



Full wwPDB EM Validation Report ⓘ

Jun 26, 2025 – 12:12 AM JST

PDB ID : 9J7N / pdb_00009j7n
EMDB ID : EMD-61208
Title : Cryo-EM structure of TauT
Authors : Zhao, Y.; Xu, H.
Deposited on : 2024-08-19
Resolution : 3.14 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

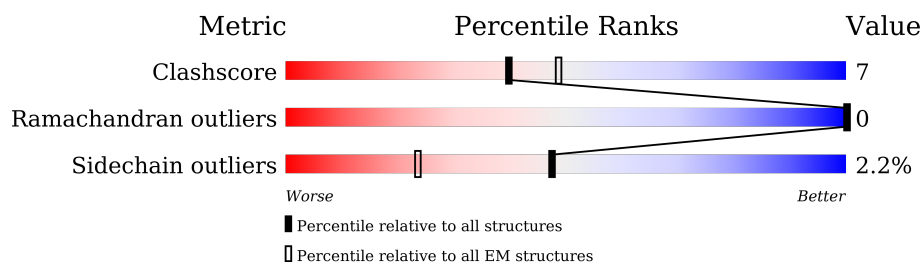
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 3.14 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	

2 Entry composition [i](#)

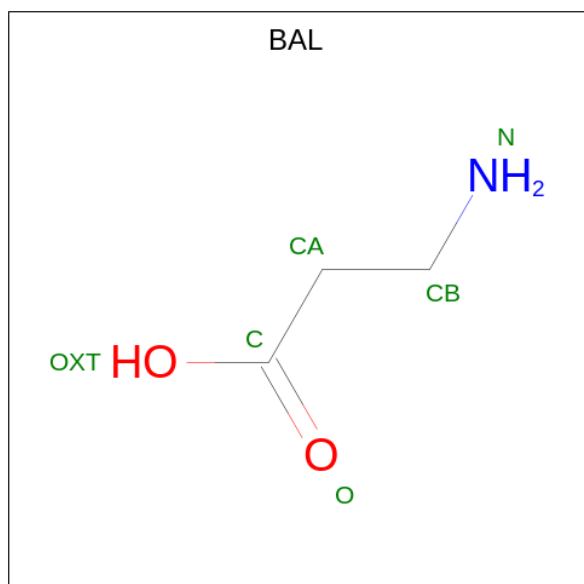
There are 6 unique types of molecules in this entry. The entry contains 4517 atoms, of which 0 are hydrogens and 0 are deuteriums.

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.

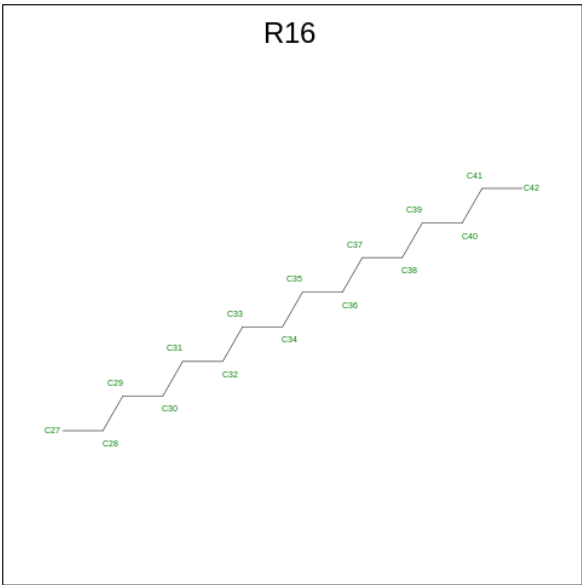
Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	543	4321	2896	658	735	32	0	0

- Molecule 2 is BETA-ALANINE (CCD ID: BAL) (formula: $C_3H_7NO_2$) (labeled as "Ligand of Interest" by depositor).



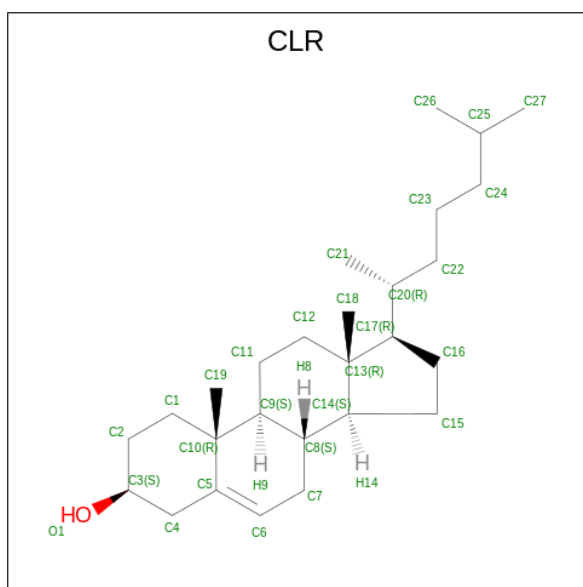
Mol	Chain	Residues	Atoms				AltConf
			Total	C	N	O	
2	A	1	6	3	1	2	0

- 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
3	A	1	Total C 16 16	0
3	A	1	Total C 16 16	0

- Molecule 4 is CHOLESTEROL (CCD ID: CLR) (formula: C₂₇H₄₆O) (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	

- Molecule 5 is CHLORIDE ION (CCD ID: CL) (formula: Cl) (labeled as "Ligand of Interest" by depositor).

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


- Molecule 6 is water.

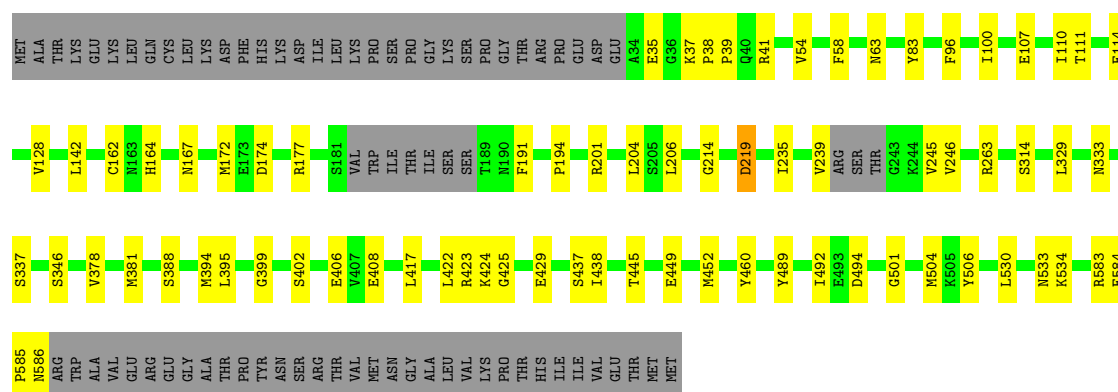
Mol	Chain	Residues	Atoms		AltConf
6	A	5	Total	O	0
			5	5	

3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

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

Chain A: 



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	66563	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: CL, R16, CLR, BAL

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	0.36	0/4462	0.50	0/6082

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	4321	0	4305	53	0
2	A	6	0	6	0	0
3	A	128	0	272	6	0
4	A	56	0	92	10	0
5	A	1	0	0	1	0
6	A	5	0	0	1	0
All	All	4517	0	4675	63	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 7.

All (63) 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:172:MET:HE3	1:A:177:ARG:HA	1.69	0.73
1:A:142:LEU:HD21	1:A:399:GLY:HA3	1.68	0.73
1:A:174:ASP:HA	1:A:177:ARG:HG3	1.82	0.61
3:A:706:R16:H272	3:A:707:R16:H272	1.82	0.61
1:A:162:CYS:HB3	1:A:194:PRO:HG3	1.85	0.58
3:A:707:R16:H351	4:A:711:CLR:H72	1.86	0.57
1:A:83:TYR:OH	5:A:712:CL:CL	2.58	0.56
1:A:35:GLU:HG3	1:A:37:LYS:HG2	1.89	0.55
1:A:460:TYR:CD2	1:A:530:LEU:HD13	2.42	0.54
1:A:162:CYS:SG	1:A:162:CYS:O	2.66	0.54
1:A:63:ASN:HD22	1:A:337:SER:HB2	1.72	0.54
1:A:110:ILE:HD12	1:A:128:VAL:HG21	1.89	0.54
1:A:107:GLU:HG2	1:A:111:THR:HB	1.90	0.53
1:A:219:ASP:OD1	1:A:219:ASP:N	2.40	0.53
1:A:263:ARG:O	1:A:263:ARG:HD3	2.08	0.53
1:A:460:TYR:HD2	1:A:530:LEU:HD13	1.74	0.53
1:A:177:ARG:HH11	1:A:191:PHE:HB2	1.74	0.52
3:A:706:R16:H341	3:A:707:R16:H312	1.91	0.51
1:A:164:HIS:H	1:A:167:ASN:HD22	1.57	0.50
1:A:424:LYS:CG	1:A:425:GLY:H	2.25	0.49
3:A:707:R16:H362	4:A:711:CLR:H152	1.95	0.49
1:A:423:ARG:O	1:A:424:LYS:HG2	2.13	0.49
1:A:54:VAL:HG11	1:A:329:LEU:HD13	1.95	0.48
1:A:445:THR:CG2	4:A:710:CLR:H121	2.44	0.48
1:A:422:LEU:HD11	3:A:706:R16:H423	1.96	0.48
1:A:408:GLU:HA	1:A:408:GLU:OE1	2.14	0.48
1:A:58:PHE:HZ	1:A:329:LEU:HB3	1.79	0.47
1:A:584:GLU:HB3	1:A:585:PRO:HD3	1.96	0.47
1:A:58:PHE:CE1	1:A:333:ASN:HB2	2.50	0.47
1:A:533:ASN:O	1:A:534:LYS:HG2	2.14	0.47
1:A:583:ARG:HD3	1:A:583:ARG:HA	1.73	0.46
1:A:100:ILE:HG12	1:A:492:ILE:HG12	1.97	0.46
1:A:378:VAL:HG11	1:A:388:SER:HB2	1.99	0.45
1:A:423:ARG:HD2	1:A:423:ARG:HA	1.80	0.44
1:A:206:LEU:HD21	1:A:452:MET:HB3	1.98	0.44
1:A:63:ASN:ND2	1:A:333:ASN:OD1	2.44	0.44
1:A:204:LEU:HD11	1:A:452:MET:HE3	1.99	0.44
1:A:263:ARG:HB2	1:A:381:MET:HE3	2.00	0.44
1:A:394:MET:HG3	1:A:395:LEU:N	2.33	0.44
1:A:445:THR:HG22	4:A:710:CLR:H121	1.99	0.44
1:A:214:GLY:HA3	1:A:449:GLU:HB2	1.99	0.44
1:A:58:PHE:HE1	1:A:333:ASN:HB2	1.83	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:38:PRO:N	1:A:39:PRO:HD2	2.33	0.43
1:A:58:PHE:CD1	1:A:58:PHE:C	2.97	0.43
1:A:489:TYR:OH	1:A:501:GLY:O	2.23	0.43
4:A:710:CLR:C19	4:A:710:CLR:H182	2.49	0.43
4:A:711:CLR:H193	4:A:711:CLR:H111	1.67	0.43
1:A:406:GLU:HG3	6:A:801:HOH:O	2.19	0.42
1:A:417:LEU:HD23	1:A:417:LEU:HA	1.90	0.42
4:A:711:CLR:H213	4:A:711:CLR:H231	1.37	0.42
1:A:402:SER:O	1:A:406:GLU:HG2	2.18	0.42
1:A:41:ARG:HD2	1:A:314:SER:OG	2.18	0.42
1:A:96:PHE:CD2	1:A:504:MET:HE3	2.55	0.42
1:A:174:ASP:N	1:A:174:ASP:OD1	2.52	0.42
1:A:201:ARG:HE	1:A:201:ARG:HB3	1.76	0.42
4:A:710:CLR:H231	4:A:710:CLR:H272	1.50	0.41
4:A:710:CLR:H22	4:A:710:CLR:H192	1.80	0.41
1:A:429:GLU:H	1:A:429:GLU:HG3	1.66	0.41
1:A:506:TYR:HD2	3:A:709:R16:H372	1.86	0.41
1:A:206:LEU:HD23	1:A:206:LEU:HA	1.87	0.41
1:A:172:MET:HG2	1:A:177:ARG:HG2	2.02	0.41
1:A:438:ILE:HD13	1:A:438:ILE:HA	1.88	0.40
4:A:710:CLR:H191	4:A:710:CLR:H8	1.67	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 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	537/620 (87%)	513 (96%)	24 (4%)	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	464/533 (87%)	454 (98%)	10 (2%)	47 69

All (10) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	114	GLU
1	A	219	ASP
1	A	235	ILE
1	A	239	VAL
1	A	245	VAL
1	A	246	VAL
1	A	346	SER
1	A	437	SER
1	A	494	ASP
1	A	586	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	63	ASN
1	A	161	HIS
1	A	167	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

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

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 12 ligands modelled in this entry, 1 is monoatomic - leaving 11 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
3	R16	A	706	-	15,15,15	0.10	0	14,14,14	0.19	0
3	R16	A	705	-	15,15,15	0.10	0	14,14,14	0.18	0
3	R16	A	703	-	15,15,15	0.09	0	14,14,14	0.19	0
4	CLR	A	710	-	31,31,31	1.22	3 (9%)	48,48,48	2.01	11 (22%)
3	R16	A	708	-	15,15,15	0.09	0	14,14,14	0.16	0
3	R16	A	704	-	15,15,15	0.10	0	14,14,14	0.17	0
4	CLR	A	711	-	31,31,31	1.51	8 (25%)	48,48,48	1.72	11 (22%)
3	R16	A	709	-	15,15,15	0.10	0	14,14,14	0.18	0
3	R16	A	707	-	15,15,15	0.10	0	14,14,14	0.18	0
2	BAL	A	701	-	5,5,5	0.95	0	5,5,5	1.56	1 (20%)
3	R16	A	702	-	15,15,15	0.09	0	14,14,14	0.18	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
3	R16	A	706	-	-	4/13/13/13	-
3	R16	A	705	-	-	2/13/13/13	-
3	R16	A	703	-	-	2/13/13/13	-
4	CLR	A	710	-	-	10/10/68/68	0/4/4/4
3	R16	A	708	-	-	1/13/13/13	-
3	R16	A	704	-	-	5/13/13/13	-
4	CLR	A	711	-	-	7/10/68/68	0/4/4/4

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	R16	A	709	-	-	7/13/13/13	-
3	R16	A	707	-	-	6/13/13/13	-
2	BAL	A	701	-	-	2/3/3/3	-
3	R16	A	702	-	-	2/13/13/13	-

All (11) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	710	CLR	C12-C13	-3.09	1.48	1.54
4	A	711	CLR	C13-C14	-2.66	1.49	1.55
4	A	711	CLR	C12-C13	-2.65	1.49	1.54
4	A	711	CLR	C8-C14	-2.62	1.48	1.53
4	A	710	CLR	C10-C5	-2.44	1.48	1.52
4	A	710	CLR	C10-C9	-2.32	1.52	1.56
4	A	711	CLR	C20-C17	-2.30	1.50	1.54
4	A	711	CLR	C10-C5	-2.20	1.48	1.52
4	A	711	CLR	C4-C5	-2.16	1.46	1.51
4	A	711	CLR	C13-C17	-2.09	1.51	1.55
4	A	711	CLR	C16-C17	-2.07	1.50	1.54

All (23) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	710	CLR	C17-C13-C14	5.79	106.93	100.07
4	A	710	CLR	C10-C9-C8	-5.38	104.66	112.73
4	A	710	CLR	C18-C13-C17	-4.65	103.05	111.71
4	A	710	CLR	C13-C14-C8	-3.85	108.69	114.38
4	A	711	CLR	C18-C13-C17	-3.74	104.74	111.71
4	A	711	CLR	C13-C14-C8	-3.71	108.89	114.38
4	A	711	CLR	C8-C7-C6	-3.69	107.43	112.73
4	A	711	CLR	C16-C17-C20	3.45	117.48	112.15
4	A	711	CLR	C10-C9-C8	-3.25	107.86	112.73
4	A	710	CLR	C13-C17-C20	-3.06	114.69	119.49
4	A	711	CLR	C21-C20-C22	-2.97	105.70	110.36
4	A	710	CLR	C3-C4-C5	2.91	116.96	112.03
4	A	711	CLR	C21-C20-C17	-2.89	108.49	112.92
4	A	711	CLR	C16-C17-C13	-2.87	100.38	103.84
4	A	710	CLR	C1-C2-C3	-2.65	107.07	110.47
4	A	711	CLR	C15-C14-C8	-2.56	114.86	119.08
4	A	711	CLR	C17-C13-C14	2.56	103.10	100.07
4	A	710	CLR	C11-C9-C10	-2.46	109.84	113.08

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	701	BAL	CB-CA-C	-2.39	109.42	113.51
4	A	710	CLR	C8-C7-C6	-2.36	109.34	112.73
4	A	711	CLR	C12-C11-C9	2.28	117.07	113.11
4	A	710	CLR	C12-C11-C9	2.23	116.98	113.11
4	A	710	CLR	C15-C16-C17	2.00	109.10	105.13

There are no chirality outliers.

All (48) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	711	CLR	C13-C17-C20-C21
4	A	711	CLR	C16-C17-C20-C22
4	A	711	CLR	C16-C17-C20-C21
4	A	711	CLR	C13-C17-C20-C22
4	A	710	CLR	C21-C20-C22-C23
4	A	711	CLR	C21-C20-C22-C23
4	A	710	CLR	C17-C20-C22-C23
4	A	711	CLR	C17-C20-C22-C23
4	A	711	CLR	C20-C22-C23-C24
4	A	710	CLR	C22-C23-C24-C25
3	A	709	R16	C31-C32-C33-C34
3	A	706	R16	C32-C33-C34-C35
3	A	702	R16	C32-C33-C34-C35
3	A	707	R16	C31-C32-C33-C34
3	A	707	R16	C35-C36-C37-C38
3	A	703	R16	C38-C39-C40-C41
3	A	706	R16	C33-C34-C35-C36
3	A	706	R16	C30-C31-C32-C33
4	A	710	CLR	C20-C22-C23-C24
3	A	705	R16	C36-C37-C38-C39
3	A	708	R16	C34-C35-C36-C37
3	A	709	R16	C36-C37-C38-C39
2	A	701	BAL	O-C-CA-CB
3	A	704	R16	C30-C31-C32-C33
2	A	701	BAL	OXT-C-CA-CB
4	A	710	CLR	C13-C17-C20-C22
3	A	709	R16	C28-C29-C30-C31
4	A	710	CLR	C13-C17-C20-C21
3	A	707	R16	C27-C28-C29-C30
4	A	710	CLR	C23-C24-C25-C27
3	A	707	R16	C28-C29-C30-C31
4	A	710	CLR	C16-C17-C20-C22

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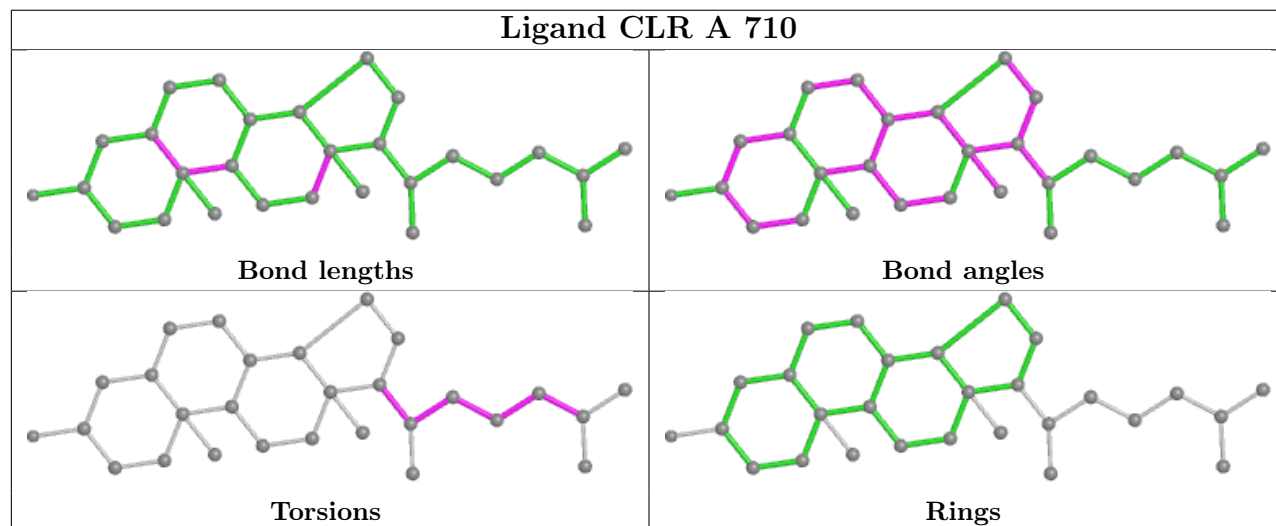
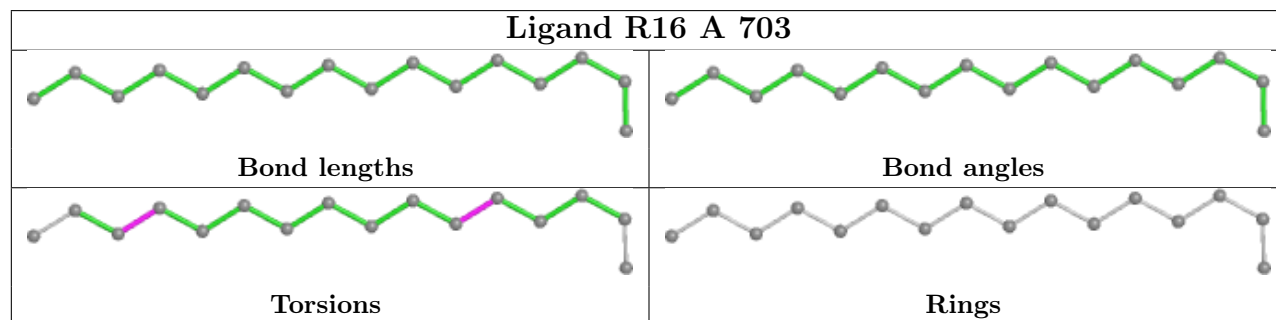
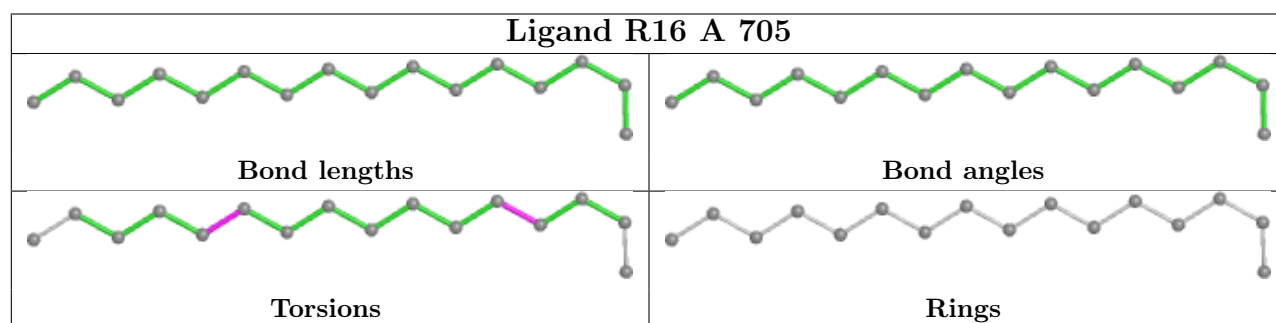
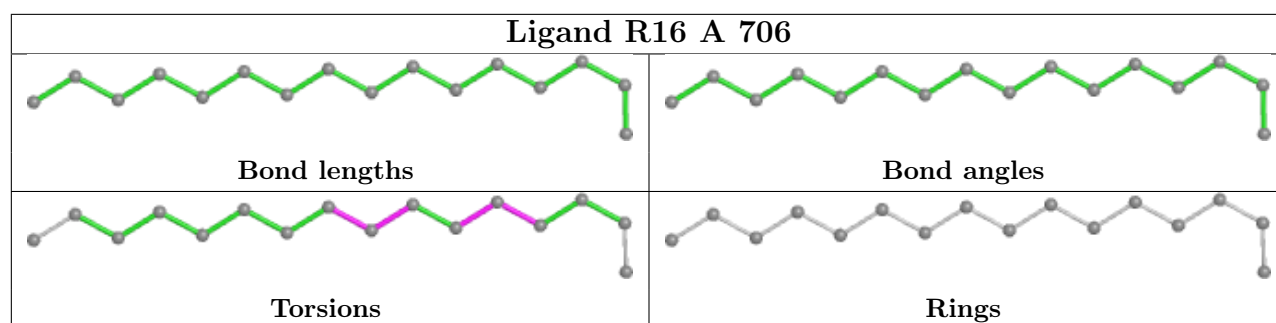
Mol	Chain	Res	Type	Atoms
3	A	705	R16	C29-C30-C31-C32
3	A	702	R16	C33-C34-C35-C36
4	A	710	CLR	C23-C24-C25-C26
3	A	709	R16	C29-C30-C31-C32
3	A	709	R16	C38-C39-C40-C41
3	A	709	R16	C39-C40-C41-C42
3	A	704	R16	C32-C33-C34-C35
3	A	707	R16	C34-C35-C36-C37
3	A	707	R16	C38-C39-C40-C41
3	A	703	R16	C30-C31-C32-C33
4	A	710	CLR	C16-C17-C20-C21
3	A	704	R16	C35-C36-C37-C38
3	A	704	R16	C33-C34-C35-C36
3	A	709	R16	C34-C35-C36-C37
3	A	706	R16	C29-C30-C31-C32
3	A	704	R16	C37-C38-C39-C40

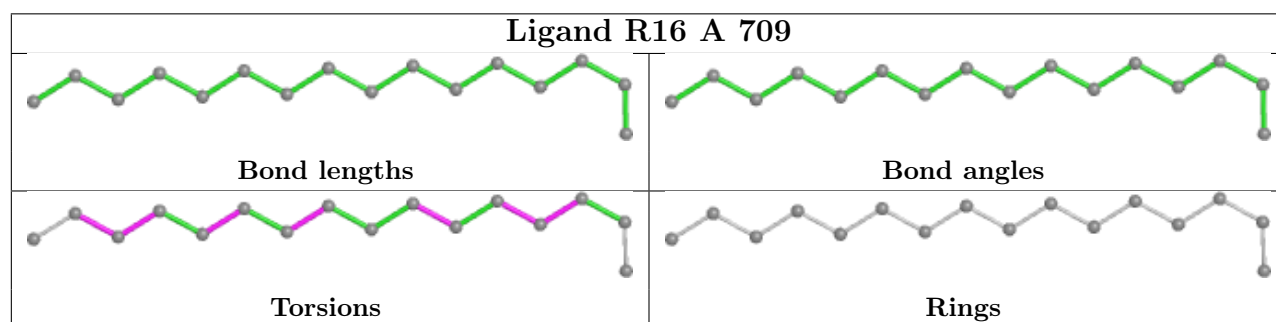
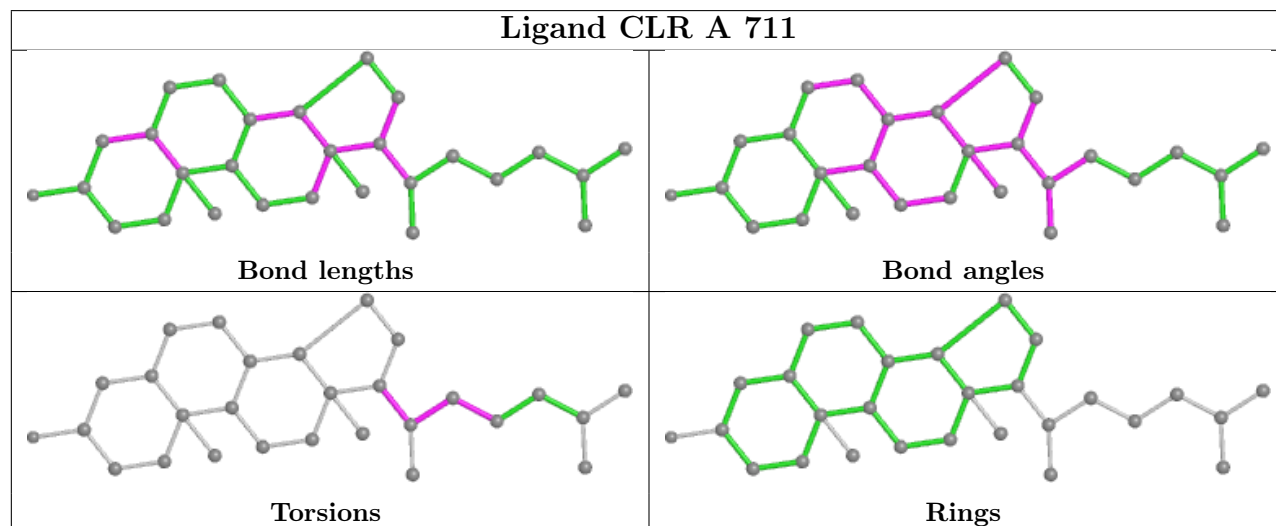
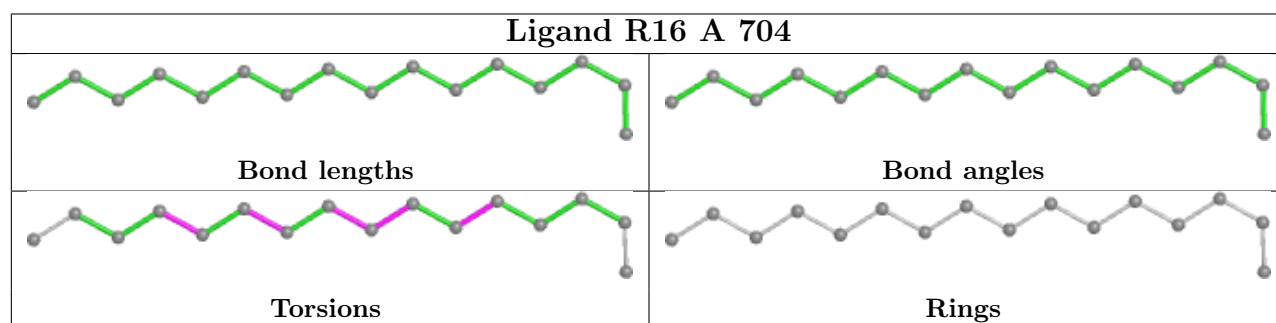
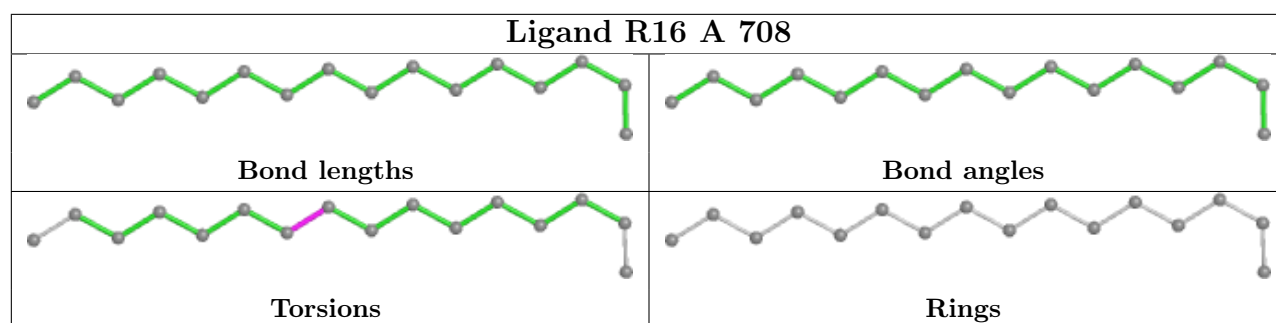
There are no ring outliers.

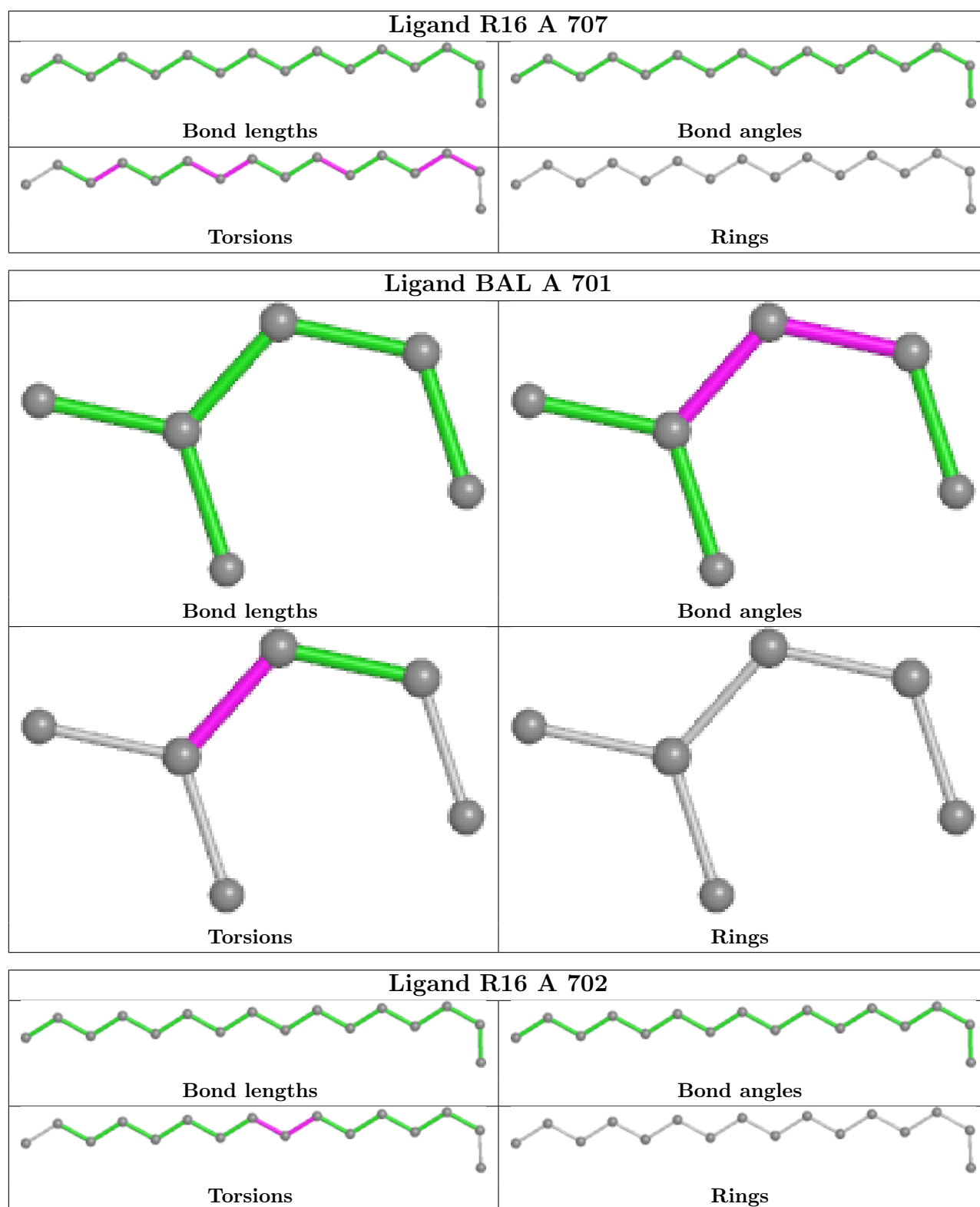
5 monomers are involved in 14 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	706	R16	3	0
4	A	710	CLR	6	0
4	A	711	CLR	4	0
3	A	709	R16	1	0
3	A	707	R16	4	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 ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.