



# Full wwPDB X-ray Structure Validation Report ⓘ

Dec 9, 2023 – 05:46 pm GMT

PDB ID : 1H83  
Title : STRUCTURE OF POLYAMINE OXIDASE IN COMPLEX WITH 1,8-DIAMINO-OCTANE  
Authors : Binda, C.; Coda, A.; Angelini, R.; Federico, R.; Ascenzi, P.; Mattevi, A.  
Deposited on : 2001-01-24  
Resolution : 1.90 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](mailto: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>.

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

MolProbity : 4.02b-467  
Mogul : 1.8.4, CSD as541be (2020)  
Xtrriage (Phenix) : **NOT EXECUTED**  
EDS : **NOT EXECUTED**  
buster-report : 1.1.7 (2018)  
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) : 2.36

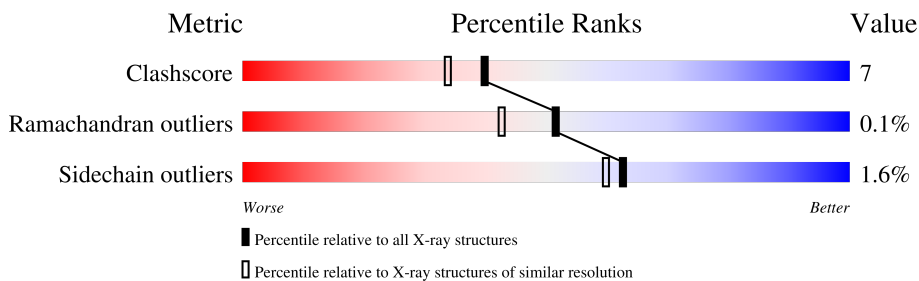
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.90 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	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
Clashscore	141614	6847 (1.90-1.90)
Ramachandran outliers	138981	6760 (1.90-1.90)
Sidechain outliers	138945	6760 (1.90-1.90)

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  $\geq 3$ , 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	472	
1	B	472	
1	C	472	
2	D	2	
2	E	2	
3	F	5	

## 2 Entry composition [i](#)

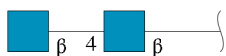
There are 6 unique types of molecules in this entry. The entry contains 12183 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 POLYAMINE OXIDASE.

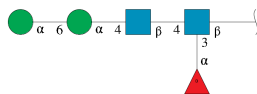
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	459	Total 3684	C 2353	N 621	O 696	S 14	65	0	0
1	B	462	Total 3715	C 2374	N 627	O 700	S 14	66	0	0
1	C	462	Total 3715	C 2374	N 627	O 700	S 14	58	0	0

- Molecule 2 is an oligosaccharide called 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.



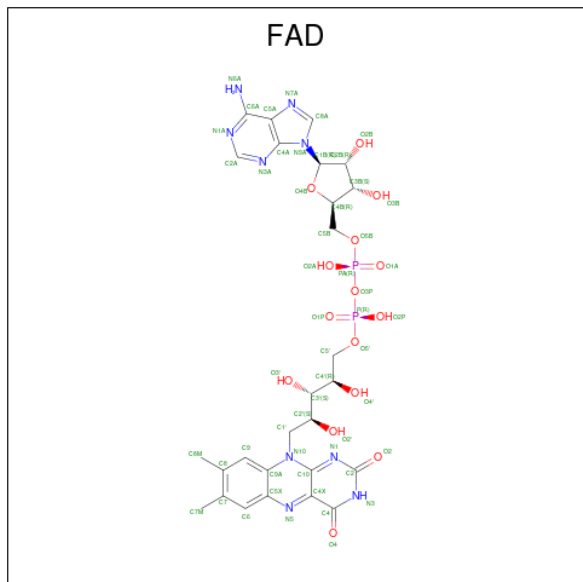
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
2	D	2	Total 28	C 16	N 2	O 10	0	0	0
2	E	2	Total 28	C 16	N 2	O 10	0	0	0

- Molecule 3 is an oligosaccharide called alpha-D-mannopyranose-(1-6)-alpha-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-[alpha-D-fucopyranose-(1-3)]2-acetamido-2-deoxy-beta-D-glucopyranose.



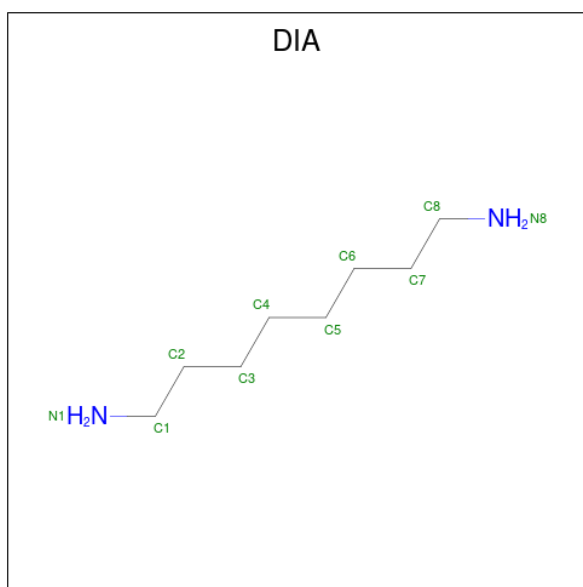
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
3	F	5	Total 60	C 34	N 2	O 24	0	0	0

- Molecule 4 is FLAVIN-ADENINE DINUCLEOTIDE (three-letter code: FAD) (formula:  $C_{27}H_{33}N_9O_{15}P_2$ ).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	
			Total	C	N	O	P			
4	A	1	Total	53	27	9	15	2	0	0
4	B	1	Total	53	27	9	15	2	0	0
4	C	1	Total	53	27	9	15	2	0	0

- Molecule 5 is OCTANE 1,8-DIAMINE (three-letter code: DIA) (formula:  $C_8H_{20}N_2$ ).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total	C	N	0	1
			20	16	4		
5	B	1	Total	C	N	0	1
			20	16	4		
5	C	1	Total	C	N	0	1
			20	16	4		

- Molecule 6 is water.

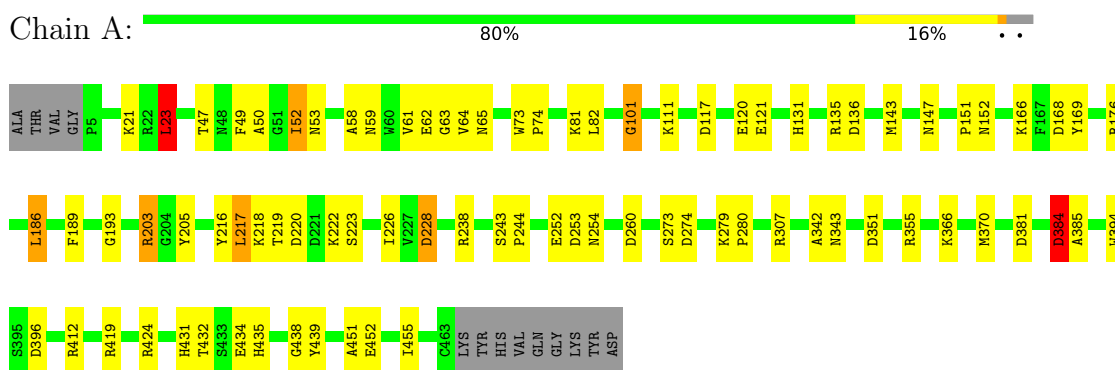
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	223	Total	O	0	0
			223	223		
6	B	242	Total	O	0	0
			242	242		
6	C	269	Total	O	0	0
			269	269		

### 3 Residue-property plots

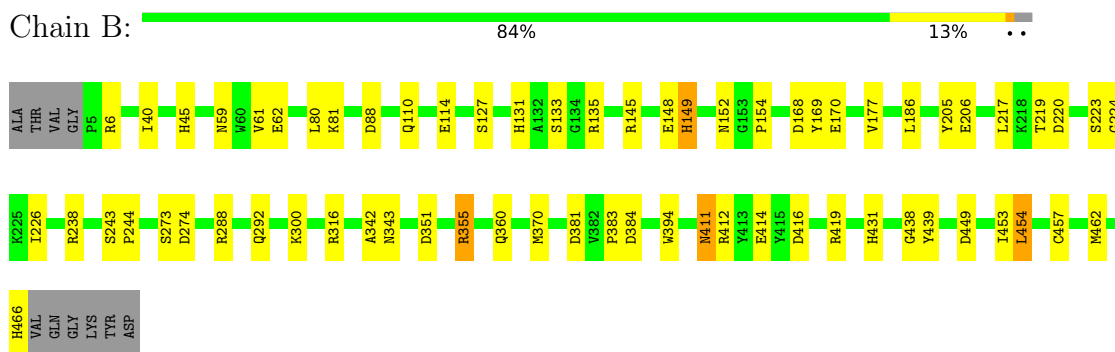
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded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

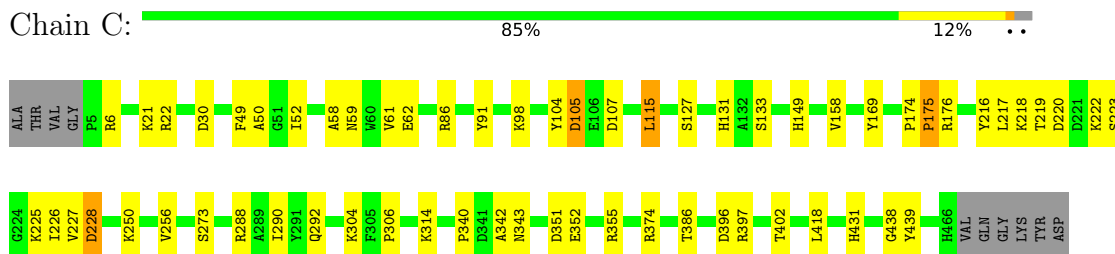
- Molecule 1: POLYAMINE OXIDASE



- Molecule 1: POLYAMINE OXIDASE



- Molecule 1: POLYAMINE OXIDASE



- Molecule 2: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain D:  100%

MAG1  
MAG2

- Molecule 2: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain E:  100%

MAG1  
MAG2

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

Chain F:  40% 60%

MAG1  
MAG2  
MAN3  
MAN4  
FCA5

## 4 Data and refinement statistics

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

Property	Value	Source
Space group	P 65 2 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	184.69Å 184.69Å 282.22Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	20.00 – 1.90	Depositor
% Data completeness (in resolution range)	97.9 (20.00-1.90)	Depositor
$R_{merge}$	0.08	Depositor
$R_{sym}$	(Not available)	Depositor
Refinement program	TNT 5D	Depositor
R, $R_{free}$	0.196 , 0.237	Depositor
Estimated twinning fraction	No twinning to report.	Xtrriage
Total number of atoms	12183	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	15.0	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: FCA, DIA, FAD, MAN, NAG

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	0.55	0/3775	1.21	15/5116 (0.3%)
1	B	0.55	0/3808	1.21	15/5160 (0.3%)
1	C	0.56	0/3808	1.22	17/5160 (0.3%)
All	All	0.56	0/11391	1.21	47/15436 (0.3%)

There are no bond length outliers.

All (47) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	355	ARG	NE-CZ-NH2	-10.02	115.29	120.30
1	A	355	ARG	NE-CZ-NH2	-8.79	115.91	120.30
1	C	176	ARG	NE-CZ-NH2	-8.47	116.06	120.30
1	A	424	ARG	NE-CZ-NH1	8.23	124.42	120.30
1	C	176	ARG	NE-CZ-NH1	8.12	124.36	120.30
1	A	101	GLY	N-CA-C	7.62	132.15	113.10
1	C	340	PRO	C-N-CA	-7.43	103.11	121.70
1	B	88	ASP	CB-CG-OD1	7.16	124.74	118.30
1	C	115	LEU	CB-CG-CD2	-6.76	99.50	111.00
1	C	86	ARG	NE-CZ-NH1	6.72	123.66	120.30
1	A	228	ASP	CB-CG-OD2	-6.51	112.44	118.30
1	B	135	ARG	NE-CZ-NH1	-6.45	117.08	120.30
1	B	186	LEU	CB-CG-CD2	-6.44	100.06	111.00
1	B	170	GLU	OE1-CD-OE2	-6.40	115.62	123.30
1	B	412	ARG	NE-CZ-NH1	-6.33	117.13	120.30
1	C	355	ARG	NE-CZ-NH1	-6.29	117.15	120.30
1	A	384	ASP	CB-CG-OD1	-6.29	112.64	118.30
1	A	260	ASP	CB-CG-OD2	6.28	123.95	118.30
1	A	61	VAL	N-CA-C	-6.24	94.15	111.00
1	B	316	ARG	NE-CZ-NH1	6.14	123.37	120.30
1	C	22	ARG	NE-CZ-NH2	-6.05	117.28	120.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	384	ASP	CB-CA-C	-5.93	98.55	110.40
1	A	396	ASP	CB-CG-OD1	5.85	123.56	118.30
1	B	351	ASP	N-CA-CB	-5.83	100.10	110.60
1	C	105	ASP	CB-CG-OD1	5.76	123.48	118.30
1	B	238	ARG	NE-CZ-NH1	5.71	123.16	120.30
1	B	217	LEU	CB-CG-CD2	-5.71	101.30	111.00
1	C	374	ARG	NE-CZ-NH2	-5.69	117.45	120.30
1	B	454	LEU	CA-CB-CG	5.62	128.22	115.30
1	A	351	ASP	N-CA-CB	-5.61	100.50	110.60
1	C	273	SER	C-N-CA	-5.58	107.74	121.70
1	C	115	LEU	CB-CG-CD1	-5.57	101.52	111.00
1	B	149	HIS	CB-CA-C	-5.53	99.33	110.40
1	C	288	ARG	NE-CZ-NH1	-5.51	117.54	120.30
1	B	300	LYS	CD-CE-NZ	-5.50	99.04	111.70
1	C	396	ASP	CB-CG-OD2	-5.43	113.41	118.30
1	A	203	ARG	NE-CZ-NH1	-5.42	117.59	120.30
1	A	186	LEU	CB-CG-CD2	-5.36	101.89	111.00
1	C	61	VAL	N-CA-C	-5.25	96.81	111.00
1	A	381	ASP	N-CA-C	-5.20	96.95	111.00
1	C	228	ASP	CB-CG-OD1	-5.20	113.62	118.30
1	C	22	ARG	NE-CZ-NH1	5.18	122.89	120.30
1	B	6	ARG	NE-CZ-NH2	5.18	122.89	120.30
1	C	397	ARG	NE-CZ-NH1	5.17	122.89	120.30
1	A	23	LEU	CB-CG-CD1	5.15	119.76	111.00
1	B	61	VAL	N-CA-C	-5.03	97.41	111.00
1	A	419	ARG	NE-CZ-NH2	-5.01	117.79	120.30

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	3684	0	3585	56	0
1	B	3715	0	3614	47	0
1	C	3715	0	3614	41	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	D	28	0	26	5	0
2	E	28	0	26	4	0
3	F	60	0	53	6	0
4	A	53	0	31	2	0
4	B	53	0	31	1	0
4	C	53	0	31	4	0
5	A	20	0	40	5	0
5	B	20	0	40	4	0
5	C	20	0	40	5	0
6	A	223	0	0	7	1
6	B	242	0	0	4	0
6	C	269	0	0	3	2
All	All	12183	0	11131	158	2

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 7.

All (158) 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)
5:C:590[A]:DIA:HC82	6:C:2227:HOH:O	1.55	1.06
1:A:273:SER:O	1:A:274:ASP:HB2	1.72	0.88
3:F:1:NAG:C4	3:F:2:NAG:C1	2.54	0.86
2:E:1:NAG:C4	2:E:2:NAG:C1	2.55	0.84
1:C:91:TYR:OH	1:C:314:LYS:HE2	1.80	0.81
1:B:131:HIS:CD2	1:B:133:SER:H	1.98	0.81
1:C:131:HIS:CD2	1:C:133:SER:H	1.98	0.80
1:B:131:HIS:HD2	1:B:133:SER:H	1.31	0.77
3:F:1:NAG:H3	3:F:5:FCA:O2	1.85	0.76
5:B:590[A]:DIA:HC82	6:B:2212:HOH:O	1.86	0.76
2:D:1:NAG:C4	2:D:2:NAG:C1	2.64	0.76
1:B:411:ASN:ND2	1:B:414:GLU:H	1.86	0.74
1:A:216:TYR:CD1	1:A:217:LEU:HD13	2.23	0.74
1:B:62:GLU:OE2	5:B:590[A]:DIA:HC22	1.86	0.74
1:A:394:TRP:HE1	1:B:152:ASN:ND2	1.86	0.73
1:A:431:HIS:CD2	1:A:431:HIS:H	2.07	0.72
1:C:292:GLN:OE1	6:C:2144:HOH:O	2.08	0.71
1:A:151:PRO:HB2	6:A:2067:HOH:O	1.91	0.70
5:A:590[A]:DIA:HC82	6:A:2196:HOH:O	1.91	0.70
1:A:216:TYR:CE1	1:A:217:LEU:HD13	2.29	0.68
1:C:62:GLU:OE2	5:C:590[A]:DIA:HC22	1.94	0.68

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:307:ARG:HG2	1:A:307:ARG:HH11	1.58	0.66
3:F:1:NAG:O4	3:F:2:NAG:C2	2.43	0.66
1:A:136:ASP:OD1	6:A:2061:HOH:O	2.13	0.66
1:C:131:HIS:HD2	1:C:133:SER:OG	1.80	0.65
1:A:307:ARG:HG2	1:A:307:ARG:NH1	2.11	0.64
2:D:1:NAG:HO4	2:D:2:NAG:C1	2.10	0.64
1:B:411:ASN:HD22	1:B:414:GLU:H	1.48	0.62
1:A:273:SER:O	1:A:274:ASP:CB	2.38	0.61
1:C:219:THR:HG22	1:C:226:ILE:HA	1.83	0.61
1:A:220:ASP:HB3	1:A:223:SER:OG	2.01	0.60
1:A:394:TRP:HE1	1:B:152:ASN:HD22	1.49	0.60
1:C:431:HIS:H	1:C:431:HIS:CD2	2.18	0.60
1:C:131:HIS:HD2	1:C:133:SER:H	1.47	0.59
1:B:439:TYR:CZ	5:B:590[A]:DIA:HC61	2.39	0.58
1:A:152:ASN:ND2	1:B:394:TRP:HE1	2.02	0.58
2:E:1:NAG:O4	2:E:2:NAG:C2	2.51	0.58
1:C:158:VAL:HG12	6:C:2077:HOH:O	2.04	0.58
1:B:220:ASP:HB3	1:B:223:SER:OG	2.04	0.57
1:A:23:LEU:HD13	1:A:451:ALA:HB1	1.87	0.57
1:A:366:LYS:HD2	1:A:385:ALA:HB3	1.87	0.57
1:A:117:ASP:O	1:A:121:GLU:HG3	2.05	0.57
1:A:73:TRP:HB3	1:A:74:PRO:HD3	1.87	0.56
1:A:218:LYS:H	1:A:228:ASP:HB2	1.71	0.56
1:B:431:HIS:H	1:B:431:HIS:CD2	2.23	0.56
1:C:220:ASP:HB3	1:C:223:SER:OG	2.06	0.56
1:C:220:ASP:OD2	1:C:222:LYS:N	2.39	0.55
1:B:81:LYS:NZ	1:B:81:LYS:HB3	2.22	0.55
1:A:111:LYS:HG2	6:A:2048:HOH:O	2.08	0.54
1:C:342:ALA:O	1:C:343:ASN:HB2	2.08	0.54
1:C:439:TYR:CZ	5:C:590[A]:DIA:HC61	2.43	0.53
1:B:169:TYR:O	5:B:590[B]:DIA:HC51	2.09	0.53
1:B:219:THR:HG22	1:B:226:ILE:HA	1.89	0.53
1:C:131:HIS:HD2	1:C:133:SER:CB	2.21	0.53
1:B:131:HIS:HD2	1:B:133:SER:OG	1.92	0.53
1:C:21:LYS:HB2	1:C:216:TYR:CE2	2.44	0.53
1:A:131:HIS:CE1	1:A:135:ARG:NH2	2.77	0.53
1:A:238:ARG:NH1	1:A:252:GLU:OE2	2.40	0.52
1:A:152:ASN:HD22	1:B:394:TRP:HE1	1.56	0.52
1:B:449:ASP:O	1:B:453:ILE:HG13	2.10	0.52
1:A:439:TYR:CZ	5:A:590[A]:DIA:HC61	2.44	0.52
1:A:63:GLY:HA2	1:A:193:GLY:O	2.10	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:169:TYR:O	5:C:590[B]:DIA:HC51	2.09	0.51
1:C:218:LYS:H	1:C:228:ASP:HB2	1.76	0.51
1:B:131:HIS:CD2	1:B:133:SER:OG	2.64	0.51
1:A:220:ASP:OD1	1:A:222:LYS:N	2.40	0.50
1:B:419:ARG:HD3	6:B:2217:HOH:O	2.11	0.50
1:C:131:HIS:CD2	1:C:133:SER:OG	2.61	0.50
1:A:58:ALA:HA	4:A:579:FAD:C4X	2.41	0.50
1:A:81:LYS:O	1:A:203:ARG:NH2	2.45	0.50
1:A:253:ASP:O	1:A:254:ASN:HB2	2.12	0.50
1:A:434:GLU:HG2	1:A:435:HIS:CD2	2.47	0.49
1:A:62:GLU:OE2	5:A:590[A]:DIA:HC22	2.12	0.49
1:A:120:GLU:OE1	1:A:166:LYS:NZ	2.41	0.49
1:B:148:GLU:O	1:B:149:HIS:HB2	2.12	0.49
2:E:1:NAG:H4	2:E:2:NAG:C1	2.40	0.49
1:B:131:HIS:HD2	1:B:133:SER:CB	2.26	0.48
1:B:220:ASP:O	1:B:224:GLY:N	2.45	0.48
1:B:438:GLY:O	4:B:579:FAD:H1'2	2.14	0.48
1:A:131:HIS:ND1	1:A:136:ASP:OD2	2.36	0.48
1:B:243:SER:HB2	1:B:244:PRO:CD	2.44	0.48
1:A:21:LYS:HB2	1:A:216:TYR:CE2	2.49	0.48
1:B:360:GLN:NE2	6:B:2188:HOH:O	2.46	0.48
1:B:110:GLN:O	1:B:114:GLU:HG2	2.13	0.47
1:C:306:PRO:HD3	1:C:386:THR:HG23	1.96	0.47
1:B:80:LEU:O	1:B:81:LYS:HB2	2.14	0.47
1:A:412:ARG:HH12	1:A:434:GLU:HG3	1.78	0.47
1:A:342:ALA:O	1:A:343:ASN:HB2	2.15	0.47
1:C:218:LYS:O	1:C:227:VAL:N	2.42	0.47
1:A:431:HIS:CD2	6:A:2206:HOH:O	2.67	0.47
1:B:81:LYS:NZ	1:B:81:LYS:CB	2.77	0.47
1:A:47:THR:O	1:A:53:ASN:HA	2.16	0.46
2:D:1:NAG:O6	2:D:2:NAG:C1	2.63	0.46
1:A:169:TYR:O	5:A:590[B]:DIA:HC51	2.15	0.46
1:B:131:HIS:HD2	1:B:133:SER:N	2.07	0.45
1:B:273:SER:O	1:B:274:ASP:HB2	2.16	0.45
3:F:2:NAG:H62	3:F:5:FCA:H5	1.98	0.45
1:C:402:THR:HB	4:C:579:FAD:HM83	1.99	0.45
1:C:131:HIS:CD2	1:C:133:SER:CB	2.99	0.45
1:B:220:ASP:OD2	1:B:223:SER:OG	2.33	0.45
1:C:58:ALA:HA	4:C:579:FAD:C4X	2.47	0.45
1:C:105:ASP:OD1	1:C:107:ASP:HB2	2.17	0.45
1:A:49:PHE:O	1:A:50:ALA:HB3	2.17	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:402:THR:CB	4:C:579:FAD:HM83	2.47	0.44
1:C:6:ARG:HA	1:C:30:ASP:O	2.17	0.44
1:C:6:ARG:HH11	1:C:6:ARG:HG3	1.82	0.44
1:C:219:THR:HA	1:C:225:LYS:O	2.16	0.44
1:C:220:ASP:OD2	1:C:222:LYS:HB3	2.17	0.44
2:D:1:NAG:H4	2:D:2:NAG:C1	2.47	0.44
1:B:81:LYS:HB3	1:B:81:LYS:HZ3	1.82	0.44
1:B:355:ARG:NE	6:B:2183:HOH:O	2.41	0.44
5:A:590[A]:DIA:C8	6:A:2196:HOH:O	2.59	0.44
1:C:62:GLU:OE2	5:C:590[B]:DIA:HC72	2.16	0.44
1:C:438:GLY:O	4:C:579:FAD:HI'2	2.17	0.44
1:A:279:LYS:HA	1:A:280:PRO:HA	1.84	0.44
1:C:49:PHE:O	1:C:52:ILE:HG12	2.18	0.44
1:A:143:MET:SD	1:A:147:ASN:ND2	2.92	0.43
1:C:91:TYR:CZ	1:C:314:LYS:HE2	2.54	0.43
1:A:186:LEU:HD23	1:A:189:PHE:CE1	2.53	0.43
1:A:452:GLU:HA	1:A:455:ILE:HD12	1.99	0.43
1:B:40:ILE:HG21	1:B:40:ILE:HD13	1.74	0.43
1:B:220:ASP:O	1:B:224:GLY:HA2	2.19	0.43
1:A:176:ARG:HD2	1:B:177:VAL:HG21	1.99	0.43
1:A:243:SER:HB2	1:A:244:PRO:CD	2.48	0.43
1:C:290:ILE:HA	1:C:418:LEU:HD21	2.01	0.43
1:A:52:ILE:HD13	1:A:52:ILE:HG21	1.73	0.42
1:A:73:TRP:N	1:A:74:PRO:CD	2.82	0.42
1:C:218:LYS:N	1:C:228:ASP:HB2	2.34	0.42
1:A:219:THR:HG22	1:A:226:ILE:HA	2.00	0.42
1:B:370:MET:HG3	1:B:384:ASP:OD2	2.19	0.42
1:A:432:THR:HA	6:A:2207:HOH:O	2.18	0.42
1:B:45:HIS:HA	1:B:206:GLU:OE2	2.19	0.42
1:A:64:VAL:HG12	1:A:65:ASN:N	2.34	0.42
1:A:217:LEU:HA	1:A:217:LEU:HD12	1.75	0.42
3:F:1:NAG:O6	3:F:2:NAG:C1	2.67	0.42
1:A:82:LEU:HA	1:A:82:LEU:HD23	1.75	0.42
1:B:381:ASP:O	1:B:383:PRO:HD3	2.19	0.42
1:A:370:MET:CE	1:A:384:ASP:HA	2.49	0.42
1:C:217:LEU:HD23	1:C:217:LEU:HA	1.80	0.42
3:F:1:NAG:C3	3:F:5:FCA:O2	2.64	0.42
1:B:131:HIS:CD2	1:B:133:SER:CB	3.03	0.42
1:B:243:SER:HB2	1:B:244:PRO:HD2	2.02	0.42
1:C:98:LYS:HG2	1:C:104:TYR:CE1	2.54	0.42
1:C:250:LYS:HG2	1:C:256:VAL:HG22	2.00	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:E:1:NAG:O6	2:E:2:NAG:C1	2.68	0.41
1:A:82:LEU:HD23	1:A:203:ARG:CZ	2.50	0.41
1:B:342:ALA:O	1:B:343:ASN:HB2	2.20	0.41
1:C:50:ALA:HB1	1:C:304:LYS:HD3	2.03	0.41
1:B:411:ASN:HD22	1:B:411:ASN:C	2.23	0.41
1:B:416:ASP:OD2	1:B:466:HIS:HD2	2.03	0.41
1:A:438:GLY:O	4:A:579:FAD:H1'2	2.20	0.41
1:B:145:ARG:O	1:B:149:HIS:N	2.52	0.41
1:A:218:LYS:N	1:A:228:ASP:HB2	2.34	0.41
1:C:351:ASP:CG	1:C:352:GLU:H	2.23	0.41
2:D:1:NAG:O4	2:D:2:NAG:C2	2.60	0.41
1:B:288:ARG:O	1:B:292:GLN:HG3	2.21	0.40
1:C:174:PRO:HA	1:C:175:PRO:HD3	1.91	0.40
1:B:457:CYS:HA	1:B:462:MET:O	2.21	0.40

All (2) 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)
6:C:2094:HOH:O	6:C:2094:HOH:O[10_665]	0.73	1.47
6:A:2131:HOH:O	6:C:2058:HOH:O[6_654]	1.30	0.90

## 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	457/472 (97%)	438 (96%)	18 (4%)	1 (0%)	47 38
1	B	460/472 (98%)	444 (96%)	16 (4%)	0	100 100
1	C	460/472 (98%)	442 (96%)	18 (4%)	0	100 100
All	All	1377/1416 (97%)	1324 (96%)	52 (4%)	1 (0%)	51 42

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	101	GLY

### 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	A	394/404 (98%)	387 (98%)	7 (2%)	59	55
1	B	397/404 (98%)	390 (98%)	7 (2%)	59	55
1	C	397/404 (98%)	392 (99%)	5 (1%)	69	68
All	All	1188/1212 (98%)	1169 (98%)	19 (2%)	62	60

All (19) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	23	LEU
1	A	52	ILE
1	A	59	ASN
1	A	168	ASP
1	A	205	TYR
1	A	217	LEU
1	A	384	ASP
1	B	59	ASN
1	B	127	SER
1	B	154	PRO
1	B	168	ASP
1	B	205	TYR
1	B	411	ASN
1	B	454	LEU
1	C	59	ASN
1	C	115	LEU
1	C	127	SER
1	C	149	HIS
1	C	175	PRO



Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (19) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	149	HIS
1	A	150	GLN
1	A	152	ASN
1	A	360	GLN
1	A	431	HIS
1	B	131	HIS
1	B	149	HIS
1	B	150	GLN
1	B	152	ASN
1	B	360	GLN
1	B	371	GLN
1	B	411	ASN
1	B	431	HIS
1	B	435	HIS
1	B	466	HIS
1	C	131	HIS
1	C	152	ASN
1	C	360	GLN
1	C	431	HIS

### 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](#)

9 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	D	1	1,2	14,14,15	0.94	1 (7%)	17,19,21	1.44	4 (23%)
2	NAG	D	2	2	14,14,15	0.88	1 (7%)	17,19,21	1.77	4 (23%)
2	NAG	E	1	1,2	14,14,15	1.21	2 (14%)	17,19,21	1.58	3 (17%)
2	NAG	E	2	2	14,14,15	0.95	1 (7%)	17,19,21	1.33	2 (11%)
3	NAG	F	1	3,1	14,14,15	1.06	2 (14%)	17,19,21	2.20	7 (41%)
3	NAG	F	2	3	14,14,15	0.96	1 (7%)	17,19,21	1.53	4 (23%)
3	MAN	F	3	3	11,11,12	0.72	0	15,15,17	3.03	5 (33%)
3	MAN	F	4	3	11,11,12	0.55	0	15,15,17	1.59	3 (20%)
3	FCA	F	5	3	10,10,11	1.21	1 (10%)	14,14,16	2.12	6 (42%)

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	D	1	1,2	-	2/6/23/26	0/1/1/1
2	NAG	D	2	2	-	2/6/23/26	0/1/1/1
2	NAG	E	1	1,2	-	2/6/23/26	0/1/1/1
2	NAG	E	2	2	-	2/6/23/26	0/1/1/1
3	NAG	F	1	3,1	-	2/6/23/26	0/1/1/1
3	NAG	F	2	3	-	2/6/23/26	0/1/1/1
3	MAN	F	3	3	-	0/2/19/22	0/1/1/1
3	MAN	F	4	3	-	2/2/19/22	0/1/1/1
3	FCA	F	5	3	-	-	0/1/1/1

All (9) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	F	2	NAG	O5-C1	-2.93	1.39	1.43
2	E	1	NAG	C1-C2	-2.86	1.48	1.52
3	F	5	FCA	C2-C3	-2.69	1.48	1.52
2	E	1	NAG	O5-C1	-2.57	1.39	1.43
2	E	2	NAG	O5-C1	-2.48	1.39	1.43
2	D	2	NAG	O5-C1	-2.37	1.39	1.43
3	F	1	NAG	O5-C1	-2.28	1.40	1.43
3	F	1	NAG	C1-C2	-2.09	1.49	1.52
2	D	1	NAG	O5-C1	-2.06	1.40	1.43

All (38) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	F	3	MAN	O2-C2-C3	10.34	130.85	110.14
2	D	2	NAG	C2-N2-C7	-5.10	115.64	122.90
3	F	1	NAG	C1-C2-N2	-4.66	102.53	110.49
3	F	5	FCA	O5-C1-C2	-4.40	103.98	110.77
3	F	4	MAN	C1-C2-C3	-4.32	104.35	109.67
3	F	1	NAG	O5-C5-C6	-3.70	101.40	107.20
3	F	1	NAG	C8-C7-N2	-3.60	110.01	116.10
3	F	2	NAG	O5-C1-C2	-3.55	105.69	111.29
2	E	2	NAG	C2-N2-C7	-3.46	117.97	122.90
2	E	1	NAG	C1-C2-N2	-3.36	104.75	110.49
2	E	1	NAG	C2-N2-C7	-3.27	118.25	122.90
3	F	1	NAG	O7-C7-C8	3.05	127.72	122.06
3	F	1	NAG	O3-C3-C4	2.95	117.17	110.35
3	F	5	FCA	C3-C4-C5	-2.94	105.20	109.77
2	D	1	NAG	O5-C5-C6	-2.79	102.84	107.20
3	F	3	MAN	C1-O5-C5	2.74	115.91	112.19
3	F	4	MAN	O2-C2-C3	2.69	115.52	110.14
3	F	5	FCA	O3-C3-C4	-2.62	104.30	110.35
2	D	1	NAG	C1-C2-N2	-2.61	106.03	110.49
3	F	2	NAG	O5-C5-C4	-2.60	104.50	110.83
3	F	3	MAN	O2-C2-C1	2.59	114.44	109.15
2	D	2	NAG	C1-C2-N2	-2.58	106.08	110.49
2	D	1	NAG	C1-O5-C5	2.50	115.58	112.19
3	F	3	MAN	O4-C4-C3	2.41	115.92	110.35
2	D	1	NAG	O3-C3-C4	2.41	115.91	110.35
3	F	1	NAG	O5-C5-C4	-2.35	105.11	110.83
3	F	2	NAG	C2-N2-C7	-2.33	119.58	122.90
3	F	3	MAN	O5-C5-C6	2.27	110.76	107.20
2	E	1	NAG	C1-O5-C5	2.24	115.23	112.19
3	F	4	MAN	C2-C3-C4	-2.22	107.05	110.89
3	F	5	FCA	O2-C2-C1	-2.18	104.69	109.15
3	F	1	NAG	O4-C4-C3	-2.18	105.30	110.35
3	F	5	FCA	C1-C2-C3	2.15	112.31	109.67
3	F	5	FCA	C2-C3-C4	-2.11	107.24	110.89
3	F	2	NAG	C3-C4-C5	2.07	113.92	110.24
2	D	2	NAG	C8-C7-N2	-2.03	112.67	116.10
2	E	2	NAG	C1-O5-C5	2.01	114.91	112.19
2	D	2	NAG	C6-C5-C4	2.00	117.69	113.00

There are no chirality outliers.

All (14) torsion outliers are listed below:

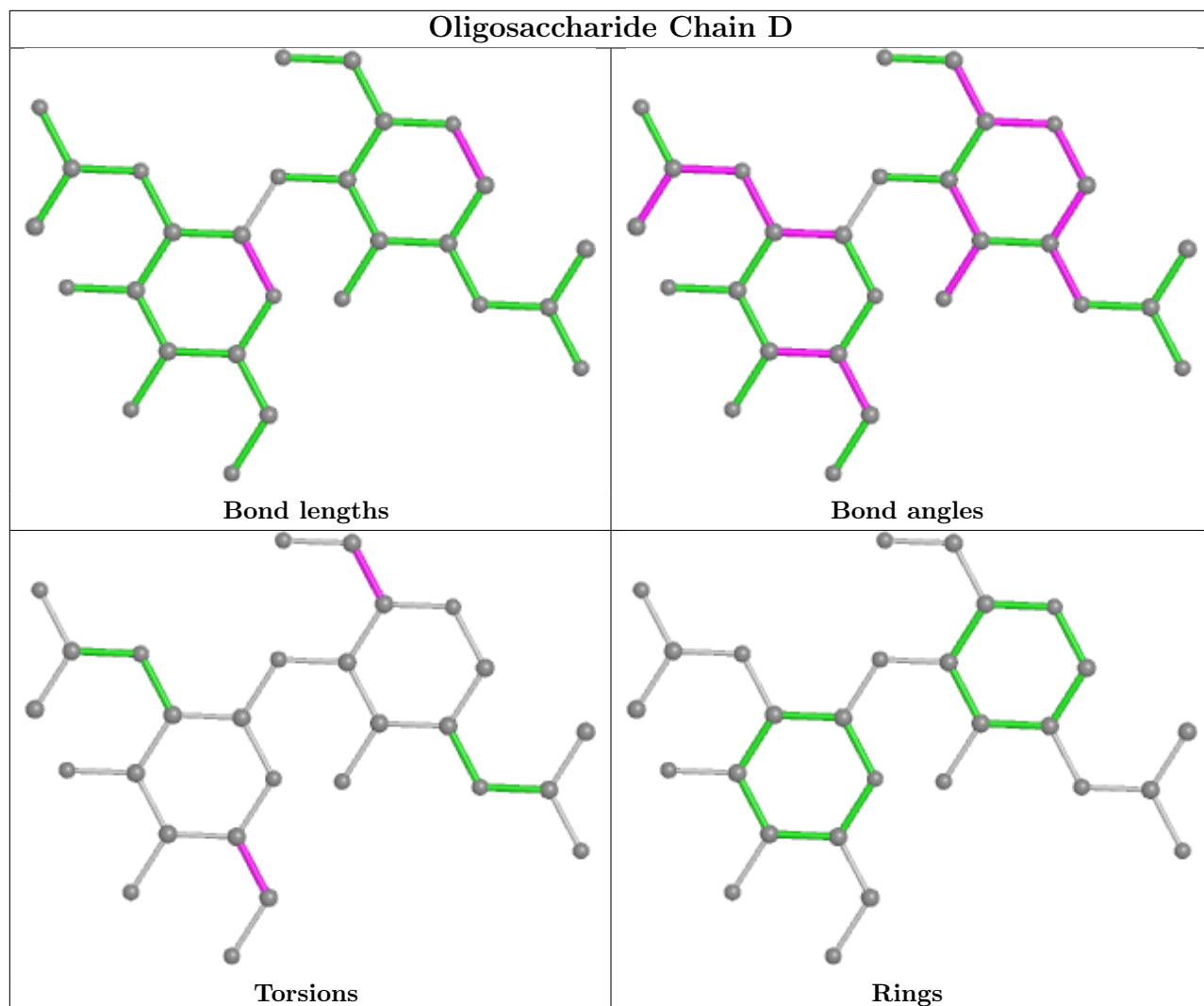
Mol	Chain	Res	Type	Atoms
2	E	2	NAG	C4-C5-C6-O6
2	D	1	NAG	C4-C5-C6-O6
2	D	2	NAG	C4-C5-C6-O6
2	E	1	NAG	C4-C5-C6-O6
3	F	2	NAG	C4-C5-C6-O6
3	F	1	NAG	C4-C5-C6-O6
3	F	4	MAN	O5-C5-C6-O6
2	D	1	NAG	O5-C5-C6-O6
2	E	1	NAG	O5-C5-C6-O6
2	E	2	NAG	O5-C5-C6-O6
3	F	2	NAG	O5-C5-C6-O6
2	D	2	NAG	O5-C5-C6-O6
3	F	4	MAN	C4-C5-C6-O6
3	F	1	NAG	O5-C5-C6-O6

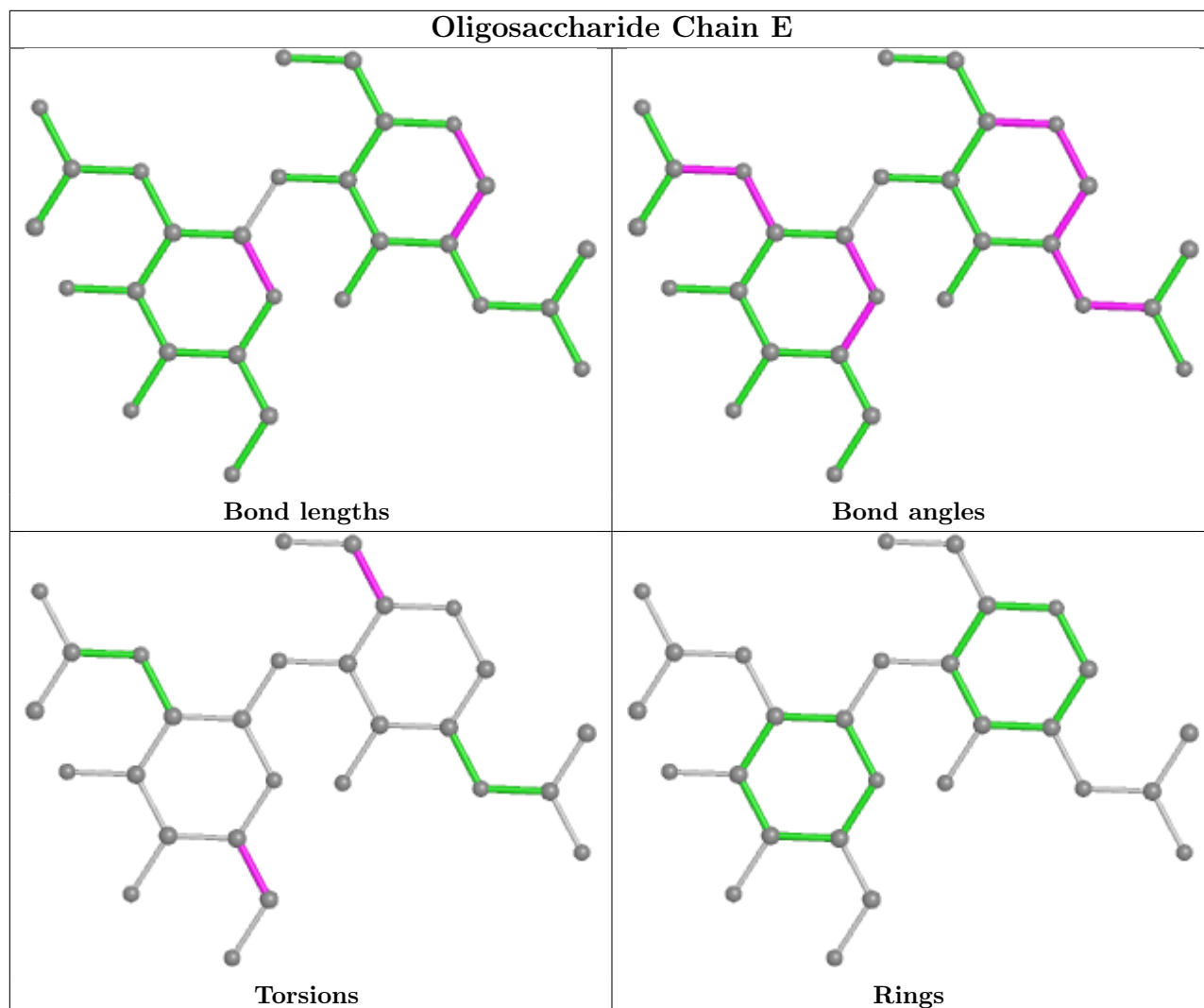
There are no ring outliers.

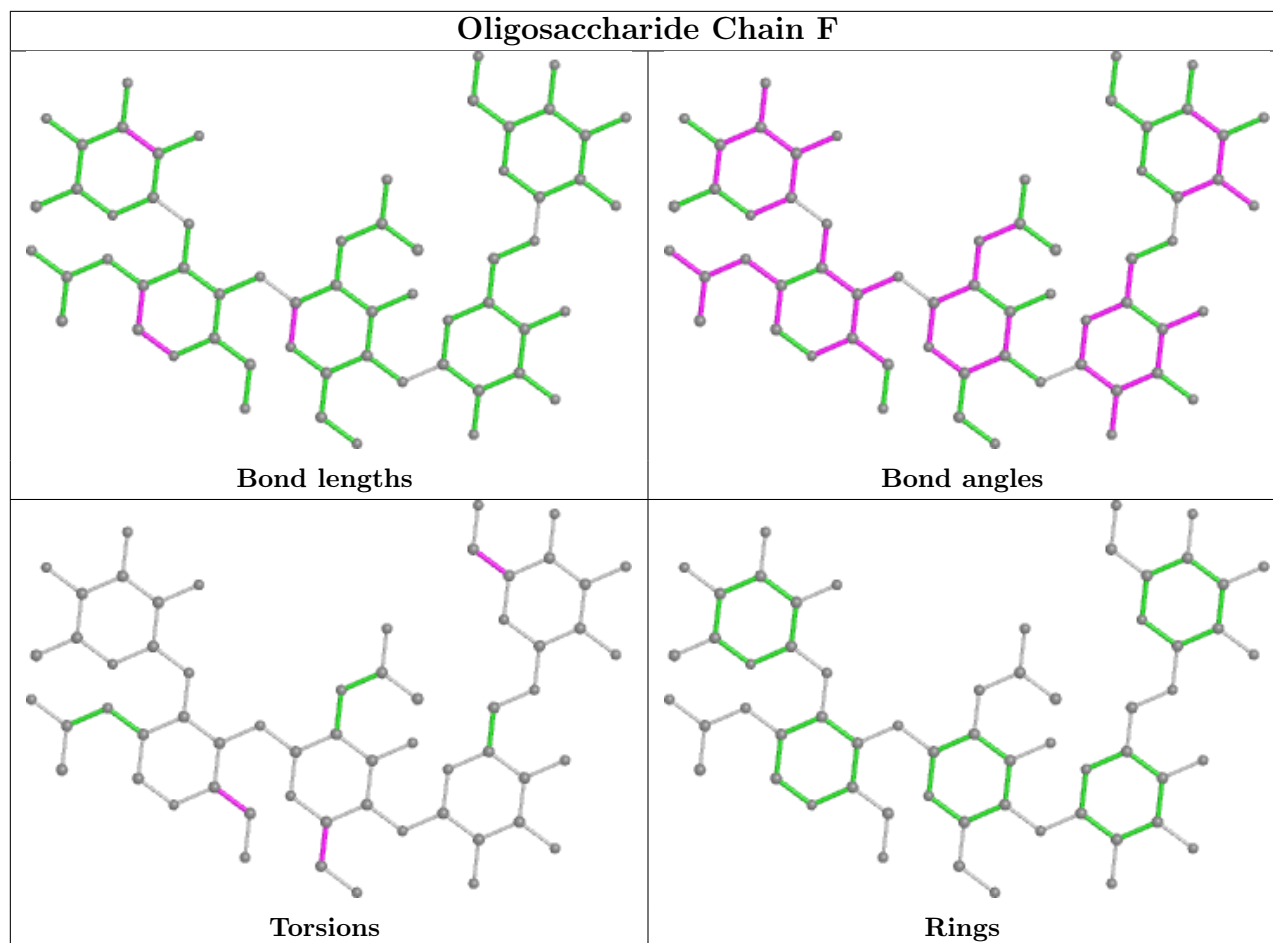
7 monomers are involved in 15 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	E	2	NAG	4	0
3	F	5	FCA	3	0
2	D	1	NAG	5	0
2	E	1	NAG	4	0
3	F	2	NAG	4	0
2	D	2	NAG	5	0
3	F	1	NAG	5	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.







## 5.6 Ligand geometry [i](#)

9 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	FAD	A	579	-	53,58,58	0.87	2 (3%)	68,89,89	1.47	11 (16%)
5	DIA	A	590[B]	-	9,9,9	0.51	0	8,8,8	0.30	0
4	FAD	C	579	-	53,58,58	1.05	1 (1%)	68,89,89	1.29	8 (11%)
5	DIA	C	590[B]	-	9,9,9	0.50	0	8,8,8	0.35	0
4	FAD	B	579	-	53,58,58	0.80	1 (1%)	68,89,89	1.26	7 (10%)
5	DIA	B	590[A]	-	9,9,9	0.48	0	8,8,8	0.44	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
5	DIA	A	590[A]	-	9,9,9	0.47	0	8,8,8	0.28	0
5	DIA	C	590[A]	-	9,9,9	0.49	0	8,8,8	0.42	0
5	DIA	B	590[B]	-	9,9,9	0.51	0	8,8,8	0.35	0

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	FAD	A	579	-	-	2/30/50/50	0/6/6/6
5	DIA	A	590[B]	-	-	3/7/7/7	-
4	FAD	C	579	-	-	1/30/50/50	0/6/6/6
5	DIA	C	590[B]	-	-	4/7/7/7	-
4	FAD	B	579	-	-	5/30/50/50	0/6/6/6
5	DIA	B	590[A]	-	-	5/7/7/7	-
5	DIA	A	590[A]	-	-	4/7/7/7	-
5	DIA	C	590[A]	-	-	6/7/7/7	-
5	DIA	B	590[B]	-	-	3/7/7/7	-

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	C	579	FAD	C4X-N5	3.49	1.37	1.30
4	B	579	FAD	C4X-N5	2.55	1.35	1.30
4	A	579	FAD	C4X-N5	2.50	1.35	1.30
4	A	579	FAD	C5X-N5	-2.10	1.35	1.39

All (26) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	579	FAD	C9A-C5X-N5	-5.36	116.60	122.43
4	C	579	FAD	O4B-C1B-C2B	-4.21	100.77	106.93
4	B	579	FAD	O4B-C1B-C2B	-3.94	101.17	106.93
4	A	579	FAD	O4'-C4'-C3'	3.12	116.68	109.10
4	A	579	FAD	C6-C5X-C9A	3.07	123.28	118.94
4	B	579	FAD	C4-C4X-N5	2.74	122.13	118.23
4	B	579	FAD	C10-N1-C2	2.71	122.33	116.90
4	C	579	FAD	C5'-C4'-C3'	-2.66	107.06	112.20
4	A	579	FAD	O4-C4-N3	2.66	125.22	120.12

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	579	FAD	C5'-C4'-C3'	-2.65	107.09	112.20
4	B	579	FAD	C10-C4X-N5	-2.63	119.27	124.86
4	A	579	FAD	C5A-C6A-N6A	2.60	124.31	120.35
4	A	579	FAD	O2A-PA-O1A	2.55	124.83	112.24
4	C	579	FAD	C9A-C5X-N5	-2.55	119.67	122.43
4	B	579	FAD	O3'-C3'-C4'	-2.49	102.79	108.81
4	C	579	FAD	C10-N1-C2	2.44	121.79	116.90
4	A	579	FAD	O4-C4-C4X	-2.32	120.44	126.60
4	A	579	FAD	C1'-N10-C9A	2.30	124.35	120.51
4	A	579	FAD	C8M-C8-C9	-2.29	115.25	119.49
4	A	579	FAD	C10-C4X-N5	-2.28	120.02	124.86
4	C	579	FAD	C9-C8-C7	2.26	122.91	119.67
4	C	579	FAD	O2A-PA-O1A	2.23	123.27	112.24
4	B	579	FAD	C7M-C7-C8	2.22	125.28	120.74
4	C	579	FAD	O2P-P-O1P	2.21	123.18	112.24
4	B	579	FAD	C7M-C7-C6	-2.19	115.45	119.49
4	C	579	FAD	C6-C7-C8	-2.02	116.78	119.67

There are no chirality outliers.

All (33) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	579	FAD	C5B-O5B-PA-O1A
5	A	590[B]	DIA	C2-C3-C4-C5
5	B	590[A]	DIA	C3-C4-C5-C6
5	B	590[B]	DIA	C2-C3-C4-C5
5	B	590[A]	DIA	C2-C3-C4-C5
5	C	590[A]	DIA	C3-C4-C5-C6
5	A	590[A]	DIA	C3-C4-C5-C6
5	C	590[A]	DIA	C2-C3-C4-C5
5	C	590[B]	DIA	C2-C3-C4-C5
5	A	590[A]	DIA	C2-C3-C4-C5
5	C	590[B]	DIA	C4-C5-C6-C7
5	A	590[A]	DIA	C5-C6-C7-C8
5	C	590[A]	DIA	C4-C5-C6-C7
5	C	590[A]	DIA	C5-C6-C7-C8
5	B	590[A]	DIA	C5-C6-C7-C8
5	B	590[B]	DIA	C1-C2-C3-C4
5	B	590[A]	DIA	C4-C5-C6-C7
5	C	590[B]	DIA	C1-C2-C3-C4
5	A	590[A]	DIA	C4-C5-C6-C7
5	A	590[B]	DIA	C1-C2-C3-C4

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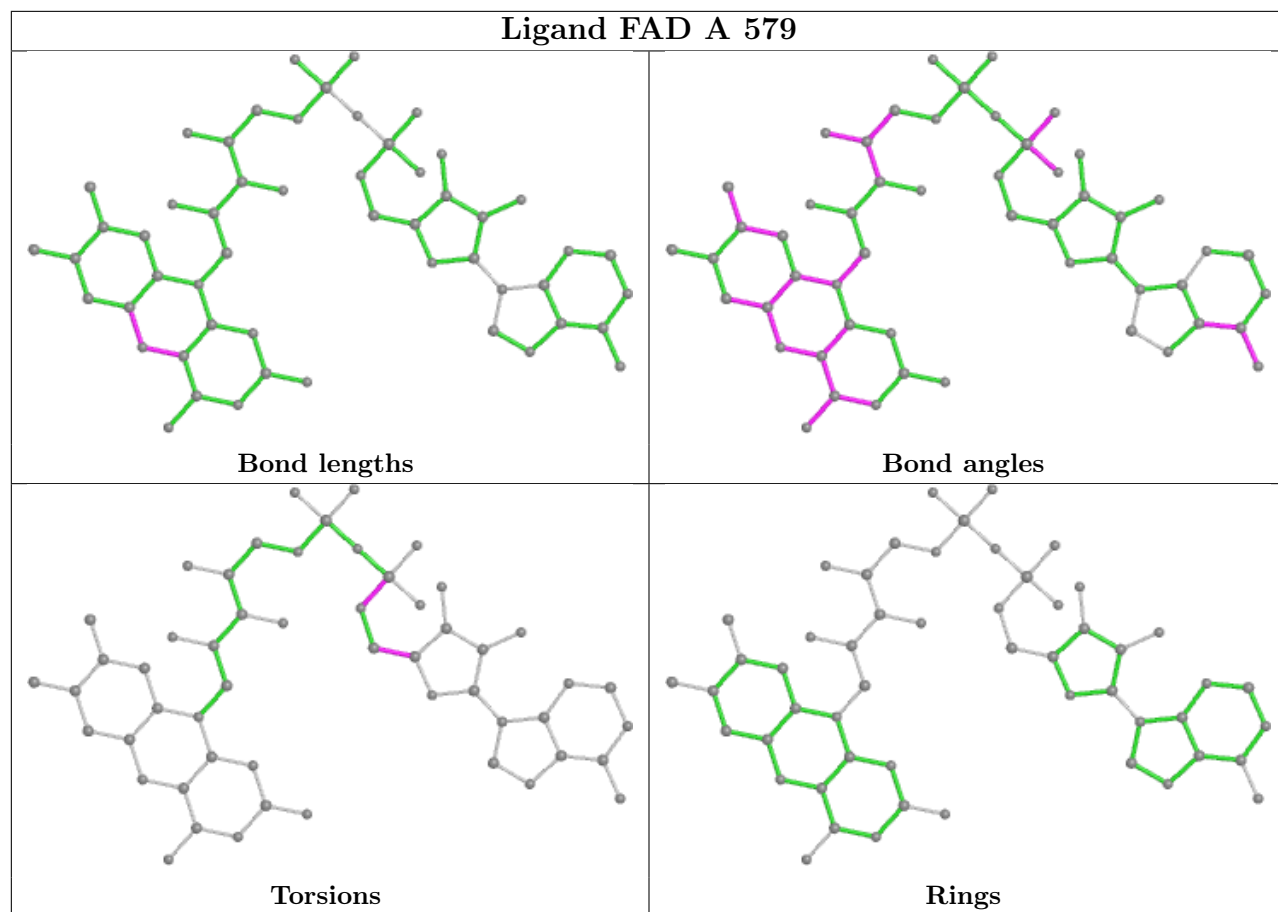
Mol	Chain	Res	Type	Atoms
5	A	590[B]	DIA	C4-C5-C6-C7
5	B	590[B]	DIA	C4-C5-C6-C7
5	B	590[A]	DIA	C6-C7-C8-N8
5	C	590[A]	DIA	C6-C7-C8-N8
5	C	590[A]	DIA	C1-C2-C3-C4
5	C	590[B]	DIA	C5-C6-C7-C8
4	B	579	FAD	O4B-C4B-C5B-O5B
4	A	579	FAD	O4B-C4B-C5B-O5B
4	C	579	FAD	O4B-C4B-C5B-O5B
4	B	579	FAD	C2'-C3'-C4'-O4'
4	B	579	FAD	C5B-O5B-PA-O2A
4	B	579	FAD	O3'-C3'-C4'-O4'
4	B	579	FAD	O3'-C3'-C4'-C5'

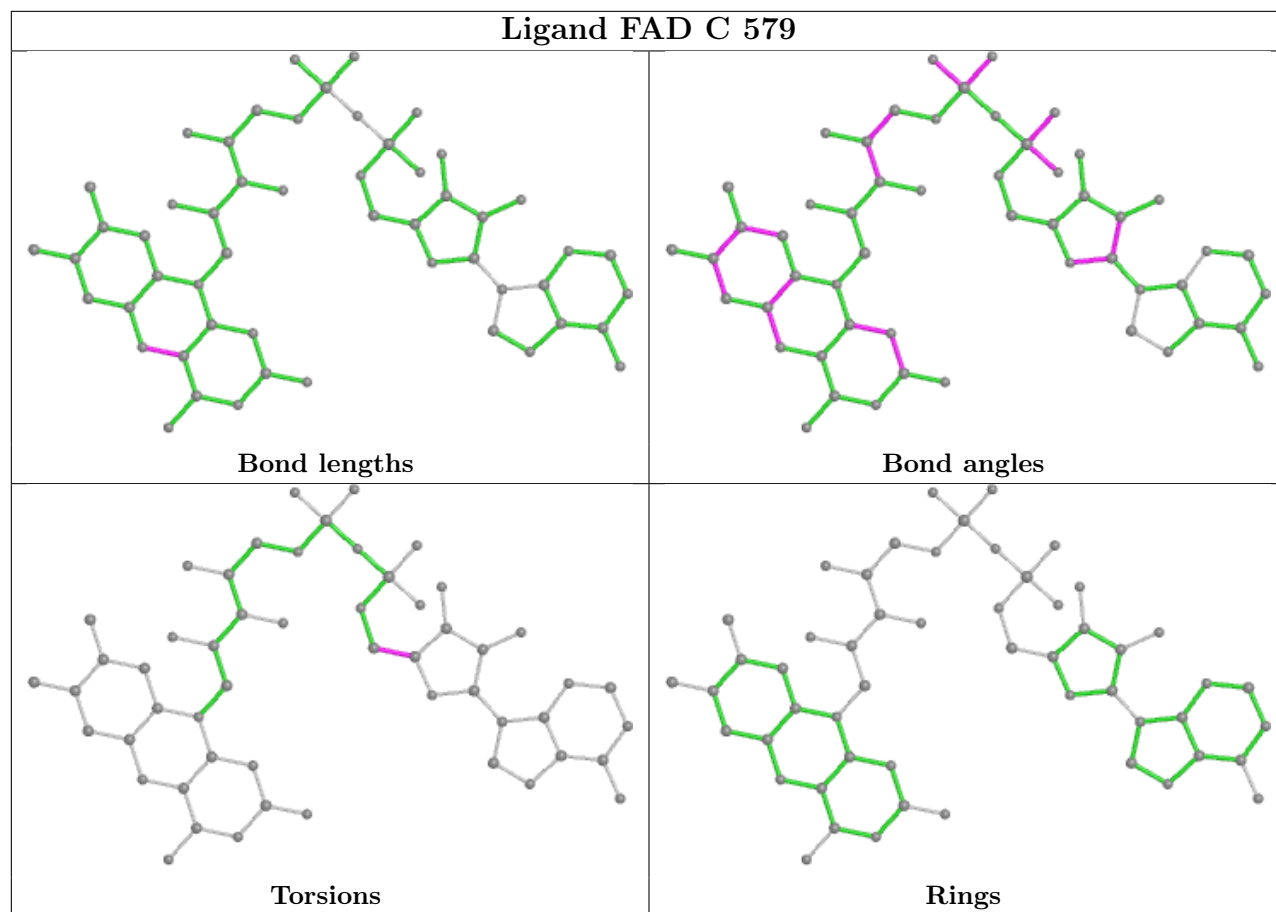
There are no ring outliers.

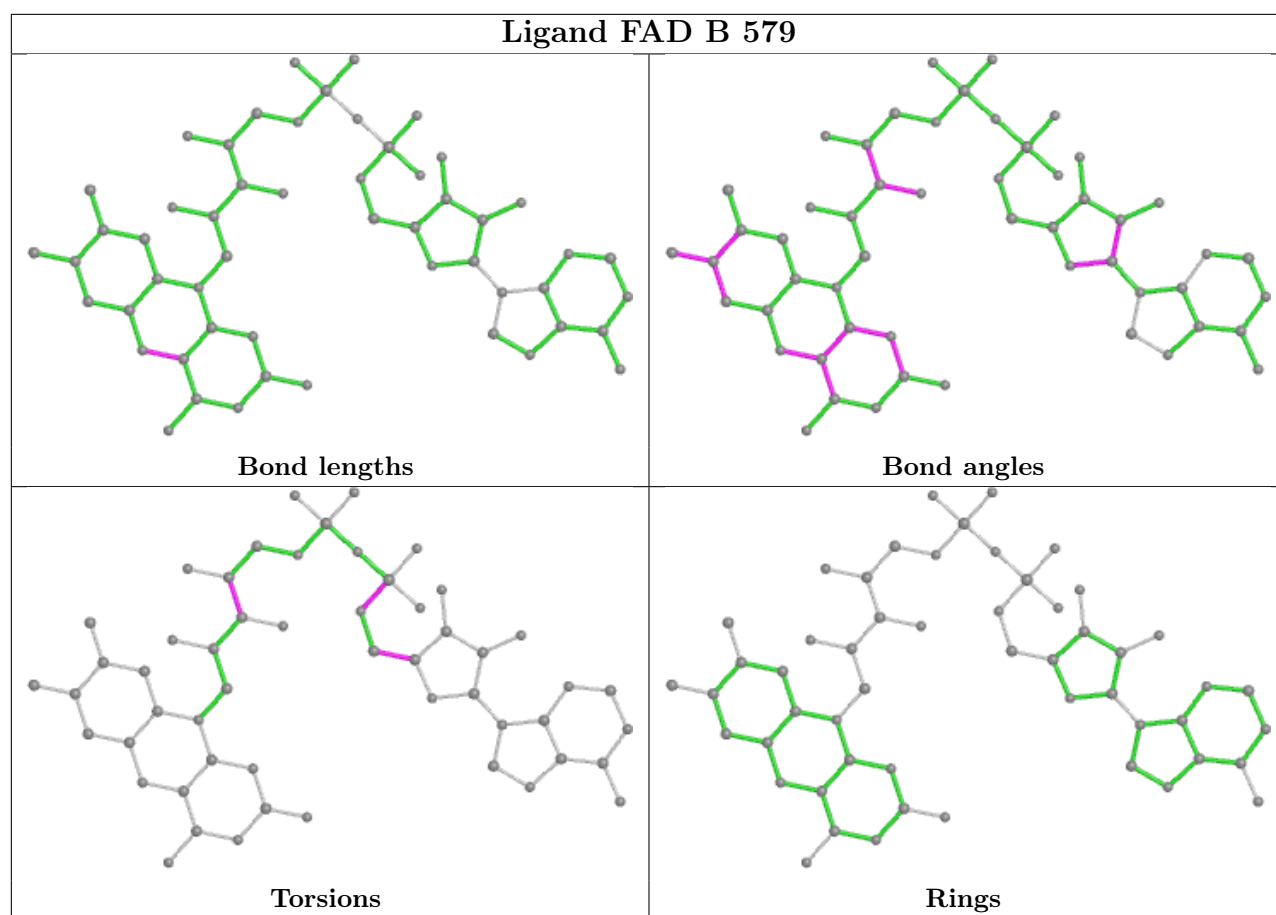
9 monomers are involved in 21 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	579	FAD	2	0
5	A	590[B]	DIA	1	0
4	C	579	FAD	4	0
5	C	590[B]	DIA	2	0
4	B	579	FAD	1	0
5	B	590[A]	DIA	3	0
5	A	590[A]	DIA	4	0
5	C	590[A]	DIA	3	0
5	B	590[B]	DIA	1	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.







## 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.