

Timing Detectors- B

High-rate, large, precise timing MRPCs/RPCs

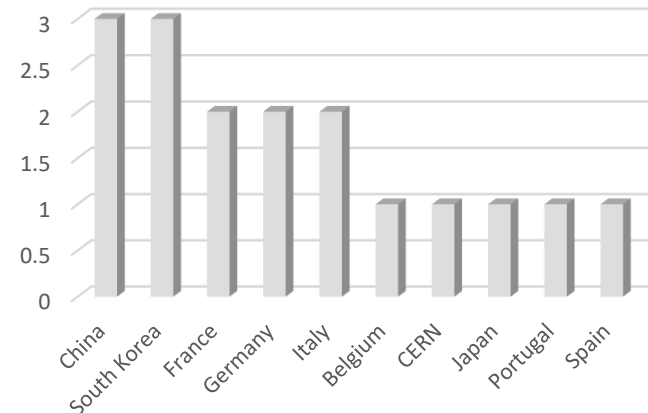
(M)RPC are still the reference in time resolution when large detectors are needed

- Trigg, ToF, PFA-based Calorimetry
- Some applications need few hundreds of ps resolution other a few tens of ps

WP7-B

17 institutes from 2 continents with expertise in RPCs/MRPCs and its readout electronics

- Institut de la physique des 2 infinis de Lyon (IP2I)
- Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas (CIEMAT)
- Vrije Universiteit Brussel (VUB)
- Gangneung-Wonju National University (GWNU)
- Shanghai Jiao Tong University (SJTU)
- Organisation de Micro-Électronique Générale Avancée (OMEGA)
- Physikalisches Institut, Heidelberg University (HDU)
- Kyoto University (KU)
- Laboratório de Instrumentação e Física Experimental de Partículas (LIP)
- Tsinghua University (THU)
- Shenzhen Institute of Advanced Technology (SIAT)
- Daegu Gyeongbuk Institute of Science and Technology (DGIST)
- Max-Planck Institute for Physics (MPP)
- INFN-BARI
- Roma Ter Vergata
- Hanyang University
- CERN EP-DT gas team



D B.1: Production and comparison of full large ($> 1 \text{ m}^2$) MRPC detectors with different techniques (24M).

M B.1: production of small detector $O(10 \text{ cm})$ of 4-8 gaps prototypes using different technologies.

D B.2: Production of large PCB of strip and PAD-based pickup configuration equipped with electronics able to reach better than 100 ps time resolution (36 M)

M B.2: Review of the needed electronics components to achieve 100 ps for strips and pad-like and performance comparison between direct and differential readout techniques.

D B.3: Production of a stable single cell MRPC with very high-rate capability (> 150 kHz/cm²) and time resolution better than 100 ps (36M).

M B.3: High-rate tests with small detector prototypes (24M)

D B.4: Construction of large-area double-gap RPC with a time resolution better than 200 ps (36M).

M B.4: Construction of small prototype (50x50 cm²) reaching 200 ps (24M).

D B.5: Timing and spatial resolution studies versus different gas mixtures (48M).

M B.4: Construction of small prototype (50x50 cm²) reaching 200 ps (24M).

M B.5: preliminary results of timing and spatial resolution with standard gas Mixture (36)

WP7-B

- Funding comments**

→ The most challenging topic is the readout electronics

Two groups (OMEGA & DGIST) will play an important role

but funding is a must

Existing

Institute	Materials			FTE		
	2024	2025	2026	2024	2025	2026
France	80	80	80	3	3	3
Spain	13	13	13	0.25	0.25	0.25
Belgium	25	25	25	0.8	0.8	0.8
Italy	40	40	40	2.5	2.5	2.5
Germany	20	20	20	1.05	1.05	1.05
Portugal	30	30	30	0.5	0.5	0.5
Switzerland	5	5	5	0.5	0.5	0.5
China	80	80	80	2.5	2.5	2.5
South Korea	83	83	83	2.4	2.4	2.4
Japan	20	20	20	1	1	1
Total	396	396	396	14.2	14.2	14.2

Additional (not existing)

Institute	Materials			FTE		
	2024	2025	2026	2024	2025	2026
France	180	180	180	0	0	0
Germany	40	40	40	1	1	1
Portugal	0	0	0	0.5	0.5	0.5
Japan	400	400	400	0	0	0
Total	520	520	520	1,5	1,5	1,5



Next steps

We foresee to have a meeting which will take place by the end of February

- Update on the current activities and funding perspectives
- Inventory of the available tools within groups and for DRD1 collaborators
- Discussion of the common activities across the different technologies

The goal is to build on current R&D activities with available fundings and provide the needed arguments to obtain more fundings and to extend the network to new comers

WP4.2 Discussions

Fundings:

➤ Sources

National, continental and international

Please attend the meeting organized on Frid. 21st

➤ Synergy

How to help each other by providing access to facilities and contacts
Facilities, tools,

Discussion to take place at CERN next week

Internal organization

➤ Deliverables responsibilities

- ❑ WP47B.1 : **Alberto Bianco**, Natsuki Tomida?
- ❑ WP47B.2 : **Weihao Wu**, Christophe de la Taille?
- ❑ WP47B. 3: **Ingo Deppner**, ?
- ❑ WP47B.4 : **Daryon Ramos Lopez**
- ❑ WP47B.5 : N.A (can wait)

- A place to put the presentations → WP7 webpage
<https://indico.cern.ch/event/1405493/>

Still a few missing contributions. Please do it or send me them to upload them for you.

We will have a meeting on Monday morning in person ahead of the DRD1

- Progress and activities
Who intends to present?
- Analysis of the synergy among the different groups: Facilities
- Funding situation in our teams;

FTE/year	D1	D2	D3	D4	D5	Total
IP2I	0.5	1			0.5	2
SJTU		1				1
MPP			0.15	0.4		0.55
VUB	0.3		0.3		0.2	0.8
KU	0.4	0.4			0.2	1
SIAT	0.5		0.5			1
LIP	0.25	0.25				0.5
GWNU	0.6	0.4				1
DGIST		0.6				0.6
INFN-BA				1.5		1.5
CIEMAT		0.15			0.1	0.25
OMEGA		1				1
HDU			0.5			0.5
TSU		0.25	0.25			0.5
Roma-TV				1		1
Hanyang				0.5		0.5
CERN					0.5	0.5
Total	2.55	5.05	1.7	3.4	1.5	14.2

Funding	D1	D2	D3	D4	D5	Total
IP2I	20	50			10	80
SJTU		20				20
MPP			5	5		10
VUB	10		10		5	25
KU	7	7			6	20
SIAT	15		15			30
LIP	15	15				30
GWNU	40	20				60
DGIST		20				20
INFN-BA				20		20
CIEMAT		8			5	13
OMEGA						
HDU			10			10
TSU		7.5	7.5		15	30
Roma-TV				20		20
Hanyang				3		3
CERN					5	5
Total	107	147.5	47.5	48	46	396

Table B.1: Summary of the available funding for the different deliverables