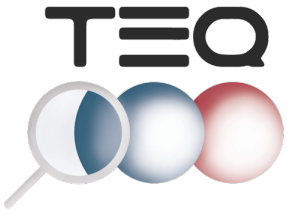
Horizon 2020
European Union funding
for Research & Innovation



DELIVERABLE 6.1

Press Release

Grant agreement n°:	**766900**
Project acronym:	**TEQ**
Project title:	**Testing the Large Scale limit of Quantum Mechanics**
Funding scheme:	**FET-OPEN**
Start date of project:	**01 January 2018**
Duration:	**48 months**
Due date of the Deliverable	**31.03.2018**
Deliverable issued:	**28.03.2018**
Dissemination Level	**Public**
Version:	**1.0**

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INTRODUCTION

As part of the dissemination plan of TEQ, the Consortium will prepare a Press Release. This document represents one of the most important points in the dissemination plan of the Project. It aims to extend the awareness of the Project in the general public. This is achieved by using a simple example from everyday life, however without being too simplistic or losing the original purpose of the document. The Press Release broadcasts the ideas on which the Consortium is built and underlines the European Commission's investments in the Project mission.

OBJECTIVES

Prepare the Press Release text.
Organize an external collaboration the development of an illustration for the Press Release.
Dissemination of the Press Release.

ACHIEVEMENTS

To properly broadcast the central ideas on which the Project is erected, a Press Release was prepared. Its message is effective, direct and easily understandable, as the document is intended for the general public.

The Press Release's title is "*TEQ leads the quest for understanding the foundations of physics*", and its text was prepared by Angelo Bassi (PI of Project) together with the Mauro Paternostro (Local PI for the QUB Partner). It is focused on the following four points:

1. What is the Quantum Superposition Principle?
2. Why quantum superpositions are not perceived in everyday life at human scales?
3. What is the Project about?
4. Which is the European Commission's investment in the Project?

The Press Release soundly answers these questions by using an example that can be simply understood by the general public. This is the free kick made during a football match, a situation that everyone has experience of, and thus it is a perfect exemplification of the ideas of the Project.

To make the Press Release even more effective, the Consortium decided to present the Press Release with a Figure that depicts the chosen example. To this end, the Consortium decided to involve the general public; the high school Liceo Scientifico "G. Galilei" in Trieste (Italy) was appointed for the task. The preparation of the Figure for the Press Release is part of a broader two years long project of the school. This collaboration is completely in line with the dissemination purposes of the Consortium, which are to inform, also by using informal approaches, the general public of research, developments and findings in quantum mechanics.

The creation of the Figure used in the Press Release is an integral part of the school's project. The Figure was chosen via two stages of selection. The first selection was done within the school, whilst the second was carried out by the Consortium. **Figure 1** reports all the proposals that passed the first selection and were subject to the second selection. The Consortium selected the third illustration, which is shown in **Figure 2**.

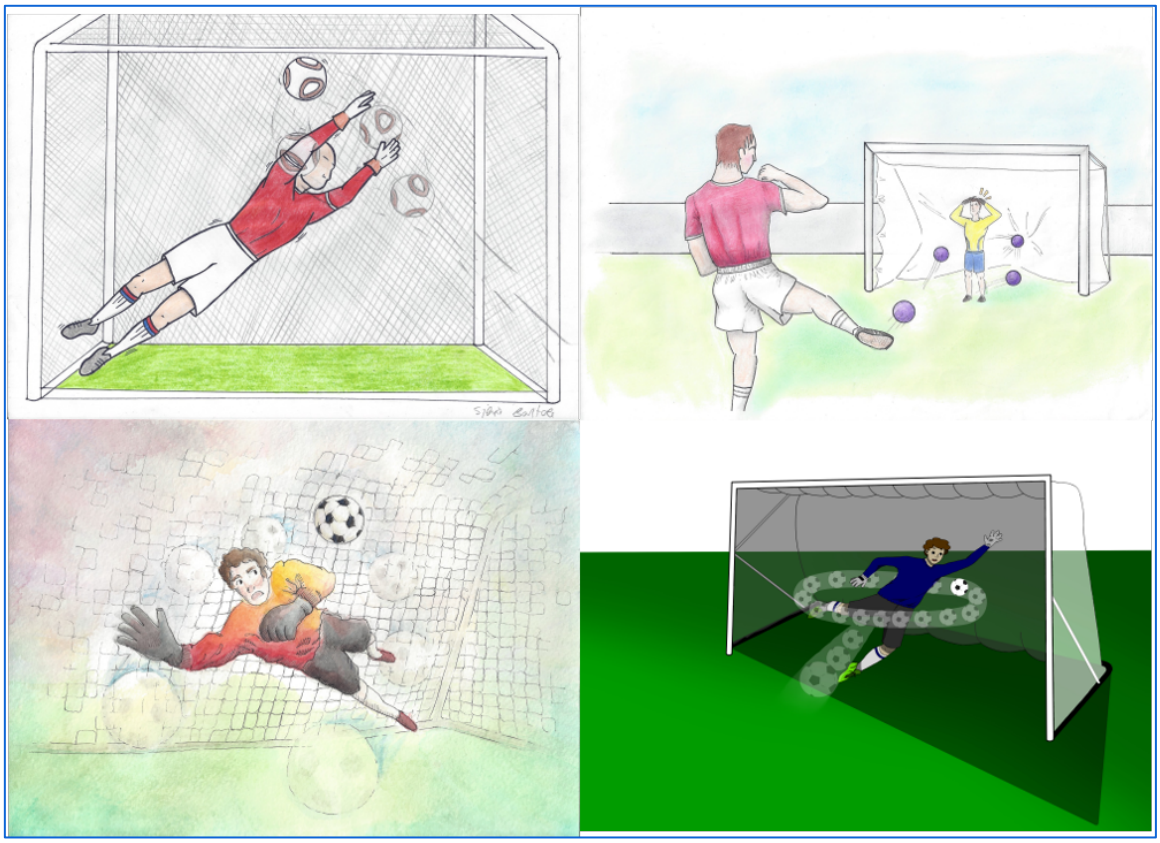
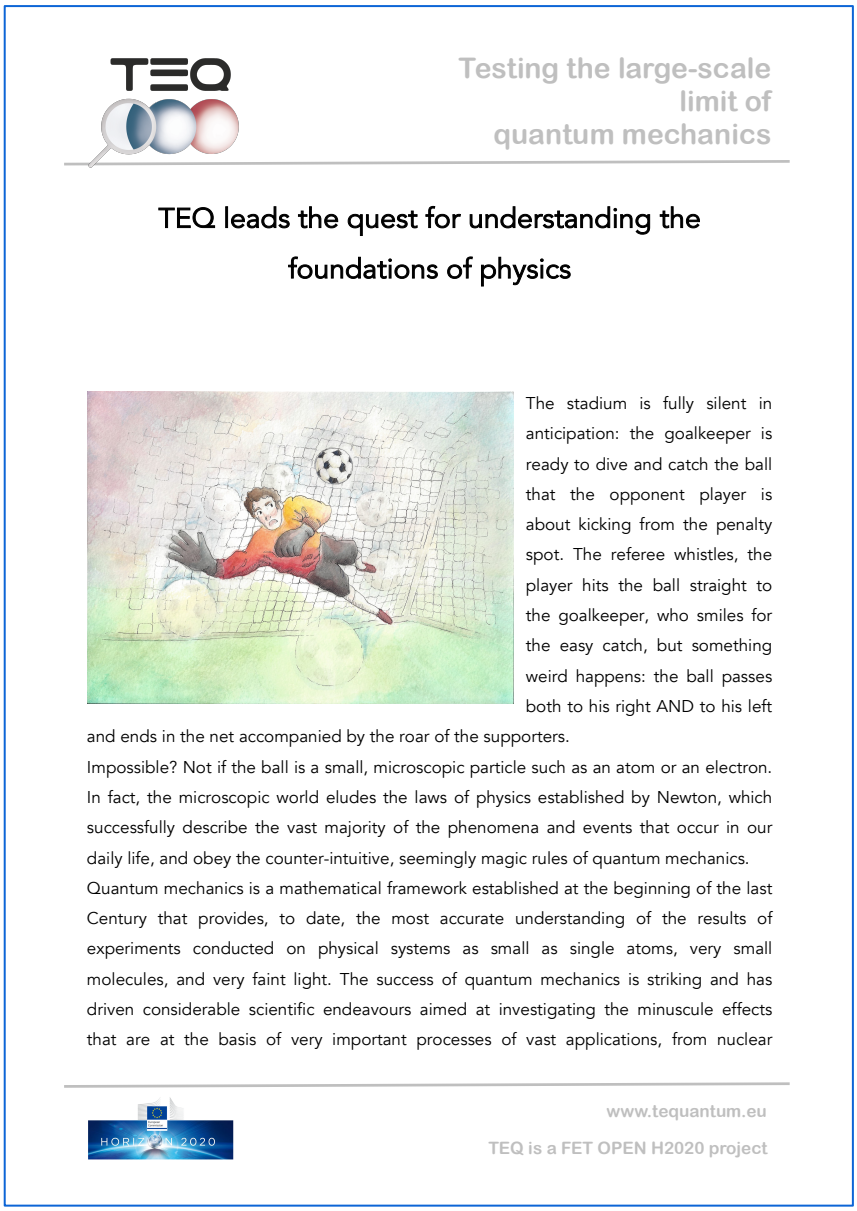


Figure 1: Illustrations selected by the school "G. Galilei" in Trieste (Italy) and presented to the Consortium for the Press Release.

Figure 2: Illustration selected by Consortium for the Press Release.

The Press Release is structured as follows.

On the first page, the Logo, the extended Name of the Project and the Project's website address, together with the H2020's logo and founding information are presented. The Project Logo and Name are shown on each page of the Press Release. **Figure 3** shows the Press Release's first page where the above information are shown. The first page also contains also the illustration reported in **Figure 2**.


Testing the large-scale limit of quantum mechanics

TEQ leads the quest for understanding the foundations of physics

The stadium is fully silent in anticipation: the goalkeeper is ready to dive and catch the ball that the opponent player is about kicking from the penalty spot. The referee whistles, the player hits the ball straight to the goalkeeper, who smiles for the easy catch, but something weird happens: the ball passes both to his right AND to his left and ends in the net accompanied by the roar of the supporters.

Impossible? Not if the ball is a small, microscopic particle such as an atom or an electron. In fact, the microscopic world eludes the laws of physics established by Newton, which successfully describe the vast majority of the phenomena and events that occur in our daily life, and obey the counter-intuitive, seemingly magic rules of quantum mechanics.

Quantum mechanics is a mathematical framework established at the beginning of the last Century that provides, to date, the most accurate understanding of the results of experiments conducted on physical systems as small as single atoms, very small molecules, and very faint light. The success of quantum mechanics is striking and has driven considerable scientific endeavours aimed at investigating the minuscule effects that are at the basis of very important processes of vast applications, from nuclear

www.tequantum.eu

TEQ is a FET OPEN H2020 project

Figure 3: First page of the Press Release.

On the final page of the Press Release, the list of the Consortium Partners is reported. Additionally, the *Photo Credit* for the illustration of the Figure and information about the collaboration between the school "G. Galilei" and the Consortium are provided. The section of the final page with the list of the Consortium Partners and the Photo credit is shown in **Figure 4**.

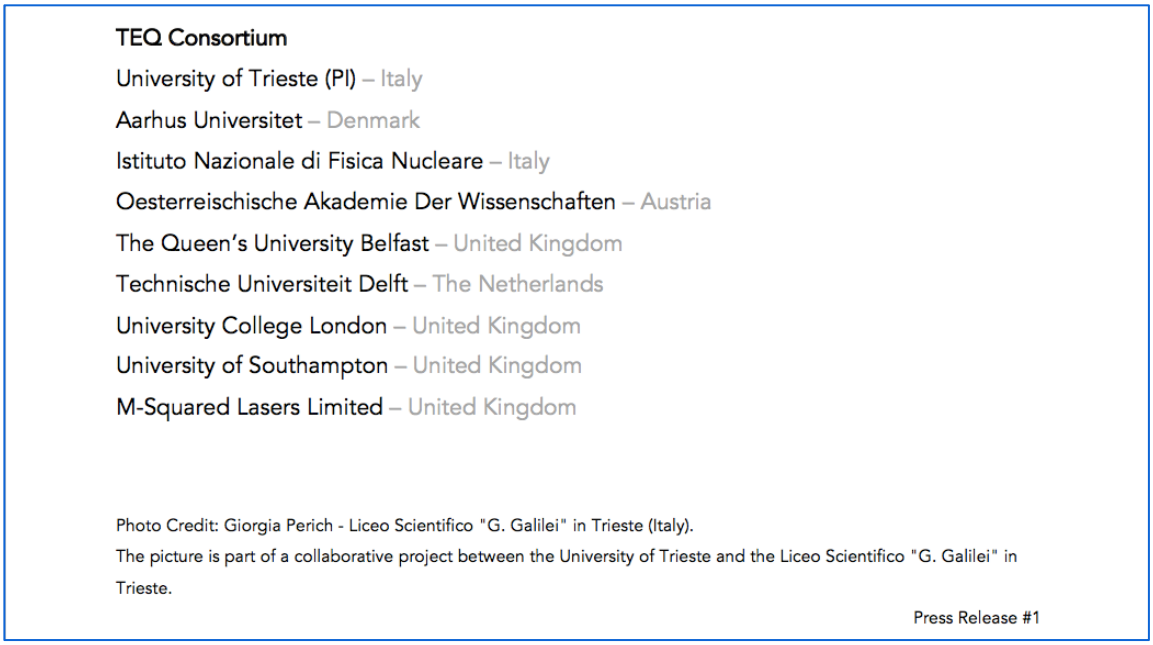


Figure 4: Part of the last page of the Press Release reporting the list of the Consortium Partners and the Photo credit for the Figure in the first page of the Press Release.

The Press Release was distributed among the Partners. The Partner's Press Offices contacted Local and National newspapes and sent them the Press Release. Several media outlets reported the Press Release in its entirety or part of it. **Figure 5** shows a screenshot of the Dissemination page on the website of the Project (www.tequantum.eu where the list of the media announcing the Project's Press Release is reported.

Figure 5: Dissemination page on the Project website with the list of the media announcing the Project's Press Release.

The list includes seven Italian, one Romanian and six English media outlets between 2017 and 2018 exhibiting the results of the dissemination activity and its impact on the media. **Figure 6** shows the screenshots of the media websites announcing the Press Release of the Project.

Figure 6: Screenshots of the media webpages announcing the Project.

Additionally, the article "A new FET Collaborative Project: Testing the Large-Scale Limit of Quantum Mechanics" by Bassi and Curceanu was submitted to *Nuclear Physics News* (to appear) to announce the Press Release to the scientific community.

The Press Release was also announced on the social media pages of the Project; on the Facebook and Twitter page. **Figure 7** shows the social media pages where the Press Release was announced.

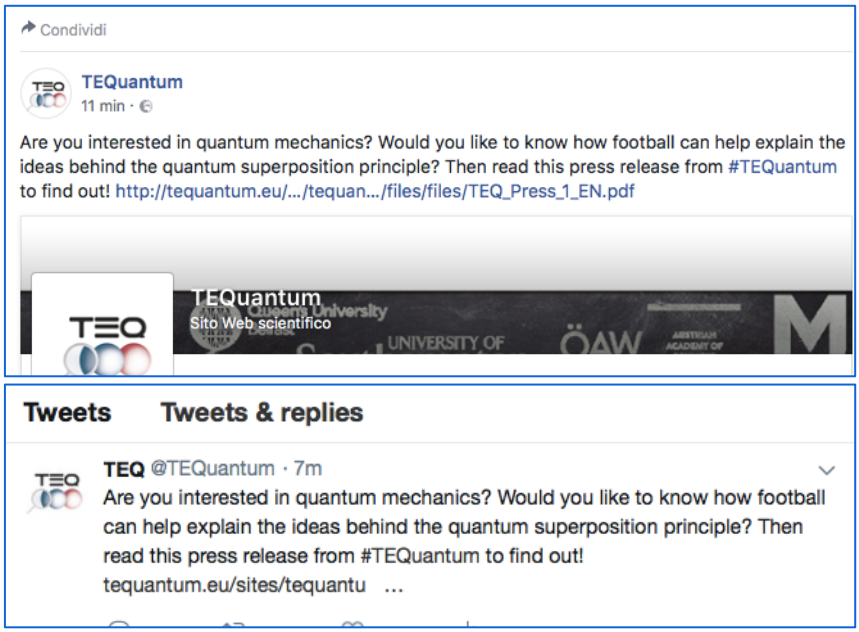


Figure 7: Screenshots of the social media pages of the Project announcing the Press Release.

ISSUES MET AND SOLUTIONS

No issue was met in the achievement of this deliverable.

CONCLUSION

The Press Release was prepared. It provides key information about the TEQ Project and how it was founded by the European Commission. The Press Release communicates the purpose and objectives of the TEQ Project using language and examples that a lay audience would understand and find engaging. An illustration was prepared for the Press Release. The Press Release was successfully disseminated both directly by the Project's website and social media channels and via international media outlets, resulting in fourteen articles across three countries.

Annex: Press Release

TEQ leads the quest for understanding the foundations of physics

The stadium is fully silent in anticipation: the goalkeeper is ready to dive and catch the ball that the opponent player is about kicking from the penalty spot. The referee whistles, the player hits the ball straight to the goalkeeper, who smiles for the easy catch, but something weird happens: the ball passes both to his right AND to his left and ends in the net accompanied by the roar of the supporters.

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magnetic resonance to the transistor, from the laser to the most accurate GPS.

Besides being undeniably successful, quantum mechanics is equally undeniably 'weird'. It allows as perfectly legitimate physical processes that put one of the microscopic systems mentioned above in two different, perfectly distinguishable configurations at the same time! That is, our microscopic foot-ball could pass on the left of the goalkeeper and on his right at the same time. The law that makes such a case possible is the so-called 'quantum superposition principle' (QSP), arguably the most fundamental statement in quantum physics.

The validity of QSP at the microscopic level has been confirmed by an enormous amount of very accurate experimental data: atoms, electrons, and photons (the quantum mechanical building blocks of light) have been prepared in states that superimpose fully distinct physical configurations, such as being 'here' and 'there', at the same time.

However, is this valid only when we consider such elementary quantum systems? Everyday experience seems to suggest so: the foot-ball always slips either on the left or on the right of the keeper (but sometimes he catches it): never in both ways simultaneously. The macroscopic world that is before our very own eyes seems to elude the richness of quantum superposition states. On the other hand, real foot-balls are made of atoms, which are quantum. So why don't we see them behaving quantum mechanically? It could simply be that such states are fragile, or in general hard to see but there nevertheless for us to explore them.

Whether we can observe quantum superpositions of macroscopic objects is arguably 'the' open question in quantum physics. An answer in the positive will boost the quest for the use of the weirdness of quantum mechanics in a much larger set of physical systems, not restricted to the microscopic world. The relevance of this difficult question cannot be remarked enough.

Now, a team of quantum scientists have joined in consortium to address such a fundamental quest from an innovative standpoint, supported by a € 4.4M grant awarded by the European Commission (EC). The Collaborative Project "TEQ" (Testing the large-scale limit of quantum mechanics) puts together 8 leading European research group and company MSquared to explore quantum effects at the large scale under the support of the EC Horizon2020 research framework programme. The project is one of only 26

funded proposals out of 374 submitted to the latest call for Future and Emerging Technologies projects.

The team will levitate a small particle within a well-controlled environment, with low temperature and low vibrations. In such an environment an indirect test of the QSP can be performed by analyzing carefully the noise that affects the center of mass motion of the trapped particle. The measured noise will then be compared to theoretical predictions from different models - some of which assume a breakdown of QSP.

The ambition of the project is to establish the ultimate bounds to the validity of the quantum framework, if any. "This is the question to address", says Prof. Angelo Bassi, PI of TEQ, "because it has been discussed for ages in the foundations of physics community and we now have the experimental tools to get a definite answer. So we really can make a big step forward here."

The award of such a competitive grant reinforces the relevance of fundamental investigations on quantum theory to underpin the current developments in the area of quantum technologies.

TEQ Consortium

University of Trieste (PI) – Italy
Aarhus Universitet – Denmark
Istituto Nazionale di Fisica Nucleare – Italy
Oesterreischische Akademie Der Wissenschaften – Austria
The Queen's University Belfast – United Kingdom
Technische Universiteit Delft – The Netherlands
University College London – United Kingdom
University of Southampton – United Kingdom
M-Squared Lasers Limited – United Kingdom

Photo Credit: Giorgia Perich - Liceo Scientifico "G. Galilei" in Trieste (Italy).
The picture is part of a collaborative project between the University of Trieste and the Liceo Scientifico "G. Galilei" in Trieste.