WORLDWIDE wwPDB PROTEIN DATA BANK

Full wwPDB EM Validation Report (i)

Jul 16, 2025 – 11:06 AM JST

PDB ID	:	8YYW / pdb_00008yyw
EMDB ID	:	EMD-39681
Title	:	Cryo-EM structure of OXGR1 bound to alpha-ketoglutarate and Gq proteins
Authors	:	Liu, A.; Liu, Y.
Deposited on	:	2024-04-04
Resolution	:	3.16 Å(reported)

The following versions of software and data (see references (i)) were used in the production of this report:

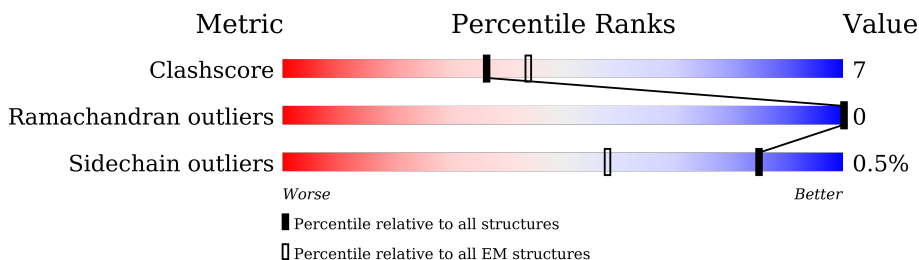|		
EMDB validation analysis	:	FAILED
Mogul	:	1.8.5 (274361), CSD as541be (2020)
MolProbity	:	4-5-2 with Phenix2.0rc1
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
MapQ	:	FAILED
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal 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 3.16 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		7
Ramachandran outliers		0
Sidechain outliers		0.5%

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	B	247	76% 18% 6%
2	C	339	77% 23%
3	D	57	89% 11%
4	E	337	73% 15% · 11%
5	F	354	55% 9% 36%

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
6	AKG	E	602	-	-	X	-

WORLDWIDE wwPDB PROTEIN DATA BANK

2 Entry composition ⓘ

There are 6 unique types of molecules in this entry. The entry contains 9068 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 ScFv16.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	B	232	Total 1783	C 1131	N 295	O 347	S 10	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	C	339	Total 2606	C 1607	N 468	O 510	S 21	0	0

- 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	D	57	Total 438	C 274	N 77	O 84	S 3	0	0

- Molecule 4 is a protein called 2-oxoglutarate receptor 1.

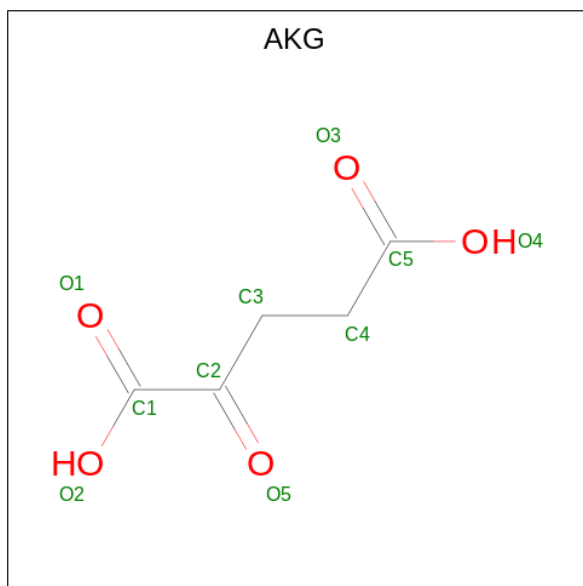| Mol	Chain	Residues	Atoms					AltConf	Trace
4	E	300	Total 2404	C 1585	N 389	O 408	S 22	0	0

- Molecule 5 is a protein called Guanine nucleotide-binding protein G(i) subunit alpha-1,Guanine nucleotide-binding protein G(q) subunit alpha.

Mol	Chain	Residues	Atoms					AltConf	Trace
5	F	225	Total 1817	C 1154	N 301	O 349	S 13	0	0

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
F	203	ALA	GLY	engineered mutation	UNP P63096
F	326	SER	ALA	engineered mutation	UNP P63096

- Molecule 6 is 2-OXOGLUTARIC ACID (CCD ID: AKG) (formula: $C_5H_6O_5$) (labeled as "Ligand of Interest" by depositor).


AKG

Mol	Chain	Residues	Atoms			AltConf
6	E	1	Total	C	O	0
			10	5	5	
6	E	1	Total	C	O	0
			10	5	5	

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.
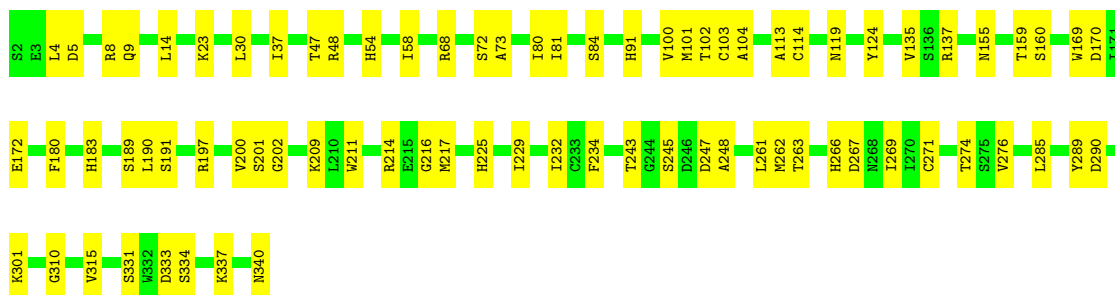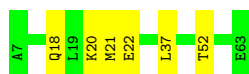
- Molecule 1: ScFv16

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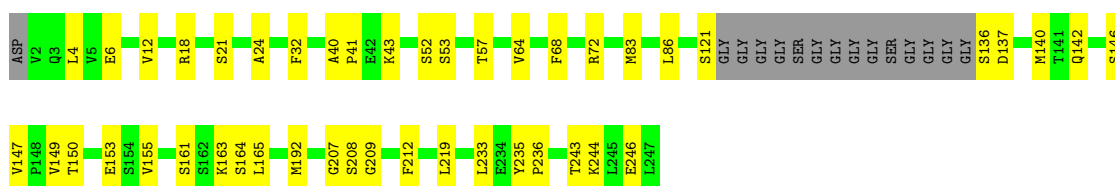
- Molecule 2: Guanine nucleotide-binding protein G(I)/G(S)/G(T) subunit beta-1

Chain C:

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

Chain D:

- Molecule 4: 2-oxoglutarate receptor 1

Chain E:

V303 K320 V321 S322 GLY ASN LEU GLU GLN ALA LYS LYS ILE SER TYR SER ASN ASN PRO
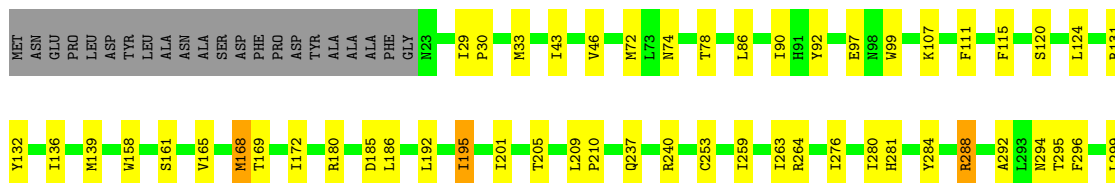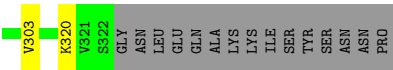
• Molecule 5: Guanine nucleotide-binding protein G(i) subunit alpha-1,Guanine nucleotide-binding protein G(q) subunit alpha

Chain F:

55% 9% 36%

MET G2 D9 V13 L36 G40 K46 I49 Q52 M53 LYS ILE ILE HIS GLU ALA GLY TYR SER GLU GLU GLU CYS LYS GLN TYR LYS ALA VAL VAL TYR SER ASN THR ILE GLN SER ILE ILE ALA ILE ILE ARG ALA MET GLY ARG LEU LYS ILE ASP PHE GLY

ASP SER ALA ARG ALA ASP ASP ALA ARG GLN LEU PHE VAL LEU ALA GLY ALA ALA GLU GLU GLY PHE MET THR ALA GLU LEU ALA GLY VAL ILE LYS ARG LEU TRP LYS ASP SER GLY VAL GLN ALA CYS PHE ASN ARG SER ARG GLU TYR GLN LEU ASN ASP SER ALA ALA TYR TYR LEU

ASN ASP LEU ASP ARG ILE ALA GLN PRO ASN TYR ILE PRO THR GLN GLN ASP VAL LEU ARG THR ARG VAL LYS THR T182 G183 L194 G202 R205 A220 D229 L234 A235 N241 R242 M243 H244 K248 E275 I278 K279 K280 S281 P282 L283 Y290 E298

Q304 T321 T327 D328 T329 Y351 V354

4 Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	167941	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose $(e^-/\text{Å}^2)$	52	Depositor
Minimum defocus (nm)	1200	Depositor
Maximum defocus (nm)	2500	Depositor
Magnification	Not provided	
Image detector	GATAN K3 BIOCONTINUUM (6k 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: AKG

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	B	0.14	0/1827	0.37	0/2477
2	C	0.15	0/2653	0.35	0/3597
3	D	0.10	0/444	0.24	0/599
4	E	0.22	1/2464 (0.0%)	0.35	0/3359
5	F	0.14	0/1847	0.35	0/2480
All	All	0.17	1/9235 (0.0%)	0.35	0/12512

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	E	288	ARG	C-O	-5.29	1.19	1.24

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	B	1783	0	1717	28	0
2	C	2606	0	2510	46	0
3	D	438	0	447	4	0
4	E	2404	0	2479	42	0
5	F	1817	0	1803	19	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
6	E	20	0	8	6	0
All	All	9068	0	8964	135	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 (135) 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:C:225:HIS:HE2	2:C:243:THR:HG1	1.32	0.77
2:C:54:HIS:HE2	2:C:72:SER:HG	1.37	0.71
4:E:29:ILE:HG13	4:E:30:PRO:HD3	1.74	0.69
1:B:40:ALA:HB3	1:B:43:LYS:HB2	1.76	0.67
4:E:107:LYS:NZ	4:E:172:ILE:O	2.27	0.67
4:E:43:ILE:HG21	4:E:292:ALA:HB1	1.76	0.66
2:C:104:ALA:HB3	2:C:113:ALA:HB3	1.78	0.66
4:E:201:ILE:O	4:E:205:THR:HG22	1.96	0.64
2:C:155:ASN:ND2	2:C:170:ASP:OD1	2.31	0.63
5:F:234:LEU:HD23	5:F:235:ALA:H	1.64	0.63
5:F:229:ASP:HB3	5:F:242:ARG:HB2	1.80	0.62
1:B:32:PHE:O	1:B:72:ARG:NH2	2.23	0.61
1:B:150:THR:HG23	1:B:153:GLU:HG3	1.84	0.59
2:C:14:LEU:HD21	3:D:20:LYS:HG2	1.84	0.59
4:E:264:ARG:HH21	4:E:281:HIS:CE1	2.21	0.58
4:E:111:PHE:HB2	4:E:169:THR:HG22	1.86	0.57
1:B:12:VAL:HG11	1:B:86:LEU:HD12	1.87	0.57
4:E:253:CYS:HB3	4:E:294:ASN:HB2	1.87	0.56
1:B:83:MET:HB2	1:B:86:LEU:HD21	1.87	0.56
2:C:101:MET:O	2:C:102:THR:OG1	2.21	0.56
4:E:74:ASN:O	4:E:78:THR:HG23	2.05	0.56
4:E:237:GLN:OE1	4:E:240:ARG:NH2	2.34	0.56
5:F:304:GLN:HG3	5:F:321:THR:HG21	1.88	0.56
2:C:5:ASP:O	2:C:9:GLN:HG2	2.06	0.56
2:C:159:THR:OG1	2:C:169:TRP:NE1	2.34	0.55
4:E:185:ASP:OD1	4:E:185:ASP:N	2.39	0.55
2:C:248:ALA:HB1	2:C:269:ILE:HG22	1.88	0.55
5:F:49:ILE:O	5:F:52:GLN:HG2	2.08	0.54
1:B:18:ARG:HB3	1:B:83:MET:HE3	1.88	0.54
2:C:201:SER:OG	2:C:211:TRP:NE1	2.38	0.54
5:F:234:LEU:HD23	5:F:235:ALA:N	2.23	0.54
2:C:217:MET:HG3	3:D:21:MET:HE1	1.90	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:E:292:ALA:HA	4:E:295:THR:HG22	1.91	0.53
2:C:160:SER:HB3	2:C:190:LEU:HG	1.90	0.53
4:E:86:LEU:O	4:E:90:ILE:HG13	2.09	0.53
1:B:52:SER:OG	1:B:53:SER:N	2.41	0.53
1:B:146:SER:OG	1:B:246:GLU:OE2	2.27	0.52
2:C:137:ARG:NH1	2:C:172:GLU:O	2.39	0.52
2:C:37:ILE:HG13	2:C:301:LYS:HE2	1.91	0.52
4:E:29:ILE:O	4:E:33:MET:HG2	2.10	0.51
4:E:46:VAL:HB	4:E:296:PHE:CZ	2.45	0.51
1:B:142:GLN:NE2	1:B:243:THR:OG1	2.44	0.51
4:E:288:ARG:HD3	6:E:602:AKG:H32	1.93	0.51
2:C:180:PHE:CE1	2:C:216:GLY:HA2	2.47	0.50
4:E:43:ILE:HA	4:E:296:PHE:CZ	2.46	0.50
2:C:58:ILE:HG13	2:C:334:SER:HA	1.94	0.50
2:C:333:ASP:OD1	2:C:333:ASP:N	2.43	0.50
1:B:208:SER:OG	1:B:209:GLY:N	2.45	0.50
2:C:68:ARG:O	2:C:84:SER:OG	2.29	0.50
2:C:276:VAL:HG13	2:C:285:LEU:HD11	1.94	0.50
1:B:64:VAL:HG23	1:B:64:VAL:O	2.12	0.49
2:C:47:THR:HG21	2:C:337:LYS:HD3	1.94	0.49
1:B:68:PHE:CE1	1:B:83:MET:HB3	2.48	0.49
2:C:271:CYS:SG	2:C:289:TYR:HB3	2.53	0.49
2:C:274:THR:OG1	2:C:315:VAL:O	2.24	0.49
5:F:36:LEU:HD23	5:F:220:ALA:HB3	1.95	0.49
4:E:288:ARG:HD3	6:E:602:AKG:O2	2.13	0.48
2:C:247:ASP:OD1	2:C:247:ASP:N	2.36	0.48
1:B:192:MET:O	1:B:192:MET:HG2	2.13	0.48
2:C:48:ARG:HE	2:C:340:ASN:HB3	1.78	0.48
2:C:183:HIS:NE2	2:C:209:LYS:HG3	2.28	0.48
2:C:23:LYS:HE3	2:C:23:LYS:HB2	1.66	0.48
2:C:200:VAL:HG22	2:C:234:PHE:CE1	2.49	0.48
4:E:284:TYR:OH	6:E:602:AKG:C5	2.62	0.48
4:E:320:LYS:HD3	4:E:320:LYS:HA	1.58	0.48
1:B:140:MET:HE3	1:B:161:SER:HB3	1.95	0.48
2:C:262:MET:HG3	2:C:263:THR:N	2.29	0.47
1:B:52:SER:O	1:B:72:ARG:NH1	2.48	0.47
2:C:197:ARG:NH1	2:C:214:ARG:HE	2.12	0.47
2:C:310:GLY:O	2:C:337:LYS:NZ	2.38	0.47
4:E:78:THR:HG22	4:E:158:TRP:CH2	2.49	0.47
5:F:182:THR:OG1	5:F:183:GLY:N	2.47	0.47
4:E:253:CYS:CB	4:E:294:ASN:HB2	2.45	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
5:F:244:HIS:O	5:F:248:LYS:HG3	2.15	0.47
4:E:161:SER:O	4:E:165:VAL:HG23	2.15	0.47
3:D:52:THR:O	3:D:52:THR:OG1	2.32	0.46
4:E:299:LEU:O	4:E:303:VAL:HG22	2.14	0.46
5:F:241:ASN:HB3	5:F:244:HIS:ND1	2.30	0.46
1:B:163:LYS:HG2	1:B:164:SER:H	1.80	0.46
4:E:29:ILE:HG13	4:E:30:PRO:CD	2.41	0.46
5:F:9:ASP:O	5:F:13:VAL:HG23	2.16	0.46
4:E:72:MET:HA	4:E:72:MET:HE2	1.97	0.46
1:B:40:ALA:HB1	1:B:41:PRO:HD2	1.98	0.46
1:B:207:GLY:HA3	1:B:212:PHE:HA	1.98	0.46
5:F:40:GLY:HA3	5:F:46:LYS:HD2	1.98	0.46
5:F:280:LYS:HG3	5:F:281:SER:H	1.81	0.45
2:C:191:SER:HB3	2:C:232:ILE:HG23	1.98	0.45
4:E:120:SER:O	4:E:124:LEU:HG	2.16	0.45
5:F:275:GLU:O	5:F:278:ILE:HG22	2.17	0.45
1:B:235:TYR:N	1:B:236:PRO:HD2	2.31	0.45
2:C:124:TYR:CE2	2:C:135:VAL:HG22	2.52	0.45
2:C:229:ILE:HG12	2:C:245:SER:OG	2.16	0.45
5:F:327:THR:HG23	5:F:329:THR:H	1.81	0.45
2:C:73:ALA:HB2	2:C:103:CYS:SG	2.57	0.44
1:B:147:VAL:HG12	1:B:149:VAL:HG13	2.00	0.44
4:E:284:TYR:HH	6:E:602:AKG:C5	2.31	0.44
1:B:6:GLU:HA	1:B:21:SER:O	2.17	0.44
2:C:4:LEU:O	2:C:8:ARG:HG3	2.18	0.44
4:E:259:ILE:O	4:E:263:ILE:HG13	2.17	0.44
6:E:601:AKG:H42	6:E:601:AKG:O2	2.17	0.44
1:B:121:SER:O	1:B:121:SER:OG	2.31	0.44
1:B:244:LYS:HE3	1:B:244:LYS:HB2	1.75	0.44
4:E:131:ARG:NH1	5:F:351:TYR:O	2.50	0.43
1:B:165:LEU:HA	1:B:233:LEU:HD22	2.00	0.43
2:C:189:SER:OG	2:C:202:GLY:O	2.34	0.43
2:C:30:LEU:HD23	2:C:262:MET:HE2	2.00	0.43
4:E:168:MET:HG2	4:E:172:ILE:HD11	2.00	0.43
4:E:115:PHE:HA	4:E:165:VAL:HG21	2.00	0.43
4:E:132:TYR:CE2	4:E:136:ILE:HD12	2.54	0.43
4:E:92:TYR:CD1	4:E:99:TRP:HE3	2.36	0.43
5:F:202:GLY:O	5:F:205:ARG:NH1	2.52	0.43
2:C:261:LEU:HD23	2:C:261:LEU:HA	1.88	0.42
5:F:290:TYR:OH	5:F:298:GLU:OE2	2.24	0.42
2:C:81:ILE:HB	2:C:91:HIS:HB2	2.01	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:C:190:LEU:HD23	2:C:190:LEU:HA	1.89	0.42
2:C:271:CYS:HB2	2:C:290:ASP:HB2	2.01	0.42
2:C:100:VAL:HG21	2:C:114:CYS:SG	2.60	0.42
4:E:97:GLU:HG2	4:E:180:ARG:HH21	1.84	0.42
2:C:54:HIS:CE1	2:C:80:ILE:HG13	2.55	0.42
3:D:18:GLN:NE2	3:D:22:GLU:OE2	2.41	0.42
4:E:276:ILE:O	4:E:280:ILE:HG13	2.20	0.42
1:B:136:SER:HB3	1:B:137:ASP:H	1.72	0.42
1:B:4:LEU:HD23	1:B:24:ALA:HB2	2.01	0.41
4:E:43:ILE:HD13	4:E:292:ALA:CB	2.50	0.41
4:E:299:LEU:HD12	4:E:303:VAL:CG2	2.50	0.41
4:E:139:MET:HE2	5:F:194:LEU:HD11	2.02	0.41
2:C:119:ASN:OD1	5:F:182:THR:OG1	2.37	0.41
4:E:209:LEU:HB3	4:E:210:PRO:HD3	2.01	0.41
1:B:52:SER:HB3	1:B:57:THR:H	1.86	0.41
4:E:192:LEU:HD12	4:E:192:LEU:HA	1.89	0.41
2:C:266:HIS:CD2	2:C:267:ASP:H	2.39	0.41
4:E:186:LEU:O	4:E:195:ILE:HD13	2.21	0.40
1:B:219:LEU:HD12	1:B:219:LEU:HA	1.94	0.40
2:C:331:SER:HB3	2:C:333:ASP:OD1	2.22	0.40
4:E:288:ARG:NH1	6:E:602:AKG:O2	2.51	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	B	228/247 (92%)	218 (96%)	10 (4%)	0	100	100
2	C	337/339 (99%)	322 (96%)	15 (4%)	0	100	100
3	D	55/57 (96%)	51 (93%)	4 (7%)	0	100	100
4	E	298/337 (88%)	283 (95%)	15 (5%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
5	F	221/354 (62%)	204 (92%)	17 (8%)	0	100	100
All	All	1139/1334 (85%)	1078 (95%)	61 (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	B	197/200 (98%)	196 (100%)	1 (0%)	86	92
2	C	282/282 (100%)	282 (100%)	0	100	100
3	D	46/46 (100%)	45 (98%)	1 (2%)	47	70
4	E	278/307 (91%)	276 (99%)	2 (1%)	81	90
5	F	200/306 (65%)	199 (100%)	1 (0%)	86	92
All	All	1003/1141 (88%)	998 (100%)	5 (0%)	85	92

All (5) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	155	VAL
3	D	37	LEU
4	E	168	MET
4	E	195	ILE
5	F	283	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (8) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	142	GLN
1	B	232	HIS
4	E	23	ASN
4	E	28	ASN

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Mol	Chain	Res	Type
4	E	223	HIS
5	F	255	ASN
5	F	294	ASN
5	F	306	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 ⓘ

2 ligands are 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	AKG	E	601	-	9,9,9	2.13	1 (11%)	11,11,11	2.12	4 (36%)
6	AKG	E	602	-	9,9,9	1.92	1 (11%)	11,11,11	1.10	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	AKG	E	601	-	-	1/9/9/9	-
6	AKG	E	602	-	-	0/9/9/9	-

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	E	601	AKG	C2-C1	-5.66	1.46	1.53
6	E	602	AKG	C2-C1	-5.05	1.46	1.53

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
6	E	601	AKG	O1-C1-C2	-3.63	116.87	121.72
6	E	601	AKG	C3-C2-C1	3.62	122.70	115.97
6	E	601	AKG	O2-C1-C2	2.94	122.01	113.97
6	E	601	AKG	C3-C4-C5	-2.68	107.83	113.60

There are no chirality outliers.
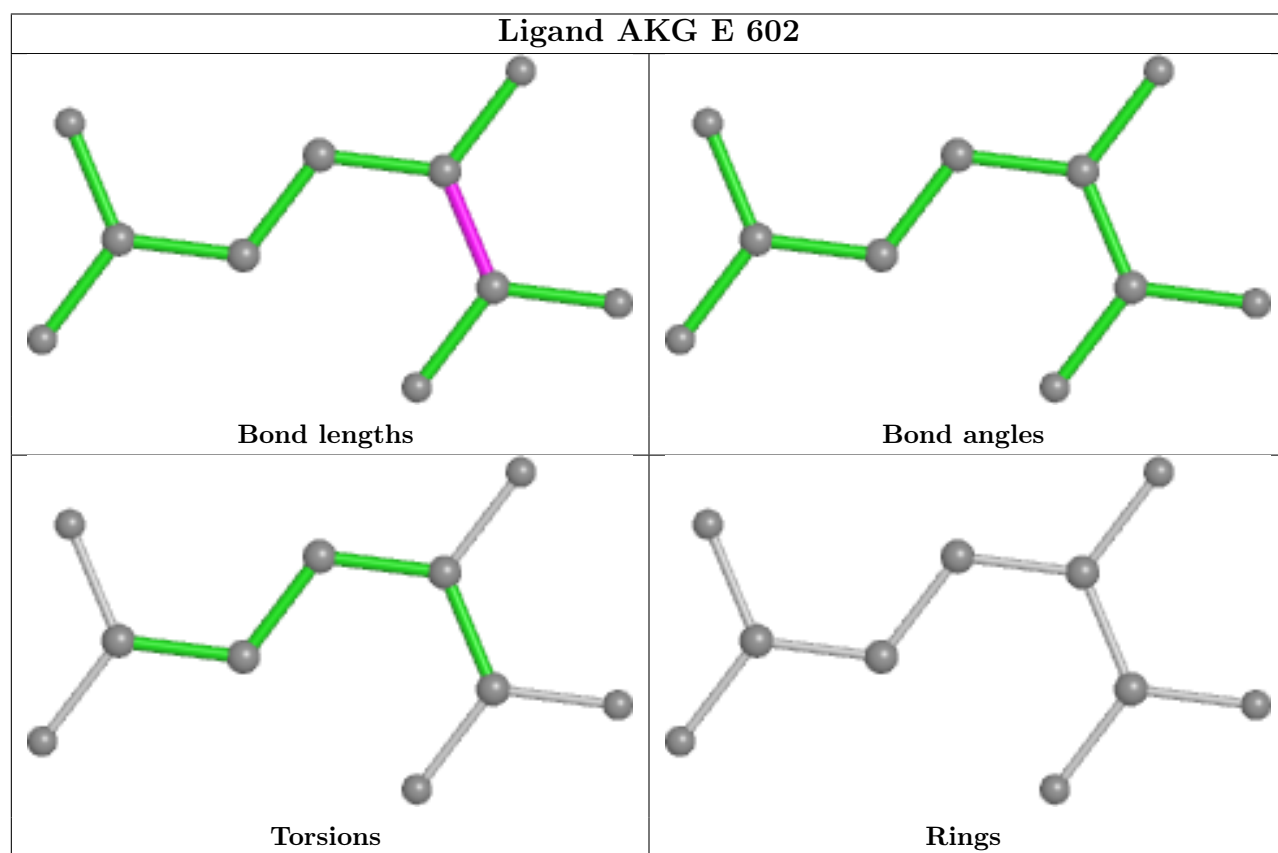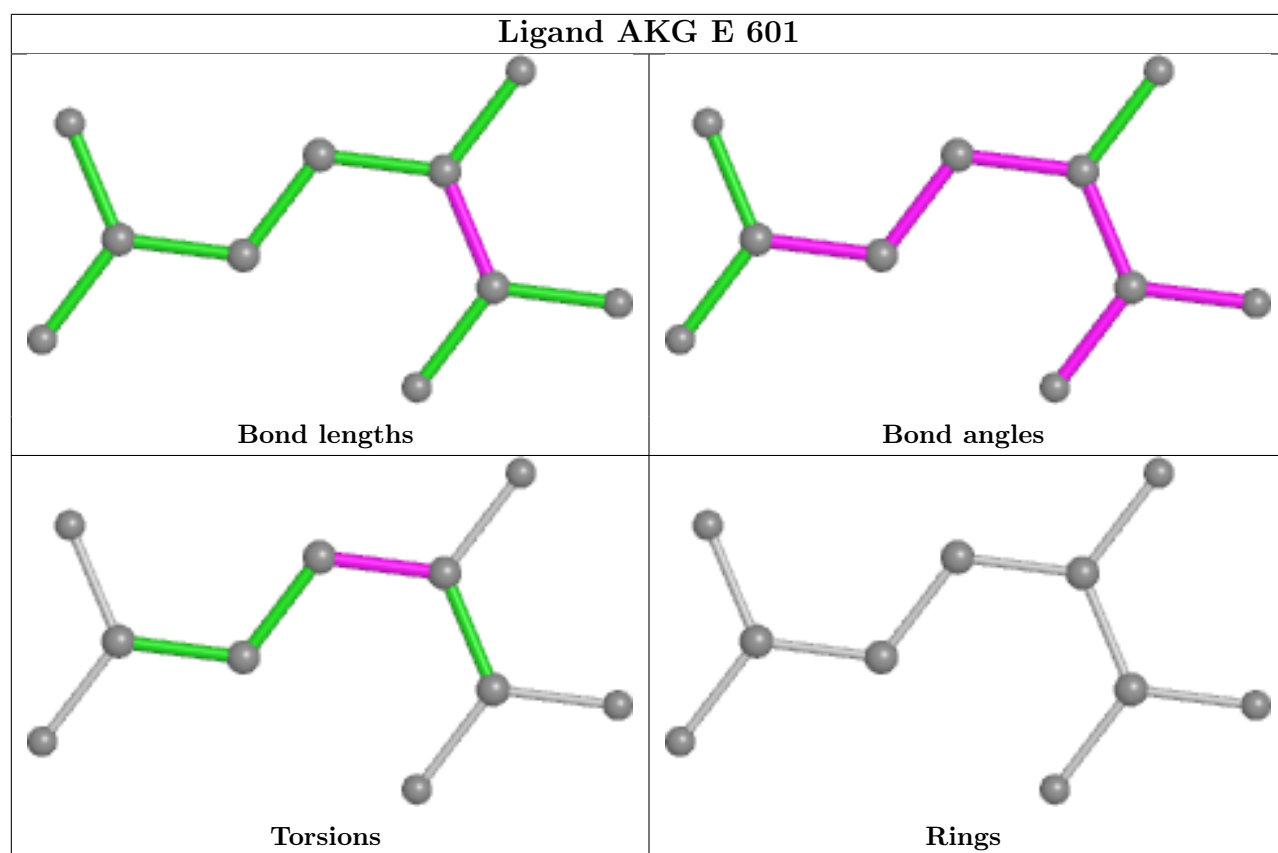
All (1) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	E	601	AKG	O5-C2-C3-C4

There are no ring outliers.

2 monomers are involved in 6 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	E	601	AKG	1	0
6	E	602	AKG	5	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 AKG E 601

Bond lengths

Bond angles

Torsions

Rings

Ligand AKG E 602

Bond lengths

Bond angles

Torsions

Rings

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.