



# Full wwPDB X-ray Structure Validation Report ⓘ

Jul 28, 2021 – 07:27 pm BST

PDB ID : 6RJB  
Title : Human transketolase variant T382E  
Authors : Rabe von Pappenheim, F.; Tittmann, K.  
Deposited on : 2019-04-26  
Resolution : 1.15 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 : 2.22  
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) : 2.22

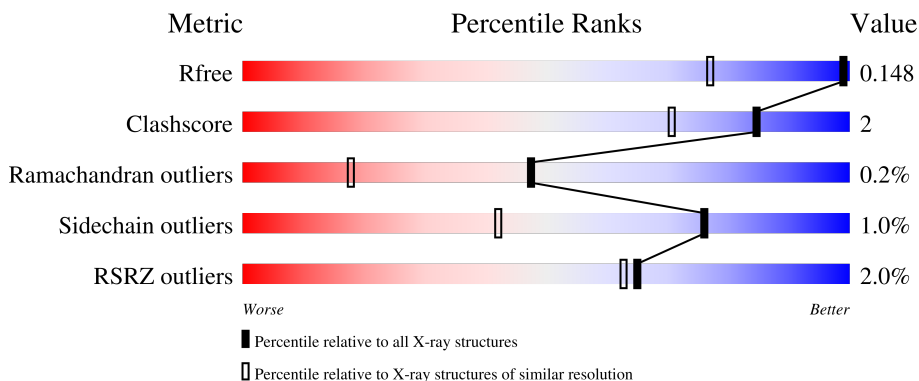
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.15 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)	Similar resolution (#Entries, resolution range(Å))
$R_{free}$	130704	1492 (1.18-1.10)
Clashscore	141614	1537 (1.18-1.10)
Ramachandran outliers	138981	1483 (1.18-1.10)
Sidechain outliers	138945	1480 (1.18-1.10)
RSRZ outliers	127900	1464 (1.18-1.10)

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 of 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	637	
1	B	637	

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:

<b>Mol</b>	<b>Type</b>	<b>Chain</b>	<b>Res</b>	<b>Chirality</b>	<b>Geometry</b>	<b>Clashes</b>	<b>Electron density</b>
8	PEG	A	727	-	-	X	-
8	PEG	B	725	-	-	X	-

## 2 Entry composition [i](#)

There are 9 unique types of molecules in this entry. The entry contains 23073 atoms, of which 11022 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 Transketolase.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	H	N	O	S			
1	A	620	10694	3343	5373	940	1010	28	0	107	0
1	B	622	10624	3320	5341	937	998	28	0	94	0

There are 30 discrepancies between the modelled and reference sequences:

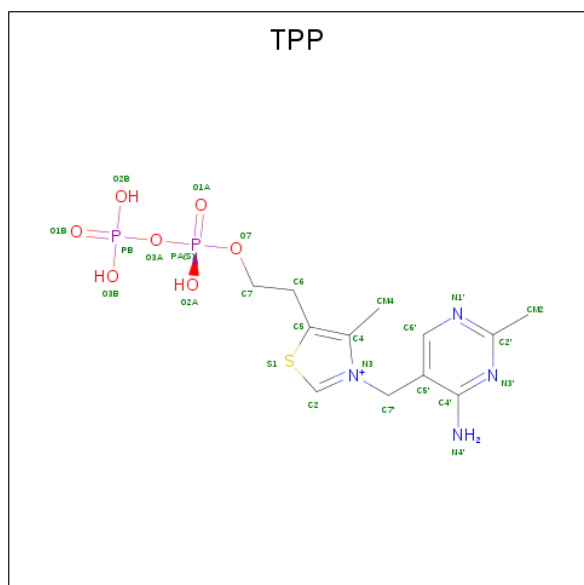
Chain	Residue	Modelled	Actual	Comment	Reference
A	382	GLU	THR	engineered mutation	UNP P29401
A	624	LEU	-	expression tag	UNP P29401
A	625	VAL	-	expression tag	UNP P29401
A	626	PRO	-	expression tag	UNP P29401
A	627	ARG	-	expression tag	UNP P29401
A	628	GLY	-	expression tag	UNP P29401
A	629	SER	-	expression tag	UNP P29401
A	630	LEU	-	expression tag	UNP P29401
A	631	GLU	-	expression tag	UNP P29401
A	632	HIS	-	expression tag	UNP P29401
A	633	HIS	-	expression tag	UNP P29401
A	634	HIS	-	expression tag	UNP P29401
A	635	HIS	-	expression tag	UNP P29401
A	636	HIS	-	expression tag	UNP P29401
A	637	HIS	-	expression tag	UNP P29401
B	382	GLU	THR	engineered mutation	UNP P29401
B	624	LEU	-	expression tag	UNP P29401
B	625	VAL	-	expression tag	UNP P29401
B	626	PRO	-	expression tag	UNP P29401
B	627	ARG	-	expression tag	UNP P29401
B	628	GLY	-	expression tag	UNP P29401
B	629	SER	-	expression tag	UNP P29401
B	630	LEU	-	expression tag	UNP P29401
B	631	GLU	-	expression tag	UNP P29401
B	632	HIS	-	expression tag	UNP P29401

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Chain	Residue	Modelled	Actual	Comment	Reference
B	633	HIS	-	expression tag	UNP P29401
B	634	HIS	-	expression tag	UNP P29401
B	635	HIS	-	expression tag	UNP P29401
B	636	HIS	-	expression tag	UNP P29401
B	637	HIS	-	expression tag	UNP P29401

- Molecule 2 is THIAMINE DIPHOSPHATE (three-letter code: TPP) (formula: C<sub>12</sub>H<sub>19</sub>N<sub>4</sub>O<sub>7</sub>P<sub>2</sub>S) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	
			Total	C	N	O	P			S
2	A	1	Total	C	N	O	P	S	0	0
			26	12	4	7	2	1		
2	B	1	Total	C	N	O	P	S	0	0
			26	12	4	7	2	1		

- Molecule 3 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	1	Total	Mg	0	1
			1	1		
3	B	1	Total	Mg	0	1
			1	1		

- Molecule 4 is CALCIUM ION (three-letter code: CA) (formula: Ca).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total Ca 1 1	0	1
4	B	1	Total Ca 1 1	0	1

- Molecule 5 is GLYCEROL (three-letter code: GOL) (formula: C<sub>3</sub>H<sub>8</sub>O<sub>3</sub>).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	1	Total C H O 14 3 8 3	0	1
5	B	1	Total C H O 14 3 8 3	0	0

- Molecule 6 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: C<sub>2</sub>H<sub>6</sub>O<sub>2</sub>).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	
			Total	C	H			O
6	A	1	10	2	6	2	0	0
6	A	1	10	2	6	2	0	0
6	A	1	20	4	12	4	0	1
6	A	1	10	2	6	2	0	0
6	A	1	10	2	6	2	0	0
6	A	1	10	2	6	2	0	0
6	A	1	10	2	6	2	0	0
6	A	1	10	2	6	2	0	0
6	A	1	20	4	12	4	0	1
6	A	1	10	2	6	2	0	0
6	A	1	10	2	6	2	0	0
6	A	1	10	2	6	2	0	0
6	A	1	10	2	6	2	0	0
6	A	1	10	2	6	2	0	0

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Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	H	O		
6	A	1	Total 10	C 2	H 6	O 2	0	0
6	A	1	Total 10	C 2	H 6	O 2	0	0
6	A	1	Total 10	C 2	H 6	O 2	0	0
6	A	1	Total 10	C 2	H 6	O 2	0	0
6	A	1	Total 10	C 2	H 6	O 2	0	0
6	A	1	Total 10	C 2	H 6	O 2	0	0
6	A	1	Total 10	C 2	H 6	O 2	0	0
6	B	1	Total 20	C 4	H 12	O 4	0	1
6	B	1	Total 10	C 2	H 6	O 2	0	0
6	B	1	Total 10	C 2	H 6	O 2	0	0
6	B	1	Total 10	C 2	H 6	O 2	0	0
6	B	1	Total 10	C 2	H 6	O 2	0	0
6	B	1	Total 10	C 2	H 6	O 2	0	0
6	B	1	Total 20	C 4	H 12	O 4	0	1
6	B	1	Total 10	C 2	H 6	O 2	0	0
6	B	1	Total 10	C 2	H 6	O 2	0	0
6	B	1	Total 10	C 2	H 6	O 2	0	0
6	B	1	Total 10	C 2	H 6	O 2	0	0
6	B	1	Total 10	C 2	H 6	O 2	0	0
6	B	1	Total 20	C 4	H 12	O 4	0	1
6	B	1	Total 10	C 2	H 6	O 2	0	0
6	B	1	Total 10	C 2	H 6	O 2	0	0
6	B	1	Total 20	C 4	H 12	O 4	0	1

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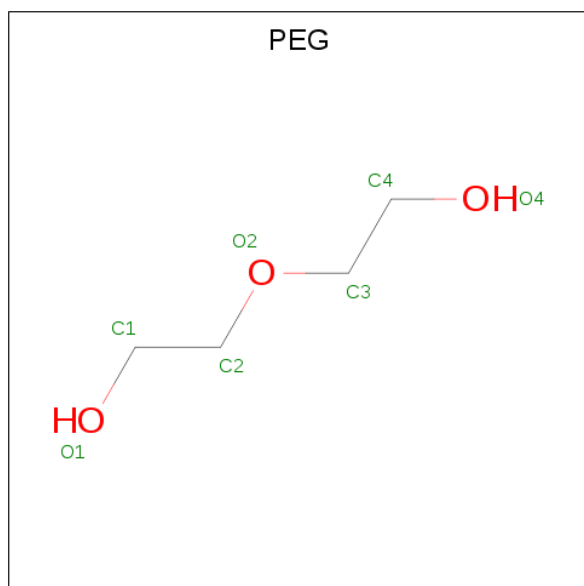
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Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
6	B	1	Total	C	H	O	0	0
			10	2	6	2		
6	B	1	Total	C	H	O	0	1
			10	2	6	2		
6	B	1	Total	C	H	O	0	0
			10	2	6	2		
6	B	1	Total	C	H	O	0	0
			10	2	6	2		

- Molecule 7 is SODIUM ION (three-letter code: NA) (formula: Na).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	2	Total	Na	0	0
			2	2		

- Molecule 8 is DI(HYDROXYETHYL)ETHER (three-letter code: PEG) (formula: C<sub>4</sub>H<sub>10</sub>O<sub>3</sub>).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
8	A	1	Total	C	H	O	0	0
			15	4	8	3		
8	B	1	Total	C	H	O	0	0
			15	4	8	3		

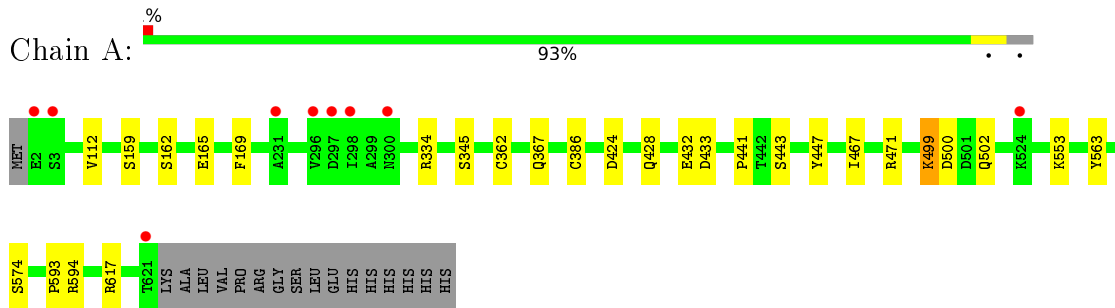
- Molecule 9 is water.

<b>Mol</b>	<b>Chain</b>	<b>Residues</b>	<b>Atoms</b>		<b>ZeroOcc</b>	<b>AltConf</b>
9	A	612	Total 618	O 618	0	25
9	B	553	Total 561	O 561	0	17

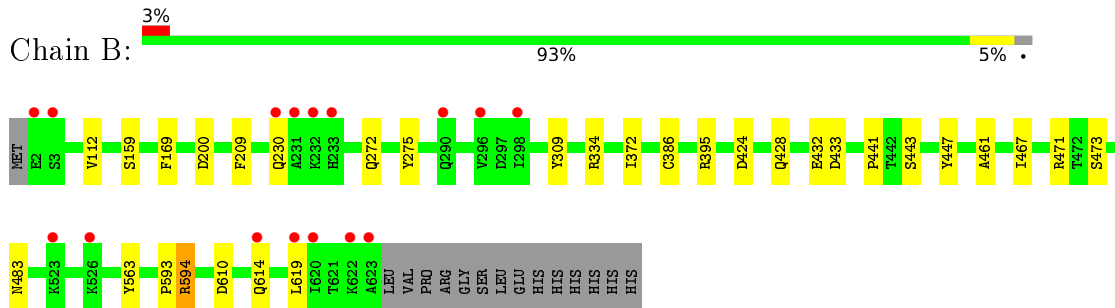
### 3 Residue-property plots [i](#)

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 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: Transketolase



- Molecule 1: Transketolase



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	73.00Å 85.78Å 92.79Å 90.00° 94.15° 90.00°	Depositor
Resolution (Å)	72.81 – 1.15 72.81 – 1.15	Depositor EDS
% Data completeness (in resolution range)	96.7 (72.81-1.15) 96.7 (72.81-1.15)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.30 (at 1.15Å)	Xtrriage
Refinement program	PHENIX (1.13_2998: ???)	Depositor
R, $R_{free}$	0.123 , 0.148 0.123 , 0.148	Depositor DCC
$R_{free}$ test set	11693 reflections (3.00%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	13.5	Xtrriage
Anisotropy	0.294	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.43 , 58.3	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.51$ , $\langle L^2 \rangle = 0.34$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.99	EDS
Total number of atoms	23073	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	19.0	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 79.68 % 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 5.2939e-07. 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: CA, PEG, NA, TPP, GOL, EDO, MG

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	0.40	0/5737	0.67	1/7743 (0.0%)
1	B	0.39	0/5628	0.67	2/7595 (0.0%)
All	All	0.39	0/11365	0.67	3/15338 (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( $^{\circ}$ )	Ideal( $^{\circ}$ )
1	A	471	ARG	NE-CZ-NH1	6.95	123.77	120.30
1	B	471	ARG	NE-CZ-NH1	5.54	123.07	120.30
1	B	594	ARG	NE-CZ-NH1	5.42	123.01	120.30

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	499[B]	LYS	Mainchain

## 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	5321	5373	5029	19	0
1	B	5283	5341	5072	21	0
2	A	26	0	16	3	0
2	B	26	0	16	3	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0
4	A	1	0	0	0	0
4	B	1	0	0	0	0
5	A	6	8	8	1	0
5	B	6	8	7	0	0
6	A	88	132	132	3	0
6	B	96	144	144	3	1
7	A	2	0	0	0	0
8	A	7	8	10	5	0
8	B	7	8	10	5	0
9	A	618	0	0	6	1
9	B	561	0	0	6	0
All	All	12051	11022	10444	50	1

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 2.

All (50) 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)
9:A:803:HOH:O	2:B:701:TPP:H2	1.83	0.79
1:B:230:GLN:O	9:B:801:HOH:O	2.10	0.70
1:A:500[B]:ASP:O	1:A:502[B]:GLN:NE2	2.25	0.70
2:A:701:TPP:H2	9:A:1288[A]:HOH:O	1.95	0.67
1:A:499[B]:LYS:NZ	1:A:500[B]:ASP:OD2	2.35	0.59
1:B:309:TYR:O	1:B:483[A]:ASN:ND2	2.34	0.58
1:B:169:PHE:CE2	1:B:372[B]:ILE:HD13	2.40	0.57
1:A:345:SER:OG	6:A:724:EDO:H12	2.08	0.54
1:A:165:GLU:O	8:A:727:PEG:H22	2.11	0.51
2:A:701:TPP:HN42	2:A:701:TPP:C2	2.23	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:362:CYS:O	8:A:727:PEG:H12	2.11	0.50
8:A:727:PEG:H32	6:B:708:EDO:O2	2.12	0.49
2:B:701:TPP:HN42	2:B:701:TPP:C2	2.24	0.49
1:A:617:ARG:NH2	9:A:810:HOH:O	2.44	0.49
1:A:162:SER:HB3	1:A:367[B]:GLN:HE21	1.78	0.48
1:A:169:PHE:HD2	8:A:727:PEG:H11	1.80	0.47
1:A:574:SER:OG	9:A:801[B]:HOH:O	2.21	0.46
1:A:159:SER:CB	8:B:725:PEG:H11	2.45	0.46
1:B:610:ASP:O	1:B:614[B]:GLN:HG3	2.16	0.46
1:B:200[B]:ASP:OD2	9:B:802:HOH:O	2.21	0.46
8:A:727:PEG:H42	1:B:159:SER:OG	2.17	0.45
2:A:701:TPP:H2	2:A:701:TPP:HN42	1.82	0.44
1:A:441[A]:PRO:HG3	1:B:563:TYR:CZ	2.53	0.44
2:B:701:TPP:H2	2:B:701:TPP:HN42	1.83	0.43
1:A:159:SER:OG	8:B:725:PEG:H11	2.19	0.43
1:B:272[B]:GLN:HG2	9:B:1013:HOH:O	2.19	0.43
1:A:443:SER:HA	1:A:467:ILE:O	2.19	0.42
5:A:704[A]:GOL:H11	9:A:1125:HOH:O	2.19	0.42
1:A:563:TYR:CZ	1:B:441[B]:PRO:HG3	2.54	0.42
1:B:433:ASP:HB3	9:B:1102:HOH:O	2.20	0.41
1:A:424:ASP:HB3	1:A:428[B]:GLN:HG3	2.02	0.41
1:A:433:ASP:HB3	9:A:1140:HOH:O	2.20	0.41
1:A:159:SER:OG	8:B:725:PEG:C1	2.69	0.41
1:B:473:SER:HB2	6:B:719[B]:EDO:H12	2.02	0.41
1:B:424:ASP:HB3	1:B:428[B]:GLN:HG3	2.02	0.40
1:B:443:SER:HA	1:B:467:ILE:O	2.20	0.40
1:B:619:LEU:HD22	9:B:804:HOH:O	2.21	0.40
1:B:461:ALA:O	9:B:803:HOH:O	2.22	0.40
6:A:711:EDO:H22	1:B:209:PHE:HE2	1.86	0.40

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
6:B:717:EDO:O1	9:A:1395:HOH:O[2_645]	2.05	0.15

## 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	727/637 (114%)	709 (98%)	17 (2%)	1 (0%)	51	18
1	B	714/637 (112%)	699 (98%)	14 (2%)	1 (0%)	51	18
All	All	1441/1274 (113%)	1408 (98%)	31 (2%)	2 (0%)	47	18

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	593	PRO
1	B	593	PRO

### 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	602/518 (116%)	597 (99%)	5 (1%)	81	50
1	B	590/518 (114%)	584 (99%)	6 (1%)	76	42
All	All	1192/1036 (115%)	1181 (99%)	11 (1%)	76	46

All (11) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	112	VAL
1	A	432	GLU
1	A	447	TYR
1	A	553	LYS

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Mol	Chain	Res	Type
1	A	594	ARG
1	B	112	VAL
1	B	275[A]	TYR
1	B	275[B]	TYR
1	B	432	GLU
1	B	447	TYR
1	B	594	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

### 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 monosaccharides in this entry.

### 5.6 Ligand geometry [i](#)

Of 58 ligands modelled in this entry, 6 are monoatomic - leaving 52 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
5	GOL	B	704	-	5,5,5	1.43	1 (20%)	5,5,5	1.48	1 (20%)
8	PEG	B	725	-	6,6,6	0.41	0	5,5,5	0.89	0
6	EDO	A	718	-	3,3,3	0.41	0	2,2,2	0.36	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
6	EDO	A	705	-	3,3,3	0.74	0	2,2,2	0.08	0
2	TPP	B	701	3,4	22,27,27	4.59	5 (22%)	29,40,40	2.01	7 (24%)
6	EDO	B	719[A]	-	3,3,3	0.55	0	2,2,2	0.43	0
6	EDO	B	722	-	3,3,3	0.61	0	2,2,2	0.08	0
6	EDO	B	707	-	3,3,3	0.49	0	2,2,2	0.10	0
6	EDO	B	709	-	3,3,3	0.53	0	2,2,2	0.10	0
6	EDO	A	717	-	3,3,3	0.51	0	2,2,2	0.08	0
6	EDO	A	711	-	3,3,3	0.30	0	2,2,2	0.39	0
5	GOL	A	704[A]	-	5,5,5	1.25	0	5,5,5	0.54	0
6	EDO	A	721	-	3,3,3	0.61	0	2,2,2	0.19	0
6	EDO	B	706	-	3,3,3	0.40	0	2,2,2	0.32	0
6	EDO	B	705[B]	-	3,3,3	0.43	0	2,2,2	0.31	0
6	EDO	A	710	-	3,3,3	0.46	0	2,2,2	0.13	0
6	EDO	A	709	-	3,3,3	0.44	0	2,2,2	0.28	0
6	EDO	A	724	-	3,3,3	0.44	0	2,2,2	0.50	0
6	EDO	B	705[A]	-	3,3,3	0.46	0	2,2,2	0.28	0
6	EDO	A	715	-	3,3,3	0.36	0	2,2,2	0.29	0
6	EDO	A	706	-	3,3,3	0.41	0	2,2,2	0.21	0
6	EDO	B	708	-	3,3,3	0.32	0	2,2,2	0.23	0
6	EDO	B	714	-	3,3,3	0.37	0	2,2,2	0.33	0
6	EDO	B	720	-	3,3,3	0.51	0	2,2,2	0.24	0
6	EDO	B	721[A]	-	3,3,3	0.35	0	2,2,2	0.26	0
8	PEG	A	727	-	6,6,6	0.27	0	5,5,5	1.56	1 (20%)
6	EDO	A	722	-	3,3,3	0.47	0	2,2,2	0.17	0
2	TPP	A	701	3,4	22,27,27	4.40	9 (40%)	29,40,40	1.88	8 (27%)
6	EDO	B	724	-	3,3,3	0.40	0	2,2,2	0.73	0
6	EDO	B	715	-	3,3,3	0.38	0	2,2,2	0.91	0
6	EDO	A	723	-	3,3,3	0.43	0	2,2,2	0.36	0
6	EDO	B	710[B]	-	3,3,3	0.46	0	2,2,2	0.29	0
6	EDO	A	712	-	3,3,3	0.38	0	2,2,2	0.36	0
6	EDO	A	713[B]	-	3,3,3	0.47	0	2,2,2	0.27	0
6	EDO	B	713	-	3,3,3	0.41	0	2,2,2	0.25	0
6	EDO	A	720	-	3,3,3	0.42	0	2,2,2	0.40	0
6	EDO	A	719	-	3,3,3	0.40	0	2,2,2	0.34	0
6	EDO	B	717	-	3,3,3	0.46	0	2,2,2	0.30	0
6	EDO	A	708	-	3,3,3	0.33	0	2,2,2	0.16	0
6	EDO	A	714	-	3,3,3	0.46	0	2,2,2	0.66	0
6	EDO	A	707[B]	-	3,3,3	0.42	0	2,2,2	0.54	0
6	EDO	B	716[B]	-	3,3,3	0.36	0	2,2,2	0.36	0
6	EDO	B	723	-	3,3,3	0.48	0	2,2,2	0.11	0
6	EDO	A	716	-	3,3,3	0.41	0	2,2,2	0.53	0
6	EDO	A	713[A]	-	3,3,3	0.41	0	2,2,2	0.41	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
6	EDO	B	710[A]	-	3,3,3	0.48	0	2,2,2	0.26	0
6	EDO	B	711	-	3,3,3	0.65	0	2,2,2	0.15	0
6	EDO	A	707[A]	-	3,3,3	0.43	0	2,2,2	0.22	0
6	EDO	B	712	-	3,3,3	0.53	0	2,2,2	0.05	0
6	EDO	B	716[A]	-	3,3,3	0.38	0	2,2,2	0.20	0
6	EDO	B	719[B]	-	3,3,3	0.33	0	2,2,2	0.50	0
6	EDO	B	718	-	3,3,3	0.42	0	2,2,2	0.42	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
5	GOL	B	704	-	-	2/4/4/4	-
8	PEG	B	725	-	-	2/4/4/4	-
6	EDO	A	718	-	-	0/1/1/1	-
6	EDO	A	705	-	-	0/1/1/1	-
2	TPP	B	701	3,4	-	5/16/17/17	0/2/2/2
6	EDO	B	719[A]	-	-	0/1/1/1	-
6	EDO	B	722	-	-	0/1/1/1	-
6	EDO	B	707	-	-	0/1/1/1	-
6	EDO	B	709	-	-	0/1/1/1	-
6	EDO	A	717	-	-	0/1/1/1	-
6	EDO	A	711	-	-	0/1/1/1	-
5	GOL	A	704[A]	-	-	4/4/4/4	-
6	EDO	A	721	-	-	0/1/1/1	-
6	EDO	B	706	-	-	0/1/1/1	-
6	EDO	B	705[B]	-	-	0/1/1/1	-
6	EDO	A	710	-	-	0/1/1/1	-
6	EDO	A	709	-	-	0/1/1/1	-
6	EDO	A	724	-	-	1/1/1/1	-
6	EDO	B	705[A]	-	-	0/1/1/1	-
6	EDO	A	715	-	-	0/1/1/1	-
6	EDO	A	706	-	-	0/1/1/1	-
6	EDO	B	708	-	-	0/1/1/1	-
6	EDO	B	714	-	-	0/1/1/1	-
6	EDO	B	720	-	-	0/1/1/1	-
6	EDO	B	721[A]	-	-	1/1/1/1	-
8	PEG	A	727	-	-	2/4/4/4	-
6	EDO	A	722	-	-	1/1/1/1	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	TPP	A	701	3,4	-	4/16/17/17	0/2/2/2
6	EDO	B	724	-	-	0/1/1/1	-
6	EDO	B	715	-	-	1/1/1/1	-
6	EDO	A	723	-	-	0/1/1/1	-
6	EDO	B	710[B]	-	-	1/1/1/1	-
6	EDO	A	712	-	-	0/1/1/1	-
6	EDO	A	713[B]	-	-	0/1/1/1	-
6	EDO	B	713	-	-	0/1/1/1	-
6	EDO	A	720	-	-	1/1/1/1	-
6	EDO	A	719	-	-	1/1/1/1	-
6	EDO	B	717	-	-	1/1/1/1	-
6	EDO	A	708	-	-	0/1/1/1	-
6	EDO	A	714	-	-	0/1/1/1	-
6	EDO	A	707[B]	-	-	0/1/1/1	-
6	EDO	B	716[B]	-	-	1/1/1/1	-
6	EDO	B	723	-	-	0/1/1/1	-
6	EDO	A	716	-	-	0/1/1/1	-
6	EDO	A	713[A]	-	-	0/1/1/1	-
6	EDO	B	710[A]	-	-	0/1/1/1	-
6	EDO	B	711	-	-	0/1/1/1	-
6	EDO	A	707[A]	-	-	0/1/1/1	-
6	EDO	B	712	-	-	0/1/1/1	-
6	EDO	B	716[A]	-	-	1/1/1/1	-
6	EDO	B	719[B]	-	-	1/1/1/1	-
6	EDO	B	718	-	-	0/1/1/1	-

All (15) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	701	TPP	C6-C5	-19.98	1.42	1.50
2	A	701	TPP	C6-C5	-18.08	1.43	1.50
2	B	701	TPP	C5'-C4'	4.97	1.51	1.42
2	A	701	TPP	C5'-C4'	4.95	1.51	1.42
2	A	701	TPP	C7'-N3	-3.64	1.41	1.48
2	A	701	TPP	C2'-N3'	-3.31	1.28	1.34
2	A	701	TPP	C2'-N1'	3.27	1.39	1.34
2	B	701	TPP	C7'-N3	-3.02	1.43	1.48
2	A	701	TPP	C4'-N3'	-2.71	1.31	1.35
2	A	701	TPP	C2-N3	2.61	1.41	1.36
2	B	701	TPP	C2'-N3'	-2.49	1.29	1.34
2	A	701	TPP	C6'-N1'	2.42	1.39	1.34
2	B	701	TPP	C2'-N1'	2.33	1.38	1.34

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	B	704	GOL	O3-C3	-2.12	1.33	1.42
2	A	701	TPP	C6'-C5'	-2.01	1.33	1.37

All (17) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	701	TPP	C5-C4-N3	5.63	118.84	107.57
2	A	701	TPP	C5-C4-N3	4.66	116.89	107.57
2	A	701	TPP	CM2-C2'-N3'	4.62	124.36	117.15
2	B	701	TPP	CM2-C2'-N3'	4.27	123.81	117.15
2	B	701	TPP	CM4-C4-C5	-3.54	119.86	127.60
2	A	701	TPP	CM4-C4-N3	-3.43	118.16	122.53
2	B	701	TPP	C2'-N3'-C4'	3.14	122.98	118.08
2	B	701	TPP	C6-C5-C4	3.10	129.93	127.43
8	A	727	PEG	O2-C2-C1	-3.08	96.52	110.07
2	A	701	TPP	N1'-C2'-N3'	-2.94	120.48	125.54
2	A	701	TPP	C6'-N1'-C2'	2.92	120.92	115.96
2	A	701	TPP	C2'-N3'-C4'	2.85	122.52	118.08
2	B	701	TPP	N1'-C2'-N3'	-2.78	120.75	125.54
2	A	701	TPP	C5'-C6'-N1'	-2.51	119.63	123.82
2	B	701	TPP	C6'-N1'-C2'	2.51	120.23	115.96
5	B	704	GOL	C3-C2-C1	-2.20	103.15	111.70
2	A	701	TPP	O3B-PB-O2B	2.01	115.33	107.64

There are no chirality outliers.

All (30) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	701	TPP	C4'-C5'-C7'-N3
2	A	701	TPP	C4-C5-C6-C7
2	B	701	TPP	C4'-C5'-C7'-N3
2	B	701	TPP	C4-C5-C6-C7
2	B	701	TPP	PA-O3A-PB-O3B
5	B	704	GOL	C1-C2-C3-O3
5	B	704	GOL	O2-C2-C3-O3
8	B	725	PEG	O2-C3-C4-O4
5	A	704[A]	GOL	O1-C1-C2-C3
5	A	704[A]	GOL	C1-C2-C3-O3
5	A	704[A]	GOL	O1-C1-C2-O2
8	A	727	PEG	O2-C3-C4-O4
5	A	704[A]	GOL	O2-C2-C3-O3
6	B	719[B]	EDO	O1-C1-C2-O2

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Mol	Chain	Res	Type	Atoms
6	A	724	EDO	O1-C1-C2-O2
6	B	717	EDO	O1-C1-C2-O2
8	B	725	PEG	C4-C3-O2-C2
2	A	701	TPP	C6'-C5'-C7'-N3
2	B	701	TPP	C6'-C5'-C7'-N3
6	A	720	EDO	O1-C1-C2-O2
8	A	727	PEG	O1-C1-C2-O2
6	A	722	EDO	O1-C1-C2-O2
6	B	721[A]	EDO	O1-C1-C2-O2
6	B	710[B]	EDO	O1-C1-C2-O2
2	B	701	TPP	PA-O3A-PB-O1B
6	B	716[A]	EDO	O1-C1-C2-O2
2	A	701	TPP	PA-O3A-PB-O2B
6	A	719	EDO	O1-C1-C2-O2
6	B	715	EDO	O1-C1-C2-O2
6	B	716[B]	EDO	O1-C1-C2-O2

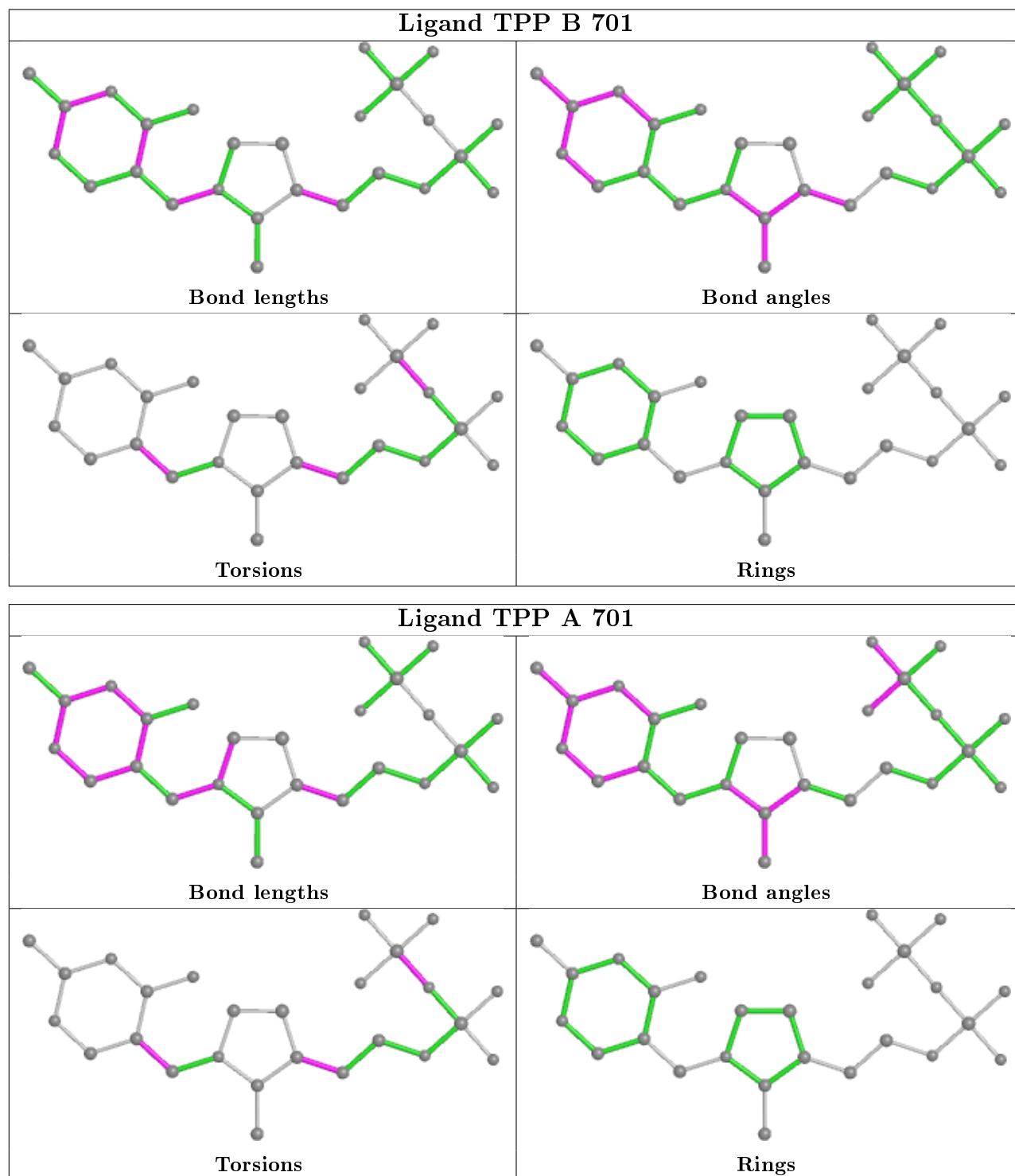
There are no ring outliers.

12 monomers are involved in 23 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
8	B	725	PEG	5	0
2	B	701	TPP	3	0
6	A	711	EDO	1	0
5	A	704[A]	GOL	1	0
6	A	724	EDO	1	0
6	B	708	EDO	1	0
6	B	721[A]	EDO	1	0
8	A	727	PEG	5	0
2	A	701	TPP	3	0
6	B	717	EDO	0	1
6	A	707[B]	EDO	1	0
6	B	719[B]	EDO	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.



## 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	620/637 (97%)	-0.21	9 (1%) 73 71	9, 13, 26, 45	0
1	B	622/637 (97%)	-0.16	16 (2%) 56 54	10, 15, 31, 55	1 (0%)
All	All	1242/1274 (97%)	-0.19	25 (2%) 65 63	9, 14, 29, 55	1 (0%)

All (25) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	622	LYS	5.8
1	A	298	ILE	5.2
1	A	2	GLU	5.0
1	B	526	LYS	4.3
1	B	620	ILE	4.1
1	B	623	ALA	4.0
1	A	296[A]	VAL	3.9
1	A	231[A]	ALA	3.7
1	A	297	ASP	3.3
1	B	230	GLN	3.3
1	B	298	ILE	3.2
1	A	621	THR	3.0
1	B	231	ALA	2.9
1	A	524[A]	LYS	2.9
1	B	614[A]	GLN	2.7
1	B	232	LYS	2.7
1	B	296[A]	VAL	2.6
1	B	523	LYS	2.5
1	B	233	HIS	2.5
1	B	2	GLU	2.4
1	B	619	LEU	2.3
1	B	290[A]	GLN	2.1
1	A	300[A]	ASN	2.1
1	B	3	SER	2.1

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Mol	Chain	Res	Type	RSRZ
1	A	3	SER	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 [i](#)

There are no monosaccharides in this entry.

## 6.4 Ligands [i](#)

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(Å <sup>2</sup> )	Q<0.9
6	EDO	B	717	4/4	0.51	0.21	40,48,49,51	0
6	EDO	A	722	4/4	0.61	0.27	58,70,71,73	0
6	EDO	B	718	4/4	0.65	0.16	41,49,50,52	0
6	EDO	A	721	4/4	0.70	0.19	27,33,36,39	0
5	GOL	A	704[A]	6/6	0.72	0.30	31,37,40,41	14
6	EDO	A	723	4/4	0.72	0.19	51,62,62,63	0
6	EDO	B	722	4/4	0.74	0.20	27,32,35,37	0
5	GOL	B	704	6/6	0.79	0.20	25,35,45,45	0
8	PEG	A	727	7/7	0.79	0.16	21,30,36,36	15
8	PEG	B	725	7/7	0.79	0.16	25,33,40,40	15
6	EDO	B	720	4/4	0.81	0.20	36,43,44,45	0
6	EDO	A	712	4/4	0.83	0.14	25,30,31,33	0
6	EDO	B	715	4/4	0.84	0.10	30,37,38,39	0
6	EDO	A	720	4/4	0.86	0.15	40,48,50,51	0
6	EDO	A	719	4/4	0.88	0.13	45,54,54,55	0
6	EDO	B	714	4/4	0.89	0.13	33,40,40,42	0
6	EDO	A	717	4/4	0.90	0.18	21,29,32,34	0
6	EDO	A	724	4/4	0.90	0.13	16,21,28,33	10
6	EDO	B	719[B]	4/4	0.92	0.27	20,24,27,27	10
6	EDO	B	719[A]	4/4	0.92	0.27	14,22,24,27	10
6	EDO	B	721[A]	4/4	0.92	0.17	23,32,35,39	10
6	EDO	A	718	4/4	0.93	0.16	22,30,33,36	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
6	EDO	B	723	4/4	0.93	0.16	33,40,46,48	0
6	EDO	A	713[B]	4/4	0.94	0.14	18,23,27,28	10
6	EDO	B	710[A]	4/4	0.94	0.14	15,18,20,20	10
6	EDO	B	710[B]	4/4	0.94	0.14	25,30,33,34	10
6	EDO	B	724	4/4	0.94	0.17	18,26,32,33	0
6	EDO	A	716	4/4	0.94	0.12	24,29,31,31	0
6	EDO	A	713[A]	4/4	0.94	0.14	11,19,23,23	10
6	EDO	B	716[B]	4/4	0.95	0.10	29,35,35,35	10
6	EDO	B	716[A]	4/4	0.95	0.10	19,23,24,24	10
6	EDO	A	715	4/4	0.96	0.12	20,24,27,27	0
6	EDO	A	714	4/4	0.96	0.10	21,25,26,26	0
6	EDO	B	713	4/4	0.96	0.14	23,28,30,30	0
6	EDO	A	711	4/4	0.97	0.10	15,20,24,24	0
6	EDO	B	711	4/4	0.97	0.06	16,19,22,23	0
6	EDO	A	705	4/4	0.97	0.07	12,15,17,19	0
6	EDO	B	708	4/4	0.98	0.07	14,20,24,24	0
6	EDO	B	709	4/4	0.98	0.07	12,17,19,21	0
6	EDO	A	707[A]	4/4	0.98	0.13	11,14,16,17	10
6	EDO	A	707[B]	4/4	0.98	0.13	18,22,23,24	10
6	EDO	A	708	4/4	0.98	0.09	16,22,27,29	0
6	EDO	B	712	4/4	0.98	0.07	15,20,23,24	0
6	EDO	A	709	4/4	0.98	0.07	13,18,20,21	0
6	EDO	A	710	4/4	0.98	0.09	16,19,23,23	0
6	EDO	B	705[A]	4/4	0.98	0.10	13,15,16,16	10
6	EDO	B	705[B]	4/4	0.98	0.10	15,18,19,20	10
6	EDO	B	706	4/4	0.98	0.08	14,18,20,21	0
2	TPP	A	701	26/26	0.99	0.07	9,11,14,16	0
6	EDO	B	707	4/4	0.99	0.06	16,19,20,22	0
6	EDO	A	706	4/4	0.99	0.08	13,16,18,20	0
2	TPP	B	701	26/26	0.99	0.07	10,11,14,16	0
4	CA	A	703[B]	1/1	1.00	0.08	10,10,10,10	1
4	CA	B	703[B]	1/1	1.00	0.07	10,10,10,10	1
7	NA	A	725	1/1	1.00	0.05	11,11,11,11	0
7	NA	A	726	1/1	1.00	0.07	16,16,16,16	0
3	MG	A	702[A]	1/1	1.00	0.07	11,11,11,11	1
3	MG	B	702[A]	1/1	1.00	0.07	10,10,10,10	1

## 6.5 Other polymers

There are no such residues in this entry.