

# 射频赛题说明

## Radio Frequency Competition Description

### 竞赛课题：

### 基于AI智能体的Ku波段微带发夹线滤波器 自动优化设计

#### Competition Topic:

## AI Agent-Based Automatic Optimization Design of Ku-band Microstrip Hairpin Filter

### 一、竞赛任务

#### I. Competition Task

本赛题要求参赛队伍设计一款生成式AI智能体，实现Ku波段微带发夹线滤波器自动化优化设计。该滤波器的具体结构和参数指标详见《HFSS射频仿真设计实例大全》第8章，徐兴福主编。

参赛队伍需要自行选择大语言模型（如Claude、GPT-4、Qwen等）并搭建智能体框架，通过智能体技术自动化地调用芯和半导体Hermes软件完成该滤波器的设计和优化工作。

This competition requires participating teams to design a generative AI agent that realizes the automated optimization design of a Ku-band microstrip hairpin filter. The specific structure and parameter specifications of this filter are detailed in Chapter 8 of the book "HFSS RF Simulation Design Example Collection", edited by Xu Xingfu.

Participating teams are required to select their own large language model (such as Claude, GPT-4, Qwen, etc.) and build an agent framework to automatically invoke Xpedic Hermes software for the design and optimization of the filter through agent technology.

### 二、设计规范

#### II. Design Specifications

##### 2.1 输入输出要求

##### 2.1 Input/Output Requirements

AI智能体需要接收该滤波器设计目标参数作为输入，包括通带范围、带外抑制和介质基片参数（要与书上给的参数值有区别）。完整运行智能体的推理和脚本调用芯和半导体Hermes软件进行仿真流程，输出为S参数结果。

The AI agent needs to receive the filter design target parameters as input, including the passband range, out-of-band rejection, and dielectric substrate parameters (which should differ from the parameter values given in the book). It should fully execute the agent's reasoning and script invocation process to run simulations using Xpedic Hermes software, with the output being the S-parameter results.

##### 2.2 验证要求

##### 2.2 Verification Requirements

参赛队伍需要提供完整的功能仿真环境，证明设计的正确性。验证时至少需要在5组测试目标参数上进行测试。

Participating teams must provide a complete functional simulation environment to demonstrate the correctness of their design. Verification must be tested on at least five sets of target parameters.

### 三、评分体系

#### III. Scoring System

竞赛采用基础分加权重分的评分方式。完成基本功能并通过验证的队伍可获得基础分60分，剩余40分根据精度和性能表现进行加权评分。

The competition adopts a scoring method combining a base score and weighted scores. Teams that complete the basic functionality and pass verification will receive a base score of 60 points. The remaining 40 points will be awarded based on a weighted evaluation of accuracy and performance.

### 3.1 基础分 (60分)

#### 3.1 Base Score (60 points)

设计能够完整运行滤波器优化设计的推理和自动化仿真流程，并在至少5组测试目标参数上得到合理的S参数输出，即可获得60分基础分。这里的"合理输出"是指输出格式正确，数值在预期范围内，不要求达到特定的准确率。

A design that can successfully run the complete inference and automated simulation workflow for the filter optimization, and obtain reasonable S-parameter outputs for at least five sets of test target parameters, will receive the 60-point base score. "Reasonable output" here means the output format is correct and the values are within an expected range; achieving specific accuracy rates is not required.

### 3.2 性能评分 (40分)

#### 3.2 Performance Score (40 points)

剩余40分按照以下权重分配：精度占50% (20分)，性能50% (20分)。

The remaining 40 points are allocated according to the following weights: Accuracy accounts for 50% (20 points), Performance accounts for 50% (20 points).

**精度评分 (20分)** 采用归一化方式计算。所有通过基础验证的队伍中，在5组测试目标参数上测试S参数准确率，准确率最高的队伍得20分，其他队伍按比例折算。计算公式为：精度得分 = (本队准确率 / 最高准确率) × 20分。

**Accuracy Score (20 points):** Calculated using a normalization method. Among all teams that pass the basic verification, the accuracy of the S-parameters is tested on five sets of target parameters. The team with the highest accuracy will receive 20 points. Other teams' scores will be scaled proportionally. Calculation formula: Accuracy Score = (Team's Accuracy / Highest Accuracy) × 20 points.

**性能评分 (20分)** 主要考察推理的准确性。考察智能体达到目标所需的迭代次数。次数越少，说明智能体的推理与初值估算越准确。采用归一化方式，性能最优的队伍得20分，其他队伍按比例折算。

**Performance Score (20 points):** Primarily examines the accuracy of inference. It examines the number of iterations required for the agent to achieve the target. Fewer iterations indicate more accurate agent inference and initial value estimation. Normalization is used, with the best-performing team receiving 20 points, and other teams' scores scaled proportionally.

#### 创新加分 (最高10分)

#### Innovation Bonus Points (Up to 10 points)

在智能体框架设计优化技术等方面有突出表现的队伍可以获得额外加分，最高10分。智能体框架的自动化程度和通用性可获得最高5分加分，算法优化技术可获得最高5分加分。

Teams demonstrating outstanding contributions in areas such as agent framework design or optimization techniques may receive additional bonus points, up to a maximum of 10 points. The automation level and versatility of the agent framework can earn up to 5 bonus points, and algorithmic optimization techniques can earn up to 5 bonus points.

## 四、提交材料

### IV. Submission Materials

#### 4.1 技术报告

##### 4.1 Technical Report

参赛队伍需要提交一份的技术报告 (PDF格式)，内容包括智能体框架的设计思路、量化策略与精度分析、优化方法、用户与智能体框架的交互日志和人工介入情况等。报告应清晰说明设计思路和关键技术选择。

Participating teams must submit a technical report (PDF format), including the design concept of the agent framework, quantification strategy and accuracy analysis, optimization methods, interaction logs between the user and the agent framework, and any manual intervention involved. The report should clearly explain the design ideas and key technical choices.

#### 4.2 源代码与脚本

##### 4.2 Source Code and Scripts

需要提交完整的Python设计代码，以及智能体相关的脚本和配置文件。同时需要提供Hermes仿真测试平台的脚本代码。所有代码应有适当的注释，便于评审。

The complete Python design code, along with the agent-related scripts and configuration files, must be submitted. Additionally, the script code for the Hermes simulation test platform needs to be provided. All code should include appropriate comments to facilitate review.

#### 4.3 验证报告

##### 4.3 Verification Report

验证报告需要包含至少五个端到端的推理和自动化仿真样例、综合分析报告。

The verification report needs to include at least five end-to-end inference and automated simulation examples, along with a comprehensive analysis report.