

Results of TRITIUM-IFIC 2 prototypes

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- 2 Prototype efficiency measurement
- 3 Long-term stability of Tritium-IFIC 2 prototypes
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Tritium-IFIC 2 Prototype



Figure: TRITIUM-IFIC 2, laboratory prototype



Figure: TRITIUM-IFIC 2, Arrocampo cell

FOTOOS PROTOTIPO CON VETOS

Tritium-IFIC 2 read-out electronic system

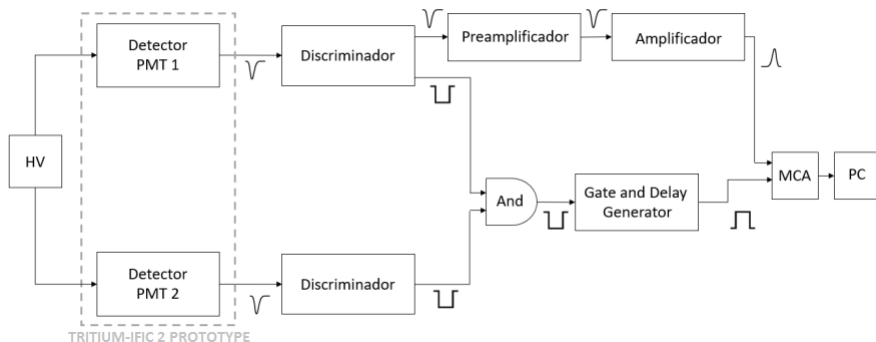


Figure: Scheme of the read-out electronic system

Tritium-IFIC 2 read-out electronic system



Figure: Read-out electronic system

Prototype efficiency measurement

| Parameter | Numerical value |
|--|----------------------|
| Number of fibers in each prototypes | 800 |
| Distance of fibers in each prototypes | 20 cm |
| Diameter of the fibers in each prototype | 1 mm |
| Activity of tritium solution | 10 kBq/L |
| Date (signal) | 20/07/2020 |
| Air conditioned (signal) | ON (18 °) |
| Fans inside the black box (signal) | ON |
| Date (background) | 22/05/2020 |
| Air conditioned (background) | ON (18 °) |
| Fans inside the black box (background) | ON |
| Low Level discrimination channel (MCA) | 100 \approx 122 mV |

Table: Relevant information for the measurement

Prototype efficiency measurement

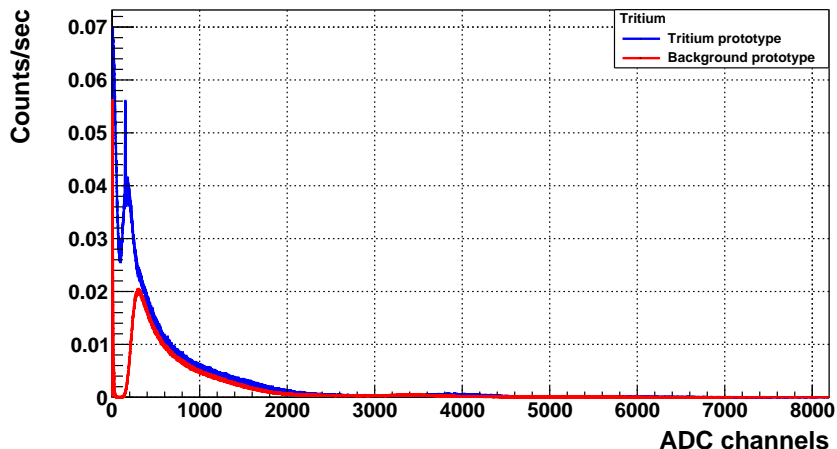


Figure: Signals of both TRITIUM-IFIC 2 prototypes

Prototype efficiency measurement

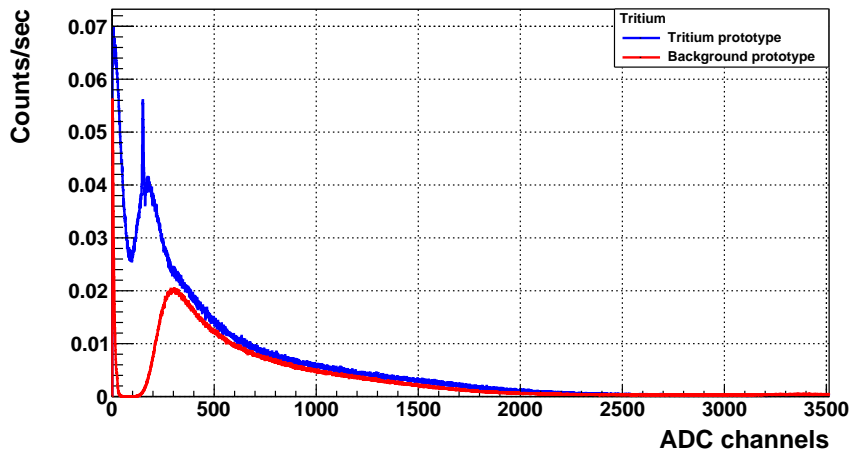


Figure: Signals of both TRITIUM-IFIC 2 prototypes (Zoom 0-4000 channels)

Prototype efficiency measurement

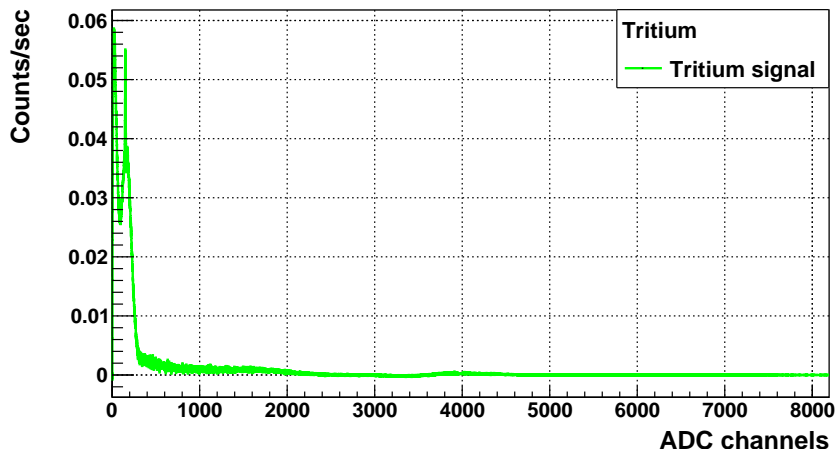


Figure: Tritium signal measured in TRITIUM-IFIC 2 prototypes

Prototype efficiency measurement

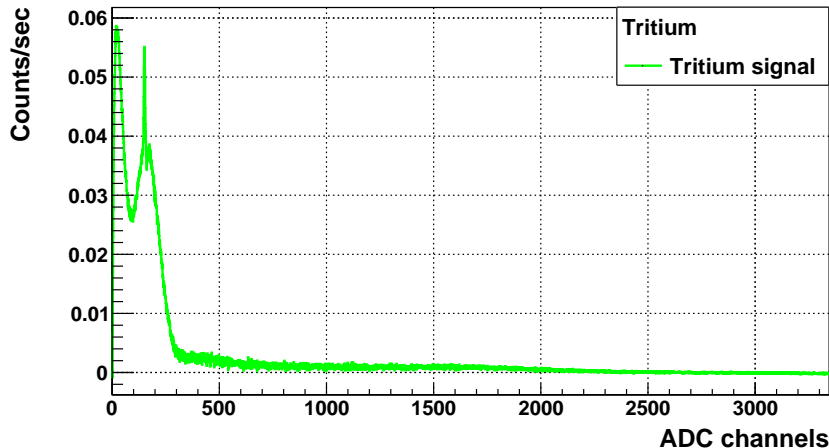


Figure: Tritium signal measured in TRITIUM-IFIC 2 prototypes (Zoom 0-4000 channels)

Prototype efficiency measurement

| Parameter | Numerical value |
|-------------------------|--|
| Counts/sec (signal) | 19.0522 |
| Counts/sec (background) | 11.9419 |
| Counts/sec (Tritium) | 7.11032 |
| Nominal activity | 10 kBq/L |
| Efficiency | $0.711 \frac{\text{c/s}}{\text{kBq/L}}$ |
| Active area/fiber | $2\pi \text{ cm}^2$ |
| Specific efficiency | $1.415 \cdot 10^{-4} \frac{\text{c/s}}{\text{cm}^2 \text{ kBq/L}}$ |

Table: Results of Tritium-IFIC 2 prototype

Prototype efficiency measurement

| | Efficiency, η_{det} (cps/(kBq/L)) | Surface F_{sci} (cm ²) | Specific efficiency $\varepsilon_{det} =$ η_{det}/F_{sci} | LDL (kBq/L) |
|------------|--|---|---|-------------|
| Muramatsu | $3.85 \cdot 10^{-4}$ | 123 | $3.13 \cdot 10^{-6}$ | 370 |
| Moghissi | $4.5 \cdot 10^{-3}$ | > 424.1 | $< 1.06 \cdot 10^{-5}$ | 37 |
| Osborne | 0.012 | 3000 | $4 \cdot 10^{-6}$ | 37 |
| Singh | 0.041 | 3000 | $1.37 \cdot 10^{-5}$ | < 37 |
| Hofstetter | $2.22 \cdot 10^{-3}$ | ~ 100 | $< 2.22 \cdot 10^{-5}$ | 25 |
| TRITIUM | 0.711 | 1600 π | $< 1.415 \cdot 10^{-4}$ | 10 |

Table: State-of-the-Art and comparison with our detector

Long-term stability of Tritium-IFIC 2 background prototype

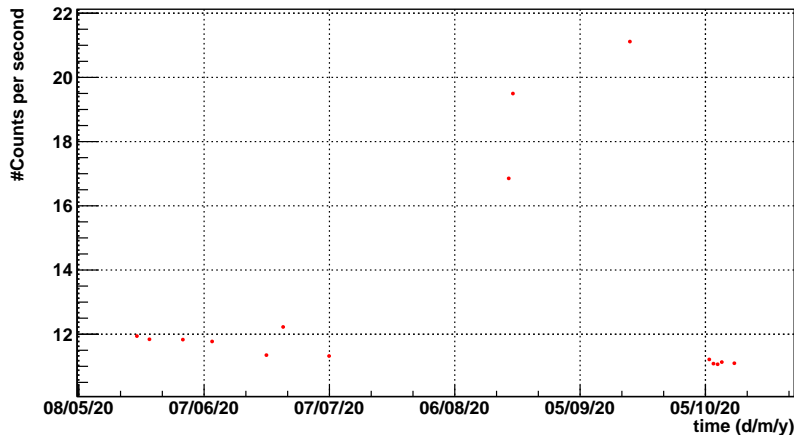


Figure: Long-term stability for TRITIUM-IFIC 2 prototype (background).

Long-term stability of Tritium-IFIC 2 background prototype

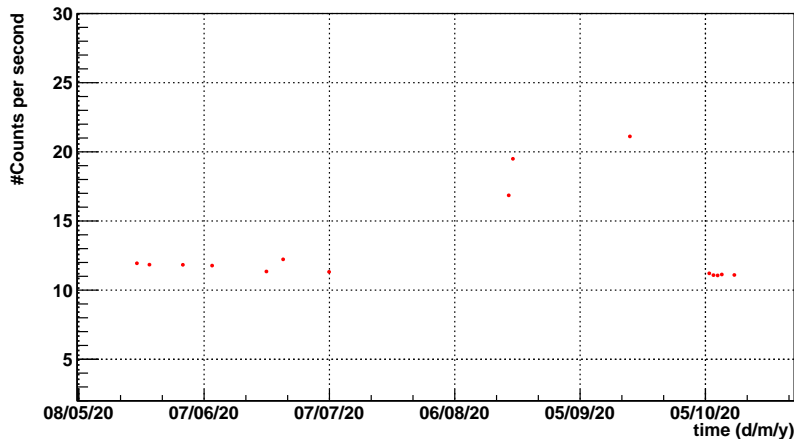


Figure: Long-term stability for TRITIUM-IFIC 2 prototype (background).
Different ZOOM.

Long-term stability of Tritium-IFIC 2 background prototype

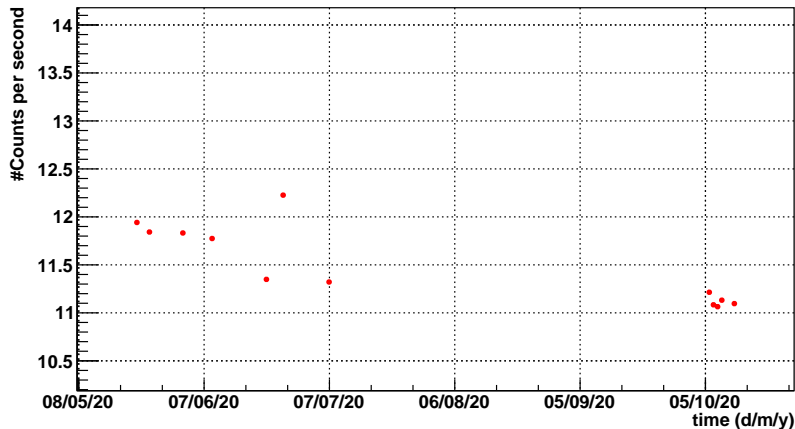


Figure: Long-term stability for TRITIUM-IFIC 2 prototype (background). Different ZOOM.

Long-term stability of Tritium-IFIC 2 signal prototype

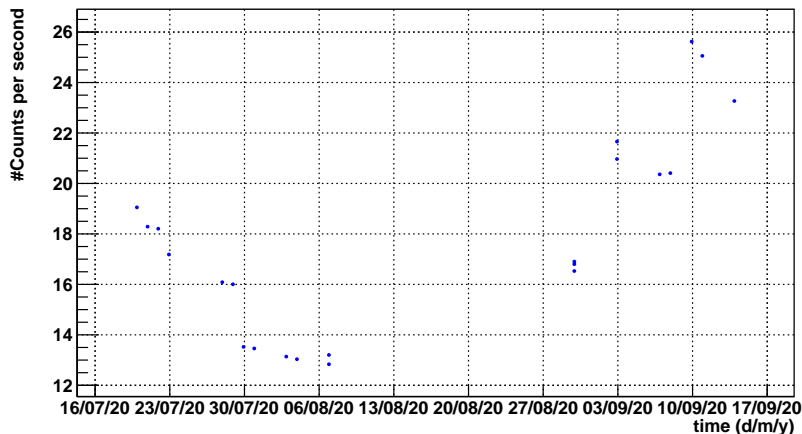


Figure: Long-term stability for TRITIUM-IFIC 2 prototype (signal).

Long-term stability of Tritium-IFIC 2 signal prototype

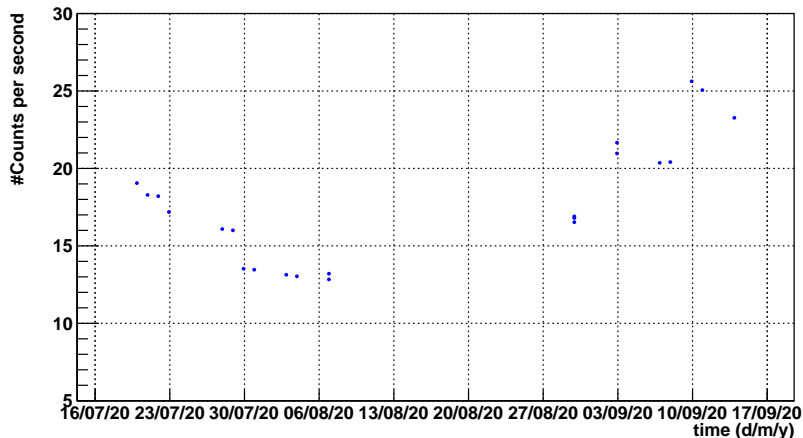


Figure: Long-term stability for TRITIUM-IFIC 2 prototype (signal). Different ZOOM.

Long-term stability of Tritium-IFIC 2 signal prototype

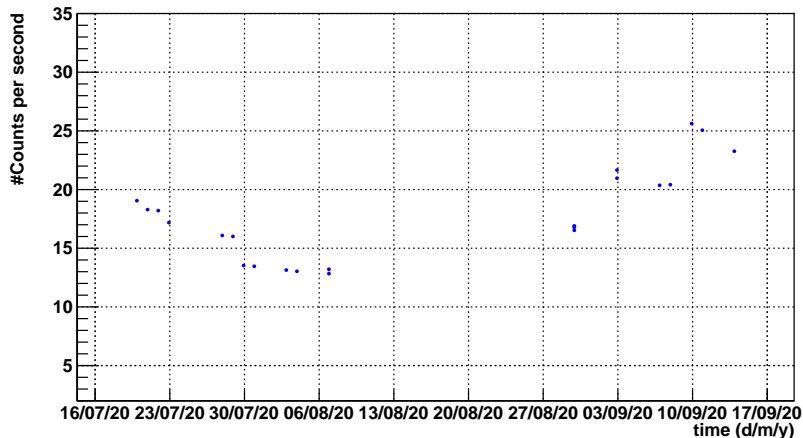
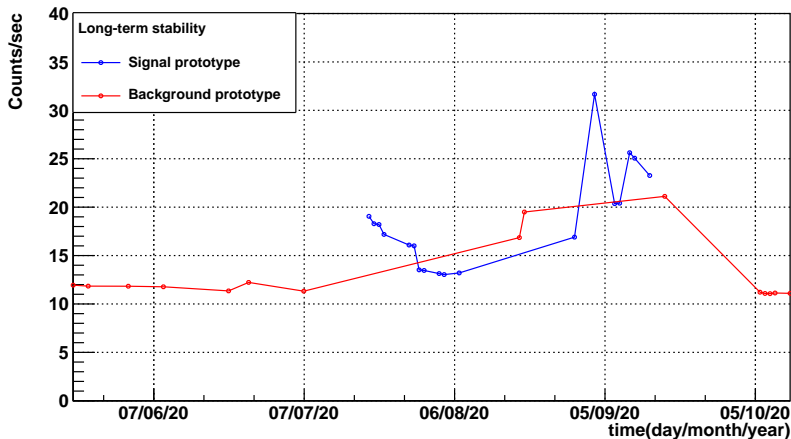


Figure: Long-term stability for TRITIUM-IFIC 2 prototype (signal). Different ZOOM.

Long-term stability of Tritium-IFIC 2 both prototypes



Long-term stability of Tritium-IFIC 2 both prototypes

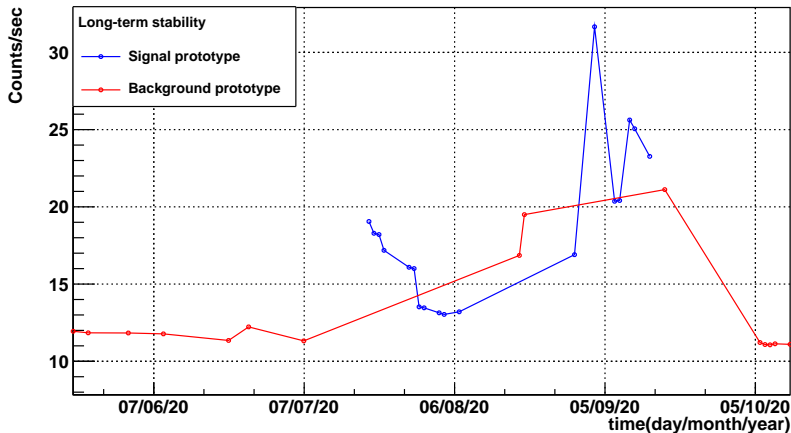


Figure: Long-term stability for TRITIUM-IFIC 2 prototype (signal and background). Different ZOOM

Next step

- Measurement of Tritium-IFIC 1:
 - ▶ $V = -700V, -750V, -800V$
 - ▶ ¿Make sense? → Refill → Measure again
- Refill Tritium IFIC 2 (signal) and measure → Friday
- Measure Tritium IFIC 2 (Background and signal) with vetos → next week
- Measure Tritium IFIC 2 (signal) with vetos and lead → in two weeks
- Build new Tritium IFIC 2 (signal) with less activity → ¿1kBq/L?
- Disassemble the first Tritium-IFIC 2 prototype (110 kBq/L) to clean it and rebuild it again, probably with new fibers.