German Aerospace Center, Institute of Solar Research

Engineering and Erection of a 300kW High-Flux Solar Simulator

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DLR is currently erecting **synlight**, a very large high-flux solar simulator (HFSS) for the verification and demonstration of CSP components and solar chemical processes.

The new facility will bridge the performance gap between today's laboratory scale HFSS and the demonstration at research platforms. The weather-independent availability of precisely reproducible solar radiation with high flux density will improve and accelerate solar research & development.

synlight will consist of 149 modules which can individually direct their artificial sunlight into up to 3 test chambers (Fig. 2 & 3 [1]).

The test chambers are individually equipped (Tab. 1) and can be operated separately due to their light proof roller shutters. Each chamber has a separate control room with protected access to the assigned modules, the entire test setup and all measured data.

Fig. 1: **synlight** building near the Jülich Solar Tower

A new building was erected (Fig. 1) and the design, as presented in [1], has almost been realized (Fig. 4 & 5). Later in 2016 the commissioning will start with the demonstration of a DLR solar H_2 reactor (Fig. 6 [2]), before **synlight** will be opened for cooperative research from early 2017 onwards.

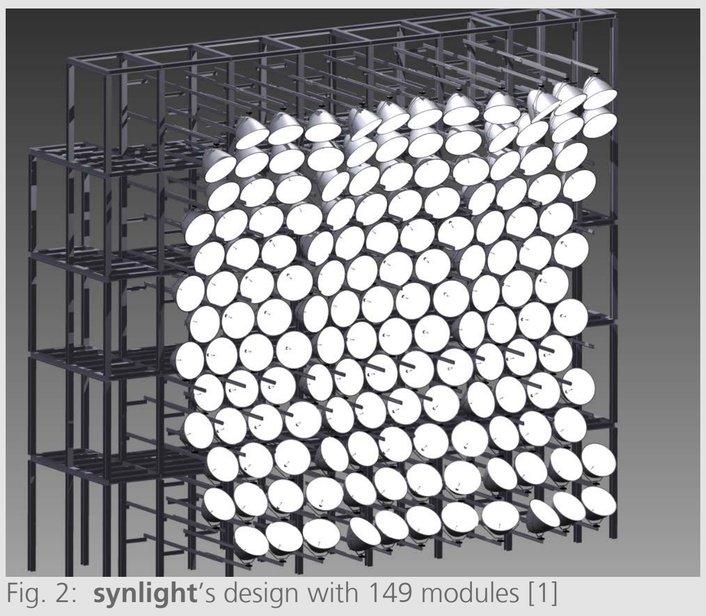


Fig. 2: **synlight**'s design with 149 modules [1]

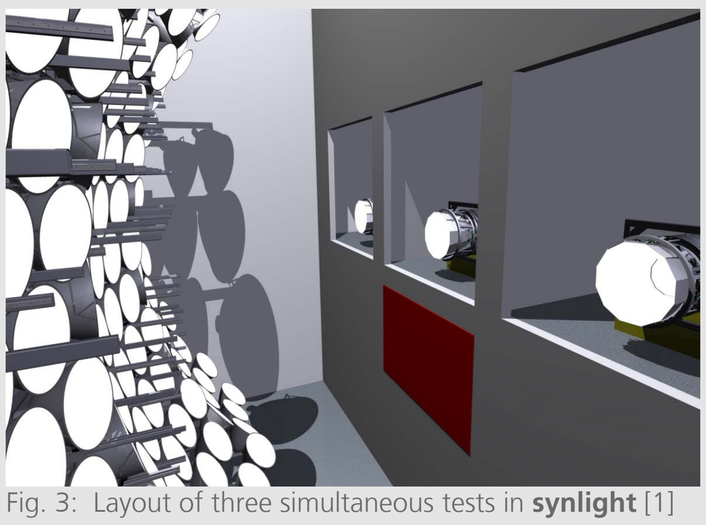


Fig. 3: Layout of three simultaneous tests in **synlight** [1]

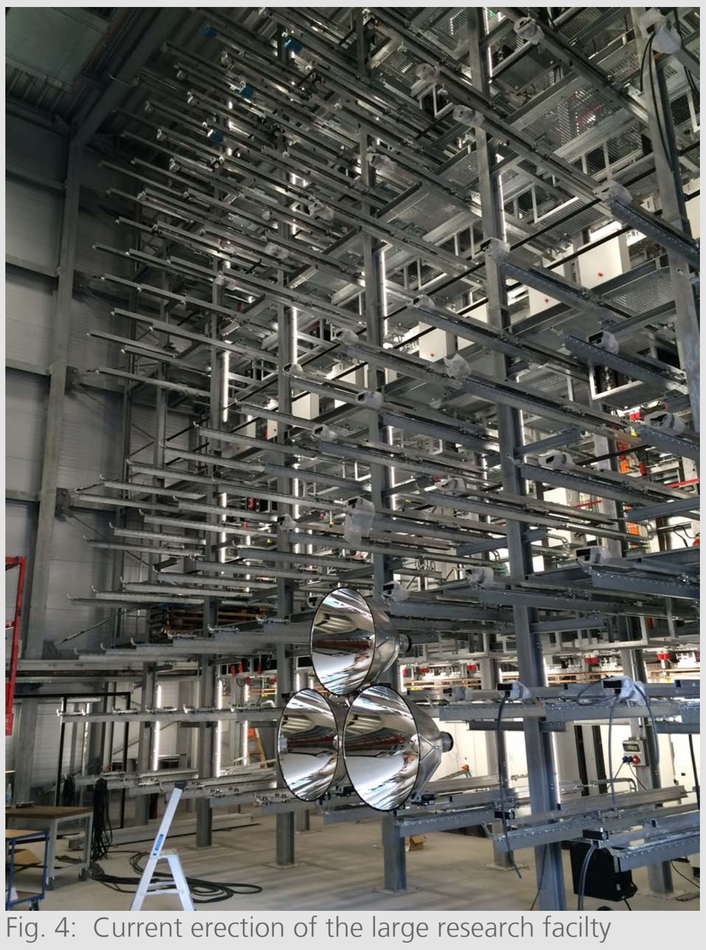


Fig. 4: Current erection of the large research facilty

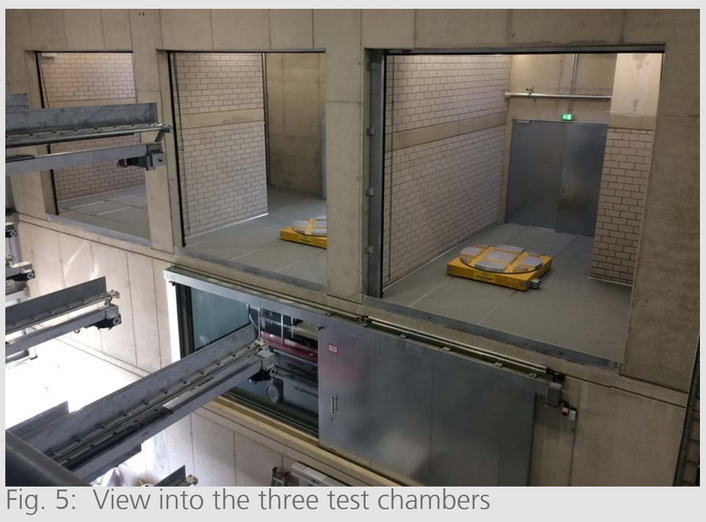
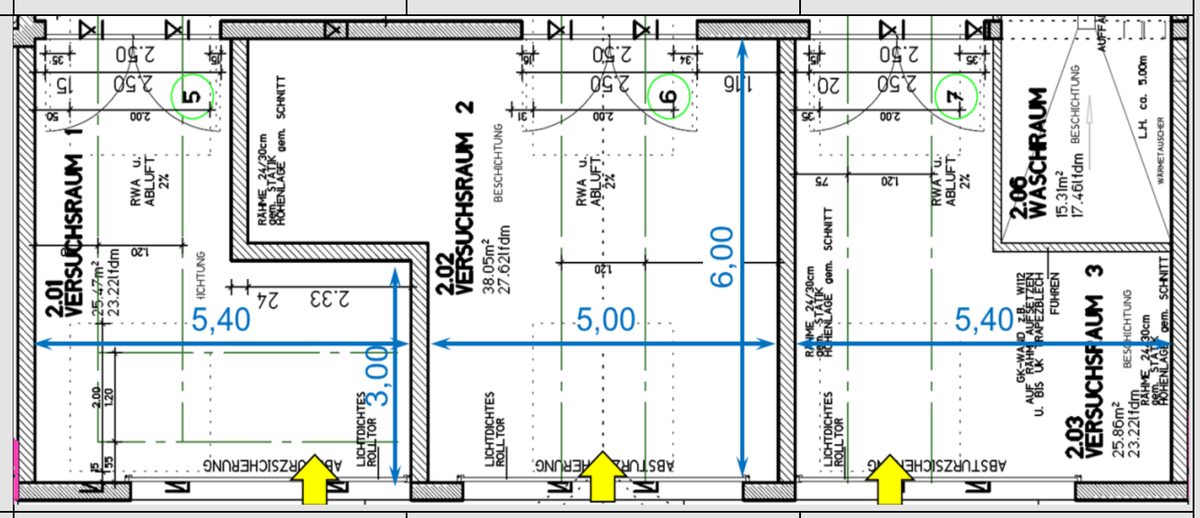


Fig. 5: View into the three test chambers

	Test Chamber 1	Test Chamber 2	Test Chamber 3
Floor plan			
Max. solar power	240kW* (320kW*)	300kW* (400kW*)	240kW* (320kW*)
Peak flux	>8MW/m²*	>11MW/m²*	>8MW/m²*
Max. aperture	2m x 2m (4m x 4m)		
Chamber space	25m² x 4,5m	38m² x 4,5m	26m² x 4,5m
Max. test object	2,5t (>4t)	2,5t (>6t)	2,5t (>4t)
Cooling	air cooling up to 5m³/s per chamber, additional cooling water supply		
Connections	power 400V/63A and 230V/16A, water 100L/min, Ethernet 1Gbit/s		
Special feature	high UV proportion	equipped for solar-chemical applications	

* Predicted values. Parameters in brackets () exceed the current standard and can be realized with some additional effort.

Tab.1: Technical parameters and floor plan of the three, individually equipped test chambers

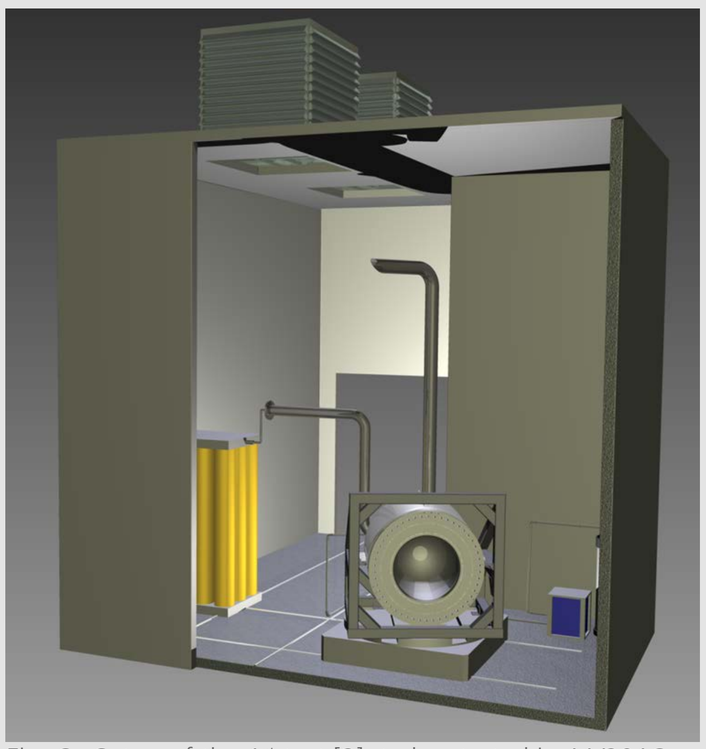


Fig. 6: Setup of the 1st test [2], to be started in 11/2016

[1] K. Wieghardt, K.-H. Funken, G. Dibowski, B. Hoffschmidt, D. Laaber, P. Hilger K.-P. Eßer: SynLight – The World's Largest Artificial Sun, SolarPACES2015. AIP Conference Proceedings 1734, 030038 (2016)

[2] St. Breuer, C. Spenke, M. Wullenkord, J.-P. Säck, M. Roeb, Chr. Sattler: Development of a hydrogen producing Ceria based demonstration plant coupled to a 200 kWth solar simulator, Hydrogen symposium Hypothesis, Toledo, Spain, September 2015

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DLR Deutsches Zentrum für Luft- und Raumfahrt

synlight

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