

Specimen #: L1-23

Measurements:

SHM Technique	Measurement	Interval	Time of measure	Measuring rate
AE	Yes	Continuous	-	-
FBG	Yes	500 cycles	Continuous during QS	100 Hz
ODSI B	Yes	500 cycles	Peak / valley at quasi-static	-
Guided Waves	Yes	5000 cycles	0 kN -0.2 kN	-
DIC	Yes	500 cycles	Continuous during QS	1 image / 2.5 sec
Monitor camera	Yes	500 cycles	Peak at QS	-

Applied loads:

# of cycles (total)	Min load	Max load	Frequency	Measurement interval	Comments
30,000	-5kN	-50kN	2Hz	500/5000	Pause in fatigue test at 30,000 cycles
50,000	-5 kN	-50 kN	2 Hz	500 / 5000	Test machine error: test stopped after 50k cycles. New limit detector for PZT set at -0.2 kN
70,000	-5 kN	-50 kN	2 Hz	500/5000	PZT error stopped test after 70k cycles
100,000	-5 kN	-50 kN	2 Hz	500 / 5000	Same PZT error stopped test after 100k cycles

245,000	-6 kN	-60 kN	2 Hz	500 / 5000	PZT error stopped test after 245k cycles
438,000	-6 kN	-60 kN	2 Hz	500/5000	PZT sensor 3 disbond noted at 356700 cycles

Several things:

- PZT sensor 3 disbond noted at 356700 cycles
- Specimen stopped after 50k cycles due to not reaching 0 kN during PZT measurement
 - Changed limit to -0.2 kN
 - Remaining PZT measurements occurred at load of -0.2kN from 50,000 cycles onwards
- Specimen stopped after 70k, 100k and 245k cycles due to PZT error
- Specimen failure during QS loading → DIC / FBG continued recording afterwards
- 1 manual PZT recording performed after specimen failure, but considering sensor failure, these measurements might not be useful.

Acoustic emission:

Wave-velocity longitudinal (along stiffener): 6215.5 m/s

Wave-velocity lateral (through stiffener): not recorded

Sensor #	X-location [mm]	Y-location [mm]
1	145	190
2	145	20
3	20	50
4	20	220

*from skin-side (from bottom left)

ODiSi-B location:

Sensor #	Location	Sensor start [mm]	Sensor end [mm]	Start location	End location
1	Left foot	845	1045	Bottom	Top
2	Right foot	2720	2920	Top	Bottom

*location as seen from stiffener side

Disbond located approximately around 2880-2890 mm

FBG location:

Channel 1: Left foot from top

Channel 2: Right foot from top

Fatigue machine measurements:

Note: analog data was only recorded from 9500 cycles with DIC, camera, AE

10 V = 100 kN

10 V = 7,5 mm

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	Skin length		Tab length	
	Left [mm]	Right [mm]	Top [mm]	Bottom [mm]
Without tabs	240	241	Left: 31	Left: 30
With tabs	301	300	Right: 29	Right: 30

Skin width		
Top [mm]	Middle [mm]	Bottom [mm]
165	165	165

Skin thickness					
Top-left [mm]	Middle-left [mm]	Bottom-left [mm]	Top-right [mm]	Middle-right [mm]	Bottom-right [mm]
1.85	1.80	1.82	1.82	1.86	1.82

Stiffener thickness			Stiffener length	
Top [mm]	Middle [mm]	Bottom [mm]	Left [mm]	Right [mm]
2.40	2.42	2.40	240	240