



# wwPDB X-ray Structure Validation Summary Report ⓘ

Jun 16, 2024 – 02:26 AM EDT

PDB ID : 1SMR  
Title : The 3-d structure of mouse submaxillary renin complexed with a decapeptide inhibitor ch-66 based on the 4-16 fragment of rat angiotensinogen  
Authors : Dealwis, C.G.; Blundell, T.L.  
Deposited on : 1992-03-11  
Resolution : 2.00 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

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

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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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	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.37.1

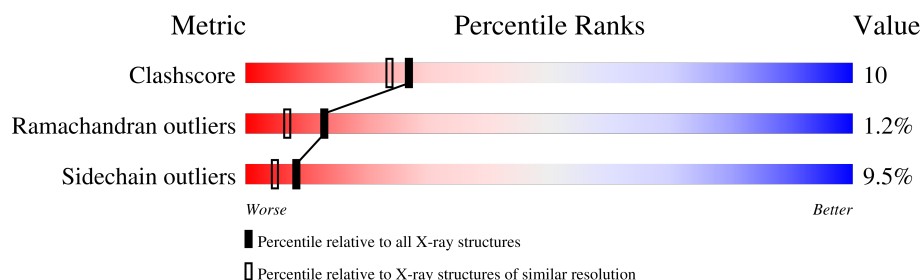
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.00 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	141614	9178 (2.00-2.00)
Ramachandran outliers	138981	9054 (2.00-2.00)
Sidechain outliers	138945	9053 (2.00-2.00)

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  $\leq 5\%$ .

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	335	52% 36% 7% ..
1	C	335	52% 36% 8% ..
1	E	335	52% 36% 8% ..
1	G	335	51% 37% 7% ..
2	B	9	44% 33% 11% 11%
2	D	9	44% 33% 11% 11%
2	F	9	44% 33% 11% 11%
2	H	9	44% 33% 11% 11%

## 2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 10560 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 RENIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	331	Total	C	N	O	S	0	0	0
			2511	1609	409	481	12			
1	C	331	Total	C	N	O	S	0	0	0
			2511	1609	409	481	12			
1	E	331	Total	C	N	O	S	0	0	0
			2511	1609	409	481	12			
1	G	331	Total	C	N	O	S	0	0	0
			2511	1609	409	481	12			

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	106	GLN	GLU	CONFLICT	UNP P00796
A	173	GLN	GLU	CONFLICT	UNP P00796
C	106	GLN	GLU	CONFLICT	UNP P00796
C	173	GLN	GLU	CONFLICT	UNP P00796
E	106	GLN	GLU	CONFLICT	UNP P00796
E	173	GLN	GLU	CONFLICT	UNP P00796
G	106	GLN	GLU	CONFLICT	UNP P00796
G	173	GLN	GLU	CONFLICT	UNP P00796

- Molecule 2 is a protein called INHIBITOR CH-66.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	B	9	Total	C	N	O	0	0	0
			90	65	12	13			
2	D	9	Total	C	N	O	0	0	0
			90	65	12	13			
2	F	9	Total	C	N	O	0	0	0
			90	65	12	13			
2	H	9	Total	C	N	O	0	0	0
			90	65	12	13			

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	148	Total 148	O 148	0	0
3	B	5	Total 5	O 5	0	0
3	C	3	Total 3	O 3	0	0

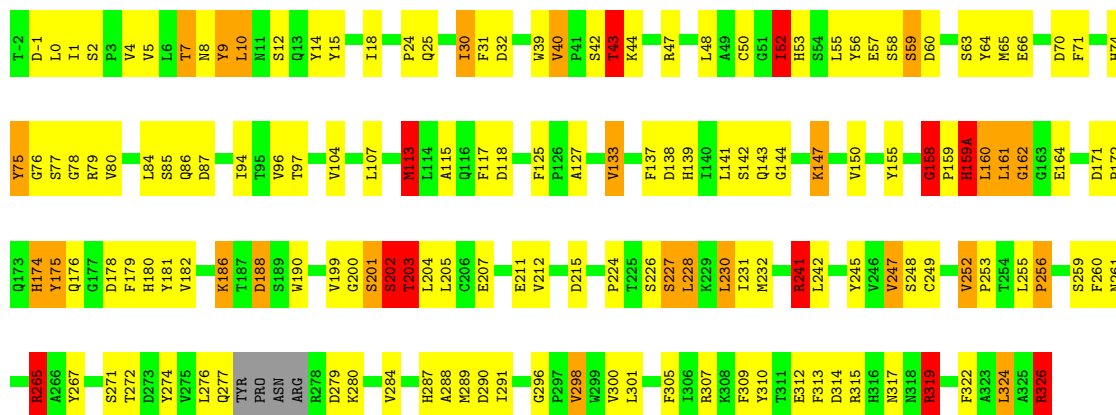
### 3 Residue-property plots

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.

Note EDS was not executed.

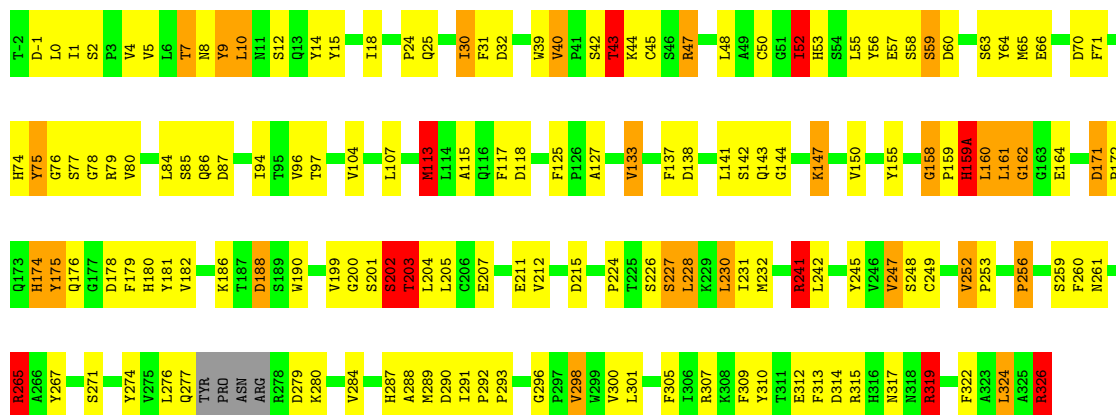
#### • Molecule 1: RENIN

Chain A: 



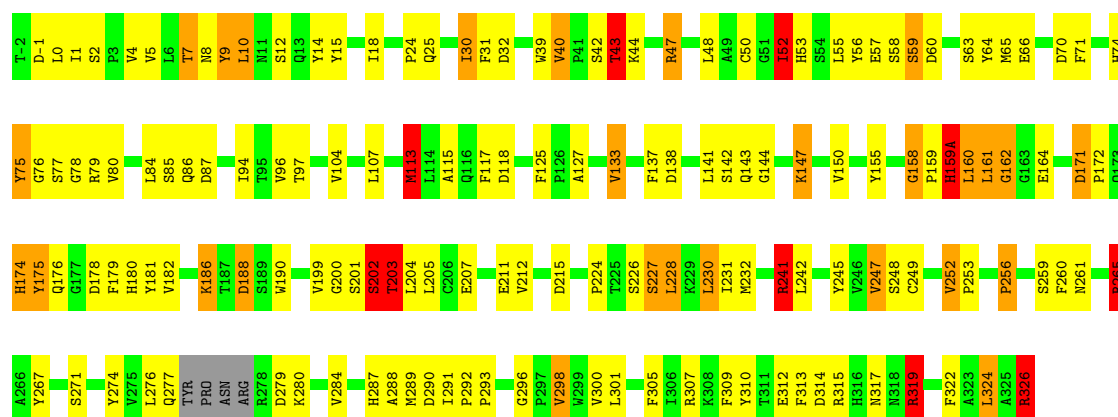
#### • Molecule 1: RENIN

Chain C: 



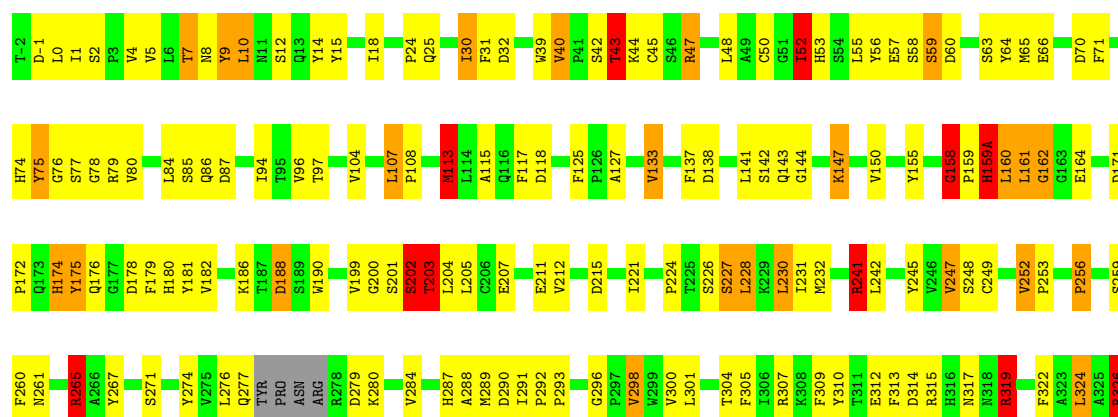
#### • Molecule 1: RENIN

Chain E: 



• Molecule 1: RENIN

Chain G: 51% 37% 7% ..



• Molecule 2: INHIBITOR CH-66

Chain B: 44% 33% 11% 11%



• Molecule 2: INHIBITOR CH-66

Chain D: 44% 33% 11% 11%



• Molecule 2: INHIBITOR CH-66

Chain F: 44% 33% 11% 11%



• Molecule 2: INHIBITOR CH-66

Chain H: 44% 33% 11% 11%

X1	H2	F3	F4	H5	X6	Y7	Y8	S9
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## 4 Data and refinement statistics

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

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	78.34Å 117.76Å 85.88Å 90.00° 101.18° 90.00°	Depositor
Resolution (Å)	(Not available) – 2.00	Depositor
% Data completeness (in resolution range)	(Not available) ((Not available)-2.00)	Depositor
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
Refinement program	RESTRAIN	Depositor
R, $R_{free}$	0.180 , (Not available)	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	10560	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	0.0	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: LPL, PIV

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	1.49	18/2572 (0.7%)	2.47	178/3500 (5.1%)
1	C	1.49	18/2572 (0.7%)	2.47	179/3500 (5.1%)
1	E	1.49	18/2572 (0.7%)	2.47	178/3500 (5.1%)
1	G	1.49	18/2572 (0.7%)	2.47	179/3500 (5.1%)
2	B	1.45	0/72	2.62	6/96 (6.2%)
2	D	1.45	0/72	2.62	6/96 (6.2%)
2	F	1.45	0/72	2.62	6/96 (6.2%)
2	H	1.45	0/72	2.62	6/96 (6.2%)
All	All	1.49	72/10576 (0.7%)	2.47	738/14384 (5.1%)

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	3
1	C	0	3
1	E	0	3
1	G	0	3
2	B	0	2
2	D	0	2
2	F	0	2
2	H	0	2
All	All	0	20

The worst 5 of 72 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	E	42	SER	CB-OG	-19.90	1.16	1.42
1	G	42	SER	CB-OG	-19.87	1.16	1.42

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	42	SER	CB-OG	-19.85	1.16	1.42
1	C	42	SER	CB-OG	-19.83	1.16	1.42
1	G	43	THR	CB-OG1	-9.08	1.25	1.43

The worst 5 of 738 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	E	160	LEU	O-C-N	15.66	147.76	122.70
1	A	160	LEU	O-C-N	15.65	147.74	122.70
1	C	160	LEU	O-C-N	15.65	147.74	122.70
1	G	160	LEU	O-C-N	15.65	147.74	122.70
1	G	307	ARG	NE-CZ-NH1	-14.70	112.95	120.30

There are no chirality outliers.

5 of 20 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	241	ARG	Sidechain
1	A	265	ARG	Sidechain
1	A	319	ARG	Sidechain
2	B	6	LPL	Mainchain,Peptide
1	C	241	ARG	Sidechain

## 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	2511	0	2442	53	16
1	C	2511	0	2442	51	19
1	E	2511	0	2442	53	17
1	G	2511	0	2442	53	19
2	B	90	0	86	2	0
2	D	90	0	86	2	0
2	F	90	0	86	2	0
2	H	90	0	86	2	0
3	A	148	0	0	3	1
3	B	5	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	C	3	0	0	1	0
All	All	10560	0	10112	210	36

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 10.

The worst 5 of 210 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:C:199:VAL:HB	1:C:203:THR:HG23	1.44	1.00
1:E:199:VAL:HB	1:E:203:THR:HG23	1.44	1.00
1:G:199:VAL:HB	1:G:203:THR:HG23	1.44	0.99
1:A:199:VAL:HB	1:A:203:THR:HG23	1.44	0.97
1:A:199:VAL:HB	1:A:203:THR:CG2	2.00	0.92

The worst 5 of 36 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)
1:C:113:MET:CE	1:E:113:MET:CE[1_444]	0.33	1.87
1:E:326:ARG:NE	1:G:326:ARG:NH1[1_565]	0.52	1.68
1:A:326:ARG:NE	1:C:326:ARG:NH1[1_565]	0.63	1.57
1:A:326:ARG:CZ	1:C:326:ARG:CZ[1_565]	0.67	1.53
1:A:113:MET:CE	1:G:113:MET:CE[1_464]	0.69	1.51

## 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	327/335 (98%)	315 (96%)	8 (2%)	4 (1%)	13 7
1	C	327/335 (98%)	315 (96%)	8 (2%)	4 (1%)	13 7

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	E	327/335 (98%)	315 (96%)	8 (2%)	4 (1%)	13	7
1	G	327/335 (98%)	315 (96%)	8 (2%)	4 (1%)	13	7
2	B	6/9 (67%)	6 (100%)	0	0	100	100
2	D	6/9 (67%)	6 (100%)	0	0	100	100
2	F	6/9 (67%)	6 (100%)	0	0	100	100
2	H	6/9 (67%)	6 (100%)	0	0	100	100
All	All	1332/1376 (97%)	1284 (96%)	32 (2%)	16 (1%)	13	7

5 of 16 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	159(A)	HIS
1	A	203	THR
1	A	280	LYS
1	C	159(A)	HIS
1	C	203	THR

### 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 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	277/287 (96%)	250 (90%)	27 (10%)	8	4
1	C	277/287 (96%)	250 (90%)	27 (10%)	8	4
1	E	277/287 (96%)	250 (90%)	27 (10%)	8	4
1	G	277/287 (96%)	250 (90%)	27 (10%)	8	4
2	B	7/7 (100%)	7 (100%)	0	100	100
2	D	7/7 (100%)	7 (100%)	0	100	100
2	F	7/7 (100%)	7 (100%)	0	100	100
2	H	7/7 (100%)	7 (100%)	0	100	100
All	All	1136/1176 (97%)	1028 (90%)	108 (10%)	8	5

5 of 108 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	E	43	THR
1	E	226	SER
1	G	228	LEU
1	E	59	SER
1	E	176	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 16 such sidechains are listed below:

Mol	Chain	Res	Type
1	G	174	HIS
1	G	86	GLN
1	E	53	HIS
1	G	53	HIS
1	C	233	GLN

### 5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

8 non-standard protein/DNA/RNA residues 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	PIV	F	1	2	5,5,6	1.36	0	7,7,9	1.94	1 (14%)
2	LPL	D	6	2	15,15,16	1.63	2 (13%)	13,19,21	1.16	1 (7%)
2	LPL	H	6	2	15,15,16	1.62	2 (13%)	13,19,21	1.17	1 (7%)
2	PIV	B	1	2	5,5,6	1.36	0	7,7,9	1.93	1 (14%)
2	LPL	F	6	2	15,15,16	1.66	2 (13%)	13,19,21	1.17	1 (7%)
2	LPL	B	6	2	15,15,16	1.64	2 (13%)	13,19,21	1.17	1 (7%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
2	PIV	D	1	2	5,5,6	1.38	0	7,7,9	1.94	1 (14%)
2	PIV	H	1	2	5,5,6	1.37	0	7,7,9	1.93	1 (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
2	PIV	F	1	2	-	3/3/3/6	-
2	LPL	D	6	2	-	3/18/18/20	-
2	LPL	H	6	2	-	3/18/18/20	-
2	PIV	B	1	2	-	3/3/3/6	-
2	LPL	F	6	2	-	3/18/18/20	-
2	LPL	B	6	2	-	3/18/18/20	-
2	PIV	D	1	2	-	3/3/3/6	-
2	PIV	H	1	2	-	3/3/3/6	-

The worst 5 of 8 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	F	6	LPL	CM-CA1	-4.39	1.50	1.54
2	B	6	LPL	CM-CA1	-4.30	1.50	1.54
2	H	6	LPL	CM-CA1	-4.27	1.50	1.54
2	D	6	LPL	CM-CA1	-4.24	1.50	1.54
2	F	6	LPL	CH-CA	-3.48	1.49	1.53

The worst 5 of 8 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	F	1	PIV	O1-C-CT	-4.74	112.55	124.31
2	H	1	PIV	O1-C-CT	-4.72	112.59	124.31
2	B	1	PIV	O1-C-CT	-4.72	112.59	124.31
2	D	1	PIV	O1-C-CT	-4.72	112.60	124.31
2	H	6	LPL	CB1-CA1-C	-2.19	105.69	110.22

There are no chirality outliers.

5 of 24 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	B	1	PIV	O1-C-CT-C1
2	B	1	PIV	O1-C-CT-C2
2	B	1	PIV	O1-C-CT-C3
2	D	1	PIV	O1-C-CT-C1
2	D	1	PIV	O1-C-CT-C2

There are no ring outliers.

8 monomers are involved in 8 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	F	1	PIV	1	0
2	D	6	LPL	1	0
2	H	6	LPL	1	0
2	B	1	PIV	1	0
2	F	6	LPL	1	0
2	B	6	LPL	1	0
2	D	1	PIV	1	0
2	H	1	PIV	1	0

## 5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

There are no ligands in this entry.

## 5.7 Other polymers [i](#)

There are no such residues in this entry.

## 5.8 Polymer linkage issues [i](#)

The following chains have linkage breaks:

Mol	Chain	Number of breaks
1	A	1
1	C	1
1	E	1
1	G	1

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	A	278:ARG	C	279:ASP	N	9.17
1	C	278:ARG	C	279:ASP	N	9.17
1	E	278:ARG	C	279:ASP	N	9.17
1	G	278:ARG	C	279:ASP	N	9.17



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

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

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

### 6.3 Carbohydrates [i](#)

EDS was not executed - this section is therefore empty.

### 6.4 Ligands [i](#)

EDS was not executed - this section is therefore empty.

### 6.5 Other polymers [i](#)

EDS was not executed - this section is therefore empty.