



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 6, 2026 – 11:37 PM UTC

PDB ID : 4IIU / pdb_00004iiu
Title : Crystal structure of a putative 3-oxoacyl-[acyl-carrier protein]reductase from Escherichia coli strain CFT073 complexed with NADP⁺ at 2.1 Å resolution
Authors : Hou, J.; Osinski, T.; Zheng, H.; Shumilin, I.; Shabalin, I.; Shatsman, S.; Anderson, W.F.; Minor, W.; Center for Structural Genomics of Infectious Diseases (CSGID)
Deposited on : 2012-12-20
Resolution : 2.10 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 ⓘ 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](#) ①) were used in the production of this report:

MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

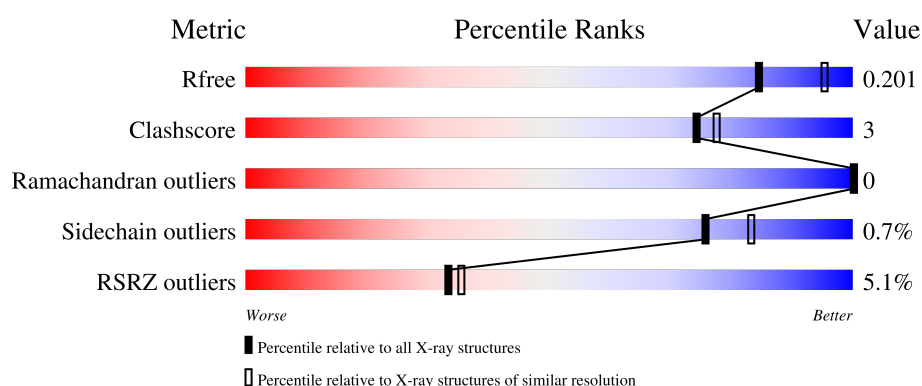
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.10 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	6658 (2.10-2.10)
Clashscore	190562	7164 (2.10-2.10)
Ramachandran outliers	187476	7099 (2.10-2.10)
Sidechain outliers	187428	7100 (2.10-2.10)
RSRZ outliers	180081	6662 (2.10-2.10)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. 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	267	5% 85% 5% 9%
1	B	267	4% 84% 6% 9%
1	C	267	6% 85% 5% 10%
1	D	267	3% 84% 6% 9%

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 7766 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 3-oxoacyl-[acyl-carrier protein] reductase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	243	Total	C	N	O	S	0	4	0
			1807	1121	338	334	14			
1	B	242	Total	C	N	O	S	0	1	0
			1764	1095	323	332	14			
1	C	240	Total	C	N	O	S	0	0	0
			1735	1079	317	326	13			
1	D	242	Total	C	N	O	S	0	1	0
			1773	1103	325	331	14			

There are 100 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-23	MET	-	expression tag	UNP Q8FJ14
A	-22	HIS	-	expression tag	UNP Q8FJ14
A	-21	HIS	-	expression tag	UNP Q8FJ14
A	-20	HIS	-	expression tag	UNP Q8FJ14
A	-19	HIS	-	expression tag	UNP Q8FJ14
A	-18	HIS	-	expression tag	UNP Q8FJ14
A	-17	HIS	-	expression tag	UNP Q8FJ14
A	-16	SER	-	expression tag	UNP Q8FJ14
A	-15	SER	-	expression tag	UNP Q8FJ14
A	-14	GLY	-	expression tag	UNP Q8FJ14
A	-13	VAL	-	expression tag	UNP Q8FJ14
A	-12	ASP	-	expression tag	UNP Q8FJ14
A	-11	LEU	-	expression tag	UNP Q8FJ14
A	-10	GLY	-	expression tag	UNP Q8FJ14
A	-9	THR	-	expression tag	UNP Q8FJ14
A	-8	GLU	-	expression tag	UNP Q8FJ14
A	-7	ASN	-	expression tag	UNP Q8FJ14
A	-6	LEU	-	expression tag	UNP Q8FJ14
A	-5	TYR	-	expression tag	UNP Q8FJ14
A	-4	PHE	-	expression tag	UNP Q8FJ14
A	-3	GLN	-	expression tag	UNP Q8FJ14

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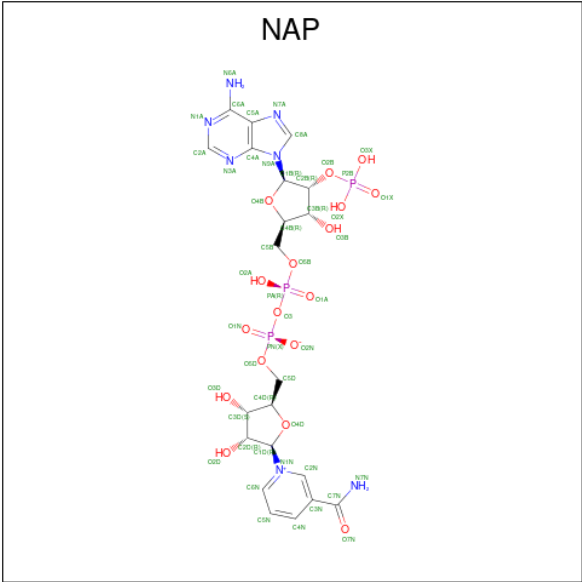
Chain	Residue	Modelled	Actual	Comment	Reference
A	-2	SER	-	expression tag	UNP Q8FJ14
A	-1	ASN	-	expression tag	UNP Q8FJ14
A	0	ALA	-	expression tag	UNP Q8FJ14
A	20	ARG	CYS	engineered mutation	UNP Q8FJ14
B	-23	MET	-	expression tag	UNP Q8FJ14
B	-22	HIS	-	expression tag	UNP Q8FJ14
B	-21	HIS	-	expression tag	UNP Q8FJ14
B	-20	HIS	-	expression tag	UNP Q8FJ14
B	-19	HIS	-	expression tag	UNP Q8FJ14
B	-18	HIS	-	expression tag	UNP Q8FJ14
B	-17	HIS	-	expression tag	UNP Q8FJ14
B	-16	SER	-	expression tag	UNP Q8FJ14
B	-15	SER	-	expression tag	UNP Q8FJ14
B	-14	GLY	-	expression tag	UNP Q8FJ14
B	-13	VAL	-	expression tag	UNP Q8FJ14
B	-12	ASP	-	expression tag	UNP Q8FJ14
B	-11	LEU	-	expression tag	UNP Q8FJ14
B	-10	GLY	-	expression tag	UNP Q8FJ14
B	-9	THR	-	expression tag	UNP Q8FJ14
B	-8	GLU	-	expression tag	UNP Q8FJ14
B	-7	ASN	-	expression tag	UNP Q8FJ14
B	-6	LEU	-	expression tag	UNP Q8FJ14
B	-5	TYR	-	expression tag	UNP Q8FJ14
B	-4	PHE	-	expression tag	UNP Q8FJ14
B	-3	GLN	-	expression tag	UNP Q8FJ14
B	-2	SER	-	expression tag	UNP Q8FJ14
B	-1	ASN	-	expression tag	UNP Q8FJ14
B	0	ALA	-	expression tag	UNP Q8FJ14
B	20	ARG	CYS	engineered mutation	UNP Q8FJ14
C	-23	MET	-	expression tag	UNP Q8FJ14
C	-22	HIS	-	expression tag	UNP Q8FJ14
C	-21	HIS	-	expression tag	UNP Q8FJ14
C	-20	HIS	-	expression tag	UNP Q8FJ14
C	-19	HIS	-	expression tag	UNP Q8FJ14
C	-18	HIS	-	expression tag	UNP Q8FJ14
C	-17	HIS	-	expression tag	UNP Q8FJ14
C	-16	SER	-	expression tag	UNP Q8FJ14
C	-15	SER	-	expression tag	UNP Q8FJ14
C	-14	GLY	-	expression tag	UNP Q8FJ14
C	-13	VAL	-	expression tag	UNP Q8FJ14
C	-12	ASP	-	expression tag	UNP Q8FJ14
C	-11	LEU	-	expression tag	UNP Q8FJ14

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Chain	Residue	Modelled	Actual	Comment	Reference
C	-10	GLY	-	expression tag	UNP Q8FJ14
C	-9	THR	-	expression tag	UNP Q8FJ14
C	-8	GLU	-	expression tag	UNP Q8FJ14
C	-7	ASN	-	expression tag	UNP Q8FJ14
C	-6	LEU	-	expression tag	UNP Q8FJ14
C	-5	TYR	-	expression tag	UNP Q8FJ14
C	-4	PHE	-	expression tag	UNP Q8FJ14
C	-3	GLN	-	expression tag	UNP Q8FJ14
C	-2	SER	-	expression tag	UNP Q8FJ14
C	-1	ASN	-	expression tag	UNP Q8FJ14
C	0	ALA	-	expression tag	UNP Q8FJ14
C	20	ARG	CYS	engineered mutation	UNP Q8FJ14
D	-23	MET	-	expression tag	UNP Q8FJ14
D	-22	HIS	-	expression tag	UNP Q8FJ14
D	-21	HIS	-	expression tag	UNP Q8FJ14
D	-20	HIS	-	expression tag	UNP Q8FJ14
D	-19	HIS	-	expression tag	UNP Q8FJ14
D	-18	HIS	-	expression tag	UNP Q8FJ14
D	-17	HIS	-	expression tag	UNP Q8FJ14
D	-16	SER	-	expression tag	UNP Q8FJ14
D	-15	SER	-	expression tag	UNP Q8FJ14
D	-14	GLY	-	expression tag	UNP Q8FJ14
D	-13	VAL	-	expression tag	UNP Q8FJ14
D	-12	ASP	-	expression tag	UNP Q8FJ14
D	-11	LEU	-	expression tag	UNP Q8FJ14
D	-10	GLY	-	expression tag	UNP Q8FJ14
D	-9	THR	-	expression tag	UNP Q8FJ14
D	-8	GLU	-	expression tag	UNP Q8FJ14
D	-7	ASN	-	expression tag	UNP Q8FJ14
D	-6	LEU	-	expression tag	UNP Q8FJ14
D	-5	TYR	-	expression tag	UNP Q8FJ14
D	-4	PHE	-	expression tag	UNP Q8FJ14
D	-3	GLN	-	expression tag	UNP Q8FJ14
D	-2	SER	-	expression tag	UNP Q8FJ14
D	-1	ASN	-	expression tag	UNP Q8FJ14
D	0	ALA	-	expression tag	UNP Q8FJ14
D	20	ARG	CYS	engineered mutation	UNP Q8FJ14

- Molecule 2 is NADP NICOTINAMIDE-ADENINE-DINUCLEOTIDE PHOSPHATE (CCD ID: NAP) (formula: C₂₁H₂₈N₇O₁₇P₃).



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

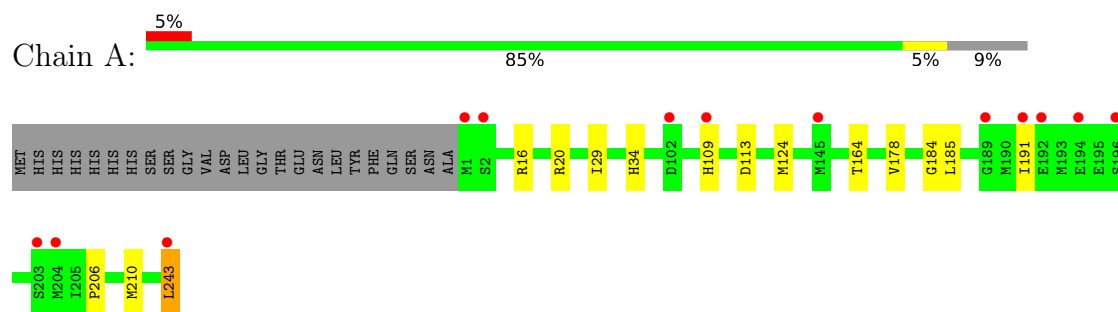
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	158	Total	O	0	0
			158	158		
3	B	92	Total	O	0	0
			92	92		
3	C	77	Total	O	0	0
			77	77		
3	D	168	Total	O	0	0
			168	168		

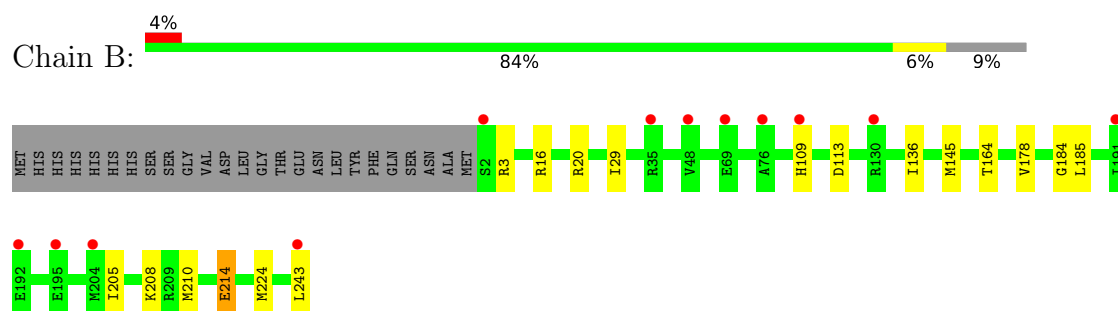
3 Residue-property plots [i](#)

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.

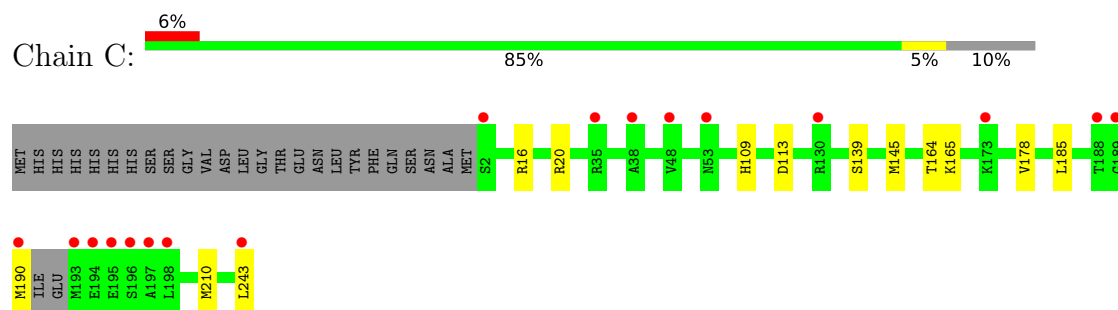
- Molecule 1: 3-oxoacyl-[acyl-carrier protein] reductase



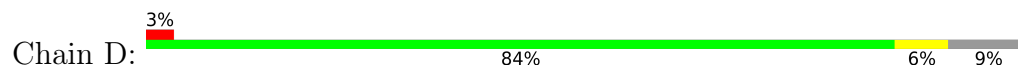
- Molecule 1: 3-oxoacyl-[acyl-carrier protein] reductase

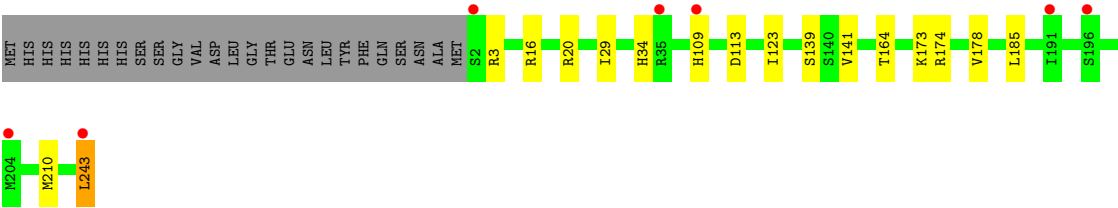


- Molecule 1: 3-oxoacyl-[acyl-carrier protein] reductase



- Molecule 1: 3-oxoacyl-[acyl-carrier protein] reductase





4 Data and refinement statistics

Property	Value	Source
Space group	P 65	Depositor
Cell constants a, b, c, α , β , γ	128.54Å 128.54Å 125.94Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	39.94 – 2.10 39.94 – 2.10	Depositor EDS
% Data completeness (in resolution range)	98.7 (39.94-2.10) 98.7 (39.94-2.10)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	4.16 (at 2.10Å)	Xtriage
Refinement program	REFMAC	Depositor
R, R_{free}	0.168 , 0.193 0.178 , 0.201	Depositor DCC
R_{free} test set	3480 reflections (5.06%)	wwPDB-VP
Wilson B-factor (Å ²)	24.4	Xtriage
Anisotropy	0.055	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 47.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.51$, $\langle L^2 \rangle = 0.34$	Xtriage
Estimated twinning fraction	0.032 for h,-h-k,-l	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	7766	wwPDB-VP
Average B, all atoms (Å ²)	34.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.64% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical 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: 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	0.67	0/1830	0.80	1/2472 (0.0%)
1	B	0.62	0/1787	0.77	1/2417 (0.0%)
1	C	0.61	0/1757	0.78	0/2377
1	D	0.68	0/1796	0.79	2/2427 (0.1%)
All	All	0.65	0/7170	0.79	4/9693 (0.0%)

There are no bond length outliers.

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	29	ILE	N-CA-C	5.44	116.13	108.36
1	A	29	ILE	N-CA-C	5.11	115.67	108.36
1	D	123	ILE	N-CA-C	5.09	115.21	110.42
1	B	29	ILE	N-CA-C	5.01	115.52	108.36

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	1807	0	1807	13	0
1	B	1764	0	1749	10	0
1	C	1735	0	1718	9	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	D	1773	0	1775	16	0
2	A	48	0	25	3	0
2	B	48	0	25	1	0
2	C	48	0	25	2	0
2	D	48	0	25	2	0
3	A	158	0	0	1	0
3	B	92	0	0	0	0
3	C	77	0	0	1	0
3	D	168	0	0	2	0
All	All	7766	0	7149	45	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 (45) 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:141:VAL:HG23	1:D:243:LEU:HD11	1.55	0.87
1:D:141:VAL:CG2	1:D:243:LEU:HD11	2.06	0.84
1:D:173:LYS:HD3	3:D:5061:HOH:O	1.86	0.75
1:A:206:PRO:O	1:D:173:LYS:HE3	1.99	0.62
1:D:243:LEU:N	1:D:243:LEU:HD13	2.16	0.60
1:A:206:PRO:O	1:D:173:LYS:HD2	2.05	0.56
1:A:124:MET:HE3	3:A:2104:HOH:O	2.06	0.55
1:C:190:MET:HE1	2:C:2901:NAP:H2D	1.90	0.53
1:C:164:THR:HG23	1:C:178:VAL:HG12	1.91	0.52
1:D:164:THR:HG23	1:D:178:VAL:HG12	1.92	0.51
1:B:214:GLU:H	1:B:214:GLU:CD	2.17	0.50
1:A:164:THR:HG23	1:A:178:VAL:HG12	1.93	0.50
1:B:145:MET:SD	1:B:243:LEU:HD23	2.53	0.49
1:B:164:THR:HG23	1:B:178:VAL:HG12	1.94	0.49
1:A:206:PRO:O	1:D:173:LYS:CE	2.60	0.49
1:A:243:LEU:HD13	1:A:243:LEU:O	2.14	0.48
1:C:165:LYS:NZ	3:C:3020:HOH:O	2.48	0.47
1:B:185:LEU:HG	1:B:210:MET:HE3	1.97	0.46
1:B:136:ILE:HD12	1:B:224:MET:HE2	1.98	0.46
1:C:243:LEU:HD12	1:C:243:LEU:O	2.16	0.46
1:B:243:LEU:O	1:B:243:LEU:HD12	2.16	0.46
1:C:185:LEU:HG	1:C:210:MET:HE3	1.97	0.46
1:D:16:ARG:O	1:D:20[A]:ARG:HG2	2.16	0.45
1:B:16:ARG:O	1:B:20:ARG:HG2	2.17	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:185:LEU:HG	1:D:210:MET:HE3	1.99	0.45
1:D:141:VAL:HG21	1:D:243:LEU:HD11	1.91	0.44
1:A:16:ARG:O	1:A:20[B]:ARG:HG3	2.18	0.44
1:C:16:ARG:O	1:C:20:ARG:HG2	2.18	0.44
1:A:16:ARG:O	1:A:20[A]:ARG:HG2	2.16	0.44
1:D:243:LEU:HD22	1:D:243:LEU:O	2.18	0.43
1:A:184:GLY:O	2:A:1901:NAP:H4N	2.18	0.43
1:C:145:MET:SD	1:C:243:LEU:HD23	2.58	0.43
1:C:139:SER:O	2:C:2901:NAP:H6N	2.19	0.43
1:D:174:ARG:HD3	3:D:5083:HOH:O	2.20	0.42
1:A:185:LEU:HG	1:A:210:MET:HE3	2.00	0.42
1:B:205:ILE:O	1:B:208:LYS:HD2	2.20	0.41
1:A:191:ILE:HD11	2:A:1901:NAP:O7N	2.21	0.41
1:D:109:HIS:O	1:D:113:ASP:HB2	2.20	0.41
1:D:34:HIS:HB2	2:D:4901:NAP:C2A	2.50	0.41
1:A:109:HIS:O	1:A:113:ASP:HB2	2.21	0.41
1:B:109:HIS:O	1:B:113:ASP:HB2	2.21	0.41
1:B:184:GLY:O	2:B:3901:NAP:H4N	2.21	0.41
1:D:139:SER:O	2:D:4901:NAP:H6N	2.20	0.41
1:A:34:HIS:HB2	2:A:1901:NAP:C2A	2.51	0.40
1:C:109:HIS:O	1:C:113:ASP:HB2	2.20	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	245/267 (92%)	238 (97%)	7 (3%)	0	100	100
1	B	241/267 (90%)	235 (98%)	6 (2%)	0	100	100
1	C	236/267 (88%)	230 (98%)	6 (2%)	0	100	100
1	D	241/267 (90%)	235 (98%)	6 (2%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
All	All	963/1068 (90%)	938 (97%)	25 (3%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains ⓘ

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	178/203 (88%)	177 (99%)	1 (1%)	78	86
1	B	174/203 (86%)	172 (99%)	2 (1%)	65	74
1	C	170/203 (84%)	170 (100%)	0	100	100
1	D	176/203 (87%)	174 (99%)	2 (1%)	65	74
All	All	698/812 (86%)	693 (99%)	5 (1%)	76	83

All (5) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	243	LEU
1	B	3	ARG
1	B	214	GLU
1	D	3	ARG
1	D	243	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (10) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	109	HIS
1	A	131	GLN
1	A	234	GLN
1	B	45	ASN
1	C	234	GLN
1	D	28	ASN
1	D	34	HIS

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Mol	Chain	Res	Type
1	D	41	GLN
1	D	120	GLN
1	D	234	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 oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

4 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
2	NAP	A	1901	-	50,52,52	1.15	6 (12%)	71,80,80	1.65	15 (21%)
2	NAP	B	3901	-	50,52,52	1.46	6 (12%)	71,80,80	1.80	15 (21%)
2	NAP	C	2901	-	50,52,52	1.30	9 (18%)	71,80,80	1.67	17 (23%)
2	NAP	D	4901	-	50,52,52	1.34	7 (14%)	71,80,80	1.75	14 (19%)

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	NAP	A	1901	-	-	8/35/67/67	0/5/5/5
2	NAP	B	3901	-	-	6/35/67/67	0/5/5/5
2	NAP	C	2901	-	-	1/35/67/67	0/5/5/5
2	NAP	D	4901	-	-	2/35/67/67	0/5/5/5

All (28) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	3901	NAP	PA-O3	4.74	1.64	1.59
2	D	4901	NAP	PA-O3	4.52	1.64	1.59
2	C	2901	NAP	C5A-C4A	4.52	1.47	1.39
2	B	3901	NAP	PN-O3	4.50	1.64	1.59
2	B	3901	NAP	C5A-C4A	4.28	1.46	1.39
2	A	1901	NAP	C5A-C4A	4.20	1.46	1.39
2	D	4901	NAP	PN-O3	3.08	1.62	1.59
2	C	2901	NAP	PA-O3	2.97	1.62	1.59
2	C	2901	NAP	C8A-N7A	2.92	1.37	1.31
2	D	4901	NAP	C5A-C4A	2.81	1.44	1.39
2	C	2901	NAP	O4D-C1D	2.63	1.44	1.40
2	D	4901	NAP	P2B-O2B	2.61	1.64	1.59
2	D	4901	NAP	C5A-N7A	-2.58	1.34	1.39
2	B	3901	NAP	C8A-N7A	2.57	1.36	1.31
2	A	1901	NAP	PA-O3	2.52	1.62	1.59
2	D	4901	NAP	C4A-N9A	-2.49	1.32	1.37
2	A	1901	NAP	C5A-N7A	-2.39	1.34	1.39
2	C	2901	NAP	C4A-N9A	-2.38	1.32	1.37
2	A	1901	NAP	C8A-N7A	2.37	1.36	1.31
2	C	2901	NAP	P2B-O2B	2.36	1.63	1.59
2	C	2901	NAP	C5A-C6A	2.32	1.47	1.41
2	D	4901	NAP	C5A-C6A	2.29	1.47	1.41
2	B	3901	NAP	C5A-C6A	2.25	1.47	1.41
2	B	3901	NAP	P2B-O2B	2.19	1.63	1.59
2	A	1901	NAP	P2B-O2B	2.14	1.63	1.59
2	C	2901	NAP	C5A-N7A	-2.13	1.35	1.39
2	C	2901	NAP	PN-O3	2.13	1.61	1.59
2	A	1901	NAP	C4A-N9A	-2.06	1.33	1.37

All (61) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	3901	NAP	C5A-C4A-N3A	-5.26	119.47	126.72
2	B	3901	NAP	N3A-C4A-N9A	4.77	135.28	127.17

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	2901	NAP	C5A-C4A-N3A	-4.67	120.28	126.72
2	D	4901	NAP	C5A-C4A-N3A	-4.66	120.30	126.72
2	C	2901	NAP	N3A-C2A-N1A	-4.20	122.22	128.58
2	D	4901	NAP	C4A-C5A-N7A	-4.17	105.82	110.58
2	A	1901	NAP	C5A-C4A-N3A	-4.15	121.00	126.72
2	D	4901	NAP	O3-PA-O1A	-4.14	98.24	110.70
2	B	3901	NAP	N3A-C2A-N1A	-4.02	122.50	128.58
2	A	1901	NAP	N3A-C2A-N1A	-3.81	122.82	128.58
2	A	1901	NAP	O3-PA-O1A	-3.74	99.44	110.70
2	D	4901	NAP	C4A-N9A-C8A	3.71	109.63	105.74
2	B	3901	NAP	C2A-N3A-C4A	3.70	120.87	111.83
2	D	4901	NAP	N9A-C8A-N7A	-3.68	108.72	113.94
2	B	3901	NAP	C4A-N9A-C8A	3.67	109.59	105.74
2	A	1901	NAP	N3A-C4A-N9A	3.66	133.40	127.17
2	C	2901	NAP	N3A-C4A-N9A	3.66	133.38	127.17
2	C	2901	NAP	C2A-N3A-C4A	3.59	120.61	111.83
2	D	4901	NAP	C5A-N7A-C8A	3.52	108.98	103.45
2	D	4901	NAP	O2A-PA-O1A	3.46	128.52	112.44
2	A	1901	NAP	C4A-N9A-C8A	3.40	109.31	105.74
2	C	2901	NAP	C4A-N9A-C8A	3.36	109.27	105.74
2	D	4901	NAP	N3A-C4A-N9A	3.33	132.83	127.17
2	A	1901	NAP	C2A-N1A-C6A	3.29	124.13	118.73
2	A	1901	NAP	O2A-PA-O1A	3.15	127.09	112.44
2	B	3901	NAP	O2N-PN-O1N	3.14	127.07	112.44
2	C	2901	NAP	C4A-C5A-N7A	-3.08	107.06	110.58
2	D	4901	NAP	C2A-N3A-C4A	3.00	119.17	111.83
2	A	1901	NAP	C2A-N3A-C4A	2.99	119.13	111.83
2	B	3901	NAP	O3X-P2B-O2X	2.98	118.97	107.80
2	D	4901	NAP	N3A-C2A-N1A	-2.96	124.10	128.58
2	B	3901	NAP	O4B-C1B-N9A	2.89	113.64	108.09
2	B	3901	NAP	O3-PN-O1N	-2.86	102.10	110.70
2	D	4901	NAP	C2B-C1B-N9A	-2.85	109.07	113.75
2	B	3901	NAP	C2B-C1B-N9A	-2.75	109.23	113.75
2	C	2901	NAP	N9A-C8A-N7A	-2.73	110.07	113.94
2	A	1901	NAP	C4A-C5A-N7A	-2.70	107.49	110.58
2	B	3901	NAP	C3N-C7N-N7N	2.57	120.91	117.74
2	C	2901	NAP	C6A-C5A-N7A	2.56	137.02	132.09
2	B	3901	NAP	O2N-PN-O3	2.55	114.16	107.27
2	C	2901	NAP	C6N-N1N-C2N	-2.53	119.72	121.88
2	A	1901	NAP	N9A-C8A-N7A	-2.52	110.36	113.94
2	C	2901	NAP	O4B-C1B-N9A	2.50	112.90	108.09
2	A	1901	NAP	O2A-PA-O3	2.47	113.95	107.27

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	2901	NAP	C5A-N7A-C8A	2.43	107.28	103.45
2	C	2901	NAP	C2B-C1B-N9A	-2.41	109.79	113.75
2	B	3901	NAP	N9A-C8A-N7A	-2.41	110.52	113.94
2	C	2901	NAP	O3X-P2B-O2X	2.37	116.70	107.80
2	A	1901	NAP	C5A-N7A-C8A	2.35	107.15	103.45
2	D	4901	NAP	C6A-C5A-N7A	2.34	136.60	132.09
2	A	1901	NAP	C6A-C5A-N7A	2.31	136.55	132.09
2	A	1901	NAP	C2B-C1B-N9A	-2.30	109.97	113.75
2	C	2901	NAP	C2A-N1A-C6A	2.30	122.50	118.73
2	C	2901	NAP	C3N-C7N-N7N	2.24	120.50	117.74
2	A	1901	NAP	O2B-P2B-O1X	-2.23	101.37	109.33
2	D	4901	NAP	C4D-O4D-C1D	-2.21	107.90	109.92
2	C	2901	NAP	O3X-P2B-O2B	-2.14	97.52	105.85
2	C	2901	NAP	C4A-N9A-C1B	-2.12	121.67	126.63
2	B	3901	NAP	C5A-C6A-N6A	-2.05	118.20	123.29
2	B	3901	NAP	C4A-C5A-N7A	-2.05	108.24	110.58
2	D	4901	NAP	O2B-P2B-O1X	-2.02	102.14	109.33

There are no chirality outliers.

All (17) torsion outliers are listed below:

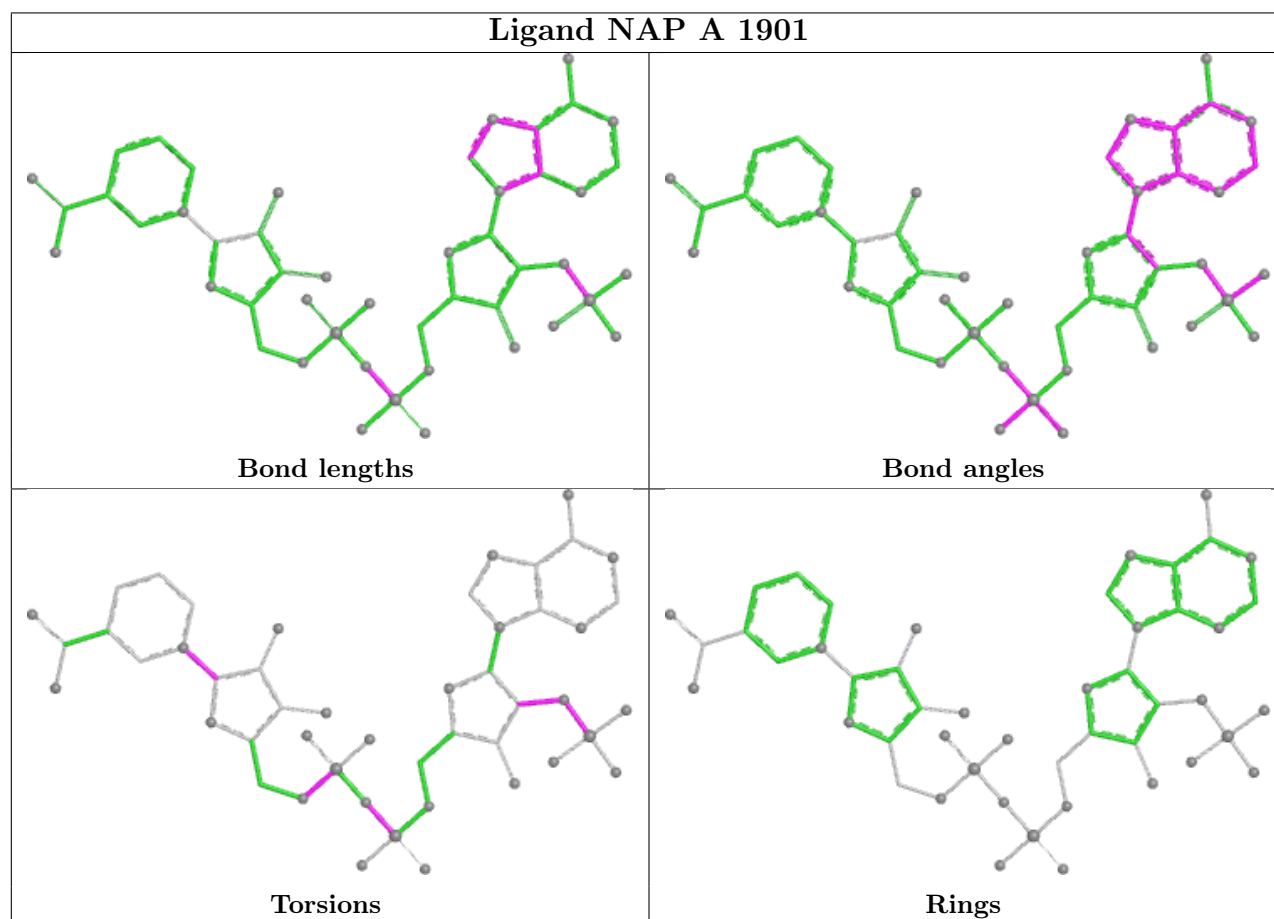
Mol	Chain	Res	Type	Atoms
2	A	1901	NAP	C5D-O5D-PN-O2N
2	B	3901	NAP	O4D-C1D-N1N-C2N
2	A	1901	NAP	PN-O3-PA-O1A
2	B	3901	NAP	PN-O3-PA-O2A
2	A	1901	NAP	C5D-O5D-PN-O3
2	A	1901	NAP	PN-O3-PA-O2A
2	C	2901	NAP	PN-O3-PA-O2A
2	D	4901	NAP	PN-O3-PA-O2A
2	A	1901	NAP	O4D-C1D-N1N-C2N
2	A	1901	NAP	O4D-C1D-N1N-C6N
2	B	3901	NAP	O4D-C1D-N1N-C6N
2	D	4901	NAP	PN-O3-PA-O1A
2	B	3901	NAP	PN-O3-PA-O1A
2	B	3901	NAP	O4B-C4B-C5B-O5B
2	A	1901	NAP	C2B-O2B-P2B-O2X
2	A	1901	NAP	C3B-C2B-O2B-P2B
2	B	3901	NAP	C3B-C2B-O2B-P2B

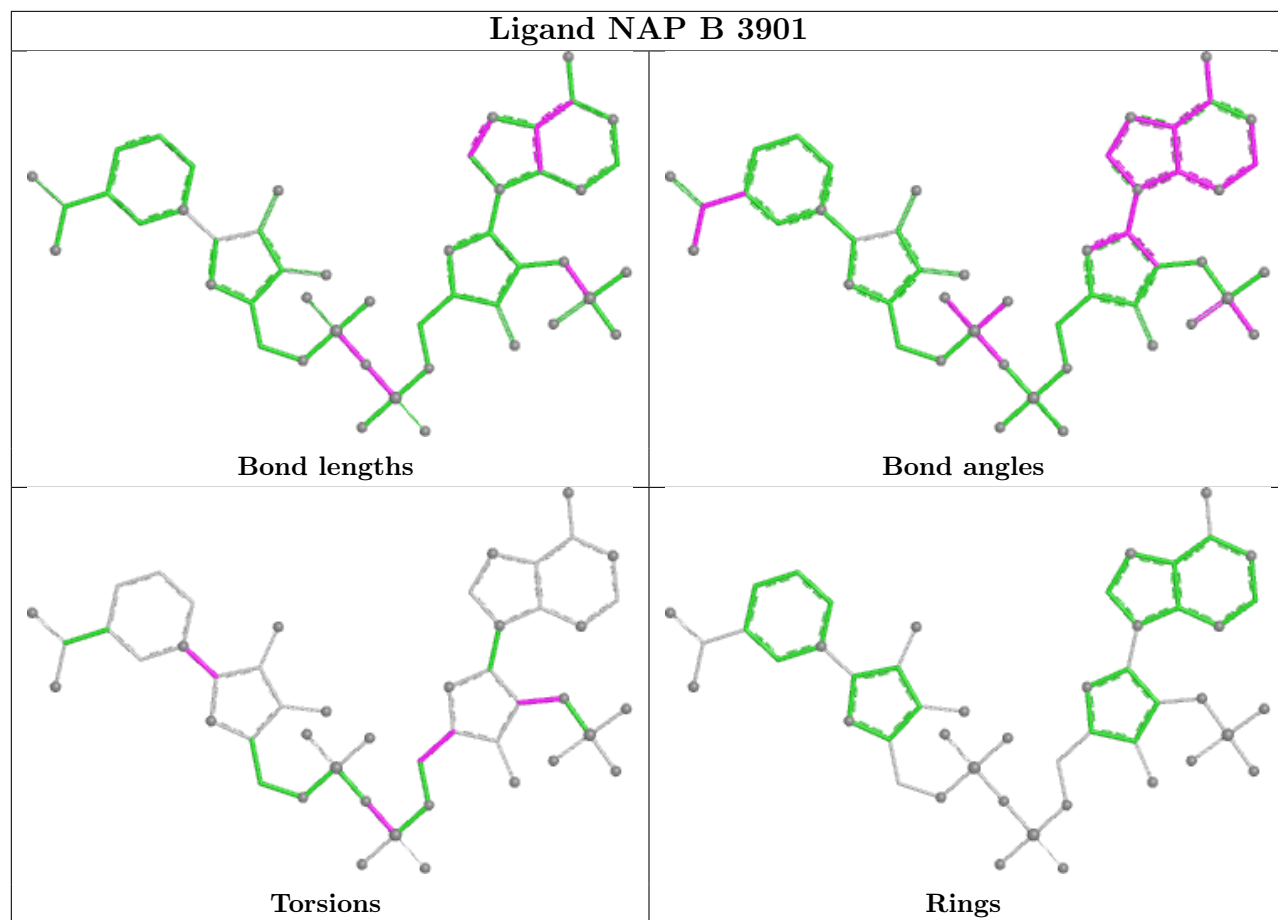
There are no ring outliers.

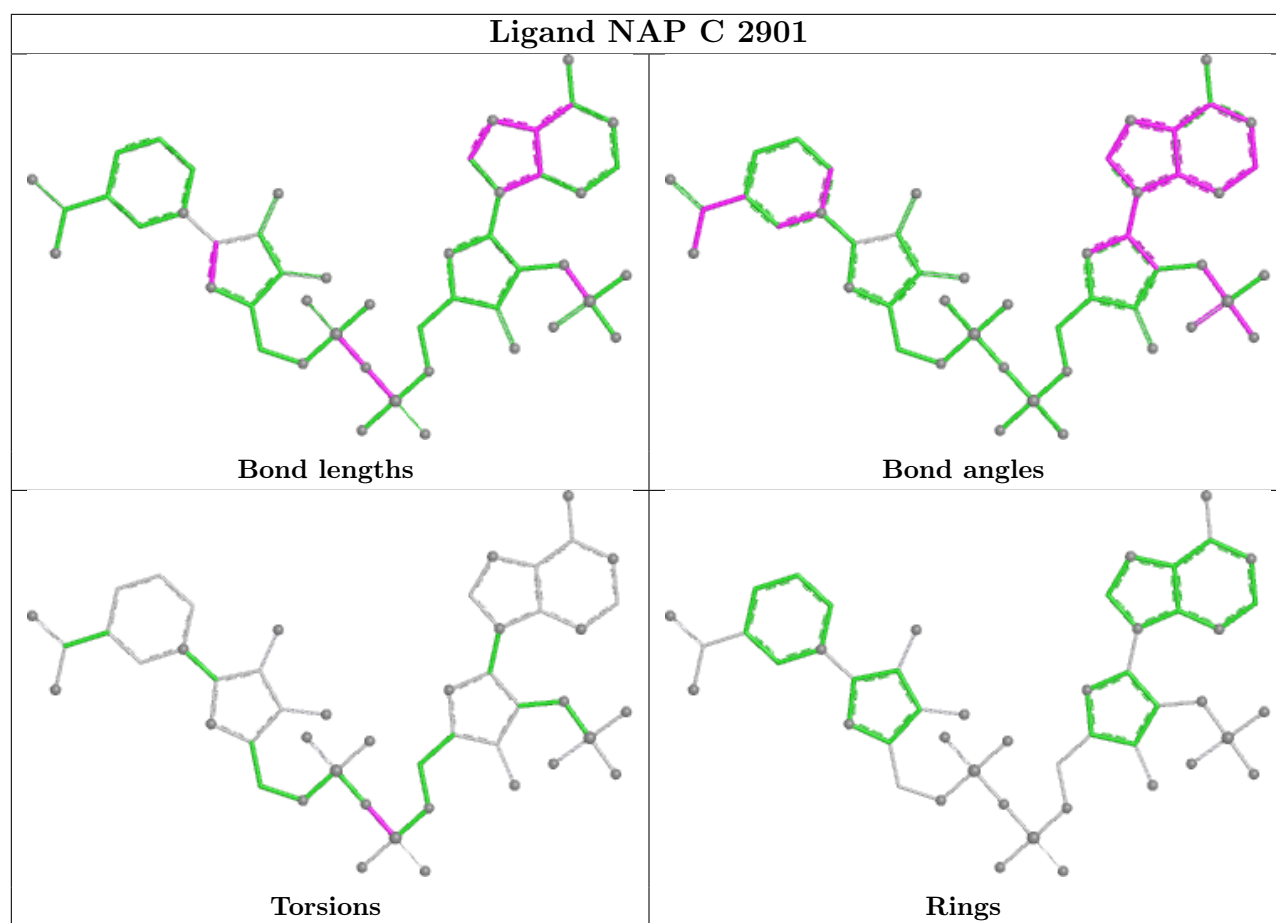
4 monomers are involved in 8 short contacts:

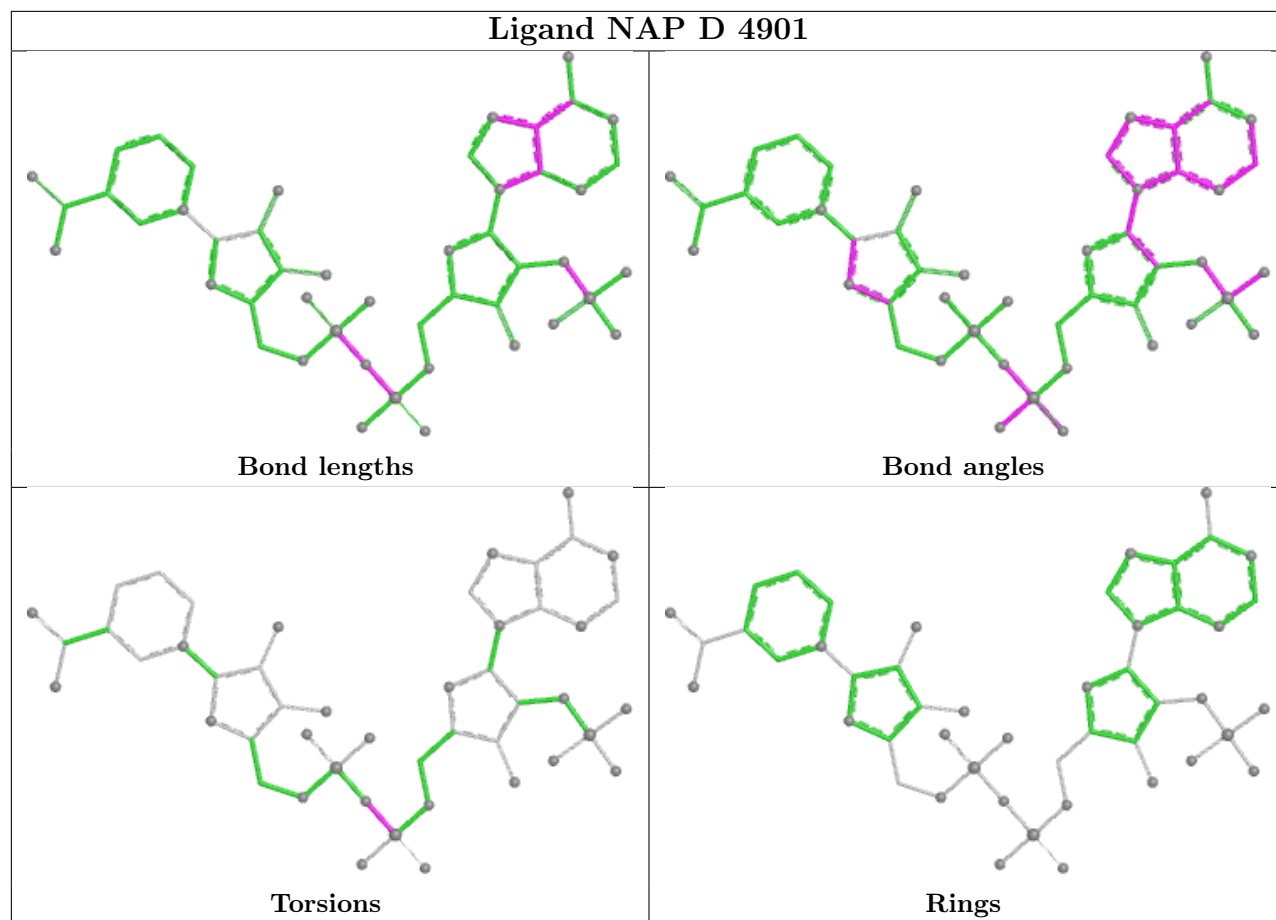
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	1901	NAP	3	0
2	B	3901	NAP	1	0
2	C	2901	NAP	2	0
2	D	4901	NAP	2	0

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, 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	243/267 (91%)	-0.09	13 (5%) 32 34	13, 23, 55, 73	4 (1%)
1	B	242/267 (90%)	0.36	12 (4%) 34 36	19, 40, 67, 79	1 (0%)
1	C	240/267 (89%)	0.48	17 (7%) 22 23	19, 42, 72, 83	0
1	D	242/267 (90%)	-0.20	7 (2%) 53 56	12, 22, 46, 64	1 (0%)
All	All	967/1068 (90%)	0.14	49 (5%) 33 35	12, 30, 65, 83	6 (0%)

All (49) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	189	GLY	4.4
1	C	193	MET	4.1
1	C	196	SER	4.0
1	D	243	LEU	3.9
1	C	53	ASN	3.8
1	C	197	ALA	3.6
1	A	1	MET	3.5
1	B	191	ILE	3.5
1	B	109	HIS	3.5
1	C	194	GLU	3.0
1	B	48	VAL	3.0
1	D	109	HIS	3.0
1	C	2	SER	3.0
1	A	243	LEU	3.0
1	C	195	GLU	2.9
1	A	204	MET	2.9
1	C	130	ARG	2.9
1	C	188	THR	2.8
1	A	196	SER	2.8
1	A	189	GLY	2.8
1	B	243	LEU	2.8

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Mol	Chain	Res	Type	RSRZ
1	C	173	LYS	2.7
1	A	191	ILE	2.7
1	D	196	SER	2.7
1	B	204	MET	2.7
1	C	190	MET	2.6
1	C	243	LEU	2.6
1	B	2	SER	2.6
1	A	109	HIS	2.5
1	D	204	MET	2.5
1	A	192	GLU	2.4
1	B	69	GLU	2.3
1	B	192	GLU	2.3
1	C	198	LEU	2.3
1	D	2	SER	2.3
1	C	38	ALA	2.3
1	B	195	GLU	2.2
1	D	191	ILE	2.2
1	A	194	GLU	2.2
1	B	130	ARG	2.2
1	B	76	ALA	2.1
1	A	203	SER	2.1
1	A	102[A]	ASP	2.1
1	B	35	ARG	2.1
1	C	35	ARG	2.1
1	C	48	VAL	2.1
1	A	2	SER	2.1
1	D	35	ARG	2.0
1	A	145	MET	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 oligosaccharides in this entry.

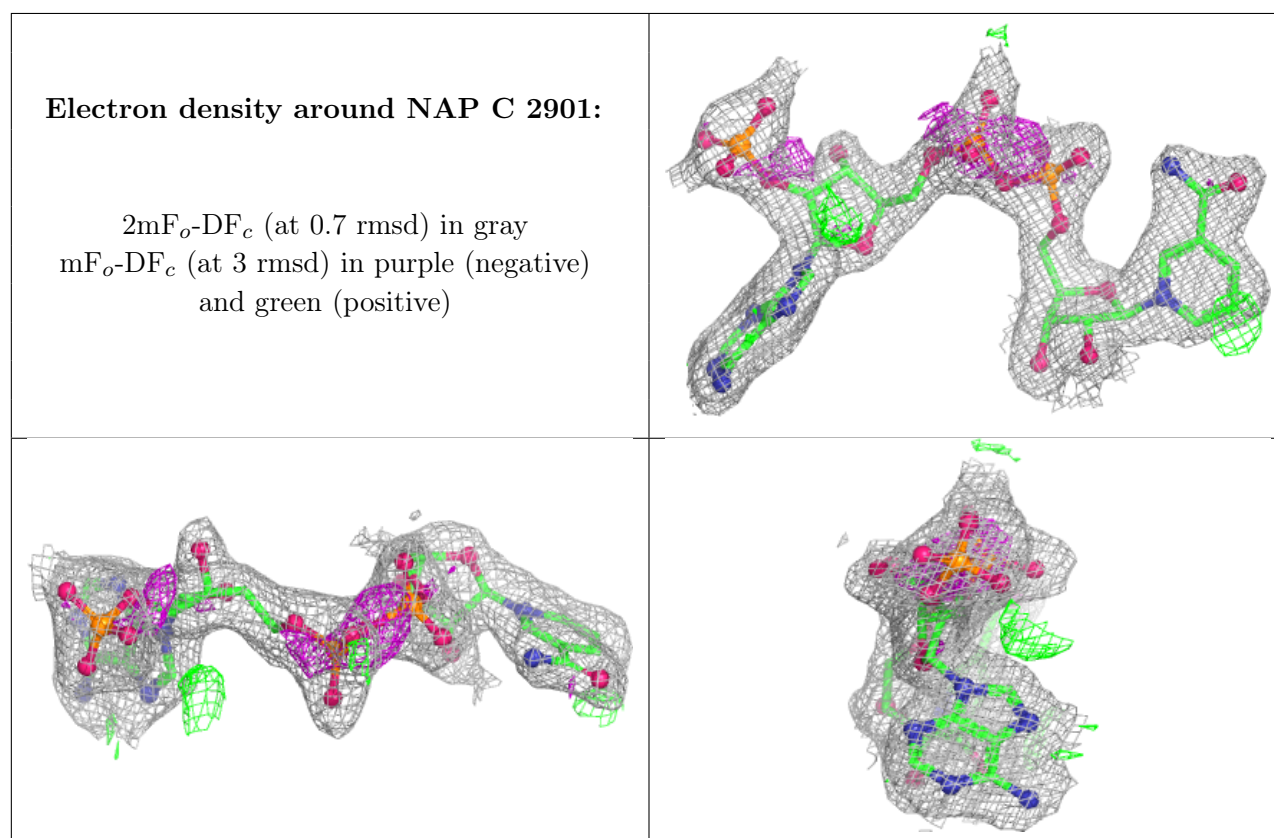
6.4 Ligands [i](#)

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.

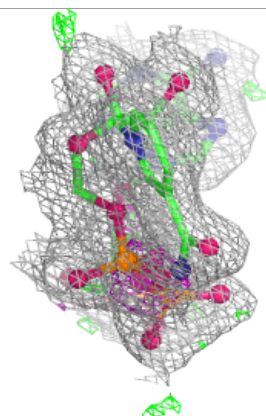
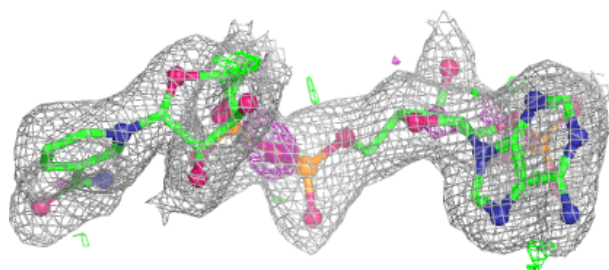
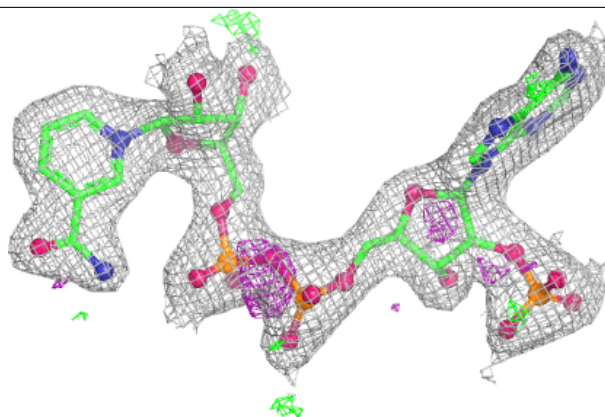
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	NAP	C	2901	48/48	0.89	0.11	36,43,52,59	0
2	NAP	B	3901	48/48	0.93	0.09	25,32,38,43	0
2	NAP	A	1901	48/48	0.96	0.07	21,25,30,33	0
2	NAP	D	4901	48/48	0.97	0.05	17,19,25,26	0

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.

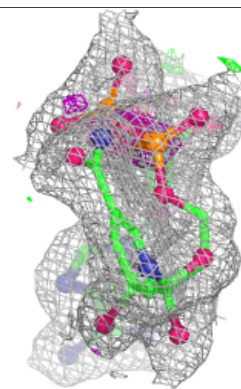
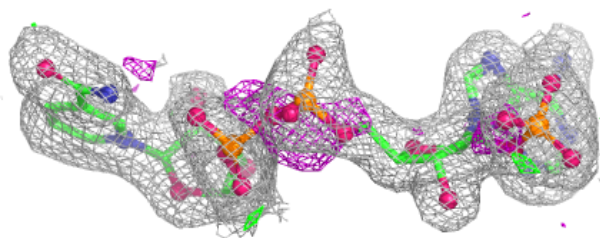
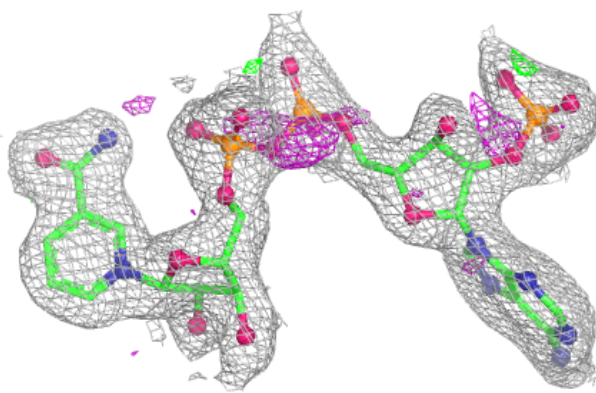


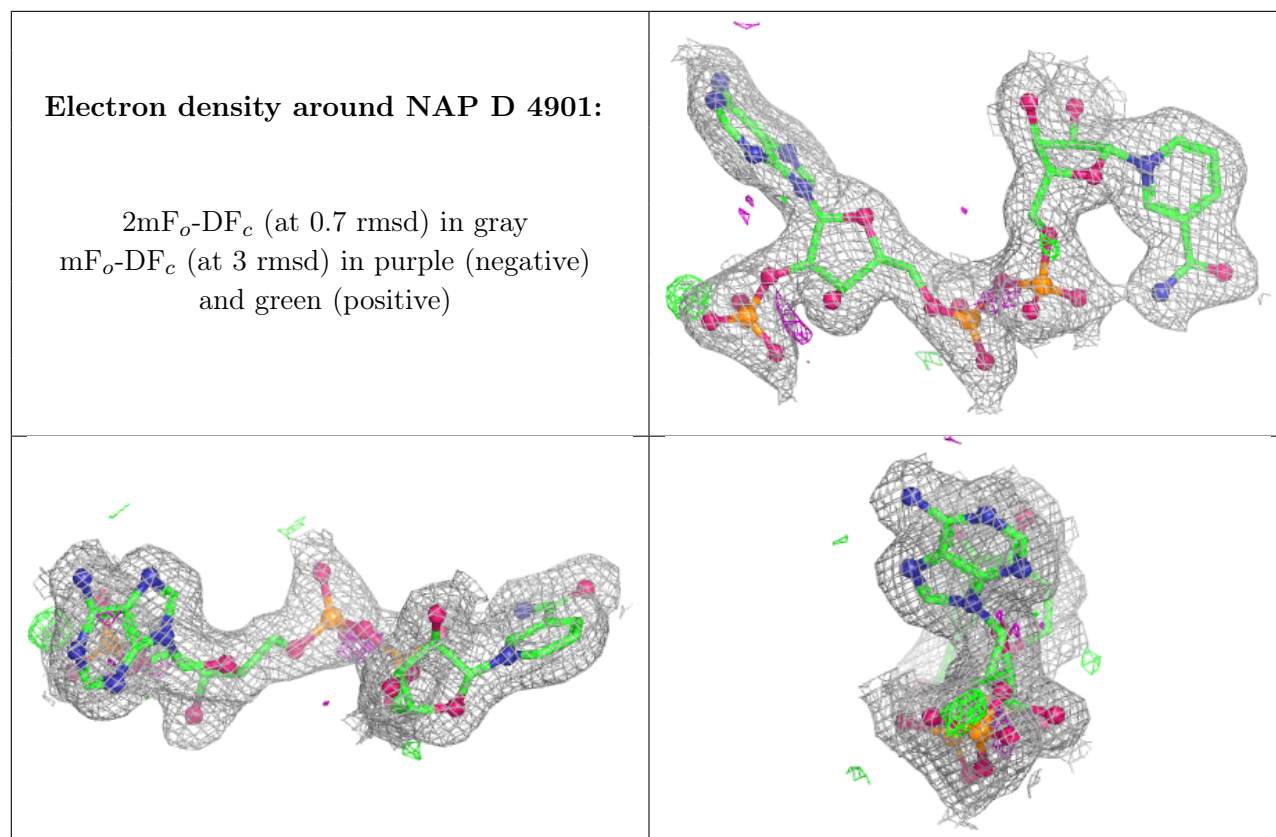
Electron density around NAP B 3901:

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

**Electron density around NAP A 1901:**

$2mF_o-DF_c$ (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.