



UNIVERSITÀ
DI PAVIA



Istituto Nazionale di Fisica Nucleare



EP-DT
Detector Technologies

CH4rLiE (PRIN PNRR 2022 -P2022FTF7L)

General status of the project

Ilaria Vai^{1,2}

¹ Dipartimento di Fisica, Università di Pavia

² INFN Sezione di Pavia



Funded by the
European Union
NextGenerationEU

CH₄rLiE

CH₄ Livestock Emission

Goal of the project: *The CH₄rLiE project aims at developing a prototype for methane emissions capture in a barn environment. ... CH₄rLiE ... proposes to act on the methane already produced and diffused in the air, using a specially developed recovery system. The idea arose from the expertise acquired in the Large Hadron Collider experiments at CERN, where "gas recuperation systems" are being developed to extract CF₄ and other components from gaseous detectors exhausted gas mixture. ... (project abstract)*

Involved units

Università degli Studi di Pavia, Dipartimenti di Fisica e Chimica
TL and PI: Ilaria Vai

Istituto Nazionale di Fisica Nucleare
TL and vicePI: Linda Finco

Università degli Studi di Torino, Dipartimento di Scienze Agrarie, Forestali e Alimentari
TL: Elio Dinuccio

With collaboration from CERN EP-DT group

Project organization

The project is organized in four Working Packages (WPs):

- *WP1*: Simulation of gas diffusions
- *WP2*: Monitoring stations preparation and research on adsorption material
- *WP3*: Preparation, testing and deployment of a prototype for CH₄ capture
- *WP4*: Evaluation of the impact of the project

Funding

Titolo del progetto: **CH4 Livestock Emission (CH4rLiE)**

Codice del progetto: **P2022FTF7L**

Settore ERC: **PE2**

Principal Investigator: **Ilaria VAI**

Ente di afferenza: **Università degli Studi di PAVIA**

Contributo MUR / costo totale: **224.787,00 €**

Suddivisione dei costi delle Unità

La suddivisione fondi è stata trasmessa il 30/07/2023

N°	Sede dell'Unità	Responsabile Scientifico	Contributo MUR / costo Totale
1	Università degli Studi di PAVIA	Ilaria VAI	125.687,00 €
2	Istituto Nazionale di Fisica Nucleare	Linda FINCO	64.563,00 €
3	Università degli Studi di TORINO	Elio DINUCCIO	34.537,00 €
Totale			224.787,00 €

Timeline proposed ...

[Link](#)

Activity	Description	Year	First Year												Second Year											
			Quarter			BIM1			BIM2			BIM3			BIM4			BIM5			BIM6					
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Activity WP1	Description	Month																								
S1	Implementation of geometry and setup diffusion environment for one gas		[Blue blocks]																							
S2	Simulation of diffusion in different atmospheric conditions		[Blue blocks]																							
S3	Combination of diffusion data for CH4, CO2, NO2		[Blue blocks]												D1-M1											
S4	Evaluation of cattle emissions in different barn ventilation conditions		[Blue blocks]																							
Activity WP2																										
S5	Preparation, testing and calibration of monitoring stations, with known gasses		[Green blocks]												D2											
S6	Preparation of data-acquisition system		[Green blocks]																							
S7	Installation of monitoring stations in the barn		[Green blocks]																							
S8	Monitoring and analysis of data from sensors stations		[Green blocks]												M2											
S9	Absorption test on commercially available molecular sieves in synergy with CERN EP-DT gas group		[Green blocks]																							
S10	Research of new materials for methane absorption and pollutant rejection		[Green blocks]												M3											
Activity WP3																										
S11	Optimization and production of filters														D3											
S12	Design and implementation of methane capture prototype														[Red blocks]											
S13	Absorption tests in laboratory of methane capture prototype														[Red blocks]											
S14	Installation in the barn														[Red blocks]											
S15	Monitoring and analysis of data from methane capture prototype														[Red blocks]											
Activity WP4																										
S16	Evaluation of the ecological impact due to the production of waste materials in the phase of methane capture														[Purple blocks]											
S17	Evaluation of the impact of the installed equipment on the barn infrastructure														[Purple blocks]											
S18	Evaluation of the economical aspects for the management of the farm														[Purple blocks]											
S19	Evaluation of the potential reduction of greenhouse gases (CH4)														[Purple blocks]											

Timeline proposed and revised

[Link](#)

Activity WP	Description	Year														
		First Year						Second Year								
		Month														
		BIM1	BIM2	BIM3	BIM4	BIM5	BIM6	BIM1	BIM2	BIM3	BIM4	BIM5	BIM6			
S1	Implementation of geometry and setup diffusion environment for one gas															
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S15	Monitoring and analysis of data from methane capture prototype															
Activity WP4																
S16	Evaluation of the ecological impact due to the production of waste materials in the phase of methane capture															
S17	Evaluation of the impact of the installed equipment on the barn infrastructure															
S18	Evaluation of the economical aspects for the management of the farm															
S19	Evaluation of the potential reduction of greenhouse gases (CH4)															

Status of the WPs in a nutshell

- WP1:
 - Simulation in progress, behind schedule due to COMSOL learning curve and computational time → **see Francesco's talk**
 - Evaluation of cattle emissions from direct measurements completed → **see Elio's talk**
- WP2:
 - Monitoring stations being assembled, software ready → **see Alessandro's talk**
 - Research on new materials ongoing → **see Nitish's talk**
- WP3:
 - Test at CERN with prototype ongoing → **see Francesco's talk**
- WP4:
 - Not yet started

Results dissemination

- [Talk](#) at DRD1 Meeting, 18th July 2024, F. Angiulli et al
- [Talk](#) at Congresso SIF 2024, 10th September 2024, F. Angiulli et al
- [Abstract](#) submitted to ASPA 2025 Congress, E. Dinuccio et al
- [Review](#) on methane capture strategies prepared, Vadivel, Kameswaran, Dondi

Dedicated talk this afternoon!

Scientific reports

Scientific report are due every four months: they are submitted to a Comitato Tecnico Scientifico (CTS) nominated by Università di Pavia. After CTS evaluation, the reports should be forwarded to the Ministry of Research (details on the procedure still to be clarified).

Three scientific reports have been submitted so far:

- 1) [Dec.2023-Mar. 2024](#):
 - a) Positive evaluation from CTS
- 2) [Apr.2024-Jul.2024](#):
 - a) Positive evaluation from CTS, with suggestion for monitoring of the timeline of the project
- 3) [Aug.2024-Nov.2024](#):
 - a) Submitted but not yet evaluated

Next report due in **April 2025**

CH4rLiE in detail: today's agenda

<https://agenda.infn.it/event/44941/>

CH4rLiE Annual Meeting			
Tuesday 28 Jan 2025, 09:00 → 18:00 Europe/Rome			
Description			
Zoom link: https://cern.zoom.us/j/8124626650?pwd=Yk9NM0ZaL3ZVZWJhZGh3RTVlVzVpEz09 Meeting ID: 812 462 6650 Passcode: 701628			
09:30	09:50	Introduction - General status of the project	
Speakers: Ilaria Vai (Istituto Nazionale di Fisica Nucleare), Linda Finco (Istituto Nazionale di Fisica Nucleare)		0:20m	
09:50	10:20	Updates on COMSOL simulations	
Speakers: Francesco Alessandro Angiulli (Istituto Nazionale di Fisica Nucleare), Ilaria Vai (Istituto Nazionale di Fisica Nucleare), Prof. Paolo Vitulo (PV)		0:30m	
10:20	10:50	Updates on monitoring stations	
Speakers: Alessandro Braphieri (Istituto Nazionale di Fisica Nucleare), Matteo Brunoldi (Istituto Nazionale di Fisica Nucleare), Paolo Vitulo (University of Pavia & INFN Pavia)		0:30m	
10:50	11:20	Updates on barn measurements	
This contribution and the previous one should contain also discussion on installation of monitoring stations Speakers: Davide Biagini (Istituto Nazionale di Fisica Nucleare), Elio Dimuccio (Istituto Nazionale di Fisica Nucleare)		0:30m	
11:20	11:30	Coffe break	0:10m
11:30	12:15	Updates on prototype testing	0:45m
Speakers: Beatrice Mandelli (CERN), Francesco Alessandro Angiulli (Istituto Nazionale di Fisica Nucleare), Matteo Brunoldi (Istituto Nazionale di Fisica Nucleare), Roberto Guida (CERN), Simone Calzaferri (Istituto Nazionale di Fisica Nucleare)			
Results of tests at CERN		0:30m	
Speakers: Beatrice Mandelli (CERN), Francesco Alessandro Angiulli (Istituto Nazionale di Fisica Nucleare), Matteo Brunoldi (Istituto Nazionale di Fisica Nucleare), Roberto Guida (CERN), Simone Calzaferri (Istituto Nazionale di Fisica Nucleare)			
Absorption model		0:15m	
Speaker: Prof. Paolo Vitulo (PV)			
12:15	12:45	Updates on materials testing	0:30m
Speaker: Daniele Dondi (Istituto Nazionale di Fisica Nucleare)			
12:45	15:00	Lunch	2h 15m
https://www.trigadviser.it/Restaurant_Review-g2357810-d2228593-Reviews-L_Ustaina_Di_Giugaton-Travaco_Siccomario_Province_of_Pavia_Lombardy.html			
15:00	15:20	Plans for results dissemination	0:20m
Talks and papers Speaker: Ilaria Vai (Istituto Nazionale di Fisica Nucleare)			
15:30	17:00	Visits at the laboratories	1h 30m

Vote for CH4rLiE Logo!

Please go to: <https://forms.gle/QT8BuUT6RDsFZLE98> and vote by 4 PM today!



Thanks to Matteo for the graphics!
