wwPDB X-ray Structure Validation Summary Report (i)

Feb 1, 2016 – 10:19 AM GMT

PDB ID	:	3LML
Title	:	Crystal Structure of the sheath tail protein Lin1278 from Listeria innocua, Northeast Structural Genomics Consortium Target LkR115
Authors	:	Forouhar, F.; Neely, H.; Seetharaman, J.; Mao, M.; Xiao, R.; Patel, D.J.; Ciccosanti, C.; Wang, H.; Everett, J.K.; Nair, R.; Acton, T.B.; Rost, B.; Montelione, G.T.; Hunt, J.F.; Tong, L.; Northeast Structural Genomics Consortium (NESG)
Deposited on	:	2010-01-31
Resolution	:	3.30 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
A user guide is available at
http://wwpdb.org/validation/2016/XrayValidationReportHelp
with specific help available everywhere you see the (i) symbol.

The following versions of software and data (see references (1)) were used in the production of this report:

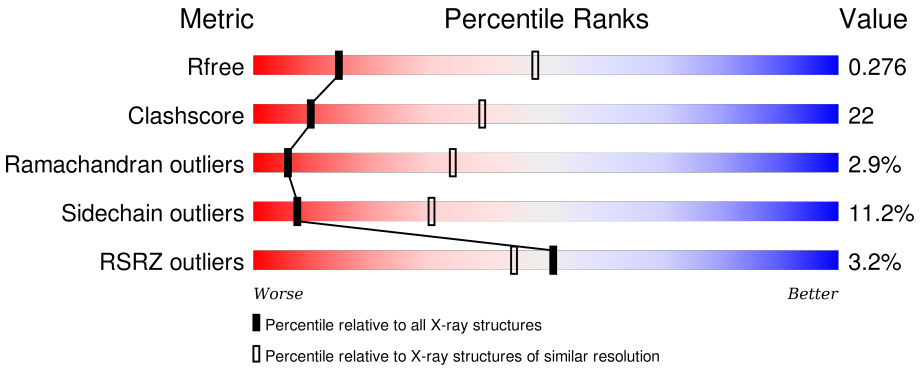
MolProbity	:	4.02b-467
Mogul	:	1.7 (RC4), CSD as536be (2015)
Xtriage (Phenix)	:	1.9-1692
EDS	:	rb-20026688
Percentile statistics	:	20151230.v01 (using entries in the PDB archive December 30th 2015)
Refmac	:	5.8.0135
CCP4	:	6.5.0
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	trunk26865

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 3.30 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))
R_{free}	91344	2060 (3.40-3.20)
Clashscore	102246	1058 (3.38-3.22)
Ramachandran outliers	100387	1038 (3.38-3.22)
Sidechain outliers	100360	1037 (3.38-3.22)
RSRZ outliers	91569	2070 (3.40-3.20)

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 >=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 <=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	460	2% 55% 35% 6% •
1	B	460	3% 53% 35% 7% 5%
1	C	460	3% 53% 35% 7% 5%
1	D	460	5% 53% 36% 6% 6%
1	E	460	5% 52% 34% 8% 6%

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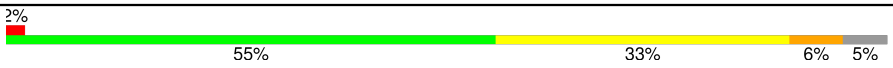
Mol	Chain	Length	Quality of chain
1	F	460	

2 Entry composition

There is only 1 type of molecule in this entry. The entry contains 20036 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 Lin1278 protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	440	Total	C	N	O	Se	0	0	0
			3376	2117	565	690	4			
1	B	435	Total	C	N	O	Se	0	0	0
			3338	2093	558	683	4			
1	C	438	Total	C	N	O	Se	0	0	0
			3359	2106	561	688	4			
1	D	434	Total	C	N	O	Se	0	0	0
			3326	2084	557	681	4			
1	E	431	Total	C	N	O	Se	0	0	0
			3302	2068	553	677	4			
1	F	435	Total	C	N	O	Se	0	0	0
			3335	2089	558	684	4			

There are 48 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	453	LEU	-	EXPRESSION TAG	UNP Q92CB1
A	454	GLU	-	EXPRESSION TAG	UNP Q92CB1
A	455	HIS	-	EXPRESSION TAG	UNP Q92CB1
A	456	HIS	-	EXPRESSION TAG	UNP Q92CB1
A	457	HIS	-	EXPRESSION TAG	UNP Q92CB1
A	458	HIS	-	EXPRESSION TAG	UNP Q92CB1
A	459	HIS	-	EXPRESSION TAG	UNP Q92CB1
A	460	HIS	-	EXPRESSION TAG	UNP Q92CB1
B	453	LEU	-	EXPRESSION TAG	UNP Q92CB1
B	454	GLU	-	EXPRESSION TAG	UNP Q92CB1
B	455	HIS	-	EXPRESSION TAG	UNP Q92CB1
B	456	HIS	-	EXPRESSION TAG	UNP Q92CB1
B	457	HIS	-	EXPRESSION TAG	UNP Q92CB1
B	458	HIS	-	EXPRESSION TAG	UNP Q92CB1
B	459	HIS	-	EXPRESSION TAG	UNP Q92CB1
B	460	HIS	-	EXPRESSION TAG	UNP Q92CB1
C	453	LEU	-	EXPRESSION TAG	UNP Q92CB1

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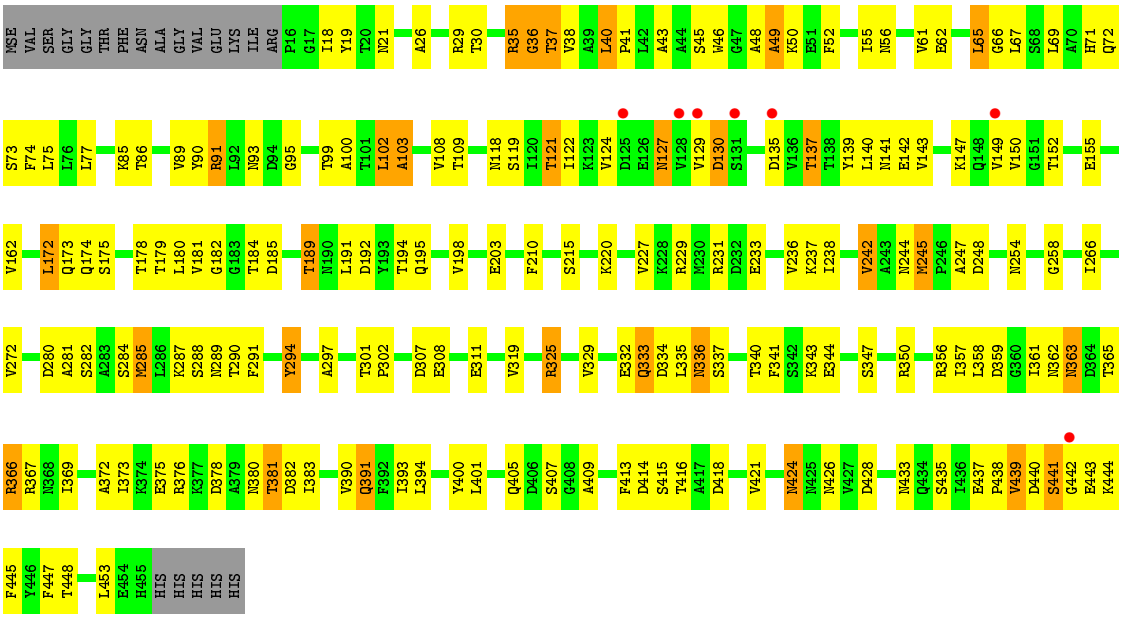
Chain	Residue	Modelled	Actual	Comment	Reference
C	454	GLU	-	EXPRESSION TAG	UNP Q92CB1
C	455	HIS	-	EXPRESSION TAG	UNP Q92CB1
C	456	HIS	-	EXPRESSION TAG	UNP Q92CB1
C	457	HIS	-	EXPRESSION TAG	UNP Q92CB1
C	458	HIS	-	EXPRESSION TAG	UNP Q92CB1
C	459	HIS	-	EXPRESSION TAG	UNP Q92CB1
C	460	HIS	-	EXPRESSION TAG	UNP Q92CB1
D	453	LEU	-	EXPRESSION TAG	UNP Q92CB1
D	454	GLU	-	EXPRESSION TAG	UNP Q92CB1
D	455	HIS	-	EXPRESSION TAG	UNP Q92CB1
D	456	HIS	-	EXPRESSION TAG	UNP Q92CB1
D	457	HIS	-	EXPRESSION TAG	UNP Q92CB1
D	458	HIS	-	EXPRESSION TAG	UNP Q92CB1
D	459	HIS	-	EXPRESSION TAG	UNP Q92CB1
D	460	HIS	-	EXPRESSION TAG	UNP Q92CB1
E	453	LEU	-	EXPRESSION TAG	UNP Q92CB1
E	454	GLU	-	EXPRESSION TAG	UNP Q92CB1
E	455	HIS	-	EXPRESSION TAG	UNP Q92CB1
E	456	HIS	-	EXPRESSION TAG	UNP Q92CB1
E	457	HIS	-	EXPRESSION TAG	UNP Q92CB1
E	458	HIS	-	EXPRESSION TAG	UNP Q92CB1
E	459	HIS	-	EXPRESSION TAG	UNP Q92CB1
E	460	HIS	-	EXPRESSION TAG	UNP Q92CB1
F	453	LEU	-	EXPRESSION TAG	UNP Q92CB1
F	454	GLU	-	EXPRESSION TAG	UNP Q92CB1
F	455	HIS	-	EXPRESSION TAG	UNP Q92CB1
F	456	HIS	-	EXPRESSION TAG	UNP Q92CB1
F	457	HIS	-	EXPRESSION TAG	UNP Q92CB1
F	458	HIS	-	EXPRESSION TAG	UNP Q92CB1
F	459	HIS	-	EXPRESSION TAG	UNP Q92CB1
F	460	HIS	-	EXPRESSION TAG	UNP Q92CB1

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 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.

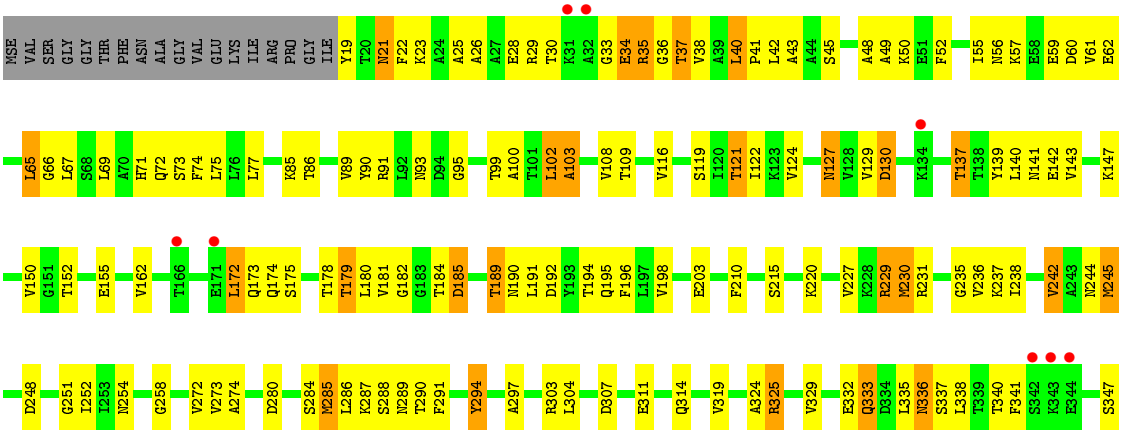
- Molecule 1: Lin1278 protein

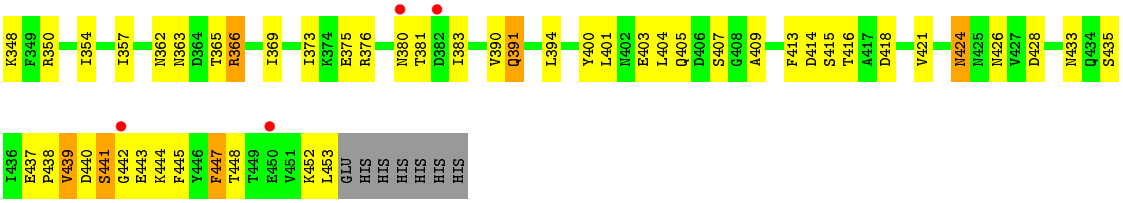
Chain A:



- Molecule 1: Lin1278 protein

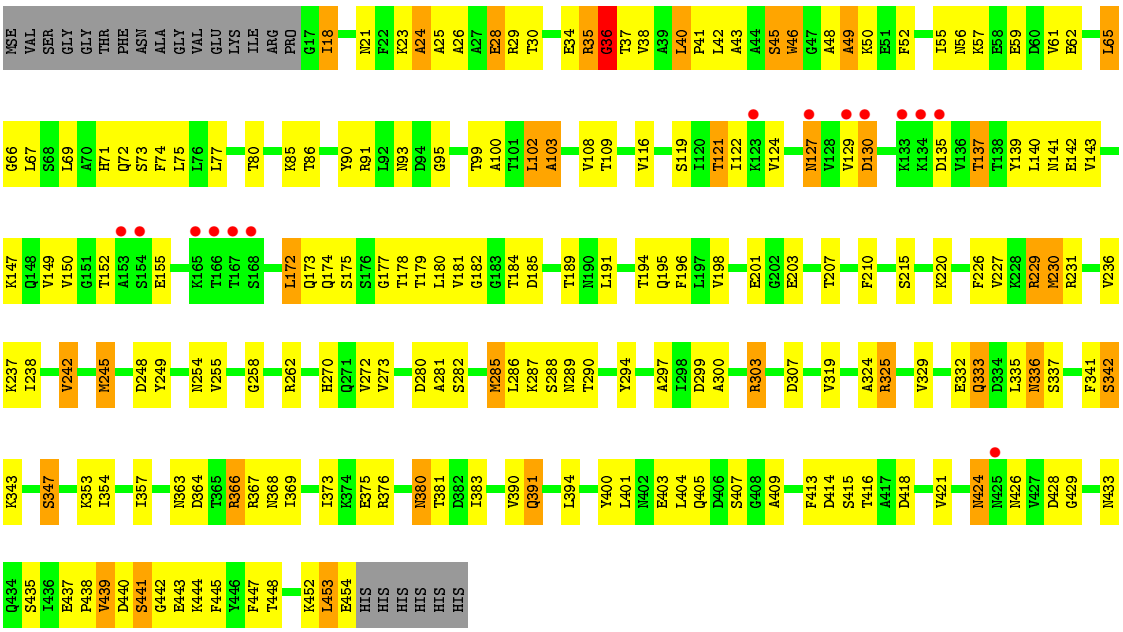
Chain B:





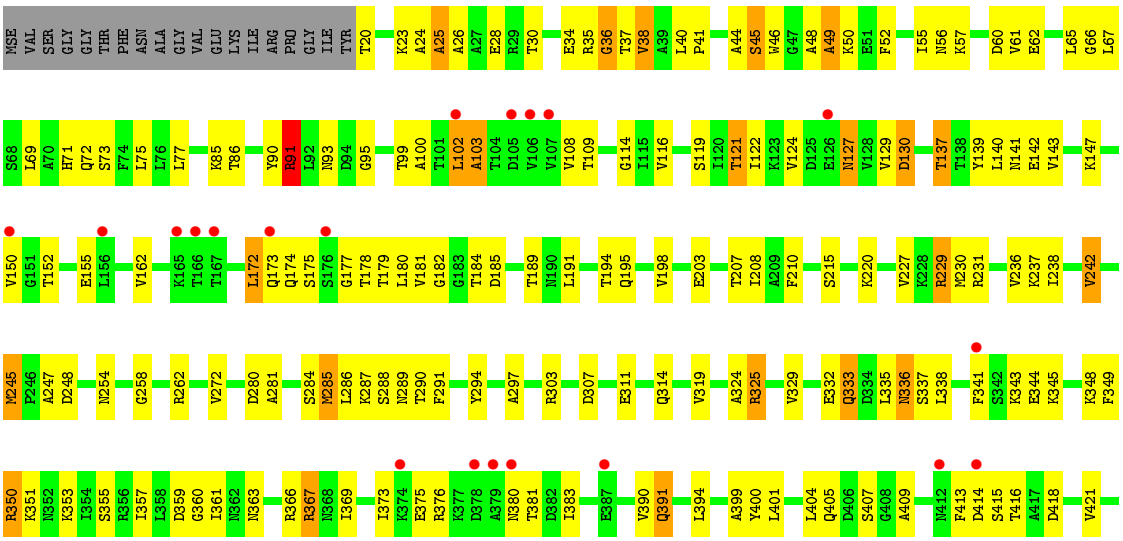
• Molecule 1: Lin1278 protein

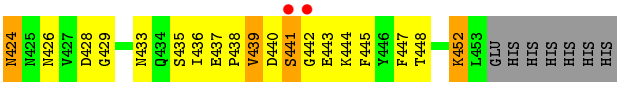
Chain C:



• Molecule 1: Lin1278 protein

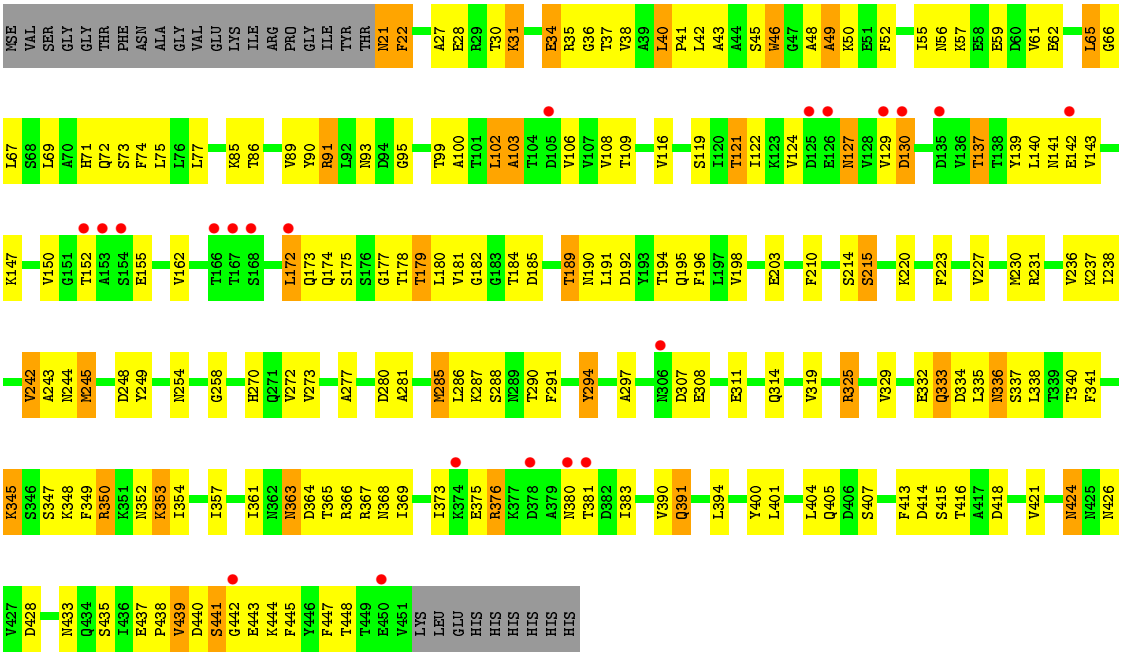
Chain D:





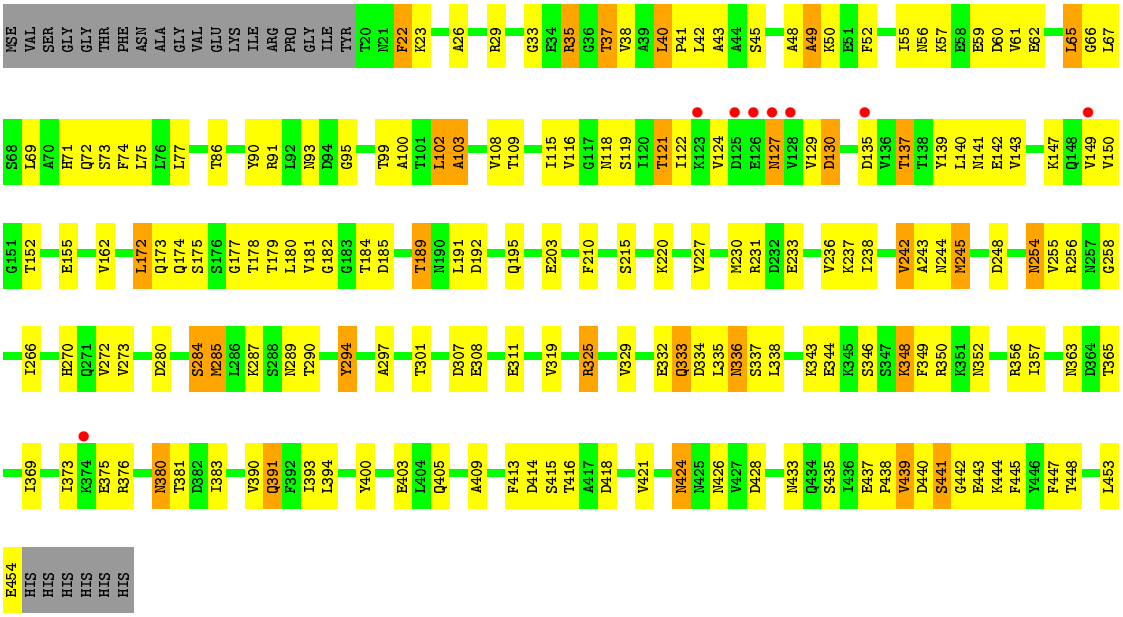
• Molecule 1: Lin1278 protein

Chain E:



• Molecule 1: Lin1278 protein

Chain F:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	91.31Å 153.72Å 217.41Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	19.96 – 3.30 29.86 – 3.30	Depositor EDS
% Data completeness (in resolution range)	90.3 (19.96-3.30) 97.6 (29.86-3.30)	Depositor EDS
R_{merge}	0.13	Depositor
R_{sym}	0.11	Depositor
$< I/\sigma(I) >$ [1]	5.49 (at 3.31Å)	Xtriage
Refinement program	CNS 1.2	Depositor
R, R_{free}	0.230 , 0.260 0.249 , 0.276	Depositor DCC
R_{free} test set	2248 reflections (4.95%)	DCC
Wilson B-factor (Å^2)	57.0	Xtriage
Anisotropy	0.155	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.28 , 43.1	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning[2]	$< \|L\| > = 0.48$, $< L^2 > = 0.31$	Xtriage
Outliers	2 of 88641 reflections (0.002%)	Xtriage
F_o,F_c correlation	0.88	EDS
Total number of atoms	20036	wwPDB-VP
Average B, all atoms (Å^2)	55.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.98% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ for acentric reflections are 0.5, 0.375 respectively for untwinned datasets, and 0.333, 0.2 for perfectly twinned datasets.

5 Model quality

5.1 Standard geometry

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	0.51	0/3418	0.68	3/4627 (0.1%)
1	B	0.47	0/3378	0.65	3/4573 (0.1%)
1	C	0.52	1/3399 (0.0%)	0.99	11/4601 (0.2%)
1	D	0.49	0/3365	1.01	11/4555 (0.2%)
1	E	0.49	0/3341	0.65	3/4523 (0.1%)
1	F	0.49	1/3374 (0.0%)	0.66	2/4567 (0.0%)
All	All	0.49	2/20275 (0.0%)	0.79	33/27446 (0.1%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	290	THR	CA-CB	-5.82	1.38	1.53
1	F	290	THR	CA-CB	-5.22	1.39	1.53

The worst 5 of 33 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	D	91	ARG	NE-CZ-NH2	-23.73	108.43	120.30
1	D	91	ARG	NE-CZ-NH1	22.72	131.66	120.30
1	C	229	ARG	NE-CZ-NH2	-22.48	109.06	120.30
1	D	262	ARG	NE-CZ-NH2	-21.40	109.60	120.30
1	C	229	ARG	NE-CZ-NH1	20.89	130.74	120.30

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	3376	0	3356	152	0
1	B	3338	0	3321	158	0
1	C	3359	0	3341	162	0
1	D	3326	0	3312	146	0
1	E	3302	0	3281	160	0
1	F	3335	0	3318	141	0
All	All	20036	0	19929	889	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 22.

The worst 5 of 889 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:35:ARG:HH12	1:B:284:SER:HA	0.95	1.11
1:A:285:MSE:HG2	1:A:357:ILE:HD13	1.17	1.10
1:B:35:ARG:NH1	1:B:284:SER:HA	1.75	1.01
1:C:285:MSE:HE3	1:C:357:ILE:HG23	1.45	0.98
1:A:233:GLU:HB2	1:C:229:ARG:HD3	1.45	0.94

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	438/460 (95%)	372 (85%)	54 (12%)	12 (3%)	6 35
1	B	433/460 (94%)	370 (86%)	53 (12%)	10 (2%)	8 39
1	C	436/460 (95%)	371 (85%)	51 (12%)	14 (3%)	5 31
1	D	432/460 (94%)	359 (83%)	60 (14%)	13 (3%)	5 33
1	E	429/460 (93%)	370 (86%)	45 (10%)	14 (3%)	5 30

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
1	F	433/460 (94%)	373 (86%)	48 (11%)	12 (3%)	6 34
All	All	2601/2760 (94%)	2215 (85%)	311 (12%)	75 (3%)	6 34

5 of 75 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	36	GLY
1	A	130	ASP
1	A	439	VAL
1	B	130	ASP
1	B	439	VAL

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	372/383 (97%)	332 (89%)	40 (11%)	8 32
1	B	368/383 (96%)	329 (89%)	39 (11%)	8 33
1	C	370/383 (97%)	329 (89%)	41 (11%)	8 31
1	D	367/383 (96%)	327 (89%)	40 (11%)	8 32
1	E	364/383 (95%)	320 (88%)	44 (12%)	6 26
1	F	368/383 (96%)	325 (88%)	43 (12%)	7 28
All	All	2209/2298 (96%)	1962 (89%)	247 (11%)	7 30

5 of 247 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	347	SER
1	D	191	LEU
1	F	254	ASN
1	C	380	ASN
1	D	75	LEU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 108 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	363	ASN
1	D	190	ASN
1	F	333	GLN
1	C	380	ASN
1	C	433	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

There are no carbohydrates in this entry.

5.6 Ligand geometry

There are no ligands in this entry.

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

6.1 Protein, DNA and RNA chains

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^{th} 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^2)	Q<0.9
1	A	436/460 (94%)	0.00	7 (1%) 74 69	13, 46, 89, 107	0
1	B	431/460 (93%)	0.06	12 (2%) 56 50	21, 53, 95, 109	0
1	C	434/460 (94%)	0.07	14 (3%) 51 44	15, 50, 92, 109	0
1	D	430/460 (93%)	0.26	22 (5%) 32 25	18, 55, 95, 110	0
1	E	427/460 (92%)	0.26	21 (4%) 33 27	25, 57, 98, 111	0
1	F	431/460 (93%)	-0.00	8 (1%) 70 63	17, 52, 92, 109	0
All	All	2589/2760 (93%)	0.11	84 (3%) 51 44	13, 53, 95, 111	0

The worst 5 of 84 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	106	VAL	5.8
1	C	127	ASN	5.5
1	E	153	ALA	5.1
1	D	107	VAL	4.9
1	B	380	ASN	4.8

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

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

There are no ligands in this entry.

6.5 Other polymers (i)

There are no such residues in this entry.