	67[A]	ASN
1	D	186	GLN
1	D	140	GLN
2	B	65	ASN

5.3.3 RNA (i)

There are no RNA molecules in this entry.

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

7 non-standard protein/DNA/RNA residues 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	$\#\|Z\| > 2$
1	CSX	C	59	1	3,6,7	0.70	0	1,6,8	0.87	0
1	CSX	A	168	1	3,6,7	0.81	0	1,6,8	0.83	0
1	CSX	D	168	1	3,6,7	0.68	0	1,6,8	1.55	0
2	CSX	B	59	2	3,6,7	0.56	0	1,6,8	0.53	0
1	CSX	C	168	1	3,6,7	0.58	0	1,6,8	0.70	0
1	CSX	A	59	1	3,6,7	0.68	0	1,6,8	0.71	0
1	CSX	D	59	1	3,6,7	0.65	0	1,6,8	0.95	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
1	CSX	C	59	1	-	0/1/5/7	-
1	CSX	A	168	1	-	0/1/5/7	-
1	CSX	D	168	1	-	0/1/5/7	-
2	CSX	B	59	2	-	0/1/5/7	-
1	CSX	C	168	1	-	0/1/5/7	-

Continued on next page...

Continued from previous page...

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
1	CSX	A	59	1	-	0/1/5/7	-
1	CSX	D	59	1	-	0/1/5/7	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	D	59	CSX	1	0

5.5 Carbohydrates (i)

There are no monosaccharides in this entry.

5.6 Ligand geometry (i)

12 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	$\#\|Z\| > 2$
6	DTT	B	272[B]	-	7,7,7	0.40	0	4,8,8	0.64	0
6	DTT	B	272[A]	-	7,7,7	0.46	0	4,8,8	0.93	0
5	ACT	B	270	-	3,3,3	0.78	0	3,3,3	1.44	0
4	DX2	C	270	-	20,21,21	0.87	0	25,30,30	2.10	9 (36%)
4	DX2	B	271	-	20,21,21	0.97	1 (5%)	25,30,30	2.43	9 (36%)
4	DX2	A	271	-	20,21,21	1.44	4 (20%)	25,30,30	5.52	10 (40%)
3	NAP	C	269	-	45,52,52	1.68	4 (8%)	56,80,80	1.28	3 (5%)
5	ACT	A	270	-	3,3,3	0.75	0	3,3,3	1.43	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\|>2$	Counts	RMSZ	$\#\|Z\|>2$
3	NAP	B	269	-	45,52,52	1.59	4 (8%)	56,80,80	1.65	8 (14%)
4	DX2	D	270	-	20,21,21	0.85	0	25,30,30	2.10	7 (28%)
3	NAP	D	269	-	45,52,52	1.69	5 (11%)	56,80,80	1.42	5 (8%)
3	NAP	A	269	-	45,52,52	1.77	5 (11%)	56,80,80	1.46	4 (7%)

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
6	DTT	B	272[B]	-	1/1/2/2	4/8/8/8	-
6	DTT	B	272[A]	-	1/1/2/2	2/8/8/8	-
4	DX2	C	270	-	-	0/0/4/4	0/3/3/3
4	DX2	B	271	-	-	0/0/4/4	0/3/3/3
4	DX2	A	271	-	-	0/0/4/4	0/3/3/3
3	NAP	C	269	-	-	3/31/67/67	0/5/5/5
3	NAP	B	269	-	-	0/31/67/67	0/5/5/5
4	DX2	D	270	-	-	0/0/4/4	0/3/3/3
3	NAP	D	269	-	-	0/31/67/67	0/5/5/5
3	NAP	A	269	-	-	0/31/67/67	0/5/5/5

The worst 5 of 23 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	269	NAP	O7N-C7N	8.56	1.40	1.24
3	C	269	NAP	O7N-C7N	8.49	1.40	1.24
3	D	269	NAP	O7N-C7N	8.14	1.39	1.24
3	B	269	NAP	O7N-C7N	6.97	1.37	1.24
3	B	269	NAP	C2A-N3A	4.55	1.39	1.32

The worst 5 of 55 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
4	A	271	DX2	CAG-CAN-CAH	-21.28	99.75	118.65
4	A	271	DX2	CAF-CAH-CAN	9.19	134.81	120.44
4	A	271	DX2	CAD-CAF-CAH	-9.01	107.81	120.44
3	D	269	NAP	N3A-C2A-N1A	-6.21	118.97	128.68
3	C	269	NAP	N3A-C2A-N1A	-5.58	119.95	128.68

All (2) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
6	B	272[A]	DTT	C3
6	B	272[B]	DTT	C3

5 of 9 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	C	269	NAP	C5B-O5B-PA-O1A
3	C	269	NAP	C5B-O5B-PA-O3
6	B	272[B]	DTT	S1-C1-C2-C3
6	B	272[A]	DTT	S1-C1-C2-O2
6	B	272[B]	DTT	S1-C1-C2-O2

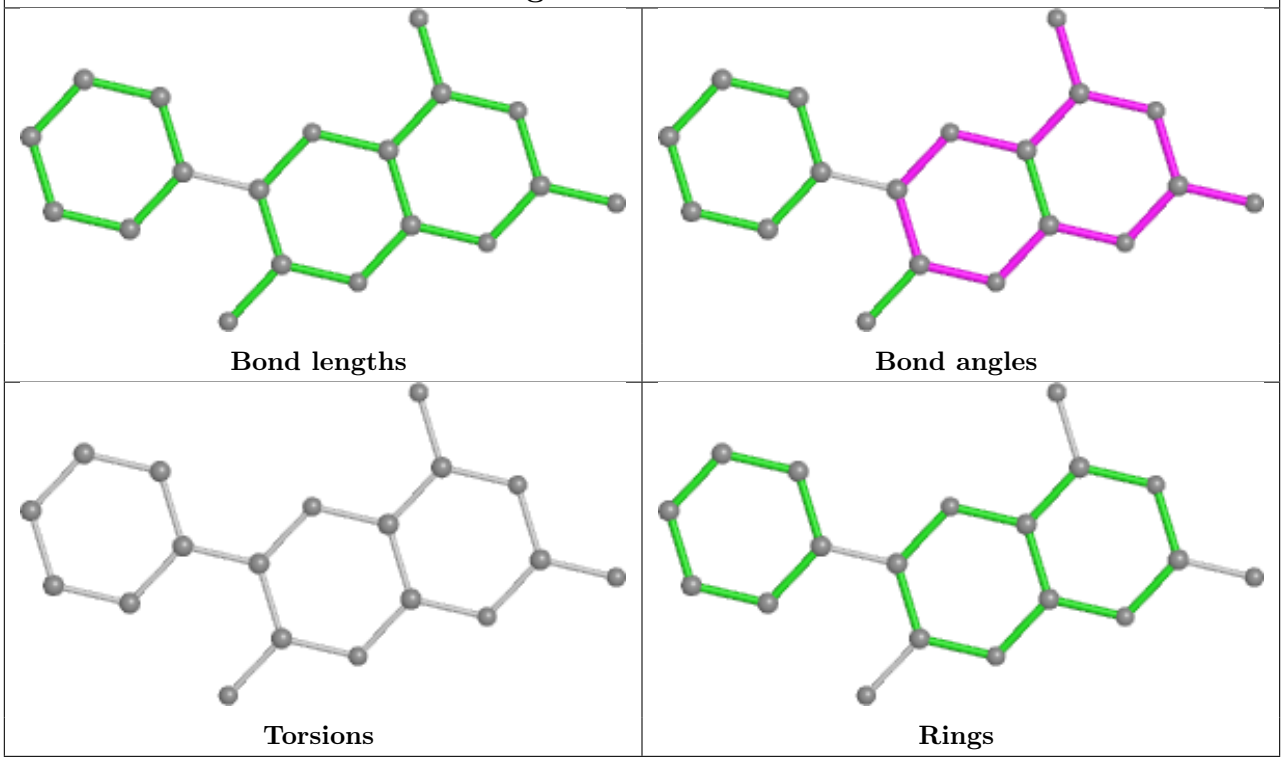
There are no ring outliers.

11 monomers are involved in 46 short contacts:

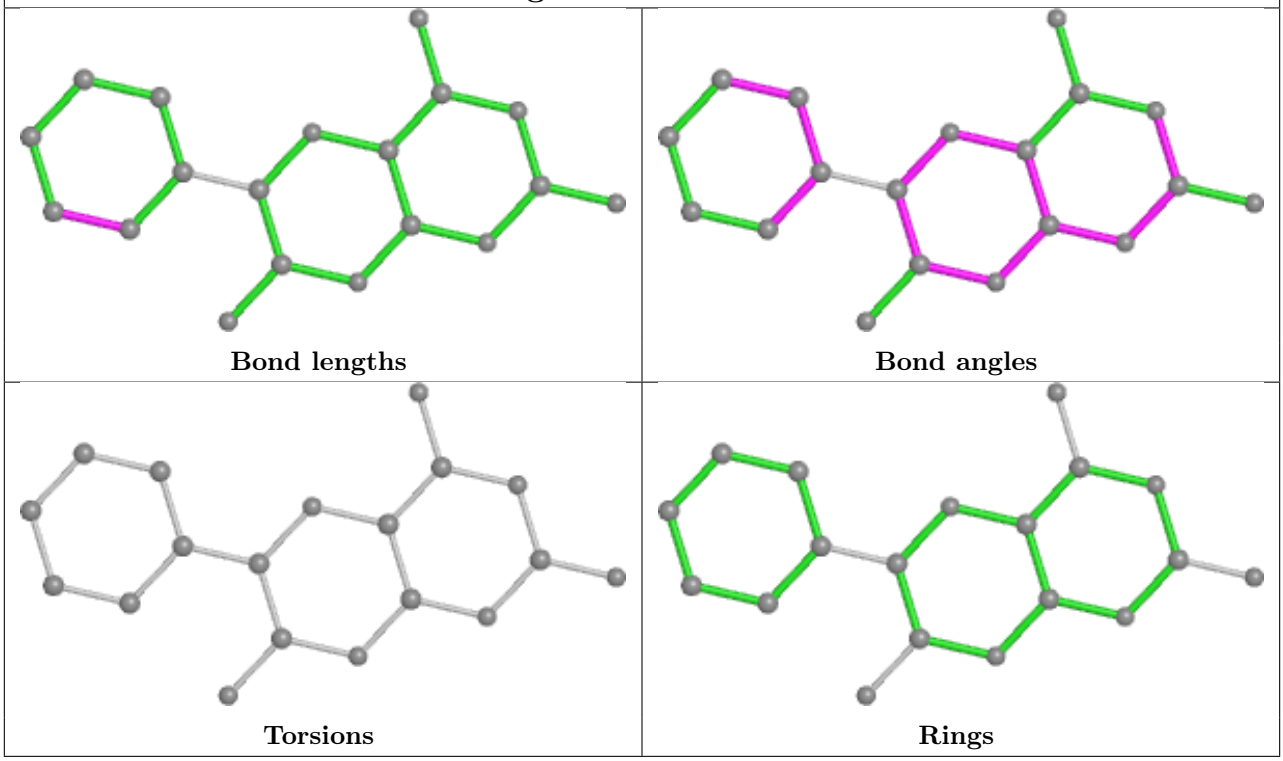
Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	B	272[B]	DTT	6	0
6	B	272[A]	DTT	7	0
5	B	270	ACT	0	1
4	C	270	DX2	6	0
4	B	271	DX2	17	0
4	A	271	DX2	4	0
3	C	269	NAP	1	0
3	B	269	NAP	1	0
4	D	270	DX2	8	0
3	D	269	NAP	2	0
3	A	269	NAP	1	0

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.

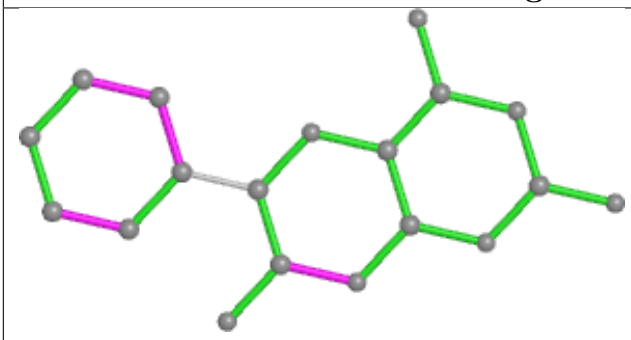
Ligand DX2 C 270



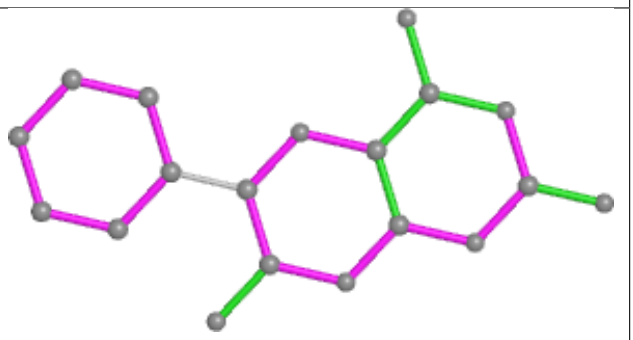
Ligand DX2 B 271



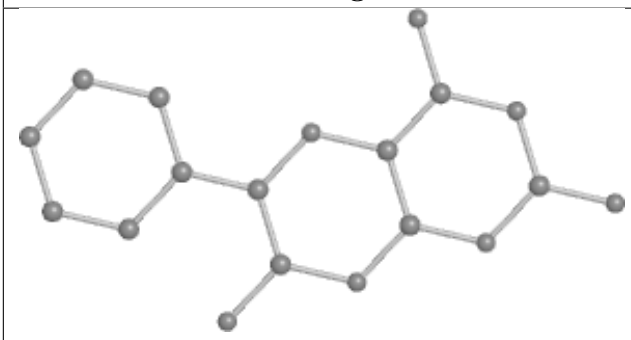
Ligand DX2 A 271



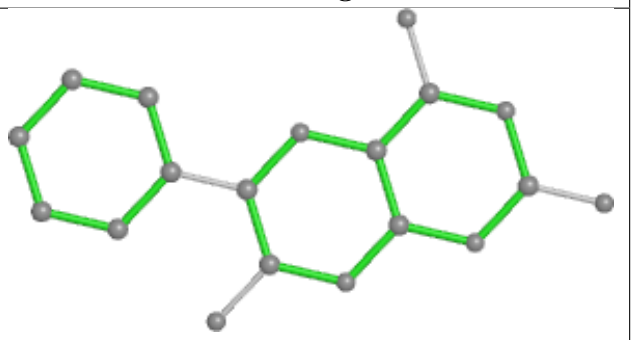
Bond lengths



Bond angles

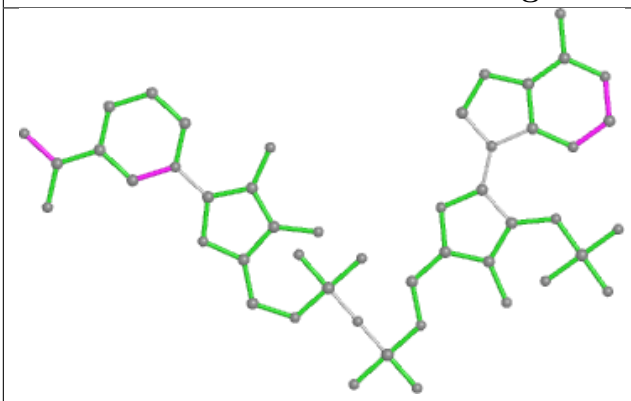


Torsions

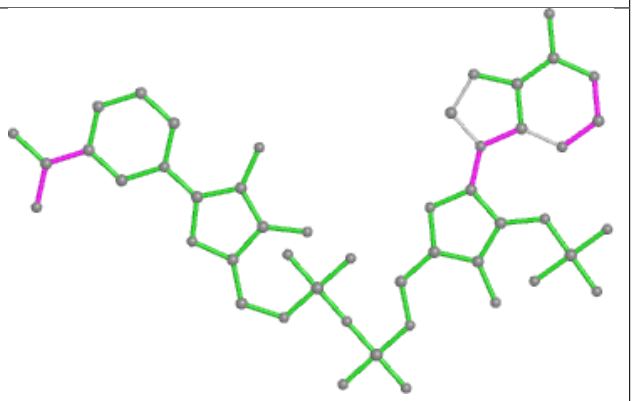


Rings

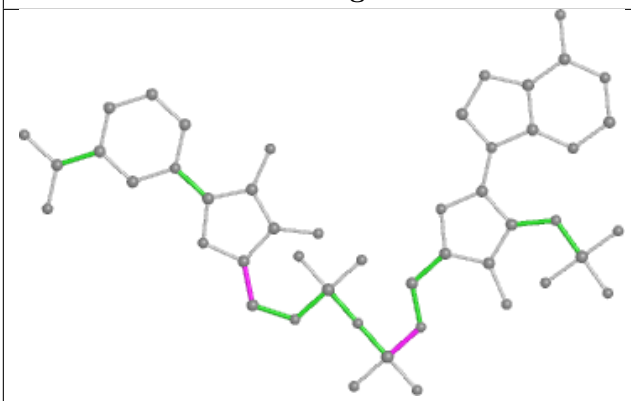
Ligand NAP C 269



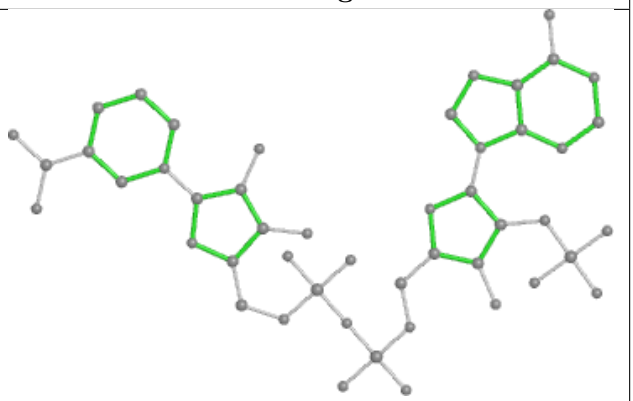
Bond lengths



Bond angles

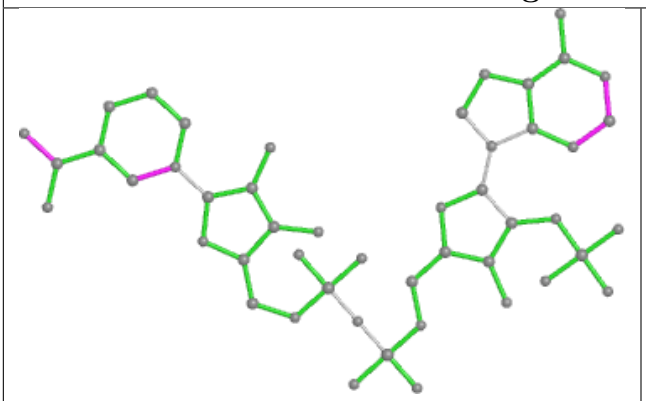


Torsions

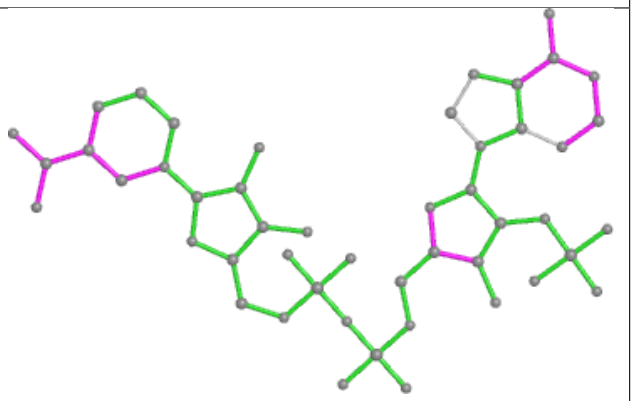


Rings

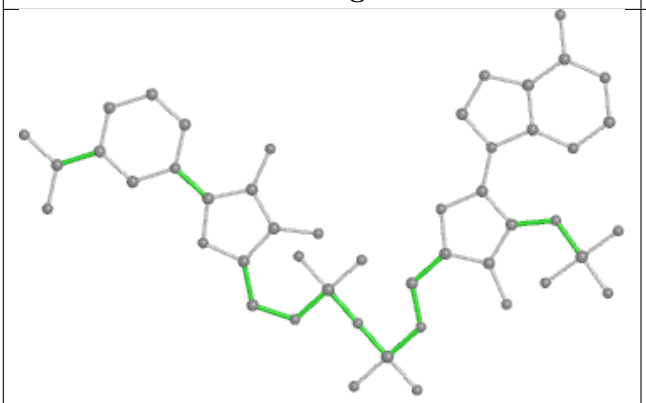
Ligand NAP B 269



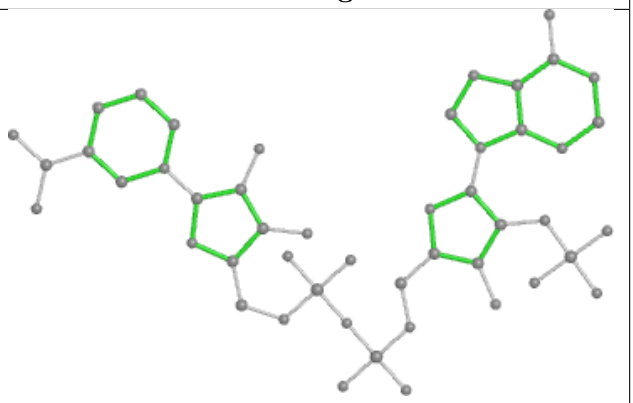
Bond lengths



Bond angles

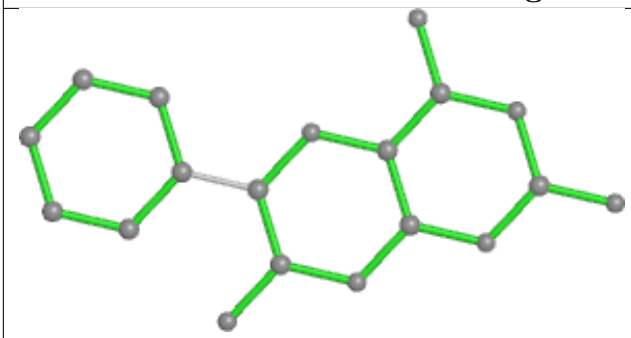


Torsions

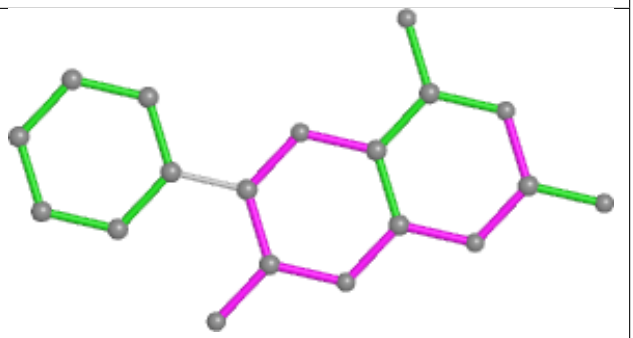


Rings

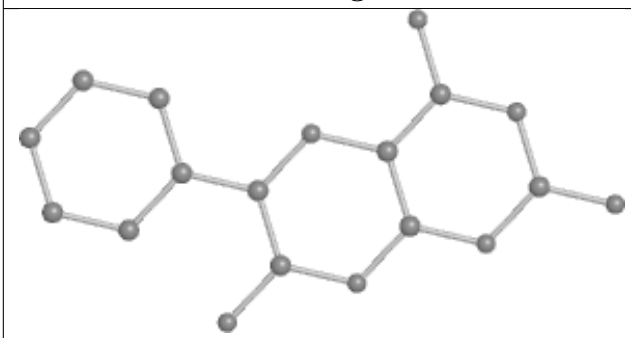
Ligand DX2 D 270



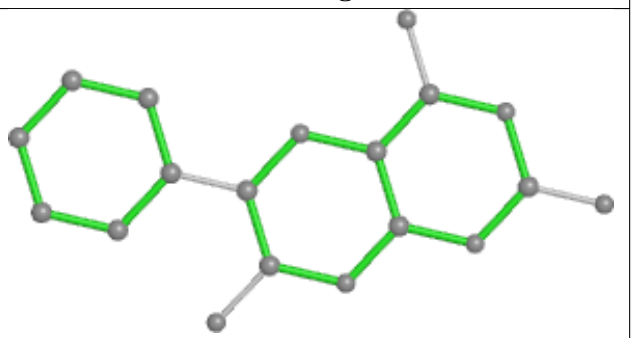
Bond lengths



Bond angles

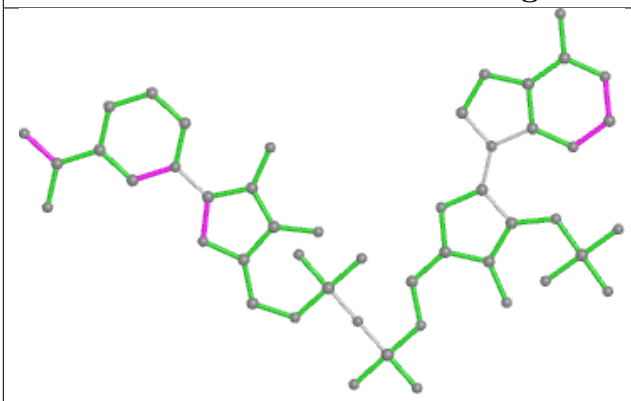


Torsions

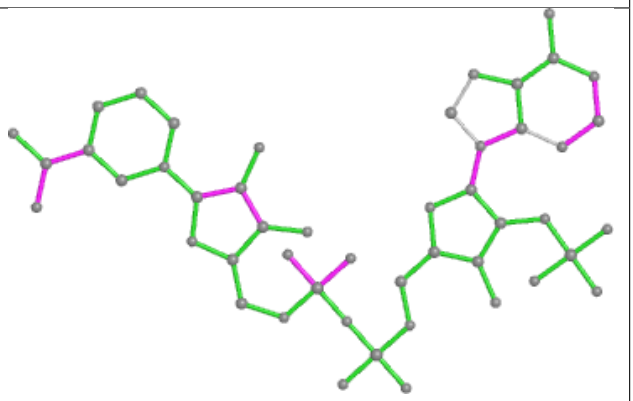


Rings

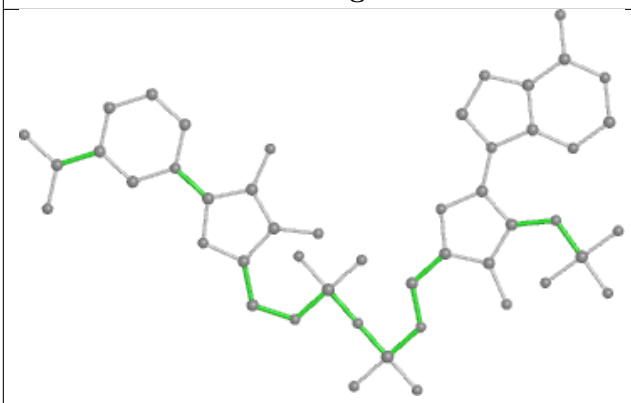
Ligand NAP D 269



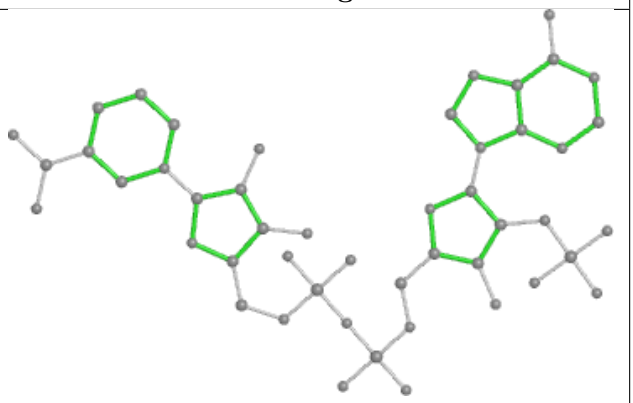
Bond lengths



Bond angles

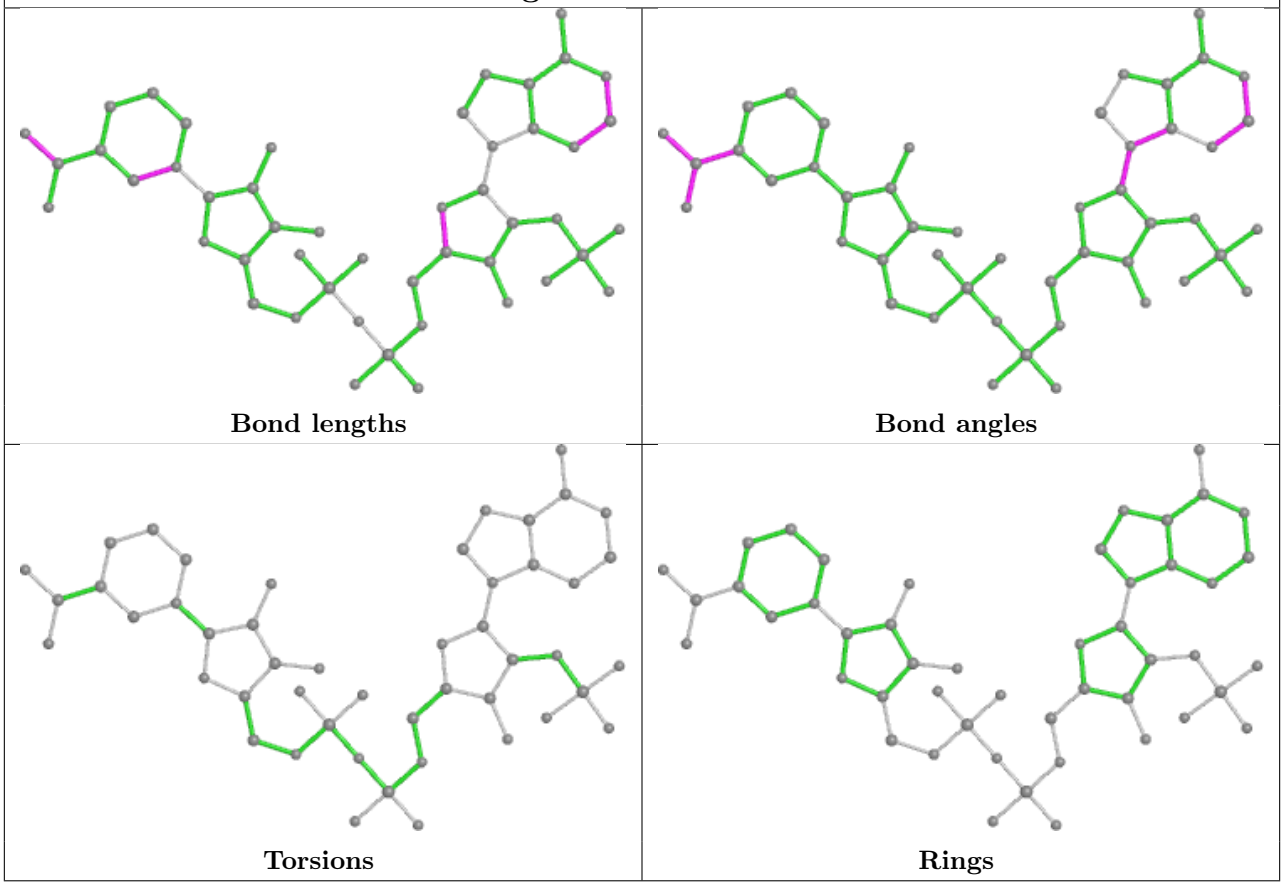


Torsions



Rings

Ligand NAP A 269



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^{th} 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	247/288 (85%)	-0.52	0 100 100	19, 24, 40, 56	4 (1%)
1	C	237/288 (82%)	-0.40	5 (2%) 63 59	18, 25, 45, 63	1 (0%)
1	D	247/288 (85%)	-0.43	1 (0%) 92 90	19, 25, 41, 68	1 (0%)
2	B	246/288 (85%)	-0.59	0 100 100	18, 24, 37, 44	0
All	All	977/1152 (84%)	-0.49	6 (0%) 89 87	18, 24, 40, 68	6 (0%)

The worst 5 of 6 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	113	GLY	6.4
1	C	232	ALA	3.0
1	C	210	PRO	2.7
1	D	211	VAL	2.6
1	C	229	ARG	2.6

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

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^{th} 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
1	CSX	A	59	7/8	0.95	0.07	25,25,28,34	0
1	CSX	A	168	7/8	0.95	0.07	28,31,54,56	0
1	CSX	C	168	7/8	0.95	0.08	23,26,39,42	1
1	CSX	D	168	7/8	0.95	0.09	26,29,41,58	0
2	CSX	B	59	7/8	0.96	0.08	19,22,30,35	0
1	CSX	D	59	7/8	0.96	0.07	25,27,30,37	0
1	CSX	C	59	7/8	0.96	0.08	22,24,31,33	0

6.3 Carbohydrates (i)

There are no monosaccharides in this entry.

6.4 Ligands (i)

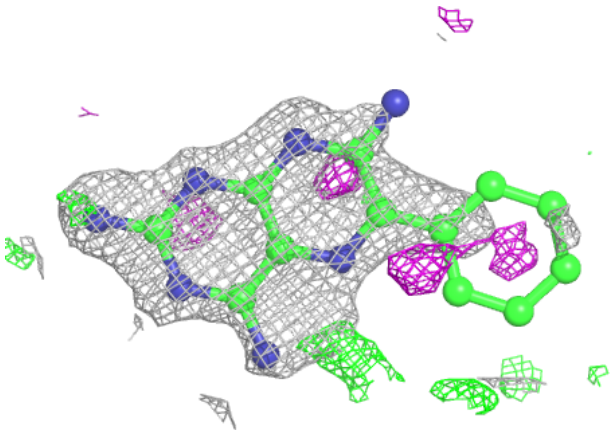
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

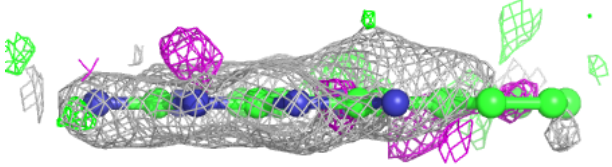
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
4	DX2	C	270	19/19	0.68	0.27	79,81,81,81	0
6	DTT	B	272[A]	8/8	0.86	0.22	39,48,52,59	7
6	DTT	B	272[B]	8/8	0.86	0.22	40,49,57,59	7
4	DX2	A	271	19/19	0.88	0.23	26,31,37,37	0
4	DX2	D	270	19/19	0.88	0.24	29,36,41,41	0
4	DX2	B	271	19/19	0.92	0.15	22,28,35,38	0
3	NAP	C	269	48/48	0.94	0.13	20,32,37,41	48
3	NAP	D	269	48/48	0.97	0.09	17,25,30,33	0
5	ACT	B	270	4/4	0.97	0.14	25,27,29,29	0
3	NAP	B	269	48/48	0.98	0.07	20,24,27,29	0
3	NAP	A	269	48/48	0.98	0.07	19,24,29,35	0
5	ACT	A	270	4/4	0.99	0.13	28,29,29,30	0

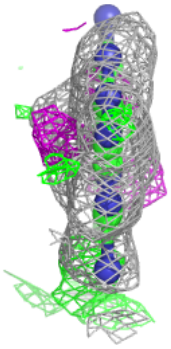
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around DX2 C 270:

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

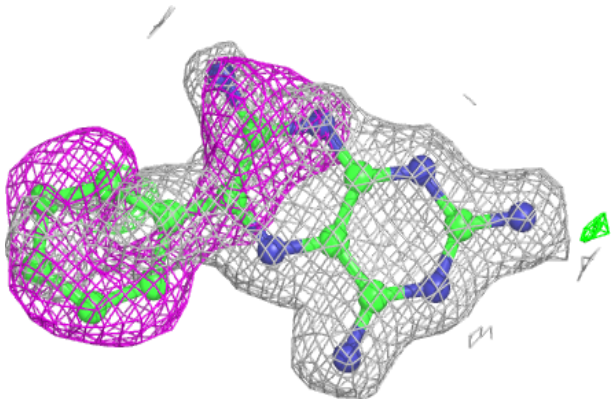


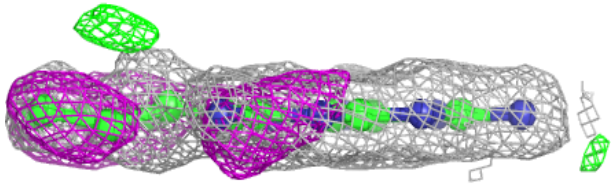


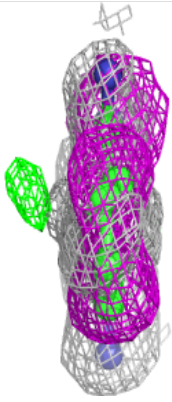


Electron density around DX2 A 271:

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

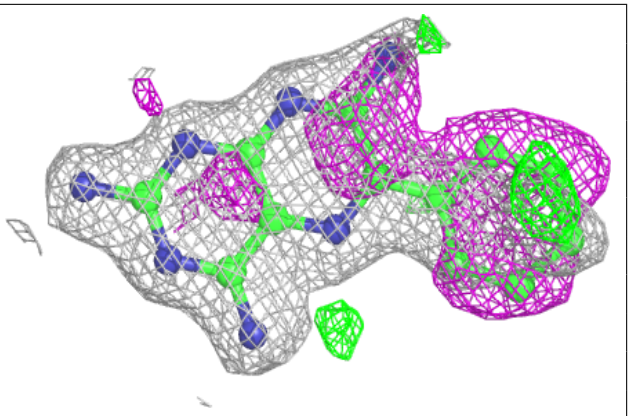


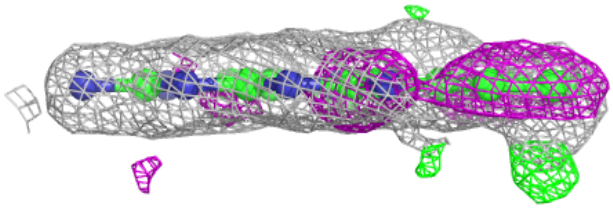


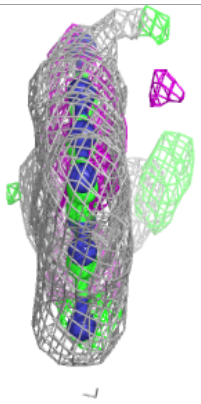


Electron density around DX2 D 270:

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

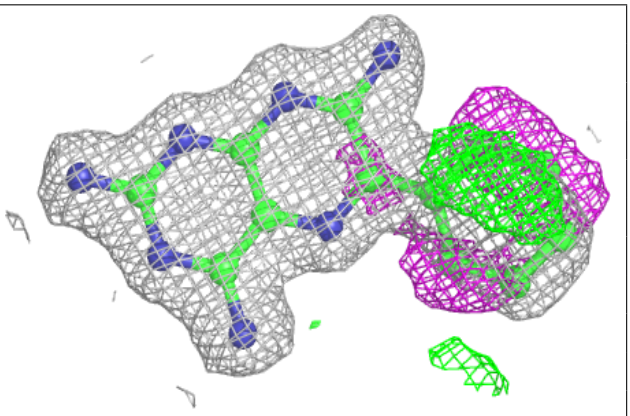


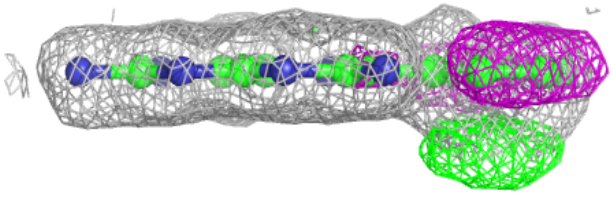


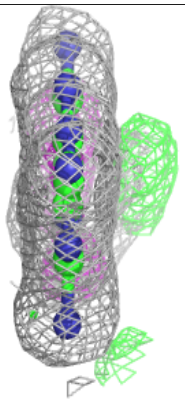


Electron density around DX2 B 271:

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

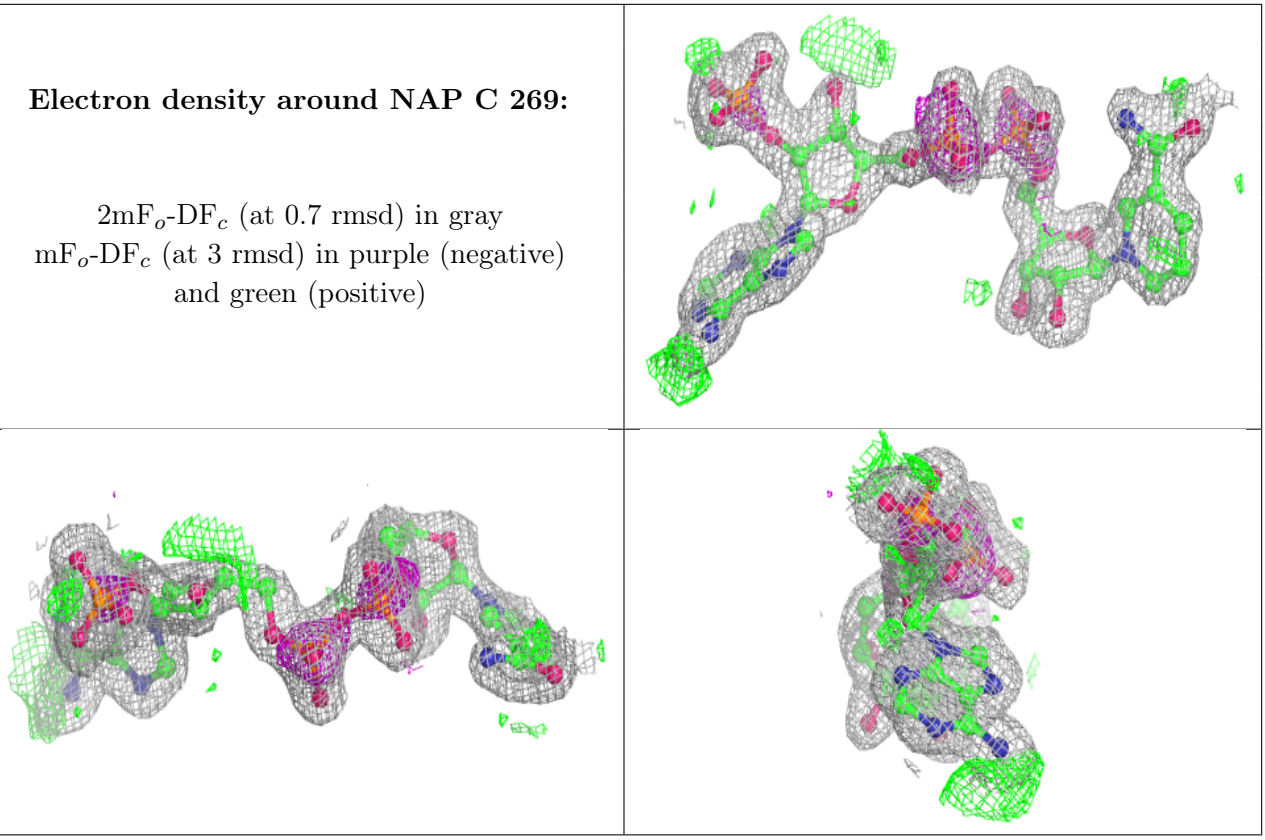






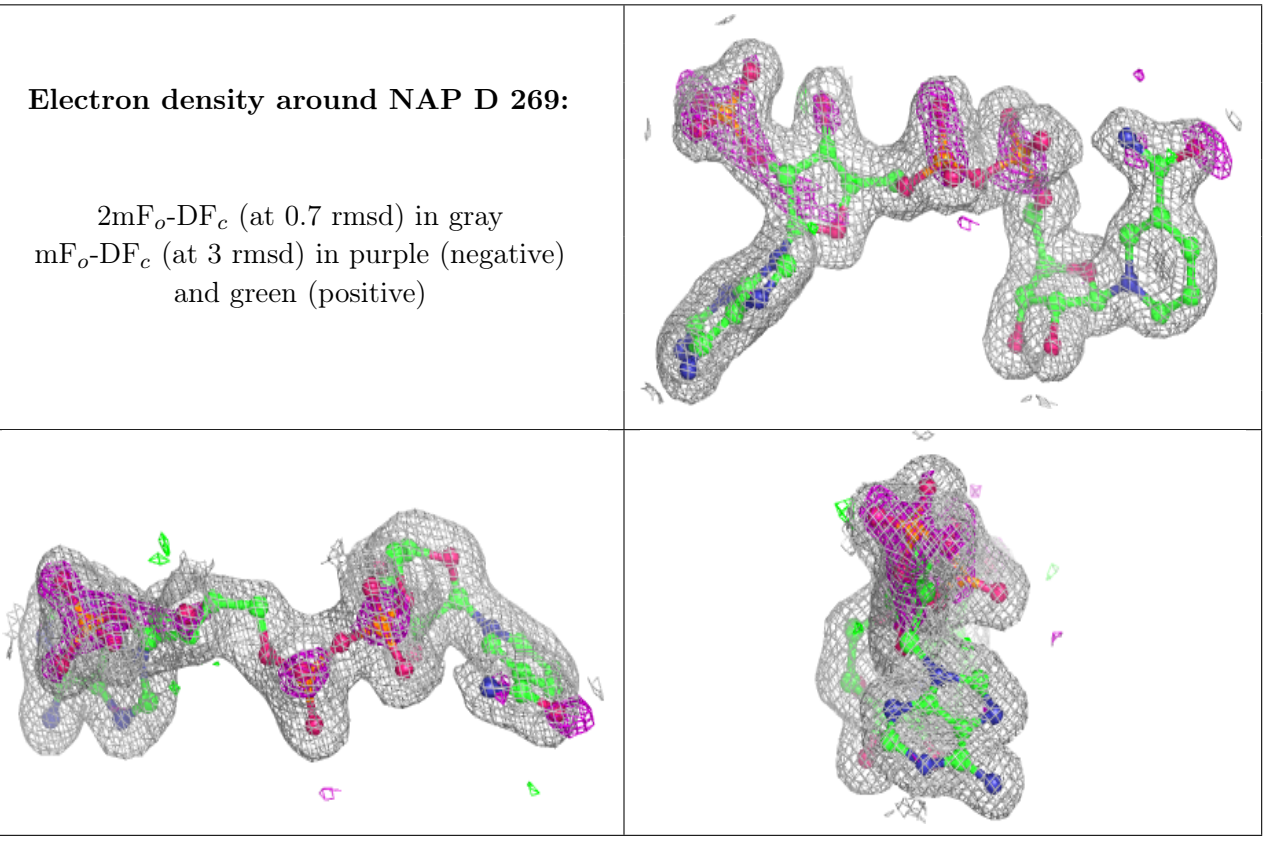
Electron density around NAP C 269:

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



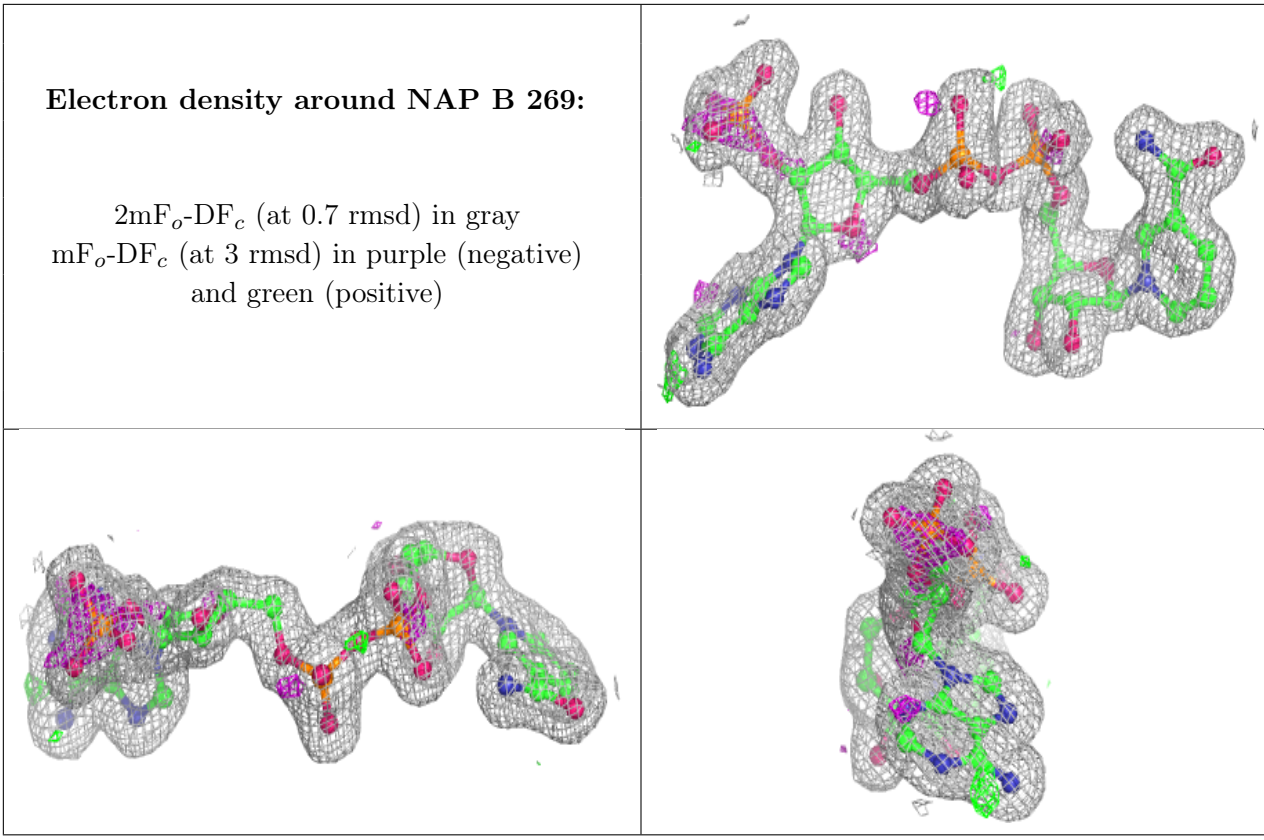
Electron density around NAP D 269:

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



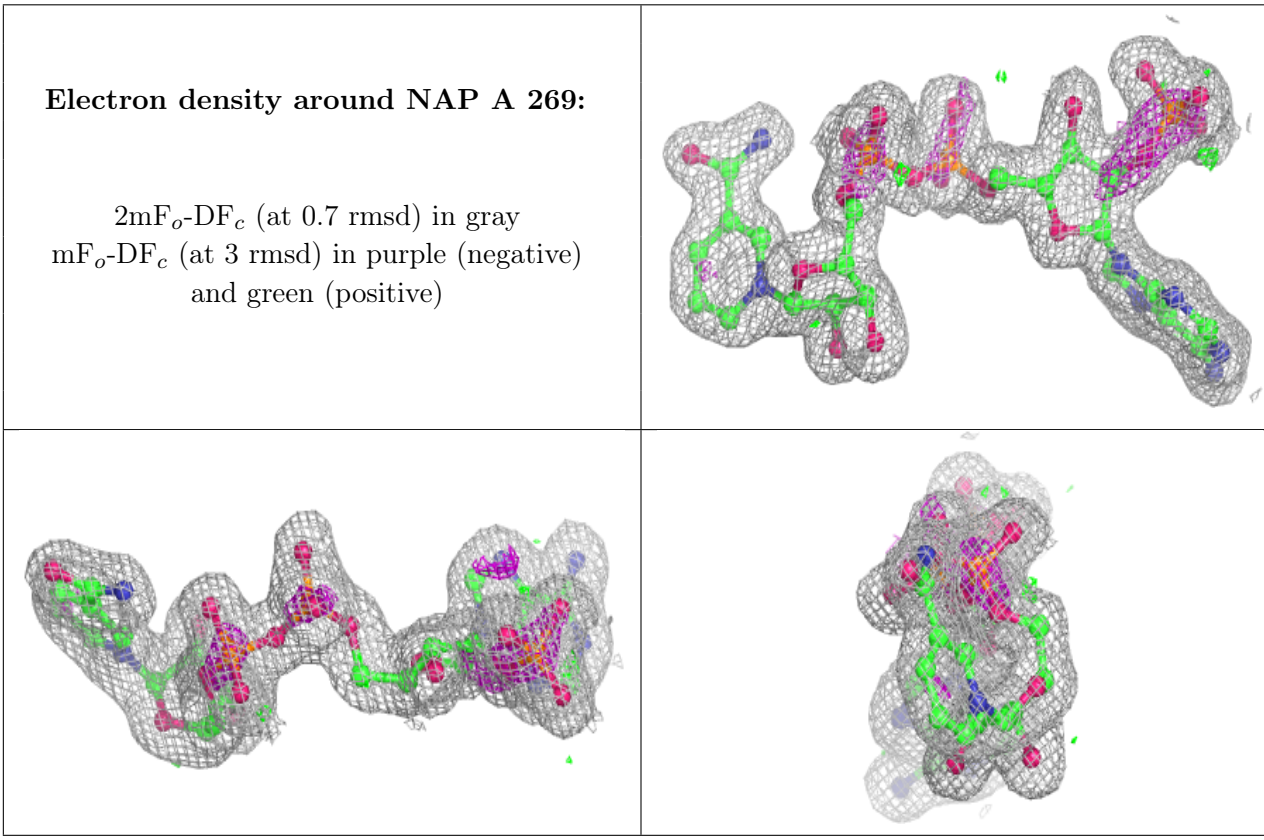
Electron density around NAP B 269:

$2mF_o$-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 269:

$2mF_o$-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.