



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 8, 2026 – 05:51 PM UTC

PDB ID : 1J96 / pdb_00001j96
Title : Human 3alpha-HSD type 3 in Ternary Complex with NADP and Testosterone
Authors : Nahoum, V.; Labrie, F.; Lin, S.-X.
Deposited on : 2001-05-23
Resolution : 1.25 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 ⓘ](#)) 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

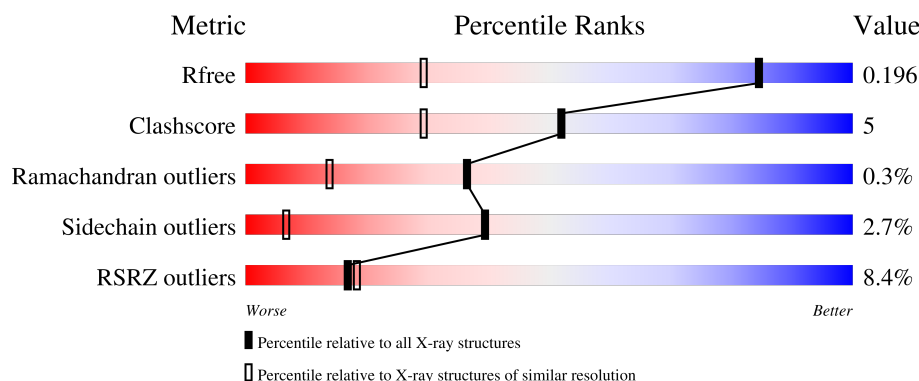
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.25 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	1693 (1.28-1.24)
Clashscore	190562	1730 (1.28-1.24)
Ramachandran outliers	187476	1695 (1.28-1.24)
Sidechain outliers	187428	1694 (1.28-1.24)
RSRZ outliers	180081	1693 (1.28-1.24)

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	323	7% 87% 9% .
1	B	323	9% 84% 11% ...

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
2	ACT	A	905	-	X	-	-
2	ACT	B	906	-	X	-	-

2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 6146 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.

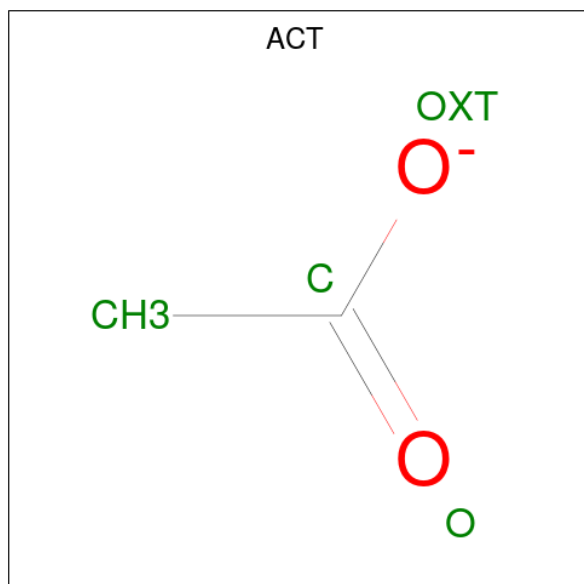
- Molecule 1 is a protein called 3alpha-hydroxysteroid dehydrogenase type 3.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	323	Total	C	N	O	S	0	1	0
			2590	1657	445	477	11			
1	B	318	Total	C	N	O	S	0	1	0
			2552	1636	438	467	11			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1	ASP	-	cloning artifact	UNP P52895
B	1	ASP	-	cloning artifact	UNP P52895

- Molecule 2 is ACETATE ION (CCD ID: ACT) (formula: C₂H₃O₂).



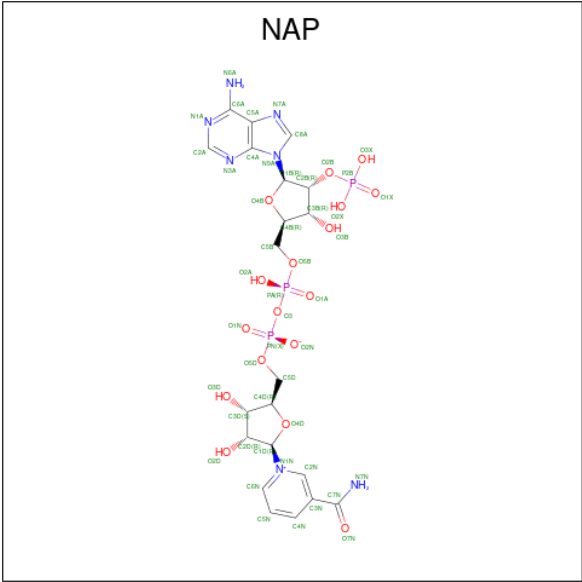
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	C	O	0	0
			4	2	2		

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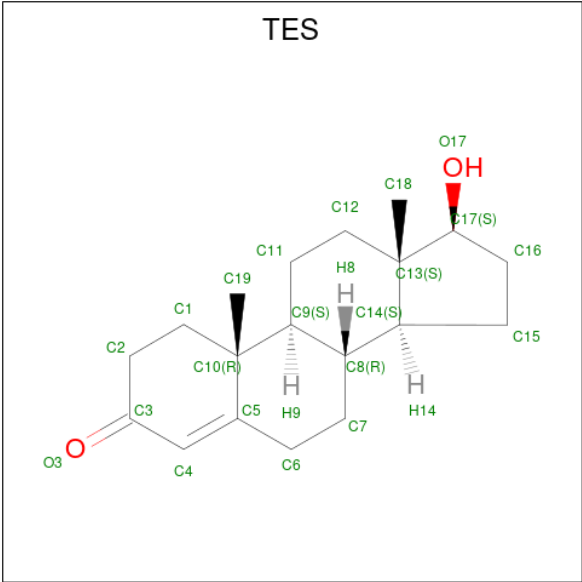
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	B	1	Total	C	O	0	0
			4	2	2		

- Molecule 3 is NADP NICOTINAMIDE-ADENINE-DINUCLEOTIDE PHOSPHATE (CCD ID: NAP) (formula: C₂₁H₂₈N₇O₁₇P₃).



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

- Molecule 4 is TESTOSTERONE (CCD ID: TES) (formula: C₁₉H₂₈O₂).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	C	O	0	0
			21	19	2		
4	B	1	Total	C	O	0	0
			21	19	2		

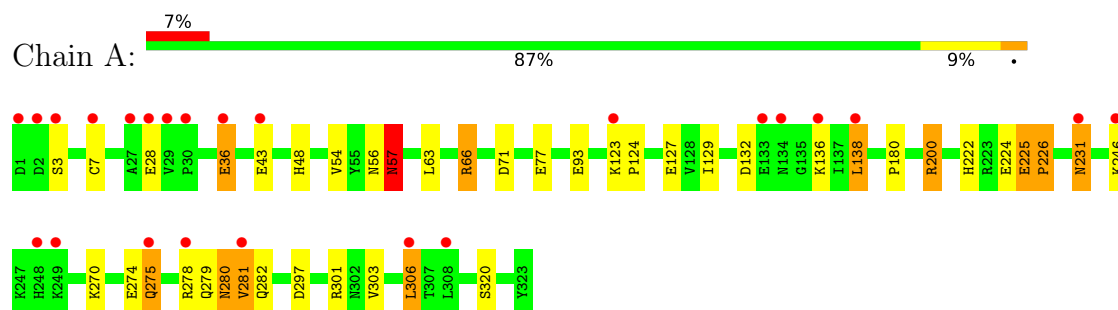
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	428	Total	O	0	0
			428	428		
5	B	430	Total	O	0	0
			430	430		

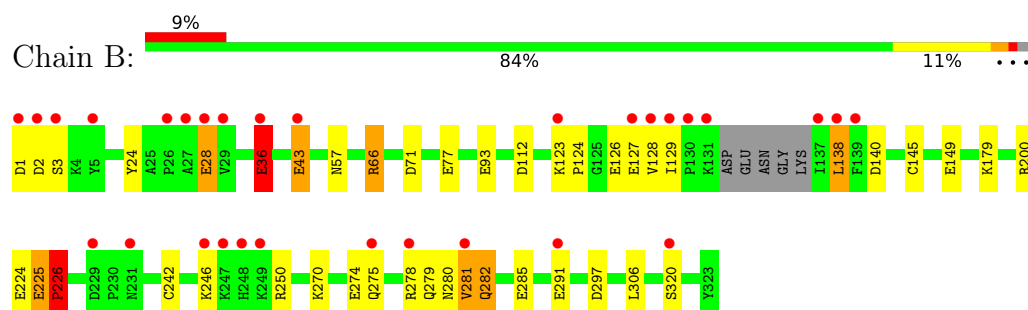
3 Residue-property plots [i](#)

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: 3alpha-hydroxysteroid dehydrogenase type 3



- Molecule 1: 3alpha-hydroxysteroid dehydrogenase type 3



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	55.07Å 87.15Å 76.88Å 90.00° 107.36° 90.00°	Depositor
Resolution (Å)	10.00 – 1.25 10.00 – 1.25	Depositor EDS
% Data completeness (in resolution range)	(Not available) (10.00-1.25) 96.3 (10.00-1.25)	Depositor EDS
R_{merge}	0.05	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.28 (at 1.00Å)	Xtriage
Refinement program	REFMAC	Depositor
R, R_{free}	0.181 , 0.199 0.177 , 0.196	Depositor DCC
R_{free} test set	17529 reflections (5.04%)	wwPDB-VP
Wilson B-factor (Å ²)	9.0	Xtriage
Anisotropy	0.420	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.44 , 46.1	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	6146	wwPDB-VP
Average B, all atoms (Å ²)	13.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.30% 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

5.1 Standard geometry

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

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	0.48	0/2663	1.44	45/3604 (1.2%)
1	B	0.49	0/2624	1.44	39/3551 (1.1%)
All	All	0.48	0/5287	1.44	84/7155 (1.2%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	2
1	B	0	2
All	All	0	4

There are no bond length outliers.

All (84) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	66	ARG	CD-NE-CZ	18.99	150.99	124.40
1	B	200	ARG	NE-CZ-NH2	17.08	134.57	119.20
1	B	225	GLU	CA-C-O	-16.70	101.30	121.01
1	A	225	GLU	CA-C-O	-16.37	101.70	121.01
1	B	66	ARG	CD-NE-CZ	15.22	145.72	124.40
1	A	200	ARG	NE-CZ-NH2	14.14	131.92	119.20
1	A	200	ARG	NH1-CZ-NH2	-12.85	102.60	119.30
1	B	57	ASN	OD1-CG-ND2	-12.50	110.10	122.60
1	A	282	GLN	OE1-CD-NE2	-12.21	110.39	122.60
1	B	282	GLN	OE1-CD-NE2	-12.04	110.56	122.60
1	A	57	ASN	OD1-CG-ND2	-11.59	111.01	122.60
1	A	275	GLN	CG-CD-NE2	-11.50	99.15	116.40

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	275	GLN	CB-CG-CD	-11.42	93.19	112.60
1	B	280	ASN	OD1-CG-ND2	-10.63	111.97	122.60
1	B	127	GLU	CG-CD-OE2	10.53	142.62	118.40
1	B	28	GLU	CB-CA-C	-10.51	93.35	110.79
1	B	28	GLU	CG-CD-OE2	10.37	142.25	118.40
1	B	275	GLN	CG-CD-NE2	10.25	131.77	116.40
1	A	275	GLN	CG-CD-OE1	10.05	140.91	120.80
1	B	36	GLU	CB-CG-CD	-9.88	95.80	112.60
1	A	127	GLU	CG-CD-OE2	9.88	141.12	118.40
1	B	200	ARG	NH1-CZ-NH2	-9.72	106.67	119.30
1	A	280	ASN	OD1-CG-ND2	-9.33	113.27	122.60
1	B	127	GLU	OE1-CD-OE2	-9.33	100.51	122.90
1	A	275	GLN	N-CA-CB	9.27	123.88	110.16
1	A	43	GLU	CG-CD-OE2	9.17	139.49	118.40
1	A	36	GLU	CG-CD-OE2	-8.72	98.33	118.40
1	A	28	GLU	CB-CA-C	-8.52	94.87	110.63
1	A	275	GLN	CB-CG-CD	-8.29	98.50	112.60
1	A	226	PRO	CA-N-CD	-8.15	100.59	112.00
1	B	226	PRO	CA-N-CD	-8.11	100.64	112.00
1	A	66	ARG	NE-CZ-NH2	7.91	126.32	119.20
1	A	225	GLU	CA-C-N	7.87	129.68	119.84
1	A	225	GLU	C-N-CA	7.87	129.68	119.84
1	B	77	GLU	CG-CD-OE2	7.82	136.39	118.40
1	B	36	GLU	CG-CD-OE2	7.65	135.99	118.40
1	A	231	ASN	OD1-CG-ND2	-7.61	114.99	122.60
1	A	36	GLU	N-CA-CB	-7.26	99.44	110.12
1	B	93	GLU	OE1-CD-OE2	-7.24	105.52	122.90
1	A	127	GLU	OE1-CD-OE2	-7.18	105.67	122.90
1	B	225	GLU	CA-C-N	7.07	128.67	119.84
1	B	225	GLU	C-N-CA	7.07	128.67	119.84
1	A	77	GLU	CG-CD-OE2	6.96	134.40	118.40
1	B	71	ASP	CA-CB-CG	6.84	119.44	112.60
1	A	275	GLN	CB-CA-C	-6.81	99.27	110.85
1	A	200	ARG	CG-CD-NE	6.81	126.98	112.00
1	A	28	GLU	CG-CD-OE2	-6.80	102.76	118.40
1	A	132	ASP	CA-CB-CG	6.76	119.36	112.60
1	A	36	GLU	CB-CG-CD	-6.70	101.21	112.60
1	B	275	GLN	OE1-CD-NE2	-6.70	115.91	122.60
1	A	48	HIS	CA-CB-CG	6.63	120.43	113.80
1	A	180	PRO	N-CA-CB	-6.60	97.33	103.27
1	B	2	ASP	CA-C-O	-6.38	111.87	119.15
1	B	275	GLN	CB-CA-C	-6.15	100.39	110.85

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	200	ARG	CD-NE-CZ	6.15	133.01	124.40
1	B	2	ASP	CB-CA-C	-6.08	99.06	109.65
1	B	226	PRO	N-CA-C	6.03	124.88	112.47
1	B	200	ARG	CG-CD-NE	6.00	125.20	112.00
1	B	28	GLU	OE1-CD-OE2	-5.82	108.93	122.90
1	A	66	ARG	NE-CZ-NH1	-5.79	115.71	121.50
1	B	36	GLU	N-CA-CB	-5.79	101.59	110.16
1	A	231	ASN	CB-CG-OD1	5.78	132.36	120.80
1	A	93	GLU	OE1-CD-OE2	-5.77	109.04	122.90
1	A	226	PRO	N-CA-C	5.74	124.29	112.47
1	B	291	GLU	OE1-CD-OE2	-5.71	109.20	122.90
1	A	138	LEU	N-CA-CB	-5.67	102.09	110.49
1	B	112	ASP	CA-CB-CG	-5.54	107.06	112.60
1	B	57	ASN	CB-CG-ND2	5.53	124.70	116.40
1	A	275	GLN	CA-C-O	-5.40	114.70	120.42
1	A	71	ASP	CA-CB-CG	5.39	117.99	112.60
1	A	93	GLU	CB-CG-CD	5.37	121.74	112.60
1	B	140	ASP	CA-CB-CG	5.37	117.97	112.60
1	B	77	GLU	OE1-CD-OE2	-5.24	110.33	122.90
1	A	77	GLU	OE1-CD-OE2	-5.22	110.37	122.90
1	A	36	GLU	OE1-CD-OE2	5.22	135.42	122.90
1	A	226	PRO	N-CD-CG	5.22	111.03	103.20
1	B	43	GLU	CB-CG-CD	-5.20	103.76	112.60
1	B	93	GLU	CG-CD-OE1	5.16	130.26	118.40
1	A	43	GLU	OE1-CD-OE2	-5.13	110.59	122.90
1	B	226	PRO	N-CD-CG	5.11	110.87	103.20
1	B	297	ASP	CA-CB-CG	5.07	117.67	112.60
1	B	216	TYR	CA-CB-CG	5.07	123.02	113.90
1	A	93	GLU	CG-CD-OE1	5.05	130.03	118.40
1	A	297	ASP	CA-CB-CG	5.03	117.63	112.60

There are no chirality outliers.

All (4) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	225	GLU	Mainchain,Peptide
1	B	225	GLU	Mainchain,Peptide

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	2590	0	2585	29	0
1	B	2552	0	2552	25	0
2	A	4	0	3	0	0
2	B	4	0	3	0	0
3	A	48	0	25	4	0
3	B	48	0	25	3	0
4	A	21	0	28	1	0
4	B	21	0	28	4	0
5	A	428	0	0	15	0
5	B	430	0	0	8	0
All	All	6146	0	5249	54	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 5.

All (54) 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:A:7:CYS:HB3	5:A:1316:HOH:O	1.24	1.34
1:B:222:HIS:HD2	1:B:224:GLU:H	1.24	0.82
1:A:222:HIS:HD2	1:A:224:GLU:H	1.24	0.82
1:A:306:LEU:HD21	5:A:1093:HOH:O	1.82	0.78
1:A:123:LYS:HE3	5:A:1141:HOH:O	1.90	0.71
1:A:280:ASN:HD21	3:A:901:NAP:H61A	1.38	0.68
1:A:123:LYS:HG2	5:A:1141:HOH:O	1.93	0.67
1:B:1:ASP:OD2	5:B:1275:HOH:O	2.13	0.66
1:A:57:ASN:C	1:A:57:ASN:HD22	2.07	0.63
1:A:56:ASN:HB2	5:A:1310:HOH:O	2.01	0.60
1:A:36:GLU:HG2	5:A:1273:HOH:O	2.02	0.59
1:B:242:CYS:HB3	5:B:1253:HOH:O	2.02	0.59
1:B:123:LYS:HG3	1:B:124:PRO:HD2	1.86	0.58
1:A:231:ASN:OD1	5:A:1102:HOH:O	2.17	0.57
1:A:123:LYS:HG3	1:A:124:PRO:HD2	1.86	0.56
1:B:145:CYS:HB3	1:B:179:LYS:HD2	1.87	0.56
1:B:279:GLN:NE2	3:B:902:NAP:H62A	2.03	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:279:GLN:NE2	3:A:901:NAP:H62A	2.04	0.56
1:B:66:ARG:NH1	5:B:1005:HOH:O	2.39	0.55
1:A:222:HIS:HE1	5:A:1093:HOH:O	1.90	0.55
1:A:136:LYS:HG2	5:A:1272:HOH:O	2.08	0.53
1:B:270:LYS:O	3:B:902:NAP:H8A	2.10	0.52
1:B:149:GLU:HG3	1:B:179:LYS:HE2	1.91	0.51
1:B:123:LYS:CG	1:B:124:PRO:HD2	2.40	0.51
1:B:123:LYS:HD3	1:B:138:LEU:CD2	2.40	0.51
1:B:24:TYR:OH	4:B:904:TES:H11	2.11	0.51
1:B:246:LYS:NZ	5:B:1253:HOH:O	2.44	0.51
1:A:63:LEU:HD12	5:A:1324:HOH:O	2.11	0.50
1:A:270:LYS:O	3:A:901:NAP:H8A	2.11	0.50
1:A:123:LYS:CG	1:A:124:PRO:HD2	2.42	0.49
1:B:24:TYR:CE1	4:B:904:TES:H193	2.47	0.49
1:B:128:VAL:HG23	4:B:904:TES:H162	1.94	0.48
1:B:123:LYS:HD2	5:B:1279:HOH:O	2.13	0.48
1:A:3:SER:HB2	5:A:1123:HOH:O	2.14	0.47
1:A:136:LYS:HE2	5:A:1272:HOH:O	2.14	0.47
1:B:250:ARG:NH1	1:B:282:GLN:HE21	2.12	0.47
1:B:123:LYS:HD3	1:B:138:LEU:HD22	1.96	0.47
1:B:66:ARG:NH2	5:B:1024:HOH:O	2.47	0.46
1:B:36:GLU:HB2	5:B:1270:HOH:O	2.16	0.46
1:A:57:ASN:C	1:A:57:ASN:ND2	2.74	0.45
1:A:274:GLU:OE2	1:A:278:ARG:NH2	2.49	0.45
1:A:66:ARG:NH1	5:A:1048:HOH:O	2.51	0.44
1:A:280:ASN:ND2	3:A:901:NAP:H61A	2.09	0.43
1:A:200:ARG:NH2	5:A:1265:HOH:O	2.51	0.43
1:A:246:LYS:NZ	1:B:126:GLU:OE2	2.45	0.43
1:B:129:ILE:HG13	4:B:904:TES:H151	1.99	0.42
3:B:902:NAP:H3D	3:B:902:NAP:O2N	2.20	0.42
1:A:301:ARG:HG3	1:A:303:VAL:HG23	2.02	0.42
1:A:275:GLN:HG3	5:A:1326:HOH:O	2.19	0.41
1:A:278:ARG:O	1:A:281:VAL:HG23	2.20	0.41
1:B:285:GLU:HG3	5:B:1334:HOH:O	2.19	0.41
1:A:129:ILE:CD1	4:A:903:TES:H151	2.50	0.41
1:B:274:GLU:OE2	1:B:278:ARG:NH2	2.54	0.40
1:B:278:ARG:O	1:B:281:VAL:HG23	2.22	0.40

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 Protein backbone

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	321/323 (99%)	313 (98%)	7 (2%)	1 (0%)	36	14
1	B	314/323 (97%)	307 (98%)	6 (2%)	1 (0%)	36	14
All	All	635/646 (98%)	620 (98%)	13 (2%)	2 (0%)	36	14

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	226	PRO
1	A	226	PRO

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	286/285 (100%)	280 (98%)	6 (2%)	47	11
1	B	282/285 (99%)	273 (97%)	9 (3%)	34	4
All	All	568/570 (100%)	553 (97%)	15 (3%)	39	7

All (15) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	54	VAL
1	A	57	ASN
1	A	138	LEU
1	A	281	VAL

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Mol	Chain	Res	Type
1	A	306	LEU
1	A	320	SER
1	B	3	SER
1	B	28	GLU
1	B	36	GLU
1	B	43	GLU
1	B	138	LEU
1	B	226	PRO
1	B	281	VAL
1	B	306	LEU
1	B	320	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (15) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	57	ASN
1	A	105	ASN
1	A	167	ASN
1	A	222	HIS
1	A	231	ASN
1	A	275	GLN
1	A	279	GLN
1	A	280	ASN
1	B	105	ASN
1	B	167	ASN
1	B	199	GLN
1	B	222	HIS
1	B	231	ASN
1	B	279	GLN
1	B	282	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

6 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
4	TES	A	903	-	24,24,24	0.70	0	39,39,39	1.31	5 (12%)
2	ACT	A	905	-	3,3,3	1.55	1 (33%)	3,3,3	4.13	2 (66%)
2	ACT	B	906	-	3,3,3	1.96	1 (33%)	3,3,3	3.52	2 (66%)
3	NAP	B	902	-	50,52,52	2.11	13 (26%)	71,80,80	1.68	15 (21%)
3	NAP	A	901	-	50,52,52	2.12	14 (28%)	71,80,80	1.65	13 (18%)
4	TES	B	904	-	24,24,24	2.29	9 (37%)	39,39,39	3.04	18 (46%)

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
4	TES	A	903	-	-	-	0/4/4/4
3	NAP	B	902	-	-	4/35/67/67	0/5/5/5
3	NAP	A	901	-	-	5/35/67/67	0/5/5/5
4	TES	B	904	-	-	-	0/4/4/4

All (38) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	902	NAP	PN-O3	-9.01	1.49	1.59
3	A	901	NAP	PN-O3	-8.65	1.50	1.59
4	B	904	TES	C7-C8	6.34	1.64	1.53
4	B	904	TES	C11-C9	5.01	1.62	1.53

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	902	NAP	C6N-N1N	4.55	1.45	1.35
3	A	901	NAP	C2N-N1N	4.47	1.39	1.35
3	A	901	NAP	C6N-N1N	4.28	1.45	1.35
3	B	902	NAP	C2N-N1N	3.60	1.38	1.35
4	B	904	TES	C8-C9	3.49	1.60	1.53
3	A	901	NAP	O5B-C5B	-3.36	1.31	1.44
3	B	902	NAP	C4A-N3A	3.33	1.40	1.34
3	B	902	NAP	O5B-C5B	-3.24	1.32	1.44
3	A	901	NAP	C4A-N3A	3.21	1.40	1.34
3	B	902	NAP	O4D-C1D	3.21	1.45	1.40
2	B	906	ACT	O-C	3.08	1.35	1.22
3	A	901	NAP	C4A-N9A	-3.00	1.31	1.37
4	B	904	TES	C8-C14	2.98	1.59	1.53
4	B	904	TES	C12-C11	2.95	1.59	1.53
3	A	901	NAP	O4D-C1D	2.89	1.44	1.40
3	B	902	NAP	PN-O1N	-2.83	1.41	1.50
3	A	901	NAP	PN-O1N	-2.83	1.41	1.50
3	B	902	NAP	C4A-N9A	-2.82	1.31	1.37
3	B	902	NAP	P2B-O2B	2.79	1.64	1.59
3	A	901	NAP	O4B-C4B	-2.77	1.38	1.45
3	A	901	NAP	P2B-O2B	2.59	1.64	1.59
3	A	901	NAP	C4N-C3N	2.56	1.43	1.39
3	B	902	NAP	O4B-C4B	-2.45	1.39	1.45
3	B	902	NAP	C4N-C3N	2.44	1.43	1.39
4	B	904	TES	O17-C17	2.32	1.47	1.43
4	B	904	TES	C13-C17	2.28	1.58	1.54
3	B	902	NAP	C3D-C4D	2.15	1.58	1.53
3	A	901	NAP	C8A-N7A	2.12	1.35	1.31
3	A	901	NAP	PA-O3	-2.10	1.57	1.59
2	A	905	ACT	CH3-C	2.09	1.57	1.49
4	B	904	TES	C7-C6	2.08	1.57	1.53
4	B	904	TES	C15-C14	2.08	1.58	1.54
3	A	901	NAP	C5N-C4N	2.07	1.42	1.38
3	B	902	NAP	C8A-N7A	2.06	1.35	1.31

All (55) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	B	904	TES	C14-C8-C9	-7.23	99.64	109.09
4	B	904	TES	C11-C9-C10	-7.11	104.32	113.08
4	B	904	TES	C6-C7-C8	-6.24	100.70	111.64
4	B	904	TES	C12-C11-C9	-5.73	103.40	113.14

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	905	ACT	OXT-C-O	5.57	142.68	122.03
3	A	901	NAP	C5A-C4A-N3A	-5.04	119.77	126.72
4	B	904	TES	C7-C8-C9	-5.01	104.52	110.52
4	B	904	TES	C16-C15-C14	-4.67	96.01	105.14
2	B	906	ACT	OXT-C-CH3	4.64	134.49	115.05
3	B	902	NAP	N3A-C2A-N1A	-4.59	121.63	128.58
3	B	902	NAP	O5D-C5D-C4D	4.58	124.60	108.99
2	A	905	ACT	OXT-C-CH3	-4.49	96.24	115.05
3	A	901	NAP	O5D-C5D-C4D	4.46	124.17	108.99
4	B	904	TES	C11-C12-C13	-4.12	105.79	112.74
4	B	904	TES	C15-C14-C8	-4.08	112.59	119.10
3	B	902	NAP	O5B-C5B-C4B	3.89	122.23	108.99
3	B	902	NAP	C5A-C4A-N3A	-3.86	121.40	126.72
3	B	902	NAP	O2N-PN-O3	3.83	117.61	107.27
4	B	904	TES	C7-C8-C14	-3.78	105.80	112.08
2	B	906	ACT	OXT-C-O	-3.76	108.09	122.03
3	A	901	NAP	O5B-C5B-C4B	3.63	121.36	108.99
4	A	903	TES	C11-C9-C10	-3.61	108.64	113.08
3	A	901	NAP	N3A-C2A-N1A	-3.57	123.18	128.58
4	B	904	TES	C13-C14-C8	-3.50	109.45	114.41
3	A	901	NAP	O2N-PN-O3	3.36	116.36	107.27
3	A	901	NAP	N3A-C4A-N9A	3.30	132.78	127.17
4	B	904	TES	C10-C9-C8	-3.16	108.09	112.71
4	B	904	TES	C14-C13-C17	-3.08	96.12	99.25
4	A	903	TES	C14-C13-C17	-2.89	96.32	99.25
4	A	903	TES	C7-C8-C9	2.88	113.97	110.52
3	B	902	NAP	PA-O5B-C5B	2.73	136.98	121.35
3	B	902	NAP	C2A-N3A-C4A	2.71	118.45	111.83
3	A	901	NAP	C2A-N3A-C4A	2.71	118.44	111.83
3	B	902	NAP	C5N-C4N-C3N	2.71	123.03	120.36
4	B	904	TES	C16-C17-C13	2.68	106.64	104.52
3	A	901	NAP	PA-O5B-C5B	2.62	136.36	121.35
3	A	901	NAP	C6A-C5A-C4A	2.57	120.69	117.18
4	B	904	TES	C7-C6-C5	-2.50	107.34	111.93
3	A	901	NAP	O2N-PN-O1N	2.45	123.85	112.44
3	B	902	NAP	O2N-PN-O1N	2.43	123.77	112.44
3	A	901	NAP	C5B-C4B-C3B	2.42	123.92	115.21
3	B	902	NAP	C5B-C4B-C3B	2.38	123.79	115.21
3	B	902	NAP	O4B-C4B-C5B	-2.30	101.97	109.33
3	B	902	NAP	N3A-C4A-N9A	2.30	131.08	127.17
3	B	902	NAP	C3N-C7N-N7N	-2.30	114.91	117.74
3	B	902	NAP	PN-O5D-C5D	2.28	134.40	121.35

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	903	TES	C11-C9-C8	2.28	114.96	111.78
4	B	904	TES	C18-C13-C14	2.28	115.80	111.68
4	A	903	TES	C14-C8-C9	-2.27	106.12	109.09
3	B	902	NAP	N9A-C8A-N7A	-2.25	110.74	113.94
3	A	901	NAP	PN-O5D-C5D	2.25	134.24	121.35
4	B	904	TES	C19-C10-C1	2.16	112.72	109.43
4	B	904	TES	C12-C13-C17	-2.11	112.02	115.23
4	B	904	TES	C19-C10-C5	-2.03	105.28	108.38
3	A	901	NAP	N9A-C8A-N7A	-2.00	111.09	113.94

There are no chirality outliers.

All (9) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	901	NAP	C5D-O5D-PN-O2N
3	A	901	NAP	C4D-C5D-O5D-PN
3	B	902	NAP	C4D-C5D-O5D-PN
3	B	902	NAP	PA-O3-PN-O5D
3	A	901	NAP	C5D-O5D-PN-O3
3	B	902	NAP	PA-O3-PN-O2N
3	A	901	NAP	PA-O3-PN-O5D
3	A	901	NAP	C2B-C1B-N9A-C8A
3	B	902	NAP	C2B-C1B-N9A-C8A

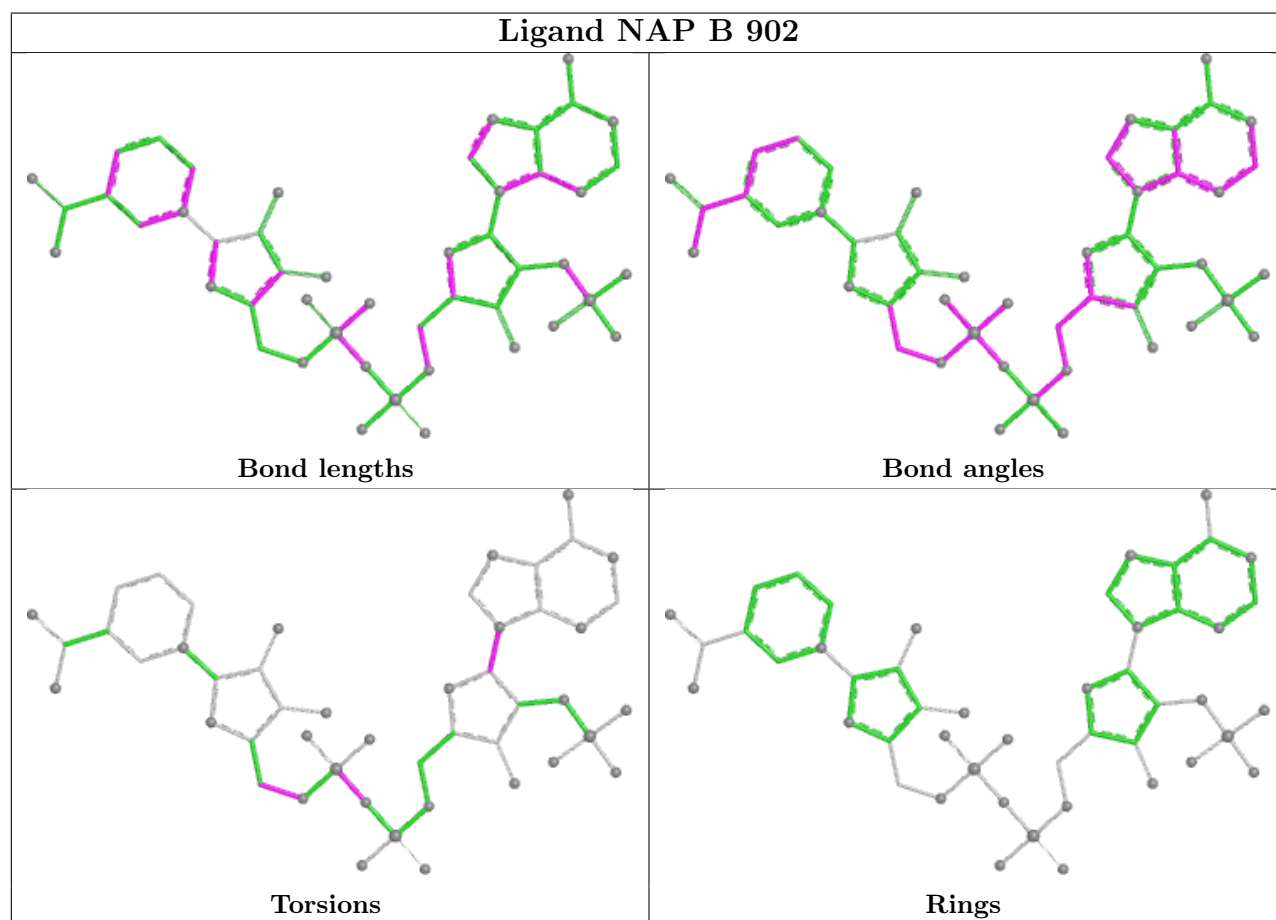
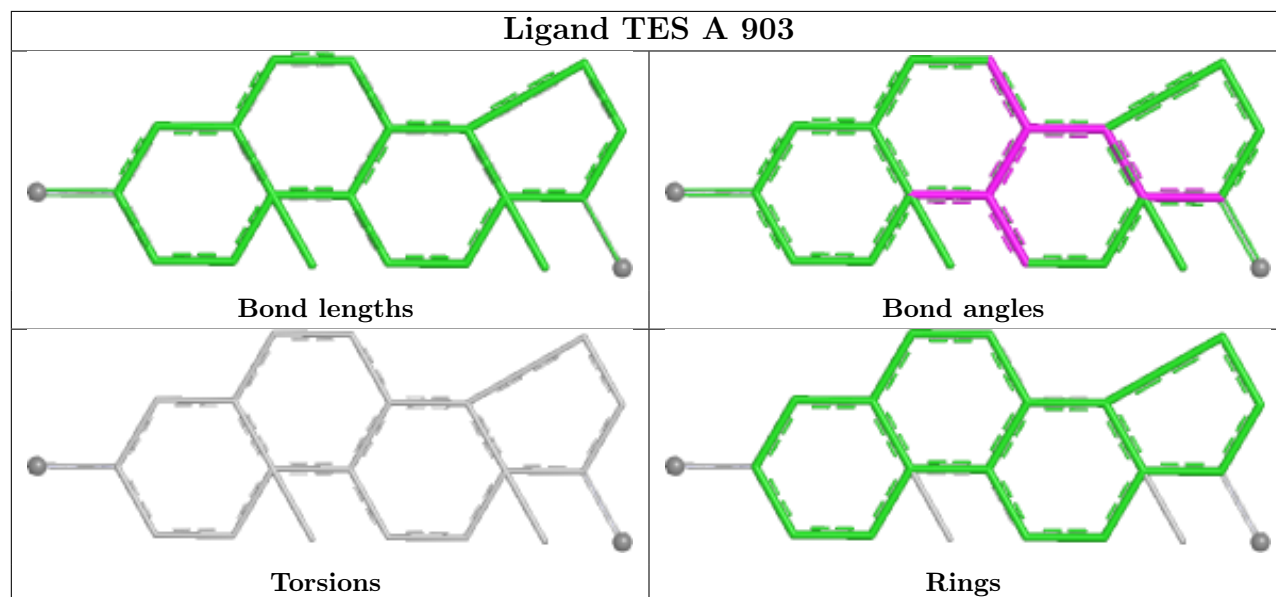
There are no ring outliers.

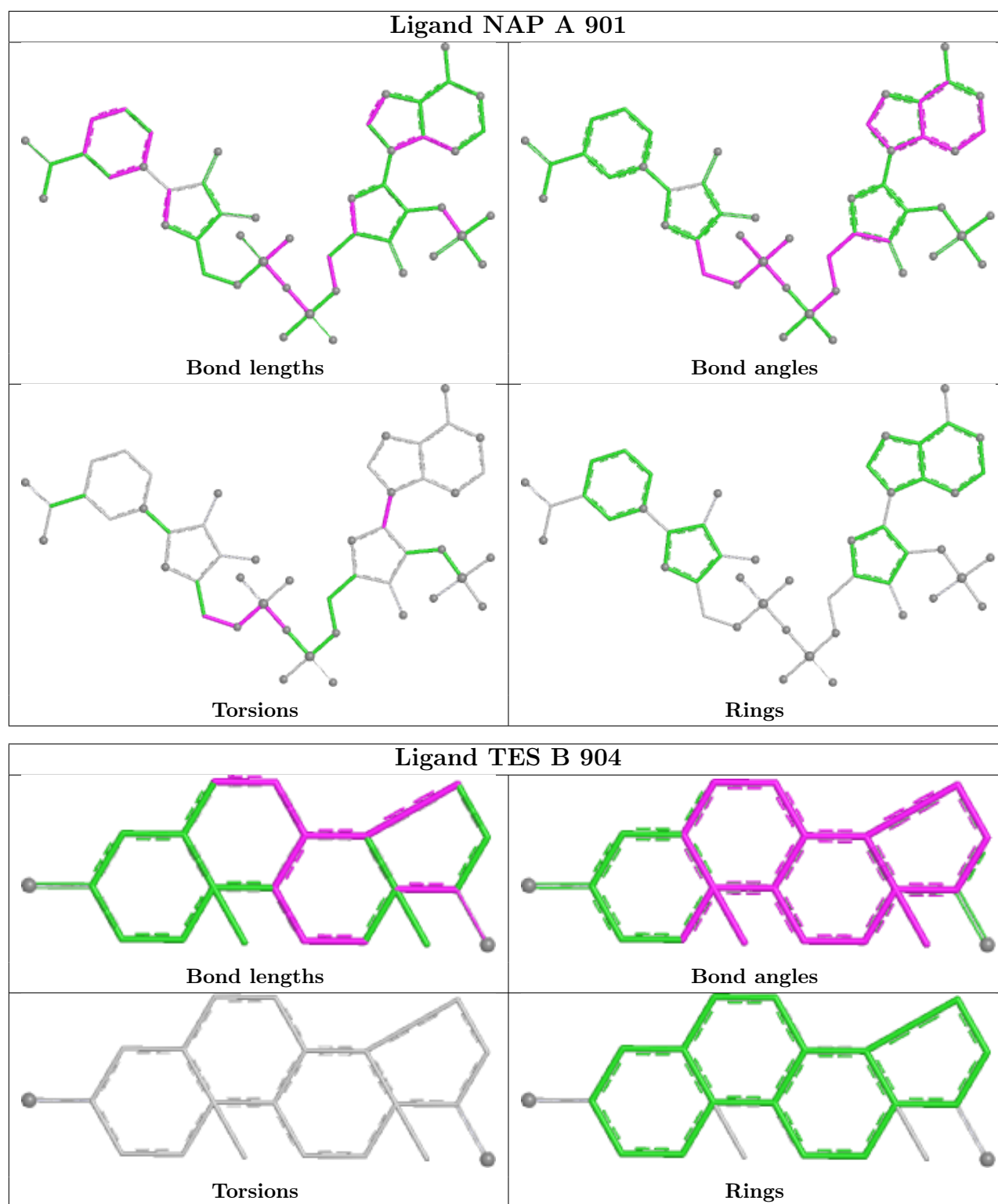
4 monomers are involved in 12 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	903	TES	1	0
3	B	902	NAP	3	0
3	A	901	NAP	4	0
4	B	904	TES	4	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 ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

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	323/323 (100%)	0.20	24 (7%)	20 22	7, 11, 21, 37	0
1	B	318/323 (98%)	0.23	30 (9%)	14 15	7, 11, 21, 32	0
All	All	641/646 (99%)	0.21	54 (8%)	17 18	7, 11, 21, 37	0

All (54) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	1	ASP	6.3
1	B	138	LEU	6.1
1	B	3	SER	5.9
1	B	2	ASP	4.9
1	B	28	GLU	4.8
1	A	28	GLU	4.4
1	B	137	ILE	4.4
1	B	27	ALA	4.2
1	A	231	ASN	4.2
1	A	138	LEU	4.1
1	A	133	GLU	4.1
1	B	123	LYS	4.0
1	A	275	GLN	3.8
1	A	308	LEU	3.7
1	A	3	SER	3.6
1	A	248	HIS	3.5
1	A	27	ALA	3.4
1	A	29	VAL	3.3
1	A	30	PRO	3.1
1	B	246	LYS	3.1
1	A	36	GLU	3.1
1	A	306	LEU	3.0
1	B	248	HIS	3.0
1	A	281	VAL	2.9

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Mol	Chain	Res	Type	RSRZ
1	B	131	LYS	2.8
1	B	275	GLN	2.8
1	A	123	LYS	2.8
1	B	36	GLU	2.7
1	B	129	ILE	2.7
1	A	43	GLU	2.7
1	A	249	LYS	2.7
1	B	320	SER	2.6
1	B	229	ASP	2.5
1	A	278	ARG	2.5
1	A	7	CYS	2.4
1	A	2	ASP	2.4
1	B	247	LYS	2.3
1	B	127	GLU	2.3
1	B	139	PHE	2.3
1	B	278	ARG	2.3
1	B	29	VAL	2.3
1	B	231	ASN	2.3
1	B	291	GLU	2.2
1	B	128	VAL	2.2
1	B	130	PRO	2.2
1	A	136	LYS	2.2
1	B	43	GLU	2.2
1	B	5	TYR	2.1
1	A	134	ASN	2.1
1	B	281	VAL	2.1
1	B	26	PRO	2.1
1	A	246	LYS	2.1
1	A	1	ASP	2.0
1	B	249	LYS	2.0

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

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

6.3 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

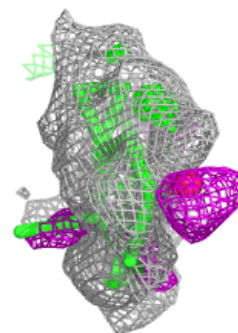
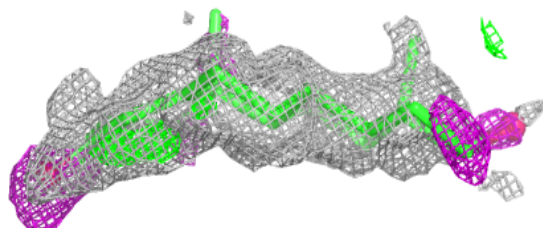
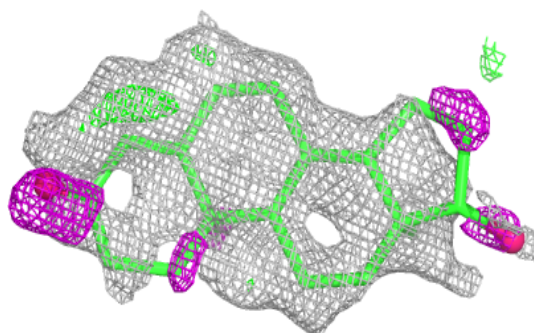
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q<0.9' lists 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
4	TES	B	904	21/21	0.57	0.17	34,34,35,37	0
2	ACT	B	906	4/4	0.72	0.18	21,25,29,30	0
2	ACT	A	905	4/4	0.73	0.20	27,28,28,32	0
4	TES	A	903	21/21	0.76	0.12	23,24,26,27	0
3	NAP	A	901	48/48	0.96	0.07	8,10,14,20	0
3	NAP	B	902	48/48	0.96	0.06	8,11,15,20	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.

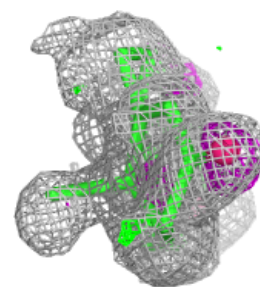
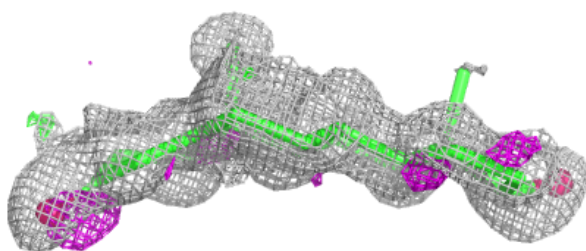
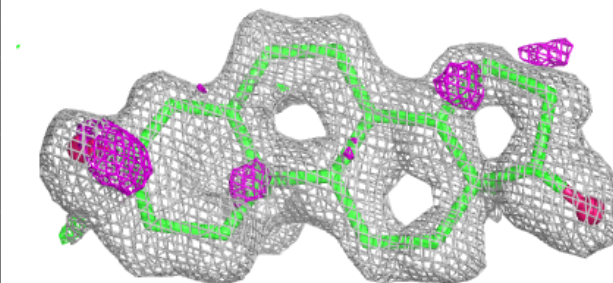
Electron density around TES B 904:

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

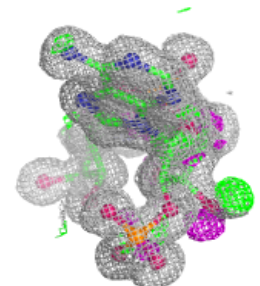
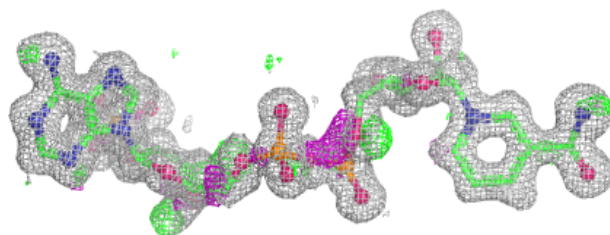
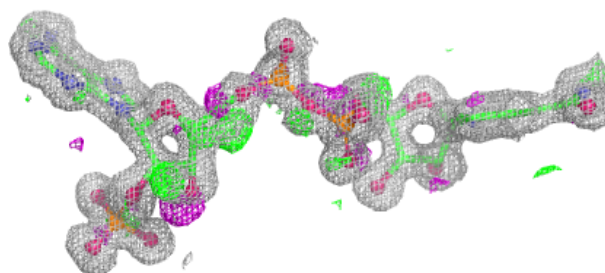


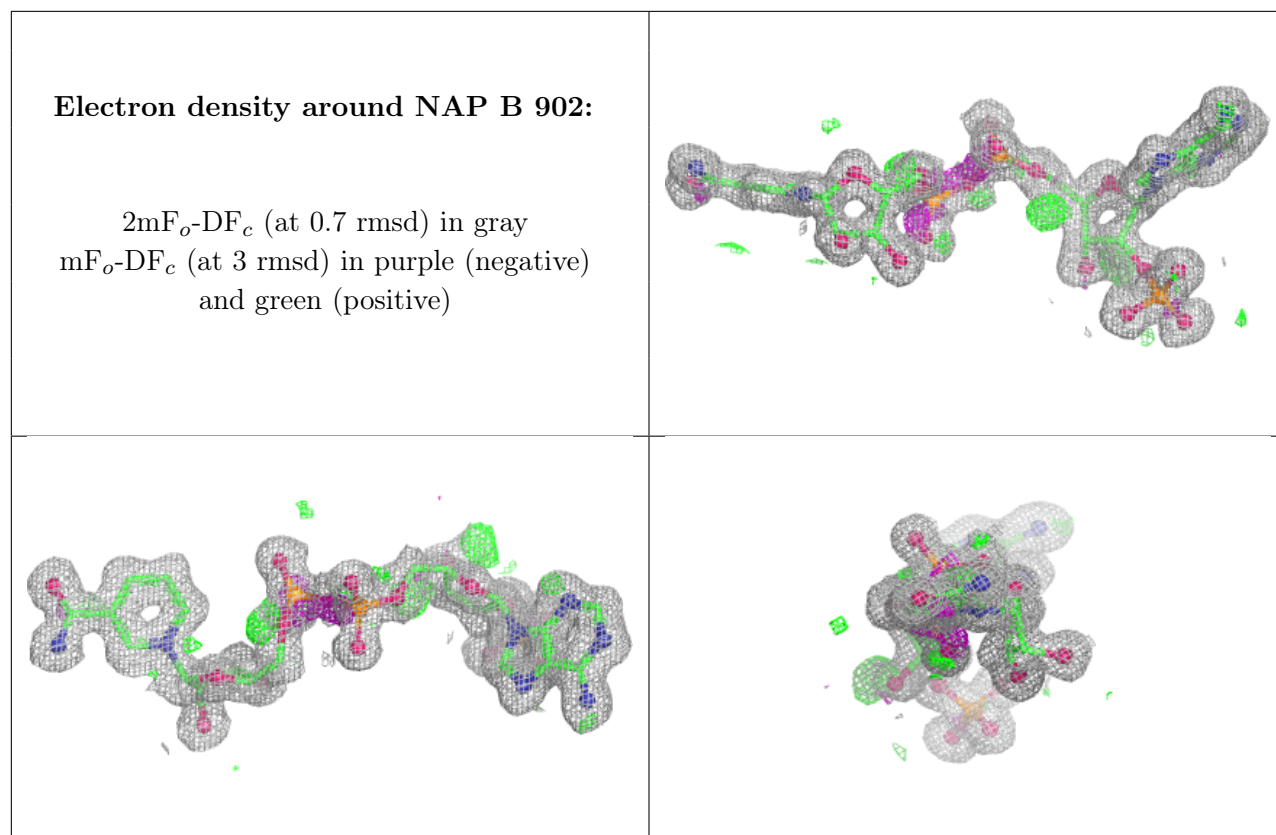
Electron density around TES A 903:

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

**Electron density around NAP A 901:**

$2mF_o-DF_c$ (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.