



中国宇航学会
深空探测技术专业委员会会刊

中文核心期刊
中国科技核心期刊
中国科学引文数据库 (CSCD) 来源期刊
中国高校百佳科技期刊

2023.1

深空探测学报

(中英文)

JOURNAL OF DEEP SPACE EXPLORATION

第10卷 第1期 Vol.10 No.1



北京理工大学
中国宇航学会深空探测技术专业委员会

深空探测学报(中英文)(双月刊)

第10卷 第1期 2023年2月

目次

专题：火星环绕探测技术

(主持人：张玉花，研究员，上海航天技术研究院)

火星环绕探测发展现状与趋势	张玉花, 朱新波, 谢攀, 等 (3)
“天问一号”火星探测环绕器导航制导与控制技术	朱庆华, 王卫华, 刘付成, 等 (11)
“天问一号”火星探测器制动捕获最优点火姿态设计	信思博, 徐亮, 赵训友, 等 (19)
“天问一号”环绕器测控数传通信系统设计与验证	王民建, 朱新波, 何春黎, 等 (28)
“天问一号”火星环绕器推进管路热控设计与分析	张玉花, 杨金, 盛松, 等 (37)
火星环绕器高增益天线在轨热设计及波束指向影响分析	张顺波, 任红宇, 靳春帅, 等 (44)
火星环绕器全链路时间标定及发射日授时方法	王森, 朱新波, 汪栋硕, 等 (52)
火星环绕器火卫一抵近探测拓展任务设想轨道设计与分析	郑惠欣, 谢攀, 李海洋, 等 (58)

研究论文

火星车多光谱相机桅杆精确指向控制方法	卢皓, 张辉, 张朕, 等 (66)
“天问一号”着陆惯导安装矩阵正交化方法研究	冯士伟, 林松, 李勇, 等 (72)
“天问一号”无线电掩星观测试验及特征分析	陈略, 王美, 简念川, 等 (80)
深空探测器任务规划认知图谱及多属性约束冲突检测	柳景兴, 王彬, 毛维杨, 等 (88)

专题栏目主持人简介



张玉花，上海航天技术研究院科技委常委、研究员，长期从事航天器总体设计、载人航天工程和月球、火星探测器研制。“嫦娥三号”“嫦娥四号”探测器副总指挥兼副总设计师，“嫦娥五号”“嫦娥六号”探测器副总指挥，“天问一号”火星探测器系统副总指挥兼环绕器总指挥。曾荣获“全国五一劳动奖章”“全国三八红旗手”“探月工程突出贡献者”“载人航天工程突出贡献奖章”等荣誉。

Journal of Deep Space Exploration

Vol. 10 No. 1 (February, 2023)

CONTENTS

Topic: Technology of Mars Orbiting Exploration

(Guest Editor: Professor ZHANG Yuhua, Shanghai Academy of Spaceflight Technology)

Current Situation and Trend of Mars Orbiting Exploration.....	ZHANG Yuhua, ZHU Xinbo, XIE Pan, et al (3)
Navigation, Guidance and Control Technology of Mars Exploration Orbiter Tianwen-1	ZHU Qinghua, WANG Weihua, LIU Fucheng, et al (11)
Optimal Firing Attitude Design for Mars Probe “Tianwen-1” Braking and Capture	XIN Sibao, XU Liang, ZHAO Xunyou, et al (19)
Design and Verification of TT&C and Data Transmission Integrated System for Tianwen-1 Mars Orbiter	WANG Minjian, ZHU Xinbo, HE Chunli, et al (28)
Research on the Thermal Design of the Propulsion Pipeline on the Tianwen-1 Mars Orbiter	ZHANG Yuhua, YANG Jin, SHENG Song, et al (37)
On-orbit Thermal Design and Beam Pointing Error Impact Analysis of High Gain Antenna of Mars Orbiter	ZHANG Shunbo, REN Hongyu, JIN Chunshuai, et al (44)
Whole Link Time Calibration of Mars Orbiter and Launch Day Timing.....	WANG Sen, ZHU Xinbo, WANG Dongshuo, et al (52)
Planning for Extending Phobos Approaching Mission of Mars Orbiter Tianwen-1: Trajectory Design and Analysis	ZHENG Huixin, XIE Pan, LI Haiyang, et al (58)

Research Papers

Accuracy Mast Pointing Control Method for Multi-Spectral Camera of Mars Rover	LU Hao, ZHANG Hui, ZHANG Zhen, et al (66)
Research on Orthogonalization Method of Installation Matrix of Landing IMU for Tianwen-1	FENG Shiwei, LIN Song, LI Yong, et al (72)
Tianwen-1 Radio Occultation Observation Experiment and Feature Analysis	CHEN Lue, WANG Mei, JIAN Nianchuan, et al (80)
Cognitive Graph for Autonomous Deep Space Mission Planning and Multi-Constraints Collision Detection	LIU Jingxing, WANG Bin, MAO Weiyang, et al (88)

Guest Editor Introduction



Zhang Yuhua, senior researcher and the standing committee member of the Science and Technology Committee of Shanghai Academy of Spaceflight Technology. She has been engaged in the overall design of spacecraft, manned space engineering and the development of lunar and Mars probes. Deputy commander and chief designer of the Chang'e-3 and Chang'e-4 Probes, deputy commander of the Chang'e-5 and Chang'e-6 Probes, and deputy commander of the Mars probe system and chief commander of orbiter of the Tianwen-1 Probe. She was awarded the “National May 1st Labour Medal”, “National March 8th Red Flag Bearer”, “Outstanding Contributor to Lunar Exploration Project”, “Outstanding Contribution Medal to Manned Space Project” and other honors.