# DORIS/JASON2 USO :

# maybe a significant step on the way to solve concerns about DORIS USO radiation sensitivity.

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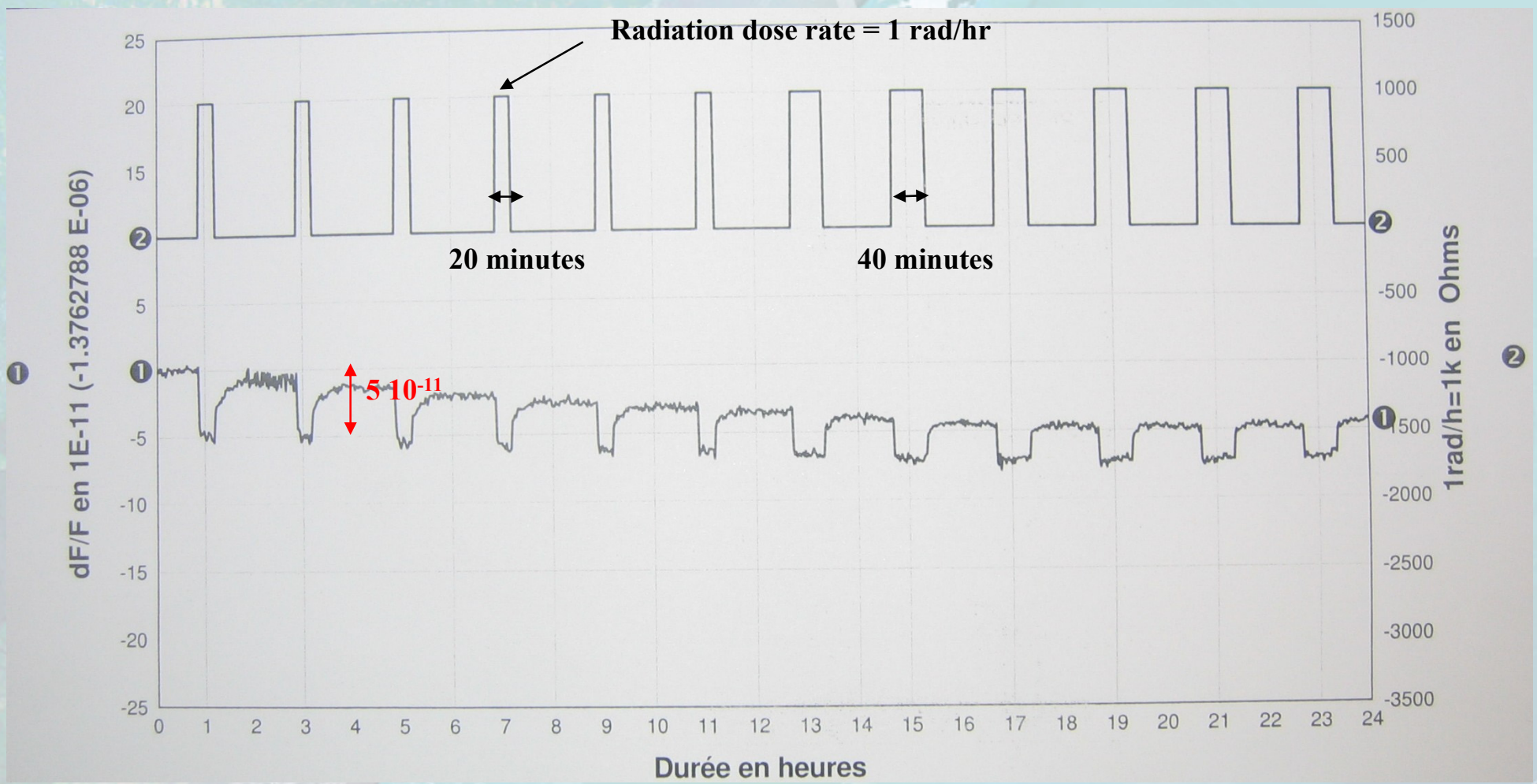
- **As a consequence of DORIS/JASON1 performances and results :**
  **=> high priority set on reduction of USO radiation sensitivity on JASON2**
- **This objective is achievable : ex, DORIS/TOPEX USO**
  - **Same design as DORIS/JASON1 USO,**
  - **But quartz supplier is different (Sawyers for TOPEX, SICN for JASON1)**
- **Initial idea :**
  - **a/ define a new radiation test protocol to evaluate quartz resonator radiation sensitivity**
    - On a 24 hours test basis, one slot of USO irradiation every 2 hours with a radiation dose rate of 1 rad/hr; six irradiation slots of 20 min., then six slots of 40 min.
    - Radiation tests performed with Gamma rays ( no proton test facility in Europe for testing with low proton dose rate)
  - **b/ quartz resonators with the lower sensitivity will be selected for DORIS/JASON2 USO**
- **First tests in September 2004**
  - **Confirm that USO sensitivity depends on quartz resonator sensitivity, not on other USO parts**
  - **But quartz resonators performances are very disappointing (cf. next slide)**
    - High sensitivity to dose rate
    - Significant sensitivity to cumulated dose : ~ some $10^{-11}$ / rad

15 YEARS OF PROGRESS IN RADAR ALTIMETRY

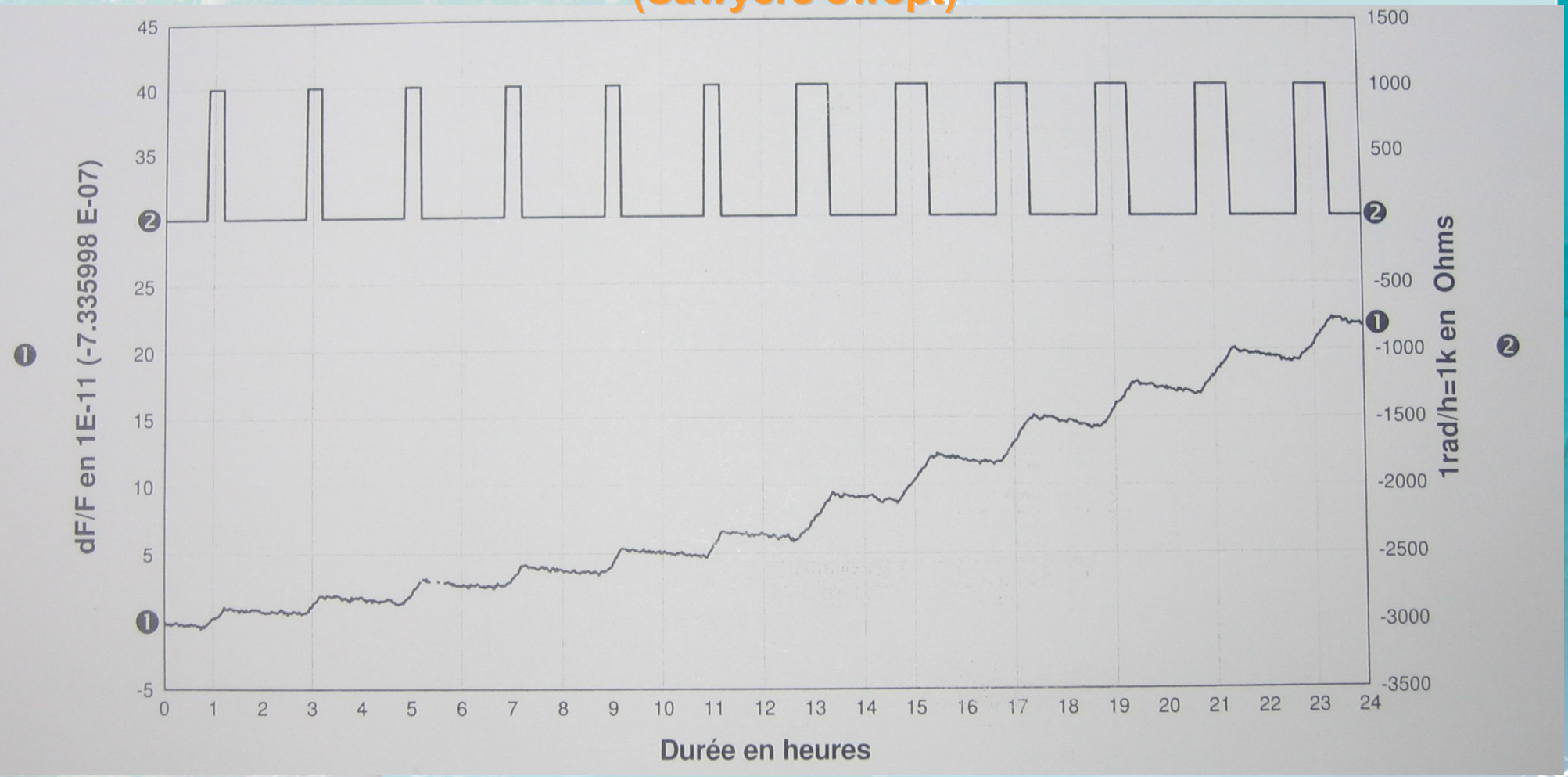
# First results of radiation test on SICN THQ quartz resonator



- **April 2005 : radiation tests performed on quartz resonators from the same manufacturing sets which were used for DORIS/TOPEX and DORIS/JASON1 USO**
  - **(See next slides) , "old resonators" are mainly sensitive to cumulated radiation dose (several $10^{-11}$ /rad) , but not to radiation dose rate.**
  - **New resonators (SICN THQ) are sensitive to radiation dose rate and to cumulated radiation dose.**
- **Based on C-MAC (DORIS USO manufacturer) experience in the frame of USO tests for spatial qualification in terms of radiation dose, it was proposed to apply a pre-irradiation of 30 krad on quartz resonators to reduce their sensitivity**
  - **30 krad irradiation and sensitivity tests performed in June 2005**
  - **Very encouraging results :**
    - **Sensitivity to cumulated dose is reduced by a factor 10**
    - **Sensitivity to dose rate disappears**
  - **Additional tests have been performed in September 2005 to check that this 30 krad pre-irradiation doesn't reduce USO orbital lifetime**
    - A supplementary 30 krad irradiation was applied to some resonators : OK
    - No sensitivity reduction noted after 60 Krad compared to 30 krad
- **Final tests will be performed by the end of March 2006 to verify that this sensitivity improvement is permanent.**

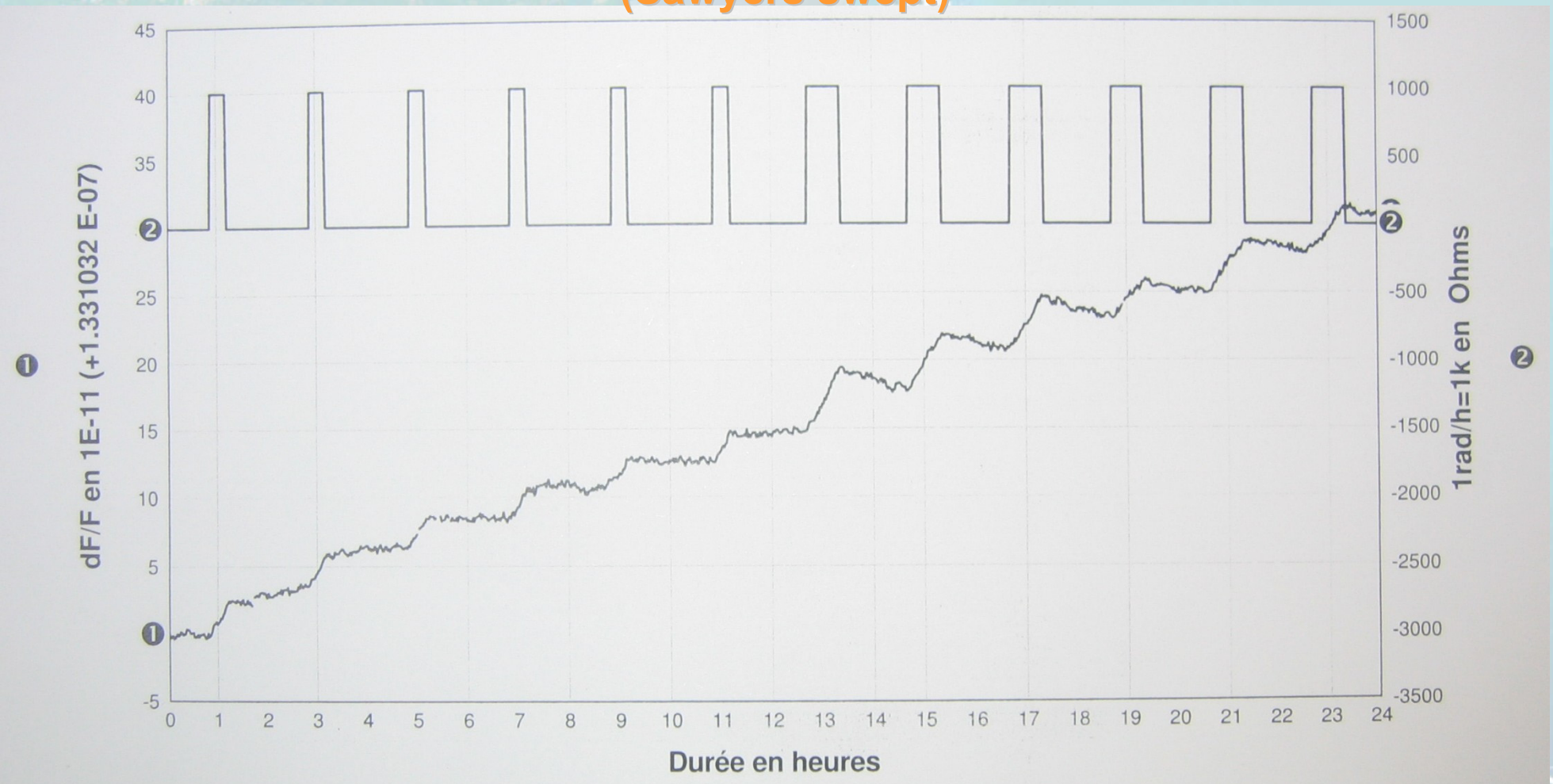
# 15 YEARS OF PROGRESS IN RADAR ALTIMETRY

## Quartz resonator # 8747-22 : from DORIS TOPEX USO MV1 resonators set (Sawyers swept)



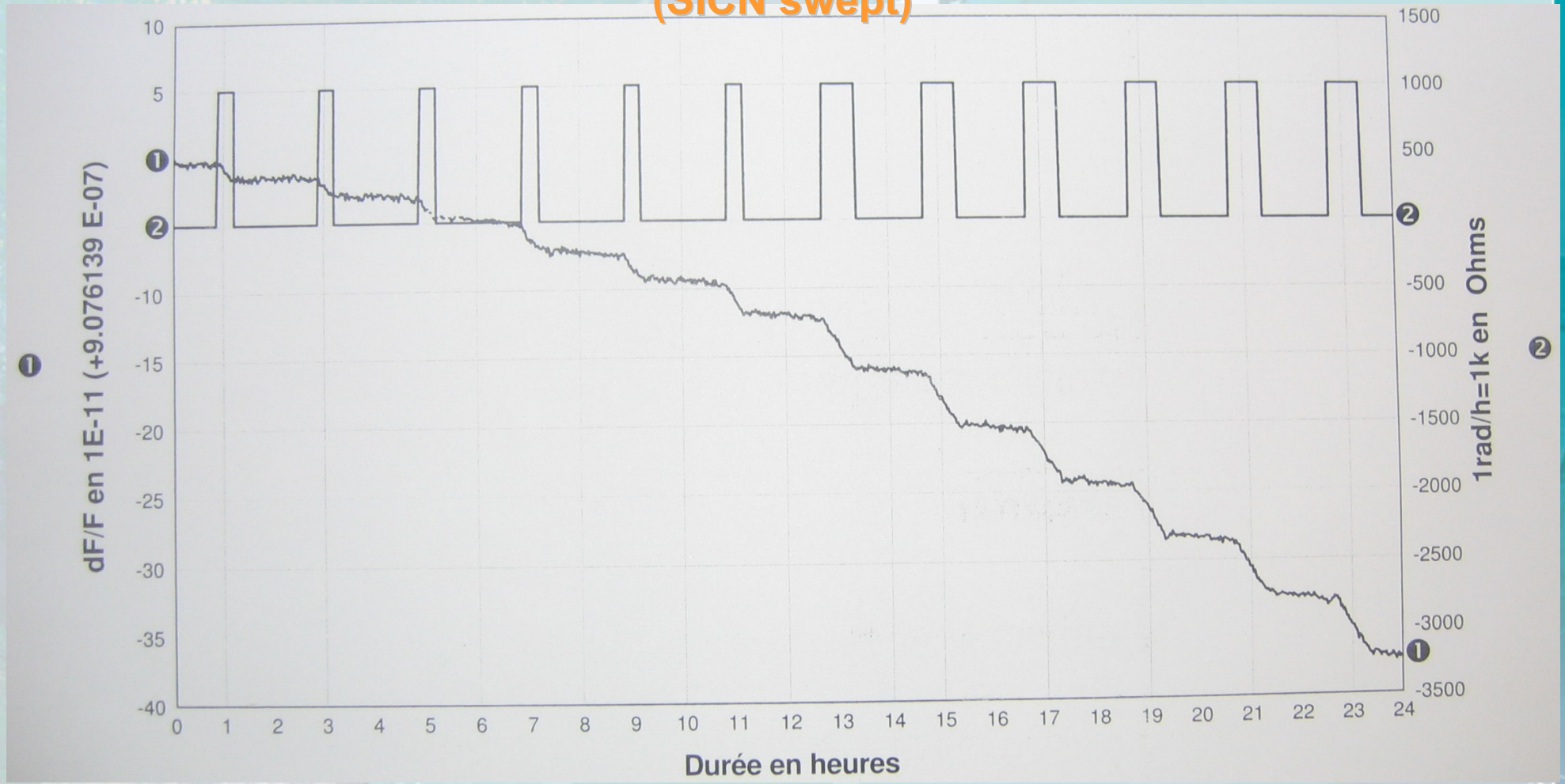
# 15 YEARS OF PROGRESS IN RADAR ALTIMETRY

## Quartz resonator # 8747-82 : from DORIS TOPEX USO MV1 resonators set (Sawyers swept)



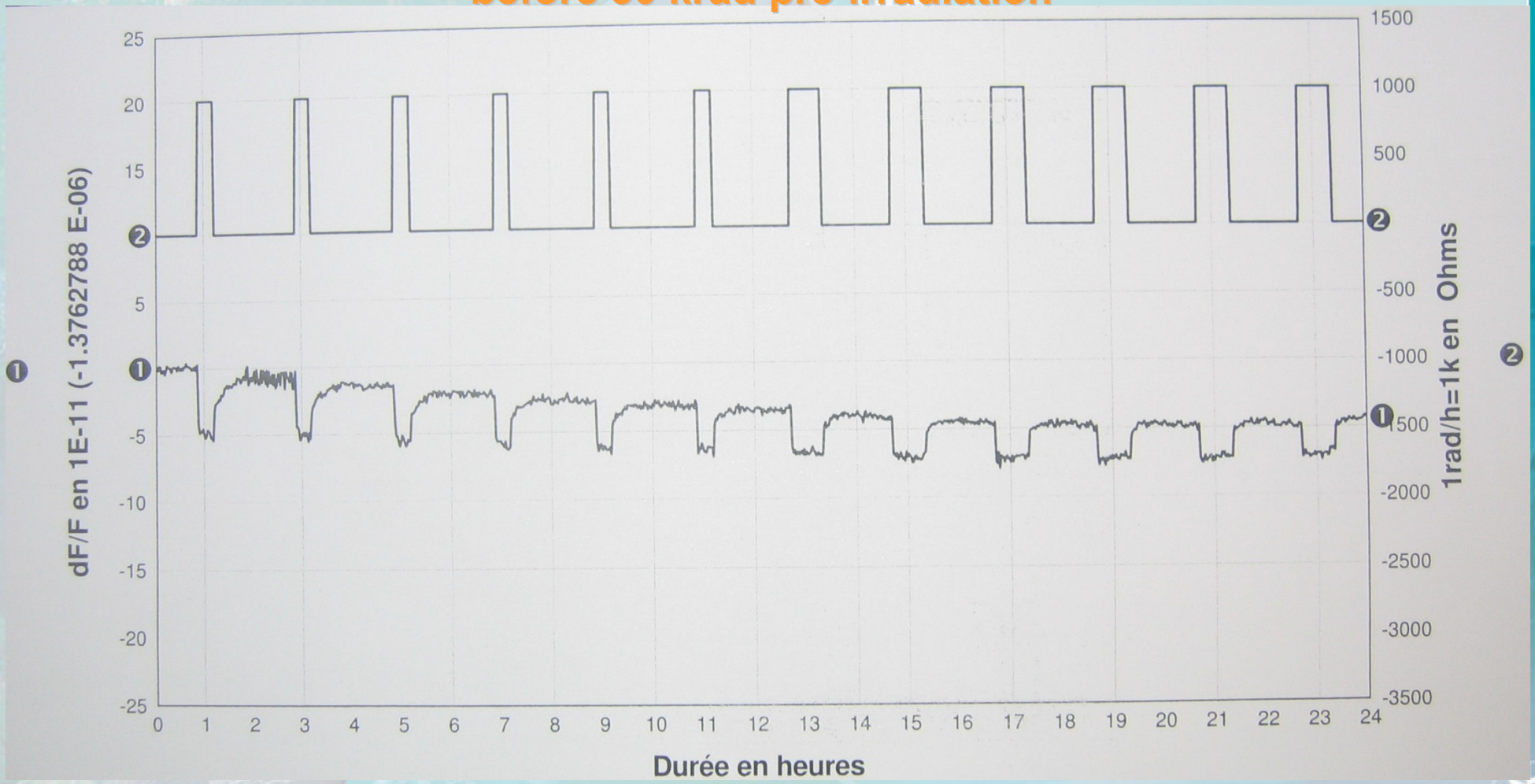
# 15 YEARS OF PROGRESS IN RADAR ALTIMETRY

## Quartz resonator # 9439-32 : from DORIS JASON1 USO resonators set (SICN swept)



# 15 YEARS OF PROGRESS IN RADAR ALTIMETRY

## Quartz resonator # 0444-50 selected for DORIS/JASON2 USO (FM 43) before 30 krad pre-irradiation



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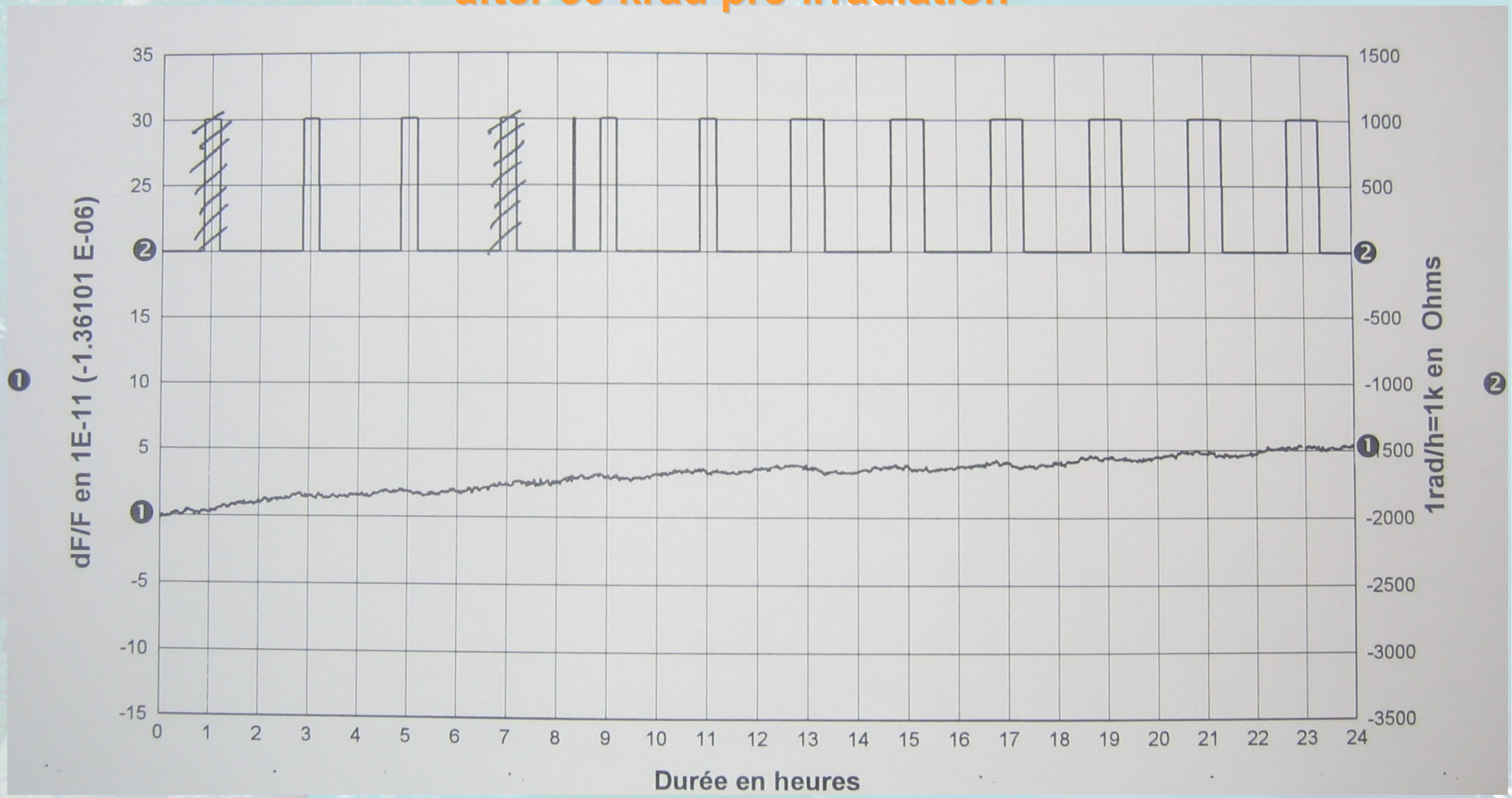
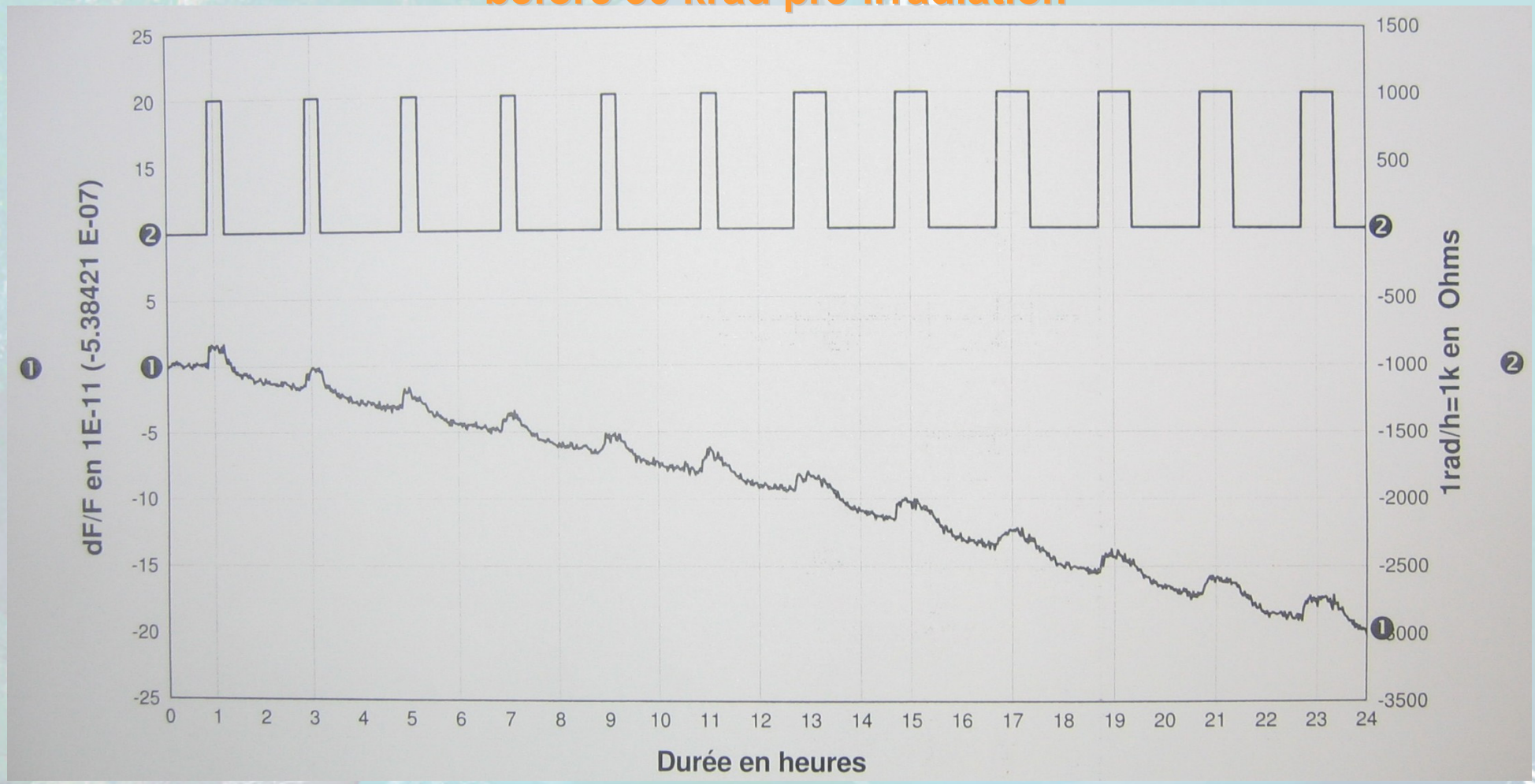


# 15 YEARS OF PROGRESS IN RADAR ALTIMETRY

## Quartz resonator # 0450-06 selected for DORIS/JASON2 USO (FM 44) before 30 krad pre-irradiation



# Quartz resonator # 0450-06 selected for DORIS/JASON2 USO (FM 44) after 30 krad pre-irradiation