



Full wwPDB EM Validation Report ⓘ

Oct 8, 2025 – 02:08 PM JST

PDB ID : 9KPF / pdb_00009kpf
EMDB ID : EMD-62486
Title : Cryo-EM structure of GPCR16-Gi complex
Authors : Wang, X.; Wu, L.J.; Hua, T.; Liu, Z.J.
Deposited on : 2024-11-22
Resolution : 3.15 Å(reported)
Based on initial model : .

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 Phenix2.0
buster-report : 1.1.7 (2018)
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
EM percentile statistics : **NOT EXECUTED**
MapQ : **FAILED**
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.46

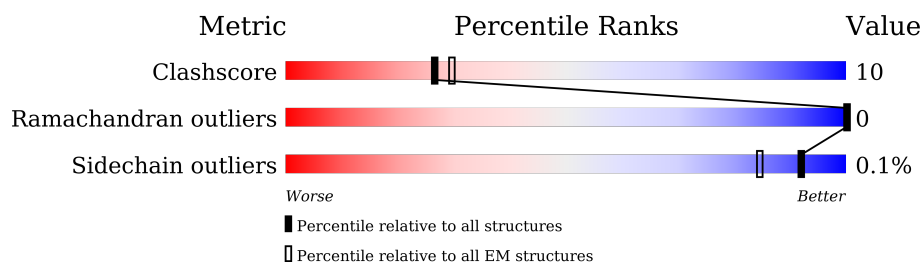
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 3.15 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	369	
2	B	366	
3	G	71	
4	R	1011	
5	S	266	

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 8914 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 Guanine nucleotide-binding protein G(i) subunit alpha-1.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	225	Total	C	N	O	S	0	0
			1812	1150	300	348	14		

There are 15 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-14	ASP	-	expression tag	UNP P63096
A	-13	TYR	-	expression tag	UNP P63096
A	-12	LYS	-	expression tag	UNP P63096
A	-11	ASP	-	expression tag	UNP P63096
A	-10	ASP	-	expression tag	UNP P63096
A	-9	ASP	-	expression tag	UNP P63096
A	-8	ASP	-	expression tag	UNP P63096
A	-7	LYS	-	expression tag	UNP P63096
A	-6	GLU	-	expression tag	UNP P63096
A	-5	ASN	-	expression tag	UNP P63096
A	-4	LEU	-	expression tag	UNP P63096
A	-3	TYR	-	expression tag	UNP P63096
A	-2	PHE	-	expression tag	UNP P63096
A	-1	GLN	-	expression tag	UNP P63096
A	0	SER	-	expression tag	UNP P63096

- 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	341	Total	C	N	O	S	0	0
			2616	1612	470	513	21		

There are 26 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	341	GLY	-	expression tag	UNP P62873

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Chain	Residue	Modelled	Actual	Comment	Reference
B	342	SER	-	expression tag	UNP P62873
B	343	SER	-	expression tag	UNP P62873
B	344	GLY	-	expression tag	UNP P62873
B	345	GLY	-	expression tag	UNP P62873
B	346	GLY	-	expression tag	UNP P62873
B	347	GLY	-	expression tag	UNP P62873
B	348	SER	-	expression tag	UNP P62873
B	349	GLY	-	expression tag	UNP P62873
B	350	GLY	-	expression tag	UNP P62873
B	351	GLY	-	expression tag	UNP P62873
B	352	GLY	-	expression tag	UNP P62873
B	353	SER	-	expression tag	UNP P62873
B	354	SER	-	expression tag	UNP P62873
B	355	GLY	-	expression tag	UNP P62873
B	356	VAL	-	expression tag	UNP P62873
B	357	SER	-	expression tag	UNP P62873
B	358	GLY	-	expression tag	UNP P62873
B	359	TRP	-	expression tag	UNP P62873
B	360	ARG	-	expression tag	UNP P62873
B	361	LEU	-	expression tag	UNP P62873
B	362	PHE	-	expression tag	UNP P62873
B	363	LYS	-	expression tag	UNP P62873
B	364	LYS	-	expression tag	UNP P62873
B	365	ILE	-	expression tag	UNP P62873
B	366	SER	-	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	57	Total	C	N	O	S	0	0
			436	273	77	83	3		

- Molecule 4 is a protein called Fusion protein 1,exo-alpha-sialidase,Taste receptor type 2 member 16,Fusion protein 2.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	R	272	Total	C	N	O	S	0	0
			2247	1516	357	357	17		

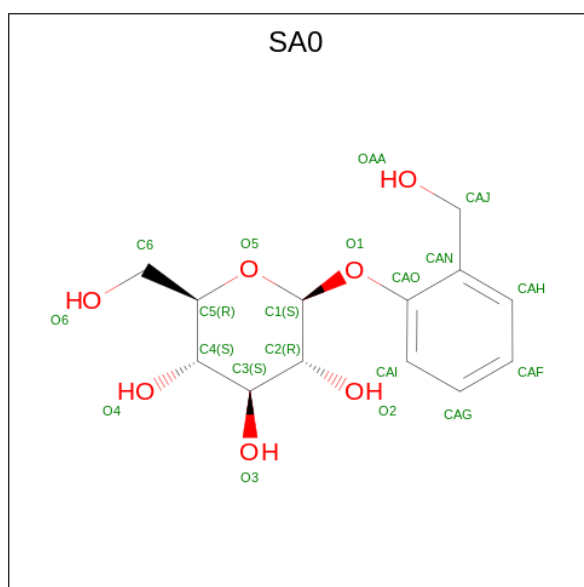
There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
R	-3	GLY	-	linker	UNP A0A4J1WX37
R	-2	SER	-	linker	UNP A0A4J1WX37
R	-1	GLY	-	linker	UNP A0A4J1WX37
R	0	SER	-	linker	UNP A0A4J1WX37
R	1	GLY	-	linker	UNP A0A4J1WX37
R	133	CYS	SER	conflict	UNP Q9NYV7

- Molecule 5 is a protein called scFv16.

Mol	Chain	Residues	Atoms					AltConf	Trace
5	S	232	Total	C	N	O	S	0	0
			1783	1131	295	347	10		

- Molecule 6 is 2-(hydroxymethyl)phenyl beta-D-glucopyranoside (CCD ID: SA0) (formula: $C_{13}H_{18}O_7$) (labeled as "Ligand of Interest" by depositor).

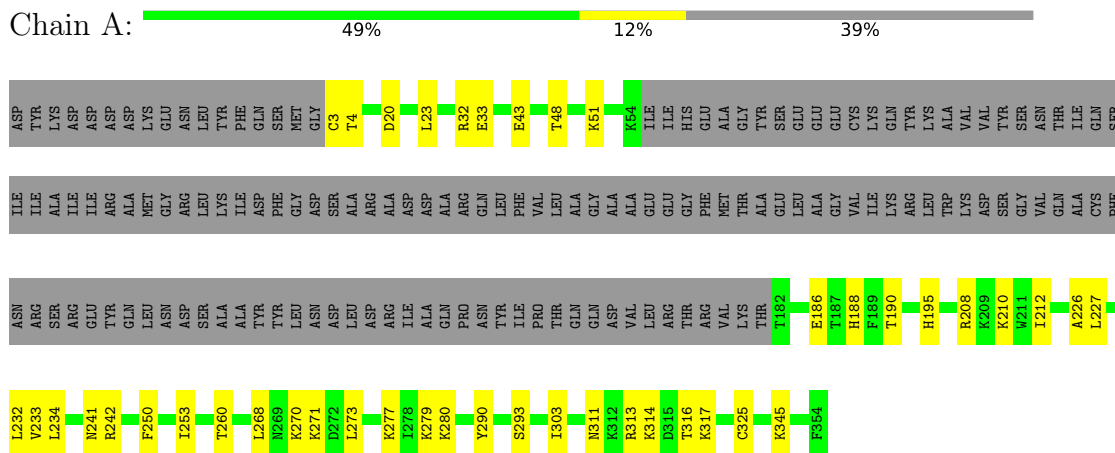


Mol	Chain	Residues	Atoms			AltConf
6	R	1	Total	C	O	0
			20	13	7	

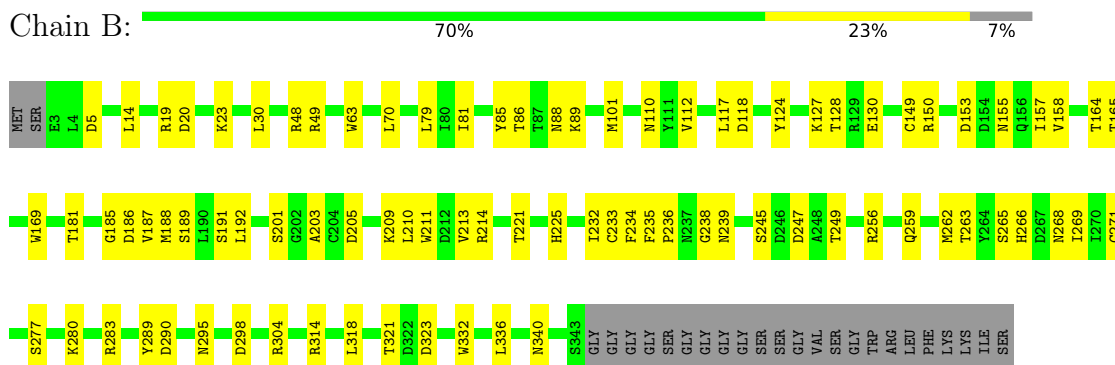
3 Residue-property plots

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.

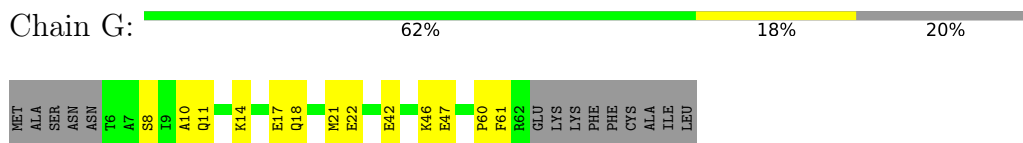
- Molecule 1: Guanine nucleotide-binding protein G(i) subunit alpha-1



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



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



- Molecule 4: Fusion protein 1,exo-alpha-sialidase,Taste receptor type 2 member 16,Fusion protein 2

Response	Percentage
Yes	20%
No	7%
Don't know	73%

- Molecule 5: scFv16

Device Type	Percentage
Smartphone	66%
Tablet	21%
Feature phone	13%

GLY	GLY	ASP
S124	Q3	V2
Q130	R18	
A131		
T132	C22	
S133	S23	
S134	A24	
	S25	
	G26	
V143	F27	
S149		
L153	F32	
L154	R38	
H155		
S156	W47	
T160	V48	
V161	A49	
L162	K65	
F165	T69	
R168	L79	
P169		
Q174	Q82	
L175	M83	
Y178	L86	
R179	R87	
M180	S88	
S181	E89	
N182		
R190	M93	
	Y94	
	Y95	
T198	I100	
A199		
F200	F108	
R206	G114	
L207		
	L117	
V214		
C217	S121	
M218	GLY	
Q219	GLY	
H220	GLY	
L221	GLY	
E222	GLY	
Y223	GLY	
P224	GLY	
	GLY	
T231	GLY	
F234		

L235
LYS
ALA
ALA
ALA
GLU
ASN
LEU
TYR
PHE
GLN
SER
HIS
HIS
HIS
HIS
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HIS

4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	229493	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	NONE	Depositor
Microscope	TFS KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	60	Depositor
Minimum defocus (nm)	1200	Depositor
Maximum defocus (nm)	2000	Depositor
Magnification	Not provided	
Image detector	FEI FALCON IV (4k 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: SA0

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	0.13	0/1842	0.33	0/2470
2	B	0.13	0/2663	0.37	0/3610
3	G	0.17	0/442	0.45	0/597
4	R	0.18	0/2312	0.36	0/3152
5	S	0.14	0/1827	0.39	0/2477
All	All	0.15	0/9086	0.37	0/12306

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	1812	0	1797	28	0
2	B	2616	0	2518	61	0
3	G	436	0	448	12	0
4	R	2247	0	2334	45	0
5	S	1783	0	1717	35	0
6	R	20	0	18	1	0
All	All	8914	0	8832	174	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 10.

All (174) 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)
4:R:206:GLN:O	4:R:210:HIS:HB2	1.57	1.02
5:S:94:TYR:O	5:S:114:GLY:HA2	1.85	0.75
5:S:133:SER:OG	5:S:134:SER:N	2.21	0.74
5:S:222:GLU:HG3	5:S:224:PRO:HD2	1.69	0.73
5:S:87:ARG:HE	5:S:89:GLU:H	1.36	0.72
2:B:86:THR:OG1	2:B:88:ASN:ND2	2.23	0.71
4:R:282:THR:HG23	4:R:285:ARG:HH21	1.58	0.67
5:S:94:TYR:O	5:S:114:GLY:CA	2.44	0.65
4:R:238:SER:O	4:R:242:THR:HG23	1.98	0.64
4:R:48:ILE:HG21	4:R:99:LEU:HB2	1.79	0.63
2:B:189:SER:HB2	2:B:232:ILE:HG22	1.78	0.63
2:B:187:VAL:HA	2:B:203:ALA:HA	1.79	0.63
2:B:165:THR:HG22	2:B:181:THR:HG22	1.81	0.62
5:S:18:ARG:HG2	5:S:117:LEU:HD11	1.80	0.62
5:S:149:SER:H	5:S:198:THR:HG23	1.65	0.62
4:R:205:LYS:HG3	4:R:209:HIS:CE1	2.36	0.61
2:B:5:ASP:N	2:B:5:ASP:OD1	2.33	0.61
5:S:3:GLN:HE21	5:S:25:SER:HB3	1.66	0.61
1:A:48:THR:HA	1:A:51:LYS:HE2	1.83	0.60
1:A:279:LYS:HB3	1:A:280:LYS:HZ2	1.67	0.58
2:B:185:GLY:N	2:B:205:ASP:OD2	2.27	0.58
2:B:128:THR:OG1	2:B:130:GLU:O	2.21	0.58
1:A:345:LYS:HE3	4:R:217:PRO:HB2	1.86	0.57
4:R:216:ASN:HB2	4:R:217:PRO:HD3	1.87	0.57
2:B:271:CYS:HB2	2:B:290:ASP:HB2	1.87	0.56
3:G:17:GLU:O	3:G:21:MET:HG3	2.05	0.56
4:R:207:ILE:HD11	4:R:222:ARG:HB3	1.86	0.56
1:A:3:CYS:SG	1:A:4:THR:N	2.80	0.55
5:S:132:THR:OG1	5:S:231:THR:HG23	2.07	0.55
1:A:232:LEU:O	1:A:241:ASN:ND2	2.40	0.55
2:B:247:ASP:OD1	2:B:249:THR:OG1	2.22	0.55
4:R:244:LEU:O	4:R:248:ILE:HD12	2.05	0.55
1:A:271:LYS:HE3	1:A:325:CYS:HA	1.89	0.55
2:B:48:ARG:HG3	2:B:340:ASN:HB3	1.88	0.54
5:S:220:HIS:O	5:S:220:HIS:ND1	2.40	0.54
4:R:132:GLY:O	4:R:136:ILE:HG12	2.08	0.54
4:R:266:TYR:HA	4:R:269:ILE:HG22	1.90	0.54
1:A:20:ASP:OD1	2:B:89:LYS:NZ	2.41	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
5:S:24:ALA:HB1	5:S:27:PHE:HE1	1.72	0.54
2:B:259:GLN:OE1	2:B:259:GLN:N	2.33	0.53
1:A:186:GLU:OE2	1:A:188:HIS:NE2	2.38	0.53
2:B:295:ASN:ND2	2:B:304:ARG:HD3	2.23	0.53
2:B:118:ASP:N	2:B:118:ASP:OD1	2.41	0.52
4:R:2:ILE:HD12	4:R:3:PRO:HD2	1.91	0.52
2:B:20:ASP:HA	2:B:23:LYS:HE2	1.90	0.52
2:B:277:SER:HB3	2:B:318:LEU:HD23	1.91	0.52
2:B:290:ASP:OD1	2:B:314:ARG:HD2	2.09	0.52
3:G:42:GLU:O	3:G:46:LYS:NZ	2.43	0.52
4:R:251:LEU:H	4:R:251:LEU:HD23	1.74	0.52
4:R:205:LYS:HG3	4:R:209:HIS:NE2	2.25	0.51
2:B:30:LEU:HB3	2:B:262:MET:HE2	1.92	0.51
4:R:138:CYS:HA	4:R:141:ILE:HG22	1.92	0.51
5:S:162:LEU:HD22	5:S:200:PHE:CD2	2.46	0.51
5:S:174:GLN:NE2	5:S:175:LEU:O	2.44	0.51
3:G:8:SER:HA	3:G:11:GLN:HE21	1.76	0.51
2:B:63:TRP:CE2	2:B:321:THR:HG22	2.46	0.50
3:G:17:GLU:HG3	3:G:21:MET:HE2	1.93	0.50
5:S:69:THR:OG1	5:S:82:GLN:HB3	2.11	0.50
2:B:262:MET:HG3	2:B:263:THR:N	2.26	0.50
1:A:226:ALA:HB1	1:A:270:LYS:HZ2	1.77	0.50
4:R:24:GLN:O	4:R:28:ILE:HG22	2.12	0.49
2:B:110:ASN:OD1	2:B:127:LYS:NZ	2.45	0.49
4:R:118:LEU:O	4:R:122:ILE:HG13	2.12	0.49
2:B:280:LYS:NZ	3:G:47:GLU:HG2	2.27	0.49
3:G:22:GLU:OE1	3:G:22:GLU:N	2.46	0.49
2:B:19:ARG:O	2:B:19:ARG:HD2	2.12	0.49
5:S:83:MET:HB3	5:S:86:LEU:HD21	1.95	0.49
2:B:234:PHE:HE2	2:B:238:GLY:HA2	1.77	0.49
2:B:295:ASN:HD22	2:B:304:ARG:HD3	1.77	0.49
1:A:43:GLU:HG3	1:A:242:ARG:HD3	1.95	0.49
2:B:249:THR:HG22	2:B:265:SER:HB3	1.94	0.49
2:B:225:HIS:CE1	2:B:245:SER:HB3	2.48	0.48
1:A:290:TYR:OH	1:A:293:SER:O	2.31	0.48
5:S:234:GLU:OE1	5:S:234:GLU:N	2.46	0.48
1:A:311:ASN:O	1:A:314:LYS:NZ	2.45	0.48
4:R:88:PHE:O	4:R:92:THR:HG23	2.14	0.48
4:R:27:LEU:O	4:R:31:VAL:HG12	2.13	0.48
1:A:208:ARG:O	1:A:212:ILE:HB	2.14	0.48
4:R:215:CYS:HA	4:R:219:MET:HG2	1.96	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
5:S:160:THR:OG1	5:S:180:MET:HE2	2.14	0.47
4:R:187:ILE:HB	4:R:188:PRO:HD3	1.96	0.47
1:A:33:GLU:HG2	1:A:195:HIS:HB2	1.96	0.47
1:A:190:THR:HG1	1:A:195:HIS:HD1	1.59	0.47
4:R:97:SER:HB3	4:R:191:LEU:HD22	1.95	0.47
2:B:186:ASP:OD1	2:B:186:ASP:N	2.35	0.46
5:S:219:GLN:NE2	5:S:224:PRO:O	2.48	0.46
1:A:32:ARG:HD2	4:R:116:LEU:HD21	1.96	0.46
5:S:47:TRP:NE1	5:S:49:ALA:O	2.48	0.46
5:S:38:ARG:NH1	5:S:94:TYR:OH	2.48	0.46
4:R:277:MET:HE2	4:R:277:MET:HB2	1.88	0.46
5:S:190:ARG:HD2	5:S:206:ARG:O	2.16	0.46
1:A:234:LEU:HD23	1:A:242:ARG:HE	1.81	0.45
1:A:250:PHE:HA	1:A:253:ILE:HG22	1.97	0.45
3:G:10:ALA:O	3:G:14:LYS:HG2	2.16	0.45
2:B:150:ARG:HB2	2:B:192:LEU:HD13	1.98	0.45
5:S:178:TYR:CE1	5:S:182:ASN:HB2	2.52	0.45
2:B:14:LEU:HD23	2:B:14:LEU:HA	1.81	0.45
2:B:210:LEU:HD23	2:B:211:TRP:N	2.32	0.45
2:B:235:PHE:CG	2:B:236:PRO:HD2	2.52	0.45
2:B:262:MET:HE2	2:B:262:MET:HB2	1.88	0.44
5:S:83:MET:HE3	5:S:83:MET:HB2	1.92	0.44
1:A:23:LEU:HD12	2:B:89:LYS:HZ3	1.82	0.44
2:B:191:SER:OG	2:B:234:PHE:HB2	2.17	0.44
2:B:266:HIS:ND1	2:B:268:ASN:OD1	2.46	0.44
4:R:85:TRP:HH2	4:R:243:ILE:HD12	1.82	0.44
4:R:112:HIS:CD2	4:R:114:ILE:HB	2.53	0.44
4:R:185:LEU:HD23	4:R:185:LEU:HA	1.82	0.44
4:R:117:TRP:HE1	4:R:121:ARG:HD2	1.82	0.44
5:S:162:LEU:HD11	5:S:217:CYS:HB2	1.99	0.44
2:B:289:TYR:HE1	2:B:295:ASN:HB2	1.83	0.44
4:R:66:ASN:ND2	4:R:81:LEU:O	2.47	0.44
5:S:93:MET:HE3	5:S:95:TYR:HE1	1.82	0.44
2:B:85:TYR:CZ	3:G:60:PRO:HB3	2.53	0.43
3:G:18:GLN:HA	3:G:21:MET:HE3	1.99	0.43
4:R:138:CYS:SG	4:R:139:VAL:N	2.91	0.43
4:R:276:LEU:HD23	4:R:276:LEU:HA	1.80	0.43
1:A:313:ARG:NH2	1:A:316:THR:OG1	2.52	0.43
5:S:168:ARG:HG2	5:S:169:PRO:HD2	2.00	0.43
2:B:101:MET:HE1	2:B:117:LEU:HG	2.00	0.43
2:B:266:HIS:HB3	2:B:269:ILE:HG22	1.99	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
5:S:214:VAL:HA	5:S:231:THR:O	2.19	0.43
1:A:232:LEU:HD23	1:A:233:VAL:N	2.32	0.43
2:B:164:THR:HG22	2:B:185:GLY:C	2.44	0.43
2:B:323:ASP:OD1	2:B:323:ASP:N	2.52	0.43
6:R:501:SA0:HAI	6:R:501:SA0:H1	1.68	0.43
2:B:213:VAL:HG23	2:B:214:ARG:HG3	2.00	0.43
4:R:10:PHE:CE2	4:R:260:VAL:HG12	2.53	0.43
5:S:155:HIS:ND1	5:S:156:SER:N	2.67	0.43
1:A:210:LYS:HG3	2:B:188:MET:HE1	2.01	0.42
2:B:283:ARG:HD2	2:B:298:ASP:OD2	2.19	0.42
2:B:158:VAL:HG11	2:B:192:LEU:HD11	2.02	0.42
2:B:314:ARG:HD3	2:B:332:TRP:CZ2	2.54	0.42
5:S:22:CYS:HB3	5:S:79:LEU:HB3	2.00	0.42
5:S:65:LYS:HA	5:S:65:LYS:HD3	1.88	0.42
1:A:227:LEU:HD22	1:A:268:LEU:HD23	2.01	0.42
4:R:283:LEU:O	4:R:287:LEU:HG	2.20	0.42
2:B:149:CYS:O	2:B:150:ARG:NH1	2.52	0.42
2:B:209:LYS:HZ3	2:B:221:THR:HG1	1.61	0.42
3:G:17:GLU:OE1	3:G:17:GLU:HA	2.18	0.42
1:A:273:LEU:O	1:A:277:LYS:HB2	2.18	0.42
2:B:157:ILE:HG22	2:B:169:TRP:HB2	2.02	0.41
3:G:47:GLU:HG2	3:G:47:GLU:O	2.20	0.41
4:R:40:ARG:HD3	4:R:40:ARG:HA	1.81	0.41
5:S:82:GLN:NE2	5:S:83:MET:O	2.53	0.41
2:B:49:ARG:NH2	3:G:61:PHE:O	2.53	0.41
2:B:70:LEU:O	2:B:81:ILE:HA	2.20	0.41
2:B:79:LEU:HD23	2:B:79:LEU:HA	1.92	0.41
2:B:233:CYS:SG	2:B:234:PHE:N	2.93	0.41
4:R:248:ILE:HD12	4:R:248:ILE:H	1.85	0.41
2:B:187:VAL:HG21	2:B:201:SER:HB3	2.02	0.41
4:R:31:VAL:HG13	4:R:32:LEU:HD22	2.02	0.41
4:R:32:LEU:HD12	4:R:46:ASP:HB3	2.03	0.41
1:A:345:LYS:HB2	1:A:345:LYS:NZ	2.35	0.41
4:R:91:LEU:HD12	4:R:91:LEU:HA	1.87	0.41
4:R:241:LEU:HD23	4:R:241:LEU:HA	1.79	0.41
2:B:112:VAL:HG23	2:B:124:TYR:HB2	2.03	0.41
2:B:239:ASN:HD22	2:B:256:ARG:NH2	2.19	0.41
5:S:153:LEU:HD12	5:S:153:LEU:HA	1.92	0.41
5:S:108:PHE:HB3	5:S:165:PHE:HZ	1.86	0.41
1:A:227:LEU:HD11	1:A:303:ILE:HD13	2.01	0.41
1:A:260:THR:HA	1:A:317:LYS:HZ1	1.85	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
5:S:32:PHE:CE1	5:S:100:ILE:HB	2.56	0.41
1:A:226:ALA:HB1	1:A:270:LYS:NZ	2.36	0.40
2:B:314:ARG:HD3	2:B:332:TRP:CH2	2.56	0.40
4:R:42:LEU:HD23	4:R:42:LEU:HA	1.86	0.40
4:R:266:TYR:O	4:R:269:ILE:HG22	2.21	0.40
2:B:153:ASP:C	2:B:155:ASN:H	2.29	0.40
2:B:239:ASN:HD22	2:B:256:ARG:CZ	2.34	0.40
4:R:152:ILE:HD13	4:R:152:ILE:HA	1.87	0.40
5:S:143:VAL:HG23	5:S:207:LEU:HD11	2.03	0.40
4:R:140:THR:O	4:R:143:PRO:HD2	2.21	0.40
2:B:336:LEU:HD23	2:B:336:LEU:HA	1.90	0.40
4:R:16:LEU:O	4:R:19:LEU:HG	2.22	0.40
4:R:102:PHE:HA	4:R:105:ILE:HG22	2.03	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	221/369 (60%)	216 (98%)	5 (2%)	0	100	100
2	B	339/366 (93%)	324 (96%)	15 (4%)	0	100	100
3	G	55/71 (78%)	52 (94%)	3 (6%)	0	100	100
4	R	268/1011 (26%)	253 (94%)	15 (6%)	0	100	100
5	S	228/266 (86%)	215 (94%)	13 (6%)	0	100	100
All	All	1111/2083 (53%)	1060 (95%)	51 (5%)	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	200/320 (62%)	200 (100%)	0	100	100
2	B	283/298 (95%)	283 (100%)	0	100	100
3	G	46/58 (79%)	46 (100%)	0	100	100
4	R	254/879 (29%)	254 (100%)	0	100	100
5	S	197/216 (91%)	196 (100%)	1 (0%)	86	92
All	All	980/1771 (55%)	979 (100%)	1 (0%)	92	97

All (1) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
5	S	130	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (9) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	255	ASN
1	A	346	ASN
2	B	32	GLN
2	B	88	ASN
2	B	176	GLN
2	B	295	ASN
4	R	112	HIS
4	R	210	HIS
5	S	3	GLN

5.3.3 RNA ⓘ

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](#)

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	$\# Z > 2$
6	SA0	R	501	-	21,21,21	0.21	0	29,29,29	0.46	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
6	SA0	R	501	-	-	5/8/28/28	0/2/2/2

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (5) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	R	501	SA0	O5-C5-C6-O6
6	R	501	SA0	OAA-CAJ-CAN-CAH
6	R	501	SA0	OAA-CAJ-CAN-CAO
6	R	501	SA0	O5-C1-O1-CAO

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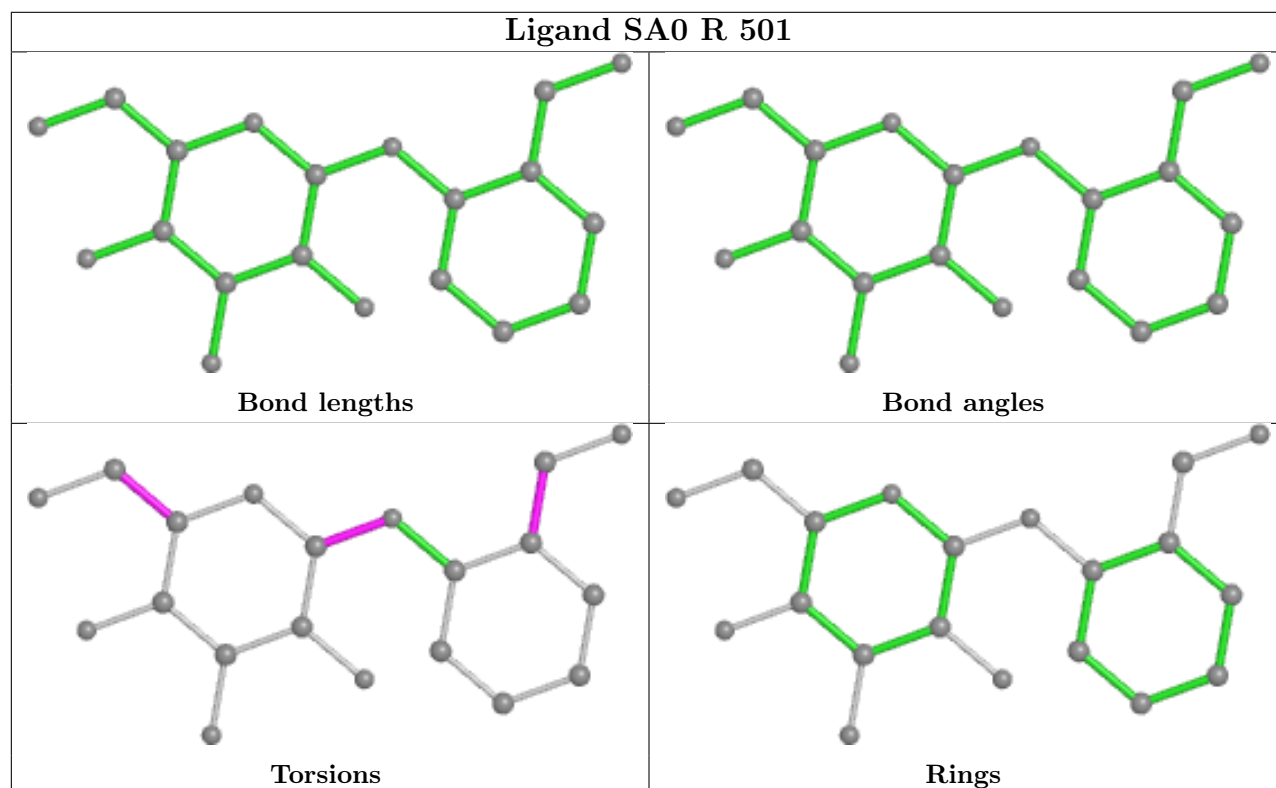
Mol	Chain	Res	Type	Atoms
6	R	501	SA0	C2-C1-O1-CAO

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	R	501	SA0	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

There are no such residues in this entry.

5.8 Polymer linkage issues

There are no chain breaks in this entry.