Decree of the Rector n. 1016 of 13/10/2023

Competition for awarding 1 research grant at the University of Udine

DISCLAIMER:
The official and legally binding call for applications is in Italian only. This document cannot be used for legal purposes and is only meant to provide information in English on the call for applications (Decree of the Rector n. 1016 of 13/10/2023). Please refer to the official call published on: https://www.uniud.it/it/albo-ufficiale

Any change and integration will be made available on the above mentioned web page. Therefore, no personal written communication regarding the examination date and/or competition results shall be provided to applicants.

Annex 1

Competition announcement for the assignment of 1 research grant at the University of Udine, entitled “Quantum Gravity via Holography at Future Null Infinity” SSD: FIS/02 (principal investigator, Stefano Ansoldi)

Art. 1

A selection procedure is hereby launched for the award of 1 research grant at the University of Udine, as identified in Attachment A which constitutes an integral part of the present announcement. The research grant is linked to the research project and is subject and conditioned upon the relative funding. The fellowship may be renewed, in compliance with Art. 22, Law No. 240 of 30 December 2010 (as in the text in force before the implementation of the Conversion Law of the D.L. 36/2022, L. 79/2022), Law No. 11 of 27 February 2015, and the current regulations of the University of Udine for awarding research grants, issued with the Rector’s Decree No. 182 of 31 March 2021. The renewal is subject to the scientific coordinator’s positive assessment of the researcher’s activities, an adequate scientific rationale, and a corresponding financial covering.

The research fellowship does not give rise to any right with regards to accessing University posts.

Any personal communication to candidates related to this selection will be sent exclusively to the email address indicated when registering for the selection, as mentioned in Art. 5.

Art. 2

The research grant described in this competition announcement and the required qualifications to apply for the position are identified in Attachment A. The lack of the admission requirements leads to the automatic exclusion from the competition procedure.

Possession of a PhD or equivalent degree obtained abroad or, only for the interested areas, of a medical specialization accompanied by an adequate scientific production, constitutes a preferential qualification for awarding the research fellowship of this selection, if it has not been provided as a mandatory requirement.

For the only purpose of the admission to the competition, the Examining Board (Art. 7) shall assess the equivalence of the qualification obtained abroad, except for the evaluation of the medical specialization.
qualification to which Article 38 of the Legislative Decree 165/2001 and subsequent modifications and additions, and EU regulations on the matter, shall be applied.

The Examining Board will proceed to the evaluation of the qualification obtained abroad according to the documentation attached to the application form. The Examining Board may exclude the candidate if the submitted documentation does not provide sufficient information for the assessment. Therefore, applicants must enclose all the documentation in their possession relating to their qualification in order to provide the Examining Board with sufficient information for assessment.

Candidates holding a qualification issued by a European Research Area country, if successful, must submit, if not already attached to the application form one of the following options:
- Supplement Diploma in English issued by the competent University.
- CIMEA Certificate of comparability of the foreign qualification, issued by CIMEA (Information Centre on Academic Mobility and Equivalence) via the "diplome" service at https://cimea.diplo-me.eu/udine/#/auth/login

Candidates holding a qualification issued by a non-European Research Area country, if successful, must submit, if not already attached to the application form one of the following options:
- Declaration of the on-site value of the qualification and the certificate relating to the degree with examinations and grades. A certificate in a language other than Italian or English must be accompanied by an official translation into one of these languages (certified by the competent diplomatic-consular authority or certified by a court in Italy).
- CIMEA Certificate of comparability of the foreign qualification, issued by CIMEA (Information Centre on Academic Mobility and Equivalence) via the "diplome" service at https://cimea.diplo-me.eu/udine/#/auth/login

If the Supplement Diploma or the statement/attestation of comparability are not available when signing the contract, the applicant must demonstrate that he/she has requested the documentation and submit it as soon as possible.

Any exclusion from the selection procedure due to lack of eligibility requirements, absence of required documents, failure to sign the selection application or submission of the selection application in a manner different from what is provided for in this call for applications will be communicated to applicants exclusively at the email address indicated in the application form.

Art. 3

The research grant referred to in this call for applications cannot be awarded:

a. to employees of Universities and the entities referred to in Article 22, section 1, of Italian Law no. 240 of 30 December 2010 (in the text prior to the reform introduced by Law no. 79 of 29 June 2022);
b. to those who have already been awarded research grants pursuant to Italian Law no. 240 of 30 December 2010 (prior to the reform introduced by Law no. 79 of 29 June 2022) for the maximum period provided by law, even if not continuously, excluding the period in which the grant was used in conjunction with the doctorate, up to the legal term of the relative course;
c. to those who have already benefited from research grants and fixed-term researcher contracts provided for, respectively, in Articles 22 and 24 of Italian Law no. 240 of 30 December 2010 (in the text prior to the reform introduced by Law no. 79 of 29 June 2022), for a total of 12 years, even if not consecutive;
d. to anyone who has a degree of kinship or affinity, up to and including the fourth degree, with:
   - the Rector, the Director General or a member of the Board of Directors of the University of Udine;
- the scientific supervisor or a professor/researcher belonging to the department or organisation hosting the research grant in question.

The research grant provided for in this call for applications cannot be combined:

a) with scholarships of any kind, except for those granted by Italian or foreign institutions to supplement, by means of stays abroad, the fellow's training or research activities;

b) with other research grants;

c) with an employment relationship, even if part-time, without prejudice to the relevant provisions for employees of public administrations.

The grant awarded under this call for applications is also incompatible with simultaneous attendance at university degree courses, either Bachelor's degree or Master’s degree courses, research Doctorates with scholarships and medical specializations, in Italy or abroad.

Art. 4

Applicants must enclose with their application, under penalty of exclusion, the following documents:

a) their professional scientific CV, highlighting the candidate's aptitude for carrying out and implementing the research project (Attachment A);

b) their identity card, their passport or any other identification document¹;

c) (for candidates with a foreign qualification only) certification or self-certification of both the academic qualification required for the admission to the selection, and of the exams (with evaluation) took during the period of study abroad, and of any other document that can be useful to the evaluation of the degree by the Examining Board.

Applicants can attach to the application, publications and any other certification considered useful to demonstrate the qualification based on the research program (Attachment A) and to certify any research activity accomplished at public or private institutes (indicating the starting and ending date and the duration).

The documents and qualifications mentioned above must be submitted in Italian or English. Those that are not as requested will not be evaluated. Documents originally written in a language other than Italian or English must come with a translation in Italian or English, that the candidate will do on its own responsibility. The translation can be an abstract concerning the thesis.

Italian and Community candidates wishing to submit qualifications referring to conditions and facts attested by Public Administrations must proceed exclusively with self-certification.

Non-EU citizens legally residing in Italy may self-certify only data that can be verified or certified by Italian public bodies. They may also use declarations in lieu when provided for by an international convention between Italy and the declarant's country of origin.

Non-EU citizens not residing in Italy cannot self-certify.

Only the qualifications possessed by the candidate on the date the application form is submitted and submitted in accordance with the procedures set out in Article 5 will be assessed.

Failure to submit mandatory documents provided for in this article will constitute grounds for exclusion from the selection.

¹ Please be aware that the residence permit is not an identification document.
Art. 5
The submission of the applications for the present call starts on October 19, 2023 at 2:00 pm (Italian time) and ends on November 7, 2023 at 2:00 pm (Italian time).

The application to take part in the selection must be completed, under penalty of exclusion, using the appropriate online procedure, available at the link https://pica.cineca.it/
The procedure involves an applicant registration step, for those who do not already have an account, and then an application completion step.

Once completed, the online application must be signed in the manner described in the online procedure (manual signature with attached identity document or digital signature), under penalty of exclusion from selection. The application does not have to be signed if you access the above-mentioned online procedure using your SPID ID.

The qualifications referred to in Article 4 must be attached to the application in .pdf format. Individual .pdf files may not exceed 30MB.

The application for participation in the selection is automatically sent to the University of Udine with the definitive closing of the online procedure.

The University Administration:
- is not responsible if it is impossible to read the submitted documentation in electronic format due to damaged files;
- shall not accept or take into consideration qualifications or documents received in paper form or by any means other than what is specified in this article.

Reference to documents or publications already submitted in connection with other competitions is not allowed.

The Administration is not responsible for any missing document or communication because of inaccurate indication of residence and/or address submitted by the candidate during the application. Also, the Administration is not responsible if the candidate has not communicated changes in this information, or has communicated them too late. The Administration is also not responsible for any postal or telegraphic problems not attributable to the Administration itself.

Applicants are advised not to wait until the last few days before the closing date to submit their application. The University accepts no responsibility for any malfunctions due to technical problems and/or overloading of the communication line and/or application systems.

Art. 6
The selection procedure is held in accordance with the modality indicated in Attachment A.

The test will aim to assess the general preparation, experience and aptitude for research of the candidate. It will consist in the evaluation of the professional scientific curriculum, of the publications and qualifications presented, and of the interview, where foreseen.

Art. 7
The Examining board for the competition is identified in Attachment A of the present competition announcement, of which it is an integral part.
At its first meeting, the Examining board shall appoint its President and Secretary, and establish the criteria and methods for evaluating the qualifications and the interview, where foreseen.

The results of the qualifications assessment must be disclosed to applicants during the interview, where foreseen.

The Examining board can award a maximum of 100 points (one hundred out of one hundred) to the selection.

At the end of the evaluation procedure, the Examining board shall formulate the general merit list based on the overall score of each candidate, and draw up the minutes of the whole competition procedure.

Based on the ranking list, the assignment is awarded to candidates who have obtained a minimum overall score of 70/100 (seventy out of one hundred).

The Examining board’s judgement is final.

The ranking list will be made public exclusively through publication on the University's official website.

Applicants will not be notified of the outcome of the evaluation.

Those who do not declare their acceptance of the research grant and do not present themselves at the research centre within the deadline communicated by the latter, even if not formally, shall lose the right to receive it. Exceptions to this term will only be granted in cases of documented force majeure.

**Art. 8**

The research activity cannot be started before signing the contract defining the terms and conditions of the collaboration.

The activity covered by the research grant must have the following characteristics:

a) it must be carried out as part of the research programme covered by the grant and not be a merely technical support to it;

b) it must have a close connection with the realization of the research program for which the winner of the grant has been awarded the contract;

c) it must be continuous and, in any case, temporally defined, not merely occasional, and in coordination with the overall activity of the University;

d) it must be carried out autonomously, solely within the limits of the programme prepared by the programme supervisor, without predetermined working hours.

The researcher is required to submit a detailed written report on the work carried out and the results achieved, accompanied by the opinion of the scientific supervisor, to the reference organisation at the intervals set out in the contract. The researcher must also submit interim reports and timesheets, if requested by the reference organisation.

Either the fellow or the reference organisation may withdraw from the contract. The reference organisation may terminate the contract not only in the cases referred to in Article 9, sections 2 and 3, of the "Internal rules for awarding research grants pursuant to law 240 of 30 December 2010" of the University of Udine, but also in the event the research project and therefore the financial coverage on which the research grant is based cease to exist.
Art. 9
The following legal dispositions shall apply to the grant referred to in this call for applications:
- for tax matters, the provisions of Article 4 of Italian Law no. 476 of 13 August 1984, as subsequently amended and supplemented;
- for social security matters, the provisions of Article 2(26) et seq. of Italian Law no. 335 of 8 August 1995, as subsequently amended and supplemented;
- for mandatory maternity leave, the provisions of the Italian Ministerial Decree of 12 July 2007;
- with regard to sick leave, the provisions of Article 1(788) of Italian Law no. 296 of 27 December 2006 and subsequent amendments.

During the period of mandatory maternity leave, the allowance paid by INPS according to Art. 5 of the Italian Ministerial Decree of 12 July 2007 is supplemented by the University up to the full amount of the research grant.

The grant will be paid in monthly instalments.

Art. 10
The data collected as part of the procedure referred to in Art. 5 are necessary to properly manage the selection procedure, for any subsequent management of the research grant and for purposes related to managing services provided by the University. The University of Udine is the Data Controller. At any time, the data subject may request access, rectification and, depending on the University's institutional purposes, cancellation and restriction of processing or oppose the processing of their data. The data subject can always lodge a complaint with the Italian Data Protection Authority. The complete disclosure is available on the University of Udine website in the "Privacy" section, accessible from the home page www.uniud.it Direct Link: https://www.uniud.it/it/pagine-speciali/guida/privacy

Art. 11
For all matters not expressly mentioned in this call for applications, refer to the regulations in force on the subject cited in the introduction and to the "Internal rules for awarding research grants pursuant to Italian Law no. 240 of 30 December 2010" of the University of Udine, issued by Rector's Decree no. 182 of 31 March 2021.

Art. 12
The procedure supervisor is Dr Sandra Salvador, Head of the Research Services Area of the University of Udine.

The Responsible office at the University of Udine is "Area Servizi per la Ricerca - Ufficio Formazione per la Ricerca", via Mantica n. 31 - 33100 Udine, Italia.

To request information about the call for applications, please complete the following form available on the University of Udine website:
https://helpdesk.uniud.it/SubmitSR.jsp?type=req&accountID=universityofudine&populateSR_id=42105
**Attachment A**

**Responsabile scientifico della ricerca / Principal investigator:**

Nome e cognome / Name and surname: Stefano Ansoldi  
Qualifica / Position: Ricercatore Universitario / Researcher  
Dipartimento / Department: Scienze Matematiche, Informatiche e Fisiche (DMIF) / Mathematics, Computer Science and Physics  
Area MUR / Research field: 02 – Scienze fisiche / Physical sciences  
Settore concorsuale e Settore scientifico disciplinare / Scientific sector: 02/A2; FIS/02 - Fisica teorica, modelli e metodi matematici

**Titolo dell’assegno di ricerca / Topic of the research fellowship “assegno di ricerca”:**  
I bandi sono consultabili dal sito dell’Ateneo, del MUR e di Euraxess / The calls are available on the University, MUR and Euraxess websites

**Obiettivi previsti e risultati attesi del programma di ricerca in cui si colloca l’attività dell’assegnista di ricerca / Foreseen objectives and results of the research programme performed by the research fellow “assegnista di ricerca”:**  
I bandi sono consultabili dal sito dell’Ateneo, del MUR e di Euraxess / The calls are available on the University, MUR and Euraxess websites

**Testo in italiano:**

Gravità Quantistica tramite Olografia all’Infinito Futuro Luce.

**Testo in English:**

Quantum Gravity via Holography at Future Null Infinity.

**Abstract del progetto**

Negli ultimi anni si è assistito a un radicale cambiamento di prospettiva sul problema della gravità quantistica, grazie alla rivelazione che essa può essere organizzata in termini di nuovi gruppi di simmetria a dimensione infinita. Ciò ha portato a un rinnovato interesse per l’applicazione del concetto di olografia a un nuovo approccio alla descrizione della geometria quantistica e alle ampiezze di diffusione della matrice S in spazi asintoticamente piatti. Questi due campi, che vanno rispettivamente sotto il nome di olografia locale e olografia celeste, condividono aspetti concettuali e strumenti tecnici più simili di quanto spesso si pensi. Le proprietà infrarosse di queste ampiezze di scattering hanno caratteristiche osservabili chiamate effetti di memoria delle onde gravitazionali che, grazie alla rapida crescita del campo dell’astrofisica delle onde gravitazionali, i rivelatori di onde gravitazionali attuali e previsti saranno presto in grado di misurare e studiare. L’obiettivo del progetto è combinare le idee e le tecniche di questi due approcci per indagare vari aspetti della natura olografica della gravità classica e quantistica, la struttura delle simmetrie asintotiche degli spazi piatti e le loro implicazioni fenomenologiche per gli effetti delle onde gravitazionali.

**Obiettivi del progetto**

I due obiettivi principali del progetto sono (i) affrontare la questione della dinamica nella gravità quantistica e nell’olografia asintoticamente piatta e (ii) determinare nuove osservabili delle onde gravitazionali che derivano dall’olografia celeste.
Stato dell’arte

Nella nostra ricerca sulla gravità quantistica, una profonda intuizione degli ultimi 40 anni è presentata dalla nozione di principio olografico, che si prevede giocherà un ruolo chiave in una teoria finale della gravità quantistica. Allo stesso tempo, negli ultimi anni si è assistito a un radicale cambiamento di prospettiva sul problema della gravità quantistica, grazie alla rivelazione che essa può essere organizzata in termini di nuovi gruppi di simmetria a dimensione infinita. Ciò ha portato a un rinnovato interesse nell’applicare il concetto di olografia a un nuovo approccio alla descrizione della geometria quantistica e alle ampiezze di diffusione della matrice S in spazi asintoticamente piatti. Sebbene questi due campi, che vanno rispettivamente sotto il nome di olografia locale e olografia celeste, siano stati sviluppati all’interno di due comunità distinte, essi condividono aspetti concettuali e strumenti tecnici più simili di quanto spesso si pensi.

Il concetto di olografia locale [1] si basa sul comportamento olografico fondamentale della relatività generale, espresso dalla caratteristica che, in presenza di un bordo, un sottoinsieme di trasformazioni che sono di gauge nel bulk diventano simmetrie fisiche sul bordo. Queste simmetrie acquisiscono una carica diversa da zero situata su sfere di codimensione 2, o angoli, e queste cariche angolari delle simmetrie fisiche possiedono un’algebra non banale. Sfruttando questa intuizione, il programma di olografia locale fornisce un’immagine in cui i gradi di libertà geometrici rilevanti vivono sull’angolo e la loro dinamica è codificata nel loro entanglement. L’obiettivo dell’olografia locale è comprendere, in modo sistematico, la natura di questa algebra di simmetria angolare e utilizzarla come principio guida per la gravità quantistica. Infatti, l’importanza centrale delle simmetrie deriva dal fatto che esse ci danno una solida presa non perturbativa sulla quantizzazione, anche nel contesto in cui la teoria quantistica non è nota, come nella gravità. Considerando che le rappresentazioni di un’algebra di simmetria forniscono un principio organizzativo per gli stati di una teoria quantistica, la quantizzazione dell’algebra di simmetria angolare fornisce importanti informazioni sullo spazio di Hilbert della geometria quantistica.


Il nuovo quadro dell’olografia celeste [13,14] ha avuto origine da queste corrispondenze. Esso rappresenta un approccio volto a fornire una descrizione olografica della gravità per spazi asintoticamente piatti che consentono la radiazione, definendo la matrice S della gravità quantistica.
combining the techniques of the CFT and the algebra of symmetry of the infinite null.

### Descrizione del progetto
Poiché è possibile dimostrare che l'algebra di simmetria angolare associata a una regione generale finita dello spazio-tempo si riduce a un'estensione più generale dell'algebra BMS, consentendo anche il rescaling di Weyl della metrica angolare, il programma di olografia locale può essere applicato altrettanto bene all'infinito nullo, dove incontra l'olografia celeste. La connessione e l'interazione tra questi due nuovi approcci aprono la strada a una nuova descrizione olografica della dinamica della gravità quantistica in termini di correlatori di osservabili al contorno. Più precisamente, il progetto può essere suddiviso in due filoni di ricerca principali.

- Il fatto che i nuovi stati della geometria quantistica possano essere descritti da un'algebra di correnti apre il v, la strada a una nuova descrizione duale della dinamica quantistica, in cui la radiazione nel bulk può essere messa in relazione con le funzioni di correlazione tra le nuove osservabili di bordo. Un'indagine completa di queste strutture teoriche di gruppo ci permetterà di definire una nozione di propagazione locale bulk-to-boundary per affrontare il problema della dinamica attraverso una fertilizzazione incrociata di tecniche provenienti dalla gravità quantistica non perturbativa, dall'olografia e dall'informazione quantistica.

- Estendendo questa strategia allo studio dell'algebra di simmetria angolare completa a livello continuo e semiclassico fino al confine all'infinito nullo, si possono importare tecniche di teoria dei campi e di fisica delle onde gravitazionali. Questa strategia può essere applicata per definire una quantizzazione non perturbativa dello spazio di fase radiativo asintotico della gravità attraverso la fusione delle procedure di discretizzazione e regolarizzazione per le algebre di corrente infinito-dimensional della geometria quantistica e la formulazione della matrice S; questa strategia può portare alla costruzione di ampiezze di transizione in cui tutte le correzioni di loop possono essere prese in considerazione.

### Possibili potenzialità applicative
All'infinito asintoticamente nullo si può collegare la descrizione dei vuoti gravitazionali inequali sotto l'azione delle cariche di simmetria alla loro impronta nel cambiamento permanente della distanza relativa tra due masse di prova in caduta libera vicino all'infinito a causa del passaggio di un'onda gravitazionale. Poiché la memoria delle onde gravitazionali consente di collegare le rappresentazioni dell'algebra di simmetria angolare che etichettano gli stati della geometria quantistica alle osservabili astrofisiche, si può tentare di estrarre previsioni fisiche dalla descrizione UV delle osservabili al contorno.

### Bibliografia

1. L. Freidel, M. Geiller and W. Wieland, *Corner symmetry and quantum geometry*, [2302.12799]
Text in English:

**Abstract**

The past few years have witnessed a radical change of perspective on the problem of quantum gravity through the revelation that it can be organized in terms of new infinite dimensional symmetry groups. This led to a revised interest in applying the concept of holography to a new approach to the description of quantum geometry as well as to S-matrix scattering amplitudes in asymptotically flat spacetimes. These two fields, which go under the name respectively of *local holography* and *celestial holography*, share conceptual aspects and technical tools more than oftentimes is realized. The infrared properties of these scattering amplitudes have observable features called gravitational-wave memory effects, which, because of the rapid growth of the field of gravitational-wave astrophysics, current and planned gravitational-wave detectors will soon be able to measure and study. The goal of the project is to combine ideas and techniques of these two approaches to investigate various aspects of the holographic nature of classical and quantum gravity, the structure of the asymptotic symmetries of flat spacetimes and their phenomenological implications for gravitational wave effects.

**Objectives of the project**

The two main objectives of the project are (i) to tackle the issue of dynamics in quantum gravity and asymptotically flat holography and (ii) to determine new gravitational-wave observables that arise from celestial holography.

**State of the art**

In our quest for quantum gravity, a profound insight of the last 40 years is represented by the notion of holographic principle, which is expected to play a key role in a final theory of quantum gravity. At the same time, the past few years have witnessed a radical change of perspective on the problem of quantum gravity through the revelation that it can be organized in terms of new infinite dimensional symmetry groups. This led to a revised interest in applying the concept of holography to a new approach to the description of quantum geometry as well as to S-matrix scattering amplitudes in asymptotically flat spacetimes. While these two fields, which...
The concept of local holography [1] is grounded on the fundamental holographic behavior of general relativity, expressed by the feature that, in the presence of a boundary, a subset of transformations which are gauge in the bulk become physical symmetries on the boundary. These symmetries acquire a non-vanishing charge located on codimension-2 spheres, or corners, and these corner charges of physical symmetries possess a non-trivial algebra. Exploiting this insight, the program of local holography provides a picture in which the relevant geometrical degrees of freedom live on corner and their dynamics is encoded into their entanglement. The goal of local holography is to understand, in a systematic manner, the nature of this corner symmetry algebra and to use this as a guiding principle for quantum gravity. In fact, the central importance of symmetries stems from the fact that they give us a firm non-perturbative handle on quantization, even in the context where the quantum theory is not known, such as in gravity. Taking the viewpoint that representations of a symmetry algebra provide an organizing principle for states of a quantum theory, quantization of the corner symmetry algebra provides important information about the Hilbert space of quantum geometry.

At the same time, it is important to realize that this new line of investigation is also deeply connected with the revised understanding of the meaning and importance of the symmetry group of asymptotically flat spacetimes. The study of the gravitational group of symmetries at null infinity, the BMS group, dates back to the sixties [2–5]. However, about fifty years later, a surprising relationship between the asymptotic super-translation symmetries, the soft graviton theorem of Weinberg, [6], and the gravitational-wave memory effect [7,8] was discovered [9] and elaborated in terms of a so-called infrared triangle [10]. Subleading infrared triangles were soon discovered starting with the existence of a subleading soft graviton theorem in [11], which was related to the spin memory effect by [12] and was interpreted as a Ward identity for an extension of the original BMS group featuring super-Lorentz transformations.

The new framework of celestial holography [13,14] has originated from these correspondences. It represents an approach aimed at providing an holographic description of gravity for asymptotically flat spaces allowing for radiation, by defining the quantum gravity S-matrix combining CFT techniques and the symmetry algebra of null infinity.

Project description
As the corner symmetry algebra associated to a general finite region of spacetime can be shown to reduce to a more general extension of the BMS algebra, allowing also for Weyl rescaling of the corner metric, local holography program can be equally well applied to null infinity, where it meets celestial holography. The connection and interplay between these two new approaches pave the way for a new holographic description of quantum gravity dynamics in terms of correlators of boundary observables. More precisely, the project can be divided in two main work packages.
- The fact that the new quantum geometry states can be described by a...
current algebra opens the way to a new dual description of quantum dynamics in which radiation in the bulk can be related to correlation functions between the new boundary observables. A full investigation of these group theoretic structures will allow us to define a notion of local bulk-to-boundary propagation to face the problem of the dynamics through a cross-fertilization of techniques coming from non-perturbative quantum gravity, holography and quantum information.

- Extending this strategy to the study of the full corner symmetry algebra at the continuum and semi-classical level to the boundary at null infinity, one can import field theory and gravitational wave physics techniques. This can be applied to define a non-perturbative quantization of the asymptotic radiative phase space of gravity through the merging of discretization and regularization procedures for infinite-dimensional current algebras of quantum geometry and the S-matrix formulation; this strategy can lead to the construction of transition amplitudes where all loop corrections can be taken into account.

Possible application potentials

At asymptotically null infinity one can connect the description of inequivalent gravitational vacua under the action of symmetry charges to their imprint in the permanent change of the relative distance between two freely falling test masses near infinity due to the passage of a gravitational wave. As gravitational wave memory allows to connect representations of the corner symmetry algebra labeling quantum geometry states to astrophysical observables, one can attempt to extract physical predictions from the boundary observables UV description.

References


Struttura dell'Università di Udine presso la quale verrà sviluppata l'attività di ricerca / Department or other structure of the University of Udine where research activities will be carried out:

Dipartimento di Scienze Matematiche, Informatiche e Fisiche (DMIF) / Department of Mathematics, Computer Science and Physics

Importo dell'assegno di ricerca (al lordo oneri carico assegnista) / Total grant gross for the research fellowship:

€ 19,367,00

Durata dell'assegno di ricerca / Duration of the research fellowship “assegno di ricerca”:

12 mesi / months

Finanziamento / Financed by:

La copertura finanziaria graverà sui fondi/progetto:

- Risorse d'Ateneo: bando interno finanziamento assegni 2023 (D.R. n. 406/2023);
- Progetto/fondi: PSD_2022_2025_DMIF_Ric_Libera.

Requisiti di ammissione / Minimum qualifications necessary:

- Possesso del titolo di Dottore di ricerca o titolo equivalente conseguito all'estero;
- possesso di un curriculum scientifico professionale idoneo allo svolgimento dell'attività di ricerca contemplata.
- Research doctorate or equivalent qualification obtained abroad;
- professional scientific curriculum suitable for the research activity above mentioned.

Procedura selettiva / Competition procedure:

Valutazione per soli titoli / Assessment of qualifications only

Commissione giudicatrice / Examining Board:

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