RadioNet support for scientific events
Application form

EVENT INFORMATION	
TITLE	European Pulsar Timing Array collaboration meeting
PLACE	Norwich, United Kingdom
ORGANISER'S INSTITUTE NAME	University of East Anglia Dr. Robert Ferdman; r.ferdman@uea.ac.uk
DATE	18-20 April, 2018
NO. OF PARTICIPANTS	40
TOTAL EVENT COST	7000 €
RADIONET SUPPORT	5000 €
OTHER SOURCES OF FUNDING	PHAROS – 3085 € (about 50% to be used for EPTA meeting) Royal Astronomical Society - £3000 (100% for SPINS-UK meeting – relevant to this application for overlap day; see below)

REQUEST

(max. 2 pages)

Short abstract of the event	*We will be hosting a collaboration meeting of the **European Pulsar Timing Array (EPTA)** from 18-20 April 2018 with the University of East Anglia (UEA) in Norwich, UK. The aim of the EPTA is to detect and study gravitational waves (GWs) from supermassive black hole binaries in distant merging galaxies with the precision timing of millisecond-period pulsars distributed over the sky (i.e. a pulsar timing array, or PTA). This meeting will include an "overlap day" with a meeting of the SPINS-UK neutron-star/gravitational wave consortium on 18 April at UEA. This presents a fantastic opportunity, where we plan to schedule talks and discussions that are relevant to both groups. This will raise awareness of the groundbreaking research being done across Europe, and the issues faced (both scientific and political) in doing this research.* *We expect approximately 80 participants for the overlap day of 18 April 2018 (40 of which will represent the EPTA), and 40 participants during the main EPTA meeting, held 19-20 April 2018.*
Relevance for RadioNet	*Precise timing of a network of highly stable millisecond pulsars presents a unique tool for directly detecting GWs emitted at nanohertz frequencies, by interacting supermassive black holes (SMBHs) within merging galaxies in the distant Universe. This currently represent the only way by which we can hope to observe and study early-Universe SMBH binaries. Our motivation for continuing this work has increased dramatically since the astonishing 2016 result from the LIGO/Virgo consortium (and several since) that left very little doubt that gravitational waves exist, and are detectable. Thus far, none of the PTA collaborations have made a GW detection, and have only reported limits on the amplitude of a stochastic background. This is likely due to the expected weak GW signal, however, this and other potential science is within our reach; it has recently been predicted that we will be able to detect a stochastic background within a decade (Taylor et al. 2016, ApJL, 819, L6).* *PTA data are, in fact, already showing promise for constraining galaxy and SMBH*

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	formation histories, and are beginning to test several prominent models, only based on upper limits to the amplitude of the stochastic background (Lentati et al. 2015, MNRAS, 453, 2576; Arzoumanian et al. 2016, ApJ, 821, 13). Even the predicted-to-be-unlikely case of a non-detection would certainly lead to profound conclusions about the nature of galactic evolution, and will provide very stringent constraints on the population of massive black holes. *The overlap between NS and gravitational-wave (GW) science and astrophysicists has grown immensely over the past decade. One of the principle source populations for the already very successful LIGO/VIRGO collaboration is coalescing double-NS binary systems, and many UK astrophysicists are deeply involved with and connected to the LIGO/VIRGO consortium, as well as the upcoming eLISA space mission. These astrophysical sources are also expected to have observable counterparts in the electromagnetic spectrum, and can be followed up by instruments that cover a large fields-of-view such as LOFAR.* *The astrophysical studies that are only possible with nanohertz-frequency GW observations with PTAs are wide-ranging, particularly when adopting a multi-messenger approach, i.e. in combination with telescope observations from the radio to X-ray and gamma-ray frequencies (see, e.g, Burke-Spolaor 2013, CQG, 30, 224013; Simon & Burke-Spolaor 2016, ApJ, 826, 11). At the forefront of these is the direct investigation of galaxy merger histories and hierarchical SMBH formation in the early Universe, since the amplitude of the GW signal is intimately related to the masses and merger rate history of the observed interacting SMBHs and host galaxies (Sesana 2013, MNRAS, 433, L1).* *As we discuss above, the relationship between NS and GW astrophysics has become increasingly intertwined, and has fortunately resulted in a boom in collaborative activity between these two formerly separate camps. In that spirit, we have scheduled our EPTA collaboration meeting to overlap with the final day of the SPINS-UK consortium, a network of neutron-star (NS) and related GW astrophysicists. This will principally include radio pulsar observers and NS theorists – several of which are also EPTA members – but also will include those working on observations at other wavelengths, particularly with X-ray telescopes. This will be a particularly useful opportunity for networking, sparking collaborative discussions and ideas for synergies between researchers. It is especially valuable for students and postdoctoral researchers, many of which will be in attendance at both meetings.*
Impact on RadioNet	*The EPTA is a consortium representing scientists and students related to the five major European radio telescopes: The Lovell Telescope in the UK; The Westerbork telescope in the Netherlands; The Effelsberg telescope in Germany; The Nançay telescope in France, and the Sardinia telescope in Italy. Combined, these telescopes acquire over 3000 hours of pulsar timing observations per year for the EPTA. EPTA member institutions are also centrally involved in work to upgrade and improve their respective telescope instrumentation and pulsar backends. In addition to the individual telescope operations, the EPTA has been involved in developing the ERC-funded Large European Array for Pulsars (LEAP). Here, the signals from the five above telescopes are coherently combined to result in a collecting area similar to that of the Arecibo telescope, but able to view a much larger portion of the sky, providing unparalleled sensitivity for pulsar timing array observations (Bassa et al. 2016, MNRAS 456, 2196).* *The EPTA also supports many students and early-career scientists – data sets from EPTA observations have formed the basis of many PhD theses, and continue to provide exciting projects for several postdoctoral researchers. These data and significant theoretical work also regularly result in high-profile publications, and these are typically led by young scientists within the collaboration. This includes both gravitational wave-related research – the central "raison d'être" of the EPTA – as well as ancillary science, including compact binary systems, tests of general relativity, dense nuclear matter, and studies of our solar system (e.g., Bassa et al. 2016, MNRAS, 460, 2207; Shaifullah, G et al. 2016, MNRAS, 462, 1029; McKee et al. 2016, MNRAS 2016, 461, 3)*
Use of the RadioNet	*The requested amount will be used for expenses related to EPTA meeting organisation: conference room costs, catering (lunch and coffee breaks). On the first day of the meeting, which overlaps with the aforementioned SPINS-UK meeting, this*

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contribution	*will be used for the EPTA portion of the costs (covering approximately 40 attendees). Any remaining funds will be used for reimbursement to some students and postdoctoral researchers for accommodation and/or travel. As outlined above, these funds will be used in conjunction with other funding support.*
Ethics	*Within the EPTA, we are fortunate to have a very active and experienced diversity and inclusion culture, and plan to have an information and question-and-answer session on this topic during the meeting. Additionally, we intend to enforce gender balance on the Scientific Organising Committee, as well as in the representation of selected speakers. We also intend to create a Code of Conduct for our meetings, in the effort to combat harassment of any kind, and cultivate a respectful, professional environment in which all participants can feel safe, comfortable, and welcome.*

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