wwPDB X-ray Structure Validation Summary Report ⓘ

Nov 9, 2024 – 05:58 PM EST

PDB ID	:	1FC1
Title	:	CRYSTALLOGRAPHIC REFINEMENT AND ATOMIC MODELS OF A HUMAN FC FRAGMENT AND ITS COMPLEX WITH FRAGMENT B OF PROTEIN A FROM STAPHYLOCOCCUS AUREUS AT 2.9-AND 2.8-ANGSTROMS RESOLUTION
Authors	:	Deisenhofer, J.
Deposited on	:	1981-05-21
Resolution	:	2.90 Å(reported)

The following versions of software and data (see references ⓘ) were used in the production of this report:

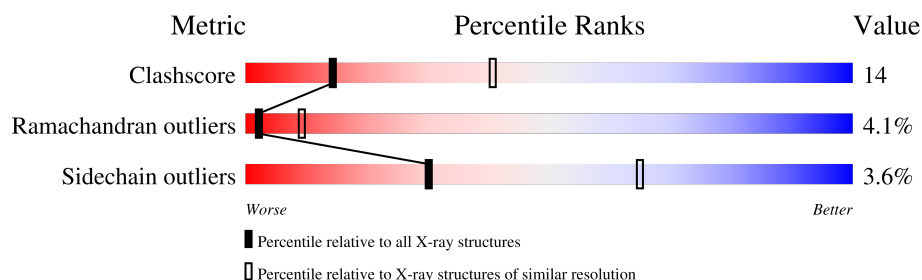|		
MolProbity	:	4.02b-467
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.39

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 2.90 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
Clashscore		14
Ramachandran outliers		4.1%
Sidechain outliers		3.6%

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))
Clashscore	180529	2564 (2.90-2.90)
Ramachandran outliers	177936	2514 (2.90-2.90)
Sidechain outliers	177891	2516 (2.90-2.90)

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	A	224	51% 37% • • 8%
1	B	224	59% 26% 7% 8%
2	C	9	67% 33%
2	D	9	78% 22%

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
2	MAN	C	3	X	-	-	-
2	FUC	C	9	X	-	-	-
2	MAN	D	3	X	-	-	-
2	FUC	D	9	X	-	-	-

2 Entry composition (i)

There are 2 unique types of molecules in this entry. The entry contains 3532 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 FC FRAGMENT.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	207	Total	C	N	O	S	60	0	1
			1656	1054	282	313	7			
1	B	207	Total	C	N	O	S	217	0	1
			1656	1054	282	313	7			

There are 14 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	272	GLN	GLU	conflict	UNP P01857
A	283	GLN	GLU	conflict	UNP P01857
A	294	GLN	GLU	conflict	UNP P01857
A	312	ASN	ASP	conflict	UNP P01857
A	315	ASP	ASN	conflict	UNP P01857
A	356	GLU	ASP	conflict	UNP P01857
A	358	MET	LEU	conflict	UNP P01857
B	272	GLN	GLU	conflict	UNP P01857
B	283	GLN	GLU	conflict	UNP P01857
B	294	GLN	GLU	conflict	UNP P01857
B	312	ASN	ASP	conflict	UNP P01857
B	315	ASP	ASN	conflict	UNP P01857
B	356	GLU	ASP	conflict	UNP P01857
B	358	MET	LEU	conflict	UNP P01857

- Molecule 2 is an oligosaccharide called beta-D-galactopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-2)-alpha-D-mannopyranose-(1-6)-[2-acetamido-2-deoxy-beta-D-glucopyranose-(1-2)-alpha-D-mannopyranose-(1-3)]alpha-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-[alpha-L-fucopyranose-(1-6)]2-acetamido-2-deoxy-beta-D-glucopyranose.
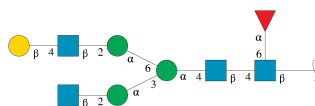
| Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	C	9	Total 110	C 62	N 4	O 44	18	0	0
2	D	9	Total 110	C 62	N 4	O 44	55	0	0

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: FC FRAGMENT

Chain A:
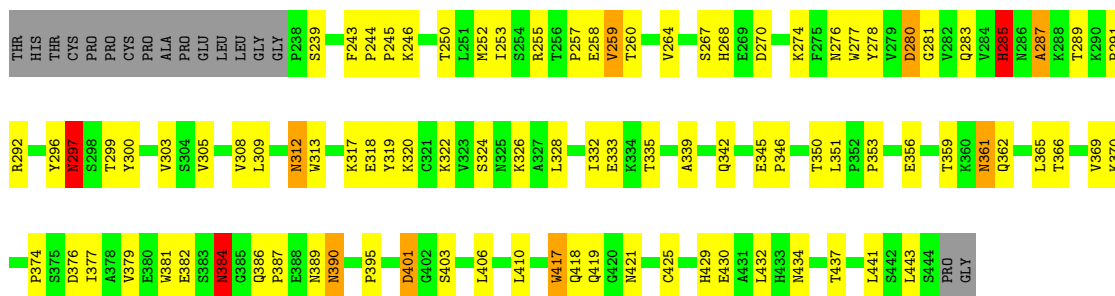
• Molecule 1: FC FRAGMENT

Chain B:
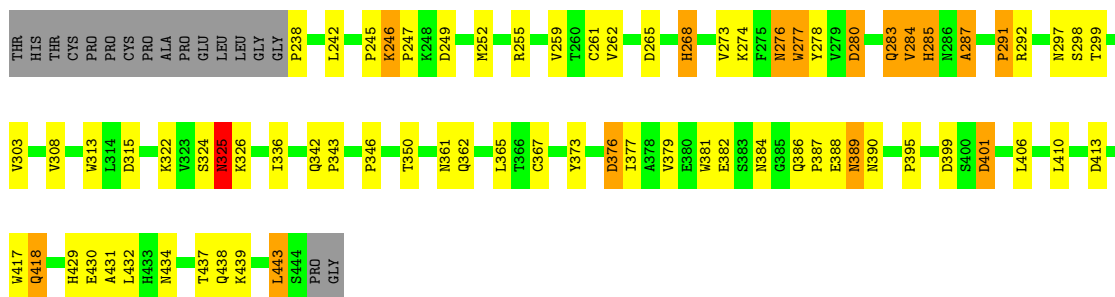
• Molecule 2: beta-D-galactopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-2)-alpha-D-mannopyranose-(1-6)-[2-acetamido-2-deoxy-beta-D-glucopyranose-(1-2)-alpha-D-mannopyranose-(1-3)]alpha-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-[alpha-L-fucopyranose-(1-6)]2-acetamido-2-deoxy-beta-D-glucopyranose

Chain C:

• Molecule 2: beta-D-galactopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-2)-alpha-D-mannopyranose-(1-6)-[2-acetamido-2-deoxy-beta-D-glucopyranose-(1-2)-alpha-D-mannopyr

anose-(1-3)]alpha-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-[alph
a-L-fucopyranose-(1-6)]2-acetamido-2-deoxy-beta-D-glucopyranose

Chain D:

78%   22%

NAG1 NAG2 MAN3 MAN4 NAG5 GAL6 MAN7 NAG8 FUC9

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 21	Depositor
Cell constants a, b, c, α, β, γ	80.40Å 146.40Å 50.40Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	(Not available) – 2.90	Depositor
% Data completeness (in resolution range)	(Not available) ((Not available)-2.90)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	unknown	Depositor
R, R_{free}	(Not available) , (Not available)	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	3532	wwPDB-VP
Average B, all atoms (Å²)	21.0	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, GAL, MAN, FUC

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	1.01	4/1702 (0.2%)	1.22	2/2318 (0.1%)
1	B	1.01	4/1702 (0.2%)	1.21	1/2318 (0.0%)
All	All	1.01	8/3404 (0.2%)	1.22	3/4636 (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	A	0	17
1	B	0	22
All	All	0	39

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

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	381	TRP	NE1-CE2	-7.99	1.27	1.37
1	A	277	TRP	NE1-CE2	-7.94	1.27	1.37
1	B	277	TRP	NE1-CE2	-7.76	1.27	1.37
1	B	313	TRP	NE1-CE2	-7.71	1.27	1.37
1	A	417	TRP	NE1-CE2	-7.63	1.27	1.37

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	401	ASP	CB-CA-C	-5.71	98.98	110.40
1	A	297	ASN	N-CA-CB	-5.52	100.66	110.60
1	A	285	HIS	CA-CB-CG	-5.42	104.39	113.60

There are no chirality outliers.

5 of 39 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	259	VAL	Mainchain
1	A	276	ASN	Sidechain
1	A	280	ASP	Mainchain
1	A	287	ALA	Mainchain
1	A	309	LEU	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	1656	0	1629	51	4
1	B	1656	0	1629	36	1
2	C	110	0	94	5	0
2	D	110	0	94	1	0
All	All	3532	0	3446	86	4

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.

The worst 5 of 86 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:274:LYS:HB3	1:B:324:SER:HB2	1.47	0.96
1:A:297:ASN:HB3	1:A:299:THR:HG22	1.61	0.81
1:A:328:LEU:HD21	1:A:332:ILE:HG13	1.64	0.77
1:A:250:THR:HG22	1:A:257:PRO:HB3	1.68	0.76
1:A:296:TYR:HD2	2:C:1:NAG:H62	1.52	0.75

All (4) 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:389:ASN:OD1	1:B:389:ASN:ND2[4_566]	1.69	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:268:HIS:CG	1:A:285:HIS:NE2[2_674]	1.81	0.39
1:A:268:HIS:ND1	1:A:285:HIS:NE2[2_674]	2.01	0.19
1:A:268:HIS:CB	1:A:285:HIS:NE2[2_674]	2.16	0.04

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	205/224 (92%)	179 (87%)	18 (9%)	8 (4%)	2	10
1	B	205/224 (92%)	179 (87%)	17 (8%)	9 (4%)	2	8
All	All	410/448 (92%)	358 (87%)	35 (8%)	17 (4%)	2	9

5 of 17 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	297	ASN
1	B	268	HIS
1	B	292	ARG
1	B	297	ASN
1	A	285	HIS

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	193/207 (93%)	186 (96%)	7 (4%)	30	65

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	B	193/207 (93%)	186 (96%)	7 (4%)	30	65
All	All	386/414 (93%)	372 (96%)	14 (4%)	30	65

5 of 14 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	284	VAL
1	B	299	THR
1	B	439	LYS
1	B	390	ASN
1	B	434	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 17 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	419	GLN
1	B	438	GLN
1	A	438	GLN
1	B	283	GLN
1	B	342	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 ⓘ

18 monosaccharides 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	NAG	C	1	2,1	14,14,15	0.72	0	17,19,21	1.77	3 (17%)
2	NAG	C	2	2	14,14,15	1.02	0	17,19,21	1.58	2 (11%)
2	MAN	C	3	2	11,11,12	0.50	0	15,15,17	1.44	2 (13%)
2	MAN	C	4	2	11,11,12	0.55	0	15,15,17	1.23	1 (6%)
2	NAG	C	5	2	14,14,15	0.96	0	17,19,21	1.68	1 (5%)
2	GAL	C	6	2	11,11,12	0.54	0	15,15,17	1.47	1 (6%)
2	MAN	C	7	2	11,11,12	0.75	0	15,15,17	1.48	1 (6%)
2	NAG	C	8	2	14,14,15	0.81	0	17,19,21	1.84	1 (5%)
2	FUC	C	9	2	10,10,11	0.77	0	14,14,16	1.14	1 (7%)
2	NAG	D	1	2,1	14,14,15	0.78	0	17,19,21	1.53	2 (11%)
2	NAG	D	2	2	14,14,15	0.95	1 (7%)	17,19,21	1.37	1 (5%)
2	MAN	D	3	2	11,11,12	0.58	0	15,15,17	1.77	2 (13%)
2	MAN	D	4	2	11,11,12	0.61	0	15,15,17	1.52	1 (6%)
2	NAG	D	5	2	14,14,15	0.84	0	17,19,21	1.70	1 (5%)
2	GAL	D	6	2	11,11,12	0.59	0	15,15,17	1.24	1 (6%)
2	MAN	D	7	2	11,11,12	0.81	1 (9%)	15,15,17	1.55	1 (6%)
2	NAG	D	8	2	14,14,15	0.97	1 (7%)	17,19,21	1.67	1 (5%)
2	FUC	D	9	2	10,10,11	0.73	0	14,14,16	1.11	1 (7%)

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	NAG	C	1	2,1	-	4/6/23/26	0/1/1/1
2	NAG	C	2	2	-	0/6/23/26	0/1/1/1
2	MAN	C	3	2	1/1/4/5	0/2/19/22	0/1/1/1
2	MAN	C	4	2	-	0/2/19/22	0/1/1/1
2	NAG	C	5	2	-	0/6/23/26	0/1/1/1
2	GAL	C	6	2	-	1/2/19/22	0/1/1/1
2	MAN	C	7	2	-	0/2/19/22	0/1/1/1
2	NAG	C	8	2	-	0/6/23/26	0/1/1/1
2	FUC	C	9	2	2/2/4/5	-	0/1/1/1
2	NAG	D	1	2,1	-	4/6/23/26	0/1/1/1
2	NAG	D	2	2	-	1/6/23/26	0/1/1/1
2	MAN	D	3	2	1/1/4/5	0/2/19/22	0/1/1/1
2	MAN	D	4	2	-	0/2/19/22	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	NAG	D	5	2	-	0/6/23/26	0/1/1/1
2	GAL	D	6	2	-	1/2/19/22	0/1/1/1
2	MAN	D	7	2	-	0/2/19/22	0/1/1/1
2	NAG	D	8	2	-	0/6/23/26	0/1/1/1
2	FUC	D	9	2	2/2/4/5	-	0/1/1/1

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	8	NAG	C1-C2	2.60	1.55	1.52
2	D	7	MAN	C2-C3	2.17	1.55	1.52
2	D	2	NAG	C1-C2	2.12	1.55	1.52

The worst 5 of 24 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	8	NAG	C1-O5-C5	7.21	121.84	112.19
2	D	8	NAG	C1-O5-C5	5.98	120.20	112.19
2	D	5	NAG	C1-O5-C5	5.76	119.91	112.19
2	D	3	MAN	C1-O5-C5	5.73	119.86	112.19
2	C	5	NAG	C1-O5-C5	5.48	119.54	112.19

5 of 6 chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
2	C	3	MAN	C1
2	C	9	FUC	C5
2	C	9	FUC	C1
2	D	3	MAN	C1
2	D	9	FUC	C5

5 of 11 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	C	1	NAG	C8-C7-N2-C2
2	C	1	NAG	O7-C7-N2-C2
2	D	1	NAG	C8-C7-N2-C2
2	D	1	NAG	O7-C7-N2-C2
2	D	1	NAG	O5-C5-C6-O6

There are no ring outliers.

3 monomers are involved in 6 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	D	6	GAL	1	0
2	C	6	GAL	3	0
2	C	1	NAG	2	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for oligosaccharide.

Oligosaccharide Chain C

Bond lengths

Bond angles

Torsions

Rings

Oligosaccharide Chain D

Bond lengths

Bond angles

Torsions

Rings
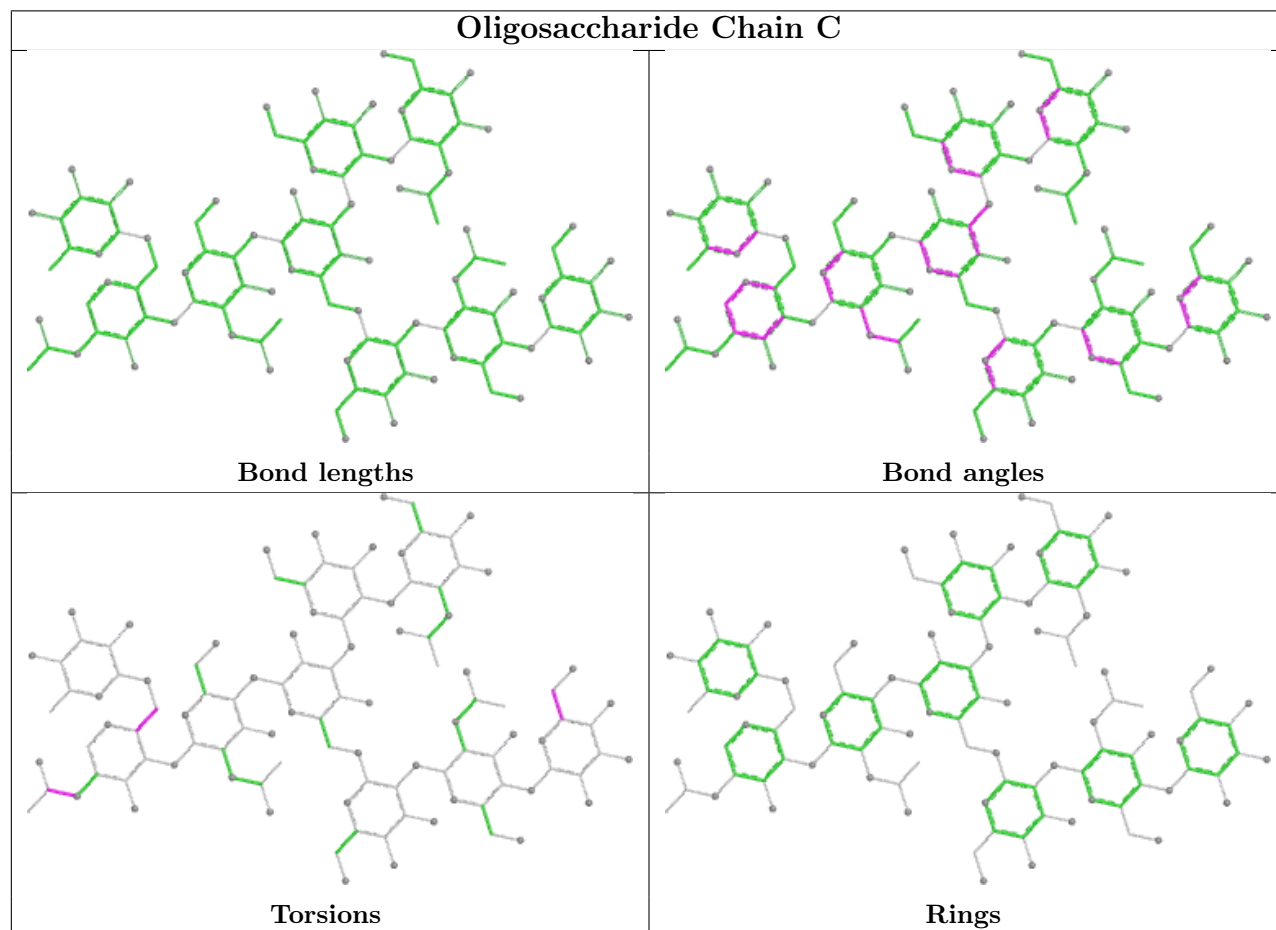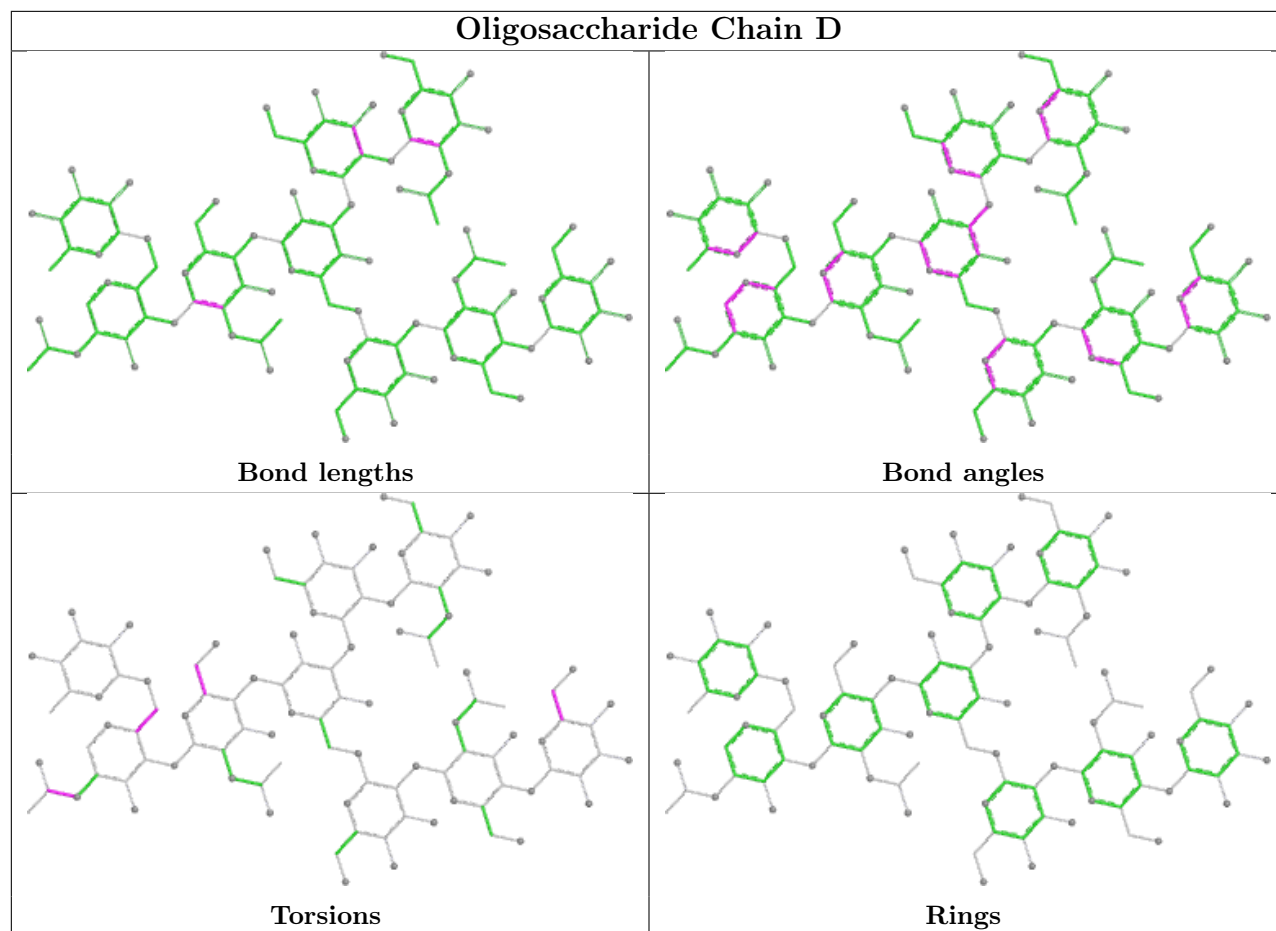
5.6   Ligand geometry ⓘ

There are no ligands in this entry.

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.