

**Title: IACHEC Timing WG telecom****Date: 1 July 2024****Time: 13:00 UTC = 22:00 – 23:20 JST = 09:00 – 10:20 EDT = 6:00 – 7:20 PDT = 15:00 -16:20 CEST****Zoom: <https://zoom.us/j/99839674619> (passcode: iachec)****Notes (editable):**

[https://suitc-my.sharepoint.com/:w/g/personal/terada\\_mail\\_saitama-u\\_ac\\_jp/Ed\\_8q\\_aHBCJAiCFIXMQltd4B5llhE6avW0735\\_m\\_ZHuWWg?e=fGHXak](https://suitc-my.sharepoint.com/:w/g/personal/terada_mail_saitama-u_ac_jp/Ed_8q_aHBCJAiCFIXMQltd4B5llhE6avW0735_m_ZHuWWg?e=fGHXak) (passcode=iachec!time)

**Participants:** Yuki, Megumi, Xiaobo, Matteo, Naoyuki, Giancarlo, Katja, Teru, Yugo, Vinay, Juan, Toshihiro.

*Meeting Notes are shown in Red. (Participants can edit this page.)*

---

**Agenda**

0. logistics
1. Status updates on systematic timing cross-calibration (Matteo)
2. Paper plan

---

**0. Logistics**

- Members
  - Yukikatsu Terada (Suzaku, Hitomi, XRISM),
  - Craig Markwardt (NICER),
  - Teruaki Enoto (NICER, XRISM),
  - Matteo Bachetti (NuSTAR),
  - Katja Pottschmidt (NuSTAR, XRISM),
  - Kristin Madsen (NuSTAR)
  - Felix Fuerst (XMM-Newton),
  - Simon Rosen (XMM-Newton),
  - Vinay Kashyap (Chandra),
  - Arnold Rots (Chandra),
  - Amy Lien (Swift),
  - Giancarlo Cusumano (Swift),
  - Guillaume Belanger(INTEGRAL),
  - Volodymyr SAVCHENKO(INTEGRAL),
  - Lucien Kuiper(INTEGRAL)
  - Xiaobo LI (HXMT),
  - Gulab Dewangan (Astrosat),
  - Dipankar Bhattacharya(Astrosat)
  - Michael Freyberg (eROSITA),
  - Makoto Sawada(XRISM),
  - Takaaki Tanaka (XRISM),
  - Megumi Shidatsu (XRISM)
  - Juan Zhang (EP),
  - Toru Tamagawa, (NinjaSat),
  - Naoyuki Ota (NinjaSat)
- WWW

- <https://iachec.org/timing/>
- ML
  - [iachec\\_time@ml.saitama-u.ac.jp](mailto:iachec_time@ml.saitama-u.ac.jp)
  - Note: this ML will be unavailable from the middle of July 2024.
- Meeting note in 16<sup>th</sup> IACHEC (2024); on IACHEC wiki <https://wikis.mit.edu/confluence/display/iachec/Timing>

## **1. Status updates on systematic timing cross-calibration (Matteo)**

- See Matteo's presentation
  - Key is to use the single code and same ephemeris for consistency in TOA calculation.
  - Inputs from instrument members: event FITS, dead-time corrected, with timing keywords + barycentric correction position (RA\_NOM, DEC\_NOM),
    - ◇ Comment: Please be careful on barycen (not barycor) for position keyword.
  - Delay calculation: Cross-correlation and/or Lorentzian fitting
- Current result (plot)
  - XMM large outlier
  - Suzaku outlier (ground system anomaly) --- reported in IACHEC 2017
  - HXMT outlier (readout mechanism)
  - Swift XRT --- Comment: results are different from Cusumano's results.
- Comment: DM in radio has time variable. Be careful on timing accuracy. (JPL also considers DM errors) --- Teru supports this systematics quantitatively.
  - for reference, Hitomi performed simultaneous observation with radio observatories. ~ 60us.
  - Jodrell bank DM has fluctuation with 1 sigma = 0.0284 pc/cm<sup>3</sup>

## **2. Paper plan and schedule**

- IACHEC Papers plan
  1. Systematic timing cross calibration (led by Matteo) inc. technique description.
    - ◇ (Science paper will be separately published)
  2. Simultaneous timing calibration campaign in Mar 2024 (XRISM, NICER, NuSTAR, HXMT, NinjaSat) (led by XRISM) -- detail will be included in XRISM paper (agreed).
  3. Systematic timing cross calibration in hard X-ray to GeV gamma-ray mission (led by Lucien)

Note: avoid duplicated work by Dr. Lucien Kuiper; see 13th IACHEC (2018), [https://iachec.org/wp-content/presentations/2018/Kuiper\\_SessionXI.pdf](https://iachec.org/wp-content/presentations/2018/Kuiper_SessionXI.pdf)

--- important as an independent study as an IACHEC activity. Rather higher energy missions. And including science also.

--- continue discussion via e-mail (or slack).

Paper #1:

- Missions
  - Current plot has Hitomi, HXMT, NICER, NuSTAR, IXPE, Swift, XMM data.
  - XRISM (events can be provided in summer - autumn)
  - NinjaSAT (events will be provided, 'barycen')
  - EP (Juan will ask PI of FXT)

- Schedule
  1. Gather events
  2. Calculation
  3. Drafting Introduction ++
  4. Consistency check with previous publications
  
- Journal: ApJSS, other AAS, (JATIS),

**EOF**