

Fact Sheet 3

List of Institut Curie's leading publications on FLASH radiotherapy

Teams at Institut Curie are engaged in a wide range of multidisciplinary projects to validate and explore the FLASH effect across all its dimensions, and above all to enable its transition to the clinic in the years to come.

2024

1. **Differential Remodeling of the Oxylipin Pool After FLASH Versus Conventional Dose-Rate Irradiation In Vitro and In Vivo.** Portier L, Daira P, Fourmaux B, Heinrich S, Becerra M, Fouillade C, Berthault N, Dutreix M, Londoño-Vallejo A, Verrelle P, Bernoud-Hubac N², Favaudon V. *Int J Radiat Oncol Biol Phys*. 2024 Aug 1;119(5): 1481-1492. doi: 10.1016/j.ijrobp.2024.01.210.
2. **Maria Grazia Ronga : Etude et modélisation de la radiothérapie par électrons de très haute énergie (VHEE).** Thèse CIFRE (IC/Thales) soutenue le 11/04/2024. <https://theses.fr/2024UPAST036>
3. **Conformation techniques for ultra-high dose rate very high energy electrons (VHEE) radiation therapy.** M. G. Ronga, U. Deut, F Gesualdi, A. Bonfrate, A. Patriarca, E. Jouglar, R. Ferrand, G. Créhange, I. Buvat, P. Girault, L. De Marzi. *Soumis dans Phys Med Biol (Oct 2024)*
4. **Technical Note: Comparison of secondary radiation dose contribution between pencil beam scanning, scattered proton and VHEE radiotherapy.** MG Ronga, F Gesualdi, A. Bonfrate, A. Patriarca, R. Ferrand, G. Créhange, I. Buvat, L De Marzi. *Soumis dans Med Phys (oct 2024)*

2023

5. **Characterization of Ultra-High-Dose Rate Electrons Beams with ElectronFLASH Linac.** Giuliano L, Franciosini G, Palumbo L, Aggar L, Dutreix M, Faillace L, Favaudon V, Felici G, Galante F, Mostacci A, Migliorati M, Pacitti M, Patriarca A, Heinrich S. *Applied Sciences*. 2023, 13(1), 631; <https://doi.org/10.3390/app13010631>.
6. **Radiation-induced immune response in novel radiotherapy approaches FLASH and spatially fractionated radiotherapies.** Bertho A, Iturri L, Prezado Y. *Int Rev Cell Mol Biol*. 2023;376: 37-68.
7. **Secondary radiation dose modeling in passive scattering and pencil beam scanning very high energy electron (VHEE) radiation therapy.** Deut U, Ronga MG, Bonfrate A, De Marzi L. *Med Phys*. 2023 Jul;50(7): 4491-4504. doi: 10.1002/mp.16443. Epub 2023 May 25. PMID: 37227704
8. **Very high-energy electron dose calculation using the Fermi-Eyges theory of multiple scattering and a simplified pencil beam model.** Ronga MG, Deut U, Bonfrate A, De Marzi L. *Med Phys*. 2023 Dec;50(12): 8009-8022. doi: 10.1002/mp.16697. Epub 2023 Sep 20. PMID: 37730956
9. **Chapter Two - Radiation-induced immune response in novel radiotherapy approaches FLASH and spatially fractionated radiotherapies.** Bertho A, Iturri L, Prezado Y. *International Review of Cell and Molecular Biology*. Volume 376, 2023, Pages 37-68.
10. **Lung Organotypic Slices Enable Rapid Quantification of Acute Radiotherapy Induced Toxicity.** Dubail M, Heinrich S, Portier L, Bastian J, Giuliano L, Aggar L, Berthault N, Londoño-Vallejo JA, Vilalt, M, Boivin G, Sharma RA, Dutreix M, Fouillade C. *Cells* 2023, oct 11, 12, 2435. <https://doi.org/10.3390/cells12202435>

2022

11. **Radiobiology of the FLASH effect.** Friedl AA, Prise KM, Butterworth KT, Montay-Gruel P, Favaudon V. *Med Phys*. 2022 Mar;49(3): 1993-2013.
12. **Model studies of the role of oxygen in the FLASH effect.** Favaudon V, Labarbe R, Limoli CL. *Med Phys*. 2022 Mar;49(3): 2068-2081.

13. **Combining FLASH and spatially fractionated radiation therapy: The best of both worlds.** Schneider T, Fernandez-Palomo C, Bertho A, Fazzari J, Iturri L, Martin OA, Trappetti V, Djonov V, Prezado Y. *Radiother Oncol.* 2022 Aug 8; S0167-8140(22)04226-8.
14. **A Comprehensive Analysis of the Relationship Between Dose Rate and Biological Effects in Preclinical and Clinical Studies, From Brachytherapy to Flattening Filter Free Radiation Therapy and FLASH Irradiation.** Beddok A, Lahaye C, Calugaru V, De Marzi L, Fouillade C, Salvador S, Fontbonne JM, Favaudon V, Thariat J. *Int J Radiat Oncol Biol Phys.* 2022 Aug 1;113(5): 985-995.
15. **Practice-oriented solutions integrating intraoperative electron irradiation and personalized proton therapy for recurrent or unresectable cancers: Proof of concept and potential for dual FLASH effect.** Calvo FA, Ayestaran A, Serrano J, Cambeiro M, Palma J, Meiriño R, Morcillo MA, Lapuente F, Chiva L, Aguilar B, Azcona D, Pedrero D, Pascua J, Delgado JM, Aristu J, Prezado Y. *Front Oncol.* 2022 Nov 14;12: 1037262.
16. **Perspectives in linear accelerator for FLASH VHEE: Study of a compact C-band system.** Faillace L, Alesini D, Bisogni G, Bosco F, Carillo M, Cirrone P, Cuttone G, De Arcangelis D, De Gregorio A, Di Martino F, Favaudon V, Ficcadenti L, Francescone D, Franciosini G, Gallo A, Heinrich S, Migliorati M, Mostacci A, Palumbo L, Patera V, Patriarca A, Pensavalle J, Perondi F, Remetti R, Sarti A, Spataro B, Torrisi G, Vannozzi A, Giuliano L. *Phys Med.* 2022 Dec;104: 149-159.

2021

17. **First theoretical determination of relative biological effectiveness of very high energy electrons.** Delorme R, Masilela TAM, Etoh C, Smekens F, Prezado Y. *Sci Rep.* 2021 May 27;11(1): 11242.
18. **Model studies of the role of oxygen in the FLASH effect.** Favaudon V, Labarbe R, Limoli CL. *Med Phys.* 2021 Aug 18. doi: 10.1002/mp.15129
19. **Radiobiology of the FLASH effect.** Friedl AA, Prise KM, Butterworth KT, Montay-Gruel P, Favaudon V. *Med Phys.* 2021 Aug 23. doi: 10.1002/mp.15184
20. **Back to the Future: Very High-Energy Electrons (VHEEs) and Their Potential Application in Radiation Therapy.** Ronga MG, Cavallone M, Patriarca A, Leite AM, Loap P, Favaudon V, Créhange G, De Marzi L. *Cancers (Basel).* 2021 Sep 30;13(19): 4942. doi: 10.3390/cancers13194942. PMID: 34638424 Free PMC article. Review.
21. **Dosimetry and radioprotection evaluations of very high energy electron beams.** Masilela TAM, Delorme R, Prezado Y. *Sci Rep.* 2021 Oct 12;11(1): 20184.

2020

22. **FLASH Irradiation spares lung progenitor cells and limits the incidence of radio-induced senescence.** C. Fouillade, S. Curras-Alonso, L. Giuranno, E. Quellenec, S. Heinrich, S. Bonnet-Boissinot, S. Leboucher, M. Bohec, S. Baulande, M. Vooijs, P. Verrelle, M. Dutreix, JA. Londoño-Vallejo, V. Favaudon. *Clin Cancer Res.* 2020 Mar 15;26(6): 1497-1506.
23. **FLASH and minibeam radiation therapy: the effect of microstructures on time and space and their potential application to proton therapy.** Mazal A, Prezado Y, Ares C, de Marzi L, Patriarca A, Miralbell R, Favaudon V. *Br J Radiol.* 2020 Mar;93(1107): 20190807.
24. **The european joint research Project UHPulse – methodology for advanced radiotherapy using particle beams with ultra-high pulse dose rates.** Schuller A, Heinrich S, Fouillade C, Subiel A, De Marzi L, Romano F, Peier P, Trachsel M, Fleta C, Kranzer R, Caresana M, Salvador S, Busold S, Schonfeld A, McEwen M, Gomez F, Solc J, Bailat C, Linhart V, Jakubek J, Pawelke J, Borghesi M, Kapsch RP, Knyziak A, Boso A, Olsovcova V, Kottler C, Poppinga D, Ambrozova I, Schmitzer CS, Rossomme S, Vozenin MC. *Physica Medica.* 2020 Dec; 80: 134-150. doi: 10.1016/j.ejmp.2020.09.020
25. **A physicochemical model of reaction kinetics supports peroxy radical recombination as the main determinant of the FLASH effect.** Labarbe R, Hotoiu L, Barbier J, Favaudon V. *Radiother Oncol.* 2020 Dec;153: 303-310.

2019

26. **The Advantage of FLASH Radiotherapy Confirmed in Mini-pig and Cat-cancer Patients.** Marie-Catherine Vozenin, Pauline De Fornel, Kristoffer Petersson, Vincent Favaudon, Maud Jaccard, Jean-François Germond, Benoit Petit, Marco Burki, Gisèle Ferrand, David Patin, Hanan Bouchaab, Mahmut Ozsahin, François Bochud, Claude Bailat, Patrick Devauchelle, Jean Bourhis (2019 Jan 1). *Clinical cancer research:* 25(1): 35-42

27. **Time-resolved dosimetry of pulsed electron beams in very high dose-rate, flash irradiation for radiotherapy preclinical studies.** V. Favaudon, J-M. Lentz; S. Heinrich, A. Patriarca; L. De Marzi, C. Fouillade, M. Dutreix. *Nuclear Inst. And Methods in Physics Research*, 2019 A 944 (162537).
28. [Simulation and experimental validation of a prototype electron beam linear accelerator for preclinical studies](#) *Physica Medica* - 01/04/2019
29. [Radiothérapie flash à très haut débit de dose : point sur les avancées récentes](#) *Cancer/Radiothérapie* - 01/10/2019

2018

30. **Experimental Set-up for FLASH Proton Irradiation of Small Animals Using a Clinical System.** Patriarca A, Fouillade C, Auger M, Martin F, Pouzoulet F, Nauraye C, Heinrich S, Favaudon V, Meyroneinc S, Dendale R, Mazal A, Poortmans P, Verrelle P, De Marzi L. *Int J Radiat Oncol Biol Phys*. 2018 Nov 1;102(3): 619-626.

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31. **Hope of High dose-rate radiotherapy.** Fouillade C, **Favaudon V**, Vozenin MC, Romeo PH, Bourhis J, Verrelle P, Devauchelle P, Patriarca A, Heinrich S, Mazal A, Dutreix M. *Bull Cancer*. 2017 Apr;104(4): 380-384.
32. **Irradiation in a flash: Unique sparing of memory in mice after whole brain irradiation with dose rates above 100Gy/s.** Pierre Montay-Gruel, Kristoffer Petersson, Maud Jaccard, Gaël Boivin, Jean-François Germond, Benoit Petit, Raphaël Doenlen, Vincent Favaudon, François Bochud, Claude Bailat, Jean Bourhis, Marie-Catherine Vozenin. *Radiotherapy and oncology: journal of the European Society for Therapeutic Radiology and Oncology*. 2017 May 27: 365-369
33. **2015**
34. **The radiotherapy FLASH to save healthy tissues.** Favaudon V, Fouillade C, Vozenin MC. *Med Sci (Paris)*. 2015 Feb;31(2): 121-3.
35. **Ultrahigh dose-rate, « flash » irradiation minimizes the side-effects of radiotherapy.** Favaudon V, Fouillade C, Vozenin M-C. *Cancer radiothérapie : journal de la Société française de radiothérapie oncologique*. 2015 Aug 17: 526-31

2014

36. **Ultrahigh dose-rate FLASH irradiation increases the differential response between normal and tumor tissue in mice.** Favaudon V, Caplier L, Monceau V, Pouzoulet F, Sayarath M, Fouillade C, Poupon MF, Brito I, Hupé P, Bourhis J, Hall J, Fontaine JJ, Vozenin MC. *Sci Transl Med*. 2014 Jul 16; 6(245): 245ra93.

2011

37. Pouzoulet F, Caplier L, Sayarath M, Fontaine JJ, Vozenin-Brotons MC, Favaudon V (invited speaker). **Ultra-high dose-rate, pulse irradiation to reduce the complications of radiotherapy.** ESTRO Meeting on the Prediction, Recognition, Evaluation and Eradication of Normal Tissue Effects in Radiotherapy (PREVENT). Brussels, March 20-21, 2011.
38. Favaudon V (invited speaker). **Potentiel des très hauts débits de dose en radiothérapie.** 10th CIRFA Congress, Anglet, France, 11 -16 September 2011.

2009

39. **« Apport de la radiobiologie à la pratique clinique. Potentiel des très hauts débits de dose en radiothérapie ».** 20e Congrès National de la Société Française de Radiothérapie Oncologique (SFRO), Paris, October 21-23, 2009. Plenary conference. Vincent Favaudon, presenter. Gold medal of the SFRO.

2000

40. **Hyperfast, early cell response to ionizing radiation.** Ponette V, Le Péchoux C, Deniaud-Alexandre E, Fernet M, Giocanti N, Tourbez H, Favaudon V *Int J Radiat Biol*. 2000 Sep;76(9): 1233-43. doi: 10.1080/09553000050134465. PMID: 10993634.