



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 8, 2026 – 01:48 PM UTC

PDB ID : 1RO5 / pdb_00001ro5
Title : Crystal Structure of the AHL Synthase LasI
Authors : Gould, T.A.; Schweizer, H.P.; Churchill, M.E.
Deposited on : 2003-12-01
Resolution : 2.30 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

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>.

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

MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

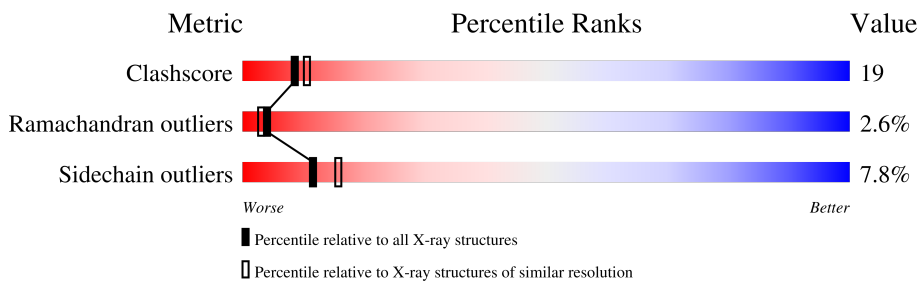
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.30 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	190562	6919 (2.30-2.30)
Ramachandran outliers	187476	6854 (2.30-2.30)
Sidechain outliers	187428	6854 (2.30-2.30)

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 ≥ 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	201	

2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 1649 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.

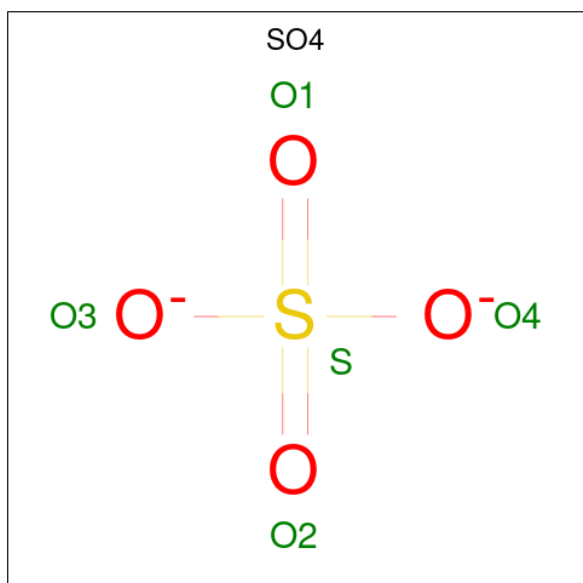
- Molecule 1 is a protein called Autoinducer synthesis protein lasI.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	197	1578	1008	274	285	11	0	2	0

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	397	GLY	-	cloning artifact	UNP P33883
A	398	SER	-	cloning artifact	UNP P33883
A	399	HIS	-	cloning artifact	UNP P33883
A	?	-	THR	deletion	UNP P33883
A	?	-	PRO	deletion	UNP P33883
A	?	-	GLU	deletion	UNP P33883
A	?	-	ALA	deletion	UNP P33883
A	60G	GLY	-	insertion	UNP P33883

- Molecule 2 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	1	Total O S 5 4 1	0	0
2	A	1	Total S 1 1	0	0
2	A	1	Total S 1 1	0	0
2	A	1	Total O S 5 4 1	0	0

- Molecule 3 is ZINC ION (CCD ID: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total Zn 1 1	0	0

- Molecule 4 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	58	Total O 58 58	0	0

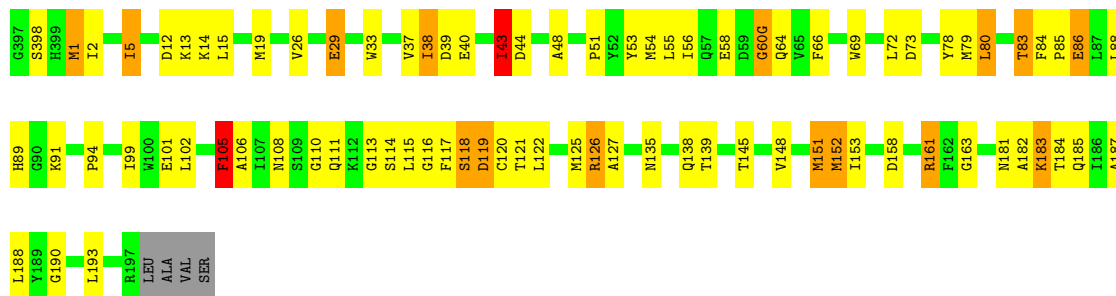
3 Residue-property plots [i](#)

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. 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: Autoinducer synthesis protein lasI

Chain A:  57% 33% 7% ..



4 Data and refinement statistics

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

Property	Value	Source
Space group	F 2 3	Depositor
Cell constants a, b, c, α , β , γ	154.90 Å 154.90 Å 154.90 Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	35.58 – 2.30	Depositor
% Data completeness (in resolution range)	99.2 (35.58-2.30)	Depositor
R_{merge}	0.10	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	REFMAC 5.1.24	Depositor
R, R_{free}	0.193 , 0.236	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	1649	wwPDB-VP
Average B, all atoms (Å ²)	47.0	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: ZN, SO4

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	2.01	29/1618 (1.8%)	1.55	13/2180 (0.6%)

All (29) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	60(G)	GLY	C-N	26.66	1.71	1.33
1	A	183	LYS	C-O	9.80	1.35	1.24
1	A	182	ALA	CA-CB	8.91	1.67	1.53
1	A	151	MET	SD-CE	8.77	2.01	1.79
1	A	1	MET	SD-CE	8.23	2.00	1.79
1	A	2	ILE	CA-CB	-7.70	1.45	1.54
1	A	152	MET	SD-CE	-7.62	1.60	1.79
1	A	56	ILE	CA-CB	-7.17	1.45	1.54
1	A	72	LEU	C-O	7.06	1.32	1.23
1	A	5	ILE	CA-CB	-6.69	1.45	1.54
1	A	108	ASN	C-O	6.57	1.31	1.24
1	A	79	MET	SD-CE	6.56	1.96	1.79
1	A	51	PRO	C-O	6.46	1.32	1.23
1	A	106	ALA	CA-CB	6.17	1.63	1.53
1	A	83	THR	CA-CB	5.96	1.64	1.54
1	A	33	TRP	C-O	5.94	1.31	1.24
1	A	105[A]	PHE	CA-C	-5.89	1.45	1.52
1	A	105[B]	PHE	CA-C	-5.89	1.45	1.52
1	A	182	ALA	C-O	5.75	1.30	1.24
1	A	116	GLY	C-O	5.72	1.28	1.24
1	A	126	ARG	CA-C	-5.68	1.45	1.52
1	A	105[A]	PHE	C-O	-5.28	1.17	1.24
1	A	105[B]	PHE	C-O	-5.28	1.17	1.24
1	A	145	THR	C-O	5.25	1.30	1.23
1	A	183	LYS	CA-C	5.24	1.59	1.52
1	A	135	ASN	C-O	-5.20	1.17	1.23

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	187	ALA	CA-C	-5.20	1.46	1.52
1	A	184	THR	CA-C	-5.16	1.46	1.52
1	A	73	ASP	CA-C	-5.09	1.46	1.52

All (13) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	116	GLY	N-CA-C	-8.59	102.88	111.56
1	A	188	LEU	N-CA-C	8.08	120.17	111.36
1	A	190	GLY	N-CA-C	-7.60	105.64	114.69
1	A	111	GLN	N-CA-C	6.86	119.60	111.71
1	A	118	SER	N-CA-C	-6.63	103.15	111.11
1	A	119	ASP	N-CA-C	5.95	117.84	111.36
1	A	26	VAL	N-CA-C	5.66	116.31	110.82
1	A	38	ILE	N-CA-C	-5.47	99.67	107.77
1	A	43	ILE	CB-CA-C	-5.45	101.21	111.30
1	A	48	ALA	N-CA-C	-5.38	106.30	112.92
1	A	43	ILE	CA-C-O	-5.09	115.45	120.90
1	A	80	LEU	N-CA-C	-5.07	105.84	111.36
1	A	60(G)	GLY	CA-C-O	5.06	124.73	119.06

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	1578	0	1585	60	0
2	A	12	0	0	0	0
3	A	1	0	0	0	0
4	A	58	0	0	3	0
All	All	1649	0	1585	60	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 19.

All (60) 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:60(G):GLY:C	1:A:64:GLN:N	1.71	1.49
1:A:151:MET:CE	1:A:151:MET:SD	2.01	1.48
1:A:19:MET:CE	1:A:55:LEU:HD21	1.78	1.12
1:A:19:MET:HE3	1:A:55:LEU:HD21	1.12	1.08
1:A:148:VAL:HG12	1:A:152:MET:HE2	1.55	0.87
1:A:19:MET:HE1	1:A:53:TYR:CG	2.12	0.84
1:A:19:MET:HE1	1:A:53:TYR:CB	2.06	0.84
1:A:5:ILE:HD11	1:A:54:MET:CE	2.12	0.79
1:A:115:LEU:HD23	1:A:120:CYS:HA	1.69	0.75
1:A:19:MET:CE	1:A:55:LEU:CD2	2.63	0.74
1:A:121:THR:HG21	1:A:151:MET:HE1	1.69	0.73
1:A:19:MET:HE1	1:A:53:TYR:HB3	1.69	0.73
1:A:19:MET:CE	1:A:53:TYR:HB3	2.23	0.69
1:A:148:VAL:CG1	1:A:152:MET:HE2	2.22	0.69
1:A:158:ASP:HB2	1:A:183:LYS:HD3	1.76	0.68
1:A:5:ILE:HD11	1:A:54:MET:HE3	1.75	0.66
1:A:5:ILE:CD1	1:A:54:MET:HE3	2.26	0.65
1:A:121:THR:HG21	1:A:151:MET:CE	2.26	0.65
1:A:60(G):GLY:C	1:A:64:GLN:CA	2.70	0.63
1:A:69[B]:TRP:CH2	1:A:125:MET:HE2	2.35	0.62
1:A:19:MET:HE2	1:A:55:LEU:HD21	1.80	0.61
1:A:89:HIS:CD2	1:A:163:GLY:HA3	2.35	0.61
1:A:69[B]:TRP:HH2	1:A:125:MET:HE2	1.67	0.59
1:A:115:LEU:CD2	1:A:120:CYS:HA	2.34	0.56
1:A:161:ARG:HG3	1:A:163:GLY:O	2.05	0.56
1:A:19:MET:HE2	1:A:55:LEU:CD2	2.35	0.55
1:A:69[A]:TRP:HE3	4:A:534:HOH:O	1.91	0.54
1:A:148:VAL:HG12	1:A:152:MET:CE	2.33	0.54
1:A:69[A]:TRP:CZ2	1:A:105[A]:PHE:HB3	2.43	0.53
1:A:119:ASP:O	1:A:120:CYS:C	2.53	0.52
1:A:37:VAL:C	1:A:38:ILE:HD12	2.35	0.51
1:A:44:ASP:HB3	4:A:551:HOH:O	2.10	0.51
1:A:105[B]:PHE:CZ	1:A:121:THR:HG23	2.47	0.50
1:A:64:GLN:HB2	1:A:66:PHE:CE1	2.47	0.50
1:A:69[A]:TRP:NE1	1:A:105[A]:PHE:CD1	2.80	0.49
1:A:5:ILE:HD11	1:A:54:MET:HE2	1.94	0.49
1:A:58:GLU:O	1:A:66:PHE:HE1	1.95	0.49
1:A:88:LEU:O	1:A:91:LYS:HG3	2.13	0.48
1:A:39:ASP:O	1:A:40:GLU:HB2	2.13	0.48
1:A:122:LEU:HD11	1:A:126:ARG:HH21	1.79	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:1:MET:HE3	1:A:1:MET:HB3	1.76	0.47
1:A:60(G):GLY:CA	1:A:64:GLN:N	2.69	0.47
1:A:99:ILE:HG12	1:A:139:THR:HB	1.97	0.47
1:A:83:THR:C	1:A:85:PRO:HD3	2.40	0.47
1:A:117:PHE:C	1:A:117:PHE:CD2	2.93	0.47
1:A:101:GLU:HG2	1:A:102:LEU:N	2.30	0.47
1:A:85:PRO:HD2	1:A:86:GLU:OE1	2.15	0.46
1:A:181:ASN:O	1:A:185:GLN:HG3	2.18	0.44
1:A:43:ILE:HD13	1:A:43:ILE:HG21	1.62	0.44
1:A:115:LEU:HD23	1:A:120:CYS:CA	2.41	0.44
1:A:69[A]:TRP:CE3	4:A:534:HOH:O	2.57	0.42
1:A:84:PHE:N	1:A:85:PRO:HD3	2.34	0.42
1:A:54:MET:HE1	1:A:127:ALA:HB3	2.01	0.42
1:A:122:LEU:O	1:A:126:ARG:HG3	2.20	0.42
1:A:119:ASP:O	1:A:122:LEU:HB3	2.20	0.41
1:A:85:PRO:O	1:A:88:LEU:HB2	2.21	0.41
1:A:78:TYR:OH	1:A:94:PRO:HD2	2.20	0.40
1:A:15:LEU:HD23	1:A:15:LEU:HA	1.60	0.40
1:A:105[B]:PHE:HZ	1:A:121:THR:HG23	1.86	0.40

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 Protein backbone

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all 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	197/201 (98%)	187 (95%)	5 (2%)	5 (2%)	4 3

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	398	SER
1	A	29	GLU

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Mol	Chain	Res	Type
1	A	13	LYS
1	A	110	GLY
1	A	113	GLY

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	169/170 (99%)	155 (92%)	14 (8%)	10	14

All (14) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	12	ASP
1	A	14	LYS
1	A	29	GLU
1	A	43	ILE
1	A	80	LEU
1	A	86	GLU
1	A	105[A]	PHE
1	A	105[B]	PHE
1	A	114	SER
1	A	118	SER
1	A	138	GLN
1	A	153	ILE
1	A	161	ARG
1	A	193	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	82	ASN
1	A	134	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 5 ligands modelled in this entry, 2 are modelled with single atom and 1 is monoatomic - leaving 2 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	$\# Z > 2$
2	SO4	A	404	-	4,4,4	0.16	0	6,6,6	0.49	0
2	SO4	A	401	-	4,4,4	0.48	0	6,6,6	1.01	0

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues

The following chains have linkage breaks:

Mol	Chain	Number of breaks
1	A	1

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	A	60(G):GLY	C	64:GLN	N	1.71

6 Fit of model and data

6.1 Protein, DNA and RNA chains

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates

EDS was not executed - this section is therefore empty.

6.4 Ligands

EDS was not executed - this section is therefore empty.

6.5 Other polymers

EDS was not executed - this section is therefore empty.