

COST Action CA15220 Action Title: Quantum Technologies in Space

Draft Agenda 1st Management Committee Meeting 149 avenue Louise, Brussels, Belgium 20 October 2016 from 09:30 to 17:00

- 1. Welcome to participants
- 2. Verification of the presence of two-thirds of the Participating COST Countries (quorum)
- 3. Adoption of agenda
- 4. Tour de table / introduction of the MC members
- 5. General information on COST mechanism and on the funding and reporting of coordination activities:
 - COST overview, policies and structure
 - Financing COST Action activities: Administrative Rules and Guidelines, Work and Budget Plan,
 - COST Action Grant Agreement, Financial Reporting
 - Scientific/networking Reporting and Monitoring
- 6. Agreement on the internal rules of procedure for the Management Committee of the COST Action
- 7. Setting the frame for the Action presentation by the Science Officer
 - Budget
 - Presentation of the Scientific Committee recommendations to the Action

----- Coffee break -----

- 8. Election of the Chair and Vice-Chair
- 9. Selection of:
 - The Grant Holder institution (Scientific Representative)
 - The FSAC rate for the Grant Holder institution
- 10. Presentation and discussion of the Action
 - a. Presentation of the Action by the "Main Proposer"/Chair of the Action (based on the Memorandum of Understanding)
 - Objectives and deliverables
 - Working Groups and other management roles/structures

 Implementation of COST policies on the promotion of Inclusiveness and Excellence (see below list of Inclusiveness Target Countries), gender balance and Early Career Investigators (ECI)

- b. MC discussion of:
 - Deliverables and timeline
 - Working Groups and other management roles/structures
 - Implementation of Scientific Committee recommendations and COST policies

Inclusiveness Target Countries: Bosnia-Herzegovina, Bulgaria, Cyprus, Czech Republic, Estonia, Croatia, Hungary, Lithuania, Latvia, Luxembourg, Malta, Montenegro, Poland, Portugal, Romania, Slovenia, Slovakia, the former Yugoslav Republic of Macedonia, Republic of Serbia and Turkey.





- 11. Establishment of Action Management structure
 - Election of Working Group Leaders and STSM Manager
 - Election of other management roles

----- Lunch break ------

- 12. Action implementation planning
 - a. Development of Objective Achievement Indicators for MoU Objectives
 - b. 1st Grant Period (GP)
 - Grant Period Goals, WG tasks and deliverables
 - Activity and budget planning (Work and Budget Plan preparation)
 - Dissemination strategy/ planning (Publications and outreach activities)
- 13. Any Other Business (AOB)
- 14. Closing



,]	COST Action CA15220	COST Grant System 18 October 2016	

Action CA15220 Fact Sheet

Title

Quantum Technologies in Space

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Dotaile					

Draft Mou: OC-2015-2-20185 Start of Action: End of Action:

20/10/2016 19/10/2020

Mou: Entry into force: CSO approval date:

16/03/2016 26/02/2016

Objectives

The scientific and technological legacy of the 20th century includes milestones such as quantum mechanics and pioneering space missions. Both endeavours have opened new avenues for the furthering of our understanding of Nature, and are true landmarks of modern science.Quantum theory and space science form building blocks of a powerful research framework for exploring the boundaries of modern physics through the unique working conditions offered by experimental tests performed in space. Space-based sources of entangled photons promise the formation of global quantum communication networks, long-distance tests of quantum theory and the interplay between relativity and quantum entanglement. Long free-fall times enable high-precision tests of general relativity and tests of the equivalence principle for quantum systems. Harnessing microgravity, high vacuum and low temperature of deep space promises allowing the study of deviations from standard quantum theory for high-mass test particles. Space-based experiments of metrology and sensing will push the precision of clocks, mass detectors and transducers towards the engineering of novel quantum technologies. Such an exciting framework is what & Idquo; Quantum Technologies in Space (QTSpace) & rdquo; aims at providing. By fostering concerted research efforts directed towards the development of a new paradium for quantum technologies, QTSpace will embody a visionary opportunity for furthering the comprehension of fundamental mechanisms of physics in an entirely new context. This Action puts together a network of genuine European dimensions. Its technical and scientific excellence, strongly inclusive character, and ambitious research vision will lead QTSPace towards the achievement of inter-sectorial benefits of fundamental and applied nature.



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	Parties		
Country	Date	Country	Date
Austria	04/03/2016	Croatia	09/05/2016
Finland	29/03/2016	France	31/03/2016
Hungary	21/03/2016	Ireland	30/03/2016
Latvia	16/03/2016	Malta	26/02/2016
Portugal	28/04/2016	Slovakia	29/04/2016
Switzerland	22/04/2016	United Kingdom	16/03/2016

Country	Date
Czech Republic	08/04/2016
Germany	18/03/2016
Israel	27/03/2016
Netherlands	29/03/2016
Spain	03/05/2016

Country	Date
Denmark	01/04/2016
Greece	18/07/2016
Italy	14/03/2016
Norway	19/09/2016
Sweden	25/07/2016

Total: 22

	Intentions to a	accept the Mo	U				
Country	Date	Country	Date	Country	Date	Country	Date
Total: 0					•		

	Working Groups
None	

Website		
None		

Management Committee	
Chair	Vice Chair
Domain Committee Rapporteur	

Austria	
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GH Scientific Representative		GH Financial Representative
GH Legal Representative		GH Manager/Administrator
Grant Holder: University	Col	lege Cork - National University of Ireland, Cork- Ireland
GH Scientific Representative		GH Financial Representative
GH Legal Representative		GH Manager/Administrator
Grant Holder: Queen's U	nive	ersity Belfast- United Kingdom
GH Scientific Representative		GH Financial Representative
GH Legal Representative		GH Manager/Administrator



MEETING ATTENDANCE LIST

ECOST-MEETING-CA15220-201016-079790

Meeti	eeting Title: 1st Management Committee meeting End Date: 2016-10-20 End Date: 2016-10-20						
Action	Action Number: CA15220						
Grant	Grant Holder: Ms Cassia Azevedo E-mail: cassia.azevedo@cost.eu Tel: +3225333844 Fax:					Fax:	
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39			
40	19 1		
41	-		

Country Codes: Austria (AT), Croatia (HR), Czech Republic (CZ), Denmark (DK), Finland (FI), France (FR), Germany (DE), Greece (EL), Hungary (HU), Ireland (IE), Israel (IL), Italy (IT), Latvia (LV), Malta (MT), Netherlands (NL), Norway (NO), Portugal (PT), Slovakia (SK), Spain (ES), Sweden (SE), Switzerland (CH), United Kingdom (UK),

Meeting Secretary (Chair or local organiser) Name + signature:



Action CA15220

Quantum Technologies in Space

1st Management Committee Meeting

Dr Fatima Bouchama Science Officer Brussels, 20/10/2016





COST Association Contact Point

Science Officer

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Administrative Officer

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COST Emergency Instructions



Evacuation instructions

Who is responsible of the office evacuation?

<u>15th floor:</u> COST Reception*

- *Leatitia Malone: <u>Leatitia.Malone@cost.eu</u> 43800
- *Dafna Rothschild: <u>Dafna.Rothschild@cost.eu</u> 43838
- Florin Petre: <u>Florin.Petre@cost.eu</u> 3855
- Administrative and Science Officers responsible of the meeting

In case of fire alarm*:

- Stop all activity
- Try to stay calm, do not run
- > Do not lose time in retrieving personal belongings
- \succ Follow the evacuation signals \blacksquare
- Emergency exits 😡 are located in front of the toilets both sides of the building
- Do not use the elevators!
- Join the meeting point, oustide of the building, which is located on the right, at the parking space in the middle of the Avenue Louise facing the children shop « TINOK »
- Be careful when crossing the road for the TRAM!
- > The counting of those present will be done at the meeting point







Kick off meeting purpose

- Official start date of the Action
- General information about COST, COST Actions Management
- Election of key positions within the Action and Selection of GH institution (by voting)
- Establishment of Action Management Structure (by voting)
- Discussion to prepare draft plan of activities in 1st Grant Period



COST: Important documents

http://www.cost.eu/participate

	0007.0.//			(COST 132-14) (PDF, 352 kB)
About COST	COSTActions	Participate Events	Media	 Action Proposal Submission Evaluation Selection and Approval (COST 133-14 (PDF, 286 kB)
		Home Participate		Action Management, Monitoring and Final Assessment (COST 134-14) (PDF, 355 kB)
Submit your COST Action proposal		Participate		 International Cooperation and Specific Organisations Participation (COST 135-14) (PDF, 220 kB)
Join an Existing COST Action				
 Become a COST Expert 		Scientists and researchers from the 35 COST Member Countries and the Copperating State can participate in science and technology networks known as COST Actions by:		Vademecum
				▶ COST Vademecum (PDF, 3 MB)
				COST Action Template Centre
				COST Grant Agreement Template (PDF, 397 kB)
sentations will ched to the				 Final Achievement Report Template - MC Chair (DOCX, 180 kB)
		 Submitting a proposal for a new COST Action Joining an existing COST Action Becoming involved in specific COST Action activities Becoming a COST Expert What are COST Actions?		 Final Assessment Report Template - Action Rapporteur (DOCX, 126 kB)
				 Monitoring Progress Report Template - MC Chair (DOCX, 155 kB)
				 Monitoring Progress Review Template - Action Rapporteur (DOCX, 122 kB)
		COST Actions are bottom-up science and technology networks, open to researchers and stakeholders with a duration of four years. They are active through a range of <u>networking tools</u> , such as workshops, conferences, training schools, short-term scientific missions (STSMs), and dissemination activities. COST does not fund research itself.		 Final Action Dissemination Grant reque form (DOCX, 117 kB)
				 e-COST Action Management Tool User Guide (eCAMT) (PDF, 2 MB)
				Key Documents
o of the M	leeting	COST prides in its support for high-risk, innovative and emerging research themes. However, COST does not set any research priorities.		Technical Annex (DOCX, 111 kB)
				COST Open Call – Submission,
		COST Actions can also pave the way to or establish synergies with EU-		Evaluation, Selection and Approval (SESA) Guidelines (PDF, 2 MB)
		funded research projects. More projects can also lead to new A potential of such consortia.	over, collaboration within research actions, thus enhancing the networking	Guidelines for the Dissemination of COST Action Results and Outcomes (PDF, 2 MB)

EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY

COST Implementation Rules

- Rules for Participation in and Implementation of COST Activities

- st

- Guidelines for Action Management, Monitoring and Assessment (PDF, 3 MB)
- Anonymity in COST Action proposals (PDF, 239 kB)

Note : All pres be attac minutes

20/10/2016 09:30-17:00

Agenda

- 1. Welcome to participants
- 2. Adoption of the agenda
- 3. Establishment of quorum
- 4. Tour de table / introduction of the MC members
- 5. General information on COST mechanism and on the funding and reporting of coordination activities:
 - COST Overview, policies and structure
 - COST Action: Participation, Management, Monitoring and Final Assessment

----- Coffee break-----

- COST Action's Administrative Rules and Guidelines
- 6. Setting the frame for the Action
 - Budget
 - Presentation of the Scientific Committee recommendations to the Action
- 7. Information on the internal rules of procedure for the Management Committee of the COST Action
- 8. Election of the Chair, Vice-Chair
- 9. Selection of:
 - The Grant Holder institution (Scientific Representative)
 - The FSAC rate for the Grant Holder institution



Minutes are prepared by COST

Agenda

- **10**. Presentation and discussion of the Action
 - MoU Objectives and working programme
 - Working method-organisation and management
 - Distribution of tasks
 - Strategies for implementing COST policies
- 11. Establishment of Action Management structure
 - Election of Working Group Leaders
 - Any other horizontal roles (STSM Coordinator, Website Host Institution, Composition of Cor Group, STSMs committee, etc..)
- 12. Action implementation planning 1st Grant Period (GP)
 - Grant Period Goals, WG tasks and deliverables
 - Activity and budget planning (Work and Budget Plan preparation)
- 13. Any Other Business (AOB) approval of IPCs already in proposal "founders"
- 14. Closing



Minutes are prepared by the MC

Agenda

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- 3. Establishment of quorum
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EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY

Action status/Verification of quorum http://www.cost.eu/COST_Actions/ca/CA15220?parties

CA COST Action CA15220

Parties

Action details

MoU	Draft: OC-2015-2-20185
CSO Approval date	26/02/2016
Start of Action	20/10/2016
End of Action	19/10/2020

Participations

Country	Date	Status
Austria	04/03/2016	Confirmed
Croatia	09/05/2016	Confirmed
Czech Republic	08/04/2016	Confirmed
Denmark	01/04/2016	Confirmed
Finland	29/03/2016	Confirmed
France	31/03/2016	Confirmed
Germany	18/03/2016	Confirmed
Greece	18/07/2016	Confirmed
Hungary	21/03/2016	Confirmed
Ireland	30/03/2016	Confirmed
Israel	27/03/2016	Confirmed
ltaly	14/03/2016	Confirmed
Latvia	16/03/2016	Confirmed
Malta	26/02/2016	Confirmed
Netherlands	29/03/2016	Confirmed
Norway	19/09/2016	Confirmed
Portugal	28/04/2016	Confirmed
Slovakia	29/04/2016	Confirmed
> Spain	03/05/2016	Confirmed
Sweden	25/07/2016	Confirmed
Switzerland	22/04/2016	Confirmed
United Kingdom	16/03/2016	Confirmed
Total: 22		

General Information*

Proposer of the Action: Dr Angelo Bassi

Science officer of the Action: Dr Fatima BOUCHAMA

Administrative officer of the Action: Ms Cassia AZEVEDO

Downloads*

Action Fact Sheet Download AFS as .RTF

Memorandum of Understanding Download MoU as PDF

> EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY

Tour de table

http://www.cost.eu/COST_Actions/ca/CA15220?parties

ŧŤŦŧ

- ✓ Name
- ✓ Country
- Background (expertise, previous experience with COST Actions?)
- ✓ Interest / Working Group

CA COST Action CA15220

Parties

Action details

MoU	Draft: OC-2015-2-20185
CSO Approval date	26/02/2016
Start of Action	20/10/2016
End of Action	19/10/2020

Participations

Country	Date	Status
Austria	04/03/2016	Confirmed
Croatia	09/05/2016	Confirmed
Czech Republic	08/04/2016	Confirmed
Denmark	01/04/2016	Confirmed
Finland	29/03/2016	Confirmed
France	31/03/2016	Confirmed
Germany	18/03/2016	Confirmed
Greece	18/07/2016	Confirmed
Hungary	21/03/2016	Confirmed
▶ Ireland	30/03/2016	Confirmed
Israel	27/03/2016	Confirmed
▶ Italy	14/03/2016	Confirmed
Latvia	16/03/2016	Confirmed
Malta	26/02/2016	Confirmed
Netherlands	29/03/2016	Confirmed
▶ Norway	19/09/2016	Confirmed
Portugal	28/04/2016	Confirmed
Slovakia	29/04/2016	Confirmed
Spain	03/05/2016	Confirmed
Sweden	25/07/2016	Confirmed
Switzerland	22/04/2016	Confirmed
United Kingdom	16/03/2016	Confirmed
Total: 22		



Agenda

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----- Coffee break-----

- COST Action's Administrative Rules and Guidelines
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EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY

COST OVERVIEW







Founded in 1971, COST is the oldest and widest European intergovernmental framework for transnational Cooperation in Science and Technology.

COST has been supporting networking of research activities across all 36 Member countries and beyond for more than **40 years**.

COST is open to all disciplines, to all novel and groundbreaking S&T ideas, to all categories of partners where mutual benefit is real.





- COST is an intergovernmental, pan-European Framework (36 Member Countries and one Cooperating State)
- COST mission: enabling Scientific and Technological developments through trans-European networking of national research investments (bottom-up)
- Framework Partnership Agreement (FPA): strategic agreement with the European Commission for Horizon 2020 and Specific Grant Agreements for its implementation
- EUR 292 million budget (constant prices) for 7 years drawn from two Horizon 2020 work programmes:
 - Challenge 6 "Europe in a changing world inclusive, innovative and reflective Societies"
 - Spreading Excellence and Widening Participation"



COST Association and relation with other actors



See: http://www.cost.eu/about_cost/who



COST ACTION PARTICIPATION





Who can participate?

Researchers affiliated to the following <u>INSTITUTIONS:</u>

- Institutions from COST Member Countries, Near Neighbour Countries and International Partner Countries.
- European Commission and EU Agencies.
- European RTD Organisations (CERN, EFDA JET, EMBL, ESA, ESO, ESRF, European XFEL, ILL).
- International Organisations (examples: UNESCO, IOCD, WHO, EFI, CABI, Marie Curie Fellows Association, European Centre for Women and Technology).

International Cooperation and Specific Organisations Participation (COST 135-14)



COST Countries



EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY

COST Action participation



EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY

How COST Countries join an Action

Less than one year after CSO Approval of the Action



More than one year after CSO Approval of the Action

Additionally Management Committee approval required for new COST country requests participation, i.e. after 26/02/2017)


International dimension of COST

The participation of Institutions from Near Neighbour Countries (NNC) and International Partner Country (IPC) is welcome and is based on *mutual benefit*

Institutions in Near Neighbour Countries (NNC):

Balkan countries (Albania and Montenegro),

<u>Mediterranean countries</u> (Algeria, Egypt, Lebanon, Libya, Morocco, the Palestinian Authority, Jordan, Syria and Tunisia)

Eastern European Countries (Armenia, Azerbaijan, Belarus, Georgia, Moldova, Russia and Ukraine)

Institutions in all other International Partner Countries (IPC)



COST Near Neighbour Countries

206 participations in running COST Actions accros 16 countries

- Albania (18)
- Algeria (4)
- Armenia (11)
- Azerbaijan (2)
- Belarus (7)
- Egypt (7)
- Georgia (6)
- Jordan (3)
- Lebanon (2)
- Moldova (4)
- Morocco (17)
- Palestinian Authority (4)
- Syrian Arab Republic (1)
- Russia (54)
- Tunisia (14)
- Ukraine (52)



International Partner Countries

519 participations in running Actions across 29 countries



October 2014 data

How IPCs, NNCs and Specific Organisations join an Action

OPTION 1: NNC & IPC already included in the proposal = FOUNDERS

- Chair encodes applicant details in e-COST on mutual benefit
- Needs MC approval

OPTION 2: NEW NNC & IPC

- Chair encodes applicant details in e-COST
- Applicant and Chair complete application form in e-COST
- Online approval by MC and COST Association

Once the Institution is approved the applicant becomes a MC Observer



COST POLICIES





COST Policies under H2020





Excellence and Inclusiveness

Targeting three dimensions:

- **Geographical (Inclusiveness Target Countries)**:
- Gender balance
- Early Career Investigators



COST Inclusiveness Target Countries

EU 13: Bulgaria Croatia Cyprus Czech Republic Estonia Hungary Latvia Lithuania Malta Poland Romania Slovakia

Slovenia

EU Candidates: fYR Macedonia Montenegro Republic of Serbia Turkey

EU Potential Candidate: Bosnia and Herzegovina

1.1. 8

EU Countries targeted by EC: Luxembourg Portugal



EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY

COST Inclusiveness Target Countries

- Encourage and enable excellent researchers from less researchintensive countries across Europe to set up, lead or join COST Actions
- Counterbalance research communities' unequal access to knowledge infrastructures, funding and resources distribution
- Contribute to the realization of Horizon 2020 Widening Pillar objectives through COST Excellence and Inclusiveness Policy

Implementation Strategy by the MC

SOME EXAMPLES:

- Leadership roles
- Organising and locating Action meetings and events
- Benefiting from COST networking tools
- Promoting STSMs
- Action Think Tank for Early Career Investigators



Gender Balance

Implementation Strategy by the MC

Encourage and enable under represented gender to be intensively involved in all COST activities by the Action

SOME EXAMPLES:

- Leadership roles in the Action structure (e.g. Grant Holders, WG Leaders)
- Benefiting from COST networking tools (in particular STSM and Training Schools)



Early Career Investigators

Implementation Strategy by the MC

Encourage ECI active participation and responsibility roles in all Action activities

SOME EXAMPLES:

- Leadership roles in the Action structure (e.g. Grant Holders, WG Leaders)
- Benefiting from COST networking tools (in particular STSM and Training Schools)

ECI = PhD + up to 8 years



COST ACTION





Action Structure





DECISION MAKING BODY

Coordination, Implementation, and Management of an Action Supervising the appropriate allocation and use of funds

Achieving the Action's MoU objectives

COMPOSED OF

Delegates nominated by their respective COST National Coordinator (CNC)

Up to 2 representatives per Participating COST Country





KEY ROLES in order to ORGANISE THE WORK

ACTION CHAIR

ACTION VICE CHAIR

WG LEADERS

GRANT HOLDER Scientific Representative

And other horizontal roles

CORE GROUP:

Prepare MC decisions



Management Committee

MAIN TASKS TO BE PERFORMED by the MC

Action Strategy

Work & Budget Plan

Dissemination & Exploitation Strategy

Memberships

Implementation of COST Policies

Approval of new Countries and Organizations

Reporting

Supervising the appropriate use of funds



Management Committee

DECISION TAKING PROCEDURE

MC MEETINGS

Minimum once a year in a participating COST Country

Typical duration ½ day

Decisions only valid if at least 2/3 of the Participating COST Countries are represented

Simple majority vote of MC Members with 1 vote / Participating COST Country

The MC Chair does not have the right to vote

MC decision must be minuted and sent to COST Association

EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY

E-VOTE

Initiated and managed by the MC Chair

All MC members are in the e-mail list

Vote open for 7 days

Simple majority vote of MC Members with 1 vote / Participating COST Country

MC decision must be minuted and should be included in the official MC minutes of the following MC Meeting



PRODUCTION & EXCHANGE OF RESEARCH

Achieving the scientific objectives as defined in the MoU

WG Leaders must be MC Members

COMPOSED BY

Researchers from Participating COST Countries **MC members** (all MC members should become members of WGs) MC Observers from approved NNC, IPC, Specific Organisations



COST Networking Tools



EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY

COST ACTION FUNDING





How are COST Actions funded?

Grant Agreement



EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY

Interaction with COST Association



Always indicate Action Number in email subject line!



e-COST Action Management Tool (eCAMT)

- Work and Budget (W&B) Plan drafting, negotiation and approval
 - Once the W&B has been approved by the COST Association e-COST will automatically launch an online MC vote for approval of the W&B
- Grant Agreement e-signature





Please note that a Grant Period Goal should be added before a networking tool can be added.





COST Actions do not fund research

COST Actions DO NOT SPONSOR

COST Actions ORGANISE if appropriate, COST Actions CO-ORGANISE



COST ACTION MONITORING





Monitoring of Actions

Element	Purpose and features
Progress Review 1	Implementation of Scientific Committee (SC) Recommendations & COST Policies
	Identifies any specific interventions needed
(M12)	This report is prepared by the COST Association and will focus on COST Policies and SC Recommendations. The reports will be reviewed by the SC.
Progress Review 2 (M24)	Monitors the progress (towards achievements), Impacts & Successes, and Dissemination & Exploitation
	Identifies specific interventions / urgent needs for improvement
	An Action Rapporteur will be appointed by the COST Association and will perform the evaluation remotely based on a report prepared by the AC (MC approval needed)



Final Assessment

Element	Purpose and features
	Identify how well the Action has reached the defined MoU objectives and deliverables (Achievements, Impacts & Successes, Dissemination & Exploitation, and added value of the networking)
	Collects data for:
Final Assessment	COST Association reporting to EC
Assessment	Impact Analyses
(End of the Action: M48)	The identification of success stories
Action: M+0)	The identification of emerging themes/ potentially important future developments
	An Action Rapporteur will be appointed by the COST Association and will perform the evaluation remotely based on a report prepared by the AC (MC approval needed)



COST ACTIONS ADMINISTRATIVE RULES AND GUIDELINES





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EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY



1st Grant period: 01/11/2016 – 30/04/2017 Allocated budget: 55 500 EUR (including FSAC, excluding this meeting)



Work and Budget Plan

1st Grant Period *: 01/11/2016 – 30/04/2017* Allocated budget: **55 500 EUR (based on 22 parties)**

A. SUMMARY BUDGET

(1) MEETINGS
 (2) SHORT-TERM SCIENTIFIC MISSIONS
 (3) TRAINING SCHOOLS
 (4) PUBLICATIONS, DISSEMINATION, OUTREACH
 (5) Other Expenses Related to Scientific Activities (OERSA)

B. TOTAL SCIENCE EXPENDITURE (sum of (1) to (5))

C. Financial and Scientific Administration and Coordination (FSAC) (max. of 15% of B.)

D. TOTAL EXPENDITURE (B+C) = 55 500 EUR





1st Grant period: 01/11/2016 – 30/04/2017 Allocated budget : 55 500 EUR (including FSAC, excluding this meeting)

✓ Define GP1 Goals (suggestions from each WG Leader)

Discuss the possible activities during GP1
 (for estimation (meetings): Based on COST rules 160 Euros / night plus 350 Euros for travel (higher for remote places)



Work and Budget Plan

GP goals (to be identified *in collaboration* with the WG Leaders)

- must be specific to the Action (avoid general comments)
- should enable the i) fulfilment of the foreseen objectives and
 ii) achievement of the foreseen deliverables as outlined in the
 MoU
- key tasks per WG included already in the MoU good starting point for defining the GP goals

<u>*Please note</u></u>: organisation of a conference is not a GP goal is a networking activity</u>*



Work and Budget Plan

 Networking activities (important points): Take into account COST policies when organising your activities⁺

- **description**: when relevant provide the rough schedule, e.g. 2hrs MC meetings, 2d WG meetings, 3hr plenary session with all WGs

- **the objectives** and how it serves towards the achievement of the set Grant Period Goals

- the outputs

- i) tangible output(s) e.g. proceedings, guidelines etc.
- ii) **less tangible output(s)** knowledge exchange, strategic planning, technical know-how, policy development etc.

e.g. identification of priorities of WGx which will be included in the STSM criteria, Development of collaboration between public and private institutes; dissemination to the end-users through leaflets and website etc.

+ e.g. have at least one meeting in an Inclusiveness Country

COST SC recommendations

The proposed Action must ensure that it implements its very good specific plans to enhance the involvement of Early Career Investigators and, to the extent possible given the field, gender balance.

The proposed Action should explore the potential industrial dimension.


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EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY

COST: Important documents

http://www.cost.eu/participate

				(COST 132-14) (PDF, 352
About COST	COST Actions	Participate Events	Media	 Action Proposal Submission Selection and Approval (C)
			(PDF, 286 kB)	
		Home Participate		Action Management, Mon Final Assessment (COST 1 (PDF, 355 kB)
Submit your COS	ST Action proposal	Participate		 International Cooperation Organisations Participation
Join an Existing	COST Action			135-14) (PDF, 220 kB)
Become a COST Expert		and the Copperating State can participate in science and		Vademecum
		technology networks known	COST Vademecum (PDF, 3	
		Submitting a proposal for a new COST Action Joining an existing COST Action Becoming involved in specific COST Action activities Becoming a COST Expert		COST Action Templat
				 COST Grant Agreement T (PDF, 397 kB)
				 Final Achievement Report MC Chair (DOCX, 160 kB)
				 Final Assessment Report T Action Rapporteur (DOCX,
				 Monitoring Progress Report MC Chair (DOCX, 155 kB)
		What are COST Actions?		 Monitoring Progress Revie Action Rapporteur (DOCX,
		COST Actions are bottom-up science and technology networks, open to researchers and stakeholders with a duration of four years. They are active through a range of <u>networking tools</u> , such as workshops,		 Final Action Dissemination form (DOCX, 117 kB)
				 e-COST Action Manageme Guide (eCAMT) (PDF, 2 M
		and dissemination activities. C	OST does not fund research itself.	Key Documents
		COST prides in its support for	high-risk, innovative and emerging	Technical Annex (DOCX, 1)
		priorities.	231 does not set any research	COST Open Call - Submit

COST Actions can also pave the way to or establish synergies with EUfunded research projects. Moreover, collaboration within research projects can also lead to new Actions, thus enhancing the networking potential of such consortia.

EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY

COST Implementation Rules

- Rules for Participation in and Implementation of COST Activities kB)
- on Evaluation OST 133-14)
- itoring and 34-14)
- and Specific n (COST

3 MB)

te Centre

- emplate
- Template
- emplate -126 kB)
- rt Template -
- w Template -122 kB)
- n Grant request
- ent Tool User IB)
- 111 kB)
- ission, Evaluation, Selection and Approval (SESA) Guidelines (PDF, 2 MB)
- Guidelines for the Dissemination of COST Action Results and Outcomes (PDF, 2 MB)
- Guidelines for Action Management, Monitoring and Assessment (PDF, 3 MB)
- Anonymity in COST Action proposals (PDF, 239 kB)

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EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY

Agenda

- 10. Presentation and discussion of the Action
 - MoU Objectives and working programme
 - Working method-organisation and management
 - Distribution of tasks
 - Strategies for implementing COST policies
- 11. Establishment of Action Management structure
 - Election of Working Group Leaders
 - Any other horizontal roles (STSM Coordinator, Website Host Institution, Composition of Cor Group, STSMs committee, etc..)
- 12. Action implementation planning 1st Grant Period (GP)
 - Grant Period Goals, WG tasks and deliverables
 - Activity and budget planning (Work and Budget Plan preparation)
- **13**. Any Other Business (AOB) **approval of** "founders" (if applicable)
- 14. Closing



Minutes are prepared by the MC









COST ACTIONS ADMINISTRATIVE RULES AND GUIDELINES







1. Pay As You Go and COST Grant System (CGS)

- The Grant Holder Institution
- How is the Grant paid?

2. COST Networking Tools:

- Meetings
- Short Term Scientific Missions
- Training Schools
- Dissemination

3. Communication with COST Association



Pay as You Go and COST Grant System (CGS)

- Ist MC Meeting is administered and paid directly by COST Association (out of the Action's budget)
- After the 1st MC Meeting all approved Action's activities are administered by the Grant Holder and are funded through COST Grant System (CGS)





- Grant Agreement, Annex A WBP (Work and Budget plan)
- Grant Holder Institution
- COST Vademecum and e-COST management tool



The Grant Holder Institution

- Management Committee (MC) affiliation
- Legal entity
- Financially stable

- COST rules including local taxation scheme
- Electronically signed documents



The Grant Holder Institution - Responsibilities

- Legal Representative
- **Financial** Representative
- **Scientific** Representative
- Administrative Representative *Grant Manager*



The Grant Holder Institution - Grant Manager Tasks

- Administrative support
- Treat reimbursement claims and process all payments
- Ensure separation of powers
- Archive documents up to 2 years after 30 April 2020



The Grant Holder Institution - Financial Support

FSAC- Financial and Scientific Administration and Coordination



- Fixed percentage contribution of up to 15% of the scientific expenditure
- Final *FSAC amount is calculated by applying the initially defined and approved percentage to the actual eligible scientific expenses
- No justification required



COST Grant System - How is the Grant Paid?

- □ First Grant payment: 65% of the grant
- Second Grant payment: Up to 35% of the grant
- No carry over of unspent funds







COST Networking Tools

- Meetings
- Training Schools
- Short Term Scientific Missions (STSMs)
- Dissemination



Meeting Types -1/3

Management Committee Meetings

- Up to 2 MC members per meeting per country can be reimbursed
- Should not last more than 1 day
- Maximum 3 meetings per Grant Period

Core Group Meetings

- Should not last more than 1 day
- Composition determined by the MC
- Can make some decisions on behalf of the MC



Meeting Types - 2/3

Working Group Meetings, Workshop Conference

- Up to a Maximum of 4 Invited Speakers can be reimbursed per meeting
- The Invited Speaker can be invited only once during the lifetime of an Action





Dissemination Meeting

- >A maximum of two participants per Grant Period
- The Speaker(s) must be listed in the official programme
- MC Members or Working Group Members
- >Up to EUR 500 for conference fee



Meetings – Eligibility MC Meetings





Meetings – Eligibility MC Meetings

MC Observers from approved IPC Institutions, approved IO, the EC and EU Agencies

Invited Speakers

Any other participant not specifically mentioned as being eligible





Meetings – Eligibility - all other categories

Any Action Participant from Participating COST Countries

Any Action Participant from approved NNC Institutions

Any Action Participant from approved European RTD Organisations

Invited Speakers from Participating COST Countries

> Up to four Invited Speakers





Meetings – Eligibility - all other categories

MC Observers from approved IPC Institutions, approved IO, the EC and EU Agencies

Any other participant not specifically mentioned as being eligible





What must all eligible participants do to be reimbursed under the COST Grant System? How to fill the online Travel Reimbursement Request on e-cost via Strong Authentication

Create a profile on e-cost (<u>https://e-services.cost.eu</u>)

e-COST

Home | Contact Us

Email/Username	
Password	
Forgot password?	Log in



Follow the link in the invitation email

OFFICIAL INVITATION Dear Dr Tarmo Uustalu,

You are invited to attend the following COST Meeting as a Meeting Participant: COST Action: IC1402 Meeting Title: RV Summit Location: Reykjavík University, Reykjavik, Iceland Meeting Type: Meeting Participant Meeting Dates: from 2016-06-04 09:00:00 to 2016-06-05 18:00:00

Please confirm or decline your participation in this event by clicking on the following link: https://e-services.cost.eu/invitation/389388e9563ff7ce94f62957c4e4a7c8/

If you are new to e-COST, you can register a new e-COST profile on the following link:

https://e-services.cost.eu

By accepting this invitation, you confirm that you accept the set of COST Rules as approved by the COST CSO and described in the COST Vademecum. Any additional documents (user guide etc.) are provided for information purposes only and its contents are not intended to replace the set of COST Rules as approved by the COST CSO, or the COST Vademecum. Neither the COST Association, nor any person acting on its behalf can be held responsible for the use of these additional documents.

The following link provides instructions on how to fill in the Travel Reimbursement Request: **www.cost.eu/StrongAuthentication**



By clicking on the link, you will be re-directed to this page

Invitation to COST Office Event

If you are the intended invitee to the following COST event and you wish to participate, please log in below to proceed.

Meeting Details

Meeting ID	ECOST-MEETING-BM1207-151213-038157
Title	Release of the OTRR-Strong Authentication feature
Start Date	2013/12/15
End Date	2013/12/15
Location	COST, Brussels, Belgium
Your Details	
Name	John Smith
Email	j.s.@cost.eu
Organisation	University ***
Username JSmith	Password ••••• Login



Step 1/5 : Accept or Decline the invitation (ideally within 5 working days)

Invitation to COST Association Event				
Dear Dr				
You are invited to the following COST event. Please indicate below if you wish to participate.				
Meeting Detai	ils			
Meeting ID	ECOST-MEETING- 140416-072346			
Title	Management Committee meeting			
Start Date	2016/04/14			
End Date	2016/04/14			
Location	COST Association, 149 Avenue Louise, B-1050, 15th Floor, Brussels, Belgium			
Step 1/5 Invitation Accept Decline				
Please advise us if you intend to come to the event.				



Step 2/5 : Reimbursement: Yes or No



No

If you decided to NOT submit a claim, please click the 'No' button above.

Once the participant confirms that (s)he intends to claim reimbursement, (s)he can already activate the browser in order to be able to sign the travel reimbursement request electronically using the Strong authentication feature:





Step 3/5 : Fill in the Travel expenses (to be filled only after the meeting) and upload relevant invoices

Travel information and expenses				
Please note: • Local organiser has paid 1 meal(s) for this meeting, which has/have been automatically deducted from the number of eligible meals that you can claim.				
Please carefully read the Travel Reimbursement Request (TRR) Rules before you encode your expenses.				
Travel dates (Door to Door)				
Travel Start Date 2016-04-13 Time 10:00 - 10:59 ~				
Travel End Date 2016-04-15 Time 22:00 - 22:59 ×				
Meeting Attendance				
Please indicate by clicking on the check box below which days you attended the COST event as confirmed by you signing the attendance list.				
14 Apr 16				

Add long distance expenses

Long distance (Cross border) travel expenses 🥡		add
Reimbursable amount	EUR 0.00	

LONG DISTANCE TRAVEL EX	PENSES
Means of transportation	Plane ~
	Plane
From	Train
	Bus
CountrySELECT	Car
	Ferry

Long distance (Cross bo	order) travel expenses 🥡	edit delete add
Means of transportation From To Journey Justification Reimbursable amount	Plane Madrid, Spain Brussels, Belgium Outward and return I travelled from Spain instead of UK because I am currently working at a Spanish institu EUR 750.00	ute.

Add Local transport and other expenses:

LOCAL TRANSPORT EXPENSES				
Each participant must encode their below:	r expenses related to Loo	cal transport in the sect	ion	
Expense type				
Public Transport Expenses ~				
Please Select Public Transport Expenses Taxi Expenses Car Travel Parking Expenses Ferry Expenses	Public transport expenses a insport (bus, train, metro ar juired. In any case, the local than EUR 25, then supportio arly detail the name of the s	re bus, train, metro and tra nd tram) are as follows: If t I transport options for you ng documents justifying th service provider, the full pr	im expenses incurred when tr he amount claimed for the en r journey(s) must be detailed i e total amount claimed must ice of the ticket and the date d	avel starts and finishes within one country. tire journey is equal to or less than EUR 25, n the relevant section below. If the amount be provided by the participant. All of travel. All segments of the journey must
be detailed in therelevant section belo	w.			
Amount	0			
Currency	EURO	~		
Please detail the nature and price of your local transport expense(s)				
Submit	ancel			



EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY

Step 4/5 :Upload supporting Documents

Supporting Documents			
Attached Document 1	Plane ticket invoice	Download	Delete
Title / Description		(Example: plane ticket, i	eceipts, etc.)
File to upload		Browse	Upload
	By clicking upload, the selected document / file will be saved online. You can upload files up to 2 MB each. Supported file types are: pdf, xps, png, jpg, jpeg, gif.		

Select bank account

Bank Account	JOHN CH. SMITH / BE000000000000002	~
	Add A New Account	
Select the Bank Account	you would like to get reimbursed on above. To select a non-listed account , click "/	dd a new account".
After selecting your ban	k account, you will be able to preview a draft version of your TRR (Travel Reimburse	ment Request) Form to ve
Once you have selected	your bank account you will be able to review your TRR and submit your claim.	
		Save



Step 5/5 :Submission

Submission
☑ I declare that the above expenses are not being reimbursed from any other source.
The COST Association reserves the right to correct this document after signature by the participant to comply with COST Rules.
Click to submit your claim electronically. You will be prompted to enter your e-COST password to verify your identity.
Note: Additional information of the Strong Authentication is available here.
Step 5/5 . I declare tha After submitting your reimbursement request, you will not be able to make any change. Are you sure you want to proceed?
The COST Associa OK Cancel
Submit e-Claim
Note: Additional information of the Strong Authentication is available here.
ep : You will now be redirected to verify your identity by entering your e-COST password. Upon successfull authentication, the claim will be electronically signed.
ОК
Submit e-Claim

EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY



Sign the attendance list

Deadline: 30 Days from the meeting end date

Derogations = **<u>pre**</u>-approval from COST



Travel expenses - What can be claimed? 1/2

Flight expenses:

- Economy class
- Max € 1200
- Full itinerary
- Ticket price

Car travel expenses:

- Maximum distance 2000 km at
 - ✓ € 0.20 per km
 - ✓ € 0.30 per km with 2 or more eligible participants
- Proof of distance is required.





Train or Bus expenses:

- Any cross-border travel
- Travel in First and second class
- Sleeper trains





Travel expenses - What can be claimed? 2/2

Local transport expenses (train, tram, metro and bus):

- Within one country
- Claimed amount ≤ €25
 → No receipts required
- Claimed amount > €25
 → All receipts required





Taxi expenses are allowed when:

- No other means of public transport is available
- Travel is required between 10pm and 7am
- Up to a maximum of €
 80 in total



Other Eligible Expenses:

- Ferry
- Visa fees
- Luggage fees
- Parking fees (i.e. airport parking or train station parking)


Accommodation expenses - What can be claimed?

- Based on flat rates only = up to €120 per night
- No receipts required
- Maximum number of nights = the number of attended meeting days as confirmed by the daily signed attendance list plus 1 night before the event commences
- The Management Committee (MC) can decide to reduce the accommodation flat rate
- All participants must receive the same flat rate allowance



Meal Allowance – How does it work?

- Based on flat rates only = up to € 20 per person per meal
- Dependent on the participant's travel times
- Any Local Organiser meal/s must be deducted
- The Management Committee (MC) can decide to reduce the meal allowance flat rate
- All eligible participants must receive the same flat rate allowance



Meeting Participation - Non-eligible expenses

- Registration, honorarium or lecture fees
- Any kind of insurance (life, medical, health, luggage)
- Printing, postage fees
- Wi-Fi-telephone, internet and minibar consumption
- Overnight stay during a trip by car, fuel costs, road tolls and car rental costs
- Regional or national taxation fees, stamp duty expenses



Final considerations: Optimise your Budget

- Consider the availability of cheap public transport in the locality of the meeting (i.e. accessibility)
- Seek to avail of research institutions linked to MC Members
- Send invitations to participants as early as possible
- COST Association premises are subject to availability



Training School



Training School

- Recommended duration: from 3 days up to 2 weeks
- Recommended ratio: 3 Trainees per 1 Trainer
- Location:
 - Participating COST Country or
 - an approved NNC Institution
- Financial Support for:



- Trainees: fixed grants- up to EUR 1500
- Organisational expenses: Local organiser Support (LOS)





Training School - Eligibility

- Trainers eligible for reimbursement:
- From Participating COST Countries
- From approved NNC Institutions
- From approved IPC Institutions
- From approved European RTD Organisations
- Up to a Maximum of 4 invited speakers

Trainees eligible for funding:

- From all COST Countries
- From approved NNC Institutions
- From approved European RTD Organisations



Local Organiser Support (LOS)



Local Organiser Support: Eligible Expenses

- Rental of meeting rooms and technical equipment
- Photocopying and printing of programmes, book of abstracts, book of proceedings, flyers, etc.
- Up to a maximum of 15% of the eligible LOS amount to support the administrative and secretarial expenses
- Field trip expenses if scientifically justified
- Coffee breaks and light refreshments including light lunches (such as sandwiches)
- One single networking meal (lunch or dinner) for the entire meeting duration
- Laboratory materials, rental of scientific equipment for a Training School

Local Organiser Support – Non Eligible Expenses:

- VAT and other indirect taxes
- Any meal exceeding the one single networking dinner limit
- Hotel group reservations
- Translation expenses
- Field trip expenses without relevant scientific justification
- Purchase of technical equipment and IT devices (e.g. Mobile phones, computers, printers...)
- Any additional expenses not listed in the list of eligible expenses



Local Organiser Support: 2 modalities



Short Term Scientific Mission (STSM)



Short Term Scientific Mission - STSM

- Duration:
 - > minimum 5 working days
 - maximum 90 days
- STSM activities must occur in their entirety within one Grant Period
- Selection of Grantees: direct responsibility of the MC
- Financial support is only a contribution:
 - ➤ Allowance per day: maximum of €160
 - In total a maximum of €2500 for up to 90 days
- Early Career Investigators (PhD + 8 years) provision:
 - > up to maximum €3500 between 91 and 180 days



STSM – from where to where?

Home Institution	Host Institution
From a Participating COST country	 To another Participating COST Country
	✓ To an approved NNC institution
	✓ To an approved IPC institution
	 To an approved EC / EU Agency/ an approved European RTD Organisation / an approved International Organisation
From an approved NNC institution	 To a Participating COST Country
From an approved European RTD Organisation	 To a Participating COST Country



Dissemination



Dissemination – eligible expenses

- Website
- Material for display or distribution (flyers, posters)
- Multimedia contents
- Publications (peer-reviewed journal papers, book of abstracts, handbooks, guideline, etc.)
- Open access licenses
- Purchase and distribution of a fixed number of copies of high-quality publications produced by a famous publisher (usually books or journals)
- Proof reading, editing, production and distribution expenses



Dissemination – Non eligible expenses

- Creation of databases meant for dissemination purposes
- Sponsorship for COST Action booths at Conferences or other events
- VAT Amounts



COST Visual Identity

- All COST funded material needs to respect corporate branding:
 - COST logo
 - EU emblem
 - Disclaimer (the views expressed in the dissemination material belongs solely to the Action and should not in any way be attributed to COST)
- See instructions at <u>www.cost.eu/visualidentity</u>



Communication with COST

- Communicate only outcomes of MC decisions to COST
- Do not include COST in internal discussions
- Always indicate the Action number in the subject line every correspondence



Important links:

COST Vademecum http://www.cost.eu/participate

COST Website http://www.cost.eu/

e-COST https://e-services.cost.eu/

STSM On-line application https://e-services.cost.eu/stsm



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http://www.facebook.com/COST.Programme www.twitter.com/COSTprogramme www.linkedin.com/company/cost-office

www.youtube.com/user/COSTOffice

Kick off meeting

QTSpace

Quantum Technologies in Space COST CA15220

ANGELO BASSI

Physics Department University of Trieste

Acknowledgements

Rainer Kaltenbaeck, Mauro Paternostro, Hendrik Ulbricht: for the initial idea and for crafting a successful proposal (at the first submission)

The initial network of proposers: 56 scientists from 23 COST countries

The MC: 37 members and 17 substitute members from 22 COST countries: Austria, Croatia, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Israel, Italy, Latvia, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland, UK.

The COST Association: in particular, Fatima and Cassia

Quantum Technologies in Space



The Challenges QTSpace aims at attacking are the development of core technologies enabling space applications of quantum technology and the achievement of a technologyenabling understanding of the foundations of physics.

[...] The goals of the Action will be pursued by fostering collaborative theoretical, experimental and industrial research towards both fundamental and technological goals. (Source: MoU)

Presentations by

Candidate Deputy Chair

- Action's Objectives
- Impact

Candidate WG Leaders

- WG's Objectives
- Tasks
- Milestones
- Deliverables

Candidate STSM Manager & COST Mission and Policies Supervisor

- STSMs
- Implementation of COST policies

Working Groups

WG1 - Fundamental science studies: Identify fundamental questions to be addressed as well as the scientific/technical requirements

WG2 - Applications: Identify applications of quantum technology in space, define the scientific and technical requirements

WG3 - Proof-of-principle experiments: Identify principles that should be demonstrated on ground, coordinate which experiments to perform.

WG4 - Implementation: Identify common challenges regarding technology needs, mission parameters, mission design. Technology development

The Core Group

A Core Group (CG) will be nominated to assure more rapid, efficient and flexible coordination of the Action. The CG will be formed by the Chair, Vice Chair, the WG Leaders, by the STSMs manager, and by COST mission and policies supervisor. The CG will prepare all relevant documents (scientific, orientation, reports, etc) for the MC meetings (Source: MoU)

Selection criteria:

- <u>Scientific</u>
- Geographic (with an eye on Inclusiveness)
- Balance senior-junior
- Gender balance



Deputy Chair and Grant Holder: Mauro Paternostro (Queen's University Belfast)

WG1 - Fundamental Studies Leader: André Xuereb (University of Malta) Deputy : Simon Groeblacher (Delft University of Technology)



WG2 - Applications Leader: Rainer Kaltenbaek (University of Vienna) Deputy : Yasser Omar (Universidade de Lisboa)

WG3: Proof-of-principle experiments Leader: Hendrik Ulbricht (University of Southampton) Deputy : Philippe Bouyer (Institut d'Optique d'Aquitaine)





WG4: Implementation Leader: Christoph Marquardt (M. Planck Institute for the Science of Light) Deputy : Vladyslav Usenko (Palacky University)

STSM manager & COST Mission and Policies Supervisor: Catalina Curceanu (LNF-INFN Frascati)



QTSpace Kick-off Meeting Brussels, 20 October 2016





Impact

Dissemination

Mauro Paternostro Queen's University Belfast (UK)









Optical quantum communication

<u>Near/mid-term goal</u>: Existing efforts towards ground-to-space and possibly space-to-space quantum communication.

Quantum- communication experiments hosted by existing platforms/dedicated future missions.



Cold-atom interferometry in microgravity

<u>Near/mid-term goals</u>: novel high-precision tests of the foundations of general relativity & benchmarks for possible deviations from the standard model of physics.



High-mass matter-wave interferometry & Optomechanics

<u>Near/mid-term goals</u>: Matter-wave interferometry with high-mass test particles & optomechanics with massive mechanical oscillators in space will to allow tests of the foundations of physics in a novel parameter regime.



Space-based optical atomic clocks

<u>Near/mid-term goals</u>: Optical atomic clocks in space hold the promises for high-precision tests of relativity & high-precision geo-positioning.



Identification of common grounds & synergies Inclusíveness & collaboration

Factual knowledge transfer (hardware testing, data acquisition/analysis, proof-of-priciple experiments)

Capacity-Building Objectives

Sharing/establishing relations with industries/funding bodies /national agencies


Impact of QTSpace

Short-term scientific impact Exploration of new parameter regimes Shaping of a new community Bridge the gap between different areas Advance both theory & experiments



Long-term scientific impact

Furthering of understanding of QM and gravity Design of studies of QM at the macro-scale Enable the test of physics

at Planck scale



Technological impact New quantum technologies for sensing and metrology Overall increase of TRL towards space readiness Space-to-earth quantum communication Pushing the operating limits

of nanoscale sensors

Impact of QTSpace

Socio-economic impact Develop new links btw academia & space industry Development of new technical products Possible new spin-off companies Inspire general public



Dissemination plan

Main channel: Action Website Publication of research papers on high-impact journals Publicly available preprints Presentations at scientific conferences/meetings Scientific seminars

QTSpace Kick-off Meeting Brussels, 20 October 2016









Mauro Paternostro Queen's University Belfast (UK)

WG1: Fundamental Studies

André Xuereb (University of Malta) & Simon Gröblacher (TU Delft)

CA15220 Kick-off, Brussels

20/10/2016

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Who are we?





CA15220 Kick-off, Brussels

20/10/2016

WG1 objective

 <u>Identify</u> fundamental science <u>questions</u> to be addressed <u>as well as</u> the <u>scientific and technical requirements</u> to perform related experimental tests in space

WG1 tasks

- 1. Evaluate tests of fundamental theories in a space environment
- 2. Evaluate experimental possibilities to test fundamental theories
- 3. Explore the possibility of joint space missions for the different experimental platforms

Year 1	Year 2	Year 3	Year 4		
Task 1					
	Task 2				
	Task 3				

WG1 activities

- Yearly workshop on fundamental studies which need space
- Yearly WG meetings for collaborative work on experiments
- <u>One training school</u> for young scientists on fundamental studies
 Should this be in year 1?
- Ongoing STSMs for interaction within the WG and with other WGs

WG1 milestones

- [Y1] Revision and definition of key experiments using photons or atoms or large particles
- [Y2] Definition of key fundamental tests to be done
- [Y3] Definition of key parameters for planned experiments
- [Y4] Definition of possible joint missions

WG1 deliverables

- [Y2] List of experiments with different physical systems; paper
- [Y2] List of fundamental tests; report
- [Y4] List of key parameters to enable tests; paper
- [Y4] Information about possible joint mission; report

WG1 risks

- Risk: Insufficient scientific readiness for space mission [medium]
- Mitigation: Use alternative scientific questions to be addressed by experiments in space

WG1 & friends: Year 1

- Workshop on fundamental studies which need the space environment
- (If Y1) Training school for young scientists on fundamental studies
- [Milestone] Revision and definition of key experiments using photons or atoms or large particles
- Action conference and MC meeting
- STSMs

WG1: Todo list (by end of 2016)

- Get together with other WGs to discuss training school (if in Y1) and workshop, if network-wide events are preferable
- Form task force to start working towards report and paper due at the end of Y2, with milestones at the end of Y1 and Y2
 - Recommendation: This task force could also be the PC for the workshops

Questions to the proto-MC

- Do we prefer network-wide events to cut down on bureaucracy?
- Shall we signal willingness to work with quantum flagship?

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Malta conference

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- Save the date! March 26 to 31, 2017
- Arrival (Sunday 26/03) and departure (Friday 31/03) days
- One full day per WG



CA15220 Kick-off, Brussels

20/10/2016

Malta conference: Venues

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Accommodation

- Corinthia Palace Hotel & Spa (5 star)
- "Greatly encouraged" to choose this option





San Lawrenz

CA15220 Kick-off, Brussels

20/10/2016

Malta conference: Venues



Conference venue

- Fort St Elmo (~17th century), Valletta
- I should be able to organise transport in the mornings





San Lawren:



CA15220 Kick-off, Brussels

Malta conference: Provisional timetable

Sunday 26/03	Monday 27/03	Tuesday 28/03	Wednesday 29/03	Thursday 30/03	Friday 31/03
13:00-19:00	08:15 Organise	Departure after breakfast			
Registration and signing of attendance sheet	09:00-09:50 Tutorial-				
	09:50-10:30 Contribu				
	10:30-11:00 Coffee b				
	11:00-11:30 Invited t				
	11:30-12:30 Contribu				
	12:30-14:00 Lunch ar				
	14:00-16:00 Poster se				
	15:30-16:00 Coffee b				
	16:00-17:00 Open qu				
	MC meeting	Walking tour	Informal discussions		
Dinner at liberty					20/10/2016

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Malta conference: Statistics

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- 28 oral presentations (4 keynotes, 4 invited, 20 contributed)
- 8 hours total poster session time
- 4 hours total open question and road-mapping sessions
- Budget requested ca. €41k
 - 50 delegates reimbursed, including 30 MC members (flights reimbursed)
 - €115 accommodation per night and €20 for dinner
 - €5k in local organiser support



Quantum Technologies in Space – QTSpace COST 15220 WG2 – Applications of Quantum Technology in Space

Rainer Kaltenbaek & Yasser Omar

PART I

Introducing ourselves

Rainer Kaltenbaek

PhD:

Zeilinger group, University of Vienna, Austria Quantum communication & computation, ...



1st Postdoc:

Resch group, IQC, Univ. of Waterloo, Canada Quantum communication & computation, quantum-inspired, nonlinear imaging



2nd Postdoc:

Aspelmeyer group, Univ. of Vienna, Austria Quantum optomechanics, optical trapping, work towards experiments in space

- APART, Marie Curie, 1 ESA study, 3 PI projects
- Lead proposer, MAQRO mission proposal
- Coordinator of the MAQRO consortium











Yasser Omar

PhD:

University of Oxford, UK Quantum information processing, particle statistics

Current position:

- Associate Professor, Instituto Superior ٠ Técnico, University of Lisbon
- Founder and leader of the Physics of . Information and Quantum Technologies Group, Instituto de Telecomunicações
- Director of the Doctoral Programme in • the Physics and Mathematics of Information: Foundations of Future Information Technologies
- quantum information theory, low-control • quantum channels, quantum thermodynamics, open quantum systems

Physics of Information & QT Group



We gratefully acknowledge the support from:



Instituto de Telecomunicaçõe

University of Lisbon and



CAMBRID

Edited by Masoud Mohseni, Yasser Omar, Gregory S. Engel and Martin B. Plenio

PART II

WG2: Applications of Quantum Technologies in Space

Towards space – ground-based experiments

Technology development, proof-of-principle experiments

Vienna: Ursin, Zeilinger Source and Transmitter Optical Ground Station Trans **PHOTONS** Alice on La Palma Bob on Tenerife

I.C.E., CNES, France





Singapore: Ling



ZARM, Bremen, Hannover, Berlin,...



Applications of Quantum Technologies in Space I/II

Missions, proposals and general ideas

Heritage, LISA Pathfinder



PREICISION SENSING

QUANTUM COMMUNICATION



Quantum-enhanced measurements?



Entangled Photon Source on ISS

QUESS – Chinese Quantum Satellite



20.10.2016







Applications of Quantum Technologies in Space II/II



Objectives

Identify possible applications of quantum technologies in space

Define the scientific and technical requirements

Objectives

Identify possible applications of quantum technologies in space

Define the scientific and technical requirements

Tasks

T2.1 – Technology developments
proof of principle → applications
T2.2 – Link to industry partners
develop enabling technologies
T2.3 – Investigate applications
not only fundamental tests
T2.4 – Need of society and industry
for QT in space

Identify possible applications of quantum technologies in space

Define the scientific and technical requirements

Tasks

- **T2.1** Technology developments
- T2.2 Link to industry partners
- T2.3 Investigate applications
- T2.4 Need of society and industry

Activities

A2.1 – Yearly workshops
A2.2 – Training school
For young researchers (esp. ECIs)
A2.3 – WG meetings
With industry & policy makers
A2.4 – Short-term scientific missions
STSMs for interaction within WG and with other WGs

Identify possible applications of quantum technologies in space

Define the scientific and technical requirements

Tasks

- **T2.1** Technology developments
- T2.2 Link to industry partners
- T2.3 Investigate applications
- T2.4 Need of society and industry

Milestones

- M2.1 Identified applications
- M2.2 Technical requirements
- M2.3 Technology roadmap
- M2.4 Links to industry



Activities

- A2.1 Yearly workshops
- A2.2 Training school
- A2.3 WG meetings
- A2.4 Short-term scientific missions

Identify possible applications of quantum technologies in space

Define the scientific and technical requirements

Tasks

- **T2.1** Technology developments
- T2.2 Link to industry partners
- T2.3 Investigate applications
- T2.4 Need of society and industry

Milestones

- M2.1 Identified applications
- M2.2 Technical requirements
- M2.3 Technology roadmap
- M2.4 Links to industry



Activities

- A2.1 Yearly workshops
- A2.2 Training school
- A2.3 WG meetings
- A2.4 Short-term scientific missions

Deliverables

- **D2.1** Identified concrete application(s)
- D2.2 List of technical requirements
- D2.3 Investigate alternative paths
- D2.4 Identified industrial partners

Relations to other working groups



20.10.2016

THANK YOU

YOU ARE VERY WELCOME TO JOIN WG2

20.10.2016

WG 3 – Proof-of-principle Experiments

WG leader: **Hendrik Ulbricht**, Southampton, UK Deputy WG leader: **Philippe Bouyer**, Bordeaux, France
Deputy leader: Philippe Bouyer,



CURRENT POSITION(S)

2011 – 2017 Director, Laboratory for photonics, digital and nano sciences, CNRS/ IOGS/Univ. Bordeaux, Talence, France
 2009 – Present CNRS Senior researcher (Directeur de Recherche), CNRS/IOGS/Univ.

009 – Present **CNRS Senior researcher** (Directeur de Recherche), CNRS/IOGS/Univ. Bordeaux, Talence, France

INDUSTRY POSITION

2011 – Present **Co-founder and Consulting Chief Scientist**, MuQuans, precision quantum sensors company, France

COMMISSIONS OF TRUST

- 2016 Present Elected member of EURAMET steering commitee
- 2014 2016 Member of Gravitation Observatory Advisory Board, European Space Agency
- 2004 Present Member of Fundamental Physics Advisory Board, CNES, France
- 2007 2011 Member of the Fundamental Physics Advisory Group, ESA

Philippe Bouyer: Research topics [selection]

FUNDAMENTAL PHYSICS WITH ATOM INETRFEROMETERS

Dual species atom interferometry in microgravity. Development of a large underground atom interferometer array for gravitational wave detection

MINIATURIZED INERTIAL SENSORS

Technology development for compact atom sensors. Demonstration of first inertial base with cold atom. Start-up of Muquans.

QUANTUM ENHANCED MEASUREMENTS

Weak and QND measurement for sensitivity enhancement Demonstration of "atomic phase locking" for longer interrogation time in clocks and sensors.









- **Quantum Ground** ٠ State & State Control
- **Force Sensing** ٠
- Non-٠ Interferometric **Tests of Collapse** Models
- Nanoparticle ٠ Talbot Interferometry (NaTall)



Ulbricht group, Southampton: Quantum Nanophysics & Matterwave Interferometry



Nanoparticle interferometer in space to control MAQRO influence of gravitation, to test macroscopic quantum superpositions

WAY

 $\Delta M \leq 39 \, \mathrm{kg}$

nass 1 m distance

DECIDE

 $\Delta M \le 1.6 \, \mathrm{kg}$

	requirement on		DECIDE		
	environment				
	gas pressure temperature thermal stability	$ \leq 6 \times 10^{-14} \mathrm{Pa} \\ 32 \mathrm{K} \\ \mathrm{NC} $	$\leq 10^{-13} \text{Pa}$ 16 K < 0.18 K		
	nanosphere				
	radius 120 nm temperature thermal stability	100 nm $\sim 60 \text{ K}$ NC	20 K < 0.22 K		
	influence of cosmic rad.	NC	NC		
	asymmetry absorption at 1064nm mass density	< 5 % STA $\geq 2201 \frac{\text{kg}}{\text{m}^3}$	< 5 % 0.25 ppb/cm 2201 $rac{ m kg}{ m m^3}$		
Schwarzschild		optical setup			
	ty finesse (trap/cool) tion readout accuracy ting stability	$\begin{array}{l} \sim 30000 \\ \sim 2\mu\mathrm{m} \end{array}$	$\begin{array}{l} \sim 30000 \\ \sim 2\mu\mathrm{m} \end{array}$		
	Yap/Cool Cavity mirrors R beam	$< \frac{180\mu\text{rad}}{\sqrt{100\text{mHz}}} \\ < \frac{180\mu\text{rad}}{\sqrt{100\text{mHz}}}$	$< \frac{\frac{180\mu \rm{rad}}{\sqrt{100\rm{mHz}}}}{< \frac{180\mu \rm{rad}}{\sqrt{100\rm{mHz}}}}$		
CCD chip + readout	W beam mal stability aser stability	$NA \le 4.6 \frac{\text{ppm}}{\text{K}}$	$< 15\mu$ rad $\leq 4.6 \frac{\text{ppm}}{\text{K}}$ critical		
	laser stability	NA	NC		
	spacecraft				
	micro-thruster acc. noise rotation stability nicro grav.	$\frac{\sqrt{\mathcal{S}_A} < 10^{-8} \text{m/s}^2 \text{Hz}^{-1/2}}{\ll 4.5 \text{mrad} \text{Hz}^{-1/2}} \\ \sqrt{\mathcal{S}_A} < 10^{-8} \text{m/s}^2 \text{Hz}^{-1/2}}$	$ \begin{array}{l} < 1.6 \times 10^{-9} \mathrm{m/s^{2} Hz^{-1/2}} \\ \ll 240 \mu \mathrm{rad} \mathrm{Hz^{-1/2}} \\ < 1.6 \times 10^{-9} \mathrm{m/s^{2} Hz^{-1/2}} \end{array} $		

• Consortium of 30+ groups from all over the world

• It is to bring a nanoparticle interferometer into space!

Objectives of WG3

Objectives:

O3.1) Identification of the principles that should be demonstrated on ground, and coordination about the implementation of the respective experiments.

O3.2) Sharing of knowledge about available technologies and experimental techniques for performing experiments in space-relevant settings.

Comments:

• Depends on what 'envisaged tests' we decide in WG1 and WG2, WG3 will then propagate such tests towards experimental implementation

• Important: cross-link between experts on different experimental platforms [photons, cold atoms, levitated nanoparticles, etc.]

-> gain from experience [technical and other] of running missions and advanced proposals

Tasks of WG3

Tasks:

T3.1) Define the experimental details of each envisaged test in space.

T3.2) Check the technical availability for space approved technology.

T3.3) Definition of outstanding proof-of-principle tests.

T3.4) Planning of Earth-based tests: parabola flights, drop tower, sounding rockets etc.

Comment:

'Envisaged tests' will have to be defined by us [COST within WG1 and WG2]:

-> the experimental platform [photons, atom clocks, atom interferometer, nanoparticles, etc.] and

-> the physics/technology to be tested

Activities of WG3

Activities:

A3.1) Yearly workshop on status of proof-of-principle experiments for QT in space.
A3.2) One training school for young researchers, in particular for ECIs, on proof-of-principle tests.
A3.3) WG meetings to coordinate collaborative work on Earth based experimental tests
A3.4) STSMs for interaction within the WG and with other WGs.

Milestones of WG3

Milestones:

M3.1) Definition of experiments to be done in space.M3.2) Assessment of status quo of technological readiness for space.M3.3) Coordination of outstanding proof-of-principle tests.

M3.4) Definition of realistic scenarios for space missions.

Comment:

This will happen for all scientific/technology ideas to be tested [envisaged tests] and for all experimental platforms based on experience of active missions and the Related technology development.

Deliverables WG3

Deliverable:

D3.1) List of experimental parameters to be reached for each envisaged test [scientific paper].

D3.2) List of status quo of technology in space [review paper].

D3.3) Delivery of realistic time schedule for outstanding proof-of-principle tests [scientific paper].

D3.4) Plan for strategic preparation of space missions based on experimental reality [white paper].

Workgroup 4: Implementation Christoph Marquardt Vladyslav Usenko





Objective: Transfer concrete scientific plans for missions into ready proposals.





Christoph Marquardt



group leader "Quantum Information Processing" Division Leuchs – Max Planck Institute for the Science of Light

Experiments in quantum communication / information processing, quantum measurement process, nonlinear photonics

Current space activities: quantum communication with GEO stationary satellites (with DLR and Tesat Spacecom)



Vladyslav Usenko



researcher at Department of Optics Palacky University in Olomouc (Czech Republic)

Research in quantum communication, quantum optics, security analysis of quantum key distribution.

Current space activities: studies and tests of quantum communication over free-space turbulent channels (collaboraion with MPL in Erlangen).



Tasks:

T4.1) Identify common challenges regarding technology needs, mission parameters and design.

- T4.2) Technology development in cooperation with space agencies and industrial partners.
- T4.3) Share experience and coordinate efforts in hardware testing in space-relevant environments.
- T4.4) Further international support by researchers and their respective national space agencies.
- T4.5) Identify and coordinate technology-development and mission-proposal opportunities.



Activities:

A4.1) Yearly workshop on implementation of concepts for QT space missions [strong industry input].

A4.2) One training school for young researchers, in particular for ECIs, on tech implementation.

A4.3) WG meetings are also a platform to coordinate interaction with relevant industry, national and European space agencies as well as policy makers and funding agencies.

A4.4) STSMs for interaction within the WG and with other WGs.



Milestones:

M4.1) Definition of mission parameters for each envisaged mission.

- M4.2) Assessment of status quo of technology and definition of further [needed] technologies.
- M4.3) Definition of industrial partners to develop technology to reach mission parameters.
- M4.4) Definition of mission opportunities [funding] and pathways to reach technical readiness.



Deliverables:

- D4.1) List of mission parameters [report].
- D4.2) List of technology [report].
- D4.3) List of partners [report].
- D4.4) List of opportunities [white paper].



Working Groups	Tasks	Year 1	Year 2	Year 3	Year 4
WG1	T1.1	M1.1	D1.1		
Activities: 1 WGm + Ws per	T1.2		M1.1, D1.2	M1.3	D1.3
year. 1 TS, year 1. STSMs.	T1.3				M1.4, D1.4
WG2	T2.1	M2.1	D2.1		
	T2.2		M2.2	D2.2	
Activities: 1 WGm + Ws per	T2.3		M2.3		D2.3
year. 1 TS, year 2. STSMs.	T2.4			M2.4	D2.4
WG3	T3.1	M3.1	D3.1		
Activities: 1 WGm + Ws per	T3.2	M3.2	D3.2		
year. 1 TS, year 3. STSMs.	T3.3		M3.3		D3.3
	T3.4			M3.4	D3.4
WG4	T4.1		M4.1	D4.1	
Activities: 1 WGm + Ws per	T4.2		M4.2		D4.2
year. 1 TS, year 4. STSMs.	T4.3		M4.3		D4.3
	T4.4			M4.4	
	T4.5				D4.4
Kick Off meeting		Month 0			
MC meetings		Month 11	Month 23	Month 35	Month 47
International Action		With MCm	With MCm	With MCm	With MCm
Conferences					
STSMs					
Progress & Final Report			Month 18	Month 36	Month 48



Catalina Oana Curceanu Laboratori Nazionali di Frascati LNF-INFN



Experienced Researcher: group leader at LNF-INFN

 Foundational physics -> experiments in the LNGS laboratory (VIP; Spokesperson)
 Nuclear Physics (exotic atoms, strangeness physics; SIDDHARTA, AMADEUS at DAFNE and E15, E57 and E62 in Japan)



Lead a team of 20 researchers at LNF-INFN More than 250 publications Organizer of Workshops and Conferences Intensive dissemination activity

□ STSM responsible for COST action: MP1006

- 2016: Award from the Foundational Question Institute (FQXI) for the project: "Events" as we see them: experimental test of the collapse models as a solution of the measurement-problem" (1 September 2015 – 31 August 2017)
- 2016: Award from the John Templeton Foundation for the project: "Hunt for the "impossible atoms": the quest for a tiny violation of the Pauli Exclusion Principle. Implications for physics, cosmology and philosophy"
- 2016: Australian Institute of Physics (AIP) Women in Physics Lecturer award for 2016.

COST ACTION QTSpace Policy (pages 18-19 Memorandum);

ITC participation

Gender Balange

ECI Early Career Investigators

Inclusiveness Target Countries (ITC) participation:

participation. QTSpace will be advertised to colleagues working in ITCs to encourage their active participation in the Action, above and beyond the level of participation from such countries that have already been secured (9 countries already). Action members from ITCs will be given leading roles in the Action and at least 30% of the QTSpace events will be organized in ITCs. (b) Gender balance.

- Geographical spread includes less research-intensive COST Member Countries. They are entitled COST Inclusiveness Target Countries (ITCs):
- Bosnia-Herzegovina, Bulgaria, Cyprus, Czech Republic, Estonia, Croatia, Hungary, Lithuania, Latvia, Luxembourg, Malta, Montenegro, Poland, Portugal, Romania, Slovenia, Slovakia, the former Yugoslav Republic of Macedonia, Republic of Serbia and Turkey.



QTSpace already includes a significant representation from female scientists (in line with typical percentage in the community). The Action will ensure that female members of QTSpace take leading roles in its management. Moreover, suitable measures will be taken to facilitate the participation of female scientists to any meeting of QTSpace, whenever necessary (for example in the form of childcare facilities). Finally, the Action will liaise with any country-specific initiative for the enhancement of the participation of women in science to establish factual joint-programme for the stimulation of a balanced contribution from all genders. (c) Early Career Investigators (ECIs).



Significant space will be given to ECIs as speakers at workshops and conferences. *ii.* Participation of ECIs to Action's events will be supported through targeted measures of financial support. *iii.* WG Vice Leaders will be selected among ECIs (or, in any case, among junior researchers). *iv.* In the selection of STSMs, priority will be given to ECIs.

COST ACTION QTSpace Policy (pages 18-19 Memorandum);

Industrial Dimension

International Cooperation

Policy on Industrial dimension

Policy on Industrial Dimension. QTSpace will naturally involve space industries, to develop the readiness level of technology needed for future applications in space or for space mission. This is part of the goals of QTSpace. The Action will create a platform for fruitful collaborations between researchers and industry. WG meetings will be open to representatives of the industry, and will allow researchers and industry to meet and foster mutual understanding. QTSpace will increase the impact of research in the industrial sector, by promoting the use and development of technologies, as well as the exploitation of COST Action results and outcomes through dedicated dissemination and exploitation activities targeting small and medium-sized enterprises (SMEs) and large companies in Europe.

Policy on International Coperation

Policy on COST International Cooperation. The interest in Quantum Technologies in Space goes well beyond the European dimension. QTSpace will foster international cooperation with big actors in space activities, e.g., NASA. Participation of NNCs, IPCs to Action's activities (WG meetings, workshops, conferences) will be fostered. This will be facilitated by the strong scientific links between participants and the most prominent scientists worldwide in the field. QTSpace will become the driving force for harnessing quantum technology in space and for studying fundamental science in space at EU as well as the international level.

STSMs – COST Vademecum pages 31, 32

Clear procedure -WHO (especially young) and WHERE can apply -For which period -How much money and when to be paid (after STSM) Registration procedure – online in advance, approval procedure, assessment -What happems AFTER -> STSM scientific report! - payment!



7. Short Term Scientific Missions (STSM)

7.1. Short Term Scientific Missions (STSM) - Eligibility Rules

Short Term Scientific Missions (STSM) are exchange visits aimed at supporting individual mobility, strengthening existing networks and fostering collaboration between researchers. A STSM should specifically contribute to the scientific objectives of the COST Action, whilst at the same time allowing those partaking in the missions to learn new techniques, gain access to specific data, instruments and / or methods not available in their own institutions / organisations.

Gender Balance, STSMs, Dissemination

Gender Balance



STSMs

Gender Balance, STSMs, Dissemination





