



# Plate girders fabricated by single sided fillet weld: imperfections, tests, resistances

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# Specimen

Specimen	Flange	Web	Weld	Length
L1	150x6	250x4	Single	5970
L2		600x4		
L3	150x6	600x4		
L4		600x4		
L5	200x10	250-		
L6		600x4		
L7		600x4		
L8		600x4		
L9	150x6	600x4	Double	2970
L10	200x10	600x4-8	Single	
L11		600x4		
S1	200x10	600x4	Single	2970
S2	150x6	250x4		
S3		250x4		



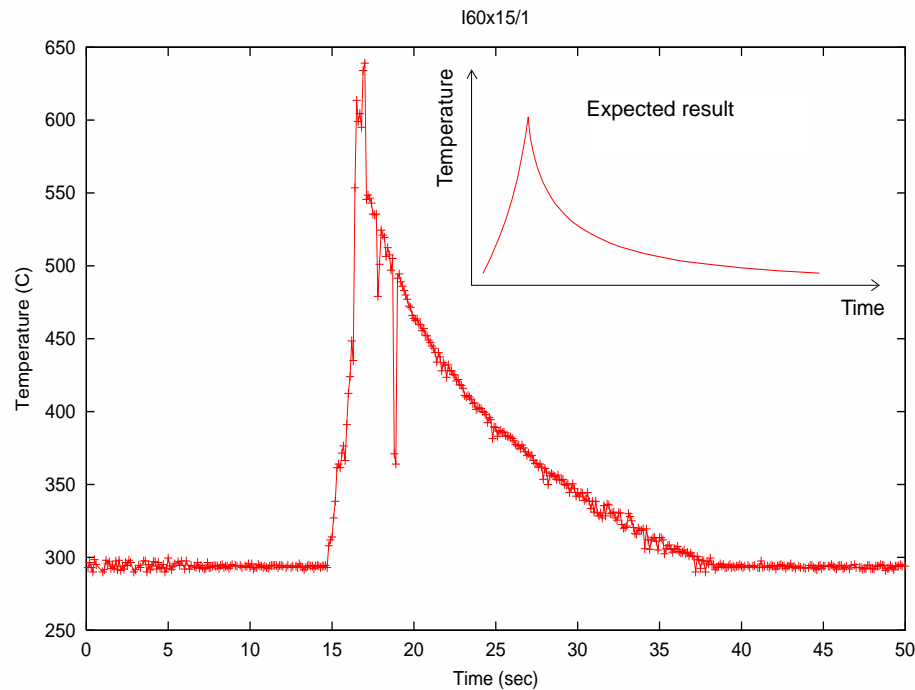


# Temperature measurements

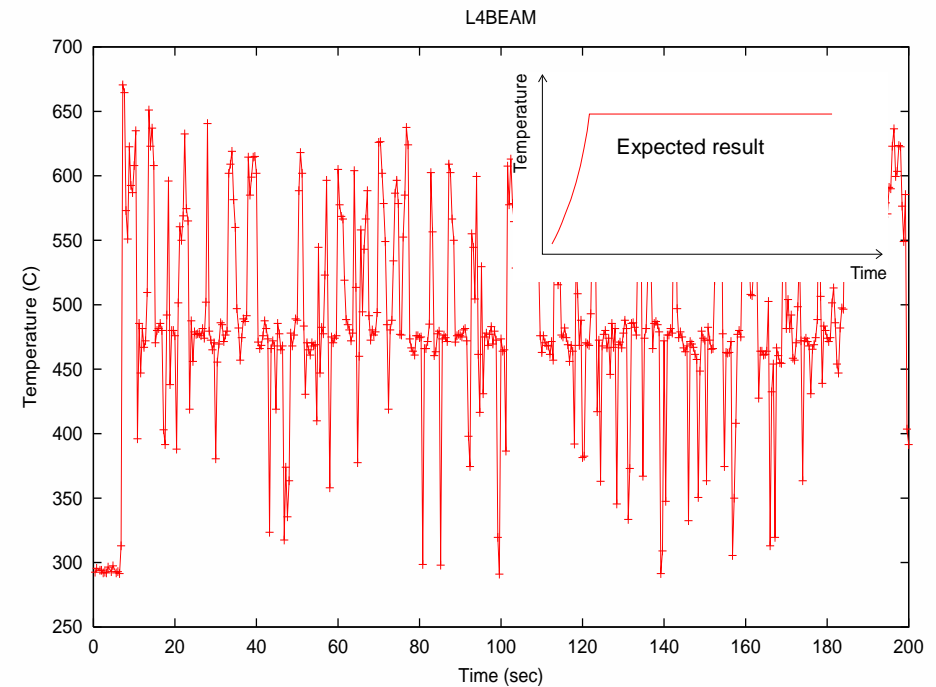




# Measurement results



MOVING CAMERA

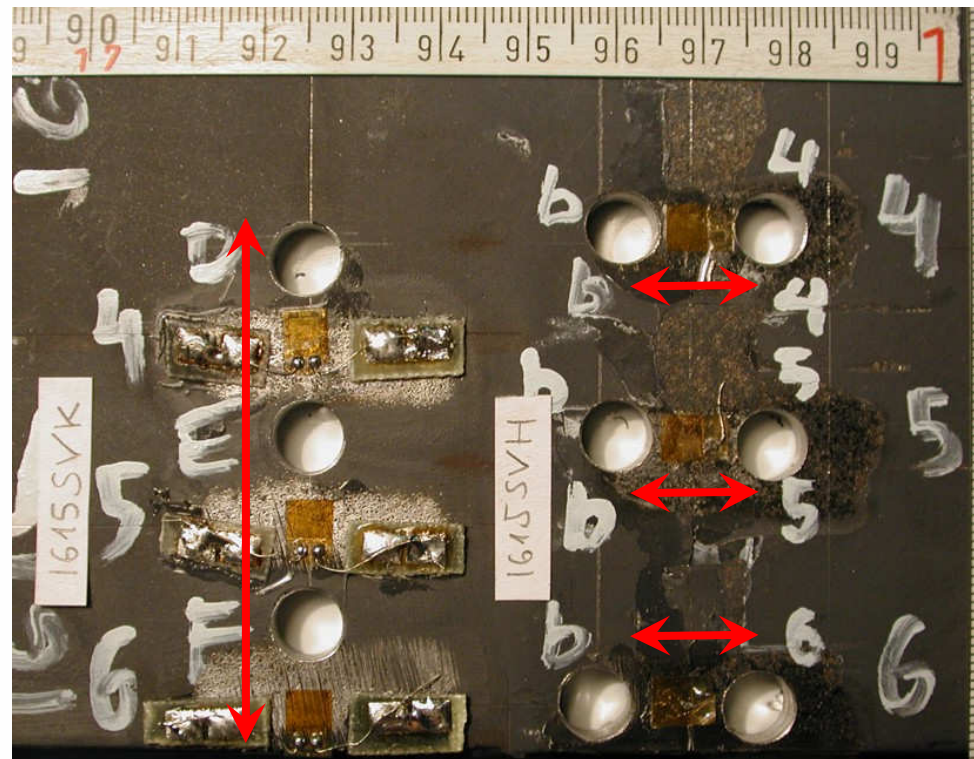


FIXED CAMERA

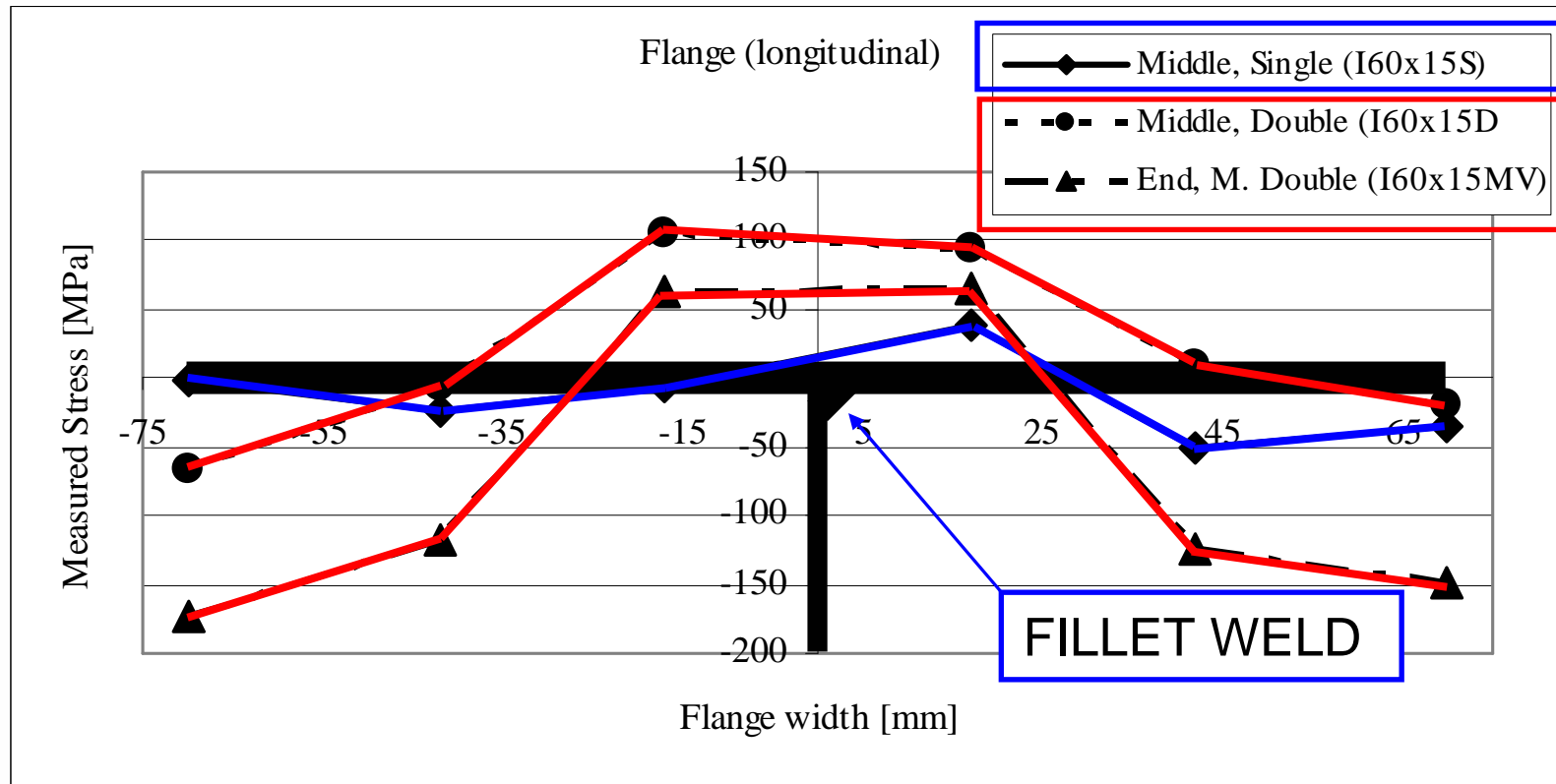




# Residual stress measurements

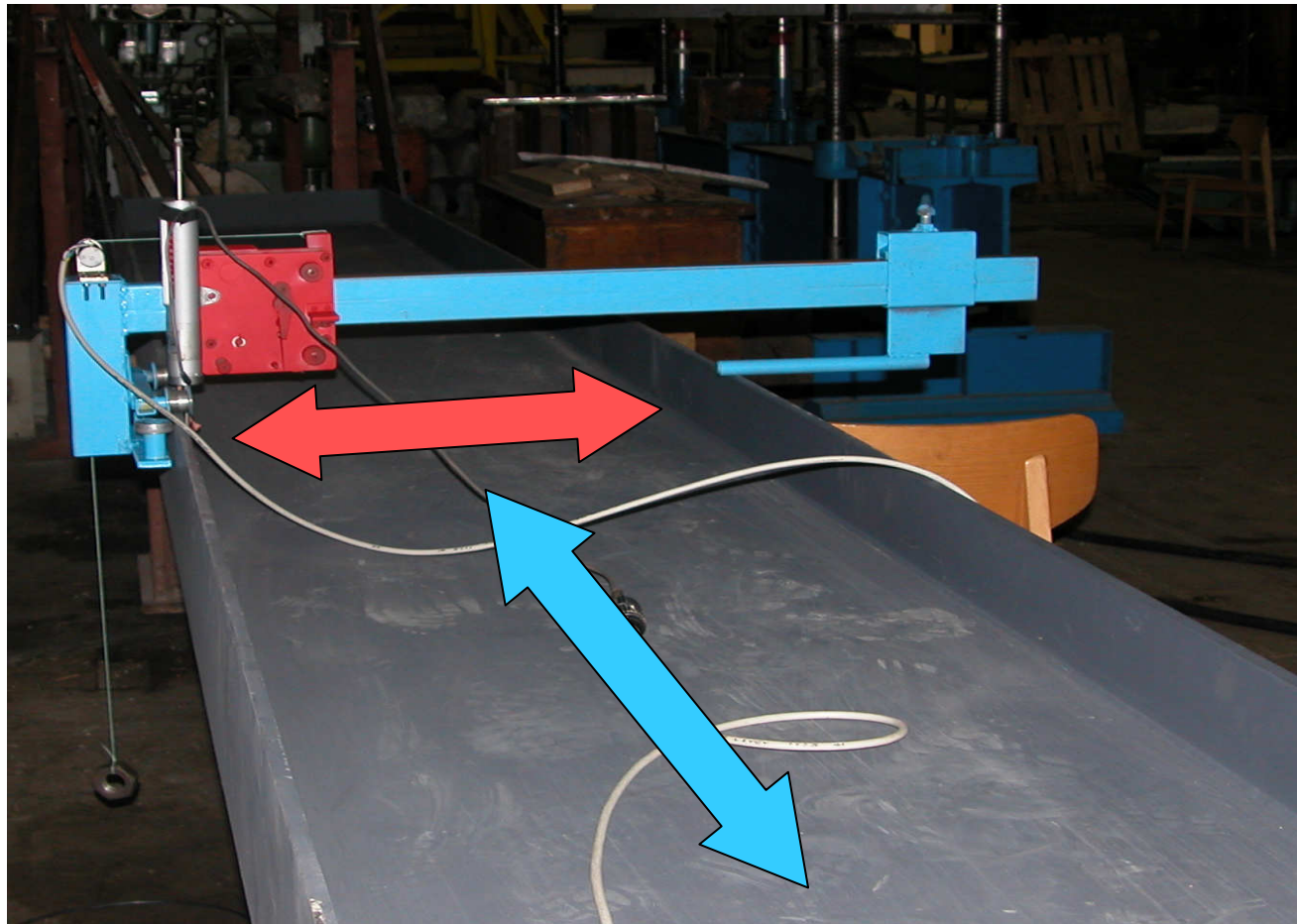


# Measurement results



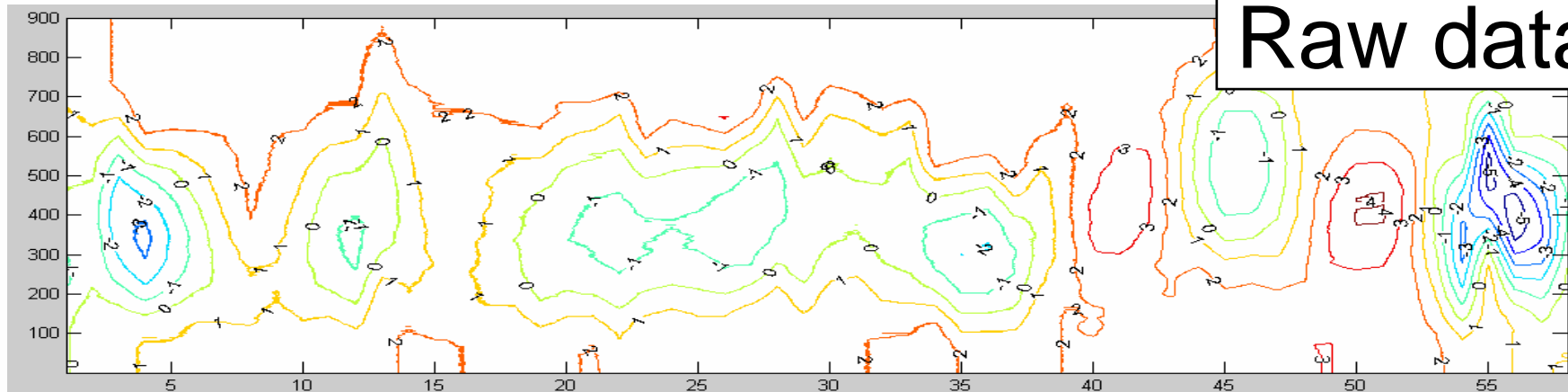


# Imperfection measurements

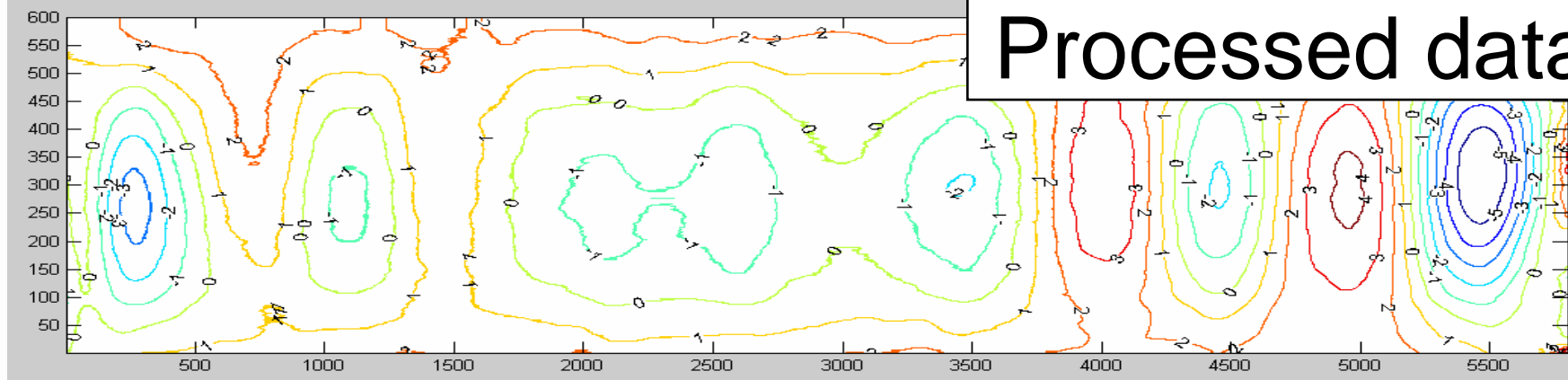




# Measurement results



Raw data

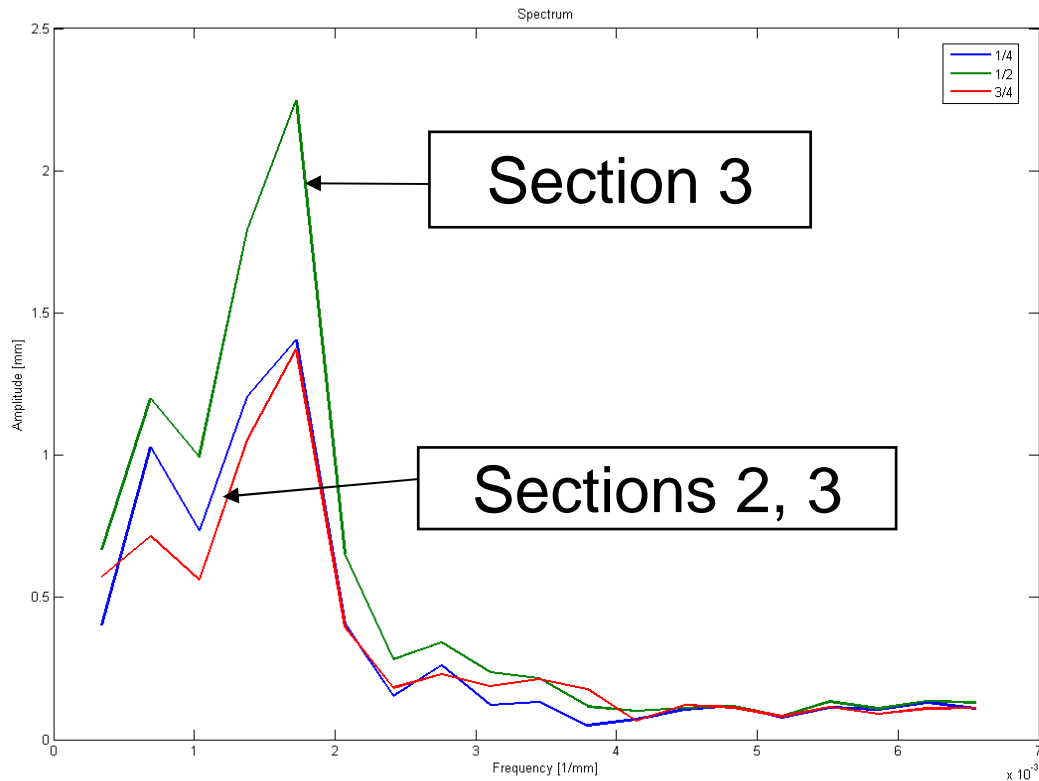


Processed data





# Characterising imperfections



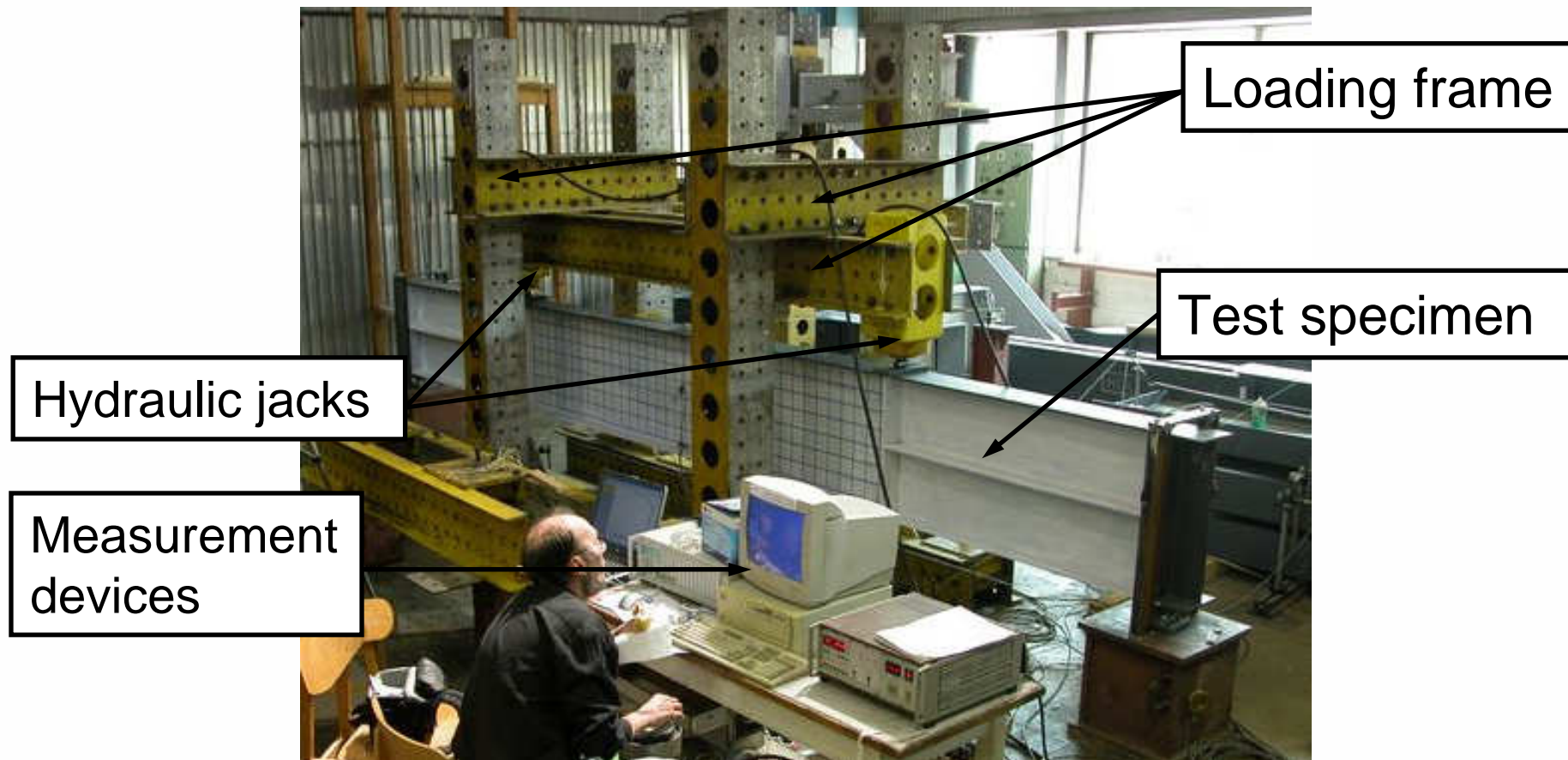
Defining wavelengths,  
amplitudes of the waves

OR

Using Fourier  
Transformation



# Load-bearing measurements



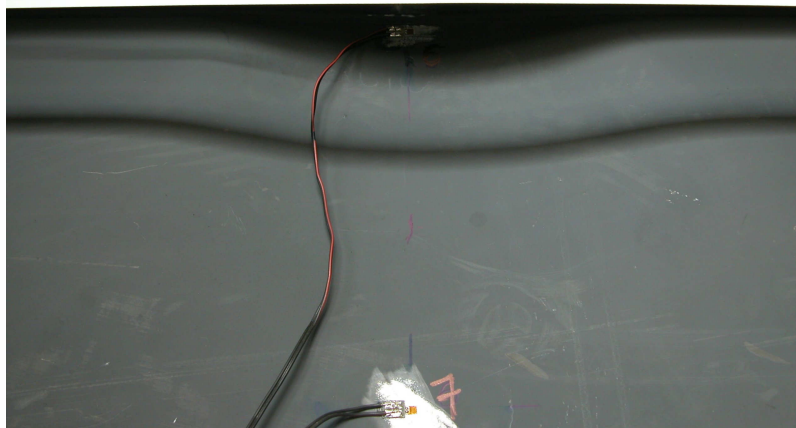
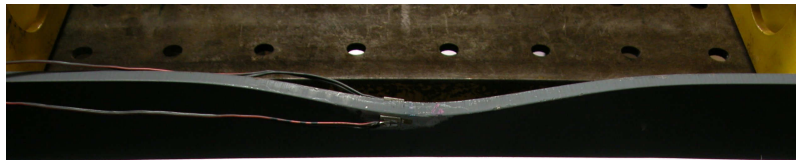
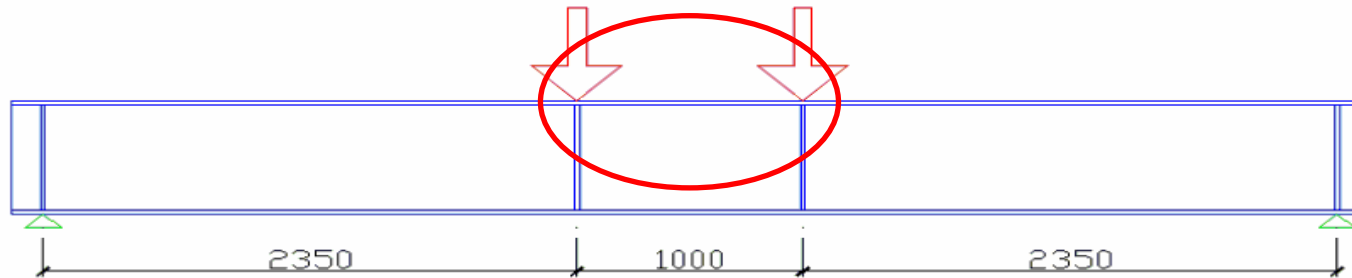


# Measurement programme

Test No.	Specimen	Arrangement		Stiffeners		Failure mode	Ultimate Load [kN]
		Type	X	Vertical	Horizontal		
T1	L5	4point	1000	both full	-	web buckling	248
T2	L3	3point	2350	250	-	flange buckling	174
T3	L4	4point	2000	-	-	web crippling	138
T4	L6	4point	3000	both full	both	-	500
T5		3point	2850	both full	both	web crippling	215
T6	L1	4point	3000	both full	-	lateral-torsional (LT) buckling	74
T7	L2	4point	3000	-	-	flange buckling	68
T8		4point	3000	both full	-	LT buckling	78
T9	L7	4point	3000	both full	higher end	local buckling	261
T10		3point	4350	both full	higher end	-	-
T11		4point	2100	both full	higher end	distortional buckling	220
T12	L9	4point	3000	both full	both	distortional buckling	176
T13	L11	3point	4350	full	higher end	distortional buckling	540
T14	L10	3point	4350	full	higher end	distortional buckling	641
T15	L8	3point	4350	full	higher end	combined distortional and LT buckling	472
T16	S1	3point	600	full	-	shear buckling	686
T17	S2	3point	600	full	-	LT buckling	581
T18	S3	3point	600	full	-	shear and LT buckling	-



# Measurement results





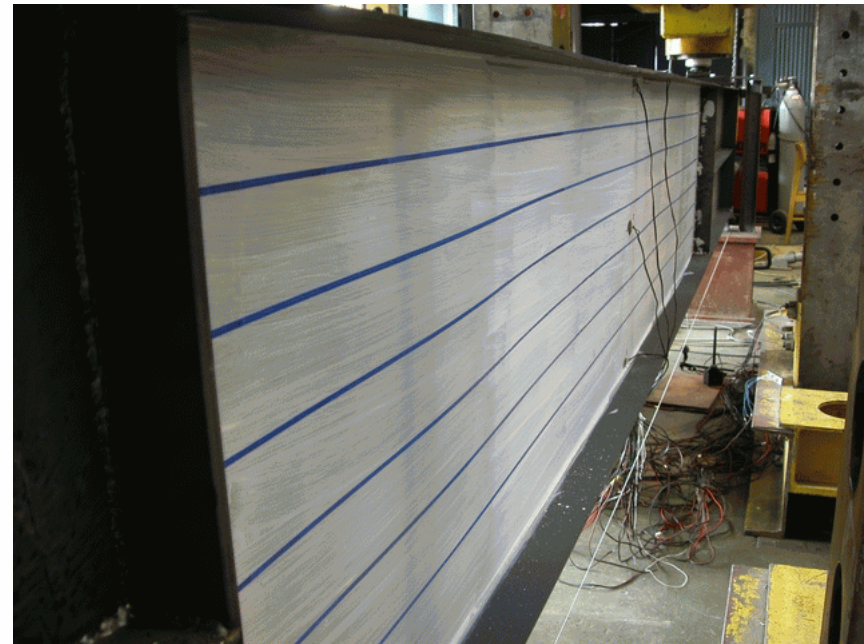
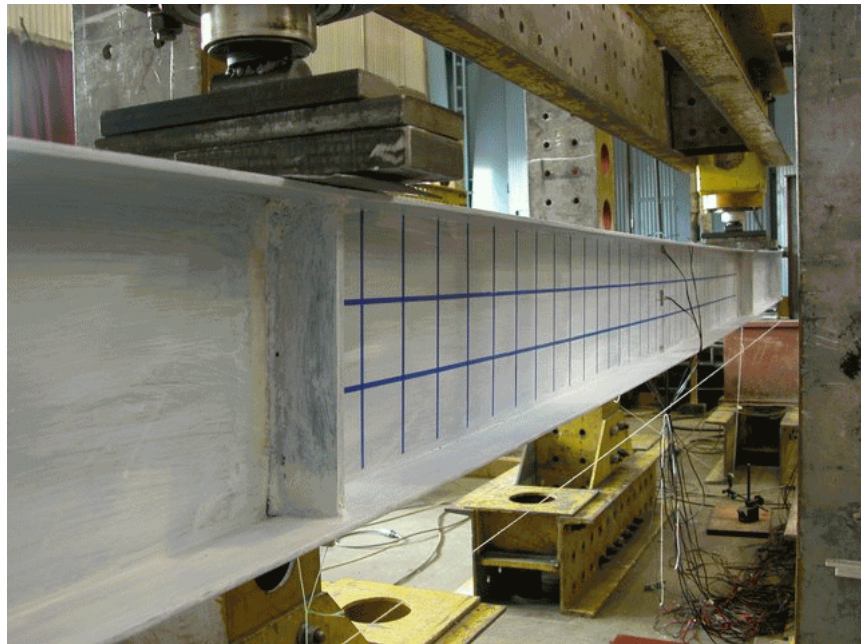


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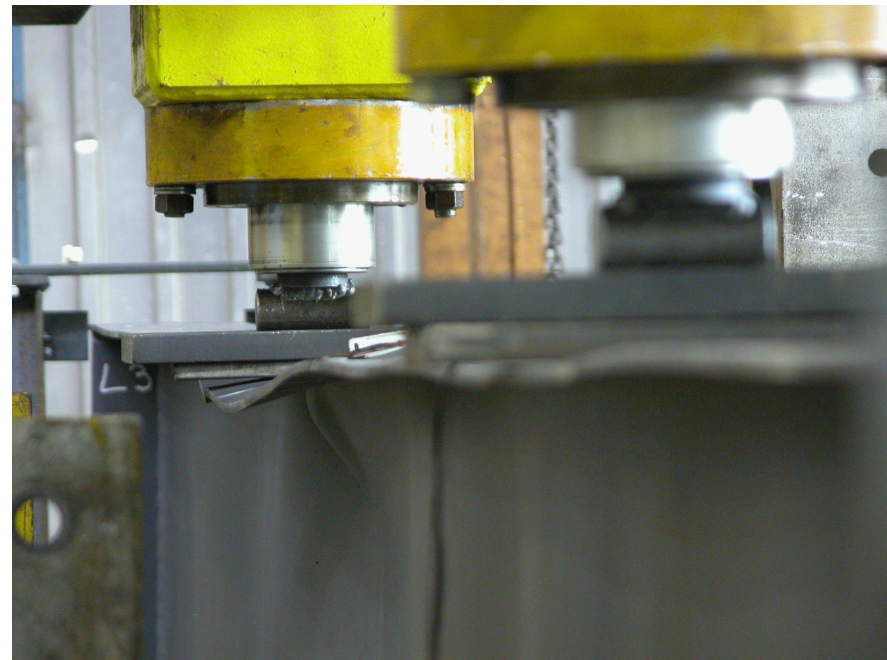
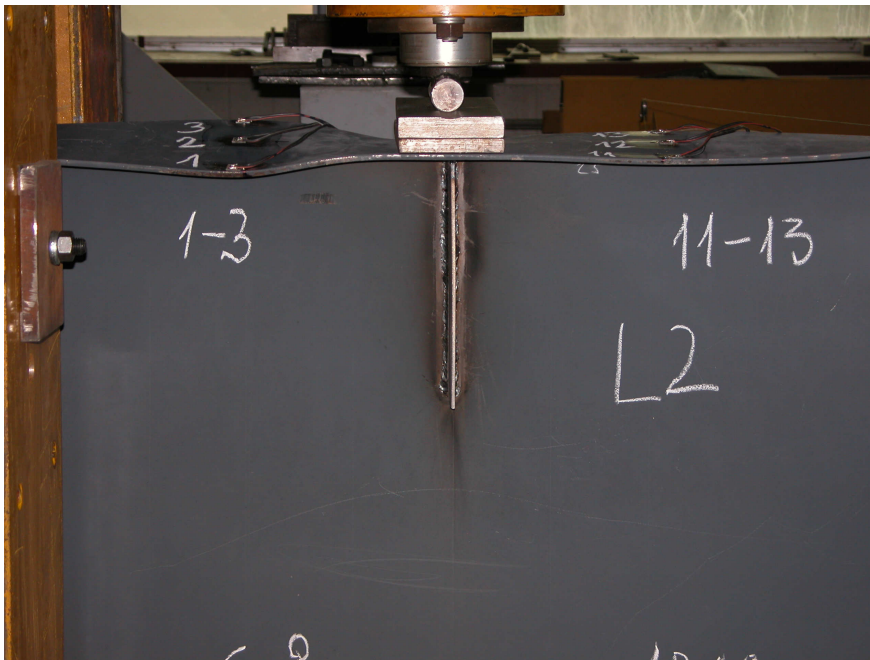
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# Global phenomena





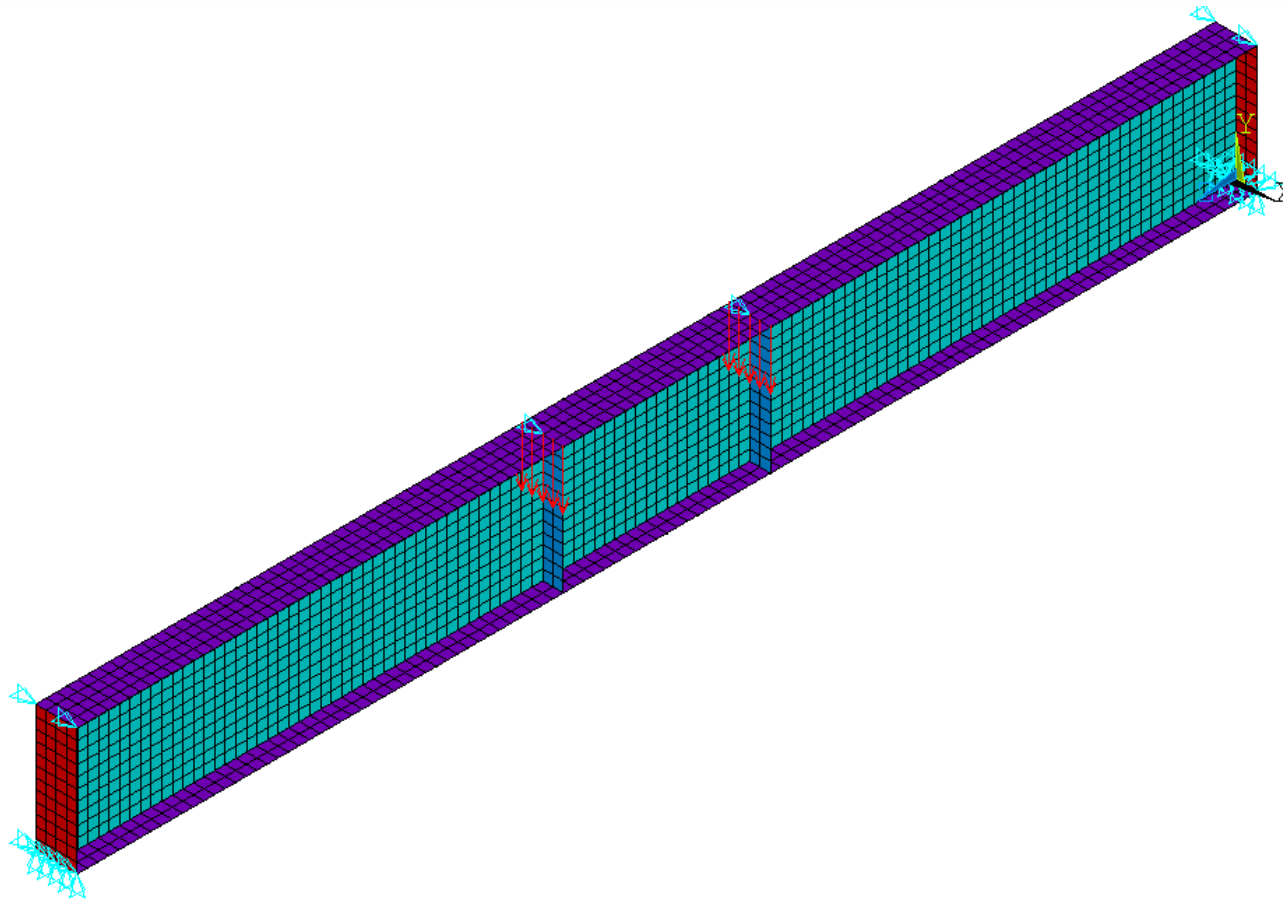
# Local phenomena





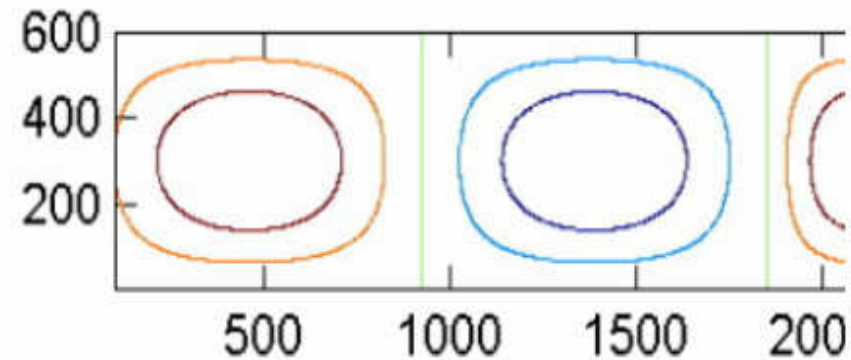
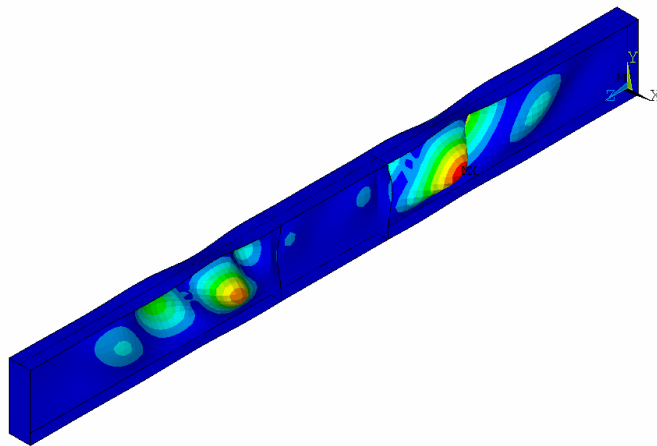
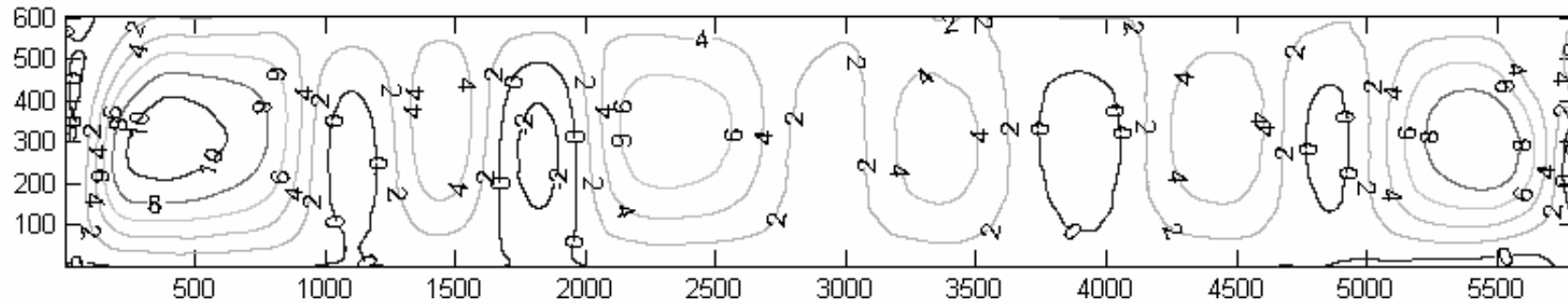


# FE model





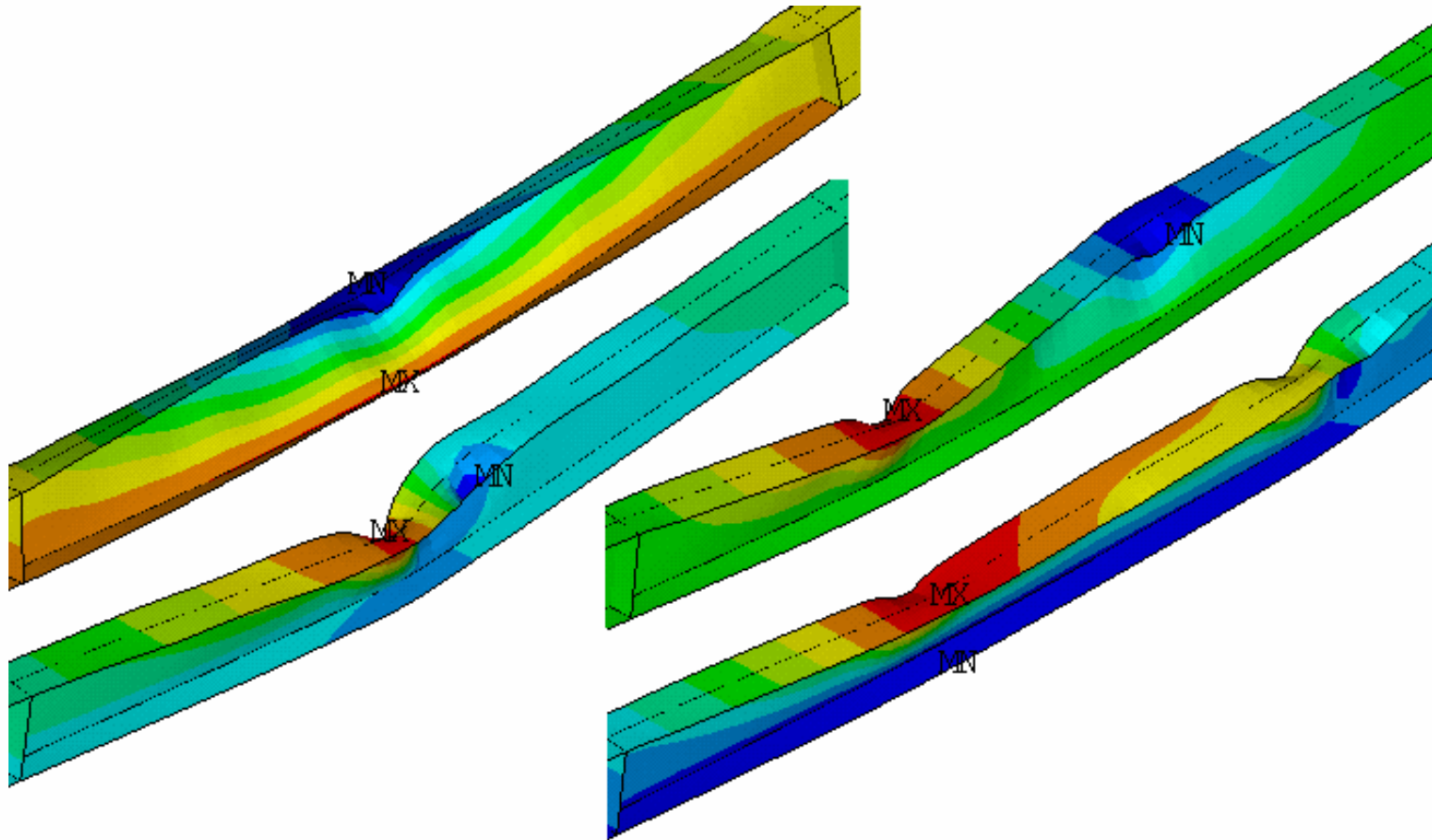
# Geometrical imperfections







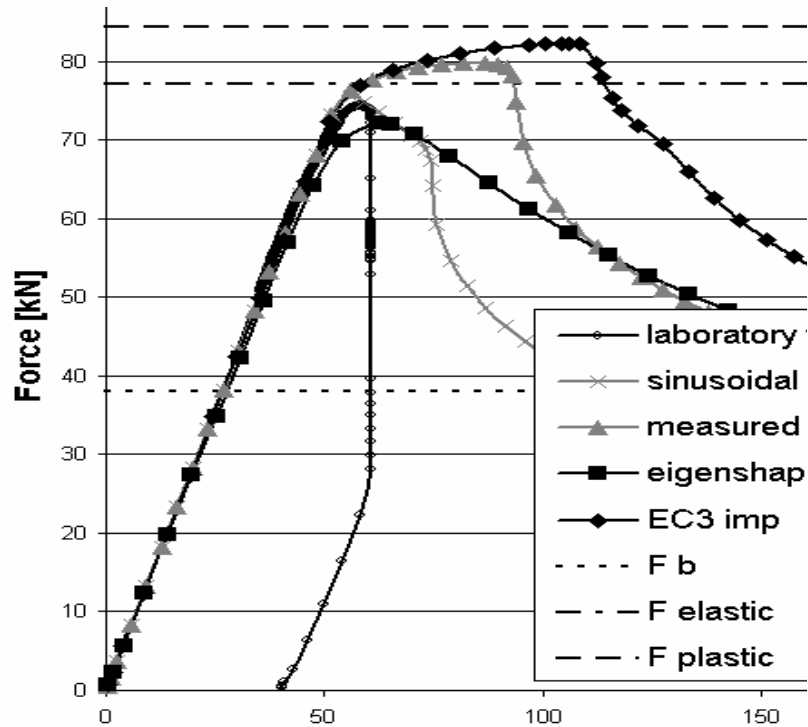
# Results



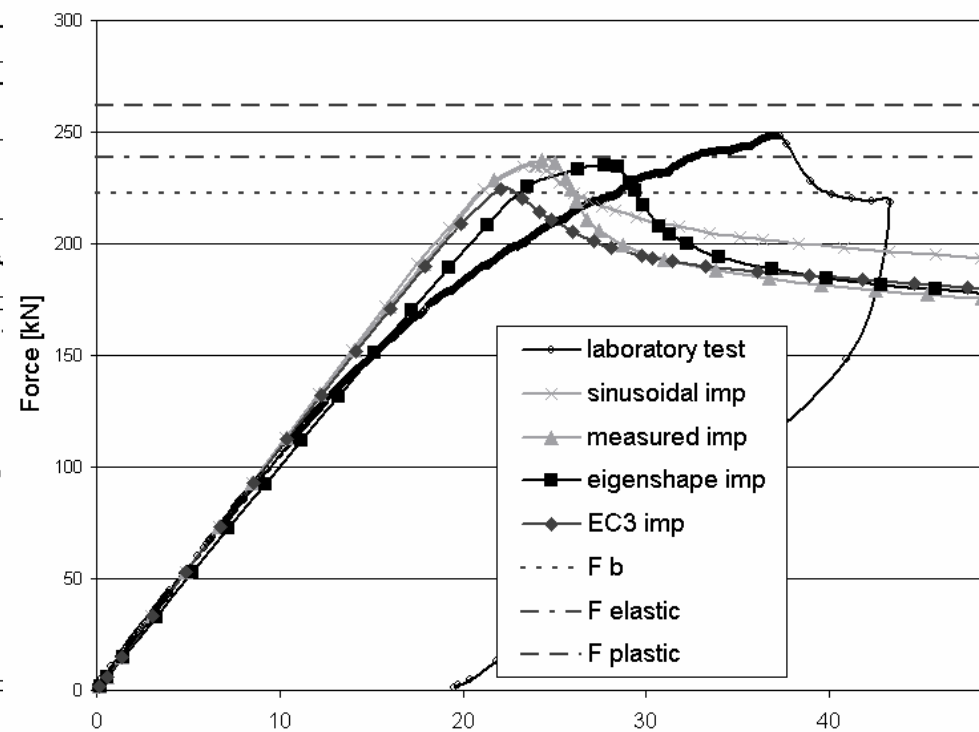


# Results

## LT buckling



## Web buckling





# Results

Test	Ultimate load/test	Ultimate load/simulations Imperfection applied				EC3 resistances		
		Measured	Sim	Eigen	EC3	$F_{b,Rd}$	$F_{c,Rd,el}$	$F_{c,Rd,pl}$
T1	kN	248	237	224	235	222	220	262
	%	100	96	90	95	Web buckling		
T3	kN	117	81	85	84	-	107	190
	%	100	69	72	71	Web crippling		
T6	kN	75	80	75	72	-	-	-
	%	100	107	100	96	LT buckling		



# Summary

- Test series with industrial background completed  
Geometrical and mechanical imperfections measured and characterized  
Nonlinear behaviour modes determined  
Numerical simulations with different geometrical imperfections carried out  
Possibilities and limitations of the standardized methods investigated





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Thank You for your attention!