Full wwPDB X-ray Structure Validation Report (i)

Dec 10, 2022 – 12:41 PM EST

PDB ID	:	1TMT
Title	:	CHANGES IN INTERACTIONS IN COMPLEXES OF HIRUDIN DERIVATIVES AND HUMAN ALPHA-THROMBIN DUE TO DIFFERENT CRYSTAL FORMS
Authors	:	Priestle, J.P.; Gruetter, M.G.
Deposited on	:	1994-05-26
Resolution	:	2.20 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 (i) 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 (i)) were used in the production of this report:

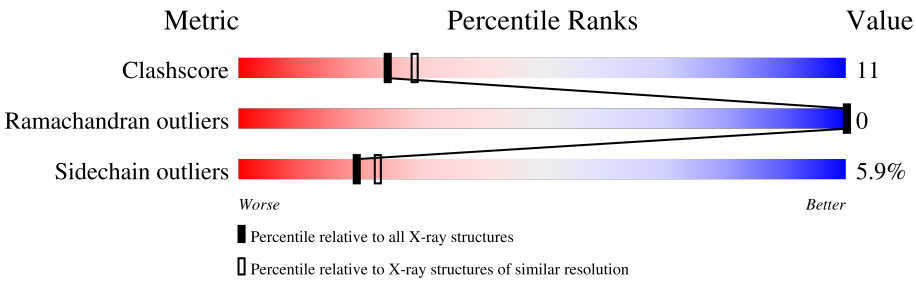
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.31.2

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 2.20 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	141614	5594 (2.20-2.20)
Ramachandran outliers	138981	5503 (2.20-2.20)
Sidechain outliers	138945	5504 (2.20-2.20)

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 <=5%

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	L	36	44% 28% • 25%
2	H	259	65% 29% 5% •
3	I	3	100%
4	J	18	22% 28% 11% 39%

2 Entry composition (i)

There are 6 unique types of molecules in this entry. The entry contains 2526 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 ALPHA-THROMBIN (SMALL SUBUNIT).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	L	27	215	134	36	44	1	0	0	1

- Molecule 2 is a protein called ALPHA-THROMBIN (LARGE SUBUNIT).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	H	258	2068	1319	365	370	14	0	0	1

- Molecule 3 is a protein called CGP 50,856 INHIBITOR, cleaved N-terminal tripeptide fragment, d-Phe-Pro-Arg.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
3	I	3	30	20	6	4	0	0	0

- Molecule 4 is a protein called CGP 50,856 INHIBITOR, cleaved C-terminal hirudin fragment.

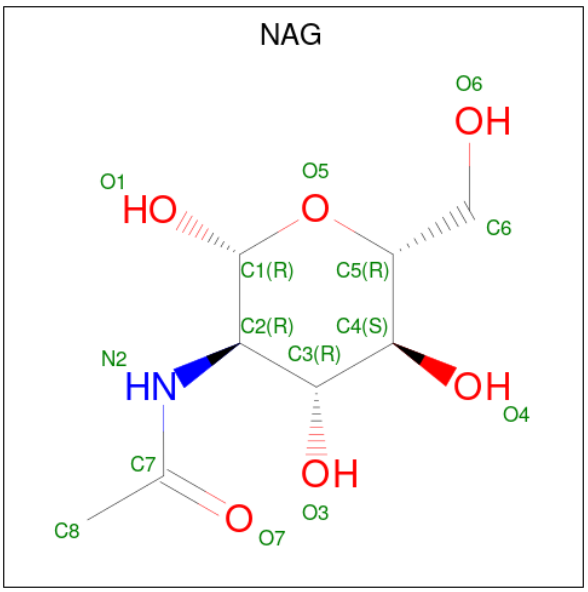
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
4	J	11	88	58	11	19	0	0	1

There are 5 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
J	48	PRO	-	linker	UNP P28504
J	49	GLY	-	linker	UNP P28504
J	50	GLY	-	linker	UNP P28504
J	51	GLY	-	linker	UNP P28504
J	52	GLY	-	linker	UNP P28504

- Molecule 5 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula:

$C_8H_{15}NO_6$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
5	J	1	14	8	1	5	0	0

- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
6	L	9	9	9	0	0
			Total	O		
6	H	97	97	97	0	0
			Total	O		
6	I	3	3	3	0	0
			Total	O		
6	J	2	2	2	0	0

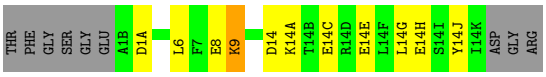
3 Residue-property plots (i)

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. 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.

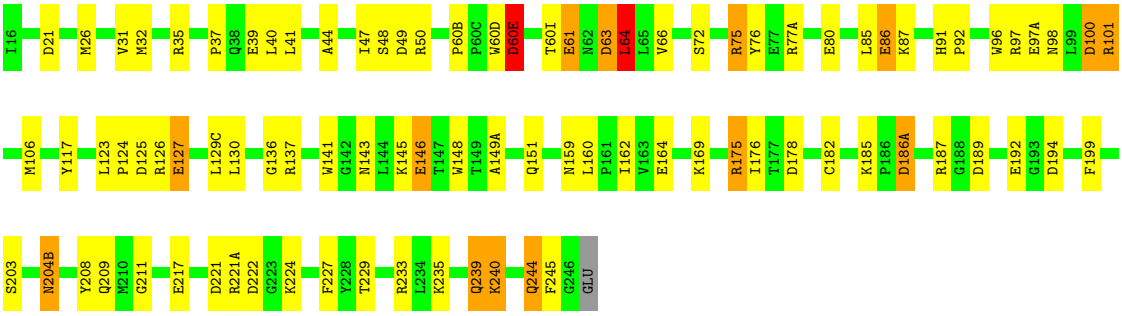
• Molecule 1: ALPHA-THROMBIN (SMALL SUBUNIT)

Chain L: 44% 28% • 25%



• Molecule 2: ALPHA-THROMBIN (LARGE SUBUNIT)

Chain H: 65% 29% 5% •



• Molecule 3: CGP 50,856 INHIBITOR, cleaved N-terminal tripeptide fragment, d-Phe-Pro-Arg

Chain I: 100%

There are no outlier residues recorded for this chain.

• Molecule 4: CGP 50,856 INHIBITOR, cleaved C-terminal hirudin fragment

Chain J: 22% 28% 11% 39%

4 Data and refinement statistics (i)

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

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, α, β, γ	80.50Å 107.10Å 45.80Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	6.00 – 2.20	Depositor
% Data completeness (in resolution range)	(Not available) (6.00-2.20)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	TNT, X-PLOR	Depositor
R, R_{free}	0.177 , (Not available)	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	2526	wwPDB-VP
Average B, all atoms (Å^2)	32.0	wwPDB-VP

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: NAG, DPN

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	L	1.24	4/217 (1.8%)	1.58	3/289 (1.0%)
2	H	0.95	11/2123 (0.5%)	1.45	34/2876 (1.2%)
3	I	0.78	0/19	1.88	0/22
4	J	1.61	4/90 (4.4%)	1.22	0/122
All	All	1.01	19/2449 (0.8%)	1.46	37/3309 (1.1%)

All (19) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	H	127	GLU	CD-OE2	6.96	1.33	1.25
4	J	58	GLU	CD-OE1	6.54	1.32	1.25
2	H	80	GLU	CD-OE1	6.41	1.32	1.25
1	L	14(H)	GLU	CD-OE1	6.10	1.32	1.25
4	J	62	GLU	CD-OE1	6.08	1.32	1.25
2	H	192	GLU	CD-OE1	5.98	1.32	1.25
2	H	164	GLU	CD-OE2	5.88	1.32	1.25
1	L	14(E)	GLU	CD-OE1	5.84	1.32	1.25
2	H	86	GLU	CD-OE2	5.76	1.31	1.25
2	H	217	GLU	CD-OE1	5.57	1.31	1.25
2	H	146	GLU	CD-OE2	5.56	1.31	1.25
4	J	61	GLU	CD-OE2	5.48	1.31	1.25
2	H	39	GLU	CD-OE1	5.42	1.31	1.25
1	L	8	GLU	CD-OE1	5.34	1.31	1.25
2	H	61	GLU	CD-OE1	5.31	1.31	1.25
4	J	57	GLU	CD-OE2	5.24	1.31	1.25
2	H	97(A)	GLU	CD-OE2	5.20	1.31	1.25
1	L	14(C)	GLU	CD-OE2	5.13	1.31	1.25
2	H	245	PHE	C-N	-5.12	1.23	1.33

All (37) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	H	208	TYR	CB-CG-CD1	-8.09	116.15	121.00
2	H	178	ASP	CB-CG-OD2	-7.96	111.14	118.30
2	H	186(A)	ASP	CB-CG-OD2	-6.91	112.08	118.30
2	H	100	ASP	CB-CG-OD1	6.87	124.48	118.30
2	H	175	ARG	NE-CZ-NH1	-6.72	116.94	120.30
2	H	100	ASP	CB-CG-OD2	-6.67	112.30	118.30
2	H	117	TYR	CB-CG-CD1	-6.65	117.01	121.00
2	H	194	ASP	CB-CG-OD1	-6.56	112.40	118.30
2	H	175	ARG	NE-CZ-NH2	6.53	123.56	120.30
2	H	189	ASP	CB-CG-OD2	6.50	124.15	118.30
2	H	49	ASP	CB-CG-OD1	-6.45	112.50	118.30
2	H	49	ASP	CB-CG-OD2	6.19	123.88	118.30
2	H	178	ASP	CB-CG-OD1	6.16	123.84	118.30
2	H	63	ASP	CB-CG-OD1	6.14	123.82	118.30
2	H	186(A)	ASP	CB-CG-OD1	6.12	123.81	118.30
2	H	63	ASP	CB-CG-OD2	-6.09	112.82	118.30
2	H	60(E)	ASP	CB-CG-OD2	-6.05	112.86	118.30
2	H	222	ASP	CB-CG-OD1	-6.01	112.89	118.30
2	H	189	ASP	CB-CG-OD1	-5.85	113.04	118.30
2	H	221	ASP	CB-CG-OD1	5.78	123.50	118.30
2	H	125	ASP	CB-CG-OD1	5.77	123.49	118.30
2	H	101	ARG	NE-CZ-NH1	-5.77	117.42	120.30
2	H	187	ARG	NE-CZ-NH2	5.72	123.16	120.30
2	H	187	ARG	NE-CZ-NH1	-5.65	117.47	120.30
2	H	227	PHE	CB-CG-CD2	-5.64	116.85	120.80
2	H	194	ASP	CB-CG-OD2	5.61	123.35	118.30
2	H	64	LEU	CB-CA-C	-5.59	99.57	110.20
2	H	50	ARG	CB-CA-C	-5.55	99.30	110.40
2	H	222	ASP	CB-CG-OD2	5.55	123.29	118.30
1	L	14(E)	GLU	N-CA-CB	5.53	120.55	110.60
1	L	9	LYS	CA-CB-CG	-5.47	101.38	113.40
2	H	97	ARG	NE-CZ-NH1	5.36	122.98	120.30
1	L	14	ASP	CB-CG-OD1	-5.35	113.49	118.30
2	H	125	ASP	CB-CG-OD2	-5.29	113.54	118.30
2	H	239	GLN	CB-CA-C	-5.27	99.86	110.40
2	H	126	ARG	NE-CZ-NH1	5.17	122.88	120.30
2	H	21	ASP	CB-CG-OD2	-5.08	113.73	118.30

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	L	215	0	214	3	0
2	H	2068	0	2018	46	0
3	I	30	0	30	0	0
4	J	88	0	72	5	0
5	J	14	0	13	0	0
6	H	97	0	0	3	0
6	I	3	0	0	0	0
6	J	2	0	0	0	0
6	L	9	0	0	0	0
All	All	2526	0	2347	52	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 11.

All (52) 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)
2:H:130:LEU:HD23	2:H:162:ILE:HD13	1.54	0.88
2:H:145:LYS:HE3	6:H:462:HOH:O	1.85	0.76
2:H:61:GLU:HG2	2:H:87:LYS:HA	1.76	0.68
2:H:91:HIS:ND1	2:H:92:PRO:HD2	2.12	0.65
4:J:59:ILE:HB	4:J:60:PRO:HD2	1.79	0.64
2:H:146:GLU:OE1	2:H:221(A):ARG:HD2	2.00	0.62
2:H:130:LEU:HD23	2:H:162:ILE:CD1	2.29	0.59
2:H:137:ARG:HE	2:H:159:ASN:HD21	1.49	0.59
2:H:211:GLY:HA2	2:H:229:THR:O	2.03	0.58
2:H:77(A):ARG:NH2	4:J:57:GLU:OE2	2.36	0.58
2:H:233:ARG:NH2	6:H:472:HOH:O	2.30	0.57
2:H:143:ASN:OD1	2:H:151:GLN:NE2	2.29	0.56
2:H:72:SER:OG	2:H:75:ARG:HB2	2.05	0.55
2:H:169:LYS:HA	2:H:176:ILE:HD12	1.88	0.55
2:H:31:VAL:HB	2:H:44:ALA:HB3	1.90	0.54
2:H:235:LYS:HG2	2:H:239:GLN:HE21	1.74	0.53
2:H:85:LEU:HD11	2:H:106:MET:HE1	1.90	0.53
2:H:175:ARG:HH11	2:H:175:ARG:HG3	1.74	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:H:85:LEU:CD1	2:H:106:MET:HE1	2.41	0.51
2:H:76:TYR:CE2	2:H:77(A):ARG:HG3	2.46	0.51
2:H:31:VAL:HG12	2:H:32:MET:N	2.27	0.49
2:H:60(D):TRP:O	2:H:60(E):ASP:HB2	2.11	0.49
2:H:40:LEU:HD11	2:H:141:TRP:HB2	1.96	0.48
2:H:203:SER:HB3	2:H:204(B):ASN:ND2	2.29	0.48
2:H:136:GLY:HA3	2:H:199:PHE:CE1	2.49	0.47
2:H:175:ARG:HG3	2:H:175:ARG:NH1	2.30	0.46
4:J:64:LEU:HD23	4:J:64:LEU:HA	1.59	0.45
2:H:47:ILE:O	2:H:48:SER:HB3	2.16	0.45
2:H:85:LEU:HD13	2:H:106:MET:CE	2.46	0.45
2:H:169:LYS:NZ	2:H:169:LYS:HB3	2.31	0.45
1:L:1(A):ASP:OD2	1:L:9:LYS:NZ	2.47	0.44
2:H:123:LEU:HD23	2:H:123:LEU:HA	1.65	0.44
2:H:159:ASN:O	2:H:160:LEU:HD23	2.17	0.44
2:H:60(B):PRO:HG2	2:H:96:TRP:CE2	2.53	0.43
2:H:60(I):THR:N	2:H:63:ASP:OD1	2.36	0.43
2:H:31:VAL:CG1	2:H:32:MET:N	2.81	0.43
2:H:41:LEU:CD1	2:H:64:LEU:HD11	2.49	0.43
1:L:14(G):LEU:HD13	1:L:14(J):TYR:CD2	2.55	0.42
2:H:148:TRP:CE2	2:H:149(A):ALA:HB3	2.53	0.42
2:H:240:LYS:NZ	2:H:244:GLN:HE21	2.17	0.42
2:H:35:ARG:HD3	2:H:37:PRO:O	2.20	0.42
2:H:98:ASN:OD1	2:H:100:ASP:HB2	2.19	0.42
2:H:61:GLU:CG	2:H:87:LYS:HA	2.47	0.42
1:L:14(A):LYS:HZ2	2:H:26:MET:HE3	1.83	0.41
2:H:101:ARG:NE	6:H:474:HOH:O	2.34	0.41
2:H:148:TRP:CZ2	2:H:149(A):ALA:HB3	2.55	0.41
2:H:40:LEU:C	2:H:40:LEU:HD23	2.41	0.41
4:J:59:ILE:HB	4:J:60:PRO:CD	2.50	0.40
2:H:72:SER:CB	2:H:75:ARG:HB2	2.51	0.40
2:H:124:PRO:HD3	2:H:209:GLN:O	2.22	0.40
2:H:240:LYS:HZ3	2:H:244:GLN:HE21	1.69	0.40
4:J:61:GLU:HA	4:J:64:LEU:HB2	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	L	25/36 (69%)	23 (92%)	2 (8%)	0	100	100
2	H	256/259 (99%)	244 (95%)	12 (5%)	0	100	100
3	I	1/3 (33%)	1 (100%)	0	0	100	100
4	J	9/18 (50%)	8 (89%)	1 (11%)	0	100	100
All	All	291/316 (92%)	276 (95%)	15 (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	L	24/31 (77%)	23 (96%)	1 (4%)	30	38
2	H	220/225 (98%)	206 (94%)	14 (6%)	17	20
3	I	2/2 (100%)	2 (100%)	0	100	100
4	J	9/13 (69%)	9 (100%)	0	100	100
All	All	255/271 (94%)	240 (94%)	15 (6%)	19	23

All (15) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	L	6	LEU
2	H	60(E)	ASP

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Mol	Chain	Res	Type
2	H	64	LEU
2	H	66	VAL
2	H	75	ARG
2	H	86	GLU
2	H	127	GLU
2	H	129(C)	LEU
2	H	182	CYS
2	H	185	LYS
2	H	186(A)	ASP
2	H	204(B)	ASN
2	H	224	LYS
2	H	240	LYS
2	H	244	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
2	H	159	ASN
2	H	204(B)	ASN
2	H	239	GLN
2	H	244	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)

1 non-standard protein/DNA/RNA residue is modelled in this entry.

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.

5.5 Carbohydrates (i)

There are no monosaccharides in this entry.

5.6 Ligand geometry (i)

1 ligand is 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	$\#\|Z\| > 2$
5	NAG	J	301	2	14,14,15	1.16	2 (14%)	17,19,21	1.68	4 (23%)

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
5	NAG	J	301	2	-	1/6/23/26	0/1/1/1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	J	301	NAG	C3-C2	-2.52	1.47	1.52
5	J	301	NAG	C1-C2	-2.22	1.49	1.52

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
5	J	301	NAG	C1-C2-N2	4.47	118.13	110.49
5	J	301	NAG	O3-C3-C2	-2.74	103.79	109.47
5	J	301	NAG	C2-N2-C7	-2.73	119.02	122.90
5	J	301	NAG	O5-C1-C2	-2.29	107.68	111.29

There are no chirality outliers.

All (1) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	J	301	NAG	O5-C5-C6-O6

There are no ring outliers.

No monomer is involved in short contacts.

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 (i)

6.1 Protein, DNA and RNA chains (i)

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates (i)

EDS was not executed - this section is therefore empty.

6.4 Ligands (i)

EDS was not executed - this section is therefore empty.

6.5 Other polymers (i)

EDS was not executed - this section is therefore empty.