

## 6 结论

本研究建立了轮胎模态分析试验系统,探讨了轮胎模态分析的试验方法及其在轮胎设计中的应用。通过对不同气压、胎面花纹和轮胎质量下轮胎的固有频率特性及模态振型的测量,分析了轮胎不同参数对轮胎模态振型、振动和噪声的影响。得出结论:随着轮胎气压增大,轮胎刚度提高,阻尼减小,轮胎的固有频率增大,滚动阻力降低,平顺性变差;同型号、同结构光面轮胎的基频小于有花纹轮胎的基频。随着轮胎质量减小,轮胎刚度大大降低,其刚度变化对轮胎固有频率特性的影响大于质量变化对轮胎固有频率特性的影响,轮胎的阻尼降低使滚动阻力降低,但平顺性变差。轮胎的一阶偏心振型直接影响轮胎的行驶平顺性,是引起轮胎平顺性变差和路面接缝噪声的主要原因。轮胎二阶以上的高次振型是影响轮胎与路面接触噪声的重要振型。通过试验结果与有限元模态计算结果的对比,说明在轮胎有限元分析过程中

所选取轮胎材料参数的误差引起有限元计算结果产生一定的误差。该系统在轮胎的设计与理论研究中得到了广泛使用,并取得了良好效果。致谢:在该试验系统的建立、调试和试验中,隆有明副所长在技术和工作中给予了极大的指导和支持,徐进书记、韩兆丙所长、姚明副所长在各方面给予了大力支持,装备室的袁熙荣工程师、丁琪余工程师和其它部门在系统设计中给予了全力支持,在此表示深深的感谢。感谢上海市华谊集团轮胎公司博士后基金的资助。

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## Tire modal test and its application to tire structure design

GE Jian-min, WANG Wei-fang, SUN Shi-ming, Rolf Gall

[Shanghai Tire and Rubber (Group) Co., Ltd., Shanghai 200072, China]

**Abstract:** The tire modal test and its application to the tire structure design were analysed, and a tire modal analysing test system was established. The inherent frequency characteristics of various tires was determined, the effective law of tire inflation pressure, tread patterns and tire weight on the inherent frequency characteristics of tires was analysed. It was found that the inherent frequency increased as the tire inflation pressure increased; the basic frequency of the tire with tread patterns was lower than that without tread patterns in the same type and size; the influence of the tire stiffness on the inherent frequency was greater than that of the tire weight. The FEA of tire modal was confirmed and the cause of deviation was diagnosed by the modal test.

**Key words:** tire; inherent frequency; modal vibration type; stiffness; damp

## 湖北公路通车里程近6万 km

中图分类号: U412.1 文献标识码: D

“九五”期间,湖北省公路交通基础设施建设发展态势良好,重点工程与干线建设齐头并进,全省路网工程全面启动。

到2000年年底,公路通车总里程达到

57 000 km,比1995年新增公路8 272 km;高速公路里程达到568 km,路网密度达到 $30.7 \text{ km} \cdot (100 \text{ m}^2)^{-1}$ 。目前京珠高速公路湖北段、襄十、襄荆等重点工程相继启动,宜昌、军山、荆州、鄂黄等长江大桥建设进展顺利。

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