



Full wwPDB EM Validation Report ⓘ

Jul 9, 2025 – 01:30 PM JST

PDB ID : 9J7M / pdb_00009j7m
EMDB ID : EMD-61207
Title : Cryo-EM structure of TauT
Authors : Zhao, Y.; Xu, H.
Deposited on : 2024-08-19
Resolution : 2.82 Å(reported)

This is a Full wwPDB EM 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/EMValidationReportHelp>

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:

EMDB validation analysis : **FAILED**
Mogul : 1.8.5 (274361), CSD as541be (2020)
MolProbity : 4-5-2 with Phenix2.0rc1
buster-report : 1.1.7 (2018)
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
MapQ : **FAILED**
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.44

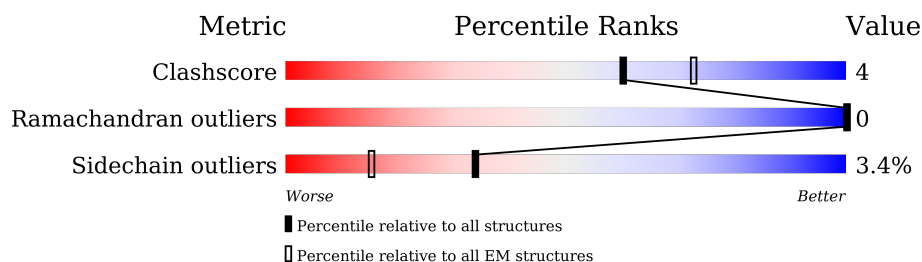
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 2.82 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)	EM structures (#Entries)
Clashscore	210492	15764
Ramachandran outliers	207382	16835
Sidechain outliers	206894	16415

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the 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 $\leq 5\%$.

Mol	Chain	Length	Quality of chain
1	A	620	

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	TAU	A	701	-	X	-	-

2 Entry composition [i](#)

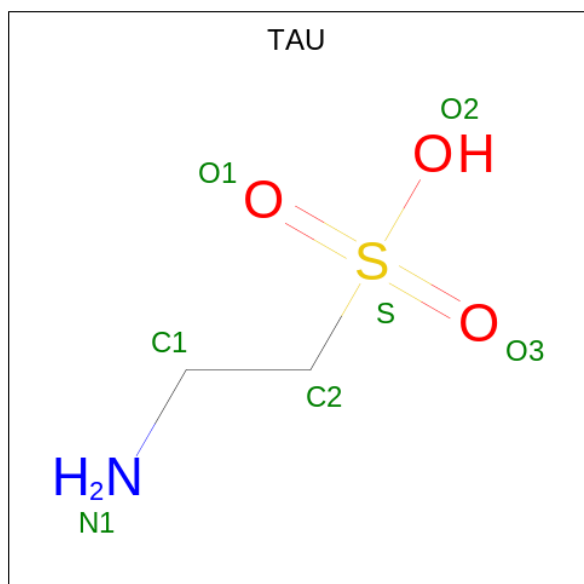
There are 8 unique types of molecules in this entry. The entry contains 4552 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, 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 Sodium- and chloride-dependent taurine transporter.

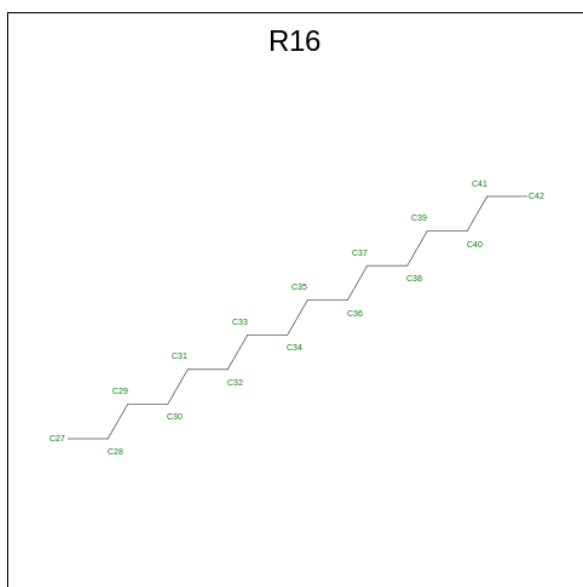
Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	543	4329	2899	663	735	32	0	0

- Molecule 2 is 2-AMINOETHANESULFONIC ACID (CCD ID: TAU) (formula: $C_2H_7NO_3S$) (labeled as "Ligand of Interest" by depositor).



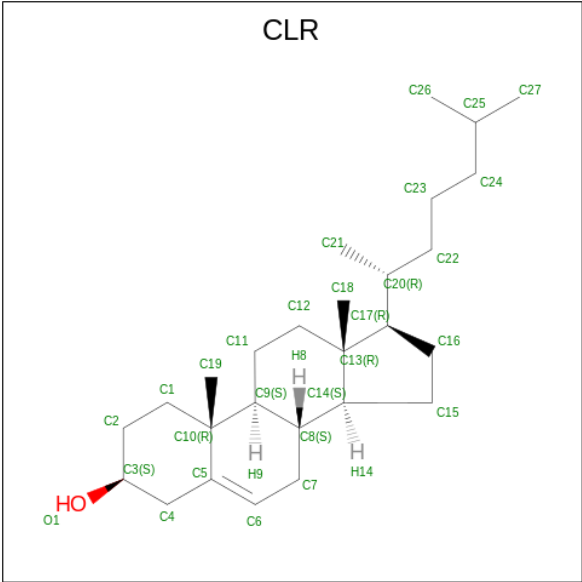
Mol	Chain	Residues	Atoms					AltConf
			Total	C	N	O	S	
2	A	1	7	2	1	3	1	0

- Molecule 3 is HEXADECANE (CCD ID: R16) (formula: $C_{16}H_{34}$) (labeled as "Ligand of Interest" by depositor).



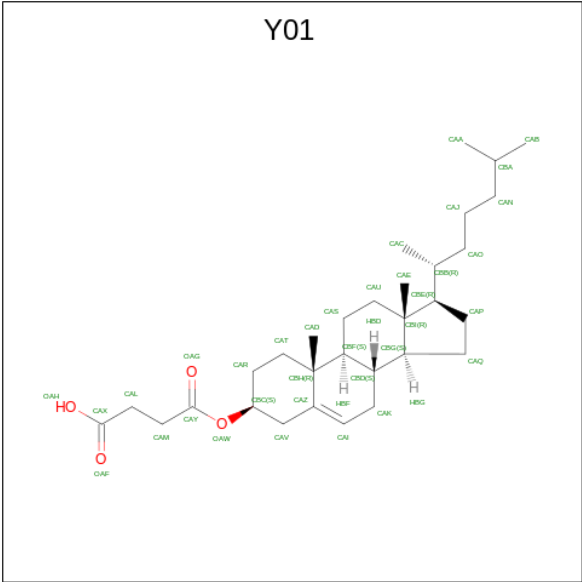
Mol	Chain	Residues	Atoms	AltConf
3	A	1	Total C 16 16	0
3	A	1	Total C 16 16	0
3	A	1	Total C 16 16	0
3	A	1	Total C 16 16	0
3	A	1	Total C 16 16	0

- Molecule 4 is CHOLESTEROL (CCD ID: CLR) (formula: $C_{27}H_{46}O$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms			AltConf
4	A	1	Total	C	O	0
			28	27	1	
4	A	1	Total	C	O	0
			28	27	1	
4	A	1	Total	C	O	0
			28	27	1	

- Molecule 5 is CHOLESTEROL HEMISUCCINATE (CCD ID: Y01) (formula: C₃₁H₅₀O₄) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms			AltConf
5	A	1	Total	C	O	0
			35	31	4	

- Molecule 6 is SODIUM ION (CCD ID: NA) (formula: Na) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms		AltConf
6	A	1	Total	Na	0
			1	1	

- Molecule 7 is CHLORIDE ION (CCD ID: CL) (formula: Cl) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms		AltConf
7	A	1	Total	Cl	0
			1	1	

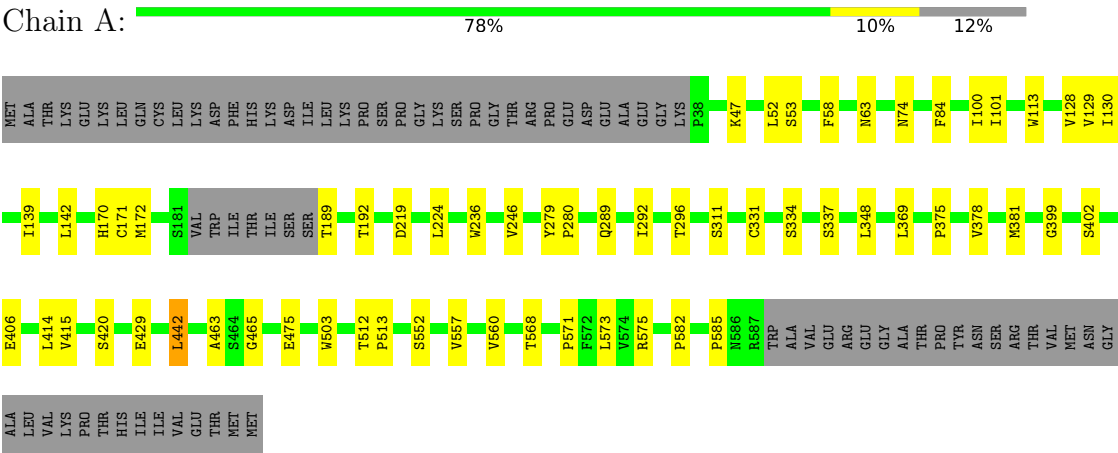
- Molecule 8 is water.

Mol	Chain	Residues	Atoms		AltConf
8	A	15	Total	O	0
			15	15	

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.

- Molecule 1: Sodium- and chloride-dependent taurine transporter



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	146014	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING ONLY	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	60	Depositor
Minimum defocus (nm)	1000	Depositor
Maximum defocus (nm)	2000	Depositor
Magnification	Not provided	
Image detector	GATAN K3 BIOQUANTUM (6k x 4k)	Depositor

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: CLR, Y01, NA, TAU, R16, CL

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	0.30	0/4471	0.42	0/6095

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	4329	0	4318	34	0
2	A	7	0	7	0	0
3	A	80	0	170	4	0
4	A	84	0	138	7	0
5	A	35	0	49	8	0
6	A	1	0	0	0	0
7	A	1	0	0	0	0
8	A	15	0	0	0	0
All	All	4552	0	4682	40	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 4.

All (40) close contacts within the same asymmetric unit are listed below, sorted by their clash

magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:331:CYS:SG	5:A:710:Y01:HAO1	1.94	1.07
1:A:331:CYS:SG	5:A:710:Y01:HAN2	2.17	0.84
1:A:331:CYS:HA	5:A:710:Y01:HAA2	1.77	0.67
1:A:334:SER:HB2	5:A:710:Y01:HAA3	1.78	0.65
1:A:296:THR:HG21	1:A:465:GLY:HA2	1.83	0.61
1:A:52:LEU:HD13	1:A:246:VAL:HG11	1.84	0.58
3:A:705:R16:H272	4:A:707:CLR:H151	1.83	0.58
1:A:142:LEU:HD21	1:A:399:GLY:HA3	1.87	0.55
1:A:582:PRO:HB2	1:A:585:PRO:HD3	1.89	0.54
1:A:74:ASN:OD1	1:A:289:GLN:NE2	2.44	0.50
1:A:568:THR:HB	1:A:575:ARG:HD3	1.95	0.49
1:A:402:SER:O	1:A:406:GLU:HG2	2.12	0.48
3:A:706:R16:H312	3:A:706:R16:H282	1.50	0.48
1:A:503:TRP:CZ3	4:A:707:CLR:H122	2.48	0.48
1:A:348:LEU:HD11	1:A:369:LEU:HD11	1.95	0.48
1:A:130:ILE:HG23	1:A:463:ALA:HA	1.97	0.47
5:A:710:Y01:HAD2	5:A:710:Y01:HAS2	1.63	0.46
1:A:331:CYS:HA	5:A:710:Y01:CAA	2.44	0.46
1:A:375:PRO:HA	1:A:378:VAL:HG22	1.99	0.45
1:A:334:SER:CB	5:A:710:Y01:HAA3	2.45	0.45
1:A:414:LEU:HD23	1:A:414:LEU:HA	1.85	0.45
4:A:709:CLR:H183	4:A:709:CLR:H20	1.89	0.44
1:A:113:TRP:CZ2	1:A:475:GLU:HG2	2.53	0.44
1:A:129:VAL:HG13	3:A:704:R16:H402	1.99	0.44
1:A:571:PRO:O	1:A:575:ARG:HG3	2.18	0.44
1:A:381:MET:HE2	1:A:381:MET:HB3	1.89	0.44
1:A:84:PHE:HB2	3:A:705:R16:H411	2.01	0.43
4:A:707:CLR:H193	4:A:707:CLR:H111	1.71	0.43
1:A:139:ILE:HG23	1:A:224:LEU:HD11	2.00	0.43
1:A:170:HIS:O	1:A:171:CYS:C	2.62	0.42
1:A:560:VAL:HG22	4:A:708:CLR:H213	2.01	0.42
1:A:63:ASN:ND2	1:A:337:SER:OG	2.52	0.42
1:A:331:CYS:SG	5:A:710:Y01:CAO	2.86	0.42
1:A:47:LYS:HB3	1:A:47:LYS:HE3	1.82	0.41
1:A:442:LEU:HG	4:A:709:CLR:H263	2.01	0.41
4:A:708:CLR:H211	4:A:708:CLR:H232	1.57	0.41
1:A:100:ILE:HD12	1:A:100:ILE:HA	1.94	0.41
1:A:236:TRP:CD1	1:A:429:GLU:HG2	2.55	0.40
1:A:512:THR:HB	1:A:513:PRO:HD3	2.03	0.40
1:A:279:TYR:HA	1:A:280:PRO:HD3	1.88	0.40

There are no symmetry-related clashes.

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 PDB entries followed by that with respect to all EM entries.

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	539/620 (87%)	523 (97%)	16 (3%)	0	100	100

There are no Ramachandran outliers to report.

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 PDB entries followed by that with respect to all EM entries.

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	466/533 (87%)	450 (97%)	16 (3%)	32	64

All (16) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	53	SER
1	A	58	PHE
1	A	101	ILE
1	A	128	VAL
1	A	172	MET
1	A	189	THR
1	A	192	THR
1	A	219	ASP
1	A	292	ILE
1	A	311	SER

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Mol	Chain	Res	Type
1	A	415	VAL
1	A	420	SER
1	A	442	LEU
1	A	552	SER
1	A	557	VAL
1	A	573	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	487	ASN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 12 ligands modelled in this entry, 2 are monoatomic - leaving 10 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
4	CLR	A	708	-	31,31,31	0.55	0	48,48,48	1.35	6 (12%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	R16	A	705	-	15,15,15	0.11	0	14,14,14	0.23	0
4	CLR	A	707	-	31,31,31	0.68	0	48,48,48	1.40	9 (18%)
5	Y01	A	710	-	38,38,38	1.46	7 (18%)	57,57,57	2.11	12 (21%)
2	TAU	A	701	-	6,6,6	1.81	3 (50%)	6,8,8	2.93	4 (66%)
3	R16	A	702	-	15,15,15	0.23	0	14,14,14	0.23	0
4	CLR	A	709	-	31,31,31	0.50	0	48,48,48	1.23	5 (10%)
3	R16	A	704	-	15,15,15	0.20	0	14,14,14	0.24	0
3	R16	A	703	-	15,15,15	0.23	0	14,14,14	0.20	0
3	R16	A	706	-	15,15,15	0.11	0	14,14,14	0.22	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	CLR	A	708	-	-	7/10/68/68	0/4/4/4
3	R16	A	705	-	-	0/13/13/13	-
4	CLR	A	707	-	-	5/10/68/68	0/4/4/4
5	Y01	A	710	-	-	7/19/77/77	0/4/4/4
2	TAU	A	701	-	-	3/4/4/4	-
3	R16	A	702	-	-	2/13/13/13	-
4	CLR	A	709	-	-	6/10/68/68	0/4/4/4
3	R16	A	704	-	-	3/13/13/13	-
3	R16	A	703	-	-	2/13/13/13	-
3	R16	A	706	-	-	9/13/13/13	-

All (10) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	701	TAU	C2-S	3.12	1.81	1.77
5	A	710	Y01	CAI-CAZ	3.11	1.39	1.33
5	A	710	Y01	CAL-CAX	2.89	1.57	1.50
5	A	710	Y01	CBB-CBE	2.84	1.59	1.54
5	A	710	Y01	CBH-CAZ	-2.40	1.48	1.52
5	A	710	Y01	CAK-CAI	-2.19	1.45	1.50
2	A	701	TAU	O1-S	2.11	1.51	1.45
5	A	710	Y01	CBD-CBG	-2.11	1.49	1.53
5	A	710	Y01	CAS-CBF	2.10	1.57	1.53

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	701	TAU	O3-S	2.05	1.51	1.45

All (36) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	A	710	Y01	OAW-CAY-CAM	6.12	124.69	111.50
5	A	710	Y01	CAD-CBH-CBF	-6.11	104.40	111.68
5	A	710	Y01	CAR-CBC-CAV	-4.58	104.15	110.99
5	A	710	Y01	CBF-CBH-CAZ	4.48	116.67	109.65
5	A	710	Y01	CAV-CAZ-CBH	4.44	122.31	116.42
2	A	701	TAU	O2-S-O3	-4.15	101.14	111.27
5	A	710	Y01	CAP-CBE-CBI	-3.88	99.16	103.84
4	A	708	CLR	C18-C13-C17	-3.77	104.67	111.71
2	A	701	TAU	O3-S-C2	3.66	111.33	106.92
4	A	707	CLR	C12-C11-C9	3.63	119.41	113.11
5	A	710	Y01	OAW-CAY-OAG	-3.63	114.93	123.70
5	A	710	Y01	CBH-CBF-CBD	-3.61	107.32	112.73
4	A	709	CLR	C18-C13-C17	-3.59	105.02	111.71
4	A	707	CLR	C18-C13-C17	-3.55	105.09	111.71
5	A	710	Y01	CAU-CAS-CBF	3.42	119.04	113.11
2	A	701	TAU	O2-S-C2	3.40	111.27	105.77
4	A	707	CLR	C10-C9-C8	-3.27	107.83	112.73
5	A	710	Y01	CBI-CBE-CBB	3.22	124.52	119.49
2	A	701	TAU	O1-S-C2	2.96	110.48	106.92
4	A	708	CLR	C16-C17-C20	2.91	116.66	112.15
4	A	709	CLR	C16-C17-C20	2.90	116.64	112.15
4	A	708	CLR	C12-C11-C9	2.88	118.10	113.11
4	A	708	CLR	C10-C9-C8	-2.76	108.59	112.73
4	A	708	CLR	C13-C14-C8	-2.68	110.41	114.38
4	A	708	CLR	C17-C13-C14	2.64	103.20	100.07
4	A	707	CLR	C16-C17-C20	2.43	115.91	112.15
4	A	709	CLR	C12-C11-C9	2.41	117.30	113.11
4	A	709	CLR	C17-C13-C14	2.30	102.79	100.07
4	A	709	CLR	C10-C9-C8	-2.19	109.44	112.73
5	A	710	Y01	CAT-CBH-CAZ	-2.15	104.81	108.75
4	A	707	CLR	C11-C9-C10	-2.13	110.28	113.08
4	A	707	CLR	C11-C12-C13	2.12	116.42	112.78
4	A	707	CLR	C21-C20-C22	-2.10	107.07	110.36
4	A	707	CLR	C13-C14-C8	-2.07	111.31	114.38
4	A	707	CLR	C1-C2-C3	-2.05	107.84	110.47
5	A	710	Y01	CBH-CAZ-CAI	-2.02	119.81	122.90

There are no chirality outliers.

All (44) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	701	TAU	C1-C2-S-O3
4	A	707	CLR	C13-C17-C20-C21
4	A	707	CLR	C16-C17-C20-C21
4	A	708	CLR	C13-C17-C20-C21
4	A	708	CLR	C16-C17-C20-C21
4	A	707	CLR	C13-C17-C20-C22
4	A	708	CLR	C13-C17-C20-C22
4	A	707	CLR	C16-C17-C20-C22
4	A	708	CLR	C16-C17-C20-C22
3	A	706	R16	C28-C29-C30-C31
5	A	710	Y01	CAC-CBB-CBE-CBI
4	A	707	CLR	C21-C20-C22-C23
5	A	710	Y01	CAN-CAJ-CAO-CBB
4	A	709	CLR	C17-C20-C22-C23
4	A	708	CLR	C20-C22-C23-C24
2	A	701	TAU	C1-C2-S-O2
5	A	710	Y01	CAO-CBB-CBE-CAP
4	A	708	CLR	C21-C20-C22-C23
3	A	706	R16	C30-C31-C32-C33
3	A	706	R16	C38-C39-C40-C41
3	A	704	R16	C37-C38-C39-C40
3	A	706	R16	C29-C30-C31-C32
5	A	710	Y01	CAO-CAJ-CAN-CBA
3	A	706	R16	C37-C38-C39-C40
4	A	709	CLR	C13-C17-C20-C22
3	A	704	R16	C35-C36-C37-C38
4	A	709	CLR	C16-C17-C20-C21
5	A	710	Y01	CAC-CBB-CBE-CAP
4	A	709	CLR	C13-C17-C20-C21
4	A	709	CLR	C16-C17-C20-C22
5	A	710	Y01	CAX-CAL-CAM-CAY
3	A	706	R16	C35-C36-C37-C38
3	A	706	R16	C31-C32-C33-C34
3	A	706	R16	C27-C28-C29-C30
4	A	708	CLR	C22-C23-C24-C25
3	A	706	R16	C39-C40-C41-C42
2	A	701	TAU	C1-C2-S-O1
5	A	710	Y01	CAO-CBB-CBE-CBI
3	A	703	R16	C35-C36-C37-C38
3	A	702	R16	C32-C33-C34-C35

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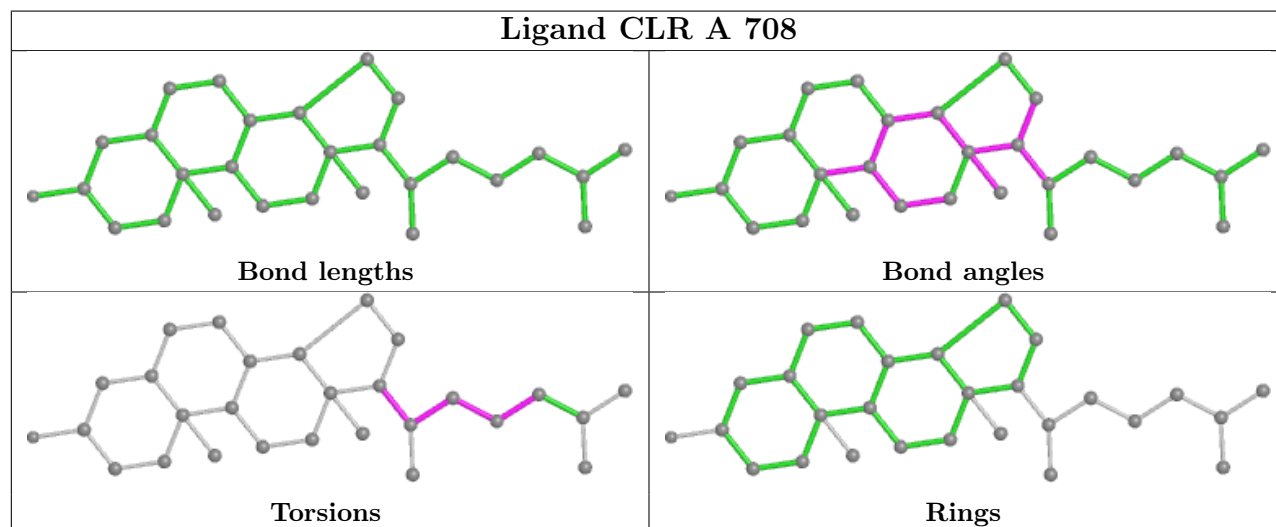
Mol	Chain	Res	Type	Atoms
3	A	702	R16	C29-C30-C31-C32
3	A	704	R16	C32-C33-C34-C35
3	A	703	R16	C37-C38-C39-C40
4	A	709	CLR	C21-C20-C22-C23

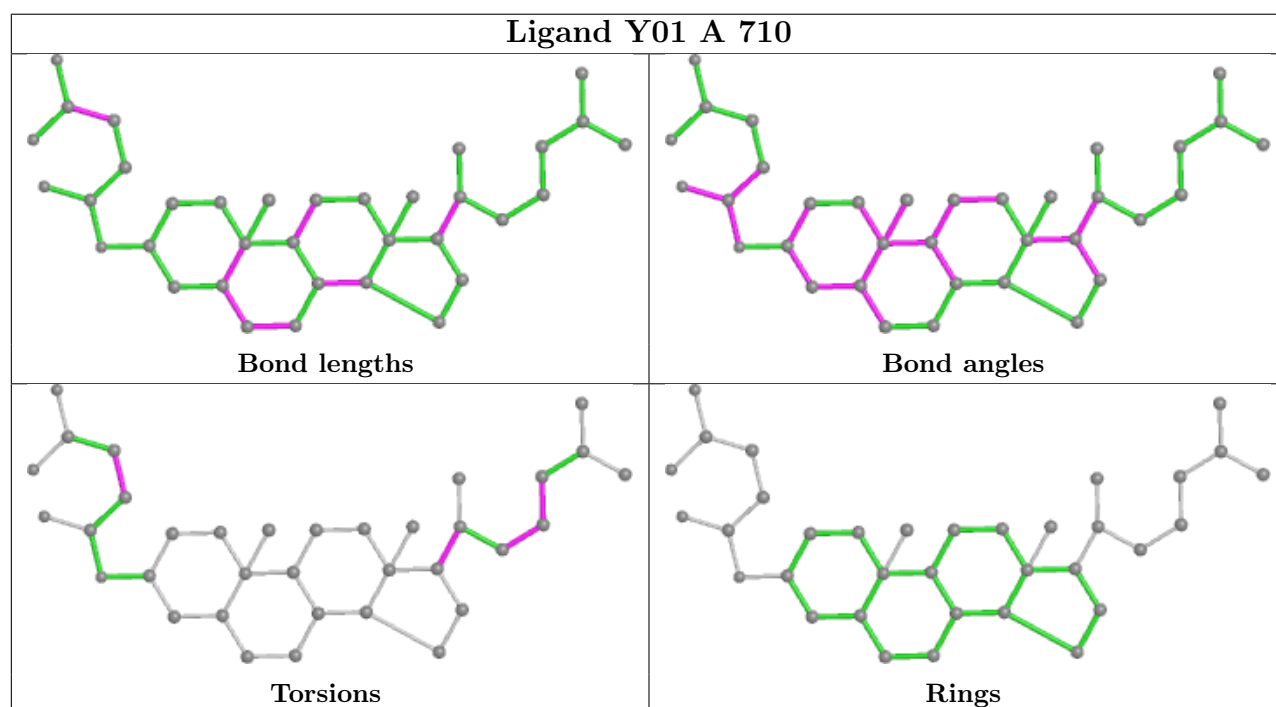
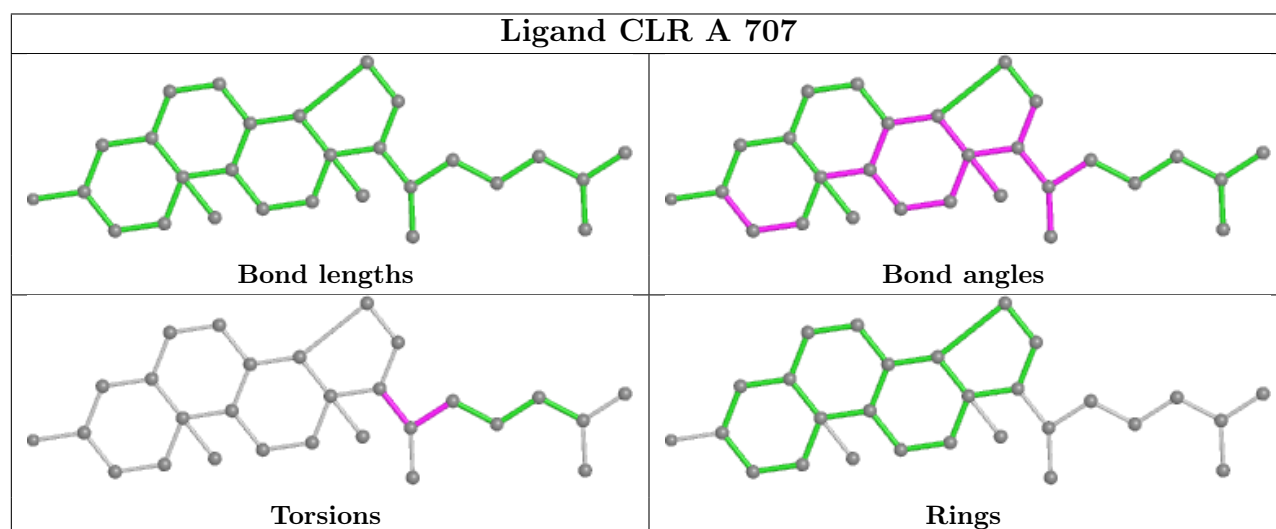
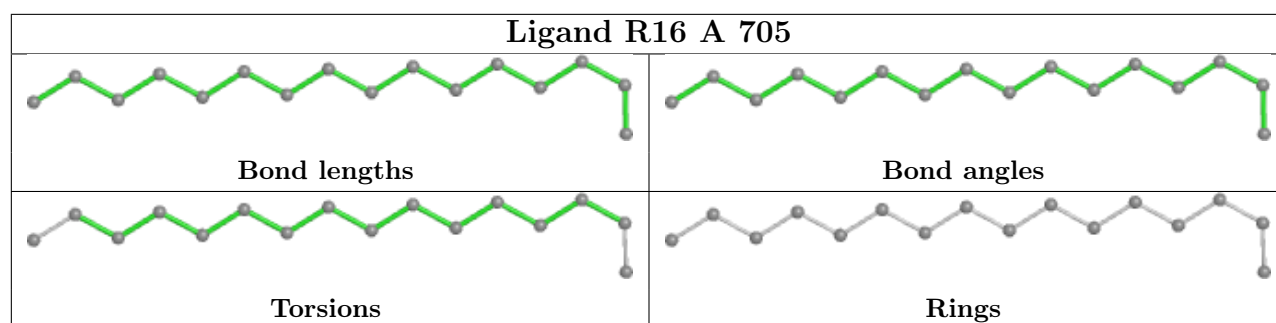
There are no ring outliers.

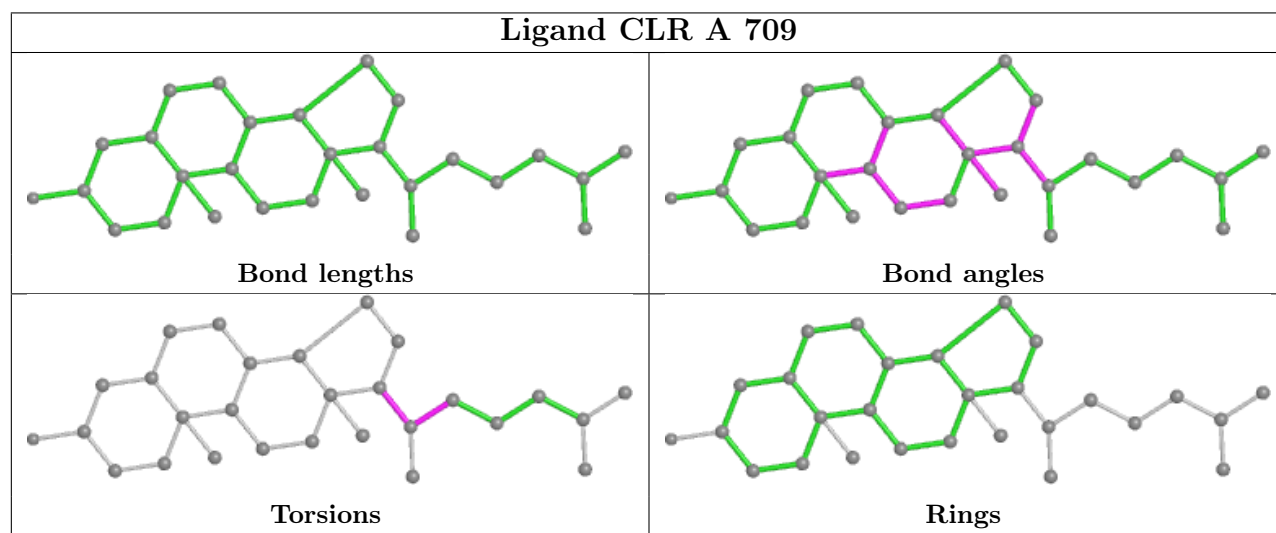
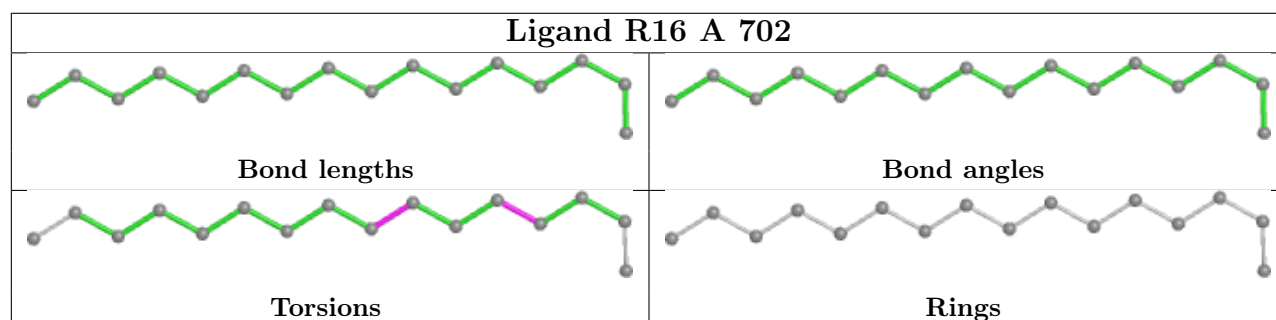
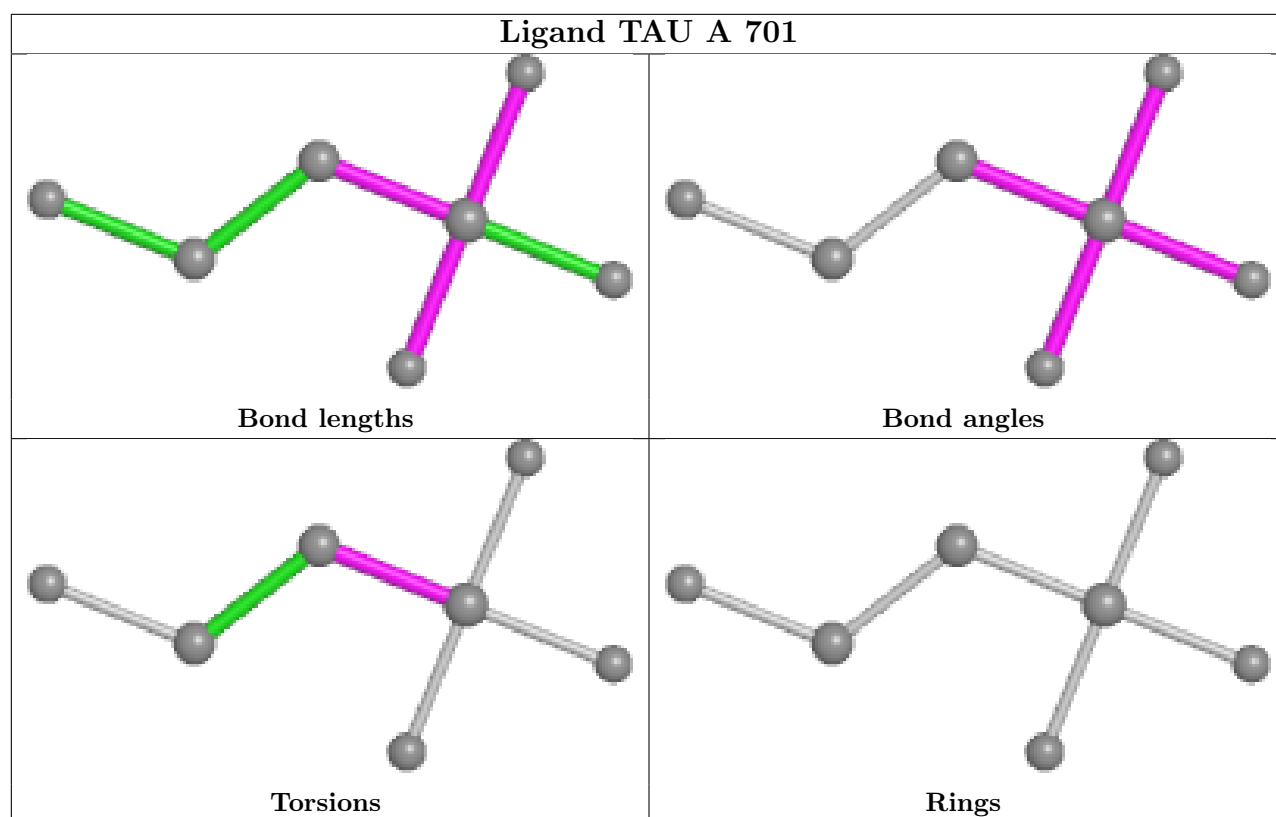
7 monomers are involved in 18 short contacts:

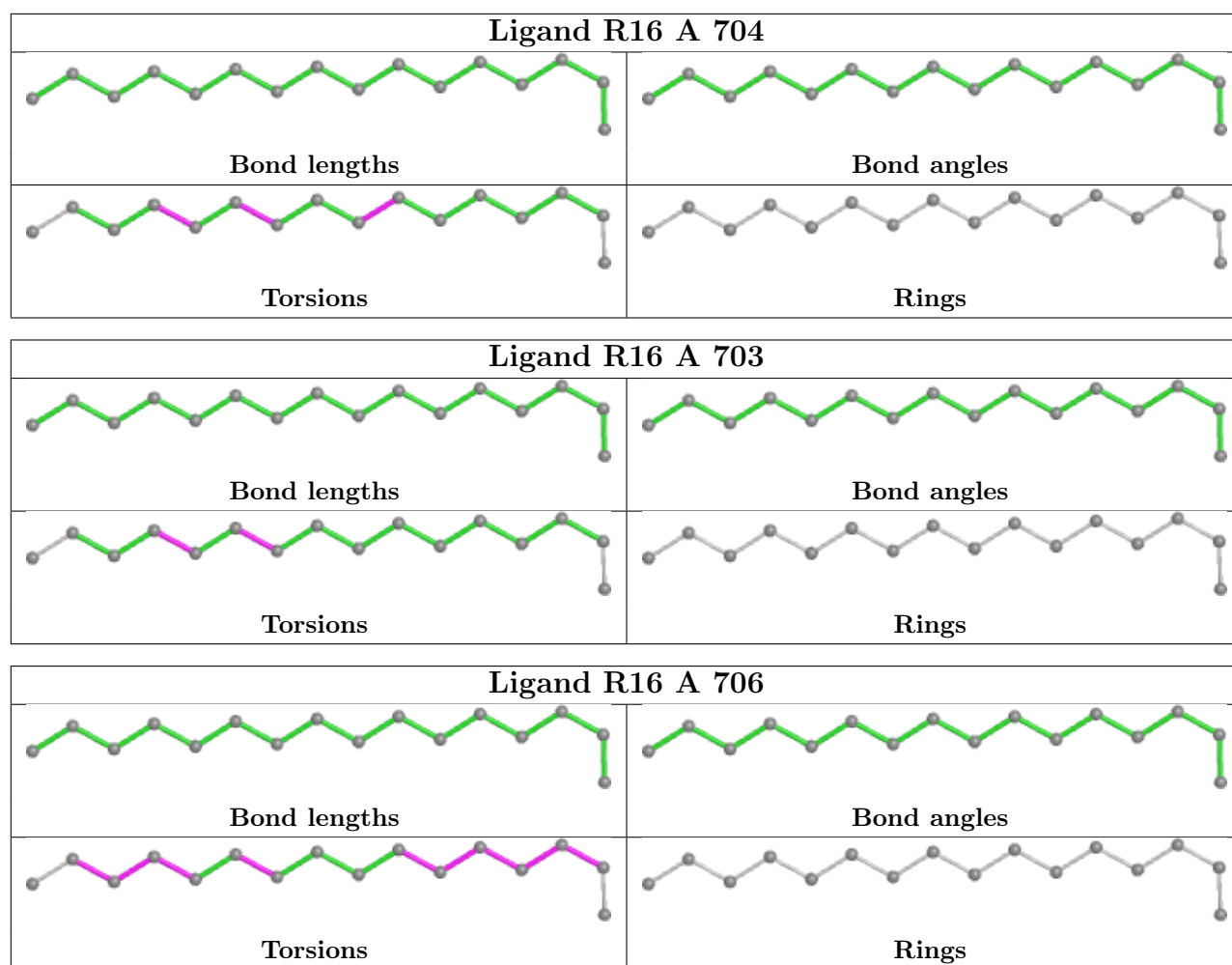
Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	708	CLR	2	0
3	A	705	R16	2	0
4	A	707	CLR	3	0
5	A	710	Y01	8	0
4	A	709	CLR	2	0
3	A	704	R16	1	0
3	A	706	R16	1	0

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.