

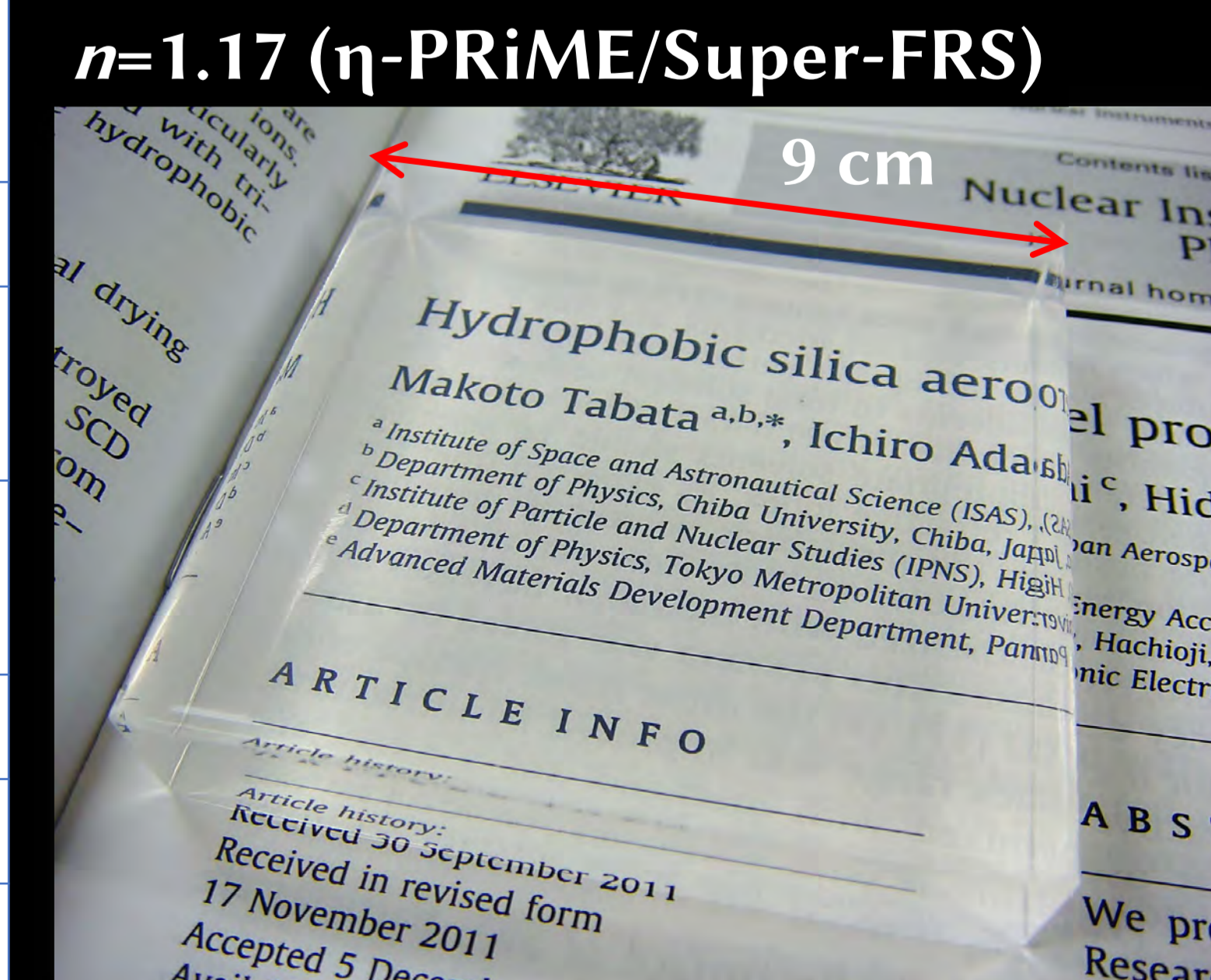
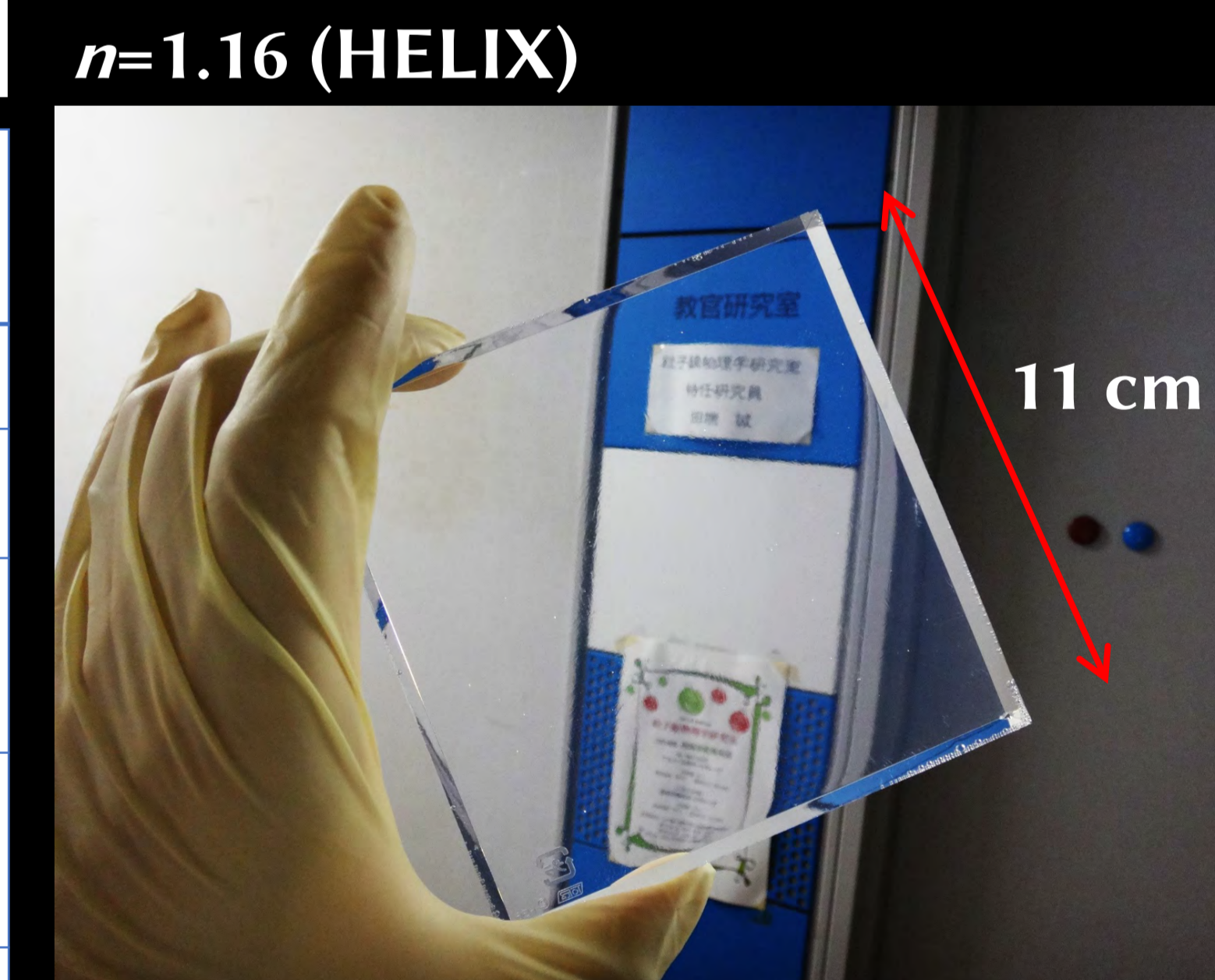
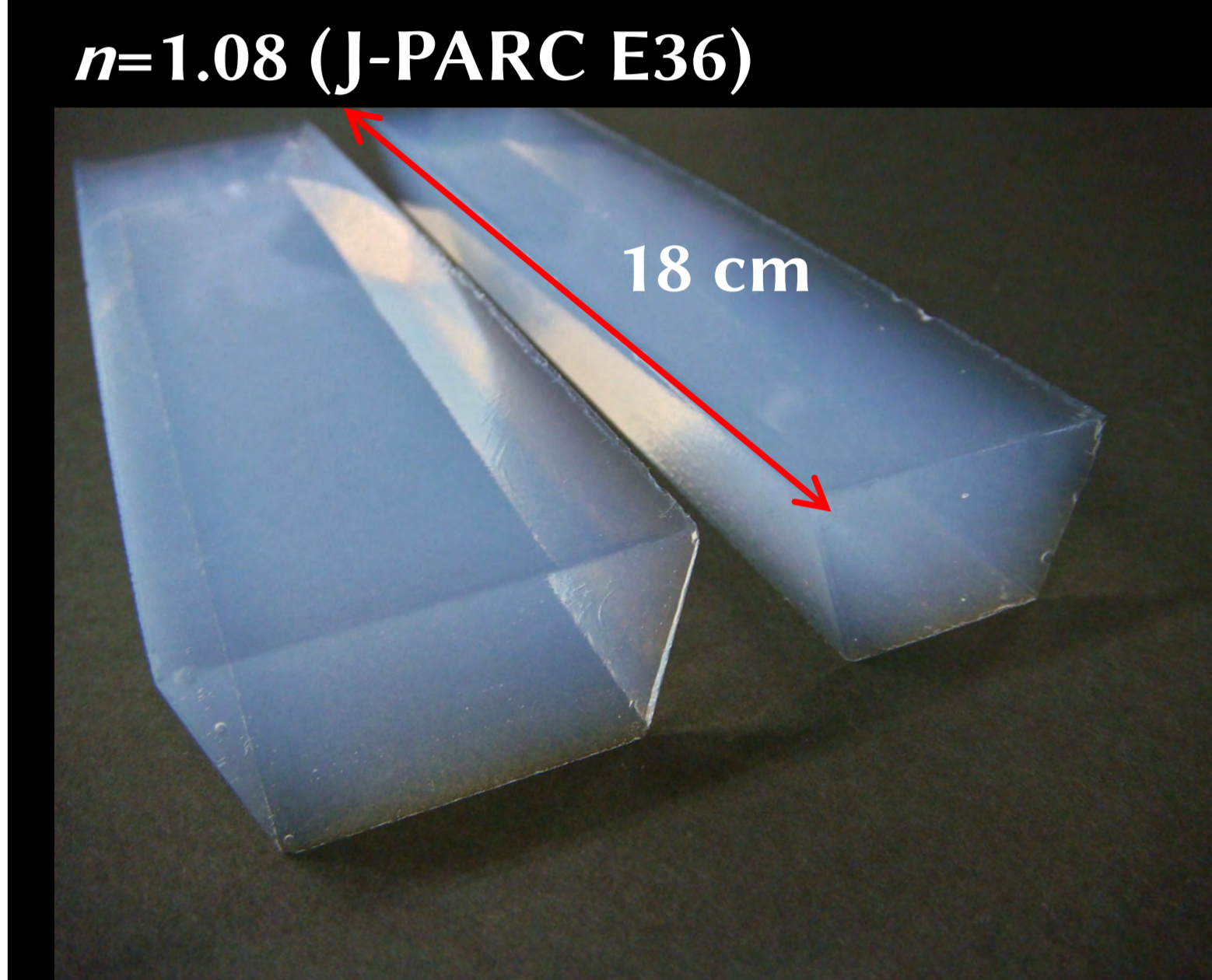
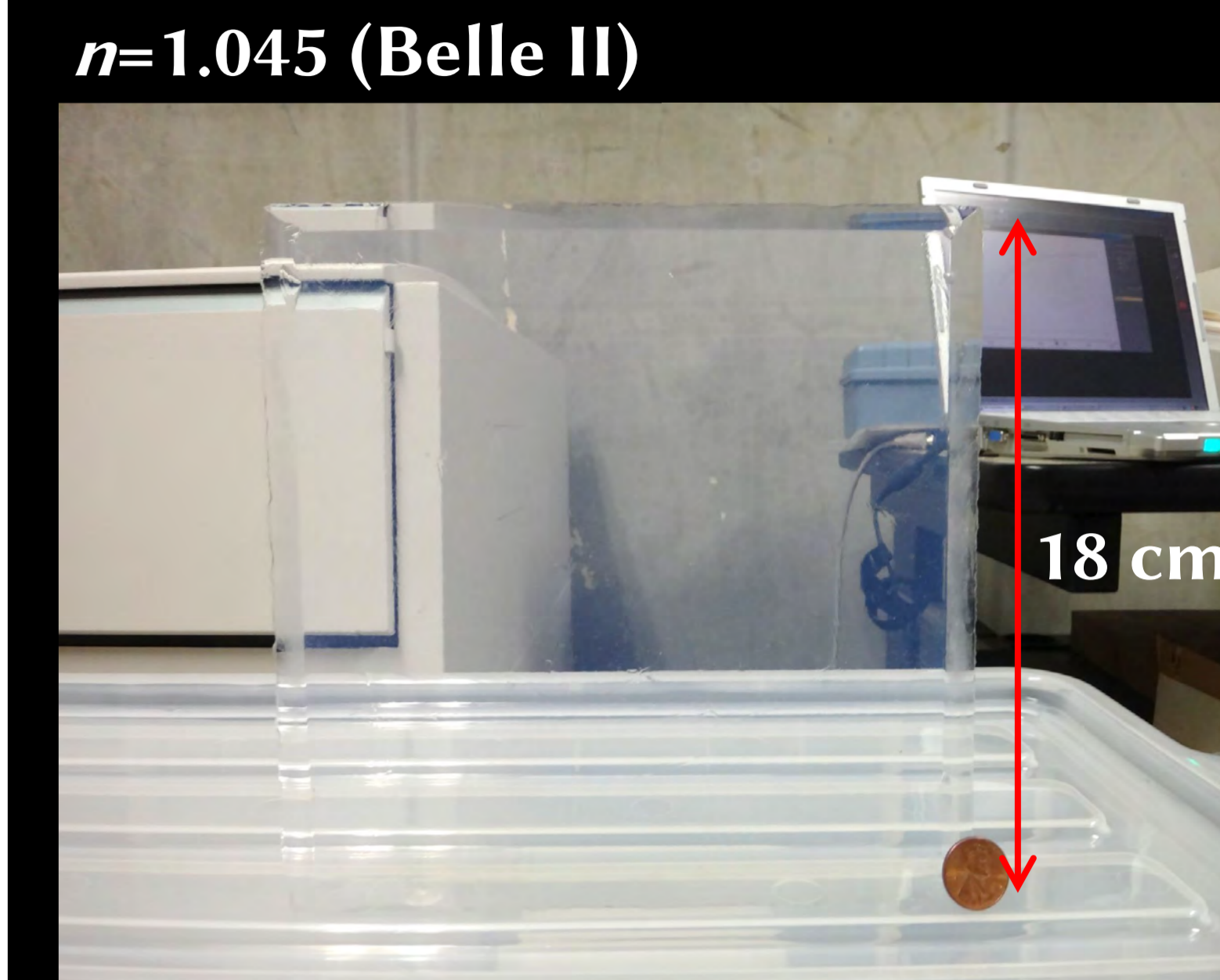
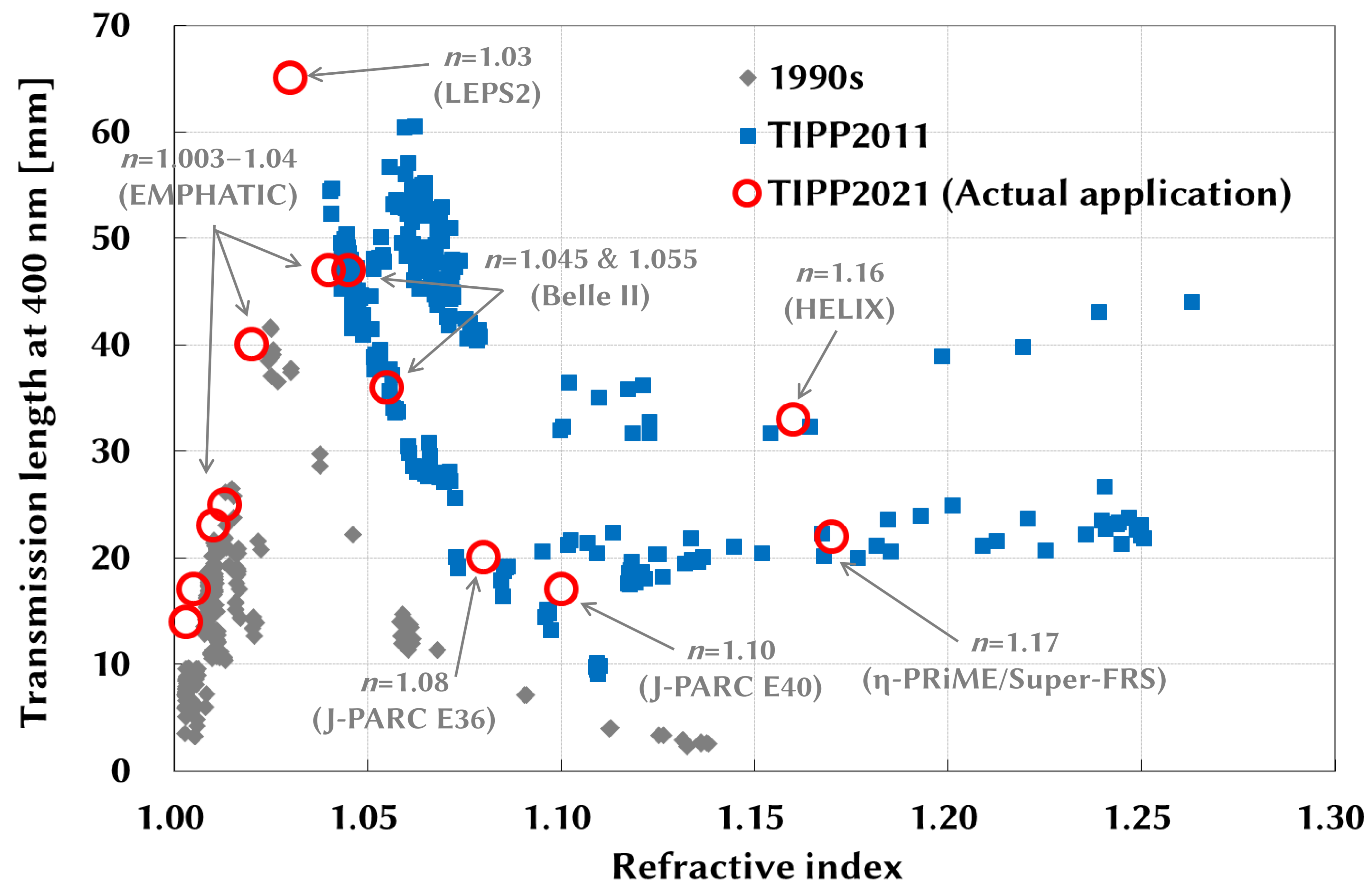
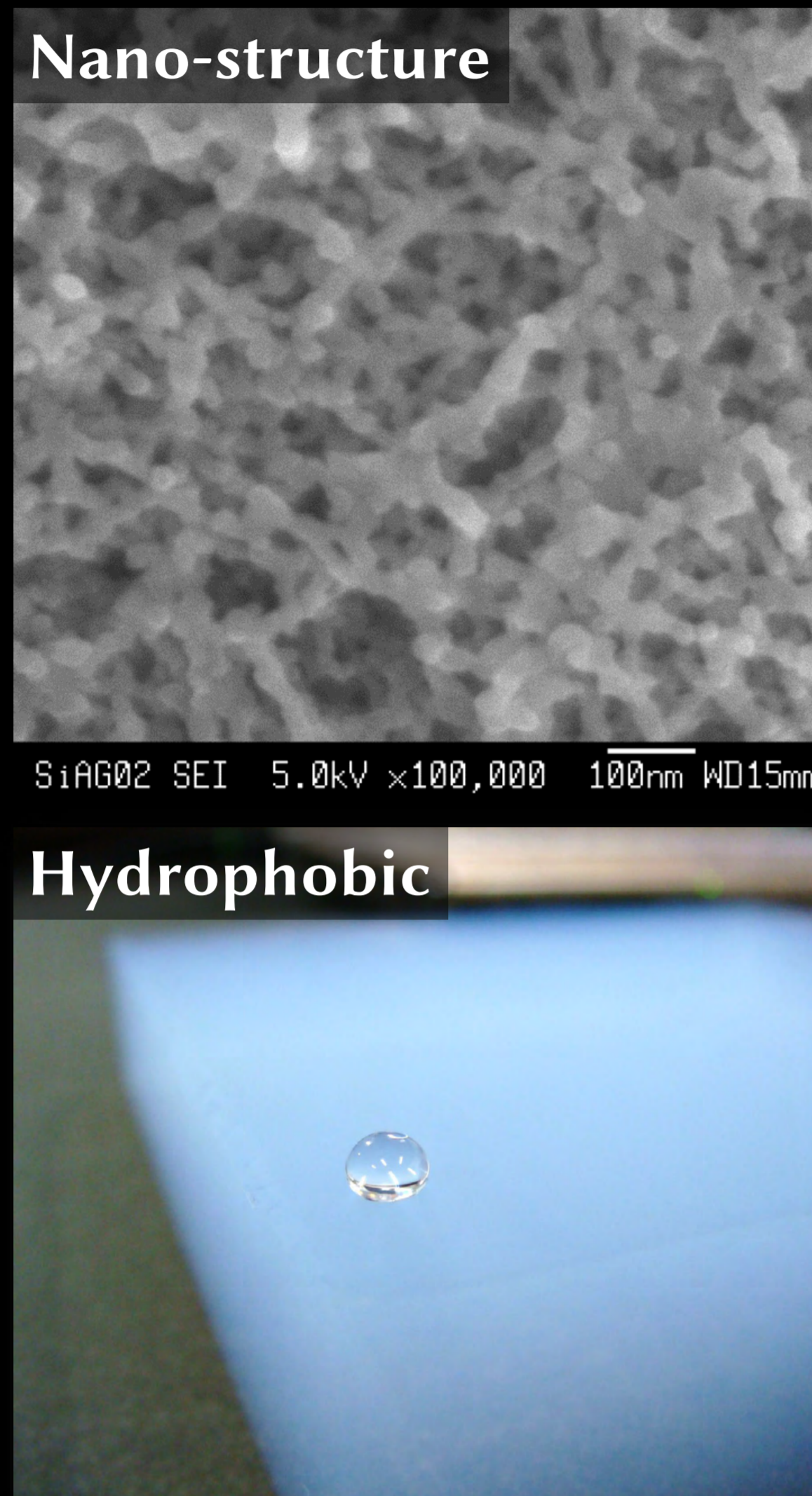
High-quality Aerogel Cherenkov Radiators Recently Developed in Japan

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- **Silica aerogel**
 - Mesoporous material with a structure in the order of ten nanometers.
 - 3D networks with SiO₂ particle clusters.
 - Pores filled with air.
 - Solid-like medium.
 - Transparent to visible light.
- Controllable refractive index by changing the silica-pore volume ratio during the production process.
- Refractive index ranging between gas and liquid/solid.
- Suitable Cherenkov radiator for particle identification in the order of GeV/c.
- Long-term stability by rendering hydrophobic.



Recent applications

Experiment	EMPHATIC (In preparation)	LEPS2 (In progress)	Belle II (In progress)	J-PARC E36 (Completed)	J-PARC E40 (Completed)	HELIX (In preparation)	η-PRiME/Super-FRS (Completed)
Facility	Fermilab (USA)	SPring-8 (Japan)	KEK (Japan)	J-PARC (Japan)	J-PARC (Japan)	Balloon (Space)	GSI (Germany)
Main physics program	Neutrino physics	Hadron physics	B, τ physics	K physics	Nuclear physics	Cosmic-ray physics	Nuclear physics
Detector operation type	Threshold-type & RICH	Threshold-type	RICH	Threshold-type	Threshold-type	RICH	Threshold-type
Detector role	π/K/p identification (up to 12 GeV/c)	π/K separation (up to 2 GeV/c)	π/K identification (up to 3.5 GeV/c)	e/μ separation (0.24 GeV/c)	π/K separation (up to 1 GeV/c)	Isotopes identification (up to 4 GeV/nucleon)	p/d separation (up to 3 GeV/c)
Refractive index (@405 nm)	1.003–1.04	1.03	1.045 & 1.055	1.08	1.10	1.16	1.17
Refractive index control	Sol-gel process	Sol-gel process	Sol-gel process	Sol-gel process	Sol-gel process & Post-densification	Sol-gel process & Post-densification	Sol-gel process & Post-densification
Transmission length (@400 nm)	14–47 mm	65 mm	47 & 36 mm	20 mm	17 mm	33 mm	22 mm
Original tile size	TBD (> 11 × 11 × 2 cm ³)	15 × 15 × 2 cm ³ & 13 × 13 × 2 cm ³	18 × 18 × 2 cm³	18 × 4.5 × 2 cm ³	12 × 12 × 1.5 cm ³	11 × 11 × 1 cm ³	9 × 9 × 1 cm ³ & 9 × 4.5 × 1 cm ³
Drying method	Supercritical CO ₂ or ethanol	Supercritical ethanol	Supercritical CO ₂	Supercritical CO ₂	Supercritical CO ₂	Supercritical CO ₂	Supercritical CO ₂
Number of tiles produced	TBD	300 tiles	450 tiles	45 tiles	50 tiles	100 tiles	27 tiles
Mass production period	Ongoing	2019–2020	2013–2014	2014	2016	2018	2013–2014
Post-production shaping process	N/A	Water-jet cut	Water-jet cut	N/A	Water-jet cut	Water-jet cut	N/A