Title:	The direct localization of a fast radio burst and its host
arXiv:	arXiv:1701.01098
Abstract:	Fast radio bursts are astronomical radio flashes of unknown physical nature with durations of milliseconds. Their dispersive arrival times suggest an extragalactic origin and imply radio luminosities orders of magnitude larger than any other kind of known short-duration radio transient. Thus far, all FRBs have been detected with large single-dish telescopes with arcminute localizations, and attempts to identify their counterparts (source or host galaxy) have relied on contemporaneous variability of field sources or the presence of peculiar field stars or galaxies. These attempts have not resulted in an unambiguous association with a host or multi-wavelength counterpart. Here we report the sub-arcsecond localization of FRB 121102, the only known repeating burst source, using high-time-resolution radio interferometric observations that directly image the bursts themselves. Our precise localization reveals that FRB 121102 originates within 100 mas of a faint 180 uJy persistent radio source with a continuum spectrum that is consistent with non-thermal emission, and a faint (25th magnitude) optical counterpart. The flux density of the persistent radio source varies by tens of percent on day timescales, and very long baseline radio interferometry yields an angular size less than 1.7 mas. Our observations are inconsistent with the fast radio burst having a Galactic origin or its source being located within a prominent star-forming galaxy. Instead, the source appears to be co-located with a low-luminosity active galactic nucleus or a previously unknown type of extragalactic source. [Truncated] If other fast radio bursts have similarly faint radio and optical counterparts, our findings imply that direct sub-arcsecond localizations of FRBs may be the only way to provide reliable associations.

Title:	Improving galaxy morphology with machine learning
arXiv:	arXiv:1705.06818
Abstract:	This paper presents machine learning experiments performed over results of galaxy classification into elliptical (E) and spiral (S) with morphological parameters: concetration (CN), assimetry metrics (A3), smoothness metrics (S3), entropy (H) and gradient pattern analysis parameter (GA). Except concentration, all parameters performed a image segmentation pre-processing. For supervision and to compute confusion matrices, we used as true label the galaxy classification from GalaxyZoo. With a 48145 objects dataset after preprocessing (44760 galaxies labeled as S and 3385 as E), we performed experiments with Support Vector Machine (SVM) and Decision Tree (DT). Whit a 1962 objects balanced dataset, we applied K- means and Agglomerative Hierarchical Clustering. All experiments with supervision reached an Overall Accuracy OA >= 97%.

Title:	ISM properties of a Massive Dusty Star-Forming Galaxy discovered at z ~ 7
arXiv:	arXiv:1705.07912
Abstract:	We report the discovery and constrain the physical conditions of the interstellar medium of the highest-redshift millimeter-selected dusty star-forming galaxy (DSFG) to date, SPT-S J031132-5823.4 (hereafter SPT0311-58), at $z = 6.900 + / - 0.002$. SPT0311-58 was discovered via its 1.4mm thermal dust continuum emission in the South Pole Telescope (SPT)-SZ survey. The spectroscopic redshift was determined through an ALMA 3mm frequency scan that detected CO(6-5), CO(7-6) and [CI](2-1), and subsequently confirmed by detections of CO(3-2) with ATCA and [CII] with APEX. We constrain the properties of the ISM in SPT0311-58 with a radiative transfer analysis of the dust continuum photometry and the CO and [CI] line emission. This allows us to determine the gas content without ad hoc assumptions about gas mass scaling factors. SPT0311-58 is extremely massive, with an intrinsic gas mass of $M_{\rm gas} = 3.3 \pm 1.9 \times 10^{11}\, M_{\odot}$. Its large mass and intense star formation is very rare for a source well into the Epoch of Reionization.

Title:	HI, star formation and tidal dwarf candidate in the Arp 305 system
arXiv:	arXiv:1704.04344
Abstract:	We present results from our Giant Metrewave Radio Telescope (GMRT) HI observations of the Arp 305 system. The system consists of two interacting spiral galaxies NGC 4016 and NGC 4017, a large amount of resultant tidal debris and a prominent tidal dwarf galaxy (TDG) candidate projected within the tidal bridge between the two principal galaxies. Our higher resolution GMRT HI mapping, compared to previous observations, allowed detailed study of smaller scale features. Our HI analysis supports the conclusion in Hancock et al. (2009) that the most recent encounter between the pair occurred $\sim 4 \times 10^8$ yrs ago. The GMRT observations also show HI features near NGC 4017 which may be remnants of an earlier encounter between the two galaxies. The HI properties of the Bridge TDG candidate include: M(HI) $\sim 6.6 \times 10$ ^{8} msolar and V(HI) = 3500$\pm$ 7 km/s, which is in good agreement with the velocities of the parent galaxies. Additionally the TDG's HI linewidth of 30 km/s and a modest velocity gradient together with its SFR of 0.2 msolar/yr add to the evidence favouring the bridge candidate being a genuine TDG. The Bridge TDG's \textit{Spitzer} 3.6 μm and 4.5 μm counterparts with a [3.6]--[4.5] colour $\sim$ -0.2 mag suggests stellar debris may have seeded its formation. Future spectroscopic observations could confirm this formation scenario and provide the metallicity which is a key criteria for the validation for TDG candidates.

Title:	Unified Rotation Curve of the Galaxy -- Decomposition into de Vaucouleurs Bulge, Disk, Dark Halo, and the 9-kpc Rotation Dip --
arXiv:	arXiv:0811.0859
Abstract:	We present a unified rotation curve of the Galaxy re-constructed from the existing data by re-calculating the distances and velocities for a set of galactic constants R_0=8 kpc and V_0=200 km/s. We decompose it into a bulge with de Vaucouleurs-law profile of half-mass scale radius 0.5 kpc and mass 1.8 x 10^{10}M_{sun}, an exponential disk of scale radius 3.5 kpc of 6.5 x 10^{10}M_{sun}, and an isothermal dark halo of terminal velocity 200 km/s. The r^{1/4}-law fit was obtained for the first time for the Milky Way's rotation curve. After fitting by these fundamental structures, two local minima, or the dips, of rotation velocity are prominent at radii 3 and 9 kpc. The 3-kpc dip is consistent with the observed bar. It is alternatively explained by a massive ring with the density maximum at radius 4 kpc. The 9-kpc dip is clearly exhibited as the most peculiar feature in the galactic rotation curve. We explain it by a massive ring of amplitude as large as 0.3 to 0.4 times the disk density with the density peak at radius 11 kpc. This great ring may be related to the Perseus arm, while no peculiar feature of HI-gas is associated.

Title:	The Linear Point: A cleaner cosmological standard ruler
arXiv:	arXiv:1703.01275
Abstract:	We show how a characteristic length scale imprinted in the galaxy 2-point correlation function, dubbed the "linear point", can serve as a comoving cosmological standard ruler. In contrast to the Baryon Acoustic Oscillation peak location, this scale is constant in redshift and it is not affected by non-linear effects to within 0.5 percent precision. We measure the location of the linear point in the galaxy correlation function of the LOWZ and CMASS samples from the Twelfth Data Release (DR12) of the Baryon Oscillation Spectroscopic Survey (BOSS) collaboration. We combine our linear point measurement with Cosmic Microwave Background constraints from the Planck satellite to estimate the isotropic-volume distance $D_V(z)$ without relying on a model-template or reconstruction method. We find $D_V(0.32) = 1241 \pm 50$ Mpc and $D_V(0.57) = 2060 \pm 33$ Mpc respectively, which are consistent with the quoted values from the BOSS collaboration. This remarkable result suggests that all the distance information contained in the Baryon Acoustic Oscillations can be conveniently compressed into the single length associated with the linear point.

Title:	Mapping the temperature of the intra-cluster medium with the tSZ effect
arXiv:	arXiv:1702.03711
Abstract:	The hot electrons in the intra-cluster medium produce a spectral distorsion of the cosmic microwave background (CMB) black body emission, the thermal Sunyaev-Zel'dovich effect (tSZ). This characteristic spectral distorsion is now commonly used to detect and characterize the properties of galaxy clusters. The tSZ effect spectral distorsion does not depends on the redshift, and is only slightly affected by the galaxy cluster properties via the relativistic corrections, when the electrons reach relativistic velocities. The present work proposes a linear component separation approach to extract the tSZ effect Compton parameter and relativistic corrections for next-generation CMB experiments. We demonstrated that relativistic corrections, if neglected, would induce a significant bias on galaxy cluster Compton parameter, tSZ scaling relation slope, and tSZ angular power spectrum shape measurements. We showed that tSZ relativistic corrections mapping can be achieved at high signal-to-noise ratio with a low level of contamination up to $\ell = 3000$ for next generation CMB experiments. At smaller angular scales the contamination produced by infra-red emission will be a significant source of bias. Such tSZ relativistic corrections mapping enables the study of galaxy cluster temperature profile via the tSZ effect only.

Title:	Milky Way dust extinction measured with QSOs
arXiv:	arXiv:1410.0109
Abstract:	We investigate reddening by Milky Way dust in the low-extinction regime of $E_{B-V} < 0.15$. Using over 50,000 QSOs at $0.5 < z < 2.5$ from the SDSS DR7 QSO Catalogue we probe the residual SDSS colours after dereddening and correcting for the known spectroscopic redshifts. We find that the extinction vector of Schlafly & Finkbeiner (2011) is a better fit to the data than that used by Schlegel et al. (1998, SFD). There is evidence for a non-linearity in the SFD reddening map, which is similarly present in the V1.2 map of the Planck Collaboration. This non-linearity is similarly seen when galaxies or stars are used as probes of the SFD map.

Title:	Localization and broadband follow-up of the gravitational-wave transient GW150914
arXiv:	arXiv:1602.08492
Abstract:	A gravitational-wave (GW) transient was identified in data recorded by the Advanced Laser Interferometer Gravitational-wave Observatory (LIGO) detectors on 2015 September 14. The event, initially designated G184098 and later given the name GW150914, is described in detail elsewhere. By prior arrangement, preliminary estimates of the time, significance, and sky location of the event were shared with 63 teams of observers covering radio, optical, near-infrared, X-ray, and gamma-ray wavelengths with ground- and space-based facilities. In this Letter we describe the low-latency analysis of the GW data and present the sky localization of the first observed compact binary merger. We summarize the follow-up observations reported by 25 teams via private Gamma-ray Coordinates Network circulars, giving an overview of the participating facilities, the GW sky localization coverage, the timeline and depth of the observations. As this event turned out to be a binary black hole merger, there is little expectation of a detectable electromagnetic (EM) signature. Nevertheless, this first broadband campaign to search for a counterpart of an Advanced LIGO source represents a milestone and highlights the broad capabilities of the transient astronomy community and the observing strategies that have been developed to pursue neutron star binary merger events. Detailed investigations of the EM data and results of the EM follow-up campaign are being disseminated in papers by the individual teams.

Title:	Rotation Curve and Mass Distribution in the Galaxy from the Velocities of Objects at Distances up to 200 kpc
arXiv:	arXiv:1607.08050
Abstract:	Three three-component (bulge, disk, halo) model Galactic gravitational potentials differing by the expression for the dark matter halo are considered. The central (bulge) and disk components are described by the Miyamoto-Nagai expressions. The Allen-Santill'an (I), Wilkinson-Evans (II), and Navarro-Frenk-White (III) models are used to describe the halo. A set of present-day observational data in the range of Galactocentric distances R from 0 to 200 kpc is used to refine the parameters of these models. The model rotation curves have been fitted to the observed velocities by taking into account the constraints on the local matter density \rho_\odotand the force K_{z=1.1} acting perpendicularly to the Galactic plane. The Galactic mass within a sphere of radius 50 kpc, M_G (R<=50 kpc)=(0.41+/-0.12)x10^12 M_\odot, is shown to satisfy all three models. The differences between the models become increasingly significant with increasing radius R. In model I, the Galactic mass within a sphere of radius 200 kpc turns out to be greatest among the models considered, M_G (R<=200 kpc)=(1.45+/-0.30)x10^12 M_\odot, and the smallest value has been found in model II, M_G (R<=200 kpc)=(0.61+/-0.12)x10^{12} M_\odot. In our view, model III is the best one among those considered, because it ensures the smallest residual between the data and the constructed model rotation curve provided that the constraints on the local parameters hold with a high accuracy. Here, the Galactic mass is M_G (R<=200 kpc)=(0.75+/-0.19)x10^12 M_\odot. A comparative analysis with the models by Irrgang et al. (2013), including those using the integration of orbits for the two globular clusters NGC 104 and NGC 1851 as an example, has been performed. The third model is shown to have subjected to a significant improvement.