



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 03:35 AM UTC

PDB ID : 1DMX / pdb_00001dmx
Title : MURINE MITOCHONDRIAL CARBONIC ANHYDRASE V AT 2.45
ANGSTROMS RESOLUTION
Authors : Boriack-Sjodin, P.A.; Christianson, D.W.
Deposited on : 1995-10-04
Resolution : 2.45 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
Xtriage (Phenix) : **NOT EXECUTED**
EDS : **NOT EXECUTED**
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

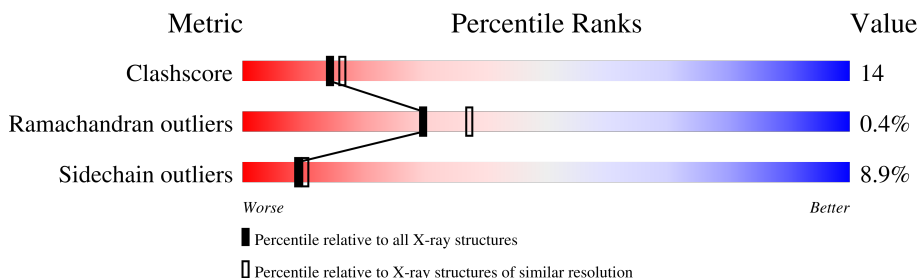
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.45 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	190562	1229 (2.46-2.46)
Ramachandran outliers	187476	1218 (2.46-2.46)
Sidechain outliers	187428	1218 (2.46-2.46)

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 $\leq 5\%$.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	248	 62% 30% • •
1	B	248	 60% 31% 5% •

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 3935 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 MURINE CARBONIC ANHYDRASE V.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	237	Total	C	N	O	S	0	0	0
			1905	1214	332	351	8			
1	B	237	Total	C	N	O	S	0	0	0
			1905	1214	332	351	8			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	185	MET	LEU	variant	UNP P23589
A	225	MET	THR	variant	UNP P23589
B	185	MET	LEU	variant	UNP P23589
B	225	MET	THR	variant	UNP P23589

- Molecule 2 is ZINC ION (CCD ID: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total	Zn	0	0
			1	1		
2	B	1	Total	Zn	0	0
			1	1		

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	63	Total	O	0	0
			63	63		
3	B	60	Total	O	0	0
			60	60		

3 Residue-property plots

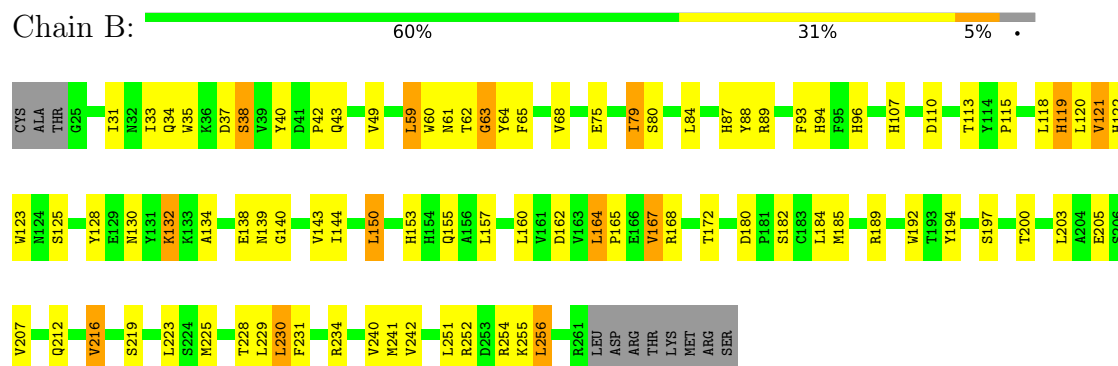
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded 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. 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: MURINE CARBONIC ANHYDRASE V



• Molecule 1: MURINE CARBONIC ANHYDRASE V



4 Data and refinement statistics

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

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α , β , γ	48.69Å 60.37Å 60.44Å 67.65° 75.26° 75.21°	Depositor
Resolution (Å)	8.00 – 2.45	Depositor
% Data completeness (in resolution range)	83.4 (8.00-2.45)	Depositor
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	X-PLOR 3.1	Depositor
R, R_{free}	0.168 , 0.286	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	3935	wwPDB-VP
Average B, all atoms (Å ²)	28.0	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: ZN

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	0.72	2/1965 (0.1%)	1.11	11/2676 (0.4%)
1	B	0.71	5/1965 (0.3%)	1.11	10/2676 (0.4%)
All	All	0.72	7/3930 (0.2%)	1.11	21/5352 (0.4%)

All (7) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	94	HIS	CE1-NE2	6.24	1.38	1.32
1	B	96	HIS	CE1-NE2	6.03	1.38	1.32
1	B	94	HIS	CE1-NE2	5.78	1.38	1.32
1	A	96	HIS	CE1-NE2	5.47	1.38	1.32
1	B	96	HIS	ND1-CE1	5.27	1.37	1.32
1	B	94	HIS	ND1-CE1	5.19	1.37	1.32
1	B	119	HIS	CG-ND1	-5.13	1.32	1.38

All (21) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	94	HIS	ND1-CG-CD2	9.97	116.07	106.10
1	B	207	VAL	N-CA-C	9.55	121.53	108.17
1	A	207	VAL	N-CA-C	8.65	120.62	107.99
1	A	119	HIS	ND1-CG-CD2	8.03	114.13	106.10
1	B	96	HIS	ND1-CG-CD2	7.69	113.79	106.10
1	A	94	HIS	ND1-CG-CD2	7.66	113.76	106.10
1	A	63	GLY	N-CA-C	-6.76	105.85	114.37
1	B	240	VAL	N-CA-C	6.71	119.10	109.51
1	B	180	ASP	CA-C-N	6.54	126.23	119.56
1	B	180	ASP	C-N-CA	6.54	126.23	119.56
1	B	63	GLY	N-CA-C	-6.44	106.25	114.37
1	A	180	ASP	CA-C-N	6.39	126.88	119.47

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	180	ASP	C-N-CA	6.39	126.88	119.47
1	B	162	ASP	N-CA-C	6.15	118.79	111.71
1	B	155	GLN	N-CA-C	6.14	118.51	111.02
1	B	192	TRP	N-CA-C	-5.83	100.64	109.85
1	A	214	THR	N-CA-C	5.68	117.14	109.24
1	A	89	ARG	N-CA-C	5.62	117.85	109.25
1	A	94	HIS	CG-CD2-NE2	-5.55	101.65	107.20
1	A	198	LEU	N-CA-C	-5.26	103.08	110.50
1	A	142	ALA	N-CA-C	-5.16	99.56	108.69

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	1905	0	1819	46	0
1	B	1905	0	1819	59	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
3	A	63	0	0	1	0
3	B	60	0	0	2	0
All	All	3935	0	3638	105	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 14.

All (105) 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:251:LEU:HA	1:B:254:ARG:HH21	1.41	0.85
1:A:203:LEU:HD13	1:A:246:ARG:NH2	2.01	0.75
1:B:38:SER:HB3	1:B:256:LEU:HD13	1.74	0.68
1:B:130:ASN:HD21	1:B:132:LYS:HB2	1.59	0.67
1:A:134:ALA:O	1:A:140:GLY:HA3	1.93	0.67

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:59:LEU:HD22	1:B:68:VAL:HG22	1.79	0.65
1:A:166:GLU:O	1:A:172:THR:HG21	1.96	0.65
1:A:130:ASN:ND2	1:A:133:LYS:HE2	2.13	0.64
1:B:79:ILE:CD1	1:B:144:ILE:HD11	2.29	0.62
1:A:27:ARG:HG2	1:A:254:ARG:HD3	1.81	0.61
1:B:132:LYS:HB2	1:B:132:LYS:HZ3	1.65	0.61
1:A:49:VAL:HG22	1:A:79:ILE:HG22	1.82	0.60
1:B:34:GLN:HB2	1:B:37:ASP:OD2	2.01	0.60
1:B:60:TRP:CH2	1:B:62:THR:HG22	2.36	0.60
1:A:120:LEU:HD13	1:A:185:MET:HE2	1.83	0.60
1:A:65:PHE:HB3	1:A:244:ASN:ND2	2.16	0.60
1:B:164:LEU:N	1:B:165:PRO:HD2	2.18	0.59
1:B:79:ILE:HD11	1:B:144:ILE:HD11	1.85	0.59
1:B:165:PRO:HD3	1:B:225:MET:HE3	1.84	0.59
1:A:169:HIS:ND1	1:A:234:ARG:HG2	2.18	0.58
1:B:132:LYS:HZ3	1:B:132:LYS:H	1.50	0.58
1:A:129:GLU:HB3	1:A:133:LYS:NZ	2.18	0.58
1:B:225:MET:O	1:B:228:THR:HB	2.04	0.58
1:B:251:LEU:CD1	1:B:254:ARG:HB2	2.34	0.57
1:A:154:HIS:HD2	1:A:157:LEU:H	1.54	0.56
1:B:168:ARG:HG2	1:B:230:LEU:HD22	1.88	0.55
1:B:115:PRO:HG3	1:B:150:LEU:HD22	1.88	0.55
1:B:167:VAL:HG23	1:B:172:THR:HG22	1.89	0.55
1:B:200:THR:O	1:B:203:LEU:HD23	2.07	0.55
1:A:93:PHE:HB3	1:A:120:LEU:HD23	1.89	0.54
1:B:89:ARG:O	1:B:122:HIS:HA	2.07	0.54
1:B:63:GLY:O	1:B:231:PHE:HD1	1.91	0.54
1:B:242:VAL:HG11	3:B:874:HOH:O	2.07	0.53
1:A:123:TRP:CZ3	1:A:125:SER:HA	2.43	0.53
1:A:144:ILE:HA	1:A:210:ILE:O	2.08	0.52
1:A:132:LYS:N	1:A:132:LYS:HD3	2.24	0.52
1:A:89:ARG:HD3	1:A:125:SER:HB3	1.92	0.51
1:A:251:LEU:HA	1:A:254:ARG:HH21	1.76	0.51
1:B:93:PHE:CB	1:B:120:LEU:HD13	2.40	0.51
1:A:27:ARG:O	1:A:205:GLU:HG2	2.12	0.50
1:B:75:GLU:HA	1:B:89:ARG:HE	1.75	0.50
1:B:134:ALA:O	1:B:140:GLY:HA3	2.12	0.50
1:B:84:LEU:HD22	1:B:88:TYR:CE1	2.47	0.50
1:A:29:SER:HB3	1:A:30:PRO:HA	1.93	0.50
1:A:74:CYS:C	1:A:76:ASP:H	2.19	0.50
1:A:128:TYR:OH	1:A:138:GLU:HB3	2.11	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:157:LEU:HB3	1:A:222:GLN:NE2	2.27	0.49
1:B:35:TRP:HD1	1:B:110:ASP:OD1	1.95	0.49
1:B:89:ARG:HD2	1:B:125:SER:HB3	1.94	0.49
1:B:130:ASN:ND2	1:B:132:LYS:HB2	2.28	0.49
1:A:106:GLU:HG2	1:A:245:TYR:HB2	1.94	0.48
1:B:49:VAL:HG22	1:B:79:ILE:HD11	1.95	0.48
1:B:93:PHE:HB3	1:B:120:LEU:HD13	1.94	0.48
1:A:33:ILE:HG23	1:A:256:LEU:HD21	1.94	0.48
1:A:46:PRO:HG2	1:A:48:ARG:HH11	1.79	0.48
1:A:34:GLN:HA	1:A:110:ASP:OD1	2.14	0.48
1:A:168:ARG:HG2	1:A:230:LEU:HD22	1.94	0.48
1:B:115:PRO:HB2	1:B:223:LEU:HD21	1.95	0.48
1:B:64:TYR:C	1:B:241:MET:HE2	2.39	0.47
1:B:153:HIS:HA	1:B:219:SER:HB2	1.95	0.47
1:B:251:LEU:HA	1:B:254:ARG:NH2	2.21	0.47
1:B:231:PHE:CE2	1:B:241:MET:HA	2.50	0.47
1:A:104:GLY:HA3	1:A:115:PRO:O	2.15	0.47
1:B:121:VAL:HB	1:B:143:VAL:HG22	1.97	0.46
1:A:123:TRP:HZ3	1:A:128:TYR:O	1.98	0.46
1:B:189:ARG:HA	1:B:212:GLN:HE22	1.80	0.46
1:B:40:TYR:CE2	1:B:42:PRO:HB3	2.52	0.45
1:A:167:VAL:HA	1:A:172:THR:CG2	2.46	0.45
1:A:223:LEU:HD22	1:A:227:ARG:NH2	2.32	0.45
1:B:75:GLU:O	1:B:87:HIS:CE1	2.70	0.45
1:A:93:PHE:CB	1:A:120:LEU:HD23	2.46	0.45
1:B:185:MET:HE2	1:B:185:MET:HB3	1.87	0.45
1:A:74:CYS:SG	1:A:76:ASP:OD2	2.73	0.44
1:B:168:ARG:O	1:B:230:LEU:HB2	2.17	0.44
1:B:134:ALA:HB1	1:B:140:GLY:O	2.17	0.44
1:A:194:TYR:HD1	1:A:195:PRO:O	2.00	0.43
1:A:118:LEU:HD23	1:A:119:HIS:N	2.34	0.43
1:A:138:GLU:HG2	1:A:139:ASN:ND2	2.33	0.43
1:A:89:ARG:HD3	1:A:125:SER:CB	2.48	0.43
1:A:173:GLN:OE1	1:A:173:GLN:N	2.51	0.43
1:B:31:ILE:HD13	1:B:251:LEU:HD13	2.00	0.43
1:A:194:TYR:CD1	1:A:194:TYR:C	2.97	0.43
1:B:107:HIS:HE1	1:B:194:TYR:OH	2.02	0.43
1:B:118:LEU:O	1:B:119:HIS:HD2	2.02	0.43
1:A:44:LEU:HA	1:A:44:LEU:HD23	1.84	0.42
1:A:261:ARG:HD2	3:A:296:HOH:O	2.18	0.42
1:B:123:TRP:HZ3	1:B:128:TYR:O	2.02	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:130:ASN:ND2	1:B:132:LYS:HZ3	2.17	0.42
1:B:61:ASN:OD1	1:B:241:MET:HE1	2.19	0.42
1:B:184:LEU:O	1:B:216:VAL:HG11	2.19	0.42
1:B:139:ASN:HA	3:B:869:HOH:O	2.19	0.42
1:A:167:VAL:HA	1:A:172:THR:HG21	2.01	0.42
1:B:251:LEU:HD12	1:B:254:ARG:NE	2.35	0.42
1:B:80:SER:HB3	1:B:87:HIS:HA	2.02	0.42
1:B:150:LEU:HD13	1:B:150:LEU:HA	1.87	0.41
1:B:33:ILE:HG23	1:B:256:LEU:HD11	2.01	0.41
1:A:33:ILE:HG21	1:A:192:TRP:CD2	2.56	0.41
1:A:65:PHE:HA	1:A:241:MET:SD	2.61	0.41
1:B:60:TRP:CZ2	1:B:62:THR:HG22	2.55	0.41
1:B:132:LYS:HZ3	1:B:132:LYS:N	2.16	0.41
1:B:132:LYS:HZ3	1:B:132:LYS:CB	2.32	0.41
1:A:115:PRO:HD2	1:A:148:LEU:O	2.21	0.41
1:A:197:SER:HA	1:A:204:ALA:O	2.21	0.41
1:B:132:LYS:H	1:B:132:LYS:NZ	2.16	0.40
1:B:197:SER:HA	1:B:205:GLU:HA	2.03	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	235/248 (95%)	223 (95%)	10 (4%)	2 (1%)	14	17
1	B	235/248 (95%)	222 (94%)	13 (6%)	0	100	100
All	All	470/496 (95%)	445 (95%)	23 (5%)	2 (0%)	30	37

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	138	GLU
1	A	75	GLU

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	207/217 (95%)	192 (93%)	15 (7%)	13	17
1	B	207/217 (95%)	185 (89%)	22 (11%)	6	6
All	All	414/434 (95%)	377 (91%)	37 (9%)	9	10

All (37) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	26	THR
1	A	39	VAL
1	A	65	PHE
1	A	74	CYS
1	A	80	SER
1	A	109	VAL
1	A	118	LEU
1	A	126	THR
1	A	150	LEU
1	A	173	GLN
1	A	212	GLN
1	A	221	SER
1	A	223	LEU
1	A	230	LEU
1	A	248	LEU
1	B	38	SER
1	B	43	GLN
1	B	59	LEU
1	B	65	PHE
1	B	79	ILE
1	B	113	THR
1	B	121	VAL

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Mol	Chain	Res	Type
1	B	132	LYS
1	B	138	GLU
1	B	150	LEU
1	B	157	LEU
1	B	160	LEU
1	B	164	LEU
1	B	167	VAL
1	B	182	SER
1	B	216	VAL
1	B	229	LEU
1	B	230	LEU
1	B	234	ARG
1	B	252	ARG
1	B	255	LYS
1	B	256	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (9) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	86	ASN
1	A	87	HIS
1	A	139	ASN
1	A	212	GLN
1	B	43	GLN
1	B	107	HIS
1	B	130	ASN
1	B	154	HIS
1	B	212	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 ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry

Of 2 ligands modelled in this entry, 2 are monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

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 is therefore empty.

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

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates

EDS was not executed - this section is therefore empty.

6.4 Ligands

EDS was not executed - this section is therefore empty.

6.5 Other polymers

EDS was not executed - this section is therefore empty.