



# Full wwPDB X-ray Structure Validation Report ⓘ

Jan 31, 2016 – 11:33 PM GMT

PDB ID : 1XR3  
Title : Actinorhodin Polyketide Ketoreductase with NADP and the Inhibitor Isoniazid bound  
Authors : Korman, T.P.; Hill, J.A.; Vu, T.N.; Tsai, S.C.  
Deposited on : 2004-10-13  
Resolution : 2.71 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](mailto:validation@mail.wwpdb.org)  
A user guide is available at  
<http://wwpdb.org/validation/2016/XrayValidationReportHelp>  
with specific help available everywhere you see the ⓘ symbol.

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The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467  
Mogul : 1.7 (RC4), CSD as536be (2015)  
Xtriage (Phenix) : **NOT EXECUTED**  
EDS : **NOT EXECUTED**  
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : trunk26865

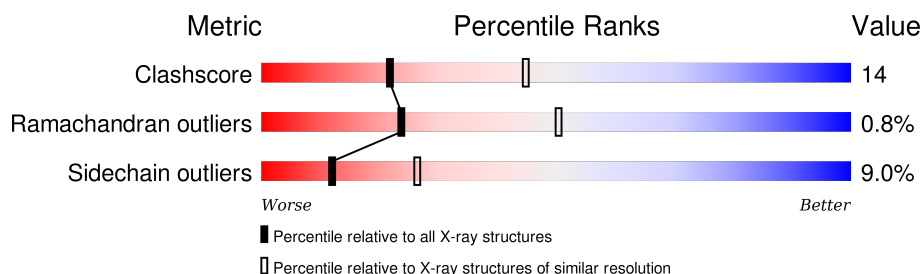
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.71 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))
Clashscore	102246	2771 (2.74-2.70)
Ramachandran outliers	100387	2726 (2.74-2.70)
Sidechain outliers	100360	2727 (2.74-2.70)

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  $\geq 3$ , 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.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	261	 70% 25% . .
1	B	261	 65% 29% . .

## 2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 3838 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 ACTINORHODIN POLYKETIDE KETOREDUCTASE.

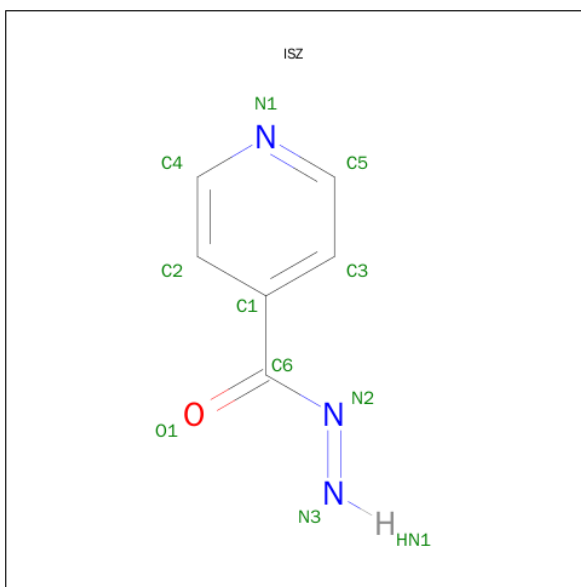
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	256	Total	C	N	O	S	0	0	0
			1876	1172	336	361	7			
1	B	254	Total	C	N	O	S	0	0	0
			1846	1149	332	357	8			

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



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
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		

- Molecule 3 is 4-(DIAZENYL CARBONYL)PYRIDINE (three-letter code: ISZ) (formula:  $C_6H_5N_3O$ ).



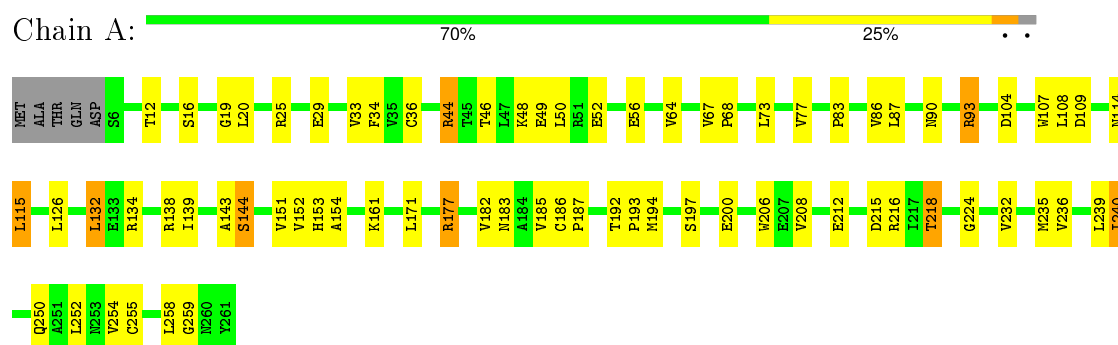
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	N	O	0	0
			10	6	3	1		
3	B	1	Total	C	N	O	0	0
			10	6	3	1		

### 3 Residue-property plots

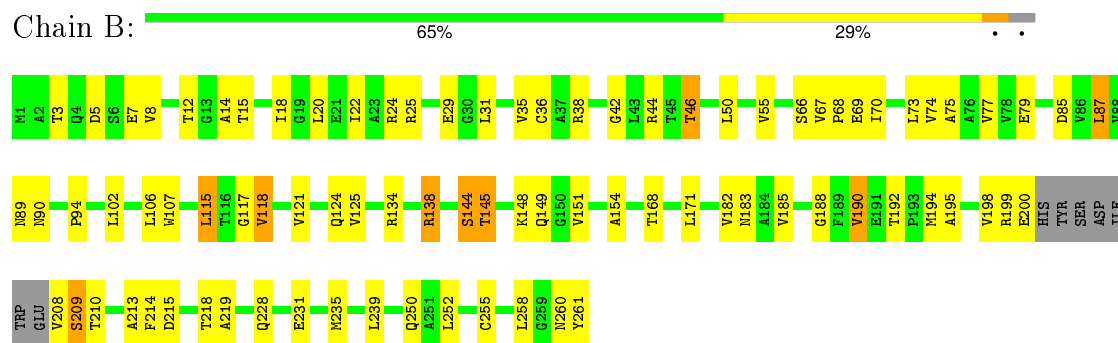
These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according 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.

Note EDS was not executed.

#### • Molecule 1: ACTINORHODIN POLYKETIDE KETOREDUCTASE



#### • Molecule 1: ACTINORHODIN POLYKETIDE KETOREDUCTASE



## 4 Data and refinement statistics

Xtriage (Phenix) and EDS were not executed - this section will therefore be incomplete.

Property	Value	Source
Space group	P 3 2 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	104.22Å 104.22Å 124.23Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	48.06 – 2.71	Depositor
% Data completeness (in resolution range)	94.6 (48.06-2.71)	Depositor
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
Refinement program	CNS 1.1	Depositor
R, $R_{free}$	0.212 , 0.256	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	3838	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	41.0	wwPDB-VP

## 5 Model quality

### 5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: ISZ, 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	0.38	0/1902	0.64	0/2583
1	B	0.38	0/1867	0.62	0/2532
All	All	0.38	0/3769	0.63	0/5115

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	1876	0	1896	57	0
1	B	1846	0	1879	52	1
2	A	48	0	25	1	0
2	B	48	0	25	4	0
3	A	10	0	5	0	0
3	B	10	0	5	1	0
All	All	3838	0	3835	107	1

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 14.

All (107) 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:177:ARG:HD3	1:A:177:ARG:H	1.23	1.03
1:B:3:THR:HG23	1:B:5:ASP:H	1.32	0.92
1:A:44:ARG:HB3	1:A:44:ARG:HH11	1.36	0.89
1:A:183:ASN:HD22	1:A:250:GLN:H	1.29	0.78
1:A:138:ARG:HG2	1:A:240:ILE:HD12	1.70	0.73
1:B:145:THR:HB	3:B:302:ISZ:H4	1.68	0.73
1:B:183:ASN:HD22	1:B:250:GLN:H	1.36	0.73
1:A:212:GLU:O	1:A:216:ARG:HB2	1.90	0.71
1:B:15:THR:HA	1:B:46:THR:HG21	1.72	0.71
1:B:117:GLY:O	1:B:121:VAL:HG12	1.93	0.69
1:A:183:ASN:ND2	1:A:250:GLN:H	1.90	0.69
1:B:18:ILE:HD11	1:B:190:VAL:HG11	1.75	0.69
1:A:177:ARG:HD3	1:A:177:ARG:N	2.01	0.67
1:B:252:LEU:HD12	1:B:252:LEU:H	1.58	0.67
1:B:75:ALA:O	1:B:79:GLU:HG3	1.95	0.66
1:A:25:ARG:NH1	1:A:29:GLU:OE2	2.28	0.66
1:B:42:GLY:O	1:B:46:THR:HG23	1.95	0.66
1:A:208:VAL:HB	1:A:212:GLU:HB2	1.78	0.64
1:A:34:PHE:CD2	1:A:77:VAL:HG22	2.33	0.64
1:B:252:LEU:N	1:B:252:LEU:HD12	2.13	0.64
1:A:143:ALA:O	1:A:161:LYS:HE3	1.98	0.62
1:B:66:SER:O	1:B:70:ILE:HG13	2.00	0.61
1:B:183:ASN:ND2	1:B:250:GLN:H	1.98	0.61
1:A:255:CYS:SG	1:A:259:GLY:N	2.71	0.60
1:B:87:LEU:HG	1:B:125:VAL:HG21	1.82	0.60
1:B:66:SER:HB3	1:B:69:GLU:HB2	1.87	0.57
1:B:138:ARG:HD3	1:B:239:LEU:O	2.04	0.56
1:B:67:VAL:N	1:B:68:PRO:HD2	2.20	0.56
1:B:25:ARG:NH1	1:B:29:GLU:OE2	2.38	0.56
1:B:215:ASP:HA	1:B:218:THR:HB	1.87	0.56
1:A:107:TRP:HZ2	1:B:115:LEU:HD22	1.71	0.55
1:B:213:ALA:HB1	1:B:215:ASP:OD2	2.07	0.55
1:B:255:CYS:HB2	1:B:258:LEU:HB3	1.89	0.55
1:B:94:PRO:HG3	1:B:194:MET:SD	2.47	0.55
1:A:93:ARG:NH1	1:A:109:ASP:OD1	2.39	0.55
1:A:171:LEU:CD1	1:A:182:VAL:HG21	2.37	0.54
1:B:188:GLY:O	2:B:301:NAP:H4N	2.08	0.54
1:B:15:THR:HB	2:B:301:NAP:O3B	2.08	0.53
1:A:93:ARG:N	1:A:114:ASN:HD21	2.07	0.53
1:A:152:VAL:HG12	1:A:153:HIS:CD2	2.43	0.53
1:A:192:THR:HB	1:A:193:PRO:HD2	1.91	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:115:LEU:O	1:B:118:VAL:HG13	2.09	0.52
1:A:44:ARG:CB	1:A:44:ARG:HH11	2.16	0.52
1:A:114:ASN:N	1:A:114:ASN:HD22	2.06	0.51
1:A:192:THR:HB	1:A:193:PRO:CD	2.40	0.51
1:A:144:SER:HB3	1:A:161:LYS:HG2	1.92	0.51
1:A:235:MET:HE2	1:A:254:VAL:HG22	1.92	0.51
1:A:144:SER:HB2	2:A:262:NAP:H6N	1.92	0.50
1:A:67:VAL:N	1:A:68:PRO:HD2	2.26	0.50
1:B:12:THR:O	1:B:90:ASN:HB3	2.11	0.50
1:A:171:LEU:HD13	1:A:182:VAL:HG21	1.93	0.50
1:A:252:LEU:N	1:A:252:LEU:HD12	2.27	0.50
1:A:208:VAL:HG11	1:A:216:ARG:HH22	1.78	0.49
1:B:199:ARG:CZ	1:B:214:PHE:HE1	2.25	0.49
1:A:115:LEU:HD22	1:B:107:TRP:HZ2	1.77	0.49
1:B:89:ASN:HD21	1:B:121:VAL:CG1	2.26	0.48
1:B:20:LEU:O	1:B:24:ARG:HG3	2.13	0.48
1:A:49:GLU:HG3	1:A:50:LEU:N	2.28	0.48
1:A:185:VAL:O	1:A:187:PRO:HD3	2.14	0.48
1:B:7:GLU:HB2	1:B:31:LEU:HG	1.96	0.48
1:B:85:ASP:HA	1:B:134:ARG:NH1	2.29	0.48
1:B:73:LEU:O	1:B:77:VAL:HG23	2.14	0.47
1:B:3:THR:HG23	1:B:5:ASP:N	2.15	0.47
1:B:144:SER:HB2	2:B:301:NAP:H6N	1.95	0.47
1:A:12:THR:O	1:A:90:ASN:HB3	2.14	0.47
1:B:215:ASP:O	1:B:219:ALA:HB2	2.14	0.47
1:B:18:ILE:O	1:B:22:ILE:HG13	2.15	0.47
1:A:151:VAL:HB	1:A:154:ALA:HB3	1.96	0.47
1:A:138:ARG:HD3	1:A:239:LEU:O	2.14	0.46
1:A:16:SER:OG	1:A:193:PRO:HG2	2.16	0.46
1:A:48:LYS:O	1:A:52:GLU:HG2	2.15	0.46
1:A:83:PRO:HB2	1:A:134:ARG:NH2	2.31	0.46
1:B:89:ASN:ND2	1:B:121:VAL:HG11	2.31	0.46
1:B:195:ALA:O	1:B:198:VAL:HG22	2.16	0.45
1:A:132:LEU:HD13	1:A:132:LEU:O	2.17	0.45
1:A:144:SER:HB3	1:A:161:LYS:CG	2.47	0.45
1:A:19:GLY:HA3	1:A:90:ASN:ND2	2.32	0.44
1:B:14:ALA:HB3	1:B:35:VAL:HB	1.99	0.44
1:A:93:ARG:H	1:A:114:ASN:HD21	1.64	0.44
1:A:235:MET:CE	1:A:254:VAL:HG22	2.47	0.44
1:A:114:ASN:N	1:A:114:ASN:ND2	2.66	0.44
1:A:126:LEU:HD22	1:A:132:LEU:HD23	1.99	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:212:GLU:HB3	1:A:216:ARG:NH2	2.33	0.43
1:A:134:ARG:HG2	1:A:134:ARG:O	2.17	0.43
1:A:20:LEU:CD1	1:A:46:THR:HG23	2.48	0.43
1:B:228:GLN:HB2	1:B:231:GLU:HG3	2.00	0.43
1:B:38:ARG:HB2	2:B:301:NAP:O1X	2.18	0.43
1:A:197:SER:O	1:A:200:GLU:HB3	2.19	0.43
1:A:143:ALA:O	1:A:144:SER:HB2	2.18	0.42
1:A:104:ASP:O	1:A:108:LEU:HG	2.18	0.42
1:B:185:VAL:HG13	1:B:235:MET:HG2	2.01	0.42
1:B:74:VAL:HG21	1:B:124:GLN:CG	2.49	0.42
1:B:168:THR:HG23	1:B:182:VAL:HG12	2.01	0.42
1:A:86:VAL:HA	1:A:138:ARG:O	2.20	0.41
1:A:144:SER:O	1:A:186:CYS:HB3	2.20	0.41
1:B:20:LEU:HD13	1:B:46:THR:HB	2.02	0.41
1:B:190:VAL:HG22	1:B:192:THR:HG23	2.03	0.41
1:A:208:VAL:CG1	1:A:216:ARG:HH22	2.34	0.41
1:B:199:ARG:NH2	1:B:214:PHE:HE1	2.18	0.41
1:B:208:VAL:HG22	1:B:209:SER:N	2.35	0.41
1:A:73:LEU:O	1:A:77:VAL:HG23	2.21	0.40
1:A:151:VAL:O	1:A:154:ALA:HB3	2.22	0.40
1:A:232:VAL:O	1:A:236:VAL:HG23	2.21	0.40
1:B:235:MET:HE1	1:B:252:LEU:HB3	2.03	0.40
1:B:148:LYS:HB3	1:B:261:TYR:CZ	2.55	0.40
1:A:218:THR:HG23	1:A:224:GLY:O	2.20	0.40
1:B:151:VAL:CG1	1:B:154:ALA:HB3	2.51	0.40

All (1) 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)
1:B:260:ASN:ND2	1:B:260:ASN:ND2[6_554]	1.79	0.41

## 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	254/261 (97%)	236 (93%)	17 (7%)	1 (0%)	39	68
1	B	250/261 (96%)	231 (92%)	16 (6%)	3 (1%)	16	38
All	All	504/522 (97%)	467 (93%)	33 (6%)	4 (1%)	24	50

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	144	SER
1	B	209	SER
1	B	210	THR
1	A	144	SER

### 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	191/195 (98%)	174 (91%)	17 (9%)	12	27
1	B	188/195 (96%)	171 (91%)	17 (9%)	12	26
All	All	379/390 (97%)	345 (91%)	34 (9%)	12	26

All (34) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	33	VAL
1	A	36	CYS
1	A	44	ARG
1	A	56	GLU
1	A	64	VAL
1	A	87	LEU
1	A	93	ARG
1	A	115	LEU
1	A	132	LEU

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Mol	Chain	Res	Type
1	A	139	ILE
1	A	177	ARG
1	A	194	MET
1	A	206	TRP
1	A	215	ASP
1	A	218	THR
1	A	240	ILE
1	A	258	LEU
1	B	8	VAL
1	B	36	CYS
1	B	44	ARG
1	B	46	THR
1	B	50	LEU
1	B	55	VAL
1	B	87	LEU
1	B	102	LEU
1	B	106	LEU
1	B	115	LEU
1	B	118	VAL
1	B	138	ARG
1	B	145	THR
1	B	149	GLN
1	B	171	LEU
1	B	190	VAL
1	B	200	GLU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (7) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	114	ASN
1	A	153	HIS
1	A	162	HIS
1	A	183	ASN
1	B	89	ASN
1	B	162	HIS
1	B	183	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 ⓘ

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	262	-	42,52,52	1.08	3 (7%)	54,80,80	1.85	6 (11%)
3	ISZ	A	263	-	9,10,10	1.06	1 (11%)	12,12,12	1.07	1 (8%)
2	NAP	B	301	-	42,52,52	1.07	3 (7%)	54,80,80	1.82	7 (12%)
3	ISZ	B	302	-	9,10,10	1.06	1 (11%)	12,12,12	1.10	1 (8%)

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	262	-	-	0/27/67/67	0/5/5/5
3	ISZ	A	263	-	-	0/4/6/6	0/1/1/1
2	NAP	B	301	-	-	0/27/67/67	0/5/5/5
3	ISZ	B	302	-	-	0/4/6/6	0/1/1/1

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	301	NAP	O4B-C1B	2.19	1.44	1.41
2	A	262	NAP	O4B-C1B	2.23	1.44	1.41

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	301	NAP	O4D-C1D	2.39	1.44	1.41
2	A	262	NAP	O4D-C1D	2.56	1.44	1.41
3	A	263	ISZ	C1-C6	2.78	1.53	1.49
3	B	302	ISZ	C1-C6	2.80	1.53	1.49
2	A	262	NAP	P2B-O1X	3.11	1.61	1.51
2	B	301	NAP	P2B-O1X	3.17	1.61	1.51

All (15) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	262	NAP	N3A-C2A-N1A	-10.06	121.19	128.89
2	B	301	NAP	N3A-C2A-N1A	-9.89	121.32	128.89
2	A	262	NAP	PN-O3-PA	-3.64	122.50	132.73
2	B	301	NAP	PN-O3-PA	-2.97	124.39	132.73
2	B	301	NAP	O4B-C1B-C2B	-2.56	101.98	106.60
2	B	301	NAP	C3N-C7N-N7N	-2.49	115.09	117.82
2	B	301	NAP	C4B-O4B-C1B	-2.39	107.10	109.72
2	A	262	NAP	C4A-C5A-N7A	-2.17	107.48	109.48
2	B	301	NAP	C4A-C5A-N7A	-2.10	107.55	109.48
2	A	262	NAP	C3N-C7N-N7N	-2.04	115.58	117.82
2	A	262	NAP	C3B-C2B-C1B	-2.02	98.83	102.73
3	A	263	ISZ	C5-N1-C4	2.30	122.39	116.83
3	B	302	ISZ	C5-N1-C4	2.36	122.53	116.83
2	B	301	NAP	O4D-C1D-N1N	4.54	113.12	108.13
2	A	262	NAP	O4D-C1D-N1N	5.03	113.66	108.13

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

3 monomers are involved in 6 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	262	NAP	1	0
2	B	301	NAP	4	0
3	B	302	ISZ	1	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 ⓘ

### 6.1 Protein, DNA and RNA chains ⓘ

EDS was not executed - this section will therefore be empty.

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

EDS was not executed - this section will therefore be empty.

### 6.3 Carbohydrates ⓘ

EDS was not executed - this section will therefore be empty.

### 6.4 Ligands ⓘ

EDS was not executed - this section will therefore be empty.

### 6.5 Other polymers ⓘ

EDS was not executed - this section will therefore be empty.