W O R L D W I D E
wwPDB
PROTEIN DATA BANK

wwPDB X-ray Structure Validation Summary Report ⓘ

Feb 26, 2014 – 03:19 PM GMT

PDB ID : 1G38
Title : ADENINE-SPECIFIC METHYLTRANSFERASE M. TAQ I/DNA COM-PLEX
Authors : Goedecke, K.; Pignot, M.; Goody, R.S.; Scheidig, A.J.; Weinhold, E.
Deposited on : 2000-10-23
Resolution : 2.00 Å(reported)

1 Overall quality at a glance ⓘ

The reported resolution of this entry is 2.00 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	Percentile Ranks	Value
Rfree		0.241
Clashscore		9
Ramachandran outliers		0.3%
Sidechain outliers		2.4%
RSRZ outliers		0.8%

Worse / *Better*

▌Percentile relative to all X-ray structures

▯Percentile relative to X-ray structures of similar resolution
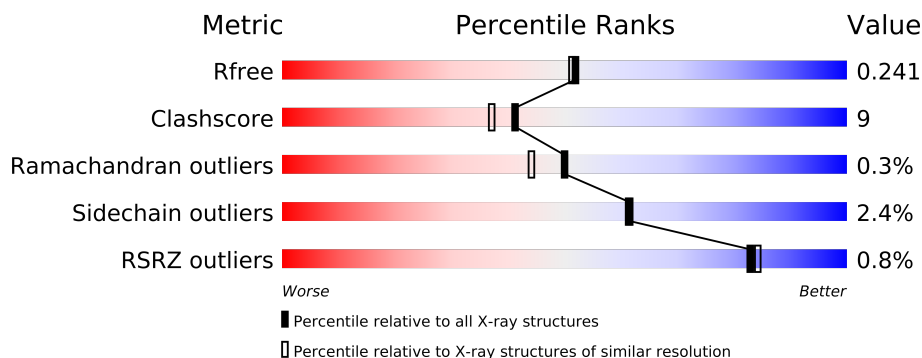
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	66092	4888 (2.00-2.00)
Clashscore	79885	6188 (2.00-2.00)
Ramachandran outliers	78287	6102 (2.00-2.00)
Sidechain outliers	78261	6100 (2.00-2.00)
RSRZ outliers	66119	4890 (2.00-2.00)

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. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density.

Mol	Chain	Length	Quality of chain
1	B	10	
1	E	10	
2	C	10	
2	F	10	
3	A	393	
3	D	393	

2 Entry composition (i)

There are 5 unique types of molecules in this entry. The entry contains 7728 atoms, of which 0 are hydrogen and 0 are deuterium.

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 DNA chain called 5'-D(*GP*TP*TP*CP*GP*AP*TP*GP*TP*C)-3'.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	B	10	Total	C	N	O	P	0	0	0
			202	98	34	61	9			
1	E	10	Total	C	N	O	P	0	0	0
			202	98	34	61	9			

- Molecule 2 is a DNA chain called 5'-D(*GP*AP*CP*AP*TP*CP*GP*(6MA)P*AP*C)-3'.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	C	10	Total	C	N	O	P	0	0	0
			203	98	41	55	9			
2	F	10	Total	C	N	O	P	0	0	0
			203	98	41	55	9			

- Molecule 3 is a protein called MODIFICATION METHYLASE TAQI.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	A	393	Total	C	N	O	S	44	0	0
			3189	2086	548	549	6			
3	D	393	Total	C	N	O	S	44	0	0
			3189	2086	548	549	6			

- Molecule 4 is 5'-DEOXY-5'-[2-(AMINO)ETHYLTHIO]ADENOSINE (three-letter code: NEA) (formula: $C_{12}H_{18}N_6O_3S$).
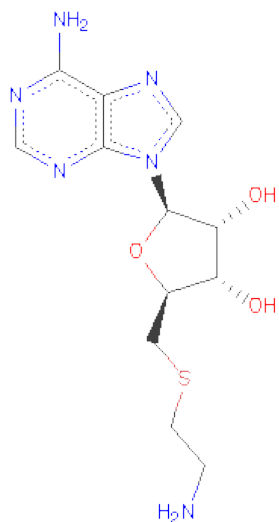
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	A	1	Total	C	N	O	S	0	0
			22	12	6	3	1		
4	D	1	Total	C	N	O	S	0	0
			22	12	6	3	1		

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	209	Total	O	0	0
			209	209		
5	B	33	Total	O	0	0
			33	33		
5	C	23	Total	O	0	0
			23	23		
5	D	184	Total	O	0	0
			184	184		
5	E	27	Total	O	0	0
			27	27		
5	F	20	Total	O	0	0
			20	20		

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.

• Molecule 1: 5'-D(*GP*TP*TP*CP*GP*AP*TP*GP*TP*C)-3'

Chain B:
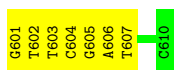
• Molecule 1: 5'-D(*GP*TP*TP*CP*GP*AP*TP*GP*TP*C)-3'

Chain E:

• Molecule 2: 5'-D(*GP*AP*CP*AP*TP*CP*GP*(6MA)P*AP*C)-3'
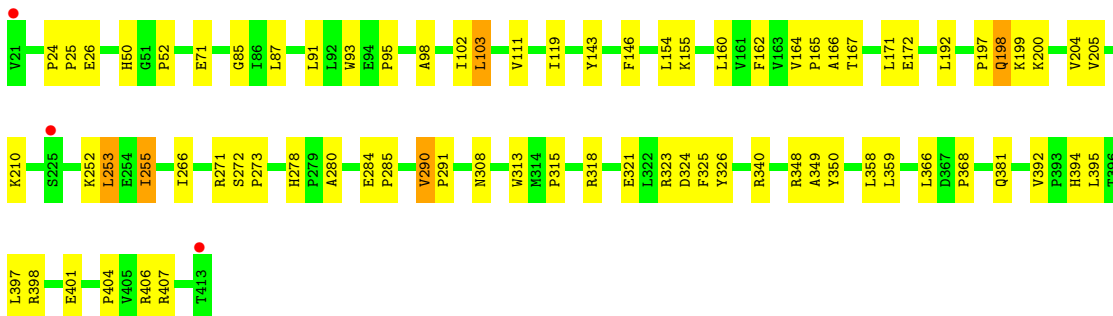
Chain C:

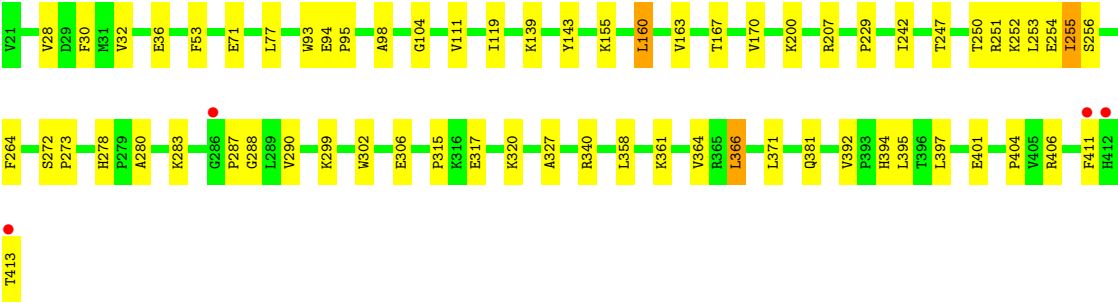• Molecule 2: 5'-D(*GP*AP*CP*AP*TP*CP*GP*(6MA)P*AP*C)-3'

Chain F:

• Molecule 3: MODIFICATION METHYLASE TAQI

Chain A:

• Molecule 3: MODIFICATION METHYLASE TAQI

Chain D:

4 Data and refinement statistics ⓘ

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	59.50Å 68.65Å 114.43Å 90.00° 92.20° 90.00°	Depositor
Resolution (Å)	20.00 – 2.00 28.64 – 2.00	Depositor EDS
% Data completeness (in resolution range)	87.1 (20.00-2.00) 87.2 (28.64-2.00)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	0.09	Depositor
$< I/\sigma(I) >$ [1]	2.35 (at 2.00Å)	Xtriage
Refinement program	CNS	Depositor
R, R_{free}	0.196 , 0.234 0.207 , 0.241	Depositor DCC
R_{free} test set	5537 reflections (10.17%)	DCC
Wilson B-factor (Å^2)	13.7	Xtriage
Anisotropy	0.290	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.41 , 34.0	EDS
Estimated twinning fraction	0.058 for h,-k,-l	Xtriage
L-test for twinning	$< |L| > = 0.45, < L^2 > = 0.28$	Xtriage
Outliers	0 of 54457 reflections	Xtriage
F_o,F_c correlation	0.92	EDS
Total number of atoms	7728	wwPDB-VP
Average B, all atoms (Å^2)	14.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.67% of the height of the origin peak. No significant pseudotranslation is detected.*

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[1]Intensities estimated from amplitudes.

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: NEA, 6MA

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	B	0.38	0/225	0.84	0/346
1	E	0.73	0/225	1.56	6/346 (1.7%)
2	C	0.38	0/202	0.84	0/307
2	F	0.67	0/202	1.44	2/307 (0.7%)
3	A	0.34	0/3293	0.60	1/4473 (0.0%)
3	D	0.34	0/3293	0.62	1/4473 (0.0%)
All	All	0.37	0/7440	0.72	10/10252 (0.1%)

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	E	0	3
2	C	0	1
2	F	0	2
All	All	0	6

There are no bond length outliers.

The worst 5 of 10 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	E	605	DG	O4'-C1'-C2'	6.85	111.38	105.90
1	E	606	DA	O4'-C1'-C2'	6.75	111.30	105.90
2	F	705	DT	O4'-C1'-C2'	6.43	111.04	105.90
3	D	395	LEU	N-CA-C	-6.20	94.26	111.00
3	A	395	LEU	N-CA-C	-6.14	94.43	111.00

There are no chirality outliers.

5 of 6 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	C	702	DA	Sidechain
1	E	603	DT	Sidechain
1	E	606	DA	Sidechain
1	E	608	DG	Sidechain
2	F	701	DG	Sidechain

5.2 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 hydrogens added by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, and the number in parentheses is this value normalized per 1000 atoms of the molecule in the chain. The Symm-Clashes column gives symmetry related clashes, in the same way as for the Clashes column.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	B	202	0	116	9	0
1	E	202	0	116	13	0
2	C	203	0	115	2	0
2	F	203	0	115	12	0
3	A	3189	0	3182	61	0
3	D	3189	0	3182	39	0
4	A	22	0	18	0	0
4	D	22	0	18	0	0
5	A	209	0	0	5	0
5	B	33	0	0	0	0
5	C	23	0	0	0	0
5	D	184	0	0	0	0
5	E	27	0	0	0	0
5	F	20	0	0	0	0
All	All	7728	0	6862	127	0

Clashscore is defined as the number of clashes calculated for the entry per 1000 atoms (including hydrogens) of the entry. The overall clashscore for this entry is 9.

The worst 5 of 127 close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
2:C:702:DA:H2"	2:C:703:DC:H5'	1.44	1.00
2:F:706:DC:H2"	2:F:707:DG:C8	2.07	0.88
1:B:601:DG:H2'	1:B:602:DT:H71	1.56	0.87
2:F:703:DC:H2"	2:F:704:DA:O4'	1.79	0.81

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
3:A:318:ARG:HD2	3:A:321:GLU:OE2	1.86	0.74

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	
3	A	391/393 (100%)	378 (97%)	13 (3%)	0	100	100
3	D	391/393 (100%)	370 (95%)	19 (5%)	2 (0%)	38	29
All	All	782/786 (100%)	748 (96%)	32 (4%)	2 (0%)	50	44

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
3	D	406	ARG
3	D	287	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	
3	A	332/332 (100%)	326 (98%)	6 (2%)	71	73
3	D	332/332 (100%)	322 (97%)	10 (3%)	53	50
All	All	664/664 (100%)	648 (98%)	16 (2%)	61	61

5 of 16 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	D	143	TYR
3	D	160	LEU
3	D	306	GLU
3	D	139	LYS
3	D	317	GLU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 8 such sidechains are listed below:

Mol	Chain	Res	Type
3	A	394	HIS
3	D	394	HIS
3	D	278	HIS
3	A	278	HIS
3	D	61	HIS

5.3.3 RNA ⓘ

There are no RNA chains in this entry.

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

2 non-standard protein/DNA/RNA residues 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	6MA	C	708	1,2	22,24,25	0.71	0	31,34,37	1.07	3 (9%)
2	6MA	F	708	1,2	22,24,25	0.80	0	31,34,37	1.31	5 (16%)

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	6MA	C	708	1,2	-	0/8/23/24	0/1/3/3
2	6MA	F	708	1,2	-	0/8/23/24	0/1/3/3

There are no bond length outliers.

The worst 5 of 8 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	F	708	6MA	C2-N1-C6	3.58	118.94	116.69
2	C	708	6MA	C2-N1-C6	3.34	118.79	116.69
2	F	708	6MA	C8-N9-C1'	3.22	132.22	126.15
2	C	708	6MA	C1-N6-C6	2.61	125.14	122.85
2	F	708	6MA	C5-C6-N6	2.37	124.44	120.44

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

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	#$|Z| > 2$
4	NEA	A	500	-	24,24,24	1.68	4 (16%)	34,34,34	1.82	7 (20%)
4	NEA	D	501	-	24,24,24	1.66	3 (12%)	34,34,34	1.89	7 (20%)

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	NEA	A	500	-	-	0/9/25/25	0/1/3/3
4	NEA	D	501	-	-	0/9/25/25	0/1/3/3

The worst 5 of 7 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	D	501	NEA	C4-N3	4.94	1.43	1.35
4	A	500	NEA	C4-N3	4.87	1.43	1.35
4	D	501	NEA	C8-N9	4.39	1.43	1.36
4	A	500	NEA	C8-N9	4.29	1.43	1.36
4	A	500	NEA	C2'-C1'	-3.37	1.48	1.53

The worst 5 of 14 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
4	D	501	NEA	C4-C5-N7	5.82	114.50	109.52
4	A	500	NEA	C4-C5-N7	5.62	114.34	109.52
4	D	501	NEA	O4'-C1'-N9	-5.18	103.62	108.44
4	A	500	NEA	O4'-C1'-N9	-4.77	104.00	108.44
4	D	501	NEA	O4'-C1'-C2'	-4.59	99.73	106.77

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

5.7 Other polymers (i)

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(Å²)	Q<0.9
1	B	10/10 (100%)	-0.67	0	100	100	6, 9, 16, 16	0
1	E	10/10 (100%)	-0.38	0	100	100	9, 12, 19, 24	0
2	C	10/10 (100%)	-0.75	0	100	100	7, 10, 13, 22	0
2	F	10/10 (100%)	-0.27	0	100	100	10, 13, 26, 30	0
3	A	393/393 (100%)	-0.29	3 (0%)	83	84	5, 13, 27, 42	9 (2%)
3	D	393/393 (100%)	-0.26	4 (1%)	79	80	5, 13, 28, 67	10 (2%)
All	All	826/826 (100%)	-0.29	7 (0%)	83	84	5, 13, 27, 67	19 (2%)

The worst 5 of 7 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
3	D	413	THR	8.1
3	D	412	HIS	5.8
3	D	411	PHE	4.7
3	A	21	VAL	3.8
3	A	413	THR	2.8

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

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. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains. 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	RSR	LLDF	B-factors(Å²)	Q<0.9
2	6MA	F	708	22/23	0.12	0.64	9,13,18,21	0
2	6MA	C	708	22/23	0.07	-0.77	6,10,11,13	0

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. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains. 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	RSR	LLDF	B-factors(Å^2)	Q<0.9
4	NEA	A	500	22/22	0.09	-0.50	7,10,14,15	0
4	NEA	D	501	22/22	0.07	-1.00	7,10,13,14	0

6.5 Other polymers (i)

There are no such residues in this entry.