



# Full wwPDB X-ray Structure Validation Report ⓘ

May 16, 2020 – 10:46 am BST

PDB ID : 5ETY  
Title : Crystal Structure of human Tankyrase-1 bound to K-756  
Authors : Takahashi, Y.; Miyagi, H.; Suzuki, M.; Saito, J.  
Deposited on : 2015-11-18  
Resolution : 2.90 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at [validation@mail.wwpdb.org](mailto:validation@mail.wwpdb.org)

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

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

MolProbity : 4.02b-467  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 2.11  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Refmac : 5.8.0158  
CCP4 : 7.0.044 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.11

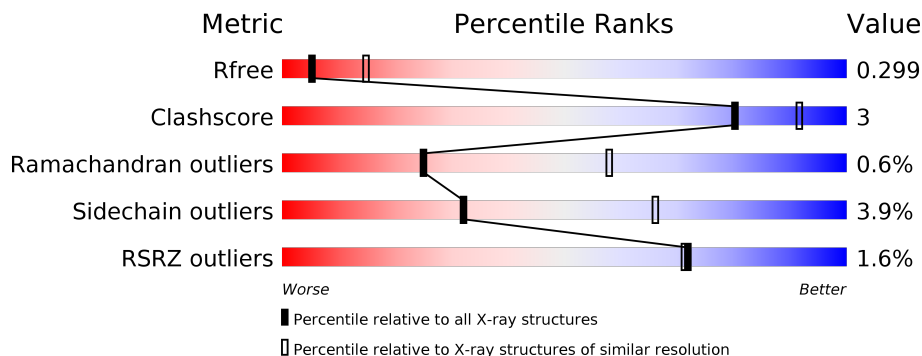
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.90 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)	Similar resolution (#Entries, resolution range(Å))
$R_{free}$	130704	1957 (2.90-2.90)
Clashscore	141614	2172 (2.90-2.90)
Ramachandran outliers	138981	2115 (2.90-2.90)
Sidechain outliers	138945	2117 (2.90-2.90)
RSRZ outliers	127900	1906 (2.90-2.90)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments on the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 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  $\leq 5\%$ . The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	257	
1	B	257	
1	C	257	
1	D	257	

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 crite-

ria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	ZN	B	1401	-	-	X	-

## 2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 6777 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, 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 Tankyrase-1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	207	1662	1048	301	302	11	0	0	0
1	B	203	1622	1026	293	293	10	0	0	0
1	C	203	1639	1036	300	293	10	0	0	0
1	D	204	1648	1041	301	296	10	0	0	0

There are 96 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1068	MET	-	initiating methionine	UNP O95271
A	1069	HIS	-	expression tag	UNP O95271
A	1070	HIS	-	expression tag	UNP O95271
A	1071	HIS	-	expression tag	UNP O95271
A	1072	HIS	-	expression tag	UNP O95271
A	1073	HIS	-	expression tag	UNP O95271
A	1074	HIS	-	expression tag	UNP O95271
A	1075	SER	-	expression tag	UNP O95271
A	1076	SER	-	expression tag	UNP O95271
A	1077	GLY	-	expression tag	UNP O95271
A	1078	VAL	-	expression tag	UNP O95271
A	1079	ASP	-	expression tag	UNP O95271
A	1080	LEU	-	expression tag	UNP O95271
A	1081	GLY	-	expression tag	UNP O95271
A	1082	THR	-	expression tag	UNP O95271
A	1083	GLU	-	expression tag	UNP O95271
A	1084	ASN	-	expression tag	UNP O95271
A	1085	LEU	-	expression tag	UNP O95271
A	1086	TYR	-	expression tag	UNP O95271
A	1087	PHE	-	expression tag	UNP O95271
A	1088	GLN	-	expression tag	UNP O95271

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Chain	Residue	Modelled	Actual	Comment	Reference
A	1089	SER	-	expression tag	UNP O95271
A	1090	MET	-	expression tag	UNP O95271
A	1266	ILE	MET	engineered mutation	UNP O95271
B	1068	MET	-	initiating methionine	UNP O95271
B	1069	HIS	-	expression tag	UNP O95271
B	1070	HIS	-	expression tag	UNP O95271
B	1071	HIS	-	expression tag	UNP O95271
B	1072	HIS	-	expression tag	UNP O95271
B	1073	HIS	-	expression tag	UNP O95271
B	1074	HIS	-	expression tag	UNP O95271
B	1075	SER	-	expression tag	UNP O95271
B	1076	SER	-	expression tag	UNP O95271
B	1077	GLY	-	expression tag	UNP O95271
B	1078	VAL	-	expression tag	UNP O95271
B	1079	ASP	-	expression tag	UNP O95271
B	1080	LEU	-	expression tag	UNP O95271
B	1081	GLY	-	expression tag	UNP O95271
B	1082	THR	-	expression tag	UNP O95271
B	1083	GLU	-	expression tag	UNP O95271
B	1084	ASN	-	expression tag	UNP O95271
B	1085	LEU	-	expression tag	UNP O95271
B	1086	TYR	-	expression tag	UNP O95271
B	1087	PHE	-	expression tag	UNP O95271
B	1088	GLN	-	expression tag	UNP O95271
B	1089	SER	-	expression tag	UNP O95271
B	1090	MET	-	expression tag	UNP O95271
B	1266	ILE	MET	engineered mutation	UNP O95271
C	1068	MET	-	initiating methionine	UNP O95271
C	1069	HIS	-	expression tag	UNP O95271
C	1070	HIS	-	expression tag	UNP O95271
C	1071	HIS	-	expression tag	UNP O95271
C	1072	HIS	-	expression tag	UNP O95271
C	1073	HIS	-	expression tag	UNP O95271
C	1074	HIS	-	expression tag	UNP O95271
C	1075	SER	-	expression tag	UNP O95271
C	1076	SER	-	expression tag	UNP O95271
C	1077	GLY	-	expression tag	UNP O95271
C	1078	VAL	-	expression tag	UNP O95271
C	1079	ASP	-	expression tag	UNP O95271
C	1080	LEU	-	expression tag	UNP O95271
C	1081	GLY	-	expression tag	UNP O95271
C	1082	THR	-	expression tag	UNP O95271

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Chain	Residue	Modelled	Actual	Comment	Reference
C	1083	GLU	-	expression tag	UNP O95271
C	1084	ASN	-	expression tag	UNP O95271
C	1085	LEU	-	expression tag	UNP O95271
C	1086	TYR	-	expression tag	UNP O95271
C	1087	PHE	-	expression tag	UNP O95271
C	1088	GLN	-	expression tag	UNP O95271
C	1089	SER	-	expression tag	UNP O95271
C	1090	MET	-	expression tag	UNP O95271
C	1266	ILE	MET	engineered mutation	UNP O95271
D	1068	MET	-	initiating methionine	UNP O95271
D	1069	HIS	-	expression tag	UNP O95271
D	1070	HIS	-	expression tag	UNP O95271
D	1071	HIS	-	expression tag	UNP O95271
D	1072	HIS	-	expression tag	UNP O95271
D	1073	HIS	-	expression tag	UNP O95271
D	1074	HIS	-	expression tag	UNP O95271
D	1075	SER	-	expression tag	UNP O95271
D	1076	SER	-	expression tag	UNP O95271
D	1077	GLY	-	expression tag	UNP O95271
D	1078	VAL	-	expression tag	UNP O95271
D	1079	ASP	-	expression tag	UNP O95271
D	1080	LEU	-	expression tag	UNP O95271
D	1081	GLY	-	expression tag	UNP O95271
D	1082	THR	-	expression tag	UNP O95271
D	1083	GLU	-	expression tag	UNP O95271
D	1084	ASN	-	expression tag	UNP O95271
D	1085	LEU	-	expression tag	UNP O95271
D	1086	TYR	-	expression tag	UNP O95271
D	1087	PHE	-	expression tag	UNP O95271
D	1088	GLN	-	expression tag	UNP O95271
D	1089	SER	-	expression tag	UNP O95271
D	1090	MET	-	expression tag	UNP O95271
D	1266	ILE	MET	engineered mutation	UNP O95271

- Molecule 2 is ZINC ION (three-letter code: ZN) (formula: Zn).

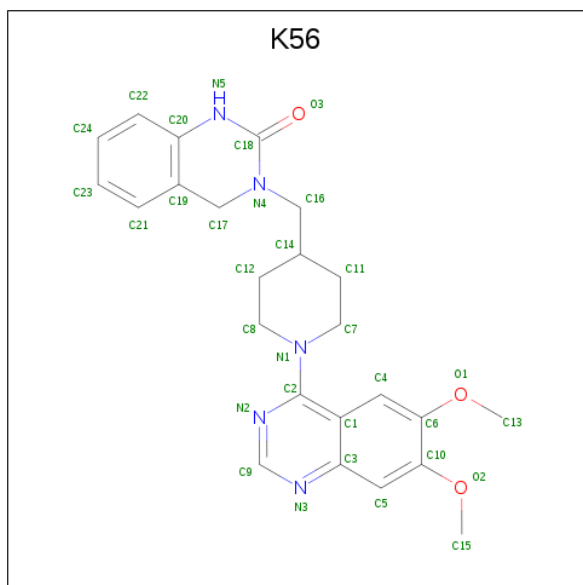
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	B	1	Total Zn 1 1	0	0
2	A	1	Total Zn 1 1	0	0
2	D	1	Total Zn 1 1	0	0

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Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	C	1	Total Zn 1 1	0	0

- Molecule 3 is 3-[[1-(6,7-dimethoxyquinazolin-4-yl)piperidin-4-yl]methyl]-1,4-dihydroquinazol in-2-one (three-letter code: K56) (formula: C<sub>24</sub>H<sub>27</sub>N<sub>5</sub>O<sub>3</sub>).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total C N O 32 24 5 3	0	0
3	B	1	Total C N O 32 24 5 3	0	0
3	C	1	Total C N O 32 24 5 3	0	0
3	D	1	Total C N O 32 24 5 3	0	0

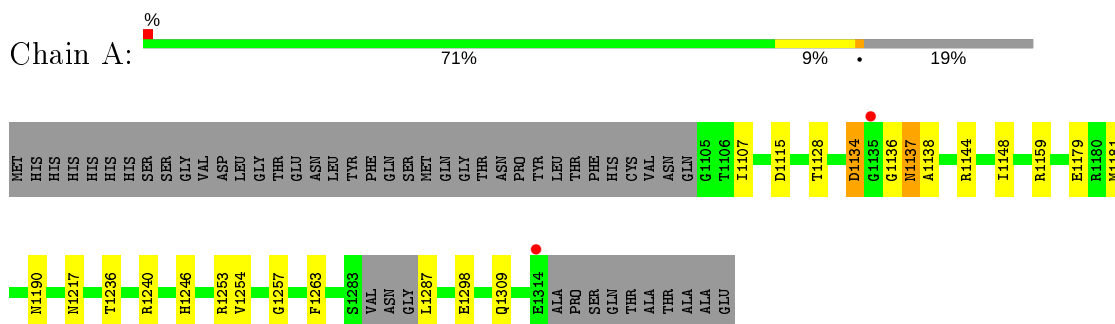
- Molecule 4 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	20	Total O 20 20	0	0
4	B	20	Total O 20 20	0	0
4	C	15	Total O 15 15	0	0
4	D	19	Total O 19 19	0	0

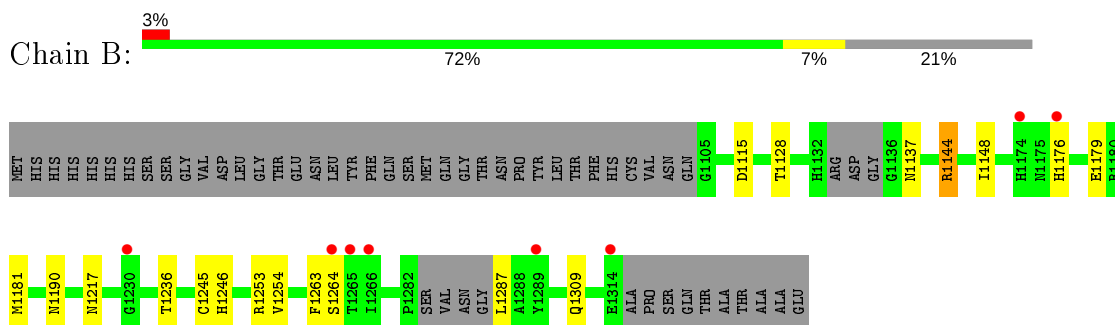
### 3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA 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 and electron density. 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. A red dot above a residue indicates a poor fit to the electron density ( $RSRZ > 2$ ). 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.

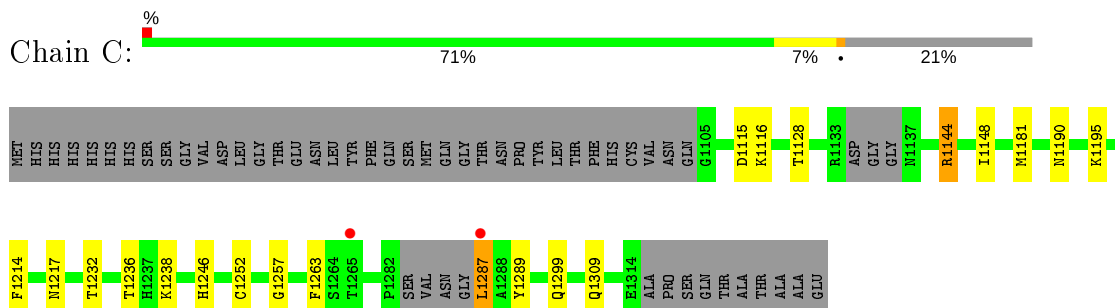
- Molecule 1: Tankyrase-1



- Molecule 1: Tankyrase-1



- Molecule 1: Tankyrase-1



- Molecule 1: Tankyrase-1





MET	M1190
HIS	K1195
HIS	M1217
HIS	G1231
SER	T1232
GLY	T1236
VAL	H1237
ASP	K1238
LEU	D1239
GLY	R1240
THR	H1246
GLU	C1252
LEU	R1253
ASN	V1254
TYR	F1263
PHE	S1264
GLN	T1265
GLN	F1282
THR	SER
ASN	VAL
PRO	TYR
ASN	LEU
LEU	ASN
THR	GLY
PHE	L1287
HIS	Q1309
CYS	F1314
VAL	ALA
ASN	GLN
ASN	ALA
G1105	PRO
T1106	SER
I1107	GLN
D1115	THR
E1123	ALA
S1127	THR
T1128	ALA
D1134	ALA
GLY	GLU
GLY	
I1137	
R1144	
I1148	
E1179	
R1180	
M1481	

## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	158.85Å 74.68Å 84.60Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	50.00 – 2.90 30.22 – 2.90	Depositor EDS
% Data completeness (in resolution range)	91.8 (50.00-2.90) 92.0 (30.22-2.90)	Depositor EDS
$R_{merge}$	0.14	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.16 (at 2.90Å)	Xtrriage
Refinement program	REFMAC 5.8.0071	Depositor
R, $R_{free}$	0.255 , 0.305 0.257 , 0.299	Depositor DCC
$R_{free}$ test set	1098 reflections (5.18%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	36.7	Xtrriage
Anisotropy	0.985	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.28 , 29.2	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.52$ , $\langle L^2 \rangle = 0.36$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.92	EDS
Total number of atoms	6777	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	55.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 46.63 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 1.1135e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical values of  $\langle |L| \rangle$ ,  $\langle L^2 \rangle$  for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

## 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: K56, ZN

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	0.58	0/1704	0.77	0/2292
1	B	0.58	0/1663	0.73	1/2239 (0.0%)
1	C	0.56	0/1680	0.77	2/2259 (0.1%)
1	D	0.57	0/1689	0.74	0/2271
All	All	0.57	0/6736	0.75	3/9061 (0.0%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	1144	ARG	NE-CZ-NH2	-7.72	116.44	120.30
1	C	1144	ARG	NE-CZ-NH1	6.77	123.68	120.30
1	B	1144	ARG	NE-CZ-NH2	6.38	123.49	120.30

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	1134	ASP	Peptide

## 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	1662	0	1588	8	0
1	B	1622	0	1540	8	0
1	C	1639	0	1571	10	0
1	D	1648	0	1577	11	0
2	A	1	0	0	0	0
2	B	1	0	0	2	0
2	C	1	0	0	0	0
2	D	1	0	0	0	0
3	A	32	0	0	0	0
3	B	32	0	0	0	0
3	C	32	0	0	0	0
3	D	32	0	0	0	0
4	A	20	0	0	0	0
4	B	20	0	0	0	0
4	C	15	0	0	1	0
4	D	19	0	0	1	0
All	All	6777	0	6276	35	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 3.

All (35) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:1245:CYS:HG	2:B:1401:ZN:ZN	0.87	0.87
1:D:1232:THR:HG22	4:D:1518:HOH:O	1.84	0.77
1:B:1245:CYS:SG	2:B:1401:ZN:ZN	1.77	0.73
1:A:1148:ILE:HD13	1:A:1246:HIS:CE1	2.34	0.63
1:A:1138:ALA:HA	1:A:1240:ARG:HD2	1.81	0.63
1:B:1148:ILE:HD13	1:B:1246:HIS:CE1	2.34	0.62
1:D:1148:ILE:HD13	1:D:1246:HIS:CE1	2.39	0.57
1:C:1148:ILE:HD13	1:C:1246:HIS:CE1	2.39	0.56
1:C:1217:ASN:OD1	1:C:1289:TYR:HD2	1.88	0.56
1:B:1181:MET:SD	1:B:1253:ARG:HG2	2.48	0.53
1:A:1181:MET:SD	1:A:1253:ARG:HG2	2.49	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:1231:GLY:O	1:D:1240:ARG:NH2	2.44	0.51
1:A:1134:ASP:HB3	1:A:1137:ASN:H	1.78	0.48
1:C:1299:GLN:HA	4:C:1501:HOH:O	2.12	0.48
1:D:1195:LYS:HA	1:D:1195:LYS:CE	2.46	0.46
1:C:1195:LYS:HA	1:C:1195:LYS:CE	2.46	0.46
1:D:1128:THR:HB	1:D:1217:ASN:HA	1.98	0.45
1:B:1263:PHE:O	1:B:1287:LEU:HD12	2.15	0.45
1:C:1263:PHE:O	1:C:1287:LEU:HD12	2.16	0.45
1:C:1128:THR:HB	1:C:1217:ASN:HA	1.99	0.45
1:A:1107:ILE:HD12	1:D:1107:ILE:HD12	1.99	0.44
1:D:1263:PHE:O	1:D:1287:LEU:HD12	2.16	0.44
1:A:1263:PHE:O	1:A:1287:LEU:HD12	2.17	0.44
1:B:1128:THR:HB	1:B:1217:ASN:HA	2.00	0.43
1:A:1128:THR:HB	1:A:1217:ASN:HA	2.01	0.42
1:C:1232:THR:O	1:C:1238:LYS:HA	2.19	0.42
1:D:1123:GLU:O	1:D:1127:SER:OG	2.35	0.42
1:D:1232:THR:O	1:D:1238:LYS:HA	2.20	0.42
1:B:1176:HIS:HB3	1:C:1263:PHE:CE2	2.55	0.41
1:A:1179:GLU:HA	1:A:1254:VAL:O	2.20	0.41
1:B:1179:GLU:HA	1:B:1254:VAL:O	2.21	0.41
1:D:1179:GLU:HA	1:D:1254:VAL:O	2.21	0.41
1:D:1181:MET:HA	1:D:1252:CYS:O	2.20	0.41
1:C:1181:MET:HA	1:C:1252:CYS:O	2.21	0.40
1:C:1214:PHE:N	1:C:1214:PHE:CD1	2.90	0.40

There are no symmetry-related clashes.

## 5.3 Torsion angles [i](#)

### 5.3.1 Protein backbone [i](#)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

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	203/257 (79%)	197 (97%)	3 (2%)	3 (2%)	<b>10</b> 34

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	B	197/257 (77%)	193 (98%)	3 (2%)	1 (0%)	29	61
1	C	197/257 (77%)	189 (96%)	7 (4%)	1 (0%)	29	61
1	D	198/257 (77%)	192 (97%)	6 (3%)	0	100	100
All	All	795/1028 (77%)	771 (97%)	19 (2%)	5 (1%)	25	58

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	1137	ASN
1	B	1137	ASN
1	A	1136	GLY
1	A	1257	GLY
1	C	1257	GLY

### 5.3.2 Protein sidechains [i](#)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

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	174/218 (80%)	167 (96%)	7 (4%)	31	65
1	B	168/218 (77%)	162 (96%)	6 (4%)	35	69
1	C	171/218 (78%)	164 (96%)	7 (4%)	30	64
1	D	172/218 (79%)	165 (96%)	7 (4%)	30	64
All	All	685/872 (79%)	658 (96%)	27 (4%)	32	66

All (27) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	1115	ASP
1	A	1144	ARG
1	A	1159	ARG
1	A	1190	ASN
1	A	1236	THR
1	A	1298	GLU

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Mol	Chain	Res	Type
1	A	1309	GLN
1	B	1115	ASP
1	B	1144	ARG
1	B	1190	ASN
1	B	1236	THR
1	B	1264	SER
1	B	1309	GLN
1	C	1115	ASP
1	C	1116	LYS
1	C	1144	ARG
1	C	1190	ASN
1	C	1236	THR
1	C	1287	LEU
1	C	1309	GLN
1	D	1115	ASP
1	D	1144	ARG
1	D	1190	ASN
1	D	1236	THR
1	D	1264	SER
1	D	1287	LEU
1	D	1309	GLN

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (10) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	1217	ASN
1	A	1246	HIS
1	B	1119	GLN
1	B	1143	ASN
1	B	1217	ASN
1	C	1132	HIS
1	C	1217	ASN
1	C	1246	HIS
1	D	1217	ASN
1	D	1246	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 carbohydrates in this entry.

## 5.6 Ligand geometry [i](#)

Of 8 ligands modelled in this entry, 4 are monoatomic - leaving 4 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with  $|Z| > 2$  is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
3	K56	D	1402	-	35,36,36	1.16	5 (14%)	49,51,51	1.63	11 (22%)
3	K56	B	1402	-	35,36,36	1.00	3 (8%)	49,51,51	1.63	10 (20%)
3	K56	C	1402	-	35,36,36	1.17	3 (8%)	49,51,51	1.67	11 (22%)
3	K56	A	1402	-	35,36,36	1.04	3 (8%)	49,51,51	1.76	7 (14%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	K56	D	1402	-	-	2/12/34/34	0/5/5/5
3	K56	B	1402	-	-	3/12/34/34	0/5/5/5
3	K56	C	1402	-	-	6/12/34/34	0/5/5/5
3	K56	A	1402	-	-	6/12/34/34	0/5/5/5

All (14) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	1402	K56	C18-N5	-3.33	1.32	1.36

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	1402	K56	C5-C10	3.08	1.42	1.36
3	D	1402	K56	C18-N5	-3.06	1.32	1.36
3	D	1402	K56	C4-C6	3.05	1.42	1.36
3	A	1402	K56	C4-C6	2.47	1.41	1.36
3	C	1402	K56	C4-C6	2.38	1.40	1.36
3	D	1402	K56	C5-C10	2.38	1.40	1.36
3	B	1402	K56	C5-C10	2.28	1.40	1.36
3	C	1402	K56	C3-N3	-2.24	1.33	1.37
3	B	1402	K56	C2-N2	2.22	1.36	1.33
3	B	1402	K56	C4-C6	2.17	1.40	1.36
3	A	1402	K56	C18-N5	-2.06	1.33	1.36
3	D	1402	K56	C16-C14	2.05	1.60	1.52
3	D	1402	K56	C3-N3	-2.01	1.33	1.37

All (39) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	1402	K56	C14-C16-N4	-5.28	105.43	113.80
3	C	1402	K56	C14-C16-N4	-5.00	105.87	113.80
3	A	1402	K56	C15-O2-C10	4.80	124.77	117.53
3	D	1402	K56	C14-C16-N4	-4.68	106.37	113.80
3	B	1402	K56	C14-C16-N4	-4.40	106.82	113.80
3	A	1402	K56	O2-C10-C5	3.97	130.37	125.24
3	B	1402	K56	N5-C18-N4	3.88	120.79	116.59
3	B	1402	K56	O3-C18-N5	-3.82	115.29	121.54
3	B	1402	K56	C13-O1-C6	3.67	123.07	117.53
3	A	1402	K56	O3-C18-N5	-3.42	115.94	121.54
3	C	1402	K56	C15-O2-C10	3.11	122.22	117.53
3	C	1402	K56	O3-C18-N5	-3.05	116.55	121.54
3	D	1402	K56	C12-C14-C11	-3.02	101.94	109.33
3	A	1402	K56	O2-C10-C6	-2.99	111.24	115.41
3	C	1402	K56	N5-C18-N4	2.95	119.78	116.59
3	C	1402	K56	O2-C10-C5	2.93	129.03	125.24
3	A	1402	K56	N5-C18-N4	2.87	119.69	116.59
3	C	1402	K56	C12-C14-C11	-2.82	102.43	109.33
3	D	1402	K56	C17-N4-C16	2.75	120.23	116.75
3	D	1402	K56	O3-C18-N5	-2.72	117.09	121.54
3	B	1402	K56	C15-O2-C10	2.68	121.57	117.53
3	C	1402	K56	C8-C12-C14	2.66	118.73	111.99
3	D	1402	K56	N5-C18-N4	2.65	119.46	116.59
3	A	1402	K56	C12-C14-C11	-2.62	102.93	109.33
3	C	1402	K56	C4-C1-C3	-2.62	115.72	118.94

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	D	1402	K56	C11-C14-C16	2.56	119.65	111.59
3	C	1402	K56	O2-C10-C6	-2.50	111.92	115.41
3	B	1402	K56	C10-C5-C3	2.40	122.83	120.12
3	D	1402	K56	C22-C20-C19	2.28	122.45	119.76
3	D	1402	K56	C1-C2-N1	2.26	125.37	120.97
3	D	1402	K56	C4-C1-C3	-2.26	116.16	118.94
3	B	1402	K56	C4-C6-C10	-2.23	117.86	120.07
3	C	1402	K56	C1-C2-N1	2.21	125.28	120.97
3	C	1402	K56	C12-C8-N1	2.15	115.54	111.10
3	B	1402	K56	C12-C14-C11	-2.10	104.20	109.33
3	D	1402	K56	C8-C12-C14	2.03	117.12	111.99
3	D	1402	K56	C7-N1-C2	2.02	124.48	118.73
3	B	1402	K56	C6-C4-C1	2.01	124.31	120.58
3	B	1402	K56	C11-C14-C16	2.01	117.92	111.59

There are no chirality outliers.

All (17) torsion outliers are listed below:

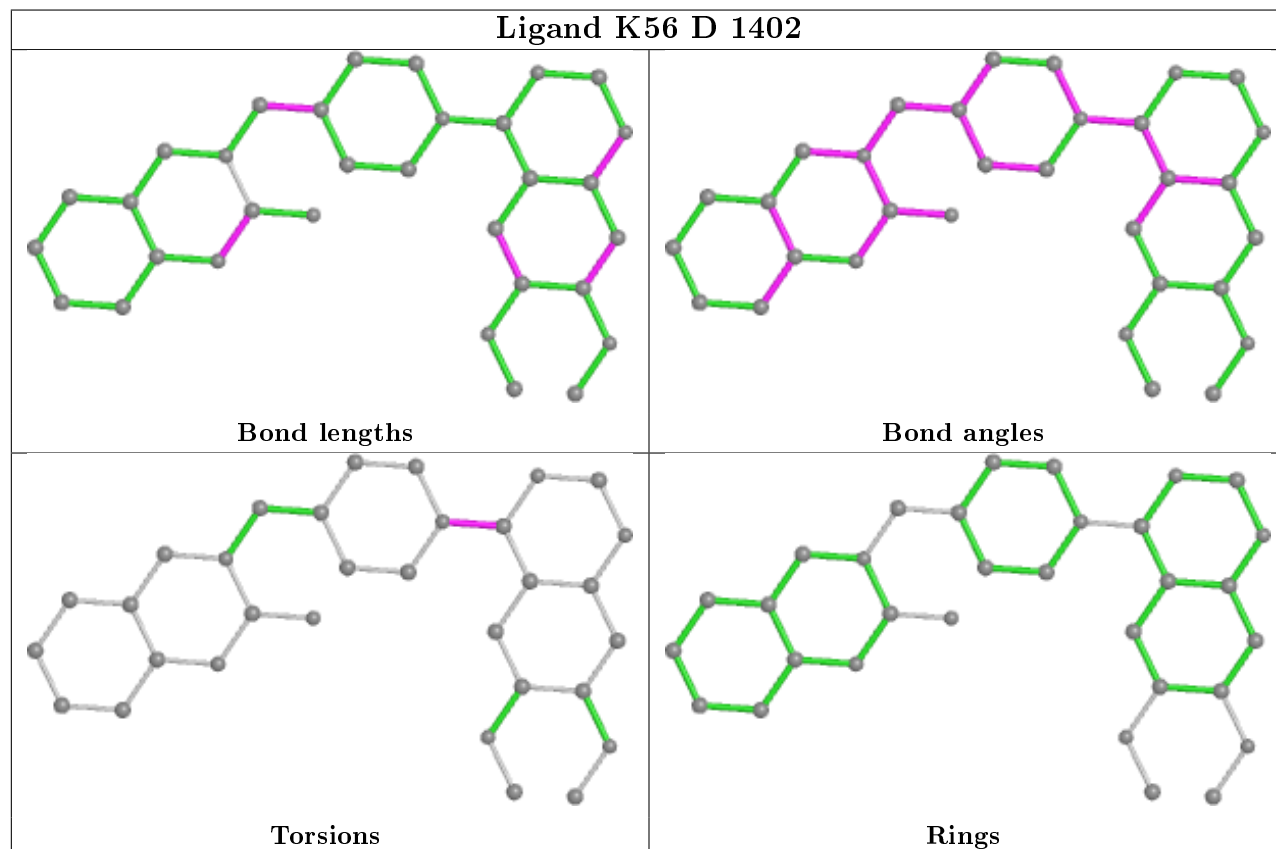
Mol	Chain	Res	Type	Atoms
3	C	1402	K56	N2-C2-N1-C7
3	C	1402	K56	C1-C2-N1-C7
3	D	1402	K56	N2-C2-N1-C7
3	D	1402	K56	C1-C2-N1-C7
3	B	1402	K56	N2-C2-N1-C7
3	B	1402	K56	C1-C2-N1-C7
3	A	1402	K56	N2-C2-N1-C7
3	A	1402	K56	C1-C2-N1-C7
3	C	1402	K56	C6-C10-O2-C15
3	A	1402	K56	C6-C10-O2-C15
3	A	1402	K56	C5-C10-O2-C15
3	C	1402	K56	C10-C6-O1-C13
3	C	1402	K56	C5-C10-O2-C15
3	C	1402	K56	C4-C6-O1-C13
3	A	1402	K56	C10-C6-O1-C13
3	A	1402	K56	C4-C6-O1-C13
3	B	1402	K56	C10-C6-O1-C13

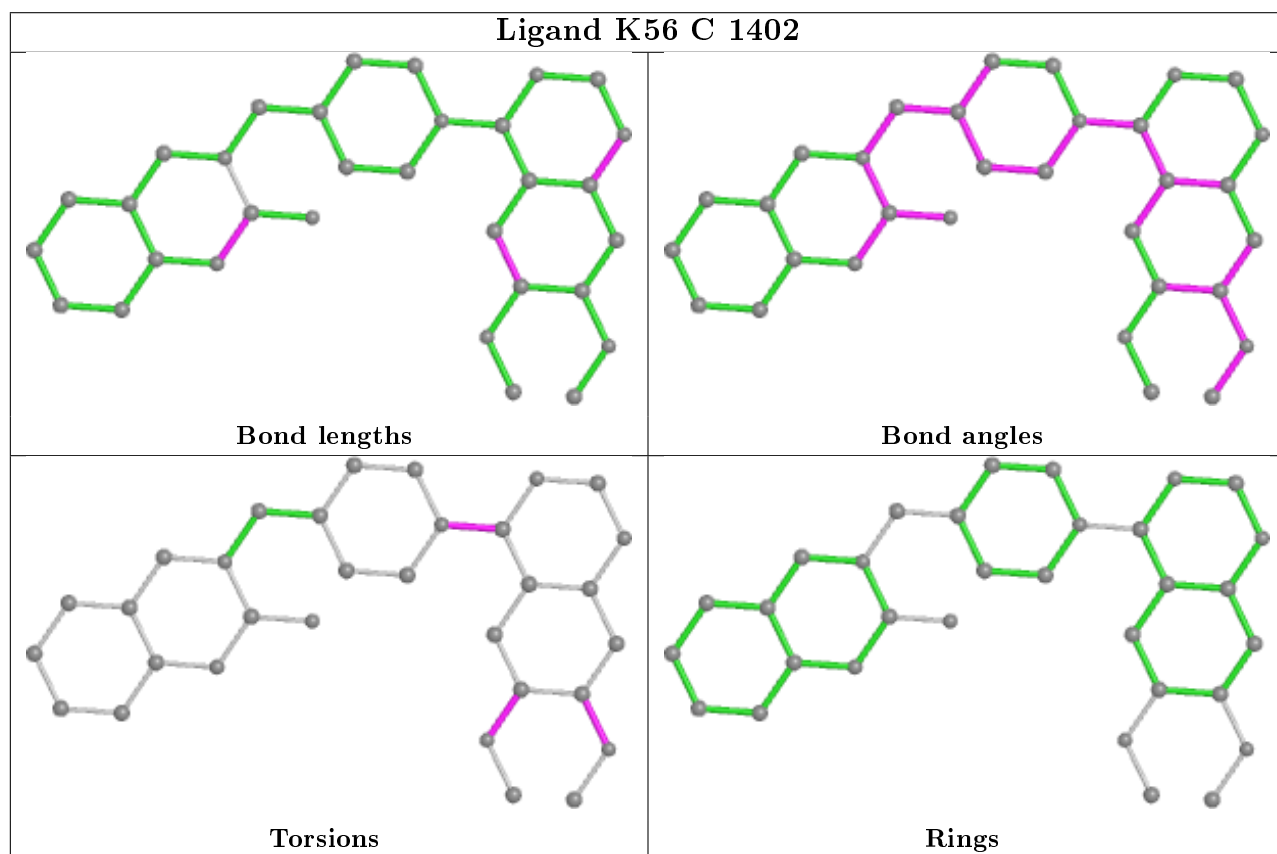
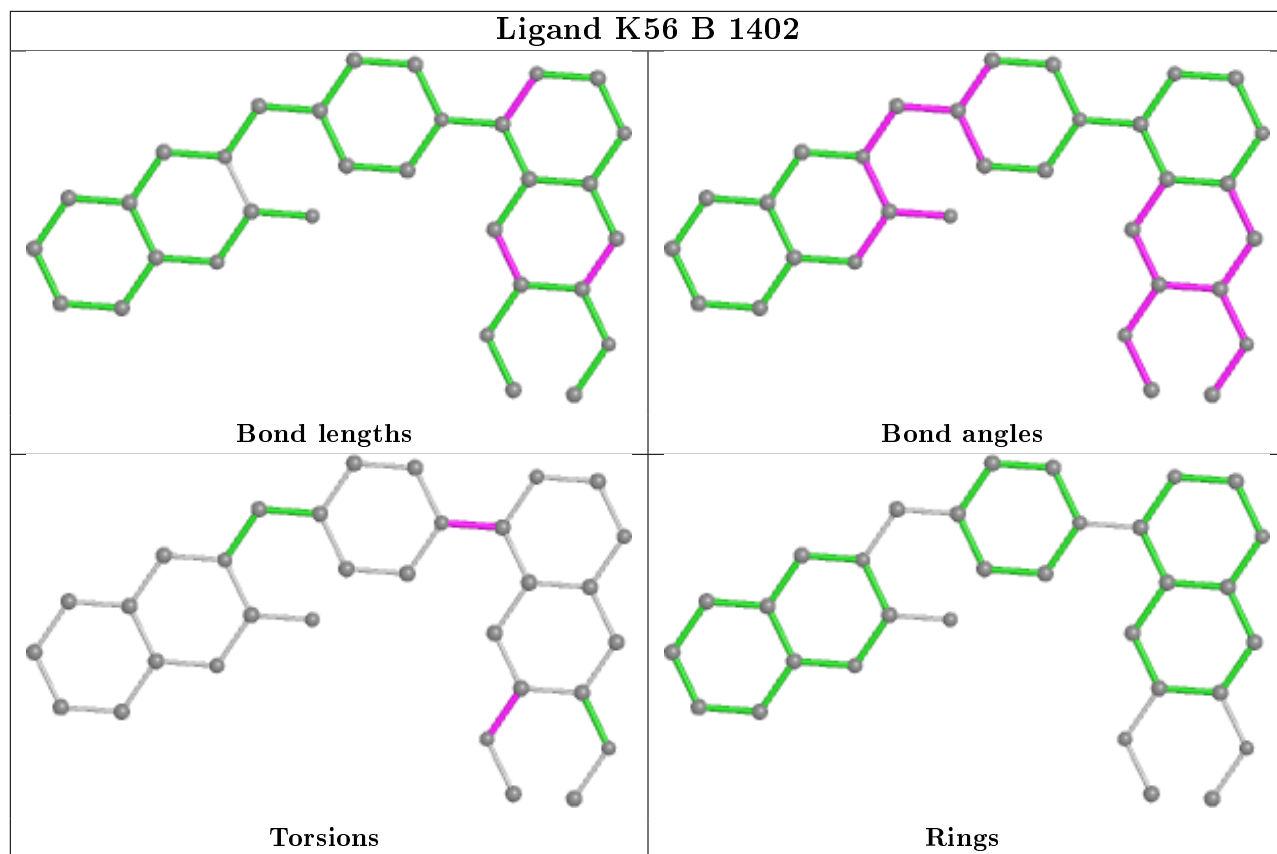
There are no ring outliers.

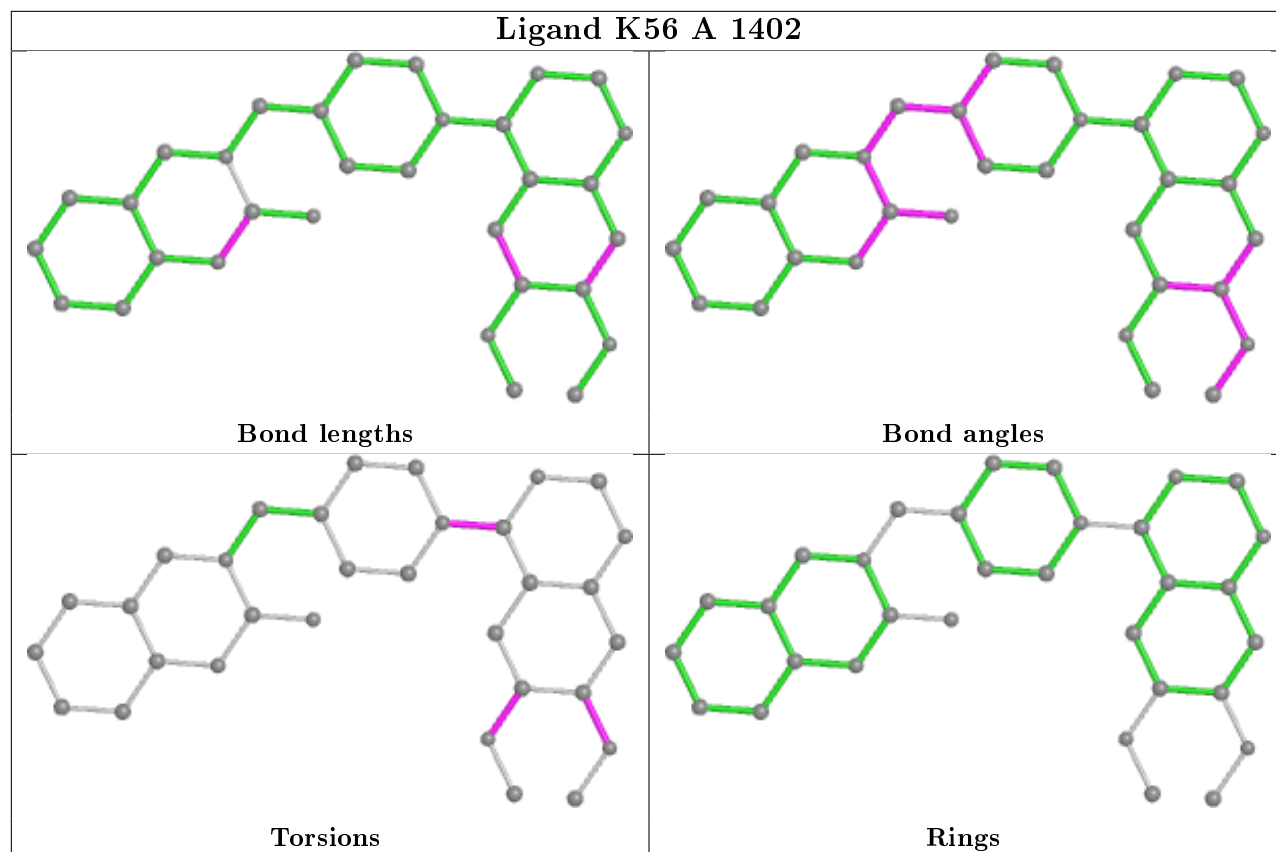
No monomer is involved in short contacts.

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.

## 6 Fit of model and data [i](#)

### 6.1 Protein, DNA and RNA chains [i](#)

In the following table, the column labelled ‘#RSRZ> 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95<sup>th</sup> percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q< 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å <sup>2</sup> )	Q<0.9
1	A	207/257 (80%)	-0.10	2 (0%) 82 82	38, 54, 82, 101	0
1	B	203/257 (78%)	-0.03	8 (3%) 39 35	33, 52, 90, 102	0
1	C	203/257 (78%)	-0.20	2 (0%) 82 82	40, 53, 79, 99	0
1	D	204/257 (79%)	-0.19	1 (0%) 91 91	36, 51, 79, 90	0
All	All	817/1028 (79%)	-0.13	13 (1%) 72 71	33, 53, 83, 102	0

All (13) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	1266	ILE	3.1
1	A	1314	GLU	3.0
1	C	1265	THR	2.9
1	B	1230	GLY	2.7
1	B	1289	TYR	2.5
1	B	1176	HIS	2.5
1	B	1265	THR	2.5
1	D	1265	THR	2.5
1	B	1174	HIS	2.4
1	B	1314	GLU	2.2
1	A	1135	GLY	2.1
1	B	1264	SER	2.1
1	C	1287	LEU	2.0

### 6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

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

### 6.3 Carbohydrates

There are no carbohydrates in this entry.

### 6.4 Ligands

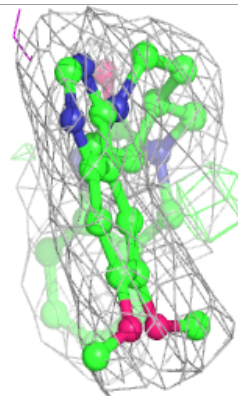
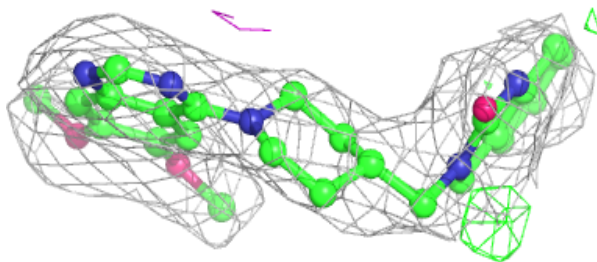
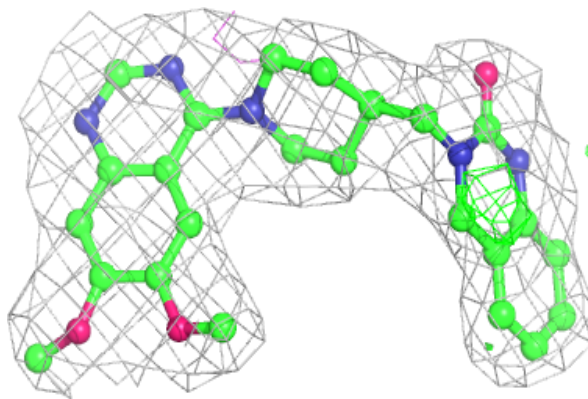
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
3	K56	A	1402	32/32	0.94	0.14	35,40,45,46	0
3	K56	B	1402	32/32	0.95	0.14	31,35,46,47	0
3	K56	D	1402	32/32	0.95	0.16	41,43,47,48	0
3	K56	C	1402	32/32	0.96	0.15	39,43,45,47	0
2	ZN	D	1401	1/1	0.99	0.03	48,48,48,48	0
2	ZN	B	1401	1/1	0.99	0.04	70,70,70,70	0
2	ZN	C	1401	1/1	0.99	0.03	50,50,50,50	0
2	ZN	A	1401	1/1	0.99	0.03	65,65,65,65	0

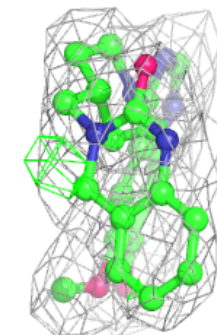
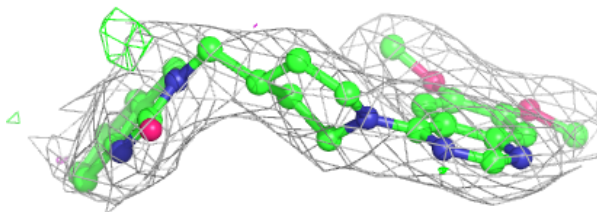
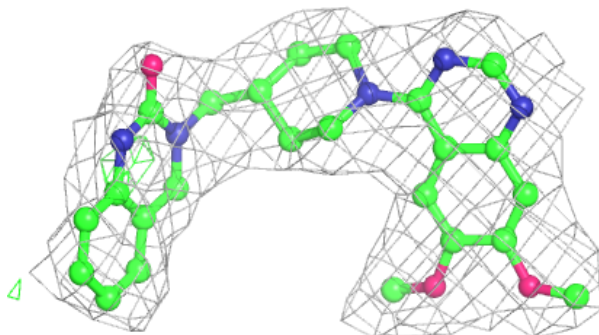
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

**Electron density around K56 A 1402:**

$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)

**Electron density around K56 B 1402:**

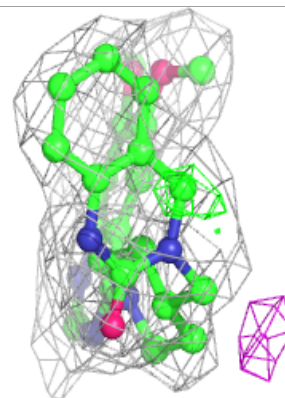
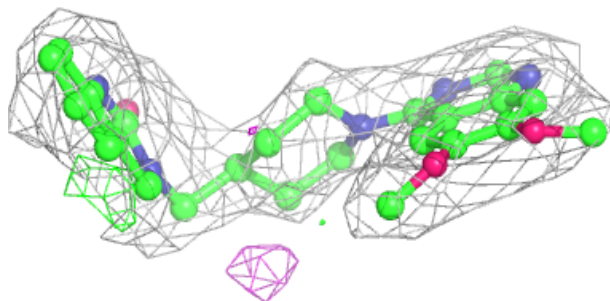
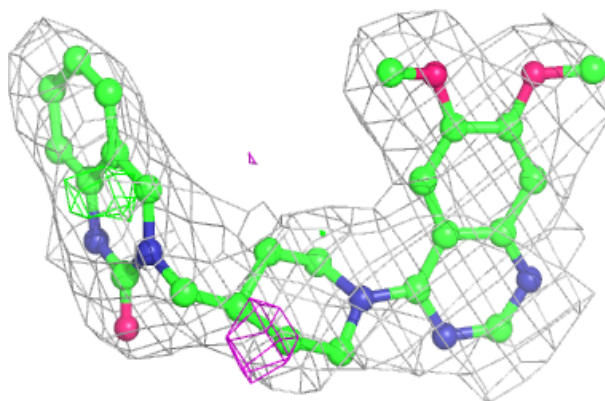
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



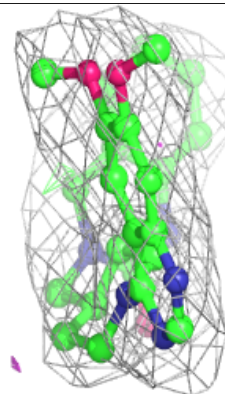
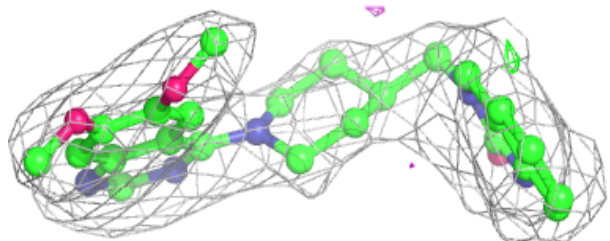
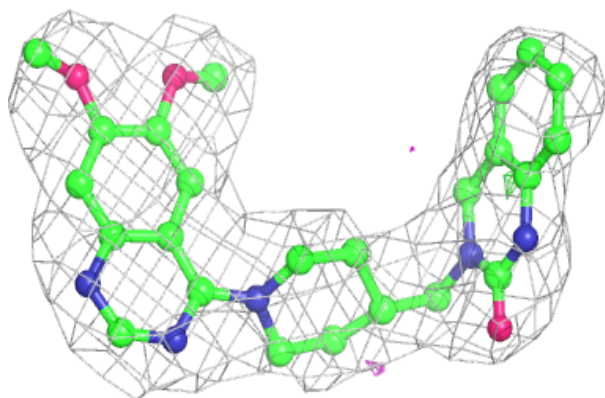


**Electron density around K56 D 1402:**

$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)

**Electron density around K56 C 1402:**

$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



## 6.5 Other polymers

There are no such residues in this entry.