WORLDWIDE wwPDB PROTEIN DATA BANK

Full wwPDB EM Validation Report ⓘ

Nov 18, 2024 – 01:02 PM JST

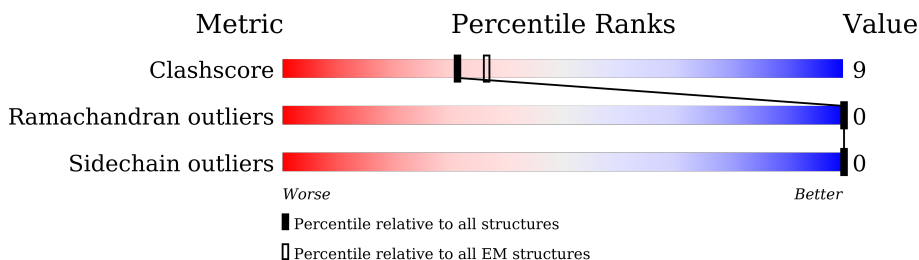|		
PDB ID	:	8ZX4
EMDB ID	:	EMD-60537
Title	:	LPI-bound GPR55 in complex with G13
Authors	:	He, Y.; Xia, R.
Deposited on	:	2024-06-13
Resolution	:	2.85 Å(reported)

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 2.85 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.

Metric	Percentile Ranks	Value
Clashscore		9
Ramachandran outliers		0
Sidechain outliers		0

Worse *Better*

∎ Percentile relative to all structures
◻ Percentile relative to all EM structures

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 <=5%

Mol	Chain	Length	Quality of chain
1	A	230	71% 21% 8%
2	B	345	74% 22% •
3	G	71	66% • 31%
4	R	297	80% 17% •

2 Entry composition ⓘ

There are 5 unique types of molecules in this entry. The entry contains 6753 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 engineered miniGalpha 13.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	212	Total 1674	C 1067	N 290	O 310	S 7	0	0

- Molecule 2 is a protein called Guanine nucleotide-binding protein G(I)/G(S)/G(T) subunit beta-1.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	B	333	Total 2436	C 1518	N 431	O 467	S 20	0	0

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	-4	MET	-	initiating methionine	UNP P62873
B	-3	GLY	-	expression tag	UNP P62873
B	-2	SER	-	expression tag	UNP P62873
B	-1	LEU	-	expression tag	UNP P62873
B	0	LEU	-	expression tag	UNP P62873
B	1	GLN	-	expression tag	UNP P62873

- Molecule 3 is a protein called Guanine nucleotide-binding protein G(I)/G(S)/G(O) subunit gamma-2.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	G	49	Total 318	C 200	N 56	O 60	S 2	0	0

- Molecule 4 is a protein called G-protein coupled receptor 55.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	R	288	Total 2287	C 1529	N 356	O 377	S 25	0	0

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
R	287	VAL	CYS	conflict	UNP Q9Y2T6

- Molecule 5 is [(2 {R})-2-oxidanyl-3-[oxidanyl-[(2 {S},3 {R},5 {R},6 {R})-2,3,4,5,6-pentakis (oxidanyl)cyclohexyl]oxy-phosphoryl]oxy-propyl] hexadecanoate (three-letter code: A1D9E) (formula: $C_{25}H_{49}O_{12}P$).
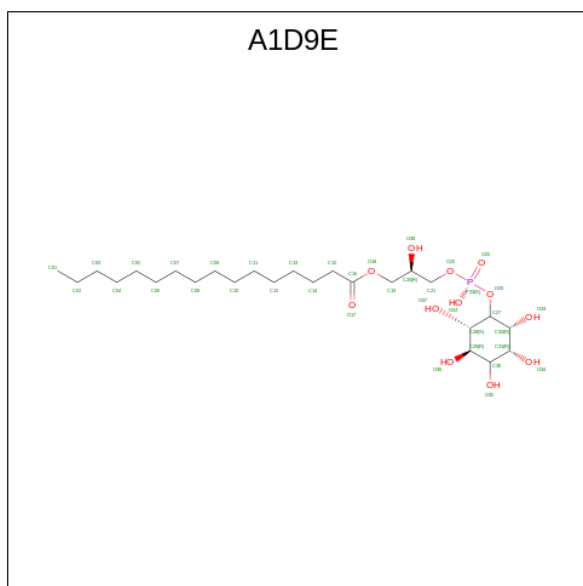

Mol	Chain	Residues	Atoms				AltConf
			Total	C	O	P	
5	R	1	38	25	12	1	0

3 Residue-property plots ⓘ

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

- Molecule 1: engineered miniGalpha 13
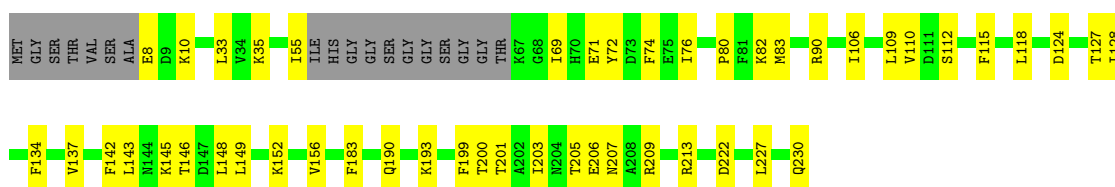
Chain A:
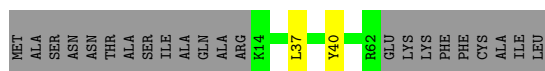

- Molecule 2: Guanine nucleotide-binding protein G(I)/G(S)/G(T) subunit beta-1

Chain B:

- Molecule 3: Guanine nucleotide-binding protein G(I)/G(S)/G(O) subunit gamma-2

Chain G:

- Molecule 4: G-protein coupled receptor 55

Chain R:

F190 G198 C201 I205 Q220 Q221 K222 A223 C224 I225 L232 A233 V234 V237 S238 V242 H243 F246 L272 S277 V285 Y289 I292 K293 E294 F295 R296 M297
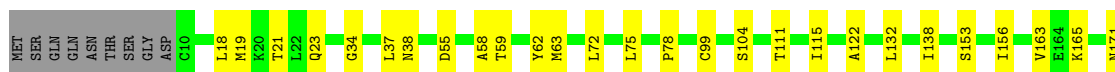
4 Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	247594	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	NONE	Depositor
Microscope	FEI TECNAI F30	Depositor
Voltage (kV)	300	Depositor
Electron dose $(e^-/\text{Å}^2)$	50	Depositor
Minimum defocus (nm)	1200	Depositor
Maximum defocus (nm)	2200	Depositor
Magnification	Not provided	
Image detector	FEI FALCON IV (4k x 4k)	Depositor

5 Model quality ⓘ

5.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: A1D9E

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	0.25	0/1700	0.44	0/2292
2	B	0.26	0/2483	0.51	0/3384
3	G	0.24	0/324	0.38	0/447
4	R	0.28	0/2356	0.42	0/3203
All	All	0.27	0/6863	0.46	0/9326

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 ⓘ

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	1674	0	1628	31	0
2	B	2436	0	2283	51	0
3	G	318	0	265	2	0
4	R	2287	0	2270	37	0
5	R	38	0	0	1	0
All	All	6753	0	6446	114	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 9.

WORLDWIDE
wwPDB
PROTEIN DATA BANK

All (114) 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)
2:B:268:ASN:HD21	2:B:304:ARG:HH22	1.29	0.79
2:B:250:CYS:HB2	2:B:264:TYR:HB2	1.65	0.77
1:A:115:PHE:HA	1:A:118:LEU:HD23	1.68	0.75
2:B:146:LEU:HD11	2:B:159:THR:HB	1.70	0.73
2:B:93:ILE:HG12	2:B:133:VAL:HG21	1.72	0.71
2:B:42:ARG:HH11	2:B:44:GLN:HE22	1.38	0.70
2:B:149:CYS:O	2:B:150:ARG:NH1	2.27	0.68
1:A:205:THR:HG23	1:A:206:GLU:HG2	1.76	0.67
2:B:245:SER:OG	2:B:247:ASP:OD1	2.12	0.67
1:A:71:GLU:OE2	2:B:99:TRP:NE1	2.28	0.65
4:R:62:TYR:CD1	4:R:115:ILE:HG12	2.32	0.64
1:A:190:GLN:O	4:R:220:GLN:NE2	2.32	0.63
2:B:271:CYS:HB2	2:B:290:ASP:HB2	1.79	0.63
4:R:293:LYS:HG3	4:R:294:GLU:H	1.63	0.62
4:R:198:GLY:HA2	4:R:232:LEU:HD21	1.82	0.61
4:R:59:THR:HA	4:R:62:TYR:CE2	2.36	0.61
2:B:51:LEU:HB2	2:B:336:LEU:HB2	1.82	0.61
2:B:331:SER:OG	2:B:333:ASP:OD1	2.19	0.61
1:A:106:ILE:HG13	1:A:137:VAL:HG11	1.84	0.60
1:A:201:THR:HG23	1:A:203:ILE:H	1.66	0.60
2:B:61:MET:HG3	2:B:317:CYS:HB3	1.84	0.59
2:B:290:ASP:HA	2:B:314:ARG:HG3	1.84	0.59
2:B:187:VAL:HA	2:B:203:ALA:HA	1.83	0.59
4:R:238:SER:O	4:R:277:SER:OG	2.15	0.59
1:A:142:PHE:HE2	1:A:207:ASN:HD22	1.49	0.59
2:B:254:ASP:HB2	2:B:261:LEU:HD11	1.84	0.59
4:R:19:MET:HE1	4:R:272:LEU:HA	1.84	0.59
2:B:320:VAL:HG22	2:B:327:VAL:HG22	1.83	0.58
2:B:274:THR:OG1	2:B:315:VAL:O	2.17	0.58
1:A:146:THR:O	1:A:149:LEU:HB2	2.04	0.57
1:A:200:THR:HG21	1:A:207:ASN:HD21	1.68	0.57
1:A:112:SER:HB3	1:A:143:LEU:HD12	1.87	0.56
2:B:286:LEU:HG	2:B:296:VAL:HG22	1.87	0.56
1:A:124:ASP:O	1:A:127:THR:OG1	2.21	0.56
1:A:193:LYS:NZ	1:A:222:ASP:OD1	2.39	0.55
1:A:74:PHE:HE1	1:A:83:MET:HG2	1.71	0.55
4:R:205:ILE:HD12	4:R:225:ILE:HG23	1.89	0.55
2:B:149:CYS:SG	2:B:157:ILE:HD11	2.47	0.55
2:B:42:ARG:HH11	2:B:44:GLN:NE2	2.04	0.53
4:R:63:MET:O	4:R:289:TYR:OH	2.15	0.53

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:294:CYS:HB3	2:B:308:LEU:HB2	1.89	0.53
4:R:19:MET:O	4:R:23:GLN:HG3	2.09	0.53
1:A:227:LEU:HD11	4:R:122:ALA:HB3	1.91	0.53
1:A:200:THR:HG21	1:A:207:ASN:ND2	2.24	0.52
4:R:34:GLY:O	4:R:38:ASN:ND2	2.37	0.52
2:B:166:CYS:HB2	2:B:180:PHE:HB2	1.92	0.51
2:B:61:MET:HE3	2:B:328:ALA:HB3	1.93	0.51
4:R:37:LEU:HB3	4:R:285:VAL:HG11	1.91	0.51
2:B:22:ARG:NE	2:B:258:ASP:O	2.44	0.51
1:A:106:ILE:HD11	1:A:134:PHE:CD1	2.46	0.51
1:A:230:GLN:NE2	4:R:224:CYS:SG	2.84	0.50
2:B:79:LEU:HG	2:B:95:LEU:HD21	1.93	0.50
2:B:286:LEU:HD22	2:B:327:VAL:HG11	1.92	0.50
2:B:266:HIS:ND1	2:B:268:ASN:OD1	2.44	0.50
1:A:142:PHE:HE2	1:A:207:ASN:ND2	2.10	0.50
1:A:209:ARG:HH22	1:A:213:ARG:HD3	1.76	0.50
2:B:168:LEU:HB3	2:B:178:THR:HG22	1.94	0.49
2:B:196:THR:HG22	2:B:196:THR:O	2.13	0.49
2:B:211:TRP:CZ3	2:B:218:CYS:HB2	2.46	0.49
2:B:268:ASN:ND2	2:B:304:ARG:HH22	2.06	0.49
4:R:62:TYR:CE1	4:R:115:ILE:HG12	2.48	0.48
1:A:90:ARG:HH21	1:A:128:ILE:HD11	1.79	0.48
2:B:192:LEU:HD23	2:B:199:PHE:HB3	1.95	0.48
2:B:30:LEU:HD11	3:G:37:LEU:HD12	1.96	0.48
4:R:111:THR:O	4:R:115:ILE:HG13	2.13	0.48
1:A:145:LYS:HD3	1:A:148:LEU:HD12	1.96	0.47
4:R:234:VAL:HA	4:R:237:VAL:HG22	1.95	0.47
4:R:293:LYS:HG3	4:R:294:GLU:N	2.28	0.47
2:B:167:ALA:HB1	2:B:176:GLN:HG2	1.96	0.47
2:B:64:GLY:HA2	2:B:105:TYR:CD2	2.49	0.47
4:R:18:LEU:O	4:R:21:THR:OG1	2.27	0.46
2:B:260:GLU:OE2	2:B:263:THR:OG1	2.31	0.46
1:A:8:GLU:HG3	1:A:10:LYS:H	1.80	0.46
2:B:124:TYR:CE2	2:B:135:VAL:HG22	2.50	0.46
4:R:55:ASP:N	4:R:55:ASP:OD1	2.49	0.46
1:A:74:PHE:HE2	1:A:76:ILE:HD11	1.81	0.46
2:B:158:VAL:HG12	2:B:190:LEU:HD21	1.97	0.46
2:B:112:VAL:HG13	2:B:126:LEU:HD11	1.98	0.45
4:R:99:CYS:HA	4:R:156:ILE:HD12	1.98	0.45
1:A:35:LYS:HG2	1:A:82:LYS:HE3	1.98	0.45
2:B:152:LEU:HG	2:B:196:THR:HG23	1.99	0.45

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:236:PRO:HB2	3:G:40:TYR:CE2	2.52	0.45
1:A:33:LEU:HA	1:A:80:PRO:HG2	1.98	0.45
2:B:159:THR:HG1	2:B:169:TRP:HE1	1.64	0.45
2:B:144:GLY:H	2:B:163:ASP:HB3	1.82	0.45
1:A:152:LYS:HE2	1:A:156:VAL:HG21	1.99	0.44
4:R:292:ILE:HD11	4:R:295:PHE:CD1	2.52	0.44
2:B:115:GLY:HA3	2:B:146:LEU:HD23	2.00	0.44
4:R:285:VAL:HA	4:R:289:TYR:CD2	2.52	0.44
4:R:201:CYS:O	4:R:205:ILE:HG12	2.18	0.43
4:R:163:VAL:HG12	4:R:165:LYS:H	1.82	0.43
4:R:62:TYR:HD1	4:R:115:ILE:HG12	1.83	0.43
4:R:153:SER:O	4:R:156:ILE:HG12	2.19	0.43
1:A:55:ILE:HD13	1:A:72:TYR:HB3	2.01	0.43
1:A:69:ILE:HD11	2:B:99:TRP:CD1	2.54	0.42
4:R:59:THR:O	4:R:63:MET:HG2	2.19	0.42
1:A:109:LEU:HD23	1:A:142:PHE:HB2	2.01	0.42
2:B:27:ASP:OD1	2:B:27:ASP:N	2.53	0.42
4:R:190:PHE:HB2	4:R:243:HIS:CD2	2.55	0.41
4:R:72:LEU:HB3	4:R:104:SER:OG	2.19	0.41
4:R:242:VAL:O	4:R:246:PHE:N	2.38	0.41
1:A:110:VAL:HG11	1:A:183:PHE:HZ	1.86	0.41
2:B:264:TYR:CD2	2:B:302:ALA:HA	2.56	0.41
2:B:268:ASN:HD21	2:B:304:ARG:NH2	2.08	0.41
4:R:132:LEU:HD12	4:R:132:LEU:O	2.19	0.41
2:B:254:ASP:OD1	2:B:255:LEU:N	2.53	0.41
4:R:222:LYS:O	4:R:225:ILE:HB	2.21	0.41
1:A:146:THR:HG21	1:A:199:PHE:HB3	2.03	0.41
4:R:58:ALA:O	4:R:138:ILE:HG21	2.21	0.41
4:R:171:ASN:OD1	5:R:301:A1D9E:O33	2.39	0.41
4:R:293:LYS:CG	4:R:294:GLU:H	2.33	0.41
4:R:75:LEU:O	4:R:78:PRO:HD2	2.21	0.40
2:B:22:ARG:HG2	2:B:259:GLN:HB3	2.04	0.40
2:B:254:ASP:HB3	2:B:257:ALA:HB3	2.04	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	208/230 (90%)	200 (96%)	8 (4%)	0	100	100
2	B	331/345 (96%)	317 (96%)	14 (4%)	0	100	100
3	G	47/71 (66%)	46 (98%)	1 (2%)	0	100	100
4	R	286/297 (96%)	271 (95%)	15 (5%)	0	100	100
All	All	872/943 (92%)	834 (96%)	38 (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	180/210 (86%)	180 (100%)	0	100	100
2	B	247/287 (86%)	247 (100%)	0	100	100
3	G	24/58 (41%)	24 (100%)	0	100	100
4	R	254/272 (93%)	254 (100%)	0	100	100
All	All	705/827 (85%)	705 (100%)	0	100	100

There are no protein residues with a non-rotameric sidechain to report.

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	207	ASN
1	A	230	GLN
4	R	221	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

1 ligand is 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	$\#|Z| > 2$
5	A1D9E	R	301	-	38,38,38	1.76	7 (18%)	47,49,49	1.18	5 (10%)

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	A1D9E	R	301	-	-	16/31/55/55	0/1/1/1

All (7) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	R	301	A1D9E	P23-O26	5.45	1.74	1.60
5	R	301	A1D9E	C29-C28	3.59	1.61	1.52
5	R	301	A1D9E	P23-O22	3.44	1.73	1.59
5	R	301	A1D9E	C28-C27	3.03	1.60	1.52
5	R	301	A1D9E	C30-C29	2.86	1.59	1.52
5	R	301	A1D9E	C32-C27	2.43	1.58	1.52
5	R	301	A1D9E	C19-C20	2.20	1.59	1.51

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	R	301	A1D9E	O18-C16-C15	3.41	122.60	111.91
5	R	301	A1D9E	C29-C28-C27	2.80	116.08	109.68
5	R	301	A1D9E	C30-C29-C28	2.47	115.13	110.82
5	R	301	A1D9E	O18-C16-O17	-2.34	117.69	123.59
5	R	301	A1D9E	O18-C19-C20	2.03	115.56	105.77

There are no chirality outliers.

All (16) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	R	301	A1D9E	C15-C16-O18-C19
5	R	301	A1D9E	O17-C16-O18-C19
5	R	301	A1D9E	C19-C20-C21-O22
5	R	301	A1D9E	C21-O22-P23-O24
5	R	301	A1D9E	C21-O22-P23-O25
5	R	301	A1D9E	O38-C20-C21-O22
5	R	301	A1D9E	C21-O22-P23-O26
5	R	301	A1D9E	C05-C06-C07-C08
5	R	301	A1D9E	C02-C03-C04-C05
5	R	301	A1D9E	C12-C13-C14-C15
5	R	301	A1D9E	C10-C11-C12-C13
5	R	301	A1D9E	C04-C05-C06-C07
5	R	301	A1D9E	C08-C09-C10-C11
5	R	301	A1D9E	C11-C12-C13-C14
5	R	301	A1D9E	C06-C07-C08-C09
5	R	301	A1D9E	C07-C08-C09-C10

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	R	301	A1D9E	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 then 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.

Ligand A1D9E R 301

Bond lengths   Bond angles

Torsions   Rings
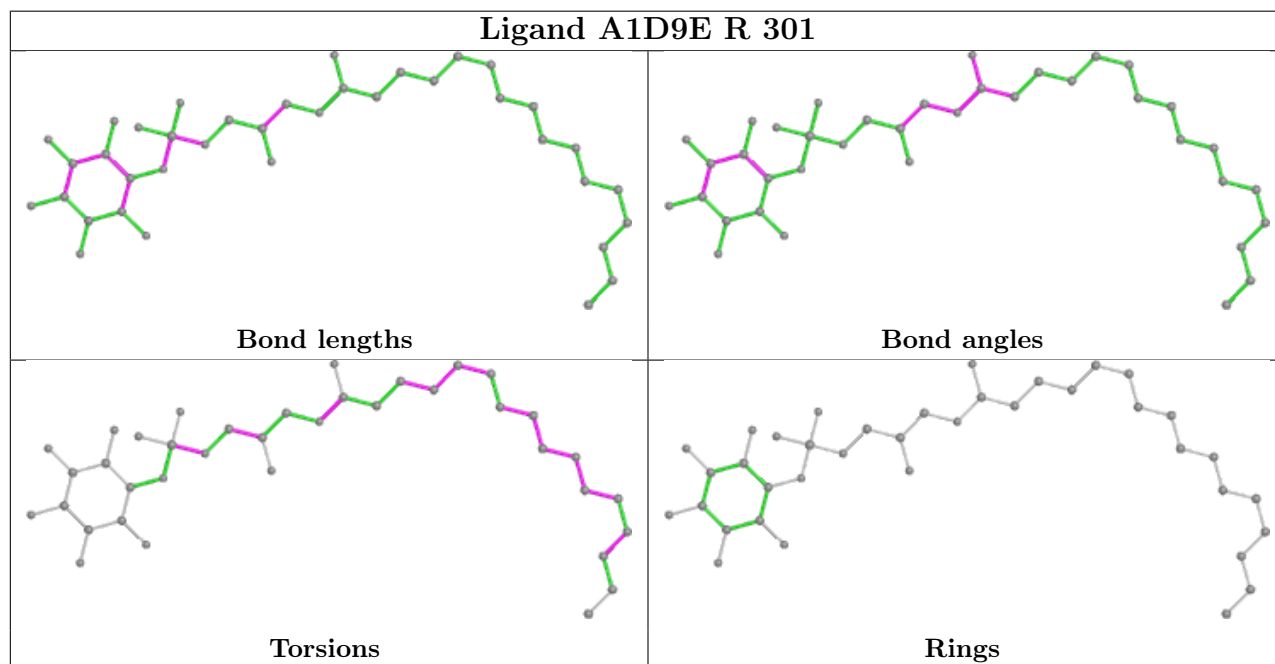
5.7 Other polymers (i)

There are no such residues in this entry.

5.8 Polymer linkage issues (i)

There are no chain breaks in this entry.