科技寫作(Scientific Writing)

Week 11 (Dec. 08 – Dec. 12)

Introduction Section

期末報告Requirement

1. 書面格式: (PDF) [RevTeX 4.2 Template and Sample]

2. 內容：

(i) PDF-1 : Title + Abstract

(ii) PDF-2 += PDF-1 + all (Sub)section Titles

(iii) PDF-3 += First-sentences of all paragraphs in Method Section

(iv) PDF-4 += PDF-3 + At least 2 Figures for experimental results (with captions and some First-sentences in the Result section.

(v) PDF-5 += PDF-4 + First-sentences of all paragraphs in at least one Discussion subsection.

期末報告Requirement (口頭15mins-年會口頭報告長度)

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口頭: **3 mins**概述研究**(1)**背景、**(2)**具體問題、**(3)**研究方法邏輯、**(4)**預期得到結果、**(5)**結果之預期**physical implication**

(iii) PDF-3 += First-sentences of all paragraphs in Method Section

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報告前e-mail繳交PDF-1~5 (檔名：姓名_ScientificWriting_1(or2345).pdf)、
評分會考慮是否超時(15 mins)及遲(未)到
若針對同學的報告提問可額外加分

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論文全文：
https://ui.adsabs.harvard.edu/abs/2024A%26A...685A..18L/abstract

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Introduction section

A nightmare for the supervisor. ☹

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1. Who are your readers: Experts

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A professional journal paper is NOT a textbook. DO NOT try to educate your readers with the introduction section. (Exception: when the major purpose of your paper is to clarify a long-standing misunderstanding of something basic.)

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Introduction =! 文獻回顧

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   (1) Appetizing

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Don’t be verbose!
Otherwise, people may give up reading before they get to the main text!
(no longer than 1 two-column page. Never!)

論文全文：
https://ui.adsabs.harvard.edu/abs/2024A%26A...685A..18L/abstract

Introduction section

1. **Who are your readers: Experts**
2. **What are the purposes of the introduction section?**
   (1) Appetizing
   (2) Providing context and logic (instead of providing knowledge!)
      (i) background
      (ii) question
      (iii) logic + method
      (iv) how this paper is organized (optional)

論文寫作實例

Introduction

1. 電子具有波動性？$\lambda = h/p$

2. 雙狹縫實驗

Method

1. 用什麼device作為屏幕
2. 如何generate具特定動量的電子束

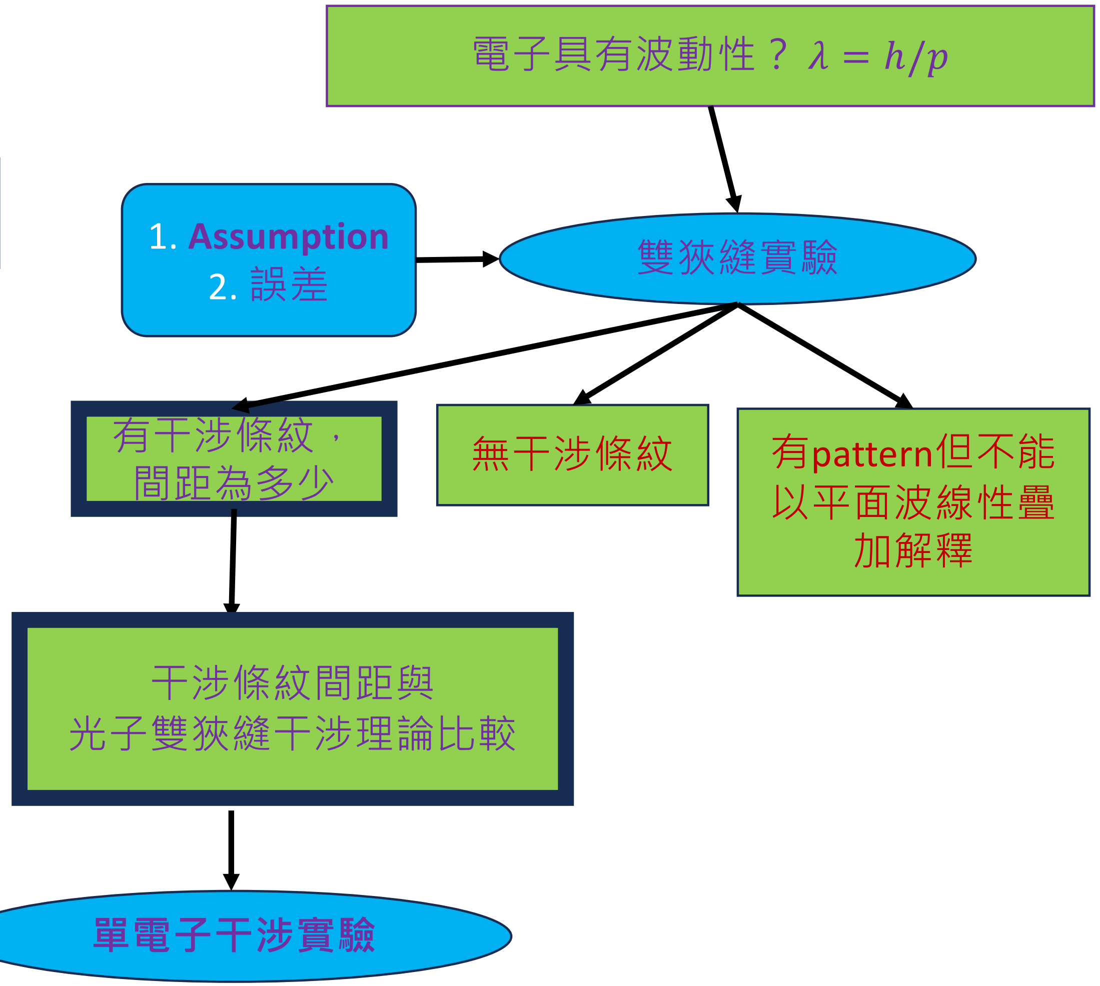
Results

1. 是否有對應到特定波長的干涉條紋？
2. 電子束動量熱誤差及系統性偏差?

Discussion

呼應問題

1. (假設)電子束中的電子無交互作用。若此假設不對，是否可能在不考慮平面波干涉的情形解釋干涉條紋?
2. 干涉條紋間距與光子雙狹縫干涉理論比較，驗證(1)電子的波動性, 及(2)電子動量與波長間的關係
3. 進行單電子雙狹縫干涉實驗以排除電子交互作用造成類似干涉的條文的可能性。



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Context: The blackbody spectrum [1], photoelectric effect [2], Compton scattering [3], and single/double-slit(s) [4] experiments have demonstrated the wave-particle duality of photons [see 5 for a pedagotical review], the quanta of electromagnetic waves. The question is, can all kinds of massive and massless particles (e.g., electrons) diffract and interfere like how photons do? More specifically, are individual particles characterized by an effective wavelength, which is related to its momentum p by $\lambda = \frac{h}{p}$ [6], where h is the Planck constant?

Subject (sample): Electrons are…

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學位論文的文獻回顧可更具體地以多個sentences敘述各實驗內容及公式怎麼來的。但在有網路及chatGPT的現代，也不是十分必要(指導教授說的算)。

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呼應Compton scattering之敘述

論文寫作實例(課文式贅述)

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Logic: To test the wave-like behavior of electrons, we performed the double-slit experiments for electron beams (e-beams). We control the momentum of the incoming e-beams to narrow ranges, such that the wavelengths can be concretely inferred from $\lambda = \frac{h}{p}$. We varied the centroid momentum and the incident angle, and examined how the patterns on the screen are varied correspondingly.

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Section 2 describes our instrumental setup and the performance of the devices. The results are in Section 3. We detected bright and dark bands on the screen, which appear similar to the interference pattern seen in the double-slit experiments for photons. We explicitly compared the patterns we detected with the patterns theoretically expected from the interference of electromagnetic waves ath the same wavelength (Section 4) and discuss the physical implications. The conclusion is in Section 5.

論文寫作實例

約1/4 page，略為extend後即為標準的introduction section。

Astronomy & Astrophysics manuscript no. output
December 10, 2025

Forming localized dust concentrations in a dust ring

DM Tau case study

Hauyu Baobab Liu[1]

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Received November 25, 2025; accepted November 26, 2025

ABSTRACT

Context. Previous high-angular-resolution 225 GHz (∼1.3 mm) continuum observations of the transitional disk DM Tau have resolved an outer ring at 20-120 au radii that is weakly azimuthally asymmetric.
Aims. We aim to examine dust growth and filtration in the outer ring of DM Tau.
Methods. We performed ∼0.″06 (∼8.7 au) resolution Karl G. Jansky Very Large Array (JVLA) 40–48 GHz (∼ 7 mm; Q band) continuum observations, along with complementary observations at lower frequencies. In addition, we analyzed the archival JVLA observations undertaken since 2010.
Results. Intriguingly, the Q band image resolved the azimuthally highly asymmetric, knotty dust emission sources close to the inner edge of the outer ring. Fitting the 8-700 GHz spectral energy distribution (SED) with two dust components indicates that the maximum grain size (a_{max}) in these knotty dust emission sources is likely $\gtrsim$300 μm, whereas it is $\lesssim$50 μm in the rest of the ring. These results may be explained by a trapping of inwardly migrating "grown" dust close to the ring inner edge. The exact mechanism for developing the azimuthal asymmetry has not yet been identified, which may be due to planet-disk interaction that might also be responsible for the creation of the dust cavity and pressure bump. Otherwise, it may be due to the fluid instabilities and vortex formation as a result of shear motions. Finally, we remark that the asymmetries in DM Tau are difficult to diagnose from the $\gtrsim$225 GHz observations, owing to a high optical depth at the ring. In other words, the apparent symmetric or asymmetric morphology of the transitional disks may be related to the optical depths of those disks at the observing frequency.

Key words. Protoplanetary disks – Planets and satellites: formation – (ISM:) dust, extinction – Radio continuum: ISM

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2. Data and reduction

2.1. Data

2.2. JVLA data processing

3. Results

4. Discussion

4.1. Spectral index distribution and model

4.2. Physical implications

4.2.1. Asymmetry in protoplanetary disks

4.2.2. Dust growth in an initially smooth background disk

5. Conclusion

Acknowledgements. The National Radio Astronomy Observatory is a facility of the National Science Foundation operated under cooperative agreement by Associated Universities, Inc. This paper makes use of the following ALMA data: ADS/JAO.ALMA #2013.1.00498.S, #2013.1.00647.S, #2015.1.00296.S, #2016.1.00565.S., #2016.1.01042.S, #2017.1.01460.S, #2018.1.01755.S. ALMA is a partnership of ESO (representing its member states), NSF (USA) and NINS (Japan), together with NRC (Canada), MOST and ASIAA (Taiwan), and KASI (Republic of Korea), in cooperation with the Republic of Chile. The Joint ALMA Observatory is operated by ESO, AUI/NRAO and NAOJ. The