Test Matrix

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Specimen | Interface | Stress ratio R | Aims | Journal paper |
| Sp\_1 | 0//0 | 0.1 | ① | [1] |
| Sp\_2 | 0//0 | 0.1 | ① | [1] |
| Sp\_3 | 0//0 | 0.5 | ① | [1] |
| Sp\_4 | 0//0 | 0.1 | ① | [1] |
| Sp\_5 | 0//0 | 0.5 | ① | [1] |
| Sp\_6 | 0//0 | 0.1 | ① | [1] |
| Sp\_7 | 0//0 | 0.1 | ①③⑤ | [1],[3],[4],[6] |
| Sp\_8 | 0//0 | 0.1 | ① | [1] |
| Sp\_9 | 0//0 | 0.1 | ① | [1] |
| Sp\_10 | 0//0 | 0.5 | ③ | [4],[7] |
| Sp\_11 | 0//0 | 0.1 | ①③⑤ | [1],[3],[4],[6] |
| Sp\_12 | 0//0 | 0.5 | ②③ | [2],[4],[7] |
| Sp\_13 | 0//0 | 0.5 | ④ |  |
| Sp\_14 | 0//0 | 0.5 | ④ |  |
| Sp\_15 | 0//0 | 0.5 | ④ |  |
| Sp\_16 | 0//0 | 0.5 | ④ | [2] |
| Sp\_17 | 0//0 | 0.5 | ④ | [2] |
| Sp\_18 | 0//0 | 0.5 | ④ |  |
| Sp\_19 | 0//0 | 0.5 | ④ |  |
| Sp\_20 | 0//0 | 0.5 | ④ |  |
| Sp\_21 | 0//0 | 0.5 | ⑤ | [3] |
| Sp\_22 | 0//0 | 0.5 | ⑤ | [3] |
| Sp\_23 | 0//0 | 0.7 | ③ |  |
| Sp\_24 | 0//0 | 0.7 | ⑤ |  |
| Sp\_25 | 0//0 | 0.5 | ⑤ |  |
| Sp\_26 | 0//0 | 0.2 | ⑤ |  |
| Sp\_27 | 0//0 | 0.2 | ⑤ |  |
| Sp\_28 | 0//0 | 0.7 | ③ |  |
| Sp\_29 | 45//45 | 0.5 | ① | [1] |
| Sp\_30 | 45//45 | 0.1 | ①⑤ | [1],[3] |
| Sp\_31 | 45//45 | 0.1 | ① | [1] |
| Sp\_32 | 45//45 | 0.5 | ⑤ | [3] |
| Sp\_33 | 45//45 | 0.1 | ①③ | [1] |
| Sp\_34 | 45//45 | 0.5 | ①②③ | [1],[2] |
| Sp\_35 | 45//45 | 0.5 | ⑤ |  |
| Sp\_36 | 45//45 | 0.5 | ①② | [1],[2] |
| Sp\_37 | 45//45 | 0.5 | ③ |  |
| Sp\_38 | 45//45 | 0.5 | ② | [2] |
| Sp\_39 | 45//45 | 0.5 | ⑤ |  |
| Sp\_40 | 45//45 | 0.7 | ⑤ |  |
| Sp\_41 | 45//45 | 0.7 | ③ |  |
| Sp\_42 | 45//45 | 0.2 | ⑤ | [3] |
| Sp\_43 | 45//45 | 0.23 | ⑤ | [3] |
| Sp\_44 | 45//45 | 0.2 | ⑤ |  |
| Sp\_45 | 45//45 | 0.7 | ⑤ |  |
| Sp\_46 | 45//45 | 0.5 | ① | [1] |
| Sp\_47 | +45//-45 | 0.5 | ③ |  |
| Sp\_48 | +45//-45 | 0.5 | ⑤ |  |
| Sp\_49 | +45//-45 | 0.5 | ⑤ |  |
| Sp\_50 | +45//-45 | 0.5 | ⑤ |  |
| Sp\_51 | +45//-45 | 0.5 | ⑤ |  |
| Sp\_52 | +45//-45 | 0.1 | ⑤ |  |
| Sp\_53 | +45//-45 | 0.1 | ③ |  |
| Sp\_54 | 0//0 | 0.5 | ①③ | [5],[7],[8] |
| Sp\_55 | 0//0 | 0.5 | ①③ | [5] |
| Sp\_56 | 0//0 | 0.5 | ①③ | [5] |

Aims:

① Bridging effect study

② Damage state difference study in quasi-static and fatigue delamination

③ Difference amount of fibre bridging in fatigue delamination

④ Difference amount of fibre bridging in quasi-static delamination

⑤ Stress ratio effect on fatigue delamination

Journal paper:

[1] Liaojun Yao, René Alderliesten, Meiying Zhao, Rinze Benedictus. Bridging effect on mode I fatigue delamination behavior in composite laminates. Composites Part A: Applied Science and Manufacturing. 2014. 63: 103-109

[2] Liaojun Yao, René Alderliesten, Meiying Zhao, Rinze Benedictus. Discussion on the use of the strain energy release rate for fatigue delamination characterization. Composites Part A: Applied Science and Manufacturing. 2014. 66:65-72

[3] Liaojun Yao, René Alderliesten, Rinze Benedictus. Interpreting the stress ratio effect on delamination growth in composite laminates using the concept of fatigue fracture toughness. Composites Part A: Applied Science and Manufacturing. 2015. 78: 135-142

[4] Liaojun Yao, René Alderliesten, Rinze Benedictus. The effect of fibre bridging on the Paris relation for mode I fatigue delamination growth in composites. Composite Structures. 2016. 140: 125-135

[5] Liaojun Yao, Yi Sun, Liheng Guo, R.C. Alderliesten, R. Benedictus, Meiying Zhao, Liyong Jia. Fibre bridging effect on the Paris relation of mode I fatigue delamination in composite laminates with different thicknesses. International Journal of Fatigue 2017. 103: 196-206

[6] Liaojun Yao, Yi Sun, Liheng Guo, Meiying Zhao, R.C. Alderliesten, R. Benedictus. A modified Paris relation for fatigue delamination with fibre bridging in composite laminates. Composite Structures 2017. 176: 556-564

[7] Liaojun Yao, Yi Sun, Liheng Guo, Liyong Jia, Meiying Zhao. A validation of a modified Paris relation for fatigue delamination growth in unidirectional composite laminates. Composites Part B: Engineering 2018. 132: 97-106

[8] Liaojun Yao, J.A. Pascoe, R.C. Alderliesten. Experimental method to account for fibre bridging in mode I fatigue delamination growth data.