



Full wwPDB X-ray Structure Validation Report ⓘ

Jun 24, 2024 – 07:10 PM EDT

PDB ID : 6Y93
Title : Crystal structure of the DNA-binding domain of the Nucleoid Occlusion Factor (Noc) complexed to the Noc-binding site (NBS)
Authors : Jalal, A.S.B.; Tran, N.T.; Stevenson, C.E.M.; Chan, E.; Lo, R.; Tan, X.; Noy, A.; Lawson, D.M.; Le, T.B.K.
Deposited on : 2020-03-06
Resolution : 2.23 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 : 4.02b-467
Xtriage (Phenix) : 1.20.1
EDS : 2.37.1
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac : 5.8.0158
CCP4 : 7.0.044 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.37.1

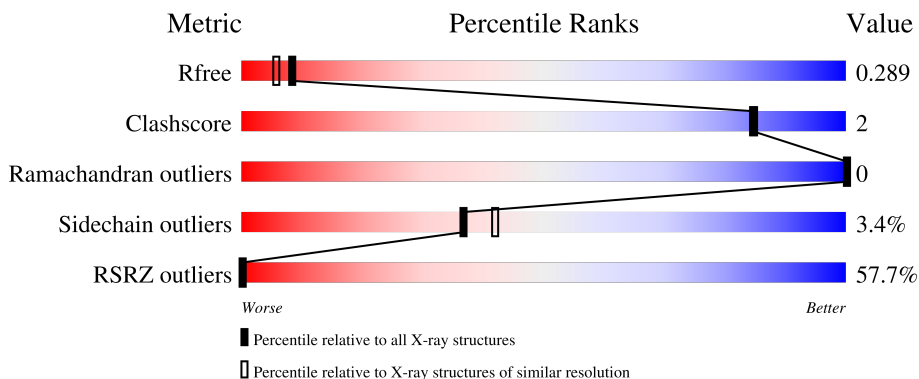
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.23 Å.

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



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	2391 (2.26-2.22)
Clashscore	141614	2539 (2.26-2.22)
Ramachandran outliers	138981	2489 (2.26-2.22)
Sidechain outliers	138945	2490 (2.26-2.22)
RSRZ outliers	127900	2353 (2.26-2.22)

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	146	
1	B	146	
2	C	22	
2	D	22	

2 Entry composition [i](#)

There are 2 unique types of molecules in this entry. The entry contains 2591 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 Nucleoid occlusion protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	105	824	517	147	158	2	0	0	0
1	B	116	871	549	151	169	2	0	0	0

There are 28 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	110	MET	-	initiating methionine	UNP P37524
A	243	LYS	-	expression tag	UNP P37524
A	244	LEU	-	expression tag	UNP P37524
A	245	ALA	-	expression tag	UNP P37524
A	246	ALA	-	expression tag	UNP P37524
A	247	ALA	-	expression tag	UNP P37524
A	248	LEU	-	expression tag	UNP P37524
A	249	GLU	-	expression tag	UNP P37524
A	250	HIS	-	expression tag	UNP P37524
A	251	HIS	-	expression tag	UNP P37524
A	252	HIS	-	expression tag	UNP P37524
A	253	HIS	-	expression tag	UNP P37524
A	254	HIS	-	expression tag	UNP P37524
A	255	HIS	-	expression tag	UNP P37524
B	110	MET	-	initiating methionine	UNP P37524
B	243	LYS	-	expression tag	UNP P37524
B	244	LEU	-	expression tag	UNP P37524
B	245	ALA	-	expression tag	UNP P37524
B	246	ALA	-	expression tag	UNP P37524
B	247	ALA	-	expression tag	UNP P37524
B	248	LEU	-	expression tag	UNP P37524
B	249	GLU	-	expression tag	UNP P37524
B	250	HIS	-	expression tag	UNP P37524
B	251	HIS	-	expression tag	UNP P37524
B	252	HIS	-	expression tag	UNP P37524

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Chain	Residue	Modelled	Actual	Comment	Reference
B	253	HIS	-	expression tag	UNP P37524
B	254	HIS	-	expression tag	UNP P37524
B	255	HIS	-	expression tag	UNP P37524

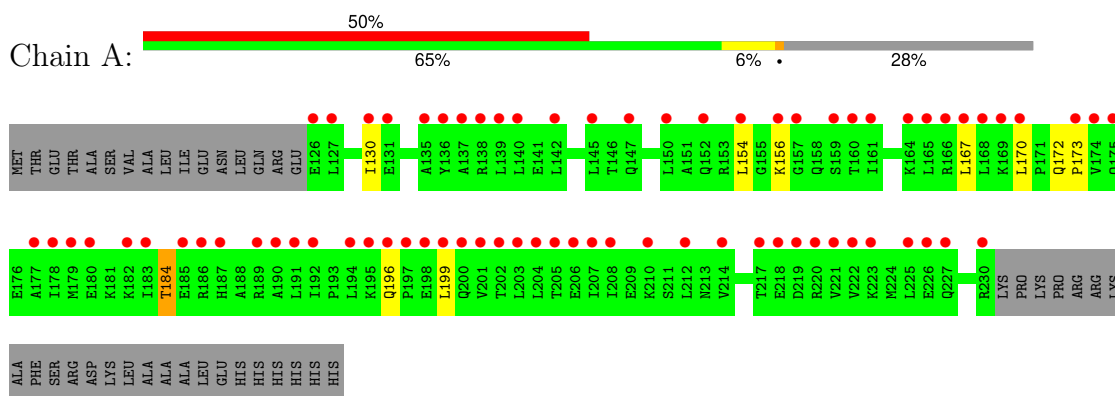
- Molecule 2 is a DNA chain called Noc Binding Site (NBS).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	P			
2	C	22	448	215	82	130	21	0	0	0
2	D	22	448	215	82	130	21	0	0	0

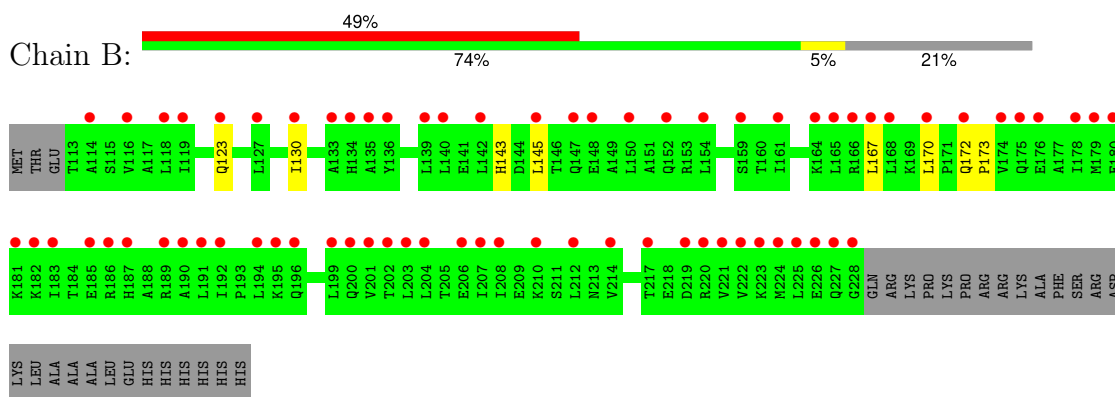
3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

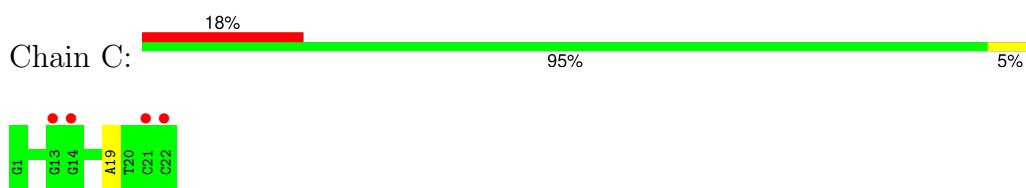
- Molecule 1: Nucleoid occlusion protein



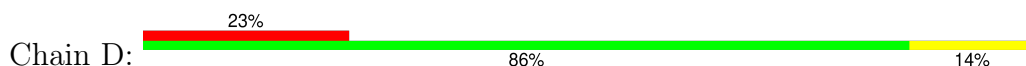
- Molecule 1: Nucleoid occlusion protein

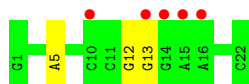


- Molecule 2: Noc Binding Site (NBS)



- Molecule 2: Noc Binding Site (NBS)





4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	134.14Å 60.57Å 81.05Å 90.00° 116.88° 90.00°	Depositor
Resolution (Å)	72.30 – 2.23 72.30 – 2.23	Depositor EDS
% Data completeness (in resolution range)	38.1 (72.30-2.23) 38.1 (72.30-2.23)	Depositor EDS
R_{merge}	0.11	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.10 (at 2.22Å)	Xtrriage
Refinement program	REFMAC 5.8.0257	Depositor
R, R_{free}	0.231 , 0.279 0.247 , 0.289	Depositor DCC
R_{free} test set	599 reflections (5.53%)	wwPDB-VP
Wilson B-factor (Å ²)	40.2	Xtrriage
Anisotropy	0.176	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.30 , 106.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.90	EDS
Total number of atoms	2591	wwPDB-VP
Average B, all atoms (Å ²)	152.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.87% 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](#)

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	0/831	0.72	0/1122
1	B	0.68	0/878	0.73	0/1191
2	C	0.26	0/502	0.73	0/773
2	D	0.27	0/502	0.72	0/773
All	All	0.56	0/2713	0.73	0/3859

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 [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	824	0	855	5	0
1	B	871	0	881	5	0
2	C	448	0	250	1	0
2	D	448	0	250	3	0
All	All	2591	0	2236	11	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 2.

All (11) 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:B:143:HIS:HB2	1:B:145:LEU:HD22	1.55	0.87
1:B:145:LEU:H	1:B:145:LEU:HD23	1.63	0.62
1:A:184:THR:OG1	2:D:13:DG:OP1	2.23	0.57
1:B:167:LEU:HA	1:B:170:LEU:HD12	1.98	0.46
1:A:196:GLN:HB2	1:A:199:LEU:HD12	1.99	0.45
1:B:145:LEU:HD23	1:B:145:LEU:N	2.30	0.45
2:C:19:DA:C2	2:D:5:DA:C2	3.04	0.45
1:A:167:LEU:HA	1:A:170:LEU:HD12	2.00	0.44
1:B:172:GLN:N	1:B:173:PRO:CD	2.84	0.41
1:A:172:GLN:N	1:A:173:PRO:CD	2.83	0.41
1:A:184:THR:HG21	2:D:12:DG:H3'	2.02	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	103/146 (70%)	98 (95%)	5 (5%)	0	100	100
1	B	114/146 (78%)	109 (96%)	5 (4%)	0	100	100
All	All	217/292 (74%)	207 (95%)	10 (5%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains [i](#)

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	89/128 (70%)	85 (96%)	4 (4%)	27	29
1	B	90/128 (70%)	88 (98%)	2 (2%)	52	59
All	All	179/256 (70%)	173 (97%)	6 (3%)	37	42

All (6) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	130	ILE
1	A	154	LEU
1	A	156	LYS
1	A	184	THR
1	B	123	GLN
1	B	130	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	152	GLN
1	A	196	GLN
1	B	152	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 monosaccharides in this entry.

5.6 Ligand geometry [i](#)

There are no ligands in this entry.

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	105/146 (71%)	3.29	73 (69%) 0 0	133, 153, 170, 188	0
1	B	116/146 (79%)	2.92	71 (61%) 0 0	132, 153, 182, 194	0
2	C	22/22 (100%)	1.49	4 (18%) 1 1	136, 148, 156, 163	0
2	D	22/22 (100%)	1.55	5 (22%) 0 0	131, 148, 160, 165	0
All	All	265/336 (78%)	2.83	153 (57%) 0 0	131, 152, 176, 194	0

All (153) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	199	LEU	12.7
1	A	179	MET	10.7
1	A	194	LEU	10.3
1	A	142	LEU	9.6
1	B	194	LEU	9.0
1	B	225	LEU	8.8
1	A	145	LEU	8.3
1	A	204	LEU	8.1
1	B	207	ILE	8.0
1	B	214	VAL	7.9
1	A	201	VAL	7.7
1	A	168	LEU	7.6
1	B	183	ILE	7.1
1	A	183	ILE	7.0
1	A	225	LEU	6.9
1	B	220	ARG	6.9
1	B	140	LEU	6.7
1	B	170	LEU	6.7
1	B	222	VAL	6.6
1	B	154	LEU	6.6
1	B	228	GLY	6.4

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Mol	Chain	Res	Type	RSRZ
1	B	212	LEU	6.3
1	B	159	SER	6.2
1	B	208	ILE	6.1
1	A	214	VAL	6.0
1	B	196	GLN	6.0
1	A	200	GLN	5.9
1	B	130	ILE	5.9
1	B	186	ARG	5.8
1	A	165	LEU	5.8
1	B	133	ALA	5.8
1	A	170	LEU	5.8
1	B	199	LEU	5.7
1	A	167	LEU	5.7
1	A	130	ILE	5.6
1	A	192	ILE	5.5
1	B	174	VAL	5.4
1	A	227	GLN	5.3
1	A	182	LYS	5.3
1	A	191	LEU	5.3
1	A	212	LEU	5.3
1	A	178	ILE	5.2
1	A	207	ILE	5.2
1	B	179	MET	5.2
1	B	203	LEU	5.1
1	A	202	THR	5.1
1	B	168	LEU	4.9
1	B	224	MET	4.9
1	A	127	LEU	4.8
1	A	161	ILE	4.8
1	A	221	VAL	4.8
1	A	185	GLU	4.7
1	B	192	ILE	4.7
1	B	191	LEU	4.6
1	B	119	ILE	4.6
1	A	206	GLU	4.6
1	B	219	ASP	4.6
1	A	210	LYS	4.5
1	B	195	LYS	4.5
1	B	136	TYR	4.5
1	B	127	LEU	4.4
1	A	159	SER	4.2
1	B	210	LYS	4.2

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Mol	Chain	Res	Type	RSRZ
1	A	203	LEU	4.2
1	B	226	GLU	4.0
1	A	180	GLU	4.0
1	B	182	LYS	3.9
1	B	201	VAL	3.9
1	A	177	ALA	3.9
1	B	227	GLN	3.9
1	A	140	LEU	3.7
1	B	145	LEU	3.7
1	B	152	GLN	3.7
1	B	202	THR	3.7
1	A	187	HIS	3.6
1	B	165	LEU	3.6
1	B	167	LEU	3.6
1	A	198	GLU	3.5
1	B	150	LEU	3.5
1	A	150	LEU	3.5
1	A	208	ILE	3.5
1	B	147	GLN	3.5
1	A	147	GLN	3.4
1	B	204	LEU	3.4
1	B	123	GLN	3.4
1	A	169	LYS	3.4
1	A	186	ARG	3.4
1	B	200	GLN	3.4
1	A	175	GLN	3.3
1	A	126	GLU	3.3
1	A	166	ARG	3.3
1	A	189	ARG	3.3
1	B	180	GLU	3.3
1	B	142	LEU	3.2
1	B	134	HIS	3.2
1	B	164	LYS	3.1
1	A	156	LYS	3.1
1	A	131	GLU	3.1
1	B	206	GLU	3.1
1	B	187	HIS	3.0
1	B	221	VAL	3.0
1	A	154	LEU	3.0
1	A	195	LYS	2.9
1	B	176	GLU	2.8
1	A	174	VAL	2.8

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Mol	Chain	Res	Type	RSRZ
1	A	164	LYS	2.8
1	A	136	TYR	2.8
1	A	219	ASP	2.8
1	A	205	THR	2.8
1	A	226	GLU	2.7
1	B	166	ARG	2.7
1	B	223	LYS	2.7
1	A	196	GLN	2.7
1	A	137	ALA	2.7
1	B	190	ALA	2.6
1	A	173	PRO	2.6
1	A	197	PRO	2.6
1	A	135	ALA	2.6
1	B	139	LEU	2.6
1	A	138	ARG	2.6
1	A	223	LYS	2.6
1	B	178	ILE	2.6
1	B	181	LYS	2.6
2	D	14	DG	2.5
1	A	190	ALA	2.4
1	B	185	GLU	2.4
1	B	189	ARG	2.4
1	A	157	GLY	2.4
1	B	135	ALA	2.4
1	A	222	VAL	2.4
1	B	175	GLN	2.4
2	D	15	DA	2.4
1	A	220	ARG	2.3
1	B	172	GLN	2.3
1	B	161	ILE	2.3
1	B	148	GLU	2.2
2	C	22	DC	2.2
1	A	230	ARG	2.2
2	D	10	DC	2.2
1	A	139	LEU	2.2
2	C	13	DG	2.2
1	A	217	THR	2.1
1	B	114	ALA	2.1
1	B	217	THR	2.1
1	A	152	GLN	2.1
2	C	21	DC	2.1
1	A	160	THR	2.1

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Mol	Chain	Res	Type	RSRZ
2	D	16	DA	2.1
2	C	14	DG	2.1
1	A	218	GLU	2.0
2	D	13	DG	2.0
1	B	116	VAL	2.0
1	B	118	LEU	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 monosaccharides in this entry.

6.4 Ligands [i](#)

There are no ligands in this entry.

6.5 Other polymers [i](#)

There are no such residues in this entry.