

H1 Status and Plans January 2021

Benjamin Moritz Veit

19. Januar 2021

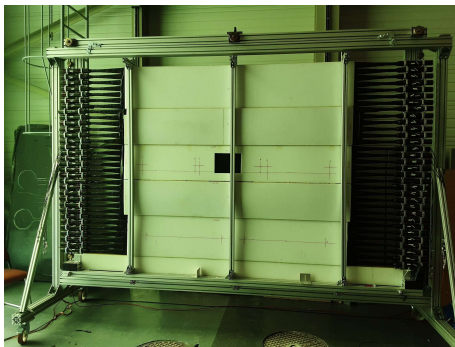


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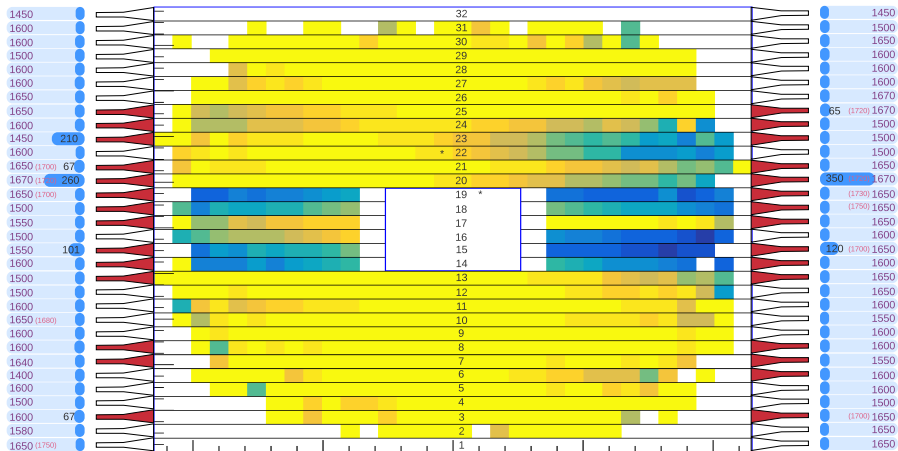


Tasks performed in 09/2020

- Labeling of all components
- Visual Inspection
- Light leak search
- Check of PMT currents (Nominal 2018/1500V reference)
- Dark rate and signal investigation
- Measurements with source
- Removing photo-multipliers
- Preparations for disassembly



Light Leak and dark currents



Nominal dark current at 1500V $\approx 61 \mu\text{A}$

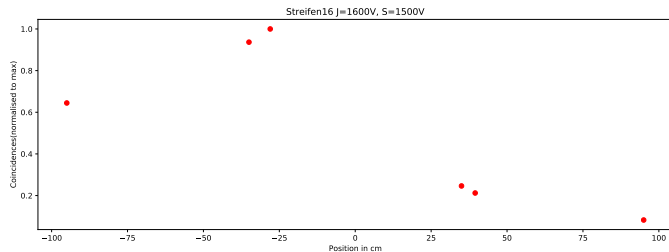
Voltages of 2018 in purple, blue bars are dark-currents (value in black), light-leaks marked as red light guides.

Setup for Measurements with source

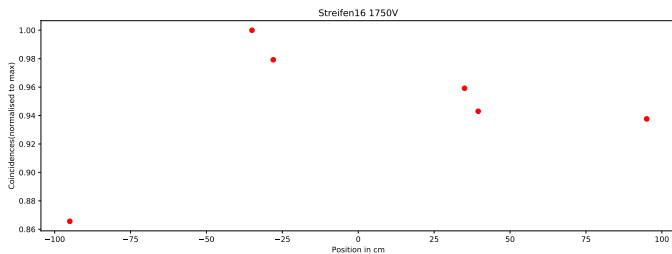
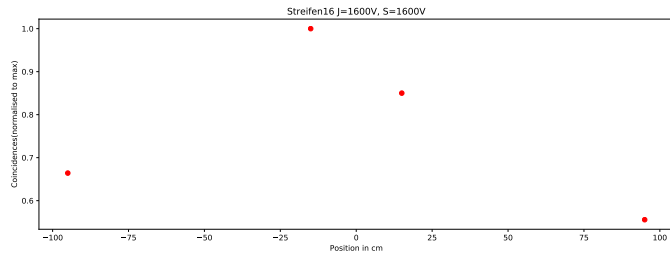
22 MBq Sr-90 Source on 6(4) positions along the slab.
3x 30 s Measurement duration averaged.



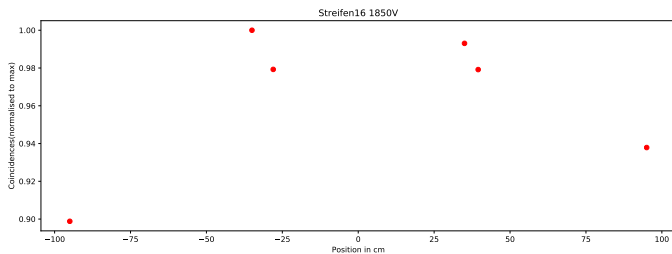
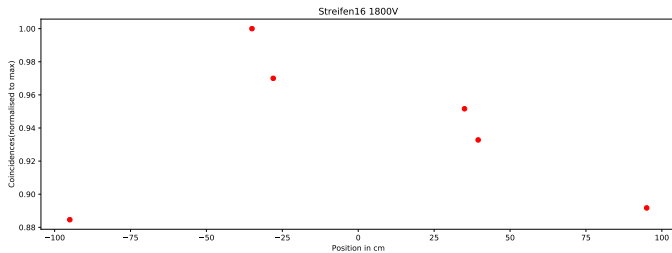
Result Slab16-1



Result Slab16-2

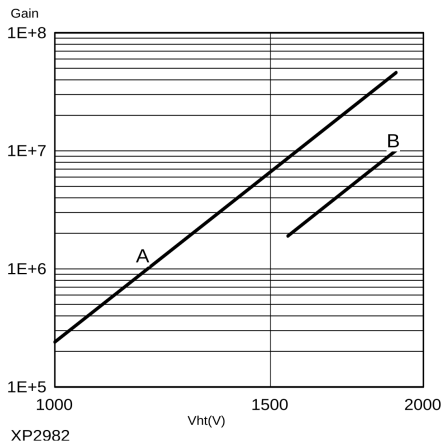


Result Slab16-3

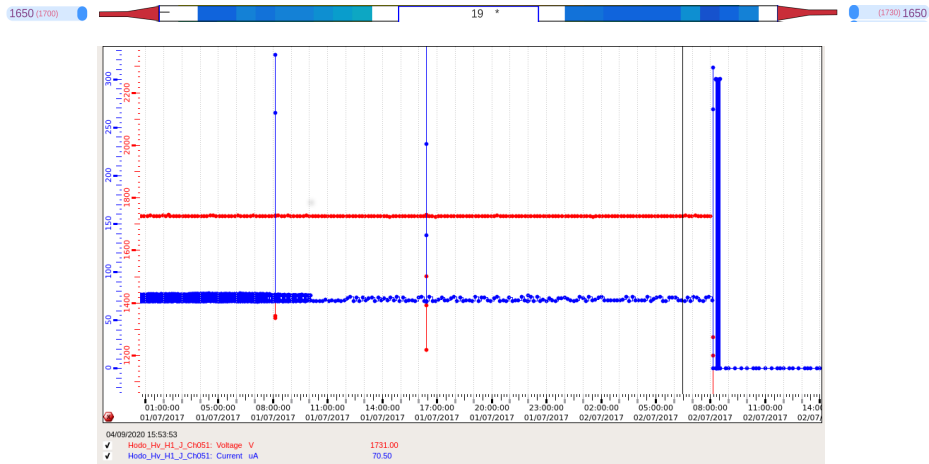


XP2982 Gain

Typical gain curve



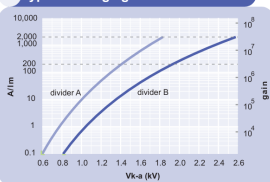
H1 PMT failure in 2017 (slab19 - jura)



Investigation on Photomultipliers

- We are looking into the issue with the maximum high voltage
→ Tests in dark box are ongoing to find the reason (base or tube?)
- Replacement PMTs under investigation (ET Enterprise 9128B)
 - Similar characteristics as XP2980
 - Higher max. gain ($5 \cdot 10^7$)
 - Mechanical compatible with old PMTs
 - Adapted base required

7 typical voltage gain characteristics



6 characteristics

	unit	min	typ	max
photocathode: bialkali				
active diameter	mm		25	
quantum efficiency at peak	%		28	
luminous sensitivity	$\mu\text{A/Im}$		65	
with CB filter		7	11	
with CR filter			1	
dynodes: 11LFBeCu				
anode sensitivity in divider A:				
nominal anode sensitivity	A/Im		200	
max. rated anode sensitivity	A/Im		2000	
overall V for nominal A/Im	V		1400	1600
overall V for max. rated A/Im	V		1800	
gain at nominal A/Im	$\times 10^6$		3	
dark current at 20 °C:				
dc at nominal A/Im	nA		0.2	5
dc at max. rated A/Im	nA		2	
dark count rate	s^{-1}		100	
afterpulse rate:	%		1	
afterpulse time window	μs	0.2		6.4
pulsed linearity (-5% deviation):				
divider A				
divider B	mA		100	
	mA		150	
pulse height resolution:				
single electron peak to valley	ratio		1.5	
rate effect (I_p for $\Delta g/g=1\%$):				
	μA		1	
magnetic field sensitivity:				
the field for which the output decreases by 50 %				
most sensitive direction	$T \times 10^{-4}$		2	
temperature coefficient:				
	$\% \text{ } ^\circ\text{C}^{-1}$		± 0.5	
timing:				
single electron rise time	ns		2.5	
single electron (fwhm)	ns		3.5	
single electron jitter (fwhm)	ns		2	
transit time	ns		30	
weight:	g		50	
maximum ratings:				
anode current	μA			200
cathode current	nA			50
gain	$\times 10^6$			30
sensitivity	A/Im			2000
temperature	$^\circ\text{C}$	-30		60
V (k-a) ⁽¹⁾	V			2800
V (k-d1)	V			450
V (d-d) ⁽²⁾	V			300
ambient pressure (absolute)	kPa			202

Status of Works

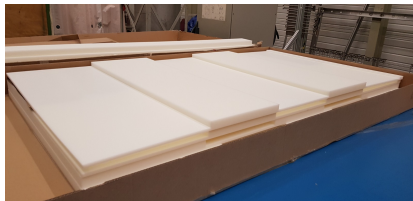
- Modules with scintillators were extracted from hodoscopes and stored in the clean area (Nov. 2020)



Several broken light guides were found but could not be correlated with bad slabs!

Status of Works

- Materials (ROHACELL, scintillators, reflective foil) arrived at CERN



- Support structure for ROHACELL rotation and aluminium profile for structural reinforcement under construction (mid February)
- Repairing broken slabs and gluing of new slabs for change of hole structure will start end of January
- High voltage failures and replacement PMTs are under investigation

Project is progressing but slowly because of lack of man power due to COVID travel restrictions, but still on track for 2021 RUN!

Big thanks to Stefano and Livio!