Getting most out of conferences

Dr Öznur Apsimon

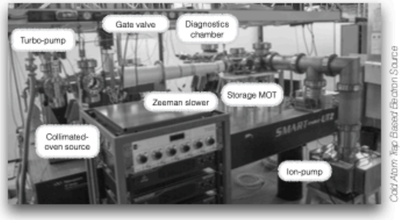
2014

AN ULTRA-COLD ELECTRON FACILITY IN MANCHESTER

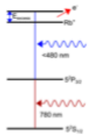
International Particle Accelerators Conference
15-20 June 2014, Dresden, Germany

R. Appleby[1,5], W. Bertsche[1,5], S. Chattopadhyay[1,2,3,5], M. Harvey[1,4], O. Mete[1,5], A. Murray[1,4], G. Xia[1,5]
[1]The University of Manchester, [2]The University of Liverpool, [3]The University of Lancaster, [4]The University of Manchester Photon Science Institute,
[5]The Cockcroft Institute for Accelerator Science and Technology, [6]The European Organisation for Nuclear Research

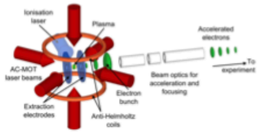
ABSTRACT An ultra-cold atom based electron source (UCAE) facility has been built in the Photon Science Institute (PSI), University of Manchester. In this paper, the key components and working principles of this source are introduced. Pre- commissioning status of this facility and the preliminary simulations results are presented.



INTRODUCTION Manchester's ultra-cold atom trap based electron source setup consists of an atom source, Zeeman slower, magneto- optical trap, storage and diagnostics chambers. An atomic beam is produced using a Rubidium (Rb) oven. The slowing of the atoms is performed through deceleration with a counter propagating laser beam by momentum transfer from the laser field. The fundamental problem of the scheme is Doppler shift of atoms out of resonance with respect the laser beam. This originates partly from the certain line width of the laser and partly from the initial momentum distribution of the atoms. Doppler shift can be compensated by using a spatially varying magnetic field for shifting resonance atomic transition to match the laser frequency. This is provided by a setup called Zeeman Slower that consists of a solenoid with varying magnetic field. Confinement of the atoms are achieved in a magneto optical trap (MOT). Three pairs of circularly polarised, counter propagating orthogonal laser beams and an inhomogeneous magnetic field provided by anti-Helmholtz coils form the atom trap.

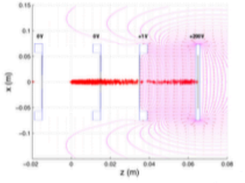


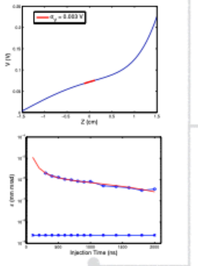
The trapping laser beams are centred on the quadrupole field of the coils. An electron beam can be produced by ionising the ultra cold atom cloud confined in the MOT by using an additional laser beam (ionisation laser).

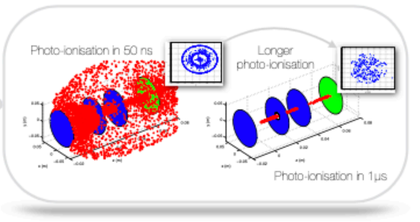


A new technique, the AC-MOT, was invented in the University of Manchester. This technique relies on the fast switching (< 20 µs) of the magnetic field on the coils and therefore provides a magnetic field free time for production and extraction of the electrons. This is important in order to prevent the electrons gaining transverse momentum due to the magnetic field which will lead to the growth of the beam emittance. An atom cloud can be maintained in the storage MOT and it can be pushed to the experimental chamber by using a laser beam. For the initial commissioning, the experimental chamber contains the electron extraction electrodes and a multi-channel plate (MCP) detector for beam profile measurements.

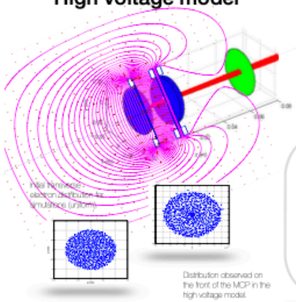
Penetrating field model



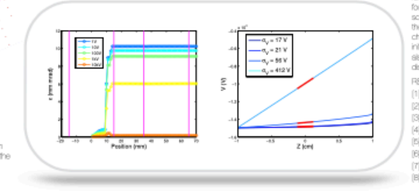




High voltage model



Ionised electrons will be separated and transferred out of the MOT towards the diagnostic stages or onto an experiment. A set of three electrodes is used to provide the extraction field. Electrodes are made out of fine mesh that is transparent to the laser beams and still provides 99% trans- mission for the electrons. Bias voltages and the locations of the electrodes can be configured to provide different initial beam characteristics. Beam tracking was performed by using General Particle Tracer code (GPT) [8]. 3D space charge force was taken into account to study the extraction process. The setup can function either in "penetrating field" or in "high voltage" mode to provide low energy spread or low emittance, respectively.



CONCLUSIONS AND OUTLOOK

Pre-commissioning simulation results and operation modes of the cold atom trap based electron source in Manchester were presented in this paper. It has been, numerically, shown that it is possible to produce and extract electrons either with energy spread of 3 meV or emittance of 0.2 mm mrad, initially, before beam optimisation to improve the beam quality even further. Forthcoming beam commissioning of the facility will initially assess beam profiles and intensities extracted from the system. The ionisation of the MOT with different laser wavelengths will be tested. The voltage difference across the MOT might be compensated by providing a large enough laser bandwidth rather than a monochromatic beam. This would allow creating a beam low energy spread and low emittance, simultaneously. Within the mid-term plans the facility will be modified for more sophisticated beam manipulation by including an RF acceleration section, focusing elements and a pepper pot emittance measurement station. The screening effect of positive ions in the MOT, present briefly after the ionisation of the electrons, will be numerically studied as it might mitigate a fraction of the space charge induced emittance growth. Momentum directions of the electrons can be initiated by the electric field vector of the laser ionising them. This phenomenon is also under numerical study alongside with the evolution of the different initial spacial distributions such as a hollow beam.

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 www.manchester.ac.uk, www.cockcroft.ac.uk, www.stfc.ac.uk oznur.mete@manchester.ac.uk

2015

MANCHESTER 1824 Photon Science Institute

IPAC15

The University of Manchester

LOW ENERGY BEAM TRACKING UNDER SCATTERING FOR A COLD ELECTRON SOURCE IN MANCHESTER

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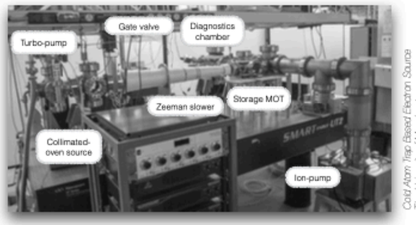
The University of Manchester and

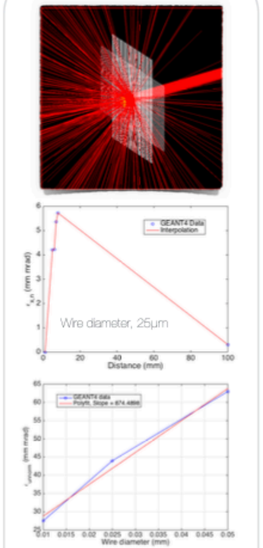
†The Cockcroft Institute of Accelerator Science and Technology, §European Organisation for Nuclear Research, CERN, ¶Photon Science Institute.

ABSTRACT High quality electron beams, with high spatial and temporal resolution, have an important use in electron diffraction experiments to probe and study the constituents of matter. A cold electron source is being developed based on electron ionisation from an atom cloud trapped by using AC magneto-optical methods in the University of Manchester. The technique will produce bunches of electrons well suited for high precision and single shot electron diffraction. In this paper issues of modelling at low energies for this state of art electron source with very low energy spread are presented, with a focus on newly developed tools to model the scattering in the meshes used to support the extraction electric fields. The dependence on emittance growth on mesh wire thickness is studied.

INTRODUCTION Electron diffraction experiments are an integral part of many fields of research, including crystallography, spectroscopy and investigations into chemical bonding. As these fields progress, there is an ever-increasing need for electron beams with better spatial and temporal resolution, requiring investigation into novel methods of increasing beam quality. The AC-MOT, currently being developed at Manchester, promises to deliver low-emittance and low temperature beams through the cooling of the electron source using magneto-optical trapping [1, 2]. It offers advantages over conventional magneto-optical trapping techniques through the AC magnetic field, such that there are no residual fields due to eddy currents persisting after the trapping cycle has ended. As such, the trajectories of electrons extracted from the AC-MOT are unaffected by stray external fields resulting in a more reliable electron source with potentially higher beam quality.

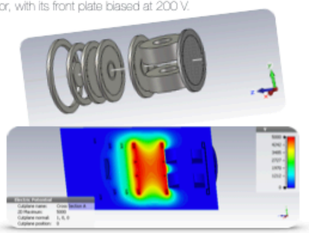


Cold Atom Trap Based Electron Source The University of Manchester

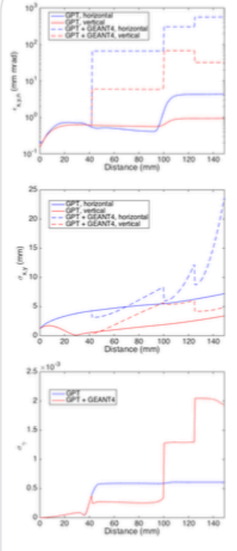


FIGURES An example to particles scattering through the woven mesh with various wire diameters simulated with GEANT4.

EXTRACTION REGION The atoms in the MOT are ionised and the electrons are extracted using a series of electrostatic electrodes towards the diagnostic section (or later an electron diffraction experiment or injection into a FEL). A full description of the AC-MOT in this experiment can be found in [1]. After passing through the grounded MOT field coils, the electrons pass through three electrodes connected to 5 kV power supplies, which provide the extraction fields. An electrode is constructed of a stainless steel ring covered with a fine mesh, designed to support the fields but allow electron transmission. The three electrodes are followed by the Microchannel Plate (MCP) detector, with its front plate biased at 200 V.



PARTICLE TRACKING Particle tracking through the extraction region was performed by using General Particle Tracer (GPT) [4] with 3D field maps extracted from CST. The choice of tracking tool is dictated by the need to model correctly low energy transport through electromagnetic fields and an efficient space-charge model to correctly include the intra-bunch forces in the ultra-low-energy beam. GPT is used for this purpose. A focus of the current design work presented in this paper is the impact of low energy electron scattering in the meshes used to support the electric fields - in this work the scattering model in GPT is replaced by a more accurate scattering model of GEANT4, to give a realistic estimation of the emit- tance growth from elastic scattering in the meshes. So in this paper, the effect of the beam-mesh interaction was in- vestigated with a coupled tracking tool of both GPT and GEANT4 [5, 6], with the fields produced in CST, ensuring the electron-mesh interaction is performed according to the interaction differential cross sections. Practically the code coupled is realised with a series of helper scripts, handling coordinate and unit translation at every mesh encountered by the GPT tracking.



FIGURES Reconstructed rms values for various observables along the beam axis using GEANT4 and GPT combined tracking.

CONCLUSIONS A technique combining the GEANT4 and GPT codes in order to simulate the non relativistic electrons undergoing acceleration under static electric fields in the Manchester-Cockcroft AC-MOT and scattering through fine mesh struc- tures is presented. The aim is electron transport from the Manchester-Cockcroft AC-MOT to an MCP with controlled emittance growth. We show that the emittance growth of a realistic beam is very high with the existing experimen- tal setup and propose a solution to preserve the emittance through extraction geometry optimisation. We are also commissioning the experiment in Manchester, with one of the goals to benchmark these simulations.

REFERENCES

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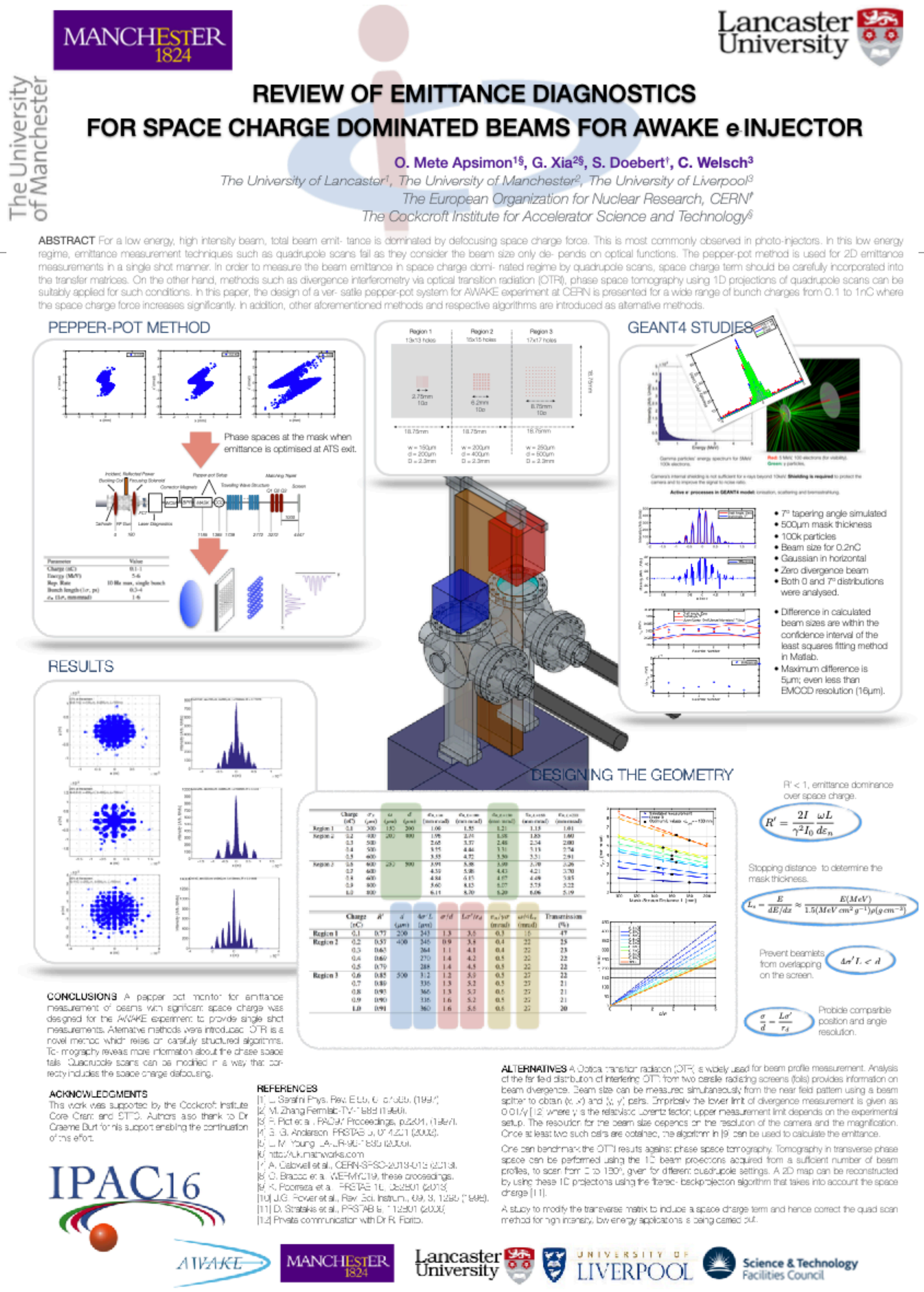
MANCHESTER 1824
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The University of Manchester
REVIEW OF EMITTANCE DIAGNOSTICS
FOR SPACE CHARGE DOMINATED BEAMS FOR AWAKE e INJECTOR
O. Mete Apsimon1§, G. Xia2§, S. Doebert†, C. Welsch3
The University of Lancaster1, The University of Manchester2, The University of Liverpool3
The European Organization for Nuclear Research, CERN†
The Cockcroft Institute for Accelerator Science and Technology§
ABSTRACT For a low energy, high intensity beam, total beam emit- tance is dominated by defocusing space charge force. This is most commonly observed in photo-injectors. In this low energy regime, emittance measurement techniques such as quadrupole scans fail as they consider the beam size only de- pends on optical functions. The pepper-pot method is used for 2D emittance measurements in a single shot manner. In order to measure the beam emittance in space charge domi- nated regime by quadrupole scans, space charge term should be carefully incorporated into the transfer matrices. On the other hand, methods such as divergence interferometry via optical transition radiation (OTRI), phase space tomography using 1D projections of quadrupole scans can be suitably applied for such conditions. In this paper, the design of a ver- satile pepper-pot system for AWAKE experiment at CERN is presented for a wide range of bunch charges from 0.1 to 1nC where the space charge force increases significantly. In addition, other aforementioned methods and respective algorithms are introduced as alternative methods.
PEPPER-POT METHOD
Phase spaces at the mask when emittance is optimised at ATS exit.
Region 1
13x13 holes
Region 2
15x15 holes
Region 3
17x17 holes
GEANT4 STUDIES
7° tapering angle simulated
500μm mask thickness
100k particles
Beam size for 0.2nC
Gaussian in horizontal
Zero divergence beam
Both 0 and 7° distributions were analysed.
Difference in calculated beam sizes are within the confidence interval of the least squares fitting method in Matlab.
Maximum difference is 5μm; even less than EMCCD resolution (16μm).
RESULTS
DESIGNING THE GEOMETRY
R' < 1, emittance dominance over space charge.
Stopping distance to determine the mask thickness.
Prevent beamlets from overlapping on the screen.
Provide compatible position and angle resolution.
CONCLUSIONS
ACKNOWLEDGMENTS
REFERENCES
ALTERNATIVES
IPAC16
AWAKE
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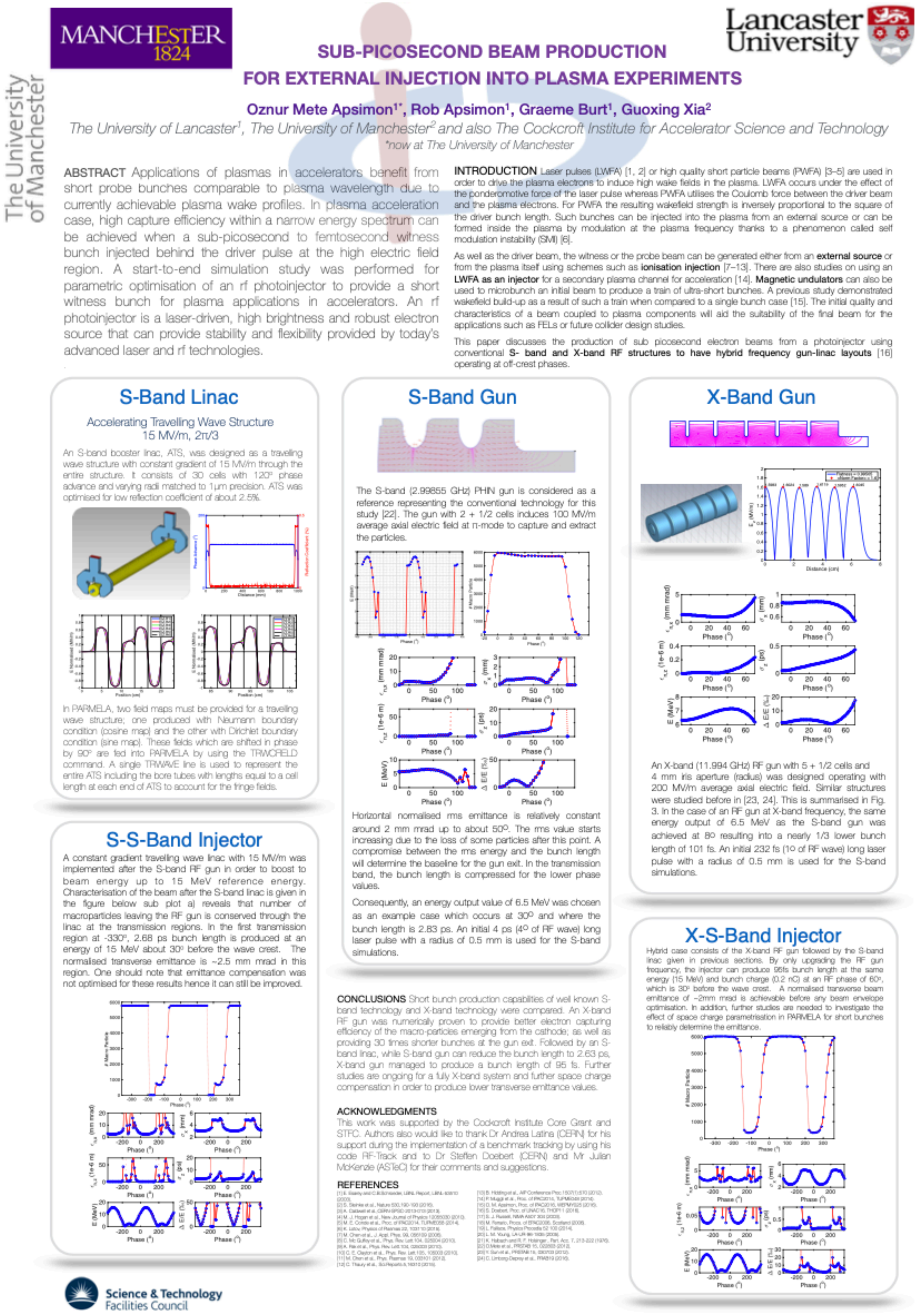
2017

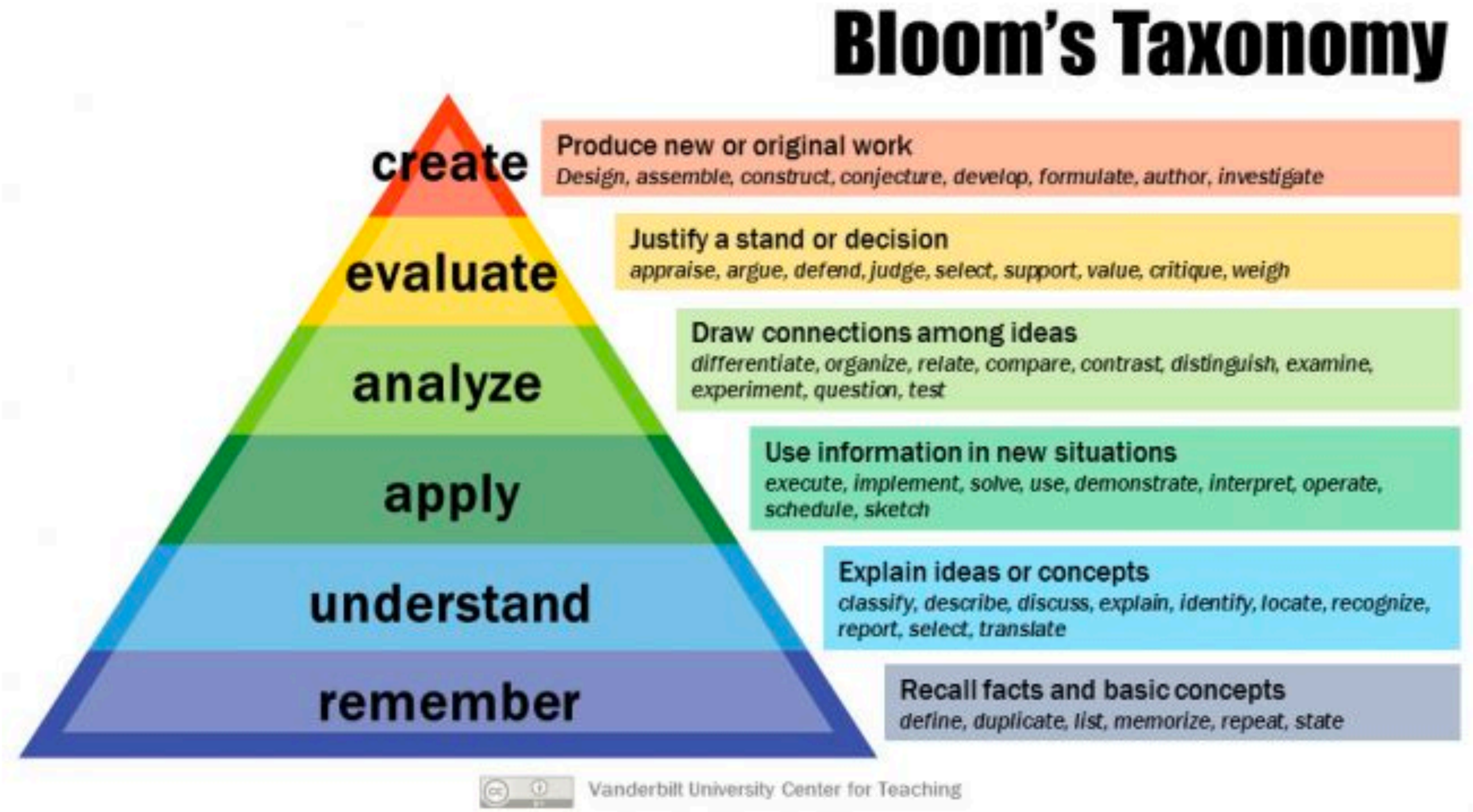
Trivia time

- Do not put too much text in your posters (I do it, too!)
- Visually attractive to kindle a conversation,
- Have printouts of your proceedings for more info,
- Do not have many posters to present, enjoy networking aspects of a conference, too,
- Do not reveal results that you will publish in a journal as some high impact journals requires embargo until they publish
- Consider conference special editions of journals, such as PRAB.



Before disseminating your research…

Conception of an idea



Conception of an idea

- Know your field (literature to date)
- Identify missing links
- Set SMART goals

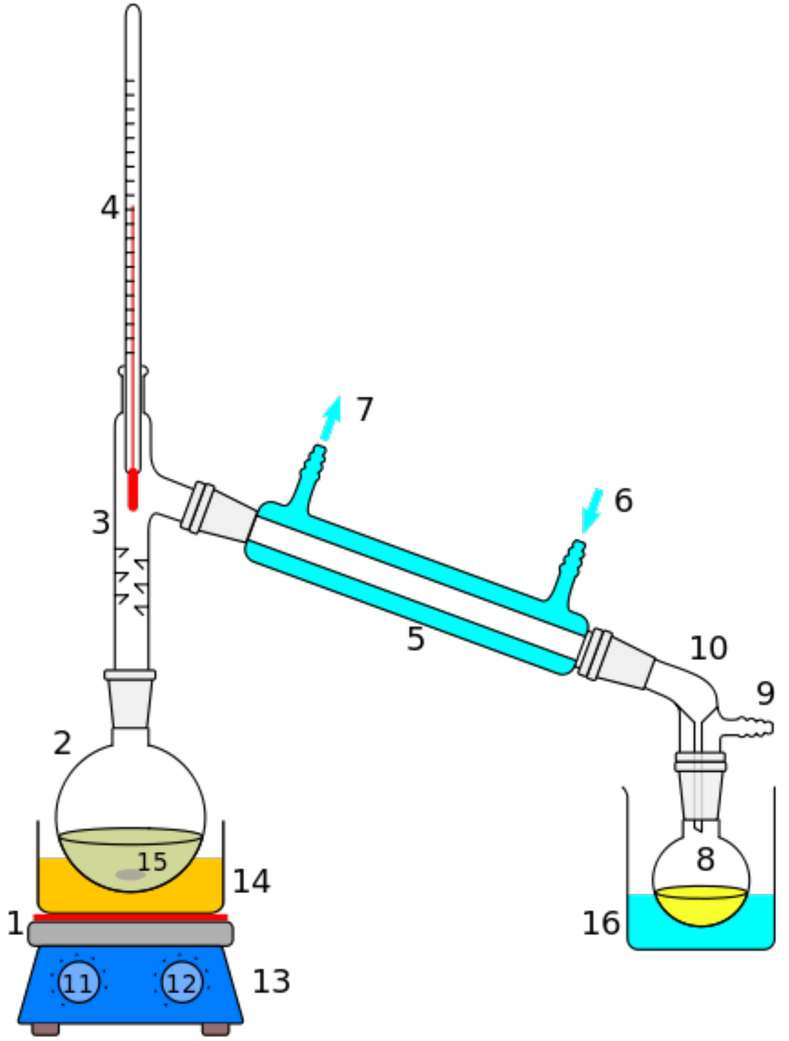
  Specific

  Measurable

  Achievable

  Relevant

  Time-bound



Once you distilled your arguments…

Scholarship of research

- Peer review
- Dissemination
- Collaboration
- Networking

Expressing your research

- Motivation
- Arguments
- Result
- Methods
- Conclusions
- **Not in this order. Where would you start?**

Think

Plan

Do

Expressing your research

- Motivation
- Arguments
- Result
- Methods
- Conclusions

3

2

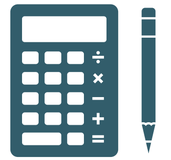
1

?

Think

Plan

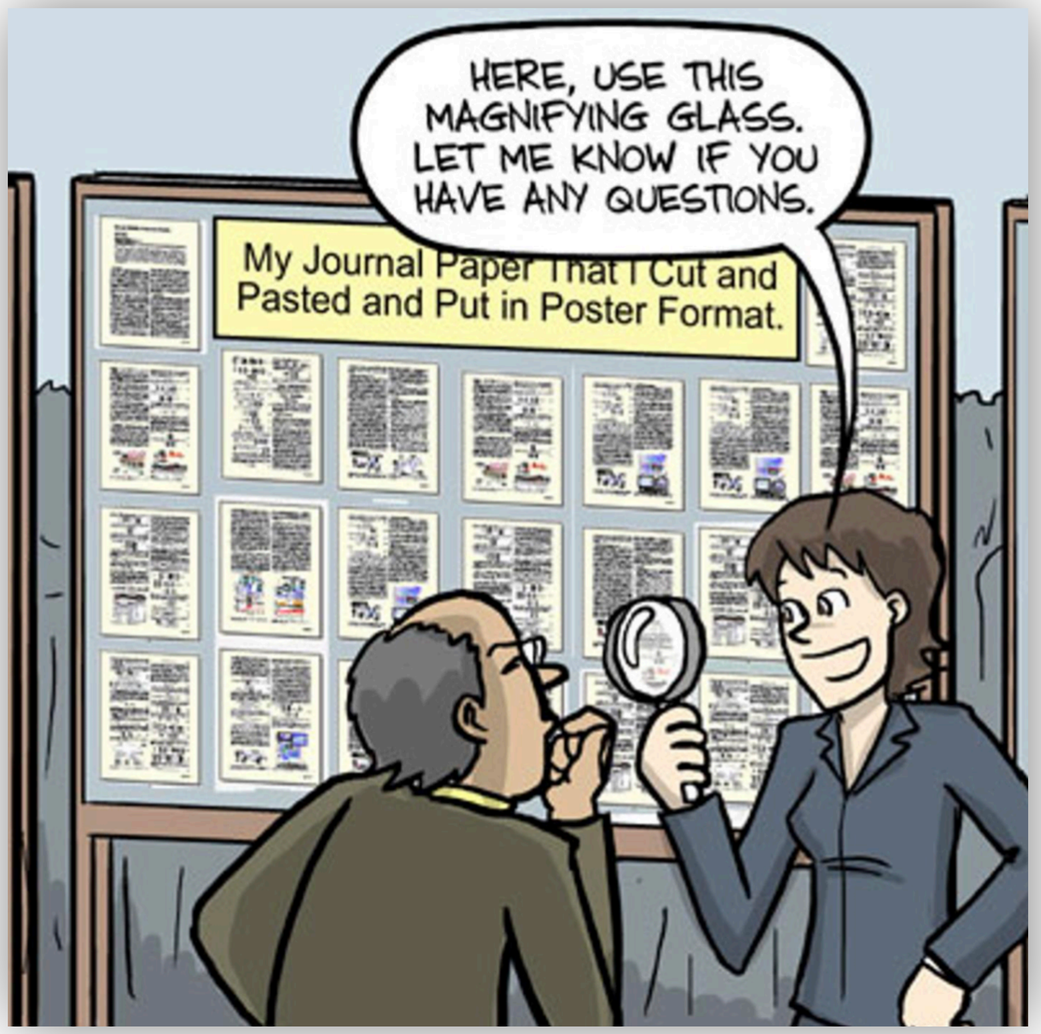
Do



- **Not in this order. Where would you start?**

Let’s go to a conference now…

Preparing a good conference poster



Availability and use of language assistance services in community pharmacies

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Introduction

- 19.4% of the US population speaks a language other than English at home and 8.6% has limited English proficiency (LEP)
- LEP patients suffer from limited access to care, receive poorer quality care, and are less likely to understand and adhere to care plans involving medications
- As a result, language assistance services (LAS) have been developed to help the pharmacy profession address these barriers

Terminology

Interpret: facilitate verbal communication for individuals who speak different languages

Translate: change written documents from one language to another

Objective

The purpose of this study was to determine the utilization of and barriers to accessing language assistance services (LAS) in community pharmacies for limited English proficiency (LEP) patients

Methods

- A 34-item survey was administered to assess LAS use and attitudes among a national sample of 500 chain and 500 independent community pharmacists
- Four mailings (i.e. pre-notification, survey, reminder, and replacement survey) were developed based on Dillman's Tailored Design Method
- Descriptive statistics were used to summarize the results and inferential statistics were used to measure for associations

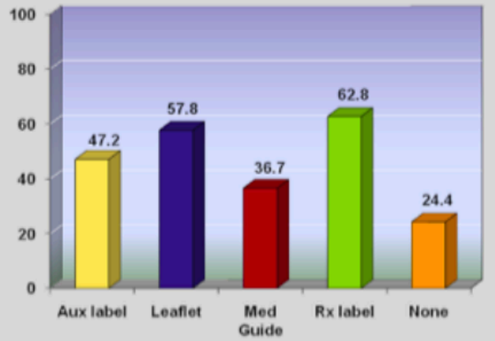
Results

- 296 surveys were completed and 26 were returned for a response rate of 30.0%
- Demographics: 63.1 % of responders were male, 36.9% were female; 44.9% independent and 55.1% chain pharmacists; 91.0% listed English as best language

Table 1. Most commonly requested

Written	Verbal
Spanish	Spanish
French	French
Vietnamese	Vietnamese
Chinese	Chinese
Polish	Italian

Figure 1. Written parts that can be translated (%)



Results – Summary of Challenges

- 52.8% of pharmacists with LAS do not notify patients about its availability
- A third of pharmacists (31.7%) report they do not have written LAS capabilities (e.g. Rx labels)
- Half (52.2.%) of all surveyed are concerned about inaccuracies in translations/interpretations
- 23.9% of pharmacists believe LAS take too much time
- 21.4% are concerned about legal issues

Conclusions

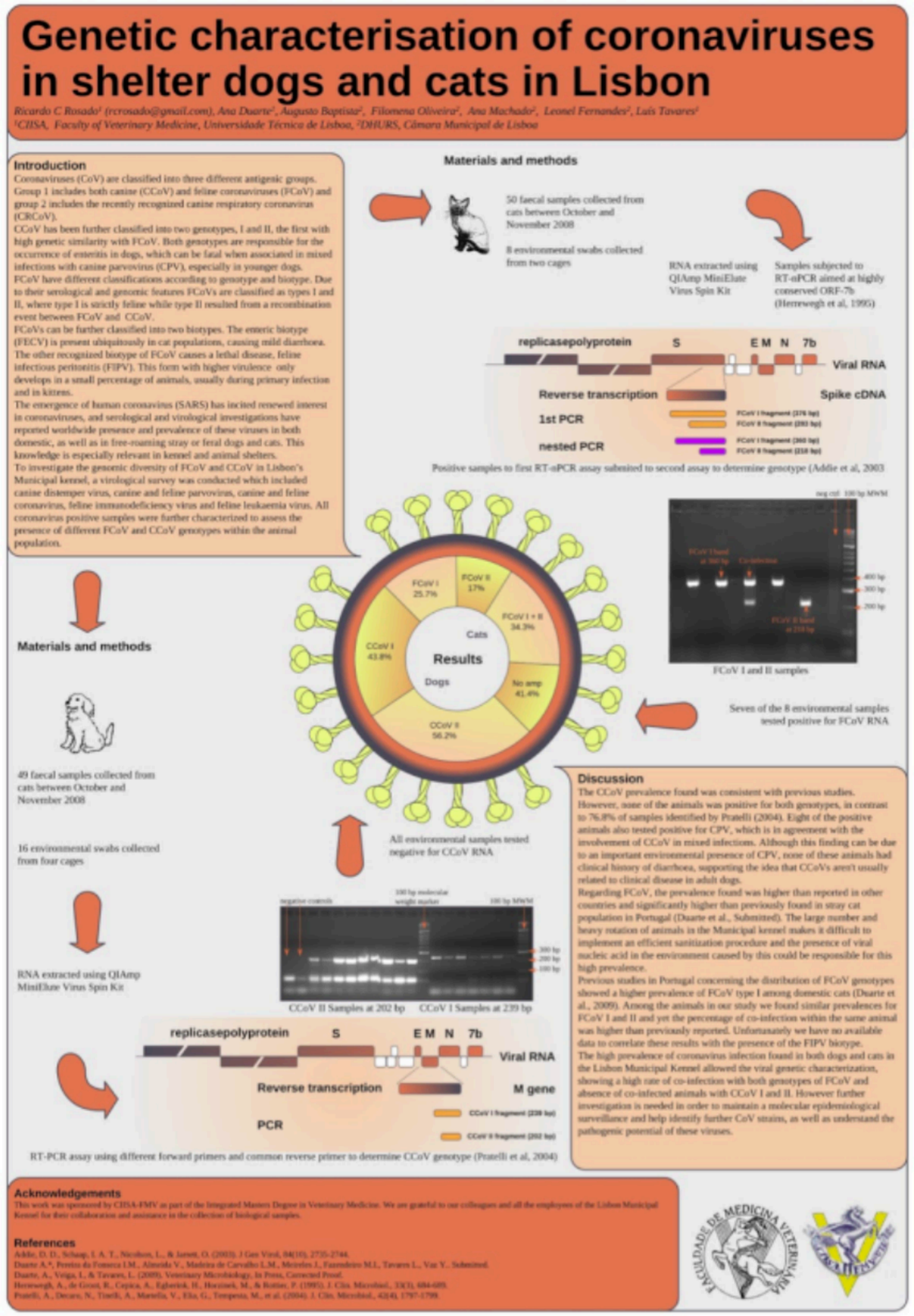
- Substantial barriers to optimal LAS use exist including availability, awareness, and efficiency of tools
- A disconnect between pharmacists and patients about LAS is also an obstacle to navigate; next step in research plan is to survey consumers
- Automated LAS kiosks, natural language processing, and use of social media are all tools that pharmacies may employ to improve LAS

http://sites.psu.edu/pubhub/wp-content/uploads/sites/36309/2016/04/Posters-The-Good-and-the-Bad.pdf

Preparing a good conference poster

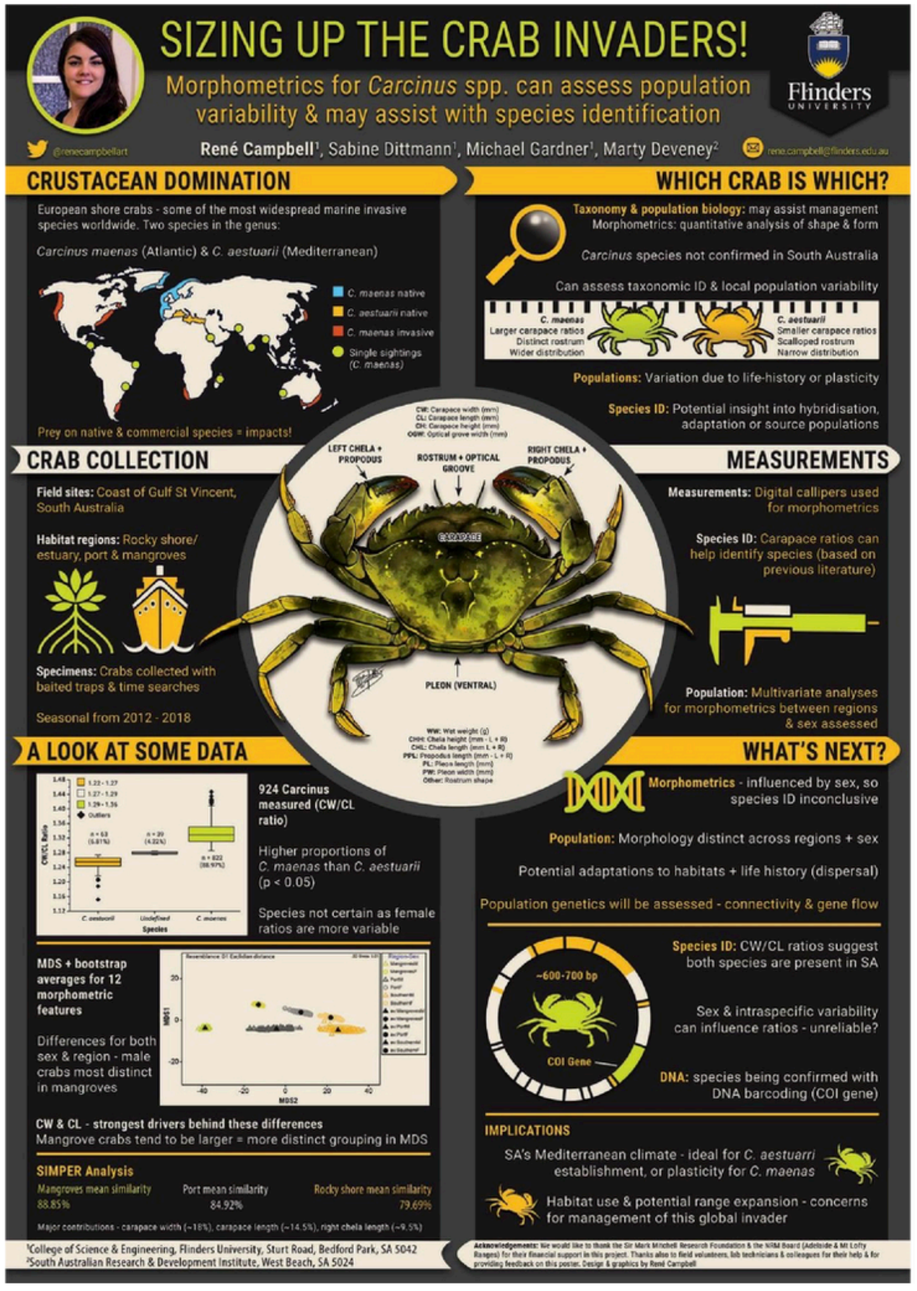
- **The good:**
  - Nice use of bullets
  - Not too text heavy
  - The columns are aligned to guide the reader to read vertically
  - The title is written using a good format (not all caps)
  - Sans-serif fonts

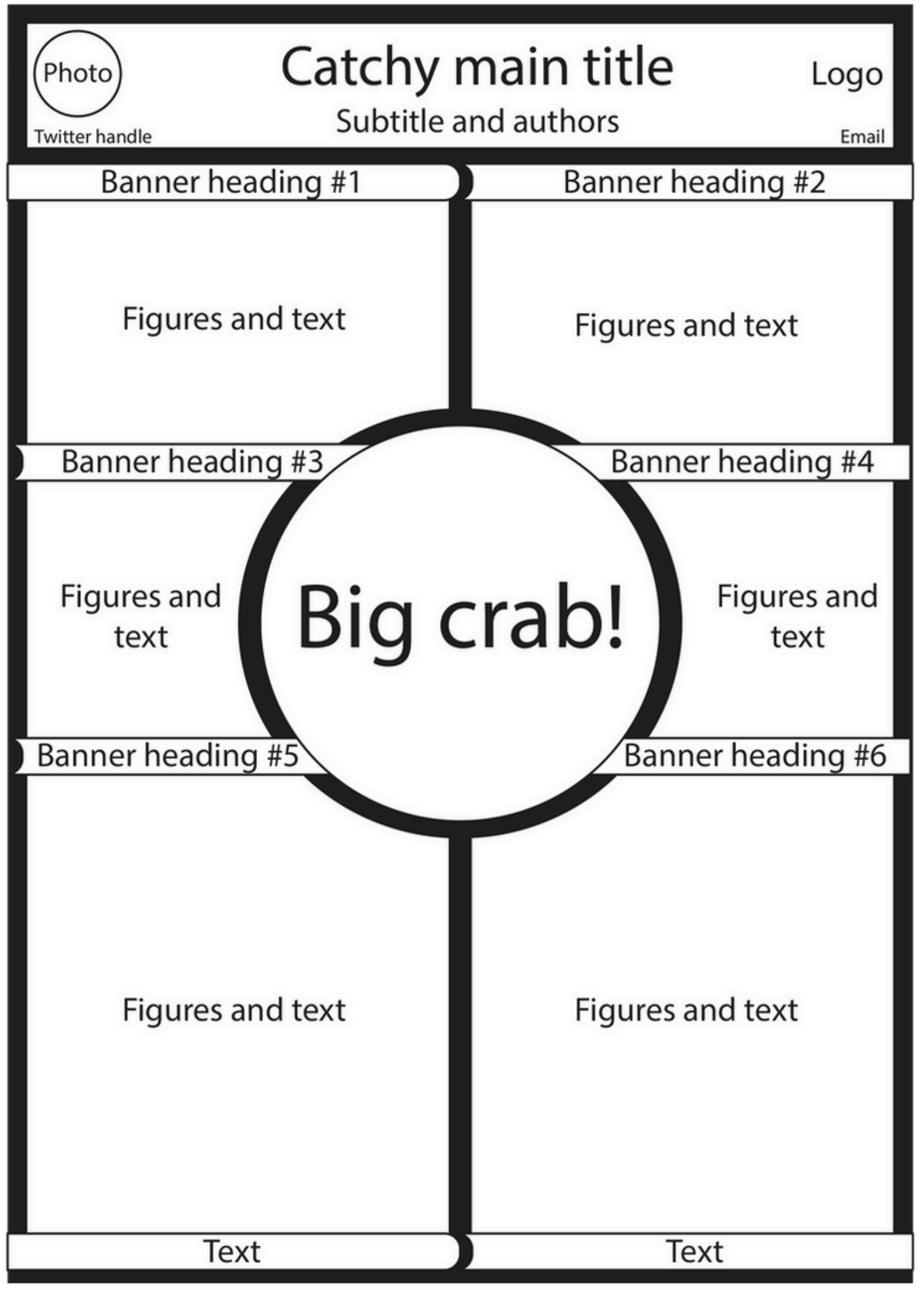
- **The bad:**
  - The grey textbox background gives the poster a dull look
  - The list of universities and icons in the title block look cluttered
  - There is no reference section
  - The overall colour scheme is not the most pleasant
  - The middle column is not centred
  - Textbox outlines or wider margins would better separate the text from the background
  - The 3D graph would be better as a 2D
  - Section titles are no justified consistently
  - Figure captions are above the figures, and some even lack one.



Preparing a good conference poster

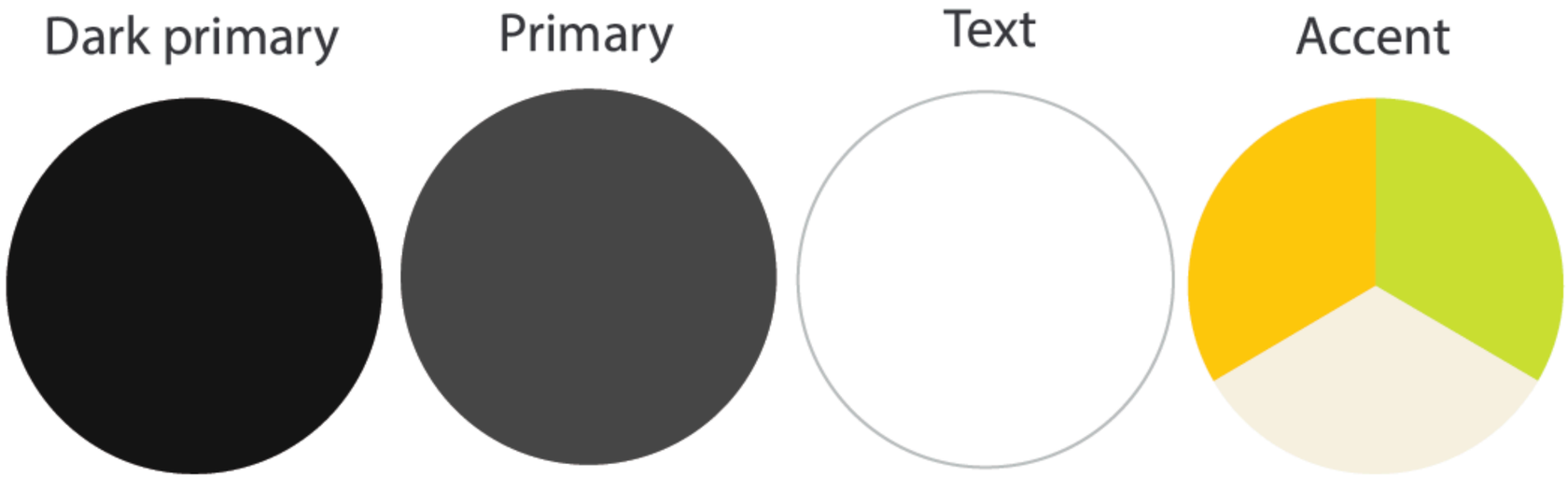
- **The good:**
  - Acknowledgements and references have their own section at the bottom
  - Logos are at the bottom
- **The bad:**
  - Overall disorganised look
  - Difficult to know which way to read this poster
  - Title font is too large compared to rest of the text
  - Images blend together and thus hard to interpret
  - No consistency between section: some sections are in text boxes and others are not
  - The dark backgrounds for the title block and references draw your eye away from the body of the poster.





by René Campbell

Consider using eyedropper tool to create consistent colour scheme.



https://www.animateyour.science/post/best-examples-of-scientific-posters

Conclusions after peer engagement

Paper titles we came up with:

- Performance characteristics of Cs implanted copper
- Catapult acceleration in graphene layers
- 6D beam dyn optimisation for DLA

General points

- avoiding self-promotion
- optimising the content in poster according to how much it will be manned
- how to secure a talk
- preparation to get the most out of expert interaction
- know your audience, aim for appropriate conferences, sign up to newsletter, research professional, google scholar, IoP
- use of social media in conferences and QR codes

Wider implications

- Language, blending in a certain community
- networking, multi-disciplinary interaction
- establishing seminal work