



CARBON BASED SMART SYSTEM FOR WIRELESS APPLICATION



Start Date : 01/09/12
Project n°318352

Duration : 45 months

Topic addressed : Very advanced nanoelectronic components: design, engineering, technology and manufacturability

WORK PACKAGE 7 : Project management

DELIVERABLE D7.12 & D7.22

Progress Management Reports #4

Covered period: T0+18 – T0+24 & Updated Implementation and Financial Plans

Due date : T0+24

Submission date : T0+33

Lead contractor for this deliverable: TRT

Dissemination level : PU – Public

	D7.12 & D7.22 : Progress Management Reports #4 & Updated Implementation and Financial Plans	2/23
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WORK PACKAGE 7: Project management

PARTNERS ORGANISATION APPROVAL

	Name	Function	Date	Signature
Prepared by:	S.Xavier	R&D Engineer	22/06/15	
Contribution by	All partners			
Approved by:	Afshin Ziaei	Research Program Manager	22/06/15	

DISTRIBUTION LIST

QUANTITY	ORGANIZATION		NAMES
1 ex	Thales Research and Technology	TRT	Afshin ZIAEI
1 ex	Chalmers University of Technology	CHALMERS	Johan LIU
1 ex	Foundation for Research & Technology - Hellas	FORTH	George KONSTANDINIS
1 ex	Laboratoire d'Architecture et d'Analyse des Systèmes	CNRS-LAAS	Patrick PONS
1 ex	Université Pierre et Marie Curie	UPMC	Charlotte TRIPON-CANSELIET
1 ex	National Research and Development Institute for Microtechnologies	IMT	Mircea DRAGOMAN
1 ex	Graphene Industries	GI	Peter BLAKE
1 ex	Thales Systèmes Aéroportés	TSA	Yves MANCUSO
1 ex	SHT Smart High-Tech AB	SHT	Yifeng FU
1 ex	Universita politecnica delle Marche	UNIVPM	Luca PIERANTONI
1 ex	Linköping University	LiU	Rositsa YAKIMOVA
1 ex	Fundacio Privada Institute Catala de Nanotecnologia	ICN	Clivia SOTOMAYOR
1 ex	Tyndall-UCC	Tyndall	Mircea MODREANU

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CHANGE RECORD SHEET

REVISION LETTER	DATE	PAGE NUMBER	DESCRIPTION
Template			
V1	03/11/2014	18	All partners contribution
V2	04/11/2014	18	Final version
V3	22/06/2015	23	Correction after 2 nd review meeting

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1 JUSTIFICATION OF MAJOR COST ITEMS AND RESSOURCES

1.1 BRIEF DESCRIPTION OF WORK, MAJOR COST ITEMS AND RESSOURCES

1.1.1 TRT

Brief description of work

WP 2	TRT has participated to the design definition for the microwave CNT amplifier, CNT switch the graphène devices
WP 3	TRT has been involved in the characterisation of CNT and graphene materials It has also developed a process flow of the RF switch based on the CNT and the first fabrication run was started Contribution the knowledge of CNT growth for filter fabrication
WP 4	TRT has been strongly involved on test activities. Contribution for the characterization of different devices (CNT and Graphene FET, CNT RF switch, CNT based filter, CNT and graphene antenna, Graphene detector). Leading the task concerning the CNT interconnects characterization.
WP 6	TRT has put a lot of work on the construction of the Nano-RF website. The public area of the website describes the stakes of the project, the partners, the main lines of the project and links it to relevant references. The private area includes confidential information and allows the partners to exchange safely voluminous data.
WP 7	TRT has been strongly involved in the establishment of the Grant Agreement and has driven the negotiations to find a commitment of all partners on a Consortium Agreement. As coordinator, TRT has launched the project with a successful Kick-Off Meeting organised in Paris area. Since, it closely manages the evolution of the project by following the costs, the delays of the deliverables, and by establishing correcting actions when necessary. Redaction of progress activity and management reports.

Major Cost Items

- Personal costs : 32,85 person-months

Tables of costs

	M18-M24	Budget M18	Type of Activity				TOTAL	% Spent	Remaining budget
			RTD	DEM	MGT	OTHER			
TRT	Personnel costs	415 283	194 351	0	49 752	0	244 103	59	171 180
	subcontracting	9 000	0	0	0	0	0	0	9 000
	other direct costs	34 395	75 297	0	0	0	75 297	219	-40 902
	indirects costs	685 409	189 104	0	0	0	189 104	28	496 305
	total	1 144 087	458 752	0	49 752	0	508 504	44	635 583

Table 1 : TRT Table of costs

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Table of Human Resources

Partner	WP	Planned PM	Actual Person-Months							% Total	Remaining PM
			Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Total		
TRT	WP 1	7,00	0,50	0,00	0,00	0,00			0,50	7%	6,50
	WP 2	16,00	2,50	2,98	0,60	2,00			8,08	51%	7,92
	WP 3	26,00	1,00	5,00	15,51	23,64			45,15	174%	-19,15
	WP 4	13,00	0,00	0,00	0,30	2,00			2,30	18%	10,70
	WP 5	14,00	0,00	0,00	0,00	0,00			0,00	0%	14,00
	WP 6	4,00	0,31	0,60	0,50	2,00			3,41	85%	0,59
	WP 7	14,00	0,46	0,40	0,70	3,21			4,77	34%	9,23
	Total	94,00	4,77	8,98	17,61	32,85	0,00	0,00	64,21	68%	29,79

Table 2 : TRT Table of Human Resources

1.1.2 CHALMERS

Brief description of work

WP 2	
WP 3	CNT growth, TCVD graphene Growth and transfer of CNT bundles into TSVs for 3D interconnection Contribute knowledge about graphene growth for RF devices
WP 4	Contribution for the task concerning the CNT interconnects characterization
WP 6	
WP 7	

Major Cost Items

- Personal costs : 6.10 person-months

Tables of costs

M18-M24	Budget M18	Type of Activity				TOTAL	% Spent	Remaining budget
		RTD	DEM	MGT	OTHER			
CHALMERS	Personnel costs	249 368	37 819	0	0	37 819	15%	211 549
	subcontracting	0	0	0	0	0	0%	0
	other direct costs	100 347	19 150	0	851	20 001	20%	80 346
	indirects costs	209 829	34 181	0	511	34 692	17%	175 137
	total	559 544	91 150	0	1 362	92 512	17%	467 032

Table 3 : CHALMERS Table of costs

Table of Human Resources

Partner	WP	Planned PM	Actual Person-Months							% Total	Remaining PM
			Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Total		
CHALMERS	WP 1	4,00	3,50	0,50	0,00	0,00			4,00	100%	0,00
	WP 2	0,00	0,00	0,00	0,00	0,00			0,00	0%	0,00
	WP 3	36,00	0,00	7,30	7,00	7,25			21,55	60%	14,45
	WP 4	16,00	0,00	0,00	0,00	0,00			0,00	0%	16,00
	WP 5	5,00	0,00	0,00	0,00	0,00			0,00	0%	5,00
	WP 6	0,00	0,00	0,00	0,50	0,50			1,00	0%	-1,00
	WP 7	9,00	0,00	2,00	0,50	0,25			2,75	31%	6,25
	Total	70,00	3,50	9,80	8,00	8,00	0,00	0,00	29,30	42%	40,70

Table 4: CHALMERS Table of Human Resources

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1.1.3 FORTH

Brief description of work

WP 2	
WP 3	fabrication of supporting structures for the FET develop fabrication modules for graphene devices, fabricate Schottky
WP4	Contribution for the characterization of different devices : CNT and Graphene FET, Graphene detector
WP 6	
WP 7	

Major Cost Items

- Personal costs : 9.76 person-months

Tables of costs

M18-M24		Budget M18	Type of Activity				TOTAL	% Spent	Remaining budget
			RTD	DEM	MGT	OTHER			
FORTH	Personnel costs	154 736	17 247	0	5 181	0	22 428	14	132 308
	subcontracting	3 000	0	0	0	0	0	0	3 000
	other direct costs	63 855	11 684	0	0	0	11 684	18	52 171
	indirects costs	154 231	13 080	0	3 989	0	17 069	11	137 162
	total	375 822	42 011	0	9 170	0	51 181	14	324 641

Table 5 : FORTH Table of costs

Table of Human Resources

Partner	WP	Planned PM	Actual Person-Months							% Total	Remaining PM
			Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Total		
FORTH	WP 1	2,00	2,00	0,00	0,00	0,00			2,00	100%	0,00
	WP 2	0,00	0,00	0,00	0,00	0,00			0,00	0%	0,00
	WP 3	58,00	22,73	5,00	5,00	6,33			39,06	67%	18,94
	WP 4	3,00	0,00	2,02	2,02	0,00			4,04	135%	-1,04
	WP 5	4,00	0,00	0,00	0,00	0,00			0,00	0%	4,00
	WP 6	0,00	0,00	0,00	0,00	1,00			1,00	0%	-1,00
	WP 7	5,00	0,00	0,00	0,00	1,43			1,43	29%	3,57
	Total	72,00	24,73	7,02	7,02	8,76	0,00	0,00	47,53	66%	24,47

Table 6: FORTH Table of Human Resources

1.1.4 LAAS

Brief description of work

WP 2	Design power switch Design CNTfilter/oscillator Design LNA
WP 3	RF graphene properties characterization employing graphene loaded CPW structure
WP 4	LAAS is the WP4 leader and lead the task concerning the characterization of the CNT RF switch. Contribution for the characterization of different devices (CNT and Graphene FET, CNT RF switch, CNT based filter, graphene antenna, graphene detector).

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WP 6	
WP 7	

Major Cost Items

- Personal costs : 7.19 person-months

Tables of costs

M18-M24		Budget M18	Type of Activity				TOTAL	% Spent	Remaining budget
			RTD	DEM	MGT	OTHER			
LAAS	Personnel costs	121 428	34 226	0	3 040	0	37 266	31%	84 162
	subcontracting	0	0	0	0	0	0	0%	0
	other direct costs	83 300	2 361	0	504	0	2 865	3%	80 435
	indirects costs	122 837	0	0	0	0	0	0%	122 837
	total	327 565	36 587	0	3 544	0	40 131	12	287 434

Table 7: LAAS Table of costs

Table of Human Resources

Partner	WP	Planned PM	Actual Person-Months M18 - 24							% Total	Remaining PM
			Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Total		
LAAS	WP 1	6,00	3,66	0,00	0,00	0,00			3,66	61%	2,34
	WP 2	2,00	0,00	2,00	0,00	0,00			2,00	100%	0,00
	WP 3	24,00	0,00	6,22	4,56	4,45			15,23	63%	8,77
	WP 4	12,00	0,00	0,00	1,84	2,22			4,06	34%	7,94
	WP 5	1,00	0,00	0,00	0,00	0,00			0,00	0%	1,00
	WP 6	0,00	0,00	0,00	0,00	0,40			0,40	0%	-0,40
	WP 7	3,00	0,00	2,00	0,56	0,12			2,68	89%	0,32
	Total	48,00	3,66	10,22	6,96	7,19	0,00	0,00	28,03	58%	19,97

Table 8: LAAS Table of Human Resources

1.1.5 UPMC

Brief description of work

WP 2	Design the CNT antenna
WP 3	RF material test structures for classical material parameters (epsilon, mu, sigma and resistance/inductance/capacitance) characterisation
WP 4	UPMC lead the activity concerning the characterization of the CNT based filter. Contribution also for the characterization of the CNT and graphene antenna and CNT/Graphene FET.
WP 6	
WP 7	

Major Cost Items

- Personal costs : 0.8 person-months

Tables of costs

M18-M24	Budget	Type of Activity				TOTAL	% Spent	Remaining budget
		RTD	DEM	MGT	OTHER			
UPMC	Personnel costs	125 851	0	0	0	0	0%	125 851
	subcontracting	39 043	0	0	0	0	0%	39 043
	other direct costs	20 902	1 712	0	0	1 712	8%	19 190
	indirects costs	99 003	0	0	0	0	0%	99 003
	total	284 799	1 712	0	0	1 712	1	283 087

Table 9 : UPMC Table of costs

Table of Human Resources

Partner	WP	Planned PM	Actual Person-Months M18 - 24							% Total	Remaining PM
			Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Total		
UPMC	WP 1	0,00	0,00	0,00	0,00	0,00			0,00	0%	0,00
	WP 2	17,00	2,60	2,43	1,30	0,00			6,33	37%	10,67
	WP 3	6,00	0,00	0,64	0,20	0,80			1,64	27%	4,36
	WP 4	15,00	0,00	0,00	0,00	0,00			0,00	0%	15,00
	WP 5	1,00	0,00	0,00	0,00	0,00			0,00	0%	1,00
	WP 6	0,00	0,00	0,00	0,00	0,00			0,00	0%	0,00
	WP 7	0,00	0,00	0,00	0,00	0,00			0,00	0%	0,00
	Total	39,00	0,00	3,07	1,50	0,80	0,00	0,00	7,97	20%	31,03

Table 10: UPMC Table of Human Resources

1.1.6 IMT

Brief description of work

WP 2	Design the CNT transistor Design capacitive CNT switch Design the parameters of the CNT array Design graphene antenna Design graphene FET, and graphene mixer/oscillator
WP 3	Contribute to technology nodes (opto litho mask fabrication)
WP 4	IMT has been strongly involved on test activities. Contribution for the characterization of different devices (CNT and Graphene FET, CNT RF switch, CNT based filter, CNT and graphene antenna, Graphene detector). Leading the task concerning the task concerning the graphene detector characterization.
WP 6	
WP 7	

Major Cost Items

- Personal costs : 8.47 person-months

Tables of costs

M18-M24		Budget M18	Type of Activity				TOTAL	% Spent	Remaining budget
			RTD	DEM	MGT	OTHER			
IMT	Personnel costs	136 861	35 562	0	860	0	36 422	27%	100 439
	subcontracting	0	0	0	0	0	0	0%	0
	other direct costs	34 979	9 906	0	650	0	10 556	30%	24 423
	indirects costs	34 369	9 094	0	302	0	9 396	27%	24 973
	total	206 209	54 562	0	1 812	0	56 374	27	149 835

Table 11 : IMT Table of costs

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Table of Human Resources

Partner	WP	Planned PM	Actual Person-Months M18 - 24							% Total	Remaining PM
			Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Total		
IMT	WP 1	2,00	0,00	2,00	0,00	0,00			2,00	100%	0,00
	WP 2	25,00	4,90	10,17	5,00	3,87			23,94	96%	1,06
	WP 3	5,00	1,00	0,50	0,00	2,50			4,00	80%	1,00
	WP 4	15,00	0,00	0,00	0,00	1,90			1,90	13%	13,10
	WP 5	2,50	0,00	0,00	0,00	0,00			0,00	0%	2,50
	WP 6	0,00	0,00	0,00	0,00	0,00			0,00	0%	0,00
	WP 7	1,50	0,10	0,50	0,00	0,20			0,80	53%	0,70
	Total	51,00	6,00	13,17	5,00	8,47	0,00	0,00	32,64	64%	18,36

Table 12: IMT Table of Human Resources

1.1.7 GI

Brief description of work

WP 2	
WP 3	Provide exfoliated graphene & transfer 2D material to arbitrary substrates or over Apertures
WP 4	
WP 6	
WP 7	

Major Cost Items

- Personal costs : 2,00 person-months

Tables of costs

M18-M24		Budget M18	Type of Activity				TOTAL	% Spent	Remaining budget
			RTD	DEM	MGT	OTHER			
GI	Personnel costs	87 029	6 822	0	704	0	7 526	9%	79 503
	subcontracting	0	0	0	0	0	0	0%	0
	other direct costs	37 558	43	0	10	0	53	0%	37 505
	indirects costs	24 268	15 671	0	2 302	0	17 973	74%	6 295
	total	148 855	22 536	0	3 016	0	25 552	17	123 303

Table 13 : GI Table of costs

Table of Human Resources

Partner	WP	Planned PM	Actual Person-Months M18 - 24							% Total	Remaining PM
			Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Total		
GI	WP 1	0,00	0,00	0,00	0,00	0,00			0,00	0%	0,00
	WP 2	0,00	0,00	0,00	0,00	0,00			0,00	0%	0,00
	WP 3	19,00	1,50	2,50	1,50	2,00			7,50	39%	11,50
	WP 4	1,00	0,00	0,00	0,00	0,00			0,00	0%	1,00
	WP 5	1,00	0,00	0,00	0,00	0,00			0,00	0%	1,00
	WP 6	0,00	0,00	0,00	0,00	0,00			0,00	0%	0,00
	WP 7	0,00	0,50	0,50	0,50	0,00			1,50	0%	-1,50
	Total	21,00	2,00	3,00	2,00	2,00	0,00	0,00	9,00	43%	12,00

Table 14: GI Table of Human Resources

1.1.8 TAS

Brief description of work

WP 2	Provide antenna parameters and help at graphene antenna design Provide graphene parameters and design test devices to find graphene properties to be used in the design
WP 3	
WP 4	
WP 6	
WP 7	

Major Cost Items

- Personal costs : 0,84 person-months

Tables of costs

M12-M18	Budget M12	Type of Activity				TOTAL	% Spent	Remaining budget
		RTD	DEM	MGT	OTHER			
TAS	Personnel costs	29 015	1 301	0	0	1 301	4	27 714
	subcontracting	0	0	0	0	0	0	0
	other direct costs	2 715	354	0	0	354	13	2 361
	indirects costs	35 818	1 005	0	0	1 005	3	34 813
	total	67 548	2 660	0	0	2 660	4	64 888

Table 15 : TAS Table of costs

Table of Human Resources

Partner	WP	Planned PM	Actual Person-Months M18 - 24							% Total	Remaining PM
			Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Total		
TAS	WP 1	2,00	0,00	0,08	0,00	0,00			0,08	4%	1,92
	WP 2	1,00	0,00	0,00	0,10	0,84			0,94	94%	0,06
	WP 3	0,00	0,00	0,00	0,00	0,00			0,00	0%	0,00
	WP 4	0,00	0,00	0,00	0,00	0,00			0,00	0%	0,00
	WP 5	2,00	0,00	0,00	0,00	0,00			0,00	0%	2,00
	WP 6	0,00	0,00	0,00	0,00	0,00			0,00	0%	0,00
	WP 7	2,00	0,00	0,00	0,00	0,00			0,00	0%	2,00
	Total	7,00	0,00	0,08	0,10	0,84	0,00	0,00	1,02	15%	5,98

Table 16: TAS Table of Human Resources

1.1.9 SHT

Brief description of work

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WP 2	
WP 3	optimization of PECVD growth process of single CNTs on conductive & non-conductive substrates Contribution the knowledge of CNT growth Growth of CNTs for filter fabrication PECVD growth of CNTs for antenna fabrication Contribution of knowledge on graphene growth
WP 4	Contribution for the characterization of the CNT interconnect
WP 6	
WP 7	

Major Cost Items

- Personal costs : 8.60 person-months

Tables of costs

M18-M24		Budget M18	Type of Activity				TOTAL	% Spent	Remaining budget
			RTD	DEM	MGT	OTHER			
SHT	Personnel costs	63 965	26 921	0	0	0	26 921	42	37 044
	subcontracting	0	0	0	0	0	0	0	0
	other direct costs	83 287	9 501	0	549	0	10 050	12	73 237
	indirects costs	88 351	21 853	0	329	0	22 182	25	66 169
	total	235 603	58 275	0	878	0	59 153	25	176 450

Table 17 : SHT Table of costs

Table of Human Resources

Partner	WP	Planned PM	Actual Person-Months							% Total	Remaining PM
			Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Total		
SHT	WP 1	1,00	0,60	0,4	0	0			1,00	100%	0,00
	WP 2	0,00	0,00	0,00	0,00	0,00			0,00	0%	0,00
	WP 3	29,00	3,50	7,80	6,70	7,00			25,00	86%	4,00
	WP 4	4,00	0,00	0,00	0,70	1,00			1,70	43%	2,30
	WP 5	0,00	0,00	0,00	0,00	0,00			0,00	0%	0,00
	WP 6	0,00	0,30	0,20	0,40	0,30			1,20	0%	-1,20
	WP 7	4,00	0,30	0,20	0,40	0,30			1,20	30%	2,80
	Total	38,00	4,70	8,60	8,20	8,60	0,00	0,00	30,10	79%	7,90

Table 18: SHT Table of Human Resources

1.1.10 UNIVPM

Brief description of work

WP 2	Multiphysics simulation of CNT transistor Multiphysics design of CNT NEMS switch Design the graphene detector
WP 3	
WP 4	Contribution for the CNT/graphene antenna characterization
WP 6	
WP 7	

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Major Cost Items

- Personal costs : 11 person-months

Tables of costs

M18-M24		Budget M18	Type of Activity				TOTAL	% Spent	Remaining budget
			RTD	DEM	MGT	OTHER			
UNIVPM	Personnel costs	26 924	23 000	0	0	0	23 000	85%	3 924
	subcontracting	1 000	0	0	0	0	0	0%	1 000
	other direct costs	6 760	5 528	0	0	0	5 528	82%	1 232
	indirects costs	47 624	16 943	0	0	0	16 943	36%	30 681
	total	82 308	45 471	0	0	0	45 471	55	36 837

Table 19 : UNIVPM Table of costs

Table of Human Resources

Partner	WP	Planned PM	Actual Person-Months M18 - 24							% Total	Remaining PM
			Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Total		
UNIVPM	WP 1	0,00	0,00	0,00	0,00	0,00			0,00	0%	0,00
	WP 2	24,00	2,00	4,00	8,00	6,00			20,00	83%	4,00
	WP 3	0,00	0,00	0,00	0,00	0,00			0,00	0%	0,00
	WP 4	10,00	0,00	0,00	3,00	3,00			6,00	60%	4,00
	WP 5	0,00	0,00	0,00	0,00	0,00			0,00	0%	0,00
	WP 6	5,00	0,50	0,50	0,50	2,00			3,50	70%	1,50
	WP 7	5,00	0,00	0,00	0,00	0,00			0,00	0%	5,00
	Total	44,00	2,50	4,50	11,50	11,00	0,00	0,00	29,50	67%	14,50

Table 20: UNIVPM Table of Human Resources

1.1.11 LiU

Brief description of work

WP 2	Provide physical properties of graphene on SiC wafer and help at graphène antenna design Will help to the design to all graphène devices to complay the graphene on wafer characteristics
WP 3	Graphene growth by high temperature decomposition of SiC
WP 4	
WP 6	
WP 7	

Major Cost Items

- Personal costs : 6,0 person-months

Tables of costs

M18-M24		Budget M18	Type of Activity				TOTAL	% Spent	Remaining budget
			RTD	DEM	MGT	OTHER			
LiU	Personnel costs	35 395	35 969				35 969	102%	-574
	subcontracting	0					0	0%	0
	other direct costs	41 714	1 504				1 504	4%	40 210
	indirects costs	46 264	22 483				22 483	49%	23 781
	total	123 373	59 956	0	0	0	59 956	49	63 417

	D7.12 & D7.22 : Progress Management Reports #4 & Updated Implementation and Financial Plans	14/23
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Table 21 : LiU Table of costs

Table of Human Resources

Partner	WP	Planned PM	Actual Person-Months M18 - 24							% Total	Remaining PM
			Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Total		
LiU	WP 1	0,00	0,00	0,00	0,00	0,00			0,00	0%	0,00
	WP 2	2,00	0,00	0,00	0,00	0,00			0,00	0%	2,00
	WP 3	20,00	1,00	5,50	6,00	6,00			18,50	93%	1,50
	WP 4	1,00	0,00	0,00	0,00	0,00			0,00	0%	1,00
	WP 5	1,00	0,00	0,00	0,00	0,00			0,00	0%	1,00
	WP 6	0,00	0,00	0,00	0,00	0,00			0,00	0%	0,00
	WP 7	0,00	0,00	0,00	0,00	0,00			0,00	0%	0,00
	Total	24,00	1,00	5,50	6,00	6,00	0,00	0,00	18,50	77%	5,50

Table 22: LiU Table of Human Resources

1.1.12 ICN

Brief description of work

WP 1	
WP 2	Design resistive switch
WP 3	CNT: Micro-Raman and Brillouin scattering for structural and study of frequency ranges. Near-field optical/thermal microscope and 3-omega to study thermal loss mechanisms. Pump-and-probe experiments to study lifetimes of phonon and phonon dynamics affecting switching.
WP 4	
WP 6	
WP 7	

Major Cost Items

- Personal costs : 4.28 person-months

Tables of costs

	M18-M24	Budget M18	Type of Activity				TOTAL	% Spent	Remaining budget
			RTD	DEM	MGT	OTHER			
ICN	Personnel costs	66 504	50 943	0	2 258	0	53 201	80%	13 303
	subcontracting	1 499	0	0	0	0	0	0%	1 499
	other direct costs	46 555	19 591	0	293	0	19 884	43%	26 671
	indirects costs	67 832	42 320	0	1 530	0	43 850	65%	23 982
	total	182 390	112 854	0	4 081	0	116 935	64	65 455

Table 23 : ICN Table of costs

Table of Human Resources

Partner	WP	Planned PM	Actual Person-Months M18 - 24							% Total	Remaining PM
			Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Total		
ICN	WP 1	0,00	0,00	0,00	0,00	0,00			0,00	0%	0,00
	WP 2	1,00	0,00	1,00	0,00	0,00			1,00	100%	0,00
	WP 3	18,00	0,00	2,41	11,98	4,00			18,39	102%	-0,39
	WP 4	0,00	0,00	0,00	0,00	0,00			0,00	0%	0,00
	WP 5	10,00	0,00	0,00	0,00	0,00			0,00	0%	10,00
	WP 6	1,50	0,00	0,00	0,00	0,00			0,00	0%	1,50
	WP 7	1,00	0,27	0,27	0,26	0,28			1,08	108%	-0,08
	Total	31,50	0,27	3,68	12,24	4,28	0,00	0,00	20,47	65%	11,03

Table 24: ICN Table of Human Resources

1.1.13 Tyndall

Brief description of work

WP 2	
WP 3	High k oxide and dielectric technology implementation
WP 4	
WP 6	
WP 7	

Major Cost Items

- Personal costs : 6,00 person-months

Partner	WP	Planned PM	Actual Person-Months M18 - 24							% Total	Remaining PM
			Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Total		
Tyndall	WP 1	0,00	0,00	0,00	0,00	0,00			0,00	0%	0,00
	WP 2	0,00	0,00	0,00	0,00	0,00			0,00	0%	0,00
	WP 3	20,00	4,50	2,88	4,50	5,00			16,88	84%	3,12
	WP 4	14,00	0,00	2,00	1,00	0,00			3,00	21%	11,00
	WP 5	2,00	0,00	0,00	0,00	0,00			0,00	0%	2,00
	WP 6	0,00	0,00	0,00	0,00	0,00			0,00	0%	0,00
	WP 7	8,50	0,00	1,00	0,50	1,00			2,50	29%	6,00
	Total	44,50	4,50	5,88	6,00	6,00	0,00	0,00	22,38	50%	22,12

Tables of costs

	M18-M24	Budget M18	Type of Activity				TOTAL	% Spent	Remaining budget
			RTD	DEM	MGT	OTHER			
Tyndall	Personnel costs	161 242	27 873				27 873	17%	133 369
	subcontracting	0	0				0	0%	0
	other direct costs	52 241	2 800				2 800	5%	49 441
	indirects costs	128 089	18 404				18 404	14%	109 686
	total	341 572	49 077	0	0	0	49 077	14	292 496

Table 25 : Tyndall Table of costs

Table of Human Resources

Partner	WP	Planned PM	Actual Person-Months							% Total	Remaining PM
			Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Total		
Tyndall	WP 1	0,00	0,00	0,00	0,00				0,00	0%	0,00
	WP 2	0,00	0,00	0,00	0,00				0,00	0%	0,00
	WP 3	20,00	4,50	2,88	4,50				11,88	59%	8,12
	WP 4	14,00	0,00	2,00	1,00				3,00	21%	11,00
	WP 5	2,00	0,00	0,00	0,00				0,00	0%	2,00
	WP 6	0,00	0,00	0,00	0,00				0,00	0%	0,00
	WP 7	8,50	0,00	1,00	0,50				1,50	18%	7,00
	Total	44,50	4,50	5,88	6,00	0,00	0,00	0,00	16,38	37%	28,12

Table 26: Tyndall Table of Human Resources

1.2 TABULAR OVERVIEW OF BUDGETED AND ACTUAL COSTS

Partner	Total Budget	Actual cost							% Total	Remaining Budget
		Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Total		
TRT	1 735 664,00	82 384,00	162 193,00	347 000,00	508 504,00	0,00	0,00	1 100 081,00	63,38%	635 583,00
CHALMERS	836 520,00	65 091,00	111 893,00	99 992,00	92 512,00	0,00	0,00	369 488,00	44,17%	467 032,00
FORTH	512 250,00	36 507,93	50 003,07	49 917,00	51 181,00	0,00	0,00	187 609,00	36,62%	324 641,00
LAAS	524 160,00	44 240,00	54 816,00	97 539,00	40 131,00	0,00	0,00	236 726,00	45,16%	287 434,00
UPMC	306 560,00	1 416,40	18 930,60	1 414,00	1 712,00	0,00	0,00	23 473,00	7,66%	283 087,00
IMT	332 760,00	42 124,21	165 655,79	39 824,00	56 374,00	0,00	0,00	303 978,00	91,35%	28 782,00
GI	248 000,00	27 576,00	19 068,00	24 925,00	25 552,00	0,00	0,00	97 121,00	39,16%	150 879,00
TSA	70 000,00	0,00	2 452,00	0,00	2 660,00	0,00	0,00	5 112,00	7,30%	64 888,00
SHT	432 899,00	41 933,00	69 742,00	85 621,00	159 154,00	0,00	0,00	356 450,00	82,34%	76 449,00
UNIVPM	246 787,00	29 396,98	16 293,02	118 789,00	45 471,00	0,00	0,00	209 950,00	85,07%	36 837,00
LIU	272 000,00	19 476,92	63 258,08	65 892,00	59 956,00	0,00	0,00	208 583,00	76,68%	63 417,00
ICN	335 901,00	15 511,63	21 063,37	116 935,00	120 935,00	0,00	0,00	274 445,00	81,70%	61 456,00
Tyndall	395 694,00	45 990,40	70 085,60	54 122,00	49 077,00	0,00	0,00	219 275,00	55,42%	176 419,00
Total Cost	6 249 195,00	451 648,47	825 453,53	1 101 970,00	1 213 219,00	0,00	0,00	3 592 291,00	57,48%	2 656 904,00

Table 27 Tabular overview of budgeted and actual costs

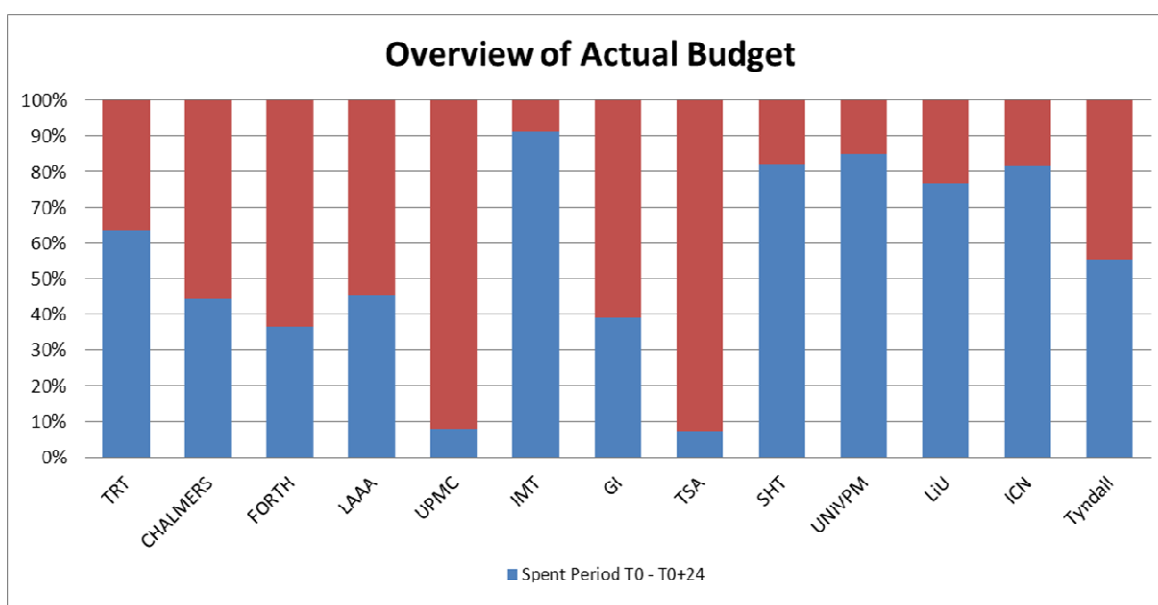


Figure 1 : Actual spent budget vs planned total budget for each partner

1.3 TABULAR OVERVIEW OF PLANNED AND ACTUAL HUMAN RESOURCES

Partner	Planned PM	Actual Person-Months							% Total	Remaining PM
		Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Total		
TRT	94,00	4,77	8,98	17,61	32,85	0,00	0,00	64,21	68,31%	29,79
CHALMERS	70,00	3,50	9,80	6,10	8,00	0,00	0,00	27,40	39,14%	42,60
FORTH	72,00	7,90	16,83	7,02	9,76	0,00	0,00	41,51	57,65%	30,49
LAAS	46,00	5,66	6,22	6,96	7,19	0,00	0,00	26,03	56,59%	19,97
UPMC	39,00	2,60	3,07	1,50	0,80	0,00	0,00	7,97	20,44%	31,03
IMT	51,00	6,00	13,17	5,00	8,47	0,00	0,00	32,64	64,00%	18,36
GI	21,00	2,00	3,00	2,00	2,00	0,00	0,00	9,00	42,86%	12,00
TSA	7,00	0,00	0,08	0,10	0,84	0,00	0,00	1,02	14,57%	5,98
SHT	36,00	4,70	8,60	8,20	8,60	0,00	0,00	30,10	83,61%	5,90
UNIVPM	39,00	2,50	4,50	11,50	12,00	0,00	0,00	30,50	78,21%	8,50
LIU	24,00	1,00	5,50	6,00	6,00	0,00	0,00	18,50	77,08%	5,50
ICN	31,50	0,27	4,68	12,24	4,28	0,00	0,00	21,47	68,16%	10,03
Tyndall	44,50	4,50	5,88	6,00	6,00	0,00	0,00	22,38	50,29%	22,12
Total	575,00	45,40	90,31	90,23	106,79	0,00	0,00	332,73	57,87%	242,27

Table 28 : Overview of planned and actual human resources per partner

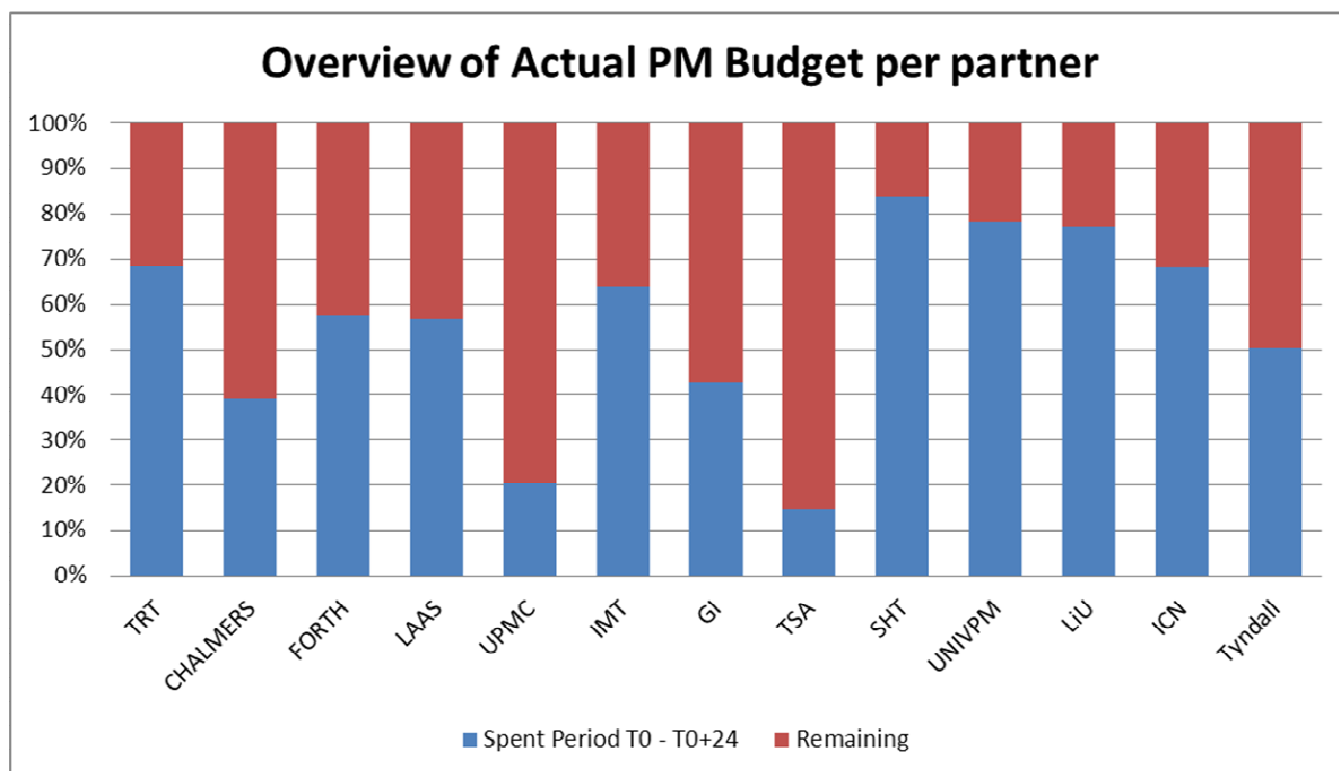


Figure 2 : Actual spent PM vs total budgeted PM for each partner

Partner	Planned PM	Actual Person-Months							% Total	Remaining PM
		Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Total		
WP1	22,00	10,26	2,98	0,10	0,00	0,00	0,00	13,34	60,64%	8,66
WP2	88,00	12,00	20,58	14,90	12,71	0,00	0,00	60,19	68,40%	27,81
WP3	261,00	18,40	58,58	62,05	68,97	0,00	0,00	208,00	79,69%	53,00
WP4	104,00	0,00	2,00	8,86	10,12	0,00	0,00	20,98	20,17%	83,02
WP5	43,50	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00%	43,50
WP6	10,50	1,11	1,30	1,40	7,20	0,00	0,00	11,01	104,86%	-0,51
WP7	48,00	1,63	4,87	2,92	7,79	0,00	0,00	17,21	35,85%	30,79
Total	577,00	43,40	90,31	90,23	106,79	0,00	0,00	330,73	57,32%	246,27

Table 29 : overview of planned and actual human resources per Workpackage

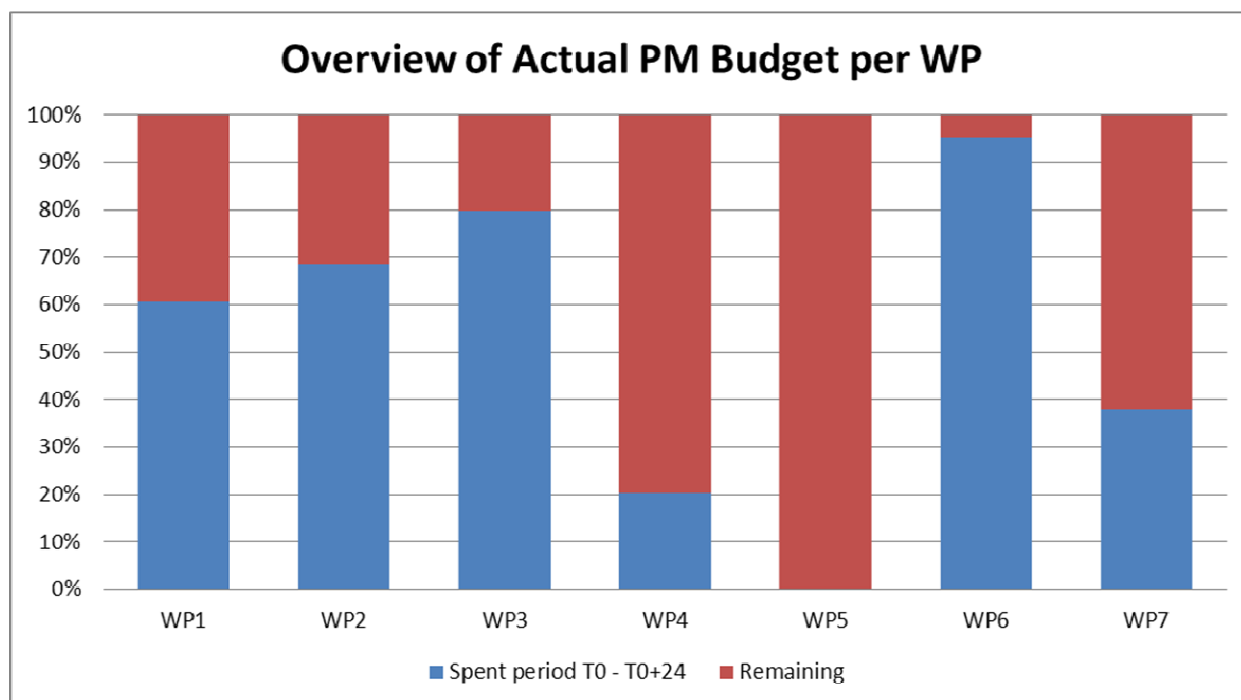


Figure 3 : Actual spent PM vs total budgeted PM for each workpackage

1.4 MAJOR DEVIATIONS

At this stage of the project, no major deviation has occurred in term of cost or human resources.

	Planned	Actual							% Total	Remaining
		Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Total		
Cost	6 249 195,00	451 648,47	825 453,53	1 101 970,00	1 213 219,00	0,00	0,00	3 592 291,00	57,48%	2 656 904,00
PM	577,00	45,42	90,31	90,23	106,79	0,00	0,00	332,75	57,67%	244,25

Table 30 : Summary of planned and actual costs and PM expenses

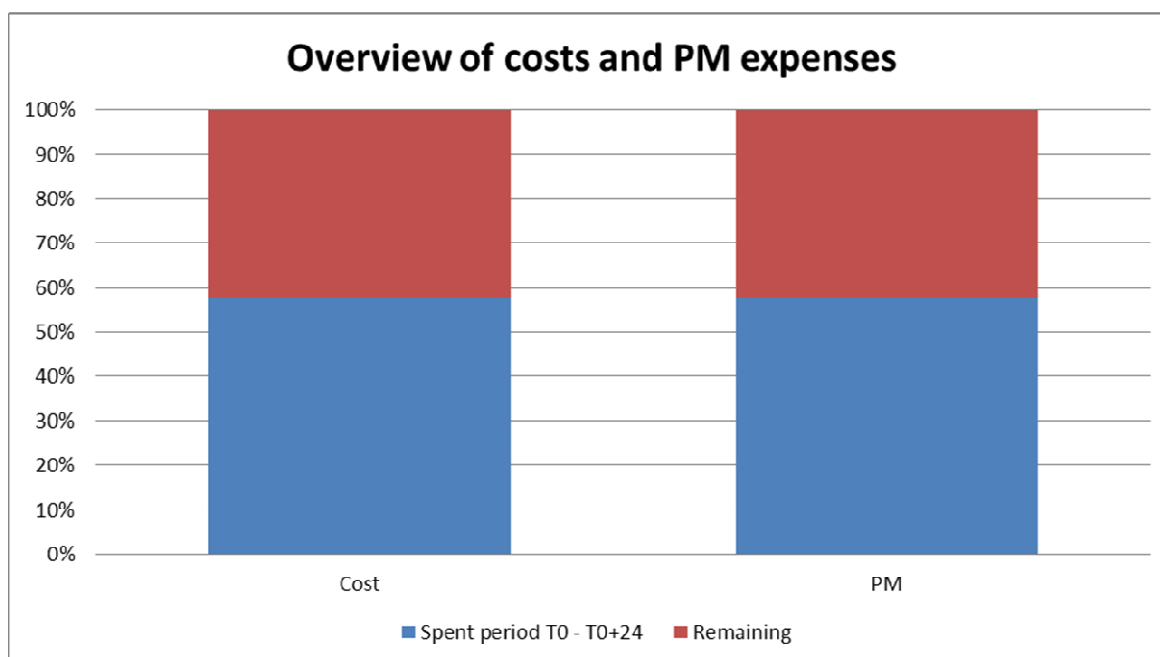


Figure 4 : Overview of cost and PM expenses

2 UPDATED IMPLEMENTATION AND FINANCIAL PLANS

9 month extension has been requested and the new duration of the project will be 45 months

2.1 UPDATED GANTT CHART

Following the project extension requested, a new Gantt chart has been established. The new Gantt chart is presented Figure 5 :

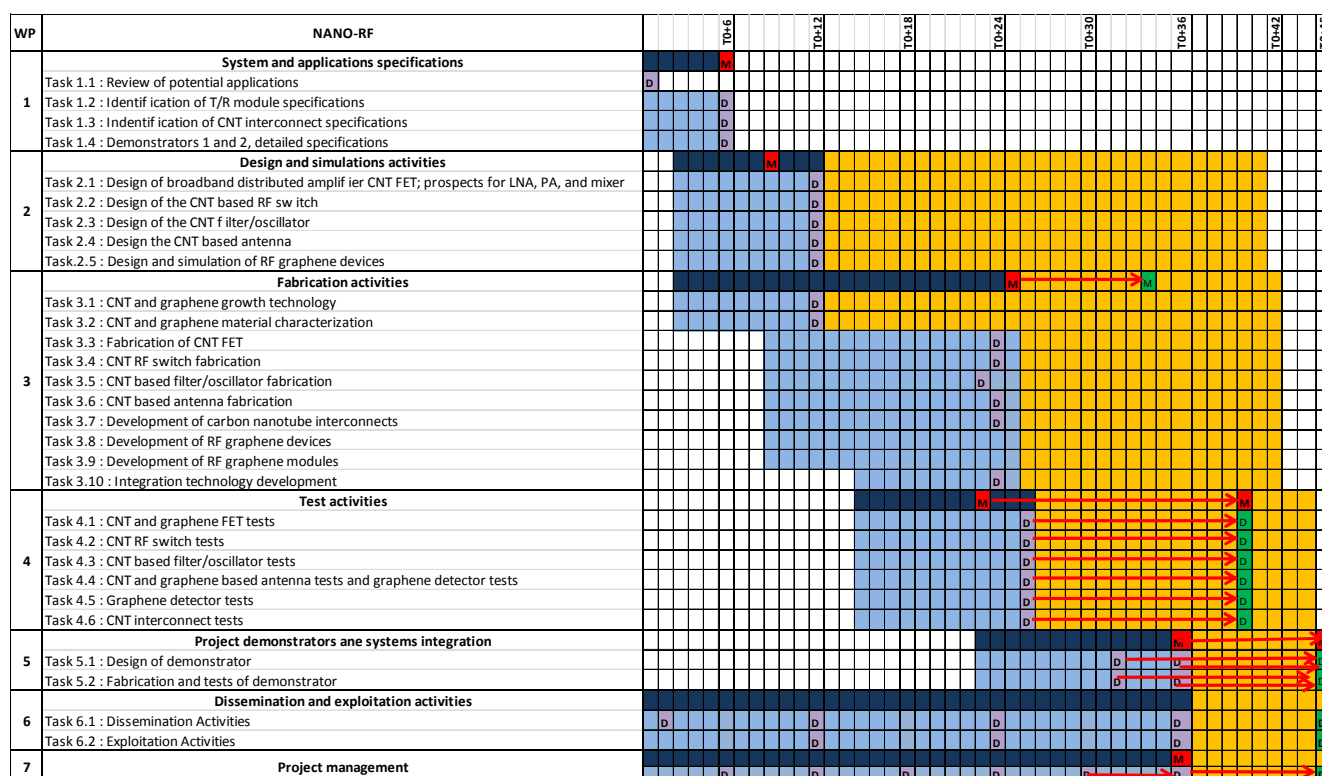


Figure 5 : Gantt chart updted for project extension

2.2 WP TABLE UDPDATED FOR EXTENSION

Following the project extension requested, a new WP table has been established. The new WP table is presented Figure 6 :

Work package N°	Work package title	Lead partic N°	Lead partic. short name	Start month	End month
1	Systems and applications specifications	8	TAS	T0	T0+6
2	Design and simulations activities	6	IMT	T0+3	T0+41
3	Fabrication activities	3	FORTH	T0+3	T0+42
4	Test activities	4	CNRS-LAAS	T0+15	T0+44
5	System integration and tests	12	ICN	T0+35	T0+45
6	Dissemination & exploitation activities	1	TRT	T0	T0+45
7	Project management	1	TRT	T0	T0+45

Figure 6 : WP Table for the extension

	D7.12 & D7.22 : Progress Management Reports #4 & Updated Implementation and Financial Plans	20/23
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2.3 GENERAL PM TABLE UPDATED FOR EXTENSION

Following the project extension requested, a new general PM table has been established. The new PM table is presented Figure 7 :

Partic. no.	Partic. short name	WP1	WP2	WP3	WP4	WP5	WP6	WP7	Total person months
1	TRT	7	16	26	13	14	4	14	94
2	CHALMERS	4	0	36	16	5	0	9	70
3	FORTH	2	0	72	8	5	3	3	93
4	LAAS	4	1	13	12	2	1	2	35
5	UPMC	0	17	6	15	1	0	0	39
6	IMT	2	25	5	15	2,5	0	1,5	51
7	GI	0	0	19	1	1	0	0	21
8	TAS	2	1	0	0	2	0	2	7
9	SHT	1	0	29	4	0	0	4	38
10	UNIVPM	0	24	0	10	0	0	5	39
11	LiU	0	2	20	1	1	0	0	24
12	ICN	0	1	18	0	10	1,5	1	31,5
13	Tyndall	0	0	23,5	3	0	0	2,5	29
Total person months		22	87	267,5	98	43,5	9,5	44	571,5

Figure 7 : General PM Table for the extension

2.4 BUGDET UPDATED FOR EXTENSION

Following the project extension requested, a cost table has been established. The new cost table is presented Figure 8 and Figure 9:

Participant number in this project	Participant short name	Fund %	Ind. Costs	Estimated eligible costs (whole duration of the project)					Requested EU contribution
				RTD /Innovation (A)	Demonstration (B)	Management (C)	Other (D)	Total A+B+C+D	
1	TRT	50	A	1 410 097,00	0,00	325 567,00	0,00	1 735 664,00	1 030 615,00
2	CHALMERS	75	T	724 520,00	40 000,00	72 000,00	0,00	836 520,00	609 237,00
3	FORTH	75	A	589 367,00	26 550,00	18 930,00	15 930,00	650 777,00	490 160,00
4	LAAS-CNRS	75	T	370 400,00	13 280,00	18 880,00	0,00	402 560,00	303 320,00
5	UPMC	75	T	286 720,00	0,00	19 840,00	0,00	306 560,00	234 880,00
6	IMT	75	F	306 120,00	12 900,00	13 740,00	0,00	332 760,00	249 780,00
7	GI	75	A	240 000,00	0,00	8 000,00	0,00	248 000,00	188 000,00
8	TAS	50	A	26 000,00	22 000,00	22 000,00	0,00	70 000,00	46 000,00
9	SHT	75	T	352 899,00	48 000,00	32 000,00	0,00	432 899,00	304 624,00
10	UNIVPM	75	T	246 787,00	0,00	0,00	0,00	246 787,00	185 090,00
11	LiU	75	T	272 000,00	0,00	0,00	0,00	272 000,00	150 000,00
12	ICN	75	T	218 804,00	50 878,00	50 647,00	15 572,00	335 901,00	255 761,00
13	Tyndall	75	T	392 643,00	0,00	3 051,00	0,00	395 694,00	297 533,00
Total				5 436 357,00	213 608,00	584 655,00	31 502,00	6 266 122,00	4 345 000,00

Figure 8 : General cost Table for the extension

Beneficiary number	Participant short name	Estimated eligible costs (whole duration of the project)						Requested EU contribution
		Effort (PM)	Personnel cost (eur)	Subcontracting (eur)	Other Direct cost (Eur)	Indirect costs (Eur)	Total costs	
1	TRT	94	726 809,00	9 000,00	151 814,00	848 041,00	1 735 664,00	1 030 615,00
2	CHALMERS	70	350 000,00	0,00	172 825,00	313 695,00	836 520,00	609 237,00
3	FORTH	72	269 600,00	3 000,00	170 585,00	207 592,00	650 777,00	490 160,00
4	LAAS-CNRS	35	231 600,00	0,00	20 000,00	150 960,00	402 560,00	303 320,00
5	UPMC	39	144 100,00	39 200,00	23 000,00	100 260,00	306 560,00	234 880,00
6	IMT	51	219 300,00	0,00	58 000,00	55 460,00	332 760,00	249 780,00
7	GI	21	118 000,00	0,00	40 000,00	90 000,00	248 000,00	188 000,00
8	TAS	7	30 000,00	0,00	3 000,00	37 000,00	70 000,00	46 000,00
9	SHT	38	155 000,00	0,00	115 562,00	162 337,00	432 899,00	304 624,00
10	UNIVPM	39	115 617,00	0,00	39 000,00	92 170,00	246 787,00	185 090,00
11	LiU	24	120 000,00	0,00	50 000,00	102 000,00	272 000,00	150 000,00
12	ICN	31,5	138 653,00	1 499,00	70 350,00	125 399,00	335 901,00	255 761,00
13	Tyndall	44,5	189 109,00	0,00	58 200,00	148 385,00	395 694,00	297 533,00
Total		566	2 807 788,00	52 699,00	972 336,00	2 433 299,00	6 266 122,00	4 345 000,00

Erreur ! Source du renvoi introuvable. **Figure 9 : General cost Table for the extension**

3 UPDATED RISK AND CONTINGENCY PLAN

3.1 CARBON NANOTUBES DEMONSTRATOR

3.1.1 Demonstrator description, critical parts.

The CNTs based demonstrator is a T/R module operating in the range of 2-80GHz. The main components to obtain such a system will be: a) Antenna b) Low noise amplifier c) Switch d) Filter. All these components are based on CNTs technology.

The following critical parts are to be developed in order to successfully obtain a functional CNT based demonstrator:

1. CNT based antenna
2. CNT FET
3. CNT switch.
4. CNT filter

Each of these parts will be addressed below

3.1.2 CNT based antenna

In case the CNTs antenna fails to perform as necessary, for example the CNT module will not receive microwaves signals, a patch antenna on the Si/SiO₂ substrate will be used. Another alternative solution is to use commercial monopole for the CNT antenna replacement.

3.1.3 CNT FET

Currently, CNT FET are already manufactured and measured in the consortium.

In case the CNTs amplifier fails to perform as necessary, for example the CNT module will not amplify the antenna signals, the solution is to replace the CNT FET with a MMMIC amplifier.

3.1.4 CNT switch

At this point, the consortium has already developed and fabricated an CNT based RF Switch

In case the CNTs switch fails to perform as necessary, for example the module is not able to switch between T/R modes, a commercial switch or a MEMS switch will replace the CNT switch.

	D7.12 & D7.22 : Progress Management Reports #4 & Updated Implementation and Financial Plans	22/23
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3.1.5 CNT filter

In case the CNTs filter fails to perform as necessary, for example the RF signal will be not filtered, a commercial filter will replace it.

All failed component will be re-designated and re-fabricated.

3.2 GRAPHENE DEMONSTRATOR

3.2.1 Demonstrator description, critical parts.

The graphene based demonstrator is a receiver module operating in the range of 2-20GHz. The main components to obtain such a system will be: a) Antenna b) Low noise amplifier c) Frequency mixer d) detection circuit all based on graphene technology.

Following the specifications work performed in WP1, the operating frequency of the demonstrator was fixed at 10GHz.

The following critical parts are to be developed in order to successfully obtain a functional graphene based demonstrator:

5. Graphene based antenna
6. Graphene FET
 1. Graphene Mixer
 2. Graphene Low noise amplifier
7. Graphene based detector.

Each of these parts will be addressed below

3.2.2 Graphene based antenna

Up to now the graphene based antenna has been simulated in WP1 and realistic parameters have been identified to proceed to prototype fabrication.

In case the graphene antenna fails to perform as necessary, there are two options to replace this part so that the graphene based demonstrator will not be compromised.

- Replacement with a CNT based antenna

Assuming that the graphene antenna fails to perform but the CNT based antenna developed within the consortium does perform as requested; the graphene based antenna will be replaced with a CNT based one. This will keep the all carbon approach originally designed.

- Replacement with a metallic antenna

In case both CNT and graphene antennae fail to perform as requested, a conventional metallic dipole antenna will be used to replace the graphene antenna. At 10 GHz such antenna are known to perform without issues although their size will be larger compared to their CNT/graphene counterparts. At the cost of larger size, the metallic antenna will still provide detection for the demonstrator to operate.

3.2.3 Graphene FET devices

At this point graphene devices have already been successfully fabricated within the consortium. Current control has been shown at low frequency.

The remaining risks regarding the GFET device fabrication are the following:

- Insufficient frequency response
- low gain / high noise

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The above issues can have a direct impact on the fabrication of the LNA and the mixer circuits. If the GFET device fails to meet the required specifications the following alternatives are available:

- Replacement with CNT based FETs

CNT FETs are developed in parallel with the graphene modules. The first alternative assuming the graphene FET based modules (LNA and Mixer) fail to meet the required specifications they will be replaced with their CNT based counterparts.

- Replacement of LNA

In case the GFET devices fail to perform with adequately low noise figures to successfully realize a low noise amplifier as described in the demonstrator specifications, and assuming the CNT based LNA also fails to meet required specifications, a commercially available LNA will be used to complete the graphene based module. Package level integration will be used to combine the LNA with the rest of the modules to reach a functional demonstrator.

- Replacement of mixer

In the case the GFET fails to perform as required in order to realize a mixing circuit, A schottky diode mixer will be realized instead. The GFET's will be used to realize the rest of the graphene based circuits and modules and they will be adapted to work with a diode based mixer instead. Although such a system is suboptimal it will still enable us to prove the concept of NANORF using even partially carbon based technology.

3.2.4 Graphene RF detector

At this point, the consortium has already developed two different types of graphene based RF detectors. One based on asymmetric ohmic contact and one based on ballistic transport. The prototypes are already meeting the required specifications as put forward in the DoW at 10GHz which is the demonstrator frequency.

Thus there is no need to develop a contingency plan for the graphene detector.