



# A possibility of RDMS participation in scintillator module production

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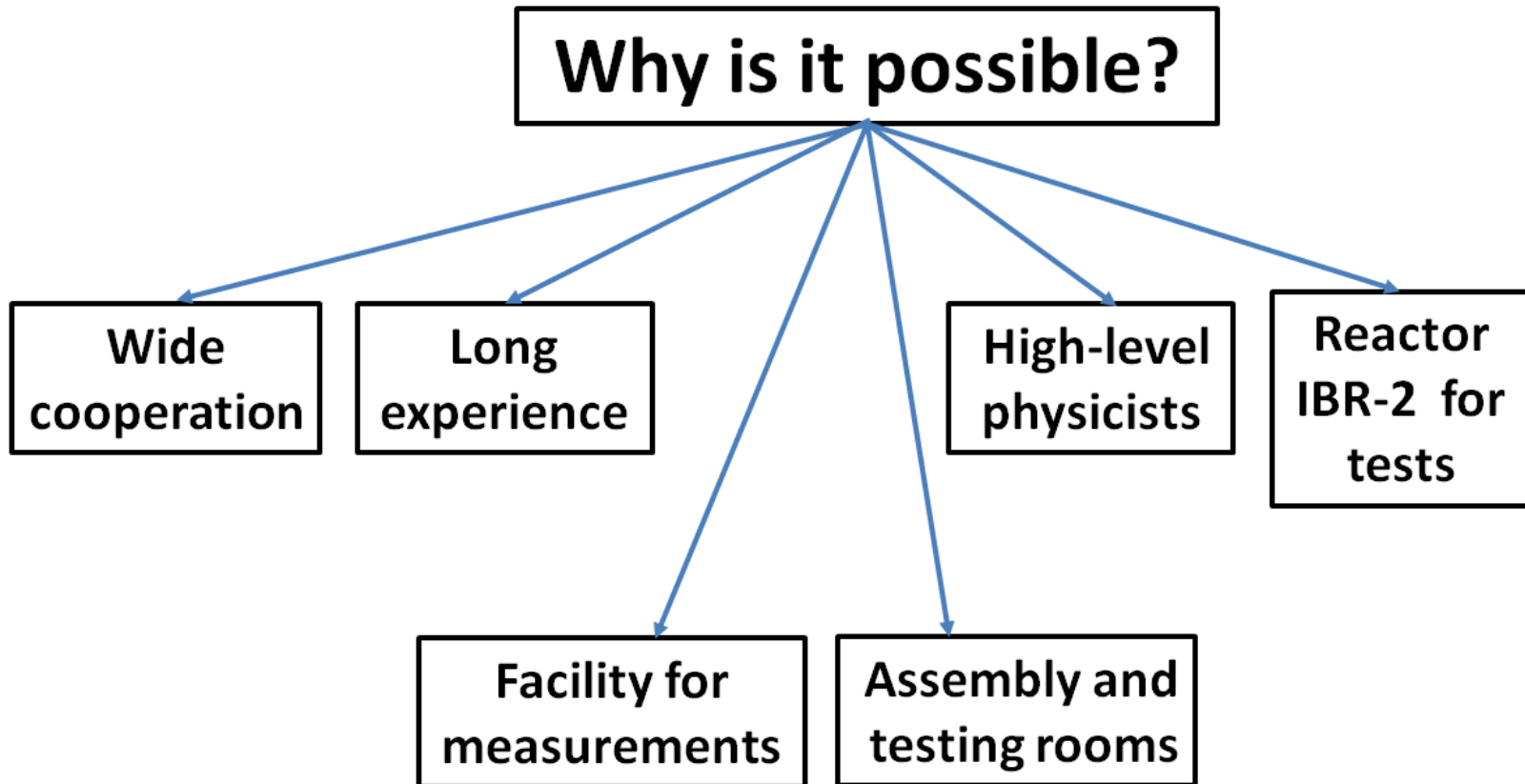
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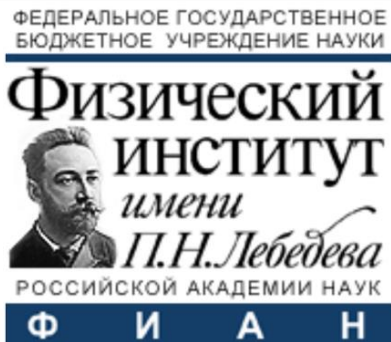
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20th Annual RDMS CMS Collaboration Conference

Tashkent-Samarkand, Uzbekistan, 12-15 September, 2018



Joint Institute for Nuclear Research



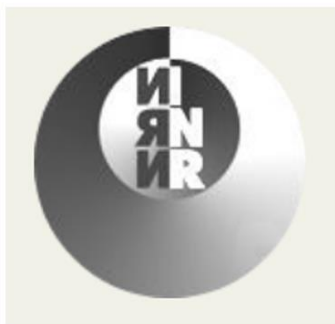
Lebedev Physical Institute of the Russian Academy of Sciences (LPI), Moscow



Institute for Scintillation Materials (ISMA), Kharkov



National Research Nuclear University (MEPhI), Moscow



Institute for Nuclear Research of the Russian Academy of Sciences (INR), Moscow



Institute for Nuclear Physics (INP) of the Academy of Sciences of Uzbekistan, Tashkent



DESY, Hamburg





***Our results of the various scintillator sample investigations for HE upgrade published in:***

1. **S.V.Afanasiev et al.** Improvement of radiation hardness of the sampling calorimeters based on plastic scintillators. Nuclear Instruments and Methods in Physics Research A, 717 (2013)11-13.
2. **S.V. Afanasiev et al.** Light yield measurements of “finger” structured and unstructured scintillators after gamma and neutron irradiation. Nuclear Instruments and Methods in Physics Research A, 818 (2016) 26-31.
3. **S. Afanasiev et al.** Direct Measurement of Radiation in the HE Calorimeter of CMS using Radiachromic Film. CMS DN-2018/008 (2018).
4. **S.V. Afanasiev et al.** “Finger” structure of tiles in CMS Endcap Hadron Calorimeters CMS NOTE -2015/001.
5. **S.V. Afanasiev et al.** HE upgrade beyond phase 1. Finger scintillator option. CMS NOTE -2014/001.
6. **S.V. Afanasiev et al.** Measuring of induced radioactivity of the HE megatile on IREN at JINR. CMS NOTE -2014/002.
7. **S.V. Afanasiev et al.** Experimental study of the plastic scintillator damage caused by radiation on IREN at JINR. CMS NOTE -2014/003.





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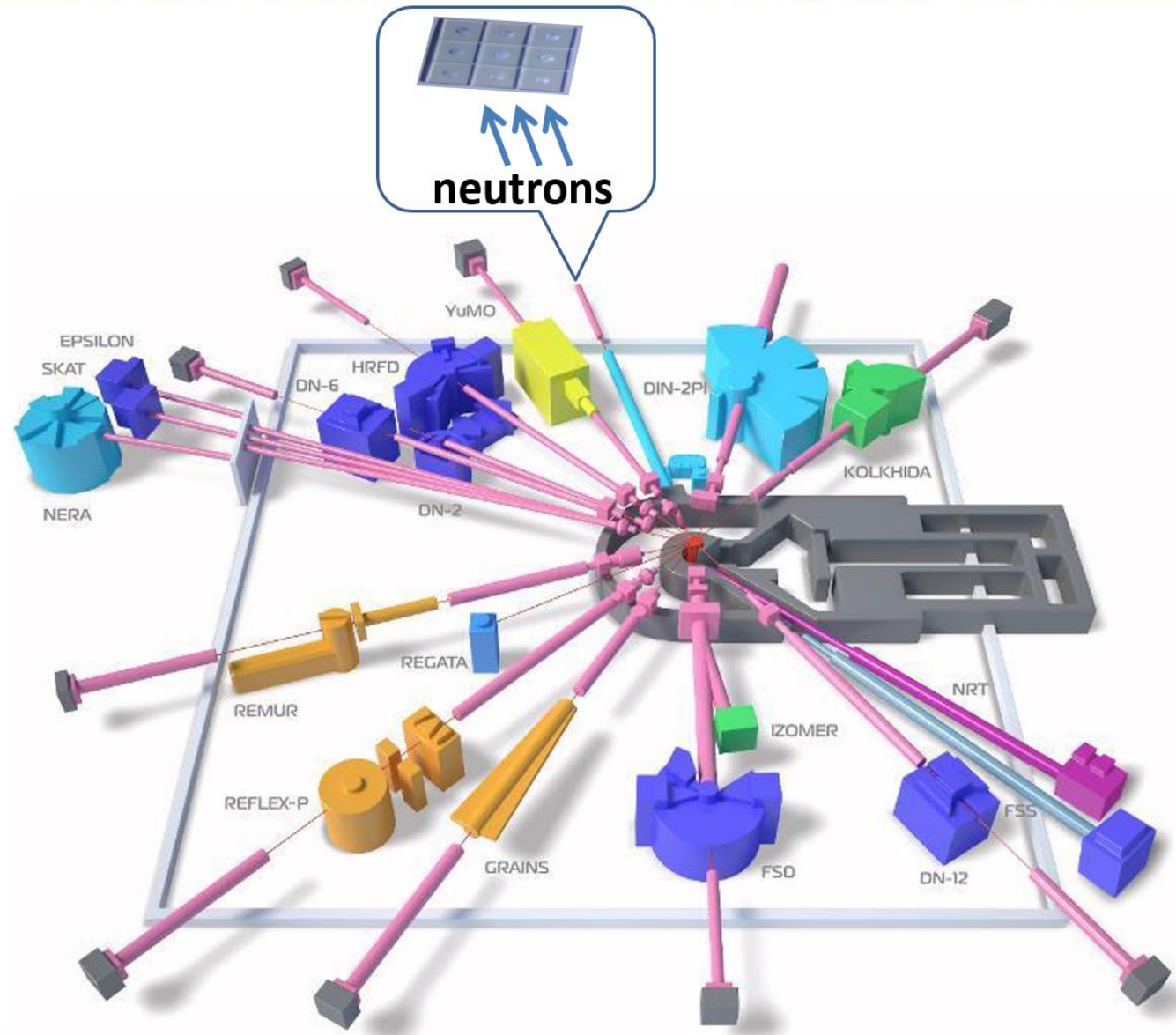
**E. Sukhov**



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SiPM Testing

1



Scintillator Tiles Motherboard Production

4



Scintillator Module production

2



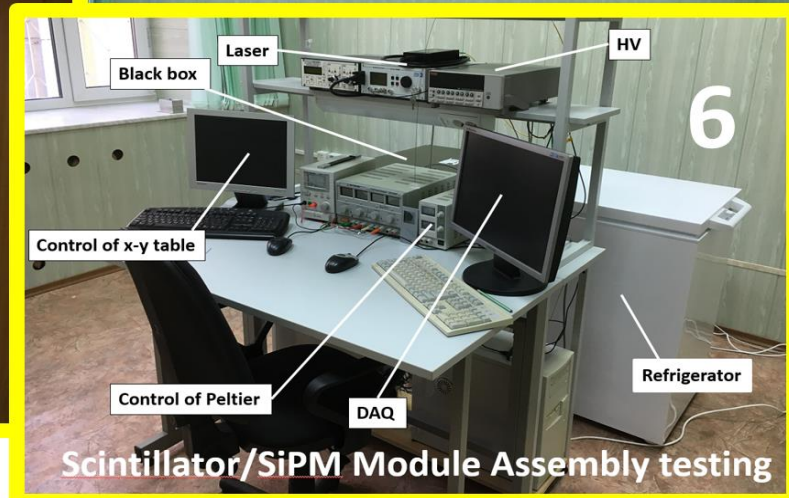
Scintillator/SiPM Module Assembly

5



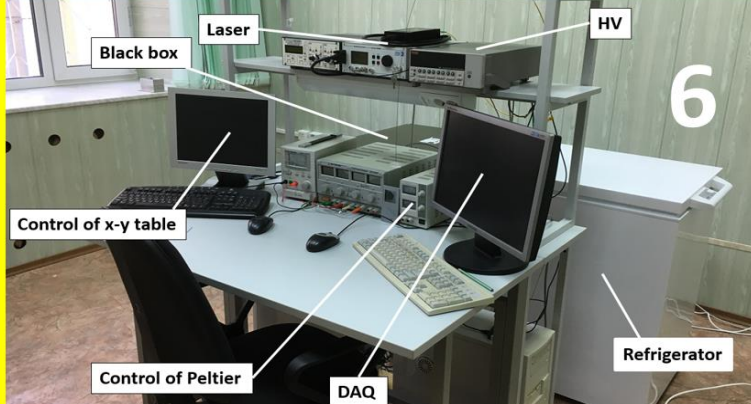
Storage of modules

3



Scintillator/SiPM Module Assembly testing

6

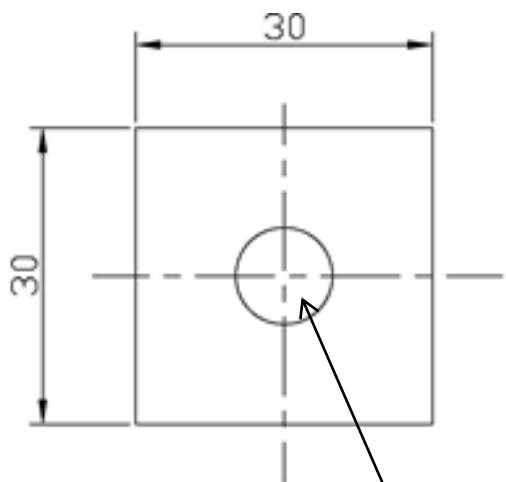




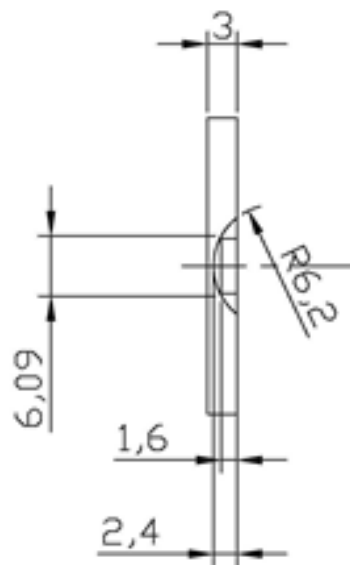
## A single tiles option

Samples 30x30x3 mm<sup>3</sup>

The surface quality	The surface of the dimple	The number of samples
Polished surface	Polished	2
	Matte	2
Non polished surface	Polished	2
	Matte	2



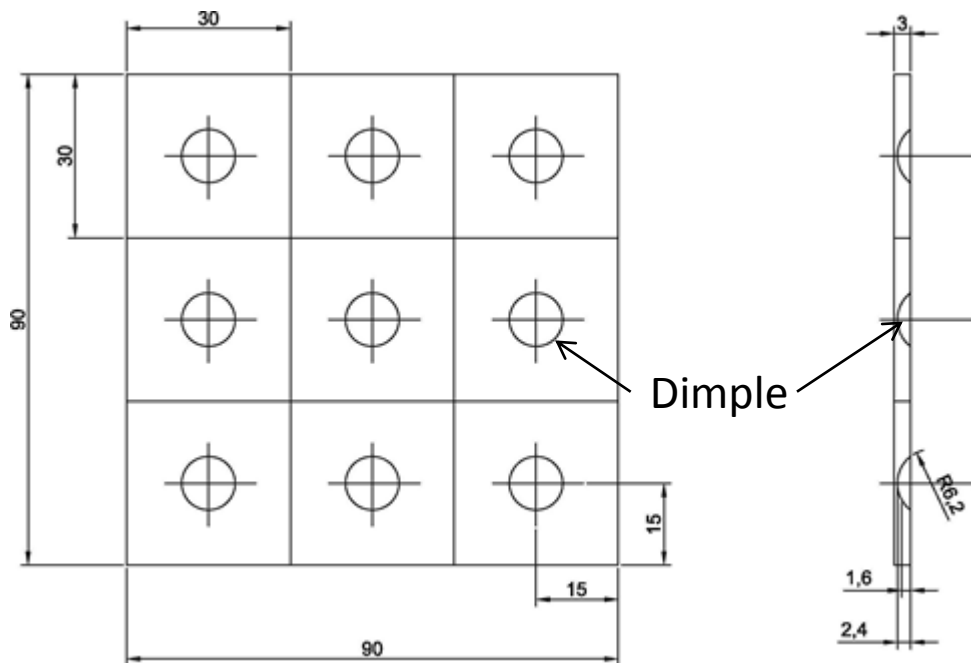
Dimple



## Block tiles

3x3 samples assembled 92x92x3 mm<sup>3</sup>

The surface quality	The surface of the dimple	The number of samples
Polished surface	Polished	1
	Matte	1
Non polished surface	Polished	1
	Matte	1







## **The plan of tiles research in Dubna**

### **Single tiles**

- influence of the dimples geometry and surface quality on the light collection;**
- influence of the quality of the tile surfaces on the light yield;**
- the choice of reflector for the surface of the tile;**
- studies of light collection from the tiles (from 20x20x3 mm<sup>3</sup> to 56x56x3 mm<sup>3</sup>);**
- temperature investigation of the tile with a reflector from -30°C to +30°C;**
- radiation test of the tiles with a reflector up to 5 Mrad.**

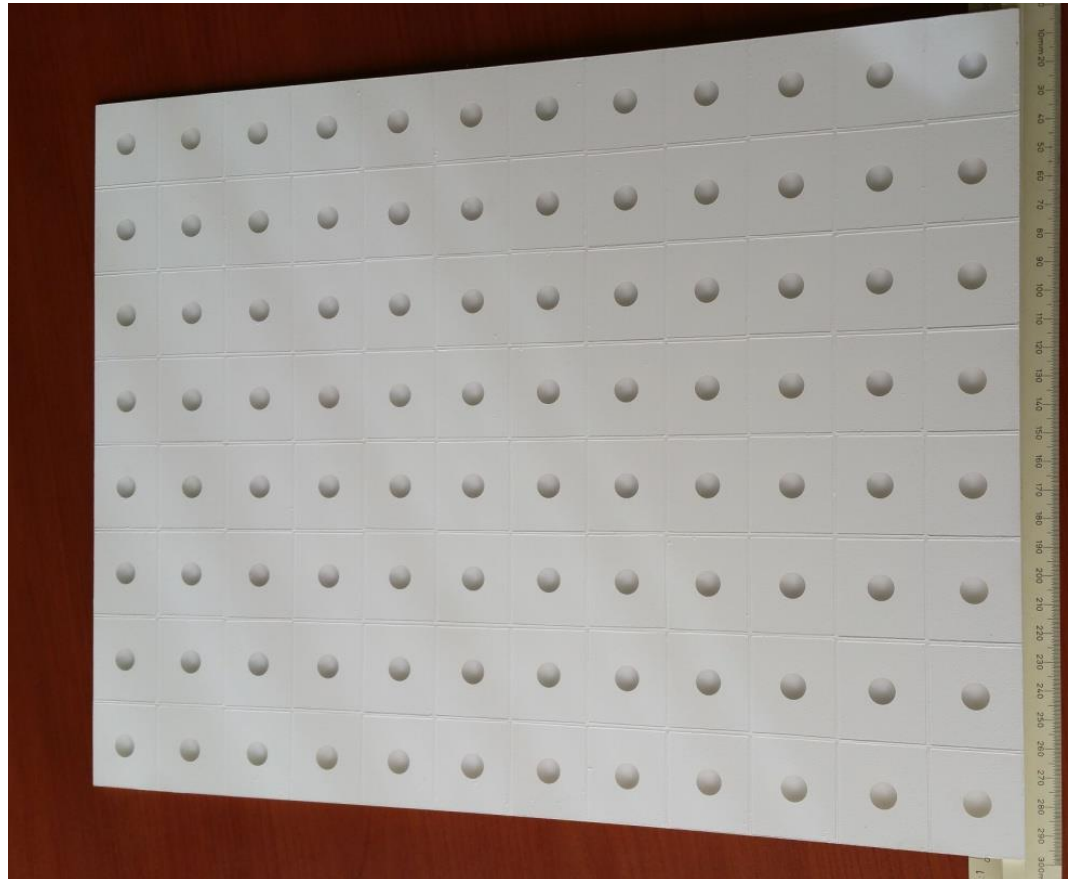


## **Block tiles**

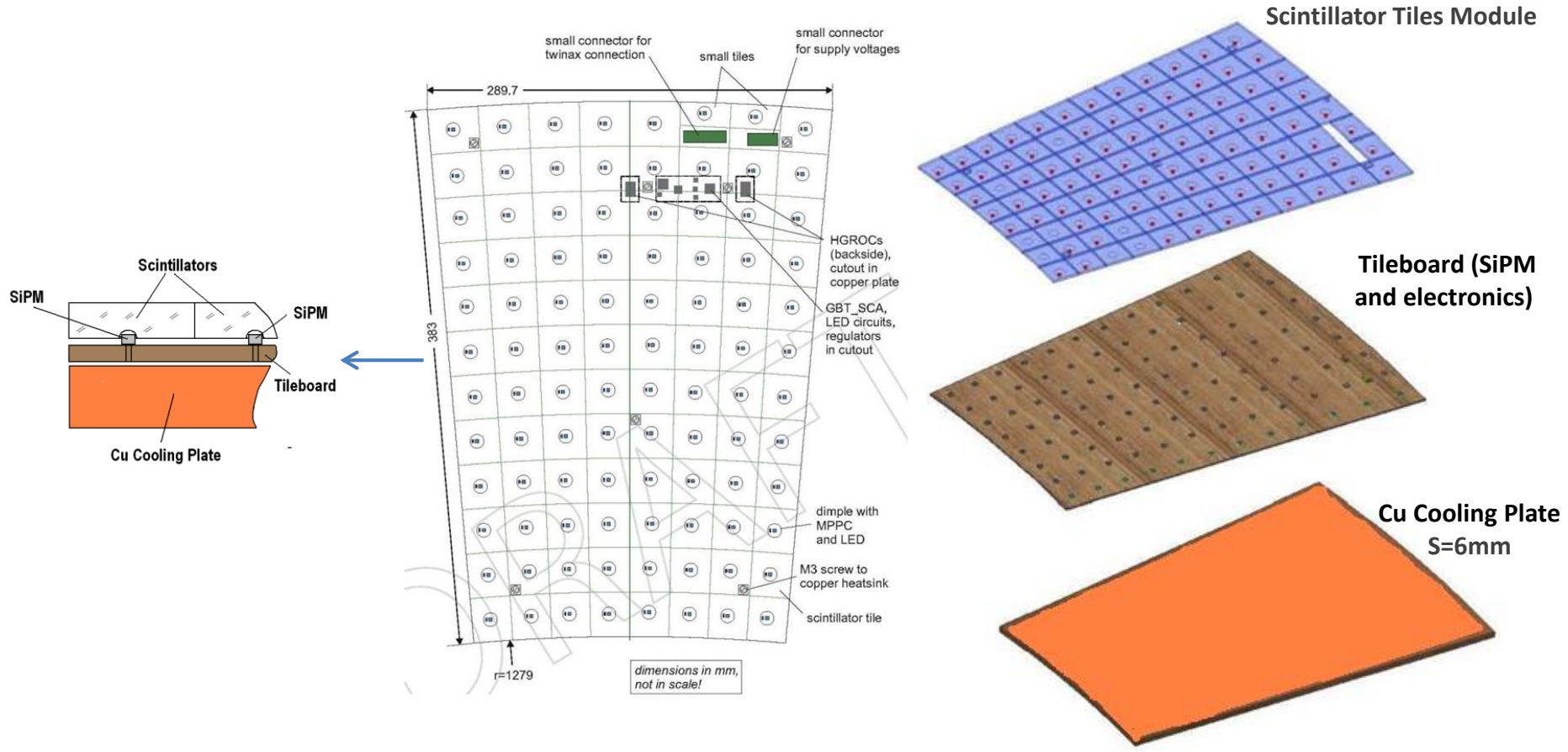
- study of the technology to produce tiles separated by a groove;**
- check of the technology of assembly of macrotile using separate tiles;**
- checking the mechanical strength of the joint tiles after temperature cycles;**
- study of the cross talk between the tiles for different options of assemblies;**
- radiation test of the block of tiles up to 5 Mrad and neutron flux up to  $10^{12}$  cm<sup>-2</sup>;**
- radiation test of assembly with final read-out electronics boards (DESY design).**



## Scintillator Macrotille



# Scintillator/SiPM Module Prototype







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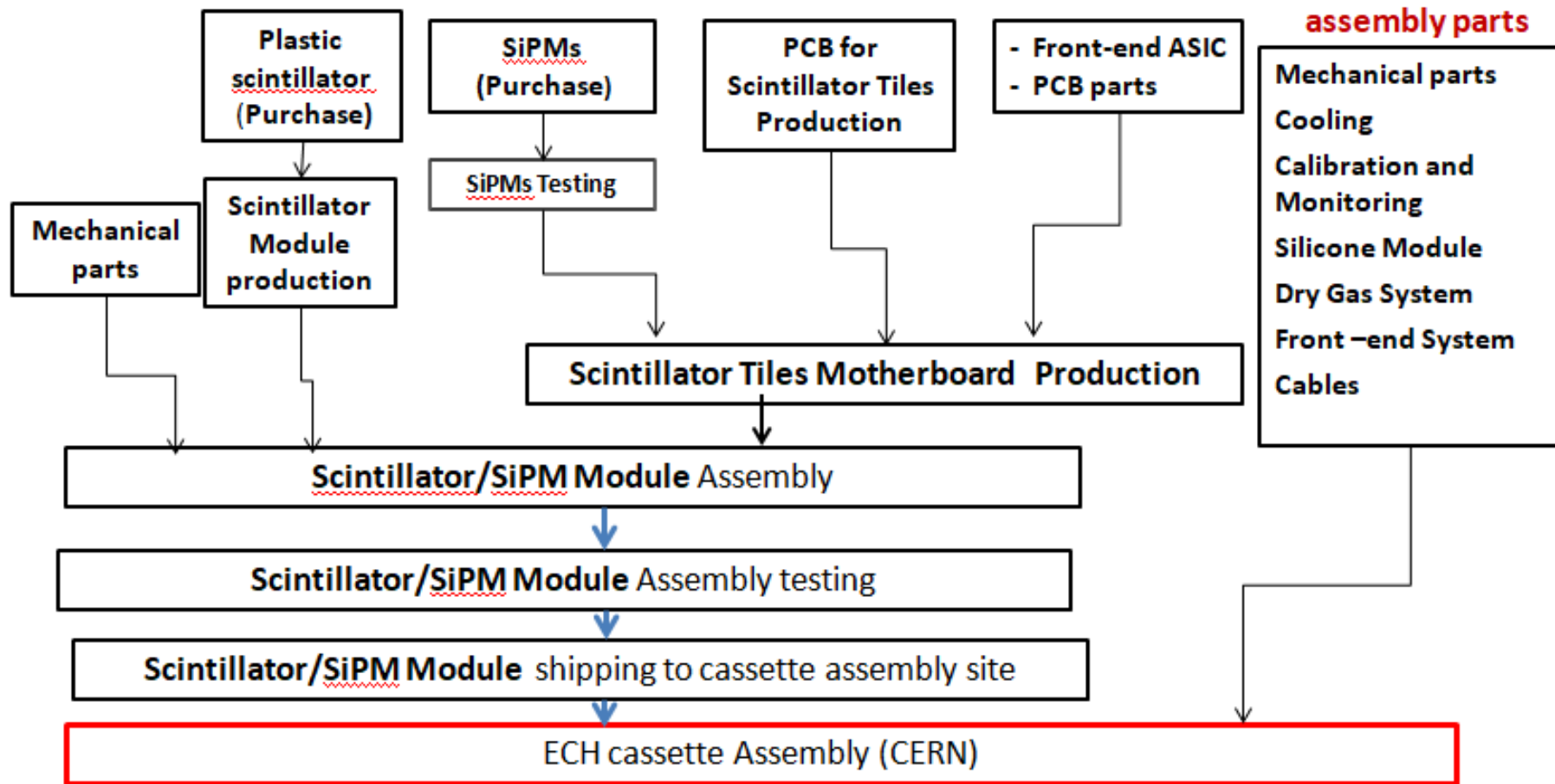


## Scintillator Module

## SiPMs

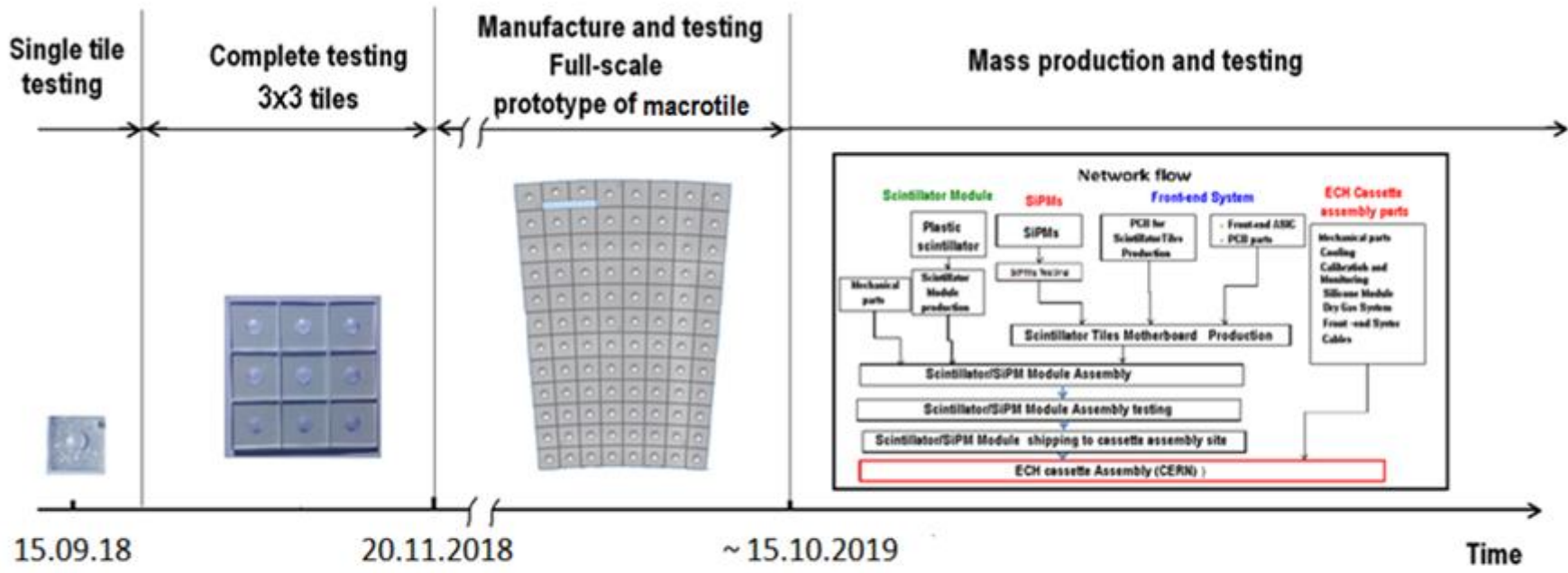
## Front-end System

## ECH Cassette assembly parts



- Currently we assume that the commercially produced scintillator (EJ 260) will be used.
- We expect that delivery of scintillation materials, number of components and electronics will be provided by other partners from CMS collaboration.

## Schedule



Today





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***Thank you for the attention !***