



Full wwPDB EM Validation Report ⓘ

Oct 8, 2025 – 02:08 PM JST

PDB ID : 9KPE / pdb_00009kpe
EMDB ID : EMD-62485
Title : Cryo-EM structure of GPCR16-GiH5 complex
Authors : Wang, X.; Wu, L.J.; Hua, T.; Liu, Z.J.
Deposited on : 2024-11-22
Resolution : 3.35 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

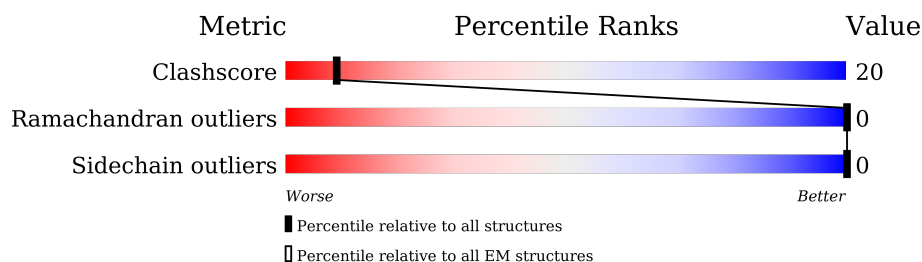
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 3.35 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	368	
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 8916 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
			1814	1152	299	349	14		

There are 19 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-13	ASP	-	expression tag	UNP P63096
A	-12	TYR	-	expression tag	UNP P63096
A	-11	LYS	-	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	ASP	-	expression tag	UNP P63096
A	-6	LYS	-	expression tag	UNP P63096
A	-5	GLU	-	expression tag	UNP P63096
A	-4	ASN	-	expression tag	UNP P63096
A	-3	LEU	-	expression tag	UNP P63096
A	-2	TYR	-	expression tag	UNP P63096
A	-1	PHE	-	expression tag	UNP P63096
A	0	GLN	-	expression tag	UNP P63096
A	1	SER	-	expression tag	UNP P63096
A	330	GLN	LYS	conflict	UNP P63096
A	333	LYS	GLN	conflict	UNP P63096
A	342	ILE	VAL	conflict	UNP P63096
A	346	GLU	ASN	conflict	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
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		

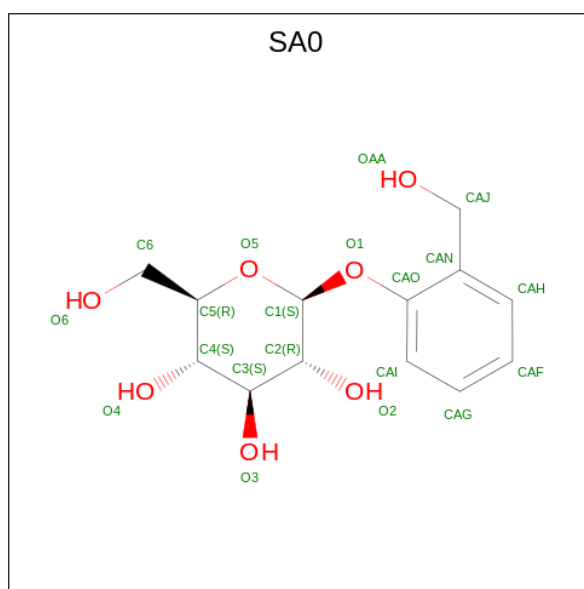
There are 6 discrepancies between the modelled and reference sequences:

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

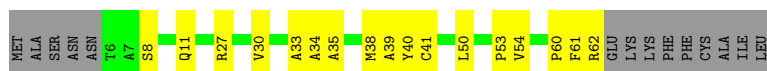
- Molecule 5 is a protein called scFv16.

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

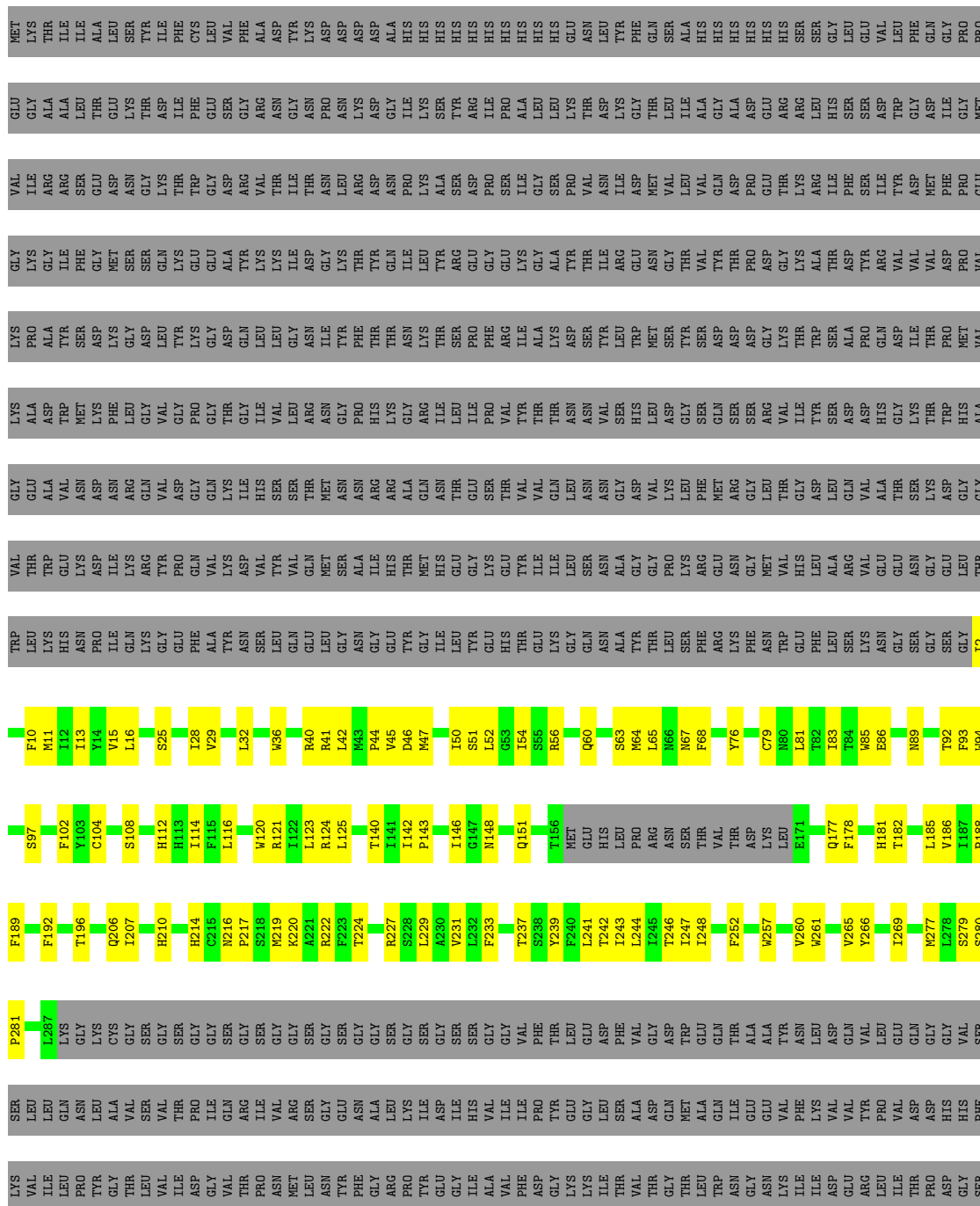
- Molecule 6 is 2-(hydroxymethyl)phenyl beta-D-glucopyranoside (CCD ID: SA0) (formula: $C_{13}H_{18}O_7$) (labeled as "Ligand of Interest" by depositor).



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

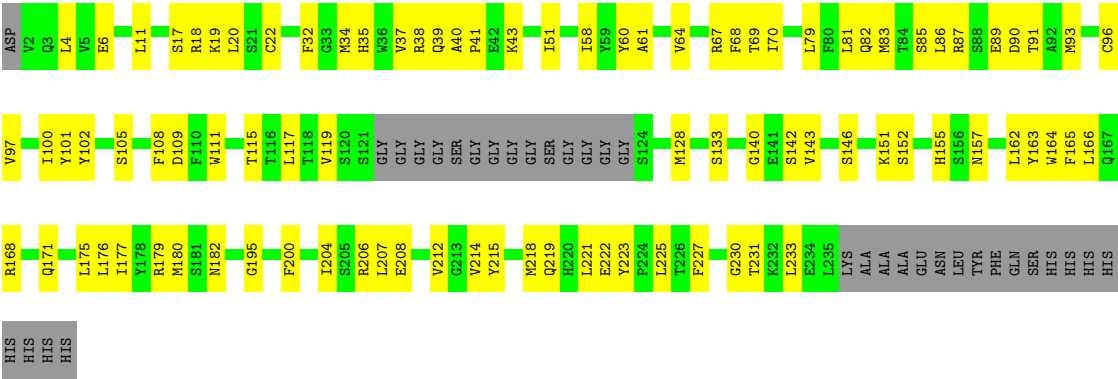


- Chain R: 17% 10% 73%



MET
LEU
PHE
ARG
VAL
THR
ILE
ASN
SER

● Molecule 5: scFv16



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	103932	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	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: 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	0.18	0/1844	0.36	0/2472
2	B	0.22	0/2663	0.44	0/3610
3	G	0.17	0/442	0.45	0/597
4	R	0.18	0/2312	0.41	0/3152
5	S	0.21	0/1827	0.42	0/2477
All	All	0.20	0/9088	0.41	0/12308

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	1814	0	1799	60	0
2	B	2616	0	2518	136	0
3	G	436	0	448	20	0
4	R	2247	0	2334	81	0
5	S	1783	0	1717	93	0
6	R	20	0	18	2	0
All	All	8916	0	8834	358	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 20.

All (358) 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)
5:S:83:MET:CE	5:S:86:LEU:HD21	1.78	1.14
2:B:271:CYS:HB3	2:B:290:ASP:HB3	1.39	1.05
5:S:83:MET:HE2	5:S:86:LEU:HD11	1.47	0.96
5:S:218:MET:CE	5:S:227:PHE:CZ	2.51	0.93
5:S:83:MET:HE2	5:S:86:LEU:HD21	1.50	0.90
5:S:83:MET:HE1	5:S:117:LEU:HD13	1.51	0.90
5:S:83:MET:CE	5:S:86:LEU:HD11	2.07	0.84
5:S:218:MET:CE	5:S:227:PHE:CE2	2.60	0.84
5:S:83:MET:HE1	5:S:117:LEU:CD1	2.11	0.81
5:S:83:MET:HE3	5:S:86:LEU:HD21	1.63	0.80
2:B:294:CYS:HB2	2:B:308:LEU:HB2	1.65	0.79
5:S:83:MET:HE2	5:S:86:LEU:CD1	2.15	0.77
5:S:40:ALA:HB3	5:S:43:LYS:HB2	1.65	0.76
5:S:64:VAL:HB	5:S:68:PHE:HD2	1.51	0.76
2:B:197:ARG:HH12	2:B:214:ARG:HB2	1.52	0.75
5:S:218:MET:HE2	5:S:227:PHE:CZ	2.20	0.75
1:A:37:LEU:HB3	1:A:221:ILE:HD13	1.69	0.74
5:S:83:MET:CE	5:S:86:LEU:CD2	2.63	0.74
5:S:83:MET:HE2	5:S:86:LEU:CD2	2.17	0.73
4:R:219:MET:HE3	4:R:219:MET:HA	1.71	0.73
5:S:212:VAL:HA	5:S:233:LEU:HD23	1.71	0.73
5:S:108:PHE:HE2	5:S:218:MET:SD	2.11	0.72
2:B:120:ILE:HG23	2:B:140:ALA:HB2	1.71	0.72
1:A:339:VAL:HA	1:A:342:ILE:HD12	1.71	0.72
2:B:191:SER:HB3	2:B:232:ILE:HG23	1.73	0.71
5:S:218:MET:HE1	5:S:227:PHE:CZ	2.23	0.71
4:R:47:MET:HA	4:R:50:ILE:HG22	1.73	0.71
1:A:315:ASP:HA	4:R:217:PRO:HB3	1.73	0.70
1:A:251:ASP:OD1	1:A:255:ASN:ND2	2.25	0.70
2:B:187:VAL:HA	2:B:203:ALA:HA	1.73	0.70
5:S:108:PHE:CE2	5:S:218:MET:SD	2.85	0.70
2:B:54:HIS:CE1	2:B:74:SER:HB3	2.27	0.70
2:B:50:THR:OG1	2:B:337:LYS:NZ	2.26	0.69
2:B:149:CYS:O	2:B:150:ARG:NH1	2.27	0.68
2:B:10:GLU:O	2:B:14:LEU:HD12	1.93	0.68
4:R:185:LEU:HD21	4:R:247:ILE:HD11	1.75	0.68
5:S:218:MET:HE3	5:S:227:PHE:CE2	2.29	0.68
5:S:155:HIS:HD2	5:S:157:ASN:HB3	1.59	0.68

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
5:S:18:ARG:HG3	5:S:19:LYS:H	1.59	0.67
2:B:70:LEU:O	2:B:81:ILE:HA	1.94	0.67
2:B:225:HIS:CD2	2:B:251:ARG:HG3	2.30	0.66
4:R:237:THR:O	4:R:241:LEU:HD22	1.95	0.66
2:B:104:ALA:HB3	2:B:113:ALA:HB3	1.77	0.66
4:R:65:LEU:HA	4:R:68:PHE:CE2	2.30	0.66
5:S:215:TYR:O	5:S:230:GLY:HA2	1.96	0.65
4:R:216:ASN:HB2	4:R:217:PRO:HD3	1.79	0.64
1:A:36:LEU:HD22	1:A:220:ALA:HB3	1.78	0.64
4:R:97:SER:OG	4:R:188:PRO:O	2.15	0.64
5:S:83:MET:HE2	5:S:86:LEU:CG	2.28	0.64
4:R:220:LYS:O	4:R:224:THR:HG23	1.97	0.64
2:B:321:THR:OG1	2:B:325:MET:N	2.30	0.64
5:S:64:VAL:HB	5:S:68:PHE:CD2	2.32	0.64
5:S:208:GLU:OE2	5:S:208:GLU:N	2.28	0.64
4:R:177:GLN:O	4:R:181:HIS:ND1	2.22	0.63
2:B:126:LEU:HA	2:B:133:VAL:HG12	1.79	0.63
4:R:65:LEU:HD11	4:R:81:LEU:HB2	1.81	0.63
4:R:196:THR:HG23	4:R:229:LEU:HD12	1.80	0.63
2:B:289:TYR:OH	2:B:297:TRP:NE1	2.33	0.62
1:A:210:LYS:HG3	2:B:188:MET:HE2	1.82	0.62
2:B:33:ILE:O	2:B:36:ASN:ND2	2.32	0.62
5:S:51:ILE:HD11	5:S:79:LEU:HD11	1.82	0.62
4:R:83:ILE:HG12	4:R:148:ASN:HD22	1.65	0.61
5:S:168:ARG:HB3	5:S:171:GLN:HB2	1.81	0.61
5:S:215:TYR:O	5:S:230:GLY:CA	2.48	0.61
2:B:70:LEU:HD11	2:B:338:ILE:HD11	1.81	0.61
5:S:17:SER:HA	5:S:83:MET:O	1.99	0.61
5:S:67:ARG:NH1	5:S:85:SER:O	2.32	0.61
4:R:2:ILE:HB	4:R:257:TRP:HZ3	1.65	0.61
5:S:155:HIS:CD2	5:S:157:ASN:HB3	2.36	0.61
4:R:277:MET:O	4:R:280:SER:OG	2.18	0.60
2:B:12:GLU:HA	2:B:15:LYS:HD2	1.82	0.60
5:S:195:GLY:HA3	5:S:200:PHE:HD1	1.66	0.60
2:B:30:LEU:HD13	3:G:34:ALA:HB1	1.83	0.60
5:S:51:ILE:HD13	5:S:70:ILE:HG12	1.83	0.60
5:S:164:TRP:HB2	5:S:177:ILE:HG22	1.84	0.60
5:S:35:HIS:NE2	5:S:101:TYR:OH	2.35	0.60
2:B:18:ILE:HD12	2:B:19:ARG:N	2.17	0.59
4:R:41:ARG:NH2	4:R:42:LEU:O	2.35	0.59
5:S:146:SER:HA	5:S:200:PHE:O	2.02	0.59

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:R:94:TRP:CE2	4:R:188:PRO:HG3	2.37	0.59
5:S:155:HIS:HD2	5:S:157:ASN:CB	2.14	0.59
1:A:50:VAL:HG22	1:A:198:MET:HE3	1.83	0.59
5:S:51:ILE:HG22	5:S:58:ILE:HG12	1.84	0.59
5:S:6:GLU:HB2	5:S:115:THR:HG23	1.84	0.59
1:A:189:PHE:HE1	1:A:198:MET:HB2	1.68	0.59
2:B:290:ASP:CB	2:B:314:ARG:HE	2.16	0.59
5:S:18:ARG:HB3	5:S:83:MET:SD	2.42	0.59
1:A:282:PRO:HB2	1:A:284:THR:HG23	1.85	0.58
2:B:245:SER:H	2:B:273:ILE:HD12	1.68	0.58
5:S:69:THR:HG22	5:S:82:GLN:HB2	1.86	0.58
5:S:83:MET:CE	5:S:117:LEU:HD13	2.30	0.58
4:R:86:GLU:HG2	4:R:181:HIS:HD2	1.68	0.58
4:R:178:PHE:HE2	4:R:248:ILE:HA	1.68	0.58
1:A:28:GLU:HA	4:R:120:TRP:HZ3	1.68	0.57
1:A:221:ILE:HB	1:A:264:ILE:HG12	1.86	0.57
2:B:212:ASP:HB3	2:B:219:ARG:HH12	1.69	0.57
1:A:37:LEU:HD22	1:A:215:PHE:CG	2.39	0.57
1:A:257:LYS:HE2	1:A:258:TRP:CZ2	2.40	0.57
2:B:189:SER:HG	2:B:232:ILE:HB	1.70	0.57
2:B:259:GLN:N	2:B:259:GLN:OE1	2.37	0.57
4:R:11:MET:O	4:R:15:VAL:HG23	2.04	0.57
1:A:264:ILE:HB	1:A:319:ILE:HD12	1.85	0.57
4:R:206:GLN:HG3	4:R:222:ARG:HD3	1.85	0.57
2:B:59:TYR:HE2	2:B:75:GLN:HG2	1.70	0.57
2:B:290:ASP:HA	2:B:314:ARG:HD3	1.87	0.56
5:S:151:LYS:NZ	5:S:152:SER:O	2.38	0.56
2:B:266:HIS:ND1	2:B:268:ASN:OD1	2.37	0.56
2:B:93:ILE:HG12	2:B:133:VAL:HG21	1.88	0.56
5:S:32:PHE:CE1	5:S:100:ILE:HB	2.41	0.56
5:S:91:THR:HB	5:S:119:VAL:HG12	1.86	0.56
2:B:183:HIS:CE1	2:B:209:LYS:HB2	2.41	0.56
2:B:25:CYS:HB2	2:B:259:GLN:HE22	1.70	0.56
4:R:60:GLN:O	4:R:64:MET:HG2	2.06	0.56
1:A:214:CYS:SG	2:B:101:MET:HE3	2.46	0.56
5:S:155:HIS:CD2	5:S:157:ASN:H	2.24	0.55
2:B:30:LEU:HD22	2:B:261:LEU:HG	1.89	0.55
2:B:68:ARG:HG3	2:B:85:TYR:CE2	2.41	0.55
2:B:74:SER:OG	2:B:75:GLN:N	2.39	0.55
4:R:25:SER:O	4:R:28:ILE:HG22	2.06	0.55
1:A:52:GLN:NE2	1:A:325:CYS:O	2.40	0.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:135:VAL:HG13	2:B:135:VAL:O	2.06	0.55
4:R:266:TYR:HA	4:R:269:ILE:HG22	1.89	0.55
2:B:327:VAL:HG13	3:G:50:LEU:HD11	1.89	0.54
2:B:343:SER:OG	3:G:54:VAL:O	2.24	0.54
5:S:100:ILE:HG23	5:S:105:SER:HB2	1.89	0.54
2:B:5:ASP:OD1	2:B:5:ASP:N	2.38	0.54
2:B:225:HIS:ND1	2:B:245:SER:HB3	2.21	0.54
5:S:223:TYR:O	5:S:225:LEU:HD12	2.08	0.54
2:B:329:THR:OG1	2:B:339:TRP:NE1	2.38	0.54
2:B:49:ARG:HH12	3:G:61:PHE:HB3	1.73	0.54
1:A:256:ASN:OD1	1:A:257:LYS:N	2.41	0.54
5:S:61:ALA:HB3	5:S:64:VAL:HG22	1.89	0.54
1:A:213:HIS:HD1	2:B:332:TRP:HZ2	1.56	0.54
5:S:219:GLN:NE2	5:S:222:GLU:O	2.41	0.54
1:A:28:GLU:HG3	1:A:32:ARG:HH12	1.73	0.53
2:B:121:CYS:HB3	2:B:139:LEU:CD1	2.38	0.53
2:B:156:GLN:HA	2:B:169:TRP:O	2.08	0.53
4:R:227:ARG:O	4:R:231:VAL:HG23	2.08	0.53
1:A:52:GLN:OE1	1:A:331:ASN:ND2	2.40	0.53
2:B:85:TYR:CE1	3:G:60:PRO:HB2	2.44	0.53
2:B:162:GLY:HA2	2:B:186:ASP:HB2	1.90	0.53
4:R:13:ILE:O	4:R:16:LEU:HG	2.08	0.53
1:A:243:MET:O	1:A:247:MET:HG3	2.09	0.53
2:B:185:GLY:H	2:B:205:ASP:HB3	1.73	0.53
2:B:189:SER:OG	2:B:232:ILE:HB	2.08	0.53
3:G:35:ALA:HA	3:G:38:MET:HG3	1.90	0.53
5:S:39:GLN:O	5:S:93:MET:N	2.40	0.53
2:B:72:SER:HB3	2:B:82:TRP:HE1	1.75	0.53
5:S:109:ASP:HA	5:S:175:LEU:HD12	1.91	0.53
5:S:142:SER:HA	5:S:204:ILE:O	2.09	0.53
2:B:286:LEU:HD12	2:B:286:LEU:H	1.73	0.52
4:R:83:ILE:HG12	4:R:148:ASN:ND2	2.24	0.52
4:R:42:LEU:HD12	4:R:46:ASP:HB2	1.91	0.52
5:S:162:LEU:HD22	5:S:200:PHE:CD2	2.45	0.52
2:B:257:ALA:HB1	3:G:30:VAL:HG12	1.92	0.52
5:S:166:LEU:HB2	5:S:176:LEU:HD11	1.90	0.52
1:A:224:CYS:HB3	1:A:269:ASN:OD1	2.09	0.52
2:B:343:SER:HA	3:G:53:PRO:HB3	1.90	0.52
5:S:11:LEU:O	5:S:18:ARG:NH2	2.43	0.52
2:B:37:ILE:HD11	2:B:301:LYS:HB2	1.91	0.51
2:B:68:ARG:HG3	2:B:85:TYR:CD2	2.46	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:321:THR:H	4:R:214:HIS:CE1	2.29	0.51
4:R:243:ILE:HA	4:R:246:THR:HG22	1.93	0.51
4:R:36:TRP:HE3	4:R:40:ARG:HG2	1.75	0.51
5:S:38:ARG:NH1	5:S:89:GLU:O	2.44	0.51
4:R:44:PRO:HG2	4:R:123:LEU:HD22	1.92	0.51
1:A:318:GLU:OE2	4:R:217:PRO:HD3	2.10	0.51
2:B:294:CYS:SG	2:B:315:VAL:HG11	2.50	0.51
1:A:15:ARG:HD3	5:S:102:TYR:HB3	1.92	0.50
1:A:271:LYS:HG2	1:A:325:CYS:HB3	1.94	0.50
2:B:278:PHE:HD2	2:B:282:GLY:HA2	1.77	0.50
5:S:67:ARG:NH2	5:S:90:ASP:OD2	2.28	0.50
1:A:35:LYS:HB3	1:A:199:PHE:CE2	2.46	0.50
2:B:225:HIS:HD2	2:B:251:ARG:NH1	2.09	0.50
2:B:22:ARG:O	2:B:259:GLN:NE2	2.45	0.50
2:B:71:VAL:HG12	2:B:81:ILE:HG12	1.93	0.50
5:S:69:THR:CG2	5:S:82:GLN:HB2	2.42	0.50
5:S:162:LEU:HD12	5:S:218:MET:O	2.11	0.50
4:R:51:SER:O	4:R:54:ILE:HG12	2.12	0.50
4:R:196:THR:HG21	4:R:233:PHE:HB2	1.94	0.50
2:B:123:ILE:HG13	2:B:171:ILE:CD1	2.42	0.50
4:R:85:TRP:NE1	4:R:266:TYR:OH	2.42	0.50
5:S:35:HIS:HB2	5:S:97:VAL:HG12	1.94	0.50
5:S:219:GLN:HE22	5:S:222:GLU:H	1.60	0.50
5:S:34:MET:HE1	5:S:96:CYS:SG	2.52	0.49
4:R:120:TRP:CD1	4:R:120:TRP:C	2.90	0.49
4:R:121:ARG:HH21	4:R:124:ARG:HB3	1.76	0.49
2:B:235:PHE:HD1	2:B:237:ASN:H	1.59	0.49
1:A:240:MET:HA	1:A:240:MET:HE3	1.94	0.49
2:B:200:VAL:HG23	2:B:210:LEU:HD12	1.94	0.49
2:B:45:MET:HE1	3:G:50:LEU:HD12	1.95	0.48
4:R:279:SER:O	4:R:279:SER:OG	2.22	0.48
1:A:34:VAL:HG11	1:A:339:VAL:HG11	1.95	0.48
1:A:187:THR:HB	1:A:198:MET:HB3	1.95	0.48
1:A:243:MET:SD	1:A:243:MET:N	2.85	0.48
2:B:286:LEU:HD23	2:B:308:LEU:HD11	1.94	0.48
2:B:187:VAL:HG11	2:B:201:SER:HB3	1.94	0.48
5:S:219:GLN:OE1	5:S:221:LEU:N	2.45	0.48
3:G:38:MET:SD	3:G:39:ALA:N	2.86	0.48
2:B:121:CYS:HB3	2:B:139:LEU:HD12	1.95	0.48
1:A:37:LEU:HG	1:A:39:LEU:HG	1.96	0.48
1:A:210:LYS:CG	2:B:188:MET:HE2	2.44	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:R:120:TRP:HD1	4:R:120:TRP:O	1.96	0.48
4:R:52:LEU:O	4:R:56:ARG:HG2	2.14	0.47
5:S:128:MET:HE3	5:S:128:MET:HA	1.94	0.47
2:B:314:ARG:HB2	2:B:332:TRP:CD2	2.49	0.47
2:B:316:SER:HB3	2:B:332:TRP:CD1	2.48	0.47
5:S:22:CYS:HB3	5:S:79:LEU:HB3	1.96	0.47
3:G:8:SER:O	3:G:11:GLN:HG3	2.15	0.47
1:A:35:LYS:HB3	1:A:199:PHE:HE2	1.78	0.47
4:R:46:ASP:OD1	4:R:281:PRO:HG2	2.14	0.47
1:A:201:VAL:HG11	1:A:211:TRP:CH2	2.50	0.47
2:B:206:ALA:HB1	2:B:225:HIS:O	2.14	0.47
1:A:226:ALA:O	1:A:243:MET:HE1	2.15	0.46
1:A:258:TRP:HZ2	2:B:314:ARG:NH2	2.13	0.46
2:B:295:ASN:ND2	2:B:304:ARG:HD2	2.29	0.46
1:A:228:SER:OG	1:A:274:PHE:N	2.48	0.46
2:B:76:ASP:OD1	2:B:76:ASP:N	2.48	0.46
4:R:85:TRP:CZ3	6:R:501:SAO:HAI	2.51	0.46
5:S:40:ALA:HB1	5:S:41:PRO:HD2	1.96	0.46
1:A:182:THR:OG1	1:A:183:GLY:N	2.49	0.46
2:B:81:ILE:O	2:B:90:VAL:N	2.47	0.46
2:B:290:ASP:HB2	2:B:314:ARG:HE	1.79	0.46
2:B:313:ASN:HB3	2:B:332:TRP:HB2	1.97	0.46
4:R:76:TYR:HA	4:R:79:CYS:SG	2.56	0.46
5:S:214:VAL:HA	5:S:231:THR:O	2.15	0.46
4:R:45:VAL:HB	4:R:102:PHE:HE2	1.81	0.46
1:A:209:LYS:HE3	1:A:211:TRP:HZ2	1.80	0.46
2:B:204:CYS:HA	2:B:228:ASP:HB2	1.96	0.46
5:S:37:VAL:HG21	5:S:111:TRP:CH2	2.51	0.46
5:S:218:MET:HE2	5:S:227:PHE:CE1	2.50	0.46
1:A:332:VAL:HA	1:A:335:VAL:HG12	1.98	0.46
2:B:163:ASP:O	2:B:164:THR:OG1	2.32	0.45
2:B:290:ASP:CG	2:B:314:ARG:HE	2.24	0.45
4:R:182:THR:O	4:R:186:VAL:HG23	2.15	0.45
4:R:252:PHE:CZ	4:R:257:TRP:HB2	2.51	0.45
5:S:165:PHE:HE1	5:S:175:LEU:HG	1.81	0.45
2:B:220:GLN:HG2	3:G:27:ARG:HH22	1.81	0.45
2:B:145:TYR:HE2	2:B:188:MET:HE1	1.81	0.45
4:R:247:ILE:HG12	6:R:501:SAO:HAF	1.99	0.45
1:A:185:VAL:HB	1:A:200:ASP:HB3	1.99	0.45
1:A:199:PHE:CZ	2:B:99:TRP:HZ2	2.35	0.45
1:A:209:LYS:HE3	1:A:211:TRP:CZ2	2.52	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:268:ASN:OD1	2:B:268:ASN:N	2.49	0.45
2:B:291:ASP:HB3	2:B:293:ASN:ND2	2.31	0.45
2:B:61:MET:HA	2:B:71:VAL:O	2.17	0.45
2:B:266:HIS:O	2:B:269:ILE:HG22	2.17	0.45
4:R:10:PHE:CG	4:R:260:VAL:HG12	2.52	0.45
5:S:4:LEU:HD23	5:S:4:LEU:HA	1.73	0.45
2:B:228:ASP:O	2:B:245:SER:HB2	2.17	0.45
4:R:192:PHE:CD1	4:R:192:PHE:C	2.94	0.45
4:R:261:TRP:O	4:R:265:VAL:HG23	2.17	0.44
5:S:155:HIS:HD2	5:S:157:ASN:CG	2.24	0.44
5:S:204:ILE:HG21	5:S:207:LEU:CD2	2.46	0.44
2:B:66:ASP:OD1	2:B:66:ASP:N	2.40	0.44
2:B:247:ASP:O	2:B:249:THR:N	2.46	0.44
5:S:39:GLN:HB3	5:S:93:MET:HB3	1.98	0.44
5:S:67:ARG:CZ	5:S:87:ARG:HE	2.29	0.44
2:B:283:ARG:HA	2:B:283:ARG:HD2	1.73	0.44
4:R:269:ILE:HD12	4:R:269:ILE:HA	1.79	0.44
1:A:20:ASP:OD2	2:B:89:LYS:NZ	2.50	0.44
1:A:38:LEU:HD11	1:A:224:CYS:SG	2.57	0.44
2:B:212:ASP:OD1	2:B:215:GLU:HB2	2.18	0.44
2:B:236:PRO:HB2	3:G:40:TYR:CE1	2.52	0.44
2:B:186:ASP:OD1	2:B:186:ASP:N	2.50	0.44
2:B:123:ILE:HD11	2:B:157:ILE:HD12	2.00	0.43
4:R:112:HIS:CD2	4:R:114:ILE:HB	2.53	0.43
2:B:123:ILE:O	2:B:136:SER:N	2.51	0.43
2:B:225:HIS:CD2	2:B:225:HIS:H	2.35	0.43
4:R:206:GLN:O	4:R:210:HIS:ND1	2.49	0.43
2:B:42:ARG:NH1	2:B:306:GLY:HA2	2.33	0.43
4:R:29:VAL:HA	4:R:50:ILE:HD11	2.00	0.43
4:R:207:ILE:HA	4:R:219:MET:HE1	2.01	0.43
2:B:335:PHE:HZ	4:R:41:ARG:HG2	1.84	0.43
5:S:60:TYR:CZ	5:S:70:ILE:HG22	2.53	0.43
2:B:232:ILE:CD1	2:B:243:THR:HG22	2.49	0.43
4:R:93:PHE:HB3	4:R:188:PRO:HB2	2.00	0.43
2:B:220:GLN:HG2	3:G:27:ARG:HH12	1.84	0.43
2:B:269:ILE:HD12	2:B:269:ILE:HA	1.82	0.43
2:B:258:ASP:OD2	3:G:27:ARG:NE	2.52	0.43
4:R:93:PHE:HE1	4:R:239:TYR:HE2	1.67	0.43
1:A:250:PHE:HE1	1:A:264:ILE:HG21	1.83	0.43
2:B:15:LYS:HA	2:B:18:ILE:HG13	2.00	0.43
2:B:233:CYS:SG	2:B:234:PHE:N	2.92	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:R:93:PHE:HE2	4:R:189:PHE:HB2	1.84	0.43
2:B:191:SER:O	2:B:191:SER:OG	2.36	0.43
4:R:242:THR:HG21	4:R:265:VAL:HG22	2.00	0.43
4:R:32:LEU:HB2	4:R:50:ILE:HD13	2.01	0.42
4:R:116:LEU:HD12	4:R:116:LEU:HA	1.87	0.42
1:A:6:SER:OG	1:A:7:ALA:N	2.52	0.42
3:G:62:ARG:HE	3:G:62:ARG:HA	1.84	0.42
2:B:61:MET:SD	2:B:61:MET:C	3.03	0.42
4:R:244:LEU:HA	4:R:247:ILE:HD12	2.00	0.42
1:A:28:GLU:HA	4:R:120:TRP:CZ3	2.52	0.42
1:A:250:PHE:CE1	1:A:266:LEU:HD21	2.54	0.42
2:B:58:ILE:HB	2:B:331:SER:O	2.20	0.42
2:B:323:ASP:OD1	2:B:323:ASP:N	2.44	0.42
5:S:133:SER:HA	5:S:231:THR:HA	2.01	0.42
1:A:50:VAL:HG22	1:A:198:MET:CE	2.48	0.42
2:B:139:LEU:HD22	2:B:169:TRP:HB3	2.01	0.42
2:B:256:ARG:HH21	3:G:33:ALA:HA	1.85	0.42
4:R:63:SER:O	4:R:67:ASN:ND2	2.53	0.42
5:S:143:VAL:CG2	5:S:207:LEU:HD11	2.50	0.42
1:A:318:GLU:C	1:A:319:ILE:HD13	2.44	0.42
2:B:197:ARG:NH1	2:B:214:ARG:HB2	2.25	0.42
2:B:195:ASP:OD2	2:B:197:ARG:HB2	2.20	0.42
2:B:220:GLN:HE22	2:B:255:LEU:HB3	1.84	0.42
4:R:121:ARG:NE	4:R:121:ARG:HA	2.34	0.42
4:R:143:PRO:O	4:R:146:ILE:HG12	2.20	0.42
2:B:108:SER:OG	2:B:154:ASP:OD2	2.31	0.41
4:R:121:ARG:NH2	4:R:125:LEU:HG	2.35	0.41
5:S:140:GLY:HA2	5:S:206:ARG:HG2	2.01	0.41
5:S:157:ASN:OD1	5:S:157:ASN:C	2.63	0.41
1:A:39:LEU:HD21	1:A:211:TRP:HH2	1.85	0.41
4:R:52:LEU:HD23	4:R:52:LEU:HA	1.83	0.41
1:A:26:ASP:OD2	2:B:78:LYS:NZ	2.49	0.41
1:A:183:GLY:HA2	2:B:119:ASN:ND2	2.35	0.41
2:B:61:MET:HE3	2:B:328:ALA:CB	2.50	0.41
4:R:277:MET:HE3	4:R:277:MET:HA	2.00	0.41
5:S:108:PHE:CD2	5:S:218:MET:SD	3.13	0.41
2:B:11:ALA:O	2:B:15:LYS:HG3	2.20	0.41
2:B:164:THR:HG22	2:B:185:GLY:C	2.45	0.41
4:R:121:ARG:HH22	4:R:125:LEU:HG	1.86	0.41
4:R:140:THR:O	4:R:143:PRO:HD2	2.20	0.41
5:S:83:MET:HE1	5:S:117:LEU:HD11	1.98	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
5:S:87:ARG:O	5:S:119:VAL:HG11	2.21	0.41
5:S:179:ARG:C	5:S:180:MET:HG3	2.45	0.41
1:A:33:GLU:HA	1:A:195:HIS:O	2.20	0.41
2:B:145:TYR:CE1	2:B:162:GLY:HA3	2.56	0.41
2:B:146:LEU:HD12	2:B:146:LEU:HA	1.88	0.41
2:B:281:SER:O	3:G:41:CYS:HA	2.21	0.41
4:R:89:ASN:HA	4:R:92:THR:HG22	2.03	0.41
5:S:35:HIS:CD2	5:S:108:PHE:HE1	2.38	0.41
2:B:180:PHE:HZ	2:B:213:VAL:HA	1.85	0.41
2:B:277:SER:OG	2:B:318:LEU:O	2.21	0.41
2:B:113:ALA:HA	2:B:123:ILE:HD13	2.01	0.41
2:B:279:SER:OG	2:B:280:LYS:N	2.53	0.41
4:R:56:ARG:CZ	4:R:269:ILE:HD11	2.51	0.41
4:R:142:ILE:O	4:R:146:ILE:HG23	2.21	0.41
5:S:177:ILE:HG13	5:S:182:ASN:O	2.21	0.41
1:A:191:PHE:HE2	1:A:333:LYS:HD3	1.86	0.41
2:B:236:PRO:HB2	3:G:40:TYR:HE1	1.86	0.41
2:B:123:ILE:HG13	2:B:171:ILE:HD12	2.02	0.40
2:B:180:PHE:HB3	2:B:211:TRP:CE3	2.56	0.40
5:S:20:LEU:HD12	5:S:81:LEU:HD23	2.03	0.40
1:A:279:LYS:HZ3	1:A:294:ASN:C	2.29	0.40
2:B:139:LEU:HD12	2:B:139:LEU:O	2.21	0.40
4:R:206:GLN:O	4:R:210:HIS:HB2	2.21	0.40
4:R:242:THR:CG2	4:R:265:VAL:HG22	2.51	0.40
5:S:35:HIS:CG	5:S:108:PHE:HE1	2.39	0.40
5:S:60:TYR:OH	5:S:69:THR:HA	2.20	0.40
1:A:278:ILE:HD12	1:A:278:ILE:HA	1.84	0.40
2:B:26:ALA:HA	3:G:30:VAL:HG22	2.04	0.40
2:B:121:CYS:HB3	2:B:139:LEU:HD11	2.03	0.40
1:A:191:PHE:CE2	1:A:333:LYS:HD3	2.56	0.40
4:R:104:CYS:O	4:R:108:SER:OG	2.22	0.40
4:R:151:GLN:HB3	4:R:177:GLN:NE2	2.35	0.40
5:S:163:TYR:HB2	5:S:218:MET:HB3	2.02	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	221/368 (60%)	213 (96%)	8 (4%)	0	100	100
2	B	339/366 (93%)	308 (91%)	31 (9%)	0	100	100
3	G	55/71 (78%)	52 (94%)	3 (6%)	0	100	100
4	R	268/1011 (26%)	257 (96%)	11 (4%)	0	100	100
5	S	228/266 (86%)	216 (95%)	12 (5%)	0	100	100
All	All	1111/2082 (53%)	1046 (94%)	65 (6%)	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	200/319 (63%)	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%)	197 (100%)	0	100	100
All	All	980/1770 (55%)	980 (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 (10) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	241	ASN
2	B	36	ASN
2	B	62	HIS
2	B	88	ASN
2	B	230	ASN
4	R	38	GLN
4	R	112	HIS
4	R	148	ASN
4	R	153	GLN
5	S	155	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 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	SAO	R	501	-	21,21,21	0.22	0	29,29,29	0.45	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	-	-	3/8/28/28	0/2/2/2

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (3) torsion outliers are listed below:

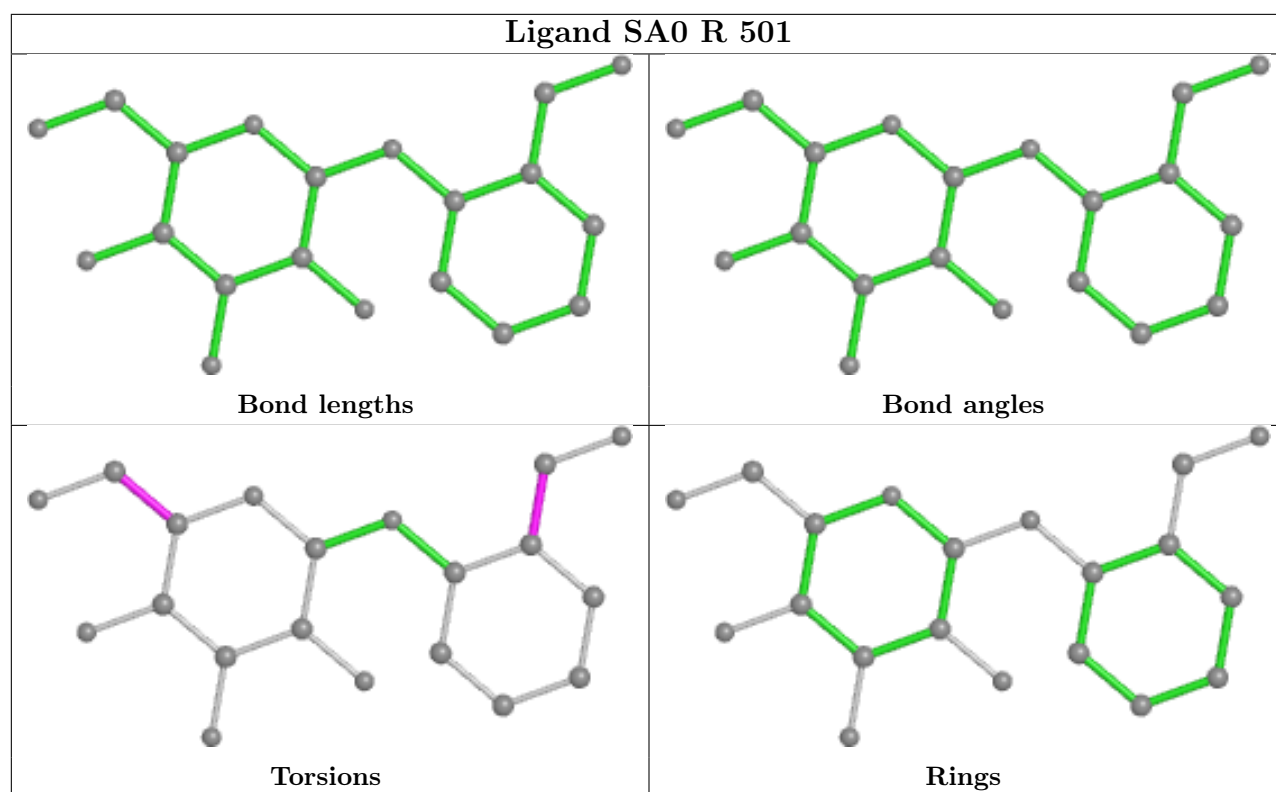
Mol	Chain	Res	Type	Atoms
6	R	501	SA0	O5-C5-C6-O6
6	R	501	SA0	OAA-CAJ-CAN-CAH
6	R	501	SA0	OAA-CAJ-CAN-CAO

There are no ring outliers.

1 monomer is involved in 2 short contacts:

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