



Full wwPDB X-ray Structure Validation Report ⓘ

Apr 4, 2018 – 04:46 PM EDT

PDB ID : 1A27
Title : HUMAN 17-BETA-HYDROXYSTEROID-DEHYDROGENASE TYPE 1
C-TERMINAL DELETION MUTANT COMPLEXED WITH ESTRADIOL
AND NADP+
Authors : Mazza, C.; Breton, R.; Housset, D.; Fontecilla-Camps, J.-C.
Deposited on : 1998-01-16
Resolution : 1.90 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 following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.7.3 (157068), CSD as539be (2018)
Xtriage (Phenix) : 1.13
EDS : rb-20031021
Percentile statistics : 20171227.v01 (using entries in the PDB archive December 27th 2017)
Refmac : 5.8.0158
CCP4 : 7.0 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : rb-20031021

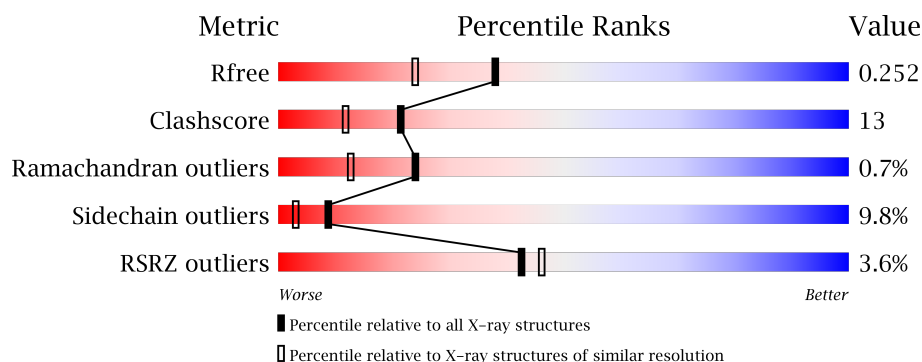
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.90 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}	111664	5502 (1.90-1.90)
Clashscore	122126	6115 (1.90-1.90)
Ramachandran outliers	120053	6048 (1.90-1.90)
Sidechain outliers	120020	6048 (1.90-1.90)
RSRZ outliers	108989	5379 (1.90-1.90)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments on the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria. 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	289	<div> <div>3%</div> <div>72%</div> <div>20%</div> <div>6%</div> </div>

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	EST	A	350	-	-	-	X
3	NAP	A	360	X	-	-	-

2 Entry composition [i](#)

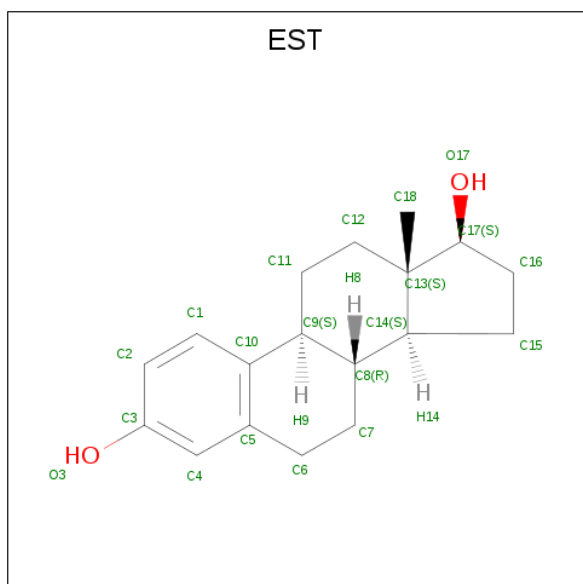
There are 4 unique types of molecules in this entry. The entry contains 2406 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 17-BETA-HYDROXYSTEROID-DEHYDROGENASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	285	Total	C	N	O	S	50	0	0
			2181	1384	386	399	12			

- Molecule 2 is ESTRADIOL (three-letter code: EST) (formula: $C_{18}H_{24}O_2$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	C	O	0	0
			20	18	2		

- 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	0	0
			48	21	7	17	3		

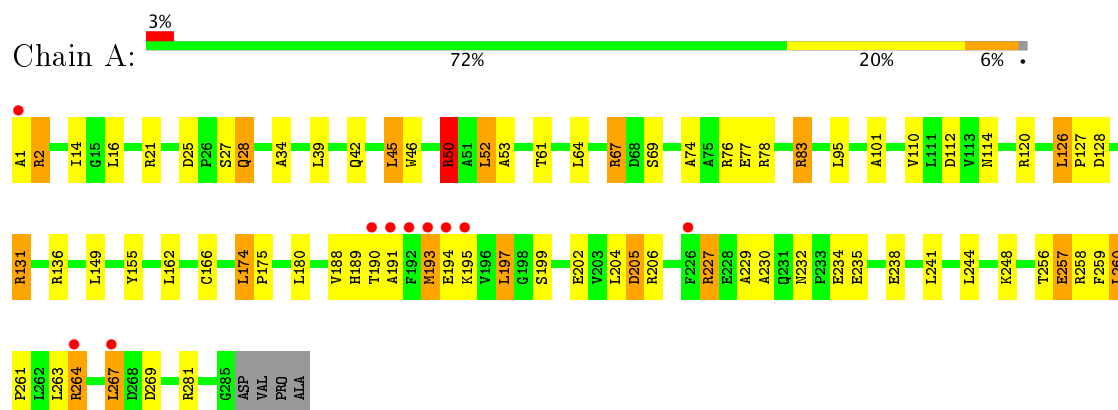
- Molecule 4 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	157	Total O 157 157	0	0

3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA 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: 17-BETA-HYDROXYSTEROID-DEHYDROGENASE



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	111.38Å 48.54Å 60.77Å 90.00° 115.13° 90.00°	Depositor
Resolution (Å)	10.00 – 1.90 11.97 – 1.90	Depositor EDS
% Data completeness (in resolution range)	(Not available) (10.00-1.90) 68.3 (11.97-1.90)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.03	Depositor
$\langle I/\sigma(I) \rangle$ ¹	6.84 (at 1.90Å)	Xtriage
Refinement program	REFMAC	Depositor
R, R_{free}	0.210 , 0.261 0.202 , 0.252	Depositor DCC
R_{free} test set	805 reflections (5.01%)	wwPDB-VP
Wilson B-factor (Å ²)	23.6	Xtriage
Anisotropy	0.149	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 75.1	EDS
L-test for twinning ²	$\langle L \rangle = 0.51$, $\langle L^2 \rangle = 0.34$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	2406	wwPDB-VP
Average B, all atoms (Å ²)	32.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.21% 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, EST

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	0.76	0/2222	1.40	23/3014 (0.8%)

There are no bond length outliers.

All (23) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	67	ARG	NE-CZ-NH1	9.13	124.87	120.30
1	A	2	ARG	CD-NE-CZ	8.53	135.54	123.60
1	A	76	ARG	CD-NE-CZ	8.47	135.46	123.60
1	A	120	ARG	NE-CZ-NH1	8.43	124.51	120.30
1	A	67	ARG	CD-NE-CZ	7.88	134.64	123.60
1	A	83	ARG	NE-CZ-NH1	7.04	123.82	120.30
1	A	136	ARG	NE-CZ-NH2	-7.01	116.79	120.30
1	A	112	ASP	CB-CG-OD1	6.12	123.81	118.30
1	A	193	MET	CG-SD-CE	5.99	109.78	100.20
1	A	50	ARG	NE-CZ-NH1	-5.96	117.32	120.30
1	A	136	ARG	NE-CZ-NH1	5.77	123.19	120.30
1	A	2	ARG	CB-CA-C	5.77	121.94	110.40
1	A	260	LEU	CB-CA-C	5.57	120.79	110.20
1	A	39	LEU	CA-CB-CG	5.56	128.09	115.30
1	A	2	ARG	CA-C-N	5.49	129.28	117.20
1	A	257	GLU	C-N-CA	5.45	135.31	121.70
1	A	281	ARG	NE-CZ-NH1	5.34	122.97	120.30
1	A	205	ASP	CB-CG-OD1	-5.30	113.53	118.30
1	A	128	ASP	CB-CG-OD2	5.19	122.97	118.30
1	A	235	GLU	CA-CB-CG	5.08	124.58	113.40
1	A	131	ARG	NE-CZ-NH1	5.07	122.84	120.30
1	A	21	ARG	NE-CZ-NH1	-5.03	117.79	120.30
1	A	45	LEU	CB-CG-CD2	5.02	119.53	111.00

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	2181	0	2220	54	0
2	A	20	0	23	5	0
3	A	48	0	23	4	0
4	A	157	0	0	7	0
All	All	2406	0	2266	57	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 13.

All (57) 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:227:ARG:HH11	1:A:227:ARG:HA	1.37	0.89
1:A:2:ARG:NH1	1:A:83:ARG:HH12	1.74	0.85
1:A:174:LEU:HD12	1:A:174:LEU:H	1.44	0.80
1:A:149:LEU:HD13	2:A:350:EST:H8	1.66	0.77
1:A:190:THR:O	1:A:191:ALA:HB3	1.87	0.73
1:A:50:ARG:HB3	1:A:50:ARG:CZ	2.23	0.68
1:A:264:ARG:HH11	1:A:264:ARG:HB2	1.57	0.67
1:A:260:LEU:N	1:A:261:PRO:HD2	2.10	0.67
1:A:42:GLN:NE2	1:A:46:TRP:HE1	1.93	0.67
1:A:42:GLN:HE21	1:A:46:TRP:HE1	1.44	0.66
1:A:2:ARG:HA	1:A:2:ARG:NE	2.09	0.65
1:A:259:PHE:O	1:A:263:LEU:HD23	1.96	0.65
1:A:256:THR:OG1	1:A:258:ARG:HB2	1.97	0.64
1:A:1:ALA:N	4:A:545:HOH:O	2.33	0.61
1:A:267:LEU:HD21	4:A:597:HOH:O	2.03	0.58
1:A:190:THR:O	1:A:191:ALA:CB	2.52	0.58
1:A:193:MET:HE1	2:A:350:EST:H161	1.87	0.57
1:A:2:ARG:NH1	1:A:83:ARG:HH22	2.03	0.57
1:A:260:LEU:HD13	4:A:530:HOH:O	2.04	0.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:2:ARG:HH12	1:A:83:ARG:HH12	1.47	0.56
1:A:2:ARG:O	1:A:83:ARG:NH2	2.39	0.55
1:A:95:LEU:HB2	1:A:110:VAL:HG21	1.88	0.55
1:A:52:LEU:O	1:A:53:ALA:HB3	2.07	0.55
1:A:28:GLN:HB3	4:A:562:HOH:O	2.08	0.54
1:A:264:ARG:HA	1:A:267:LEU:HD12	1.90	0.53
3:A:360:NAP:H2N	4:A:618:HOH:O	2.08	0.53
1:A:229:ALA:HA	1:A:258:ARG:NH1	2.23	0.52
1:A:189:HIS:CE1	1:A:230:ALA:HB3	2.45	0.51
1:A:114:ASN:O	1:A:162:LEU:HD21	2.10	0.51
1:A:149:LEU:CD1	2:A:350:EST:H182	2.42	0.50
1:A:264:ARG:HA	1:A:267:LEU:CD1	2.42	0.49
1:A:174:LEU:N	1:A:175:PRO:HD2	2.28	0.48
1:A:2:ARG:NH1	1:A:83:ARG:NH1	2.53	0.48
1:A:67:ARG:HD3	3:A:360:NAP:H62A	1.79	0.47
1:A:227:ARG:HH11	1:A:227:ARG:CA	2.17	0.47
1:A:191:ALA:O	1:A:194:GLU:HG2	2.14	0.47
1:A:149:LEU:HD11	2:A:350:EST:H182	1.96	0.47
1:A:16:LEU:HD23	1:A:16:LEU:C	2.36	0.46
1:A:25:ASP:OD2	1:A:27:SER:OG	2.31	0.46
1:A:264:ARG:NH1	1:A:264:ARG:HB2	2.28	0.45
1:A:232:ASN:HB3	1:A:234:GLU:OE1	2.18	0.44
3:A:360:NAP:H2N	3:A:360:NAP:O1N	2.18	0.44
1:A:174:LEU:CD1	1:A:174:LEU:H	2.23	0.43
1:A:180:LEU:C	1:A:180:LEU:HD23	2.38	0.43
3:A:360:NAP:C2D	4:A:618:HOH:O	2.66	0.43
1:A:267:LEU:H	1:A:267:LEU:HG	1.68	0.43
1:A:166:CYS:HB3	1:A:180:LEU:CD2	2.49	0.43
1:A:260:LEU:N	1:A:261:PRO:CD	2.78	0.43
1:A:191:ALA:HB1	1:A:194:GLU:CD	2.39	0.42
1:A:64:LEU:HD23	1:A:64:LEU:C	2.40	0.42
1:A:155:TYR:HH	2:A:350:EST:HO7	1.61	0.42
1:A:34:ALA:O	1:A:61:THR:HA	2.20	0.42
1:A:14:ILE:CD1	1:A:188:VAL:HG11	2.50	0.41
1:A:126:LEU:N	1:A:127:PRO:CD	2.83	0.41
1:A:101:ALA:HA	1:A:206:ARG:HB3	2.02	0.41
1:A:74:ALA:HB1	1:A:78:ARG:HH21	1.85	0.41
1:A:67:ARG:NH1	4:A:537:HOH:O	2.52	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	283/289 (98%)	272 (96%)	9 (3%)	2 (1%)	24 13

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	197	LEU
1	A	199	SER

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	235/238 (99%)	212 (90%)	23 (10%)	9 3

All (23) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	28	GLN
1	A	45	LEU
1	A	50	ARG
1	A	52	LEU
1	A	69	SER
1	A	77	GLU
1	A	126	LEU
1	A	131	ARG
1	A	174	LEU

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Mol	Chain	Res	Type
1	A	195	LYS
1	A	197	LEU
1	A	202	GLU
1	A	204	LEU
1	A	205	ASP
1	A	227	ARG
1	A	238	GLU
1	A	241	LEU
1	A	244	LEU
1	A	248	LYS
1	A	257	GLU
1	A	264	ARG
1	A	267	LEU
1	A	269	ASP

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

Mol	Chain	Res	Type
1	A	17	HIS
1	A	42	GLN
1	A	221	HIS
1	A	224	GLN
1	A	231	GLN
1	A	274	ASN

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 ⓘ

There are no carbohydrates in this entry.

5.6 Ligand geometry

2 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	EST	A	350	-	23,23,23	0.89	1 (4%)	36,36,36	1.71	9 (25%)
3	NAP	A	360	-	44,52,52	1.76	10 (22%)	53,80,80	1.82	7 (13%)

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	EST	A	350	-	-	0/0/40/40	0/4/4/4
3	NAP	A	360	-	1/1/12/12	0/27/67/67	0/5/5/5

All (11) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	360	NAP	P2B-O2B	-8.02	1.44	1.59
3	A	360	NAP	O2D-C2D	-2.89	1.35	1.43
2	A	350	EST	C8-C14	-2.74	1.48	1.53
3	A	360	NAP	P2B-O2X	-2.63	1.44	1.54
3	A	360	NAP	P2B-O3X	-2.58	1.44	1.54
3	A	360	NAP	P2B-O1X	-2.22	1.43	1.50
3	A	360	NAP	C8A-N9A	-2.04	1.34	1.36
3	A	360	NAP	C5A-N7A	-2.01	1.32	1.39
3	A	360	NAP	C3N-C7N	2.20	1.54	1.50
3	A	360	NAP	C6N-N1N	2.25	1.41	1.35
3	A	360	NAP	O4D-C1D	2.48	1.44	1.41

All (16) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	360	NAP	N3A-C2A-N1A	-7.29	122.62	128.86
3	A	360	NAP	C3N-C7N-N7N	-3.62	113.55	117.76
2	A	350	EST	C18-C13-C17	-3.30	104.49	109.55
3	A	360	NAP	C4B-O4B-C1B	-3.27	106.42	109.83
3	A	360	NAP	O7N-C7N-N7N	-2.43	119.07	122.60
3	A	360	NAP	C3B-C2B-C1B	-2.26	98.58	102.89
2	A	350	EST	C13-C14-C8	2.35	117.94	114.38
2	A	350	EST	C6-C7-C8	2.37	113.95	110.63
2	A	350	EST	C12-C11-C9	2.52	115.11	112.25
2	A	350	EST	C7-C6-C5	2.53	117.59	112.87
3	A	360	NAP	N6A-C6A-N1A	2.53	123.83	118.57
2	A	350	EST	C18-C13-C14	2.64	116.72	111.72
2	A	350	EST	C9-C8-C14	3.15	113.36	108.81
2	A	350	EST	C15-C14-C8	3.39	124.45	119.07
2	A	350	EST	C16-C17-C13	3.63	107.51	104.53
3	A	360	NAP	O7N-C7N-C3N	6.19	127.38	119.62

All (1) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
3	A	360	NAP	C2D

There are no torsion outliers.

There are no ring outliers.

2 monomers are involved in 9 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	350	EST	5	0
3	A	360	NAP	4	0

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 [i](#)

6.1 Protein, DNA and RNA chains [i](#)

In the following table, the column labelled ‘#RSRZ> 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q< 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2		OWAB(Å ²)	Q<0.9
1	A	278/289 (96%)	-0.23	10 (3%)	42 46	15, 28, 48, 87	5 (1%)

All (10) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	192	PHE	18.0
1	A	191	ALA	7.1
1	A	195	LYS	6.6
1	A	193	MET	4.3
1	A	194	GLU	2.8
1	A	264	ARG	2.6
1	A	190	THR	2.5
1	A	1	ALA	2.5
1	A	267	LEU	2.4
1	A	226	PHE	2.1

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 carbohydrates 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(\AA^2)	Q<0.9
2	EST	A	350	20/20	0.36	0.52	72,74,75,75	20
3	NAP	A	360	48/48	0.90	0.13	31,38,45,47	0

6.5 Other polymers [i](#)

There are no such residues in this entry.