Future opportunity I

Nuclear data for space radiation protection

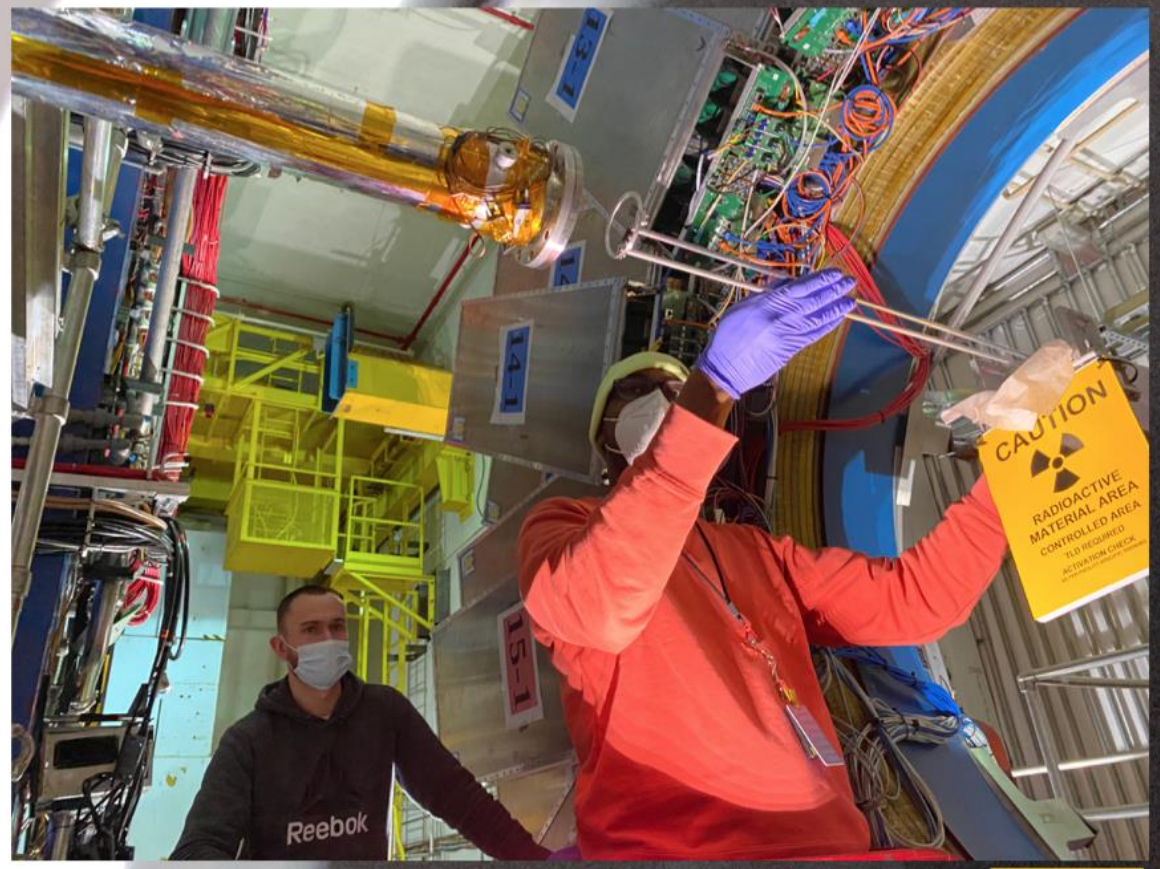
Not part of STAR physics program in the final RHIC phase but represents an opportunity for RHIC to contribute with some important nuclear data

- **The Space Radiation Protection community has identified 3-50 GeV/n region as an area of need. https://doi.org/10.3389/fphy.2020.565954**
- **STAR has excellent light fragment capabilities.**
- **RHIC can deliver the ion beam species (C, Al, Fe) and energies (3-50 GeV/n) of need to the Space Radiation Protection community. STAR installed the targets of interest (C, Al, Ni) and is ready to take FXT data when opportunities arise.**

In total, two weeks of running including machine setup

Targets installed in 2022

Fixed target installation



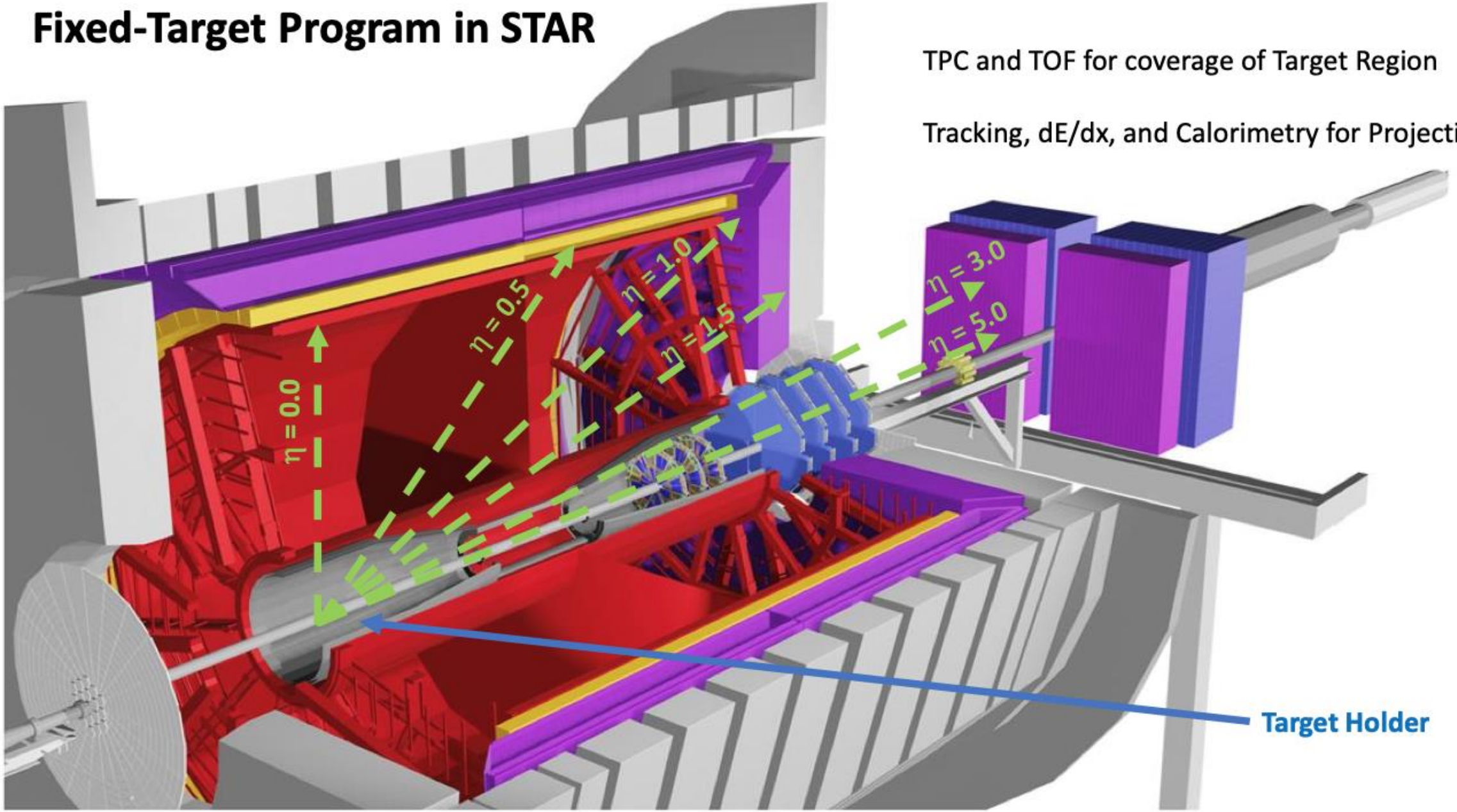
12/22/2022

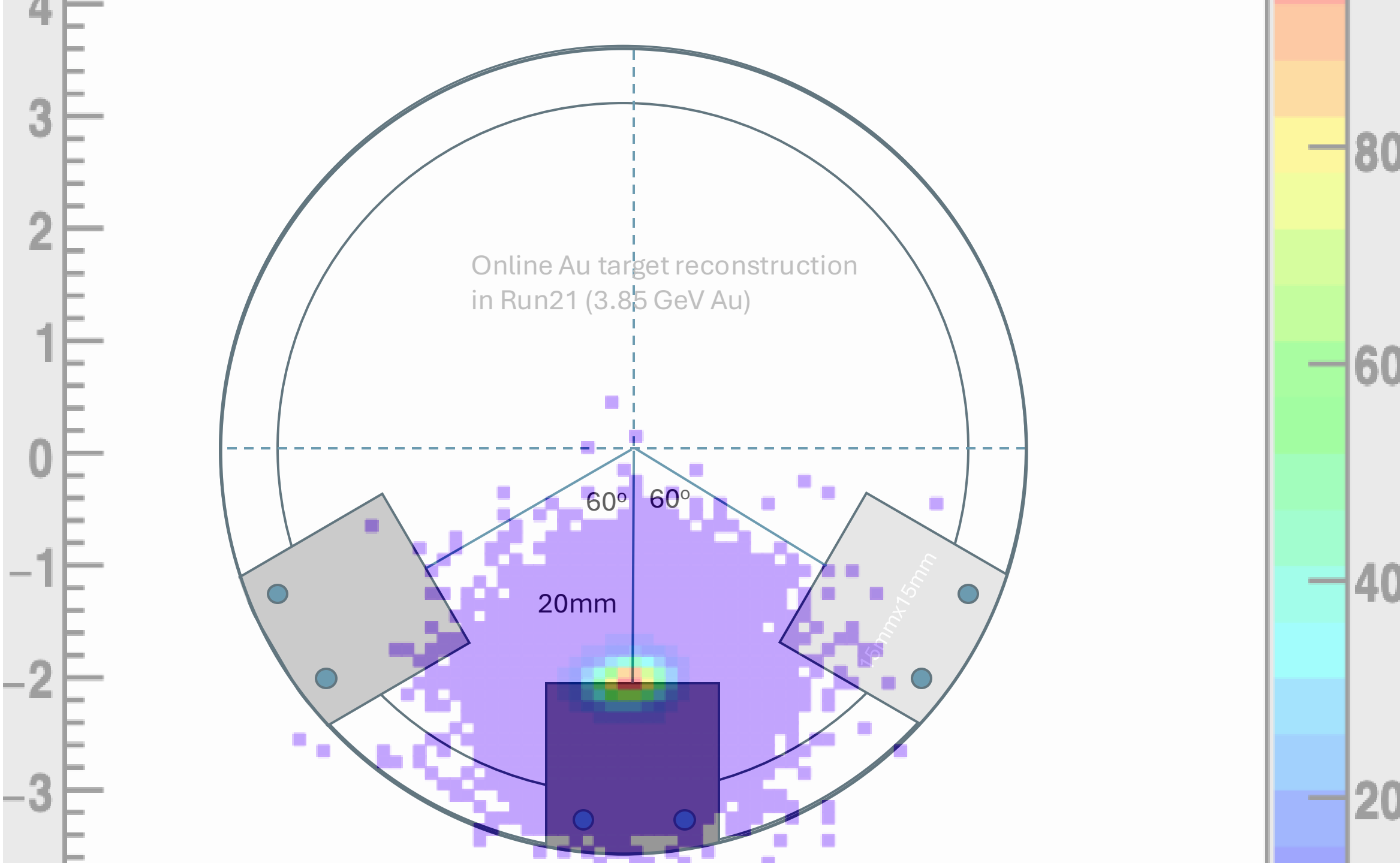
- Three targets (1mm C (graphite), Ni, 1.5mm Al)
- East side at 1.8m to face Blue beam
  (Au target remains in West side at 2m)
- for Space Radiation program: to run likely in Run25

Fixed-Target Program in STAR

TPC and TOF for coverage of Target Region

Tracking, dE/dx, and Calorimetry for Projectile




Online Au target reconstruction
in Run21 (3.85 GeV Au)
60°
60°
20mm
15mmx15mm
4
3
2
1
0
−1
−2
−3
80
60
40
20

Fixed Target run with Blue beam - proposal

- Al beam in Blue at nominal injection energy (~12 GeV) on three targets: C, Al, Ni
  - ~6 hours on each target (Al+C, Al+Al, Al+Ni) : ~80M x 3 min-bias events
- Proposed data taking: ~24 hrs Saturday PM – Sunday

- Run conditions:
  - 12 bunches to minimize out-of-time pileup
  - Vertical and horizontal bumps (+BBQ kicker) to scrape beam halo on the targets
  - “level” Min-bias trigger rate (sent to CAD) ~ 8kHz
  - Beam position to be adjusted/optimized using online target reconstruction (sent to CAD)