

The 2nd international Nanocar Race Toulouse, 2021



In 2021 the European FET OPEN project MEMO (Mechanics with Molecules) (<https://memo-project.eu>) is organizing the 2nd international Nanocar Race (Nanocar Race II). All teams will compete at the same time in a remote controlled mode from Toulouse and will meet at the Toulouse CEMES-CNRS G. Dupouy campus (France) in 2021 for about a week for training and then to nanorace via the public network. The competition will be live broadcasted.

The preregistration for Nanocar Race II must be performed following the instructions on the MEMO project web site (<https://memo-project.eu>). It is a declaration of interest to participate and is open to all teams engaged to respect the Nanocar Race II rules (*The teams which have participated to Nanocar race I in 2017 must register a new molecule-vehicle*). The preregistration is now open providing the following information (deadline 30th June 2018):

- 1) Address & description of the team composition (physics, organic chemist, theory).
- 2) The list of expected sponsors (private, public).
- 3) A very short description of the instrument (ambient, UHV) used by the team to drive its molecule-vehicle during the Nanocar Race II (already installed or not).
- 4) Conditions needed for the remote control from Toulouse of the team lab (bandwidth, safety regulation).
- 4) A description of the proposed molecular design (large molecule with wheels or small molecules with no wheels but paddles or wings, quantum motor).
- 5) The proposed motive power (for example: inelastic, dipolar, light...).
- 6) The preferred surface and Nanocar Race environment (ambient, LT-UHV).

In September 2018, the Nanocar Race II organization committee will screen the preregistrations, select the teams authorized to compete, and fix the official surfaces. At that time, the different possible Nanocar Races which are going effectively to occur in 2021 are determined by the committee: ambient and/or LT-UHV, car and/or truck. This will depend on the number of pre-registered teams per class. A first list of teams admitted to nanorace in 2021 is determined + a complementary list (if necessary).

Calendar

Pre-registration	Feb. 2018: opening	June 2018: closing
Org. committee meeting	Meeting Sept. 2018	Decision: Jan. 2019
Final registration	Jan. 2019: opening	Jan. 2020: closing
Nanocar race preparation	From Jan. 2020	to March 2021
Committee visit to the team	During year 2020	
Nanocar race 2	Year 2021	

The list of teams admitted to the Nanocar Race II will be communicated in January 2019. Then, each selected team will have two years to consolidate its design for the announced surface and Nanocar Race class, for the synthesis of the molecule-vehicle and the training. For the final online registration in 2019, each selected Nanocar Race team will have to provide to the organizing committee by January 2020 the following information:

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- 1) The molecular structure of the molecule-vehicle engaged in the race (xyz file).
- 2) STM/AFM image of the molecule-vehicle on selected surfaces for ambient or LT-UHV.
- 3) Demonstration that its molecule-vehicle is drivable with no mechanical push.
- 4) The definitive list of its sponsors (private, public).
- 5) The anticipated name of the pilots which will be in Toulouse for the Nanocar Race II.

In year 2020, a member of the organization committee will visit each team to get a detail knowledge of their preparation level and of the remote control protocol to be used.

Nanocar Race II organization committee:

F. Moresco (MEMO & LT-UHV), A.S. Duwez (MEMO & ambient),
C. Joachim (MEMO & Europe), S.W. Hla (America), M. Ariga (Japan), H. Gao (Asia).

Nanocar Race II Patronage:

J.P. Sauvage

Already defined Nanocar Race II rules:

- **General:**
 - Remote control from Toulouse for all teams.
 - Having at least one sponsor to cover the Nanocar Race II expenses of the team.
 - No mechanical push during Nanocar Race II.
 - Change of molecule-vehicle possible during Nanocar Race II.
 - Nanoracing surfaces: determined by the organization committee.
 - Weather conditions: ambient and/or LT-UHV.
 - Team leaders or pilots must be ready for outreach activities (press, TV, web).
- **Ambient nanocar race (Day 1)**
 - Duration: 4 h.
 - Molecule-vehicle size: from about 100 atoms to the order of 1000 atoms.
 - Only molecule-vehicles with distinguishable front and rear are accepted.
 - Nanoracing circuits (to be determined by the organization committee):
 - For speedy drivers.
 - For molecule-trucks (carrying a molecular load).
 - Prize winner: maximum distance in 4 h.
- **LT-UHV nanocar race (Day 2)**
 - Duration: 24 h.
 - Two classes of molecule-vehicles are accepted:
 - Classical wheels and motor (Inelastic and/or dipolar).
 - Quantum motor (inelastic).
 - Only molecule-vehicles with distinguishable front and rear are accepted.
 - Molecule-vehicle size: from about 100 atoms to the order of 1000 atoms.
 - Nanoracing circuits (to be determined by the organization committee):
 - For speedy drivers: Slalom.
 - For molecule-trucks (carrying a molecular load): straight line.
 - Prize winner: maximum distance in 24h.

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