Issue Date:	**2021-08-31**	**CEN-CLC/FGQT**	**N119**
Deadline:	**n/a**	**Supersedes: –**	
Status:	FOR DISCUSSION AND DECISION		

TITLE	**Extending the Roadmap ToC without disruption**
PROJECT	FGQT Roadmap
REFERRING TO	“draft”
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ABSTRACT

N112 is a proposal to restructure the roadmap document in N020e, and the text gives the impression that it deals with a radical change which needs a fundamental discussion before we can make a decision about it.

N115 is an analysis of N112, and illustrates that there is no need for a disruptive approach to change the ToC: the same goals can be achieved through a simple extension and reshuffling of the present ToC.

In the present contribution, we propose a way forward and show how useful ideas in N112 can be merged into the Roadmap document in a non-disruptive manner. If adopted, we propose that the present text in N20e is renumbered, augmented and a bit reshuffled by the Roadmap editor (probably 2 hours work or less). Therefore this proposal contains “instructions to the editor”.

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1. Situation sketch

N112 proposes a restructuring of the roaddocument, and by using words like “new structure”, “old structure” and “transition period” it looks like a proposal to change matters radically and in a disruptive manner.

N115 analyses what is actually being proposed in N112, and if it is really a radical change proposal? The comparison of the existing and proposed structure resulted in the following table.

Present TOC, N020	Proposal in N112
1 Introduction	1 Introduction
2 Standardisation	2 Standardisation
3 Terminology	3 Terminology
4.1 Enabling Technologies	4.1 Enabling Technologies
	4.2 Components and subsystems
4.2 Quantum Communication 4.3 Quantum Computing 4.4 Quantum Simulation 4.5 Quantum Metrology and Q sensing	4.3 Platforms and subsystems - a. Quantum Communication systems - b. Quantum computing & Quantum simulation - c. Quantum systems for metrology & sensing - d. <something very similar with a>
	4.4 Composite systems ➔ restricted mainly to Quantum communication
5. Innovation and Use cases	4.5. Use cases, economically and societally relevant applications
6 Conclusions	5. Outlook and Conclusions

When the existing structure is renumbered a bit, and the new ideas in N112 are merged with it, then the structure in the table below can be created. Note that there are voices to merge „quantum computing“ and „quantum simulation“ into a single chapter. When needed this can be decided at a later point in time, and easily be merged by renumbering the chapters.

Proposed roadmap ToC
1 Introduction
2 Standardisation
3 Terminology
4 Enabling Technologies
5 Components and subsystems
6. Quantum Communication 7. Quantum Computing 8. Quantum Simulation 9. Quantum systems for metrology & sensing
10 Composite systems
11. Use cases
12. Outlook and Conclusions

2. Proposed Roadsmap ToC for N020

If this proposal is adopted, we ask de Editor of the Roadmap document to update the present text in N20e by renumbering, augmenting and reshuffling its text as elaborated below. It is probably 2 hours work or less.
Therefore, the text below contains:

- "Instructions to the editor": to guide him/her with the updating process. They can be removed thereafter.
- "Editorial notes": text that should be copied literally into the draft to invite delegates to produce appropriated text at a later moment in time.

Outside the scope of our proposal is a discussion about the role of annexes. At this moment there are some academic materials in the main body of the document that might fit better in an annex. Annexes are good places for elaborations, e.g. detailed state-of-the-art overviews and explorations of standardizable aspects. But let's decide later on that.

Start of proposal

Instructions for the Editor: Keep ALL present text in N020e on abstracts, foreword, abbreviations, etc, upto "chapter 1"

Chapter 1: Introduction

Instructions for the Editor: Keep present text in N020e on chapter 1

Chapter 2: Standardisation

Instructions for the Editor: Keep present text in N020e on chapter 2

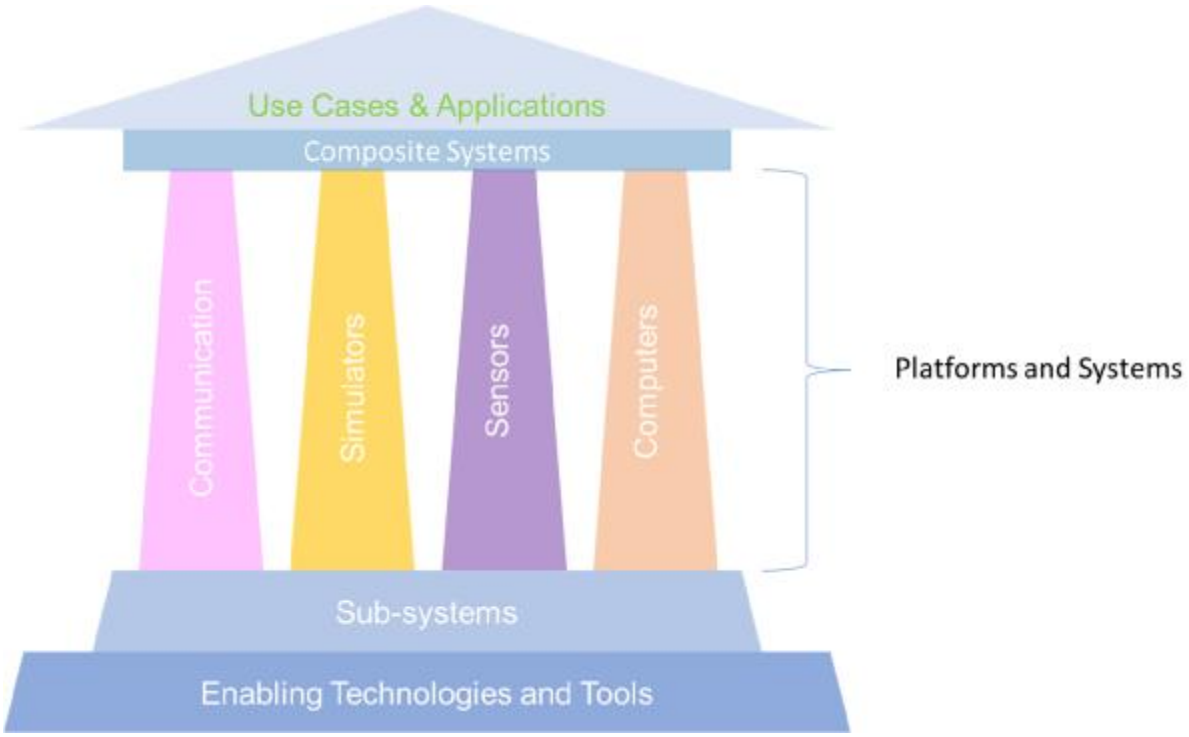
Chapter 3: Terminology

Instructions for the Editor: Keep present text in N020e on chapter 3

Chapter 4: Enabling technologies

4.1 Overview

Editorial note: This text should explain how all kinds of developments are interwoven with each other, and each development has its own state of maturity. There are however some main "pillars" that can be identified. Explain them for instance with the picture shown in N115
CONTRIBUTIONS FROM DELEGATES ARE NEEDED HERE



Editorial note: This text should subsequently summarize a variety of technological developments that can be used in one or more quantum platforms and systems. This list may not be in a particular order, can never be complete and can be extended when needed,

CONTRIBUTIONS FROM DELEGATES ARE NEEDED HERE
but we may start for instance with the list suggested in N112:

a. *Single Photon Detectors*
b. *Entangled photon sources*
c. *Very low noise coherent detectors*
d. *Frequency stable lasers*
e. *Quantum memories*
f. *Atom trap chips*
g. *Ion trap chips*
h. *Superconducting chips*
i. *NV center materials*
j. *Quantum control utilities, devices, software tools*

Keep the description of each technology short since this section 4.1 is only an introductory section of chapter 4. When needed, each technology can be explained in further detail, each in its own section of chapter 4 (but only when text is available). These descriptions can be presented in ***arbitrary order***, on the basis of availability of text.

4.2 Colour centres in (nano)diamonds

Instructions for the editor: Keep present text in N020e on chapter 4.1.1.1 and 4.1.2.9, but renumber it Merge the two where possible

4.3 <Quantum technology #2>

Editorial note: This text should elaborate on one of the enabling technologies summarized in section 4.1
CONTRIBUTIONS FROM DELEGATES ARE NEEDED HERE

4.4 <Quantum technology #3>

Editorial note: This text should elaborate on another enabling technology summarized in section 4.1. Etcetera

CONTRIBUTIONS FROM DELEGATES ARE NEEDED HERE

Chapter 5: Components and subsystems

5.1 Overview

Editorial note: This introductory text should summarize a variety of quantum components and subsystems that can be used in one or more quantum platforms and systems. This list is in no particular order and can always be extended when needed. Start, for instance, with the list suggested in N112:

a. Quantum Optical Senders and Receivers
- Integrated optical chips – senders (including active elements; DV/CV – low variation)
- Integrated optical chips – receivers (including active elements for CV: significant difference between CV and DV
- Integrated optical chips (transceivers – DV/CV)

b. DSP Units, Post-processing units
- Post-processing engines (FPGA/ASIC based)
- DSP engines (FPGA/ASIC Based)

c. Ion trap systems

CONTRIBUTIONS FROM DELEGATES ARE NEEDED HERE

5.2 <Component family #1>

Editorial note: This text should elaborate for instance on one component "family" summarized in section 5.1
When appropriate, extend this section with a description of the kind of requirements that deserve a standard in future, or refer to existing ones

CONTRIBUTIONS FROM DELEGATES ARE NEEDED HERE

5.3 <Component family #2>

Editorial note: This text should elaborate for instance on another component "family" summarized in section 5.1. When appropriate, extend this section with a description of the kind of requirements that deserve a standard in future, or refer to existing ones.

CONTRIBUTIONS FROM DELEGATES ARE NEEDED HERE

Chapter 6: Quantum Communication

Instructions to the Editor: Keep present text in N020e on chapter 4.2, but raise it in level and renumber it

Chapter 7: Quantum Computing

Instructions to the Editor: Keep present text in N020e on chapter 4.3, but raise it in level and renumber it

Chapter 8: Quantum Simulation

Editororial Note: It is worth considering merging this topic with "quantum computing" since both have a similarity.
CONTRIBUTIONS ABOUT SUCH DECISION/VIEW ARE NEEDED HERE

Instructions to the Editor: For the time being, keep it in a separate chapter (use present "text" in section 4.4 of N020e), and decide later if it should be merged or not.

Chapter 9. Quantum systems for metrology & sensing

Instructions to the Editor: Keep present text in N020e on chapter 4.5, but raise it in level and renumber it.

Editorial note: Consider a move of the topic "single photon sources" to chapter 4. This can be decided later of this should be done or not.
CONTRIBUTIONS FROM DELEGATES ARE NEEDED HERE

Chapter 10. Composite systems

Instructions to the Editor: It is currently unclear if this is sufficiently different from what is / will be described in chapter 6, but reserve a dedicated chapter about it for the time-being and decide later.

Editorial note: This chapter is intended to describe *Composite Systems utilizing one or more platforms and that can be employed in one or more use cases (at the moment incomplete and restricted mainly to Quantum Communication, to be continued)*

a. (Quantum Information Networks – terrestrial version, space borne versions, mixed cases)
b. Quantum Key Distribution Networks
- *Trusted repeater type*
- *End-to-end Quantum Communication type*

c. Quantum Information Networks
d. to be continued

CONTRIBUTIONS FROM DELEGATES ARE NEEDED HERE

Chapter 11: Use cases

Instructions to the Editor: Keep present text in N020e on chapter 5, but renumber it

Chapter 12: Outlook and Conclusions

Instructions to the Editor:: Keep present text in N020e on chapter 6, but renumber it

ANNEXES

Instructions to the Editor::Keep all annexes and their content as they are now, and keep their present numbering

End of proposal