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**Tashkent International University of Education
Turin Polytechnic University in Tashkent**

PROCEEDINGS

of the MMIT'25 International Conference

**TA'LIMNING ZAMONAVIY USULLARI VA
INNOVATSION TEXNOLOGIYALAR**

**MODERN METHODS AND INNOVATION
TECHNOLOGIES IN EDUCATION**

**СОВРЕМЕННЫЕ МЕТОДЫ И
ИННОВАЦИОННЫЕ ТЕХНОЛОГИИ
В ОБРАЗОВАНИИ**

29 May 2025, Tashkent, Uzbekistan

**MAQOLALAR TO'PLAMI
СБОРНИК СТАТЕЙ**



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Modern methods and innovation technologies in education

**Современные методы и инновационные технологии в
образовании**

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TOLALI OPTIK ALOQA TIZIMLARINI TADQIQ QILISHDA QO‘LLANILADIGAN PAKET DASTURLAR TAHLILI

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Annotatsiya. Tolali optik aloqa tizimlarini tadqiq qilishda qo‘llaniladigan paket dasturlarning tahlili ko‘rib chiqilgan. Sababi hozirgi vaqtda ta‘lim jarayonida oliy ta‘lim muassasalarini laboratoriya jihozlari bilan ta‘minlashda turli xil darajadagi qiyinchiliklar paydo bo‘lamoqda. Laboratoriya bazasi bilan ta‘minlashdagi eng muhim qiyinchiliklardan biri laboratoriya jihozlarining yuqori narxi hisoblanadi (bitta stendning narxi bir necha yuz million so‘mni tashkil qilishi mumkin).

Kalit so‘zlar: *GeoUtr, abonent, dastur, mijoz, geolokatsiya, manzil, texnologiya, GPON.*

ANALYSIS OF PACKAGE PROGRAMS USED IN THE STUDY OF FIBER OPTIC COMMUNICATION SYSTEMS

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Abstract. An analysis of the package programs used in the study of fiber-optic communication systems is considered. The reason is that currently, various levels of difficulties arise in providing higher educational institutions with laboratory equipment in the educational process. One of the most significant difficulties in providing a laboratory base is the high cost of laboratory equipment (the cost of one stand can amount to several hundred million soums).

Keywords: *GeoUtr, subscriber, application, client, location, address, technology, GPON.*

Laboratoriyalar jihozlari bilan ta‘minlash muammosi telekommunikatsiya sohasidagi mutaxassislarni tayyorlashda, xususan optik aloqa tizimlari fanini o‘qitishda eng dolzarb masalalardan hisoblanadi, chunki laboratoriya jihozlarining yuqori narxidan tashqari, uning tez eskirishi va yildan-yilga yangi texnologiyalarning hayotga tadbiq qilinishi asosiy omillardan hisoblanadi. Ta‘lim amaliyot shuni ko‘rsatdiki, stendlarga asoslangan laboratoriyalarga bazasiga alternativa sifatida dasturiy va texnik ta‘minot platformalarini o‘z ichiga olgan virtual laboratoriyalarni qo‘llash mumkin va bu ta‘lim jarayonida samaralidir [1]. Virtual laboratoriyalardan har xil maqsadda foydalanish mumkin, masalan laboratoriya va amaliy mashg‘ulotlarida qo‘llashdan tortib, malakaviy va ilmiy ishlarni bajarishda. Paket dasturlar bilan ishlashda dasturiy va texnik ta‘minot platformalari shaxsiy kompyuter va maxsus dasturiy ta‘minot to‘plamidan yetarli. Bu imkoniyatlar ta‘lim jarayonida ushbu talim usullaridan qo‘llashin soddalastiradi.

Paket dasturlar - bu ma‘lum bir fan sohasining ma‘lum bir sinfi muammolarini hal qilish uchun mo‘ljallangan o‘zaro bog‘langan modullar to‘plamidir. Optik aloqa sohasidagi qo‘llaniladigan paket dasturlarni quyidagicha siniflash mumkin:

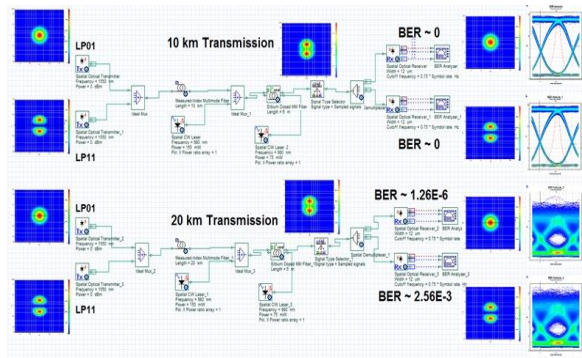
- muammoga yo‘naltirilgan paket dasturlar;
- usulga yo‘naltirilgan paket dasturlar.

Muammoga yo‘naltirilgan paket dasturlar – bu ma‘lum bir funktsional sohadagi murakkab muammolarni hal qilish uchun mo‘ljallangan dasturiy mahsulotlar. Sanoat sektori uchun qo‘llaniladigan muammoga yo‘naltirilgan paket dasturlar nafaqat ishlab chiqarishni takomillashtirilgan usullardan foydalangan holda loyihalashtirish, ish rejasining bajarilishini

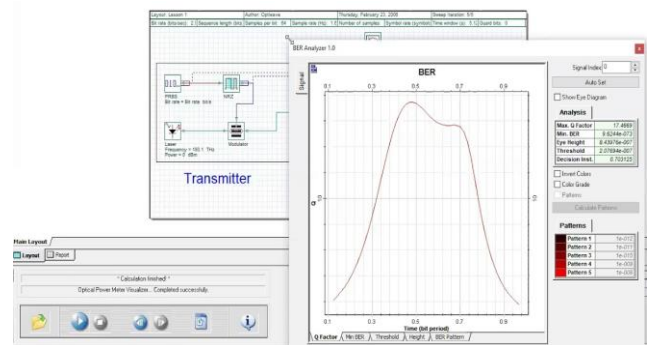
nazorat qilish, balki resurslar va xarajatlar bilan bog'liq bir qator funktsiyalarni bajarish uchun texnologik asos bo'lishi kerak [2].

Usulga yo'naltirilgan paket dasturlar – bu axborot tizimlarining predmeti va funktsiyalaridan qat'i nazar, matematik, statistik va boshqa masalalarni yechish usullarini ta'minlovchi dasturiy mahsulotlar kiradi [3].

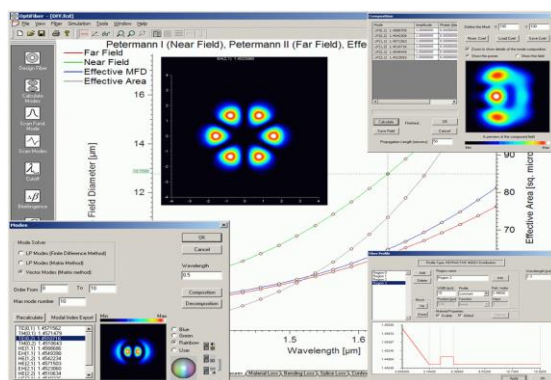
Texnika sohasi xususan optik aloqa sohasidagi masalalarni yechishda asosan muammoga yo'naltirilgan paket dasturlar ken foydalaniladi. Tolali optik aloqa sohasida qo'llaniladigan bu turdagi paket dasurlarga misol sifatida OptiSystem, OptiPerfomer, OptiFiber, OptiBPM, OptiFDTD, OptiSpice, OptiGraiting dasturlarin keltirishimiz mumkin [4].



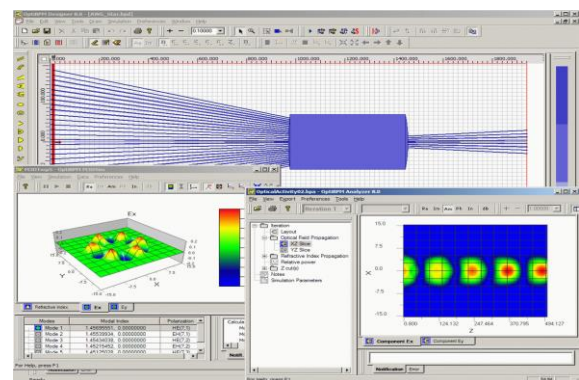
OptiSystem



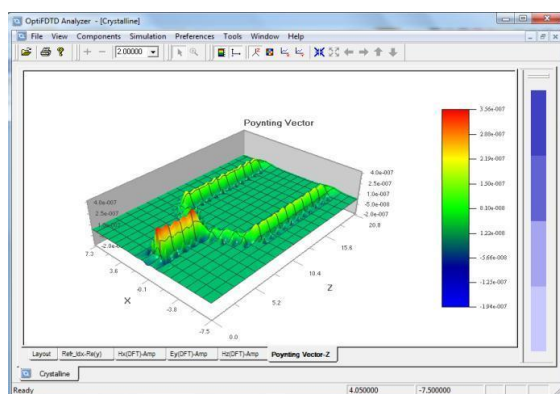
OptiPerformer



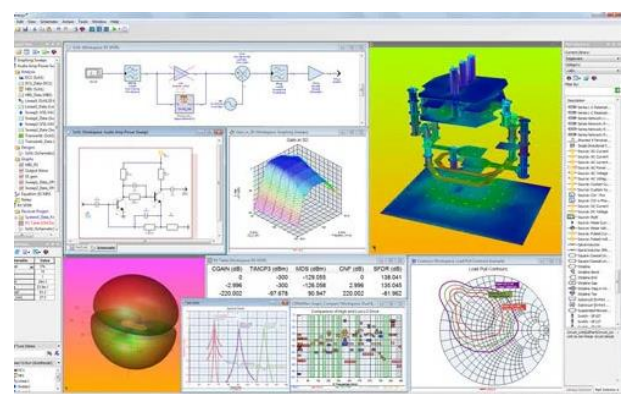
OptiFiber



OptiBPM



OptiFDTD



OptiSPICE

1-rasm. Optik aloqa sohasida qo'llaniladigan virtual paket dasturlarda bajarilgan ishlarga misollar

OptiSystem - bu fizik darajadagi optik aloqa liniyalarning ishlab chiqish, testlash va virtual optimallashtirish bo'yicha vazifalarni bajarishga qaratilgan kompleks dasturiy ta'minotni modellashtirish vositasi hisoblanadi.

Dastur yuqori simulyatsiya muhitiga va keng baza komponentlari va quyi tizimlarning aniq ierarxik tuzilishiga ega. Aktiv va passiv komponentlarning katta kutubxonasi tizimning ishlashiga komponent spetsifikatsiyalarining ta'sirini o'rganish uchun dinamik ravishda o'zgartirilishi mumkin bo'lgan real, chastotaga bog'liq parametrlarni o'z ichiga oladi. OptiSystem olimlar, soha muhandislari, talabalar va boshqa manfaatdor foydalanuvchilarning tadqiqot ehtiyojlarida ishlatiladi.

OptiSystem quyidagi ilovalarni o'z ichiga oladi:

- fizik darajada komponentlardan tizim darajasiga qadar optik aloqa tizimlarini ishlab chiqish;
- passiv optik tarmoqlarni simulyatsiyalash;
- optik transport tarmoqlarini simulyatsiyalash;
- halqali sinxron optik tarmoqlar va sinxron raqamli ierarxiyaga ega tarmoqlarni ishlab chiqish;
- uzatgichlar, kanallar, kuchaytirgichlar va qabul qiluvchilarni ishlab chiqish;
- optik signal parametrlari va xarakteristikalarini tadqiq qilish;
- optik uzatish tizimlarida sifat ko'rsatkichlarini baholash.

OptiPerformer dasturi OptiSystem dasturining sodda va engil ishlovchi varianti hisoblandi. Asosiy farqi komponentlar kutubxonasi kamroq va boshqa dasturlar bilan integratsiyasi cheklangan. Lekin optik aloqa tizimlarini simmulaytsiyalash va tadqiq qilishda imkoniyatlarini cheklamaydi [5].

OptiFiber optik tolalarni loyihalashtirish va ishlab chiqarish masalalarni yechisda qo'llaniladigan dasturidir.

Optik aloqa tizimining optimal loyihalashtirilishi optik tolalar parametrlariga bog'liq. Optik tolalarning geometrik o'lchamlari, material tarkibi va sinishi ko'rsatkichi profil ko'rinishi kabi muhim chiziqli va chiziqli bo'lmagan hodisalarga ta'sir qiluvchi parametrlarini simulyatsiyalash orqali tadqiq qilish imkoniyatini beradi.

OptiFiber ilovalarni quyidagilarni o'z ichiga oladi:

- bir modali optik tolalarni loyihalashtirish;
- ko'p modali optik tolalarni loyihalashtirish;
- optik tolali parametrlarni baholash;
- o'lchangan tolalar profillarini tahlil qilish;

OptiBPM - fotonik qurilmalarda optik signallarni xususiyatlarini tadqiq qilish, multiplekslash va demultiplekslashni amalga oshiradigan murakkab optik to'lqin o'tkazgichlarini loyihalash imkonini beruvchi loyihalash dasturi. OptiBPM nurni tarqalish usuliga (BPM) asoslangan bo'lib, u har qanday to'lqin o'tkazuvchi vosita orqali, xoh izotrop, xoh anizotrop bo'ladimi, yorug'likning o'tishini taqlid qiladi.

OptiBPM yordamida bir vaqtning o'zida yaqin moda maydoni taqsimotini va emissiyani kuzatishingiz mumkin. Ushbu dastur splitterlar, ulagichlar, modulyatorlar va multipleksorlarni loyihalash imkonini beradi.

OptiFDTD - bu uch o'lchamdagi fotonik komponentlarni loyihalash va modellashtirish imkonini beruvchi dastur. Dastur vaqt maydoni chekli farqlar usuliga asoslangan (Finite Difference Time Domain, FDTD), bu Maksvell tenglamalarini ikkinchi darajali aniqlik bilan echish uchun raqamli algoritmdir.

OptiFDTD quyidagi imkoniyatlarga ega:

- yorug‘lik to‘lqinlarning tarqalishi, sochilishi, aks etishi va diffraktsiyasini modellashtirish;
- nohiziqli optik hodisalarni modellashtirish;
- yorug‘lik manbalarini modellashtirish;
- optik elementlarni modellashtirish (nometall, linzalar va polarizatorlar);
- taqsimlangan elementlarni modellashtirish (optik tolali kuchaytirgichlar va dispersiyani kompensatsiya qiluvchi elementlar);
- optik tolalar va boshqa qurilmalarning dispersiya xususiyatlarini baholash.

OptiSPICE - lazerlardan kuchaytirgichlarga, optik konnektorlar va dispersiya kompensatorlariga optoelektronik sxemalarni loyihalash va simulyatsiya qilish uchun ishlatiladigan dastur hisoblanadi.

Optik aloqa sohasida tadqiqot masallarini yechishda qo‘llaniladigan virtual paket dasturlar tahlili shuni ko‘rsatdiki, Telekommunikatsiyalar sohasida o‘quv jarayonini tashkil etish va ilmiy tadqiqotlar olib borish uchun virtual laboratoriya asosi sifatida foydalanish mumkin. Simulyatsiyalovchi dasturiy vositalardan ilmiy maqsadlarda foydalanishda optik aloqa tizimlarining yangi modellarini yaratish va tadqiq qilish imkoniyatini beradi.

Dasturiy ta‘minot majmuasi asosida virtual laboratoriyaning rivojlanishi Telekommunikatsiyalar sohasida malakali mutaxassislar tayyorlashda oliy ta‘lim muassasalarida laboratoriyalar tashkil etish muammosini hal qilishni soddalashtirish tiradi.

Adabiyotlar ro‘yxati

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An abstract graphic featuring a complex network of interconnected nodes and lines, resembling a molecular structure or a digital network, set against a dark blue background. The nodes are represented by circles of varying sizes, and the lines are thin, light blue, creating a web-like pattern that fills the upper two-thirds of the page.

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