



Full wwPDB X-ray Structure Validation Report ⓘ

Feb 4, 2024 – 02:33 AM EST

PDB ID : 1PST
Title : CRYSTALLOGRAPHIC ANALYSES OF SITE-DIRECTED MUTANTS OF THE PHOTOSYNTHETIC REACTION CENTER FROM RHODOBACTER SPHAEROIDES
Authors : Chirino, A.J.; Feher, G.; Rees, D.C.
Deposited on : 1993-12-13
Resolution : 3.00 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 : 4.02b-467
Mogul : 1.8.5 (274361), 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

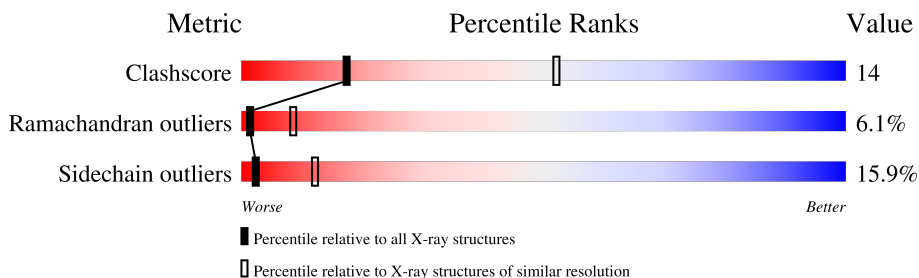
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.00 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	2416 (3.00-3.00)
Ramachandran outliers	138981	2333 (3.00-3.00)
Sidechain outliers	138945	2336 (3.00-3.00)

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	L	266	
2	M	296	
3	H	237	

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
5	BPH	M	5	X	-	-	-
8	CRT	M	304	-	X	-	-

2 Entry composition [i](#)

There are 8 unique types of molecules in this entry. The entry contains 6786 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 PHOTOSYNTHETIC REACTION CENTER.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	L	266	2121	1433	336	344	8	0	0	0

- Molecule 2 is a protein called PHOTOSYNTHETIC REACTION CENTER.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	M	296	2360	1579	384	387	10	0	0	0

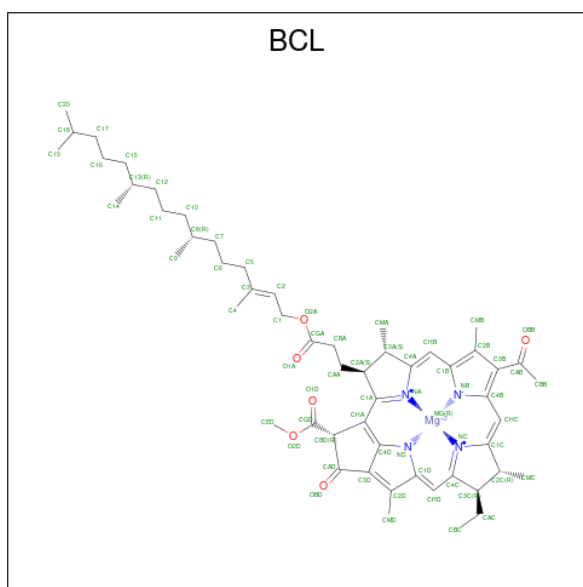
There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
M	202	LEU	HIS	conflict	UNP P02953

- Molecule 3 is a protein called PHOTOSYNTHETIC REACTION CENTER.

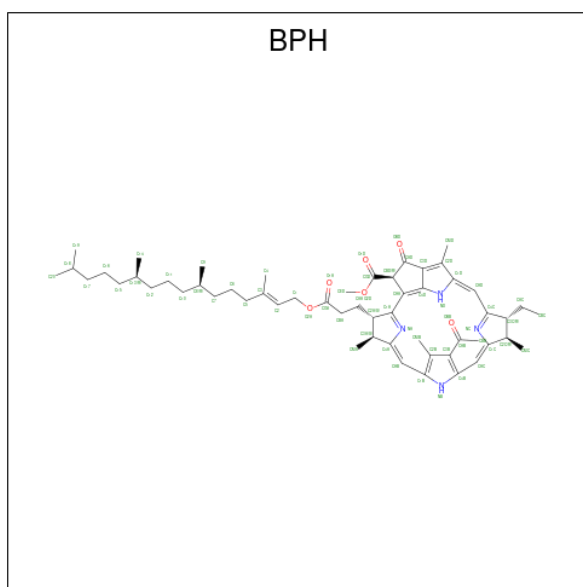
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	H	237	1807	1156	310	332	9	0	0	0

- Molecule 4 is BACTERIOCHLOROPHYLL A (three-letter code: BCL) (formula: C₅₅H₇₄MgN₄O₆).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	
4	L	1	Total	C	Mg	N	O	0	0
			66	55	1	4	6		
4	L	1	Total	C	Mg	N	O	0	0
			51	40	1	4	6		
4	M	1	Total	C	Mg	N	O	0	0
			51	40	1	4	6		

- Molecule 5 is BACTERIOPHEOPHYTIN A (three-letter code: BPH) (formula: $C_{55}H_{76}N_4O_6$).



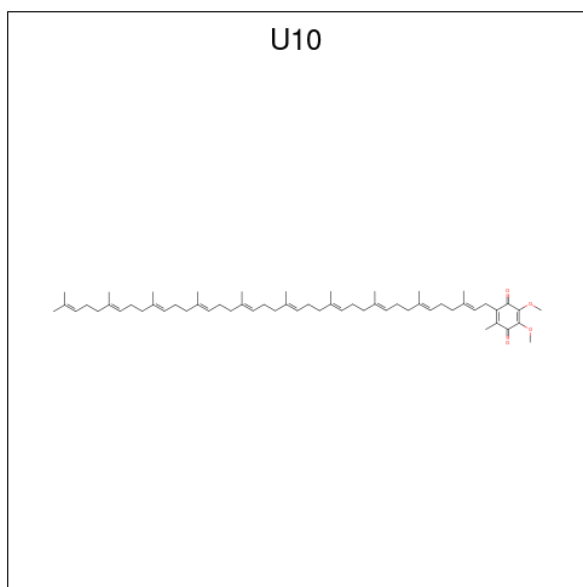
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
5	L	1	Total	C	N	O		
			65	55	4	6	0	0

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Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
5	M	1	Total	C	N	O	0	0
			65	55	4	6		
5	M	1	Total	C	N	O	0	0
			65	55	4	6		

- Molecule 6 is UBIQUINONE-10 (three-letter code: U10) (formula: C₅₉H₉₀O₄).

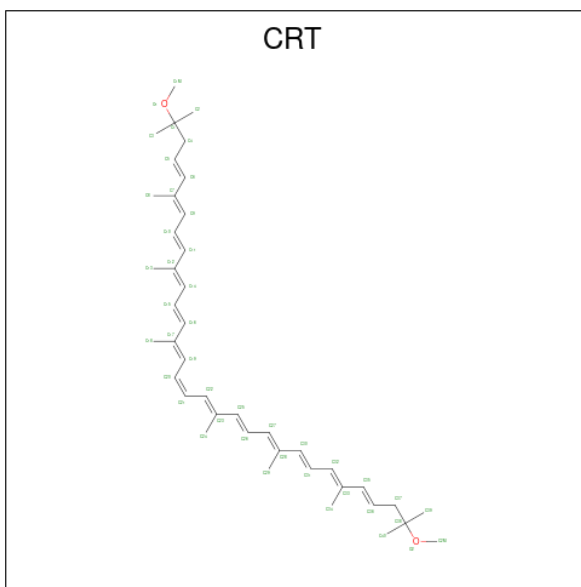


Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	L	1	Total	C	O	0	0
			41	37	4		
6	M	1	Total	C	O	0	0
			51	47	4		

- Molecule 7 is FE (III) ION (three-letter code: FE) (formula: Fe).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	M	1	Total	Fe	0	0
			1	1		

- Molecule 8 is SPIRILLOXANTHIN (three-letter code: CRT) (formula: C₄₂H₆₀O₂).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
8	M	1	Total	C	O	0	0
			42	41	1		

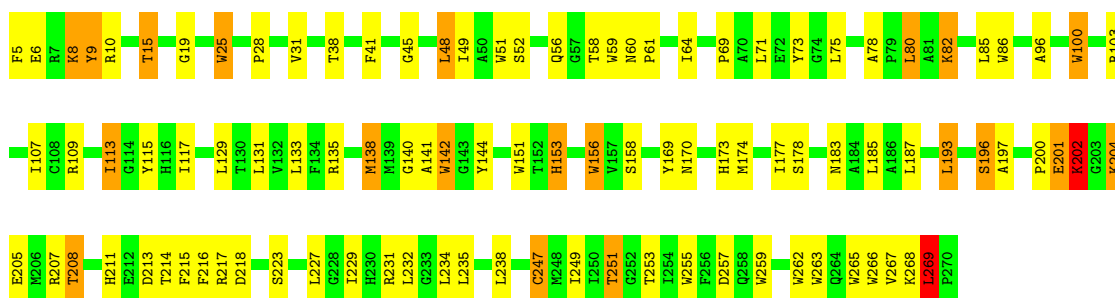
3 Residue-property plots

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.

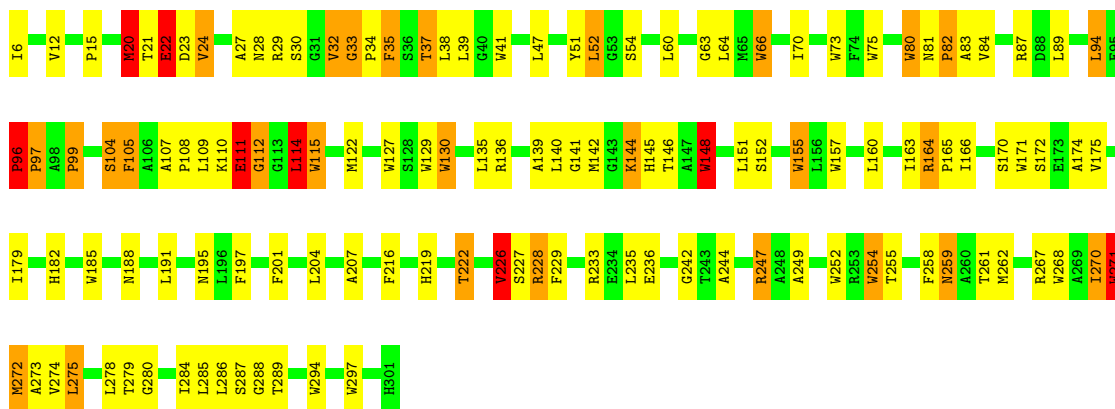
- Molecule 1: PHOTOSYNTHETIC REACTION CENTER

Chain L: 



- Molecule 2: PHOTOSYNTHETIC REACTION CENTER

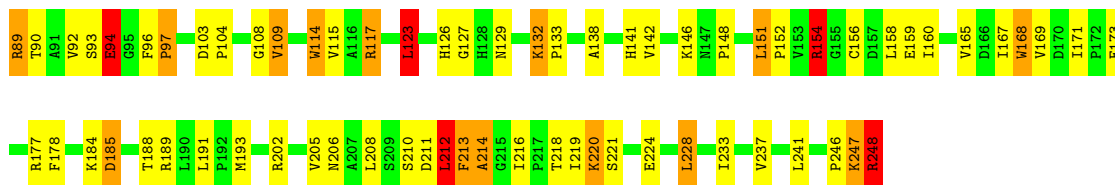
Chain M: 



- Molecule 3: PHOTOSYNTHETIC REACTION CENTER

Chain H: 





4 Data and refinement statistics

Xtrriage (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	138.00Å 77.50Å 141.80Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	(Not available) – 3.00	Depositor
% Data completeness (in resolution range)	(Not available) ((Not available)-3.00)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	X-PLOR	Depositor
R, R_{free}	0.218 , (Not available)	Depositor
Estimated twinning fraction	No twinning to report.	Xtrriage
Total number of atoms	6786	wwPDB-VP
Average B, all atoms (Å ²)	25.0	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: FE, CRT, BPH, U10, BCL

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	0.83	0/2204	1.66	54/3014 (1.8%)
2	M	0.90	0/2450	1.77	81/3344 (2.4%)
3	H	0.80	0/1855	1.56	30/2523 (1.2%)
All	All	0.85	0/6509	1.67	165/8881 (1.9%)

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	L	0	1
2	M	0	2
3	H	0	4
All	All	0	7

There are no bond length outliers.

All (165) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	L	100	TRP	CD1-CG-CD2	10.03	114.33	106.30
3	H	168	TRP	CD1-CG-CD2	9.15	113.62	106.30
2	M	171	TRP	CD1-CG-CD2	9.08	113.56	106.30
1	L	86	TRP	CD1-CG-CD2	9.04	113.53	106.30
2	M	157	TRP	CD1-CG-CD2	8.71	113.27	106.30
2	M	185	TRP	CD1-CG-CD2	8.65	113.22	106.30
1	L	25	TRP	CD1-CG-CD2	8.51	113.11	106.30
1	L	151	TRP	CD1-CG-CD2	8.51	113.10	106.30
2	M	171	TRP	CE2-CD2-CG	-8.49	100.51	107.30
2	M	294	TRP	CD1-CG-CD2	8.44	113.05	106.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	M	297	TRP	CD1-CG-CD2	8.44	113.05	106.30
1	L	59	TRP	CD1-CG-CD2	8.27	112.92	106.30
1	L	262	TRP	CD1-CG-CD2	8.27	112.91	106.30
1	L	86	TRP	CE2-CD2-CG	-8.19	100.75	107.30
3	H	21	TRP	CD1-CG-CD2	8.17	112.83	106.30
2	M	66	TRP	CD1-CG-CD2	8.15	112.82	106.30
2	M	41	TRP	CD1-CG-CD2	8.12	112.80	106.30
2	M	185	TRP	CE2-CD2-CG	-8.11	100.81	107.30
1	L	142	TRP	CD1-CG-CD2	8.07	112.75	106.30
1	L	100	TRP	CE2-CD2-CG	-8.03	100.87	107.30
1	L	51	TRP	CD1-CG-CD2	8.03	112.72	106.30
2	M	252	TRP	CD1-CG-CD2	8.01	112.71	106.30
2	M	22	GLU	N-CA-C	7.93	132.41	111.00
1	L	142	TRP	CE2-CD2-CG	-7.86	101.01	107.30
2	M	129	TRP	CD1-CG-CD2	7.85	112.58	106.30
1	L	151	TRP	CE2-CD2-CG	-7.84	101.03	107.30
1	L	25	TRP	CE2-CD2-CG	-7.84	101.03	107.30
2	M	294	TRP	CE2-CD2-CG	-7.83	101.04	107.30
2	M	268	TRP	CE2-CD2-CG	-7.79	101.07	107.30
2	M	297	TRP	CE2-CD2-CG	-7.73	101.11	107.30
2	M	115	TRP	CD1-CG-CD2	7.72	112.47	106.30
1	L	266	TRP	CD1-CG-CD2	7.72	112.47	106.30
1	L	259	TRP	CD1-CG-CD2	7.71	112.47	106.30
3	H	168	TRP	CE2-CD2-CG	-7.71	101.14	107.30
2	M	41	TRP	CE2-CD2-CG	-7.70	101.14	107.30
2	M	252	TRP	CE2-CD2-CG	-7.70	101.14	107.30
2	M	254	TRP	CD1-CG-CD2	7.67	112.43	106.30
1	L	263	TRP	CD1-CG-CD2	7.63	112.40	106.30
2	M	268	TRP	CD1-CG-CD2	7.61	112.39	106.30
1	L	59	TRP	CE2-CD2-CG	-7.58	101.24	107.30
1	L	259	TRP	CE2-CD2-CG	-7.55	101.26	107.30
2	M	157	TRP	CE2-CD2-CG	-7.51	101.29	107.30
2	M	271	TRP	CD1-CG-CD2	7.47	112.28	106.30
1	L	255	TRP	CD1-CG-CD2	7.47	112.27	106.30
2	M	80	TRP	CD1-CG-CD2	7.46	112.27	106.30
2	M	75	TRP	CD1-CG-CD2	7.45	112.26	106.30
3	H	211	ASP	CA-C-N	-7.45	100.81	117.20
3	H	21	TRP	CE2-CD2-CG	-7.44	101.35	107.30
2	M	66	TRP	CE2-CD2-CG	-7.44	101.35	107.30
1	L	255	TRP	CE2-CD2-CG	-7.44	101.35	107.30
2	M	155	TRP	CD1-CG-CD2	7.44	112.25	106.30
3	H	31	LEU	N-CA-C	-7.43	90.93	111.00

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	L	263	TRP	CE2-CD2-CG	-7.43	101.36	107.30
2	M	75	TRP	CE2-CD2-CG	-7.37	101.40	107.30
2	M	129	TRP	CE2-CD2-CG	-7.35	101.42	107.30
1	L	262	TRP	CE2-CD2-CG	-7.32	101.45	107.30
1	L	51	TRP	CE2-CD2-CG	-7.25	101.50	107.30
2	M	73	TRP	CD1-CG-CD2	7.23	112.08	106.30
2	M	148	TRP	CA-CB-CG	7.22	127.42	113.70
2	M	254	TRP	CE2-CD2-CG	-7.21	101.53	107.30
1	L	266	TRP	CE2-CD2-CG	-7.19	101.55	107.30
2	M	148	TRP	N-CA-C	-7.19	91.60	111.00
2	M	271	TRP	CE2-CD2-CG	-7.15	101.58	107.30
3	H	114	TRP	CE2-CD2-CG	-7.14	101.59	107.30
2	M	155	TRP	CE2-CD2-CG	-7.11	101.61	107.30
1	L	265	TRP	CE2-CD2-CG	-7.06	101.65	107.30
1	L	169	TYR	CB-CG-CD2	-7.04	116.78	121.00
1	L	156	TRP	CE2-CD2-CG	-7.02	101.68	107.30
2	M	130	TRP	CE2-CD2-CG	-7.02	101.69	107.30
2	M	80	TRP	CE2-CD2-CG	-7.01	101.69	107.30
2	M	73	TRP	CE2-CD2-CG	-7.00	101.70	107.30
1	L	265	TRP	CD1-CG-CD2	6.94	111.85	106.30
2	M	115	TRP	CE2-CD2-CG	-6.94	101.75	107.30
2	M	127	TRP	CE2-CD2-CG	-6.94	101.75	107.30
2	M	270	ILE	CB-CA-C	-6.91	97.78	111.60
1	L	156	TRP	CD1-CG-CD2	6.84	111.77	106.30
3	H	173	GLU	N-CA-C	-6.75	92.77	111.00
2	M	127	TRP	CD1-CG-CD2	6.68	111.64	106.30
2	M	130	TRP	CD1-CG-CD2	6.63	111.60	106.30
2	M	294	TRP	CG-CD2-CE3	6.47	139.73	133.90
1	L	10	ARG	NE-CZ-NH2	-6.46	117.07	120.30
2	M	114	LEU	CA-CB-CG	6.44	130.12	115.30
2	M	171	TRP	CG-CD2-CE3	6.39	139.65	133.90
3	H	114	TRP	CD1-CG-CD2	6.29	111.33	106.30
1	L	259	TRP	CG-CD2-CE3	6.28	139.55	133.90
2	M	148	TRP	CD1-CG-CD2	6.23	111.29	106.30
3	H	37	ARG	NE-CZ-NH1	6.18	123.39	120.30
1	L	153	HIS	CA-CB-CG	6.16	124.08	113.60
2	M	171	TRP	CB-CG-CD1	-6.15	119.00	127.00
2	M	252	TRP	CG-CD2-CE3	6.12	139.41	133.90
3	H	49	PRO	N-CA-C	6.12	128.01	112.10
2	M	66	TRP	CG-CD2-CE3	6.11	139.40	133.90
1	L	59	TRP	CB-CG-CD1	-6.10	119.06	127.00
2	M	226	VAL	N-CA-CB	-6.05	98.19	111.50

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	M	268	TRP	CG-CD2-CE3	6.04	139.34	133.90
2	M	185	TRP	CB-CG-CD1	-6.01	119.19	127.00
1	L	59	TRP	CG-CD2-CE3	6.01	139.31	133.90
1	L	255	TRP	CB-CG-CD1	-6.00	119.20	127.00
3	H	168	TRP	CG-CD1-NE1	-5.94	104.16	110.10
3	H	177	ARG	NE-CZ-NH2	-5.94	117.33	120.30
2	M	148	TRP	CE2-CD2-CG	-5.92	102.57	107.30
1	L	231	ARG	NE-CZ-NH1	5.91	123.25	120.30
2	M	155	TRP	CB-CG-CD1	-5.90	119.33	127.00
1	L	100	TRP	CG-CD1-NE1	-5.88	104.22	110.10
3	H	212	LEU	CA-C-N	5.88	130.13	117.20
3	H	154	ARG	NE-CZ-NH1	5.86	123.23	120.30
2	M	29	ARG	CA-C-N	-5.84	104.35	117.20
3	H	228	LEU	CA-CB-CG	5.79	128.63	115.30
1	L	25	TRP	CG-CD2-CE3	5.79	139.11	133.90
1	L	10	ARG	NE-CZ-NH1	5.78	123.19	120.30
2	M	185	TRP	CG-CD2-CE3	5.76	139.09	133.90
2	M	252	TRP	CB-CG-CD1	-5.76	119.52	127.00
3	H	46	ASP	N-CA-C	-5.74	95.50	111.00
2	M	6	ILE	N-CA-C	-5.73	95.52	111.00
2	M	104	SER	N-CA-CB	-5.73	101.90	110.50
1	L	142	TRP	CG-CD2-CE3	5.73	139.06	133.90
2	M	297	TRP	CB-CG-CD1	-5.70	119.59	127.00
1	L	25	TRP	CB-CG-CD1	-5.68	119.62	127.00
2	M	226	VAL	CA-CB-CG2	-5.65	102.42	110.90
1	L	138	MET	CG-SD-CE	-5.63	91.19	100.20
3	H	165	VAL	CA-CB-CG2	-5.62	102.47	110.90
3	H	37	ARG	NE-CZ-NH2	-5.53	117.53	120.30
2	M	272	MET	CG-SD-CE	-5.52	91.37	100.20
3	H	123	LEU	CA-CB-CG	5.51	127.97	115.30
2	M	164	ARG	NE-CZ-NH1	5.50	123.05	120.30
1	L	86	TRP	CG-CD1-NE1	-5.50	104.60	110.10
2	M	233	ARG	NE-CZ-NH1	5.47	123.03	120.30
3	H	90	THR	N-CA-C	-5.46	96.25	111.00
2	M	20	MET	CG-SD-CE	5.45	108.92	100.20
2	M	297	TRP	CG-CD2-CE3	5.42	138.78	133.90
2	M	254	TRP	CG-CD2-CE3	5.40	138.76	133.90
1	L	142	TRP	CB-CG-CD1	-5.39	120.00	127.00
3	H	248	ARG	NE-CZ-NH1	5.37	122.98	120.30
1	L	9	TYR	CB-CG-CD1	-5.36	117.78	121.00
2	M	247	ARG	NE-CZ-NH1	5.33	122.96	120.30
1	L	86	TRP	CG-CD2-CE3	5.33	138.69	133.90

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	M	171	TRP	CG-CD1-NE1	-5.32	104.78	110.10
2	M	80	TRP	N-CA-C	-5.31	96.67	111.00
2	M	294	TRP	CB-CG-CD1	-5.31	120.10	127.00
2	M	226	VAL	CB-CA-C	5.29	121.46	111.40
3	H	51	ALA	N-CA-C	5.28	125.26	111.00
2	M	270	ILE	N-CA-CB	5.28	122.94	110.80
2	M	157	TRP	CG-CD1-NE1	-5.26	104.84	110.10
3	H	94	GLU	N-CA-C	5.22	125.09	111.00
3	H	21	TRP	CG-CD2-CE3	5.21	138.59	133.90
3	H	168	TRP	CG-CD2-CE3	5.18	138.56	133.90
3	H	30	TYR	CA-CB-CG	-5.18	103.56	113.40
1	L	25	TRP	CG-CD1-NE1	-5.15	104.95	110.10
2	M	294	TRP	CG-CD1-NE1	-5.15	104.95	110.10
2	M	268	TRP	CB-CG-CD1	-5.14	120.31	127.00
3	H	117	ARG	O-C-N	-5.14	114.47	122.70
2	M	75	TRP	CG-CD2-CE3	5.14	138.52	133.90
3	H	21	TRP	CB-CG-CD1	-5.13	120.33	127.00
1	L	80	LEU	CA-CB-CG	5.11	127.05	115.30
1	L	255	TRP	CG-CD2-CE3	5.10	138.49	133.90
2	M	297	TRP	CG-CD1-NE1	-5.10	105.00	110.10
1	L	151	TRP	CG-CD2-CE3	5.10	138.49	133.90
3	H	141	HIS	CA-C-N	-5.08	106.02	117.20
2	M	52	LEU	N-CA-C	5.07	124.68	111.00
1	L	259	TRP	CB-CG-CD1	-5.04	120.45	127.00
1	L	217	ARG	NE-CZ-NH2	-5.03	117.79	120.30
2	M	185	TRP	CG-CD1-NE1	-5.03	105.07	110.10
1	L	59	TRP	CG-CD1-NE1	-5.02	105.08	110.10
1	L	156	TRP	CG-CD2-CE3	5.01	138.41	133.90
2	M	66	TRP	CB-CG-CD1	-5.00	120.50	127.00

There are no chirality outliers.

All (7) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
3	H	40	TYR	Peptide
3	H	56	PHE	Peptide
3	H	58	LEU	Peptide
3	H	83	ARG	Peptide
1	L	269	LEU	Peptide
2	M	81	ASN	Peptide
2	M	96	PRO	Peptide

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	L	2121	0	2077	53	0
2	M	2360	0	2285	75	0
3	H	1807	0	1814	60	0
4	L	117	0	115	11	0
4	M	51	0	41	8	0
5	L	65	0	76	7	0
5	M	130	0	152	7	0
6	L	41	0	52	5	0
6	M	51	0	68	5	0
7	M	1	0	0	0	0
8	M	42	0	57	2	0
All	All	6786	0	6737	187	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 (187) 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)
3:H:154:ARG:HD2	3:H:160:ILE:HG12	1.52	0.92
2:M:229:PHE:HB2	2:M:244:ALA:HB2	1.58	0.84
1:L:205:GLU:HA	3:H:65:ILE:HG13	1.63	0.79
2:M:261:THR:HG22	3:H:40:TYR:HD1	1.49	0.76
2:M:27:ALA:HB2	2:M:51:TYR:HD1	1.50	0.74
4:M:1:BCL:HBB3	5:M:3:BPH:H4C1	1.69	0.73
2:M:20:MET:SD	2:M:22:GLU:HG2	2.29	0.73
3:H:189:ARG:HD2	3:H:216:ILE:HB	1.71	0.72
3:H:89:ARG:HE	3:H:89:ARG:H	1.38	0.72
2:M:236:GLU:HG3	3:H:117:ARG:HH21	1.55	0.71
2:M:97:PRO:HA	2:M:111:GLU:O	1.92	0.70
2:M:27:ALA:HB2	2:M:51:TYR:CD1	2.27	0.69
5:L:271:BPH:HED1	6:M:303:U10:H171	1.74	0.67
2:M:144:LYS:HZ3	2:M:148:TRP:HB2	1.59	0.67
5:M:3:BPH:HBB2	5:M:3:BPH:HHC	1.77	0.67
3:H:148:PRO:HD2	3:H:167:ILE:HD11	1.78	0.66

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:L:100:TRP:HZ3	6:M:303:U10:H33	1.61	0.66
3:H:168:TRP:HB2	3:H:178:PHE:HB2	1.78	0.65
3:H:158:LEU:HD23	3:H:202:ARG:HH22	1.62	0.64
1:L:52:SER:OG	1:L:85:LEU:HD23	1.97	0.63
3:H:39:GLY:HA2	3:H:42:LEU:HG	1.81	0.63
3:H:154:ARG:HG3	3:H:202:ARG:NE	2.14	0.63
2:M:107:ALA:HB3	2:M:112:GLY:HA3	1.80	0.63
3:H:132:LYS:HE3	3:H:171:ILE:HD11	1.81	0.62
1:L:229:ILE:HG21	6:L:272:U10:H3M2	1.80	0.62
2:M:204:LEU:HB2	2:M:279:THR:HG21	1.82	0.62
4:L:2:BCL:HBB3	4:L:2:BCL:HMB1	1.82	0.62
2:M:130:TRP:CZ3	2:M:151:LEU:HG	2.35	0.61
2:M:12:VAL:HG11	3:H:169:VAL:HG11	1.81	0.61
2:M:271:TRP:HA	2:M:274:VAL:HG22	1.82	0.61
2:M:27:ALA:HA	2:M:51:TYR:HA	1.81	0.61
2:M:89:LEU:HD11	8:M:304:CRT:H81	1.83	0.60
2:M:63:GLY:HA3	5:M:5:BPH:H5C2	1.84	0.59
3:H:63:THR:HA	3:H:73:LEU:O	2.02	0.59
1:L:197:ALA:HB1	2:M:235:LEU:HD21	1.83	0.59
2:M:110:LYS:HD2	2:M:114:LEU:HD13	1.84	0.58
6:L:272:U10:H121	6:L:272:U10:H1M1	1.84	0.58
1:L:80:LEU:HB3	1:L:85:LEU:HD13	1.86	0.58
3:H:60:LYS:O	3:H:76:PRO:HD3	2.04	0.57
4:L:2:BCL:H122	5:L:271:BPH:HBA1	1.87	0.57
4:L:4:BCL:O1A	2:M:207:ALA:HA	2.05	0.57
2:M:145:HIS:O	2:M:148:TRP:HB3	2.05	0.57
2:M:21:THR:HB	2:M:27:ALA:CB	2.35	0.56
1:L:173:HIS:HB2	1:L:247:CYS:SG	2.46	0.56
3:H:30:TYR:OH	3:H:56:PHE:HB3	2.06	0.56
1:L:187:LEU:HD23	2:M:273:ALA:HB2	1.88	0.55
3:H:154:ARG:HG3	3:H:202:ARG:HE	1.69	0.55
2:M:226:VAL:HG13	2:M:244:ALA:HB1	1.87	0.55
4:L:2:BCL:HAA2	4:L:4:BCL:HBC1	1.87	0.55
1:L:117:ILE:HD11	2:M:222:THR:HG23	1.88	0.55
2:M:94:LEU:HD13	2:M:114:LEU:HG	1.87	0.55
1:L:41:PHE:HB3	1:L:96:ALA:HB2	1.88	0.55
1:L:15:THR:HG21	1:L:19:GLY:O	2.06	0.55
3:H:93:SER:HB2	3:H:96:PHE:CZ	2.43	0.54
1:L:60:ASN:O	1:L:64:ILE:HG13	2.08	0.54
2:M:228:ARG:HD2	2:M:228:ARG:H	1.72	0.54
1:L:170:ASN:O	1:L:173:HIS:HB3	2.07	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:M:21:THR:HB	2:M:27:ALA:HB3	1.88	0.54
4:M:1:BCL:HHC	4:M:1:BCL:HBB2	1.89	0.53
2:M:164:ARG:HH21	2:M:288:GLY:HA3	1.73	0.53
4:L:2:BCL:H171	5:L:271:BPH:H2	1.90	0.53
3:H:62:LYS:HG2	3:H:75:VAL:HG23	1.91	0.53
2:M:236:GLU:HG3	3:H:117:ARG:NH2	2.22	0.52
1:L:75:LEU:HG	1:L:140:GLY:O	2.10	0.52
3:H:233:ILE:O	3:H:237:VAL:HG23	2.09	0.52
1:L:229:ILE:HD13	6:L:272:U10:H1M2	1.92	0.52
2:M:35:PHE:HB2	2:M:47:LEU:HD21	1.91	0.51
1:L:131:LEU:HD22	1:L:156:TRP:HH2	1.76	0.51
2:M:249:ALA:HB3	3:H:40:TYR:CE2	2.46	0.51
1:L:174:MET:HB3	4:M:1:BCL:O1D	2.10	0.51
4:L:4:BCL:HMB1	4:L:4:BCL:HBB2	1.93	0.50
3:H:59:PRO:HB2	3:H:60:LYS:HD3	1.93	0.50
2:M:275:LEU:CD1	2:M:278:LEU:HD23	2.41	0.50
3:H:241:LEU:HA	3:H:247:LYS:HE2	1.94	0.50
2:M:179:ILE:HG23	4:M:1:BCL:HED1	1.93	0.50
4:L:2:BCL:HBA1	4:L:2:BCL:O2D	2.12	0.49
1:L:69:PRO:HB3	1:L:78:ALA:HB2	1.93	0.49
1:L:135:ARG:NH1	1:L:251:THR:HG22	2.28	0.49
1:L:218:ASP:HB3	2:M:136:ARG:HD3	1.94	0.49
2:M:22:GLU:CB	2:M:139:ALA:HB1	2.43	0.49
3:H:133:PRO:HA	3:H:168:TRP:HA	1.94	0.49
3:H:29:TYR:HB3	3:H:30:TYR:CE2	2.48	0.49
1:L:215:PHE:CZ	2:M:146:THR:HG21	2.48	0.49
6:L:272:U10:H3M3	6:L:272:U10:H4M2	1.95	0.49
2:M:285:LEU:O	2:M:289:THR:HB	2.13	0.48
1:L:73:TYR:HE2	1:L:82:LYS:HD2	1.78	0.48
3:H:37:ARG:HH21	3:H:43:GLU:H	1.61	0.48
1:L:107:ILE:HD13	2:M:255:THR:CG2	2.44	0.48
5:M:3:BPH:HHC	5:M:3:BPH:CBB	2.44	0.48
2:M:22:GLU:HB3	2:M:139:ALA:HB1	1.95	0.48
1:L:113:ILE:HD13	2:M:247:ARG:HG3	1.96	0.47
2:M:165:PRO:HG2	2:M:174:ALA:HB2	1.96	0.47
1:L:113:ILE:CD1	2:M:247:ARG:HG3	2.44	0.47
3:H:50:ALA:HB1	3:H:55:PRO:HG2	1.94	0.47
2:M:22:GLU:HG3	2:M:139:ALA:O	2.14	0.47
1:L:201:GLU:O	1:L:204:LYS:HE2	2.15	0.47
1:L:208:THR:OG1	1:L:211:HIS:HD2	1.98	0.47
2:M:219:HIS:HA	6:M:303:U10:O2	2.14	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:H:220:LYS:HG2	3:H:221:SER:N	2.30	0.47
1:L:267:VAL:O	2:M:87:ARG:HD2	2.15	0.46
4:L:2:BCL:H112	4:L:4:BCL:HBB2	1.97	0.46
2:M:140:LEU:HB2	2:M:142:MET:HG2	1.97	0.46
3:H:212:LEU:O	3:H:214:ALA:N	2.46	0.46
3:H:129:ASN:ND2	3:H:224:GLU:HB2	2.29	0.46
3:H:247:LYS:HG2	3:H:248:ARG:N	2.31	0.46
4:L:4:BCL:HMB1	4:L:4:BCL:CBB	2.44	0.46
3:H:68:HIS:HE1	3:H:123:LEU:HB2	1.80	0.46
2:M:170:SER:HB3	2:M:172:SER:OG	2.16	0.46
1:L:178:SER:HA	4:M:1:BCL:O1A	2.16	0.45
1:L:238:LEU:HD23	5:L:271:BPH:HBC1	1.97	0.45
5:L:271:BPH:HHC	5:L:271:BPH:OBB	2.15	0.45
2:M:242:GLY:HA2	3:H:115:VAL:HG11	1.98	0.45
2:M:280:GLY:HA2	5:M:3:BPH:HED3	1.99	0.45
3:H:154:ARG:HB2	3:H:202:ARG:HH21	1.81	0.45
3:H:210:SER:HA	3:H:213:PHE:HD2	1.82	0.45
1:L:153:HIS:CE1	5:L:271:BPH:H191	2.51	0.45
3:H:191:LEU:HD21	3:H:205:VAL:HG21	1.98	0.45
2:M:163:ILE:HA	2:M:166:ILE:HG12	1.98	0.45
1:L:48:LEU:HD12	1:L:85:LEU:HD11	2.00	0.44
3:H:48:THR:HA	3:H:49:PRO:HD2	1.64	0.44
2:M:33:GLY:H	2:M:34:PRO:HD3	1.82	0.44
2:M:188:ASN:HA	2:M:191:LEU:HD22	1.99	0.44
3:H:104:PRO:HB3	3:H:109:VAL:HG12	1.99	0.44
3:H:152:PRO:HB2	3:H:154:ARG:HD3	1.98	0.44
1:L:268:LYS:O	1:L:269:LEU:HB2	2.16	0.44
6:M:303:U10:H3M3	6:M:303:U10:H4M2	1.99	0.44
3:H:247:LYS:HE3	3:H:247:LYS:HB3	1.95	0.44
1:L:214:THR:HG21	2:M:20:MET:O	2.18	0.44
2:M:96:PRO:HA	2:M:115:TRP:CG	2.52	0.44
2:M:82:PRO:O	2:M:84:VAL:N	2.51	0.43
2:M:94:LEU:HD22	2:M:94:LEU:HA	1.84	0.43
2:M:261:THR:HA	3:H:40:TYR:CD1	2.53	0.43
2:M:160:LEU:HD23	2:M:284:ILE:HG21	1.98	0.43
2:M:109:LEU:O	2:M:114:LEU:HD22	2.18	0.43
3:H:64:PHE:HB2	3:H:73:LEU:HB3	2.00	0.43
1:L:25:TRP:HZ3	3:H:97:PRO:HG3	1.84	0.43
1:L:107:ILE:HG23	2:M:254:TRP:HE3	1.83	0.43
2:M:148:TRP:HZ2	2:M:271:TRP:CH2	2.36	0.43
1:L:177:ILE:HD13	4:M:1:BCL:HMD1	2.00	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:L:213:ASP:HA	1:L:223:SER:OG	2.19	0.43
6:L:272:U10:H172	6:L:272:U10:H101	2.01	0.43
4:M:1:BCL:HMB1	4:M:1:BCL:OBB	2.19	0.43
1:L:56:GLN:HG3	1:L:58:THR:HG22	2.00	0.43
1:L:60:ASN:HA	1:L:61:PRO:HD3	1.78	0.43
3:H:104:PRO:O	3:H:108:GLY:N	2.52	0.42
5:M:3:BPH:HBC2	5:M:3:BPH:H2C	1.90	0.42
2:M:201:PHE:HD1	2:M:279:THR:HG23	1.84	0.42
3:H:148:PRO:HA	3:H:151:LEU:HD23	1.99	0.42
1:L:107:ILE:HD13	2:M:255:THR:HG23	2.01	0.42
2:M:164:ARG:HB3	2:M:165:PRO:HD3	2.01	0.42
3:H:103:ASP:HA	3:H:104:PRO:HD3	1.73	0.42
4:L:2:BCL:H2C	5:M:3:BPH:HBC2	2.00	0.42
2:M:201:PHE:HA	2:M:204:LEU:HD12	2.02	0.42
1:L:38:THR:HG21	1:L:100:TRP:CE3	2.55	0.42
2:M:22:GLU:HB3	2:M:23:ASP:H	1.63	0.42
2:M:242:GLY:HA3	3:H:117:ARG:HD2	2.01	0.42
3:H:82:ASP:O	3:H:84:PRO:HA	2.20	0.42
2:M:261:THR:HG22	3:H:40:TYR:CD1	2.40	0.42
1:L:28:PRO:O	2:M:254:TRP:HA	2.20	0.42
1:L:38:THR:HG21	1:L:100:TRP:HE3	1.84	0.42
2:M:35:PHE:HB3	2:M:39:LEU:HB2	2.02	0.42
3:H:210:SER:HA	3:H:213:PHE:CD2	2.55	0.42
2:M:66:TRP:CD1	2:M:122:MET:HB2	2.55	0.41
2:M:152:SER:O	2:M:155:TRP:HB3	2.20	0.41
2:M:66:TRP:NE1	2:M:70:ILE:HD11	2.35	0.41
4:L:2:BCL:H142	4:L:4:BCL:HMB1	2.03	0.41
1:L:141:ALA:HB3	1:L:144:TYR:CE2	2.56	0.41
4:M:1:BCL:C3B	8:M:304:CRT:H20	2.50	0.41
1:L:69:PRO:HG2	1:L:142:TRP:HB2	2.02	0.41
1:L:207:ARG:NH2	2:M:141:GLY:HA3	2.34	0.41
2:M:259:ASN:ND2	3:H:40:TYR:HB3	2.36	0.41
3:H:132:LYS:CE	3:H:171:ILE:HD11	2.47	0.41
1:L:131:LEU:HD22	1:L:156:TRP:CH2	2.56	0.41
3:H:159:GLU:O	3:H:210:SER:HB3	2.21	0.41
5:L:271:BPH:HHB	5:L:271:BPH:HMB1	1.87	0.41
3:H:108:GLY:HA3	3:H:114:TRP:CE3	2.56	0.41
1:L:200:PRO:O	1:L:202:LYS:N	2.54	0.41
1:L:45:GLY:O	1:L:49:ILE:HG13	2.21	0.40
1:L:75:LEU:HA	1:L:142:TRP:CD1	2.57	0.40
3:H:31:LEU:HD22	3:H:31:LEU:HA	1.87	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:H:89:ARG:H	3:H:89:ARG:NE	2.11	0.40
3:H:156:CYS:HB3	3:H:206:ASN:O	2.22	0.40
6:M:303:U10:H421	6:M:303:U10:H401	1.77	0.40
3:H:184:LYS:O	3:H:185:ASP:HB3	2.21	0.40
1:L:8:LYS:HE2	1:L:9:TYR:CE2	2.57	0.40
3:H:68:HIS:CE1	3:H:123:LEU:HB2	2.55	0.40
1:L:193:LEU:O	1:L:196:SER:HB2	2.21	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	264/266 (99%)	237 (90%)	20 (8%)	7 (3%)	5	26
2	M	294/296 (99%)	242 (82%)	30 (10%)	22 (8%)	1	5
3	H	235/237 (99%)	188 (80%)	28 (12%)	19 (8%)	1	4
All	All	793/799 (99%)	667 (84%)	78 (10%)	48 (6%)	1	8

All (48) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	L	71	LEU
1	L	115	TYR
1	L	201	GLU
1	L	269	LEU
2	M	22	GLU
2	M	52	LEU
2	M	54	SER
2	M	99	PRO
2	M	104	SER
2	M	105	PHE

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Mol	Chain	Res	Type
2	M	111	GLU
2	M	144	LYS
3	H	13	ALA
3	H	51	ALA
3	H	60	LYS
3	H	94	GLU
3	H	127	GLY
3	H	138	ALA
3	H	185	ASP
3	H	212	LEU
2	M	37	THR
2	M	83	ALA
2	M	287	SER
3	H	44	ASN
3	H	57	PRO
3	H	68	HIS
3	H	92	VAL
3	H	142	VAL
3	H	214	ALA
1	L	15	THR
2	M	82	PRO
2	M	96	PRO
3	H	32	GLN
3	H	39	GLY
3	H	49	PRO
2	M	30	SER
2	M	33	GLY
2	M	80	TRP
3	H	31	LEU
3	H	246	PRO
1	L	31	VAL
1	L	202	LYS
2	M	24	VAL
2	M	195	ASN
2	M	97	PRO
2	M	112	GLY
2	M	15	PRO
2	M	32	VAL

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	210/210 (100%)	180 (86%)	30 (14%)	3 15
2	M	232/232 (100%)	197 (85%)	35 (15%)	3 14
3	H	192/192 (100%)	156 (81%)	36 (19%)	1 8
All	All	634/634 (100%)	533 (84%)	101 (16%)	2 12

All (101) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	L	5	PHE
1	L	6	GLU
1	L	8	LYS
1	L	48	LEU
1	L	82	LYS
1	L	103	ARG
1	L	109	ARG
1	L	113	ILE
1	L	129	LEU
1	L	133	LEU
1	L	138	MET
1	L	158	SER
1	L	183	ASN
1	L	185	LEU
1	L	193	LEU
1	L	196	SER
1	L	202	LYS
1	L	204	LYS
1	L	208	THR
1	L	216	PHE
1	L	227	LEU
1	L	232	LEU
1	L	234	LEU
1	L	235	LEU
1	L	247	CYS
1	L	249	ILE

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Mol	Chain	Res	Type
1	L	251	THR
1	L	253	THR
1	L	257	ASP
1	L	269	LEU
2	M	20	MET
2	M	22	GLU
2	M	24	VAL
2	M	28	ASN
2	M	32	VAL
2	M	35	PHE
2	M	37	THR
2	M	38	LEU
2	M	60	LEU
2	M	64	LEU
2	M	94	LEU
2	M	99	PRO
2	M	105	PHE
2	M	108	PRO
2	M	111	GLU
2	M	114	LEU
2	M	135	LEU
2	M	148	TRP
2	M	175	VAL
2	M	182	HIS
2	M	197	PHE
2	M	216	PHE
2	M	222	THR
2	M	226	VAL
2	M	227	SER
2	M	228	ARG
2	M	258	PHE
2	M	259	ASN
2	M	262	MET
2	M	267	ARG
2	M	270	ILE
2	M	271	TRP
2	M	272	MET
2	M	275	LEU
2	M	286	LEU
3	H	14	SER
3	H	15	LEU
3	H	29	TYR

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Mol	Chain	Res	Type
3	H	34	GLU
3	H	35	ASN
3	H	38	GLU
3	H	52	ASN
3	H	53	GLN
3	H	60	LYS
3	H	62	LYS
3	H	68	HIS
3	H	70	ARG
3	H	75	VAL
3	H	83	ARG
3	H	87	LEU
3	H	89	ARG
3	H	94	GLU
3	H	97	PRO
3	H	109	VAL
3	H	123	LEU
3	H	126	HIS
3	H	132	LYS
3	H	146	LYS
3	H	151	LEU
3	H	154	ARG
3	H	188	THR
3	H	193	MET
3	H	208	LEU
3	H	212	LEU
3	H	213	PHE
3	H	218	THR
3	H	219	ILE
3	H	220	LYS
3	H	228	LEU
3	H	247	LYS
3	H	248	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	L	173	HIS
1	L	211	HIS
2	M	11	GLN
3	H	141	HIS
3	H	204	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](#)

There are no monosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 10 ligands modelled in this entry, 1 is monoatomic - leaving 9 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
5	BPH	L	271	-	51,70,70	1.44	5 (9%)	52,101,101	2.06	10 (19%)
4	BCL	L	2	1	64,74,74	1.25	8 (12%)	78,115,115	1.89	19 (24%)
6	U10	L	272	-	41,41,63	1.77	10 (24%)	49,52,79	1.53	11 (22%)
5	BPH	M	5	-	51,70,70	1.46	5 (9%)	52,101,101	1.81	12 (23%)
6	U10	M	303	-	51,51,63	1.58	12 (23%)	61,64,79	1.59	12 (19%)
4	BCL	L	4	1	49,59,74	1.44	10 (20%)	60,97,115	2.42	20 (33%)
5	BPH	M	3	-	51,70,70	1.42	5 (9%)	52,101,101	1.71	12 (23%)
4	BCL	M	1	2	49,59,74	1.32	7 (14%)	60,97,115	2.17	22 (36%)
8	CRT	M	304	-	40,41,43	4.18	25 (62%)	48,50,54	2.92	19 (39%)

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	BPH	L	271	-	-	7/37/105/105	0/5/6/6
4	BCL	L	2	1	-	8/37/137/137	-
6	U10	L	272	-	-	8/37/61/87	0/1/1/1
5	BPH	M	5	-	2/2/18/22	4/37/105/105	0/5/6/6
6	U10	M	303	-	-	16/49/73/87	0/1/1/1
4	BCL	L	4	1	-	4/19/119/137	-
5	BPH	M	3	-	-	11/37/105/105	0/5/6/6
4	BCL	M	1	2	-	4/19/119/137	-
8	CRT	M	304	-	-	25/47/47/51	-

All (87) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
8	M	304	CRT	C6-C5	9.01	1.55	1.32
8	M	304	CRT	C26-C25	8.04	1.55	1.34
5	M	5	BPH	C3A-C2A	-7.80	1.47	1.54
8	M	304	CRT	C10-C11	7.77	1.54	1.34
8	M	304	CRT	C31-C30	7.76	1.54	1.34
8	M	304	CRT	C15-C16	7.60	1.54	1.34
5	L	271	BPH	C3A-C2A	-7.52	1.47	1.54
8	M	304	CRT	C35-C36	7.45	1.51	1.32
8	M	304	CRT	C21-C20	7.16	1.54	1.36
5	M	3	BPH	C2C-C3C	-6.92	1.48	1.54
8	M	304	CRT	C37-C38	-6.53	1.37	1.54
6	L	272	U10	C7-C8	-4.36	1.44	1.50
8	M	304	CRT	C25-C23	-4.27	1.36	1.45
8	M	304	CRT	C30-C28	-4.11	1.37	1.45
8	M	304	CRT	C11-C12	-4.02	1.37	1.45
4	L	2	BCL	O2D-CGD	-3.88	1.23	1.33
8	M	304	CRT	C31-C32	3.86	1.55	1.43
8	M	304	CRT	C15-C14	3.84	1.55	1.43
4	L	2	BCL	C1D-C2D	-3.84	1.37	1.45
8	M	304	CRT	C20-C19	3.78	1.55	1.43
5	L	271	BPH	O2D-CGD	-3.65	1.24	1.33
8	M	304	CRT	C21-C22	3.65	1.54	1.43
8	M	304	CRT	C26-C27	3.59	1.54	1.43
4	L	4	BCL	C1D-C2D	-3.57	1.38	1.45
4	L	4	BCL	O2D-CGD	-3.53	1.24	1.33
4	M	1	BCL	O2D-CGD	-3.52	1.24	1.33
5	M	3	BPH	C3A-C2A	-3.51	1.51	1.54
8	M	304	CRT	C16-C17	-3.51	1.38	1.45

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	L	272	U10	C6-C1	3.50	1.41	1.35
4	L	4	BCL	O2A-CGA	-3.44	1.23	1.33
8	M	304	CRT	C35-C33	3.43	1.53	1.45
5	M	5	BPH	O2D-CGD	-3.43	1.24	1.33
5	M	5	BPH	O2A-CGA	-3.36	1.23	1.33
5	M	3	BPH	O2D-CGD	-3.35	1.25	1.33
6	M	303	U10	C7-C8	-3.33	1.45	1.50
8	M	304	CRT	C6-C7	-3.30	1.38	1.45
8	M	304	CRT	C10-C9	3.29	1.53	1.43
5	M	3	BPH	O2A-CGA	-3.22	1.23	1.33
6	M	303	U10	C3-C2	-3.14	1.39	1.48
4	L	2	BCL	O2A-CGA	-3.13	1.24	1.33
6	L	272	U10	C23-C24	3.09	1.40	1.33
6	M	303	U10	C4-C5	-3.08	1.40	1.48
4	M	1	BCL	O2A-CGA	-3.08	1.24	1.33
6	M	303	U10	C6-C1	3.07	1.40	1.35
5	L	271	BPH	O2A-CGA	-2.99	1.24	1.33
8	M	304	CRT	C4-C5	2.95	1.54	1.50
6	L	272	U10	C18-C19	2.94	1.40	1.33
4	M	1	BCL	C1D-C2D	-2.92	1.39	1.45
6	L	272	U10	C3-C2	-2.91	1.40	1.48
6	L	272	U10	C4-C5	-2.81	1.40	1.48
6	L	272	U10	C28-C29	2.81	1.39	1.33
6	M	303	U10	C33-C34	2.77	1.39	1.33
4	M	1	BCL	C3B-CAB	-2.74	1.41	1.49
6	L	272	U10	C34-C33	2.72	1.47	1.28
4	L	2	BCL	C2-C3	2.71	1.39	1.33
4	L	2	BCL	C1D-ND	-2.69	1.34	1.37
4	L	4	BCL	C3B-CAB	-2.65	1.42	1.49
4	L	2	BCL	C3B-CAB	-2.64	1.42	1.49
6	M	303	U10	C18-C19	2.59	1.39	1.33
6	L	272	U10	C13-C14	2.57	1.39	1.33
4	M	1	BCL	C4B-NB	2.53	1.37	1.35
6	M	303	U10	C28-C29	2.53	1.39	1.33
6	M	303	U10	C23-C24	2.52	1.39	1.33
6	M	303	U10	C38-C39	2.50	1.39	1.33
6	M	303	U10	C44-C43	2.49	1.45	1.28
5	L	271	BPH	C2-C3	2.45	1.38	1.33
6	M	303	U10	C13-C14	2.45	1.38	1.33
4	L	4	BCL	C2-C3	2.40	1.39	1.32
6	L	272	U10	C8-C9	2.40	1.38	1.33
5	M	5	BPH	C2C-C3C	-2.35	1.52	1.54

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	L	4	BCL	C4D-ND	-2.33	1.34	1.37
4	L	2	BCL	CAA-C2A	-2.32	1.49	1.54
4	L	4	BCL	C4B-NB	2.31	1.37	1.35
5	M	5	BPH	C2-C3	2.31	1.38	1.33
8	M	304	CRT	C8-C7	2.29	1.55	1.50
8	M	304	CRT	C19-C17	2.26	1.38	1.35
5	L	271	BPH	C2C-C3C	-2.25	1.52	1.54
4	L	4	BCL	CMC-C2C	-2.17	1.48	1.53
5	M	3	BPH	C2-C3	2.16	1.38	1.33
6	M	303	U10	C8-C9	2.15	1.38	1.33
4	L	4	BCL	C1D-ND	-2.15	1.35	1.37
8	M	304	CRT	C9-C7	2.14	1.38	1.35
4	L	4	BCL	C3D-CAD	-2.08	1.38	1.45
4	M	1	BCL	C3D-CAD	-2.08	1.38	1.45
4	L	2	BCL	C3A-C2A	-2.05	1.48	1.54
8	M	304	CRT	C3-C1	2.02	1.57	1.52
4	M	1	BCL	C2-C3	2.02	1.38	1.32

All (137) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
8	M	304	CRT	C37-C36-C35	-8.93	106.03	126.00
5	L	271	BPH	O2D-CGD-CBD	8.04	121.19	111.00
4	L	4	BCL	C1C-NC-C4C	6.93	109.82	106.71
8	M	304	CRT	C36-C35-C33	-6.74	115.70	125.89
4	M	1	BCL	C1C-NC-C4C	6.52	109.64	106.71
8	M	304	CRT	C26-C27-C28	-6.24	118.41	127.31
8	M	304	CRT	C5-C6-C7	-6.16	116.58	125.89
5	L	271	BPH	O1D-CGD-CBD	-5.81	115.06	124.74
5	M	3	BPH	O2D-CGD-CBD	5.55	118.03	111.00
5	M	5	BPH	O2D-CGD-CBD	5.55	118.03	111.00
4	L	2	BCL	C1C-NC-C4C	5.54	109.20	106.71
4	M	1	BCL	O2D-CGD-CBD	5.06	120.25	111.27
4	L	4	BCL	O2D-CGD-CBD	4.99	120.14	111.27
4	L	4	BCL	C1D-ND-C4D	-4.98	102.80	106.33
8	M	304	CRT	C20-C19-C17	-4.76	120.51	127.31
5	M	5	BPH	O1D-CGD-CBD	-4.64	117.01	124.74
8	M	304	CRT	C21-C22-C23	-4.64	120.69	127.31
4	L	4	BCL	C4D-CHA-C1A	4.46	126.68	121.25
4	L	4	BCL	C4A-NA-C1A	4.43	108.70	106.71
4	L	4	BCL	O1D-CGD-CBD	-4.36	115.57	124.48
5	L	271	BPH	C3D-CAD-CBD	4.35	113.33	107.61

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
8	M	304	CRT	C8-C7-C9	-4.26	116.95	122.92
4	M	1	BCL	C4D-CHA-C1A	4.17	126.32	121.25
4	L	4	BCL	CMB-C2B-C1B	-4.15	122.09	128.46
4	L	4	BCL	CMB-C2B-C3B	4.14	132.43	124.68
8	M	304	CRT	C34-C33-C35	-4.05	111.70	118.08
4	M	1	BCL	C4D-C3D-CAD	-4.03	103.34	108.10
4	L	2	BCL	C4D-CHA-C1A	4.01	126.14	121.25
4	L	2	BCL	C4D-C3D-CAD	-3.98	103.41	108.10
4	L	2	BCL	CMB-C2B-C1B	-3.95	122.40	128.46
5	M	5	BPH	C3D-CAD-CBD	3.91	112.75	107.61
6	M	303	U10	C7-C6-C5	3.88	123.15	118.48
8	M	304	CRT	C38-C37-C36	3.83	133.23	113.56
4	L	2	BCL	CMB-C2B-C3B	3.83	131.84	124.68
4	L	2	BCL	C1D-ND-C4D	-3.81	103.63	106.33
4	L	4	BCL	C4D-C3D-CAD	-3.79	103.63	108.10
4	M	1	BCL	C1D-ND-C4D	-3.78	103.65	106.33
5	M	5	BPH	CMC-C2C-C1C	-3.69	106.29	114.38
5	L	271	BPH	CMB-C2B-C3B	3.68	131.56	124.68
5	M	5	BPH	CBA-CAA-C2A	3.67	124.52	113.81
4	L	2	BCL	CBC-CAC-C3C	3.65	121.60	113.47
4	L	4	BCL	C3D-C4D-ND	3.59	116.04	110.24
6	L	272	U10	C20-C19-C21	3.58	121.30	115.27
5	M	3	BPH	C3D-CAD-CBD	3.54	112.27	107.61
5	L	271	BPH	CMC-C2C-C1C	-3.50	106.70	114.38
6	M	303	U10	C30-C29-C28	-3.49	114.73	123.68
4	M	1	BCL	C3D-C4D-ND	3.48	115.87	110.24
4	L	2	BCL	C3D-C4D-ND	3.46	115.83	110.24
4	L	2	BCL	CBA-CAA-C2A	-3.35	103.97	113.86
4	M	1	BCL	C1-C2-C3	-3.32	121.37	126.75
4	L	2	BCL	C3D-C2D-C1D	3.32	110.36	105.83
4	L	2	BCL	CAD-C3D-C2D	3.31	156.79	140.80
4	L	4	BCL	CAA-CBA-CGA	3.31	122.93	113.25
8	M	304	CRT	C39-C38-C37	3.30	124.69	110.20
8	M	304	CRT	C9-C10-C11	-3.24	113.09	123.22
6	M	303	U10	C40-C39-C41	3.21	120.68	115.27
6	M	303	U10	C30-C29-C31	3.21	120.67	115.27
4	L	4	BCL	CAD-C3D-C2D	3.12	155.85	140.80
6	L	272	U10	C10-C9-C11	3.12	120.51	115.27
4	M	1	BCL	CAD-C3D-C2D	3.09	155.70	140.80
8	M	304	CRT	C15-C14-C12	-3.08	122.92	127.31
4	M	1	BCL	O1D-CGD-CBD	-3.02	118.31	124.48
8	M	304	CRT	C40-C38-C37	2.98	123.28	110.20

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	L	2	BCL	C4A-NA-C1A	2.94	108.03	106.71
4	L	2	BCL	C1-O2A-CGA	2.93	124.14	116.44
6	L	272	U10	C7-C8-C9	-2.92	121.94	126.79
4	M	1	BCL	C4A-NA-C1A	2.91	108.02	106.71
5	M	3	BPH	CAC-C3C-C4C	-2.91	107.23	113.73
5	M	3	BPH	CED-O2D-CGD	2.88	122.46	115.94
6	L	272	U10	C10-C9-C8	-2.87	116.30	123.68
8	M	304	CRT	C3-C1-C4	-2.87	106.45	110.86
5	L	271	BPH	CBA-CAA-C2A	2.81	122.03	113.81
6	L	272	U10	C30-C29-C31	2.80	119.98	115.27
5	M	3	BPH	C1C-C2C-C3C	2.77	105.48	102.84
5	L	271	BPH	C4A-C3A-C2A	2.76	105.46	102.84
4	L	2	BCL	OBD-CAD-C3D	-2.74	121.93	128.52
4	L	4	BCL	C2A-C3A-C4A	2.73	106.28	101.87
4	L	4	BCL	OBD-CAD-C3D	-2.72	121.98	128.52
6	M	303	U10	C40-C39-C38	-2.71	116.73	123.68
4	M	1	BCL	C3D-C2D-C1D	2.68	109.49	105.83
6	L	272	U10	C15-C14-C13	-2.68	116.80	123.68
5	L	271	BPH	C17-C16-C15	-2.68	100.92	113.24
4	L	4	BCL	CHA-C4D-ND	-2.62	127.01	132.50
6	L	272	U10	C20-C19-C18	-2.61	116.98	123.68
5	L	271	BPH	CAC-C3C-C4C	-2.60	107.93	113.73
4	M	1	BCL	OBD-CAD-C3D	-2.59	122.29	128.52
4	L	2	BCL	C3A-C2A-C1A	2.57	105.19	101.34
5	M	3	BPH	C1-O2A-CGA	2.57	123.18	116.44
5	L	271	BPH	C1-C2-C3	-2.56	121.62	126.04
5	M	3	BPH	CGD-CBD-CAD	-2.56	102.46	110.73
4	M	1	BCL	CHA-C4D-ND	-2.55	127.17	132.50
4	L	4	BCL	CAA-C2A-C3A	-2.54	105.82	112.78
5	M	3	BPH	CMB-C2B-C3B	2.52	129.39	124.68
4	L	4	BCL	CHD-C1D-ND	-2.51	122.15	124.45
4	L	2	BCL	CHA-C4D-ND	-2.48	127.30	132.50
5	M	5	BPH	CMB-C2B-C3B	2.46	129.28	124.68
5	M	3	BPH	C4-C3-C5	2.45	119.40	115.27
4	L	2	BCL	CAA-C2A-C3A	-2.45	106.07	112.78
5	M	3	BPH	CMA-C3A-C4A	-2.45	109.02	114.38
6	M	303	U10	C10-C9-C8	-2.43	117.45	123.68
4	L	4	BCL	C3D-C2D-C1D	2.42	109.14	105.83
4	M	1	BCL	CMB-C2B-C3B	2.41	129.18	124.68
4	L	4	BCL	C5-C3-C4	2.40	119.91	114.60
6	M	303	U10	C20-C19-C18	-2.36	117.62	123.68
8	M	304	CRT	C29-C28-C27	-2.35	119.63	122.92

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	M	3	BPH	C4A-C3A-C2A	2.35	105.07	102.84
6	M	303	U10	C1M-C1-C6	-2.34	120.58	124.40
4	M	1	BCL	C2C-C3C-C4C	2.34	104.84	101.34
8	M	304	CRT	C30-C28-C27	-2.33	115.36	118.94
4	M	1	BCL	CMB-C2B-C1B	-2.29	124.95	128.46
8	M	304	CRT	C18-C17-C16	-2.26	114.52	118.08
5	M	5	BPH	OBD-CAD-CBD	-2.23	122.55	125.82
6	L	272	U10	C15-C14-C16	2.20	118.97	115.27
6	L	272	U10	C30-C29-C28	-2.17	118.12	123.68
6	M	303	U10	C25-C24-C23	-2.15	118.17	123.68
6	M	303	U10	C25-C24-C26	2.14	118.88	115.27
4	M	1	BCL	C5-C3-C4	2.14	119.33	114.60
5	M	5	BPH	C1-O2A-CGA	2.13	122.04	116.44
6	M	303	U10	C15-C14-C13	-2.13	118.21	123.68
6	L	272	U10	C22-C21-C19	2.13	119.97	112.98
5	M	5	BPH	CBC-CAC-C3C	-2.12	109.50	113.77
5	M	3	BPH	O1D-CGD-CBD	-2.12	121.21	124.74
4	L	4	BCL	CHA-C1A-NA	-2.11	121.57	126.40
8	M	304	CRT	C10-C9-C7	2.11	130.32	127.31
4	L	2	BCL	CED-O2D-CGD	2.11	120.71	115.94
5	M	5	BPH	CMA-C3A-C4A	-2.10	109.78	114.38
6	L	272	U10	C1M-C1-C6	-2.09	120.99	124.40
4	M	1	BCL	CAC-C3C-C4C	-2.09	107.94	112.58
6	M	303	U10	C35-C34-C36	2.08	118.77	115.27
4	M	1	BCL	CAA-C2A-C3A	-2.08	107.08	112.78
8	M	304	CRT	C32-C31-C30	-2.08	116.73	123.22
4	M	1	BCL	C4B-C3B-CAB	2.06	131.10	127.13
4	M	1	BCL	CAA-CBA-CGA	2.05	119.24	113.25
5	M	5	BPH	CED-O2D-CGD	2.04	120.56	115.94
4	L	2	BCL	C2A-C1A-CHA	2.04	127.43	123.86
5	M	5	BPH	C4-C3-C5	2.04	118.70	115.27
4	M	1	BCL	CHA-C1A-NA	-2.02	121.77	126.40

All (2) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
5	M	5	BPH	C8
5	M	5	BPH	C13

All (87) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	M	1	BCL	CHA-CBD-CGD-O2D
5	L	271	BPH	C4C-C3C-CAC-CBC
5	M	3	BPH	C2C-C3C-CAC-CBC
6	L	272	U10	C18-C19-C21-C22
6	L	272	U10	C20-C19-C21-C22
6	L	272	U10	C19-C21-C22-C23
6	L	272	U10	C29-C31-C32-C33
6	M	303	U10	C23-C24-C26-C27
6	M	303	U10	C25-C24-C26-C27
6	M	303	U10	C33-C34-C36-C37
6	M	303	U10	C35-C34-C36-C37
6	M	303	U10	C39-C41-C42-C43
8	M	304	CRT	C15-C16-C17-C19
8	M	304	CRT	C19-C20-C21-C22
8	M	304	CRT	C21-C22-C23-C24
8	M	304	CRT	C23-C25-C26-C27
8	M	304	CRT	C26-C27-C28-C29
8	M	304	CRT	C29-C28-C30-C31
8	M	304	CRT	C28-C30-C31-C32
8	M	304	CRT	C31-C32-C33-C34
8	M	304	CRT	C34-C33-C35-C36
8	M	304	CRT	C36-C37-C38-C39
4	L	2	BCL	O1D-CGD-O2D-CED
4	L	2	BCL	CBD-CGD-O2D-CED
4	M	1	BCL	CBD-CGD-O2D-CED
5	M	3	BPH	CBD-CGD-O2D-CED
4	L	4	BCL	CBD-CGD-O2D-CED
5	M	3	BPH	O1D-CGD-O2D-CED
5	L	271	BPH	C3-C5-C6-C7
4	M	1	BCL	O1D-CGD-O2D-CED
6	M	303	U10	C40-C39-C41-C42
6	M	303	U10	C38-C39-C41-C42
6	L	272	U10	C9-C11-C12-C13
6	L	272	U10	C24-C26-C27-C28
8	M	304	CRT	C15-C16-C17-C18
4	L	4	BCL	O1D-CGD-O2D-CED
5	M	3	BPH	CBA-CGA-O2A-C1
6	M	303	U10	C9-C11-C12-C13
6	M	303	U10	C24-C26-C27-C28
5	M	3	BPH	O1A-CGA-O2A-C1
5	L	271	BPH	C15-C16-C17-C18
5	L	271	BPH	C10-C11-C12-C13
8	M	304	CRT	C18-C17-C19-C20

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Mol	Chain	Res	Type	Atoms
4	L	2	BCL	C3A-C2A-CAA-CBA
5	L	271	BPH	C2C-C3C-CAC-CBC
4	L	2	BCL	O1A-CGA-O2A-C1
4	L	2	BCL	C1A-C2A-CAA-CBA
6	M	303	U10	C19-C21-C22-C23
8	M	304	CRT	C2-C1-C4-C5
8	M	304	CRT	C3-C1-C4-C5
4	L	2	BCL	CBA-CGA-O2A-C1
8	M	304	CRT	C35-C36-C37-C38
5	M	3	BPH	C3-C5-C6-C7
4	M	1	BCL	CHA-CBD-CGD-O1D
8	M	304	CRT	C30-C31-C32-C33
4	L	2	BCL	C2C-C3C-CAC-CBC
5	M	3	BPH	C4C-C3C-CAC-CBC
6	M	303	U10	C5-C4-O4-C4M
4	L	4	BCL	C2-C1-O2A-CGA
5	L	271	BPH	C2-C1-O2A-CGA
8	M	304	CRT	C2-C1-O1-C1M
8	M	304	CRT	C3-C1-O1-C1M
5	L	271	BPH	CBD-CGD-O2D-CED
6	M	303	U10	C18-C19-C21-C22
5	M	5	BPH	C3A-C2A-CAA-CBA
8	M	304	CRT	C8-C7-C9-C10
8	M	304	CRT	C20-C21-C22-C23
6	L	272	U10	C2-C3-O3-C3M
8	M	304	CRT	C6-C7-C9-C10
8	M	304	CRT	C31-C32-C33-C35
8	M	304	CRT	C1-C4-C5-C6
8	M	304	CRT	C17-C19-C20-C21
6	M	303	U10	C29-C31-C32-C33
4	L	2	BCL	C1-C2-C3-C4
6	L	272	U10	C30-C29-C31-C32
6	M	303	U10	C15-C14-C16-C17
4	L	4	BCL	CAD-CBD-CGD-O2D
5	M	3	BPH	CAD-CBD-CGD-O2D
5	M	5	BPH	CAD-CBD-CGD-O2D
5	M	3	BPH	C5-C6-C7-C8
5	M	3	BPH	CAA-CBA-CGA-O2A
6	M	303	U10	C20-C19-C21-C22
5	M	5	BPH	C14-C13-C15-C16
5	M	3	BPH	CAA-CBA-CGA-O1A
5	M	5	BPH	O1D-CGD-O2D-CED

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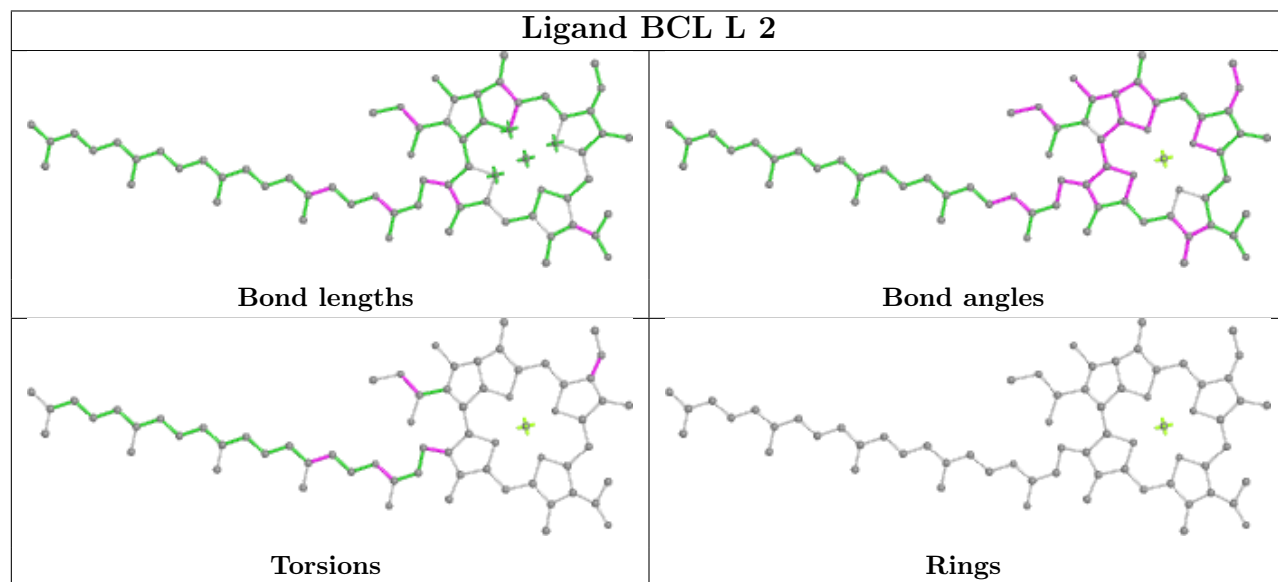
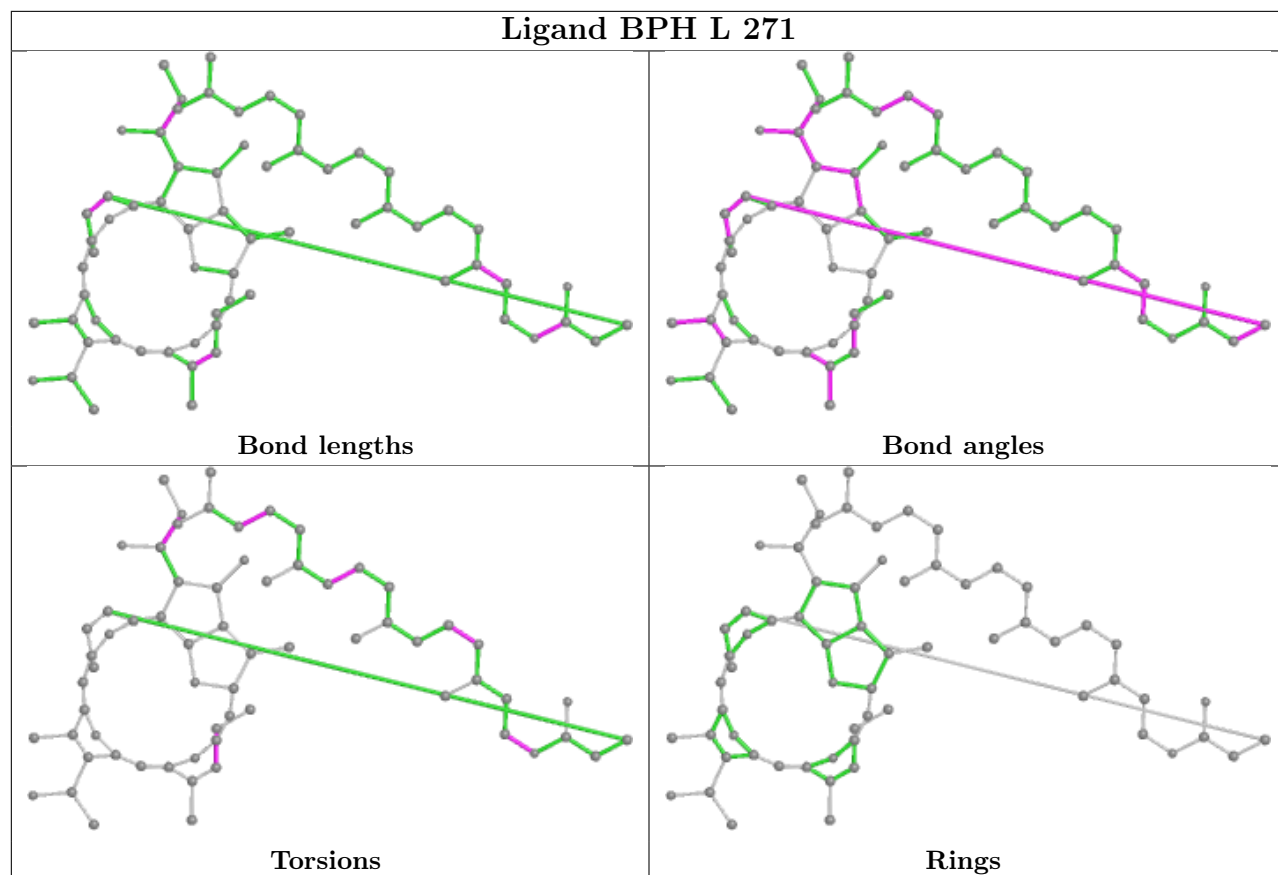
Mol	Chain	Res	Type	Atoms
8	M	304	CRT	C32-C33-C35-C36
6	M	303	U10	C3-C4-O4-C4M

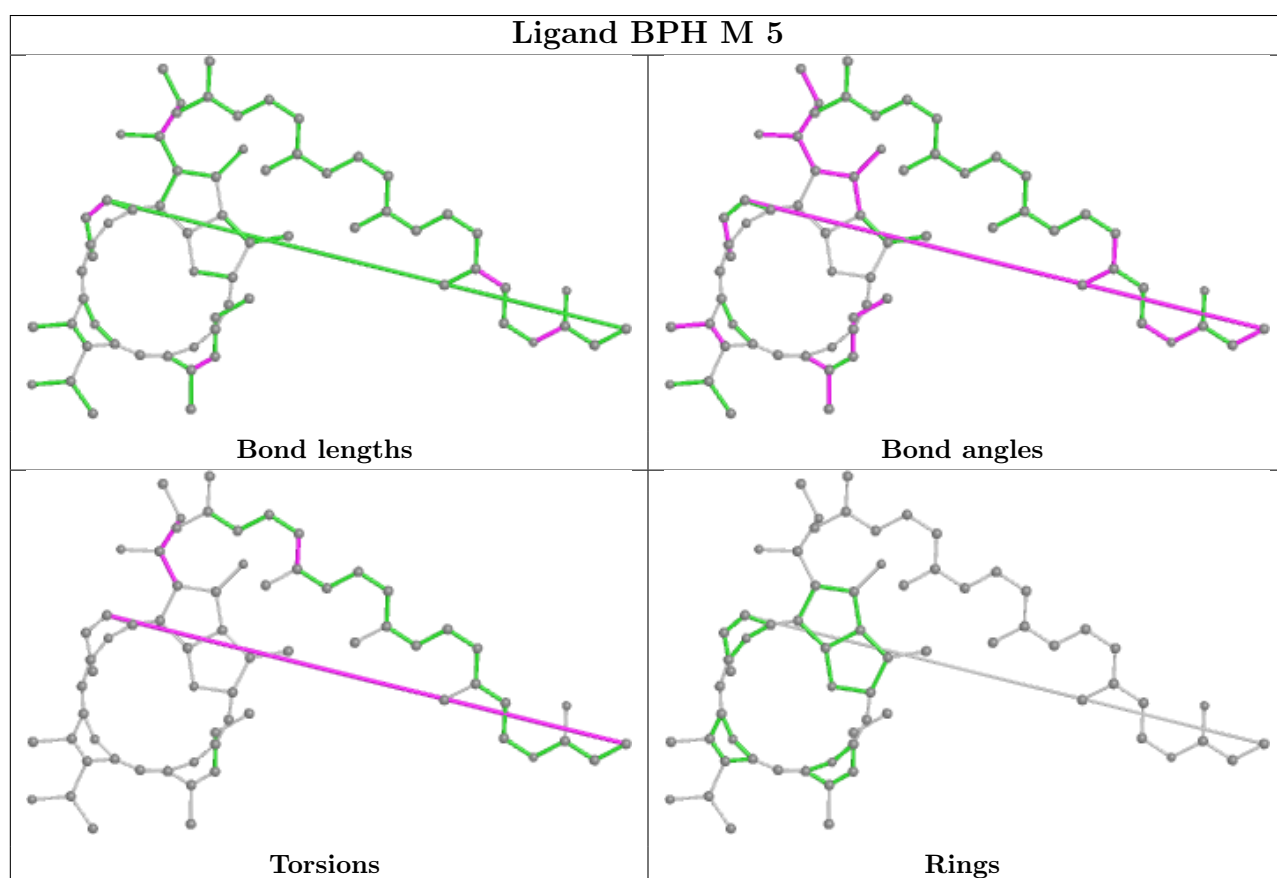
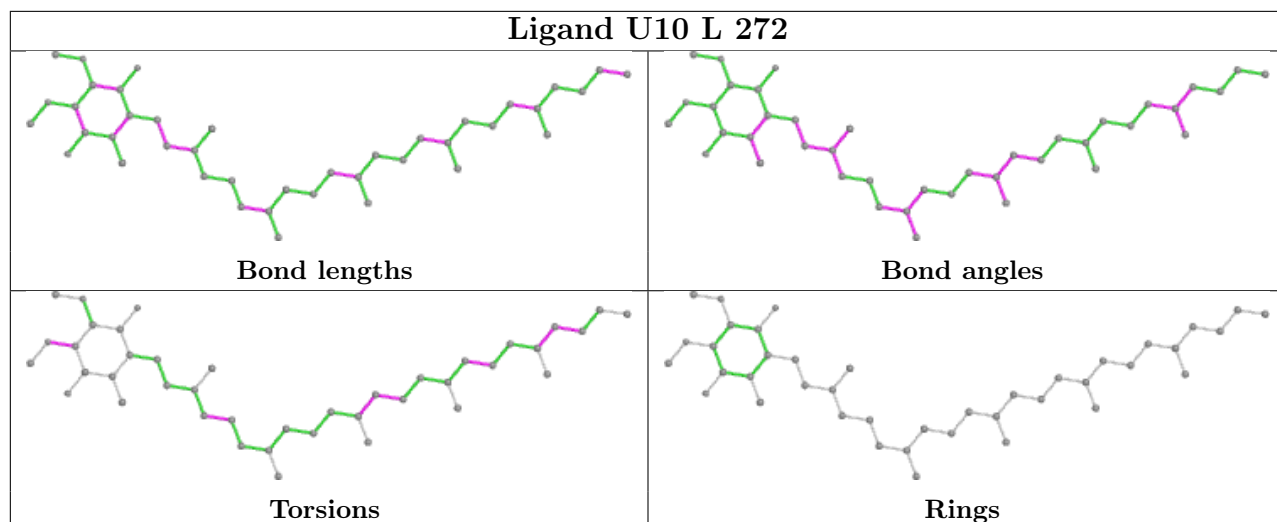
There are no ring outliers.

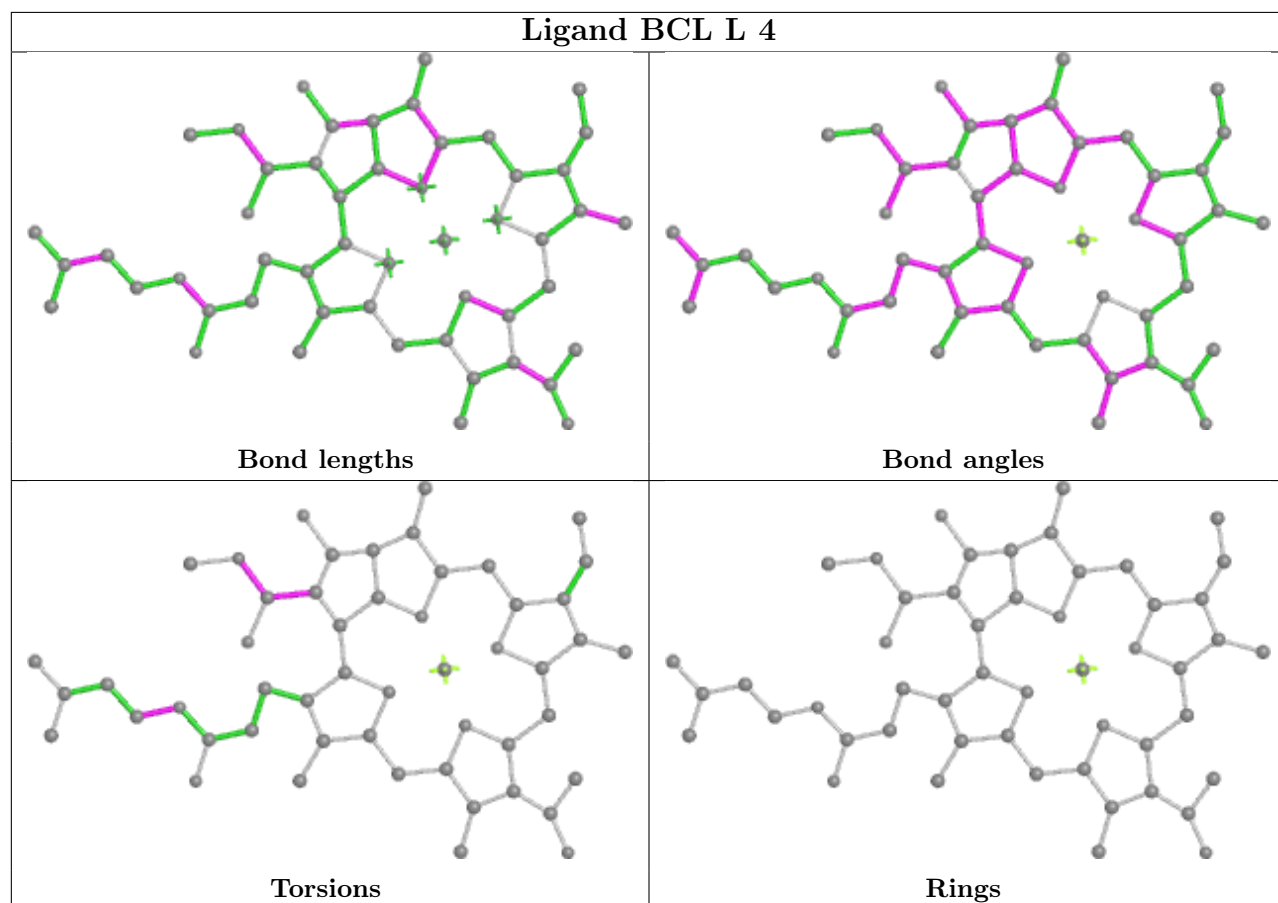
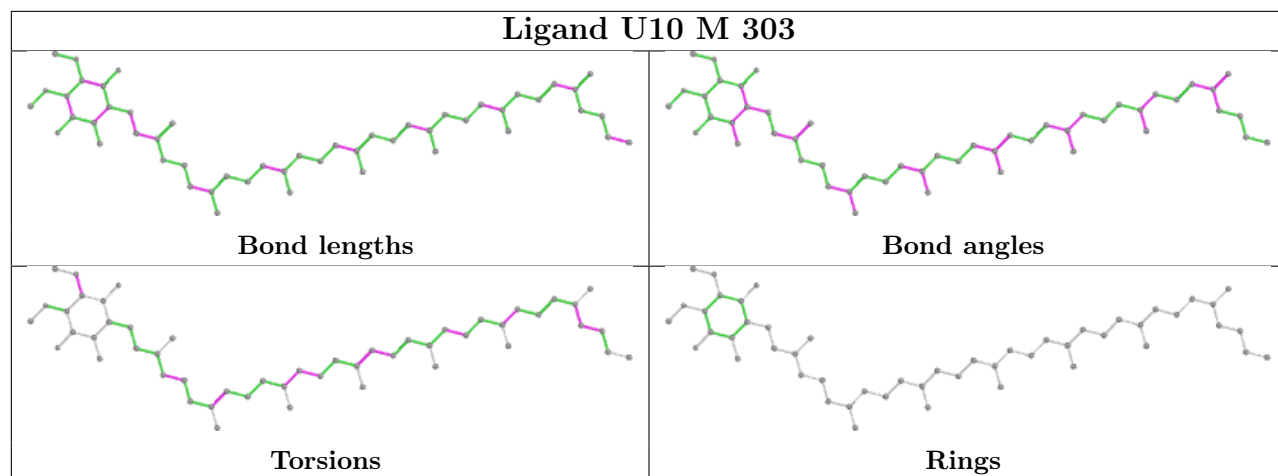
9 monomers are involved in 39 short contacts:

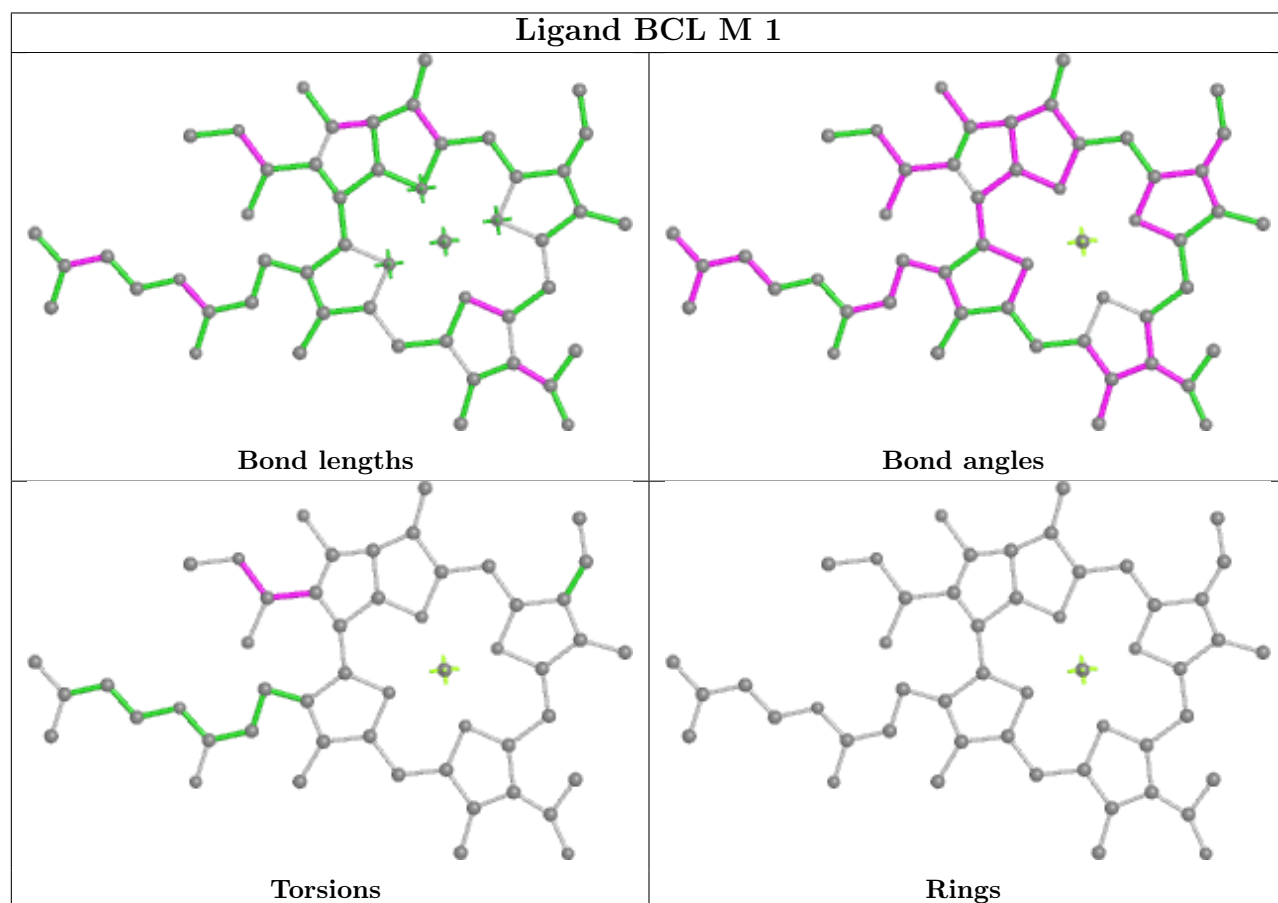
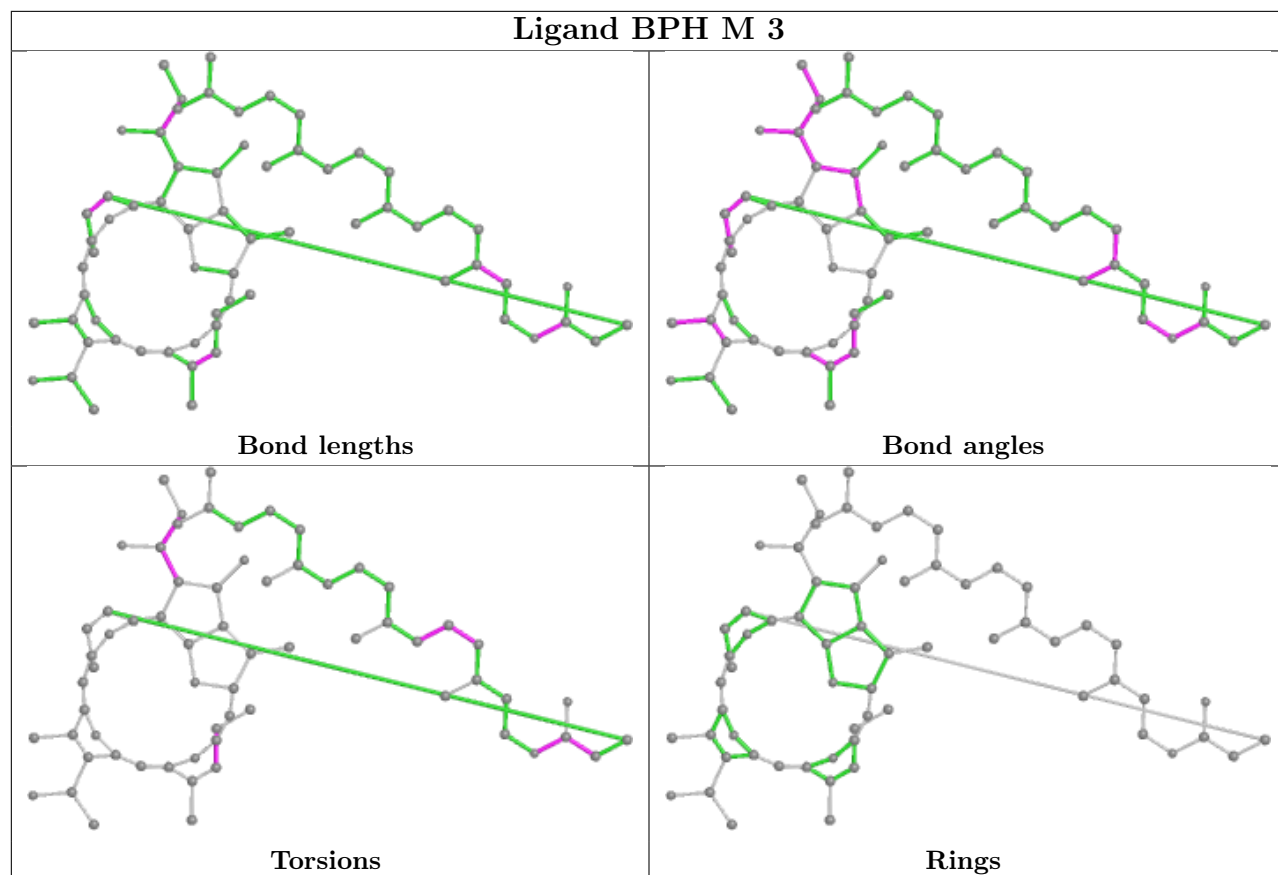
Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	L	271	BPH	7	0
4	L	2	BCL	8	0
6	L	272	U10	5	0
5	M	5	BPH	1	0
6	M	303	U10	5	0
4	L	4	BCL	6	0
5	M	3	BPH	6	0
4	M	1	BCL	8	0
8	M	304	CRT	2	0

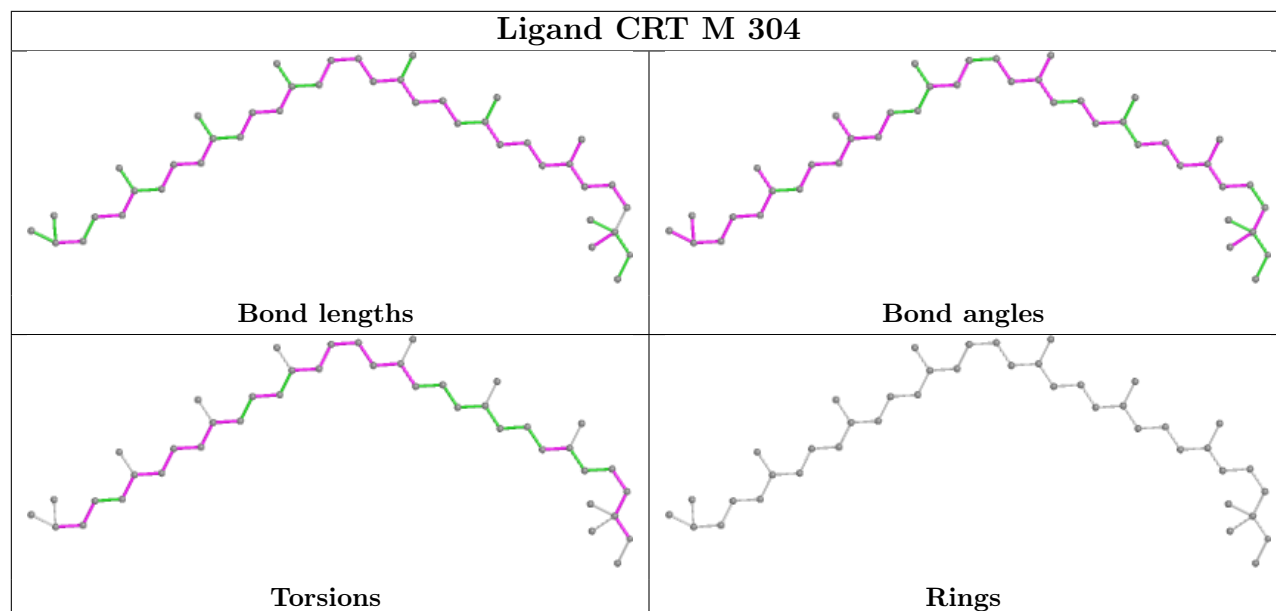
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. 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.