



WP13: Alternative Radiation Generation

WP tasks and challenges

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Tasks and challenges

- **Task 13.1: Investigations of injection schemes for high quality electron bunches**

Challenges: robust control of electron injection for beams with > 1 GeV, > 50 pC, $< 1\%$ energy spread with a commercial ~ 200 TW laser system. (Options: Ionization injection, density gradient injection?)



Deliverable: Report in 36 months.

Recent related work carried out: M. Zeng et al. PoP (2016); M. Weikum et al., NIMPRA (2016); X. Yang et al., submitted (2016).

Tasks and challenges

- **Task 13.2: Extension of spectral range of plasma-based radiation sources to gamma-rays and the far infra-red**

Challenges: quasi-monoenergetic gamma-ray source with high brilliance. (Options: betatron radiation, Compton scattering, radiation reaction, laser-gas or laser-solid interaction, use of plasma channels?)



Deliverable: Report in 48 months.

Recent related work carried out: W.J. Ding & Sheng, PRE (2016); J. Luo et al., Sci. Rep. (2016); F.Y. Li et al. (to be submitted in 2016).

Tasks and challenges

- **Task 13.3: Investigations of coherence development in plasma-based radiation sources**

Challenges: Potential plasma based coherent radiation different from conventional FELs. (Beam injection control, ion channel laser, development of coherence?)



Related to tasks 1 and 2

Experimental and theoretical studies under progress at Strathclyde

Tasks and challenges

- **Task 13.4: Development of diagnostic systems for investigating plasma-based radiation sources**

Challenges: diagnostic of beam transport, radiation coherence measurements, measurement of the correlation between the beam and radiation, advanced on-line diagnostic of electron beams and radiation.



Deliverable: Report in 36 months.

Several diagnostic systems are already in use at Strathclyde and some are under development.