



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 10, 2026 – 02:25 PM UTC

PDB ID : 1DTD / pdb_00001dtd
Title : CRYSTAL STRUCTURE OF THE COMPLEX BETWEEN THE LEECH CARBOXYPEPTIDASE INHIBITOR AND THE HUMAN CARBOXYPEPTIDASE A2 (LCI-CPA2)
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Deposited on : 2000-01-12
Resolution : 1.65 Å(reported)

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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
Mogul	:	2022.3.0, CSD as543be (2022)
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

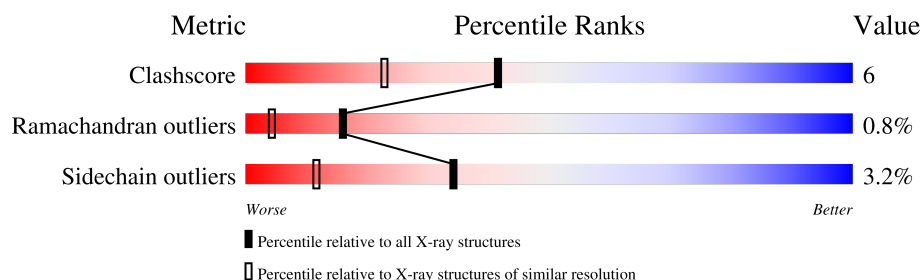
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.65 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	2662 (1.66-1.66)
Ramachandran outliers	187476	2621 (1.66-1.66)
Sidechain outliers	187428	2621 (1.66-1.66)

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	303	
2	B	61	

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
4	GLU	A	300	X	X	X	-

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 3085 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 CARBOXYPEPTIDASE A2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	303	Total	C	N	O	S	28	0	0
			2371	1515	399	448	9			

There are 3 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	490	ALA	-	insertion	UNP P48052
A	587	SER	ARG	conflict	UNP P48052
A	588	ARG	SER	conflict	UNP P48052

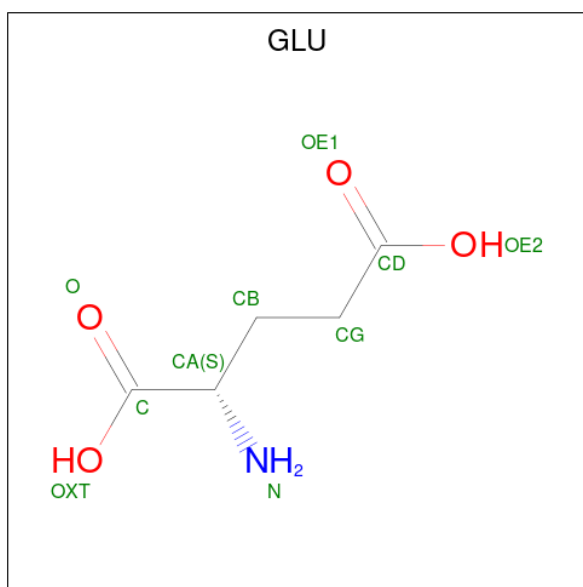
- Molecule 2 is a protein called METALLOCARBOXYPEPTIDASE INHIBITOR.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	61	Total	C	N	O	S	0	0	0
			472	296	78	90	8			

- Molecule 3 is ZINC ION (CCD ID: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	1	Total	Zn	0	0
			1	1		

- Molecule 4 is GLUTAMIC ACID (CCD ID: GLU) (formula: C₅H₉NO₄).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	A	1	Total	C	N	O	0	0
			10	5	1	4		

- Molecule 5 is water.

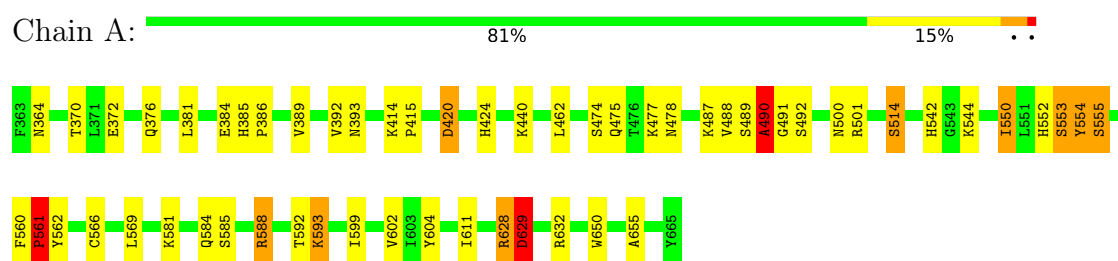
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	176	Total	O	0	0
			176	176		
5	B	55	Total	O	0	0
			55	55		

3 Residue-property plots

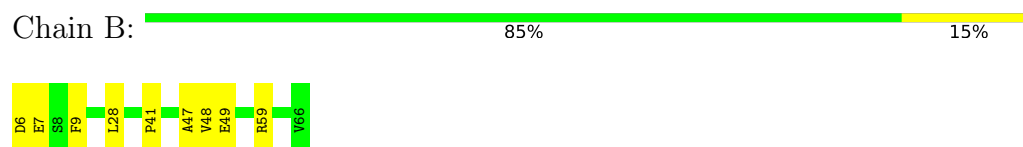
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded 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: CARBOXYPEPTIDASE A2



• Molecule 2: METALLOCARBOXYPEPTIDASE INHIBITOR



4 Data and refinement statistics

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

Property	Value	Source
Space group	P 32 2 1	Depositor
Cell constants a, b, c, α , β , γ	80.44 Å 80.44 Å 114.46 Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	12.00 – 1.65	Depositor
% Data completeness (in resolution range)	98.0 (12.00-1.65)	Depositor
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	REFMAC	Depositor
R, R_{free}	0.187 , 0.234	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	3085	wwPDB-VP
Average B, all atoms (Å ²)	25.0	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	1.37	10/2436 (0.4%)	1.73	37/3306 (1.1%)
2	B	0.55	0/489	1.36	1/671 (0.1%)
All	All	1.27	10/2925 (0.3%)	1.67	38/3977 (1.0%)

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	A	0	7

All (10) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	588	ARG	CD-NE	39.99	2.02	1.46
1	A	514	SER	CB-OG	28.72	1.99	1.42
1	A	491	GLY	C-N	24.87	1.68	1.33
1	A	488	VAL	CA-CB	13.88	1.71	1.54
1	A	490	ALA	C-N	12.57	1.51	1.33
1	A	477	LYS	CG-CD	-11.96	1.16	1.52
1	A	487	LYS	CG-CD	11.13	1.85	1.52
1	A	632	ARG	CD-NE	9.93	1.60	1.46
1	A	562	TYR	N-CA	-6.69	1.37	1.46
1	A	372	GLU	CB-CG	-5.91	1.34	1.52

All (38) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	491	GLY	CA-C-N	-28.90	74.26	122.81

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	491	GLY	C-N-CA	-28.90	74.26	122.81
1	A	632	ARG	CD-NE-CZ	-19.60	96.97	124.40
1	A	488	VAL	N-CA-CB	16.82	128.86	110.53
1	A	550	ILE	CB-CG1-CD1	14.13	143.48	113.80
1	A	553	SER	O-C-N	-14.13	103.92	122.72
1	A	628	ARG	O-C-N	-14.07	103.87	122.59
1	A	490	ALA	O-C-N	-12.39	106.11	122.59
1	A	561	PRO	CA-C-N	12.04	144.54	121.54
1	A	561	PRO	C-N-CA	12.04	144.54	121.54
1	A	487	LYS	CB-CG-CD	-11.98	83.74	111.30
1	A	372	GLU	CA-CB-CG	-11.89	90.31	114.10
1	A	490	ALA	CA-C-N	-11.48	98.90	121.41
1	A	490	ALA	C-N-CA	-11.48	98.90	121.41
1	A	487	LYS	CG-CD-CE	10.12	134.59	111.30
1	A	554	TYR	N-CA-C	9.62	124.54	110.59
1	A	561	PRO	O-C-N	-8.23	111.53	122.64
1	A	488	VAL	CA-CB-CG1	8.10	124.17	110.40
1	A	424	HIS	CA-CB-CG	-7.14	106.66	113.80
1	A	593	LYS	CA-C-O	6.89	127.94	120.43
1	A	628	ARG	CB-CA-C	-6.84	96.81	110.42
1	A	562	TYR	N-CA-C	6.73	125.13	110.80
1	A	553	SER	CA-C-O	-6.51	113.32	121.46
1	A	393	ASN	CA-CB-CG	-6.19	106.41	112.60
1	A	491	GLY	O-C-N	6.00	130.50	122.70
1	A	364	ASN	CA-CB-CG	5.96	118.56	112.60
1	A	629	ASP	CA-C-O	-5.72	114.79	120.80
1	A	592	THR	CA-C-N	-5.67	114.90	122.72
1	A	592	THR	C-N-CA	-5.67	114.90	122.72
1	A	584	GLN	CB-CA-C	-5.57	102.14	110.88
1	A	392	VAL	CA-C-N	-5.55	114.36	122.19
1	A	392	VAL	C-N-CA	-5.55	114.36	122.19
1	A	561	PRO	N-CA-CB	5.52	109.05	103.25
1	A	553	SER	N-CA-CB	5.44	119.78	110.65
1	A	552	HIS	ND1-CE1-NE2	-5.30	103.10	108.40
2	B	6	ASP	CA-CB-CG	5.15	117.75	112.60
1	A	420	ASP	CA-CB-CG	5.02	117.62	112.60
1	A	628	ARG	N-CA-CB	5.00	118.94	110.49

There are no chirality outliers.

All (7) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	490	ALA	Mainchain
1	A	553	SER	Peptide,Mainchain
1	A	561	PRO	Peptide,Mainchain
1	A	628	ARG	Peptide,Mainchain

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	2371	0	2290	30	1
2	B	472	0	421	5	0
3	A	1	0	0	0	0
4	A	10	0	5	6	0
5	A	176	0	0	2	0
5	B	55	0	0	0	1
All	All	3085	0	2716	35	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 6.

All (35) 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:550:ILE:HD13	5:A:8:HOH:O	1.62	0.96
4:A:300:GLU:HA	4:A:300:GLU:OE1	1.60	0.96
1:A:604:TYR:HH	4:A:300:GLU:N	1.70	0.89
1:A:414:LYS:HB2	1:A:415:PRO:HD2	1.63	0.80
1:A:585:SER:O	1:A:588:ARG:HG2	1.91	0.71
1:A:370:THR:HA	1:A:475:GLN:HE22	1.59	0.68
1:A:420:ASP:OD2	1:A:550:ILE:HD12	1.92	0.67
1:A:542:HIS:HD2	1:A:544:LYS:H	1.45	0.63
2:B:47:ALA:O	2:B:59:ARG:HD2	2.02	0.59
1:A:440:LYS:HZ2	1:A:650:TRP:CD1	2.20	0.59
1:A:414:LYS:HB2	1:A:415:PRO:CD	2.34	0.57
1:A:370:THR:HA	1:A:475:GLN:NE2	2.20	0.56
1:A:500:ASN:HD22	4:A:300:GLU:C	2.15	0.55
2:B:48:VAL:HG23	2:B:49:GLU:HG2	1.90	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:542:HIS:CD2	1:A:544:LYS:H	2.26	0.52
1:A:490:ALA:HB3	1:A:492:SER:N	2.24	0.52
1:A:550:ILE:HD11	5:A:7:HOH:O	2.08	0.51
1:A:385:HIS:N	1:A:386:PRO:HD3	2.26	0.51
2:B:7:GLU:HG3	2:B:9:PHE:CE2	2.48	0.49
1:A:602:VAL:HG23	2:B:41:PRO:HG2	1.95	0.48
2:B:7:GLU:HG3	2:B:9:PHE:CZ	2.49	0.47
1:A:561:PRO:HB2	1:A:569:LEU:HD13	1.97	0.47
1:A:474:SER:HA	1:A:478:ASN:O	2.15	0.47
1:A:554:TYR:HB2	1:A:629:ASP:H	1.78	0.47
1:A:604:TYR:OH	4:A:300:GLU:N	2.42	0.47
1:A:384:GLU:HG3	1:A:385:HIS:CE1	2.50	0.46
1:A:560:PHE:HB2	1:A:561:PRO:CD	2.45	0.46
1:A:501:ARG:NH1	4:A:300:GLU:O	2.40	0.45
1:A:440:LYS:HZ2	1:A:650:TRP:NE1	2.14	0.45
1:A:501:ARG:HH22	4:A:300:GLU:N	2.14	0.45
1:A:554:TYR:O	1:A:555:SER:CB	2.65	0.44
1:A:420:ASP:OD2	1:A:550:ILE:CD1	2.63	0.43
1:A:478:ASN:C	1:A:478:ASN:HD22	2.27	0.42
1:A:599:ILE:HD11	1:A:611:ILE:HD11	2.01	0.42
1:A:581:LYS:HD3	1:A:655:ALA:HB1	2.02	0.41

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:A:514:SER:OG	5:B:119:HOH:O[4_555]	1.95	0.25

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	301/303 (99%)	283 (94%)	15 (5%)	3 (1%)	12	2
2	B	59/61 (97%)	58 (98%)	1 (2%)	0	100	100
All	All	360/364 (99%)	341 (95%)	16 (4%)	3 (1%)	16	4

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	555	SER
1	A	561	PRO
1	A	490	ALA

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	255/256 (100%)	247 (97%)	8 (3%)	35	12
2	B	53/53 (100%)	52 (98%)	1 (2%)	50	28
All	All	308/309 (100%)	299 (97%)	9 (3%)	34	14

All (9) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	376	GLN
1	A	381	LEU
1	A	389	VAL
1	A	462	LEU
1	A	489	SER
1	A	566	CYS
1	A	593	LYS
1	A	629	ASP
2	B	28	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (11) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	404	ASN
1	A	475	GLN
1	A	478	ASN
1	A	527	ASN
1	A	542	HIS
1	A	605	GLN
2	B	13	GLN
2	B	16	GLN
2	B	35	ASN
2	B	37	HIS
2	B	57	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 oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 2 ligands modelled in this entry, 1 is monoatomic - leaving 1 for Mogul analysis.

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	GLU	A	300	-	8,9,9	1.81	1 (12%)	8,11,11	2.27	3 (37%)

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	GLU	A	300	-	1/1/3/3	8/9/9/9	-

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	300	GLU	CB-CA	-4.26	1.44	1.53

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	300	GLU	CB-CA-N	4.32	121.38	110.12
4	A	300	GLU	OE1-CD-CG	-3.23	112.85	123.09
4	A	300	GLU	CG-CB-CA	-2.27	108.66	113.86

All (1) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
4	A	300	GLU	CA

All (8) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	300	GLU	O-C-CA-N
4	A	300	GLU	N-CA-CB-CG
4	A	300	GLU	CA-CB-CG-CD
4	A	300	GLU	OXT-C-CA-N
4	A	300	GLU	C-CA-CB-CG
4	A	300	GLU	O-C-CA-CB
4	A	300	GLU	OE1-CD-CG-CB
4	A	300	GLU	OE2-CD-CG-CB

There are no ring outliers.

1 monomer is involved in 6 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	300	GLU	6	0

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

The following chains have linkage breaks:

Mol	Chain	Number of breaks
1	A	1

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	A	491:GLY	C	492:SER	N	1.68

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.