



# wwPDB X-ray Structure Validation Summary Report ⓘ

Jan 31, 2016 – 09:02 PM GMT

PDB ID : 1N7D  
Title : Extracellular domain of the LDL receptor  
Authors : Rudenko, G.; Henry, L.; Henderson, K.; Ichtchenko, K.; Brown, M.S.; Goldstein, J.L.; Deisenhofer, J.  
Deposited on : 2002-11-13  
Resolution : 3.70 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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  
<http://wwpdb.org/validation/2016/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 : 1.7 (RC4), CSD as536be (2015)  
Xtriage (Phenix) : **NOT EXECUTED**  
EDS : **NOT EXECUTED**  
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : trunk26865

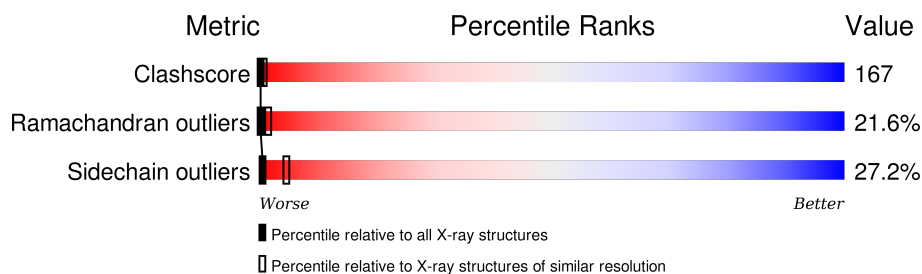
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 3.70 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))
Clashscore	102246	1224 (3.90-3.50)
Ramachandran outliers	100387	1172 (3.90-3.50)
Sidechain outliers	100360	1170 (3.90-3.50)

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. 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.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	699	

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
2	NAG	A	2030	X	-	X	-
3	NAG	A	3030	X	-	X	-
5	KEG	A	6003	-	-	X	-

## 2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 4956 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 Low-density lipoprotein receptor.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	639	Total	C	N	O	S	0	0	0
			4702	2874	800	966	62			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	494	GLN	ASN	ENGINEERED	UNP P01130
A	636	GLN	ASN	ENGINEERED	UNP P01130

- Molecule 2 is a polymer of unknown type called SUGAR (N-ACETYL-D-GLUCOSAMINE).

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	5	Total	C	N	O	0	0
			61	34	2	25		

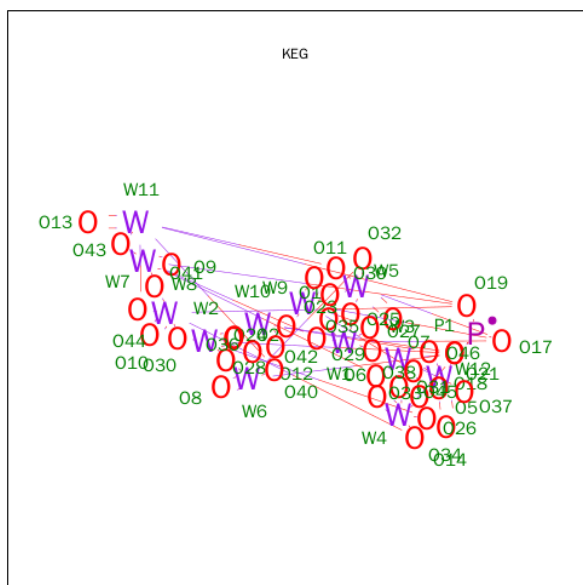
- Molecule 3 is a polymer of unknown type called SUGAR (4-MER).

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	4	Total	C	N	O	0	0
			50	28	2	20		

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

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	8	Total	Ca	0	0
			8	8		

- Molecule 5 is 12-TUNGSTOPHOSPHATE (three-letter code: KEG) (formula: O<sub>40</sub>PW<sub>12</sub>).



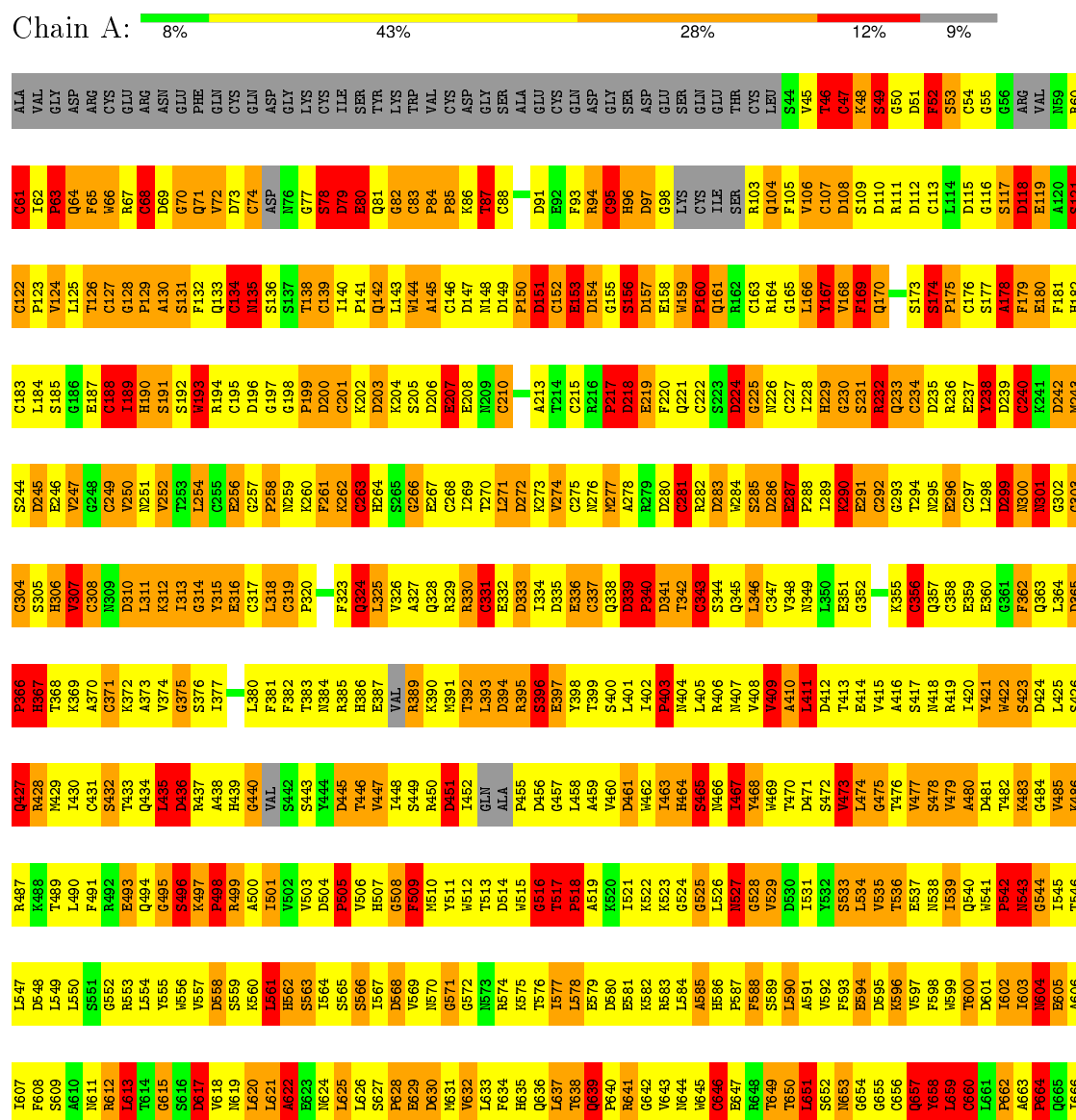
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
5	A	1	Total 53	O 40	P 1	W 12	0	0
5	A	1	Total 53	O 40	P 1	W 12	0	0
5	A	1	Total 29	O 21	P 1	W 7	0	0

### 3 Residue-property plots

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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.

Note EDS was not executed.

- Molecule 1: Low-density lipoprotein receptor



1667	1668	1669	1670	1671	1672	1673	1674	1677	1678	1681	1682	1683	1684	1685	1686	1687	1688	1689	1690	1691	1692	1693	ALA	GLU	ALA	ALA	VAL	ALA

## 4 Data and refinement statistics

Xtriage (Phenix) and EDS were not executed - this section will therefore be incomplete.

Property	Value	Source
Space group	P 31 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	185.29 Å   185.29 Å   85.19 Å 90.00°   90.00°   120.00°	Depositor
Resolution (Å)	45.30 – 3.70	Depositor
% Data completeness (in resolution range)	87.8 (45.30-3.70)	Depositor
$R_{merge}$	0.09	Depositor
$R_{sym}$	(Not available)	Depositor
Refinement program	CNS 1.1	Depositor
R, $R_{free}$	0.381 , 0.382	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	4956	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	124.0	wwPDB-VP

## 5 Model quality

### 5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: KEG, CA, BMA, NAG, MAN

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	0.90	5/4796 (0.1%)	1.77	160/6528 (2.5%)

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	2
2	A	1	0
3	A	1	0
All	All	2	2

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	343	CYS	CB-SG	-8.68	1.67	1.82
1	A	139	CYS	CB-SG	6.30	1.93	1.82
1	A	356	CYS	CB-SG	-6.30	1.71	1.82
1	A	134	CYS	CB-SG	5.64	1.91	1.82
1	A	190	HIS	N-CA	5.32	1.56	1.46

The worst 5 of 160 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	339	ASP	C-N-CD	-14.47	88.76	120.60
1	A	314	GLY	N-CA-C	-12.66	81.45	113.10
1	A	68	CYS	CA-CB-SG	-12.09	92.23	114.00
1	A	473	VAL	N-CA-C	-11.68	79.47	111.00
1	A	517	THR	C-N-CD	-11.25	95.86	120.60



All (2) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
2	A	2030	NAG	C1
3	A	3030	NAG	C1

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	167	TYR	Sidechain
1	A	468	TYR	Sidechain

## 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	4702	0	4113	1510	4
2	A	61	0	50	25	0
3	A	50	0	43	31	0
4	A	8	0	0	0	0
5	A	135	0	0	19	12
All	All	4956	0	4206	1527	16

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 167.

The worst 5 of 1527 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:A:586:HIS:CB	1:A:602:ILE:HG21	1.37	1.55
1:A:251:ASN:CA	3:A:3030:NAG:H82	1.11	1.54
1:A:586:HIS:HB2	1:A:602:ILE:CG2	1.39	1.51
1:A:251:ASN:HB3	3:A:3030:NAG:C8	1.41	1.48
1:A:251:ASN:HB3	3:A:3030:NAG:C7	1.43	1.47

The worst 5 of 16 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)
5:A:6003:KEG:P1	5:A:6003:KEG:O17[4_556]	1.52	0.68
5:A:6003:KEG:P1	5:A:6003:KEG:O18[4_556]	1.52	0.68
5:A:6003:KEG:W1	5:A:6003:KEG:O1[4_556]	1.62	0.58
5:A:6003:KEG:W2	5:A:6003:KEG:O2[4_556]	1.63	0.57
5:A:6003:KEG:O18	5:A:6003:KEG:O18[4_556]	1.70	0.50

## 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	625/699 (89%)	334 (53%)	156 (25%)	135 (22%)	<b>0</b> <b>1</b>

5 of 135 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	46	THR
1	A	47	CYS
1	A	49	SER
1	A	63	PRO
1	A	64	GLN

### 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	508/614 (83%)	370 (73%)	138 (27%)	<b>0</b> <b>4</b>

5 of 138 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	316	GLU
1	A	367	HIS
1	A	658	TYR
1	A	324	GLN
1	A	342	THR

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 14 such sidechains are listed below:

Mol	Chain	Res	Type
1	A	309	ASN
1	A	345	GLN
1	A	507	HIS
1	A	301	ASN
1	A	466	ASN

### 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 ⓘ

9 carbohydrates 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	$\# Z  > 2$
2	NAG	A	2030	1,2	14,14,15	0.76	0	15,19,21	0.61	0
2	NAG	A	2031	2	14,14,15	0.84	1 (7%)	15,19,21	0.64	0
2	BMA	A	2032	2	11,11,12	0.76	0	14,15,17	0.40	0
2	MAN	A	2033	2	11,11,12	0.95	1 (9%)	14,15,17	0.77	1 (7%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
2	MAN	A	2035	2	11,11,12	13.83	1 (9%)	14,15,17	5.30	2 (14%)
3	NAG	A	3030	1,3	14,14,15	0.76	0	15,19,21	0.61	0
3	NAG	A	3031	3	14,14,15	0.83	1 (7%)	15,19,21	0.62	0
3	BMA	A	3032	3	11,11,12	0.77	0	14,15,17	0.40	0
3	MAN	A	3033	3	11,11,12	0.93	1 (9%)	14,15,17	0.77	1 (7%)

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
2	NAG	A	2030	1,2	1/1/5/7	0/6/23/26	0/1/1/1
2	NAG	A	2031	2	-	0/6/23/26	0/1/1/1
2	BMA	A	2032	2	-	0/2/19/22	0/1/1/1
2	MAN	A	2033	2	-	0/2/19/22	0/1/1/1
2	MAN	A	2035	2	-	0/2/19/22	0/1/1/1
3	NAG	A	3030	1,3	1/1/5/7	0/6/23/26	0/1/1/1
3	NAG	A	3031	3	-	0/6/23/26	0/1/1/1
3	BMA	A	3032	3	-	0/2/19/22	0/1/1/1
3	MAN	A	3033	3	-	0/2/19/22	0/1/1/1

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	3031	NAG	C1-C2	2.15	1.55	1.52
2	A	2031	NAG	C1-C2	2.18	1.55	1.52
3	A	3033	MAN	C2-C3	2.53	1.56	1.52
2	A	2033	MAN	C2-C3	2.57	1.56	1.52
2	A	2035	MAN	O6-C6	45.84	3.40	1.42

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	2033	MAN	C1-C2-C3	2.09	112.01	109.54
3	A	3033	MAN	C1-C2-C3	2.10	112.03	109.54
2	A	2035	MAN	C1-O5-C5	2.25	115.11	112.25
2	A	2035	MAN	O6-C6-C5	19.59	176.06	111.33

All (2) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
3	A	3030	NAG	C1
2	A	2030	NAG	C1

There are no torsion outliers.

There are no ring outliers.

2 monomers are involved in 56 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	2030	NAG	25	0
3	A	3030	NAG	31	0

## 5.6 Ligand geometry [i](#)

Of 11 ligands modelled in this entry, 8 are monoatomic - leaving 3 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	KEG	A	6001	-	76,76,76	3.19	43 (56%)	6,234,234	2.18	2 (33%)
5	KEG	A	6002	-	76,76,76	2.63	34 (44%)	6,234,234	4.36	3 (50%)
5	KEG	A	6003	-	13,37,76	1.97	5 (38%)	0,95,234	0.00	-

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	KEG	A	6001	-	-	0/0/456/456	0/0/24/24
5	KEG	A	6002	-	-	0/0/456/456	0/0/24/24
5	KEG	A	6003	-	-	0/0/162/456	0/0/8/24

The worst 5 of 82 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	A	6001	KEG	W2-O28	-8.11	1.55	1.93
5	A	6001	KEG	P1-O18	-7.87	1.27	1.54
5	A	6001	KEG	W6-O36	-7.58	1.58	1.93
5	A	6001	KEG	W1-O29	-7.04	1.60	1.91
5	A	6001	KEG	W3-O33	-6.91	1.61	1.91

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	A	6002	KEG	O18-P1-O17	-7.71	99.61	108.94
5	A	6001	KEG	O19-P1-O18	-3.48	104.72	108.94
5	A	6001	KEG	O21-P1-O18	3.29	112.92	108.94
5	A	6002	KEG	O19-P1-O17	3.68	113.38	108.94
5	A	6002	KEG	O19-P1-O18	6.15	116.37	108.94

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

3 monomers are involved in 31 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	A	6001	KEG	6	0
5	A	6002	KEG	7	0
5	A	6003	KEG	6	12

## 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 ⓘ

### 6.1 Protein, DNA and RNA chains ⓘ

EDS was not executed - this section will therefore be empty.

### 6.2 Non-standard residues in protein, DNA, RNA chains ⓘ

EDS was not executed - this section will therefore be empty.

### 6.3 Carbohydrates ⓘ

EDS was not executed - this section will therefore be empty.

### 6.4 Ligands ⓘ

EDS was not executed - this section will therefore be empty.

### 6.5 Other polymers ⓘ

EDS was not executed - this section will therefore be empty.